EDF Energy Nuclear Generation Ltd

Decommissioning of Hunterston B Nuclear Power Station

Environmental Statement

Volume I: Main Text

November 2023

Public

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Report for

EDF Energy Nuclear Generation Limited (EDF)

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Document Reference:

852351-WSPE-XX-XX-RP-O-00001_A_P01

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Document revisions

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1	First Issue	November 2023

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Introduction

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1. Introduction

1.1 Introduction

1.1.1 This Environmental Statement (ES) supports an application made by EDF Energy Nuclear Generation Limited (hereafter referred to as the 'Applicant') to the Office for Nuclear Regulation (ONR) to achieve consent to carry out the dismantling and decommissioning of the Hunterston B Nuclear Power Station (hereafter referred to as 'HNB') under the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (as amended) (hereafter referred to as 'EIADR')[1].

1.1.2 If consented, the decommissioning works would include the dismantling and deconstruction of buildings and structures in areas within and outside of the Nuclear Site Licence (NSL) boundary that are part of the power station (the Proposed Works). To assist the identification of these areas for assessment, an Indicative Dismantling Works Area (hereafter referred to as the 'Works Area') has been identified. For the purposes of assessment, the NSL boundary is referred to as the 'Site'. The Site and Works Area boundaries are shown in **Figure 1.1**. This ES has been prepared in accordance with the EIADR. A description of the other legislative and regulatory frameworks that this application interacts with, is presented in **Chapter 4: Policy and Legislation**.

1.2 Overview of the Decommissioning Process and Proposed Works

1.1.1 HNB is a twin reactor Advanced Gas Cooled Reactor (AGR) station, which ceased electrical power generation in January 2022 after 46 years of service and defueling of the reactors has now commenced. The Applicant's strategy for decommissioning HNB is to achieve 'Early Safestore', by enclosing the two reactors and debris vaults in a Safestore structure which will ensure the integrity of the enclosed structures to enable the deferment of dismantling of these elements to a later date. To align with this strategy, the decommissioning process at HNB is planned to be delivered under three phases which are summarised as follows:

- **Preparations for Quiescence phase** – This phase includes the de-planting, dismantling and deconstruction of all plant and buildings not included within the Safestore structure on-site and the relevant management of wastes arising from the activities undertaken during this phase. In addition, it includes the modification of the existing reactor building to create the Safestore structure.
- **Quiescence phase** – A period of relative inactivity with management of a mainly quiescent state to allow further radioactive decay of materials within the Safestore. The duration of this phase is approximately 70 years, during which there would be a regime of continuous monitoring and surveillance, with periodic care and maintenance interventions as required.
- **Final Site Clearance** – The reactors and debris vaults will be dismantled and removed. Construction and engineering works to prepare for these final dismantling tasks will take place to ensure the provision of the necessary infrastructure, services

[1] UK Government (1999). *Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (as amended)* (Online) Available at: https://www.legislation.gov.uk/uksi/1999/2892/contents/made (Accessed May 2023).

and facilities. Upon clearance and delicensing, the land will be released for future re-use.

1.1.2 A more comprehensive description of the Proposed Works is presented in **Chapter 2: The Decommissioning Process**.

1.3 The Applicant

1.1.3 At the time that this ES will be submitted, EDF Energy Nuclear Generation Limited (ENGL) is the current Licensee holding the Nuclear Site Licence for HNB granted under the Nuclear Installations Act 1965 (as amended)[2]. ENGL is making this application as the current Licensee (as defined in the EIADR) and in accordance with obligations under the Nuclear Site Licence (Licence Condition 35) to make and implement adequate arrangements for the decommissioning of HNB.

1.4 The Applicant and the Nuclear Decommissioning Authority

1.4.1 In 2021, the UK Government and EDF agreed revised arrangements to deliver the decommissioning of the seven Advanced Gas Cooled Reactor (AGR) stations, including HNB. Under the revised arrangements, the AGR stations, including HNB, will transfer to the Nuclear Decommissioning Authority (NDA) following End of Generation and the removal of all fuel from the reactors and fuel ponds. The transfer of the AGR stations from ENGL to the Nuclear Decommissioning Authority will be subject to regulatory approvals, with Magnox Ltd (a subsidiary of the NDA) applying to become the Licensee and holder of the Nuclear Site Licence for each of the AGR sites. Thereafter, the NDA and Magnox Ltd will become the responsible parties for implementing the decommissioning programmes.

1.4.2 In light of Magnox Ltd being the responsible party for delivering the majority of the decommissioning works consented by this EIADR, it is important to highlight that EDF and Magnox Ltd have worked collaboratively to inform Magnox Ltd of plan developments at the AGR sites, including HNB. A review of synergies that could be realised at HNB considering Magnox Ltd delivery and the adjacent site at HNA has been undertaken and has led to changes to the original HNB decommissioning proposals, to take advantage of this where relevant. In addition, synergy groups have been set-up between EDF and Magnox Ltd to share learning from decommissioning at other UK nuclear sites to help develop EDF's decommissioning proposals as they become more detailed.

1.4.3 In November 2023, Magnox Ltd commenced a re-branding exercise to Nuclear Restoration Services. The legal entity at the time of submission is still Magnox Ltd, and thus, throughout this EIADR submission, references to 'Magnox Ltd' are retained.

1.5 The project team

1.1.4 This ES has been prepared on behalf of the Applicant by WSP UK Limited.

1.1.5 Regulation 5(2)a of the Guidance on the EIADR[3] it states that the ES "*shall be prepared by a competent person and state the relevant expertise and qualifications of that person*".

[2] UK Government (1965). *Nuclear Installations Act 1965 (as amended)* (Online) Available at: https://www.legislation.gov.uk/ukpga/1965/57 (Accessed November 2023).
[3] Office for Nuclear Regulation (2023). *Guidance on the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations* (Online) Available at: onr-nlr-gd-001.docx (live.com) (Accessed November 2023)

Appendix 1A presents the Competent Experts and Competency Statement provided by the Applicant.

1.5.1 WSP is registered with the Institute of Environmental Management and Assessment (IEMA)'s Environmental Impact Assessment (EIA) Quality Mark scheme. The scheme allows organisations that lead the co-ordination of EIAs in the UK to make a commitment to excellence in their EIA activities and have this commitment independently reviewed.

1.6 Environmental Impact Assessment

1.6.1 This ES forms the written reporting of EIA activities carried out on behalf of the Applicant. An ES is required to gain consent for the Proposed Works from the ONR as per Regulation 5(1) of EIADR[1]. The EIA assesses the likely significant effects of the Proposed Works on the environment and identifies the measures to mitigate these likely significant effects where required.

1.6.2 EIADR do not define specific significance criteria with respect to the evaluation of likely significant effects. Therefore, the overall approach that has been taken to defining significance of effects, as well as further information about the approach to preparing this ES, is presented in **Chapter 5: The Environmental Impact Assessment Process.**

1.6.3 In accordance with good practice, a Scoping Report for the Proposed Works was prepared, to identify the potential environmental effects associated with the Proposed Works at the time that the Scoping Report was prepared. Of these effects, those that were considered at the time to be likely significant effects, were proposed for further assessment in the EIA, whereas those that were not, were not proposed to be considered further.

1.6.4 The Scoping Report was issued to the ONR on 03 August 2022, with a request for the ONR to provide its written opinion as to the scope and level of detail of information proposed to be provided within this ES, under Regulation 6(1) of EIADR. The ONR consulted with the statutory consultation bodies (as per Regulation 2 of EIADR) and other relevant consultation bodies, where it was deemed appropriate by the ONR.

1.6.5 Drawing on the ONR Pre-application Opinion[4], which was adopted on 04 October 2022, assessment work, as presented in this ES, has been informed by technical engagement with statutory consultation bodies and other stakeholder engagement. This ES includes the relevant environmental information to identify and assess the likely significant environmental effects of the Proposed Works. In response to specific points raised in the ONR Pre-application Opinion (see **Appendix 5A**), a Technical Note (see **Appendix 5B**) was produced and submitted to the ONR to clarify the scope of the EIA prior to the submission of the ES.

1.7 Purpose of the Environmental Statement

1.1.6 The Applicant may not commence the Proposed Works unless it has applied for and gained a consent from the ONR (as the determining authority) to carry out the Proposed Works (Regulation 4(1) of EIADR). The information that is required to be included in an ES is set out in Regulation 5(1) as shown below in **Table 1.1**.

[4] ONR (2023). *ONR-OFD-AR-22-026 Hunterston B EIADR Pre-Application Opinion*. (Online). Available at: https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.onr.org.uk%2Fdocuments%2F2023%2Fhunterston-b-onr-ofd-ar-22-026.docx&wdOrigin=BROWSELINK. (accessed August 2023).

Table 1.1 Regulation 5(1) ES requirements

Regulation 5(1) ES requirement	Relevant chapter
"a) a description of the project comprising information on the site, design, size and other relevant features of the project;	**Chapter 2: The Decommissioning Process**
b) a description of the likely significant effects of the project on the environment;	Environmental aspect **Chapter 6 – 20**
c) a description of any features of the project or measures envisaged to avoid, prevent or reduce and, if possible, offset, any likely significant adverse effects on the environment;	Environmental aspect **Chapter 6 – 20**
d) a description of the reasonable alternatives studied by the licensee, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the likely significant effects of the project on the environment;	**Chapter 3: Alternatives**
e) a non-technical summary of the information referred to in sub-paragraphs (a) to (d); and	**Non-Technical Summary (NTS)**
f) any further information specified in Schedule 1 relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected."	Environmental aspect **Chapter 6 – 20**

1.8 Structure of this Environmental Statement

1.1.1 This ES comprises:

- Volume I: ES Main Chapters – (This volume) presents the main body of the EIA, including the description of the site and the Proposed Works; a review of reasonable alternatives; an outline of the EIA process; and the EIA assessment which is divided into a number of environmental aspect chapters;
- Volume II: ES Figures – Figures to illustrate the Proposed Works and any assumptions, or to support the environmental aspect chapters;
- Volume III: ES Technical Appendices – Additional reports and survey data which provide further detail on the environmental aspect assessments undertaken and information used to inform the assessments presented in Volume I; and
- Volume IV: Non-Technical Summary (NTS) – provides a standalone summary of the Proposed Works and the findings of the ES in non-technical language.

1.1.7 The remainder of this volume of the ES is structured as follows:

- **Chapter 2: The Decommissioning Process** provides a description of the Proposed Works;
- **Chapter 3: Alternatives** provides a review of key alternatives considered for the delivery of HNB decommissioning;
- **Chapter 4: Policy and Legislation** provides an overview of the principal legislation, policies and guidance that are relevant to the Proposed Works;
- **Chapter 5: The Environmental Impact Assessment Process** details the overarching approach and methodology that has been adopted to inform the technical assessment of each environmental aspect in this ES;
- **Chapters 6 - 20** present the technical assessments for each environmental aspect and define likely significant environmental effects which may arise as a result of the Proposed Works. Environmental measures and mitigation are identified where appropriate;
- **Chapter 21: Cumulative Effects Assessment** presents the assessment of cumulation of effects with other existing or approved projects or effects in combination with other environmental aspects, on the same receptor or receptor group; and
- **Chapter 22: Summary** provides a summary of the likely significant effects for each of the environmental aspects and relevant mitigation measures.

1.8.1 The glossary and abbreviation list can be found in **Appendix 1B**.

1.9 Other documents

1.9.1 Documents that are provided to support this ES include:

- Hunterston B EIADR Consultation Feedback Report;
- Outline Environmental Management Plan; and
- A Habitats Regulations Assessment Screening document (to accord with Regulation 4A of EIADR)[1].

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The Decommissioning Process

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2. The Decommissioning Process

2.1 Introduction

2.1.1 This chapter provides a description of the Hunterston B (HNB) Nuclear Site Licence (NSL) boundary ('the Site'), the Indicative Dismantling Works Area ('the Works Area') and its surroundings, and a description of the Proposed Works and the main activities to be undertaken in each phase of the decommissioning project at HNB.

2.2 The Site and surroundings

2.2.1 Construction of HNB commenced in 1967, with the station coming online and generating power in February 1976. The nuclear plant comprises two Advanced Gas-cooled Reactors (AGR) providing steam at high pressure and temperature to two dedicated 660 MW steam turbine generators. Since 1976, HNB has generated low carbon electricity for 77.9 million homes and avoided 101.5 million tonnes of Carbon Dioxide (CO_2) compared to conventional thermal power stations. The Site ceased generation from Unit 1 on 26 November 2021 and Unit 2 on 7 January 2022.

Site location and context

2.2.2 The Site is located on the west coast of Scotland on the Firth of Clyde (see **Figure 2.1**), opposite the islands of Great and Little Cumbrae. It is approximately 7 km south/south-west of the seaside town of Largs, approximately 3.5 km to the north-west of West Kilbride and within the jurisdiction of North Ayrshire Council (NAC).

2.2.3 It neighbours the Hunterston A (HNA) nuclear power station which ceased generation in 1990 and is currently being decommissioned. Magnox Ltd released a case study in 2021 outlining that the previous strategy for decommissioning Magnox Ltd reactor sites to defer Final Site Clearance for approximately 85 years from End of Generation may not be the most suitable decommissioning methodology for all Magnox Ltd reactor sites, with the NDA endorsing a site-specific approach to reactor dismantling. This study outlined that for some sites, this will result in their decommissioning being brought forward whilst for others a deferral strategy with varying deferral periods will be the chosen approach. At the time of writing, Magnox Ltd has not published a revised decommissioning strategy for HNA, and thus for the purposes of assessment, it is assumed that Final Site Clearance of HNA will commence in approximately 2075 after entering Care and Maintenance in approximately 2030. Any change in decommissioning strategy of the HNA site will be subject to confirmation that no likely significant environmental effects arise from the proposed change in approach. If changes are found to have likely significant effects, Magnox Ltd will progress a formal change under Regulation 13 of the EIADR which will involve the submission of a revised EIA to ONR for determination and approval.

2.2.4 Both stations are largely surrounded by land in agricultural use with regular, medium sized fields divided by drainage ditches and hedges. The coastal foreshore of Hunterston Sands and mudflats to the north and west of the Site, and the Southannan Sands and raised beach to the north-east are prominent features in the local landscape.

2.2.5 In the immediate vicinity, much of the land in the Works Area has formed part of the Hunterston estate dating from around the 12th Century. The historic Hunterston House and the neighbouring Hunterston Castle remain part of the Hunterston estate, to the east

of the Site. To the north of Power Station Road (the main access to the Site) lies Hunterston Port and Resource Centre (Hunterston PARC), a deep-water port and former coal terminal. The Marine Construction Yard within Hunterston PARC has recently hosted a National Offshore Wind Turbine Test Facility and planning policy objectives, as outlined in the North Ayrshire Adopted Local Development Plan[1] and National Policy Framework 4[2] are to regenerate the site to provide an industrial and economic hub.

2.2.6 To the south of the station are 132 kV and 400 kV substations that connect the station to the national transmission network. Additionally, a High Voltage Direct Current (HVDC) converter station is located to the south of the Site to support the export of electricity to the rest of the UK, mainly generated by wind power from across Scotland.

Existing site surroundings

2.2.7 Notable environmental features in proximity to the site are shown on **Figure 2.2**. The site is located approximately 0.2 km south of Southannan Sands Site of Special Scientific Interest (SSSI) which is designated as the best representative example of intertidal sandflat habitat on the Clyde coastline. Portencross Woods SSSI lies approximately 0.5 km south of the Site but is adjacent to the Cooling Water (CW) Intake and Jetty (shared with HNA) which require decommissioning as part of the works and is included within the Works Area.

2.2.8 The Ayrshire Coastal Path is an approximately 170 km route largely following the coastline from Glenapp in the south to Skelmorlie in North Ayrshire. The route utilises the Power Station Access Road from the Jetty past the Site, through the Works Area.

2.2.9 Power Station Road connects directly to the A78 which is part of the Scottish Truck Road Network. The A78 largely follows the coastline from Greenock towards Ayr. The main vehicle access to Glasgow from the Site is provided via the A78 southbound in combination with the A737. The A78 northbound provides an alternate route to Glasgow, but requires transportation through Fairlie, Largs and Greenock prior to joining the A8 and the wider motorway network west of Glasgow.

2.2.10 The nearest train stations to the Site are located in Fairlie (3.3 km by road), West Kilbride (4 km by road). There is a further station at Largs where the line terminates. There is a railhead nearby at Hunterston Port that the Applicant currently uses for the transportation of spent fuel flasks to the nuclear fuels reprocessing plant in Sellafield. The relationship to utilise this railhead is expected to conclude following the completion of defueling, anticipated in 2025.

Site description

2.2.11 The Site is located on a gentle north-facing slope which rises from an elevation of approximately 5 m Above Ordinance Datum (AOD) close to the northern boundary of the Site to approximately 25 m AOD at its southern boundary. The area within the Site predominantly features built form of the Reactor Building and adjoining Turbine Hall, and an expansive range of smaller ancillary buildings, warehouses and tanks. These are set within operational land-uses comprising access roads and service yards all bound by

[1] North Ayrshire Council. (2019), *Adopted Local Development Plan*. (online). Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed November 2023).
[2] Scottish Government (2003)., *National Policy Statement 4* (online) Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2023/02/national-planning-framework-4/documents/national-planning-framework-4-revised-draft/national-planning-framework-4-revised-draft/govscot%3Adocument/national-planning-framework-4.pdf (Accessed November 2023).

security fencing. The remaining areas within the Site comprise staff car parks located within the north-western corner and amenity grassland with some tree cover along the southern edge of the Reactor Building and the southern perimeter.

2.2.12 The Site is approximately 30 hectares and is shown on **Figure 1.1,** alongside the Works Area, which covers approximately 34.5 hectares. Three areas (identified in **Figure 2.3**), within the Works Area are referred to throughout this ES for the purposes of describing the Proposed Works as follows:

- The Radiation Controlled Area (RCA) – This is made up of three areas on the HNB Site. The main central location consists of the Reactor Building (containing the two reactors) and a number of adjoining structures containing plant and structures that have the potential to contain radioactive contamination. This area includes areas such as the fuel cooling ponds, the debris vaults and other radioactive waste treatment plant and buildings. The northern RCA area is where the site laundry and existing Low Level Waste (LLW) building is located. The southernmost RCA area is the former Gas circulator workshop and former health physics centre from when HNB and HNA were operated as a combined site.
- The Conventional Area - consists of the area outside of the RCA. It includes ancillary plant and buildings such as the Turbine Hall and services building, cooling water systems and numerous other buildings, compounds, roadway, hardstandings which make up the operational site. For the purposes of assessment, it also includes areas outside of the main security fence such as the car parks, and other structures that require removal as part of the Proposed Works such as the Sewage Treatment Plant, electricity transmission buildings and the Cooling Water Intake and Outlet Land Shafts.
- The Marine Works Area – The Cooling Water Intake and Outfall, associated tunnels and the Jetty and are not included within the Site but are key parts of the power station that will be decommissioned.

Site layout

Graphic 2.1 Location of notable site areas

2.2.13 A double security fence surrounds the Site and HNA. An additional fence separates the two power station sites to the east of the HNA Reactor Buildings. A further fence encloses the electricity transmission switch houses to the south of the Reactor Building.

2.2.14 The two AGRs are both housed within pre-stressed concrete pressure vessels within the Reactor Building in a central location of the HNB site. This Reactor Building is topped by a rectangular charge hall to allow for the changing and removal of fuel from the reactor. Common fuel handling, active maintenance and active waste disposal facilities are arranged in a central services block between the two reactors. Other common reactor services and fuel dispatch are also accommodated in the central services block. The charge hall is a steel-framed structure enclosed with lightweight steel cladding and glazing and roofed with metal decking. The total building size is approximately 119 m long, 50 m wide and 65 m high above ground level.

2.2.15 Ancillary services associated with the handling of active materials and fuel are grouped on the south side of the Reactor Buildings. These are adjacent to the central services block, together with the gas treatment and filtration plants. The cooling ponds, Active Effluent Treatment Plant (AETP) and Pond Water Treatment Plant (PWTP) are situated adjacent to each other below ground level to the south of the Reactor Building. Other buildings within the controlled area include the decontamination centre, fuel store and maintenance cell.

2.2.16 To the north of the Reactor Building is the adjoining Turbine Hall which holds two turbines. Buildings to the north of the Turbine Hall include buildings such as the laundry, the health physics building and Low Level Waste (LLW) Facility which make up the northern Radiation Controlled Area. Chemical stores for substances such as hydrogen and diesel

are located to the east of the Turbine Hall, with some plant and boilers also located in this area.

2.2.17 To the north-west of the turbine hall lies the contractors compound, the training centre and various contractor storage buildings.

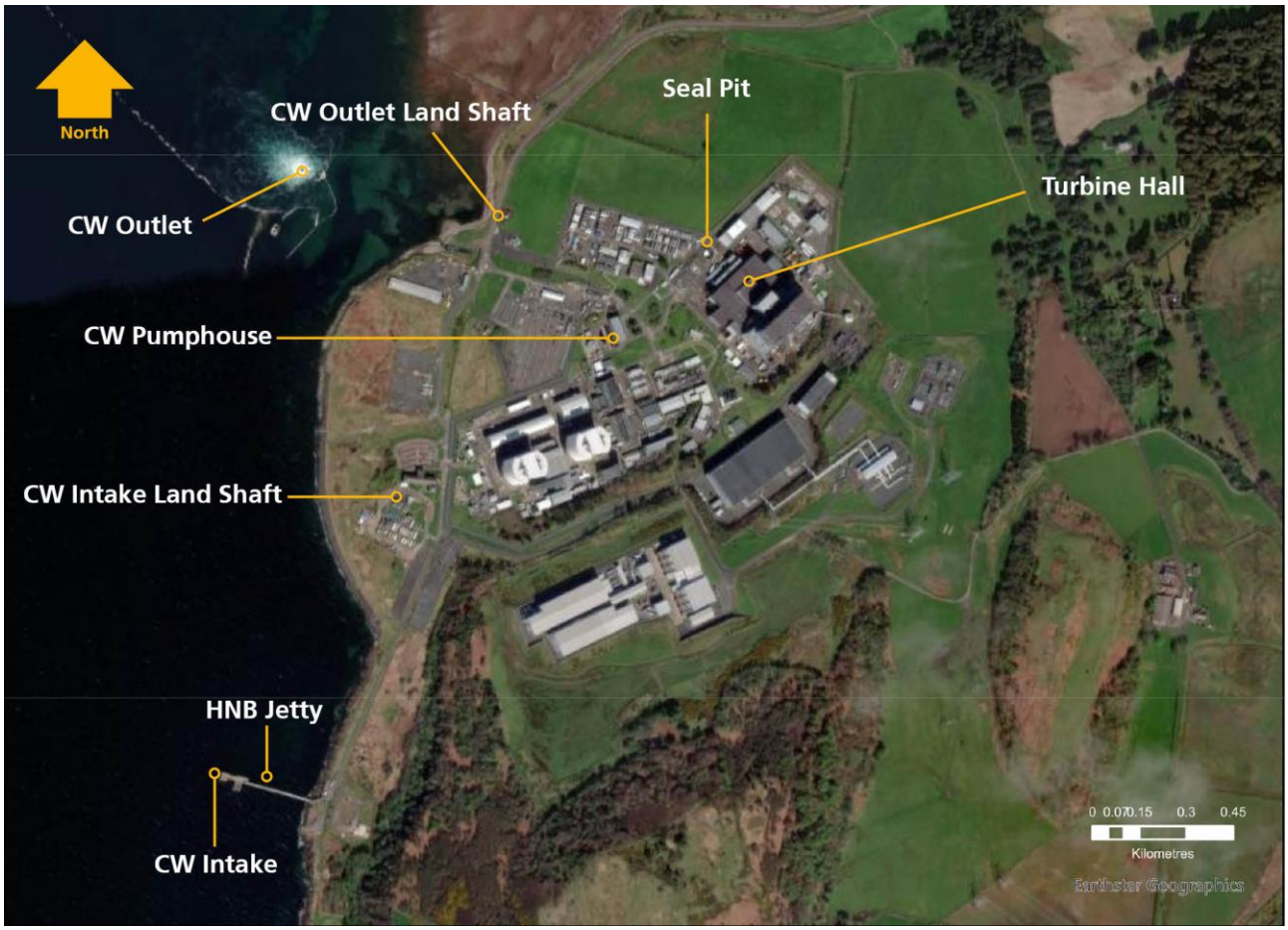
2.2.18 To the south and west of the turbine hall and reactor building is a group of buildings which includes the main site administration building, further office facilities, the staff canteen, workshops, various stores. As outlined on **Figure 2.3**, the southern Radiation Controlled Area is located in this location which is the Gas Circulator Workshop and Former Health Physics building.

2.2.19 To the north of these buildings are the majority of above ground elements of the CW system including the CW Pumphouse. Further detail on the CW system is provided in the paragraphs below.

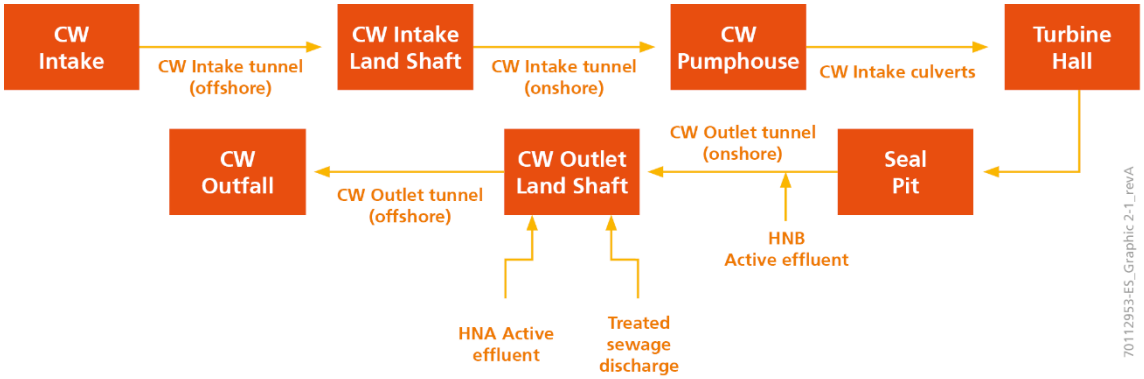
Cooling Water system

2.2.20 The above ground features of the CW System are shown in **Graphic 2.2a**. A schematic drawing of the CW system is shown on **Graphic 2.2b.** Seawater is drawn from the Firth of Clyde at the end of the Jetty. The CW Intake structure consists of vertical reinforced concrete driven piles with an in-situ reinforced concrete deck slab. The vertical shaft below the intake structure connects to the 3.66m diameter concrete lined CW Intake Tunnel which runs for a length of 1,078m through rock to the forebay of the CW Pumphouse. Approximately halfway along this tunnel is the CW Intake Land Shaft which provides an access point into the CW Intake Tunnel.

Graphic 2.2a Above ground features of the CW System



Graphic 2.2b Schematic diagram of HNB CW system



2.2.21 The jetty gives access to the CW Intake for maintenance purposes, such as the clearing of the trash screens at the CW Intake. This jetty is shared with HNA. There is a sodium hypochlorite plant serving the intake at the shore end of the jetty. The plant consists of two storage tanks in an underground concrete bund and an above ground modular building.

2.2.22 The CW Pumphouse is in three sections: the forebay, the screen chambers and the pumphouse itself. The whole structure is located at the west of the Site. The forebay is attached to the west side of the screen chambers. This is an uncovered reinforced

concrete sub structure, with the base at approximately 7.92 m below ground level, which connects to the end of the CW Intake Tunnel.

2.2.23 The CW Pumps draw water from the forebay through the screen chambers, which filters the seawater prior to the water reaching the CW Pumps.

2.2.24 These CW Pumps send cooling water to the Turbine Hall via two reinforced concrete 2.36 m diameter CW intake culverts. The culverts run underground for approximately 190 m from the CW Pumphouse to the turbine condensers in the Turbine Hall.

2.2.25 Water leaving the turbine condensers flows through two square 2.29 m reinforced concrete box section outlet culverts to the Seal Pit. The Seal Pit is an open topped concrete structure (7.92 m deep) with a weir in the base which the water flows over and down a vertical shaft to connect with the end of the CW Outlet Tunnel.

2.2.26 Active effluent is piped from the south of the reactor building and round the east side of the reactor building (underground) to the Seal Pit where it is mixed and diluted with Cooling Water and discharged out to sea via the CW Outlet Tunnel and CW Outfall. This permit for discharge is reliant upon operation of the CW pumps as the cooling water flushes the active effluent out of the CW Outlet Tunnel to the CW Outfall.

2.2.27 The 3.35 m diameter concrete lined CW Outlet Tunnel runs westwards for approximately 745 m through rock to the CW Outfall in the Firth of Clyde. The CW Outlet Tunnel Land Shaft is situated approximately 380 m along this tunnel to allow for man access, dewatering and antifoaming chemical injection purposes. It is adjacent to this location that the discharge from the HNB Sewage Treatment Plant and HNA active effluent discharges connect into the CW Outlet Tunnel for discharge into the Firth of Clyde. The tunnel terminates at the CW Outfall in a vertical 90-degree bend at -2.9 m which is always below the sea surface.

Drainage infrastructure

2.2.28 Some of this drainage infrastructure is also shared with HNA. The main discharge for surface water is located to the south-west of the power station access roundabout via an oil interceptor. A small northern section of the site does however discharge to the sea via a small surface water ditch to the north of the station. This existing drainage system is expected to be left in-situ and maintained as necessary throughout the decommissioning programme with adaption where necessary.

2.2.29 The foul water system on the HNB site takes flows to the Sewage Treatment Plant which, following treatment, then discharges into the CW Outlet Tunnel at the CW Outfall Land Shaft under the authorisation of a permit from Scottish Environmental Protection Agency (SEPA).

2.3 Description of the Decommissioning Process

Overview

2.3.1 This section sets out the description of the decommissioning proposals for the purposes of this Environmental Statement (ES). Whilst timescales and working practices may change while the decommissioning plan becomes further developed, it provides a ‘realistic worst case’ for the Proposed Works at HNB based on current understanding of the proposals. Ongoing development and changes to the decommissioning proposals by the Site Licensee post EIADR consent will be assessed against the basis of this project description as outlined in **Appendix 5C** ‘HNB Managing EIADR Compliance’.

2.3.2 For the purpose of this ES, the Proposed Works do not include the defueling of the reactor in accordance with the definition of decommissioning and requirements for assessment under the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999[3] (EIADR) (as amended).

2.3.3 The Proposed Works will be undertaken in three phases:

- Preparations for Quiescence phase;
- Quiescence phase; and
- Final Site Clearance phase.

2.3.4 The indicative decommissioning timeline within **Graphic 2.3** has been utilised for the purposes of assessment. It represents the current understanding for the 'best case scenario' for the completion of works in the Preparations for Quiescence phase which also is considered to represent the worst-case for the assessment via an intensification of the Proposed Works on site relative to a slower Preparations for Quiescence phase.

[3] UK Government (1999). *Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999* (Online) Available at: https://www.legislation.gov.uk/uksi/1999/2892/contents/made (Accessed May 2023).

Graphic 2.3 Decommissioning Timeline

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Preparations for Quiescence phase

2.3.5 The Preparations for Quiescence phase begins after defueling and forms the first phase of the Proposed Works.

2.3.6 The purpose of the Preparations for Quiescence phase is to reduce the hazard presented by the radioactive and non-radioactive materials and wastes on site and to place the Site into a passively safe and secure state for the Quiescence phase where the need for human intervention to maintain acceptable conditions is minimised.

2.3.7 The Preparations for Quiescence phase will be a period when the Site undergoes a relatively large amount of civil engineering work, including demolition of all existing buildings, except for the Reactor Building which will be repurposed and modified to create a 'Safestore' to allow further radioactive decay to occur during the Quiescence phase. The Preparations for Quiescence phase will involve the processing, packaging and removal of some operational Intermediate Level Waste (ILW) that has accumulated on-site and the processing, packaging of LLW generated as a result of deplanting and demolition activities.

Deplanting and deconstruction

2.3.8 Some hazardous chemicals and hazardous chemicals within plant have been drained and removed from site already in parallel to defueling as part of hazard reduction works. This has only been undertaken when the following requirements have been met:

- Where the purpose of the work is solely hazard removal for plant where ongoing site activities do not necessitate the chemicals presence on-site;
- Where chemicals could be brought back to site and plant could be re-commissioned should it be necessary (i.e. removal of chemicals do not permanently prevent its use); and
- Where the works can be done safely and in-line with existing site processes to prevent environmental impacts from the works.

2.3.9 Deplanting is the process by which plant is isolated, drained of fluids, flushed/cleaned (if necessary) and removed from the Site. Full deplanting will be undertaken in the Conventional Area in sequence, with building demolition. Deplanting will also be undertaken in the RCA in an activity referred to as 'Active Area Deplanting'. This will support the removal of some buildings within the RCA, but will also remove hazards from the Safestore prior to the Quiescence phase to help enable simpler monitoring and maintenance.

2.3.10 Deconstruction is the term given for the removal of buildings and structures to ground level as part of the Preparations for Quiescence phase.

Conventional deplanting and deconstruction

2.3.11 The deplanting and deconstruction of buildings and structures in the Conventional Area during the Preparations for Quiescence phase is broken into 13 zones. **Appendix 2A** outlines the buildings and structures included within each of these 13 zones. The location of these zones can be found on **Graphic 2.4**. The northern and southern 'satellite Radiation Controlled Areas' at HNB lie within zones 8 and 11 respectively. It is expected that these will be deplanted and fully decontaminated under the Active Area Deplanting works which will enable them to be demolished as conventional buildings using conventional methods as outlined in the programme in **Graphic 2.3**.

Graphic 2.4 Location of Buildings within each Managed Retreat building group

*Note – Group 3 also includes the work to decommission the Jetty, CW Intake and CW Intake Land Shaft structures

2.3.12 Exact methodologies to be used during deconstruction will be determined by the appointed contractor at the time, although it is expected that larger plant will be cut or split on site into components or sub-components to facilitate its simpler removal from the Works Area.

2.3.13 All Conventional Area buildings and structures will be demolished in their entirety, including the removal of any cabling to ground level. Whilst demolition is generally to ground level, some buildings on-site contain basements that also require demolition and deconstruction. Likewise, there is a need to undertake some works below ground level to remove trenched pipework where land contamination may have occurred during operation.

2.3.14 The works below ground will create voids, with their anticipated size and assumptions detailed in **Table 2.1**. It is currently planned that existing drainage infrastructure is left in-situ to assist the drainage of the Site during the Quiescence phase and thus no assumption of the size of these voids are outlined below.

Table 2.1 Table of main voids created during the Preparation for Quiescence phase

Building	Void (m3)	Void to be filled (m3)	Assumption
Turbine Hall	51,817		Void may be left partially filled through the Quiescence phase and managed accordingly.
Forebay	1,500	1,500	Infilled with material generated from demolition activities
CW Pumphouse (inc. chambers, drumscreens and trash baskets)	8,600	8,600	Infilled with material generated from demolition activities but may be left partially unfilled through quiescence phase and managed accordingly
Gate Valve	60	60	Infilled with material generated from demolition activities
Seal Pit	1,150	1,150	Infilled with material generated from demolition activities but may be left partially unfilled through quiescence phase and managed accordingly
CW Intake Land Shaft	195	195	Infilled with material generated from demolition activities
CW Outlet Land Shaft	175	175	Infilled with material generated from demolition activities
Jetty Sodium Hypochlorite Plant	300	300	Infilled with material generated from demolition activities

2.3.15 The EIADR assumes that all suitable demolition material suitable for use as in-fill will be retained on-site to be used as in-fill for voids, specifically those of the CW system and the Turbine Hall basement. This will be subject to permissions from SEPA in the future. Prior to use as in-fill, it is anticipated that rubble debris from the demolition of buildings will first be crushed. Where practicable, concrete crushers that use compression rather than pneumatic hammers will be selected due to their lower noise profile. The crushing process is likely to be located within the laydown area created in Group 1 (see **Graphic 2.4**) which will allow for easier management of noise and dust mitigation. The size of plant required will depend on the rate at which it will be required to crush the material and the size and hardness of the concrete. The likely operation therefore would be to stockpile the arisings adjacent to the crusher and operate the equipment for only one or two days a week when required before using the material as fill promptly thereafter. For the purposes of assessment, this approach and the approach where it is crushed 'on location' in the relevant zone it has been produced have been assessed, with the worst case for noise forming the assessment case.

2.3.16 In addition to the voids outlined in **Table 2.1**, there are further substantial voids in the form of the CW tunnels. It is not anticipated that these voids will be filled. Further information about how the CW system will be decommissioned is outlined below.

Marine works and cooling water system decommissioning

2.3.17 A new Active Effluent Discharge Line (AEDL) will be installed from the Seal Pit to the Outfall in the Firth of Clyde by placing a new pipe within the CW Outlet Tunnel prior to decommissioning the CW System. This will enable the discharge of active effluent from the site in the absence of cooling water flow through the CW System. This will necessitate the variation of HNB's existing active effluent discharge permit. Further detail on the optioneering of revised active effluent discharge arrangements for decommissioning are provided in **Chapter 3: Alternatives**. It is assumed that these works would be implemented through the use of dive teams working from anchored pontoons around the CW Outfall to minimise sediment disturbance. HNA Active effluent and HNB Sewage will also be required to either have new pipes installed or tie into the new HNB AEDL pipe from the CW Outlet Land Shaft to carry these effluents to the existing CW Outfall in the Firth of Clyde.

2.3.18 Before deplanting and demolition of the CW system can commence, it will be necessary to isolate the CW system from the sea. The first stage of this is to lower the existing gates for the forebay/drum screen apertures and seal pit simultaneously at low tide. The inlet system from the drum screen bay to the turbines will be dewatered by pumping out the water into the forebay. The outlet system from the turbines to the Seal Pit will be dewatered by pumping out the water into the Seal Pit at the access chamber to the culverts adjacent to the Seal Pit.

2.3.19 The existing gate for the CW system sealing the intake structure at the end of the Hunterston Jetty will be lowered into position utilising a mobile crane. The intake tunnel will then be dewatered from the top of the intake structure into the Firth of Clyde.

2.3.20 At the intake and outlet land shafts, a concrete plug will be created on the seaward side of the structures within the tunnels, above ground sections demolished and the shafts filled with fill material generated from deplanting and deconstruction activities. Water retained between the CW Outlet Land Shaft and the seal pit will then be pumped into the Firth of Clyde subject to necessary permissions from SEPA. It is currently assumed that the CW Intake and Outlet Tunnels are not contaminated with radiation and are structurally sound and are thus suitable to leave in situ permanently. Sampling will be undertaken closer to the time of the works to validate this assumption that they are out of scope of the Environmental Authorisations (Scotland) Regulations 2018[4] (EASR 18) and do not constitute an 'on-site disposal'.

2.3.21 Following the completion of the concrete plug at the intake land shaft, the intake structure at the end of the Jetty can be demolished. This is assumed to be demolished by cutting sections of the deck of the intake structure and lifting this away by crane (located on the jetty). Each section of deck will be transported to a processing area. The jetty piles will be cut off at the sea bed level and removed. Where safe and practicable, the decommissioning will be undertaken from the shore, and at low tides. However, the works to remove the intake structure and part of the jetty will require the assistance of a dive team operating from a pontoon.

2.3.22 The CW Pumphouse will be deplanted and demolished requiring plant dismantling operations carried out in deep chambers. The outline method for demolition and plant dismantling of the CW Pumphouse is as follows:

- Prior to removal of the CW pumphouse superstructure, preparatory work will be carried out within the pump chambers to release pipework, CW pumps and motors.

[4] UK Government (2018). *The Environmental Authorisations (Scotland) Regulations 2018*. (Online). Available at: The Environmental Authorisations (Scotland) Regulations 2018 (legislation.gov.uk) (accessed November 2023)

The overhead crane will be used to move the equipment to the loading bay for processing.

- The superstructure will be demolished to expose the pump chambers and provide access to lift out any remaining plant and equipment with mobile cranes.
- The superstructure and building frame will be demolished using a long-reach excavator equipped with shears, and cut to be removed from the Site.
- Hydraulic breakers will be used to demolish the forebay.
- If available, site won material will be utilised to fill voids.

2.3.23 The CW Seal Pit and CW Outfall Land Shaft will be demolished to ground level and the voids will then be backfilled if material from on-site demolition activities is available.

Active area deplanting

2.3.24 The RCA consists of a number of buildings that have been used to handle radioactive materials. Apart from the Reactor Building and adjoining structures, these structures include: the LLW Store, the Laundry, the Health Physics Services Building, the Contaminated Plant and Gas Circulator Main Workshop and the former Health Physics Base Facilities. All these buildings set away from the Reactor Building will be demolished to ground level during the Preparations for Quiescence phase.

2.3.25 Although the basic deplanting and demolition techniques applied to radioactive facilities will be similar to those used for plant and buildings in the Conventional Area, well-established and effective techniques for controlling and containing radioactive contamination and reducing radiation exposure will be applied in line with the As Low As Reasonably Practicable (ALARP) principle. For example, where necessary, work will be done within temporary enclosures or containment structures, which will be specially ventilated and filtered. In addition, after de-contamination and prior to demolition, a fixative may be sprayed on exposed surfaces in order to control dust generation. If appropriate, further dust control will be ensured through the use of water sprays with appropriate management of the wastewater arising.

2.3.26 Deplanting within the Reactor Building will be undertaken to make the plant safe prior to the modification of the building into the Safestore for the Quiescence phase and to ease monitoring and maintenance of the facility through this period.

2.3.27 Prior to demolition, radioactive facilities (excluding the Safestore), will be de-planted and de-contaminated down to pre-specified levels. Monitoring checks will also be made on the building and on the demolition rubble to confirm that the radioactive contamination has been removed to the required level. The objective of this monitoring will be to ensure solid wastes classed as LLW are transferred to the Decommissioning Waste Processing Facility (DWPF) for further re-processing and packaging prior to waste consignment. All discharges of airborne radioactive contamination or liquid effluents will be monitored and controlled in accordance with the EASR18 permit. Following this, buildings will be removed to ground-level as part of conventional deconstruction as outlined above. Further information on waste management during the Preparation for Quiescence phase is provided in **Section 2.4**.

2.3.28 The active area deplanting works in the Preparations for Quiescence phase also require the removal of some operational ILW currently stored on site within specially designed tanks, vaults and stores. These wastes will be processed and removed from site in accordance with Best Practicable Means Studies. Some may require processing and packaging within the Operational Waste Processing Facility (OWPF) to make them ready

for long term storage. More information on Waste Management as part of the Proposed Works is provided in **Section 2.4**.

Modification of the Reactor Building to create the Safestore

2.3.29 The major plant and structures inside the Reactor Building are substantial, robust items within which the radioactivity is shielded and either naturally immobile or fully contained in high integrity vessels. Prior to the Reactor Building being put into a safe and secure state, some deplanting will be undertaken as outlined in paragraphs 2.3.24 – 2.3.28 above.

2.3.30 The Reactor Building will be modified during the Preparation for Quiescence phase to ensure that the building and contents remain safe, secure and weatherproof during Quiescence. Further detail on the optioneering process is provided in **Chapter 3: Alternatives.**

2.3.31 For the purposes of assessment, it is assumed that works to the Reactor Building will be undertaken during the Preparations for Quiescence phase. These works will involve:

- Scaffolding of the Safestore to assist removal of glazing and existing cladding;
- Use of Cranes to assist removal/ replacement of structural elements of the building; and
- Re-cladding of the Safestore to provide a secure weatherpoof envelope.

2.3.32 For the purposes of assessment, it is assumed that the Safestore will house the Charge Hall that sits above the Reactor Building, meaning the Safestore structure will remain the highest building on-site at 66.5 m until Final Site Clearance. The assessment also assumes the retention of the AETP as an annexe on the southern facade of the Safestore as including this plant within active area deplanting in the Preparations for Quiescence could cause delays to the completion of the Preparations for Quiescence phase.

2.3.33 Any change from the current cladding would have to be considered under the Town and Country Planning Act regime whereby an application for consent would be submitted to NAC. For the purposes of this EIADR assessment, and in particular in undertaking the Landscape and Visual Impact Assessment (see **Chapter 14: Landscape and Visual Impact Assessment**), it is assumed that the Reactor Building will be re-clad using standing seam aluminium cladding and would be coloured Dark Grey/blue.

2.3.34 Any necessary equipment to enable appropriate monitoring and management of conditions within the Reactor Building and to ensure security throughout the Quiescence phase will be installed during the Preparations for Quiescence phase.

Interim site landscaping

2.3.35 To soften views of the largely deconstructed Site, some interim site landscaping is proposed to be implemented during the Preparations for Quiescence phase. An indicative Interim Site Landscaping Plan is provided in **Appendix 14G** to outline future requirements of landscaping proposals. It is anticipated that this planting will happen at the earliest practicable point during the Preparation for Quiescence phase to enable it to mature in the Quiescence phase.

The Quiescence phase

2.3.36 Following completion of the Preparations for Quiescence phase, it is estimated the Site will remain in a mainly quiescent state for approximately 70 years. This is to allow for further decay of radioactive plant and materials housed in the Safestore prior to Final Site

Clearance to reduce the radioactive hazard when undertaking site clearance activities. The illustrative site layout during the Quiescence phase is shown on **Graphic 2.5**. The only structure remaining throughout this phase will be the Safestore. It is assumed that none of the Site will be released from its Nuclear Site License until after Final Site Clearance, and it is assumed that the existing fence lines on-site will be retained and monitored.

Graphic 2.5 Site layout during the Quiescence phase

2.3.37 Other than routine inspections and minor maintenance as necessary, there is minimal activity anticipated during the Quiescence phase. Should refurbishment of the Safestore cladding be required, there may be a need for a small re-mobilisation to site to undertake the works. This may involve the use of existing concrete slabs as laydown area for materials and portacabins to provide contractor facilities to manage the works. It would also be likely to require the use of scaffolding on the Safestore. Waste from any required recladding of the Reactor Building will be removed from the Site and will be recycled where possible.

2.3.38 Equipment will have been installed during the Preparations for Quiescence phase to enable remote monitoring of the Reactor Buildings and contents to ensure that no unacceptable conditions can occur without knowledge of the site operator. Alarm facilities will be provided so that attention is drawn to any circumstances that may require action. This will enable an appropriate and timely response to be made to any unusual occurrences.

2.3.39 It is unlikely that continuous monitoring by personnel on site will be required for the whole of the Quiescence phase. It is proposed that key parameters within the Safestore will be monitored from a remote location, supplemented by periodic visits by trained and competent personnel.

2.3.40 The inspection regime has yet to be finalised but would include external inspections that will identify damage to building fabric, such as the loss of cladding. Other building and site inspections will include:

- The integrity of site fences;
- Inspection of drains for blockages;
- Inspection of voids left in-situ through quiescence; and
- Inspection of drainage sumps.

2.3.41 These visits would take place both on a planned basis and following severe weather events, with a purpose of seeking to confirm that the Site remained safe and in a good state of repair.

2.3.42 It will be necessary to undertake grounds maintenance on the Site. As with current practice, the area around the security fences will be managed and hard surfaced areas and roadways will be maintained on an 'as required' basis. The clearing of ditches and drains on-site will be undertaken as required. It is intended that vegetation within the site boundary will be maintained to prevent it becoming overgrown, but opportunities for vegetation to be allowed to develop further will be explored through the development of the Interim State Landscape Plan (see **Appendix 14G**).

Final Site Clearance phase

2.3.43 The purpose of this phase is to remove the Safestore from the Site, including all radioactive or other hazardous materials and wastes, for the purpose of de-licensing the Site.

2.3.44 This includes the following activities:

- Site re-instatement.
- Safestore dismantling:
  - Reactor Building preparatory works;
  - Active area deplanting and reactor dismantling; and
  - Conventional demolition of Safestore Structure.
- Site remediation and de-licensing of the Site.

Site re-instatement

2.3.45 At the very end of the Quiescence phase, there will be works referred to as site re-instatement to re-establish a site presence and prepare for works during the Final Site Clearance phase. This will include the construction of a Decommissioning Waste Management Centre (DWMC). Whilst the design and location of these buildings will be designed and confirmed closer to the time, an indication of where the DWMC is likely to be located is shown on **Graphic 2.6**. It is anticipated that the DWMC will require consent under the Town and Country Planning Act (or equivalent) prior to their construction. More information about the DWMC is provided in **Section 2.4** below.

2.3.46 Other facilities and work required as part of site re-instatement may include the following:

- upgrading/modification of installed security systems and site access control;

- installation and/or upgrade of power, telecommunications, water, drainage and sewage systems to the site to support the enlarged workforce and activities to be carried out during Final Site Clearance;
- refurbishment/extension of site roads and car parks;
- construction of offices and welfare facilities;
- construction of workshops, stores, laboratories etc.; and
- construction of change facilities and controlled access points.

Graphic 2.6 Indicative Final Site Clearance site plan

Reactor Building and contents dismantling

2.3.47 Safestore building preparatory works marks the formal start of Final Site Clearance. These activities include works to ease access into the Safestore, install services and internal modifications to facilitate active area deplanting and reactor dismantling activities.

2.3.48 At all times, all necessary effort and attention will be placed on containing radioactivity, reducing worker radiation exposure, monitoring radioactive materials and appropriately packaging radioactive wastes.

2.3.49 Following preparatory works, remaining active plant, including the reactor pressure vessels will be deplanted in-line with methodologies in-line with those described for during the Preparations for Quiescence phase. Waste from these activities will be processed and packaged via the DWMC. When suitable access is available, works will commence to retrieve operational wastes from the HADVs. These will also be processed in the DWMC.

2.3.50 When all potentially contaminated and contaminated plant is removed from the Safestore, it will be demolished using conventional methods to ground level and any voids will be

filled with suitable material obtained from the demolition activities. Voids anticipated to be created during Final Site Clearance are outlined in **Table 2.2**.

Table 2.2 Voids to be filled during Final Site Clearance

Building role	Void (m3)	Void to be filled (m3)	Current plan for voids
Turbine Hall (if void retained through quiescence)	51,817		In-filled with site won material. Any leftover void left in situ at end of Final Site Clearance.
Ponds	1,000	1,000	In-filled with site won material
AETP	1,400	1,400	In-filled with site won material
Debris vaults	4,800	4,800	In-filled with site won material

Site remediation and de-licensing of the site

2.3.51 For the purposes of this assessment, it is assumed that there will be a future use of the Site and thus it will be left as brownfield land ready for re-development. It is assumed that there is no requirement to remove site infrastructure such as car parks, hardstanding, roads and water mains as this may be of use to a future user of the Site. Contaminated land on the site will be managed with a Land Quality plan which, in consultation with SEPA, will consign whether ground remediation is required prior to de-licensing of the site or not.

2.3.52 Given the extensive timeframe, site enhancement measures (e.g. artificial establishment of vegetation) have not yet been considered, however, this will be determined at the appropriate time. It is also recognised that the environment could change by the time Final Site Clearance commences and appropriate management should therefore be undertaken at that stage.

Deconstruction methods and management

Hours of work

2.3.53 HNB has operated a 24-hours a day, seven days a week operational working pattern through operations and subsequently defueling. During the Preparations for Quiescence phase, working hours will change to represent the different types and nature of ongoing activities on the site. Whilst some aspects of active area deplanting may necessitate the need for maintaining shift working, the majority of the Proposed Works, such as conventional deplanting and deconstruction and Safestore construction, will be limited to normal working hours between 07:30 and 18:00 hours Monday to Friday. There may be occasional infrequent exceptions to when the working day may be extended in order to complete specific items of work safely. During the Preparations for Quiescence phase, it is anticipated that security personnel will remain on site 24 hours a day, seven days a week, using shift arrangements.

2.3.54 During the Quiescence phase, works on site would be infrequent. However, it is anticipated that any site monitoring or maintenance works would also be focused within normal working hours. During Final Site Clearance, it is likely the majority of works would

be focused during normal working hours similar to the Preparations for Quiescence phase, although some shift working may be required.

Site lighting

2.3.55 The existing night-time illumination within the Site consists mainly of internal lights within the transparently clad parts of the Reactor Building and Turbine Hall, together with low level 'street' lights. During the Preparation for Quiescence phase, additional lighting may be necessary at the start and end of the working day during the winter months. Use of such lighting will be at the discretion of the relevant Site Supervisor. Compared to the current night-time illumination at the Site, any visual difference from this temporary additional lighting will be negligible and in-line with lighting that has been occasionally required during station outages during operation. Consideration will be given to the use of directional lighting to minimise any light spill when any further on-site lighting is required for the works. The existing security lighting will be retained through the Preparations for Quiescence phase.

2.3.56 It is anticipated that lighting requirements on site will reduce during the Quiescence phase before increasing during Final Site Clearance in areas around the Safestore to levels similar to those seen during the Preparations for Quiescence phase.

Plant, equipment and materials

Plant and equipment

2.3.57 **Table 2.3** identifies the anticipated plant, equipment and materials to be used during the Preparations for Quiescence phase. It is assumed for the purposes of the assessment that any equipment required for Final Site Clearance will be similar to the Preparations for Quiescence phase, albeit less plant is expected to be present on site at any given time.

2.3.58 Scaffolding will be used as necessary to facilitate decommissioning activities and only qualified scaffolding operatives will be employed. Components will be managed, stored and maintained on site and re-used as required. Some temporary high access to buildings may be provided by mast climbing platforms. These devices consist of powered elevating platforms that can be moved up and down the face of a building on vertical masts attached to the building. The use of this equipment may be advantageous in certain areas, and it requires less labour in erection and maintenance than conventional scaffolding.

Table 2.3 Indicative plant list for the decommissioning activities

Demolition Equipment	General Site Equipment
90 T 360 excavator	General Site Equipment
70T 360 excavator	Site Cabin inc office/shower/lockup
50T 360 excavator	Work area safety fencing
30 T 360 excavator	Tanker
20T 360 excavator	Oil tank/bowser (275 gal)
8T Excavator	Asbestos equipment
Loading Shovel	Asbestos decontamination unit

Demolition Equipment	General Site Equipment
Articulated dump truck	Scaffolding
Crusher	Lean on building (m2)
Screener	Mobile tower (8.3m)
Telehandler	Polythene tenting
Scissor Lift	Scaffolding (alloy + accessories) /m
Dust Suppression	Specialist Equipment
Compressor	Polyfusion welding equipment
Hydraulic breaker attachment	Water injection equipment
Hydraulic hearer attachments	Asbestos ventilation plant
Mechanical Muncher attachment	Industrial vacuum (asbestos) equipment
Grab	Lifting Gear
Materials handler	Chain Hoist (3Te)
HGV low loader	Mobile Crane (16Te)
20T HGV 8 wheeler	All terrain crane (30Te, 40Te, 50Te, 60Te)
Burning equipment	All terrain crane (70Te, 80Te, 90Te, 100Te)
Mobile Crane	All terrain crane (120Te, 160Te, 200Te)
Compactor Single drum compactor	All terrain crane (400Te, 160Te)
General Equipment	Skips
Forklift truck 2.5 tonne	Hyd Jack (20 Te)
Contractor general power supply	Pumping Equipment
Generator for Turbine Hall crane	Portable Oil pump
LP Power Washer (Heavy duty)	Water pump (Diesel – 102mm; 1500l/min)
UHP Power Washer	Flushing pump
Fixitive Spraying Equipment	Radiological Equipment
Grit blasting equipment – Fixed & Mobile	Radiological decontamination unit
Mob. Lighting Unit (4 light + 61/4 kVA gen)	Radiological tenting (inc, frame) m2
LP Power Washer (Heavy duty)	Radiological Ventilation Plant 9000cuft/min 3 phase
UHP Power Washer	Contamination Control Barrier & Partial change facilities

Demolition Equipment	General Site Equipment
Bunded Fuel Tank (Temp.)	
Generators (250 KVA-10 KVA)	
Pick-up truck	
Welding Set (300 Amp diesel)	
Industrial vacuum cleaning equipment	
Water spray equipment (dust suppression)	
Ventilation equipment	
Air Mover and Discharge Hoses	
Concrete mixer	
Hydraulic crimper	

2.3.59 Where plant to be delivered to the Site is large, such as cranes, effort will be made to import them to site and construct them on-site where practicable.

2.3.60 The decision as to whether concrete is batched on site or not will be confirmed upon receipt of contractor method statements and will depend on a number of criteria, including: the size of plant; availability of ready mixed concrete in the quantities required to the requisite quality; and price. However, if concrete is batched on site, it is likely to be located in the Contractor Compound area.

2.3.61 During the Preparations for Quiescence phase, it is not expected that there will be any requirement to temporarily store large amounts of demolition material prior to either its exportation from site or its use as in-fill material.

Decommissioning workforce

2.3.62 At the End of Generation, the HNB workforce comprised 448 staff and 140 Full Time Equivalent (FTE) contractors giving a total of 588 FTE employees. As of May 2023, this had reduced to 400 staff and 150 FTE contractor roles.

2.3.63 The workforce for the Proposed Works will fluctuate and is likely to vary through each phase, as described in the following sub-sections.

Preparations for Quiescence phase

2.3.64 After the completion of defueling, it is anticipated that many station staff will be re-trained and redeployed to undertake decommissioning activities. Notwithstanding this, the staff workforce is expected to reduce to between 220-300 employees to deliver the Proposed Works. This element of the workforce is anticipated to remain relatively constant, but will steadily reduce during the Preparations for Quiescence phase.

2.3.65 It is anticipated that the number of contractors working on the HNB site is likely to be more mobile, fluctuating to meet the demands of activities on site at any given time. It is

anticipated that up to 250 contractors may be on-site at any given time during the Preparations for Quiescence phase.

2.3.66 Only suitably trained operatives will be used, and contractors will be encouraged to employ local people where skills exist and are available. There will be a requirement for a mixture of mechanical, civil and electrical tradesmen with project management staff. There will also be a requirement for steel-fixers, scaffolders, bricklayers, plant operators and general deconstruction operatives. It is likely that the bulk of this labour force will be available locally. However, some specialist operatives may need to be brought in from further afield.

Quiescence phase

2.3.67 Although it is assumed that there will be no human presence on site for the majority of the Quiescence phase, it is expected that there will be a need for some staff on site during the early years. For the purpose of this assessment to ensure a worst case, it is assumed that site based permanent workforce drops to zero upon entry to the Quiescence phase.

Final Site Clearance phase

2.3.68 Numbers of workers will fluctuate over the Final Site Clearance phase, but will likely fluctuate across the period at a level lower than that anticipated for the Preparations for Quiescence phase. A broad range of skills will be required during this phase and can be expected to include: labourers, demolition contractors, craftsmen, engineers, management and technical specialists.

Asbestos removal

2.3.69 Many buildings across the Site contain asbestos. Whilst a proportion of this material has been removed and replaced with alternative materials during operation, asbestos remains within some buildings on site. All accessible asbestos in buildings will be removed during the Preparations for Quiescence phase, with the remainder removed at Final Site Clearance.

2.3.70 Safety during asbestos removal will focus on the hazards associated with manual handling and working at heights, in addition to the hazard of the asbestos itself, and there will be strict compliance with the Control of Asbestos Regulations 2012[5]. In this respect, works to undertake the removal of asbestos will be undertaken using best practice methodologies by licensed asbestos removal contractors.

2.3.71 There are different methods adopted in the removal of asbestos which may vary subject to the type of asbestos present. It should also be noted that removal methods may change over the lifetime of the Proposed Works. Removal of asbestos from the Site is likely to be undertaken using specialist contractors who will utilise full-body suits and respirators to maintain safety and prevent inhalation. The use of airlocked tents around work areas and use water solutions to prevent the spread of dust are likely to be utilised. Water from the asbestos works will be collected and filtered to remove asbestos prior to discharge to the environment.

2.3.72 Asbestos with no radioactivity will be double bagged in its wet state after stripping, hence there will be no liquid waste to be processed from the removal operations itself. Non-radioactive asbestos will be sent to off-site licensed asbestos disposal sites.

[5] UK Government (2012). *The Control of Asbestos Regulations 2012*. (Online). Available at: https://www.legislation.gov.uk/uksi/2012/632/made (Accessed May 2023)

2.3.73 It is anticipated that some asbestos may need to be cleared from the RCA. This material will need to be tested for contamination following being stripped and may require disposal off-site as LLW.

Transportation of materials and waste

2.3.74 It is assumed that all materials and wastes will be transported to and from the Site via road. Whilst it is not possible to rule out the need for Abnormal Indivisible Loads (AILs), it is not expected to be commonplace throughout the decommissioning lifecycle. LLW and Operational HAW consigned off-site will be transported off-site utilising processes already embedded during station operation and in-line with the requirements of the Radioactive Materials (Road Transport) Act 1991 (as amended)[6].

Preparations for Quiescence phase

2.3.75 There will be a requirement for some materials to be imported during the Preparations for Quiescence phase, such as for the re-cladding of the Reactor Building, concrete for the sealing of the CW system, site operational needs, plant and equipment and materials required for processing and packaging wastes. Assuming that 10 m^3 or 23 tonnes of material can be transported per lorry, these volumes will result in a total of approximately 9,750 HGV loads (19,500 total HGV movements) across the Preparations for Quiescence phase.

2.3.76 Voids will be created on-site from demolition activities in the Preparations for Quiescence phase. These voids will be filled where possible with site won material from demolition activities, but demolition activities in the Preparations for Quiescence phase will not generate enough material to fill all voids. It is anticipated that there will be a material deficit of approximately 53,500 m^3 at the end of the Preparations for Quiescence phase. Work is ongoing on the Void Management Strategy to confirm the viability of leaving voids created in the Preparations for Quiescence phase in-situ through the Quiescence phase.

2.3.77 It is intended that no aggregate fill material is imported to site solely for the purpose of filling voids in either the Preparations for Quiescence or Final Site Clearance phases. Leaving voids in situ throughout the Quiescence phase therefore forms the basis of assessment for multiple chapters of this ES. However, as feasibility studies required to confirm suitable site management arrangements with voids left in-situ at HNB through Quiescence are yet to be undertaken, the importation of infill material to fill voids will form the basis of traffic related assessments (**Chapter 6: Air Quality, Chapter 7: Climate Change, Chapter 15: Noise and Vibration and Chapter 16: Traffic and Transport**). The filling of the expected voids is expected to take place in years 7 and 8 of the Preparations for Quiescence phase and will generate a total of 10,714 additional HGV movements (5,357 HGV movements each way).

2.3.78 A profile of transport movements was produced from combining the programme for waste generation on-site from deplanting and demolition activities, requirements for deliveries to site of materials and plant for the Proposed Works and the potential requirement for importing of infill material for voids. This identifies the peak year for Heavy Goods Vehicle (HGV) movements during the Preparations for Quiescence phase corresponds to Year 8 which is approximately 2033. During the peak year, the Site is expected to average up to 24 HGV movements per day (two-way movements) on average across a working week (Monday - Friday).

[6] UK Government (1991). *Radioactive Material (Road Transport) Act 1991*. (Online). Available at: Radioactive Material (Road Transport) Act 1991 (legislation.gov.uk) (accessed November 2023).

Quiescence phase

2.3.79 During the Quiescence phase there will be negligible traffic associated with the Site. The only regular traffic movements will relate to security or inspections personnel, with visits for maintenance purposes as and when required. It is not anticipated that any large deliveries of materials to the Site will be required.

Final Site Clearance

2.3.80 During Final Site Clearance there will be a requirement for deliveries of various materials, including those required for the construction of the DWMC, deliveries of temporary accommodation for workers (offices etc.) and of grout and packages for ILW and LLW packaging. Overall, it is estimated that there will be an annual maximum of approximately 5,000 HGV loads of materials for these requirements in the Final Site Clearance phase.

2.3.81 For the purposes of assessment, it is assumed that all waste generated during Final Site Clearance will also be transported by road. It is anticipated that approximately 5,000 HGV vehicle movements will be required during the peak year during this phase to implement the Final Site Clearance activities. The amount of material to be removed off-site will be dependant upon the further development of the Void Strategy. If voids are left through the Quiescence phase in-line with the current assumption, it is assumed that the remaining Turbine Hall void and new Final Site Clearance voids can be filled using site won infill material generated during the Final Site Clearance phase.

2.4 Waste and materials management

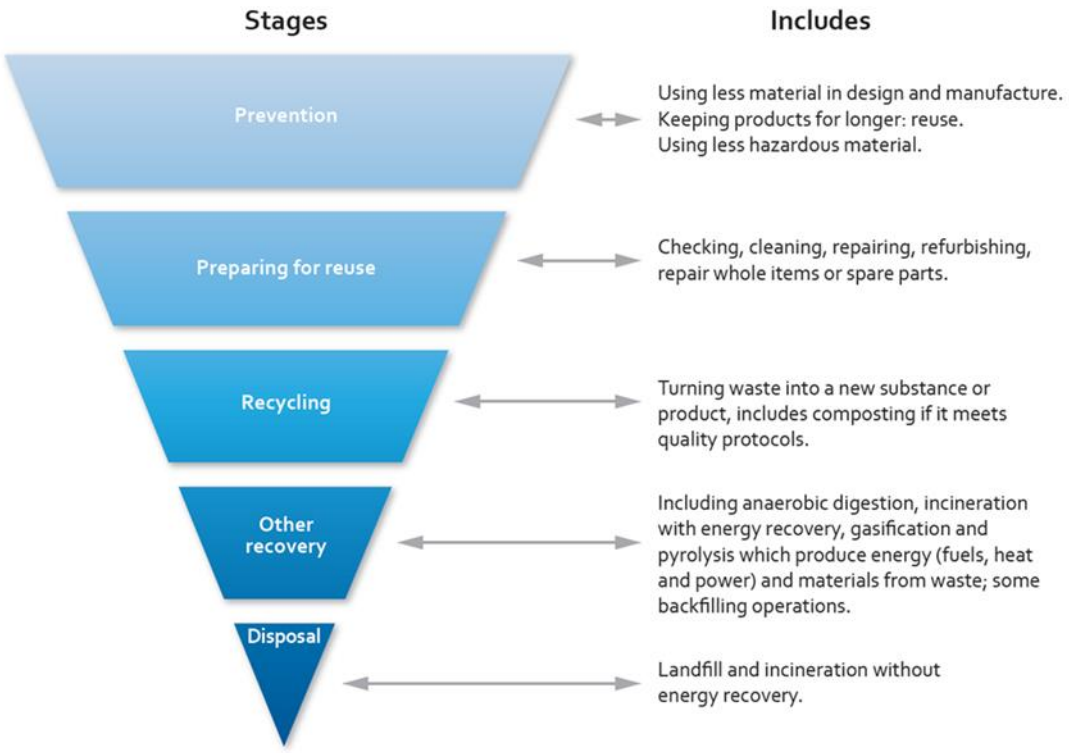
2.4.1 Waste management is a key component of the Proposed Works, with deplanting and demolitions leading to both radioactive and conventional waste streams that will require disposal.

Conventional waste

2.4.2 Anticipated conventional wastes arising from the Proposed Works may include metals, glass, plastics and other miscellaneous wastes similar to any other demolition of industrial type buildings. Due to the age of the buildings and plant at the Site, the demolitions will generate some hazardous wastes such as asbestos and lagging that will require special management during removal to protect both our workers and the environment (see **Section 2.4**).

2.4.3 The use of the Waste Hierarchy (see **Graphic 2.7**) is a central component of the decommissioning proposals and has informed key strategic decisions regarding the decommissioning strategy for HNB, all wastes will be handled in line with relevant waste legislation.

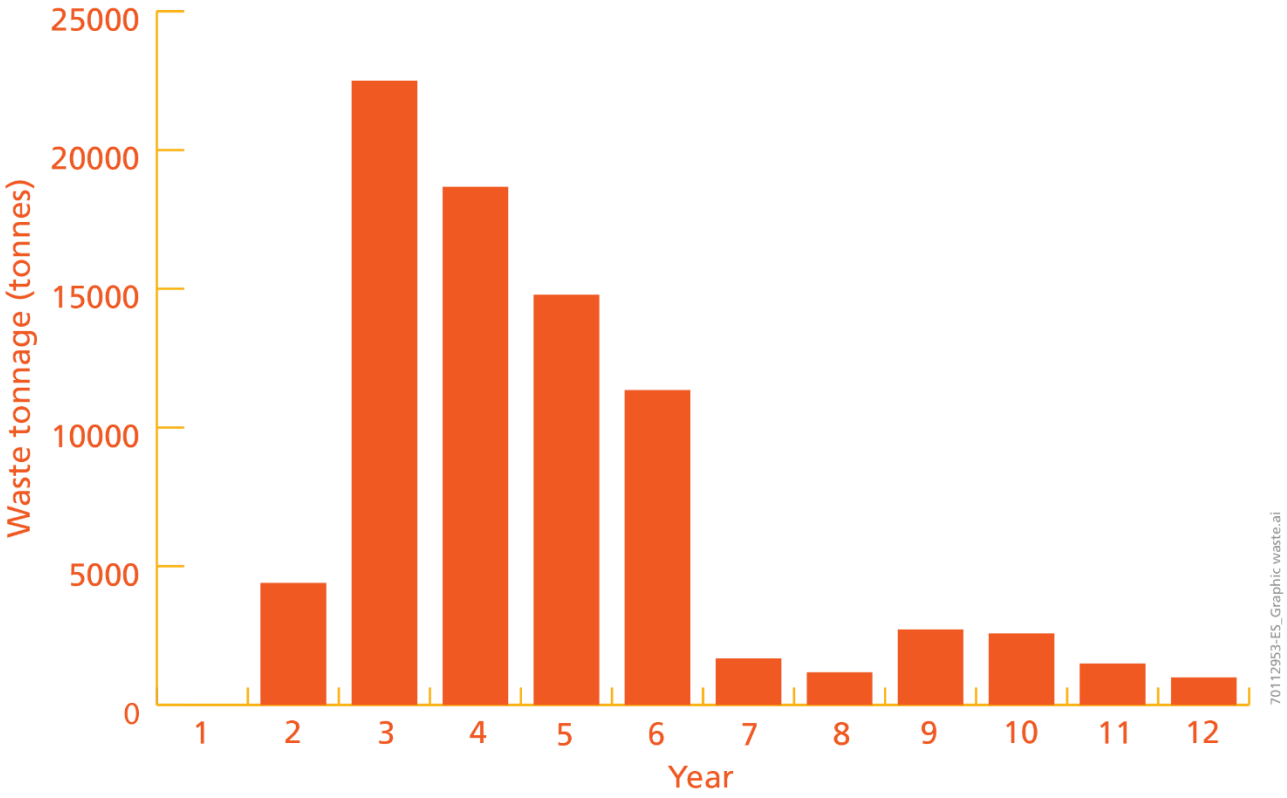
Graphic 2.7 Waste hierarchy



Preparations for Quiescence phase

2.4.4 During the Preparations for Quiescence phase, the production of waste on-site will vary dependant upon the programme of works ongoing in each year. A profile of waste produced is provided below in **Graphic 2.8**.

Graphic 2.8 Conventional Waste Profile in Preparations for Quiescence phase



2.4.5 Where practicable, wastes will be segregated and processed in-line with the waste hierarchy to maximise re-use and recycling. Total waste quantities anticipated across the Preparations for Quiescence phase are outlined in **Table 2.4**.

Table 2.4 Table of waste (conventional) quantities during Preparations for Quiescence phase

Waste Type	Total (T)
LAGGING	22
Miscellaneous Hazardous Materials (including Asbestos)	4,094
Aluminium	3
Cast iron	552
Carbon steel	2,603
Glass	155
Mixed cable	1,483
Miscellaneous materials	25,113
Mild steel	40,044
Non ferrous	1,073

Waste Type	Total (T)
Plastic	7
Stainless steel	1,209
Titanium	231
Clean Rubble above ground	22,945
Hazardous rubble	5,736.22

Quiescence phase

2.4.6 The Quiescence phase is not expected to produce large amounts of waste. Some waste may be generated as a result of maintenance works to the Safestore, but this is not expected to be substantial.

Final Site Clearance phase

2.4.7 Conventional waste will also be generated from activities in the Final Site Clearance phase despite the focus of works being placed within and around the Safestore as not all material contained will be considered contaminated. Materials produced from removal of the Safestore will, subject to testing, be removed from site as conventional waste for recycling or disposal where practicable. The long period of quiescence will have provided opportunity for partially contaminated materials to experience radioactive decay and thus also increase the amount of waste able to be consigned off-site as conventional waste.

2.4.8 The DWMC will also be removed at the end of the Final Site Clearance phase, and is therefore anticipated to be a source of waste.

Non-radioactive discharges and emissions throughout the decommissioning period

2.4.9 The potential non-radioactive emissions to the environment during the Preparations for Quiescence and Final Site Clearance phases are those that are typical of any construction or demolition operation of similar scale. These would include dust, air pollutant emissions, noise and vibration from the following:

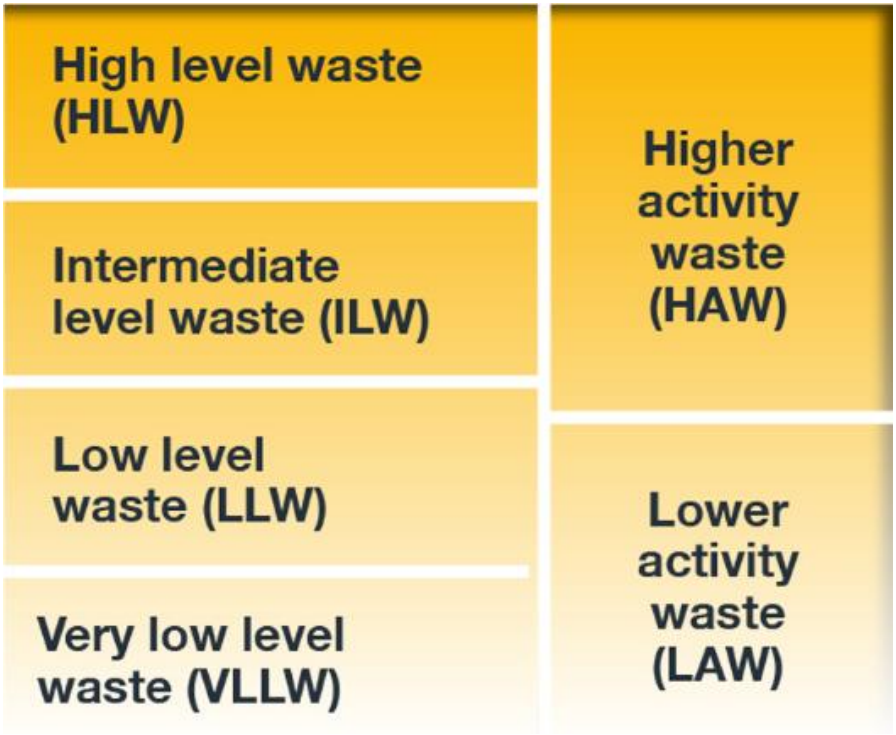
- use of heavy vehicles and other plant;
- traffic movements to and from site including for plant, materials, wastes and servicing/supply of staff;
- operation of concrete crushing equipment and/or other plant for size reduction of rubble;
- movement of soils and rubble;
- construction activities and any associated demolition plant;
- demolition activities and any associated construction/demolition personnel;
- generators and compressors used by construction/demolition personnel; and
- concrete batching (if carried out on site).

2.4.10 None of the activities associated with operation of the DWPF and OWPF involve plant or machinery that would generate noise that would be extensively audible outside the buildings.

Radioactive waste

2.4.11 The Proposed Works will require management of both Higher Activity Waste (HAW) and Lower Activity Waste (LAW) as shown in in **Graphic 2.9**. These waste streams are also frequently defined as Very low Level Waste (VLLW), Low Level Waste (LLW)[7], Intermediate Level Waste (ILW)[8] and High Level Waste (HLW) which overlap the HAW and LAW categories although no distinction is currently made between LLW and vLLW at HNB. High Level Waste (HLW), is not present at the HNB Site, therefore there is no need for managing HLW during the Proposed Works[9][10].

Graphic 2.9 Radioactive waste classification types[11]



[7] LLW is defined as waste containing radioactive materials not exceeding 4 gigabecquerels per tonne (GBq/te) of alpha radioactivity or 12 GBq/te of beta/gamma radioactivity. The term is usually taken to refer to solid wastes that are not exempt under the RSA93 but which are suitable for disposal or treatment at various off-site locations across the United Kingdom.
[8] ILW is defined as waste in which radioactivity levels exceed the upper boundaries for LLW, but which does not require its heat-generating properties to be taken into account in the design of storage or disposal facilities.
[9] In addition to the terms LLW and ILW, there are also some solid wastes that are potentially radioactive but which can be shown to contain radioactivity at levels below the relevant exemption level specified under the Environmental Authorisations (Scotland) Regulations 2018, such that they become out of scope of the regulations and therefore are suitable for disposal as non-radioactive waste. In respect of their radioactive content these wastes are often described as being 'below regulatory concern'. Such wastes can be and are (as soon as possible after they arise) re-used, recycled or disposed of by whatever routes are appropriate, taking account of their non-radioactive characteristics and the Waste Hierarchy.

[11] UK Government (2020). Radioactive Waste Strategy September 2019. (Online). Available at: Radioactive Waste Strategy September 2019 - GOV.UK (www.gov.uk). (Accessed November 2023).

2.4.12 Radioactive waste management comes under the EASR18 and must demonstrate Best Practicable Means (BPM) have been followed for onward management of radioactive waste. Radioactive wastes may be sent off-site for further treatment or compacted to minimise the volume of waste that requires disposal or long-term storage where this can be demonstrated to be the BPM for that waste.

2.4.13 Nuclear power stations such as HNB also generate gaseous and aqueous radioactive wastes that are discharged to the environment under authorisation from SEPA. During operation, aqueous wastes that are permitted to be discharged at HNB discharge into the CW Outlet Tunnel at the Syphon Seal adjacent to the Cooling Water Seal Pit and are subsequently discharged at the CW Outfall utilising the through flow of cooling water.

2.4.14 The remainder of this section identifies the proposed management of radioactive waste arisings, which are anticipated to include:

- LLW (including vLLW);
- ILW; and
- Gaseous and liquid effluents requiring discharge to the environment.

2.4.15 The waste treatment, disposal and volumes presented in this subsection have been taken from the UK Radioactive Waste Inventory 2022 (UKRWI 2022). Each waste will continue to be analysed and characterised and the BPM waste treatment route will be determined from each waste stream with acknowledgement of the waste hierarchy. This may result in further development in how radioactive wastes are packaged and processed and may lead to some wastes identified as ILW in the UK RWI being consigned for treatment and disposal as LLW. This is also likely to change the number and type of anticipated waste packages arising from each radioactive waste stream outlined in UKRWI 2022.

2.4.16 The Management of Radioactive Waste from Decommissioning of Nuclear Sites: Guidance on Requirements for Release from RSR22 produced by SEPA, the Environment Agency and Natural Resources Wales sets out the standards that must be met to release the site from its nuclear site license and the associated conditions of its RSR/EASR permit. This guidance does outline that the on-site disposal of LAW is a potential mechanism for the disposal of some LAW generated from the decommissioning process. On-site disposal of LAW does not form part of the current decommissioning proposals and is therefore not within scope of this EIADR assessment of the Proposed Works. On-site disposal of LAW would only be considered should BPM assessments conclude it is safe to do so and is the preferred method of managing LAW disposal from the Proposed Works. Should on-site disposal of LAW become part of the works to decommission HNB, such disposal would require prior agreement with SEPA following the BPM process to satisfy the requirements of the RSR/EASR permit. At this stage, the operator of the Site may be required to submit a change to the EIADR under Regulation 13 which may be accompanied by a relevant assessment. In addition to the regulatory expectations and requirements discussed above, an Integrated Waste Strategy (IWS) will be prepared which will help set out how waste will be managed in accordance with regulatory expectations. A Radioactive Waste Management Case (RWMC) will be used to demonstrate the longer-term safety and environmental performance of the planned management of specific waste(s) and provide a transparent demonstration of optimised radioactive waste management, compliance with regulatory requirements, policy, national and international standards and how waste management operations are integrated across the lifetime plans for the waste and/or Site as a whole.

Waste Processing Facilities

Preparations for Quiescence phase

LAW

2.4.17 The processing of LAW during the Preparations for Quiescence phase will be undertaken within a new DWPF on the Site. It will contain the following operational areas:

- reception facilities;
- area for managing potentially contaminated material to allow for monitoring then sentencing to relevant LLW processing area;
- processing areas for unwrapping, identifying, sorting and size reduction activities;
- arising liquid waste handling facilities (drainage, discharge routes);
- decontamination facilities;
- monitoring facilities;
- drum content sorting, assay and interim storage areas;
- drum load out area;
- half height ISO load out route;
- change and toilet facilities; and
- office facilities.

2.4.18 The DWPF will cut and package waste where necessary to improve packaging efficiency prior to disposal off-site at licensed facilities. To reduce void space within containers, the DWPF will house a compaction unit. Packages may be held on site for a number of weeks prior to removal from site within containers to increase efficiencies of the transportation of LLW packages. Packages consigned off-site may be stored for a matter of weeks in an interim store to facilitate efficient vehicle movements of waste onwards to relevant licensed radioactive waste facilities. Whilst in interim storage, the packages will be monitored for external radioactive contamination.

2.4.19 On the basis of radiological characterisation studies carried out to date, together with decommissioning experience at other sites, it is not expected that waste consigned to the DWPF will be re-categorised as ILW and that no ILW will arise as a result of the processing of LLW described above.

2.4.20 The DWPF will be delivered on site through the refurbishment of the existing site laundry and LLW building, but will be supplemented by new buildings to provide buffer storage in the locations shown on **Figure 2.4**. It is anticipated that these buildings will require planning permission under the Town and Country Planning Act 1990 (Scotland) prior to the start of their construction. The creation of the DWPF is anticipated to be delivered prior to the end of defueling in anticipation of the start of active area deplanting once defueling has been completed. It will be deplanted and deconstructed to ground level as part of the group of buildings within Zone 11 at the end of the Preparations for Quiescence phase.

HAW

2.4.21 The processing of HAW during the Preparations for Quiescence phase will be undertaken within the Operational Waste Processing Facility (OWPF) which will be delivered on-site by refurbishing existing buildings at the station shortly after the completion of defueling. Studies are ongoing to identify the BPM for management of operational HAW during the Preparations for Quiescence phase. Processing of operational HAW may involve consigning off-site for further treatment (i.e. incineration, washing, decontamination). On-site processing may involve the encapsulation of ILW in cement and packaging in containers appropriate for long-term storage.

2.4.22 There is currently no central disposal facility available for ILW in Scotland. Scottish Government's Higher-activity Radioactive Waste Policy and Implementation Strategy[12] therefore recommends storage of ILW until a suitable site has been identified for long-term near-surface management. Following an optioneering study considering a new build ILW Store and use of Magnox Ltd's existing ILW Store at HNA, it was concluded that ILW requiring long-term storage processed and packaged during the Proposed Works would be stored in the HNA ILW Store until a near surface management facility in line with Scottish Government Policy is available. This strategic assumption is subject to further waste characterisation and studies of the most suitable waste packaging solution.

Final Site Clearance phase

2.4.23 During Final Site Clearance, it is anticipated that one waste processing facility will handle both HAW and LAW arising from decommissioning activities. The DWMC will receive radioactive wastes retrieved from the deplanting and HADV waste retrieval works within the Safestore, sort the wastes as required, carry out any further size reduction or processing of wastes and load the wastes into packages for onward treatment or final disposal.

2.4.24 The WMC will contain areas for:

- The receipt and survey of wastes;
- segregation of ILW, LLW and VLLW;
- waste weighing;
- waste package storage;
- package loading and encapsulation;
- final monitoring including for external contamination of boxes; and
- loading of boxes onto road transport.

2.4.25 In order to maximise the operational efficiency of the facility, buffer store areas may be required for both incoming wastes and completed waste packages. The facility will also contain the necessary ventilation and extraction systems, lifting equipment, liquid effluent treatment, building services and personnel change areas required to support its operation. The design will take account of the requirement to decontaminate and demolish the facility at the end of Final Site Clearance.

[12] Scottish Government (2016). *Higher-activity Radioactive Waste Policy and Implementation Strategy*. (Online). Available at: https://www.gov.scot/publications/higher-activity-waste-implementation-strategy/ (Accessed November 2023).

Low Level Waste

2.4.26 LLW arises during routine operations and maintenance of the power station. In operation, this waste is treated on-site to enable the re-use and recycling of wastes where practicable. Wastes that remain LLW are packaged on-site to be transported to further treatment and disposal facilities or are discharged to the environment under authorisations from SEPA.

Preparations for Quiescence phase

2.4.27 LLW management facilities already exist on Site to process and package LLW before its transfer for onward disposal at suitably permitted facilities. During the Preparations for Quiescence phase the amount of LLW requiring disposal will increase compared to that generated during operation. It is anticipated that this waste will arise from deplanting within the RCA. Items of LLW likely to arise include pipes, shield plugs, filters, plastic, plastic sheeting, grout and scaffold materials. In addition, there will be quantities of concrete and mild steel arising from dismantling operations classified as LLW.

2.4.28 As far as practicable, wastes will be segregated to reduce the amount of LLW requiring treatment or disposal. This will also provide an opportunity to increase the amount of material that can then be re-used or recycled.

2.4.29 All decontamination processes will be similar to those used at other decommissioning sites. Examples of these decontamination processes are wipe down, water jetting, shot blasting, scabbling and chemical decontamination.

2.4.30 Minimisation of radioactive waste disposal and maximisation of re-use and re-cycling will require a ‘controlled clearance’ process to monitor any exempt or potentially exempt radioactive wastes (or other materials) prior to their being removed from the Site. Use of this ‘controlled clearance’ process, which will be an extension of the current LLW management system, will ensure that nothing radioactive is taken off the Site unless it is lawful and safe so to do.

2.4.31 Current estimates of LLW arisings during the Preparations for Quiescence phase are presented in **Table 2.5.**

Table 2.5 Current estimates of volumes of LLW for processing during the Preparations for Quiescence phase taken from RWI 2022

Origin	Estimated Volume as Arising (m^3)	Waste Source
PfQ phase: General Reactor LLW	2147	General solid LLW arisings from decommissioning within the Reactor Building prior to Safestore construction.
PfQ phase: Ponds and Active Effluent Treatment Plant LLW	737	General solid LLW arisings from decommissioning the Ponds and Active Effluent Treatment Plant.
PfQ phase: Laundry	945	General solid LLW arisings from decommissioning of the Active Laundry Facility.
DWPF: Secondary wastes	416	Wastes arising from contamination and control during waste retrieval and operation of the DWPF.
OWPF: Secondary wastes	416	Wastes arising from contamination and control procedures during waste retrieval and operation of the OWPF.

Note to **Table 2.5**: The percentage of a waste streams to go to LLW Repository are based on assumption of required processing and packaging at time of completion of RWI (2022). Wastes are subject to further characterisation work that may alter the amount of waste that requires long-term storage for disposal and may reduce the number or change the type of packages utilised for LLW.

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Quiescence phase

2.4.32 During this phase, it is not anticipated that there would be any sizeable volume of LLW produced on site that would be consigned to off-site facilities.

Final Site Clearance phase

2.4.33 During Final Site Clearance, LLW management and waste processing will be undertaken utilising processed equivalent to those for the Preparations for Quiescence phase. These works will be undertaken within the DWMC.

2.4.34 Solid LLW will arise at this time from contaminated concrete surfaces, filters, protective clothing, polyethylene used to create radioactive containment, tools, equipment, some machinery and, potentially, contaminated ground. Solid LLW will be conditioned and packaged using facilities within the DWMC and consigned to suitable permitted facilities. Current estimates of Final Site Clearance LLW arisings are given in **Table 2.6**.

Table 2.6 Current estimates of LLW volumes for processing during Final Site Clearance

Origin	Volume as Arising (m^3)	Typical Physical Composition of the Waste
Stainless Steel (Reactor) LLW	1,270	Stainless Steel
Mild Steel (Reactor) LLW	2,406	Mild Steel
Graphite LLW	466	Graphite
Concrete (Reactor and Non-Reactor) LLW	1020	Concrete and reinforced concrete.
Miscellaneous Metals and Materials (Reactor and Non-Reactor) LLW	1049.8	Variety of mixed decommissioning materials, including metals, organics and other mixed materials.
Secondary Wastes LLW	1,945	Will include Metallic, cloth and plastic items. Other organics include incinerator ash. Percentages of constituents are very uncertain.

Note to **Table 2.6**: The percentage of a waste streams to go to LLW Repository are based on assumption of required processing and packaging at time of completion of RWI (2022). Wastes are subject to further characterisation work that may alter the amount of waste that requires long-term storage for disposal and may reduce the number or change the type of packages utilised for LLW.

Intermediate Level Waste

2.4.35 ILW has been produced during routine operations at the Site. Ion exchange resin and sludges arise from the AETP and PWTP as part of normal operations with engineered tanks providing interim on-site storage. Desiccants have typically been used during operation of the AGR to dry the gas in the Gas Bypass Plant. This desiccant has been replaced routinely through operations, with expended desiccant stored on-site within a

purpose-built vault near the Gas Bypass Plant. Miscellaneous Contaminated Items (MCI) comprise contaminated waste items arising, for example, metal, concrete or other structural components that have arisen during operations.

2.4.36 Miscellaneous activated components (MACs) comprise items that were used in the reactors and which as a result have become radioactive (‘activated’). These are currently stored in purpose-built voids below ground level of the Reactor Building and will be retained within the Safestore footprint.

2.4.37 In addition to operational wastes which require removal during decommissioning, ILW will also be produced as a result of the Proposed Works. These arisings are expected to only be generated from reactor dismantling works during Final Site Clearance. Therefore, it is expected that the Preparations for Quiescence phase will only process ILW generated during Operation, and not new ILW generated from deplanting activities.

Preparations for Quiescence phase

2.4.38 The Preparations for Quiescence phase involves the processing and packaging of HAW present on Site which is located outside of the debris vaults.

2.4.39 Studies are ongoing to identify the BPM for treatment and disposal of operational ILW during the Preparations for Quiescence phase. Processing of operational ILW may involve consigning some ILW off-site for further treatment (i.e. incineration, washing, decontamination), or encapsulation of waste in cement and packaging in HAW containers appropriate for long-term storage.

2.4.40 Sludges and resins are anticipated to be processed within the OWPF. The OWPF will involve the refurbishment of existing buildings at HNB to provide plant to process and package this waste ready for further cement encapsulation at HNA and long-term storage within the HNA ILW Store.

2.4.41 Based on the information that informed the RWI 2022 submission, **Table 2.7** outlines the expected volumes of waste to that will be processed during the Preparations for Quiescence phase. Whilst this outlines the expected total volume of each waste type, it utilises a worst-case approach to then inform estimates of package type and number of packages that would then require long-term storage. Further work to understand treatment and processing of these wastes are ongoing as will further characterisation. This is likely to lead to reduced volumes of waste actually requiring long-term storage as some wastes are likely eligible for further treatment such as washing and/or incineration. Waste package type is also liable to change in the intervening period between now and the packaging of waste at the end of the processing phase.

Table 2.7 Current estimates of ILW Volumes which will be processed and packaged for storage during the Preparations for Quiescence phase.

Origin	Volume as Arising (m3)	Typical Physical Composition of the Waste
Ion Exchange Resin and Sand	27.1	Ion exchange resins (~45%), Filter backwash sand (~55%).
Sludge	47	Sand, sludge and water

Origin	Volume as Arising (m3)	Typical Physical Composition of the Waste
Desiccants and Catalysts	294	Desiccant (~94%), Catalyst (~2%), Shielding speheres (steel and deramic) (~3%) and charcoal (~1%)
Wet (Pond) Carbonaceous Debris	1.4	Dust-like debris washed into ponds and graphite fragments
Miscellaneous Contaminated Items	8	Primarily metallic items such as heat exchangers and candle filters

Note to **Table 2.7**: Package estimates are based on assumption of required processing and packaging at time of completion of RWI (2022). Wastes are subject to further characterisation work that may reduce the number or change the type of packages utilised for ILW.

2.4.42 MACs produced during the operation and defueling of HNB which are stored in the debris vaults will be kept on-site within the Safestore. This will enable further radioactive decay to occur prior to their removal during Final Site Clearance.

Quiescence phase

2.4.43 No operational ILW and no decommissioning ILW is expected to arise during the Quiescence phase.

Final Site Clearance phase

2.4.44 Final Site Clearance will involve the removal of all remaining operational ILW from the Site which will have been stored in the debris vaults during the Quiescence phase, as well as the removal of decommissioning ILW produced during the removal of the reactor and other plant within the Safestore.

2.4.45 As outlined in **Section 2.4**, a new WMC will be constructed to process and package the ILW generated from dismantling of the elements of the power station retained in the Safestore and retrieved from the HAD Vaults during this phase. The current estimates of the volume of ILW to be processed during Final Site Clearance are provided in **Table 2.8** Waste characterisation will be undertaken closer to the time of these works which may lead to changes in how the wastes are processed packaged and eventually stored or disposed of.

Table 2.8 Current estimates of ILW volumes for disposal during Final Site Clearance

Origin	Volume as Arising (m^3)	Typical Physical Composition of the Waste
Stainless Steel (Reactor)	194.3	Stainless Steel
Mild Steel (Reactor)	591.3	Mild steel items
Graphite	1831	Dust-like debris from fuel assembly carbon deposition and larger graphite fragments from fuel sleeves
Miscellaneous activated components (1)	764	Miscellaneous items including metals, plastics, organics and in-organics.

Note to Table 2.8: 1. MAC is operational waste which will be retrieved from the reactor voids for conditioning and packaging during Final Site Clearance. 2. The number and type of packages is likely to change in the interim as further studies are undertaken regarding the best methodology for disposal and packaging of ILW.

Radioactive discharges to the environment

2.4.46 Radioactive disposals, including discharges to the environment, are controlled under the EASR18 and subject to authorisations and limits set by SEPA. As required by the authorisations, best practicable means are used to minimise radioactive discharges.

2.4.47 Liquid discharges during Generation and then Defueling at HNB are undertaken via permitted discharges at the CW Outfall. Currently all waste-water arising on-site that has the potential to be radioactively contaminated is transferred to the AETP, which will be one of the last items of plant to be decommissioned during the Preparations for Quiescence phase. Following treatment and checks on radioactivity, active effluent is periodically discharged to the Firth of Clyde alongside any cooling water.

Preparations for Quiescence phase

2.4.48 During the Preparations for Quiescence phase, active effluent will still be produced from on-site activities from sources including: waste-water from cutting operations, decontamination operations and showers. As outlined in paragraph 2.2.26, the existing active effluent discharge is reliant upon cooling water flow through the CW system. To enable the CW System to be decommissioned it is required that alternate arrangements for active effluent discharge are provided through the Preparations for Quiescence phase. For the purposes of assessment, this is assumed to be delivered by the construction of a new pipe to carry active effluent from the Seal Pit, through the CW Outlet Tunnel to the existing discharge location of the CW Outfall. This change to existing discharge arrangements requires a variation of the existing permit from SEPA under the EASR18.

2.4.49 Where necessary, buildings and work areas with the potential for airborne radioactive contamination will have forced ventilation with exhaust air passing through high efficiency particulate filters as appropriate. Changes to current gaseous discharge arrangements will require authorisation by SEPA under EASR18.

2.4.50 Once the AETP is decommissioned, a mobile facility may be used to treat any remaining potentially radioactive liquids arising during the remainder of the Preparations for Quiescence phase.

2.4.51 In all instances, any discharges occurring within this phase are expected to be well within current authorised limits of existing permits.

Quiescence phase

2.4.52 During the Quiescence phase, there will be very low levels of radioactive discharges to the atmosphere from the reactor pressure vessels. It is expected that atmospheric discharges from the Site will be significantly lower compared to discharges that occurred when the reactors were operational and those anticipated during the Preparations for Quiescence phase. In all instances, any discharges occurring within this phase are expected to be well within current authorised limits of existing permits.

2.4.53 Under normal circumstances, no radioactive liquid effluent discharges are expected during the Quiescence phase.

Final Site Clearance phase

2.4.54 During Final Site Clearance, radioactive releases to atmosphere will derive principally from cutting processes. Aerosols produced will be locally vented and discharged following filtration. Radioactive effluent arisings will result from processes such as water drenching of cutting activities and will be processed utilising a Mobile AETP and discharged in accordance with EASR18.

Radioactive disposal and authorised transfer routes

2.4.55 Potential radioactive waste disposal routes are summarised in **Table 2.9**.

Table 2.9 Off-site transfer and final radioactive waste destinations

Radioactive Wastes	Off-Site transfer and/or Final destination
Operational ILW processed during the Preparations for Quiescence phase	Stored in HNA ILW Store prior to movement to National repository in Near Surface Management Facility
Decommissioning ILW processed during Final Site Clearance	National repository in Near Surface Management Facility. Re-categorised as LLW and processed accordingly
Solid combustible LLW	Incineration at permitted facilities, or storage at Low Level Waste Repository (LLWR) or equivalent facility
Solid non-combustible LLW	Treated at metal treatment facilities or storage at LLWR or equivalent facility

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3.
Alternatives

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3. Alternatives

3.1.1 Under Regulation 5 of the EIADR, there is a requirement for a description to be provided of the 'reasonable alternatives' studied by the licensee in developing the decommissioning proposals assessed within the EIADR Environmental Statement.

3.1.2 This chapter describes the main alternatives to the proposed 'Early Safestore' decommissioning strategy that were considered for decommissioning HNB. This chapter therefore outlines:

- The potential methods of reactor decommissioning;
- The analysis of the options considered; and
- A summary of the strategy selection process.

3.1.3 Also described are the main alternatives considered and the reasons for the chosen option for specific aspects of the decommissioning project, including:

- Timing of demolition activities;
- Approach to waste management facilities;
- Active effluent discharge during decommissioning;
- Void Management;
- Transport of waste and materials;
- Safestore appearance; and
- Site end-states.

3.1.4 This chapter provides an outline of the main alternatives relating to the Proposed Works studied by the applicant, together with an indication of the main reasons for the choices made. Environmental considerations are discussed where relevant.

3.1.5 It should be noted that the decisions discussed in this chapter will be regularly reviewed as part of efforts to ensure the decommissioning activities are cost and programme efficient, as well as maintaining any radioactive emissions to the public As Low As Reasonably Practicable (ALARP). It is therefore conceivable that a change to the decommissioning project described and assessed in this statement may be proposed following receipt of decommissioning consent under EIADR. This could feasibly arise in relation to a number of matters as the decommissioning plans become more developed. If any change which may have a significant effect on the environment were to be proposed, then Regulation 13 of EIADR would apply and further submissions for consent would be required from the ONR.

3.2 Decommissioning strategy

Decommissioning approaches considered

3.2.1 The preferred decommissioning strategy has been developed, in accordance with the requirements of License Condition 35 of each site's Nuclear Site Licence, following assessment of various decommissioning options that could be undertaken on the British

AGR power station fleet. As licence holders for the AGR sites, EDF Nuclear Generation Limited (ENGL) have an ongoing obligation under Nuclear Site Licence Condition (LC) 35 to maintain a current decommissioning strategy and plan; this includes review of the currency of the strategy. Thus, ENGL has conducted a number of strategy reviews in the past. As part of the most recent study, the primary objective was identified as "*to progressively reduce and remove the hazard on the site while:*

- *ensuring continued safety,*
- *minimising the environmental impact as far as reasonably achievable,*
- *decommissioning the station as soon as it is reasonably practicable to do so to release land from nuclear regulation for other use as appropriate, and*
- *ensuring value for money in the expenditure of resources on decommissioning."*

3.2.2 In order to adequately manage the decommissioning process and to prepare plans and proposals for the decommissioning of each station, in accordance with the basic objectives and which take full account of all relevant factors, the following principles were specified:

- The safety of the public, staff and plant, and the protection of the environment, is of paramount importance throughout all decommissioning activities.
- Decommissioning wastes will be managed in accordance with a sustainable approach to waste management.
- Full cognisance will be taken of all relevant legislation, regulations and guidance in the management of decommissioning.
- Financial provisions for decommissioning will be made in accordance with the liabilities management agreements.
- Resources and records will be maintained to enable the safe, efficient decommissioning of the AGR nuclear power stations.
- Strategies, plans & programmes for decommissioning will be prepared, developed and periodically reviewed.

3.2.3 The AGR decommissioning strategy is kept under review, to reflect any significant relevant developments in aspects including regulatory position, official guidance, industry experience, technical developments and business context. Previous studies have identified the preferred option as 'Early Safestore' which is an approach which relies upon the removal of the conventional power station infrastructure from the Site as rapidly as practicable and the creation of a Safestore as soon as practicable after the End of Generation, to allow entry into a long period of Quiescence prior to Final Site Clearance.

3.2.4 The most recent review in 2023 of the overall decommissioning strategy evaluated all decommissioning approaches that could be considered for the AGR fleet, generating a 'long-list' of potential options for decommissioning approach for consideration that are representative of previous studies. These are outlined in **Table 3.1**.

Table 3.1 Long-list of decommissioning options

Option number		Title/Summary of Option
Option 0	Option 0a	Abandonment
	Option 0b	Fund-led deconstruction
Option 1	Option 1a	Minimum compliance / asset care
	Option 1b	Minimum Compliance/Asset Care until dismantling at T+85 years
	Option 1c	In-situ decommissioning/ entombment
Option 2		Prompt reactor dismantling and final site clearance
Option 3	Option 3a	Continuous but deferred dismantling
	Option 3b	Deferred dismantling with short quiet period of asset care, no Safestore
Option 4 - Safestore	Option 4A	Early Safestore Strategy (ESS) with deferral of reactor dismantling and final site clearance, and prompt entry to the Quiescence phase with a short quiescent period
	Option 4B	Deferred dismantling with Early Safestore This is the current baseline AGR decommissioning strategy
	Option 4C	Early Safestore Strategy (ESS) with deferral of reactor dismantling and final site clearance, and prompt entry to the Quiescence phase for an extended period based on conservative assessment of reactor dismantling dose rates
	Option 4D	Safestore strategy with deferral of reactor dismantling and final site clearance, and deferred entry to a short Quiescence phase
	Option 4E	Deferred dismantling with a slower Preparations for Quiescence phase and Safestore
	Option 4F	Safestore strategy with deferral of reactor dismantling and final site clearance, and deferred entry to the Quiescence phase for an extended period based on conservative assessment of reactor dismantling dose rates

3.2.5 Of these long-list options, the optioneering process pre-screened out numerous options. The options pre-screened out and the reasons for this are outlined in **Table 3.2**.

Table 3.2 Options pre-screened for elimination

Option	Summary of option	Why it is not considered further
Option 0A - Abandonment	After completion of defueling, no further decommissioning work would take place, nor any other work on the Site.	This approach is not considered credible, because it would not deliver the decommissioning objectives; it would neither maintain safety nor reduce hazards on the Site.
Option 0B - Fund-led deconstruction	"Fund-led deconstruction" is the situation where the decommissioning strategy and plan is set dependent upon funding availability.	This is not relevant for the AGRs, as it has been confirmed that the AGRs will have access to the NLF after Transfer to Magnox. While the details of how that will be managed for Magnox are to be finalised, access to the NLF will relieve funding constraints.
Option 1A - Minimum compliance / asset care	In this option, no further decommissioning work would take place on the Site after defueling. Only the minimum asset management work required to maintain baseline health and safety standards would be carried out; this would maintain the then-extant condition of the Site and structures, but would involve no change.	Because this option has no defined end point, there would be no prospect to release land on the Site for other uses. Cumulative costs for asset care would be expected to increase exponentially as the structures aged, and would eventually become prohibitive. Simple application of this approach would merely exhaust the NLF with no actual deconstruction having taken place. This approach is not considered credible, because it would not deliver the decommissioning objectives: it would not reduce hazards on the Site and would prevent the Site from being released from regulatory control for other use.
Option 1C – Entombment / in-situ decommissioning	In-situ decommissioning, also referred to as 'entombment or 'mounding' is a decommissioning process by which the main buildings containing radioactive materials after defueling, for example the reactors, are in-filled with cementitious grout or other material to eliminate any voids prior to being buried under an engineered mound.	The relevant primary IAEA Safety Standards document, GSR Part 6[1], does not consider this to be a decommissioning strategy and explicitly rules it out as an option in the case of planned permanent shutdown and that it may only be considered a solution This approach is not considered credible, as it would not deliver the objectives or meet government policy requirements.

[1] International Atomic Energy Agency (2014). *IAEA Safety Standards, General Safety Requirements Part 6, No. GSR Part 6, "Decommissioning of Facilities"*. (Online) Available at: https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1652web-83896570.pdf (Accessed November 2023).

3.2.6 Following the option pre-screening exercise, the remaining options were analysed for their suitability in turn. It was decided to consider the six Safestore options in two groups of three, corresponding to the difference in time to reach the commencement of the Quiescence phase after End of Generation, with the duration of the Quiescence phase giving variations of those two basic classes. Further discussion of this is outlined below.

Option 1b - Minimum compliance/asset care until dismantling at T+85 years

3.2.7 In this scenario, after completion of defueling, no further decommissioning work would take place on the Site until 85 years after End of Generation. Only the minimum asset management work required to maintain baseline health and safety standards would be carried out between the end of defueling and Final Site Clearance. This would maintain the then-extant condition of the Site and structures, but would involve no change. After that period, the Site would be re-established and a complete decontamination, deplanting, demolition, reactor dismantling and site clearance exercise would take place.

3.2.8 Doses and waste quantities are essentially the same as for the scenario outlined in the project description, but this waste is entirely generated during Final Site Clearance. The overall cost would however be expected to be significantly higher than the baseline because of the need to maintain the whole site, there is a significantly higher on-going annual asset management cost.

3.2.9 This option was discounted at this stage for the following reasons:

- No active hazard reduction with the only radiological hazard reduction occurring due to decay of the radioactive materials, rather than through proactive control of the wastes.
- Significant safety risks associated with degradation of plant and structures on-site over time.
- Potential increased complications for eventual demolition caused by fauna making use of station buildings as habitats in the interim prior to removal.
- No reduction in built form on the Site for an extended period despite majority of plant having no retained purpose.
- Increased carbon emissions from need to maintain workforce and associated travel to site.
- Increased cost.
- Likely not to be compliant with government policy due to the lack of planned effort to achieve hazard reduction as early as was reasonably practicable.

3.2.10 This option was discussed at optioneering but was subsequently identified as not credible due to the fact that it does not seem to be compliant with government policy that decommissioning should be undertaken to enable the reduction of site hazards.

Option 2 - Prompt dismantling

3.2.11 In this scenario, decommissioning actions begin shortly after the permanent shutdown and defueling, and continue with no quiescent period until the facility has been dismantled and the Site is cleared to a level that permits the facility to be released from regulatory control for unrestricted use, or released with restrictions on its future use. In this scenario, work is driven so that the assumed duration of the whole cycle would be about 20 years. This duration is based on the initial deconstruction phase being similar to the Preparations for Quiescence phase (albeit without construction of a Safestore) and taking approximately 10 years, with a similar period of time for reactor dismantling and other Final Site

Clearance activities following this. This is an ambitious timescale, of a similar timescale to the decommissioning of several nuclear power stations in the USA, albeit those were generally water reactors and thus hold a different decay curve and thus produce a reduced quantity of waste that requires long term disposal.

3.2.12 This approach is one of the two 'standard' strategies mentioned in the relevant IAEA Safety Standards document GSR Part 6. ENGL consider this strategy appropriate for the Pressurised Water Reactor (PWR) station at Sizewell B. It can be noted that this strategy has not been applied in the UK for a commercial graphite-moderated, gas-cooled reactor over the envisaged timescales, which would make it a "first of a kind" activity.

3.2.13 The benefits of this approach include:

- Hazard reduction takes place most rapidly after EoG.
- There is the shortest practicable period to reach final site clearance and potential for release of land, though see below about the implications of a ILW disposal route not being available.
- Asset care costs are reduced.
- Continuous working on the Site means there is no requirement to re-establish the Site as a working area later.
- Continuous working on the Site maintains a Suitably Qualified Experienced Person (SQEP) workforce.

3.2.14 Factors against the use of this approach for the AGRs include:

- There are significant risk implications in terms of very high dose levels / dose rates during prompt dismantling of the reactor.
- Creation of large quantities of HAW (as ILW), and the associated increased difficulty of handling wastes with higher levels of activity, e.g. requiring shielded handling equipment and shielded waste packages, plus possible requirements for extra staff to deal with the more complex work.
- Absence of a disposal route for HAW in the near- to medium-term, i.e. a Geological Disposal Facility (GDF) or a Near Surface Management Facility in Scotland. Until such facilities are available, a large new ILW Store for reactor dismantling wastes would be needed on the Site, meaning that the full site would not be cleared.
- Uncertainties about the capacities and availability of waste disposal routes in the short-term to handle the higher waste quantities.
- Considerably higher overall costs (and discounted costs) than the Early Safestore approach, due to a large amount of complex work shortly after End of Generation.

3.2.15 Prompt dismantling is considered more applicable for PWRs than AGRs. It was however identified that some sites may have local situations that make earlier dismantling more attractive, and that it is still technically feasible as an approach but is likely to have a higher cost and have greater complexity due to higher dose rates.

Option 3a - Continuous but deferred dismantling

3.2.16 This scenario is similar to Option 2, but proceeds at a slower pace overall so that the duration of the whole cycle could be several decades. This would include periods of greater and lesser activity during the process and assumes that reactor dismantling would commence approximately 40 years after End of Generation. For the purpose of

optioneering assessment, it was assumed that a Geological Disposal Facility/ Near Surface Management Facility in Scotland would be available by circa 2060 to receive AGR reactor dismantling wastes and thus not necessitate the need for a new ILW Store on the Site which would otherwise increase the cost associated with this option.

3.2.17 The benefits of this approach were noted as:

- Progressive, continual hazard reduction over time.
- Work on some areas of the Site could be deferred slightly to undergo radioactive decay and thus make specific tasks simpler and lower-dose than under prompt dismantling.
- The assumed timing should reduce risks associated with non-availability of an ILW disposal route.
- There is a continuous working presence on the Site so that there is no requirement to re-establish the Site as a working area later reducing the risk of loss of site knowledge.

3.2.18 Factors against the use of this approach included:

- While dose rates for reactor dismantling would be lower than under prompt dismantling, they would still be high compared to other options and there would be significant risk implications in terms of dose levels / dose rates during dismantling of the reactor.
- Creation of significant quantities of HAW (as ILW), and the associated increased difficulty of handling wastes with higher levels of activity.
- Possible requirement for extra staff to deal with the more complex work.
- Uncertainty over waste package type, as requirements for duration and location of waste storage have not yet been finalised.
- A delay in the provision of a GDF/NSMF could affect this option, by requiring additional ILW stores to be constructed. Thus, there is significant reliance upon external suppliers.
- There are greater Asset Care costs over a longer period than for prompt dismantling.

3.2.19 Overall, it was identified that this option could be technically feasible, but is likely to be associated with significantly higher cost than other technically feasible options.

Option 3b - Deferred dismantling with short quiet period of asset care, no Safestore

3.2.20 In this scenario, Preparations for Quiescence would include large-scale deplanting and deconstruction over 12-15 years without construction of a Safestore. The existing reactor building island would be placed under an asset care regime for approximately 25 years before commencement of reactor dismantling approximately 40 years after End of Generation.

3.2.21 The benefits and dis-benefits of this approach are similar to those outlined for Option 3a above but include the benefit of reduced asset care costs and increased hazard reduction over Option 3a.

Option 4b - Deferred dismantling with Early Safestore

3.2.22 This scenario is the option that has been the preferred approach to AGR decommissioning for some time following multiple reviews. In this scenario, after

defueling, all or part of the facility containing radioactive material is either processed or placed in such a condition that it can be put in safe storage and the facility maintained until it is subsequently decontaminated and/or dismantled 85 years after End of Generation. Deferred dismantling may involve early dismantling of some parts of the facility and early processing of some radioactive material and its removal from the facility, as part of hazard reduction and preparatory steps for the safe storage of the remaining parts of the facility.

3.2.23 Options 4a and 4c rely on the same approach as 4b, but provide options for the period of Quiescence ±20 years.

3.2.24 The benefits of the deferred dismantling with Safestore approach identified included:

- Deferral of reactor dismantling reduces the dose rates associated with that work.
- Deferral allows radioactive decay to make a reduction in the quantity and level of radioactive waste arising from decommissioning which reduced the size of interim storage facilities required.
- Deferral allows time for disposal routes to be established.
- Funding provision for the whole decommissioning lifecycle is made more secure due to the quiescent period when fund recovery growth can take place.

3.2.25 Factors against the use of this approach include:

- The overall time to site clearance and release of land is greater than for earlier dismantling (such as options 2, 3a and 3b).
- There is a need for Asset Care of the Safestore and interim waste storage facilities during the Quiescence phase.

3.2.26 Reactor dismantling commencing 85 years after End of Generation was selected as it limits dose to workers involved in the reactor dismantling work to certain levels and was therefore considered as ALARP in earlier decommissioning studies. While dose is very important, it is not a simple process to define an ALARP dismantling dose at this point. Thus, the 85 years figure is taken as a good starting point to allow refinement for each reactor i.e. some variation to the Quiescence phase duration as seen in Options 4a and 4c. In addition to dose, like other options, the availability and type of ILW storage could be key in defining the correct length of Quiescence phase for options under this broader category.

3.2.27 Option 4b was identified to remain a very credible option for decommissioning approach for the AGR fleet.

Option 4e Deferred dismantling with slower entry to the Quiescence phase with Safestore

3.2.28 This scenario is very similar to the scenario outlined above, but assumes a longer less intensive period for the Preparations for Quiescence phase due to the complexity of works in this period. Options 4d and 4f are similar to Option 4e, but consider shorter and longer periods of quiescence respectively.

3.2.29 The benefits and dis-benefits are similar to Option 4b, with the differences being that this approach may increase asset care costs prior to demolition, but that this may be counter-acted by greater hazard reduction prior to entry to the Quiescence phase and greater efficiencies to be found in decommissioning across the fleet to smooth resourcing.

Conclusions of the decommissioning strategy review

3.2.30 Whilst the review identified numerous potentially suitable options for decommissioning, the existing decommissioning strategy of 'Early Safestore' which aligns to Option 4b was still deemed credible and preferable based on information available at the time. The review acknowledges however the ambitious nature of this plan, and that decommissioning more akin to option 4e may arise at sites as site specific decommissioning plans develop further. The site licensee will continue to maintain and develop its overarching decommissioning strategy to comply with nuclear site licence condition 35 in the future.

3.3 Waste management facilities in the Preparations for Quiescence phase

3.3.1 To facilitate the delivery of all AGR stations into a quiescent state, the need for the following waste management and storage facilities was identified:

- Decommissioning Waste Processing Facility (DWPF);
- Operational Waste Processing Facility (OWPF); and
- Interim ILW Store (ILW Store).

3.3.2 These were originally anticipated to be new build facilities at all AGR sites as part of the Baseline Decommissioning Plan 2016 (BDP16). However, opportunities were identified as part of BDP16 that these facilities could be re-used/repurposed (rather than new build), and use of shared facilities with adjacent Magnox sites (i.e. HNA) should be considered. Optioneering has been performed on all 3 facilities to date and the current assumptions and alternatives considered are summarised below.

ILW storage

3.3.3 There is currently no suitable storage facility in line with Scottish Government's Higher-activity Radioactive Waste Policy and Implementation Strategy available to store HAW. The requirement of the Early Safestore strategy to process some operational HAW during the Preparations for Quiescence generates the need for storage of ILW packages on-site.

Consolidation of Intermediate Level Waste (ILW) storage across Hunterston sites has been recognised as an opportunity to optimise Baseline Decommissioning Plans for several decades. Historically, it was deemed prudent for the HNB decommissioning plans to allow for a dedicated HNB Interim Conditioned Intermediate Level Waste Store (ICILWS) as this kept plans conservative for provisioning purposes and kept control of the decommissioning programme with the Site Licensee. See proposal for new ICILWS location (New Build Option ILW Store) on **Figure 3.1**.

3.3.4 As HNB approached the end of the generating phase of the station lifecycle, a series of studies were completed to develop and optimise the detailed plan for implementation of an ILW storage capability. Options considered were to utilise a new build facility on the HNB site to store ILW from HNB, or to utilise the existing HNA ILWS to store ILW from HNB. This work confirmed the use of the HNA ILWS for HNB waste as both a credible and preferable approach.

3.3.5 These ILW Store options were appraised against safety, technical, environmental, socio-economic, regulatory and security criteria. The appraisal concluded that the preferred option, in light of potential reduced environmental impacts, cost and carbon savings was to store ILW within the HNA ILWS after processing on the HNB Site within its own OWPF.

Further work is ongoing to consider the most appropriate waste processing and packaging solution.

3.3.6 The key environmental factors associated with this decision included:

- Reduced carbon impact under the 'build less' principle as substantial embedded carbon in the production of materials for construction were not required.
- Reduction in built form on the HNB Site through the Quiescence phase with only the Safestore now required through this phase.
- Reduction in noise and air quality emissions associated with ILW ICILWS construction.
- Overall reduction in conventional wastes produced as the HNB ICILWS would eventually require decommissioning and removal from site.

Decommissioning Waste Processing Facility

3.3.7 As outlined in **Chapter 2: The Decommissioning Process**, a DWPF is required during the Preparations for Quiescence phase to process solid LLW arisings from activities such as Active Area deplanting. An appraisal was undertaken of options to either construct a new DWPF building or to refurbish and adapt existing buildings for the use as a DWPF.

3.3.8 The construction of a new build DWPF was considered within the HNB site license area in the location shown on **Figure 3.2**. This location necessitated the need for early demolition works to create space for the new facility. The building was anticipated to be a metal-clad portal frame structure on a concrete floor, with a maximum footprint of approx 2,000 m^2 and up to 10m in height.

3.3.9 Options to refurbish existing buildings included re-use of buildings that currently house the LLW facility used for processing and packaging low level wastes generated during operation, and the Site laundry.

3.3.10 The options study concluded that a building refurbishment (with accompanying small new buildings) was preferable to a new build structure. The reasons for this included:

- Simpler consenting process for the new building elements than new whole DWPF facility.
- Assumption that refurbishment option did not require new or modified EASR permits as permitted discharge point would remain the same.
- Additional waste generated from construction and then demolition of new build DWPF (Sustainability).
- Additional noise effects from construction of new build facility.
- Additional carbon cost of new build facility.
- Refurbishment was found to provide large cost savings compared to the new build option.
- Refurbishment had significant programme savings compared to a new build DWPF.

3.3.11 After the conclusions of the options study, it was identified that further storage locally on-site would benefit the building refurbishment. It was identified that the Site Stator Shed would be removed, with a new storage facility in its place to provide temporary storage of waste prior to collection for consignment to onward waste management facilities. In addition, another small modular building was identified as a requirement to provide

necessary storage of un-used waste packages prior to use in the main DWPF facility. The location of these buildings are identified on **Figure 2.4**.

Operational Waste Processing Facility

3.3.12 An Operational Waste Processing Facility (OWPF) is required for dealing with Higher Activity Wastes (HAW) as part of decommissioning such as sludges and resins from the Active Effluent Treatment Plant (AETP) system, carbonaceous debris from the pond, Miscellaneous Contaminated Items from deplanting and Desiccant and Catalyst from gas bypass plant.

3.3.13 In BDP16, the baseline assumption for the OWPF was that a new build facility was required with a footprint of approximately. 1,500 m^2. This assumption was produced with limited data and knowledge about the waste types and the waste processing and disposal routes that are now available to HNB. Other nuclear industry establishments have built new facilities where the existing facilities have been in poor condition or space was limited. However, HNB has the benefit of plant areas and buildings in good condition that will last for the duration of the short decommissioning phase to the point of the entry to the Quiescence phase. In addition, the strategy did not account for HAW that may become LLW within a few years of the Quiescence phase i.e. did not include areas for decay storage.

3.3.14 An optioneering study was commissioned by EDF to examine whether a new build OWPF was required, or whether existing facilities on the HNB site could be refurbished / repurposed to house the waste processing plant required to process HAW. The study concluded that a refurbished option is the preferred solution for the following reasons:

- Reduced conventional safety risks as lesser construction activities.
- Refurbishment scope expected to be simpler than construction.
- It would be unlikely to require planning permission whilst a new build would.
- Does not introduce as much waste during construction which eventually requires removal from site during decommissioning of the facility.
- Reduced carbon footprint.
- May enable retention of existing permitted discharge points and no requirement for adjusted permit that would be required for new build.
- Less audible and visual disturbance than new build.
- Refurbishment can be delivered earlier in the programme representing less of a risk to entry into the Quiescence phase.
- Cost savings relative to new build.

3.4 Active Effluent Discharge

3.4.1 As outlined in **Chapter 2: The Decommissioning Process,** active liquid effluent from HNB and HNA discharge into the sea via the Cooling Water (CW) Outfall where the active effluent is diluted and mixed with cooling water from the CW system.

3.4.2 The current radioactive substances effluent discharge permit requires a flow rate of 7 m^3s^{-1} through the syphon seal and this flow is provided by pumps in the CW Pumphouse. Running a single pump gives 7.1 m^3/s therefore a pump must be in service to maintain current discharge permit arrangements.

3.4.3 The primary function of the CW system, to provide cooling to the turbine condensers, will no longer be relevant at the end of defueling. There are however several secondary functions that are still required during defueling. Once these secondary functions of the CW system are no longer required, new arrangements to ensure liquid effluents are discharged to sea will be required to avoid disproportionate costs and carbon emissions as a result of running and maintaining these 2-Megawatt pumps, as well as allowing decommissioning of the CW System and Turbine Hall.

3.4.4 As activities such as Active Area Deplanting will require continued discharge of active effluents throughout the Preparations for Quiescence phase, new discharge arrangements are required to be permitted prior to the turning off of the CW Pumps to enable CW System decommissioning.

3.4.5 An optioneering process was undertaken to identify the preferred option for active effluent discharges. This process identified multiple options including:

- Various options relying on utilising and reconfiguring the existing CW system.
- Using a tanker for offsite discharges.
- Installation of a new Alternate AEDL (either by drilling a new line or threading a new line through existing CW culvert).

3.4.6 This optioneering concluded that the preferred option was to install a new Alternate AEDL between syphon seal and CW outlet by threading a pipe through existing CW culvert. The decision to thread a new line through the existing CW system was partly selected due to the likely reduced environmental impact compared to drilling a new-line through areas of potential concern for land contamination in the terrestrial environment and potential disturbance of marine sediment that would be associated with a new line in the Firth of Clyde.

3.4.7 The preferred option was then underpinned with plume/dispersion modelling that examined the effect of discharge location, timing relative to the tide and flow rate of 5 different scenarios and found:

- Discharge timing relative to the tide and CW dilution flow rate have an insignificant effect on dispersion in the Firth of Clyde.
- Discharging in the current CW location is acceptable. Extension further into the channel is not required to achieve sufficient dispersion.

3.4.8 A feasibility assessment was also undertaken through engagement with specialist marine contractors about whether the AEDL could be threaded through the existing CW Outlet Tunnel, or whether it would require a new horizontally drilled line. This feasibility assessment concluded that threading a new pipeline through the existing culvert was constructible and therefore confirmed that it is the preferred option for the discharge of active effluent discharge during HNB decommissioning.

3.5 Void management

3.5.1 Studies looking to set a general fleet approach to decommissioning identified that decommissioning works would create significant voids on-site during the Preparations for Quiescence and Final Site Clearance phases. Buildings such as the Turbine Hall were noted to have significant basements, whilst the decommissioning of the CW system was also identified as creating significant voids on-site. This was identified as presenting challenges for the decommissioning programme as leaving the voids in-situ was identified to:

- provide a potential safety hazard on-site;
- provide potential water management and water quality issues;
- lead to an increased maintenance burden through the Quiescence phase;
- be potentially considered un-acceptable to the local public; and
- potentially be mis-aligned to requirements to de-license the Site at the end of decommissioning.

3.5.2 An opportunity was identified that voids on-site could be filled, or partially filled, with suitable material generated from the deconstruction activities. However, it was identified that it would be unlikely that enough suitable fill material would be generated in the Preparations for Quiescence phase to fill voids entirely prior to the long period of Quiescence. With this in mind a high-level optioneering assessment was undertaken across the AGR fleet to consider whether the general assumption prior to site specific analysis on the void management strategy should be to:

- Option A – Completely fill voids created in the Preparations for Quiescence phase with a combination of site-won material and additional imported material to reduce the management burden through the Quiescence phase, or
- Option B – Leave voids that can't be filled using site won material during the Quiescence phase and manage accordingly. There may therefore be a combination of filled, partially filled and empty voids to manage during Quiescence.

3.5.3 It was identified as part of this work that considering the full lifecycle of the Site is important in decision making, as the decision to import material during the Preparations for Quiescence phase would be likely to cause the need to export rubble material from the Site during Final Site Clearance. Likewise, the need to manage ongoing voids on-site would potentially require management for a long period during the Quiescence phase. The benefits and dis-benefits of each option identified by the high-level assessment are outlined in **Table 3.3**.

Table 3.3 Comparative review of options

	Benefits	Dis-benefits
Option A	Reduced maintenance burden during Quiescence phase	Increased cost to import and export material during the relevant phases
		Increased traffic movements and associated increase in environmental impacts from noise and traffic emissions to bring material to and from site
	Increased safety as removes the hazard of the void on-site which would be balanced by potential safety risks whilst undertaking void filling works.	Increased carbon emissions to import and export material
		Opposition from public due to increased near-term traffic impacts
		Reduced impact on local fill material resources
Option B	Reduced cost – Savings to be made from both not importing material but also having a location for Final Site Clearance generated fill material to be utilised on site	Reduction in long-term safety on the Site compared to Option A but reduction in safety risks associated with void filling activities
	Reduction in carbon emissions from: Transport of materials (import and export), handling of materials on-site and quarrying of infill material.	Will require greater modifications to site drainage systems including potential requirement for pumping systems over a long time period
	Reduced traffic movements and therefore reduction in traffic related noise and emissions of NO_2	Potential impact on water quality from creating standing water that may increase groundwater impacts
		Visual impact of un-filled voids may generate public opposition to the approach

3.5.4 This initial optioneering assessment outlined that despite the challenges regarding Safety and technical delivery for Option B, it was likely that these were largely mitigatable and represented significant cost savings, carbon savings and other environmental benefits over Option A. It was therefore decided that leaving voids in-situ would become the 'baseline' assumption for the AGR sites subject to further site specific Void Management Strategies being developed.

3.5.5 At HNB, it is estimated that the Preparations for Quiescence phase, will create approximately 64,000 m^3 of voids associated with decommissioning of the CW System and Turbine Hall alone. Across the Preparations for Quiescence phase, by nature of the type of structures at HNB and as demolitions will generally be undertaken only to ground level, it is estimated that deplanting and demolition activities could generate approximately 14,000 m^3 rubble that should be suitable for use as infill material. Using experience from previous decommissioning activities, a conservative estimate of 25% of this figure has been assumed to be not suitable for use which leaves approximately 10,500 m^3 for use as infill. Re-using this material on-site has the benefit of removing approximately 2,100 HGV movements (two way) from the local highway network, and is therefore deemed the most

sustainable approach subject to design of void infilling to prevent impacts on local groundwater. The potential environmental impacts of this re-use of materials as infill material on groundwater quality is considered in the assessment in **Chapter 12: Soils, Geology and Hydrogeology**.

3.5.6 Whilst using this material as infill is of benefit to the Proposed Works, it is still anticipated that there is approximately 53,500 m^3 shortfall in site won material to use as infill in the Preparations for Quiescence phase. Should off-site infill material be required to be delivered to site, this would equate to approximately 11,000 HGV movements (two way) on the highway network.

3.5.7 During Final Site Clearance, decommissioning of the cooling pond, AETP and Debris Vaults are expected to create a further 7,200 m^3 of void. If voids are not filled during the Preparations for Quiescence phase and therefore retained through Quiescence, the total void at Final Site Clearance on-site would be 60,700 m^3.

3.5.8 The Final Site Clearance phase is expected to generate approximately 77,000 m^3 rubble at HNB. Replicating the assumption that 25% of site won rubble may not be suitable for re-use as infill material, this leaves approximately 56,500 m^3 material suitable to use as infill material at the Site during Final Site Clearance.

3.5.9 This demonstrates that if voids are left in-situ through the Quiescence phase, a cut/fill balance within 5,000 m^3 can be achieved at the Site which would save approximately 22,000 HGV movements (two way) in total (approximately 11,000 HGV movements in each phase). This has justified at a site-level the fleet-wide assumption that material should not be imported to fill voids during the Quiescence phase.

3.5.10 A Void Management Strategy will be developed in the future to identify and implement suitable measures that will be embedded in the design to prevent effects on surface water and groundwater quality and to reduce any potential safety hazards associated with retaining voids through the Quiescence phase. The implementation of mitigation such as that shown in the Indicative Interim State Landscape Plan (**Appendix 14G**) will assist in the reduction of visual impacts associated with retaining voids on-site.

3.6 Safestore

3.6.1 The key to the current decommissioning strategy at HNB is the requirement for a Safestore which allows for the Reactors, High Activity Debris Vaults (HADVs), Cooling ponds, AETP and other plant left in the reactor building following risk based deplanting to be kept in a good condition and monitored without on-site hands-on management.

3.6.2 An engineering assessment was undertaken during 2022 to evaluate the Safestore options to assist EDF in its strategy review for Safestore and assist development of the Site specific HNB decommissioning plan.

3.6.3 The optioneering process was commenced with a building walkdown, to understand the existing condition of the HNB reactor building and charge hall and adjoining structures which could then influence the options assessment.

3.6.4 The conclusion of the building walkdown was that the entire southern façade and 70% of the northern façade would require re-cladding in all scenarios. For full height options under consideration, it was highlighted that new cladding would be required for the charge hall to replace existing glazing.

The options

3.6.5 The process applied engineering judgement together with quantitative discussion where possible to score options within a Multi Attribute Decision Analysis tool which allows multiple types of attributes to be assessed and provides a weighted score. The options considered within the study were as follows:

Option 1 – Reduced height –New cladding

3.6.6 This option requires the removal of all plant within the charge hall sitting above the reactor building including the fuel handling machine and the charge hall runway crane. This would allow for the whole charge hall structure to be removed, and a replacement roof to be constructed which would provide a reduced building volume and height (to ~36 m).

3.6.7 The main structural framing of the building will remain, but some new additional secondary structural elements would be required to facilitate the addition of new cladding to the outside of the existing building. The cladding will be selected based on a requirement for it to provide necessary environmental control and longevity. It was assumed in the optioneering process that re-cladding would be an aluminium cladding solution as it would provide a long-life and would provide other benefits in assisting control of the internal environment. This option includes additional flood defence measures at the base of the Safestore building.

Option 2 - Full height - New cladding

3.6.8 This option considers the retention of the charge hall in the event that removing the plant contained within this area is too difficult or provides too long a delay to the entry to the Quiescence phase. It involves the full re-cladding of the building, including the provision of some secondary support structures to facilitate adding this cladding. The assessment assumed it would use the same type of cladding as outlined for Option 1. This option includes additional flood defence measures at the base of the Safestore building.

Option 3 – Full height – Full use of existing cladding

3.6.9 This assumes the retention of the existing roof structures and the cladding on facades where practicable, but nonetheless still requires re-cladding of the south elevation, the charge hall facades and 70% of the northern façade. Under this option, the opportunity to replace with cladding with greater longevity is possibly lost, and the cladding would therefore be expected to be replaced multiple times through the Quiescence phase.

Option 4 – Reduced height - Partial use of existing cladding

3.6.10 This option involves similar structural rework to Option 1, but would retain existing cladding on the east and west facades and ~30% of the northern façade cladding. It would require a new roof over the reactor building as the charge hall would have been removed. Similar to Option 3, it would require the recladding of the Safestore numerous times through the Quiescence phase.

The Options assessment

3.6.11 The four options were scored against multiple different factors within 4 broad categories, which are summarised in **Table 3.4**.

Table 3.4 Options assessment categories

Category	Factors considered
Safety	• Improved security of safety enclosure; • Reduction of significant demolition over reactor vessels; • Improvement of safety through control and removal of hazards; • Early removal of Hazardous building materials; • Reduction to future maintenance and repair; and • Reduction of volume and extent of asset to be retained.
Technical	• Buildability; • Simplicity of construction; • Low Demolition requirement; • Control of internal environment; • Resistance to deterioration of Safestore Envelope; • Ability to commence safestore before completion of deplanting; • Ability to retain fuel handling machine; • Ease of Final Site Clearance; and • Requirement for temporary shelter during FSC to remove long items from reactor core.
Environmental	• Minimised Carbon impact; • Reduction of materials requiring disposal; • Incorporation of flood prevention measures; • Robustness vs. long term hazards; • Appearance with regard to planning and improvement of business image; and • Ease of obtaining planning permission.
Economic	• Reduction in construction costs; • Reduction of construction programme; • Reduction of demolition programme; • Maintenance requirements on cladding; • Reduction of time for ongoing maintenance; and • Plan simplicity during design phase.

3.6.12 The scoring process identified the below:

- Option 1 achieved the highest rating for Safety and Environmental considerations.
- Option 2 received the highest rating from a technical standpoint.
- Option 4 scored the highest from an economic standpoint albeit there were marginal differences between that and Option 1.
- Option 3 did not score highest in any categories.

3.6.13 The first EIADR consultation was undertaken in parallel with the optioneering process. As part of the consultation, numerous comments were received outlining the importance of the eventual colour of the Safestore and that this may have more significance than a reduced height structure. To understand the difference in visibility between the full height and reduced height options, a Zone of theoretical Visibility (ZTV) study was undertaken. This is shown in **Graphic 3.1** below. This highlights that there is not a significant difference in visibility between a full height and reduced height Safestore.

Graphic 3.1 Zone of Theoretical Visibility for full height Safestore and reduced height Safestore

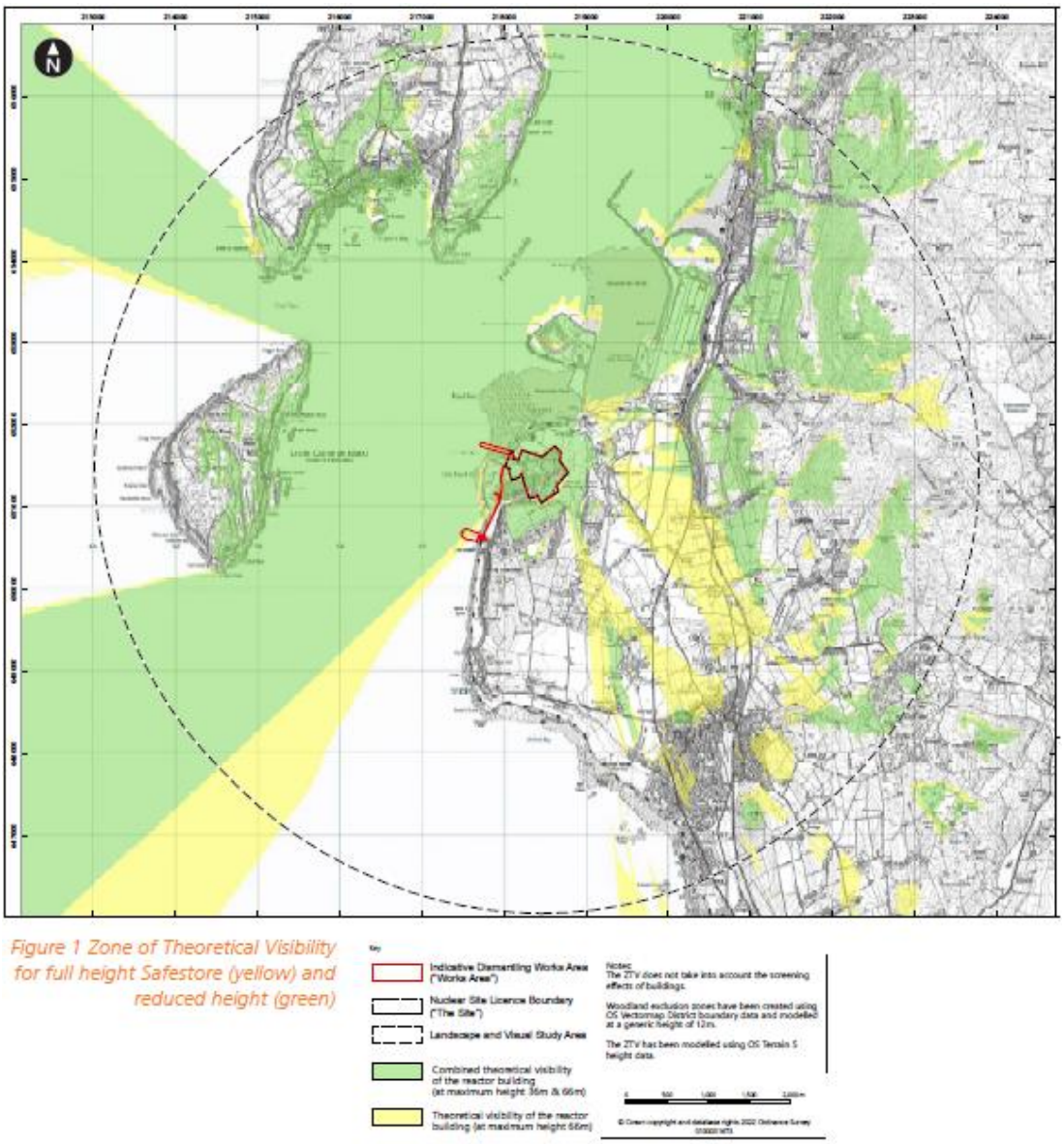

Figure 1 Zone of Theoretical Visibility for full height Safestore (yellow) and reduced height (green)

Conclusion of Safestore study

3.6.14 The key differentiators between the different options included the ability to achieve a greater amount of hazard reduction and the reduction in costs to manage the asset through the Quiescence phase.

3.6.15 The optioneering process identified the highest scoring option as Option 1 as it scored highly on the technical and safety requirements for the Safestore, but also represented benefits of reduced carbon emissions and costs across the whole lifecycle compared to the two full height options.

3.6.16 Option 1 was therefore concluded to provide the most complete solution from a structural engineering perspective. However, work is ongoing to understand the complexity and feasibility of the Active Area Deplanting works to remove the fuel handling machine and other plant within the charge hall and to understand the extent and complexity of

demolition/construction work required for each option. The feasibility of this needs to be considered relative to the intention to commence the Quiescence phase as soon as practicable and it is therefore not certain that the reduced height options in Option 1 and 4 are viable until the completion of this work.

3.6.17 For the purposes of the EIADR assessment, it is therefore assumed the Safestore would align with Option 2 which is the best scoring of the two full height options as this represents a reasonable worst case for assessment.

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Policy and Legislation

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4. Policy and Legislation

4.1 Introduction

4.1.1 This chapter presents an overview of the legislative and policy context of relevance to the environmental assessment of the Proposed Works. Additionally, interactions with other consenting regimes are discussed to provide context in **Table 4.3.**

4.1.2 Each environmental aspect chapter in this Environmental Statement (ES) (**Chapters 6** to **20**) includes aspect specific legislation, and a summary of the relevant policies and technical guidance where pertinent to the assessment. Legislation, policy and guidance has been used to define the scope of the assessment and to inform the value ascribed to relevant receptors.

4.1.3 Cognisance of developing Government policy and legislation for the duration of the Proposed Works will be maintained, and any relevant changes pertaining to the relevant activities and waste management will be reviewed and adhered to.

4.2 Pre-application Opinion

4.2.1 A Pre-application Opinion was adopted by the ONR, on 04 October 2022. A summary of the relevant responses received in the Pre-application Opinion in relation to legislation, policy and technical guidance, and confirmation of how these have been addressed within the ES is presented in **Table 4.1**.

Table 4.1 Summary of Pre-application Opinion responses

Paragraph Ref.	Consideration	Addressed within the ES
35	Paragraph 3.2.3 of the scoping report lists the EU Directives that are implemented by UK domestic legislation and are therefore relevant to the decommissioning project. It would be useful for the ES to state how these directives are implemented in UK law (i.e. the relevant regulations), why these apply to the EIADR project and how they have been considered in the EIA.	Noted. Further detail on how the directives are implemented into UK law is provided in **Table 4.2**. Appropriate signposting is made to the technical topic chapters which will include detail on the applicability of the UK legislation to their assessments and the Proposed Works as a whole.
37	The Legislative Context section provides tables summarising relevant national policy and development policy (Tables 3.2 and 3.3); it would be useful for the ES to state why each policy is relevant to the project and how it has been considered in the EIA.	**Table 4.3** and **Table 4.4**. within this chapter provide an overview of the relevant national and local policies. Specific details with respect to their relevance to the Proposed Works and topic assessments are provided in the technical topic chapters of the ES, with appropriate cross references included in the front-end, signposting to where further topic specific information can be found.

4.3 Withdrawal of the UK from the EU

4.3.1 UK Legislation is influenced by a variety of international agreements including European Union (EU) directives, regulations and agreements.

4.3.2 On 31 December 2020, the UK exited the EU following the expiry of the "transition period", as provided for by the European Union (Withdrawal) Act 2018 (Withdrawal Act 2018)[1]. Sections 2-3 of the Withdrawal Act 2018, as amended, confirm that direct EU legislation, and EU-derived domestic legislation, continue to have effect in UK domestic law after that date. In summary, the interpretation of any retained EU law is to be the same as it was before that date, insofar as the retained EU law remains unmodified in UK law and regulations have not been made providing otherwise (s. 6(3) of the Withdrawal Act 2018).

4.3.3 The Directives, as they have been given effect in UK domestic legislation, are therefore relevant to the Proposed Works and are referred to where required in this ES, as shown in **Table 4.2**.

Table 4.2 Overview of EU Directives and their implementation in UK and Scottish Law

EU Legislation	Implementation in UK and Scottish Legislation	Environmental aspect ES Chapter where legislation is discussed further
Environmental Impact Assessment (EIA) Directive (2011/92/EU)[2] (as amended by EIA Directive 2014/52/EU)[3]	Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (as amended)[4]	Relevant consenting regime to the Proposed Works (see **Table 4.3**), against which all aspect ES chapters are assessed.
Habitats Directive (92/43/EEC)[5]	The Conservation (Natural Habitats & c.) Regulations 1994 (as amended in Scotland)[6] The Conservation of Habitats and Species Regulations 2017 (as amended)[7]	Chapter 8: Terrestrial Biodiversity and Ornithology, Chapter 9: Marine Biodiversity

[1] UK Government (2018) *European Withdrawal Act 2018* (Online) Available at: www.legislation.gov.uk/ukpga/2018/16/contents/enacted (Accessed November 2023).
[2] European Commission (2011). *Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment*. (Online) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011L0092&from=EN (Accessed November 2023).
[3] European Commission (2014). *Directive 2014/52/EU of the European Parliament and of the Council of 16 November 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment*. (Online) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0052&from=EN (Accessed November 2023).
[4] UK Government (1999). *Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999* (Online) Available at: https://www.legislation.gov.uk/uksi/1999/2892/contents/made (Accessed June 2023).
[5] European Commission (1992*). Directive 92/43/EEC of the European Parliament and of the Council of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora*. (Online) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992L0043&from=EN (Accessed November 2023).
[6] UK Government (1994). *The Conservation (Natural Habitats, &c.) Regulations 1994* (online). Available at: http://www.legislation.gov.uk/uksi/1994/2716/made (Accessed January 2023)
[7] UK Government (2010). *The Conservation of Habitats and Species Regulations 2010*. (Online). Available at: https://www.legislation.gov.uk/uksi/2010/490/contents/made (Accessed January 2023).

EU Legislation	Implementation in UK and Scottish Legislation	Environmental aspect ES Chapter where legislation is discussed further
Waste Framework Directive (2008/98/EC)[8]	Waste (Scotland) Regulations 2011[9] Waste Management Licensing (Scotland) Regulations 2011[10] Waste (Scotland) Regulations 2012[11]	Chapter 19: Conventional Waste
Industrial Emissions Directive (2010/75/EU)[12]	The Pollution Prevention and Control (Scotland) Regulations 2012[13]	Chapter 6: Air Quality
Air Quality Directive (2008/50/EC)[14]	The Air Quality Standards (Scotland) Regulations 2010[15]	Chapter 6: Air Quality
Birds Directive (2009/147/EC)[16]	The Conservation Habitats and Species Regulations 2017 (as amended)[7]	Chapter 8: Terrestrial and Freshwater Biodiversity
Environmental Liability Directive (2004/35/EC)[17]	Environmental Liability (Scotland) Regulations 2009[18]	Chapter 9: Marine Biodiversity

[8] European Commission (2008). *Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives*. (Online) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&from=EN (Accessed November 2023).
[9] UK Government (2011) *Waste (Scotland) Regulations 2011*. (Online) Available at: https://www.legislation.gov.uk/sdsi/2011/9780111012185/contents (Accessed July 2023)
[10] UK Government (2011). *Waste Management Licensing (Scotland) Regulations 2011*. (Online) Available at: https://www.legislation.gov.uk/sdsi/2011/9780111012147/contents
[11] UK Government (2012). *Waste (Scotland) Regulations 2012*. (Online). Available at: https://www.legislation.gov.uk/ssi/2012/148 (Accessed January 2023).
[12] European Commission (2010). *Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emission*. (Online) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0075&from=EN (Accessed November 2023).
[13] UK Government (2012). *The Pollution Prevention and Control (Scotland) Regulations 2012*. (Online). Available at: https://www.legislation.gov.uk/ssi/2012/360/contents/made (Accessed January 2023).
[14] European Commission (2008). *Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe*. (Online) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0050&from=en (Accessed November 2023).
[15] UK Government (2010). *The Air Quality Standards (Scotland) Regulations 2010*. (Online). Available at: https://www.legislation.gov.uk/ssi/2010/204/contents/made (Accessed January 2023).
[16] European Commission (2009). *Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds*. (Online) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0147&from=EN (Accessed November 2023).
[17] European Commission (2004). *Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage*. (Online) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32004L0035&from=EN (Accessed November 2023).
[18] UK Government (2009). *Environmental Damage (Prevention and Remediation) (Scotland) Regulations 2009*. (Online). Available at: https://www.legislation.gov.uk/ssi/2009/266/contents/made (January 2023).

EU Legislation	Implementation in UK and Scottish Legislation	Environmental aspect ES Chapter where legislation is discussed further
Water Framework Directive (2000/60/EC)[19]	Water Environment and Water Services (Scotland) Act 2003 (WEWS Act)[20] Water Environment (Controlled Activities) (Scotland) Regulations 2011[21]	Chapter 8: Terrestrial and Freshwater Biodiversity, Chapter 10: Coastal Management and Water Quality, Chapter 11: Surface Water and Flood Risk, Chapter 12: Soils, Geology and Hydrogeology
Marine Strategy Framework Directive (2008/56/EC) [22]	The Marine Strategy Regulations 2010[23]	Chapter 9: Marine Biodiversity
Groundwater Directive (2006/118/EC) [24]	Water Environment (Groundwater and Priority Substances) (Scotland) Regulations 2009[25]	Chapter 12: Soils, Geology and Hydrogeology

Overview of Relevant Legislation

4.3.4 This ES has been prepared to seek consent from the ONR for the Proposed Works under the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (EIADR) (as amended). The works to decommission HNB will be undertaken and regulated in compliance not only with the EIADR, but with other relevant security, health, safety and environmental protection legislation including:

- Health and Safety at Work (etc.) Act 1974;
- Nuclear Installations Act 1965 (as amended);
- The Management of Health and Safety at Work Regulations 1999;
- The Construction (Design and Management) Regulations 2015;
- The Ionising Radiation Regulations 2017;
- The Environmental Authorisations (Scotland) Regulations 2018; and

[19] European Commission (2000). *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy*. (Online) Available at: https://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC_1&format=PDF (Accessed November 2023).
[20] UK Government (2003). *Water Environment and Water Services (Scotland) Act 2003* (online). Available at: http://www.legislation.gov.uk/asp/2003/3/contents (Accessed January 2023)
[21] UK Government (2011). *The Water Environment (Controlled Activities) (Scotland) Regulations 2011*. (Online). Accessible at: https://www.legislation.gov.uk/ssi/2011/209/contents/made. (Accessed February 2023)
[22] European Commission (2008). *Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).* (Online). Accessible at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0056 (Accessed December 2023)
[23] UK Government (2010). *The Marine Strategy Regulations*. (Online). Available at: https://www.legislation.gov.uk/uksi/2010/1627/contents/made. (Accessed January 2023).
[24] European Commission (2006). *Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration*. (Online) Accessible at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32006L0118. (Accessed November 2023).
[25] UK Government (2009). *Water Environment (Groundwater and Priority Substances) (Scotland) Regulations 2009* (Online). Accessible at https://www.legislation.gov.uk/ssi/2009/266/contents/made (Accessed January 2023).

- Environmental Protection Act 1990.

4.3.5 Appropriate plans, risk assessments and control measures, will be required under such legislation, and where relevant to the assessment in this ES, cross references are made (in **Chapters 6** to **20**). Consent to begin decommissioning under EIADR does not remove any such duties from the Nuclear Site Licensee, nor does this in anyway restrict or otherwise limit the ability of other regulators to fulfil their statutory duties.

4.3.6 Some assessment of the environmental effects that may arise from the Proposed Works may fall within the scope of other legislative and consenting frameworks in addition to the EIADR. **Table 4.3** summarises the scope of decommissioning work where the assessment of environmental effects is also covered by other legislative and consenting frameworks, and as such there are interfaces with the EIADR.

Table 4.3 Overview of legislative and consenting framework that interface with EIADR

Consenting regime	Scope of Decommissioning Requiring Assessment of Environmental Effects
The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999[4] (as amended)	Dismantling and decommissioning works for Hunterston B (HNB) Nuclear Power Station (excluding the removal of fuel from the reactors, and the management of waste arisings and decontamination where such activities are undertaken as part of normal operations) for the purpose of permanently preventing the continued operation of that station.
The Town and Country Planning (Scotland) Act 1997[26] (as amended) and the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017	Whilst the definition of development contained in the Town and Country Planning (Scotland) Act 1997 does not explicitly include the decommissioning of nuclear power stations, the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 provide a definition of development which includes the decommissioning of nuclear power stations. Discussions with Scottish Government and ONR are ongoing regarding this part of the legislation. Upon completion of these discussions, if it is concluded that an EIA is required under the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017, this environmental assessment will be submitted to North Ayrshire Council with sufficient time for the application to be determined prior to the planned commencement of decommissioning works. Planning applications under the Town and Country Planning (Scotland) Act 1997 may also be required for the following development required to enable the decommissioning process: • Construction and operation of a storage building to house un-used LLW packages prior to processing within the Decommissioning Waste Processing Facility (DWPF); • Construction and operation of a small storage building to temporarily house LLW packages created in the DWPF prior to transportation from site; • The potential modification and change of use of existing structures to enable the delivery of a refurbishment to house an Operational Waste Processing Facility (OWPF),

[26] UK Government (2017). *The Town and Country Planning ((Scotland) Act 1997*. (online) Available at: https://www.legislation.gov.uk/asp/2019/13/contents/enacted (Accessed November 2023).

Consenting regime	Scope of Decommissioning Requiring Assessment of Environmental Effects
	• Some engineering works and groundworks such those associated with the carrying out of remediation activities or void filling; • Construction and operation of temporary site offices and welfare facilities to facilitate deconstruction and remediation works in the Preparations for Quiescence and Final Site Clearance phases; • Modification of the existing reactor building into a Safestore; and • Construction and operation of a Waste Management Centre to support Final Site Clearance. Where planning permission is required, consideration will be given to whether the planning applications, to be made to North Ayrshire Council, would require an accompanying Environmental Impact Assessment in accordance with the requirements under the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017.
Marine (Scotland) Act 2010[27]	The works required within the marine environment as part of the decommissioning proposals are likely to require a marine licence. Activities from the Proposed Works that are likely to require a marine licence include the sealing off and removal of the outfall, intake and jetty and the potential construction of a new effluent discharge. Applications for marine licence may require assessment of environmental effects in accordance with the Water Framework Directive, Conservation of Habitats and Species Regulations 2017 and the Marine Works (EIA) (Scotland) Regulations 2017.
Conservation of Habitats and Species Regulations 2017[7]	Where the Proposed Works directly or indirectly affect an internationally/nationally significant ecological designation, a separate assessment of potential effects must be carried out under the Conservation of Habitats and Species Regulations 2017 (the Habitat Regulations). A HRA Screening Report accompanies this ES which will inform the Appropriate Assessment to be undertaken by the ONR, as the Competent Authority under the Habitat Regulations. In consultation with NatureScot, the ONR will consider whether the findings of no significant effects on the integrity of internationally/nationally significant ecological designations that are reported in the HRA Screening Report is accepted. In accordance with the Habitat Regulations the ONR must have regard to the findings of their Appropriate Assessment in exercising its function under the EIADR.
Water Framework Directive[28]	For activities in the marine environment up to 1 nautical mile out to sea, assessment and approval may be required where there is a potential effect on the immediate and any linked water bodies and to ensure compliance with the relevant river basin management plan. As part of this application under the EIADR, a

[27] UK Government (2010) *Marine (Scotland) Act 2010*. (online) Available at: https://www.legislation.gov.uk/asp/2010/5/contents (Accessed November 2023).
[28] UK Government (2011). *The Water Environment (Controlled Activities) (Scotland) Regulations 2011* (Online). Available at: https://www.legislation.gov.uk/ssi/2011/209/contents/made (Accessed April 2023).

Consenting regime	Scope of Decommissioning Requiring Assessment of Environmental Effects
	Water Framework Directive (WFD) assessment has been included for the consideration of the ONR and other relevant stakeholders (notably SEPA) with respect to the regulation and consenting of the Proposed Works. .

4.4 National Policy

Introduction

4.4.1 The EIA will consider national policy which is relevant to the Proposed Works, as summarised in **Table 4.4**. Where these national policies are relevant to specific technical aspects, they will be discussed further in **Chapters 6 – 20** of this ES.

Table 4.4 Relevant national policy

Policy	Summary
National Polices for Nuclear Decommissioning	
The Decommissioning of the UK Nuclear Industry's Facilities, September (2004)[29]	Statement of the UK Government and devolved administrations' policy on the decommissioning of nuclear facilities (the UK Decommissioning Policy).The UK Decommissioning Policy requires that operators produce and maintain decommissioning strategies and plans before they plan to close facilities, that decommissioning strategies and plans are maintained, periodically reviewed and updated at least every five years. Relevant details of the current decommissioning strategy and plan for HNB, are described in Chapter 2: The Decommissioning Process. The current decommissioning strategy and plan for HNB has been developed taking into account the factors set out in para. 5 of the UK Decommissioning Policy, including the following factors which are of most relevance to this ES: ● minimising waste generation and providing for effective and safe management of wastes which are created, ● minimising environmental impacts including reusing or recycling materials whenever possible, ● maintaining adequate site stewardship, ● maintaining access to an adequate and relevant skills and knowledge base, and ● using existing best practice wherever possible.
Managing the Nuclear Legacy – A Strategy for Action (Cm 5552), July (2002)	Sets out proposals for a Liabilities Management Authority to be responsible for the transfer from British Nuclear Fuels Limited (BNFL) and the United Kingdom Atomic Energy Authority (UKAEA) of the UK's public sector civil nuclear liabilities and their subsequent management. The Government's intention was to establish a structure to provide the strategic direction

[29] Department of Energy and Climate Change (2004). *The Decommissioning of the UK Nuclear Industry's Facilities.* (Online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/361068/The_Decommissioning_of_the_UK_Nuclear_Industrys_Facilities.pdf (Accessed November 2023)

Policy	Summary
	necessary for a focussed, long-term civil nuclear clean-up programme and to improve public confidence in its nuclear liabilities management policy.
Meeting the Energy Challenge – A White Paper on Nuclear Power (2008)	It will be for energy companies to fund, develop and build new nuclear power stations in the UK, including meeting the full costs of decommissioning and their full share of waste management costs. The White Paper explains the basis for this decision, how the Government have considered responses to consultation, and how they have taken them into account in framing policy.
Nuclear Decommissioning Authority Strategy (2021)[30]	The Nuclear Decommissioning Authority (NDA) Strategy presents the NDA's high-level approach to decommissioning the 17 designated sites in the NDA estate, including the 14 reactor sites that Magnox are responsible for, to deliver decommissioning and end states as soon as reasonably practicable. Published prior to the agreement of revised arrangements for the decommissioning of the EDF owned AGR stations, the NDA Strategy (2021) does not provide a high level strategy for the decommissioning of HNB. Subsequent revisions to the NDA Strategy are expected to reflect and provide the framework for HNB (and other AGR stations) as and when the ownership of the station transfers from EDF to the NDA and Magnox becomes the responsible Nuclear Site Licence holder. In due course, should the next publication of the NDA Strategy and/or the development of the decommissioning plan for HNB by Magnox require changes to the current decommissioning plan presented in Chapter 2: The Decommissioning Process, changes would be screened to determine whether there could be changes to the significant environmental effects reported in this EIADR application. Where change does not have the potential to result in a new significant adverse environmental effect, a record of the assessment would be made in a Findings of No Significant Effect (FONSE) record in the site EIADR file. Where change does have the potential to result in a new significant adverse environmental effect, an application for the approval of change would be made to the ONR as required by Regulation 13 of the EIADR.
Part 1: UK Policy Proposals for Managing Radioactive Substances and Nuclear Decommissioning[31] **Part 2: Draft UK Policy Framework for Managing Radioactive Waste[32]**	Published for consultation in March 2023, this Draft UK Policy Framework seeks to consolidate and update policies relating to the management of radioactive substances and nuclear decommissioning. The draft Policy aims to achieve a consistent approach across the devolved administrations, including Scotland. A key proposed change is to amend the UK Government and devolved administrations' policy on managing solid low level radioactive waste to promote on-site disposal on nuclear and former nuclear sites where it is safe and where overall social, environmental and economic impacts are lower than those of other disposal options. The current decommissioning plans (as described in Chapter 2: The

[30] UK Government (2021) *Nuclear Decommissioning Authority Strategy*. (Online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/973438/NDA_Strategy_2021_A.pdf (Accessed July 2023).

[31] UK Government (2023). *UK policy proposals for managing radioactive substances and nuclear decommissioning*. (Online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1139242/part_I_policy_proposals_managing_radioactive_substances_and_nuclear_decommissioning.pdf (Accessed July 2023).

[32] UK Government (2023). *Draft UK policy framework for managing radioactive substances and nuclear decommissioning.* (Online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1139248/part_II_draft_policy_managing_radioactive_substances_and_nuclear_decommissioning.pdf (Accessed July 2023).

Policy	Summary
	Decommissioning Process) assume that LLW is removed from site and treated elsewhere. Consideration will be given to the amended policy (yet to be adopted) and any related changes in regulatory guidance in future waste characterisation and waste management plans. The Draft UK Policy Framework refers to proposals to amend the regulatory framework that applies to the final stages of nuclear decommissioning that are being taken forward in the Energy Bill 2022. If these proposals are enacted, nuclear sites could be delicensed earlier than at present, once a site has met internationally agreed standards for ending nuclear third party liability and once the ONR is satisfied that all nuclear safety issues have been addressed. Sites would remain under regulation by the relevant environment agency and the relevant Health and Safety Executive. Whilst relevant to the final stages of the decommissioning of HNB, and potentially affecting an earlier release of land for future use, it would be premature for the purposes of this EIADR application to make assumptions that differ from the current HNB decommissioning plan pending enactment of this legislation. At paragraph 9.32, the Draft UK Policy Framework, emphasises that the UK Government and devolved administrations of Scotland and Wales consider that the land on which publicly owned nuclear facilities are located may be a key strategic asset and should be considered first for the location of national infrastructure. This policy position is reflected in the National Planning Framework 4 adopted by Scottish Ministers. Whilst the Proposed Works do not include a proposal for future use it is assumed, for the purposes of this ES, that the Site will be left in a brownfield state recognising the future development potential envisaged in NPF4. Paragraph 9.18 of the Draft UK Policy Framework states that whilst decommissioning should be carried out as soon as reasonably practicable, it is recognised that a deferral, may be appropriate taking into account factors that include: ● *"to take advantage of new or developing technologies;* ● *further development of existing good practice;* ● *taking benefit from radioactive decay;* ● *adopting a lead and learn approach; and* ● *realising an opportunity to re-use a facility."* The justification for the decommissioning plan for HNB, including a period of deferral, is set out in **Chapter 3: Alternatives**.
National Policies for Waste Management	
Scotland's Zero Waste Plan (2010)[33]	The aim of the Zero Waste Plan is to make Scotland a zero-waste society, with a circular economy. This promotes the reuse, recycling and recovery of resource, rather than treating them as waste. No specific reference is made to radioactive or high activity waste within the plan, however Paragraph 4.9.5 (Appendix B) states that "*development*

[33] Scottish Government (2010). *Scotland's Zero Waste Plan*. (online) Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2010/06/scotlands-zero-waste-plan/documents/00458945-pdf/00458945-pdf/govscot%3Adocument/00458945.pdf (Accessed November 2023).

Policy	Summary
	plans should identify suitable sites for the processing of all waste types, including construction and demolition wastes". Details relevant to the management of waste during the Proposed Works are presented in **Chapter 2: The Decommissioning Process** in so far as they relate to the EIADR consenting process.
Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom (2007)[34]	This statement of UK Government and devolved administrations' policy for the long-term management of the UK's solid low level radioactive waste (LLW) and covers all aspects of the generation, management, and regulation of solid LLW. The policy outlines the regulatory context of LLW in the UK, overseen by a number of regulatory bodies. The policy necessitates that a risk-informed approach to LLW management is developed into LLW management plans by waste managers and that "*all nuclear licenced sites should have a plan for the management of their LLW holdings and predicted future arisings, that is part of a wider integrated waste management strategy, and is compatible with proposed end states*" (Paragraph 7). The policy outlines the following key requirements: ● "*use of a risk-informed approach to ensure safety and protection of the environment;* ● *minimisation of waste arisings (both activity and mass);* ● *forecasting of future waste arisings, based upon fit for purpose characterisation of wastes and materials that may become wastes;* ● *consideration of all practicable options for the management of LLW;* ● *a presumption towards early solutions to waste management;* ● *appropriate consideration of the proximity principle and waste transport issues; and* ● *in the case of long term storage or disposal facilities, consideration of the potential effects of future climate change*." Details relevant to the management of LLW during the Proposed Works are presented in **Chapter 2: The Decommissioning Process** in so far as they relate to the EIADR consenting process.
Scotland's Higher-Activity Radioactive Waste Policy (2011)[35]	This high-level policy document provides the framework for the long-term management of higher activity radioactive waste arising in Scotland. The Policy is not prescriptive in its approach, recognising that it applies to waste:

[34] UK Government (2007). *Policy for the Long -Term Management of Solid Low Level Radioactive Waste in the United Kingdom (2007)*. (Online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/254393/Low_level_waste_policy.pdf (Accessed July 2023).

[35] Scottish Government (2011). *Scotland's Higher-Activity Radioactive Waste Policy 2011*. (online) Available at: https://www.gov.scot/publications/scotlands-higher-activity-radioactive-waste-policy-2011/documents/ (Accessed November 2023).

Policy	Summary
	• which may not be produced for decades; and • for which long-term management options may not be feasible at present or have yet to be developed. • The aim of the policy is to ensure that all activities for the long-term management of the waste are made in a way that protects the health and interests of people and the integrity of the environment now and in the future. This aim needs to be considered at the time long-term management decisions are made and when treatment or storage or disposal of the waste is undertaken. These decisions will need to recognise the risk of foreclosing alternative long-term management options and the future impact of these long-term management activities on people and the environment.
Scotland's Higher-Activity Radioactive Waste: Implementation Strategy (2016)[36]	This Strategy supports Scotland's Higher Activity Radioactive Waste Policy[35] and outlines that the long-term management of higher activity radioactive waste should be in near-surface facilities. The Strategy states that long-term management options may include: "*treatment, including sending it to another location for treatment, either in Scotland or elsewhere including overseas, subject to any requirements by the relevant regulators in the UK and overseas for the return of the waste; or* *storage in near-surface facilities which are near to the site where waste is produced; or* *disposal in near-surface facilities which are near to the site where waste is produced*." At the time of preparing this ES, the applicant understands the feasibility work to appraise options for near-surface facilities is in the early stages and it would be premature to make assumption about a preferred long-term management option.
National Planning Framework 4 – (NPF4)[37]	NPF4 was adopted by Scottish Ministers on 13 February 2023. NPF4 updates the provisions of NPF3[38], replacing it and the Scottish Planning Policy[39]. The Hunterston port and wider site is identified within NPF4 as a location with potential for a 'National Development', a significant development that is of national importance to the delivery of the Spatial Strategy as defined in NPF4. NPF4 policy for the Hunterston Strategic Asset, supports *'the repurposing of Hunterston port as well as the adjacent former nuclear power station sites and marketable business land of the Hunterston Estate. Hunterston has long been recognised as a strategic location for the port and energy sectors given its deepwater access and*

[36] Scottish Government (2016). *Scotland's Higher-Activity Radioactive Waste: Implementation Strategy 2016*. (online) Available at: https://www.gov.scot/publications/higher-activity-waste-implementation-strategy/documents/ (Accessed November 2023).
[37] Scottish Government (2023). *National Planning Framework 4* (Online). Available at: https://www.gov.scot/publications/national-planning-framework-4/ Accessed February 2023)
[38] Scottish Government (2014). *Scotland's Third National Planning Framework (NPF3) 2014*. (online) Available at: https://www.gov.scot/publications/national-planning-framework-3/documents/ (Accessed November 2023).
[39] Scottish Government (2014). *Scottish Planning Policy (SPP).* (online) Available at: https://www.gov.scot/publications/scottish-planning-policy/documents/ (Accessed November 2023).

Policy	Summary
	existing infrastructure. *Hunterston is a key site, anchoring other opportunities around the Firth of Clyde'.* NPF4 defines National Development within the Hunterston Strategic Asset as being of a scale or type classified as 'major' by the 'The Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009', and for the following classes of development: ● a) Infrastructure to support a multi-modal deep water harbour; ● b) Land and buildings for bulk handling, storage, processing and distribution; ● c) Facilities for marine energy generation technology fabrication and decommissioning; ● d) Facilities for marine energy servicing; ● e) Land and buildings for industrial, commercial, research and development, and training uses; ● f) Infrastructure for the capture, transportation and long-term storage of greenhouse gas emissions, where transportation may be by pipe or vehicular means; ● g) Infrastructure for the production, storage and transportation of low carbon and renewable hydrogen; and hydrogen production related chemicals including ammonia; ● h) Infrastructure for the generation and storage of electricity from renewables exceeding 50 megawatts; and ● i) Electricity transmission infrastructure of 132kv or more. Whilst the Proposed Works do not constitute a National Development as defined in NPF4, it is assumed, for the purposes of this ES, that the Site will be left in a brownfield state recognising the future development potential envisaged in NPF4.
The Transboundary Radioactive Contamination (Scotland) Direction 2021[40]	The Direction states its purpose is to "*ensure that SEPA considers whether plans to dispose of radioactive waste are liable to result in the radioactive contamination, significant from the point of view of health, of water, soil or airspace of notifiable countries … unless the proposed variation will not increase any authorised limits placed on radioactive waste disposal activities."* In the context of the Proposed Works, there will not be an increase in any authorised limits placed on existing radioactive waste disposal activities. Variations of HNB's EASR18 Permit may be necessitated at various points of decommissioning.

[40] Scottish Government (2021). *The Transboundary Radioactive Contamination (Scotland) Direction 2021*. (Online). Available at: https://www.gov.scot/publications/the-transboundary-radioactive-contamination-scotland-direction-2021/. (Accessed October 2023)

4.5 Local Policy

Introduction

4.5.1 The ES considers local policy which is relevant to the Proposed Works as summarised in **Table 4.5**. Where these local policies are relevant to specific technical aspects, they will be discussed further in **Chapters 6 – 20** of this ES.

Table 4.5 Local policy relevant to the Proposed Works

Policy	Relevance
North Ayrshire Local Development Plan (Adopted 2019)[41]	The statutory development plan applicable to the Site comprises the adopted North Ayrshire Local Development Plan (LDP) and associated planning guidance documents[42]. The LDP sets out how NAC aims to guide development over the next 20 years and includes its spatial development strategy, placemaking policy and strategic development areas, as well as detailed policies. Hunterston forms Strategic Development Area 1 within the LDP, which recognises its national importance as an energy hub and deep-water port and supports its inclusion within NPF4. Regarding the nuclear stations at HNB, the LDP supports the following: • *"appropriate development to support the operational life of the existing facility;* • *nuclear decommissioning and radioactive waste management from within the Site; and* • *other facilities for large and small-scale power generation."* Whilst the Proposed Works do not include a proposal for future use it is assumed, for the purposes of this ES, that the Site will be left in a brownfield state recognising the future development potential envisaged in the LDP.
Ayrshire Shoreline Management Plan (SMP) (Adopted 2018)[43]	The SMP is a large-scale assessment of the risks associated with coastal tides and aims to help inform the future management of these risks to land and people through its action plan. HNB and thus the Proposed Works are located in Sub-cell 6b2 and Policy Unit 6b2.1. The SMP identifies the Policy Unit as a Strategic Site under the NPF and defines a Policy Plan to *'advance the line',* which in the short-term is achieved by allowing *'the existing line to be advanced by maintaining and extending the existing defence assets*'. In the medium to long-term, this is achieved through the maintenance and upgrade to existing defence assets to protect the assets behind the defence line.

[41] North Ayrshire Council (2019). *North Ayrshire Local Development Plan (2019)*. (Online) Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed November 2023).
[42] The associated planning guidance within the North Ayrshire Local Development Plan can be found at: North Ayrshire Council (2021). *Other Planning Guidance*. (Online) Available at: https://www.north-ayrshire.gov.uk/planning-and-building-standards/ldp/other-planning-guidance.aspx (Accessed November 2023).
[43] North Ayrshire Council and South Ayrshire Council (2018). *Ayrshire Shoreline Management Plan*. (Online) Available at: https://www.north-ayrshire.gov.uk/community-safety/flooding/ayrshire-shoreline-management-plan.aspx (Accessed November 2023).

Policy	Relevance
Clyde Regional Marine Plan (2019)[44]	The Clyde Marine Planning Partnership (CMPP) have been nominated by Marine Scotland as the delegate for taking forward regional marine planning in the Clyde and are currently developing a marine plan which will provide a framework to manage, effectively and sustainably, the economic, social and environmental needs of the Clyde Marine Region. The pre-consultation draft specifically references the Proposed Works, and the Site's coastal location, due to the need for access to water from the Clyde for industrial cooling, during operation. Objective ENCA 2 *The laying, replacement and maintenance of important subsea cables and pipelines is undertaken with due consideration of all marine users,* is relevant in the context of the Proposed Works in the marine environment, which will be consented via the marine licencing process. To date, a pre-consultation draft plan has been produced; if adopted prior to the submission of the ES, due regard will be given to the plan for the relevant environmental aspects.

4.6 Other Consents, Licences and Permits

4.6.1 In addition to the consent sought through the submission of this ES to ONR under the EIADR, the Proposed Works may also require new consents, licences and permits (the provisions for which are governed by their own separate regulatory processes) and/or variations to existing licences and permits. The key consents, permits and licences are listed below, Where relevant, the interactions between these consents, licences and permit arrangements and the EIA are discussed in **Chapters 6 – 20** of this ES:

- –**Planning permission** – New buildings, structures, and engineering works (as listed in **Table 4.3**) that are required to enable the decommissioning of HNB may also require planning permission from North Ayrshire Council under the Town and Country Planning (Scotland) Act 1997[26]. EIADR consent is not required for the construction of the waste processing facilities but will be required in order to operate those facilities during the Preparations for Quiescence phase.
- **Marine Licence** – Activities including the sealing off and removal of power station marine infrastructure and the construction of new effluent discharge are likely to require a marine licence. Marine licences will be sought where required under the Marine (Scotland) Act 2010[27] from Marine Scotland. **Environmental Permitting** – The Environmental Authorisations (Scotland) Regulations 2018[45] require environmental permits to be issued for the handling and/or storage of certain waste materials.
- **Permit for radioactive substances under the – Environmental Authorisations (Scotland) Regulations 2018 (EASR) permit** – When carrying out a radioactive substances activity, an EASR permit is required before the activity is scheduled to begin. A permit is already in place, and will require variation to reflect changes during the Proposed Works. Other non-nuclear environmental permits or exemptions may

[44] Clyde Marine Planning Partnership (2019). *Clyde Regional Marine Plan*. (online) Available at: https://www.clydemarineplan.scot/marine-planning/clyde-regional-marine-plan/ (Accessed November 2023).
[45] UK Government (2018). *The Environmental Authorisations (Scotland) Regulations 2018* (Online). Available at: https://www.legislation.gov.uk/sdsi/2018/9780111039014/contents (Accessed February 2023).

also be required if these are not already in place before the Proposed Works begin. The Guidance on Requirements for Release from Radioactive Substances[46] for operators of nuclear sites that hold, or intend to hold, an environmental permit for the disposal of radioactive waste describes how submissions to the regulators are required to demonstrate how the site meets the requirements for it to be released from radioactive substances regulation.

- **Discharge Consent (for surface/groundwater)** - Under the provisions of the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended in 2013 and 2017)[47], should any water be required to be discharged/abstracted as part of the Proposed Works, as separate licence will be required from SEPA.
- **Hazardous Substances Consent** - Under the provisions of the Control of Major Accident Hazards (COMAH) Regulations 2015[48] there may be a requirement to vary or surrender existing Hazardous Substances Consents due to reductions in chemical volumes stored onsite.

[46] SEPA et al. (2018) *Management of radioactive waste from decommissioning of nuclear sites: Guidance on Requirements for Release from Radioactive Substances Regulation* (online). Available at: https://www.sepa.org.uk/media/365893/2018-07-17-grr-publication-v1-0.pdf (Accessed February 2023).

[47]

[48] UK Government (2015). *The Control of Major Accident Hazards Regulations 2015*. (Online). Available at: https://www.legislation.gov.uk/uksi/2015/483/contents/made (Accessed November 2023).

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5.

The EIA Process

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5. The EIA Process

5.1 Introduction

5.1.1 Environmental Impact Assessment (EIA) is a process for identifying the likely significant environmental effects (positive and negative) of a project, and subsequently providing a tool to inform decision-making with respect to the granting of consent by the relevant regulatory body. The EIA process culminates in the provision of an Environmental Statement (ES) which presents the findings of the EIA and describes the likely significant effects, including cumulative effects, associated with the Proposed Works.

5.1.2 Schedule 1(4) of the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (EIADR)[1] (as amended) states that a licensee who applies for a consent under regulation 4(a) shall provide an ES, being a statement, which provides:

- "*A description of the factors specified in regulation 10B(3) likely to be significantly affected by the project: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.*"

5.1.3 The EIA process should be systematic, analytical, impartial, consultative, and iterative allowing opportunities for environmental concerns to be addressed. Typically, a number of iterations take place in response to environmental constraints and opportunities identified during the EIA process, stakeholder engagement and consultation prior to submission (see **Section 5.5**). This iterative process is a fundamental element of the EIA for the Proposed Works and is described in this ES.

5.1.4 The environmental aspect assessments (**Chapters 6-20**) have been carried out using the general approach and processes set out in this chapter. Where required, specific aspect chapters have refined the approach set out in this chapter in order to properly address particular requirements in a suitable manner. Any changes to the approach set out here are detailed in the appropriate environmental aspect chapter. These approaches are based on recognised good practice and guidelines (for example ONR's guidance on EIADR[2]) relevant to both EIA as a whole or that specific environmental aspect chapter.

5.2 EIA terminology

Impacts and effects

5.2.1 The terms 'impact' and 'effect' are often used synonymously, and this can lead to confusion. For clarity, a cause-and-effect logic will be applied to the EIA of the Proposed

[1] UK Government (1999). *Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999* (Online) Available at: https://www.legislation.gov.uk/uksi/1999/2892/contents/made (Accessed June 2023).
[2] ONR (2023). *Guidance on the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations.* (Online). Available at: onr-nlr-gd-001.docx (live.com) (Accessed November 2023).

Works, whereby impacts are the changes that arise as a result of decommissioning (e.g. changes in water quality) and effects are the consequences of those changes (e.g. marine habitat becomes degraded by the change in water quality).

Types of effects

5.2.2 Schedule 1, paragraph 5 of EIADR[1] states that the ES should include:

5.2.3 "*The description of the likely significant effects on the factors specified in regulation 10B(3) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project.*"

5.2.4 The ES considers all of these types of effects, as appropriate, in the environmental aspect chapters (**Chapters 6-20**), in so far that individual aspects are so affected. However, whilst some terms are self-explanatory, a list of definitions of the key types of effects have been provided to confirm how these terms have been applied throughout the ES.

Direct effects

5.2.5 Direct effects are those that result directly from the Proposed Works, such as the potential direct impacts on water quality within the surrounding marine environment from removal of parts of the cooling water intake.

Indirect and secondary effects

5.2.6 Indirect and secondary effects are those that result from consequential change caused by the Proposed Works. As such they would normally occur later in time or at locations farther away than direct effects. An example would be the effect on marine ecology from changes in water quality which has been altered from removal/decommissioning of parts of the cooling water intake.

Transboundary effects

5.2.7 Transboundary effects are those effects that would affect the environment in another state within the European Economic Area (EEA).

Cumulative effects

5.2.8 Two types of Cumulative Effects Assessments (CEA) have been considered in the assessment:

- Inter-project (combined with other development) cumulative effects; effects resulting from the Proposed Works combining with the same topic-related effects generated by other developments to affect a common receptor; and
- Intra-project (within the Proposed Works) cumulative effects; individual environmental aspect effects resulting from the Proposed Works, which are not significant in their own right, but could combine with other environmental aspect effects from the same development to create effects that are significant.

5.3 The EIA process

5.3.1 As outlined in **Chapter 4: Policy and Legislation**, the Project falls under EIADR[1]. EIADR set out the procedures to be followed in relation to EIAs undertaken for nuclear decommissioning in the UK.

5.3.2 The ONR provide guidance via the Guidance on the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations[2], to nuclear licensees to establish the requirements to achieve compliance with EIADR, and ultimately gain consent to dismantle and decommission a nuclear facility.

5.3.3 The EIA undertaken for the Proposed Works has focused on aspects and matters where a likely significant effect may occur. This approach ensures that the EIA process is proportionate in line with best practice and focuses effort in those areas where significant effects are likely as required by Regulation 5(1) of EIADR[1].

5.3.4 The preparation of this ES is one of the key stages in the EIA process as it has brought together information about any likely significant environmental effects.

5.4 EIA Scoping

5.4.1 A Scoping Report was submitted by EDF to the ONR on 01 August 2022. The Scoping Report presented the Indicative Decommissioning Works Area boundary (IDWA) which defined the area within which the decommissioning and dismantling activities would be located. This set out the likely significant environmental effects (as identified at that time) that would be assessed in more detail in the ES (i.e. scoped-in) as well as those that were unlikely to be significant and could therefore be scoped-out of further assessment.

5.4.2 A Pre-application Opinion was adopted by the ONR on 04 October 2022 and is appended in **Appendix 5A**. The Pre-application Opinion and the statutory consultee responses have subsequently informed the assessment work and further design evolution undertaken to date. A summary of the Pre-application Opinion comments and where they are addressed in this ES is provided in **Table 5.*5.1*** of this chapter, **Chapter 4: Policy and Legislation** and environmental aspect chapters (Chapters 6-20).

5.4.3 Within the Pre-application Opinion, the ONR cited a specific point relating to additional topics that, in the opinion of the ONR were not addressed sufficiently within the Scoping Report and that were therefore to be considered in the EIA. These topics are:

- Transboundary effects;
- Human health impacts;
- Impacts on fishing, maritime recreation and maritime commercial services;
- Material and resources use; and
- Marine archaeology and shipwrecks.

5.4.4 The Applicant consulted with the ONR in December 2022 on this matter and agreement was sought for the Applicant to submit a Technical Note, in advance of the submission of the ES, to provide clarity on the scoping in or out of these topics. The Technical Note is presented in **Appendix 5B**.

Table 5.5.1 Summary of Pre-application Opinion Responses

Paragraph Ref.	Consideration	How addressed in the ES
17	Hunterston B is part of a fleet of Advanced Gas Cooled Reactors (AGRs) currently operated by EDFE. The current strategy for the AGR fleet is that they will be transferred from EDFE to Nuclear Decommissioning Authority (NDA) ownership and will then be operated by Magnox Ltd. This transfer will take place following completion of defueling. ONR notes that there are uncertainties for future activities in the decommissioning project, where the activities will take place after the site has transferred to the NDA ownership. The ES could also provide information on how the EDFE has engaged with the NDA and Magnox Ltd to date, and how these organisations will progress the decommissioning project once they take ownership of the site, including the review and management of any uncertainties.	The EIADR Submission includes a document which outlines the arrangements Magnox may take to review ongoing programme and works, and their alignment to EIADR, to demonstrate EIADR compliance (see **Appendix 5C**).
24	The approach to managing the decommissioning waste during the 'Preparations for Quiescence Phase' should be confirmed in the ES. The Hunterston A site is currently decommissioning and is in scope of EIADR; if facilities on the Hunterston A site are to be used then this should be considered in terms of the potential cumulative impacts of the two decommissioning projects.	Noted. Details relevant to the management of waste during the Proposed Works are presented in **Chapter 2: The Decommissioning Process** in so far as they relate to the EIADR consenting process and associated requirements. The consideration of potential environmental impacts for facilitating the storage of HNB ILW at HNA will be a consideration for the site licensee of Hunterston A as a change to the HNA EIA Baseline.
32	ONR appreciates that due to the long timescales of the decommissioning project, there are currently uncertainties about the later stages of the project but we expect the ES to include information on how future decommissioning phases will be reviewed and re-assessed, and reported.	Noted, the EIADR submission provides clarity on proposed monitoring arrangements for the latter phases of decommissioning, as part of the approach to the EIA. The Outline Environmental Management Plan (EMP) presents the outline monitoring arrangements and will be reviewed and updated as necessary in response to delivery of the Proposed Works.
39	The assessment methodology presented in chapter 4 of the scoping report follows good practice and clearly sets out the criteria to use for determining sensitivity, magnitude of change and significance	Noted.

Paragraph Ref.	Consideration	How addressed in the ES
	level. Paragraph 4.4.14 clearly sets out what level of effect is considered to be significant.	
40	Within the technical chapters, there is some repetition of the information presented in Chapter 4 and there is some inconsistency with the presentation of the significance matrix in some technical chapters but not others. Receptor sensitivity is also missing from some of the chapters.	This chapter, specifically paragraphs 5.7.11 – 5.7.15, discusses the approach to determining significance and the application of a significance matrix. This section highlights that there are variations to the generic approach presented in this chapter, which are presented in the respective environmental aspect chapters (e.g. variance of matrix, omission of a matrix, omission of criteria). This ES ensures that any variations to the generic approach are signposted in the topic chapters and the sensitivity of relevant receptors is considered, where required.
41	ONR notes that, while this is not included in the scoping report, the ES would benefit from a summary, for example in a table format, of the receptors/ environmental areas have been assessed and where these have been considered in the technical chapters. This would provide a useful guide, particularly for consultees who will want to focus on specific aspects of the report, to where information can be found. It would also indicate where there are interfaces between different topic areas for example between costal management and water quality (Chapter 9) and surface water and flood risk (Chapter 10).	Noted, a summary is provided in this chapter of the ES, which identifies where topics stipulated in the regulations are dealt with and where there are interfaces between environmental aspects (see **Table 5.2**). These interfaces have also been identified in the introductions to each of the environmental aspect chapters. A summary of the receptors/environmental aspects that have been assessed and where they are considered in the environmental aspect chapters is provided in **Chapter 22: Summary of Effects**. This provides an overview, on an aspect by aspect basis, of the receptors and significance of effect (including magnitude and sensitivity).
42	The scoping report describes the temporal scope of the project and how environmental effects will be compared to the situation prevailing before the	Noted, a statement is presented in this chapter of the ES that details the

Paragraph Ref.	Consideration	How addressed in the ES
	decommissioning project commences (the current baseline), and to the situation that would prevail in the future without the decommissioning project (the projected future baseline). However, no description of how the environmental baseline has been established to inform the scoping process is provided. Please see ONR's comments on the Technical Chapters for further feedback on the projected future baseline.	overarching approach to defining the environmental baseline (see **Section 5.6**), with cross references to the environmental aspect chapters which provide further detail on the data sources consulted to formulate the baseline. The Scoping Report provided information on where data has been drawn from for the baseline under the 'data gathering methodology subsection' of each environmental aspect chapter. This approach has been replicated in the ES. The current baseline uses the best available evidence at the time of submission and is the most contemporary data for all environmental aspects.
43	EDFE recognises that interim consideration of the evolving baseline will be required due to the extended duration of the decommissioning project; interim reviews will be built into the decommissioning programme and refinements to assessments implemented as necessary. ONR considers that understanding the evolving baseline over the long timescales of the decommissioning project is an important factor and it is good to see this recognised here. The ES should make it clear how uncertainties in the future baseline prediction will be managed as the project progresses.	The ES aspect chapters outline where a future baseline can be identified for use in the assessment where practicable. Onward processes to monitor the evolving baseline as decommissioning progresses have been outlined in a collaborative NDA/Magnox/EDF document as part of the EIADR submission (see **Appendix 5C**).
45	Assessment of effects and determining significance: The scoping report provides an overview of the methodology that will be used for assessing environmental effects and the proposed assessment methodology follows good practice.	Noted.
46	The project has a ~96 year period and is split into three discrete phases of work, the preparation for the quiescent phase, the quiescent phase and the final site clearance phase. Each technical chapter refers back to Chapter 2 of the Scoping Report when referring to the temporal scope of the assessment and have considered each phase of the Project (however this is unclear in some chapters). However, as noted in an earlier comment, it is not clear which points in time in each phase within the project duration have been used as the basis for the	The ES clearly identifies that the current baseline is utilised for assessment purposes. Any limitations in this approach are identified in the methodology of the environmental aspect chapters. Where relevant (e.g. Traffic and transport, Noise, Air quality) specific year(s) are

Paragraph Ref.	Consideration	How addressed in the ES
	assessment. In addition, the majority of chapters conclude that the future baseline is hard to predict and so the current baseline was used for scoping. It is not clear whether this approach will also be used for the EIA and this should be clarified in the ES. If a future baseline cannot be determined at this stage, the ES should set out how this limitation is to be managed.	defined and cross aspect interfaces identified in the ES. It should be noted that there will be variation between the environmental aspects, with respect to the worst-case year identified. Section 5.7 in this chapter of the ES confirms the overarching approach to the selection of worst-case years applicable to each aspect assessment. The EMP will routinely review the current environmental conditions in comparison to the baseline within this ES. Further embedded and good practice measures will be implemented on Site and recorded in the EMP as necessary, to account for changes in baseline which elsewise could lead to additional environmental effects.
47	Environmental Measures: The definition of mitigation measures considered in the EIA process is clearly set out in this section.	Noted.
48	Assessment of Cumulative Effects: The proposed methodology to define the types of development for the assessment of cumulative effects is considered appropriate. ONR notes that a zone of influence for determining cumulative effects is defined in Figure 4.1 but a rationale for this zone has not been provided in the scoping report, nor has a review of the potential significant effects been conducted. The scoping report does clarify that in the ES the zone of influence will be defined by each environmental topic and be combined into a single area. This approach is deemed appropriate.	The rationale for the CEA ZoI is presented in this chapter of the ES (see para 5.9.4). Likely significant CEA effects are reported in **Chapter 21: Cumulative Effects Assessment**.
49	It would have been beneficial for the scoping report to provide an understanding of what potential significant environmental effects could arise for both intra and inter-project cumulative impacts, with a clear statement concluding that these assessments are scoped into the EIA. Within the ES, the scope of the cumulative impact assessment should be clearly set out, and a proportionate approach should be applied.	The identification of methodologies and the preliminary list of 'other development' for inter-project effects presented in the Scoping Report clearly indicated that further assessment would be undertaken as part of this ES, and the list of 'other development' for consideration refined.

Paragraph Ref.	Consideration	How addressed in the ES
		The ES clearly sets out the scope of the assessment and the relevant projects/plans included in the CEA have been agreed with relevant stakeholders.
50	Transboundary Effects: It is not clear if Transboundary Effects have been scoped in or out of the EIA; the report states that they are unlikely but does not make a clear statement on the inclusion of transboundary effects in the scope of the EIA. This should be clarified in the ES.	Noted, transboundary effects are scoped out of the EIA and a statement confirming this has been provided in **Section 5.10** of this chapter. This has been agreed with the ONR in advance of this ES via submission of a technical note clarifying our position in respect to transboundary effects (see **Appendix 5B**).
51	The information in the scoping report (section 4.7) is focused on potential doses to members of the public but the assessment of potential transboundary effects should consider potential significant effects on all environmental and social aspects. This should be considered further in the EIA process. If the effects can be scoped out of the EIA, further engagement with the ONR should be sought and the ES should capture the rationale.	Transboundary effects are scoped out of the EIA. EDF have discussed this issue with the ONR. Confirmation of the reasoning for scoping out such effects has been provided via a technical note in advance of the submission of this ES. This technical note has also been included as an appendix to this ES (see **Appendix 5B**).
52	Radiological Effects: Section 4.8 states that radiological discharges (solid, liquid and gaseous) and their impacts are assessed in detail during the process for applying for a permit (or a variation) under the Environmental Authorisations (Scotland) Regulations 2018 and are regulated by the Scottish Environment Protection Agency (SEPA) through routine regulatory interactions, and are therefore scoped out of the EIA.	Noted, the interpretation here is correct. **Chapter 20: Radioactive Waste and Discharges** discusses this further
53	Section 4.8 also states that the effects of working with ionising radiation as a result of the decommissioning works is also scoped out of the EIA as they are specifically regulated by ONR under the Ionising Radiation Regulations 2017 and through compliance with the site licence conditions. ONR considers the rationale for both aspects to be reasonable.	Noted, the interpretation here is correct.
54	The description of the scope would benefit from clear statements about how other radiological effects, such as radioactive waste management, and the management of contaminated land are considered in the scope of the EIA and an explanation of where	Noted, details of the approach to radioactive waste management as part of the Proposed Works is presented in **Chapter 2: The**

Paragraph Ref.	Consideration	How addressed in the ES
	this is covered in the technical chapters. This could be clarified in the ES.	**Decommissioning Process**. and the management of contaminated land is covered in **Chapter 12: Soils, Geology and Hydrogeology** of this ES. This chapter clarifies which aspects are presented with respect to the provisions of the regulations (see **Table 5.3**). **Chapter 20: Radioactive Waste and Discharges** provides further clarity on the justification for the scoping out of radiological effects.
57	The majority of the chapters conclude that long-term changes in the baseline cannot be predicted and therefore the current baseline will be used for the assessment. It is unclear if this was for the scoping process or if it is the approach for the EIA. It is appreciated predicting the future baseline is challenging for many topics and receptors, however further evidence to understand why this is the case should be provided in the ES. If this is the approach for the EIA, this is a limitation to the assessment, which should be clearly accounted for in the ES.	Noted, this chapter (paragraphs 5.6.8 – 5.6.10) provides a statement to confirm the approach taken to the consideration of the future baseline in this ES.
58	The ES should provide a clear justification of how the study areas were defined and set out the baseline for the EIA, focusing on the receptors and resources that could be significantly affected. As per section 4.5 of the scoping report, the ES should include a description of the mitigation measures that will be implemented to minimise the environmental impact of the project.	Noted, the environmental aspect chapters of this ES clearly describe the Study Areas that apply to each of the aspect assessments. The Study Areas have been refined subsequent to the areas identified in the Scoping Report. Embedded and additional mitigation, where relevant, are also presented in the environmental aspect assessments.
60	The scoping report does not detail how uncertainty will be managed in the scoping phase or in the EIA. Given the long timescales of the decommissioning project, having uncertainty is acceptable, however it is important to detail how uncertainty is addressed. If a methodology for managing uncertainty was set out and assumptions made to accommodate these limitations, this may support the conclusions drawn on why certain receptors are scoped in or out of the EIA.	Noted, where relevant, assumptions are detailed in each of the environmental aspect assessments to enable the definition of a worst-case scenario. This ES clearly identifies any assumptions that influence the assessment and reports these in a sub-section of the methodology section in each environmental aspect chapter. This chapter, signposts to readers where

Paragraph Ref.	Consideration	How addressed in the ES
		assumptions and uncertainty are dealt with (see **Section 5.12**).
61	There is potential to reduce the scope through the EIA process, in particular scoping out phases for some topics as well as scoping out some receptors and activities. Once further information becomes available, EDFE should aim to refine and finalise the scope of assessment, so that a proportionate ES (that documents significant effects) can be delivered to the ONR.	Noted, where appropriate the scope of assessments have been refined and discussed with relevant consultees prior to the finalisation of the assessments presented in this ES.

5.5 Consultation and engagement

5.5.1 EDF has undertaken consultation to gain feedback on the methodology for the decommissioning works, refine the Scope of the EIA and assist in the development of any required mitigation.

5.5.2 There have been two rounds of non-statutory consultation.

Non-statutory consultation

5.5.3 The first non-statutory consultation on the Proposed Works took place from 8 August to 19 September 2022, and the second took place from 30 May to 10 July 2023. A consultation information letter provided a summary of information about the Project, details about the consultation, including how to get involved and where more information could be found was circulated to the local community and wider stakeholders. In addition, advertisements were placed in local newspapers and a social media campaign on Facebook, LinkedIn and Google undertaken to raise awareness of the consultations. Letters providing information on the consultation were also sent directly via email to stakeholders identified as having an interest in the proposals. For Round 1 Consultation, a press release was issued to local newspapers notifying communities of the upcoming consultation, which received coverage.

5.5.4 Public exhibition events were held at accessible venues within communities who may be interested in the proposals. At the Round 1 Consultation, 80 people attended the four events, and 20 attended the two events held for Round 2. A virtual exhibition space was also made available at both rounds to provide an alternative for those unable to attend the public events, which accumulated 484 total views in the first round, and 185 in the second.

5.5.5 A range of materials were provided at both rounds; online on EDF's website, at the public events, and deposited at local libraries, in order to ensure accessibility of information to a range of audiences. These included a Consultation Document providing non-technical information on the Proposed Works, phasing, waste management, and environmental assessments. A Frequently Asked Questions document provided for each round outlined likely queries regarding the Proposed Works and consultation and provided answers to these. At Round 1 Consultation, the EIA Scoping Report was also provided for consultees to view and comment on as the consultation was undertaken in parallel to ONR's consideration of the document prior to the production of their Pre-application Opinion (**Appendix 5A**).

5.5.6 Feedback could be submitted through an online feedback form, in hard copy to the project Freepost address, and by email. 27 responses were received to the first round of consultation, and 15 to the second. After each round, the project team reviewed feedback received for consideration within the design development of the Proposed Works. Information on the consultation undertaken by EDF, including details of how regard was given to feedback received and EDF's response to issues raised, is provided in the Consultation Feedback Report.

Consideration of engagement in the EIA process

5.5.7 The approach to the EIA has been informed by the EIA scoping process, public consultation and standalone technical stakeholder engagement.

5.5.8 Alongside the non-statutory Round 1 Consultation, EDF undertook a series of presentations sharing information on the Proposed Works and consultation at meetings of Community Councils near to Hunterston B - Fairlie, Largs and West Kilbride. A summary of feedback to the Round 1 Consultation to date was provided at the Hunterston Site Stakeholder Group (SSG) meeting on 1 September 2022, which provided time to respond to queries on the Proposed Works.

5.5.9 At the start of the Round 2 Consultation, EDF presented at the SSG meeting on 1 June 2023 to share information about the consultation and provide an overview of the updated proposals. A video meeting was also held with the Cumbrae, Fairlie and West Kilbride Community Councils to update them on the Proposed Works and provide an opportunity for the applicant to respond to queries raised by these key local stakeholders.

5.5.10 Each environmental aspect chapter (**Chapters 6-20**) includes a 'Consultation and Stakeholder engagement' section which provides a record of all relevant comments received from environmental bodies, in relation to that aspect with information as to how the Pre-application Opinion and consultation responses have been addressed in the ES. The section in environmental aspect chapter also details any technical engagement with relevant environmental bodies undertaken during the EIA process.

5.6 Scope of the assessment

Technical scope

5.6.1 This ES accords with the requirements of EIADR in relation to the content of this ES. **Table 5.2** signposts where the information is provided in the ES pursuant to Regulation 5 and Schedule 1 of the EIADR[3].

[3] UK Government (2018). *The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) (Amendment) Regulations 2018*. (Online). Available at: https://www.legislation.gov.uk/uksi/2018/834/made.

Table 5.2 Information required in the ES

Information required in EIADR	Where considered in the ES
Regulation 5 (Schedule 1) Part 1	
Description of project, including in particular: • ***(a) a description of the location of the project.*** • ***(b) a description of the physical characteristics of the whole project, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases;*** • ***(c) a description of the main characteristics of the operational phase of the project (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used; and*** • ***(d) an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced during the construction and operation phases.*** **(Schedule 1 Para 1 EIADR)**	**Chapter 2: The Decommissioning Process** Environmental aspect **Chapters 6 – 20**.
A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the licensee, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects. **(Schedule 1 Para 2 EIADR)**	**Chapter 3: Alternatives**
A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge. **(Schedule 1 Para 3 EIADR)**	Environmental aspect **Chapters 6 – 20**.
A description of the factors specified in regulation 10B(3) likely to be significantly affected by the project: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material	Environmental aspect **Chapters 6 – 20**.

Information required in EIADR	Where considered in the ES
assets, cultural heritage, including architectural and archaeological aspects, and landscape. **(Schedule 1 Para 4 EIADR)**	
A description of the likely significant effects of the project on the environment resulting from, among other thing: ● ***(a) the construction and existence of the project, including, where relevant, demolition works;*** ● ***(b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;*** ● ***(c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;*** ● ***(d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);*** ● ***(e) the cumulation of effects with other existing or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources; and*** ● ***(f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change.*** ● ***(g) the technologies and the substances used.*** ● ***The description of the likely significant effects on the factors specified in regulation 10B(3) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project. This description should take into account the environmental protection objectives established at European Union or Member State level which are relevant to the project.*** **(Schedule 1 Para 5 EIADR)**	Environmental aspect **Chapters 6 – 20**.
A description of the forecasting methods or evidence, used to identify and assess the significant effects on the	Environmental aspect **Chapters 6 – 20**.

Information required in EIADR	Where considered in the ES
environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved. **(Schedule 1 Para 6 EIADR)**	
A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases. **(Schedule 1 Para 7 EIADR)**	Environmental aspect **Chapters 6 – 20**. **Outline EMP**.
A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to European Union legislation such as the COMAH Directive or the Nuclear Safety Directive or other relevant environmental assessments may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies. ***(*Schedule 1 Para 8 EIADR*)***	**Chapter 18: Major Accidents and Disasters**
A non-technical summary of the information provided under paragraphs 1 to 8. **(Schedule 1 Para 9 EIADR)**	**Non-Technical Summary**.
A reference list detailing the sources used for the descriptions and assessments included in the report. **(Schedule 1 Para 10 EIADR)**	Environmental aspect **Chapters 6 – 20**.

Identification of baseline conditions

5.6.2 Determining the existing environmental conditions is an important part of the EIA process. Baseline data are collected to better understand the likely significant effects from the Proposed Works and may quantify existing levels of pollutants (e.g. for noise, air and water pollution) and identify potentially vulnerable/sensitive habitats, species or human populations/groups and other environmentally sensitive receptors such as historic environment receptors. Where a baseline aspect cannot be quantified then nominal levels

of importance, quality or value are assigned based on widely accepted criteria in fields such as ecology, historic environment, landscape and socio-economic assessment.

5.6.3 The baseline has been established through desk-based studies and/or surveys of the Works Area for each environmental aspect/receptor and provides a 'baseline' against which changes, potentially caused by the Proposed Works, can be compared. The baseline environment encompasses the Study Area, which are set out in each of the environmental aspect chapters (**Chapters 6-20**).

5.6.4 Detailed methodologies for baseline data gathering specific to each environmental aspect assessment can be found in **Chapters 6-20**.

Spatial scope

5.6.5 The spatial scope, referred to as the Study Area, of the assessment for each environmental aspect, i.e. the area over which changes to the environment are predicted to occur as a consequence of the Proposed Works, will depend on the nature of the potential effects and the location of receptors that could be affected. It takes account of:

- the physical area of the Proposed Works (i.e. the Indicative Dismantling Works Area, referred to as the Works Area, as shown on **Figure 1.1**);
- the nature of the baseline environment; and
- the manner and extent to which environmental effects may occur.

5.6.6 Each environmental aspect chapter (Chapters 6-20) describes the Study Area to be considered, providing a clear explanation as to why that Study Area has been adopted. The spatial scope of each assessment has taken account of comments received from stakeholders, the EIA Pre-application Opinion and non-statutory consultation responses.

Temporal scope

5.6.7 The temporal scope covers the time period over which changes to the environment and the resultant effects are predicted to occur as a result of the Proposed Works, and are typically defined as either being temporary or permanent:

- **Permanent** - these are effects that will remain even when the Proposed Works are complete, although these effects may be caused by environmental changes that are permanent or temporary.
- **Temporary** – these are effects that are related to environmental changes associated with a particular activity and that will cease when that activity finishes.

5.6.8 Environmental effects have been compared to the situation prevailing before the Proposed Works commence (the current baseline), and to the situation that would prevail in the future without the Proposed Works (the projected future baseline). Where appropriate the evolving baseline has been considered within the environmental aspect assessments, noting the extended duration of the three decommissioning phases.

5.6.9 The future baseline is identified by extrapolating the current baseline using technical knowledge to predict likely changes (e.g., predictable changes such as climate change, changes that can be predicted based on reasonable assumptions and modelling calculations, information about other relevant developments etc.). It is recognised that interim consideration of the evolving baseline will be required due to the extended duration of the Proposed Works; interim reviews will be built into the decommissioning programme and refinements made to assessments undertaken as necessary.

5.6.10 Each environmental aspect chapter of this ES has defined the baseline (both current and future against which the environmental effects of the Proposed Works have been assessed). The baseline conditions which have been assessed for each environmental aspect are outlined in Chapters 6-20 of this ES. Where relevant, environmental aspect chapters have provided further information on the indicative programme for specific elements of the Proposed Works that have been considered for assessment purposes.

5.7 Assessment of effects and determining significance

Overview of significant evaluation methodology

5.7.1 For consistency, and to allow comparison between aspects, the methodology described in this section has been applied when preparing the ES. This methodology is designed to consider whether impacts of the Proposed Works will have an effect on any environmental receptors. Assessments consider the magnitude of change and the sensitivity of aspect specific resources or receptors that could be affected to classify the significance of effects.

5.7.2 The conclusion that is made on whether an effect is considered to be significant (or not significant) is either quantitatively defined against a relevant significance threshold or based upon professional judgement, with reference to the description of the Proposed Works in **Chapter 2: The Decommissioning Process**, and available information relating to:

- The magnitude and other characteristics of the potential changes (impacts) that are expected to be caused by the Proposed Works.
- The sensitivity of receptors to these changes.
- The effects of these changes on relevant receptors.
- The value or importance of receptors (where relevant).

5.7.3 For each environmental aspect, the categories of resource or receptor sensitivity and magnitude of change will be described or defined. The following sections therefore provide the generic criteria that will be applied for the definition of resource or receptor sensitivity, magnitude of change and classification of effect.

5.7.4 The environmental aspect chapters (Chapters 6-20) provide greater detail on the approach to the assessment and specific guidelines for the definition of impact magnitude and resource or receptor sensitivity for that environmental aspect. The approach to the assessment undertaken by each environmental aspect has broadly followed the approach set out in the following sections. Variations from this approach may be applicable to specific environmental aspects whereby professional judgment in the application of standards or guidance published by professional bodies (for example the Chartered Institute of Ecology and Environmental Management (CIEEM) or the Landscape Institute) is applied. Where this is the case, further detail and justification has been provided.

Evaluation matrices

5.7.5 Significance evaluation involves combining information about the sensitivity or value of a receptor, and the magnitude and other characteristics of the changes that affect the receptor. The approach to using this information for significance evaluation is outlined below.

Resource and receptor sensitivity

5.7.6 The sensitivity or value of a receptor is largely a product of the importance of an asset, as informed by legislation and policy, and as qualified by professional judgement. For example, receptors for landscape, biodiversity or the historic environment may be defined as being of international or national importance; lower value resources may be designated as being sensitive or important at a county or district level.

5.7.7 The use of a receptor would also play a part in its classification. For example, when considering effects on the amenity of a human population, a receptor used for recreational purposes may be valued more than a place of work as the environmental quality of the recreational receptor is more likely to be an important part of that receptor's use.

5.7.8 **Table 5.3** sets out the generic guidelines for the assessment of sensitivity of a resource or receptor.

Table 5.3 Generic guidelines for the assessment of sensitivity

Value or Sensitivity	Guidelines
Very High	Value: Feature or receptor possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site or receptor (for example designated features of international or national importance). Sensitivity: Feature or receptor has little to no capacity to accommodate the proposed form of change.
High	Value: Feature or receptor possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site or receptor (for example designated features of international or national importance). Sensitivity: Feature or receptor has a very low capacity to accommodate the proposed form of change.
Medium	Value: Feature or receptor possesses key characteristics which contribute significantly to the distinctiveness and character of the site or feature (for example designated features of regional or county importance). Sensitivity: Feature or receptor has a low capacity to accommodate the proposed form of change.
Low	Value: Feature or receptor only possesses characteristics which are locally significant. Feature or receptor not designated or designated only at a local or district level. Sensitivity: Feature or receptor has some tolerance to accommodate the proposed change.
Very low	Value: Feature or receptor characteristics do not make a significant contribution to local distinctiveness and not designated. Sensitivity: Feature or receptor is generally tolerant and can accommodate the proposed change.

Magnitude of change

5.7.9 The magnitude of change affecting a receptor that would result from the Proposed Works is identified on a scale from minor alterations or change, up to major changes or the total or substantial loss of the receptor. For certain environmental aspects, the magnitude of change would be related to guidance on levels of acceptability (e.g. for air quality or noise), and be based on numerical parameters, whilst for others it will be a matter of professional judgement to determine the magnitude of change, using descriptive terminology.

5.7.10 **Table 5.4** sets out the generic guidelines of the assessment of the magnitude of change.

Table 5.4 Generic guidelines for the assessment of magnitude

Magnitude	Guidelines
Very High	Very large-scale changes over the whole development area, and potentially beyond, to key characteristics or features of the particular environmental aspect's character or distinctiveness.
High	Large-scale changes over the whole development area and potentially beyond to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Medium	Medium-scale changes over the majority of the development area and potentially beyond to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Low	Noticeable but small-scale changes over part of the development area and potentially beyond to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Very low	Noticeable but very small-scale change or barely discernible changes over a small part of the development area and potentially beyond, to key characteristics or features of the particular environmental aspect's character or distinctiveness.

Determination of significance

5.7.11 The determination of significance is derived with reference to information about the nature of the Proposed Works, the receptors that could be significantly affected and their sensitivity or value, together with the magnitudes of change that are likely to occur.

5.7.12 For many environmental aspects, significance is determined by using a matrix. Variations to this matrix approach are detailed within the respective aspect chapters (Chapters 6-20), along with descriptions of receptor sensitivity, magnitude of change and levels of effect that are considered significant. Definitions of how the categories used in the matrix are derived for each environmental aspect are also set out.

5.7.13 In addition, professional judgement may be applied in the assessment, as the boundaries between the sensitivities or magnitudes of change may not be clearly defined and the resulting assessment conclusions may have needed clarifying.

5.7.14 The overarching significance matrix used for the EIA is shown in **Table 5.5**. The generic definitions used to determine the level of significance are shown in **Table 5.6**. Reference is made to:

- 'Major' effects, which will always be determined as being significant.

- ‘Moderate’ effects can be significant, or not significant, based on specific scenarios and professional judgement.
- ‘Minor’ or ‘negligible’ effects, which will always be deemed as ‘not significant’.

5.7.15 Effects can be either beneficial or adverse.

Table 5.5 Example significance evaluation matrix

		Magnitude of change				
		Very high	**High**	**Medium**	**Low**	**Very low**
Sensitivity/importance/value	**Very high**	Major (Significant)	Major (Significant)	Major (Significant)	Major (Significant)	Moderate (Probably significant)
	High	Major (Significant)	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)
	Medium	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)
	Low	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)
	Very Low	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)	Negligible (Not significant)

Table 5.6 Generic classification of effect definitions

Significance rating	Guidelines
Major	Very large or large change in environmental or socio-economic conditions. Effects, both negative and positive, which are likely to be important considerations at a national to regional level because they contribute to achieving national or regional objectives, or which are likely to result in exceedance of statutory objectives or breaches of legislation.
Moderate	Intermediate change in environmental or socio-economic conditions. Effects that are likely to be important considerations at a regional or local level.
Minor	Small change in environmental or socio-economic conditions.
Negligible	No discernible change in environmental or socio-economic conditions. An effect that is likely to have a neutral or negligible influence.

5.8 Environmental measures

5.8.1 In accordance with Schedule 1(7) of EIADR[1], the ES must include "*A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any significant adverse effects on the environment*." For each environmental aspect, the EIA process has identified impacts and effects and takes into consideration environmental measures that the Proposed Works will adopt. These environmental measures include avoidance, best practice and design commitments, which are classified into primary or tertiary measures in accordance with the IEMA '*Guide to Shaping Quality Development*'[4] definitions as follows:

- Primary (inherent): Referred to as 'embedded environmental measures', are modifications to the location, design or operation of components of the Proposed Works made during the pre-application phase that are an inherent part of the Proposed Works, and do not require additional action to be taken.
- Secondary (foreseeable): Mitigating actions that will require further activity to achieve the anticipated outcome and are referred to as 'additional measures'.

5.8.2 Tertiary (inexorable): Actions that would occur with or without input from the EIA. These include actions that will be undertaken to meet other existing legislative requirements or actions that are considered to be standard practice used to manage commonly occurring environmental effects. These are referred to as 'good practice measures' and are also embedded within the Proposed Works. Such measures are typically secured via the implementation of an EMP. Opportunities for embedded environmental measures have been identified throughout the evolution of the Proposed Works and the EIA process, whereby likely significant adverse environmental effects have been fed back into the design process to verify whether they can be avoided or otherwise mitigated in accordance with the hierarchy. Alongside this, good practice measures have been identified with reference to legislative requirements and measures of standard practice to manage commonly occurring effects to also be considered in the assessment.

5.8.3 Following the application of embedded environmental measures, where the potential for a significant environmental effect remains, 'additional measures' will be considered to avoid, reduce, or compensate such an effect. The ES reports on the anticipated effects of the Proposed Works following the implementation of all environmental measures to determine the 'residual effects'. A clear statement has been made as to whether the residual effects are significant or not significant. Residual effects may be beneficial as well as adverse.

5.8.4 An Outline EMP is provided as part of this EIADR application to provide an indication of the future structure of the EMP, which will be implemented post-EIADR consent.

Monitoring measures

5.8.5 As required by EIADR[1], there is a need to monitor the effectiveness and implementation of any proposed measures, where appropriate. The means for securing how measures will be implemented and monitored have been set out in this ES. Any monitoring proposed with respect to significant adverse effects is identified in the environmental aspect chapters (**Chapters 6-20**).

5.8.6 A schedule of all the required embedded and good practice measures are recorded in the Outline EMP, which acts as the primary tool to capture and agree all environmental

[4] IEMA. (2015). *IEMA Environmental Impact Assessment Guide to Shaping Quality Development*. Available at: https://www.iaia.org/pdf/wab/IEMA%20Guidance%20Documents%20EIA%20Guide%20to%20Shaping%20Quality%20Development%20V6.pdf (Accessed June 2023)

measures, and the mechanisms for securing them. The ES is based on the assumption that all of these measures will be implemented as part of the Proposed Works.

5.9 Assessment of Cumulative Effects

5.9.1 A Cumulative Effects Assessment (CEA) has been carried out for the Proposed Works, which evaluates the result from the combined impacts of the Proposed Works with other large-scale developments on the same single receptor or resource (inter-project) and the interaction of environmental aspect effects occurring as a result of the Proposed Works (intra-project).

5.9.2 Inter-project and intra-project effects are considered in **Chapter 21: Cumulative Effects Assessment**, and in specific environmental aspect chapters, where cumulative effects are inherent to that assessment, for example the consideration of dust deposition on biodiversity designations and habitats, within **Chapter 8: Terrestrial Biodiversity and Ornithology**. The inter-projects cumulative effects for landscape and visual receptors are considered in **Chapter 14: Landscape and Visual Impact Assessment (LVIA)**, in accordance with GLVIA3.

Inter-project effects

5.9.3 A range of public sector and industry led guidance is available on CEA, however, at present there is no single agreed industry standard method of assessment. In the absence of a definitive approach, and given the scale of the Proposed Works, professional judgement has been applied, alongside using Planning Inspectorate guidance presented in Advice Note Seventeen[5] as guidance towards the CEA approach[6]. For the Proposed Works, the criteria for assigning certainty to 'other existing development and/or approved development' within Advice Note Seventeen[7] will be applied (see **Table 5.7**).

[5] Planning Inspectorate. (2019). *Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects*. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-17/#:~:text=This%20Advice%20Note%20seeks%20to,with%20habitats%20regulations%20assessment)%3B (Accessed: June 2023)

[6] It is acknowledged that Advice Note 17 applies to Development Consent Order applications. However, Advice Note 17 provides a structured approach to the assessment of cumulative effects and therefore aspects of this approach have been applied to the Proposed Works.

Table 5.7 Criteria for identifying other developments

Hierarchy of other developments	Proposed criteria of other developments	
Tier 1	Under construction or currently undergoing decommissioning such as HNA	Decreasing level of detail likely to be available.
	Permitted application(s), where the project is classified as 'major development', whether under the Town and Country Planning (Scotland) Act 1997. or other consent regimes, but not yet implemented.	
	Submitted application(s), where the project is classified as 'major development', whether under Town and Country Planning (Scotland) Act 1997 or other consent regimes, but not yet determined.	
Tier 2	National developments identified on the National Planning Framework 4[8] and/or the relevant local planning authorities planning portal where the project is classified as 'major' development' and a scoping report has been submitted.	
Tier 3	National developments identified on the National Planning Framework 4 and/or the subject of pre-application discussion with a relevant Local Planning Authority (LPA), where a scoping report has not been submitted. Projects registered on the LPA's portal classed as major development but do not require EIA.	
	Identified in the relevant Local Development Plan (and emerging Development Plans - with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited.	
	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.	

5.9.4 The ZoI, within which any potential effects may combine with the effects arising from other developments, has been broadly defined by a nominal search area extending up to 10 km from the Works Area as presented in **Chapter 21: Cumulative Effects Assessment**. Each environmental aspect chapter includes a CEA within which other development relevant to that aspect, has been identified and considered.

[8] Local Government and Housing Directorate (2023). *National Planning Framework 4*. (Online) Available at: https://www.gov.scot/publications/national-planning-framework-4/documents/ (Accessed November 2023).

5.9.5 In order to ensure that the CEA is proportionate, each of the developments and allocations identified within the ZoI have been considered in terms of whether they would be likely to generate impacts which could combine to result in cumulative effects in combination with the Proposed Works. Criteria used for this process have been specific to each environmental aspect and will take account of scale, nature and timescales.

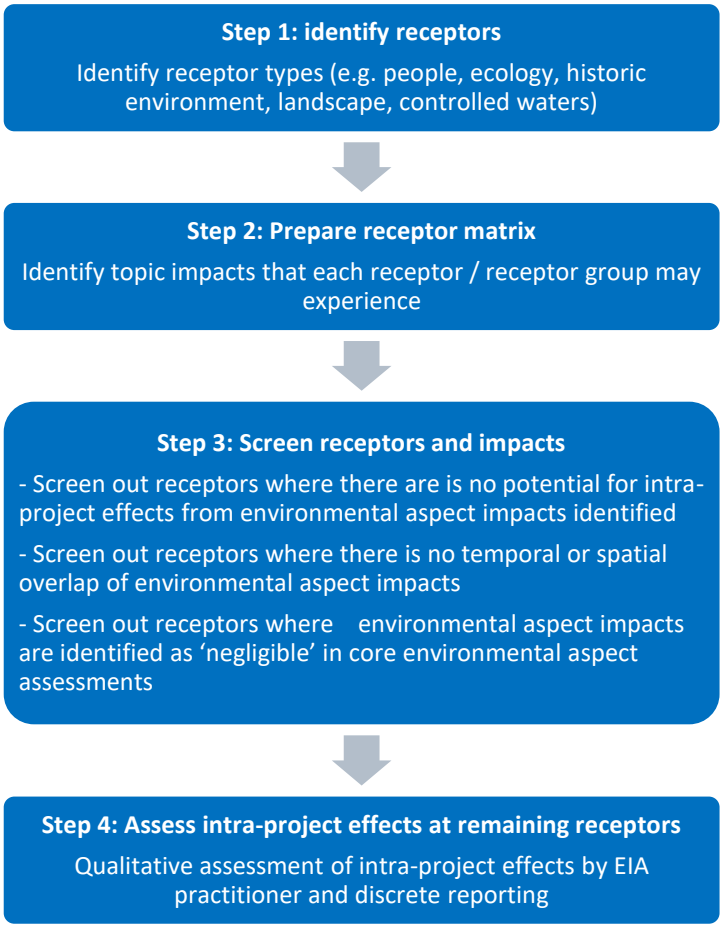
5.9.6 The other development list and relevant information on these developments was agreed with relevant stakeholders and frozen in September 2023 prior to submission to allow impact assessments to be completed and reported in this ES. A list of other development is provided in **Chapter 21: Cumulative Effects Assessment** and illustrated on **Figure 21.1**.

Intra-project effects

5.9.7 The assessment of intra-project effects involves identifying whether any of the individual environmental aspect effects resulting from the Proposed Works, which are not significant in their own right, could combine to create effects that are significant.

5.9.8 There is no standard approach to the assessment of intra-project effects although it is carried out with reference to guidance and to professional judgement. The proposed approach used for the assessment of intra-project effects for the Proposed Works is shown in **Graphic 5.1.** This follows a receptor-based approach for the consideration of intra-project effects.

Graphic 5.1 Intra-project effects assessment process



5.10 Transboundary effects

5.10.1 EIADR[1] requires an ES to consider the transboundary effects of a development (paragraph 5 of part 1 of Schedule 1). Given the nature of the Proposed Works and its location, significant transboundary effects are unlikely. Transboundary effects are discussed further in **Appendix 5B**.

5.10.2 With specific reference to radiological effects, doses to members of the public in the UK are tightly controlled and regulated in line with the Euratom Basic Safety Standards Directive and Environmental Authorisations (Scotland) Regulations 2018 (EASR) permitting. Doses to members of the UK population from most nuclear facilities are estimated at below the UK Government's threshold of optimisation (e.g. 20 mSv/y). Discharges during decommissioning are likely to be lower. Furthermore, any discharges will undergo significant dispersion before reaching other states and as such significant transboundary effects are unlikely to occur.

5.11 Assumptions and limitations

5.11.1 Assumptions and limitations are addressed under each environmental aspect as identified in the appropriate chapters (**Chapters 6-20**).

5.12 Structure of ES

5.12.1 The structure of this ES for the Proposed Works follows the order outlined in **Table 5.8** below, and it has acknowledged any changes as a result of the requirements of the Pre-application Opinion provided by the ONR, both in terms of presentation of the Proposed Works to aid understanding, or as the programme of works has evolved.

Table 5.8 Structure of the Environmental Statement

ES	Content
Non-Technical Summary (NTS)	A concise and standalone document that provides a description of the EIA process and its findings in a manner that is both appealing to read and easily understood by the general public.
Chapter 1: Introduction	Overview of the Proposed Works. The Applicant and EIA project team and competency details. Purpose of the ES. Structure of the ES. A brief summary of other relevant assessments and documents (for example, Habitats Regulations Assessment).
Chapter 2: The Decommissioning Process	Description of the Proposed Works and the surroundings. Embedded environmental measures and management measures.
Chapter 3: Alternatives	Alternatives considered and reasons for the choice of preferred options.
Chapter 4: Policy and Legislation	Legislative context.

ES	Content
	National and local policy context. Other relevant guidance and policies. Other consents, licences and permits required for decommissioning.
Chapter 5: The EIA Process	The EIA process. EIA terminology. EIA scoping. Stakeholder engagement. Identification of baseline conditions. Overview of assessment methodology. Approach to significance evaluation. Development of environmental measures. Approach to CEA.
Environmental aspect chapters (Chapters 6-20)	Introduction. Relevant aspect specific legislation, policy and technical guidance. Consultation and engagement. Data gathering methodology. Baseline description. Scope of the assessment. Embedded environmental and good practice measures. Assessment methodology. Limitations and assumptions. Assessment of effects.
Chapter 21: Cumulative Effects Assessment	Assessment of the effects that arise as a result of the Proposed Works with other developments or projects or effects in combination with other environmental aspects on the same receptor or receptor group.
Chapter 22: Summary of Effects	Summary of the outcome of the environmental aspect assessments.

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Air Quality

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6. Air Quality

6.1 Introduction

6.1.1 This chapter describes the air quality assessment and presents the methodology for assessing likely significant effects of the Proposed Works. A screening assessment of road traffic emissions has been undertaken and concludes that the criteria for a detailed assessment are not met as a result of the Proposed Works. This screening assessment considered the impacts on both human and ecological receptors. These effects have subsequently been assessed qualitatively to justify scoping out of further assessment from this ES chapter.

6.1.2 Potential effects on human and ecological receptors relating to dust emissions as a result of the Proposed Works have been assessed. This chapter describes the key considerations with respect to air quality as related to the Proposed Works, within the Indicative Dismantling Works Area (hereafter referred to as 'the Works Area'), inclusive of the HNB Nuclear Site Licence (NSL) boundary (hereafter referred to as 'the Site') and relevant receptors within a wider Study Area.

6.1.3 This chapter should be read in conjunction with the description of the Proposed Works provided in **Chapter 2: The Decommissioning Process**.

6.2 Relevant legislation, policy and technical guidance

Legislation

6.2.1 The legislation in **Table 6.1** is relevant to the assessment of the effects on air quality receptors:

Table 6.1 Legislation relevant to air quality

Legislation	Legislation Issue
The Air Quality (Scotland) Standards Regulations 2010[1]	Transpose's Directive 2008/50/EC, including the limit values, into UK legislation. Similar to Directive 2008/50/EC, the regulations define ambient air as outdoor air, and explicitly exclude workplaces and other places to which members of the public do not have regular access.
Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe[2] ('Ambient Air Directive')	Consolidates existing European Union (EU) wide air quality legislation (with the exception of Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air) and provides a new regulatory framework for $PM_{2.5}$. The Ambient Air Directive sets limit values (for the protection of human health) and critical levels (for the protection of vegetation and ecosystems) for selected pollutants that are to be achieved by

[1] UK Government (2010). *The Air Quality (Scotland) Standards Regulations 2010*. (Online). Available at: https://www.legislation.gov.uk/uksi/2010/1001/introduction/made (Accessed November 2023).
[2]European Commission (2008*). Directive 2008/50/EC of the European Parliament and of The Council of 21 May 2008 on ambient air quality and cleaner air in Europe*. (Online). Available at: https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32008L0050 (Accessed November 2023).

Legislation	Legislation Issue
	specific dates, and details procedures EU Member States should take in assessing ambient air quality. Regulated pollutants include sulphur dioxide (SO_2), nitrogen dioxide (NO_2), oxides of nitrogen (NO_x), particulate matter smaller than 10µm (PM_{10}), particulate matter smaller than 2.5µm ($PM_{2.5}$), lead (Pb), benzene (C_6H_6) and carbon monoxide (CO). The limit values and critical levels are legally binding limits on concentrations of pollutants in the atmosphere, which can broadly be taken to achieve a certain level of environmental quality. The values are based on the assessment of the effects of each pollutant on human health, taking into account the effects on sensitive groups such as children, the elderly and those with health conditions, or on vegetation and ecosystems. The limit values and critical levels relate to concentrations in ambient air. The Ambient Air Directive defines ambient air as outdoor air, and explicitly excludes workplaces and other places to which members of the public do not have regular access.
The Pollution Prevention and Control (Scotland) Regulations 2012[3]	Came into force on 7 January 2013 and implement the requirements of the Industrial Emissions Directive. The Pollution Prevention and Control *regulations* apply an integrated environmental approach to the regulation of certain industrial activities. This means that emissions to air, water (including discharges to sewer) and land, plus a range of other environmental effects, must be considered together.
The Non-Road Mobile Machinery (Type-Approval and Emission of Gaseous and Particulate Pollutants) Regulations 2018 (SI 2018/764)[4]	The regulations introduce emission limits for gaseous and particulate pollutants, as well as type approval for internal combustion engines for non-road mobile machinery (NRMM).
The Air Quality (Scotland) Regulations 2000 (as amended)[5] and The Air Quality (Scotland) Amendment Regulations 2016[6]	The Air Quality (Scotland) Standards Regulation 2000[5] and The Air Quality (Scotland) Regulations 2016[6] set out the Air Quality Objectives (AQOs) in Scotland. The Regulations outline an AQO of 40µgm^{-3} for annual mean concentrations of NO_2 and 18µgm^{-3} for annual mean concentrations of $PM_{10,}$ both pollutants associated with traffic emissions There is an EU limit of 25µgm^{-3} for the annual mean concentration of $PM_{2.5}$. The AQO have been set for the protection of human health and therefore relevant to this assessment. Appendix 6A provides further detail relating to AQO's within Scotland.
Directive 2010/75/EU of the European Parliament and of the Council on industrial	The Directive takes an integrated approach to controlling pollution to air, water and land, and sets industry standards for the most polluting industries. It aims to prevent and reduce harmful industrial emissions,

[3] UK Government (2012). *The Pollution Prevention and Control (Scotland) Regulations 2012.* (Online). Available at: https://www.legislation.gov.uk/ssi/2012/360/contents/made (Accessed November 2023).
[4] UK Government (2018). *The Non-Road Mobile Machinery (Type-Approval and Emission of Gaseous and Particulate Pollutants) Regulations 2018/764).* (Online) Available at: https://www.legislation.gov.uk/uksi/2018/764/contents (Accessed November 2023).
[5] UK Government (2000). *The Air Quality (Scotland) Regulations 2000 (as amended).* (Online). Available at: https://www.legislation.gov.uk/ssi/2000/97/made (Accessed November 2023
[6] UK Government (2016). *The Air Quality (Scotland) Amendment Regulations 2016*. (Online). Available at: https://www.legislation.gov.uk/ssi/2016/162/contents/made (Accessed November 2023).

Legislation	Legislation Issue
emissions (integrated pollution prevention and control)[7] later referred to as the Industrial Emissions Directive	while promoting the use of techniques, such as Best Available Techniques, to reduce emissions to air, water and land.

Policy

6.2.2 A summary of the relevant policies is given in **Table 6.2.**

Table 6.2 Policy relevant to air quality

Policy Reference	Policy Relevance
National Policy	
Fourth National Planning Framework - (NPF4)[8]	Policy 23: Health and safety includes the statement that "*Development proposals that would have a significant adverse effect on air quality should not be supported.*"
Cleaner Air for Scotland 2 (CAFS2) – Towards a Better Place for Everyone[9]	CAFS2 replaces the previously published 'Clean air for Scotland: the road to a healthier future' policy. It is accompanied by a delivery plan and aims to fulfil Scotland's legal responsibilities over the period 2021 – 2026. The policy also aims to achieve the ambitious vision for Scotland "*to have the best air quality in Europe*". It includes a series of actions to deliver further air quality improvements.
Local Policy	
North Ayrshire Local Development Plan[10]	Policy 27 relates to sustainable transport and active travel. North Ayrshire Council (NAC) will support development that "*reduces the need to travel or appropriately mitigates adverse impacts of significant traffic generation, road safety and air quality, including taking into account the cumulative impact*".

Technical guidance

6.2.3 A summary of the relevant technical guidance is given in **Table 6.3.**

[7] European Commission (2010). *Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)*. (Online) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32010L0075 (Accessed November 2023).
[8] Scottish Government (2023). *Fourth National Planning Framework* (Online). Available at: National Planning Framework 4 (www.gov.scot) (Accessed November 2023)
[9] The Scottish Government (2021). *Cleaner Air for Scotland 2 – Towards a Better Place for Everyone*. (Online). Available at: https://www.gov.scot/publications/cleaner-air-scotland-2-towards-better-place-everyone/pages/4/ (Accessed November 2023).
[10] North Ayrshire Council (2019). *Adopted Local Development Plan: Your Plan Your Future.* (Online). Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed November 2023).

Table 6.3 Technical Guidance relevant to air quality

Technical Guidance	Context
Local Air Quality Management (LAQM) Technical Guidance (TG22)[11]	Provides guidance for technical officers and local authorities to discharge their obligations under the LAQM regime. It contains guidance on numerous areas including, for example, screening tools and methodologies, air quality monitoring, estimating emissions and dispersion modelling.
Land-Use Planning & Development Control: Planning For Air Quality[12]	Suggests a procedure for screening potential air quality effects of new development and a procedure for assessing the significance of air quality effects in planning applications.
Delivering Cleaner Air for Scotland: Development Planning & Development Management[13]	Suggests a procedure for screening potential air quality effects of new development and a procedure for assessing the significance of air quality effects in planning applications within Scotland.
Guidance on the Assessment of Dust from Demolition and Construction[14]	Provides a four-step process for evaluating the risk associated with dust emissions from construction and demolition sites on different types of receptors to dust soiling[15], health effects and ecological effects.
Guidance on Monitoring in the Vicinity of Demolition and Construction Sites[16]	Provides updated guidance on air quality monitoring in the vicinity of demolition and construction sites. To be applied in conjunction with the guidance on the assessment of dust from demolition and construction.
Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites[17]	Provides guidance on the air quality impacts of development on designated nature conservation sites, establishes that the assessment of the effects that air quality impacts may have on habitats and species should be the responsibility of a suitably qualified and experienced ecologist.
Considering air pollution impacts in development management casework[18]	This guidance document reports how Scottish Natural Heritage considers potential impacts on protected areas from air emissions produced by certain types of development. Screening criteria are reported for the consideration of whether proposals will have a significant effect and therefore if an assessment is required.

[11] Defra (2022). *Local Air Quality Management Technical Guidance (TG22)* (Online) Available at: https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf (Accessed November 2023).
[12] IAQM & EPUK, 2017. *Land-Use Planning & Development Control: Planning For Air Quality*. (online). Available at: https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf (Accessed November 2023)
[13] Environmental Protection Scotland and RTPI Scotland (2017). *Delivering Cleaner Air for Scotland: Development Planning & Development Management.* (Online). Available at: https://www.ep-scotland.org.uk/wp-content/uploads/2015/04/DeliveringCleanerAirForScotland-18012017.pdf (Accessed November 2023).
[14] IAQM (2023). *IAQM Guidance on the assessment of dust from demolition and construction* (Online). Available at: https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-dust-2023-BG-v6-amendments.pdf (Accessed November 2023).
[15] The effect of deposited dust upon surfaces, which can lead to annoyance.
[16] IAQM. (2018). *Guidance on Monitoring in the Vicinity of Demolition and Construction Sites, Version 1.1*. (Online). Available at: http://iaqm.co.uk/text/guidance/guidance_monitoring_dust_2018.pdf (Accessed November 2023).
[17] IAQM (2019). *A guide to the assessment of air quality impacts on designated nature conservation sites, Version 1.0* (Online) Available at: https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2019.pdf (Accessed November 2023).
[18] Scottish Natural Heritage (2017). *Considering air pollution impacts in development management casework.* (Online). Available from: https://www.nature.scot/sites/default/files/2018-08/Guidance%20-%20Considering%20air%20pollution%20impacts%20in%20development%20management%20casework.pdf (Accessed November 2023).

Technical Guidance	Context
Air Quality Guidelines for Europe[19] and Air Quality Guidelines Global Update (2005)[20]	These documents provide health-based air quality guidelines for a number of pollutants and critical levels for biodiversity receptors.
Guidance on Decision-making Thresholds for Air Pollution[21]	This guidance document informs the assessment of air quality impacts on designated conservation sites. The report provides criteria for Annual Average Daily Traffic (AADT) flows, below which it can be reasonably assumed that their effect will not undermine the achievement of the conservation objectives or result in a significant effect. This decision can be made without further assessment effort.
Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the habitats regulations[22]	In the absence of specific Nature Scot guidance with respect to Critical Load (CL) thresholds, this guidance note is referred to as best practice and describes how Natural England advises competent authorities and others on the assessment of plans and projects likely to generate road traffic emissions to air which are capable of affecting European Sites. The note provides a threshold of 1% or less of a European Site's CL where long term pollution is expected to be nonconsequential.

6.3 Data gathering methodology

Desk study

6.3.1 The baseline desk study reported within this ES chapter is supported by a number of data sources. The principal data sources used to inform this chapter comprise of the following:

- Mapped estimates of background concentrations from the Air Quality in Scotland website[23];
- Mapped estimates of background concentrations and deposition rates provided by the UK Air Pollution Information System (APIS)[24];

[19] WHO. (2000). *Air Quality Guidelines for Europe*. (online). Available at: http://www.euro.who.int/__data/assets/pdf_file/0005/74732/E71922.pdf?ua=1 (Accessed November 2023).
[20] WHO. (2005). *Air Quality Guidelines Global Update 2005*. (online). Available at http://www.euro.who.int/__data/assets/pdf_file/0005/78638/E90038.pdf?ua=1 (Accessed 09 August 2023).
[21] JNCC (2021). *Guidance on Decision-making Thresholds for Air Pollution*. (online). Available at: Main Report: Guidance on Decision-making Thresholds for Air Pollution (jncc.gov.uk) (Accessed September 2023).
[22] Natural England (2018). *Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the habitats regulations*. (online). Available at: https://publications.naturalengland.org.uk/publication/4720542048845824 (Accessed November 2023).
[23] Air Quality in Scotland (2021). *Data for local Authority Review and Assessment purposes*. (online). Available at: http://www.scottishairquality.scot/data/mapping?view=data (Accessed November 2023).
[24] APIS (Air Pollution Information System) (2016). *About the Air Pollution Information System* (Online). Available from: http://www.apis.ac.uk/introduction.html (Accessed November 2023).

- Reports providing air quality monitoring data produced by North Ayrshire Council (NAC)[25] and Glasgow City Council[26] under their LAQM obligations;
- Aerial imagery (Google Earth Pro (imagery date June 2023) and Ordnance Survey maps); and
- Hunterston B Pollution Prevention Control (PPC) permit PPC/A/1008859[27] and annual Scottish Pollutant Release Inventory (SPRI) reports[28].

Survey work

6.3.2 No surveys have been undertaken to inform this air quality chapter. Due to the rural setting of the Site and to the fact that the sensitive human receptors are located more than 250 m from the Site, monitoring data gathered from the NAC and from Air Quality in Scotland was considered sufficient to inform the air quality baseline.

Pre-Application Opinion

6.3.3 A Pre-application opinion was adopted by the ONR, on 04 October 2022. A summary of the elements of the Pre-application Opinion that are of relevance to the assessment of effects on air quality and confirmation of how these are addressed by the assessment is included in **Table 6.4**.

Table 6.4 Summary of Pre-application Opinion Responses

Paragraph Ref.	Consideration	How addressed in the ES
63	ONR received a consultation comment that the impact of air emissions and depositions on designated sites should be considered as part of the EIA. This should be considered in the ES.	Noted. **Table 6.17** defines those ecological receptors that may be affected by emissions from the Proposed Works. These include Southannan Sands SSSI and Portencross Woods LNCS/SSSI. Road traffic emissions have been scoped out for detailed assessment of impacts. The effect of these road traffic emissions on both human and ecological receptors have been considered qualitatively to justify scoping out of further assessment. The impacts from dust emissions on the ecological sites reported in **Table 6.17** have been considered in **Section 6.8.**

[25] North Ayrshire Council (2022). *2022 Air quality Annual Progress Report (APR) for North Ayrshire Council*. (online). Available at: https://www.scottishairquality.scot/sites/default/files/publications/2022-08/2022_NAC_APR001_Final.pdf (Accessed November 2023).
[26] Glasgow City Council (2022). *2022 Air Quality Annual Progress Report (APR) for Glasgow City Council*. (online). Available at: https://www.glasgow.gov.uk/CHttpHandler.ashx?id=59743&p=0 (Accessed November 2023).
[27] Scottish Environment Protection Agency (SEPA), (2022). *Public Register for Scotland*. (Online). Available at: https://www.sepa.org.uk/regulations/waste/waste-electrical-and-electronic-equipment-weee/public-register/ (Accessed November 2023).
[28] SEPA (2022). *Scottish Pollution Release Inventory*. (Online). Available at: https://informatics.sepa.org.uk/SPRI/ (Accessed November 2023).

Paragraph Ref.	Consideration	How addressed in the ES
64	ONR considers that the scope of assessment which sets out activities that will generate road traffic emissions is suitable, but the ES should include a clearly defined and justified study area.	The completion of a detailed assessment of the effects from road traffic emissions associated with the Proposed Works has been scoped out of this ES. Justification for this is reported within the 'Effects scoped out of assessment' subsection of **Section 6.7.** This means that a specific assessment Study Area has not been utilised when considering road traffic emissions. The screening assessment that is reported within **Section 6.7** considers the entire route of the preferred construction Route 4 (as per the ES **Chapter 16: Traffic and Transport**) when evaluating the impacts to human receptors. The screening assessment considered ecological sites within 200 m of the construction Route 4. This Study Area adopted for the screening assessment is reported within **Section 6.7**.
65	The potential receptors include human and ecological receptors. The scoping report states that key transport routes have been identified and will be confirmed as part of the iterative EIA process, along with any additional sensitive human receptors. This is an acceptable approach. ONR notes that the ES should define the human receptors as there is uncertainty as to whether other sensitive human receptors have been considered other than residential properties.	As discussed above, the completion of a detailed assessment of the effects from road traffic emissions associated with the Proposed Works has been scoped out of this ES. This ES includes a qualitative assessment of human and ecological receptors which may be impacted by dust emissions. **Chapter 8: Terrestrial Biodiversity and Ornithology** also considers the impact of dust emissions upon designated and non-designated sites. Potential receptors affected by the Proposed Works comprise residents living near to the Site and public property such as a school or a hospital, which may be subject to dust nuisance. Such receptors are typically referred to as human receptors with respect to EIA. This is in line with the IAQM dust guidance.

Paragraph Ref.	Consideration	How addressed in the ES
66	The determination of significance for dust effects and road traffic emissions is mostly considered appropriate, however there are omissions regarding how significance will be determined with respect to impacts on nature conservation sites and short-term impacts on human health receptors from road traffic emissions.	The determination of the significance of impacts on nature conservation sites and short-term impacts on human health receptors from dust emissions is reported within the respective 'Determination of significance' subsection of **Section 6.6**. The impacts from road traffic emissions on human and ecological receptors have been scoped out of detailed assessment. A screening assessment is reported within the 'Effects scoped out of assessment' subsection of **Section 6.7.** Significant effects are not expected as a result of these impacts.
67	The ES should also detail why the monitoring data presented is suitable, and how the EIA has considered the data particularly when some of the data was collected from kerbside sites in urban areas while the proposed project is in a rural coastal setting.	Noted, paragraph 6.4.2 states that the '*Site lies within a rural environment, and therefore air quality can reasonably be assumed to be better within the immediate area of the Site than that reported for the urban automatic monitoring site operated by NAC*'. The data from NAC is supplemented with data drawn from Air Quality in Scotland, which is centred on the National Grid Reference for the Site. This data is considered suitable since it provides a worst-case representation of the baseline air quality environment of the Site.
68	The air quality chapter concludes that the impacts of dust emissions from demolition activities, earthworks, construction, track out and road traffic emissions, and the effects on both human and ecological receptors are scoped in. Point source emissions of combustion products and their effect on human and ecological receptor; effects of climate change on air quality; and effects of pollutant emission from non-road mobile machinery are scoped out of the assessment. The proposed scope is considered appropriate.	The ES reflects the scope, it should be noted that traffic emissions have been scoped out after undertaking a screening assessment following best practice guidance (IAQM, 2017).

Technical engagement and non-statutory consultation

6.3.4 Consultation has been completed and the responses received are reported within **Table 6.5** below.

Table 6.5 Consultation responses

Consultee	Consideration	How addressed in the ES
National Health Service (NHS) Ayrshire and Arran	It is noted that there are no plans for additional air quality monitoring on-site during the demolition phase and that current monitoring stations in Irvine will be utilised. There is some concern over this due to the proximity to surrounding communities, including potentially vulnerable receptors. We would welcome therefore some monitoring on-site or in the immediate vicinity.	The Site lies within a rural environment and air quality at the Site is comfortably within the relevant AQOs and therefore no additional monitoring is proposed. **Section 6.4** demonstrates that in areas of concern in terms of air quality (i.e. AQMAs) that are in an urban setting there is sufficient monitoring**.** Receptors in close proximity to the Site have the potential to be impacted from dust emissions associated with the Proposed Works. An assessment of the impact of these dust emissions has now been completed and is reported within **Section 6.8.** This assessment has concluded that there is no risk for impacts to human health from demolition, construction, earthworks or trackout activities (see **Table 6.22**). The effects from road traffic emissions associated with the Proposed Works have been considered within **Section 6.7.** Traffic movements predicted as a result of the Proposed Works are not considered to be high, with the increased movements not being sufficient to warrant detailed assessment of road traffic emissions in line with the screening criteria within **Table 6.16**.
NHS Ayrshire and Arran	It was also discussed that dust travelling from the Site into wider communities may have an impact on public perception and would welcome proactive communication via multiple methods in managing this, as anxiety levels within the local community are likely to be high.	An assessment of the effects from dust emissions as a result of the Proposed Works has been completed and is reported within **Section 6.8.** This assessment has concluded that there is no risk for impacts to human health from demolition, construction, earthworks or trackout activities. Best practice measures to reduce

Consultee	Consideration	How addressed in the ES
		the impact from dust emissions have been proposed in **Table 6.24** and will be followed regardless of the risk concluded in this assessment. There is a requirement to undertake stakeholder engagement within **Table 6.24.**

6.4 Overall baseline

Current baseline

6.4.1 NAC has not declared any Air Quality Management Areas (AQMA).

6.4.2 The monitoring data reported for this current baseline is not fully reflective of the air quality in the Works Area. NAC currently only operates one automatic monitoring station, which is located within an urban environment. The Site lies within a rural environment, and according to the Defra background maps (**Table 6.6**) air quality is comfortably below the relevant AQO.

6.4.3 NAC completed mitigation projects in North Ayrshire aiming to reduce pollutant concentrations relating to traffic congestion in High Street, Irvine and queuing traffic in New Street, Dalry[25]. Significant improvements in air quality were reported by NAC during 2021 when compared to 2019 (pre COVID-19) and the council reports that air quality at locations where the mitigation projects were completed will continue to be monitored to ensure post COVID-19 pollutant concentrations remain consistent with the downward trend.

6.4.4 Air Quality in Scotland provides data for background concentrations of Nitrous Oxides (NO_X), Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10}). These background concentrations are provided for 1 km^2 grid squares within the area of each administrative authority. The background concentrations of each pollutant which are applicable to the location of the Site for 2023 are presented in **Table 6.6**.

Table 6.6 Annual mean pollutant background concentrations (µg m^{-3}) (2023)

Grid square	NO_2	NO_x	PM_{10}
218500, 651500	4.0	5.6	6.7

2018 base year (µg m^{-3}). Source: Air Quality in Scotland[23]

Automatic monitoring

6.4.5 NAC currently operates a continuous monitoring station on the High Street in Irvine, approximately 18.7 km south-east of the Site. **Table 6.7** provides details about the monitoring site and **Table 6.8** provides monitoring data collected at this site between 2017 and 2022.

6.4.6 Due to the location of the preferred construction Route 4, it is relevant to report the air quality within the Glasgow City Centre AQMA. Glasgow City Council (GCC) have

undertaken automatic monitoring within the city and within the City Centre AQMA[29]. Concentrations of NO_2 are reported to have remained below pre COVID-19 levels and most monitoring sites also remain below the annual average NO_2 AQO. GLA4/Glasgow kerbside is the only automatic monitoring station to record concentrations of NO_2 above this AQO during 2021. **Table 6.9** reports the location of automatic monitors within Glasgow City and **Table 6.10** reports the annual mean NO_2 concentrations reported at each automatic monitoring site. The automatic monitoring sites found within Glasgow City Centre AQMA are GLA4, Glasgow Kerbisde, GLA5, GLKP and GHSR.

Table 6.7 Location of the continuous monitoring station within NAC

Site ID	Site location	Site type	X	Y	Pollutants
ROMON	High Street, Irvine	Roadside	232188	638861	NO_2, PM_{10} and $PM_{2.5}$

Source: North Ayrshire Council, 2022

Table 6.8 Annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ 2017 – 2022

Site ID	Pollutant	Annual mean AQO (μgm^{-3})	Data capture 2021 (%)	Annual mean concentrations (μgm^{-3})					
				2017	2018	2019	2020	2021	2022
ROMON	NO_2	40	100	21	18	16	10	13	11
ROMON	PM_{10}	18	99	13	14	14	11	11	13
ROMON	$PM_{2.5}$	10	99	7	8	8	6	6	7

Source: North Ayrshire Council, 2022

6.4.7 **Table 6.8** shows that there have been no exceedances of the NO_2, PM_{10} or $PM_{2.5}$ AQO in recent years.

Table 6.9 Location of the continuous monitoring station within GCC

Site ID	Site location	Site type	X	Y	Pollutants
GLA4	Glasgow Kerbside	Kerbside	258708	665200	NO_2
GLKP	Glasgow Townhead	Urban Background	259675	665900	NO_2 PM_{10} $PM_{2.5}$ O_3
GGWR	Glasgow Great Western Road	Roadside	258007	666649	NO_2
GHSR	Glasgow High Street	Roadside	260013	665346	NO_2 PM_{10} $PM_{2.5}$

[29] Glasgow City Council (2022). *2022 Air Quality Annual Progress Report (APR) for Glasgow City Council*. (online). Available at: https://www.glasgow.gov.uk/CHttpHandler.ashx?id=59743&p=0 (Accessed November 2023).

Site ID	Site location	Site type	X	Y	Pollutants
GLA5	Glasgow Anderston	Urban Background	257925	665487	NO_2 PM_{10} $PM_{2.5}$
GLA6	Glasgow Byres Road	Roadside	256526	666933	NO_2 PM_{10} $PM_{2.5}$
GL9	Glasgow Dumbarton Road	Roadside	255030	666608	NO_2 PM_{10} $PM_{2.5}$
GL2 (3)	Glasgow Nithsdale Road	Roadside	257883	662673	NO_2 PM_{10} $PM_{2.5}$
GLA7	Glasgow Waulkmillglen Reservoir	Rural	252461	658154	NO_2 PM_{10} $PM_{2.5}$ O_3
GL3	Glasgow Broomhill	Roadside	255030	667195	PM_{10} $PM_{2.5}$

Source: Glasgow City Council, 2022

Table 6.10 Annual mean concentrations of NO_2 within GCC 2017 – 2021

Site ID	Annual mean AQO (μgm^{-3})	Data capture 2021 (%)	Annual mean concentrations (μgm^{-3})				
			2017	2018	2019	2020	2021
GLA4	40	98	**59**	**61**	**56**	36	**45**
GLKP	40	99	25	24	24	17	18
GGWR	40	99	31	29	30	19	22
GHSR	40	98	35	31	30	21	23
GLA5	40	65	22	24	26	20	22
GLA6	40	99	37	34	35	23	26
GL9	40	95	**43**	34	35	25	29
GL2 (3)	40	90	-	32	31	-	24
GLA7	40	95	9	9	9	5	7
GL3	40	98	59	61	56	36	45

Source: Glasgow City Council, 2022
Bold denotes an exceedance of the respective AQO

6.4.8 As discussed, **Table 6.10** shows a downward trend in concentrations of NO_2 in recent years and concentrations of NO_2 that are below pre COVID-19 levels. GLA4 reported an annual mean concentration of NO_2 that exceeded the respective AQO during 2021. **Figure 6.1** presents the locations of each of these automatic monitoring sites in relation to part of the preferred construction Route 4. GLA4, Glasgow Kerbside is approximately 0.8 km to the east of construction Route 4.

Passive monitoring

6.4.9 Passive diffusion tube monitoring of NO_2 was undertaken at 22 locations across North Ayrshire during 2021, the latest data available. Details of the monitoring stations closest to the Site are included in **Table 6.11** with the data collected between 2016 and 2021 included in **Table 6.12**. **Figure 6.2** shows the locations of these monitoring sites in relation the Site, with DT22 being the closest and therefore considered to be the most representative of the same rural environment context. 2022 data is currently unavailable.

Table 6.11 Details of passive monitoring sites in NAC

Site ID	Site Name	Site type	X	Y	Distance to kerb (m)	Distance to the Site (km)
DT13	Dalry Rd, Kilwinning	Kerbside	229928	643400	1	13.6
DT14	Vernon St, Saltcoats	Kerbside	224697	641366	1	11.5
DT18	2 Townhead St, Dalry	Roadside	229230	649338	3	10.7
DT19	Highfield Hamlet, Dalry	Urban background	230943	650280	1	12.2
DT20	85 Main Street, Largs	Kerbside	220333	659322	0	7.8
DT22	Princess St/Glasgow St, Ardrossan	Kerbside	219582	650020	0.5	1.5

Source: North Ayrshire Council, 2022

Table 6.12 Measured annual mean concentrations of NO_2

Site ID	Data capture 2020 (%)	Annual mean concentrations of NO_2 (μgm^{-3})					
		2016	2017	2018	2019	2020	2021
DT13	100	18	19	21	17	13	15
DT14	100	11	9	10	9	6	6
DT18	100	20	18	17	14	8	6
DT19	100	19	17	18	16	12	13
DT20	100	5	5	5	5	3	3
DT22	100	18	19	17	14	11	13

Source: North Ayrshire Council, 2022

6.4.10 **Table 6.12** shows that annual mean concentrations of NO_2 were far below the 40µg m^{-3} annual mean AQO for NO_2 at the monitoring locations nearest to the Site between 2016

and 2021. No monitoring results for 2021 within NAC exceeded any relevant UK or EU Limit Values.

6.4.11 Emissions originating from HNB comprise traffic emissions associated with the operational workforce and historically, point source emissions from the auxiliary boilers and periodic testing of the standby diesel generators. During the operation of HNB, operational traffic increases occurred periodically due to outages, but the effects from these emissions are considered within the baseline characterisation. Emissions from the auxiliary boilers and standby generators are regulated under the Site's PPC permit (PPC/A/1008859). In 2018, annual emissions of relevant combustion products from these combustion plants were below the reporting thresholds for the SPRI.

Future baseline

6.4.12 Irrespective of the Proposed Works, it is expected that there would be a gradual decline in baseline air pollutant concentrations as a result of anticipated improvements in air quality resulting from the implementation of the Government's Cleaner Air for Scotland[9] objectives; improvements in real world emissions performance of road vehicles and more stringent emission limits for industrial sources as environmental permits for operators covering the various industrial sectors are updated in a phased manner to bring them in line with the requirements of the Industrial Emissions Directive[7].

6.4.13 Air Quality in Scotland provides projected future year background concentrations of NO_X, NO_2 and PM_{10}. **Table 6.13**, reports these background concentrations for the Site, which show a downward trend in pollutant concentrations for future years. Decommissioning works are expected to be complete in approximately 100 years. It can be assumed that background concentrations of key relevant pollutants are likely to decrease in future years when compared to the current baseline.

Table 6.13 Annual mean pollutant background concentrations (µg m^{-3})

Pollutant	2023	2024	2025	2026	2027	2030
NO_x	5.6	5.4	5.3	5.2	5.2	5.2
NO_2	4.0	3.9	3.8	3.7	3.7	3.7
PM_{10}	6.7	6.6	6.5	6.5	6.5	6.5

Background annual mean concentrations of pollutant at centre of grid square 218500,651500. 2018 base year (µg m^{-3}).
Source: Air Quality in Scotland

6.5 Embedded environmental and good practice measures

6.5.1 Good practice air quality measures as described in the IAQM guidance on the Assessment of Dust from Demolition and Construction[14] will be employed across the Project and incorporated in the EMP. These are reported in detail in **Table 6.24**.

Table 6.14 Summary of embedded environmental measures

Embedded Measure	Compliance Mechanism	Embedded or good practice measure
A Dust Management Plan will be produced for the Proposed Works, in accordance with IAQM guidance on the Assessment of Dust from Demolition and Construction[23]. The DMP will include good practice measures, such as those provided in Table 6.24.	EMP	Embedded measure

6.6 Assessment methodology

6.6.1 The proposed generic project-wide approach to the assessment methodology is set out in **Chapter 5: The EIA Process**, and specifically in **Section 5.3** and **Section 5.4**. However, whilst this has informed the approach that has been used in this air quality chapter, it is necessary to set out how this methodology has been applied, and adapted as appropriate, to address the specific needs of the air quality assessment in the Environmental Statement (ES).

General approach

6.6.2 The methodological approach to the air quality assessment that has been undertaken is described below in paragraphs 6.6.4 to 6.6.13.

Dust emissions

6.6.3 Using the IAQM Guidance on the assessment of dust from demolition and construction[14], a desk-based assessment to assess the effects of dust emissions associated with the Proposed Works has been undertaken. **Appendix B** provides further detail for the methodology reported within the IAQM guidance.

6.6.4 The dust emitting activities that may take place during the Proposed Works include:

- Demolition – an activity involved with the removal of an existing structure or structures;
- Earthworks – the processes of soil-stripping, ground-levelling, excavation and landscaping;
- Construction – an activity involved in the provision of a new structure; and
- Activities that cause trackout – the transport of dust and dirt from the Site onto the public road network. This arises when HGVs leave site with dusty materials or transfer dust and dirt onto the road having travelled over unpaved ground on-site.

6.6.5 IAQM Guidance[14] requires the consideration of three separate dust impacts:

- Annoyance due to dust soiling;
- The risk of health impacts due to an increase in exposure to PM_{10}; and
- Harm to ecological receptors.

6.6.6 Detailed air quality assessment involves a three-stage process:

- Stage 1 – areas where there are expected to be dust emitting activities are classified according to the risk of dust impacts (based upon the scale and nature of the works, taking into account the proximity of sensitive receptors);
- Stage 2 – appropriate site-specific mitigation measures are identified; and
- Stage 3 – the significance of effects is then determined.

6.6.7 The magnitude of dust emitting activities and the sensitivity of the area surrounding the Proposed Works has been concluded first and has been considered as part of a matrix to determine the risk of dust impacts for the four dust generating activities (demolition, earthworks, construction and track out). The magnitude of dust emitting activities is based on the scale of activities associated with the Proposed Works and was categorised as small, medium or large[14] (see **Table 6.15**).

Determination of significance

6.6.8 To consider the significance of the dust emissions associated with the Proposed Works, the risk of dust impacts has been determined first. This process is described as 'Stage 1' in paragraph 6.6.6.

6.6.9 The risk of impacts have been defined as either high, medium, low or negligible. This categorisation was based upon professional judgement and the guiding principles in IAQM guidance[14] (see **Table 6.15**).

6.6.10 Based on the overall risk assessment for the four activities, site specific mitigation has been proposed. These mitigation measures will be identified within a Dust Management Plan. The approach to determine the most applicable or effective mitigation measures, for the risk level determined, was based upon professional judgement and the guiding principles presented in IAQM guidance[14].

6.6.11 The significance of dust emission impacts is best determined after site-specific mitigation measures are applied. This understanding has been led by research by IEMA, who concluded that pre-mitigation impacts are not relevant as the EIA process influences the design process. Therefore, in line with IEMA and IAQM guidance[14,] the assessment of significance of dust effects has been undertaken following the application of site-specific mitigation. The approach to concluding significance that has been applied is, in line with the IAQM guidance[14] which reports that significant effects on receptors are prevented through the application of effective mitigation. Furthermore, guidance concludes that the residual effect is '**Not Significant'**.

Table 6.15 Matrices for determining risk of impacts from dust

Category Type	Sensitivity of Area	Dust Emission Magnitude		
		Large	Medium	Small
Demolition	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk
	Low	Medium Risk	Low Risk	Negligible
Earthworks	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Trackout	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible
	Low	Low Risk	Low Risk	Negligible

Road traffic emissions

6.6.12 A screening assessment has been undertaken to consider the impact of road traffic emissions associated with the Proposed Works. EPUK and IAQM[12] and Environmental Protection Scotland[13] provide guidance on when it is appropriate to carry out a detailed air quality assessment of a development that generates road traffic.

6.6.13 The screening assessment considers the impact of road traffic emissions on both human and ecological receptors. The key criteria that have been used for screening the impact on human receptors are presented in **Table 6.16**. The IAQM guidance on air quality impacts on nature sites[18] has been used as the primary basis for screening the impacts from road traffic emissions on ecological receptors.

Table 6.16 Screening criteria for detailed air quality assessment of road traffic emissions

Nature of Impact	Screening criteria for a detailed air quality assessment
Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors (LDV = cars and small vans <3.5t gross vehicle weight)	A change of LDV flows of: • more than 100 AADT within or adjacent to an AQMA; and • more than 500 AADT elsewhere.
Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors (HDV = goods vehicles + buses >3.5t gross vehicle weight)	A change of HDV flows of: • more than 25 AADT within or adjacent to an AQMA; and • more than 100 AADT elsewhere.
Realign roads, i.e. changing the proximity of receptors to traffic lanes	Where the change is 5 m or more and the road is within an AQMA.
Introduce a new junction or remove an existing junction near to relevant receptors	The introduction of a new junction or removal of a junction will lead to a detailed air quality assessment when this addition/removal causes traffic to significantly change vehicle acceleration or deceleration, e.g. traffic lights, or roundabouts.

Taken from Environmental Protection Scotland: Delivering Cleaner Air for Scotland[13]

6.7 Scope of the assessment

Study Area

6.7.1 There are different Study Areas for different emissions to air associated with the Proposed Works. Each emission source has a different Zone of Influence (ZoI) which is dependent upon the location of the emission source, the magnitude of the emissions, the extent to which they are anticipated to be dispersed and diluted in the atmosphere, and the relative location of the sensitive human and ecological receptors.

6.7.2 The methodological approach to define the spatial extent of the relevant Study Areas for air quality has been informed by the IAQM guidance[17]. Details of the approach to determining the Study Areas for dust and fine particulate emissions are provided below in paragraphs 6.7.3 to 6.7.6.

Dust and fine particle emissions

6.7.3 The phases of the Proposed Works which may include the undertaking of activities with the potential to give rise to dust and fine particle emissions are the Preparations for Quiescence phase and Final Site Clearance phase. The activities associated with these phases of the Proposed Works include demolition, construction, general earthworks and vehicle movements. These activities could cause dust and fine particulates to be generated directly by the works and also have the potential to result in track-out of material beyond the Works Area boundary as a result of vehicle movements to and from the Site.

6.7.4 If required, the following ZoIs, taken from IAQM guidance, will be used to assess dust emissions with respect to:

- A human receptor within:

- 250 m of the boundary of the Proposed Works; or
- 50 m of the route(s) used by mobile machinery; and
- Mobile machinery on the public highway, up to 250 m from site entrance(s).

- An ecological receptor within:
  - 50 m of the boundary of the Proposed Works; or
  - 50 m of the route(s) used by mobile machinery; and
  - Mobile machinery on the public highway, up to 250 m from site entrance(s).

6.7.5 The temporal scope of the assessment is consistent with the period over which the Proposed Works will be carried out (see **Chapter 2: The Decommissioning Process**).

6.7.6 The IAQM's dust guidance has been updated during 2023. The air quality Scoping Report submitted for this application, included the ZoIs as per the previous IAQM's dust guidance. Previously, human receptors would be assessed within 350 m of the boundary of the Proposed Works.

Road traffic emissions

6.7.7 A screening assessment has been undertaken to consider the impacts from road traffic emissions. This screening assessment has considered the entire route of the preferred construction Route 4 (as per **Chapter 16: Traffic and Transport**) to assess at the impact on human receptors.

6.7.8 When considering the impact on ecological receptors, a distance of 200 m from the construction route to any nationally designated sites has been used to identify any ecological receptors that have the potential to be impacted by road traffic emissions associated with the Proposed Works.

Potential receptors

6.7.9 Potential receptors include those which have the potential to be impacted by dust emissions associated with the Proposed Works. The ZoIs reported within the IAQM's updated dust guidance will be used to identify potential human and ecological receptors (as reported within paragraph 6.7.4).

6.7.10 There are no highly sensitive human receptors within 250 m of the Proposed Works or within 50 m of the construction routes within 250 m of the Proposed Works. There are more than 1 receptors of medium sensitivity, present at the Hunterston A (HNA) site and associated HNA offices. The updated IAQM guidance has been used in this ES Chapter. The Air Quality chapter within the Scoping Report submitted for the Proposed Works did not refer to the updated guidance because the IAQM guidance, was not available at that time. There is one human receptor within 350 m of the Proposed Works. 350 m was the previously reported screening distance within the IAQM guidance. This would not alter the outcome of the assessment of dust emissions, since the mitigation measures proposed are based on the highest overall risk concluded. **Figure 6.3** shows the location of nearby human receptors and a buffer of 250 m and 350 m around the Proposed Works.

6.7.11 There are potentially sensitive ecological receptor sites within the vicinity of the Works Area as presented in **Table 6.17** and **Table 6.18** (see **Figure 8.2**, **Chapter 8: Terrestrial Biodiversity And Ornithology** and **Chapter 9: Marine Biodiversity**).

Table 6.17 Location and description of representative designated ecological receptors

Receptor	Easting (m)	Northing (m)	Reason for Consideration
Portencross Wood SSSI/LNCS/AWI	218000	651012	Within 250 m of the Proposed Works.
Southannan Sands SSSI	218155	651861	Within 250 m of the Proposed Works and within 200 m of construction Route 4.

Table 6.18 Location and description of representative non-designated ecological receptors

Receptor	Location	Reason for Consideration
Kilruskin Wood LNCS	See Figure 7.4	Within 50m of Construction Route 4.
Goldenberry Hill LNCS/AWI	See Figure 7.4	Within 250m of the Proposed Works.

Likely significant effects

6.7.12 Likely significant air quality effects were proposed at Scoping and have been considered in the ES assessment. These are reported in **Table 6.19**.

Table 6.19 Likely significant air quality effects proposed at Scoping

Receptor	Likely significant effects
Human and ecological receptors.	**Construction, demolition, earthworks and trackout activities:** Fugitive dust emissions contributing to loss of amenity and effects on human health/biodiversity areas. Whilst it is typically the case that fugitive dust emissions can be adequately mitigated to ensure no significant effects occur, an assessment of such emissions using the IAQM's dust guidance[14] may still be required to define site-specific mitigation.
Human and ecological receptors.	**On-road HGVs and LDV movements for construction and demolition activities**: Combustion product emissions potentially increasing the baseline concentration of NO_x, NO_2, PM_{10} and $PM_{2.5}$ and associated effects on human health and integrity of biodiversity sites.

6.7.13 The likely significant air quality effects that have been taken forward for assessment in the ES are summarised in **Table 6.20**.

Table 6.20 Likely significant air quality effects

Receptor	Likely significant effects
Human and ecological receptors.	**Construction, demolition, earthworks and trackout activities:** Fugitive dust emissions contributing to loss of amenity and effects on human health/biodiversity areas. Whilst it is typically the case that fugitive dust emissions can be adequately mitigated to ensure no significant effects occur, an assessment of such emissions using the IAQM's dust guidance[14] has been undertaken to define site-specific mitigation.

Effects scoped out of assessment

6.7.14 The effects scoped out of further assessment are:

- On-road HGVs and LDV movements for construction and demolition activities associated with the Proposed Works;
  - Combustion product emissions potentially increasing the baseline concentration of NO_x, NO_2, PM_{10} and $PM_{2.5}$ and associated effects on human health and integrity of biodiversity sites.

6.7.15 The road traffic emissions associated with the Proposed Works include emissions generated from:

- The workforce travelling to and from site during the Preparations for Quiescence phase and Final Site Clearance phase.
- The transportation of construction and deconstruction materials, plant and equipment to and from site to enable both the construction of the Safestore, and the de-planting and deconstruction during the Preparations for Quiescence phase and Final Site Clearance phase.
- The transportation of wastes generated during the de-planting and deconstruction process during the Preparations for Quiescence phase and Final Site Clearance phase.

6.7.16 The road traffic emissions discussed above have been scoped out of further assessment after review of traffic data provided within the ES **Chapter 16: Traffic and Transport** and review of the final design of the Proposed Works. The justification for this position is reported below in paragraphs 6.7.19 to 6.7.23.

6.7.17 ES **Chapter 16: Traffic and Transport,** assumes that the worst-case traffic flows are expected during the Preparations for Quiescence phase. Therefore, the traffic screening assessment presented in this chapter has considered the maximum vehicle movements anticipated during all three phases of the Proposed Works.

Road traffic emissions during the Preparations for Quiescence phase

Impacts on human receptors

6.7.18 Different construction routes have been considered within ES **Chapter 16: Traffic and Transport**. Route 4 has been selected as the preferred route and therefore has been taken forward for consideration within this air quality ES Chapter.

6.7.19 During the Preparations for Quiescence phase, there are road traffic emissions expected from construction traffic needed for the deplanting and deconstruction works, potential void infilling works and for the construction of the Safestore. During deplanting and deconstruction, there are expected to be traffic movements for the transportation off site of the wastes generated.

6.7.20 Annual Average Daily Traffic flows (AADTs) have been estimated for the HDV movements associated with the above traffic movements and are reported in **Table 16.15** of the ES **Chapter 16: Traffic and Transport.** A change in HDV traffic flow of 24 AADT has been reported as a result of the Proposed Works. A change in LDV traffic flow of 124 AADT has been reported as a result of the Proposed Works. As per **Chapter 16: Traffic and Transport**, the change in traffic flows have been estimated for the worst-case year expected during the Preparations for Quiescence phase. The worst-case year is assumed to be 2033, due to the potential for an overlap in deconstruction activities, on-site waste management activities and the infilling of voids using off-site material..

6.7.21 Review of the preferred Route 4 shows that construction traffic is expected to travel through the Glasgow City Centre AQMA. As per **Table 6.16**, a change in HDV flows of more than 24 AADT within or adjacent to an AQMA will screen the need for a detailed assessment of these road traffic emissions. A detailed assessment of road traffic emissions expected from the HDV flows associated with the Proposed Works has been scoped out for the following reasons:

- The change in HDV of 24 AADT predicted as a result of the Proposed Works is close to the threshold, however, it is not above 25 AADT as stated within the guidance and as reported in **Table 6.16**.
- Air quality within the Glasgow City Centre AQMA has been reviewed and is reported within **Section 6.4**. There is a general downward trend in annual mean concentrations of NO_2 reported at all automatic monitoring sites and these concentrations are reported to be below pre COVID-19 levels. The only automatic monitoring site which has reported an exceedance of the annual mean NO_2 AQO is GLA4/Glasglow kerbside. This monitoring site is more than 200m from the section of Route 4 which travels through the Glasgow City AQMA. Therefore, it can be reasonably assumed that the road traffic emissions from construction traffic travelling along this route will not impact the air quality at GLA4/Glasgow kerbside.
- The annual mean concentrations of NO_2 reported during 2021 at the remaining automatic monitoring sites within the Glasgow City AQMA are more than 10 μgm^{-3} below the respective AQO. The addition of road traffic emissions associated with the Proposed Works is not expected to result in exceedances of the annual mean NO_2 AQO at these monitoring locations.

6.7.22 As per **Table 6.16,** a change in LDV flows of more than 100 AADT within or adjacent to an AQMA will screen the need for a detailed assessment of these road traffic emissions. It is not expected that the entire workforce which make up the LDV flows will reside within Glasgow and therefore begin their journey along the part of Route 4 which is within the Glasgow City Centre AQMA. This is confirmed by **Chapter 17: People and Communities,** which reports that approximately 69% of the HNB operational workforce resided within North Ayrshire. The remainder of Route 4 into Site is outside of an AQMA. As per **Table 6.16**, a change in LDV flows of more than 500 AADT outside of an AQMA would screen the need for a detailed assessment of road traffic emissions from LDV flows. The change in LDV flow of 100 AADT predicted as a result of the Proposed Works is below 500 AADT and is not above the 100 AADT threshold (when within or adjacent to an AQMA), therefore the need to undertake a detailed assessment of the effects from these road traffic emissions can be scoped out.

6.7.23 It can also be noted that the AADTs as a result of the Proposed Works are expected to be intermittent over a period within the Preparations for Quiescence phase, since each different construction activity will not occur at once. This conclusion, alongside the conclusions made above relating specifically to HGV and LDV AADTs expected as a result of the Proposed Works, means that it can be reasonably assumed that significant impacts on human receptors from road traffic emissions associated with the Proposed Works are not expected.

Impacts on ecological receptors

6.7.24 The IAQM guidance on air quality impacts on nature sites[18] outlines that to consider the air quality impacts on nationally designated sites, a screening assessment should screen out air quality emission sources which are too small or too far away from the sites.

6.7.25 Nationally designated sites are reported within **Table 6.17.** Portencross Woods SSSI is not within 200 m of construction Route 4 and is therefore not considered further. There is a section of the construction Route 4 which is adjacent to the Southannan Sands SSSI. The closest point of the Southannan Sands SSSI to construction Route 4 is approximately 28.6 m. The APIS website reports that there are habitats within Southannan Sands SSSI which are sensitive to N deposition. Therefore, as per the IAQM guidance, consideration of the AADT expected from the Proposed Works has been undertaken.

6.7.26 The IAQM guidance on air quality impacts on nature sites[17] suggests the use of 1000 LDV AADT and 200 HDV AADT as a threshold for scoping out the need for a detailed assessment of impacts from road traffic emissions on nationally designated sites. These are thresholds reported within the DMRB technical guidance. The change in LDV flow of 124 AADT predicted as a result of the Proposed Works is below 1,000 AADT, therefore the need to undertake a detailed assessment of the effects from these road traffic emissions can be scoped out. The change in HDV of 24 AADT predicted as a result of the Proposed Works is below 200 AADT, therefore the need to undertake a detailed assessment of the effects from these road traffic emissions can be scoped out.

6.7.27 Natural England's guidance[22] outlines that a significant effect on nationally designated sites is likely if it is '*likely to undermine the conservation objectives of the site.'* Consideration of the impact to an ecological site's CL is now widely used to further consider the long-term pollution on an ecological site from air quality sources. As per the Nature Scot guidance[18], an ecological site's CL is the '*minimum rate of deposition of a pollutant at which a habitat may be affected'.* The Environment Agency report that an increment of 1% or less of the CL is considered inconsequential[30]. Despite the Environment Agency reporting this for permitting considerations, the threshold of 1% or less of the CL is used widely and suggested to be used within the IAQM's guidance on air quality impacts on nature sites to define long term impacts on national designated sites from air quality pollution.

6.7.28 JNCC[21] report that at a distance of 25 m from an affected road:

- A change in traffic flow of 547 AADT is required to cause a change of 1% of the CL for NO_x; and
- A change in traffic flow of 731 AADT is required to cause a change of 1% of the CL for Ammonia.

6.7.29 At a distance of 28.6 m from the construction Route 4, and with a change in HDV of 25 AADT and a change in LDV of 100 AADT expected from the Proposed Works, impacts

[30] Environment Agency (2016). *Air emissions risk assessment for your environmental permit*. (online). Available at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit (Accessed September 2023).

from these road traffic emissions on the Southannan Sands SSSI can be reasonably concluded as **Not Significant**.

6.7.30 As reported within **Chapter 8: Terrestrial Biodiversity and Ornithology**, there is part of Construction Route 4 within 0.025 km of two LNCS: Southannan LNCS, which includes Southannan AWI site; and Kilruskin Wood LNCS, which includes Kilruskin Wood AWI site. **Figure 8.4** reports the location of these LNCSs. **Chapter 8: Terrestrial Biodiversity and Ornithology** concludes that, with regards to vehicle emissions, the Proposed Works are predicted to only have an effect on the conservation status of these two LNCS/AWI sites that is of **Very Low** magnitude and **Not Significant**.

6.8 Assessment of effects – dust emissions

6.8.1 The ZoIs outlined in paragraph 6.7.4 (as per the IAQM's dust guidance) have been used to determine whether an assessment of dust emission effects is required.

6.8.2 There are ecological receptors found within 250 m of the Proposed Works. A qualitative desk-based assessment of the effects of dust emissions derived as a result of the Proposed Works is therefore required. The qualitative desk-based assessment considers the effects of dust emissions associated with the Preparations for Quiescence phase as this is considered the worst-case phase of the Proposed Works, with the most overlap of activities that have the potential to give rise to dust emissions.

Assessment of potential dust emission magnitude

6.8.3 The IAQM assessment methodology[14] has been used to determine the potential dust emission magnitude for the following four different dust and Particulate Matter (PM) sources: demolition; earthworks; construction and trackout. The findings of the assessment are presented below in paragraphs 6.8.5 to 6.8.9.

6.8.4 As per **Table B.1** within **Appendix 6B**, the dust emission magnitudes have been concluded by estimating the type of dust emission and the quantity of this dust emission. This is in line with the IAQM guidance, which provides examples of dust emission magnitudes relating to a range of dust generating activities.

Demolition

6.8.5 During the Preparations for Quiescence phase existing buildings in the Works Area will be demolished. The waste expected from this activity has been estimated to be more than 75,000 m^3 of material, therefore the potential dust emission magnitude is classed as 'Large' for demolition activities.

Earthworks

6.8.6 Of the existing buildings to be demolished, there are some which contain basements therefore the demolition of these buildings will create voids. Part of the rubble collected from demolition works will be used to fill in these voids. The total floor area of voids to be filled have been estimated. A maximum basement depth of 8m has been assumed for this assessment. The total volume of voids created by the Proposed Works is approximately 65,000 m^3, assuming a maximum depth of 8 m, there is an estimated exposed surface area of voids, of approximately 8,000 m^2. . Therefore, the potential dust emission magnitude is classed as 'Small' for earthwork activities, as the area is less than 18,000 m^2.

Construction

6.8.7 Construction works during the Preparations for Quiescence phase includes the cladding around the reactor building to create the Safestore. The dimensions of the reactor building have been provided and the total building volume is estimated to be above 75,000m^3. The works will primarily involve removing existing cladding and glass and fitting of new cladding. Therefore, the potential dust emission magnitude is classed as 'Medium' for construction works.

Trackout

6.8.8 As per paragraph 6.7.20, AADT two-way HDV flows have been estimated for the Proposed Works, also recognising that vehicles within the Site and Works Area will continue to use existing roads, with only limited transit across unmade ground. The Proposed Works will generate less than 20 outward HDV movements in any one day. The potential dust emission magnitude for trackout is therefore classed as 'Small'.

6.8.9 **Table 6.21** provides a summary of the potential dust emission magnitude determined for activities involved in the Proposed Works.

Table 6.21 Construction dust emission magnitude

Source	Dust emission magnitude
Demolition	Large
Earthworks	Small
Construction	Medium
Trackout	Small

Assessment of sensitivity of the Study Area

6.8.10 As discussed in **Section 6.6,** the IAQM guidance[14] considers three separate dust impacts and advises that the sensitivity of the area in the vicinity of the Proposed Works towards each dust impact is assessed. This section defines the sensitivity of the area in the vicinity of the Proposed Works in respect to the following three dust impacts:

- Dust soiling;
- Human health; and
- Ecological impacts.

6.8.11 According to the IAQM guidance[14] (see **Appendix 6B**) residential properties and schools would be '*high sensitivity*' receptors for both dust and particulate matter. Places of work (which includes retail uses) would be classed as 'medium sensitivity' receptors, and locations with transient exposure or where users would not expect a reasonable level of amenity (i.e. locations with already elevated dust deposition levels) would be classed as 'low sensitivity' receptors (for example, playing fields, footpaths, short-term car parks etc). The receptors considered in this assessment are classed as 'High sensitivity' receptors since they comprise of residential properties.

Dust soiling

6.8.12 There are no highly sensitive human receptors within 250 m of the Proposed Works, however there are workers present at the HNA site which are classed as medium sensitivity receptors, according to the IAQM guidance (see **Table 6B.2**). The HNA office is located more than 20 m away from the areas of demolition, earthworks and construction activities within the Works Area. Therefore, as per **Table 6B.3**, the sensitivity of the surrounding area with respect to the dust soiling impacts from these activities is classed as 'Low'.

6.8.13 For trackout, distances are measured from the side of the roads used by the construction traffic. According to IAQM guidance[14] it is only necessary to consider trackout impacts from roads up to 500 m from 'Large' sites. There are no highly sensitive human receptors within 50 m of the preferred Route 4 (up to 500 m from the Proposed Works). There is more than 1 medium sensitive receptor (HNA workers present at the HNA office) within 20 m of the Power Station Road. Therefore, as per **Table B.2,** the sensitivity of the surrounding area with respect to dust soiling impacts from trackout activities is classed as 'Medium'.

Human health

6.8.14 There are no highly sensitive human receptors within 250 m of the Proposed Works, however there are HNA workers, classed as medium sensitivity (see **Table 6B.4**) receptors present within the vicinity of the Proposed Works, at the HNA site. Therefore, as the background PM_{10} concentration for the Site (as reported in **Table 6.13**) is below 14 µg/m^3, as per **Table 6B.5** the sensitivity of the area within 250 m of the Proposed Works, with respect to human health impacts from demolition, earthworks and construction activities associated with the Proposed Works is classed as 'Low'.

6.8.15 For trackout, distances are measured from the side of the roads used by the construction traffic. According to IAQM guidance[14] it is only necessary to consider trackout impacts from roads up to 500 m from 'Large' sites. The background PM_{10} concentration for the Site (as reported in **Table 6.13**) is below 14 µg/m^3. There are more than 1 medium sensitive receptors (HNA workers found at the HNA office) within 20 m of Power Station Road. Therefore, the sensitivity with respect to human health impacts from trackout is classed as 'Low'.

Ecological

6.8.16 According to the IAQM guidance, an ecological site with SSSI designation is a 'Medium' sensitive receptor (see **Table 6B.6**). There are two SSSIs found within 50 m of the Proposed Works and one within 50 m of the preferred construction Route 4 (within 500 m of the Proposed Works). Therefore, according to the matrix reported in **Table 6B.7,** the sensitivity of the surrounding area towards ecological impacts from demolition, earthworks, construction and trackout activities is classed as 'Low'.

6.8.17 **Table 6.22** summaries the conclusions of sensitivity of the surrounding area.

Table 6.22 Summary of the sensitivity of the area in relation to all four activities

Potential impact	Sensitivity of the surrounding area			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	Low	Low	Low	Medium
Human health	Low	Low	Low	Low
Ecological	Low	Low	Low	Low

Risk of impacts

6.8.18 IAQM guidance[14] provides a matrix which combines the sensitivity of the area (**Table 6.22**), and the dust emission magnitude (**Table 6.21**). The combination of the two provides an indication of the risk that a dust impact will occur for each activity in the absence of mitigation measures.

6.8.19 The results show that, if no mitigation measures are put in place, the risk of dust impacts from demolition activities is 'Medium' and is 'Low' from construction activities. The risk of impacts from earthworks and trackout activities is 'Negligible'. The risk of dust impacts has been concluded by following the matrix reported within the IAQM guidance[14] and in **Table B.5** within **Appendix 6B**.

6.8.20 The results are summarised in **Table 6.23** below.

Table 6.23 Final results defining the risk of impact of each activity

Potential impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	Medium	Negligible	Low	Negligible
Human health	Medium	Negligible	Low	Negligible
Ecological	Medium	Negligible	Low	Negligible

Mitigation measures

6.8.21 The mitigation measures shown in **Table 6.24** are highly recommended by the IAQM for a 'Medium risk' site that will ensure potential dust effects are negligible. These are reported as a result of the assessment of dust emission effects.

Table 6.24 Summary of mitigation measures

Category	Measures to be incorporated across the Proposed Works
Communication	Develop and implement a stakeholder communication plan that includes community engagement before work commences on site.

Category	Measures to be incorporated across the Proposed Works
	Display the name and contact details of person(s) accountable for air quality and dust issues on the Works Area boundary. This may be the environment manager/ engineer or the Project Manager. Display the head or regional office contact information.
Site management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken. Make the complaints log available to the local authority when asked. Record any exceptional incidents that cause dust and/or emissions, either on- or off-site and the action taken to resolve the situation in the log book.
Monitoring	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked. Increase the frequency of site inspections by the person accountable for air quality and dust issues on-site, when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. Undertake on-site and off-site inspections around high potential activities, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary. Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with local authorities. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences.
Preparing and maintaining site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible. Erect solid screens or barriers around dusty activities or the Site boundary that are at least as high as any stockpiles on site. Where possible, fully enclose site or specific operations where there is a high potential for dust production and the Site is active for an extensive period. Avoid site runoff of water or mud. Keep hoarding, barriers and scaffolding clean using wet methods. Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. Where appropriate, cover, seed or fence stockpiles to prevent wind whipping.
Operating vehicles/ machinery	Ensure all vehicles switch off engines when stationary and not operating – no idling vehicles. Impose and signpost a maximum-speed-limit of 10 mph on surfaced and 10 mph on un-surfaced haul roads and work areas. Lower maximum speed limits will be considered further.

Category	Measures to be incorporated across the Proposed Works
	Avoid the use of diesel- or petrol-powered generators and use low-carbon alternative equipment where practicable. Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
Operations	Where possible, only use cutting, grinding or sawing equipment fitted, or in conjunction, with suitable dust suppression techniques such as water sprays or local extraction e.g. suitable local exhaust ventilation systems. This will be aligned with HSE policy. Ensure an adequate water supply on the Site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate. Use enclosed chutes and conveyors and covered skips where practicable. Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment, wherever appropriate. Ensure equipment readily available on-site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event, using wet cleaning methods.
Waste management	Avoid burning of waste materials.
Earthworks	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. Stockpiles of topsoil which remain present for six months or longer will be used (e.g. through seeding) to encourage stabilisation, minimise soil erosion and prevent infestation by nuisance weeds. Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable. This will depend on conditions and season. Only remove the cover in small areas during work and not all at once.
Construction	Avoid scabbling if possible. Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place. Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery. For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.
Trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the Site. This may require the sweeper being continuously in use. At compound and access points, wheel wash or dust sweepers will be used.

Category	Measures to be incorporated across the Proposed Works
	Avoid dry sweeping of large areas, where possible. Refer to the Dust Management Plan. Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. Record all inspections of haul routes and any subsequent action in a site log book. Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the Site where reasonably practicable). Where possible, ensure there is an adequate area of hard surfaced road between the wheel wash facility and the Site exit, wherever site size and layout permits. Access gates to be located at least 10 m from receptors where possible. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned during activities with a high potential for creating dust.

6.9 Assessment of cumulative effects

Inter-project effects

6.9.1 There is the potential for air quality effects associated with the Proposed Works to interact with, or combine with the effects arising from other developments or projects proposed within the relevant Zones of Influence applicable to each environmental aspect.

6.9.2 An assessment inter-project effects is considered within in **Chapter: 21: Cumulative Effects Assessment** of this ES.

Intra-project effects

6.9.3 There is the potential for intra-project effects on amenity and ecology as a result of air quality impacts. An assessment of intra-project effects is provided in **Chapter 21: Cumulative Effects Assessment**, as well as considered within the following environmental aspect chapters: **Chapters 8: Terrestrial Biodiversity and Ornithology** and **Chapter 17: People and Communities** of this ES.

6.10 Summary

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor	Magnitude of Change	Significance	Summary of Rationale
Human	Fugitive dust emissions contributing to loss of amenity and effects on human health.	Medium sensitivity	Medium risk from demolition activities associated with the Proposed Works. Low risk from Construction activities associated with the Proposed Works. Negligible risk from Earthworks and trackout activities associated with the Proposed Works.	Not Significant	The risk of effects has been concluded without consideration of the application of mitigation measures. With the embedded measures reported within **Table 6.14** applied, the risk of impact from fugitive dust emissions will be not significant. As per paragraph 6.6.11, the IAQM guidance[14] reports that significant effects on receptors are prevented through the application of effective mitigation. Furthermore, this concludes that the residual effect is 'not significant'.
Ecological	Fugitive dust emissions contributing to loss of amenity and effects on biodiversity areas.	Low sensitivity	Medium risk from demolition activities associated with the Proposed Works. Low risk from Construction activities	Not Significant	The risk of effects has been concluded without consideration of the application of mitigation measures. With the embedded measures reported within **Table 6.14**

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor	Magnitude of Change	Significance	Summary of Rationale
			associated with the Proposed Works. Negligible risk from earthworks and trackout activities associated with the Proposed Works.		applied, the risk of impact from fugitive dust emissions will be not significant. As per paragraph 6.6.11, the IAQM guidance[14] reports that significant effects on receptors are prevented through the application of effective mitigation. Furthermore, this concludes that the residual effect is 'not significant'.

7.

Climate Change

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7. Climate Change

7.1 Introduction

7.1.1 This chapter assesses the potential effects with respect to climate change, specifically in relation to greenhouse gas (GHG) emissions arising from the Indicative Dismantling Works Area (hereafter referred to as 'the Works Area') and from road traffic related to the Proposed Works. This chapter should be read in conjunction with the project description provided in **Chapter 2: The Decommissioning Process**.

7.1.2 The 2018 amendment to the Environment Impact Assessment (EIA) for Decommissioning Regulations[1] (hereafter referred to as EIADR) requires consideration of the impact of the Proposed Works on climate (for example the nature and magnitude of GHG emissions) and the vulnerability of the Proposed Works to climate change (Climate Change Resilience (CCR)).

7.1.3 The aim of the GHG assessment is to determine the GHG emissions arising from the Proposed Works. These calculations are used to inform assessment of the extent to which the Proposed Works would affect the ability to achieve national, regional and local targets for decarbonisation.

7.1.4 For Climate Change Resilience, a quantitative projection of future climate conditions at the Hunterston B (HNB) Nuclear Site Licence Boundary (hereafter referred to as "the Site"), based on the UK Climate Change Projections 2018 (UKCP18), is presented as in Appendix 7B). The measures to ensure Climate Change Resilience of the Proposed Works are reported in relevant aspect chapters of the Environmental Statement (ES) (**Chapter 6: Air Quality**; **Chapter 11: Surface Water and Flood Risk;** and **Chapter 12: Soils, Geology and Hydrogeology**). They are summarised within this climate change chapter under the sub-heading "Climate Change Resilience".

7.1.5 The in-combination climate change impact (ICCI) assessment, which considers the extent to which climate change exacerbates effects on receptors identified in the other aspect chapters, including the efficacy of any mitigation, is described in relevant aspect chapters of the ES.

7.2 Relevant legislation, policy and technical guidance

Legislation

7.2.1 The legislation presented in **Table 7.1** is relevant to the GHG assessment.

[1] UK Government (2018). *The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) (Amendment) Regulations 2018* (online). Available at: https://www.legislation.gov.uk/uksi/2018/834/made (Accessed November 2023).

Table 7.1 Legislation relevant to GHG emissions

Legislation	Legislation Issue
Climate Change Act 2008[2] (including The Climate Change Act 2008 (2050 Target Amendment) Order 2019[3])	This Act, as amended in 2019, commits the UK to reduce its net GHG emissions by at least 100% below 1990 levels by 2050 (the 'UK carbon target', often referred to as 'net zero') and requires the Government to establish 5-year carbon budgets. The Act also established an independent expert body, the Climate Change Committee (CCC), to advise the Government on the level of those emissions targets and report on progress made to reduce emissions.
The Carbon Budgets Order 2009[4]	This legislation implements the carbon budgets set out in the Climate Change Act 2008[2]. The budgets require the UK to continually reduce emissions in line with the carbon reduction commitments established under that Act. The carbon budgets are: • first carbon budget, 2008 to 2012, 3,018 mega tonnes carbon dioxide equivalent ($MtCO_2e$) representing 25% reduction below 1990 levels; • second carbon budget, 2013 to 2017, 2,782 $MtCO_2e$ representing 31% reduction below 1990 levels; • third carbon budget, 2018 to 2022, 2,544 $MtCO_2e$ representing 37% reduction below 1990 levels by 2020; • fourth carbon budget, 2023 to 2027, 1,950 $MtCO_2e$ representing 51% reduction below 1990 levels by 2025;[5] • fifth carbon budget, 2028 to 2032, 1,725 $MtCO_2e$ representing 57% reduction below 1990 levels by 2030;[6] and • sixth carbon budget, 2033 to 2037, 965 $MtCO_2e$ representing 78% reduction below 1990 levels by 2035.[7]
Climate Change (Scotland) Act 2009[8] (as amended by the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019[9])	This Act of the Scottish Parliament, as amended in 2019, includes an emissions target for Scotland of net zero by 2045, with GHG emissions required to be 100% below the baseline of 1990 levels in Scotland. The Act also sets interim targets for emissions reductions: • 2020 is at least 56% lower than the baseline; • 2030 is at least 75% lower than the baseline; and • 2040 is at least 90% lower than the baseline. To help ensure delivery of the long-term targets, the framework also includes statutory annual targets for every year to net zero in

[2] UK Government (2008). *Climate Change Act 2008* (online). Available at: https://www.legislation.gov.uk/ukpga/2008/27/contents (Accessed November 2023).
[3] UK Government (2008). *The Climate Change Act 2008 (2050 Target Amendment) Order 2019* (online). Available at: https://www.legislation.gov.uk/uksi/2019/1056/contents/made (Accessed November 2023).
[4] UK Government (2009). *The Carbon Budgets Order 2009* (online). Available at: https://www.legislation.gov.uk/uksi/2009/1259/contents/made (Accessed November 2023).
[5] UK Government (2011). *The Carbon Budget Order 2011* (online). Available at: https://www.legislation.gov.uk/uksi/2011/1603/contents/made (Accessed November 2023).
[6] UK Government (2016). *The Carbon Budget Order 2016* (online). Available at: https://www.legislation.gov.uk/uksi/2016/785/contents/made (Accessed November 2023).
[7] UK Government (2021). *The Carbon Budget Order 2021* (online). Available at: https://www.legislation.gov.uk/uksi/2021/750/contents/made (Accessed November 2023).
[8] UK Government (2009). *Climate Change (Scotland) Act 2009 (revised)* (online). Available at: http://www.legislation.gov.uk/asp/2009/12/contents (Accessed November 2023).
[9] UK Government (2019). *Climate Change (Emissions Reduction Targets) (Scotland) Act 2019* (online). Available at: https://www.legislation.gov.uk/asp/2019/15/part/1/crossheading/the-netzero-emissions-target (Accessed November 2023).

Legislation	Legislation Issue
	2045.[10] Annual target reports set out whether each annual emissions reduction target has been met.

Policy

7.2.2 A summary of the relevant policies is given in **Table 7.2.**

Table 7.2 Policy relevant to climate change

Policy Reference	Policy Relevance
International Policy	
The United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement[11]	The UNFCCC is the major international body responsible for managing climate change and carbon emissions. In 2015, it adopted the Paris Agreement, the aims of which are stated as: "*This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by: (a) Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change*". The agreement sets targets for countries' GHG emissions; the targets are not legally binding or enforceable.
UNFCCC Kyoto Protocol[12]	The Kyoto Protocol was adopted in December 1997. It commits industrialised countries and economies to transition to limit and reduce GHG emissions in accordance with agreed individual targets. These have been strengthened in more recent international agreements culminating in the Paris Agreement, as described above. It covers six categories of GHG: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphurhexafluoride (SF6). In this GHG assessment, these six GHG are collectively considered "GHG emissions" and reported as carbon dioxide equivalent (CO2e) GHG emissions.
UNFCCC Glasgow Climate Pact[13]	The recent Conference of the Parties (COP 26) resulted in almost 200 countries agreeing on: the acceleration of action on climate change this decade to reduce emissions (mitigation); helping those already impacted by climate change (adaption); enabling countries to deliver on their climate goals (finance); and working together to deliver even greater action (collaboration). This agreement is in the form of the Glasgow Climate Pact which reaffirms the long-term goal to limit global warming to 1.5°C above pre-industrial levels and resolves to pursue efforts to

[10] Scottish Government (2022). *Reducing greenhouse gas emissions: Annual targets* (online). Available at: https://www.gov.scot/policies/climate-change/reducing-emissions/ (Accessed November 2023).
[11] UNFCC (2015). *Paris Agreement* (online). Available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf (Accessed November 2023).
[12] UNFCC (1998). *Kyoto Protocol* (online). Available at: https://unfccc.int/resource/docs/convkp/kpeng.pdf (Accessed November 2023).
[13] UNFCC (2021). *Glasgow Climate Pact* (online). Available at: https://unfccc.int/sites/default/files/resource/cop26_auv_2f_cover_decision.pdf (Accessed November 2023).

Policy Reference	Policy Relevance
	achieve this, recognising that limiting global warming to 1.5°C "*requires rapid, deep and sustained reductions in global greenhouse gas emissions, including reducing global carbon dioxide emissions by 45 per cent by 2030 relative to the 2010 level and to net zero around mid-century, as well as deep reductions in other greenhouse gases*".
National Policy	
National Planning Framework 4 – (NPF4)[14]	NPF4 set outs the Scottish Governments priorities and policies for the planning system up to 2045 and how the approach to planning and development will help to achieve a net zero, sustainable Scotland by 2045. Reducing greenhouse gas emissions is highlighted as a cross-cutting outcome. Policies of particular relevance to this aim include: "*Policy 1; When considering all development proposals significant weight will be given to the global climate and nature crises.*" "*Policy 2: Development proposals will be sited and designed to minimise lifecycle greenhouse gas emissions as far as possible.*"
Scottish Energy Strategy: the future of energy in Scotland[15]	Sets out the vision for the future energy systems in Scotland to 2050. The vision is to achieve "*A flourishing, competitive local and national energy sector, delivering secure, affordable, clean energy for Scotland's households, communities and businesses*". The Strategy sets out Scotland's leading role in the global effort to decarbonise and tackle climate change. The approach to energy in the Strategy is to "*decarbonise the whole energy system, in line with emissions levels set out in the Climate Change (Scotland) Act*".
The UK's Nationally Determined Contribution (NDC) under the Paris Agreement[16]	In December 2020, the UK submitted its first NDC under the Paris Agreement,[11] committing to "*at least a 68%*" reduction in economy-wide GHG emissions below 1990 levels (1995 levels for F-gases) by 2030, aligned with the UK's 2050 net zero GHG emissions target.
Clean Growth Strategy[17]	Provides the strategy for the UK's future clean growth to allow carbon budgets to be met and support economic growth. It sets out policies and targets out to 2050 for reducing GHG emissions across a number of sectors.

[14] Scottish Government (2023). *National Planning Framework* (Online). Available at: https://www.gov.scot/publications/national-planning-framework-4 (Accessed November 2023)
[15] Scottish Government (2017). *Scottish Energy Strategy: The future of energy in Scotland.* (online) Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2017/12/scottish-energy-strategy-future-energy-scotland-9781788515276/documents/00529523-pdf/00529523-pdf/govscot%3Adocument/00529523.pdf?forceDownload=true (Accessed November 2023).
[16] Department for Business, Energy & Industrial Strategy (2020). *The UK's Nationally Determined Contribution under the Paris Agreement* (online). Available at: https://www.gov.uk/government/publications/the-uks-nationally-determined-contribution-communication-to-the-unfccc (Accessed November 2023).
[17] Department for Business, Energy and Industrial Strategy (2017) *Clean Growth Strategy* (online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700496/clean-growth-strategy-correction-april-2018.pdf (Accessed November 2023).

Policy Reference	Policy Relevance
The Ten Point Plan for a Green Industrial Revolution[18]	Sets out the UK Government's approach to "*build back better*" following the impacts of the COVID-19 pandemic. It includes details of how the Government intend to accelerate the path to net zero.
Net Zero Strategy: Build Back Greener[19]	This strategy sets out sectoral policies and proposals for decarbonising all sectors of the UK economy to meet the coming carbon budgets, the NDC and the net zero target by 2050. It aims to enable the delivery of the objectives set out in the Ten Point Plan.[18]
Net Zero – The UK's contribution to stopping global warming[20]	This report prepared by the CCC to the Governments of the UK, Wales and Scotland reassesses the UK's long-term emission target. In Scotland the report recommends a net-zero date of 2045 achieved through known technologies, improvements in people's lives and policy updates. As a result of this report, emission targets in the UK and Scotland were updated in the Climate Change Act 2008[3] and Climate Change (Scotland) Act 2009.[9]
Progress reducing emissions in Scotland – 2022 Report to Parliament[21]	This is the annual Progress Report to the Scottish Parliament, required under the Climate Change (Scotland) Act 2009.[8] It assesses Scotland's overall progress in achieving its legislated targets to reduce GHG emissions.
Climate Change Plan: third report on proposals and policies 2018-2032[22]	This plan which lays out the pathway to a low carbon economy while delivering sustainable economic growth and securing the benefits to a greener Scotland in 2032.
Securing a green recovery on a path to net zero: climate change plan 2018–2032 - update[23]	This update to Scotland's 2018-2032 Climate Change Plan sets out the Scottish Government's pathway to achieving the targets set by the Climate Change Act 2019[9]. It is a key strategic document on Scotland's green recovery from COVID-19.
European Union (EU) Emissions Trading Scheme (ETS)[24]	The EU ETS is a cap-and-trade mechanism in which an allowance for annual carbon emissions from various sectors have been agreed at the EU level. Nuclear generation has a free allowance under the EU ETS.

[18] HM Government (2020). *The Ten Point Plan for a Green Industrial Revolution* (online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936567/10_POINT_PLAN_BOOKLET.pdf (Accessed November 2023).
[19] Department for Business, Energy & Industrial Strategy (2021). *Net Zero Strategy: Build Back Greener* (online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1033990/net-zero-strategy-beis.pdf (Accessed November 2023).
[20] CCC (2019). *Net Zero – The UK's contribution to stopping global warming* (online). Available at: https://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-The-UKs-contribution-to-stopping-global-warming.pdf (Accessed November 2023).
[21] CCC (2022). *Reducing emissions in Scotland – 2022 Progress Report to Parliament* (online). Available at: https://www.theccc.org.uk/wp-content/uploads/2022/12/Progress-in-reducing-emissions-in-Scotland-2022-Report-to-Parliament.pdf (Accessed November 2023).
[22] Scottish Government (2018). *Climate Change Plan: third report on proposals and policies 2018-2032 (RPP3)* (online). Available at: https://www.gov.scot/publications/scottish-governments-climate-change-plan-third-report-proposals-policies-2018/pages/0/ (Accessed November 2023)
[23] Scottish Government (2020). *Securing a green recovery on a path to net zero: climate change plan 2018–2032 – update* (online). Available at: https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/documents/ (Accessed November 2023).
[24] European Parliament and the Council of the European Union (2003). *Establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC (the EU Emissions Trading System)* (online). Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003L0087&from=EN (Accessed November 2023).

Policy Reference	Policy Relevance
The Greenhouse Gas Emissions Trading Scheme Order[25]	Established through The Greenhouse Gas Emissions Trading Scheme Order the UK Emissions Trading Scheme (UK ETS) replaced the UK's participation in the EU ETS on 1 January 2021.
The NDA Group Sustainability Strategy[26]	Sets out the NDA group's five-year strategy to deliver safe, secure and sustainable nuclear clean-up and waste management.
Local Policy	
NAC Adopted Local Development Plan 2019[27]	This plan includes NAC's vision for the next 20 years including policies aimed at reducing carbon emissions and adapting to climate change. Overall, the strategy aims to *"reduce our impact on climate change and facilitate our transition to a low carbon economy by encouraging mitigation and adaptation measures".*
North Ayrshire Environmental Sustainability & Climate Change Strategy (ESCCS) 2021-2023[28]	The third ESCCS has been developed to support the delivery of NAC's priorities and detail the actions that NAC will take to continue to work towards a sustainable environment. NAC declared a Climate Emergency on 11 June 2019[29] and consequently has committed within the ESCCS to achieving net-zero carbon emissions for North Ayrshire by 2030. The ESCCS sets out seven workstreams with priority actions for achieving a net zero carbon and climate resilient North Ayrshire: • Affordable warmth; • A green economy; • Transport and travel; • Natural environment; • Sustainable operations; • Carbon absorption; and • Climate change adaptation.

Technical guidance

7.2.3 A summary of the relevant technical guidance for the GHG emissions assessment is given in **Table 7.3**.

[25] HM Government (2020) *The Greenhouse Gas Emissions Trading Scheme Order 2020* (online) Available at: https://www.legislation.gov.uk/uksi/2020/1265/contents/made (Accessed November 2023).
[26] Nuclear Decommissioning Authority (2022), *The NDA Group Sustainability Strategy: 2022* (online) Available at: https://www.gov.uk/government/publications/the-nda-group-sustainability-strategy-2022 (Accessed November 2023).
[27] North Ayrshire Council (2019). *Adopted Local Development Plan* (online). Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed November 2023).
[28] North Ayrshire Council (2021). *Environmental Sustainability & Climate Change Strategy* (online). Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/Finance/environmental-sustainability-climate-change-strategy.pdf (Accessed November 2023).
[29] North Ayrshire Council (2019). *Cabinet meeting 11 June 2019* (online). Available at: https://north-ayrshire.cmis.uk.com/north-ayrshire/Document.ashx?czJKcaeAi5tUFL1DTL2UE4zNRBcoShgo=hb2N88lM4w5j3IYvwtmqDIC%2bNyGiVpxG452LkLnA%2fi%2bjiPGehW3fsw%3d%3d&rUzwRPf%2bZ3zd4E7Ikn8Lyw%3d%3d=pwRE6AGJFLDNlh225F5QMaQWCtPHwdhUfCZ%2fLUQzgA2uL5jNRG4jdQ%3d% (Accessed November 2023).

Table 7.3 Technical Guidance relevant to climate change

Technical Guidance	Context
Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance – 2nd Edition[30]	Provides guidance on GHG emissions assessment, mitigation and reporting within an EIA context. This is the primary source of guidance for assessing GHG emissions. The 2022 guidance further builds upon the 2017 guidance, with key changes including an emphasis on mitigation at the project outset and throughout its duration, and more nuanced levels of GHG emissions significance. It provides detail on the application of the five Institute of Environmental Management and Assessment (IEMA) Principles on Climate Change Mitigation and EIA:[31] 1. "*The GHG emissions from all projects will contribute to climate change, the largest inter-related cumulative environmental effect.* 2. *The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA Directive (e.g. human health, biodiversity, water, land use, air quality).* 3. *The UK has legally binding GHG reduction targets – EIA must therefore give due consideration to how a project will contribute to the achievement of these targets.* 4. *GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant.* 5. *The EIA process should, at an early stage, influence the location and design of projects to optimise GHG performance and limit likely contribution to GHG emissions.*"
Methodology to calculate embodied carbon 1st edition[32]	The guidance note represents best practice on how to estimate carbon emissions associated with product and construction process stages. The aim of the guidance is to provide a framework of practical guidance on how to calculate embodied carbon emissions associated with projects.
Publicly Available Standard (PAS) 2080: 2016 – Carbon management in infrastructure[33]	Provides an approach to reducing GHG emissions from infrastructure projects including working with stakeholders throughout a project.
The Greenhouse Gas Protocol: A Corporate Accounting and	Provides standards and guidance for preparing a GHG emissions inventory. It covers the accounting and reporting of the six GHGs covered by the Kyoto Protocol.[12]

[30] IEMA (2022). *Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance – 2nd Edition* (online). Available at: https://www.iema.net/resources/blog/2022/02/24/launch-of-the-updated-eia-guidance-on-assessing-ghg-emissions (Accessed November 2023).
[31] IEMA (2010). *IEMA Principles Series: Climate Change Mitigation & EIA*. (online) Available at: https://www.iema.net/document-download/33006#:~:text=IEMA%20Principles%20Series%3A&text=Reducing%20greenhouse%20gas%20(GHG)%20emissions,related%20when%20planning%20future%20actions. (Accessed November 2023).
[32] RICS (2012). *Methodology to calculate embodied carbon 1st edition* (online). Available at: https://www.igbc.ie/wp-content/uploads/2015/02/RICS-Methodology_embodied_carbon_materials_final-1st-edition.pdf (Accessed November 2023).
[33] BSI (2016). *PAS 2080: 2016 – Carbon management in infrastructure* (online). Available at: https://shop.bsigroup.com/ProductDetail?pid=000000000030323493&creative=443668107352&keyword=&matchtype=b&network=g&device=c&gclid=EAIaIQobChMI1pLT1OCG7QIVB813Ch3RrwQUEAAYAiAAEgJXGfD_BwE (Accessed November 2023).

Technical Guidance	Context
Reporting Standard (GHG Protocol)[34]	
BS EN ISO 14064-1[35] **and 14064-2**[36]	Sets out guidance for quantification and reporting of GHG emissions and removals. The methodology presented in this chapter for the quantification of GHGs follows this guidance and the stated guidance on reporting will be taken into account as part of this assessment.
Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6): Climate Change 2021 - The Physical Science Basis[37]	The publication reinforces the evidence presented in the previous IPCC report (AR5) and, through the utilisation of updated climate model simulations and analyses, states that "*it is unequivocal that human influence has warmed the atmosphere, ocean and land*". It is highlighted that "*global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO_2 and other greenhouse gas emissions occur in the coming decades*". The publication states that "*limiting human-induced global warming to a specific level requires limiting cumulative CO_2 emissions, reaching at least net zero CO_2 emissions, along with strong reductions in other greenhouse gas emissions*" and it is this assertion which will underpin the international response to global warming. These factors are used to contextualise the GHG emissions created by the Proposed Works.
IPCC AR6: Climate Change 2022 – Mitigation of Climate Change[38]	Provides an updated global assessment of climate change mitigation progress and pledges and also examines the sources of global emissions. It explains developments in emission reduction and mitigation efforts, assessing the impact of national climate pledges in relation to long-term emissions goals.
The Sixth Carbon Budget Electricity Generation[39]	This document contains a summary of content for the electricity generation sector from the CCC's Sixth Carbon Budget Advice. The CCC's recommended carbon budget sector allocations[40] for electricity generation are:

[34] World Resources Institute and World Business Council for Sustainable Development (2015). *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)* (online). Available at: https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf (Accessed November 2023).
[35] BSI (2019). *BS EN ISO 14064-1: 2019 Greenhouse gases. Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals*. BSI; London.
[36] BSI (2019). *BS EN ISO 14064-1: 2019 Greenhouse gases. Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements* (online). BSI; London.
[37] IPCC (2021). *The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)). Cambridge University Press* (online). Available at: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf (Accessed November 2023).
[38] IPCC (2022). *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)). Cambridge University Press*. (online). Available at: https://www.ipcc.ch/report/ar6/wg3/ (Accessed November 2023).
[39] Climate Change Committee (2020) *The Sixth Carbon Budget Electricity generation* (online) Available at: https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Electricity-generation.pdf (Accessed November 2023).
[40] Climate Change Committee (2021). *The Sixth Carbon Budget: Dataset (V2)* (online). Available at: https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-Dataset_v2.xlsx (Accessed November 2023).

Technical Guidance	Context
	• fourth carbon budget, 2023 to 2027, 189 $MtCO_2e$; • fifth carbon budget, 2028 to 2032, 93 $MtCO_2e$; • and sixth carbon budget, 2033 to 2037, 36 $MtCO_2e$. These allocations are used to contextualise emissions from the Proposed Works.

7.3 Data gathering methodology

Desk study

7.3.1 The UK and Scotland carbon budgets and the CCC's recommended sector allocations have been used to establish the assessment baseline. No other data sources have been gathered to inform the baseline for the GHG emissions assessment. Data sources that have been used for the GHG assessment at ES stage are discussed in **Section 7.7**.

Survey work

7.3.2 No survey work has been undertaken in the completion of this ES Chapter.

Data limitations

7.3.3 Assumptions have been made to characterise the likely activities associated with the Proposed Works and therefore enable GHG emissions to be determined. These assumptions ensure a proportionate assessment has been carried out. They are detailed in **Section 7.8: Assumptions and Limitations.**

7.4 Consultation

Pre-application Opinion

7.4.1 A Pre-application Opinion was received on 4 October 2022 from the Office for Nuclear Regulation (ONR). A summary of the issues raised in the Scoping Opinion regarding Climate Change, and confirmation of how these have been considered within the assessment is presented in **Table 7.4**.

Table 7.4 Summary of Pre-application Opinion Responses from ONR

Paragraph Ref.	Consideration	How addressed in the ES
28	Safestore Construction: The Safestore structure which will be constructed over the reactor buildings to protect them from the weather conditions for the duration of the Quiescent phase will have a 100-year design life. The scoping report does not include consideration of the resilience of the Safestore and other facilities such as the	The OWPF and DWPF are both to be provided by refurbishment of existing buildings on the site. Both facilities will be removed at the end of the Preparations for Quiescence phase together with other buildings on the site outside of the Safestore structure. Because of the short

Paragraph Ref.	Consideration	How addressed in the ES
	Operational Waste Processing Facility (OWPF) and Decommissioning Waste Processing Facility (DWPF) to climate change. The ES should include information on how the design of facilities on site for the duration of the Quiescence phase ensures resilience against future climate change and more extreme weather events.	intervening period between now and when the buildings will be removed from site, it is anticipated these will not be on-site in a period when sufficient sea level rise associated with climate change will have occurred. The fact that the OWPF will be delivered by a refurbishment of existing buildings represents a change in assessment scope from that proposed at scoping but will in itself provide carbon savings compared to the original proposals. The measures to ensure climate change resilience of the Proposed Works are reported in relevant aspect chapters of the ES. **Appendices 7B and 7C** to this Chapter supplement this and include application of UK climate change projections and consideration of the resilience of the Proposed Works to climate change.
69	Climate Change: In addition to the comments raised on the resilience of the Safestore to climate change, the EIA should consider available climate change data already in the public domain such as the 2018 Ayrshire Shoreline Management Plan. In addition to this, the EIA should take into account potential “soft” coastal management techniques deployed in the area to manage coastal flooding.	The EIA has considered any relevant climate change data available in the public domain, such as the 2018 Shoreline Management Plan, as suggested. This was referenced in the Scoping Report. The future baseline section of **Chapter 11: Surface Water and Flood Risk** (**Section 11.5**) has also considered SEPA climate change allowances based upon the latest UKCP18 climate change scenarios. In relation to the comment about coastal management techniques outlined in the Shoreline Management Plan, this has been taken into account as part of an embedded measure for future coastal protection and flood risk adaptation in Paragraph 11.5.62.
92	Soils Geology and Hydrology: EDFE should review the existing groundwater dataset for the site to identify if there are any gaps or areas of uncertainty as this will help to determine if additional investigations or monitoring is required to inform the EIA. Consideration needs to be given in the EIA to the potential effects of climate change on	The embedded measures in **Table 12.7** of **Chapter 12: Soils, Geology and Hydrology** includes a commitment to comply with the Land Contamination Risk Management guidance, which states that climate change should be considered in land

Paragraph Ref.	Consideration	How addressed in the ES
	the local hydrogeology regimes such as changes to recharge and sea level rises that may influence the groundwater regime.	contamination risk assessment. LCRM does not detail how this should be done, therefore there is a further commitment to give due regard in land contamination risk assessment to available guidance relating to climate change effects. This is an evolving field, however the commitment makes reference to the published SoBRA guidance on assessing risk to controlled waters the water environment from UK land contamination under conditions of future climate change (detailed in **Table 12.3**).

7.5 Overall baseline

Current baseline

7.5.1 The fourth UK carbon budget[5] (2023 to 2027) of 1,950MtCO_2e and Scotland's 2022 annual target of 34.2 MtCO_2e (representing a 59.8% reduction from the 1990 baseline of 85.1 MtCO_2e[41]), can be considered as the current baseline for the GHG emissions assessment (see **Table 7.1**). The 2023 CCC sector allocations for electricity generation are 44.0 MtCO_2e under the UK carbon budget and 1.2 MtCO_2e within Scotland's 2023 annual target.

7.5.2 The change in GHG emissions associated with the Proposed Works has been evaluated against national, regional and local targets for decarbonisation. The activities involved in the Preparations for Quiescence phase, which are planned to commence in 2026, will occur during the fourth (2023-2027), fifth (2028-2032) and sixth (2033-2037) UK Carbon Budget periods. It is therefore these carbon budgets which are used to contextualise the emissions from this phase.

7.5.3 Given that the change in emissions will be evaluated against these targets, an assessment of the change in GHG emissions arising from current site use in comparison to the Proposed Works is not required.

Future baseline

7.5.4 GHG emissions are expected, and required, to reduce in the future. The UK Government has set a net zero target which requires the UK to reduce GHG emissions by 100% below 1990 levels by 2050[3] and the Scottish Government has a more ambitious target of net zero by 2045.[9] Policy has been implemented at national, regional and local scales in order to achieve targets for decarbonisation (see **Table 7.1** and **Table 7.2**). The future baseline considers a number of the UK carbon budgets (including sectoral allocations), and the Scottish Government's interim and annual targets, over the duration of the Proposed Works (see **Table 7.3**).

[41] Scottish Government (2021). *Scottish Greenhouse Gas statistics: 1990-2019* (online). Available at: https://www.gov.scot/publications/scottish-greenhouse-gas-statistics-1990-2019/documents/ (Accessed November 2023).

7.5.5 Emissions from a 'without decommissioning' case in the future baseline will not be quantified in this assessment as the decommissioning of HNB is required by UK Government policy on the decommissioning of nuclear facilities and under the conditions of the Nuclear Site Licence for HNB.

7.6 Embedded environmental and good practice measures

7.6.1 Environmental measures have been embedded into the Proposed Works and **Table 7.5** outlines how these will influence the climate assessment.

Table 7.5 Summary of embedded environmental and good practice measures

Embedded Measure	Compliance Mechanism	Embedded or good practice measure
Fuel and energy consumption: Energy efficient and well-maintained plant equipment should be used, as should mains electricity, if available, rather than diesel-fuelled portable generators. This will reduce GHG emissions from fuel and energy consumption.	Environmental Management Plan (EMP)	Good practice
There are GHG emissions from deconstruction and construction traffic. Deliveries and the transportation of waste will be consolidated where possible and there should be 'no idling' vehicles. Sustainable modes of travel for the construction workforce will be encouraged. This will reduce GHG emissions from construction traffic.	EMP	Good practice
Embodied Carbon: There are embodied GHG emissions associated with the raw materials used to construct the Safestore. Where possible, choice of local sourcing of construction materials should be encouraged. Circular economy principles will be considered and deployed where possible. Carbon measuring and reporting would be undertaken.	EMP	Good practice
Due to the length of the Proposed Works, opportunities to mitigate GHG emissions **are likely to develop throughout the decommissioning lifecycle. Within the works there should be periodic reviews of the** works **which highlight these opportunities and enable the introduction of carbon reducing measures** at relevant stages in the decommissioning process. These measures should be aligned to The Nuclear Decommissioning Authority Group Sustainability Strategy[42].	EIA Baseline	Embedded measure

[42] Nuclear Decommissioning Authority (2022), *The NDA group Sustainability Strategy 2022* (online) Available at: https://www.gov.uk/government/publications/the-nda-group-sustainability-strategy-2022 (Accessed November 2023).

7.7 Assessment methodology

7.7.1 The proposed generic project-wide approach to the assessment methodology is set out in **Chapter 5: The Environmental Impact Assessment process**, and specifically in **Section 5.3** and **Section 5.4**. However, whilst this has informed the approach that has been used in this climate change chapter, it is necessary to set out how this methodology was applied, and adapted as appropriate, to address the specific needs of this GHG assessment.

General approach

7.7.2 The approach applied to the GHG assessment is to quantify and contextualise the GHG emissions of the Proposed Works. The 'with Proposed Works' case has considered the life cycle stages of the Proposed Works as set out within **Table 7.6**. The only assessment case to consider for the GHG assessment of the Proposed Works is the 'with Proposed Works' case. Emissions from a 'without decommissioning' case in the future baseline has not been quantified in this assessment as stated in **Section 7.5.**

Quantification of GHG emissions

7.7.3 The approach to quantifying the GHG emissions associated with the Proposed Works has considered the whole infrastructure life cycle of the works. The infrastructure life cycle phases as described within PAS 2080: Carbon Management in Infrastructure[33] and in **Table 7.6** were used. These phases allowed for the identification of the GHG emission sources associated with the Proposed Works. The assessment presents a reasonable worst-case. This methodology is in line with the latest IEMA guidance.[30]

7.7.4 GHG emissions associated with the emissions sources described in **Table 7.6** are generally calculated using the following equation:

$$\boldsymbol{Activity\ data\ X\ GHG\ emissions\ factor = GHG\ emissions\ value}$$

7.7.5 Assumptions were made to characterise the likely activities associated with the Proposed Works and therefore enable GHG emissions to be determined. These assumptions ensure a proportionate assessment has been carried out.

7.7.6 Detailed in **Table 7.6** is the overarching methodology for each defined PAS 2080 infrastructure life cycle stage which was used to characterise the GHG emission sources during the Proposed Works.

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Table 7.6 Activities during each stage of the Proposed Works

Phase	Main stages of the Proposed Works	A1-A2-A3 – Product stage: raw material supply, transport and manufacture	A4 – Construction transport	A5 – Construction process stage	B2-B5 – Maintenance, repair, replacement and refurbishment	B6 – Operational energy use	B7 – Operational water use	B8 – Other operational processes	C1 – Deconstruction	C2 – Transport	C3 – Waste processing for recovery	C4 – Disposal
Preparations for Quiescence phase	New infrastructure for decommissioning	X	X	X								
	Deplanting								X	X	X	X
	Safestore construction	X	X	X								
Quiescence phase				X	X	X	X	X				
Final Site Clearance	Site re-establishment	X	X	X								
	Retrieval and management of stored active waste				X	X	X	X				
	Reactor and reactor building dismantling (Safestore)								X	X	X	X

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A1-A2-A3 – Product stage: raw material supply, transport and manufacture

7.7.7 Embodied carbon represents the sum of GHG emissions covering extraction of raw and primary materials and their manufacture and refinement into products and construction materials, as well as the transport and supply logistics to the factory gate. The Royal Institute of Chartered Surveyors (RICS) methodology to calculate embodied carbon[32] along with the Inventory of Carbon and Energy (ICE) Database[43] was used.

7.7.8 For this GHG assessment, the embodied carbon figures from the ICE database are considered as the emission factor, and the weight of the materials considered as the activity data. The embodied carbon figures from the ICE database have been multiplied by the weight of materials associated with material resources. A list of material resources required for Safestore construction has been based upon available design information.

A4 – Construction transport

7.7.9 Surface access emissions associated with construction activities (Safestore emissions were estimated based on trip length and using the Department for Environment, Food and Rural Affairs (Defra) Emissions Factors Toolkit (EFT) (version 11).[44] Details on the number of vehicles were estimated through the traffic and transport workstream (**Chapter 16: Traffic and Transport**). The distances travelled by construction vehicles were estimated using Department for Transport (DfT) datasets.[45]

7.7.10 DfT data on commuting distances[46] was used to determine the GHG emissions from construction workers travelling to the Works Area.

A5 – Construction process stage

7.7.11 Construction process emissions (including on-site energy and water use, and waste generated) were calculated using the RICS' construction Key Performance Indicators (KPI) for process emissions of 1,400 kgCO2e per £100,000 of construction cost[47].

B2-B5 – Maintenance, repair, replacement and refurbishment

7.7.12 For maintenance, repair, refurbishment, and replacement throughout the use stage, an estimate of GHG emissions was calculated. This was completed using modelling by the Royal Institute of British Architects (RIBA)[48].

[43] Circular Ecology (2019). *Embodied Carbon – The ICE Database* (online). Available at: https://circularecology.com/embodied-carbon-footprint-database.html#.XKX_oJhKhPY (Accessed November 2023).
[44] Defra (2021). *Emissions Factors Toolkit v11* (online). Available at https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/ (Accessed November 2023).
[45] DfT (2023). *Table RFS0108: Domestic road freight statistics: July 2021 to June 2022* (online). Available at: https://www.gov.uk/government/statistics/domestic-road-freight-statistics-july-2021-to-june-2022 (Accessed November 2023).
[46] DfT (2023). *NTS0403e: National Travel Survey: 2022* (online). Available at: https://www.gov.uk/government/statistics/national-travel-survey-2022 (Accessed November 2023).
[47] RICS (2017). *Whole life carbon assessment for the built environment* (online). Available at: https://www.rics.org/globalassets/rics-website/media/news/whole-life-carbon-assessment-for-the--built-environment-november-2017.pdf (Accessed November 2023).
[48] RIBA (2017). *Embodied and whole life carbon assessment for architects* (online). Available at: https://www.architecture.com/-/media/gathercontent/whole-life-carbon-assessment-for-architects/additional-documents/11241wholelifecarbonguidancev7pdf.pdf (Accessed 26 September 2023).

B6 – Operational energy use

7.7.13 Energy use was calculated using an estimation of electricity and heating demand of the building types based on Chartered Institution of Building Services Engineers (CIBSE) characterisation[49,50].

7.7.14 Efficiency features of the new infrastructure was considered within the assessment. Annual emission calculations considered the carbon intensity of UK grid electricity (gCO_2e/kWh).

B7 – Operational water use

7.7.15 To calculate emissions associated with operational water, proxy information from case studies and literature reviews, which estimates litres of water used per employee per day, was used.

B8 – Other operational processes

7.7.16 Represents other process GHG emissions arising from the Waste Management Centre (WMC) and supporting facilities to enable it to operate and deliver its service including management of operational waste during Final Site Clearance. GHG emissions in this category principally related to surface access emissions.

7.7.17 Surface access emissions during the operation of facilities were be estimated using vehicle numbers estimated through the traffic and transport workstream (**Chapter 16: Traffic and Transport**), and typical commuting distance from the DfT[46] and the Defra EFT[44].

C1 – Deconstruction

7.7.18 Demolition of residual structures will produce GHG emissions from the operational energy of equipment and the transportation on-site.

7.7.19 GHG emissions from operational energy usage of deconstruction equipment were estimated using information available on the nature and quantity of plant and machinery for each sub-phase. This was supplemented using the RICS' KPI for process emissions of 1,400 $kgCO_2e$ per £100,000 of project cost.

C2 – Transport

7.7.20 Surface access emissions associated with decommissioning activities were assessed using the same methodology as described in paragraphs 7.7.9 to 7.7.10.

C3 – Waste processing for recovery

7.7.21 GHG emissions from waste processing were estimated using information available on waste types and processing methods. Waste tonnage has been based on quantities presented within **Chapter 19: Conventional Waste** of the ES**.**

[49] CIBSE. (2012). *GVF2012 Guide F: Energy Efficiency in Buildings*. (Online) Available at: https://www.cibse.org/getmedia/eaba1423-77fb-466b-99b8-03e93f37c420/GVF-corrigendum.pdf.aspx (Accessed April 2022).
[50] CIBSE. (2012). *TM46: Energy Benchmarks*. CIBSE; London.

C4 – Disposal

7.7.22 Emissions associated with waste disposal were calculated using information available on waste types, quantities and disposal routes. The latest Department for Energy Security and Net Zero (DESNZ) emissions factors[51] were applied.

Determination of significance

7.7.23 Current IEMA guidance[30] states that: "*The crux of significance therefore is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*".

7.7.24 The significance of GHG emissions associated with the Proposed Works has been evaluated based on the extent to which the Proposed Works materially affects the ability to achieve national, regional and local targets for decarbonisation. The primary basis of contextualisation will be UK and Scotland carbon budgets (see **Table 7.1**), including the relevant CCC sectoral allocations (see **Table 7.3**), and the UK carbon target of 'net zero' in 2050 and the Scottish Government target of net zero by 2045. Regional and local policy for reducing GHG emissions has also be considered, but are not the basis of assessment. Consideration has also be given as to whether GHG emissions are appropriately mitigated and compliant with relevant policy.

7.7.25 The significance of the GHG emissions from the Proposed Works is determined based on the criteria in **Table 7.7** developed from the IEMA guidance[30]. Major or moderate adverse effects and beneficial effects are considered to be significant. Minor adverse and negligible effects are not considered to be significant.

Table 7.7 Significance criteria

Significance	Significance Criteria
Major adverse	The Proposed Works do not make a meaningful contribution to both the UK and Scottish Governments meeting their carbon budgets / targets. Adverse GHG impacts are not mitigated and only compliant with do minimum standards. Impacts are also not compliant with requirements of national, regional and local policy.
Moderate adverse	The Proposed Works fall short of fully contributing to both the UK and Scottish Governments meeting their carbon budgets / targets. Adverse GHG impacts are partially mitigated and partially meet the requirements of national, regional and local policy.
Minor adverse	The Proposed Works are fully in line with the trajectory of the UK and Scottish Governments meeting their carbon budgets / targets. Adverse GHG impacts are mitigated with good practice design standards and meet the requirements of national, regional and local policy.
Negligible	The Proposed Works have minimal residual GHG emissions and are 'ahead of the curve' when contextualised against the net zero trajectory of the UK and Scottish Governments meeting their carbon budgets / targets. GHG impacts are mitigated through measures that go beyond good

[51] Department for Energy Security and Net Zero (2023) *Greenhouse gas reporting: conversion factors 2023* (online). Available at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2023 (Accessed November 2023).

Significance	Significance Criteria
	practice design standards and the requirements of national, regional and local policy.
Beneficial	The Proposed Works have net GHG emissions below zero, causing a direct or indirect reduction in atmospheric GHG emissions which has a positive impact on the UK and Scottish Governments meeting their carbon budgets / targets.

7.8 Assumptions and limitations

7.8.1 The GHG assessment has been based on the design assumptions described in **Chapter 2: The Decommissioning Process** supplemented by other inputs including the literature sources listed in **Appendix 7A**. These assumptions characterise the likely activities associated with the Works and therefore enable GHG emissions to be determined and support a proportionate assessment of GHG emissions associated with the Works. The assumptions are detailed in paragraphs 7.8.2 to 7.8.17 below.

Preparations for Quiescence phase

7.8.2 It was assumed that in the Preparations for Quiescence phase, 13 zones on the site will be deconstructed as described in **Section 2.3** of **Chapter 2: The Decommissioning Process**. The programme for the deconstruction of these zones is described in **Table 7.8**.

Table 7.8 Estimate of demolition duration for zones

Zone	Estimated Duration (months)
1	12
2	10
3	16
4	4
5	6
6	8
7	19
8	12
9	17
10	18
11	15
12	8
13	11

7.8.3 The durations presented in **Table 7.8** above have been used in conjunction with the predicted demolition plant items, quantities of these items, and percentage of time the plant items are expected to be in use, to estimate the hours of use of each item and the resultant quantities of fuel that will be required in deconstruction to power these plant items. A list of plant items is presented in **Table 7.9**.

Table 7.9 Predicted demolition plant utilised throughout demolition

Plant Item	Manufacturer	Model
90t Machine	Volvo	EC950
70t Machine	Volvo	EC750
50t Machine	Volvo	EC550
30t Machine	Volvo	EC350
20t Machine	Volvo	EC220
8t Machine	Volvo	ECR88
Loading Shovel	Volvo	L120
Articulated Dump Truck	Volvo	A30
Crusher	Nordberg	LT105
Screener	Finlay	595
Telehandler	Cat	TN83
Scissor lift	Nachi	RV120
Dust Suppression	Dust Boss	DB60
Compressor	Atlas Copco	XAS96
Hydraulic breaker attachment	Krupp	2500
Hydraulic Shear attachment	Demarac	DMS05
Mechanical Muncher attachment	Krupp	CP2300
Grab	Demarac	DRG19
Materials Handler	Fuchs	MHL370

Plant Item	Manufacturer	Model
Heavy Goods Vehicle (HGV) low loader	Kassbohrer	30-90t
20T HGV 8 wheeler	Scania	20t (P-series)
Generators	CAT	250KVA – 10KVA
Burning equipment) Oxy-Propane)	BOC	-
Mobile Crane	Liebherr	LTM 1070-4.2
Single drum Compactor	JCB	116D

7.8.4 **Table 7.10** presents the predicted demolition plant utilised throughout demolition and are derived from Safestore optioneering studies adopting the most carbon intensive option from these studies. They were extracted from the HNB Safestore Optioneering Study. They are the materials associated with the most carbon intensive option (Option 2).

Table 7.10 Safestore construction materials

Material type	Quantity (m^2)
Vertical Cladding	17,405
Façade Structure	3,230
Roofing	7,130
New roof primary steelwork	1,080
Foundation pads	80
Strips footings	597
Protection wall	3,781
Masonry face and insulation	3,781

7.8.5 In the absence of data on plant machinery, a combination of cost and the RICS industry benchmark of 1,400 kg CO_2e/£100k project cost have been used to calculate process emissions from the construction of the Safestore. The most carbon intensive option was utilised to inform the cost for this assessment.

7.8.6 The number of HGV and Light Goods Vehicle (LGV) movements associated with the Preparations for Quiescence phase have been obtained from **Chapter 16: Traffic and Transport** of this ES. They are displayed in **Table 7.11** below. It is assumed that there are a maximum of 24 two-way HGV journeys per day and 100 two-way LGV journeys per day during this phase.

Table 7.11 Trip generation

Decommissioning Phase	Activity	Timescale	Max HGVs (vehs/day – two ways)	Max Car/LGV traffic (vehs/ day – two ways)
Preparations for Quiescence phase	Deplanting and deconstruction, Active area deplanting, Waste processing and packaging	Y1- Y6	<11	100
	Deplanting and deconstruction (specifically, filling of turbine hall void), waste processing and processing	Y7-Y8	<25	100
	Safestore construction, deplanting and deconstruction	Y9 – Y10	<20	100
	Safestore construction, deplanting and deconstruction	Y11 – Y12	<10	100

7.8.7 For the calculation of transport emissions the one-way transport distance for HGVs is estimated to be 108 km. This is based on the Department for Transport[45] dataset on the average length of haul by type and weight of vehicle. LGV journeys are assumed to be commuting trips, 13.7km in length, based on Department for Transport Data[46].

7.8.8 For waste disposal in deplanting and deconstruction in the Preparations for Quiescence phase, waste tonnage has been obtained from **Chapter 19: Conventional Waste** of this ES. These tonnages are presented in **Table 7.12**. The latest Department for Energy Security and Net Zero (DESNZ) emissions factors[51] were applied to these quantities**.** It is assumed that these materials will be disposed of in landfill sites. This represents a conservative and worst-case scenario approach to calculating these GHG emissions.

Table 7.12 Waste quantities

Waste type	Waste tonnage (tonnes)
Asbestos	58
Lagging	22
Hazardous miscellaneous materials	4,036
Clean aluminium	3
Clean cast iron	552
Clean carbon steel	2,603
Clean glass	155
Clean mixed cable	1,483
Non-Hazardous miscellaneous materials	25,113

Waste type	Waste tonnage (tonnes)
Clean mild steel	40,044
Clean non ferrous	1,073
Clean plastic	7
Clean stainless steel	1,209
Clean Titanium	231
Clean Rubble (disposed on site)	127,472

Final Site Clearance

7.8.9 There will be a need to erect a number of temporary buildings on the Site to facilitate Final Site Clearance. The design and location of these buildings will be confirmed closer to the time that this phase will be undertaken.

7.8.10 Therefore, for activities related to Final Site Clearance assumptions have been made, where necessary, in order to characterise the likely activities associated with this phase and therefore enable GHG emissions to be estimated. These assumptions ensure a proportionate assessment has been carried out.

7.8.11 Assumptions have been made to estimate the size of the temporary buildings and the specific type and quantity of materials required for their construction. For the purposes of the assessment, it has been assumed that five industrial buildings will be constructed. These buildings are assumed to have an average floor area of 400m^2. A Carbon Factor has been used to estimate embodied carbon for each type of material used in the construction of these buildings and the HGV emissions generated from the transportation of materials. These were obtained from the ICE Database.

7.8.12 The precise details of the nature and quantity of plant and machinery for the construction of new structures for Final Site Clearance are unknown at this stage. Therefore the RICS KPI, which states that emissions should not exceed 1,400 kg CO_2e/£100k, has been used to estimate the process emissions from the construction of new buildings in the Final Site Clearance phase.

7.8.13 The amount of operational energy that these temporary buildings will require to function, has also been estimated based on the assumption that there will be five industrial buildings on site, which will have an average floor area of 400 m^2. Emissions factors and government projections of the carbon intensity of the grid in 2100[52] have been used.

7.8.14 The assumption for operational water use is has been derived from a literature review. The reference for office water use (50 litres per person, per day) has been used[53]. This is likely to be an overestimate, however it represents a worst-case scenario estimate.

7.8.15 The Final Site Clearance phase also includes the deconstruction of the Safestore. Material types and quantities which will be disposed of in the deconstruction of the Safestore, have been extracted from the HNB Safestore Optioneering Study. They are the

[52] DESNZ, (2003). *Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal* (Online). Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal (Accessed November 2023).
[53] South Staffs Water (n.d.). *Water Use in Your Business* (Online) Available at: https://www.south-staffs-water.co.uk/media/1509/waterusebusiness.pdf (Accessed November 2023).

materials associated with the most carbon intensive option (Option 2). They are detailed in **Table 7.13.**

Table 7.13 Safestore deconstruction waste

Waste type	Quantity (m^2)
Vertical Cladding	17,405
Façade Steelwork	17,405
Roof Cladding	7,130
Roof Steelwork	7,130
Slab Demolition	3,000
Foundations	80
Strip Footings	597
Protection Wall	1,512
Masonry Face and Insulation	3,781

7.8.16 The above quantities have been used to calculate HGV emissions associated with deconstruction. The figure for the tCO2/per tonne of material disposed in the Pre-Quiescence and been applied to the quantities in the above table. It is assumed that these materials will be disposed of in landfill sites. This represents a conservative and worst case scenario approach to calculating these GHG emissions.

7.8.17 The number of LGV movements throughout the Final Site Clearance (for both construction and operation of buildings on the site and Safestore Deconstruction) have been obtained from **Chapter 16: Traffic and Transport**. It is assumed that there are 100 two-way LGV journeys per day during this phase. LGV journeys are assumed to be commuting trips, 13.7 km in length, based on current Department for Transport Data[46].

7.9 Scope of the assessment

Study Area

Spatial scope

7.9.1 The spatial scope for the GHG emissions assessment was informed by the spatial extent of the Proposed Works, including all activities within the Site during its decommissioning, as well as the GHG emissions associated with transport movements to and from the Proposed Works. Further details of activities considered are provided in **Table 7.6**.

Temporal scope

7.9.2 The temporal scope of the GHG emissions assessment is consistent with the period over which the Proposed Works would take place (a period of 96 years).

Potential receptors

7.9.3 GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global climate is therefore the only receptor for the GHG assessment. IEMA Guidance states that the receptor has a high sensitivity, given the severe consequences of global climate change and the cumulative contributions of all GHG emission sources.[30]

Likely significant effects

7.9.4 The likely significant climate change effects that have been taken forward for assessment are summarised in **Table 7.14**. This is based on phases as defined within PAS 2080: Carbon Management in Infrastructure[33] (see **Graphic 7.1**) and undertaken with reference to **Chapter 2: The Decommissioning Process**. Due to the nature of the Proposed Works, the PAS 2080 infrastructure lifecycle stages do not occur in sequence, and they have been used selectively to identify the sources of GHG emissions during each phase of the Proposed Works.

Graphic 7.1 Infrastructure life cycle stages[33]

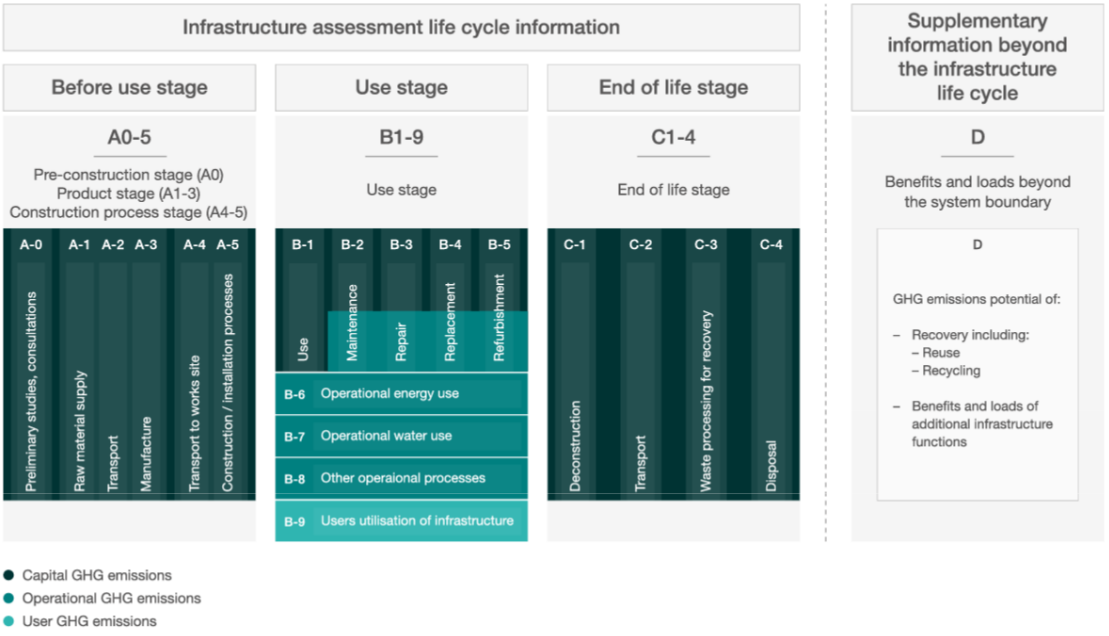

Table 7.14 Likely significant climate change effects

Phase	Main stages of the Proposed Works	Sources of GHG emissions	Scoped in / out
Preparations for Quiescence phase	Deconstruction: demolish all buildings to ground level in the Works Area, excluding the reactor building and associated infrastructure.	C1 – Deconstruction: represents the on-site activities of deconstructing, dismantling and demolishing infrastructure. For example, emissions arising through the use of plant and transport on-site.	Scoped in
		C2 – Transport: this represents all carbon emissions due to transport to disposal.	Scoped in
		C3 – Waste processing for recovery: represents the activities associated with treatment and processing for recovery, reuse and recycling of waste materials arising from the deplanting. This includes use of all waste material outputs from dismantling, deconstruction or demolition of the infrastructure and covers all debris, all construction products, materials or construction elements, etc. arising from the deplanting and operational activities associated with waste management facilities on site.	Scoped in
		C4 – Disposal: includes the carbon emissions resulting from final disposal of demolition materials. This category also includes any possible post-transportation treatment that is necessary before final disposal.	Scoped in

Phase	Main stages of the Proposed Works	Sources of GHG emissions	Scoped in / out
	Safestore construction: construction of a secure building to house the remaining reactors and vault.	A1-A2-A3 – Product stage: raw material supply, transport and manufacture: embodied GHG emissions associated with the raw material assets required to construct the Safestore.	Scoped in
		A4 – Construction transport: transport of construction materials resources and equipment from point of purchase to the works site. Commuting of workforce during construction.	Scoped in
		A5 – Construction process stage: emissions associated with construction and installation processes (including fuel and electricity consumption) of the temporary works, ground works, landscaping and permanent works. Emissions associated with site water demand. Waste management activities (transport, processing, final disposal) associated with waste arising from the Safestore construction.	Scoped in
		A5 – Construction process stage (land-use change): emissions associated with land use change are usually calculated on a national level. GHG emissions from changes in land use type associated with the Proposed Works are expected to be minimal and have been scoped out from the assessment.	Scoped out
Quiescence phase	Surveillance period: Safestore inspection and maintenance.	B1 – Boundary of use stage: installed products and materials: called	Scoped out

Phase	Main stages of the Proposed Works	Sources of GHG emissions	Scoped in / out
		'use', this represents the carbon emitted directly from the fabric of products and materials once they have been installed as part of infrastructure and it is in normal use. It is not anticipated that any of the materials used in the construction of the Safestore will be capable of emitting carbon directly.	
		B2-B5 – Maintenance, repair, replacement and refurbishment: represents the works activities and new materials for the maintenance, repair, replacement and refurbishment of the Safestore during the use stage / operation. The selection of highly durable materials, careful design and high quality construction of the Safestore, supports the infrequent need for maintenance of the facility. GHG emissions are therefore likely to be minimal and have been scoped out of the assessment.	Scoped out
		B6 – Operational energy use: emissions resulting from the energy used by the Safestore to enable it to deliver its service during operation. The design basis of the Safestore is such that it requires only a minimal programme of work to sustain the safe, stable, passive storage conditions and the continued integrity of the 'safe stored' reactors and site. Energy use is likely to be minimal and this	Scoped out

Phase	Main stages of the Proposed Works	Sources of GHG emissions	Scoped in / out
		stage has been scoped out of the assessment.	
		B7 – Operational water use: emissions resulting from the consumption of water required by the Safestore to operate and deliver its service. The design basis of the Safestore is such that it requires only a minimal programme of work to sustain the safe, stable, passive storage conditions and the continued integrity of the 'safe stored' reactors and site. Water use is likely to be minimal and this stage has been scoped out of the assessment.	Scoped out
		B8 – Other operational processes: represents other process GHG emissions arising from the Safestore to enable it to operate and deliver its service including management of operational waste. Includes GHG emissions from operational transport. There will be periodic visits by a centrally based team to inspect and monitor the site and its environs. GHG emissions are likely to be minimal and this stage has been scoped out of the assessment.	Scoped out
		B9 – User's utilisation of infrastructure: represents the activities associated with user's utilisation during the use stage. This is defined by the principle of control and influence whereby the GHG emissions are B9 (user's utilisation) when they arise from an activity that the user has control	Scoped out

Phase	Main stages of the Proposed Works	Sources of GHG emissions	Scoped in / out
		over. This stage is not relevant to the operation of the Safestore and is scoped out of the assessment.	
Final Site Clearance	Site re-establishment: new facilities construction for final decommissioning, including a Waste Management Centre (WMC).	A1-A2-A3 – Product stage: raw material supply, transport and manufacture: embodied GHG emissions associated with the raw material assets required to construct new facilities required to facilitate Final Site Clearance, such as the WMC.	Scoped in
		A4 – Construction transport: transport of construction materials resources and equipment from point of purchase to the works site. Commuting of workforce during construction.	Scoped in
		A5 – Construction process stage: emissions associated with construction and installation processes (including fuel and electricity consumption) of the temporary works, ground works, landscaping and permanent works. Emissions associated with site water demand. Waste management activities (transport, processing, final disposal) associated with waste arising from the construction.	Scoped in
		A5 – Construction process stage (land-use change): emissions associated with land use change are usually calculated on a national level. GHG emissions from changes in land use type associated with the	Scoped out

Phase	Main stages of the Proposed Works	Sources of GHG emissions	Scoped in / out
		Proposed Works are expected to be minimal and have been scoped out from the assessment.	
	Retrieval and management of stored active waste: wastes transferred to WMC and sent to a suitable waste repository.	B1 – Boundary of use stage: installed products and materials: called 'use', this represents the carbon emitted directly from the fabric of products and materials once they have been installed as part of infrastructure and it is in normal use. It is not anticipated that any of the materials used in the construction of the facilities will be capable of emitting carbon directly.	Scoped out
		B2-B5 – Maintenance, repair, replacement and refurbishment: represents the works activities and new materials for the maintenance, repair, replacement and refurbishment of the WMC and supporting facilities during the use stage / operation.	Scoped in
		B6 – Operational energy use: emissions resulting from the energy used by the WMC and supporting facilities to enable it to deliver its service during operation.	Scoped in
		B7 – Operational water use: emissions resulting from the consumption of water required by the WMC and supporting facilities to operate and deliver its service.	Scoped in
		B8 – Other operational processes: represents other process GHG emissions arising from the WMC and supporting	Scoped in

Phase	Main stages of the Proposed Works	Sources of GHG emissions	Scoped in / out
		facilities to enable it to operate and deliver its service including management of operational waste.	
		B9 – User's utilisation of infrastructure: represents the activities associated with user's utilisation of the Safestore during the use stage. This is defined by the principle of control and influence whereby the GHG emissions are B9 (user's utilisation) when they arise from an activity that the user has control over. This stage is not relevant to the operation of the facilities and is scoped out of the assessment.	Scoped out
	Reactor and reactor building dismantling (Safestore): dismantling and demolition of reactor and reactor building (Safestore), deconstruction of any other facilities and site clearance.	C1 – Deconstruction: represents the on-site activities of deconstructing, dismantling and demolishing the infrastructure. For example, emissions arising through the use of plant and transport on-site.	Scoped in
		C2 – Transport: this represents all carbon emissions due to transport to disposal.	Scoped in
		C3 – Waste processing for recovery: represents the activities associated with treatment and processing for recovery, reuse and recycling of waste materials arising from the Final Site Clearance. This includes use of all waste material outputs from dismantling, deconstruction or demolition of the infrastructure and covers all debris, all construction	Scoped in

Phase	Main stages of the Proposed Works	Sources of GHG emissions	Scoped in / out
		products, materials or construction elements, etc. arising from the Final Site Clearance.	
		C-4 – Disposal: includes the carbon emissions resulting from final disposal of demolition materials. This category also includes any possible post-transportation treatment that is necessary before final disposal.	Scoped in

7.10 Assessment of effects

Preparations for Quiescence phase

New infrastructure for decommissioning

Raw materials supply, transport and manufacture

7.10.1 There is no significant new built infrastructure that will be constructed in the Preparations for Quiescence phase that forms part of the Proposed Works. Therefore, there are no emissions associated with the supply of raw materials, transport and manufacturing in connection with new infrastructure, construction transport and construction processes.

Deconstruction

Deconstruction

7.10.2 The emissions related to on-site activities of deconstructing, dismantling and demolishing infrastructure, for example, emissions arising through the use of plant and transport on-site are estimated as 26 $ktCO_2e$.

Transport

7.10.3 This represents all carbon emissions due to transport of materials and wastes to the location of disposal and the worst case that material is imported to site to fill voids created from deplanting and deconstruction activities. GHG emissions associated with this process in the deconstruction activities of the Proposed Works are estimated as 10 $ktCO_2e$

Waste processing for recovery

7.10.4 This category represents the activities associated with treatment and processing for recovery, reuse and recycling of waste materials arising from the deplanting. It is assumed

that there is no recovery of waste during this phase. As a result, there are no emissions associated with waste processing recovery in the deconstruction phase.

Disposal

7.10.5 The estimate of carbon emissions resulting from final disposal of demolition materials are 1 $ktCO_2e$ which is based on the assumption that all demolition material is exported to landfill.

Safestore Construction

Raw materials supply, transport and manufacture

7.10.6 The embodied GHG emissions associated with the raw material assets required to construct the Safestore are estimated as 19 $ktCO_2e$.

Safestore construction transport

7.10.7 This represents all carbon emissions from HGV journeys required for the construction of the Safestore. It also includes the emissions associated with Safestore construction workers commuting. The total of these GHG emissions are calculated at 4 $ktCO_2e$.

Construction process stage

7.10.8 Emissions associated with Safestore construction and installation processes (including fuel and electricity consumption) are estimate as 0.2 $ktCO_2e$.

Summary

7.10.9 The total GHG emissions associated with the Preparations for Quiescence phase of the Proposed Works are estimated to be approximately 60 $ktCO_2e$, of which 43% of these emissions are associated with on-site activities of deconstructing, dismantling and demolishing, and 31% is embodied carbon associated with the use of new materials for the Safestore.

Final Site Clearance

Site re-establishment

Raw materials supply, transport and manufacture

7.10.10 The embodied GHG emissions associated with the raw material assets required to construct new facilities required to facilitate Final Site Clearance are estimated to be around 4 $ktCO_2e$.

Construction transport

7.10.11 The transport of construction materials resources and equipment from point of purchase to the works site for the construction of new facilities for Final Site Clearance and emissions related to the commuting workforce during this period are estimated as 0.2 $ktCO_2e$.

Construction process stage

7.10.12 Emissions associated with construction and installation processes involved in site re-establishment are estimated as 1.1 $ktCO_2e$.

Retrieval and management of stored active waste

Maintenance, repair, replacement and refurbishment

7.10.13 Emissions related to the works activities and new materials for the maintenance, repair, replacement and refurbishment of the WMC and supporting facilities during the use stage / operation are calculated as 3 $ktCO_2e$.

Operational energy

7.10.14 Emissions resulting from the energy used by the WMC and supporting facilities to enable it to deliver its service during operation are estimated at 0.01 $ktCO_2e$.

Operational water

7.10.15 Emissions resulting from the consumption of water required by the WMC and supporting facilities to operate and deliver its service are estimated at 0.002 $ktCO_2e$.

Other operational processes

7.10.16 Other process GHG emissions arising from the WMC and supporting facilities to enable it to operate and deliver its service including the emissions associated with commuting workers are estimated at 1 $ktCO_2e$.

Reactor and reactor building dismantling

Deconstruction

7.10.17 The on-site activities of deconstructing, dismantling and demolishing the infrastructure, for example, emissions arising through the use of plant and transport on-site, are estimated as 0.1 $ktCO_2e$.

Transport

7.10.18 All carbon emissions due to transport to disposal are calculated as 0.7 $ktCO_2e$.

Waste processing for recovery

7.10.19 This category represents the activities associated with treatment and processing for recovery, reuse and recycling of waste materials arising from the reactor and reactor building dismantling. It is assumed, as a worst-case scenario, that there will be no recovery of waste. As a result, there are no emissions associated with waste processing recovery in the deconstruction phase.

Disposal

7.10.20 The carbon emissions resulting from final disposal of demolition materials associated with the reactor and Safestore are calculated as 0.1 $ktCO_2e$.

Summary

7.10.21 The total lifetime GHG emissions associated with the Final Site Clearance of the Proposed Works are estimated to be around 10 $ktCO_2e$.

Summary

7.10.22 Overall lifetime GHG emissions associated with the Proposed Works are estimated to be 70.4 $ktCO_2e$. A summary of the phased lifecycle GHG emissions assessment is presented in **Table 7.15.**

Table 7.15 Lifecycle emissions over the duration of the Proposed Works

Phase	Main stages of the Proposed Works	Sources of GHG emissions	Estimated lifetime GHG emissions ($ktCO_2e$)
Preparations for Quiescence phase	Deconstruction: demolish all buildings to ground level in the Works Area, excluding the reactor building and associated infrastructure.	C1 – Deconstruction: use of plant and transport on-site.	26
		C2 – Transport:	10
		C3 – Waste processing for recovery	0
		C4 – Disposal	1
	Safestore construction: construction of a secure building to house the remaining reactors and vault.	A1-A2-A3 – Product stage: raw material supply, transport and manufacture	19
		A4 – Construction transport	4
		A5 – Construction process stage.	0.2
Final Site Clearance	Site re-establishment: new facilities construction for final decommissioning, including a Waste Management Centre (WMC).	A1-A2-A3 – Product stage: raw material supply, transport and manufacture	4
		A4 – Construction transport	0.2
		A5 – Construction process stage	1.1
	Retrieval and management of stored active waste: wastes	B2-B5 – Maintenance, repair, replacement and refurbishment:	3

Phase	Main stages of the Proposed Works	Sources of GHG emissions	Estimated lifetime GHG emissions ($ktCO_2e$)
	transferred to WMC and sent to a suitable waste repository.	B6 – Operational energy use	0.01
		B7 – Operational water use	0.002
		B8 – Other operational processes	1
	Reactor and reactor building dismantling (Safestore): dismantling and demolition of reactor and reactor building (Safestore), deconstruction of any other facilities and site clearance.	C1 – Deconstruction	0.1
		C2 – Transport	0.7
		C3 – Waste processing for recovery	0
		C-4 – Disposal	0.1

Contextualisation against relevant UK carbon budgets

7.10.23 The significance of GHG emissions associated with the Proposed Works is evaluated based on the extent to which the Proposed Works materially affects the ability to achieve national, regional and local targets for decarbonisation. The primary basis of contextualisation is the UK carbon budgets, including the relevant CCC sectoral allocations. Regional and local policy for reducing GHG emissions is also considered but are not the basis of assessment. Consideration is also given as to whether GHG emissions are appropriately mitigated and compliant with relevant policy.

7.10.24 The GHG assessment has considered GHG emissions from the Proposed Works in three separate phases: Preparations for Quiescence phase, Quiescence phase and Final Site Clearance. The Preparations for Quiescence phase of the Proposed Works runs from approximately 12 years from 2027. GHG emissions from this phase will therefore fall within the 4th, 5th and 6th carbon budget.

7.10.25 Further stages will fall entirely within future budgets once set.

7.10.26 **Table 7.16** presents the net $ktCO_2e$ associated with the Preparations for Quiescence phase, Quiescence phase and Final Site Clearance phases of the Proposed Works during each of the legislated carbon budget periods.

Table 7.16 Lifecycle emissions contextualised against the UK carbon budgets

Phase of Proposed Works	Estimated lifetime GHG emissions ($ktCO_2e$)	Net Proposed Works GHG emissions per relevant carbon budget ($ktCO_2e$) and 2050 net zero target ($ktCO_2e/yr$)		
		4th (2023 to 2027)	5th (2028 to 2032)	6th (2033 to 2037)
Total UK carbon budget		1,950,000	1,725,000	965,000
CCC sector allocation		189,200	92,700	35,800
Preparations for Quiescence phase		4.9	13.7	13.7
Quiescence phase		-	-	-
Final Site Clearance				
Total		4.9	13.7	13.7
Total % of UK carbon budget		0.0002%	0.001%	0.003%
Total % of CCC sector allocation		0.003%	0.03%	0.07%

7.10.27 This assessment has established that the Proposed Works' lifetime net GHG emissions will equate, 0.0002% of the UK's fourth carbon budget, 0.001% of the UK's fifth carbon budget and 0.003% of the UK's sixth carbon budget. In this context, it is concluded that the Proposed Works will not have a material adverse effect on the UK Government meeting its carbon budgets / targets. In this context, it is not considered that the lifetime net GHG emissions will have a material adverse effect on the achievement of Scottish Carbon Budgets or local policy objectives.

7.10.28 As a result, in accordance with the assessment methodology and criteria for defining significance in **Table 7.7**, the Proposed Works are assessed as having a **Minor Adverse Effect** and is therefore assessed as being **Not Significant.**

7.11 Assessment of cumulative effects

Inter-project effects

7.11.1 There is the potential for climate change effects associated with the Proposed Works to interact with, or combine with the effects arising from other developments or projects proposed within the relevant Zones of Influence applicable to each environmental aspect.

7.11.2 An assessment inter-project effects is considered within in **Chapter: 21: Cumulative Effects Assessment** of this ES.

Intra-project effects

7.11.3 Consideration has been given as to whether any of the climate change receptors are likely to be subject to cumulative intra-project effects because of other environmental topic effects upon the same receptor. The global climate is the only receptor for the climate

change assessment and therefore the Proposed Works are not expected to result in any significant intra-project effects.

7.12 Climate Change Resilience

7.12.1 The measures to ensure climate change resilience of the Proposed Works are reported in relevant aspect chapters of the ES. The environmental measures identified in aspect assessments related to improving the climate change resilience of the Proposed Works have been reproduced in **Table 7.17**.

Table 7.17 Climate Change Resilience measures

Chapter	Environmental measure	Relevance for climate change resilience
6: Air Quality	Good practice air quality measures as described in the IAQM guidance on the Assessment of Dust from Demolition and Construction will be employed across the Project and incorporated in the Environmental Management Plan.	A decrease in summer precipitation may contribute to an increase in dust emissions, resulting in adverse effects on human receptors during the Preparations for Quiescence phase and Final Site Clearance. This will be mitigated by dust management measures that will be implemented on site through use of the EMP. An outline EMP has been submitted as part of this EIADR to frame the future development of this document.
12: Soils, Geology and Hydrogeology	In accordance with LCRM, consideration will be given to climate change effects in land contamination risk assessment completed during the Proposed Works. Assessments will give regard, as appropriate, to available relevant industry guidance, such as SoBRA (2022) Guidance on Assessing Risk to Controlled Waters from UK Land Contamination Under Conditions of Future Climate Change. This will be secured in the Environmental Management Plan.	Climate change may influence the hydrogeological regime, including potential changes in rainfall runoff, infiltration and recharge rates. Land contamination risk assessments will mitigate against the risks these changes may bring to prevent adverse effects from a land contamination perspective.
11: Surface Water and Flood Risk	In accordance with Scottish Planning Policy, the design event for the purposes of the Flooding Risk Assessment is the 0.5% Annual Exceedance Probability (plus climate change) for the duration of the Proposed Works up to 2125. The future baseline section (**Section 11.5**) has considered SEPA climate change allowances based upon the latest UKCP18 climate change scenarios. This includes information derived from a range of coastal and pluvial modelling studies, which taken together with a range of existing and	Climate change and associated increase in winter rainfall, intense storm events and sea level rise pose a risk to the site of the reactor and Safestore. Accounting for climate change in the Flooding Risk Assessment and the embedded mitigations provided by the Coastal Protection and Flood Risk Adaptation Measures and will help prevent damage or deterioration to the assets resulting from extreme precipitation the action of pluvial flooding and sea level rise.

Chapter	Environmental measure	Relevance for climate change resilience
	proposed embedded environmental measures will help minimise any potential effects towards flood risk receptors. Embedded mitigations include Coastal Protection and Flood Risk Adaptation Measures, such as the existing coastal flood defences which will continue to protect the Site during the Proposed Works (taking into account current climate change allowances). The HNB Safety Case will be periodically reviewed to take account of future updates to climate change allowances. Should changes in coastal protection be required then the HNB Safety Case process will ensure their timely identification. This will be secured Environmental Management Plan, Nuclear Site Safety Case.	

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Terrestrial Biodiversity & Ornithology

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8. Terrestrial Biodiversity and Ornithology

8.1 Introduction

8.1.1 This chapter sets out the assessment of the effects of the Proposed Works on terrestrial biodiversity and ornithology. It includes the assessment of effects on birds, recognising that this group of taxa spans terrestrial, freshwater and marine environments.

8.1.2 Within this chapter, 'terrestrial ecological features' are defined as those ecological features (species, habitats and ecosystems[1]) that are relevant to the area above mean high water springs (MHWS). The effects of the Proposed Works on ecological features that are relevant to the area below MHWS are considered in **Chapter 9: Marine Biodiversity.**

8.1.3 **Chapter 11: Surface Water and Flood Risk** and **Chapter 12: Soils, Geology and Hydrogeology** do not identify any hydraulic links between the Indicative Dismantling Works Area ('the Works Area') and ecological features that are potentially of biodiversity conservation importance. Effects on freshwater biodiversity are therefore scoped-out of the assessment. The exception to this is the assessment of effects on anadromous and catadromous fish species in the marine environment, which is provided in **Chapter 9: Marine Biodiversity**.

8.1.4 This chapter should be read in conjunction with the description of the Proposed Works presented in **Chapter 2: The Decommissioning Process**.

8.2 Relevant legislation, policy and technical guidance

Legislation

8.2.1 The legislation summarised in **Table 8.1** is relevant to the assessment of effects on terrestrial biodiversity and ornithology.

Table 8.1 Legislation relevant to terrestrial biodiversity and ornithology

Legislation	Legislation relevance
Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and	Adopted in 1992, the Habitats Directive, along with the Birds Directive, established the EU-wide Natura 2000 ecological network of protected areas to be safeguarded against potentially damaging developments. These areas are also referred to as 'European Sites'[3] and now form the UK's national site network. The Habitats Directive also lists species that are of conservation concern and require legal protection in Europe.

[1] CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine* version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester.
[3] 'European Sites' include Special Protection Areas (SPAs) designated in accordance with the Birds Directive and Special Areas of Conservation (SACs) designated in accordance with the Habitats Directive. These designations protect species and habitats that are biodiversity conservation priorities across Europe. European Sites now form part of the UK's national site network and the designation and protection of these sites continues to apply.

Legislation	Legislation relevance
flora (Habitats Directive)[2]	
Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (Birds Directive)[4]	The Birds Directive, through the establishment of Special Protection Areas (SPA), provides designated sites to protect European wild bird species, and the habitats of listed species.
Ramsar Convention on Wetlands of International Importance 1971[5]	The Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. It encourages the designation of sites containing rare, unique, or representative wetland habitats, or wetlands important for conserving biodiversity. It was ratified by the UK, along with the designation of its first Ramsar sites, in 1976. Most Ramsar sites in Scotland are linked to the UK's national site network - either as a SPA or Special Area of Conservation (SAC).
The Conservation (Natural Habitats & c.) Regulations 1994 (as amended in Scotland) (Habitats Regulations)[6]	In Scotland, the EU Habitats Directive is translated into specific legal obligations by the Conservation (Natural Habitats, &c.) Regulations 1994. This legislation is known as the Habitats Regulations. The Habitats Regulations cover the requirements for: • protecting sites that are internationally important for threatened habitats and species, referred to collectively as European Sites[7]; and • a legal framework for species requiring strict protection, referred to as European Protected Species (EPS). The most recent amendments to the Habitats Regulations in 2019 in Scotland mean that the principles of the European Habitats and Birds Directives, in terms of the designation and protection of European Sites, continue to apply.
The Wildlife and Countryside Act 1981 (as amended in Scotland)[8]	The Wildlife and Countryside Act is the primary legislation for the protection of animals, plants and habitats in the UK. It gives protection to native species, particularly those that are under threat, and controls the release of non-native species. It enhances biodiversity conservation through the establishment of Sites of Special Scientific Interest (SSSI).

[2] European Commission (1992). *Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora* (online). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992L0043&from=EN (Accessed November 2023).
[4] European Commission (2009). *Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version)* (online). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0147&from=EN (Accessed November 2023).
[5] UNESCO (1971). *Ramsar Convention on Wetlands of International Importance 1971* (online). Available at: https://www.ramsar.org/sites/default/files/documents/library/current_convention_text_e.pdf (Accessed November 2023).
[6] *The Conservation (Natural Habitats, &c.) Regulations 1994* (online). Available at: http://www.legislation.gov.uk/uksi/1994/2716/made (Accessed November 2023)
[7] European sites are those sites originally designated under the EU Birds and Habitats directives but remain under statutory protection in the UK. These include Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), including areas proposed for such designation but not formally adopted.
[8] *Wildlife and Countryside Act 1981* (online) Available at: http://www.legislation.gov.uk/ukpga/1981/69 (Accessed November 2023)

Legislation	Legislation relevance
Protection of Badgers Act 1992[9]	The Protection of Badgers Act consolidates previous legislation, making it an offence to kill, injure or take a badger, or to damage / interfere with a sett, unless a licence is obtained from a relevant authority.
Nature Conservation (Scotland) Act 2004[10]	The Act sets out a series of measures to conserve biodiversity and to protect and enhance the biological and geological natural heritage of Scotland. The Act provides the principal legislative components of a new and integrated system for nature conservation in Scotland. It also sets out duties for public bodies to further conservation of biodiversity (not just protected sites) and report on its compliance with the Biodiversity Duty. It amends the Wildlife and Countryside Act 1981 by extending the list of offences and amending the provisions for enforcement.
Wildlife and Natural Environment (Scotland) Act 2011[11]	When brought into effect, the Act introduced new wildlife offences to Scotland, including increased regulation of snaring practices, strengthened badger protection, and introduced a new regime for controlling invasive and non-native species (INNS).

Policy

8.2.2 A summary of the relevant policies is presented in **Table 8.2**.

Table 8.2 Policy relevant to terrestrial biodiversity and ornithology

Policy Reference	Policy Relevance
National Policy	
National Planning Framework 4 (NPF4)[12]	The policies within NPF4 that are relevant to terrestrial biodiversity and ornithology are Policies 1, 3, 4, 6 & 20. These emphasise the protection of biodiversity and natural assets, and the role they play in carbon reduction. Development proposals for national, major or Environmental Impact Assessment (EIA) development will only be supported where it can be demonstrated that the proposal will conserve, restore and enhance biodiversity, including nature networks so they are in a demonstrably better state than without intervention and also avoiding contributing to a deficit of blue and green infrastructure. It is therefore important to assess the effects of decommissioning activities on biodiversity, testing the compatibility of the Proposed Works with these policies. The Hunterston Strategic Asset is mentioned as one of the six national developments that support the delivery of productive places theme. This

[9] *Protection of Badgers Act 1992* (online). Available at: http://www.legislation.gov.uk/ukpga/1992/51 (Accessed November 2023).
[10] *Nature Conservation (Scotland) Act 2004* (online) Available at: http://www.legislation.gov.uk/asp/2004/6/contents (Accessed 09 March 2023)
[11] *Wildlife and Natural Environment (Scotland) Act 2011* (online). Available at: http://www.legislation.gov.uk/asp/2011/6/contents/enacted (Accessed 09 March 2023)
[12] Scottish Government (2023). *National Planning Framework 4*. (Online). Available at: https://www.gov.scot/publications/national-planning-framework-4/documents (Accessed August 2023)

Policy Reference	Policy Relevance
	national development "*supports re-use of the port and wider site, engaging in new technologies and creating opportunities from nuclear decommissioning to make best use of existing infrastructure and provide local benefits*".
Local Policy	
North Ayrshire Local Development Plan (LDP) (2019)[13]	The North Ayrshire LDP sets out guidance for development and investment for the next 20 years. The relevant policies concerning terrestrial biodiversity and ornithology are: Policy 14: Green and Blue Infrastructure states that 'All proposals should seek to protect, create, enhance and/or enlarge natural features and habitats which make up green and blue infrastructure, ensuring no unacceptable adverse environmental impacts'. Support will be given to proposals which seek to enhance biodiversity, including restoration of degraded habitats and avoidance of further habitat fragmentation/isolation. Policy 16: Protection of Designated Sites states that development will be supported that would not have an unacceptable adverse effect on: ● Nature Conservation Sites of International Importance - ▸ other than where there are no alternative solutions; ▸ there are imperative reasons of overriding public interest; and ▸ compensatory measures are provided. ● Nature Conservation Sites of National Importance - unless it can be demonstrated that the objectives of the designation and integrity of the site would not be compromised, or any adverse effects are outweighed by social, environmental or economic benefits of national importance. ● Nature Conservation Sites of Local Importance - unless the objectives of the designation and integrity of the designated area would not be compromised, or any adverse effects are outweighed by social, environmental or economic benefits of local importance. ● Marine Protected Areas (MPA) – including South Arran MPA. ● Protected Species – unless the applicant can demonstrate that a species licence is likely to be granted. ● Scottish Biodiversity List (SBL)[14] of animals, plants and habitats. Policy 18: Forestry, Woodland, Trees and Hedgerows states that development will only be supported when it would not result in loss or deterioration of ancient or long-established plantation or semi-natural woodland, unless there are overriding public benefits. The Scottish Government's Control of Woodland Policy and Ayrshire and Arran

[13] North Ayrshire Council (2019) *Adopted Local Development Plan* (online). Available at: https://www.north-ayrshire.gov.uk/planning-and-building-standards/ldp/local-development-plan.aspx (Accessed November 2023).
[14] NatureScot (2020). *Scottish Biodiversity List*. (Online). Available at: https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy-and-cop15/scottish-biodiversity-list (Accessed November 2023).

Policy Reference	Policy Relevance
	Woodland Strategy include compensatory planting requirements. Supplementary Guidance: Trees and Development provides guidance on information to be submitted as part of planning applications involving tree works as well as matters to consider when minimising impacts on trees.

Technical guidance

8.2.3 Technical guidance that is relevant to the assessment of the effects on terrestrial biodiversity and ornithology is presented in **Table 8.3**.

Table 8.3 Technical Guidance relevant to terrestrial biodiversity and ornithology

Technical Guidance	Context
Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1[15]	Good practice guidance on Ecological Impact Assessment (EcIA).
Environmental Impact Assessment – Guide to delivering Quality Development Ecological Impact Assessment[16]	Good practice guidance on the EIA process.
Guidelines for Baseline Ecological Assessment[17]	Guidance on baseline ecological assessment.
Guidelines for Preliminary Ecological Appraisal, 2nd edition[18]	Good practice guidance on preliminary ecological appraisal.
British Standard (BS) 42020:2013, Biodiversity. Code of practice for planning and development[19]	Guidance to ensure that actions and decisions taken at each stage of the planning process are informed by sufficient and appropriate ecological information.
Handbook for Phase 1 Habitat Survey - A technique for environmental audit[20]	Good practice guidance on Phase 1 Habitat surveys.
A Review of Disturbance Distances in Selected Bird Species[21]	Guidance on thresholds of disturbance of certain bird species.
Bird Monitoring Methods[22]	Good practice guidance on bird survey / monitoring methods.

[15] CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.2*. Chartered Institute of Ecology and Environmental Management, Winchester.
[16] Institute of Environmental Management and Assessment. (2016). *Environmental Impact Assessment – Guide to Delivering Quality Development.* IEMA; Lincoln, UK
[17] Institute of Environmental Assessment. (1995). *Guidelines for Baseline Ecological Assessment.* E & FN Spon; London, UK
[18] Chartered Institute of Ecology and Environmental Management. (2017). *Guidelines for Preliminary Ecological Appraisal, 2nd edition.* CIEEM; Winchester, UK.
[19] British Standards Institution. (2013). *Biodiversity - Code of practice for planning and development*. BSI; London, UK.
[20] Joint Nature Conservation Committee (JNCC). (2010). *Handbook for Phase 1 Habitat Survey - a technique for environmental audit*. JNCC; Peterborough, UK.
[21] Ruddock, M and Whitfield, DP. (2007). *A Review of Disturbance Distances in Selected Bird Species.* Natural Research (Projects) Ltd; Banchory, UK:
[22] Gilbert, G, Gibbons, D W and Evans, J (1998). *Bird Monitoring Methods.* Pelagic Publishing Ltd; Exeter, UK.

Technical Guidance	Context
Bat Surveys for Professional Ecologists: Good Practice Guidelines[23]	Guidance on bat ecology and good practice survey methods and standards.
Inverness badger survey 2003[24]	Guidance / information on badger surveys and types of badger sett.
FCS Guidance Note 35c: Forest operations and otters in Scotland[25]	Describes measures that forest, and woodland managers should follow to avoid or minimise the risk of committing offences relating to otters.
Standing advice for planning consultations – Otters[26]	Advice to applicants seeking permission for development that could affect otters (including survey recommendations), and to assist planning officers and other regulators in their assessment of these applications.
Monitoring the Otter *Lutra lutra*. Conserving Natura 2000 Rivers Monitoring Series No. *10*[27]	Includes guidance / information on otter surveys.
Great crested newt mitigation guidelines[28]	Guidance on great crested newt ecology and good practice survey methods and standards.

8.3 Data gathering methodology

Study Area

8.3.1 The Study Area encompasses the area over which all desk-based and field data were gathered to inform the assessment. Due to the presence of multiple ecological features and many potential effects, the level and type of data collection varies across the Study Area. The Study Area comprises:

- The land inside the Hunterston B (HNB) Nuclear Site Licence (NSL) boundary ('the Site') and Works Area as indicated on **Figure 8.1**;
- The desk study areas for sites designated for biodiversity conservation at international, European[29], national and local levels;

[23] Collins, J. (2016). *Bat Surveys for Professional Ecologists: Good Practice Guidelines*. Bat Conservation Trust; London, UK.
[24] Scottish Natural Heritage (Agency) (2005), *Inverness badger survey 2003*. Scottish Natural Heritage; Edinburgh, UK.
[25] Scottish Forestry. (2009). *FCS Guidance Note 35c: Forest operations and otters in Scotland*. (Online). Available at: https://forestry.gov.scot/publications/35-forest-operations-and-otters-in-scotland. (Accessed November 2023)
[26] NatureScot (2020). *Standing advice for planning consultations – Otters*. (Online). Available at: https://www.nature.scot/doc/standing-advice-planning-consultations-otters#:~:text=If%20otters%20are%20breeding%2C%20the,exclusion%20zone%20should%20be%2030m. (Accessed November 2023).
[27] Chanin, P (2003). *Monitoring the Otter Lutra lutra. Conserving Natura 2000 Rivers Monitoring Series No. 10*. English Nature; Peterborough, UK
[28] English Nature (2001). *Great crested newt mitigation guidelines*. English Nature; Peterborough, UK:
[29] The term 'European Site' refers to biodiversity conservation sites designated under the European nature directives, differentiating them for sites designated at a national level (e.g. SSSIs). In the UK European Sites now form part of the National Site Network.

- The desk study area for legally protected species (and legally controlled species) and other ecological features that are of notable importance for biodiversity conservation; and
- The Survey Area, including the Site, the Works Area and perimeter areas;.

8.3.2 The different components of the Study Area and Survey Area are summarised in **Table 8.4** and **Table 8.5,** and are detailed further alongside the biodiversity baseline in **Section 8.5**, including supporting figures and appendices.

8.3.3 The Study Area was determined based on good practice guidance (see **Table 8.3**), the types of ecological features known to be present, and the potential effects that could occur. The Study Area was defined on a precautionary basis to ensure that, as a minimum, the Zone of Influence (ZoI)[30] of the Proposed Works that is relevant to all ecological features was covered during baseline data collection.

8.3.4 In defining the Study Area, the mobility and dispersal behaviour of different species and species groups is taken into account, as well as the likely extent of the environmental impacts resulting from the Proposed Works.

8.3.5 The temporal scope of the assessment for terrestrial biodiversity and ornithology is consistent with the period over which the Proposed Works would be carried out and therefore covers the decommissioning period (**Chapter 2: The Decommissioning Process**).

Desk study

8.3.6 The desk-based study of ecological features that are known to occur or have previously been recorded within the Site, Works Area and surrounding areas is set out in detail in a separate desk study report[31] (**Appendix 8A**). Similarly, the desk-based study of ornithological features is included together with the bird survey data in a separate report[32].

8.3.7 Additional desk-based study, subsequent to the desk study report, that has informed the assessment includes a review of the updated details of designated biodiversity conservation sites, HNB Land Management Annual Reviews (LMARs) issued after 2018, and the North Ayrshire Local Biodiversity Action Plan 2019 - 2023.

8.3.8 The desk study data sources and desk study areas are summarised in **Table 8.4**.

Table 8.4 Desk study data

Ecological feature	Data	Sources	Desk study areas
Statutory biodiversity conservation sites	Site locations / boundaries; citations; and	NatureScot's Sitelink web-based application[33]. North Ayrshire Council (NAC) website[34].	Sites within 10 km. Sites designated for seabirds within 20 km,

[30] The zone of influence is the area within which a likely significant effect associated with the Proposed Works may be identified for a particular ecological feature.
[31] WSP (2020). *Hunterston B Decommissioning EIA - Baseline Report: Desk Study (Terrestrial Biodiversity).* WSP; Newcastle.
[32] Wood (2020a). *Hunterston B Decommissioning EIA - Baseline Report: Breeding and Non-breeding Birds.* Wood; Newcastle
[33] NatureScot (no date) *Site Link*. (Online) Available at: https://gateway.snh.gov.uk/sitelink/searchmap.jsp (Accessed November 2023)
[34] North Ayrshire Council (2022) *Online Local Development Plan*. (Online) Available at: https://www.maps.north-ayrshire.gov.uk/Sites/LDP2/ (Accessed November 2023).

Ecological feature	Data	Sources	Desk study areas
	supporting information.		extended to 200 km for highly mobile seabirds.
Non-statutory biodiversity conservation sites	Site locations / boundaries; citations; and supporting information.	North Ayrshire Council (NAC) website[33]. North Ayrshire Council Review of Local Nature Conservation Sites (LNCS)[35]	Sites within 3 km.
Habitats (Ancient Woodland[36] and Ponds)	Locations and boundaries	Ancient Woodland Inventory (AWI) [37, 38] Ordnance survey maps (1:25,000 scale)[39] and aerial imagery (Google Maps[40] and Bing Maps[41]).	Ancient Woodland within 3 km. Ponds within 0.5 km.
Legally protected species **Species of Principal Importance for biodiversity conservation i.e. on the Scottish Biodiversity List ('SBL species')[42]** **Birds of Conservation Concern (BoCC) (Stanbury et al 2021[43])** **Species listed in the Local (Ayrshire) Biodiversity Action Plan (LBAP)[44,45]**	Locations of species records:	South West Scotland Environmental Information Centre (SWSEIC). HNB Integrated Land Management Plan (ILMP)[47]; and HNB Annual Land Management Reviews (LMARs)[48].	Species records within 3 km (extended to 5 km for bat roosts).

[35] North Ayrshire Council (undated). *Review of Local Nature Conservation Sites (LNCS).* (Online) Available at: https://storymaps.arcgis.com/stories/d037001e221a4760ab8bcad7a16284ac (Accessed November 2022)
[36] Ancient woodland is land that has been continually wooded since at least 1750.
[37] Scottish Natural Heritage (undated). *Natural Spaces*. (Online). Available at: NatureScot data services | NatureScot
[38] Nature Scot (no date) *AWI inventory*. (Online). Available at: https://opendata.nature.scot/datasets/ancient-woodland-inventory/explore?location=55.757811%2C-4.678194%2C10.85 (Accessed November 2023)
[39] Ordnance Survey (no date) *Ordnance survey* (Online). Available at: www.ordnancesurvey.co.uk (Accessed November 2023).
[40] Google (2022) *Google Maps* (Online). Available at: www.maps.google.co.uk (Accessed November 2023)
[41] Bing (2022) *Bing Maps* (Online). Available at: https://www.bing.com/maps (Accessed November 2023)
[42] Species included on the Scottish Biodiversity List: NatureScot (2023). *Scottish Biodiversity List* (Online) Available at: https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy-and-cop15/scottish-biodiversity-list (Accessed November 2023).
[43] Stanbury, A.J., Eaton, M.A., Aebischer, N.J., Balmer, D., Brown, A.F., Douse, A., Lindley, P., McCulloch, N., Noble, D.G. & Win, I. (2021) *Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain.* British Birds Volume: 114
[44] South Ayrshire Council (2007*). Ayrshire Biodiversity Action Plan: The Conservation and Enhancement of Ayrshire's Biodiversity 2007-2010*. (Online). https://www.south-ayrshire.gov.uk/article/59335/Ayrshire-local-biodiversity-action-plan. (Accessed November 2023).
[45] North Ayrshire Council (2019) *North Ayrshire Local Biodiversity Action Plan 2019-2031* (Online). https://www.north-ayrshire.gov.uk/planning-and-building-standards/conservation/biodiversity-and-conservation-information.aspx (Accessed November 2023).
[47] EDF Energy Nuclear Generation Ltd (2017) *Hunterston Integrated Land Management Plan.* EDF; London.
[48] EDF Energy Nuclear Generation Ltd (2013 to 2021). *Hunterston B Land Management Annual Review.* EDF; London.

Ecological feature	Data	Sources	Desk study areas
Legally controlled species[46]			
Birds (additional species records and monitoring data)	Locations of species records and monitoring data	JNCC Seabird Monitoring Programme database[49]. British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) data/sectors within approximately 5 km[50]. Ayrshire County Bird Reports (2014[51] and 2015-16[52]).	Species records and assemblages within 5 km

Survey work

8.3.9 A suite of biodiversity surveys ('Baseline Surveys') was carried out between spring 2019 and spring 2020. This included habitat surveys and surveys of a range of taxa, including otter (*Lutra lutra*), badger (*Meles meles*), bats and birds. These surveys are detailed in separate baseline reports (**Appendix 8B** to **8F**, with updates and additional information in **Appendix 8G** and **8H**) as summarised in **Table 8.5**.

8.3.10 A habitat survey of the Works Area, plus a 100 m perimeter, was completed in 2022, updating the previous habitat survey and extending the Survey Area to reflect minor iteration of the Works Area boundary. This survey is detailed in **Appendix 8G**. The survey also updated the assessment of bat roost suitability within the Site and recorded any apparent evidence of otter and badger activity within a 250 m perimeter around the Works Area.

Table 8.5 Terrestrial biodiversity and ornithology surveys

Ecological feature	Scope of survey	Survey Area	Survey period	Survey report
Habitats	Habitat survey	Site and Works Area, plus a 100 m perimeter.	June 2019 (updates in August and December 2022)	**Appendix 8B** (update in **Appendix 8G**)
Otter	Otter survey	Site and Works Area, plus a 250 m perimeter.	July 2019 (updates in August and December 2022)	**Appendix 8C** (additional information in **Appendix 8G**)

[46] Non-native species listed in Schedule 9 (parts 1 and 2) of the Wildlife and Countryside Act 1981 (as amended) and includes animals and plants which may not be released or allowed to escape into the wild.
[49] JNCC (2020). *Seabird Monitoring Programme*. (Online). Available at: https://app.bto.org/seabirds/public/index.jsp (Accessed November 2023).
[50] British Trust for Ornithology (2022) *WeBS Report Online* (Online). Available at: https://app.bto.org/webs-reporting
[51] Simpson, F.S. (ed) (2017). *Ayrshire Bird Report 2014*. Scottish Ornithologists' Club, Ayrshire Branch.
[52] Dick, A.M. (ed) (2019). *Ayrshire Bird Report 2015 and 2016*. Scottish Ornithologists' Club, Ayrshire Branch.

Ecological feature	Scope of survey	Survey Area	Survey period	Survey report
Badger	Badger survey	Site and Works Area, plus a 250 m perimeter.	July 2019 (updates in August and December 2022)	**Appendix 8D** (additional information in **Appendix 8G**)
Bats (roosts)	Preliminary bat roost assessment (PRA). Survey of potential bat roosts	Site, focusing on land inside the HNB security fence.	May 2019 (update in December 2022) July – Sept 2019	**Appendix 8E** (additional information in **Appendix 8G**).
Bat (activity)	Bat activity survey	The Site, plus 50 m perimeter.	April – October 2019	**Appendix 8E**
Birds (breeding)	Breeding bird survey	Site and Works Area plus a 100 m perimeter.	April to July 2019 (additional data collected in May to July 2023).	**Appendix 8F** (additional information in **Appendix 8H**)
Birds (non-breeding)	Non-breeding bird survey, including disturbance monitoring.	Site plus a 500 m perimeter.	October 2019 to March 2020.	**Appendix 8F** (additional information in **Appendix 8H**)

Data limitations

8.3.11 Survey constraints are addressed separately in the accompanying reports (**Appendix 8A** to **Appendix 8H**). The constraints are minor and likely to have negligible influence on the characterisation of the baseline status of ecological features and the assessment of the effects of the Proposed Works on biodiversity.

8.3.12 A period of over three years has elapsed since the completion of the Baseline Surveys and the Works Area has been refined, mainly to include marine infrastructure associated with HNB. This includes a jetty (including cooling water intake) and the access route to it; and the cooling water outlet tunnel (including cooling water outfall). This extends the Works Area to the south of the Site and into the Firth of Clyde to the west (see **Figure 8.1**). The habitat survey completed in 2019 was therefore updated in 2022. The purpose of the survey update, referred to as a *'Baseline Verification'*, was to determine whether the terrestrial biodiversity baseline, derived by the previous survey work and desk-based study, remains valid to inform the assessment.

8.3.13 Baseline Verification is reported separately (**Appendix 8G**) and concludes that there have been no substantive changes in the baseline status of terrestrial habitats within the Site and Works Area. It is therefore likely that there have been no substantive changes in the baseline status of species populations since the Baseline Surveys were completed in 2019 and 2020. The characterisation of the biodiversity baseline reported in the baseline reports therefore remains valid.

8.3.14 The desk-based study was completed in 2019 (**Appendix 8A**). Subsequent, additional desk-based study has therefore also informed the assessment, including a review of updated details of designated biodiversity conservation sites, HNB Land Management

Annual Reviews (LMARs) issued after 2018, and the North Ayrshire Local Biodiversity Action Plan 2019-2023.

8.3.15 Local Nature Conservation Sites (LNCS) in North Ayrshire remain under review and subject to landowner consultation (North Ayrshire Council, Thom Ledingham *pers. comm*. 22/08/23). Recent updates to the information on these sites have however informed the assessment and the desk-based study is therefore concluded to inform a robust assessment of the effects of the Proposed Works on LNCS.

8.3.16 Updated/additional species records could not be obtained[53]. The report therefore relies on species records collated in 2019[54]. Baseline Verification concluded, however, that there have been no substantive changes in the baseline status of terrestrial habitats within the Site and perimeter area and biodiversity monitoring to assess progress against the HNB Integrated Land Management Plan, reported through LMARs, has not detected any shift in the biodiversity baseline. Any additional species records reported to SWSEIC between 2019 and 2023 are therefore likely to have a negligible influence on the characterisation of the baseline status of ecological features and/or the assessment of the effects of the Proposed Works on biodiversity.

8.4 Consultation

Pre-application Opinion

8.4.1 A Pre-application opinion was adopted by the Office for Nuclear Regulation (ONR), on 04 October 2022. A summary of the elements of the Pre-application Opinion that are of relevance to the assessment of effects on terrestrial biodiversity and ornithology and confirmation of how these are addressed by the assessment is included in **Table 8.6**.

Table 8.6 Summary of Pre-application Opinion Responses

Paragraph Ref.	Consideration	How addressed in the ES
71	Following a review from a consultee, it is suggested that the following Special Protections areas (SPA) can be scoped out of the EIA. These are the Renfrewshire Heights SPA, Arran Moors SPA and Ailsa Craig SPA due to the distance from the site.	These SPAs are scoped-out of the assessment (**Section 8.5** and **Section 8.9**), along with those that are at a greater distance from the Site and Works Area. This is explained further in the HRA Screening Report accompanying this EIA.
72	The scope of the assessment includes the effects on birds, recognising that this spans terrestrial, freshwater and marine environments, this is considered appropriate. However, please see ONR's opinion on the scope of the marine biodiversity topic area and the consideration of potential impacts on diving birds.	Effects on diving birds are either scoped-out (**Section 8.9**) or assessed in this ES chapter (**Section 8.10**).

[53] SWSEIC acknowledged the data request and did not respond to follow-up requests between November 2022 and April 2023.
[54] Details of statutory biodiversity conservation sites and distances between biodiversity conservation sites and the Works Area are updated in this chapter.

Paragraph Ref.	Consideration	How addressed in the ES
73	ONR considers that the scope of the potential biodiversity receptors that may be affected by the decommissioning project is appropriate, and EDFE has provided a justification for the receptors scoped out. ONR notes that more detail on the sensitivity of the receptors should be provided in the ES to support conclusions on the significance of the potential environmental impacts.	In summarising the effects of the Proposed Works on ecological features the emphasis is primarily on the biodiversity conservation '*importance*' of the feature and the predicted magnitude of effect on its conservation status, in accordance with good practice (CIEEM 2018[1]). Although the term '*sensitivity*' is not necessarily used, consideration of the sensitivity of each ecological feature to the effects of the Proposed Works is inherent to the assessment method (**Section 8.10**).
74	ONR received a consultation response reflecting positively on the inclusion of the terrestrial, freshwater and marine biodiversity receptors covered in the scoping report, including biodiversity sites (International to local), coastal habitats and species, intertidal habitats and species, subtidal habitats and species, vegetation, fish populations, marine mammals, otters, badgers, bats, breeding birds and wintering/passage birds.	The assessment of the effects of the Proposed Works on those ecological features that are scoped-in to the assessment and confirmed through consultation is set out in **Section 8.10**.
75	In addition to this, the consultation response welcomed EDFE's commitment to protect existing biodiversity features during the decommissioning process, as well as following its completion. The response noted that in line with the draft National Planning Framework (NPF4) that is currently being developed by the Scottish Government, there is notable opportunity through this proposed decommissioning project to deliver positive effects for biodiversity and suggested that opportunities are investigated for the enhancement of habitats and species on the site during the long decommissioning process.	It is acknowledged that NPF4 is no longer draft (**Section 8.2**). The biodiversity net gain (BNG) metric, approved by Defra for calculating biodiversity net gain in England and Wales, is planned to be applied to calculate the BNG baseline (biodiversity units) and the anticipated loss of biodiversity units due to the Proposed Works (**Section 8.11**). This will provide for ongoing review of opportunities for the delivery of BNG through the decommissioning process. The delivery of opportunities for biodiversity enhancement form an objective of the proposed Interim State Landscape Plan (see **Appendix 14G**) including the planting of native, mixed deciduous and evergreen shrubs.
76	ONR supports these comments and notes that the scoping report recognises NPF4 as a relevant policy to the decommissioning project and identifies the policy issues related to terrestrial and freshwater biodiversity (e.g. Natural Places and Blue and Green Infrastructure).	NPF4 informs the assessment (**Section 8.10**) and is summarised in **Section 8.2**.

Technical engagement and non-statutory consultation

8.4.2 North Ayrshire Council was briefed on the scope and results of the baseline biodiversity surveys on 10 June 2021. No amendments to the scope of the data collection were identified. It was however acknowledged that breeding birds recorded within the Study Area are not functionally linked to SPAs designated for breeding populations of the same species and those SPAs are therefore scoped out of the assessment.

8.4.3 NatureScot's technical responses are summarised in **Table 8.7**. NatureScot was updated further on the baseline data and assessment on 30 October 2023 and emphasised that the Proposed Works should seek biodiversity enhancement. No amendments to the data collection or assessment scope were identified.

Table 8.7 Summary of Technical Responses

Consideration	How addressed in the ES
Hunterston Natural Capital Assessment **An important research piece is the July 2022 Baseline natural capital assessment for the Hunterston Strategic Development Area (Natural Capital Solutions Ltd) which includes the area currently consulted on as well as the wider Hunterston Strategic Development Area (HSDA) identified in North Ayrshire Councils LDP2. Key considerations for the EIA that have resulted from the natural capital assessment are:** **Sea level rise has the potential to erode the Hunterston coast up to 50m in 2050 and 125m by 2100. This erosion of the coastline is likely to impact on the Power Station Road (access road to the nuclear area). Current projections suggest that parts of semi-natural grassland and improved agricultural fields may also be inundated.** **The baseline natural capital assessment of Hunterston study area demonstrates that the site provides a wide range of ecosystem services across its terrestrial and marine habitats.** **The baseline assessment highlighted flood risk needs to be addressed when considering development in the HSDA.**	Coastal erosion and the associated implications in terms of predicted future baseline and the assessment of effects on terrestrial biodiversity and ornithology are summarised in **Section 8.5**.
Hunterston Port and Resource Campus (Hunterston PARC) **The recent work within the Hunterston PARC site to create an ecologically focused Landscape Specification Document provides opportunities for utilising this approach and maximizing the benefits at HNB.** **Hunterston Strategic Development Area (Hunterston SDA)** **The recent creation of a habitat management plan, covering a habitat management area, to improve areas of agricultural land for wading birds within a red line boundary of a battery**	Non-operational areas of the Site are managed for biodiversity conservation in accordance with the HNB ISLP and the Site's certification under the Wildlife Trusts' Biodiversity Benchmark by EDF. Biodiversity monitoring is undertaken annually to assess progress against management plan objectives and is reported in Land Management Annual Reviews (LMARs). The biodiversity net gain (BNG) metric, approved by Defra for calculating biodiversity net gain in England and Wales, is to be applied to calculate the anticipated loss of biodiversity units to the

Consideration	How addressed in the ES
storage scheme, within the Hunterston SDA, provides opportunities for a scaled approach to enhance land management for a wider range of biodiversity on a landscape scale across land ownership boundaries.	Proposed Works and a proportionate level of compensatory habitat creation that will seek to deliver BNG. BNG plans will also seek synergies with biodiversity conservation plans and strategies associated with neighbouring development areas and local plans (**Section 8.11**).

8.5 Overall baseline

The Site and its surrounds

8.5.1 The Works Area (including the Site) is adjacent to the Firth of Clyde, on the Ayrshire coast, opposite the island of Little Cumbrae. The Works Area predominantly comprise buildings and hard standing (mainly access and car parks), interspersed with areas of amenity grassland. Tree cover is mainly around the southern perimeter of the Site. Hunterston A (HNA) is situated to the west of, and immediately adjacent, to HNB and is also predominantly built infrastructure and hard standing.

8.5.2 The wider area surrounding the Works Area is predominantly farmland (grassland/pasture) and areas of plantation, with the coastline (shingle, boulders and coastal reinforcements) and the Firth of Clyde to the East. Sandflats approximately 0.2 km north of the Site form part of Southannan Sands SSSI, which is designated for intertidal sandflat habitat that extends over 4 km along the coast to the north.

8.5.3 Non-operational areas of the Site are currently managed for biodiversity conservation in accordance with the HNB Integrated Land Management Plan. Progress towards achieving management plan objectives is reviewed annually and reported in Land Management Annual Reviews (LMARS). In recognition of this commitment to biodiversity conservation the HNB Site is certified under the Wildlife Trusts' Biodiversity Benchmark.

Biodiversity conservation sites

8.5.4 There are two SPAs within 20 km of the Works Area (**Figure 8.2**): Renfrewshire Heights SPA (11.5 km north-east); and Arran Moors SPA (16.6 km west). Both are designated for breeding populations of hen harrier (*Circus cyaneus*). This species was not recorded by the Baseline Surveys and there is no potential connectivity between these SPAs and the Proposed Works and no pathway for any effects on hen harrier. These SPAs are therefore scoped-out of the assessment and this is explained further in the HRA Screening Report accompanying this EIA.

8.5.5 There are a further 12 SPAs within 200 km that have marine seabird qualifying features: Ailsa Craig, Laggan, North Colonosay and Western Cliffs, Rathlin Island, Sheep Island, Larne Lough, Treshnish Isles, Rum, Canna and Sanday, Outer Ards, Strangford Lough and Belfast Lough. The foraging range of qualifying features from three sites overlap the Study Area, however these species primarily forage in the wider offshore environment, beyond the marine elements of HNBs infrastructure and these European Sites are therefore also scoped-out of the assessment. This is explained further in the HRA Screening Report accompanying this EIA.

8.5.6 There are four statutory biodiversity conservation sites within 10 km of the Works Area (**Figure 8.3**), all of which are Sites of Special Scientific Interest (SSSI).

8.5.7 There are 15 non-statutory biodiversity conservation sites within 3 km (**Figure 8.4**), nine of which are Local Nature Conservation Sites (LNCS). The other six sites are of biodiversity conservation importance although they do not qualify as LNCS. As set out above, the details of LNCS remain in draft and subject to ongoing landowner consultation.

8.5.8 There are also 15 Ancient Woodland Inventory (AWI) sites within 3 km, the majority of which are entirely or partially within LNCSs.

8.5.9 Details of the relevant biodiversity conservation sites are summarised in **Table 8.8** and **Table 8.9**. This information, along with **Figure 8.3** and **Figure 8.4**, updates **Appendix 8A**.

Table 8.8 Statutory biodiversity conservation sites

Site	Summary reasons for designation	Proximity to Works Area (Approx.)
Portencross Woods SSSI	One of the best examples of semi-natural coastal woodland (Upland mixed ash woodland) in North Ayrshire.	0.05 km east
Southannan Sands SSSI	One of the best examples of intertidal sandflats habitat within the coastal cell covering the Clyde coastline.	0.18 km north
Kames Bay SSSI	An important educational research site for the study of inter-tidal marine biology.	3.1 km north-west
Ballochmartin Bay SSSI	The most varied section of coast on Great Cumbrae. An important research site, the beach is backed by herb-rich grassland and roadside verges supporting slow worms (*Anguis fragilis*) and a number of uncommon higher plant species.	4.4 km north

Table 8.9 Non-statutory biodiversity conservation sites

Site	Summary reasons for designation	Proximity to Works Area (Approx.)
Local Nature Conservation Sites*		
Goldenberry Hill LNCS	Mosaic of acidic habitats ranging from oak-and-birch type woodlands to open areas of dry and wet heath, with some acidic grasslands. A number of plants are locally uncommon, particularly in the lowlands. Parts of the Site are of plantation and semi-natural origins. The west side is contiguous with Portencross Wood SSSI cliff woodlands.	0.08 km south-east
Cambelton Hill and Water-meadow*	Two widely differing habitats, which enhances the Site's species diversity. The hill supports areas of acidic woodland. There is a semi-natural atmosphere, with examples of bluebell woodland. Low-lying pasture appears to be of limited botanical interest, due to recent (and past) drainage.	0.36 km south-east
Hunterston House Wood*	Mature woodland of some interest because of its lowland setting. Listed in the AWI as long-established plantation origin.	0.58 km east

Site	Summary reasons for designation	Proximity to Works Area (Approx.)
	However, there is limited species diversity and it is impacted by shade from beech and rhododendron.	
Thicket Plantation*	Mature semi-natural woodland in an area of intensive farmland. Supports a range of old woodland indicators.	0.94 km south-east
Auld Hill and Portencross LNCS	The cliff woodlands are of interest and form part of a longer stretch from the north (SSSI woodlands). The more open Auld Hill summit has declined in interest due to improvement of grasslands. Overall, the area remains of high nature conservation interest.	1.27 km south
Seamill to Ardneil Bay with Portencross LNCS	Important for its range of coastal habitats and species. Open dunes grade to more stable dune grassland which can be species-rich. There is likely to be considerable value in the diversity of the coastal seaweeds and associated invertebrates. This stretch of coastline is also important for birds. It provides shoreline feeding for waders and rock outcrops and islets for roosting.	1.37 km south
Kilruskin Wood LNCS	The Site is listed on the AWI as being of long-established plantation origin although conditions are largely semi-natural, and the canopy is generally more mature in the north. Overall, the Site represents a very rich woodland with a good range of old woodland indicator species.	1.47 km east
Ardneil Plantation*	Small block of semi-natural woodland at the fringes of an area of intensive farmland. There are a range of woodland indicators in the field layer. The woodland is small and fragmented by recent development and it is hard to justify it being considered a high quality site at county level.	1.88 km south
Carlung*	The Site supports mature estate type woodland. It is listed in the AWI as being of long-established plantation origin. There are large populations of typical woodland dominants but only a limited range of old woodland indicator species.	1.91 km south-east
Crosbie to Southannan LNCS	The area is very diverse and supports a broad range of species, including wetland elements. Some of the larger glens and associated habitats, could be separated as stand-alone sites.	1.93 km east
Little Cumbrae LNCS	The boundary includes the whole island, which boosts the Site's plant species list, which is impressive and includes a number of coastal rarities. Bird interest at the island is also very high with large breeding sea bird populations.	2.05 km west
Farland Point LNCS	The Site is of high local interest reflecting its range of habitats from acidic mire to more calcareous coastal grassland. The wet heath and marsh areas are of interest although they are threatened by scrub encroachment.	2.28 km north
Ninian Brae Woodland LNCS	The brae slopes support a large area of broadleaved woodland, most of which is now considered semi-natural in	2.69 km north

Site	Summary reasons for designation	Proximity to Works Area (Approx.)
	character, though much of it is derived from plantation woodland. Regeneration is taking places in many sections.	
Kaim Hill and Crosbie Hills LNCS	The Site contains upland moorland type habitats covering the southerly upland areas in North Ayrshire and adjacent to similar habitats represented at the Kelburn Uplands LNCS. The key interest lies in the large areas of blanket bog. Other interests include heathland, acid grassland, flushes, mires and small watercourses.	2.78 km east
Southannan*	A small ancient and semi-natural woodland with limited semi-natural interest, and suffering from rhododendron, and related past policy management. It supports a range of woodland herbs	2.96 km north-east
Ancient Woodland Inventory (AWI) Sites		
Portencross Woods AWI	Ancient Woodland (semi-natural origin)	0.03 km east
Goldenberry Hill AWI	Long established woodland (plantation origin)	0.2 km south
Campbelton Wood AWI	Long established woodland (plantation origin)	0.3 km south-east
Hunterston House Wood AWI	Long established woodland (plantation origin)	0.5 km east
Thicket Plantation AWI	Long established woodland (plantation origin)	0.9 km south
Ardneil Bank Wood AWI	Long established woodland (plantation origin)	1.2 km south
Kilruskin Wood AWI	Long established woodland (plantation origin)	1.5 km east
Ardneil, Portencross AWI	Ancient woodland (semi-natural origin)	1.7 km south
Carlung Wood AWI	Long established woodland (plantation origin)	2.0 km south-east
Kilruskin Glen AWI	Long established woodland (plantation origin)	2.0 km east
The Glen AWI	Ancient Woodland (semi natural origin)	2.1 km north-east

Site	Summary reasons for designation	Proximity to Works Area (Approx.)
Allan Wood AWI	Ancient Woodland (semi natural origin)	2.3 km north-east
Dykes Plantation AWI	Long established woodland (plantation origin)	2.7 km east
The Avenue AWI	Long established woodland (plantation origin)	2.8km south-east
Southannan AWI	Other – mixed deciduous and coniferous mature woodland	2.9km north-east

* Sites marked with an asterisk do not qualify as LNCSs, they are included in the list however due to their biodiversity conservation interest..

Habitats

8.5.10 The habitat survey is detailed in a separate baseline report (**Appendix 8B**), which has been updated by way of baseline verification (**Appendix 8G**). The habitats within the Survey Area are marked on **Figure 8.5** and summarised in **Table 8.10**.

Table 8.10 Summary of Biodiversity Baseline: Habitats

Habitats	Summary
Broadleaved plantation woodland	Broadleaved plantation woodland within the south of the Site and within the Works Area, in places comprising a mix of semi-mature ash (*Fraxinus excelsior*), sycamore (*Acer Pseudoplatanus*), hawthorn (*Crataegus monogyna*), horse chestnut (*Aesculus hippocastanum*) and rowan (*Sorbus aucuparia*). Other areas include beech (*Fagus sylvatica*) and more mature sycamore.
Mixed plantation woodland	Small stands of mixed plantation woodland within the Site and Works Area and to the south. One stand comprises mature ash, sycamore, Sitka spruce (*Picea sitchensis*) and alder (*Alnus glutinosa*), while another comprises mature sycamore, beech and Scots pine (*Pinus sylvestris*) with scattered gorse (*Ulex europaeus*) and bramble (*Rubus fruticosus*).
Parkland and scattered trees	Scattered broadleaved and coniferous trees within and outside the Site and Works Area and a small, dense, stand of cedar within the northern part of the Site and Works Area.
Semi-improved neutral grassland	Narrow band of semi-improved neutral grassland near the coastline overlapping the north-west limit of the Works Area, outside the Site. It supports a variety of species including false oat-grass (*Arrhenatherum elatius*), ribwort plantain (*Plantago lanceolata*), common bird's-foot trefoil (*Lotus corniculatus*), black medic (*Medicago lupulina*), thistle (Cirsium sp.), nettle (*Urtica dioica*), yarrow (*Achillea millefolium*), sea radish (*Raphanus maritimus*) and occasional cock's-foot (*Dactylis glomerata*). Yellow iris (*Iris pseudacorus*) occurs locally in damper hollows within the grassland.
Improved grassland	Agricultural fields to the north of the Site and Works Area. Predominantly improved grassland, subject to grazing by sheep. This habitat is characterised by the presence of white clover (*Trifolium repens*), perennial rye-grass (*Lolium perenne*),

Habitats	Summary
	crested dogs-tail (*Cynosurus cristatus*) and daisy (*Bellis perennis*), with thistle (Cirsium sp.) along field margins.
Marshy Grassland	An area of marshy grassland within the south of the Site and within the Works Area comprises soft rush (*Juncus effusus*), with thistle, buttercup (Ranunculus sp.), rosebay willowherb (*Chamerion angustifolium*) and common ragwort (*Senecio Jacobaea*). Marshy grassland along the edge of a field drain, outside of the Site and Works Area to the south-east comprises soft rush, yellow flag iris, silverweed (*Potentilla anserina*), water mint (*Mentha aquatica*) and dock (Rumex sp.).
Poor semi-improved grassland	Several areas of poor semi-improved grassland to the south and west of the Site and Works Area, often subject to ground disturbance. To the south-east of the Site boundary this habitat comprises abundant Yorkshire fog (*Holcus lanatus*) and meadow grass (Poa sp.), with scattered black medic, common bird's-foot trefoil and occasional dock. In other areas, thistle, nettle, soft rush, buttercup and sweet vernal-grass (*Anthoxanthum odoratum*) also frequently occur.
Tall ruderal	Tall ruderal vegetation, dominated by rosebay willowherb and bramble, within the Site and Works Area to the east.
Running water	Field drain to the south-east of the Site and Works Area. Sea water also enters a large cylindrical tank within the northern edge of the Site and Works Area. The Firth of Clyde is outside the Site to the west, overlapping parts of the Works Area.
Shingle and boulders (above high-tide mark)	Shingle and gravel on the coast to the north-west of the Site, overlapping the Works Area, with occasional scattered sea sandwort (*Honkenya peploides*) and orache (Atriplex sp.). Larger boulders form part of the sea defences.
Dune Scrub	Small area of dune scrub within the north-west of the Study Area, outside the Site and Works Area, comprising sea buckthorn and bramble. Dune scrub is a component of Coastal Sand Dunes, which is a Habitat of Principal Importance for biodiversity conservation (SBL habitat).
Amenity grassland	A relatively common/widespread habitat within the Site and Works Area, and in places includes daisy, greater plantain (*Plantago major*), nettle and dock.
Ephemeral/ short perennial	Ephemeral/ short perennial vegetation inside and outside of the Site and Works Area, typically in areas of land with shallow soil that have been subject to disturbance. This vegetation predominantly comprises low-growing species, dominated by white clover and creeping buttercup (*Ranunculus repens*), with frequent greater plantain and occasional black medic, Yorkshire fog, soft rush and thistles.
Introduced shrub	Planted and managed shrub within the Site and Works Area, including Rhododendron sp. Barberry (Berberis sp.), sea buckthorn, beach rose (*Rosa rugosa*), cedar and Hydrangea sp.
Hedgerow	Intact hedgerow with blackthorn (*Prunus spinosa*), dog rose (*Rosa canina*), and hazel (Corylus sp.) outside the Site and Works Area to the north. Hedgerows are a habitat of Principal Importance for biodiversity conservation (SBL habitat).
Buildings	Numerous buildings, including pumphouses, offices, portacabins, reactor building, storage facilities and workshops, within the Site and Works Area.

Species

8.5.11 The baseline status of species and species groups within the Study Area is summarised in **Table 8.11**.

Table 8.11 Summary of Biodiversity Baseline: Species

Ecological feature/ survey	Survey/ data sources	Last surveyed	Baseline summary
Otter	Desk Study (**Appendix 8A**) Otter survey (**Appendix 8C**) Baseline Verification (**Appendix 8G**)	2022	Otter activity (spraints, three active holts, three potential holts, and one active couch) is focused along the rocky coastline to the west and north-west of the Site (**Figure 8.6**). Crevices / alcoves in rock armour along the coastline to the south-west, provide potential rest / shelter sites. It is likely that otters use the coastline for foraging, commuting and resting, and potentially for natal holts/dens and/or nursery areas.
Badger	Desk Study (**Appendix 8A**) Badger survey (**Appendix 8D**) Baseline Verification (**Appendix 8G**)	2022	Badger has previously been recorded within approximately 3 km of the Site and Works Area, with the most recent record being from 2015. However, no evidence of badger activity was recorded within 100 m of the Site and Works Area.
Bats	Desk Study (**Appendix 8A**) Bat surveys (**Appendix 8E**) Baseline Verification (**Appendix 8G**)	2022	The extent of hardstanding, limited extent of vegetation and noise / light disturbance within the Works Area means that the majority of habitat within this area is of low suitability for bats. No bat roosts were recorded during baseline surveys, with the majority of buildings within the Works Area being of negligible, or low to negligible, suitability for roosting bats (**Figure 8.7**). Common pipistrelle, soprano pipistrelle, brown long-eared bat and a Myotis species have previously been recorded within 3 km of the Site. Bat activity surveys recorded foraging / commuting soprano pipistrelle (*Pipistrellus pygmaeus*), common pipistrelle (*Pipistrellus pipistrellus*) and noctule (*Nyctalus noctula*). A record of *Nyctalus* sp. is attributable to either a noctule or Leisler's (*Nyctalus leisleri*) bat.
Harvest mouse *(Micromys minutus)*	HNB Annual Land Management Review 2022	Not applicable	This species was recorded on coastal grassland to the north of the Works Area, approximately 300 m from the Site boundary. It inhabits a range of complex habitats that have tall grasses and other vegetation, including tussocky grassland, hedgerows, field margins, road verges, reedbeds, salt marsh and ditches/dykes.

Ecological feature/ survey	Survey/ data sources	Last surveyed	Baseline summary
			The habitats within the Works Area are mainly amenity grassland, hard standing and small blocks of plantation, which are poor habitats for this species.
Birds (breeding)	Desk Study (**Appendix 8A**) Breeding bird surveys (**Appendix 8F**) Breeding bird survey update and verification (**Appendix 8H**)	2023	There are records of at least 60 species of breeding birds within 1 km of the Site. There are records of 28 breeding seabird colonies within 10 km, with 27 active within the past 25 years. This includes colonies of four species not recorded within 1 km of the Site. An additional nine breeding species were recorded within nearby WeBS sectors. Breeding bird surveys recorded low numbers of common, widespread species that are typical of Ayrshire. Breeding (or potentially breeding) pairs / territories of seven species listed on the SBL or BoCC Red List were recorded: dunnock (*Prunella modularis*), herring gull (*Larus argentatus*), house sparrow (*Passer domesticus*), linnet (*Carduelis cannabina*), reed bunting (*Emberiza schoeniculus*), song thrush (*Turdus philomelos*) and mistle thrush (*Turdus viscivorus*). Herring gulls breed on the roofs of the power station buildings and house sparrows also breed in the built-up areas. The other species are associated with scrub and woodland habitats, which are mainly outside of the Works Area. A combined total of seven breeding pairs of black guillemot (*Cepphus grylle*) and a peak count of 18 breeding adults were recorded, associated with the jetty (within the Works Area) and an offshore platform outside of the Works Area. This represents up to 4.8 % of the estimated Ayrshire population and up to 0.048 % of the estimated Scottish population.
Birds (non-breeding)	Desk Study (**Appendix 8A**) Bird surveys (**Appendix 8F**)	2020	There are records of at least 87 species of non-breeding birds within 1 km of the Site. An additional 12 non-breeding species were recorded within the nearby WeBS sectors. The non-breeding bird assemblage within the Study Area includes over-wintering farmland birds and a range of species associated with coastal habitats: • Seven species listed on Annex I of the Birds Directive: bar-tailed godwit (*Limosa lapponica*), dunlin (*Calidris alpina*), golden plover (*Pluvialis apricaria*), peregrine (*Falco peregrinus*), red-throated diver (*Gavia stellata*), shag

Ecological feature/ survey	Survey/ data sources	Last surveyed	Baseline summary
			(*Phalacrocorax aristotelis*) and whooper swan (*Cygnus cygnus*); • Twenty species listed on the SBL[14]: bar-tailed godwit, black-headed gull (*Chroicocephalus ridibundus*), bullfinch (*Pyrrhula pyrrhula*), dunlin, dunnock, golden plover, herring gull, house sparrow, kestrel (*Falco tinnunculus*), lapwing (*Vanellus vanellus*), linnet, peregrine, red-throated diver, redwing (*Turdus iliacus*), reed bunting, skylark (*Alauda arvensis*), song thrush, starling (*Sturnus vulgaris*), twite (*Linaria flavirostris*) and whooper swan; • Fifteen species listed on the BoCC Red List: curlew (*Numenius arquata*), fieldfare (*Turdus pilaris*), grey wagtail (*Motacilla cinerea*), herring gull, house sparrow, lapwing, linnet, mistle thrush, redwing, ringed plover, shag, skylark, song thrush, starling and twite; and • Twenty-eight species on the BoCC Amber List: black guillemot, black-headed gull, bullfinch, common guillemot (*Uria aalge*), common gull (*Larus canus*), dunlin, dunnock, eider (*Somateria mollissima*), goldeneye (*Bucephala clangula*), great black-backed gull (*Larus marinus*), greenshank (*Tringa nebularia*), greylag goose (*Anser anser*), kestrel, knot (*Calidris canutus*), lesser black-backed gull (*Larus fuscus*), mallard (*Anas platyrhynchos*), meadow pipit (*Anthus pratensis*), mute swan (*Cygnus olor*), oystercatcher (*Haematopus ostralegus*), redshank (*Tringa totanus*), reed bunting, shelduck (*Tadorna tadorna*), snipe (*Gallinago gallinago*), stock dove (*Columba oenas*), teal (*Anas crecca*), turnstone (*Arenaria interpres*), whooper swan and wigeon (*Anas penelope*). The peak counts of non-breeding wetland birds within the Study Area are lower than, or comparable to, the highest five-year mean peak WeBS counts (non-breeding) within 5km of the Site. The only exception is greylag goose, which occurs in notably higher numbers compared to the five-year mean peak WeBS counts within 5km; this count is however <0.1 % of the

Ecological feature/ survey	Survey/ data sources	Last surveyed	Baseline summary
			estimated Scottish non-breeding population (Forester et al, 2007[55]). All other species were not recorded regularly enough, or in sufficient numbers, within the Study Area to be considered populations/assemblages of notable nature conservation importance.
Invasive Non-native Species	Desk Study (**Appendix 8A**) Habitat survey (**Appendix 8B**) Baseline Verification (**Appendix 8G**)	2022	Himalayan Balsam (*Impatiens glandulifera*) and Rhododendron sp. have been recorded within the HNB landholding, the latter within the Works Area.

Future baseline

8.5.12 Climate change is likely to alter the status and distribution of many species and the composition of habitats and communities in the long term. Climate change scenarios cannot be predicted with certainty, although the Met Office has produced climate change projections for the 21st Century[56].

8.5.13 Sea level rise has the potential to erode this part of coast substantively over the long decommissioning period. This would be likely to result mainly in the loss/inundation of areas of improved and poor semi-improved grassland and smaller areas of amenity grassland and tall ruderal vegetation. These habitat types are of relatively low biodiversity conservation importance and the loss of a small proportion of these common/widespread habitat types would have only a negligible effect on the future baseline status of other ecological features. This would be further reduced in the event of the extension and maintenance of coastal defences adjacent to HNB in accordance with current coastal management plans.

8.5.14 The responses of individual species, populations and communities to climate change rely on complex physiological, behavioural and potentially evolutionary responses to the interaction between, and combined effects of, a number of variables such as atmospheric pollutant levels, ambient temperatures, rainfall and humidity. As climate change scenarios cannot be predicted with confidence, and the responses of a wide range of species are uncertain, it is appropriate to base the predicted future baseline status of habitats and species on the current status of these features, as well as any currently apparent or predicted trends in status, taking into account relevant, published and widely accepted data sources.

[55] Forrester, R.W. & Andrews, I.J. (2007). *The Birds of Scotland*. Scottish Ornithologist Club, Aberlady.
[56] Met Office (2019). *UK Climate Projections: Headline Findings. July 2021. Version 3* (Online) Available at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/summaries/index (Accessed 10 March 2022).

8.5.15 A gradual improvement, rather than deterioration, in the status of ecological features within the Study Area would be consistent with the Scottish Biodiversity Strategy[57] and the post-2020 Statement of Intent[58]. In the absence of the Proposed Works, however, large shifts in the baseline status of ecological features over the period of the Proposed Works are not predicted. This is because it is a reasonable assertion that current land use and management practices are likely to continue. It is appropriate therefore to base the assessment on the current status of ecological features within the Study Area.

8.5.16 The future baseline during the Preparations for Quiescence phase is likely to be comparable to the current baseline; the likelihood of changes in the baseline over the much longer Quiescence phase, leading up to the Final Site Clearance phase is less certain. The baseline will therefore be subject to periodic update and review, during both phases, informed by routine biodiversity monitoring to be incorporated into a decommissioning Environmental Management Plan (EMP). The results of this monitoring will further inform site working practices and refinements to embedded environmental measures, such that the effects of the Proposed Works on ecological features continue to be mitigated and are not significant.

8.6 Embedded environmental and good practice measures

8.6.1 Embedded environmental and good practice measures to reduce the potential effects of the Proposed Works on terrestrial biodiversity and ornithology are outlined in **Table 8.12**.

[57] The Scottish Government (2013). *2020 Challenge for Scotland's Biodiversity - A Strategy for the conservation and enhancement of biodiversity in Scotland*. The Scottish Government; Edinburgh..
[58] Scottish Government (2020). *Scottish Biodiversity Strategy Post-2020: A Statement of Intent* (Online) Available at: https://www.gov.scot/publications/scottish-biodiversity-strategy-post-2020-statement-intent/ (Accessed November 2023).

Table 8.12 Summary of Embedded Environmental Measures

Embedded Measure	Compliance Mechanism	Embedded measure or good practice
Measures to protect habitats and biodiversity conservation sites: • Site works will be routinely monitored by an Ecologist (Clerk of Works), also referred to as 'ECoW', by way of regular site inspections, with an appropriate frequency to be agreed with the Principal Contractor. • Habitats (coast, woodland, grassland) within and immediately adjacent to the Works Area are to be demarcated within exclusion zones. There shall be no entry into these areas, with all works, plant, materials, equipment and personnel remaining within the Works Area. An exception to this being routine habitat management/maintenance under the direction of an Ecologist. • Trees are to be protected in accordance with the advice of a suitably qualified/experienced arboriculture consultant and in accordance with good practice (BS 5837:2012 - Trees in relation to design, demolition and construction). • Any unavoidable tree loss to facilitate works is to be compensated through planting of at least two trees for each one that is removed within the wider Hunterston area • Measures to manage pollution risk and pollution controls will be set out in a Pollution Prevention Plan (PPP) and Pollution Incident Response Plan (PIRP), which will draw on SEPA's Guidance for Pollution Prevention (GPP) and Pollution Prevention and Control Guidelines (PPGs)[59] and will be implemented as part of the EMP. This will include information on the storage of any fuels, oils and other chemicals and pollution incidence response planning. • Fuels for plant and equipment and all other chemicals should be managed in accordance with best practice[59] to avoid spills, pollution events or ground contamination.	EMP Pollution Prevention Plan (PPP) Pollution Incident Response Plan (PIRP) Dust Management Plan	Embedded measure

[59] SEPA is replacing the PPGs with updated versions known as GPPs on the NetRegs website: https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/ (Accessed November 2023).

Embedded Measure	Compliance Mechanism	Embedded measure or good practice
• Dust emissions will be mitigated using standard good practice controls to be set out in a Dust Management Plan and implemented as part of the EMP during the Preparations for Quiescence and Final Site Clearance phases. Embedded measures that will limit dust emissions are detailed further in **Chapter 6: Air Quality**. This will include, for example, siting of stockpiles and dust-generating activities away from sensitive receptors; covering stockpiles and skips; use of enclosed chutes/conveyors; use of dust screens/barriers; dampening materials/stockpiles using sprays/mists; and removal of materials that generate dust and/or re-vegetating exposed earth/earthworks as early as practicable.		
Measures to protect mammals and other fauna: • Where practicable, within constraints associated with the Proposed Works, excavations are to be backfilled or covered and securely sealed or will have a means of escape for any entrapped fauna, for example gradually sloping sides, or ramps extending from the base of the excavation up to the ground surface. Where this is impracticable during the works, voids will be monitored and any entrapment of fauna will be reported to the ECoW who will recommend additional working practices as appropriate. • Gates to compound areas are to be designed to prevent mammals from gaining access and would be closed at night. Any temporarily exposed pipes would be capped when contractors are off site to prevent mammals from gaining access. • **Construction/demolition materials are to be stored in predetermined parts of the Works Area, over 30 m from adjacent habitats and wherever practicable elevated off the ground (e.g. on pallets), or stored within skips prior to their removal, unless otherwise agreed by the ECoW. Storage and handling of materials should minimise the risk of creating refuge for, or harming, mammals.** • **As far as practicable, any areas/mounds of spoil and/or earth are to be fully compacted, removing cracks/crevices that could create wildlife refuges;** • No litter or waste materials are to be discarded in works areas as they could create temporary refuges for wildlife.	EMP	Embedded measure

Embedded Measure	Compliance Mechanism	Embedded measure or good practice
• Any mammal paths are to be cleared of materials and/or equipment at the end of each working day; • Noise emissions control: selection of plant, and engineered noise control, where required, to control any noise emissions in accordance with good practice. • All personnel/contractors are to remain vigilant and aware of the risk of encountering mammals (e.g. hedgehog, otter and badger) when driving to and from the Site. A low maximum speed limit will be implemented within the Works Area, in accordance HNB's established safety procedures relating to vehicle movements. Statutory speed limits will be adhered to on approach to the Works Area via surrounding routes. This will limit the risk of animal mortality due to traffic collisions. • In the event personnel/contractors observe a protected species (e.g. otter, badger, bat, nesting bird etc) or suspect such species to be present within or adjacent to works areas all work shall cease and the advice of the ECoW will be sought immediately. • In advance of site works (including preparatory investigations/enabling works), the ECoW will brief the Principal Contractor on the sensitive ecological features that are on/near the Site and the Principal Contractor will ensure all site staff/personnel are aware of the precautionary working practices set out in the EMP.		
Additional measures to protect otter: Prior to elements of the Proposed Works that are within 200 m of the coast, the otter survey will be updated, covering a 200 m perimeter around these elements. Where necessary, potential otter refuges and resting sites will be monitored using camera traps to assess the use of these features by otter. The following embedded measures will minimise the risk of harming or disturbing otters: • Exclusion zones of 30 m (radius) around otter holts/shelters, extended to 200 m around natal holts/shelters.	EMP	Embedded measure

Embedded Measure	Compliance Mechanism	Embedded measure or good practice
• An ECoW will monitor the Proposed Works and ensure that all environmental measures relevant to otter are delivered and ensure compliance with the relevant legislation. • **Wherever practicable, works and/or artificial lighting within 50 m of the coast will be avoided during the hours of darkness, taken to be 30 minutes before sunset to 30 minutes after sunrise.** • **In the event that use of artificial light within 50 m of the coast is unavoidable, for example in the afternoon or morning in winter months, this will be kept to the practicable minimum and will not be left on overnight.** • Any lighting used during the Proposed Works will be directed into the Works Area to minimise light spill onto adjacent habitats, including coastal habitats. • Strict speed limits (5 mph) will apply within the Works Area and 'otter crossing' signs will be deployed on access tracks that run parallel/adjacent to the coast. • **The ECoW would where necessary monitor otter activity along the coast using camera traps and may halt site activities at any time should they consider that the works are having a detrimental effect on otter. The works would resume once appropriate additional working practices had been put in place.** • Dispersal routes along the coast will not be blocked/severed, a clear route around the works will be available to otter at all times, which will be periodically monitored/checked by the ECoW. • An emergency procedure would be implemented by site workers if an otter is encountered. All works within 30 m would cease as soon as it is safe to do so, and the ECoW would inspect the Site and define appropriate measures as required. • Should construction activities take place at more than one coastal location at any one time, this would be subject to ECoW approval, to avoid any cumulative effects on otter activity. This includes any works taking place within 30 m of the coast. In the event the survey update concludes that any element of the Proposed Work is likely to disturb an otter's place of shelter/rest, the work would be undertaken under a European Protected		

Embedded Measure	Compliance Mechanism	Embedded measure or good practice
Species (EPS) licence to ensure compliance with the legal protection of otter, with the following additional measures in place: • An ECoW would provide supervision during the works and would set up a 10 m exclusion zone around the shelter/resting location in advance of works commencing; • A tool-box talk would be provided to all site construction workers to raise awareness of potential disturbance effects to otters; • **Where necessary construction works on the coast could be limited to daytime hours (avoiding early morning and early evening;** • Surveys would be undertaken prior to, during and following works to assess the status of the shelter/rest site; and • In the event a natal den is established within 200 m of the Proposed Works the ECoW would advise on additional precautions, such as a widening of the exclusion zone or delaying elements of the Proposed Works until the young otters are fully mobile.		
Additional measures to protect bats: Prior to demolition or conversion/modification of buildings or structures (typically in the spring/summer period prior to demolition), bat surveys of the affected area will be updated, including preliminary roost assessment and any follow-up surveys that are necessary to determine the status of roosting bats. In the event a bat roost is discovered it will be removed under an EPS licence to ensure compliance with the legal protection of bats. The mitigation will be confirmed through the licensing process and is expected to include one or a combination of measures: • A Clerk of Works (Ecologist) will monitor the Proposed Works and ensure all environmental measures relevant to bats are delivered and ensure compliance with the relevant legislation. • Exclusion or displacement of bats from the roost feature;	EMP Lighting scheme	Embedded measure

Embedded Measure	Compliance Mechanism	Embedded measure or good practice
• Cautious removal of the roost feature ('soft strip') under the direction and supervision of the ecologist named on the licence (or an accredited agent); and • Compensatory habitat creation, for example bat boxes deployed in secluded and less disturbed areas around the Site and Site perimeter. Wherever practicable within the constraints of site security and safety requirements, the lighting scheme employed throughout the Proposed Works will minimise light trespass onto adjacent habitat and is to be designed based on good practice principles (Bat Conservation Trust & Institute of Lighting professionals 2023[60]).		
Additional measures to protect badger: Badger has not been recorded however it is a mobile species and as a precaution, prior to mobilisation of the Proposed Works, the badger survey will be updated, covering the Works Area and a 50 m perimeter. Where necessary, any potential badger setts will be monitored using camera traps to assess the use of these features by badger. In the event badgers are recorded, additional precautions/working practices will be incorporated into the EMP to limit the risk of adverse effect on this species and to ensure compliance with the legal protection of badgers.	EMP	Embedded measure
Measures to protect hedgehog: • There are no records of hedgehog within 3km of the Works Area within the past 10 years. Site staff and contractors will however remain alert to the possible presence of hedgehog. Any hedgehog encountered during the Proposed Works will be removed from the Works Area and released into suitable habitat that will remain undisturbed.	EMP	Embedded measure
Measures to prevent spread of non-native species: Prior to mobilisation of the Proposed Works an invasive non-native species (INNS) survey will be completed, covering the Site, the Works Area and a 10 m perimeter. In the event that any stands	EMP	Embedded measure

[60] Bat Conservation Trust (BCT) & Institute of Lighting Professionals (2023). *Guidance Note GN08/23: Bats and Artificial Lighting at Night*. Institute of Lighting Professionals, Rugby, Warwickshire.

Embedded Measure	Compliance Mechanism	Embedded measure or good practice
of non-native species are discovered they will be demarcated within a 10 m exclusion (no disturbance) zone and will be removed and managed in accordance with good practice[61] to be incorporated into biosecurity measures that will form part of the EMP. Additional measures to limit the risk of importing INNS to the Site on footwear/clothing and machinery will be implemented: • a vehicle/plant wash/disinfectant facility to wash the lower exterior and wheels of vehicles/plant as well as footwells, using buckets, brushes and scrapers. • Silts washed off vehicles/plant will be cleaned out of the wheel wash and removed from the Site. • Clothing/footwear of site personnel is to be clean prior to entering Site, with boots brushed and washed. • Waste water that is potentially contaminated with INNS will be disposed of in accordance with good practice[60].		
Measures to protect birds: • The Proposed Works minimise vegetation loss. • Working practices to minimise effects on ornithological features are to be set out in a Bird Protection Plan. A Clerk of Works (Ecologist) will monitor the Proposed Works and ensure that all environmental measures relevant to birds are delivered and ensure compliance with the relevant legislation. • **Any removal/disturbance of vegetation will, as far as practicable, take place outside of the birds' breeding season (avoiding March to August inclusive).** • **In circumstances where work on buildings or disturbance of vegetation during the breeding season is unavoidable, a breeding bird and nest check will be carried out**	EMP Bird protection plan	Embedded measure

[61] SEPA (n.d). *Biosecurity and management of invasive non-native species for construction sites and Controlled Activities*. (Online) Available at: https://www.sepa.org.uk/media/163480/biosecurity-and-management-of-invasive-non-native-species-construction-sites.pdf (Accessed November 2023)

Embedded Measure	Compliance Mechanism	Embedded measure or good practice
in advance and any active nests are to be demarcated within an exclusion (no disturbance) zone until the young birds fledge. This zone will be species-specific and defined by the Clerk of Works. • An emergency procedure would be implemented by site workers if a birds' nest is encountered. All works within 30 m would cease as soon as it is safe to do so, and the ECoW would inspect the Site and define appropriate measures as required.		
Review of baseline and updates to embedded environmental measures: The biodiversity baseline will be subject to periodic update and review, informed by routine biodiversity monitoring to be incorporated into the decommissioning EMP. The results of this monitoring will further inform site working practices and refinements to embedded environmental measures, such that the effects of the Proposed Works on ecological features continue to be not significant.	EMP (monitoring plan)	Embedded measure

8.7 Assessment methodology

8.7.1 The project-wide assessment methodology is set out in **Chapter 5: The EIA Process**, and specifically in **Section 5.3** and **Section 5.4**. Whilst this has informed the approach that is adopted in the terrestrial biodiversity and ornithology chapter, it is necessary to align this methodology with good practice in Ecological Impact Assessment[15,1].

8.7.2 The assessment is based on the results of the desk study and field surveys, as well as relevant published information (for example on the status, distribution, sensitivity to environmental changes and ecology of the features scoped into the assessment, where this information is available), and professional knowledge of ecological processes and functions.

8.7.3 For each scoped-in ecological feature (**Section 8.9**), the potential effects of the Proposed Works on it are assessed against its current baseline condition.

8.7.4 Where part of a designated site is located within the ecological ZoI relating to a particular biophysical change that is likely to occur as a result of the Proposed Works, the effects on the designated site as a whole are assessed. A similar approach is taken for areas of habitat.

8.7.5 For species that occur within the ZoI, the assessment considers the total area that is used by the affected individuals or the local population of the species (e.g. for foraging or as breeding territories), rather than the specific defined footprint of the Proposed Works.

8.7.6 The assessment process informs the environmental measures that are embedded into the Proposed Works (**Table 8.12**) to avoid or reduce adverse effects or to deliver enhancements.

8.7.7 The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999[62] (hereafter referred to as "EIADR") recognises that decommissioning will affect different environmental elements to differing degrees, and that not all of these are of sufficient concern to warrant detailed investigation or assessment through the EIA process. The EIADR identify those environmental resources that warrant investigation as those that are "*likely to be significantly affected by the project*"[63,64].

8.7.8 The EIADR do not define significance. The significance of an effect resulting from a development is determined in this assessment by reference to the sensitivity (or 'importance') of a receptor and the magnitude of the effect. This approach provides a mechanism for identifying areas where mitigation measures may be required and to identify the most appropriate measures to alleviate the risk presented by the Proposed Works.

8.7.9 CIEEM[15] defines a significant effect as one "*that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general*".

[62] *Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999* (Online) Available at: https://www.legislation.gov.uk/uksi/1999/2892/contents/made (Accessed November 2023).
[63] *The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) (Amendment) Regulations 2018, Regulation 5*. (Online) Available at: https://www.legislation.gov.uk/uksi/2018/834/regulation/7/made (Accessed November 2023).
[64] *The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) (Amendment) Regulations 2018, Schedule 1*. (Online) Available at: https://www.legislation.gov.uk/uksi/2018/834/schedule/1/made (Accessed November 2023).

8.7.10 When considering likely significant effects on ecological features, whether these be adverse or beneficial, the following characteristics of environmental change are taken into account[65]:

- extent – the spatial or geographical area over which the environmental change may occur;
- magnitude – the size, amount, intensity or volume of the environmental change;
- duration – the length of time over which the environmental change may occur;
- frequency – the number of times the environmental change may occur;
- timing – the periods of the day/year etc. during which an environmental change may occur; and
- reversibility – whether the environmental change can be reversed through restoration actions.

Determining importance of ecological features

8.7.11 It is necessary to identify which ecological features identified through the desk study and field surveys (**Appendix 8A** to **8H**) are 'important'[66] in the context of the Proposed Works. Following CIEEM guidance, the importance of ecological features is first determined with reference to UK legislation (**Table 8.1**) and policy (**Table 8.2**) and then with regard to the extent of habitat or size of population that may be affected by the Proposed Works.

8.7.12 As the importance of ecological features is determined with regard to the extent of habitat or size of population that may be affected by the Proposed Works, the level of importance can differ from that which would be conferred by legislative protection or identification as a conservation priority and from one development to another. For example, water vole is important at a national level because it is a SBL species and has exhibited a population decline of more than 25% in the last 25 years. However, a small population that could be affected by a development would be assessed as being of less than national importance if there is alternative well-connected and suitable habitat nearby that has the capacity to support individuals that may be displaced.

8.7.13 Wherever possible, information regarding the extent and population size, population trends and distribution of the ecological features has been used to inform the categorisation described in **Table 8.13** to determine importance for the purposes of this assessment. Where detailed criteria or contextual data are not available, professional judgement was used to determine the level of importance.

8.7.14 All ecological features that are of sufficient importance that effects on them could be significant are included in the scope of the assessment. Where protected species are present and there is the potential for a breach of the associated legislation, those species are also treated as 'important' ecological features.

[65] The definitions of the characteristics of environmental change are based on the descriptions provided in CIEEM 2018. Other chapters in this EIA Report may use some of the same terms albeit with a different definition.
[66] Importance relates to the quality and extent of designated sites and habitats, habitat/species rarity and its rate of decline. Ecological features that are not considered to be important are those that are sufficiently widespread, unthreatened and resilient and with populations that will remain viable and sustainable irrespective of the Proposed Works.

Table 8.13 Importance of ecological features

Geographic context of importance	Example/ description
International or European	• International sites including Ramsar sites and European sites (SPAs, SACs, plus candidate/potential sites); and • Areas of habitat or populations of species that meet the published selection criteria for designation as an international site, based on discussions with NatureScot and field data collected to inform the assessment, but are not currently designated as such.
National	• Nationally designated sites including SSSIs and National Nature Reserves (NNRs); • Areas (and the populations of species which inhabit them) which meet the published selection criteria guidelines for selection of biological SSSIs but which are not themselves designated, based on field data collected, and in agreement with NatureScot; • SBL habitats and species, Red listed and legally protected species that are not addressed directly in Part 2 of the "Guidelines for Selection of Biological SSSIs" but can be determined to be of national importance using the principles described in Part 1 of the guidance; and • Areas of Ancient Woodland e.g. woodland listed within the Ancient Woodland Inventory[67].
Regional	• SBL species considered to be of regional importance in the context of published information on population size and distribution.
County	• LNRs and Non-statutory designated sites; and • Areas which, based on field data collected to inform the EcIA meet the published selection criteria for those sites listed above (for habitats or species, including those listed in relevant Local Biodiversity Action Plans) but which are not themselves designated.
Local	• SBL habitats and species, Red listed and legally protected species that based on their extent, population size, quality etc are determined to be at a lesser level of importance than the geographic contexts above; • Common and widespread semi-natural habitats occurring in proportions greater than may be expected in the local context; and • Common and widespread native species occurring in numbers greater than may be expected in the local context.
Negligible	• Common and widespread semi-natural habitats and species that do not occur in levels elevated above those of the surrounding area; and

[67] Scottish Government (2023) *Ancient Woodland Inventory (Scotland)* (2015) (online). Available at: https://data.gov.uk/dataset/c2f57ed9-5601-4864-af5f-a6e73e977f54/ancient-woodland-inventory-scotland (Accessed November 2023)

Geographic context of importance	Example/ description
	• Areas of heavily modified or managed land uses (e.g. hard standing used for car parking and roads).

Magnitude of Change

8.7.15 A scale of magnitude of environmental change resulting from the Proposed Works is described in **Table 8.14** to provide an understanding of the relative change from the baseline position, be that an adverse or beneficial change.

Table 8.14 Establishing the magnitude of change

Scale of change	Criteria and resultant effect
High	The change permanently (or over the long-term) affects the conservation status of a habitat / species, reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area and relative to the wider habitat resource / species population, a large area of habitat or large proportion of the wider species population is affected. For designated sites, integrity is compromised. There may be a change in the level of importance of the receptor in the context of the project ZoI.
Medium	The change permanently (or over the long-term) affects the conservation status of a habitat / species reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area and relative to the wider habitat resource / species population, a small-medium area of habitat or small-medium proportion of the wider species population is affected. There may be a change in the level of importance of this receptor in the context of the project ZoI.
Low	The quality or extent of designated sites or habitats or the sizes of species' populations, experience some small-scale reduction or increase. These changes are likely to be within the range of natural variability and they are not expected to result in any permanent change in the conservation status of the species / habitat or integrity of the designated site. The change is unlikely to modify the evaluation of the receptor in terms of its importance in the context of the project ZoI.
Very Low	Although there may be some effects on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats, or the size of species populations, means that they would experience little or no change. Any changes are also likely to be within the range of natural variability and there would be no short-term or long-term change to conservation status of habitats / species receptors or the integrity of designated sites.
Neutral	A change, the level of which is so low, that it is not discernible on designated sites or habitats or the size of species' populations.

Determining significance – adverse and beneficial effects

8.7.16 Adverse effects are assessed as being significant if the favourable conservation status of an ecological feature would be lost as a result of the Proposed Works. Beneficial effects

are assessed as those where a resulting change from baseline improves the quality of the environment (e.g. increases species diversity, increases the extent of a particular habitat etc., or halts or slows down an existing decline). For a beneficial effect to be considered significant, the conservation status would need to positively increase in line with a magnitude of change of "high" as described in **Table 8.14**.

8.7.17 Conservation status is defined as follows:

> "*For habitats, conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and typical species within a given geographical area*;
>
> *For species, conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area*"[15]

8.7.18 The decision as to whether the conservation status of an ecological feature would alter is made using professional judgement, drawing upon the information produced through the desk study, field survey and assessment of how each feature is likely to be affected by the Proposed Works.

8.7.19 A similar procedure is used where designated sites may be affected by the Proposed Works, except that the focus is on the effects on the 'integrity' of each site; defined as:

> "*The coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*".

8.7.20 The assessment of effects on integrity draws upon the assessment of effects on the conservation status of the features for which the Site has been designated. Where these features are not clearly defined, which is often the case for non-statutory biodiversity sites, it is necessary to use professional judgement to identify the interest features or obtain additional information about the interest features from NatureScot, Scottish Wildlife Trust or the local planning authority responsible for identifying these sites, so that sufficient information on which to base an assessment is available.

8.8 Assumptions and limitations

8.8.1 Limitations relating to the baseline data underlying the assessment are identified in **Section 8.3**. There are no further assumptions or limitations associated with this chapter.

8.8.2 A precautionary approach to the assessment has been adopted in accordance with good practice (CIEEM[15]), avoiding underestimates of likely significant effects.

8.9 Scope of the assessment

8.9.1 During the Preparations for Quiescence, the Proposed Works related to the terrestrial environment involve deplanting and demolition to ground level of the majority of built structures, with the exception of the Reactor Building, which will be modified to create the Safestore. This will be followed by routine maintenance during the Quiescence phase and demolition of the Safestore and ground remediation during Final Site Clearance.

Study area

8.9.2 The Study Area, including the different components relating to each type of ecological feature, is summarised in **Section 8.3**. The Study Area was determined based on good

practice guidance, the types of ecological features known to be present, and the potential effects that could occur. The Study Area was defined on a precautionary basis to ensure that, as a minimum, the ZoI relevant to all relevant ecological features are covered during baseline data collection. The Study Area has been kept under review throughout the EIA process, including responding to the iterative design process for the Proposed Works to ensure that the baseline characterisation remains adequate to enable the assessment of all likely significant effects on ecological features.

Potential receptors

8.9.3 The Scoping study identified ('scoped-in') the terrestrial biodiversity and ornithology receptors that are likely to be subject to significant effects as summarised in **Table 8.15**.

8.9.4 Ecological features that are unlikely to be subject to significant effects, for example where they are remote from the Works Area or there is no pathway via which an effect on them could occur, are not considered further. This includes European Sites, as explained in the HRA Screening Report accompanying this EIA.

8.9.5 The recent HNB Annual Land Management Review 2022 reports the results of harvest mouse surveys (*Micromys minutus*) in winter 2021/22. This species was recorded on the coastal grassland strip to the north of the Works Area, approximately 300 m from the Site boundary. This habitat is predominantly rough grassland, extending along the access road (Power Station Road) verges and connecting to a surrounding network of hedgerows and field margins. The Red List of British Mammals68 categorises the harvest mouse as Near Threatened (NT) in Great Britain and Critically Endangered (CR) in Scotland, although the Mammal Society acknowledges that this species may be under-recorded in Scotland. This species inhabits a range of complex habitats that have tall grasses and other vegetation, including tussocky grasslands, hedgerows, field margins, road verges, reedbeds, salt marsh and ditches/dykes (Mammal Society[69]). The habitats within the Works Area are mainly amenity grassland, hardstanding and small blocks of plantation, which are poor habitats for this species. Harvest mouse therefore remains scoped-out of the assessment.

8.9.6 No evidence of badger activity was recorded by the Baseline Surveys or by the more recent Baseline Verification. This species is therefore scoped-out of the assessment. The status of badger will however be kept under review, through routine biodiversity monitoring to be incorporated into the decommissioning EMP. In the event this monitoring detects badger, further precautionary working practices and/or mitigation will be implemented to limit the risk of adverse effects on this species and any associated risk of failure to comply with badger legislation.

8.9.7 Decommissioning of marine infrastructure during the Preparations for Quiescence phase could have effects on diving birds, including red-throated diver and shag. Both species were recorded in low numbers in the vicinity of HNB marine infrastructure, as well as other species that are of lesser conservation concern, including red-breasted merganser, cormorant, eider and black guillemot. The effects of the Proposed Works on diving birds are therefore scoped-out of the assessment, with the exception of black guillemot, which was recorded nesting on marine infrastructure within and adjacent to the Works Area in numbers of up to county-level importance.

[68] Mathews F, and Harrower C. (2020). *IUCN – compliant Red List for Britain's Terrestrial Mammals. Assessment by the Mammal Society under contract to Natural England, Natural Resources Wales and Scottish Natural Heritage*. Natural England, Peterborough ISBN 978-1-78354-485-1.
[69] Mammal Society (2023) *Species – Harvest Mouse* (Online) Available at: https://www.mammal.org.uk/species-hub/full-species-hub/discover-mammals/species-harvest-mouse/ (Accessed November 2023).

Table 8.15 Receptors likely to be subject to Significant Effects

Ecological feature (receptor)	Importance (legislation and policy)	Importance (Works Area)	Justification
Biodiversity sites (statutory – UK)	National	-	There are five SSSIs within 10 km: Portencross Woods SSSI (0.05 km east); Southannan Sands SSSI (0.18 km north); Kames Bay SSSI (3.1 km north-west); Ballochmartin Bay SSSI (4.4 km north); and Lynn Spout SSSI (9.9 km south-east). Atmospheric emissions during the Proposed Works could affect one or more of these sites.
Biodiversity sites (non-statutory)	County	-	There are 20 Local Nature Conservation Sites (LNCS) within approximately 3 km of the Works Area. The closest is Portencross Woods LNCS, which is approximately 0.05 km to the east. Atmospheric emissions during the Proposed Works could affect one or more of these sites.
Terrestrial habitats and associated species	National	Local	The habitats within and adjacent to the Works Area predominantly comprise hard standing and buildings, amenity grassland and poor semi-improved grassland, with areas of broadleaved woodland plantation, scattered broadleaved trees, and patches of tall ruderal vegetation. These habitats are common and widespread and are of up to Local nature conservation importance. There are areas of SBL habitats situated within 3 km, including ancient woodland, which could be affected by atmospheric emissions during the Proposed Works.
Otter	International	Local	EPS and SBL species recorded along the coast, within 250 m of the Works Area, that could be subject to disturbance (visual / noise / vibration / lighting) effects and / or harm due to vehicle movements.
Bats	International	Local	Surveys recorded three bat species within 50 m of the Works Area: soprano pipistrelle, common pipistrelle and noctule. All three are EPS and SBL species. No bat roosts were recorded and bat activity within the Works Area was relatively limited and associated with three of the more common / widespread species. Bats could be subjected to loss / severance of habitat (roosting / foraging / commuting) and disturbance (visual / noise / vibration / lighting) effects.
Hedgehog (*Erinaceus europaeus)*	National	Less than Local	The Works Area includes only small / limited areas of habitats for these species and is unlikely to be important in sustaining populations of local or greater importance. These species could be

Ecological feature (receptor)	Importance (legislation and policy)	Importance (Works Area)	Justification
			subjected to disturbance (visual / noise / vibration / lighting) effects and / or harm due to excavations and vehicle movements.
Black guillemot (breeding)	National	Up to County	Surveys recorded seven breeding pairs of black guillemot and 18 breeding adults, representing up to 4.8% of the Ayrshire breeding population. This species could be subject to harm due to site clearance activities and disturbance (visual / noise / vibration / lighting impacts).
Other bird species (breeding)	National	Local	Breeding (or potentially breeding) pairs / territories of seven species listed on the SBL and / or BoCC Red List were recorded during the surveys of the Works Area and adjacent areas. These species could be subject to harm due to site clearance activities and disturbance (visual / noise / vibration / lighting impacts).
Birds (wintering/ passage)	National	Local	Wintering bird surveys of the Works Area have recorded SBL species and BoCC Red List species. These species could be subject to harm due to site clearance activities and disturbance.

Likely significant effects

8.9.8 Likely significant effects on terrestrial biodiversity and ornithology that are taken forward for assessment are summarised in **Table 8.16**.

8.9.9 The effects relate to the Preparations for Quiescence and Final Site Clearance Phases. The assessment of the effects of these phases on ecological features are considered together, recognising that the nature of the effects of both phases on ecological receptors are similar and relate to demolition and earthworks and associated site activities.

8.9.10 There are likely to be no significant effects on ecological features during the Quiescence phase, recognising that there is currently anticipated to be no earthworks and limited maintenance activity on the Site during that phase, and the embedded environmental measures (**Table 8.12**) will continue to implemented during routine site maintenance, including and not limited to measures to protect bats.

Table 8.16 Likely significant effects on terrestrial biodiversity and ornithology

Phase and activity	Effect	Receptor (Ecological Feature)
Preparations for Quiescence (demolition, construction, earthworks and excavation)	Emissions to air (dust and emissions from plant and vehicle movements) causing habitat degradation.	Statutory biodiversity sites; non-statutory biodiversity sites; and SBL habitats (inc. ancient woodland).
Preparations for Quiescence (demolition, construction, earthworks and excavation)	Loss or degradation of habitats. Severance of habitats. Disturbance (noise, vibration, visual and lighting). Causing harm to, and / or disturbance / displacement of fauna.	Otter, bats, hedgehog and birds.
Preparations for Quiescence (demolition, construction, earthworks and excavation)	Earthworks causing the spread of non-native / invasive plant species, which could displace / out-compete native species and encroach into other / new habitats.	Habitats and native plant species.
Final Site Clearance (Safestore demolition and earthworks / remediation)	Loss or degradation of habitats. Severance of habitats. Disturbance (noise, vibration, visual and lighting). Causing harm to, and / or disturbance / displacement of fauna.	Otter, bats, hedgehog and birds.
Final Site Clearance (Safestore demolition and earthworks / remediation)	Earthworks causing the spread of non-native / invasive plant species, which could displace / out-compete native species and encroach into other / new habitats.	Habitats and native plant species.

8.10 Assessment of effects

Statutory biodiversity conservation sites

Preparations for Quiescence and Final Site Clearance

Habitat loss and degradation

8.10.1 There are no statutory biodiversity conservation sites within, overlapping or immediately adjacent to the Works Area, and there will be no removal or direct physical disturbance of habitats within, or bordering, statutory biodiversity conservation sites.

8.10.2 Dust emissions during construction, demolition, earthworks and trackout[70] activities could smother vegetation adjacent to the Works Area, leading to deterioration in the conservation status of statutory biodiversity conservation sites.

8.10.3 The effects of dust are set out in **Chapter 6: Air Quality**. Based on Institute of Air Quality Management (IAQM) guidance[71] dust emissions are most likely to affect ecological receptors within 0.05 km of the boundary of the Works Area and the route(s) used by mobile machinery, increasing to 0.25 km from the Site entrance for mobile machinery on the public highway.

8.10.4 There are two statutory biodiversity conservation sites within approximately 0.25 km of the Works Area. Portencross Woods SSSI is approximately 0.05 km to the east and is notified for semi-natural coastal woodland (upland mixed ash woodland). Southannan Sands SSSI is approximately 0.18 km to the north-west and is notified for intertidal sandflats.

8.10.5 As set out in **Chapter 6: Air Quality**, the Proposed Works will generate less than 20 outward Heavy Duty Vehicle (HDV) movements in any one day. The potential dust emission magnitude associated with trackout is therefore small, also recognising that vehicles within the Site and Works Area will continue to use existing roads, with only limited transit across unmade ground.

8.10.6 Dust emissions from the Proposed Works will be mitigated using standard good practice controls to be set out in a Dust Management Plan and implemented as part of the EMP during the Preparations for Quiescence and Final Site Clearance phases. Embedded measures that will limit dust emissions are detailed further in **Chapter 6: Air Quality**. This will include, for example, siting of stockpiles and dust-generating activities away from sensitive receptors; covering stockpiles and skips; use of enclosed chutes/conveyors; use of dust screens/barriers; dampening materials/stockpiles using sprays/mists; and removal of materials that generate dust and/or re-vegetating exposed earth as early as practicable.

8.10.7 There will be no physical removal/loss of habitat within or bordering biodiversity conservation sites and there is likely to be no degradation of habitats within these sites due to dust emissions from the Proposed Works. The magnitude of change in the conservation status of each/any statutory biodiversity conservation site is therefore likely to be **Neutral** and **Not Significant**.

Habitat degradation (vehicle emissions)

8.10.8 Emissions from HDVs and Light Duty Vehicles (LDVs) during construction and demolition activities could lead to degradation of vegetation within biodiversity conservation sites. Increases in the baseline concentration of oxides of Nitrogen (NOx) and Ammonia (NH_3) in particular can lead to poorer plant growth, reduced productivity and eutrophication, which can damage sensitive habitats and biodiversity conservation sites.

8.10.9 **Chapter 16: Traffic and transport** identifies the preferred construction route[72], referred to as Construction Route 4. The Zone of Influence of HDV/LDV emissions on biodiversity conservation sites is generally accepted as being 0.2 km[73] from a highway route. This distance is applied to the assessment of effects on sites that are of international biodiversity conservation importance (e.g. SAC). The presence of sites of international

[70] Movement of dust and dirt from a construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.
[71] IAQM (2023). *IAQM Guidance on the assessment of dust from demolition and construction* (Online). Available at: https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-dust-2023-BG-v6-amendments.pdf (Accessed November 2023).
[72] The term 'construction route' is consistent with **Chapter 16: Traffic and Transport**
[73] Natural England (2018). *Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the habitats regulations*. (online). Available at: https://publications.naturalengland.org.uk/publication/4720542048845824 (Accessed November 2023).

importance within 0.2 km of the increase in vehicle emissions is therefore a trigger for more detailed assessment. There are no sites of international importance for biodiversity conservation within 0.2 km of the Works Area or Construction Route 4. This distance is however applied as a reference in assessing effects of the Proposed Works on other biodiversity conservation sites.

8.10.10 **Chapter 6: Air Quality** explains that the threshold at which an increase in traffic flow triggers a detailed assessment of the air quality effects on statutory biodiversity conservation sites is 1,000 Average Annual Daily Traffic (AADT) or 200 AADT for HDVs. The predicted change in traffic levels on the construction route, attributable to the Proposed Works, is 100 AADT (24 HDV AADT). This is well below the threshold that typically triggers a detailed assessment of the effects of vehicle emissions on statutory biodiversity conservation sites.

8.10.11 Effects of NOx emissions on vegetation are considered relative to the Critical Level (CL), which is the concentration in the atmosphere above which adverse effects on receptors such as plants/habitats and ecosystems may occur. An increase in background concentration equivalent to >1% of the CL is widely applied as a threshold for long term impacts on nationally designated sites[73, 74].

8.10.12 JNCC[75] report that at distances of 0.025 km from a road:

- A change in traffic flow of 547 AADT is required to cause a change of 1% of the CL for NOx; and
- A change in traffic flow of 731 AADT is required to cause a change of 1% of the CL for Ammonia.

8.10.13 Southannan Sands SSSI is the only SSSI within 10 km of the Works Area that is within 0.2 km of Construction Route 4. It is over 0.025 km (approximately 0.029 km) from the route. The Proposed Works are predicted to increase traffic on Construction Route 4 that is attributable to HDVs by 24 AADT and traffic attributable to LDVs by 100 AADT. This is not likely to change baseline concentrations of NOx or Ammonia at the SSSI by >1% of the CL. It is therefore concluded that the effect of vehicle emissions on Southannan Sands SSSI and all other statutory biodiversity conservation sites will be **Neutral** and **Not Significant**.

Non-statutory biodiversity conservation sites

Preparations for Quiescence and Final Site Clearance

Habitat loss and degradation

8.10.14 There are no non-statutory biodiversity conservation sites within, overlapping or immediately adjacent to the Works Area and there will be no removal or direct physical disturbance of habitats within, or bordering, non-statutory biodiversity conservation sites.

8.10.15 As described above for statutory biodiversity sites, dust emissions associated with the Proposed Works could potentially smother vegetation, leading to deterioration in the conservation status of non-statutory biodiversity conservation sites. Dust emissions are most likely to affect ecological receptors within 0.05 km of the boundary of the Proposed

[74] Environment Agency (2016). *Air emissions risk assessment for your environmental permit*. (online). Available at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit (Accessed November 2023).
[75] JNCC (2021). *Guidance on Decision-making Thresholds for Air Pollution*. (online). Available at: https://hub.jncc.gov.uk/assets/6cce4f2e-e481-4ec2-b369-2b4026c88447 (Accessed November 2023).

Works and the route(s) used by mobile machinery, increasing to 0.25 km from the Site entrance for mobile machinery on the public highway.

8.10.16 There is one LNCS and two AWI sites within approximately 0.25 km of the Works Area. Goldenberry Hill LNCS is approximately 0.08 km south-east and includes Goldenberry Hill AWI site, which is approximately 0.2 km to the south. Portencross Woods AWI site is approximately 0.03 km to the east and connects to Goldenberry Hill LNCS.

8.10.17 Construction Route 4 passes immediately adjacent to two LNCS: Southannan LNCS, which includes Southannan AWI site; and Kilruskin Wood LNCS, which includes Kilruskin Wood AWI site. However, as set out in **Chapter 6: Air Quality** the Proposed Works will generate less than 20 outward Heavy Duty Vehicle movements in any one day and the potential dust emission magnitude associated with trackout is small, also recognising that vehicles within the Site and Works Area will continue to use existing roads, with only limited transit across unmade ground. Other dust emissions associated with the Proposed Works will be mitigated using standard good practice controls to be set out in a Dust Management Plan as described above. Dust deposition on non-statutory biodiversity conservation sites is therefore likely to be negligible.

8.10.18 There will be no physical removal/loss of habitat within or bordering non-statutory biodiversity conservation sites and there is likely to be negligible degradation of habitats within these sites due to dust. The magnitude of change in the conservation status of any non-statutory biodiversity conservation site is therefore likely to be **Neutral** and **Not Significant**.

Habitat degradation (vehicle emissions)

8.10.19 As set out above for statutory biodiversity sites, emissions from HDVs and LDVs could potentially lead to degradation of vegetation within biodiversity conservation sites that are within 0.2 km. Increases in the baseline concentration of NOx and Ammonia can damage habitats within these sites.

8.10.20 A predicted increase in background concentration of NOx/Ammonia equivalent to >1% of the CL and/or a change in traffic flows of 1,000 AADT (200 AADT for HDVs) is applied as a threshold that triggers detailed assessment of the effects of vehicle emissions on statutory biodiversity conservation sites that are of international importance. This is therefore a particularly precautionary threshold to apply to non-statutory biodiversity conservation sites that are of county-level or regional importance.

8.10.21 **Chapter 6: Air Quality** explains that the predicted change in traffic levels on the construction route, attributable to the Proposed Works, is 100 AADT (24 HDV AADT). This is well below the threshold that triggers a detailed assessment of effects on sites of international importance and therefore there are likely to be no significant effects on non-statutory sites, which are of county importance, or ancient woodland, which is of up to national importance.

8.10.22 As set out above, JNCC[75] report that at distances of 0.025 m from a road:

- A change in traffic flow of 547 Annual Average Daily Traffic (AADT) is required to cause a change of 1% of the CL for NOx; and
- A change in traffic flow of 731 AADT is required to cause a change of 1% of the CL for Ammonia.

8.10.23 The predicted change in AADT attributable to the Proposed Works is well below these two thresholds, however Construction Route 4 passes within 0.025m of two LNCS: Southannan LNCS, which includes Southannan AWI site; and Kilruskin Wood LNCS, which includes Kilruskin Wood AWI site.

8.10.24 Southannan LNCS and AWI site is a small site with limited semi-natural interest and is impacted by invasive non-native species (Rhododendron). It covers approximately 2.9 ha and it is estimated that less than 0.003 ha is within 0.025 km of Route 4.

8.10.25 Kilruskin Wood LNCS and AWI site is of long-established plantation origin, although conditions are largely semi-natural and the canopy is generally more mature in the north. The Site represents a very rich woodland with a good range of old woodland indicator species. It covers approximately 8.8 ha and it is estimated that less than 1 ha is within 0.025 km of Route 4.

8.10.26 It is concluded on a precautionary basis that there is only limited risk of baseline levels NOx/Ammonia approaching 1% of CL over the small areas of Southannan LNCS/AWI site and Kilruskin Wood LNCS/AWI site that are immediately adjacent to the construction route. It is therefore also reasonable to conclude on a precautionary basis that the Proposed Works are predicted to have an effect on the conservation status of these two LNCS/AWI sites that is of **Very Low** magnitude and **Not Significant**.

Habitats and plants

Preparations for Quiescence and Final Site Clearance

8.10.27 The approximate extent of each habitat type within the Works Area is summarised in **Table 8.17**. The majority (c.23 ha) of the Works Area is buildings, hardstanding and bare ground. These habitats are of negligible intrinsic biodiversity conservation importance. Species-poor grassland, including amenity grassland, improved grassland and poor semi-improved grassland covers approximately a further 3.5 ha of the Works Area. These habitat types are common, widespread and of very low intrinsic biodiversity conservation importance.

8.10.28 Broad-leaved plantation and mixed plantation cover a relatively small part of the Works Area (c.2 ha). These small areas are not notably mature or diverse and are of less than local biodiversity conservation importance and are to be retained throughout the Proposed Works. The other habitat types within the Works Area occur in very small, localised areas that are also of less than local biodiversity conservation importance. The Proposed Works are mainly confined to hard standing within the Works Area, with vegetation being retained wherever practicable and the intention is for this to be bolstered/maintained through the implementation of an Interim State Landscape Plan (see **Chapter 14: Landscape and Visual Impact Assessment**) . Biosecurity measures are to be implemented during the Proposed Works to limit the risk of spreading non-native species into surrounding habitats.

8.10.29 The habitats adjacent to the Works Area are also predominantly common, widespread and of low intrinsic biodiversity conservation importance, predominantly including improved grassland and poor semi-improved grassland. The embedded environmental measures to be implemented through the EMP, for example dust control measures, will minimise the risk of habitat degradation outside of the Works Area.

8.10.30 Any unavoidable damage to or loss of habitat within or immediately adjacent to the Works Area would therefore be limited to small areas of habitat that are or no greater than local biodiversity conservation importance and this would have a **Negligible/Neutral** effect on the conservation status of each habitat type within the Works Area and therefore **No Significant Effects** on any habitat types are anticipated.

Table 8.17 Habitat cover within the Works Area

Habitat	Area (ha)
Hardstanding	14.9
Buildings	7.8
Amenity grassland	3.4
Broad-leaved plantation	1.5
Ephemeral short perennial	0.7
Tall ruderal	0.5
Mixed plantation	0.3
Dense and Scattered scrub	0.3
Marshy grassland	0.2
Poor semi-improved grassland	0.2
Semi-improved neutral grassland	0.1
Introduced shrub	0.1
Improved grassland	<0.1
Bare ground	<0.1
Shingle & boulders (above high-tide)	<0.1
Dune scrub	<0.01
Parkland and scattered tree	<0.01

Otter

Preparations for Quiescence and Final Site Clearance phases

8.10.31 Otters are widespread throughout Scotland, which is a European stronghold for this species. Otters are an EPS and areas designated as Special Areas of Conservation (SAC) for otters are of European importance for the conservation of this species. There

are however no SACs within the Study Area. Otter is also an SBL species and therefore otter populations are often of national biodiversity conservation importance. The habitats surrounding the Works Area and within the wider Study Area are however subject to extensive anthropogenic influences, including coastal development and farming and the otter population that occupies the Study Area is unlikely to be of national importance. On a precautionary basis, the population is considered to be of up to county-level biodiversity conservation importance.

8.10.32 There is no evidence of otter activity within the Works Area. The habitats within this area are predominantly buildings, hardstanding and managed grassland and are well illuminated in places, and subject to noise disturbance from operational machinery. The Works Area is therefore almost entirely poor otter habitat that is unlikely to be used by this species. The Proposed Works will therefore result in negligible loss of otter habitat.

8.10.33 Otter activity is focused along the rocky coastline adjacent to the western boundary of the Works Area, including three holts, two potential holts and one couch (**Appendix 8G**). The two potential holts are within 50 m of the Works Area (Cooling Water Outlet Land Shaft). Crevices/alcoves in the rock armour extending along the coastline to the south-west also provide potential rest/shelter sites. It is likely that otters use the coastline for foraging, commuting and resting, potentially establishing natal holts/dens and/or nursery areas.

8.10.34 The otters that use the coastline adjacent to the Works Area are part of a population that is likely to range over a much wider surrounding area and be of country-level or greater biodiversity conservation importance. Otter is however a highly mobile species, with males ranging over tens of kilometres, overlapping female territories. The number of otters that forage and rest along the coast adjacent to the Works Area is therefore likely to be small, representing a small proportion of the wider population.

8.10.35 Demolition works and ground remediation in proximity to the coast could disturb and displace otter from coastal habitats adjacent to the Works Areas, with visual and noise disturbance effects potentially extending to 200 m from the Proposed Works[76]. Similarly, decommissioning of marine infrastructure (Cooling Water Intake and Outfall) could sever otters' coastal habitats.

8.10.36 The number of otters/otter families displaced from coastal habitats adjacent to the Proposed Works is likely to be small, recognising that this species ranges over long distances, as described above. Similarly, the extent of habitat that is to be disturbed is likely to represent only a very small proportion of an otter's foraging territory. On this basis, and in light of the embedded measures outlined in **Table 8.12**, the temporary habitat loss or localised barrier effects during the Proposed Works would result in an adverse effect of **Low** magnitude on the conservation status of the otter population that is **Not Significant**.

Bats

Preparations for Quiescence and Final Site Clearance phases

8.10.37 Three bat species occur within the Works Area and/or perimeter areas: soprano pipistrelle, common pipistrelle and noctule. All three are EPS and SBL species and large roosts or aggregations of these species are therefore of national, and potentially up to international, biodiversity conservation importance.

8.10.38 Soprano pipistrelle and common pipistrelle are however two of the most common and widespread bat species that are resident in Scotland and noctule are also widespread in

[76] NatureScot (2020). *Standing advice for planning consultations – Otters*. (Online). Available at: https://www.nature.scot/doc/standing-advice-planning-consultations-otters (Accessed November 2023).

south-west Scotland. Levels of bat activity recorded by the baseline surveys (**Appendix 8C**) are not notably high compared to bat activity at other, similar locations. The numbers of all three species within the Works Area and perimeter areas indicate bat populations/assemblages that are likely to be of no greater than local biodiversity conservation importance.

8.10.39 There are buildings within the Works Area that are of Moderate and Low suitability for roosting bats, however no bat roosts were recorded. Similarly, there are no trees within the Works Area or perimeter areas that are likely to be suitable for roosting bats. The proposed works will therefore not result in loss or disturbance of bat roosts.

8.10.40 The habitats within the Works Area are predominantly buildings and hardstanding, amenity grassland, improved grassland and poor semi-improved grassland, which are of low suitability for foraging bats. The habitats around the perimeter of the Works Area are also mainly improved and poor semi-improved grassland. There is only a limited extent of more suitable habitats for bats, mainly including broadleaved plantation, mixed plantation and marshy grassland. Collectively, the habitats within the Works Area and perimeter areas are of low suitability for bats.

8.10.41 The Proposed Works will result in limited loss of habitat that is of low suitability for bats and disturbance of similar habitats through changes in artificial lighting around the perimeter of the Works Area. The embedded environmental measures to be implemented through the EMP, for example dust control measures, will minimise the risk of habitat degradation outside of the Works Area.

8.10.42 The Proposed Works are therefore likely to displace small numbers of three widespread bat species into more suitable surrounding habitats. On this basis, and in light of the embedded measures outlined in **Table 8.12**, the habitat loss/disturbance during the Proposed Works would result in an adverse effect of **Low** magnitude on the conservation status of the common pipistrelle, soprano pipistrelle and noctule populations present and the effect on the conservation status of each of these three species is therefore **Not Significant**.

Hedgehog

Preparations for Quiescence and Final Site Clearance phases

8.10.43 Hedgehog is an SBL species and populations of this species are therefore of up to national biodiversity conservation importance. Hedgehogs are common in parks, gardens and farmland throughout mainland Britain and Ireland, preferring woodland edges, hedgerows and suburban habitats[77].

8.10.44 The habitats within the Works Area and perimeter areas are predominantly buildings and hardstanding, amenity grassland, improved grassland and poor semi-improved grassland, which are of relatively low suitability for hedgehog. Any hedgehog population within this area is therefore likely to be of less than local biodiversity conservation importance.

8.10.45 Hedgehog has not been recorded within the Works Area. The embedded measures outlined in **Table 8.12** however includes precautions to avoid harming hedgehogs, recognising that it is estimated that Britain's hedgehog population has declined by 73%[78].

[77] The Mammal Society (2022). *Hedgehog Factsheet.* (Online) Available at: https://www.mammal.org.uk/wp-content/uploads/2022/07/Hedgehog-Fact-Sheet-v2.pdf (Accessed November 2023)
[78] The Mammal Society (2019). *Saving Britain's Wildlife. Are we driving hedgehogs to extinction?* (Online) Available at: https://www.mammal.org.uk/2019/06/are-we-driving-hedgehogs-to-extinction/ (Accessed November 2023)

The Proposed Works are therefore likely to have a **Neutral** effect on the conservation status of hedgehog populations that is **Not Significant**.

Birds (breeding)

Preparations for Quiescence

8.10.46 The breeding bird surveys recorded low numbers of common, widespread species that are typical of Ayrshire. Breeding (or potentially breeding) pairs / territories of seven species listed on the SBL or BoCC Red List were recorded: dunnock (*Prunella modularis*), herring gull (*Larus argentatus*), house sparrow (*Passer domesticus*), linnet (*Carduelis cannabina*), reed bunting (*Emberiza schoeniculus*), song thrush (*Turdus philomelos*) and mistle thrush. In each case, the number of birds recorded within the Works Area and perimeter is relatively small, likely to represent less than 1% of the respective Ayrshire populations and are therefore of no greater than local biodiversity conservation importance.

8.10.47 The embedded measures (see **Table 8.12**) will minimise the risk of harming breeding birds or damaging their active nests or eggs in compliance with the legal protection of all native bird species in the UK. Birds are therefore unlikely to be harmed, however they are likely to be displaced due to loss of nesting habitat and/or noise, vibration, lighting and visual disturbance.

Black guillemot

8.10.48 The baseline surveys recorded seven pairs of nesting black guillemot and up to 18 breeding individuals. This represents up to 4.8% of the county's (Ayrshire) breeding population. Breeding black guillemot nest on the jetty, which is inside the Works Area, and a small offshore platform, which is outside of the Works Area. Preparation for Quiescence will lead to loss of nesting habitat associated with the jetty (not the offshore platform) and displacement of small numbers of breeding/nesting black guillemot.

8.10.49 Decommissioning of marine infrastructure during the Preparations for Quiescence phase could have an effect on diving/foraging black guillemot. Works in the marine environment have the potential to affect diving birds through generation of underwater noise and changes in water quality through disturbance of seabed sediments, leading to disturbance and displacement of diving birds and in extreme cases sublethal injury or mortality.

8.10.50 The assessment of potential effects on water quality and sediment dynamics is presented in **Chapter 10: Coastal Management and Water Quality**. Whilst the physical removal of marine infrastructure has the potential to alter hydrodynamics and sediment transport, it is concluded that these effects on the marine environment will be highly localised and very low in magnitude. The mobilisation of any contaminated sediments in the vicinity of the Works Area, associated with historical industrial activity, will also be minimised by undertaking as much of the jetty dismantling works as practicable from the shore at low tide. The proposed methodology for decommissioning of the cooling water outfall will similarly avoid seabed trenching.

8.10.51 The potential ecological effects of underwater noise are considered in **Chapter 9: Marine Biodiversity**, which concludes that any noise and vibration associated with the Proposed Works is likely to be short-term and localised and will have an effect on fish that is of very low magnitude.

8.10.52 Embedded environmental measures will avoid harming birds and dependant young, and the relatively small number of breeding/nesting birds that are displaced are likely to find alternative nesting habitat elsewhere along the coastline. Similarly, the limited, localised

mobilisation of sediment and localised short-term elevation in noise will result in a low risk of displacing small numbers of diving birds. The Proposed Works will also result in only limited, localised displacement of prey species (fish). The Proposed Works will therefore have an adverse effect of no greater than **Very Low** magnitude on the conservation status of black guillemot and this effect is **Not Significant**.

Herring gull

8.10.53 The removal of buildings will reduce the available nesting habitat for herring gull. The 12 herring gull pairs recorded as potentially breeding on the power station buildings are likely to be displaced to short vegetation or bare ground outside the Works Area, or beyond. These breeding pairs represent less than 1% of the Ayrshire population, with approximately 900 pairs recorded breeding on Lady Isle, off Troon, alone[52]. Areas of short grassland/vegetation developing within the demolition footprint and through landscape planting early on during this phase would provide limited replacement nesting habitat for herring gull. The Proposed Works are therefore likely to have an adverse effect of **Very Low** magnitude on the conservation status of herring gull and this effect is **Not Significant**.

Reed bunting

8.10.54 Reed buntings typically nest at ditch/wetland edges, in marginal vegetation and arable crops, and occasionally in hedgerows. There is likely to be negligible loss of reed bunting nesting habitat and negligible displacement of this species. The Proposed Works will therefore have a **Neutral** effect on reed bunting, which is **Not Significant**.

Other bird species

8.10.55 The number of breeding territories of other bird species of biodiversity conservation concern recorded within the Site is relatively small: dunnock (3), house sparrow (7), linnet (2), song thrush (1) and mistle thrush (1). The Proposed Works are mainly confined to hard standing within the Works Area and any unavoidable damage to, or loss of, nesting habitat within the Works Area would be limited to small areas of habitat. A small number of these breeding territories are likely to be displaced and re-established in nearby suitable habitat. Landscape planting is likely to gradually provide replacement habitat for these species, ultimately increasing the available habitats. The Proposed Works are therefore likely to have **Neutral** effect on the conservation status of all four species, which is **Not Significant**.

Quiescence

8.10.56 Vegetation within the Works Area will continue to mature throughout the 70-year Quiescence phase. Embedded environmental measures to protect birds (**Table 8.12**) will continue to be implemented during routine site maintenance, including maintenance of landscape planting. The gradual maturation of habitats within the Works Area, combined with a substantial reduction in disturbance of the Works Area is likely to increase the numbers of breeding bird territories and have a beneficial effect of very low magnitude on the conservation status of dunnock, herring gull, house sparrow, linnet, reed bunting and song thrush populations. These effects are however not likely to be significant.

Final Site Clearance

8.10.57 Embedded environmental measures (**Table 8.12**) will continue to be implemented to protect birds during Final Site Clearance. The erection and subsequent removal of

temporary structures will potentially establish and then displace no more than a very small number of nesting herring gull territories. This is likely to have a **Neutral** effect on the conservation status of herring gull, which is **Not Significant**.

8.10.58 The Proposed Works are confined to hard standing within the Works Area and any unavoidable damage to, or loss of, breeding bird habitat within the Works Area would be limited to small areas of habitat and there is likely to be negligible loss of nesting habitat for dunnock, house sparrow, linnet, song thrush or reed bunting and limited displacement of small numbers of each species into suitable surrounding habitats. There is therefore likely to be a **Neutral** effect on the conservation status of these species, which is **Not Significant**.

Birds (wintering / passage)

Preparations for Quiescence

8.10.59 The non-breeding bird assemblage within the Study Area includes over-wintering farmland birds and a range of species associated with coastal habitats, including:

- Twenty species listed on the SBL[16] (bar-tailed godwit, black-headed gull, bullfinch, dunlin, dunnock, golden plover, herring gull, house sparrow, kestrel, lapwing, linnet, peregrine, red-throated diver, redwing, reed bunting, skylark, song thrush, starling, twite and whooper swan); and
- Fifteen species listed on the BoCC Red List (curlew, fieldfare, grey wagtail, herring gull, house sparrow, lapwing, linnet, mistle thrush, redwing, ringed plover, shag, skylark, song thrush, starling and twite).

8.10.60 These wintering and passage bird species do not occur regularly enough, or in sufficient numbers, within the Survey Area to be considered populations/assemblages of greater than local biodiversity conservation importance.

8.10.61 The assemblages of wintering and passage birds associated with the marine and intertidal areas include black-headed gull, common gull, cormorant, curlew, eider, greylag goose, herring gull, mallard, oystercatcher, red-breasted merganser, redshank, shag, shelduck, teal and wigeon. The peak counts these wintering and passage species tend to be lower or comparable to the highest five-year mean peak counts (non-breeding) recorded elsewhere within 5 km of the Site. The peak survey count of greylag goose is notably high compared to the five-year mean peak counts within 5 km. This count is however <0.1% of the estimated Scottish non-breeding population (Forester et al, 2007). The assemblages of wintering/passage birds associated with marine and intertidal areas within approximately 500 m of the Site are therefore also concluded to be of no greater than local biodiversity conservation importance.

8.10.62 The Proposed Works are mainly confined to hard standing within the Works Area and any unavoidable damage to, or loss of, wintering/passage bird habitat within the Works Area would be limited to small areas of habitat. Landscape planting is likely to gradually provide replacement habitat for these species, ultimately increasing the available habitat.

8.10.63 Wintering and passage birds are likely to be displaced due to noise, vibration, lighting and visual disturbance associated with the Proposed Works. Disturbance effects are estimated to extend up to approximately 250 m from the Works Area, based on a precautionary approach and the likely disturbance distance of breeding birds[79]. The bird species within

[79] Ruddock, M and Whitfield, D.P. (2007). *A Review of Disturbance Distances in Selected Bird Species*. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage

the Study Area are highly mobile and will readily disperse into other terrestrial and intertidal habitat adjoining the Works Area, without substantive loss of fitness.

8.10.64 The displacement of assemblages of wintering/passage bird species that are of up to local biodiversity conservation importance, into similar adjacent coastal/terrestrial habitats, is likely to have an adverse effect of **Very Low** magnitude on the conservation status of each of these species, which is **Not Significant**.

Quiescence

8.10.65 The gradual maturation of habitats within the Works Area, combined with a substantial reduction in disturbance of the Works Area is likely to increase the numbers of wintering and passage birds within the Works Area and adjacent areas. This is likely to have a beneficial effect of **Very Low** magnitude on the conservation status of wintering and passage bird species populations/assemblages that are of no greater than local biodiversity conservation importance and is therefore **Not Significant**.

Final Site Clearance

8.10.66 The effects of Final Site Clearance are likely to be similar to those of Preparation for Quiescence, albeit reduced in magnitude. The Proposed Works are mainly confined to hard standing and any unavoidable damage to, or loss of, wintering/passage bird habitat within the Works Area would be limited to small areas of habitat.

8.10.67 Habitat loss and displacement of assemblages of wintering/passage bird species that are of up to local biodiversity conservation importance, into similar adjacent coastal/terrestrial habitats, is likely to have an adverse effect of **Very Low** magnitude on the conservation status of each of these species, which is **Not Significant**.

8.11 Assessment of cumulative effects

Inter-project effects

8.11.1 There is the potential for terrestrial biodiversity and ornithology effects associated with the Proposed Works to interact with, or combine with the effects arising from other developments or projects proposed within the relevant Zones of Influence applicable to each environmental aspect.

8.11.2 An assessment inter-project effects is considered within in **Chapter: 21: Cumulative Effects Assessment** of this ES.

Intra-project effects

8.11.3 The assessment has inherently considered the potential impacts of noise, air quality, and water on sensitive biodiversity receptors.

8.11.4 A summary of the potential intra-project effects is provided in **Chapter 21 Cumulative Effects Assessment.**

8.12 Summary

Table 8.18 Summary of predicted effects

Receptor	Summary of Predicted Effect	Importance of ecological feature	Magnitude of Effect	Significance	Summary of Rationale
Statutory biodiversity sites (Portencross Woods SSSI and Southannan Sands SSSI)	Habitat degradation due to dust and plant/vehicle emissions to air	National	Neutral	Not Significant	Embedded measures will minimise dust mobilisation and dust deposition on SSSIs is likely to be negligible. No substantive changes in concentration of airborne pollutants at SSSIs is predicted.
Non-statutory biodiversity sites and Ancient Woodland	Habitat degradation due to dust and plant/vehicle emissions to air	County	Very Low (Kilruskin Wood LNCS)/ AWI site and Southannan LNCS/AWI site only).	Not Significant	Embedded measures will minimise dust mobilisation and dust deposition on LNCSs is likely to be negligible. No substantive changes in concentration of airborne pollutants at LNCSs is predicted. It is concluded on a precautionary basis that there is only limited risk of baseline levels NOx/Ammonia approaching 1% of CL over small areas of Southannan LNCS/AWI site and Kilruskin Wood LNCS/AWI. It is therefore reasonable to conclude on a precautionary basis that the Proposed Works are predicted to have a very low magnitude effect on these two LNCS/AWI sites.
Habitats	Habitat loss	Local	Very low (adverse)	Not significant	The Proposed Works are mainly confined to hard standing. Any unavoidable habitat loss will be limited to small areas of habitat types that are common and widespread. Embedded measures

Receptor	Summary of Predicted Effect	Importance of ecological feature	Magnitude of Effect	Significance	Summary of Rationale
					will limit the risk of importing or spreading invasive non-native species.
Otter	Disturbance and displacement from shelter, resting and foraging habitats, with associated effects on otter populations	County	Very Low (adverse)	Not Significant	The Proposed Works are likely to have a temporary, localised displacement effect on a small number of otters. This highly mobile species ranges over a wide area and will be able to disperse into suitable similar habitats adjacent to the Works Area.
Bats (Common pipistrelle; soprano pipistrelle; Noctule)	Loss of potential roost habitat; and foraging habitat rendered inhospitable/unsuitable due to changes to artificial lighting regime	Local	Very Low (adverse)	Not Significant	No bat roosts will be lost. The habitats within the Works Area are generally of low suitability for bats. The majority of the buildings are of low suitability for roosting bats. The three bat species that occur in proximity to the Works Area are common and widespread and the Proposed Works are likely to result in only limited localised displacement of small numbers of foraging bats.
Hedgehog	Loss of habitat and harm and/or displacement of hedgehog	Local	Neutral	Not Significant	The habitats within the Site are relatively poor hedgehog habitat and the Proposed Works incorporates embedded measures to limit the risk to this species.
Breeding birds (black guillemot)	Habitat loss/ displacement of breeding pairs and displacement of diving/foraging birds	Up to County	Very Low (adverse)	Not Significant	Preparations for Quiescence will lead to the loss of nesting habitat associated with the jetty (not the offshore platform), resulting in displacement of small numbers of breeding/nesting black guillemot. Embedded environmental measures

Receptor	Summary of Predicted Effect	Importance of ecological feature	Magnitude of Effect	Significance	Summary of Rationale
					will avoid harming birds and dependant young and the relatively small number of birds that are displaced are likely to find alternative nesting habitat elsewhere along the coastline. Limited, localised mobilisation of sediment and localised short-term elevation in noise will result in a low risk of displacing small numbers of diving birds and limited, localised displacement of prey species.
Breeding birds (herring gull)	Habitat loss, and displacement of breeding territories	Local	Very Low (beneficial)	Not Significant	Preparations for Quiescence and Final Site Clearance will lead to loss of nesting habitat and displacement of breeding territories of small numbers of herring gull that are of local biodiversity conservation importance. The longer Quiescence phase will lead to a general improvement in the available habitat for breeding birds and a substantive reduction in disturbance within the Works Area.
Breeding birds (dunnock, house sparrow, linnet, reed bunting and song thrush)	Habitat loss, and displacement of breeding territories	Local	Very Low (beneficial)	Not Significant	Preparations for Quiescence and Final Site clearance will lead to temporary displacement of breeding territories of small assemblages of birds that are of local biodiversity conservation importance. The longer Quiescence phase will lead to a general improvement in the available habitat for breeding birds and a substantive reduction in disturbance within the Works Area.

Receptor	Summary of Predicted Effect	Importance of ecological feature	Magnitude of Effect	Significance	Summary of Rationale
Wintering and passage birds	Habitat loss, and displacement of bird species and assemblages	Local	Neutral	Not Significant	Preparations for Quiescence and Final Site clearance will lead to temporary displacement of small assemblages of birds that are of local biodiversity conservation importance. The longer Quiescence phase will lead to a general improvement in the available habitat for wintering/passage birds and a substantive reduction in disturbance within the Works Area.

9.

Marine Biodiversity

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9. Marine Biodiversity

9.1 Introduction

9.1.1 This chapter presents the baseline and the assessment of likely impacts on marine biodiversity associated with the Proposed Works. It describes the key marine ecological receptors which occur in the vicinity of the Indicative Dismantling Works Area (hereafter referred to as the "Works Area") and considers the sensitivity of these receptors.

9.1.2 This chapter should be read in conjunction with the description of the Proposed Works as presented in **Chapter 2: The Decommissioning Process.**

9.1.3 Marine biodiversity is defined as being the biodiversity of the ecosystems found below high tide (generally taken as mean high water spring, MHWS) therefore coastal vegetation other than kelp and seagrass (considered within intertidal habitats in this chapter) is discussed in **Chapter 8: Terrestrial Biodiversity and Ornithology**. Seabirds and shorebirds have been considered alongside other ornithological receptors and are also covered in **Chapter 8**.

9.1.4 **Chapter 10: Coastal Management and Marine Water Quality**, discusses abiotic processes relevant to habitats and the species they support.

9.1.5 This chapter examines the likely for changes to the abundance and distribution of species and/or habitats resulting from the dismantling and decommissioning of the existing marine structures. This includes the cooling water intake and outfall and associated infrastructure as well as the jetty to the south of the Hunterston B ('HNB') Nuclear Site Licence (NSL) Boundary (hereafter referred to as the "Site"); these areas are enveloped within the Works Area, despite being outwith the Site itself.

9.2 Relevant legislation, policy and technical guidance

Legislation

9.2.1 Historically, much of the protection afforded to marine habitats and species in the UK has been through European Union (EU) directives as transposed into national legislation. The legislation has been amended since the UK's exit from the EU, but the essential provisions are nonetheless retained. The legislation presented in **Table 9.1** is relevant to the assessment of the effects on marine biodiversity receptors.

Table 9.1 Legislation relevant to marine biodiversity

Legislation	Legislation Issue
Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna	Adopted in 1992, the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora aims to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements. With the Birds Directive, it forms the cornerstone of Europe's nature conservation policy and establishes the EU wide Natura 2000 ecological network of protected areas safeguarded against potentially damaging developments. It also lists species of conservation concern and is thus relevant to defining the importance of potential receptors.

Legislation	Legislation Issue
and flora (Habitats Directive)[1]	
The Conservation (Natural Habitats & c.) Regulations 1994 (as amended in Scotland) (Habitats Regulations)[2]	In Scotland, the EU Habitats Directive is transposed into specific legal obligations by the Conservation (Natural Habitats, &c.) Regulations 1994. This piece of legislation is usually known as the Habitats Regulations. The Habitats Regulations cover the requirements for: ● protecting sites that are internationally important for threatened habitats and species e.g., European sites[3]; and ● a legal framework for species requiring strict protection e.g., European protected species. The most recent amendments to the Habitats Regulations in 2019 in Scotland mean that the provisions of the Habitats and Birds Directives relating to how European sites are designated and protected continue to apply.
Council Directive 2008/56/EC Establishing a Framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)[4]	The EU adopted the Marine Strategy Framework Directive (MSFD) in July 2008. It requires Member States to take measures to achieve or maintain Good Environmental Status (GES) by introducing measures, to be monitored against defined indicators of GES. Since the UK left the EU, Scotland has worked with the UK government on amendments which have been made to the Marine Strategy Regulations 2010 which transpose the requirements of the EU's Marine Strategy Framework Directive into domestic law, so that they continue to be effective now that the UK is no longer part of the EU. The existing UK-wide framework has been maintained to allow for consistent marine environmental monitoring and standards across the UK. The UK continues to develop its marine strategy with other countries in the north-east Atlantic, through the OSPAR Convention (Convention for the Protection of the Marine Environment of the North-East Atlantic)[5] following exit from the EU. GES therefore remains relevant across the whole of the UK including the devolved administrations.
Marine Strategy Regulations 2010[6]	The UK's Marine Strategy Regulations transpose the MSFD into UK law for the entire UK, and are to be read as if the UK were a Member State. The relevance to the decommissioning activities at Hunterston is that this legislation implements the requirements and metrics associated with achieving GES in Scotland.

[1] European Commission (1992). *Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora* (online). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992L0043&from=EN (Accessed 24 March 2023).

[2] UK Government (1994). *The Conservation (Natural Habitats, &c.) Regulations 1994* (online). Available at: http://www.legislation.gov.uk/uksi/1994/2716/made (Accessed 24 March 2023)

[3] European sites are those sites originally designated under the EU Birds and Habitats directives but remain under statutory protection in the UK. These include Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), including areas proposed for such designation but not formally adopted.

[4] European Commission (2008). *Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)* (online) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32008L0056 (Accessed 24 March 2023)

[5] OSPAR Commission (1992). *Convention for the Protection of the Marine Environment of the North-East Atlantic* (online) Available at: https://www.ospar.org/site/assets/files/1169/ospar_convention.pdf (Accessed: 09/06/2023)

[6] UK Government (2010*). The Marine Strategy Regulations 2010.* (Online) Available at: https://www.legislation.gov.uk/uksi/2010/1627/contents/made (Accessed November 2023)

Legislation	Legislation Issue
The Wildlife and Countryside Act 1981 (as amended in Scotland)[7]	The 1981 Act was first enacted to implement the Birds Directive and Bern Convention into the legal framework for the protection of wildlife in Britain. The introduction of the Habitats Directive in 1994 established a new set of rules for the protection of the species and habitats listed in the Act. Further, devolution also resulted in the 1981 Act being amended and supplemented by two pieces of legislation, the Nature Conservation (Scotland) Act 2004 and Wildlife and Natural Environment (Scotland) Act 2011. In the marine context, the 1981 Act applies to inshore waters (within 12 nautical miles (nm) of land). Part 1 of the Act details wildlife-based offences in relation to the species listed in the 8 Schedules. The key marine species described in Schedule 5 include some migratory and non-migratory fish, marine mammals, freshwater and marine molluscs, sea anemones and allies, annelid worms, crustaceans and sea-mats.
Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003[8]	The 2003 Act consolidated Scottish salmon and freshwater fisheries law into a single Act and is the key governing legislation for Scotland's district salmon fishery boards. The Act is also the regulatory framework for legal fishing methods and offences, fishing closures and local measures, particularly directed to the protection of juvenile and spawning salmonids and their passage. It enforces salmon and freshwater fisheries law and sets out specific offences.
Nature Conservation (Scotland) Act 2004[9]	The Act sets out a series of measures which are designed to conserve biodiversity and to protect and enhance the biological and geological natural heritage of Scotland. In doing so, the Act provides the principal legislative components of a new and integrated system for nature conservation within Scotland. It also sets out duties for public bodies to further conservation of biodiversity (not just protected sites) and to report on their compliance with the Biodiversity Duty[10]. It amends the Wildlife and Countryside Act 1981 by extending the list of offences and amending the provisions for enforcement.
Marine Scotland Act 2010[11]	The Marine (Scotland) Act provides a framework for addressing the competing demands on Scotland's seas. It introduces a duty to protect and enhance the marine environment and includes measures to help boost economic investment and growth in areas such as marine renewables. Established within the Scottish Parliament, the Act is concerned with the marine planning, marine licensing, marine conservation, seal conservation and enforcement of the conservation measures in the Scottish marine area.

[7] UK Government (1981). *Wildlife and Countryside Act 1981* (online) Available at: http://www.legislation.gov.uk/ukpga/1981/69 (Accessed 24 March 2023)
[8] Scottish Parliament (2003). *Salmon and freshwater Fisheries (Consolidation) (Scotland) Act 2003* (online). Available at: http://www.legislation.gov.uk/asp/2003/15/contents (Accessed 24 March 2023)
[9] Scottish Parliament (2004). *Nature Conservation (Scotland) Act 2004* (online) Available at: http://www.legislation.gov.uk/asp/2004/6/contents (Accessed 24 March 2023)
[10] Under the Act, all public bodies have "a duty to further the conservation of biodiversity when carrying out their responsibilities" – this includes, for example, through compliance with relevant legislation, contributing to sustainable development, and demonstrating the safeguarding of biodiversity and environmental assets for future generations. Further information available at: https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy-and-cop15/biodiversity-duty (Accessed 13 September 2023)
[11] UK Government (2010). *Marine (Scotland) Act 2010* (online). Available at: http://www.legislation.gov.uk/asp/2010/5/contents (Accessed 24 March 2023)

Policy

9.2.2 A summary of the relevant policies is presented in **Table 9.2.**

Table 9.2 Policy relevant to marine biodiversity

Policy Reference	Policy Relevance
National Policy	
National Planning Framework 4 (NPF4)[12]	The policies within NPF4 which are relevant to marine biodiversity, are Policies 3 & 4. These emphasise the protection of biodiversity and natural assets, and the role they play in carbon reduction. Development proposals for national, major or Environmental Impact Assessment (EIA) development will only be supported where it can be demonstrated that the proposal will conserve, restore and enhance biodiversity, including nature networks, so they are in a demonstrably better state than without intervention. It is thus important to demonstrate that the decommissioning activities will not result in any significant degradation of the marine environment. The Hunterston Strategic Asset is mentioned as one of the six national developments that support the delivery of productive places theme. This national development "*supports re-use of the port and wider site, engaging in new technologies and creating opportunities from nuclear decommissioning to make best use of existing infrastructure and provide local benefits*".
Local Policies	
North Ayrshire Local Development Plan (LDP)[13]	The North Ayrshire LDP sets out a guidance for development and investment for the next 20 years. The relevant policies concerning marine biodiversity are: ● Policy 14: Green and Blue Infrastructure states that "*All proposals should seek to protect, create, enhance and/or enlarge natural features and habitats which make up green and blue infrastructure, ensuring no unacceptable adverse environmental impacts*". Support will be given to proposals which seek to enhance biodiversity, including restoration of degraded habitats and avoidance of further habitat fragmentation/isolation. ● Policy 16: Protection of Designated Sites states that development will be supported if it would not have an unacceptable adverse effect on: a) Nature Conservation Sites of International Importance – other than where there are no alternative solutions; there are imperative reasons of overriding public interest; and compensatory measures are provided; b) Nature Conservation Sites of National Importance – unless it can be demonstrated that the objectives of the designation and integrity of the site would not be compromised, or any adverse

12 Scottish Government (2022) *National Planning Framework 4*. (online) Available at: https://www.gov.scot/publications/national-planning-framework-4/pages/1/ (Accessed November 2023).

13 North Ayrshire Council (2019). *North Ayrshire Local Development Plan*. (online) Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed March 2023).

Policy Reference	Policy Relevance
	effects are outweighed by social, environmental or economic benefits of national importance; c) Nature Conservation Sites of Local Importance – unless the objectives of the designation and integrity of the designated area would not be compromised, or any adverse effects are outweighed by social, environmental or economic benefits of local importance; d) Marine Protected Areas (MPA) – including the South Arran MPA; e) Biodiversity Action Plan Habitats and Species – unless it is demonstrated that the effects on the priority features set out in the plan are clearly outweighed by social or economic benefits of local importance; and f) Protected Species – unless the applicant can demonstrate that a species licence is likely to be granted. Hunterston is recognised as an energy hub and deep-water port of strategic national importance and supported by the LDP for its inclusion in the NPF4[12].
Clyde Regional Marine Plan[14]	The Clyde Marine Planning Partnership[15] is currently developing a marine plan which will provide a framework to manage, effectively and sustainably, the economic, social and environmental needs of the Clyde Marine Region. The policies within the plan are designed to guide all marine and coastal users with respect to proposed and existing developments, and any activities associated with them. Those of relevance are Objectives NH1 and NH2 which state: ● "*The health of the marine and coastal natural heritage of the Clyde Marine Region is protected and, where appropriate, enhanced*"*;* and ● "*Development and use of the coastal and marine environment does not have significant negative impact on biodiversity, the Marine Protected Area network, other protected habitats and species and Priority Marine Features in line with the relevant conservation objectives and, where possible, contributes to their maintenance and/or enhancement*". A pre-consultation draft plan has been issued and responses are being analysed (as of May 2023); no draft or adopted plan has been published yet.

Technical guidance

9.2.3 Technical guidance that is relevant to the assessment of the effects on marine biodiversity receptors is presented in **Table 9.3**.

[14] Clyde Marine Planning Partnership (2018*) Clyde Regional Marine Plan* (online). Available at: https://www.clydemarineplan.scot/marine-planning/clyde-regional-marine-plan/ (Accessed 27/03/2023)

[15] The Clyde Marine Planning Partnership currently (as at August 2023) comprises 24 stakeholders across a range of sectors with marine and/or coastal interest in the Firth of Clyde. The principal role of the CMPP is to prepare a Marine Plan for the Clyde Marine Region (being Marine Scotland's nominated delegate for this role), as well as undertaking other aspects of Integrated Coastal Management (ICM). Further detail is available at: https://www.clydemarineplan.scot/ (Accessed 17 July 2023)

Table 9.3 Technical Guidance relevant to marine biodiversity

Technical Guidance	Context
Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine version 1.1[16]	Good practice guidance on Ecological Impact Assessment (EcIA).
Guidelines for Environmental Impact Assessment[17]	Good practice guidance on the EIA process.
Guidelines for Baseline Ecological Assessment[18]	Guidance on baseline ecological assessment.
Guidelines for Preliminary Ecological Appraisal, 2nd edition[19]	Good practice guidance on preliminary ecological appraisal.
British Standard (BS) 42020:2013, Biodiversity. Code of practice for planning and development[20]	Guidance to ensure that actions and decisions taken at each stage of the planning process are informed by sufficient and appropriate ecological information.
Handbook for Phase 1 Habitat Survey - a technique for environmental audit[21]	Good practice guidance on Phase 1 Habitat surveys (including intertidal surveys).
Guidance on Assigning Benthic Biotopes using EUNIS or the Marine Habitat Classification of Britain and Ireland (revised 2019)[22]	Guidance to assign biotopes using the Marine Habitat Classification for Britain and Ireland and EUNIS (European Nature Information System) classifications during the intertidal survey.
JNCC Marine Monitoring Handbook procedural guidance 1.1 and 3.6[23]	Guidance for best practice survey techniques for marine species and habitats.
NatureScot guidance[24]	Guidance on surveying and monitoring for species and habitats in relation to marine renewable developments. Though this is not a renewable development, the guidance includes general provisions for surveying in the marine environment.

[16] CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1*. Chartered Institute of Ecology and Environmental Management; Winchester, UK.

[17] Institute of Environmental Management and Assessment. (2016). *Guidelines for Ecological Impact Assessment*. IEMA; Lincoln, UK.

[18] Institute of Environmental Assessment. (1995). *Guidelines for Baseline Ecological Assessment*. E & FN Spon; London, UK.

[19] Chartered Institute of Ecology and Environmental Management. (2017). *Guidelines for Preliminary Ecological Appraisal, 2nd edition.* CIEEM; Winchester, UK.

[20] British Standards Institution. (2013). *Biodiversity - Code of practice for planning and development*. BSI; London, UK.

[21] Joint Nature Conservation Committee. (2010). *Handbook for Phase 1 Habitat Survey - a technique for environmental audit.* JNCC; Peterborough, UK.

[22] Parry, M.E.V. (2019*) Guidance on Assigning Benthic Biotopes using EUNIS or the Marine Habitat Classification of Britain and Ireland (revised 2019), JNCC Report No. 546*, JNCC, Peterborough, ISSN 0963-8091.

[23] Davies, J., Baxter, J., Bradley, M., Connor, D., Khan, J., Murray, E., Sanderson, W., Turnbull, C. and Vincent, M. (2001). *Joint Nature Conservation Committee Marine Monitoring Handbook*, 405 pp, ISBN 185716 550 0.

[24] Trendall, J.R., Fortune, F. and Bedford, G.S. (2011). *Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 1*.

9.3 Data gathering methodology

Study Area

9.3.1 Study Areas were determined based on good practice guidance (see **Table 9.3**) and the types of ecological features known to be present, and the likely effects that could occur. The Study Areas were defined on a precautionary basis to ensure that, as a minimum, the Zone of Influence (ZoI)[25] relevant to all marine ecological features is covered during baseline data collection.

9.3.2 The Study Areas for habitats / benthic communities comprise the intertidal and benthic zones within the Works Area (see **Figure 9.1**) and the ZoI of the Proposed Works. Areas for other groups differ depending on the receptor considered due to the variations in sensitivity of the marine features. The marine ecological features have been scoped in based on their occurrence within the Works Area and immediate environs, and based on their status/distribution, conservation status and legislative protection in the proximity of the Proposed Works and as determined from desk review and field surveys[26,27].

9.3.3 For each species group the Study Areas have been determined based on their mobility and likely extent of impacts resulting from the Proposed Works. Therefore, for pinniped species, Study Areas have been based on established foraging ranges, using distances of 120 km for common seal, and 145 km for grey seal[28]. Natal fish waters have been considered within 200 km of the Works Area, and where there is potential for connectivity between the Works Area and the natal waters to arise[29]. For cetacean species, a distance of 200 km has been applied.

Table 9.4 Extent of Study Areas for each receptor group

Receptor group	Extent
Intertidal habitats/species	20 km
Subtidal habitats/species	20 km
Fish (migratory and non-migratory)	200 km
Cetaceans	200 km
Pinnipeds	120 km for common seal and 145 km for grey seal

9.3.4 The temporal scope of the assessment for marine biodiversity is consistent with the period over which the Proposed Works would be carried out and therefore covers all three decommissioning phases (see **Chapter 2: The Decommissioning Process**).

[25] The zone of influence is the area around the Site that may be affected by the proposed changes within the Site.

[26] Dewey, S., O'Dell, J., and MacMillan, A. (2022). *Hunterston B Marine Habitat Mapping Survey*. A report to Wood Group UK by Seastar Survey Ltd. 77 pages.

[27] WSP (2022) *Hunterston B Nuclear Power Station Intertidal Habitat Validation Survey Results October 2022*

[28] Sea Mammal Research Unit (SMRU) (2011) - *Special Committee on Seals (SCOS) Scientific advice on matters related to the management of seal populations: 2011*. (online) Available at: http://www.smru.st-andrews.ac.uk/files/2016/08/SCOS-2011.pdf (Accessed 28 March 2023).

[29] MMO (2020) *MMO1188: Habitats Regulations Assessment for the North East, North West, South East and South West Marine Plans: Screening Report and Appropriate Assessment Information Report*. (Online) Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/857273/AAIR_final.pdf (Accessed 28 March 2023).

Desk study

9.3.5 Desk studies have been undertaken as a preliminary stage to identify key features of the environment in proximity to the Proposed Works and to identify any designated sites that could potentially be affected within the relevant Study Areas (described in **Table 9.4**).

9.3.6 The assessment has been undertaken with reference to **Chapter 2: The Decommissioning Process**, supported by the following principal data sources:

- Marine Scotland – National Marine Plan interactive map[30];
- Sea Watch Foundation sightings[31];
- Hebridean Whale and Dolphin Trust[32];
- Orca[33]; and
- Literature review and public data relevant to the Firth of Clyde.

Survey work

9.3.7 Site-specific surveys were undertaken in August 2020 for the intertidal zone and in April, June and July 2021 for the subtidal benthic environment. An additional validation survey of the intertidal zone was undertaken in October 2022 to ensure that the scope of the survey completed in August 2020 remained adequate to inform the EIA.

9.3.8 The intertidal survey covered a continuous swathe along the seafront of the Works Area. The subtidal benthic surveys included bathymetry, sidescan sonar, drop-down video, subtidal grab sampling, and habitat mapping and covered two main areas around the cooling water discharge and the cooling water intake (see **Figure 9.2** and **Figure 9.3** for habitat maps derived from these surveys, the findings of which are discussed in more detail below).

Data limitations

9.3.9 The following limitations to the baseline data are acknowledged:

- The acquisition of acoustic data around the “boil” (existing cooling water discharge) was impeded by high reflectivity artefacts due to the high degree of turbulence and aeration of the water column. Echo sounder and sidescan sonar data dropouts occurred at distances of up to 100 – 150 m from the discharge point. Data were acquired as close to the ‘boil’ point as possible whilst ensuring vessel and equipment safety, and several lines were re-run in order to obtain the best possible quality of data over the largest possible area within the survey boundaries. It was not possible to survey the inshore-most section, even at high water. However, bathymetry and sidescan sonar data were acquired to above Admiralty Chart Datum (ACD) throughout the survey area.

[30] Marine Scotland (2023). *Marine Scotland Maps National Marine Plan interactive* (Online). Available at: https://marinescotland.atkinsgeospatial.com/nmpi/ (Accessed 28 March 2023).

[31] Sea Watch Foundation (2021) *National Whale and Dolphin Watch 2021* (online). Available at: https://www.seawatchfoundation.org.uk/wp-content/uploads/2022/01/NWDW-2021-Report_FINAL-2.pdf (Accessed 28 March 2023).

[32] Hebridean Whale and Dolphin Trust (2023) *Sightings Map*. (online) Available at: https://whaletrack.hwdt.org/sightings-map/ (Accessed 04 April 2023).

[33] Orca (2023) *Species Sightings*. (online) Available at: https://www.orcaweb.org.uk/species-sightings/sightings-map (Accessed 04 April 2023).

- Marine mammal data is based on citizen science inputs and literature review rather than dedicated site-specific survey. However, given the location and limited extent of the Proposed Works, the data used are considered adequate for the purposes of this assessment.
- No data on sediment quality around the intake and outfall are available to assess potential contamination, and secondary implications to biodiversity. The limited scope for sediment remobilisation and secondary impacts to biota, however, means that this does not materially affect the conclusions of this assessment. The likely low levels of sediment contamination, and limited mobilisation of seabed material, make it highly unlikely that any significant bioavailability of contaminants will occur.
- No site-specific fish surveys were undertaken, and only limited information is available on the non-commercial fish species in the Firth of Clyde. The limited spatial extent of potential impacts means that this does not materially affect the conclusions of this assessment.
- Uncertainty regarding when marine decommissioning of HNA offshore structures may be undertaken.

9.4 Consultation

Overview

9.4.1 The assessment has been informed by consultation responses and statutory and stakeholder engagement.

Pre-application opinion

9.4.2 A Pre-application opinion was adopted by the ONR, on 04 October 2022. A summary of the relevant responses received in the Pre-application Opinion in relation to marine biodiversity and confirmation of how these have been addressed within the assessment is presented in **Table 9.5**. Also presented are comments from responses received from NatureScot and Scottish Environmental Protection Agency (SEPA), in addition to those incorporated within the formal Pre-application Opinion.

Table 9.5 Summary of Pre-application opinion responses

Paragraph ref.	Consideration	Addressed within the Environmental Statement (ES)
77	ONR notes that birds are not covered in the marine biodiversity chapter and are instead covered in Chapter 7: Terrestrial and Freshwater Biodiversity. This is considered an acceptable approach but impacts on diving birds should be assessed in the EIA e.g. underwater noise effects, potential for disturbance of sediments, and adverse effects on prey species.	Noted. Through liaison between the relevant EIA technical topic teams, all relevant receptors will be appropriately considered, including diving birds, which are captured within **Chapter 8: Terrestrial Biodiversity and Ornithology**.
78	ONR notes that the study area to inform the scope of the EIA for marine biodiversity is not clearly defined and more information should be	Noted. Additional detail around the identification of the Study Area for marine biodiversity has been provided

Paragraph ref.	Consideration	Addressed within the Environmental Statement (ES)
	provided on this for the ES. Further to this, information on the baseline is provided and refers to the habitats in the vicinity of the site presented in Figure 8.1. This figure identifies a 'discharge boil area' but it is not clear from the scoping report what this is, and how it impacts on marine biodiversity. This should be explained in the ES.	within this ES (**Section 9.3**). The 'discharge boil area' (the area of turbulent water surface caused by the outfall discharge) has also been considered in greater detail, along with the implications of discharge ceasing, noting that the cessation of cooling water discharge is not part of the current scheme of works being assessed.
79	In determining the significance of an effect on potential receptors, the report states in paragraph 8.5.10 that ecological features that are not considered 'important' from a geographic context are those that are sufficiently widespread, unthreatened and resilient and will remain viable and sustainable irrespective of the decommissioning project. ONR notes that all marine receptors that are potentially affected by the project should be included in the scope and cannot be scoped out on the basis that they are widespread. The ES should provide further clarity on the term 'importance' in the context of a receptor sensitivity.	Noted. Additional detail concerning receptor 'importance' has been included within **Section 9.7**. Furthermore, as confirmed in paragraph 8.6.10 of the Scoping Report, no identified potential effects or receptors have been scoped out of the assessment at this stage, with the exception of European sites (due to the distances between marine sites and absence of potential pathways of effect). However, additional detail on European sites is presented within the Habitats Regulations Appraisal Screening Report.
81	As reported in Table 8.8 of the Scoping Report, there is potential that explosives could be used in the marine environment. This may result in disturbance to marine fauna as a result of underwater noise. The impact of noise and vibration on marine fauna, and physical harm/damage to marine habitats and species as a result of the use of explosives should be assessed, along with the possible disturbance to sediment and potential contaminant release.	The use of explosives in the marine environment has now been discounted for the preference of more conventional decommissioning and dismantling methods. This has removed the requirement to consider the impact of noise and vibration from this specific source of potential impact.
82	ONR received a consultation comment that EDFE should ensure engagement with the relevant bodies on the proposals for remedial work on offshore infrastructure to ensure that the known non-native species within this region are not spread from this area.	Noted. As the Proposed Works progress, the Site licensee will undertake appropriate engagement with respect to the relevant issues. The potential for the spread of invasive and non-native species (INNS) as a result of the Proposed Works has been addressed within **Section 9.10**.
83	Further to this, a consultee responded with a suggestion that the ES reviews the local Sites of Special Scientific Interest (SSSI) in the vicinity of the site and includes an assessment of the impacts of water and airborne pollution (including noise and light), as well as hydrodynamic change, both direct and indirect impacts. ONR agrees with this suggestion.	Noted. Liaison with other relevant technical topic specialists has been undertaken to ensure potential effects as a result of noise, light and water pollution on marine biodiversity are addressed appropriately within **Section 9.10**.

Paragraph ref.	Consideration	Addressed within the Environmental Statement (ES)
84	As the site is no longer operating, the thermal plume from the warmer cooling water effluent being discharged into the marine environment has ceased. Whilst the impact of this activity ending on marine habitats and species is out of scope of EIADR, it would be useful to understand how this has been considered in establishing the current baseline for the EIA. In addition to this, section 8.3.11 states that seaweed removal campaigns will cease during the decommissioning project. Consideration as to how this may alter the existing habitat at the site needs to be considered when establishing current and future baselines and the potential effects on the marine environment as a result of this should also be considered in the EIA.	Reference to the cessation of discharge from HNB, including with reference to the 'boil area' noted in paragraphs 9.3.9 and 9.5.59, has been included and discussed as appropriate within **Section 9.10**. Potential effects on the intertidal zone following the cessation of seaweed removal campaigns have also been considered from both a current and future baseline perspective, including when assessing habitats within the intertidal area.

Technical engagement and non-statutory consultation

9.4.3 A targeted stakeholder meeting was held with SEPA on 26 October 2023. The meeting covered a project overview, information on the decommissioning process and additional project description information for context. The assessment methodologies, draft findings and environmental measures were presented for a range of environmental aspects, including those for **Chapter 10: Coastal Management and Water Quality**, which are inherently linked to marine biodiversity. A summary of this marine biodiversity assessment was also presented.

9.4.4 Similar issues were presented to the Clyde Marine Planning Partnership on 2 November 2023, where the findings of the assessments were discussed with CMPP representatives.

9.4.5 Additional consultation responses are presented in **Table 9.6**.

Table 9.6 Consultation responses

Consultee	Consideration	Addressed within the Environmental Statement (ES)
NatureScot	Regarding Southannan Sands SSSI: We note, table 8.7, that important ecological receptors, including the SSSI and its associated Priority Marine Features (PMF) have been identified as being at potential risk from changes in coastal hydrodynamics as a result of any removal of existing marine infrastructure associated with the power station.	Noted. Potential effects on PMF have been considered, and are assessed within **Section 9.10**.
NatureScot	Regarding Kames Bay and Ballochmartin Bay SSSIs: These two SSSIs are located 3 km to the north west and 4.5 km to the north of the proposal area respectively. The notified features of these two sites are the flora and	Noted. Whilst Kames Bay and Ballochmartin Bay SSSIs (on Great Cumbrae Island) are considered within the baseline (**Section 9.5**), they are separated from the Works Area by a

Consultee	Consideration	Addressed within the Environmental Statement (ES)
	fauna of the intertidal area (the area between the highest and lowest tidal levels). Atmospheric and water based pollution impacts may arise from the marine and terrestrial component works of this proposal. We advise that these impacts are assessed and mitigation proposed if necessary.	deep water channel, and there is no scope for impacts to arise on them. As such, they were scoped out from requiring further assessment in the HNB EIADR Scoping Report in 2022.
NatureScot	The Scoping report addresses the topic of marine species that need to be evaluated as part of the impact assessment for this development. We advise that the following European Protected Species (EPS) and PMF species are all found within the Firth of Clyde: harbour porpoise, bottlenose dolphin, common dolphin, minke whale, harbour seal, grey seal and basking shark. Due to the potential for disturbance and auditory injury impacts via noise during decommissioning works, the impact of the development on these receptors needs to be evaluated.	Noted. Acknowledging the considerable range of environmental conditions within the wider Firth of Clyde, these receptors are considered where appropriate within **Section 9.10**. Although it's acknowledged that many of these occur within the wider Firth, they may not be present in the immediate vicinity of Hunterston as outlined within the Scoping Report.
NatureScot	We note that the scoping report identifies native oyster (Ostrea edulis) and sea grass beds, both Priority Marine Features (PMFs), in the vicinity of the Site. PMFs do not have legislative protection, but the basis for protection of their national status across Scottish waters is included in the National Marine Plan. As such The Office for Nuclear Regulation as regulatory authority, must be provided with sufficient detail to consider the effect of the proposal on PMFs before the proposal can be consented.	Noted. Local intertidal and subtidal surveys did not identify native oyster as being present within the ZoI of the Proposed Works.
NatureScot	We welcome the emphasis placed in the Scoping report (Table 19.1) to scope in the management of invasive species. The decommissioning activities will need to be assessed for the potential to increase the spread of INNS into the surrounding marine and terrestrial areas, including the adjacent SSSI. These risks should be assessed in the EIA and mitigation proposed where required.	Noted. No INNS were recorded as being present during surveys at the Site, and assuming compliance with standard regulations, e.g. Ballast Water Convention, there is no scope for the introduction of new marine species.
SEPA	Chapter 8, Marine Biodiversity, should make reference to the following; Scotland's National Marine plan and associated policies including Planning Circular 1/2015: Relationship between the statutory land use planning system and marine planning and licencing, and the Firth of	Noted. A Biosecurity Management Plan will be established for the Proposed Works, to be implemented as part of the Environmental Management Plan. This will consider the Firth of Clyde Biosecurity Plan[34],

[34] Firth of Clyde Forum (2012). Firth of Clyde Biosecurity Plan 2012-2016. (online) Available at: https://www.clydemarineplan.scot/wp-content/uploads/2016/05/FoCF-Biosecurity-plan.pdf. (Accessed November 2023).

Consultee	Consideration	Addressed within the Environmental Statement (ES)
	Clyde Biosecurity Plan. Whilst the WANE Act has been mentioned there is no mention of any biosecurity planning. We believe biosecurity will be an important issue as the proposal is to remove the infrastructure associated with the complex intertidal areas although we do note they are not removing the sub-surface cooling water pipes. Given that this water body is contaminated with three known marine non-native species (including Dvex) it is recommended that you consult with the appropriate leads in Marine Scotland to draw-up a biosecurity programme to prevent the spread of marine non-native species from this area – particularly if barges are going to be used to remove material from the site.	and be subject to consultation with key stakeholders during the marine licensing process.

9.5 Overall baseline

Current baseline

9.5.1 This section sets out the baseline environmental characteristics of the Site and surrounding areas with respect to marine biodiversity.

The Site and its surrounds

9.5.2 The Site is located on the Firth of Clyde along the Ayrshire coastal mainland, opposite the island of Little Cumbrae.

9.5.3 The majority of the Works Area is situated between 100 m and 400 m inland of the MHWS mark. The nearest landward approaches are at the south-west corner of the Works Area and immediately to the north-east of the surface water outfall in the north-west. Marine infrastructure associated with HNB within the Works Area includes a cooling water outfall extending approximately 300 m into the Firth of Clyde and a cooling water intake structure that is cited at the end of a jetty (170 m in length). The landward end of the jetty is situated approximately 600 m south-south-west of HNB and is accessed via Power Station Road. The jetty is built over the concrete cooling water intake pipe for Hunterston A (HNA) power station. The cooling water intake runs under the seabed in a straight line between the intake structure and the intake land shaft, located to the south-west of the Site.

9.5.4 The shoreline immediately to the west of the Site comprises a variety of coastal habitats, including shingle, grasslands and cobbled shores. The sandflats located approximately 0.2 km north of the Site form part of Southannan Sands SSSI, which is designated for the intertidal sandflat habitat that extends over 4 km along the coast to the north of the Works Area. There is no spatial overlap between Southannan Sands SSSI and the Works Area.

Designated Sites

9.5.5 The Inner Hebrides and the Minches Special Area of Conservation (SAC) is the closest designated site with marine qualifying features and is designated for harbour porpoise.

This SAC is located approximately 42.9 km from the Works Area by sea and is outside of the Firth of Clyde.

9.5.6 Other SACs designated for marine features within the Study Area (see **Section 9.3**) are:

- For harbour porpoise: North Channel SAC (92.7 km, SW); Skerries and Causeway SAC (107.5 km, SW);
- For seals: Eileanan agus Sgeiran Lios mor SAC (common seal) (91.3 km, N) and Treshnish Isles SAC (grey seal) (125.6 km, NW); and
- For migratory fish: Solway Firth SAC (112 km, SE); Afon Gwyrfai a Llyn Cwellyn SAC (292.1 km, S); Dee Estuary/ Aber Dyfrdwy SAC (277.6 km, SE); River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid SAC (300.8 km, S); River Derwent and Bassenthwaite Lake SAC (147 km, SE); River Bladnoch SAC (77.3 km, S); Endrick Water SAC (44.2 km, NE); and Little Gruinard River SAC (222.6 km, N).

9.5.7 The South Arran Marine Protected Area (MPA) is within 20 km to the west of the Works Area, with protected features including maerl beds, kelp and seaweed communities, burrowed mud, and one of the Clyde's largest seagrass beds.

9.5.8 There are three SSSIs within 10 km of the Works Area with marine and coastal features:

- Southannan Sands SSSI (0.2 km north along the coast);
- Kames Bay SSSI (2.10 km north-west, on Great Cumbrae); and
- Ballochmartin Bay SSSI (3.50 km north, on Great Cumbrae).

9.5.9 Seal haul-out sites are designated under Section 117 of the Marine (Scotland) Act 2010[35]. The nearest designated haul-out is at Troon Rock (approximately 25 km south-southeast of the Works Area, in the outer Clyde) [36].

Intertidal ecology

9.5.10 A total of eight biotopes (five hard substrate and three sedimentary) were recorded during an intertidal validation survey of the foreshore on 07 October 2022[27] (see **Figure 9.2**). Ten biotopes were recorded in a previous survey in 2020 (Figures 3.1 and 3.2 in Wood (2021))[37].

9.5.11 The biotopes recorded across 2020 and 2022 ranged from those typical of a more exposed shore to the south, with a transition to sedimentary biotopes in the more sheltered bay at Hunterston Sands at the north end of the survey area. A summary of the biotopes recorded is presented in **Table 9.7**.

9.5.12 Generally, the intertidal area is characteristic of a moderately-exposed to exposed environment with a large area of fucoid habitat on the lower shore, supporting bladder wrack, knotted wrack (*Ascophyllum nodosum*), toothed wrack (*Fucus serratus*), spiral wrack (*F.spiralis*), bladder wrack (*F.vesiculosus*) and channelled wrack (*Pelvetia canaliculata*). The single bladder morphological variant of *F.vesiculosus* observed during

[35] Seal haul-outs are locations on land where seals come ashore to rest, moult or breed. Marine Scotland has been working closely with the Sea Mammal Research Unit (SMRU) to identify suitable sites for designation. Harassing a seal (intentionally or recklessly) at a haul-out site is an offence under the Act.

[36] NRS (2013). *Designated Seal Haul-out Site in Seal Management Area 1 South-West Scotland as set out in an order made under section 117 of the Marine (Scotland) Act 2012*. (online) Available at: https://webarchive.nrscotland.gov.uk/20180105052418mp_/http:/www.gov.scot/Resource/0045/00454611.pdf (Accessed 14 April 2023).

[37] Wood (2021) *Hunterston B Nuclear Power Station Intertidal Survey Results*. Report for EDF Energy. Document ref: 42667-WOOD-XX-XX-RP-OM-0006_A_C1.

surveys suggests a lower energy shoreline. Dwarf eelgrass (*Zostera noltii*) is found along the intertidal sediment flats at Southannan Sands SSSI, to the north of the Site. The flats comprise fine to medium sheltered sands, with a small area of mud/silt at Fairlie Sands.

9.5.13 Some changes were observed between the 2020 and 2022 Phase 1 habitat surveys, most notably in the northern extent of the survey area as follows:

- The 2022 survey identified a more mixed littoral sediment (LS.LMx.Mx) compared to the subtidal muddy sand (SS.Smu.IsaMu) observed in 2020. Increased records of macroalgae and boulders may be the result of better access (due to lower water levels whilst conducting the 2022 survey) or may be the result of large storm events, which may have moved boulders up the shore or scoured sand away from the boulders.
- Barren shingle biotope (LS.LCS.Sh.BarSh), extends further south and further down the shore compared to the 2020 survey, which recorded a range of biotopes in this area.

9.5.14 During the operation of HNB, it was necessary to clear kelp (*Laminaria* spp.) at regular intervals from the vicinity of the cooling water intake to prevent blockages of the intake screens. This was undertaken by a local fishing vessel *Eilidh Anne* under a marine licence issued by Marine Scotland. The marine licence (07254/20/0) was valid until June 2023 and allowed the removal of 50 tonnes of seaweed per annum. Since cessation of generation at HNB, seaweed removal campaigns along the Hunterston foreshore have ceased. The very limited quantity of seaweed involved is not considered enough to affect the overall habitat composition of the intertidal zone. It is therefore considered that the cessation of seaweed removal does not materially affect the current baseline or identification of key baseline features.

9.5.15 No INNS, Priority Marine Features (PMFs) or protected species or other notable fauna or flora were recorded as being present in the intertidal area.

Table 9.7 Summary of intertidal biotopes recorded during the 2022 survey

Biotope code	Biotope name	Species recorded
Hard Substrate Biotopes		
LR.FLR.Lic.YG	Yellow and grey lichens on supralittoral rock	n/a
LR.MLR.BF.Fser.Bo	*Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders	*Fucus serratus* *Semibalanus balanoides* *Patella vulgata* *Littorina littorea*
LR.MLR.BF.Fser.R	*Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders	*Fucus serratus* *Fucus vesiculosus* Ulvaceae Rhodophyceae *Semibalanus balanoides* *Patella vulgata* *Littorina* spp.
LR.LLR.FVS.AscVS	*Ascophyllum nodosum* and *Fucus vesiculosus* on variable salinity mid eulittoral rock	*Ascophyllum nodosum* *Fucus vesiculosus* *Fucus spiralis* *Ulva intestinalis* *Pelvetia canaliculata*

Biotope code	Biotope name	Species recorded
LR.FLR.Eph.EphX	Ephemeral green and red seaweeds on variable salinity and/or disturbed eulittoral mixed substrata	*Ulva lactuca* *U. intestinalis*
Sedimentary Biotopes		
LS.LCS.Sh.BarSh	Barren Littoral Shingle	n/a
LS.Lsa.MuSa	Polychaete/bivalve-dominated muddy sand shores	n/a
LS.LMx.Mx	Littoral mixed sediment	*Fucus serratus* *Fucus vesiculosus* *Ascophyllum nodosum* *Patella vulgata* *Semibalanus balanoides* *Littorina littorea*

Subtidal benthic ecology

9.5.16 Subtidal benthic sampling was undertaken between April and July 2021. Surveys comprised acoustic surveys in April followed by drop-down camera and grab sampling in June and July. Acoustic surveys consisted of single beam bathymetry and sidescan sonar. A drop-down camera survey captured underwater imagery (video and still photography), whilst grab surveys collected samples from each of the habitats identified in the acoustic surveys for both substrate particle size analysis and macrobenthic invertebrate analyses. The findings of these surveys have been reported separately[38].

General characteristics

9.5.17 The existing large volume cooling water outfall forms an area of highly disturbed water colloquially referred to as “the boil”. The seabed around this is predominantly characterised by macrophyte-dominated sediments, with areas of high energy infralittoral rock. In the vicinity of the cooling water intake, two habitat types are dominant: macrophyte-dominated sediments and gravelly mixed sediments. Habitats in the vicinity of the Site are presented in **Figure 9.2**.

9.5.18 Marine Scotland Map NMPi[30] shows no PMFs located sufficiently close to the Works Area to be affected by the Proposed Works. However, some of the biotopes recorded during site surveys (paragraph 9.5.25 to 9.5.42) qualify as the PMF habitat ‘kelp and seaweed communities on sublittoral sediment’ and the assessment has been made on the basis that PMFs are present within the Study Area.

9.5.19 Echo soundings show that the area surveyed (**Figure 9.3**) is relatively shallow, with depths varying between 7.50 m and 7.99 m below Admiralty Chart Datum (ACD) around the cooling water intake and 1.5 m above ACD in the cooling water discharge survey area. A shallow bank is present to the west of the cooling water outfall, extending 400 m. An area of deeper water, (approximately 5 m below ACD) extends toward the coast on the south side of the jetty. At the time of survey (2021) while the power station was still operational, a large eddy was observed in this location, possibly caused by the flow of water toward the cooling water intake.

[38] Dewey, S., O’Dell, J., and MacMillan, A. (2022). *Hunterston B Marine Habitat Mapping Survey*. A report to Wood Group UK by Seastar Survey Ltd. 77 pages.

9.5.20 Analysis of the sidescan sonar data[39] identifies three main substrate types:

- areas of clear sediment (i.e. without large areas of macrophytes or other seabed features being present) made up of sand and gravels at depths >2.5 m below ACD around the cooling water intake, which are probably locally influenced by increased current flows resulting from the cooling water intake;
- areas of sediment with cobbles and boulders in shallower regions <2.5 m below ACD, supporting dense macroalgal communities, with exposed bedrock in water depths around ACD closer to the shore; and
- areas dominated by sand and gravel with densely packed cobbles and boulders around the cooling water outfall.

Particle size analysis

9.5.21 Three different sediment substrate types are present, namely slightly gravelly sand, gravelly sand and sandy gravel. The former two were the most common sediment type.

9.5.22 Within these broad classes, the two subtidal survey areas are characterised by similarly variable sediments including fine to medium sands, fine to very fine sands with a smaller coarse gravel fraction, very fine to medium gravels with together with a significant fine sand fraction and coarse to very coarse sands.

9.5.23 Sand fractions are high (69.2 – 98.3%) and proportions of mud are low (maximum 2.75%) in almost all samples, classified as being moderately sorted.

Habitat mapping and classification

9.5.24 The following EUNIS Level 3 habitats have been identified in the Study Area:

- High Energy Infralittoral Rock;
- Low Energy Infralittoral Rock;
- Macrophyte Dominated Sediment; and
- Sublittoral Sand.

9.5.25 A total of 8 Marine Nature Conservation Review (MNCR) biotopes were identified from underwater image analysis as shown in **Figure 9.3** and described in **Table 9.8**.

Table 9.8 Summary of biotopes recorded during the benthic survey

Biotope code	Biotope name	Features
IR.LIR.K.Sar	*Sargassum muticum* on shallow slightly tide-swept infralittoral mixed substrata	INNS: *Sargassum muticum*
IR.HIR.Ksed.LsacSac	*Laminaria saccharina* and/or *Saccorhiza polyschides* on	INNS: *Sargassum muticum*

[39] The sidescan sonar signal in the cooling water discharge survey area was impacted by the highly aerated water coming from the discharge pipe. The aerated water acts as a strong acoustic reflector, preventing the soundwaves from reaching the seabed and resulting in patches of no seafloor data.

Biotope code	Biotope name	Features
	exposed infralittoral rock	
SS.SMp.KSwSS	Kelp and seaweed communities on sublittoral sediment	PMF: Kelp and seaweed communities on sublittoral sediment
SS.SMp.KSwSS.LsacCho	*Laminaria saccharina* and *Chorda filum* on sheltered upper infralittoral muddy sediment	PMF: Kelp and seaweed communities on sublittoral sediment INNS: *Sargassum muticum*
SS.SMp.KSwSS.LsacR	*Laminaria saccharina* and filamentous red algae on infralittoral sand	PMF: Kelp and seaweed communities on sublittoral sediment INNS: *Sargassum muticum*
SS.SMx.Imx	Infralittoral mixed sediment	PMF: kelp and seaweed communities on sublittoral sediment INNS: *Sargassum muticum*
SS.Ssa	Sublittoral sands and muddy sands	PMF: kelp and seaweed communities on sublittoral sediment INNS: *Sargassum muticum*
SS.Ssa.ImuSa	Infralittoral muddy sand	n/a

9.5.26 Four biotopes are present in the vicinity of the outfall and intake structures:

- IR.LIR.K.Sar ('*Sargassum muticum* on shallow slightly tide-swept infralittoral mixed substrata');
- SS.SMp.KSwSS ('Kelp and seaweed communities on sublittoral sediment');
- SS.SMp.KSwSS.LsacCho ('*Laminaria saccharina* and *Chorda filum* on sheltered upper infralittoral muddy sediment'); and
- SS.SMp.KSwSS.LsacR ('*Laminaria saccharina* and filamentous red algae on infralittoral sand').

9.5.27 SS.SMp.KSwSS.LsacR is the most common biotope. The PMF habitat 'kelp and seaweed communities on sublittoral sediment' is present where any SS.SMp.KSwSS (and subtype) biotopes are identified. No other PMFs are present.

9.5.28 The INNS *Sargassum muticum* is frequently recorded in both survey areas, usually on cobbles and boulders overlying coarse sediment, although the substrate was not always visible, particularly in the still images. The species is present at almost all sites, usually within the IR.LIR.K.Sar ('*Sargassum muticum* on shallow slightly tide-swept infralittoral mixed substrata') biotope.

Kelp beds

9.5.29 The benthic environment in the Study Area is generally characterised by dense macroalgal communities on soft sediments with occasional cobbles and boulders present.

The most common macroalgae include the kelps *Saccharina latissima* and *Chorda filum*, with *Saccorhiza polyschides* recorded in one replicate sample.

9.5.30 These kelps generally coincide with a variety of filamentous and finely branching brown seaweeds and filamentous and foliose red algae. Robust species including the brown seaweeds *Dictyosiphon foeniculaceus*, *Desmarestia aculeata*, *Halidrys siliquosa*, *Fucus serratus* and the red seaweed *Odonthalia dentata* are also present.

9.5.31 Kelp beds are underwater forests formed by seaweeds (the most common in Scotland being *Laminaria digitata*, *Laminaria hyperborea*, *Saccharina latissima* and *Saccorhiza polyschides*). They provide important shelter and feeding areas for many marine species including several of commercial significance. Kelp beds also play an important role in recycling coastal nutrients.

9.5.32 Because kelps are attached to rocks rather than being rooted in sediment, they grow in areas with strong currents and waves. They therefore dissipate wave energy and can offer some degree of coastal protection from storms.

9.5.33 Current threats to kelps are global warming, temperature fluctuations, sea-level rise and unsustainable harvesting.

Seagrass beds

9.5.34 While the intertidal validation survey did not record any seagrasses, they are present at Southannan Sands SSSI approximately 0.2 km away. They are very vulnerable to pollution (particularly elevated nitrates from urban or farm run-off), trampling and dredging, nearby coastal developments, and competition from INNS. They are also an UK Biodiversity Action Plan (BAP) priority habitat[40] and are considered as threatened and declining habitat by OSPAR[41].

9.5.35 Two species of seagrasses occur in Scotland; common eelgrass *Zostera marina* and dwarf eelgrass *Zostera noltii.* The salt-tolerant tasselweed *Ruppia maritima* is also found, though generally not considered a marine species, Seagrass beds are a very important PMF as they provide a variety of ecosystem functions including shelter and foraging areas for a wide range of fauna and nurseries for fish. They also stabilise coastlines with their root systems, preventing erosion of the seabed and coast. Seagrasses grow in shallow coastal areas in sandy or muddy beds, sometimes together with maerl in exposed areas at low tides to maximum depths of 10 m.

Epifauna

9.5.36 Epifauna is generally scarce. The most commonly identified taxa during the surveys were epiphytic, including the encrusting bryozoans *Membranipora membranacea* and *Electra pilosa*, short hydroid turf (likely *Obelia sp*.), small gastropods and serpulid worms. The anemone *Cerianthus lloydii* was occasionally recorded in images of muddy and mixed sediments, and sea stars including *Asterias rubens* and *Marthasterias glacialis* were also occasionally identified. These substrates are widely distributed across the Survey Area, thus the distribution of these occasional species is not localised within any specific zone.

[40] UK BAP priority habitats are those identified as being the most threatened and requiring conservation action.

[41] OSPAR (2023). *List of threatened and/or declining species and habitats*. (Online) Available at: https://www.ospar.org/work-areas/bdc/species-habitats/list-of-threatened-declining-species-habitats (Accessed: 06 April 2023).

Macrobenthic infauna

9.5.37 In general, the macrofauna is dominated by Annelida (35.5% of all individuals), Crustacea (29.9%), Nematoda (17.7%) and Mollusca (1.1%). Species diversity is generally high across all sampling locations, but shows a large degree of variation across the survey area. Other groups, such as Platyhelminthes, Nemertea, Echinodermata, Phoronida, Actiniaria, Pycnogonida, Ascidiacea and Chordata are recorded in very small proportions.

9.5.38 The taxa exhibit clear differences in abundance between the two survey areas. The most abundant taxon overall is Nematoda, usually considered meiofaunal rather than part of the macrobenthos, which makes up 17.7% of all individuals identified. Nematodes are present in all samples but are particularly common in the cooling water intake survey area. The other most common taxa are the harpacticoid copepod *Thalestris longimana* (12.5%) and the oligochaete *Grania spp.* (12.4%), with the *T. longimana* far more common in the cooling water intake survey area while the *Grania spp.* Is more common in the cooling water outfall survey area. The bivalve *Macomangulus tenuis* is abundant in the cooling water outfall survey area, while the second-most abundant bivalve species *Kurtiella bidentata* is more abundant in the cooling water intake survey area. This geographical split is also observed in the most abundant polychaete species where *Protodorvillea kefersteini* is far more abundant in the cooling water intake survey area while the syllid *Streptosyllis websteri* is most abundant in the cooling water discharge survey area.

9.5.39 In general, species diversity is high in all samples, with a total number of individuals being the highest in the samples from the intake survey area ($\bar{x}$ = 1,797 individuals per sample, range = 778 – 3,529) compared to the outfall survey area ($\bar{x}$ = 833, range = 352 – 1,228). The total number of taxa recorded exhibited a similar pattern, with the highest number of taxa present in samples from the intake survey area ($\bar{x}$ = 84 taxa per sample, range = 63 – 102) compared to the outfall survey area ($\bar{x}$ = 56, range = 47 – 74). However, a lower diversity index is observed at the north of the cooling water intake in contrast with the high diversity at the south-west of the intake. Furthermore, although lower in the total number of individuals sampled, samples in the cooling water discharge area exhibit higher diversity.

9.5.40 The total biomass is not consistent between the two survey areas and is generally higher in the intake survey area (approximately 1.3 g to 5.3 g) than the outfall survey area (approximately 0.5 g – 2.9 g). The total biomass in both survey areas is dominated by Molluscs, followed by almost equal proportions of Annelids and Crustacea.

Infaunal biotopes

9.5.41 Biotopes are difficult to assign in the vicinity of the cooling water outfall however, species recorded during the 2021 surveys are indicative of the biotope SS.Ssa.IfiSa.TbAmPo ('Semi-permanent tube-building amphipods and polychaetes in sublittoral sand'), with particularly high numbers of the bivalve *Mytilus tenuis*, characteristic of intertidal fine sand biotopes. Other samples have been identified as SS.SCS.ICS ('Infralittoral coarse sediment') and IR.LIR.K.Sar ('*Sargassum muticum* on shallow slightly tide-swept infralittoral mixed substrata').

9.5.42 Large numbers of nematodes, polychaetes and bivalves are present around the cooling water intake. Biotopes include SS.SCS.CCS.Pkef ('*Protodorvillea kefersteini* and other polychaetes in impoverished circalittoral mixed gravelly sand'), and general sandy muds and muddy mixed sediments.

Table 9.9 Summary of biotopes recorded during the benthic survey

Biotope code	Biotope name	Species recorded
IR.LIR.K.Sar	*Sargassum muticum* on shallow slightly tide-swept infralittoral mixed substrata	n/a
SS.SCS.ICS	Infralittoral coarse sediment	Presence of bivalve mollusc *Kurtiella bidentata*
SS.SCS.CCS.Pkef	*Protodorvillea kefersteini* and other polychaetes in impoverished circalittoral mixed gravelly sand	Very high numbers of nematodes
SS.Ssa.IfiSa.TbAmPo	Semi-permanent tube-building amphipods and polychaetes in sublittoral sand	High numbers of the bivalve mollusc *Macomangulus tenuis*

Fish

9.5.43 Fish fauna within the Firth of Clyde is described by Heath and Speirs (2011)[42], McIntyre *et al.*, (2012)[43] and within Scotland's Marine Atlas[44]. A total of 70 fish taxa have been recorded during survey trawls by Marine Scotland between 1927 and 2009, from which 59 were demersal species.

9.5.44 Common species recorded (in over 90% of samples) include hake *Merluccius merluccius*, long rough dab *Hippoglossoides platessoides*, dab *Limanda limanda*,grey gurnard *Eutrigla gurnardus,* cod *Gadus morhua*, whiting *Merlangius merlangus,* poor cod *Trispoterus minutus*, and Norway pout *T.esmarki*, Pelagic species such as herring *Clupea harengus* and sprat *Sprattus sprattus* have also been recorded, though slightly less frequently than the main demersal species. Several species recorded are listed on the Scottish Biodiversity List[45] (SBL), including skate *Dipturus batis*, thornback ray *Raja clavata*, twaite shad *Also fallax*, plaice *Pleuronectes platessa*, herring and cod.

9.5.45 Although data collection by Marine Scotland ceased over 10 years ago and there have since been some changes to the fish community within the Clyde (particularly with respect to the collapse of the herring fishery and the subsequent increase in sprats)[46], the data collated provides a useful indicative baseline of the general fish community of the region.

9.5.46 Marine Scotland[47] identifies the wider Firth of Clyde as spawning grounds for sprat *Sprattus sprattus*, sand eel *Ammodytes tobianus* and haddock, and nursery grounds for whiting, sand eel, saithe and herring. The Clyde is also identified as playing host to high

[42] Heath, M and Spiers, D (2011) *Changes in species diversity and size composition in the Firth of Clyde demersal fish community* (1927-2009). Proceedings of the Royal Society, Volume 279, 543-552.

[43] McIntyre, F., Fernandes, P.G. and W.R., Turrell (2012) *Scottish Marine and Freshwater Science*, Volume 3, 2043-7722.

[44] Marine Scotland (2011) *Scotland's Marine Atlas: Overall Assessment* (online). Available at: https://marine.gov.scot/information/scotlands-marine-atlas-overall-assessment-2011 (Accessed 05 April 2023).

[45] NatureScot (2020). *Scottish Biodiversity List.* (Online) Available at: https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy-and-cop15/scottish-biodiversity-list (Accessed 05 April 2023).

[46] Lawrence & Fernandes (2021) *A switch in species dominance of a recovering pelagic ecosystem* Current Biology 31, 4354–4360. October 11, 2021 ª 2021 Elsevier Inc. Available at: https://doi.org/10.1016/j.cub.2021.07.020

[47] Marine Scotland (2014). *Fisheries Sensitivity Maps*. (Online) Available at: https://marine.gov.scot/information/fisheries-sensitivity-maps (Accessed 05 April 2023).

intensity nursery grounds for cod, hake (*Merluccius merluccius*), ling (*Molva molva*) mackerel and spurdog (*Squalus acathias*)[48].

9.5.47 Basking shark *Cetorhinus maximus* are regularly recorded around the outer Firth of Clyde, mostly between April and October. The species is listed within the SBL and protected within the 12 nm limit off Scotland under the Wildlife and Countryside Act 1981[7]. Basking shark are considered vulnerable on a global level and declining numbers within the UK have resulted in the species being classified as 'endangered' on the IUCN Red List[49]. No observations of basking sharks were recorded whilst surveys were completed in 2020, 2021 and 2022. Basking sharks have been sighted once within Kames Bay (Great Cumbrae Island) in 2022-2023, as reported by the Hebridean Whale and Dolphin Trust[50].

9.5.48 Six migratory (diadromous) species are known to frequent waters surrounding the Works Area as they migrate between marine and freshwater environments. These species include Atlantic salmon *Salmo salar*, sea trout *Salmo trutta*, European eel *Anguilla anguilla*, Twaite Shad *Alosa fallax*, river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*[51, 52]. All six species are included within the SBL of principal importance for biodiversity conservation in Scotland.

9.5.49 The migration periods for the relevant migratory fish species inhabiting the Clyde Estuary are presented in **Table 9.10**.

Table 9.10 Fish migration periods

Species	Period											
	J	F	M	A	M	J	J	A	S	O	N	D
Atlantic salmon	■	■	■	■	■	■						
Sea trout				■	■	■	■	■	■			
European eel						■	■	■	■	■	■	■
Twaite Shad				■	■	■						
River lamprey			■	■	■				■	■	■	
Sea lamprey			■	■	■	■						

9.5.50 The Clyde Management Plan[14] assessed that there are 'many concerns' for fish populations, but the situation is currently 'static' and therefore neither worsening nor improving. The recovery of the fish stock is important, and the management plan notes

[48] Ellis, J.R., Milligan, S.P., Readdy, L., Taylor, N. and Brown, M.J. 2012. *Spawning and nursery grounds of selected fish species in UK waters*. Sci. Ser. Tech. Rep., Cefas Lowestoft, 147: 56pp

[49] IUCN (2022). *The IUCN Red List of Threatened Species*. (Online) Available at: https://www.iucnredlist.org/ (Accessed 16 May 2023)

[50] Hebridean Whale and Dolphin Trust (2023) *'Whale Track' records tracker* (Online). Available at: https://whaletrack.hwdt.org/all-records/. (Accessed 11 May 2023)

[51] Jackson, F.L., Millidine, K.J., Glover, R.S., Fryer, R.J., Malcolm I.A. (2022) *NEPS Fish Species Presence/Absence 2018, 2019, 2021*. DOI: 10.7489/12404-1.

[52] O'Reilly, M., Nowacki S., and Elliott M., (2016). *A Citizen Science approach to monitoring migratory lampreys under the Water Framework Directive, with some new accounts of Sea Lampreys (Petromyzon marinus) from south west Scotland*. The Glasgow Naturalist Volume 26, Part 2, 102-105.

the importance of protecting nursery grounds and by supporting improvement in the overall condition of the marine environment[44].

Marine mammals

9.5.51 Fifteen species of cetaceans have been recorded since 1980 in the Firth of Clyde. However, the lack of peer-reviewed data available on their abundance limits the ability to determine current population status and trends adequately. Any reliable scientific data is restricted to observations of distribution rather than determining numerical abundance[53].

9.5.52 Species recently recorded in and around the Firth of Clyde include harbour porpoise *Phocoena phocoena*, northern bottlenose whale *Hyperoodon ampullatus*, killer whale *Orcinus orca*, Risso's dolphin *Grampus griseus*, common dolphin *Delphinus delphis* and bottlenose dolphins *Tursiops truncatus*, and minke whale *Balaenoptera acutorostrata*, although it should be noted that all were reported in relatively low numbers[54,55,56].

9.5.53 The species most frequently seen near the Works Area are common dolphin, bottlenose dolphin and harbour porpoise. In the most recent sightings (2022-2023), Risso's dolphin was observed on a number of occasions within the Kennacraig waters, as reported by Sea Watch Foundation[54]. There are no known major resident[57] marine mammal populations, breeding or nursery areas in close proximity to the Works Area.

9.5.54 Both common seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*) are known to frequent Great Cumbrae and the other islands of the Firth of Clyde on occasion. A minor haul out is located at the Eileans, just off Millport. Though there are no major seal haul outs in the inner Firth of Clyde, Troon Rock (approximately 25 km away) is recognised for its importance and is a designated haul-out.

Future baseline

9.5.55 A gradual improvement in the ecological condition within the Works Area would be consistent with the Scottish SBL Strategy [58], which notes an overall 6.7% improvement in the condition of protected habitats and species in Scotland, since 2005. From a marine and coastal perspective, the long-term goal is ongoing progression towards a clean, healthy, safe, productive and diverse environment, achieving an overall 'good' environmental status for Scottish seas. This however cannot be guaranteed; thus, the assessment will be based on projections from the current baseline environment described above.

9.5.56 Climate change is likely to alter the status and distribution of many species, habitats and communities in the long term, and is referenced as a particular challenge for the marine

[53] Scottish Government (2021) *Scottish Marine and Freshwater Science Volume 3 Number 3: Clyde Ecosystem Review* (online) Available at: https://www.gov.scot/publications/scottish-marine-freshwater-science-volume-3-number-3-clyde-ecosystem/ (Accessed 09/06/2023)

[54] SeaWatch Foundation (2023) *South West Scotland and Inner Hebrides Recent Sightings*. (online) Available at: https://www.seawatchfoundation.org.uk/recentsightings/ (Accessed 04 April 2023).

[55] Hebridean Whale and Dolphin Trust (2023) *Sightings Map*. (online) Available at: https://whaletrack.hwdt.org/sightings-map/ (Accessed 04 April 2023).

[56] Orca (2023) *Species Sightings*. (online) Available at: https://www.orcaweb.org.uk/species-sightings/sightings-map (Accessed 04 April 2023).

[57] For the purposes of this chapter, 'resident species' is taken to mean those species that typically occur in a water body, including those with seasonal residency, for example species which regularly migrate through a particular water body.

[58] The Scottish Government (2013). *2020 Challenge for Scotland's Biodiversity - A Strategy for the conservation and enhancement of biodiversity in Scotland.* (online) Available at: https://www.gov.scot/publications/2020-challenge-scotlands-biodiversity-strategy-conservation-enhancement-biodiversity-scotland/documents/ (Accessed June 2023).

environment in the SBL. Climate change scenarios cannot be predicted with certainty, although the Met Office has produced climate change projections for the 21st Century.

9.5.57 The responses of individual species, populations and communities to climate change rely on complex physiological, behavioural and potentially evolutionary responses to the interaction between, and combined effects of, a number of variables most importantly (in the marine environment) ambient sea temperatures, salinity changes and ocean acidification. As climate change scenarios cannot be predicted with confidence and the responses of a wide range of species are uncertain, it is appropriate to base future predictions on the current baseline status and trends of habitats and species.

9.5.58 In the absence of the Proposed Works, large shifts in the baseline status of ecological features would occur in any case, based on the assumption that current management practices (particularly those relating to fish stocks) are likely to continue. For example, there has already been a significant change in the structure of the fish community following the imposition of closed seasons/areas, and continued improvement (therefore change) is a stated goal of these measures.

9.5.59 Over a shorter timescale, the cessation of the cooling water discharge from the operational power station that causes the "boil area" will allow re-establishment of the natural community in this disturbed area. This will likely start with the gradual recolonisation of marine macrophytes which would commence in the first spring following cessation, followed by successional changes as the community matures. The evidence suggests that mature kelp beds can regenerate from disturbance within a period of 1-6 years, and the associated community within 7-10 years[59].

9.5.60 Similarly, cessation of abstraction is likely to result in the areas of clear sand and gravels around the cooling water intake being re-colonised.

[59] MarLIN - The Marine Life Information Network - Laminaria hyperborea with dense foliose red seaweeds on exposed infralittoral rock

9.6 Embedded environmental measures

9.6.1 Embedded environmental measures proposed to reduce the likely impacts on marine biodiversity are outlined in **Table 9.11**.

Table 9.11 Summary of Embedded Environmental Measures

Embedded Measure	Key mitigation objective	Phase	Implementation
Limited use of anti-fouling materials The use of anti-fouling material may remain in areas which will be operational after the initial decommissioning activities, such as the Active Effluent Discharge Line (AEDL), which is expected to protrude from the end of the existing outfall infrastructure, but use will be minimised to reduce the amount of harmful chemicals / biocides.	Minimising the use of toxic coatings reduces water quality impacts and secondary effects to biota. Avoidance of persistent compounds also eliminates long term ecotoxicological effects.	Preparations for Quiescence phase	Marine licence conditions EMP
The use of conventional methods The deck and surrounding piles of the cooling water intake structure will be removed using conventional methods, and not using explosives, which may include: use of (for example) diamond-wire cutting machines, vibro-piling to remove piles from the seabed, presence of jack-up vessels/ floating cranes/ guard vessels during the works.	Reducing the level of disturbance to marine species from noise and vibration will minimise direct disturbance, particularly to fish, and secondary effects to species that may prey on them.	Preparations for Quiescence phase	EMP
Minimising subtidal working Regarding the dismantling of the jetty, as much work as possible will be carried out from the shore, including work in the intertidal zone, where working 'in the dry' will minimise sediment mobilisation and facilitate avoidance of disturbance of sensitive features.	Minimising marine works reduces the direct impact to benthic habitats, as well as secondary effects to biota and marine water quality from sediment remobilisation.	Preparations for Quiescence phase	EMP
Appropriate scheduling of works	Appropriate scheduling of works has the potential to reduce the physical	Preparations for Quiescence phase	Marine licence conditions

Embedded Measure	Key mitigation objective	Phase	Implementation
Through consideration of sensitive species, and general timings of the Proposed Works, potential effects can be minimised.	disturbance, noise impacts and stress to species during sensitive periods.		
Adherence to standard pollution control measures All vessels and plant involved in the Proposed Works would be required to adhere to standard pollution control measures, such as those established under the International Convention for the Prevention of Pollution from Ships (MARPOL)[60] and the Ballast Water Convention[61]. This includes implementation of a Shipboard Oil Pollution Emergency Plan (SOPEP)[62]. The International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention) should also be adhered to for all vessels involved in the Proposed Works.[63]	Measures to minimise and manage any accidental release of contaminants to the marine environment avoids impacts to water quality and secondary effects on marine biota.	Preparations for Quiescence phase	EMP
Prevent further accidental spillage of contaminants Preventing the addition of particularly concerning contaminants in the Clyde, which include cadmium, lead, mercury, pesticides and persistent organic pollutants (POP's)[64].	Measures to minimise and manage any accidental release of contaminants to the marine environment avoids impacts to water quality and secondary effects on marine biota.	All phases	EMP

[60] *International Convention for the Prevention of Pollution from Ships (MARPOL)*. (online) Available at: https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx [Accessed 12 May 2023]

[61] *International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM).* (Online). Available at: https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships%27-Ballast-Water-and-Sediments-(BWM).aspx (Accessed 04 August 2023).

[62] *International Convention for the Prevention of Pollution from Ships (MARPOL), Shipboard Marine Pollution Emergency Plans*. (Online) Available at: https://www.imo.org/en/OurWork/Environment/Pages/Shipboard-Marine-Pollution-Emergency-Plans.aspx (Accessed November 2023).

[63] International Maritime Organization (2021) *Anti-fouling* (Online) Available at: https://www.imo.org/en/OurWork/Environment/Pages/Anti-fouling.aspx (Accessed 29/09/2023)

Embedded Measure	Key mitigation objective	Phase	Implementation
Natural infill with marine sediments Voids within the seabed beyond the intertidal area will not be plugged, instead, they will be left to infill naturally with marine sediments minimising further disturbance to the marine environment.	Allowing natural infill of the voids avoids disturbance to benthic habitats and secondary effects on biota and water quality.	Quiescence phase and Final Site Clearance	EMP

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9.7 Assessment methodology

9.7.1 The proposed generic project-wide approach to the assessment methodology is set out in **Chapter 5: The EIA Process**, and specifically in **Section 5.3** and **Section 5.4**. However, whilst this has informed the approach that has been used in this marine biodiversity chapter, it is necessary to set out how this methodology has been applied, and adapted as appropriate, to address the specific needs of the marine biodiversity assessment in this ES.

9.7.2 The assessment is based on field surveys, relevant published information (for example on the status, distribution, sensitivity to environmental changes and ecology of the features scoped into the assessment, where this information is available), and professional knowledge of ecological processes and functions.

9.7.3 For each scoped-in ecological feature (see paragraph 9.9.6), potential effects have been assessed against the current baseline conditions and with respect to the Proposed Works.

9.7.4 Where part of a designated site is located within the ecological ZoI relating to a particular biophysical change, the effects on the designated site as a whole has been assessed. A similar approach has been taken for areas of notable habitat.

9.7.5 For species that occur within the ZoI, the assessment has considered the total area that is used by the affected individuals or the local population of the species (e.g. for foraging), rather than the footprint of the Proposed Works. This approach means receptors located far afield from the works are considered within the assessment.

Determination of significance

9.7.6 The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999[65] (hereafter referred to as "EIADR") recognises that decommissioning will affect different environmental elements to differing degrees, and that not all of these are of sufficient concern to warrant detailed investigation or assessment through the EIA process. The EIADR identify those environmental resources that warrant investigation as those that are "*likely to be significantly affected by the Proposed Scheme*".

9.7.7 The EIADR does not define significance. The significance of an effect resulting from a development is determined in this assessment by reference to the sensitivity (or 'importance') of a receptor and the magnitude of the effect. This approach provides a mechanism for identifying areas where mitigation measures may be required and to identify the most appropriate measures to alleviate the risk presented by the Proposed Works.

9.7.8 Chartered Institute of Ecology and Environmental Management (CIEEM)[16] defines a significant effect as one "*that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general*".

9.7.9 When considering likely significant effects on ecological features, whether these be adverse or beneficial, the following characteristics of environmental change are taken into account[66]:

[65] UK Government (1999*). Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999* (Online) Available at: https://www.legislation.gov.uk/uksi/1999/2892/contents/made (Accessed April 2023).

[66] The definitions of the characteristics of environmental change are based on the descriptions provided in CIEEM 2018. Other chapters in this EIA Report may use some of the same terms albeit with a different definition.

- extent – the spatial or geographical area over which the environmental change may occur;
- magnitude – the size, amount, intensity or volume of the environmental change;
- duration – the length of time over which the environmental change may occur;
- frequency – the number of times the environmental change may occur;
- timing – the periods of the day/year etc. during which an environmental change may occur; and
- reversibility – whether the environmental change can be reversed through restoration actions.

9.7.10 It is necessary to determine which ecological features are important in the context of the Proposed Works. Following CIEEM guidance, the importance of ecological features is first determined with reference to UK legislation and policy and then with regard to the extent of habitat or size of population that may be affected by the Proposed Works. This means that the level of importance can differ from that which would be conferred by legislative protection or identification as a conservation notable species alone. For example, a small population of a protected species that could be affected by a development would be assessed as being of less than national importance where there is suitable habitat nearby that has the capacity to support displaced individuals.

9.7.11 Wherever possible, information regarding the extent and population size, population trends and distribution of the ecological features has been used to inform the determination of importance described in **Table 9.12**. Where detailed criteria or contextual data are not available, professional judgement is used to determine the level of importance. This approach is an evolution of that presented in the scoping report; while the principles are the same, some details in the criteria have been more fully aligned with those used for terrestrial biodiversity. This is to ensure a greater consistency of the assessment across technical aspects, particularly where a receptor may be considered both terrestrial and marine (e.g. seabirds). Further, it is noted that the ONR states that "*The ES should provide further clarity on the term 'importance' in the context of a receptor sensitivity*."

9.7.12 The 'importance' of an ecological feature is categorised largely through consideration of its conservation status. This is because conservation status in the UK intrinsically embodies and integrates a variety of concepts including scarcity, naturalness, threat, resilience, ecological function and ecosystem services. Ecological features that are not considered 'important' are those which are sufficiently widespread, unthreatened and resilient, and whose viability will be unaffected by the Proposed Works. **Table 9.12** details the basis for assigning receptor importance.

9.7.13 Impacts to a species or habitat of lesser importance may have a consequent effect on a receptor of higher importance; for example, a reduction in the numbers of a common prey fish that in turn leads to the decline of a population of seabirds or marine mammals. It is therefore necessary to consider factors such as ecological services and trophic relationships within the assessment.

Table 9.12 Importance of marine biodiversity features

Level of importance	Example criteria
Very high	• International sites including Ramsar sites and European sites including Special Protection Area (SPAs), SACs (including candidate/potential sites); and • Based on discussions with Marine Scotland and field data collected to inform the assessment, areas of habitat or populations of species which meet the published selection criteria for designation as an international site, but which are not currently designated as such.
High	• Nationally designated sites including SSSIs and Marine Protected Areas (MPAs) and future Highly Protected Marine Areas (HPMAs) • Areas (and the populations of species which inhabit them) which meet the published selection criteria Guidelines for Selection of Biological SSSIs[67] but which are not themselves designated based on field data collected, and in agreement with Marine Scotland; and • SBL habitats and species, Red listed and legally protected species that are not addressed directly in Part 2 of the "*Guidelines for Selection of Biological SSSIs*" but can be determined to be of national importance using the principles described in Part 1 of the guidance.
Medium	• Non-statutory designated sites; and • Areas which (based on field data) meet the published selection criteria for those sites listed above (for habitats or species, including those listed in relevant Local Biodiversity Action Plans - LBAP) but which are not themselves designated.
Low	• SBL/PMF habitats and species, Red listed and legally protected species that based on their extent, population size, quality etc. are determined to be of local interest. • Common and widespread marine habitats and biotopes occurring in proportions greater than may be expected in the local context; and • Common and widespread native species occurring in numbers greater than may be expected in the local context.
Very Low	• Common and widespread habitats, biotopes and species that occur in levels comparable to those of the surrounding area; and • Areas of heavily modified or managed coast/seabed (e.g. coastal defence and other structures) where a more important species is not present.

9.7.14 **Table 9.13** details the basis for assigning magnitude of change.

[67] JNCC (2013) *Guidelines for the Selection of biological SSSIs* (online) available at https://hub.jncc.gov.uk/assets/dc6466a6-1c27-46a0-96c5-b9022774f292 (Accessed November 2023).

Table 9.13 Establishing the magnitude of change

Magnitude	Criteria
High	The change permanently (or over the long-term) affects the conservation status of a habitat/species, reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area and relative to the wider habitat resource/species population, a large area of habitat or large proportion of the wider species population is affected. For designated sites, integrity is compromised. There may be a change in the level of importance of the receptor as a result of the Proposed Works.
Medium	The change permanently (or over the long term) affects the conservation status of a habitat/species reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area and relative to the wider habitat resource/species population, a small-medium area of habitat or small-medium proportion of the wider species population is affected. There may be a change in the level of importance of this receptor as a result of the Proposed Works.
Low	The quality or extent of designated sites or habitats or the sizes of species' populations, experience some small-scale reduction or increase. These changes are likely to be within the range of natural variability and they are not expected to result in any permanent change in the conservation status of the species/habitat or integrity of the designated site. The change is unlikely to modify the evaluation of the receptor in terms of its importance as a result of the Proposed Works.
Very low	Although there may be some effects on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats, or the size of species populations, means that they would experience little or no change. Any changes are also likely to be within the range of natural variability and there would be no short-term or long-term change to conservation status of habitats/species receptors or the integrity of designated sites.

9.7.15 Adverse effects are assessed as being significant if the favourable conservation status of an ecological feature would be lost as a result of the Proposed Works. Beneficial effects are assessed as those where a resulting change from baseline improves the quality of the environment (e.g. increases species diversity, increases the extent of a particular habitat etc., or halts or slows down an existing decline). For a beneficial effect to be considered significant, the conservation status would need to positively increase in line with a magnitude of change of "high" as described in **Table 9.14**.

9.7.16 Conservation status is defined as follows[68]:

> *"For habitats, conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and typical species within a given geographical area;*
>
> *For species, conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area".*

9.7.17 The decision as to whether the conservation status of an ecological feature would alter will be made using professional judgement, drawing upon the information produced through the desk study, field survey and assessment of how each feature is likely to be affected by the Proposed Works.

[68] European Commission (2004). *Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage* (Online). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32004L0035&qid=1626091552770 (Accessed March 2023).

9.7.18 A similar procedure will be used where designated sites may be affected by the Proposed Works, except that the focus is on the effects on the integrity of each site; defined as:

> *"The coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified".*

Table 9.14 Significance evaluation matrix as applied to this assessment

Sensitivity/importance/value	Magnitude of change: Very high	High	Medium	Low	Very low
Very high	Major (Significant)	Major (Significant)	Major (Significant)	Major (Significant)	Moderate (Probably significant)
High	Major (Significant)	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)
Medium	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)
Low	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)
Very Low	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)	Negligible (Not significant)

9.7.19 The assessment of effects on integrity draws upon the assessment of effects on the conservation status of the features for which the site has been designated. Where these features are not clearly defined, which can be the case for non-statutory designated sites, it is necessary to use professional judgement to identify the interest features. This judgement is augmented, where possible, by additional contextual information about such features provided by the relevant organisations (including, for example, Marine Scotland or the Local Planning Authority, which in this case is North Ayrshire Council) who are responsible for identifying such sites. The principle is that the baseline information used for the assessment is as comprehensive as possible.

9.8 Assumptions and limitations

9.8.1 Limitations relating to the baseline data underlying the assessment are identified in **Section 9.3**. There are no further assumptions or limitations associated with this chapter.

9.9 Scope of the assessment

9.9.1 The Proposed Works related to the marine environment involve the demolition of the cooling water intake and outfall heads and associated infrastructure; and the jetty to the south of HNB.

Study Area

9.9.2 The Proposed Works may result in a variety of environmental changes such as direct loss of habitat/species and indirect effects such as noise etc. Each of these impacts will have a spatial dimension that varies according to the scope of the activity and the nature of the receptor. In order to assess the resultant effects, a series of ZoIs are described that form the basis of the Study Area.

9.9.3 The determination of a Study Area for each important ecological feature is key to establishing which environmental changes may result in likely significant effects. The Study Areas differ depending on the type of environmental change (e.g., the change from the existing baseline) as a result of the Proposed Works and the ecological feature being considered.

9.9.4 The most straightforward Study Area to define is the area affected directly by the demolition of the marine structures and direct habitat changes as a result of these works. This Study Area is the same for all affected ecological features and comprises the footprint of the Works Area below MHWS.

9.9.5 For each environmental change that extends beyond the area affected directly by the demolition works (e.g., increased noise), the Study Area varies according to receptor, depending on their sensitivity to the change and the precise nature of the change. For example, fish and marine mammals have different hearing capabilities and a marine mammal may be disturbed by underwater noise several kilometres from the noise source (dependent on the source to a variable extent)[69] , while other species (e.g., many invertebrates) may be unaffected by changes in noise. In view of these complexities, the definition of Study Areas (as detailed in **Table 9.2**) beyond the Proposed Works footprint has been based on expert judgement informed by a review of appropriate evidence where available (e.g., disturbance criteria for various species).

Potential receptors

9.9.6 The following key marine biodiversity receptors have been identified as relevant to this assessment:

- intertidal habitats (including consideration of Southannan Sands SSSI) and associated species (including coastal vegetation below high water);
- subtidal benthic habitats including kelp beds and sedimentary habitats and associated species;
- migratory fish;
- non-migratory fish; and
- marine mammals.

9.9.7 Where a receptor is too distant or no pathway of effect is deemed to exist, it has not been considered further as outlined at the scoping stage. Therefore, European sites are not considered here, due to the small geographic scale of the works not affecting any such sites. Additional detail is given in the Habitats Regulations Assessment (HRA) Screening Report accompanying this EIA.

[69] Marine Scotland (Undated) *Chapter 23: Noise and Vibration (Underwater).* (Online) Available at: https://marine.gov.scot/sites/default/files/23_noise_underwater_0.pdf (Accessed 06 April 2023).

Likely significant effects

9.9.8 The likely significant marine biodiversity effects that have been taken forward for assessment in this chapter are summarised in **Table 9.15**.

Table 9.15 Likely significant effects on marine biodiversity

Project task	Activity	Potential impact
Decommissioning of marine infrastructure during Preparations for Quiescence phase	• Removal of intake to seabed level, or a suitably safe level below the seabed; • Minor dredging works to prepare the seabed for decommissioning; • Capping of intake and outfall structures; and • The presence of support/guard vessels.	Disturbance/degradation/loss of habitats: and Adverse effects on marine species due to: • resuspension of sediment (leading to possible smothering and mobilisation of contaminants); • underwater noise from dredging; and • vessel discharges.
Removal of marine infrastructure through conventional methods during Preparations for Quiescence phase	• Use of (for example) diamond-wire cutting machines, vibro-piling to remove piles from the seabed; and • The presence of jack-up vessels/ floating cranes/ guard vessels during the works.	Degradation of habitats and adverse effects on associated species due to sediment remobilisation; and Disturbance of marine fauna through increased underwater noise.
Installation of AEDL during Preparations for Quiescence phase	• Presence of anchored construction vessel	Adverse effects on marine species due to underwater noise and vessel discharges.
Onshore demolition during Preparations for Quiescence phase	• Demolition wastes and site runoff.	Sediment laden or contaminated runoff released into the marine environment, with associated increase in sediment loads and potential contamination.
Ground remediation during Final Site Clearance phase	• Methods to be determined.	Sediment-laden or contaminated runoff released into the marine environment.
Building demolition during Final Site Clearance phase	• Movement of plant, demolition wastes within the Site and the use of cranes and other engineering equipment.	Sediment-laden or contaminated runoff released into the marine environment. Migration of terrestrial contamination over time may possibly extend impact from the Quiescence phase.

9.10 Assessment of effects

9.10.1 This section provides an assessment of the likely impacts on marine biodiversity arising from the removal of the intake and outfall structures to seabed level, and the demolition of the HNB jetty.

9.10.2 The impacts on coastal processes and water quality are addressed in **Chapter 10: Coastal Management and Water Quality.** This substantially informs the marine biodiversity assessment, particularly with respect to secondary impacts from changes to hydrodynamics and coastal processes, none of which have been assessed as significant.

9.10.3 The relevant impacts identified for this chapter take place during the Preparation for Quiescence and Final Site Clearance phase of the Proposed Works (see**Table 9.15**) and these are assessed for each receptor identified in paragraph 9.9.6. It is clear that the most significant impact pathways would be experienced during the Preparations for Quiescence phase for all receptors due to this phase including the decommissioning and removal of marine infrastructure.

Intertidal habitats/species

Decommissioning and removal of marine infrastructure during the Preparations for Quiescence phase

9.10.4 The sandflats and dwarf eel grass (seagrass) habitat found within the Southannan Sands SSSI are the closest PMF to the Works Area, approximately 200 m away at the closest approach. These are considered to be receptors of national (high) importance.

9.10.5 Seagrass is sensitive to pressures such as substrate loss, smothering, increase in suspended solids and turbidity, alteration to water flows and wave exposure, as well as chemical contamination[70].

9.10.6 The Proposed Works within the marine environment are located on sublittoral sediment, mainly comprising gravel and sand. No sediment quality data has been collected for the Study Area; however, the localised nature of the Proposed Works are expected to result in temporary small changes to currents and waves and salinity, with minimal implications for the mobilisation and dispersal of any potential contaminants present. Moreover, the Firth of Clyde is a relatively turbid area due to the freshwater input in the coastal area, as classified by the Scottish Marine Assessment[71]. This means that habitats/species inhabiting these waters have adapted to this type of environment. These temporary changes will also have a low impact on background fine and coarse sediment transport. Once works have ceased, natural recovery would be expected to commence immediately, with recolonisation from neighbouring undisturbed areas by some motile species. Settlement of larval sessile fauna and kelp spores would occur in the following spring, with the development of a mature community occurring over the following several years.

9.10.7 Considering the location of the Proposed Works and the distance from the sandflats and seagrass beds associated with Southannan Sands SSSI (0.2 km), the magnitude of change on littoral transport to these beds is considered to be within the range of natural variability, i.e. very low.

[70] Tyler-Walters, H. (2008). *Zostera subg. Zostera marina Common eelgrass. In Tyler-Walters H. and Hiscock K. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, Plymouth: Marine Biological Association of the United Kingdom*. (Online) Available at: https://www.marlin.ac.uk/species/detail/1282 (Accessed 06 April 2023).

[71] Marine Scotland (2020), *Scottish Marine Assessment: Suspended particulate inorganic matter (turbidity).* (Online) Available at: https://marine.gov.scot/sma/assessment/suspended-particulate-inorganic-matter-turbidity (Accessed 05 April 2023).

9.10.8 Similarly, a temporary and localised increase in suspended sediment levels as a result of the Proposed Works will not directly impact the sandflats and seagrass beds. This is because the existing background level of suspended material is high and the small quantity that might be transported as far as the sandbanks does not represent an appreciable increase. Therefore, sediment remobilisation will have a very low magnitude of change and thus minor (**Not Significant**) effect on intertidal receptors, including the seagrasses and sandflats at Southannan Sands SSSI.

Demolition works and ground remediation during the Preparations for Quiescence and Final Site Clearance phases

9.10.9 Run-off from potentially contaminated land due to the demolition of land-based infrastructure will be controlled using standard site management practices and the risk of such run-off is thus considered to be low risk with the appropriate measures in place. The embedded pollution control measures set out within the Environmental Management Plan (EMP) would be implemented and adhered to throughout all demolition activities on land. It is expected that these would be secured within an EMP. Considering the distance from land-based decommissioning works to the intertidal habitats, their intermittent nature, and the embedded measures for managing site drainage and runoff, the magnitude of change is predicted to be very low and therefore any effects will be negligible (**Not Significant**).

9.10.10 Although the habitats at Southannan Sands are nationally important, there is limited potential for the Proposed Works to generate impacts. Residual effects of the works to intertidal habitats and species will be negligible to minor (**Not Significant**).

Subtidal habitats/species

Decommissioning and removal of marine infrastructure during the Preparations for Quiescence phase

Loss of habitat

9.10.11 Habitat loss resulting from the removal of structures at seabed level or below the seabed, and minor dredging interventions (as detailed in **Table 9.14**) will affect kelp communities and a variety of sandy and muddy biotopes, such as SS.SSa.IFiSa.TbAmPo ('Semi-permanent tube-building amphipods and polychaetes in sublittoral sand'), SS.SCS.ICS ('Infralittoral coarse sediment'), IR.LIR.K.Sar ('Sargassum muticum on shallow slightly tide-swept infralittoral mixed substrata') and SS.SCS.CCS.Pkef ('*Protodorvillea kefersteini* and other polychaetes in impoverished circalittoral mixed gravelly sand'). The most sensitive of these is SS.SMp.KSwSS ('Kelp and seaweed communities on sublittoral sediment'). The receptor is of low importance because although it is listed as a SBL feature and noted in the LBAP[72], its limited extent and abundance does not qualify at a regional level. The sandy and muddy biotopes within the Works Area are common and widespread, occurring in levels comparable to those of the surrounding area and thus of negligible importance, with respect to this assessment.

9.10.12 The 'Kelp and seaweed communities on sublittoral sediment' biotope is identified at six locations within the two benthic surveyed areas (see **Section 9.5**), where five are located adjacent to the cooling water outfall structure and one adjacent to the intake structure. However, sub-biotopes of this species predominate the survey area as seen in **Figure 9.3.** The maximum loss of kelp biotope would not exceed the footprint of the jetty

[72] NAC (n.d) North Ayrshire Local Biodiversity Action Plan 2019-2031. (Online) Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/Finance/approved-lbap.pdf (Accessed November 2023).

(approximately 850 m^2). The works are expected to last for a maximum of 170 days (including site mobilisation), after which natural recolonisation will commence. Kelp is relatively resilient to physiochemical variations, such as short-term salinity fluctuations[73,74], short-term exposure to organic and nutrient enrichment (<4 years)[75,76], smothering, wave exposure[73,81,82] and habitat structure changes due their rapid growth rates. Studies have showed high recovery rates for *Saccharina latissima* and *Chorda filum* (both recorded within the Study Area), with the former showing early colonisation within algal succession after 2 weeks of clearance and can reach full sexual maturity within 15-20 months[77]. Given the wide distribution of this habitat and the small proportion that will be impacted, the magnitude of change is considered to be very low.

9.10.13 The very low to regional (medium) importance of the receptors and the very low magnitude of change means that the loss of habitat will be negligible (not significant).

9.10.14 The limited scale and duration of the Proposed Works will not result in significant habitat damage or loss. Therefore, effects on benthic species associated with these habitats as a result of seabed works will similarly be insignificant. The magnitude of change is assessed as very low and the resultant effects will be negligible (**Not Significant**).

Physical disturbance and degradation in habitat quality

9.10.15 The methods used for the dismantling and decommissioning of marine structures may involve a variety of techniques, including localised dredging, diamond-wire cutting and vibro-pilling. Seabed intervention may cause a temporary resuspension of solids and increased turbidity.

9.10.16 Changes in suspended solids and remobilisation may impact photosynthesis and therefore inhibit growth and density of canopy forming seaweeds when turbidity increases by 0.1/m (light attenuation coefficient)[78]. However, kelp are relatively resilient to such changes[79,80]. Further studies showed that smothering by 5-30 cm sediment during discrete events is unlikely to damage *Saccharina latissima* and *Chorda filum* but may provide a

[73] Birkett, D.A., Maggs, C.A., Dring, M.J. & Boaden, P.J.S., (1998). *Infralittoral reef biotopes with kelp species: an overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Natura 2000 report prepared by Scottish Association of Marine Science (SAMS) for the UK Marine SACs Project., Scottish Association for Marine Science. (UK Marine SACs Project, vol VI.), 174 pp.* (Online) Available from: http://ukmpa.marinebiodiversity.org/uk_sacs/pdfs/reefkelp.pdf (Accessed 13 April 2023).

[74] Karsten, U., (2007). *Research note: salinity tolerance of Arctic kelps from Spitsbergen*. Phycological Research, 55 (4), 257-262.

[75] Bokn, T.L., Duarte, C.M., Pedersen, M.F., Marba, N., Moy, F.E., Barrón, C., Bjerkeng, B., Borum, J., Christie, H. & Engelbert, S., (2003). *The response of experimental rocky shore communities to nutrient additions*. Ecosystems, 6 (6), 577-594.

[76] Johnston, E.L. & Roberts, D.A., (2009). *Contaminants reduce the richness and evenness of marine communities: a review and meta-analysis*. Environmental Pollution, 157 (6), 1745-1752.

[77] Stamp, T.E., Williams, E., Lloyd, K.A., & Mardle, M.J., (2022). *Saccharina latissima with red and brown seaweeds on lower infralittoral muddy mixed sediment. In Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, Plymouth: Marine Biological Association of the United Kingdom*. (Online) Available from: https://www.marlin.ac.uk/habitat/detail/1051 (Accessed 12 April 2023).

[78] MarLIN - The Marine Life Information Network (2023). *Laminaria hyperborea with dense foliose red seaweeds on exposed infralittoral rock* (online) Available at: https://www.marlin.ac.uk/habitats/detail/171/laminaria hyperborea with dense, foliose red seaweeds_on_exposed_infralittoral_rock (Accessed 17 April 2023)

[79] Birkett, D.A., Maggs, C.A., Dring, M.J. & Boaden, P.J.S., (1998b*). Infralittoral reef biotopes with kelp species: an overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Natura 2000 report prepared by Scottish Association of Marine Science (SAMS) for the UK Marine SACs Project., Scottish Association for Marine Science. (UK Marine SACs Project, vol VI.), 174 pp.* (Online) Available at: http://ukmpa.marinebiodiversity.org/uk_sacs/pdfs/reefkelp.pdf (Accessed 13 April 2023).

[80] Stæhr, P.A., Pedersen, M.F., Thomsen, M.S., Wernberg, T. & Krause-Jensen, D., (2000). *Invasion of Sargassum muticum in Limfjorden (Denmark) and its possible impact on the indigenous macroalgal community*. Marine Ecology Progress Series, 207, 79-88.

physical barrier to light penetration, essential to kelps and adversely impact recruitment processes[81]. However, studies showed that the species can survive in darkness for between 6-16 months at a temperature of 8°C[82], indicating kelp is highly resilient[77].

9.10.17 Sediment resuspension may temporally affect the characterising species (*Polydora ciliata*, *Spiophanes bombyx*, *Corophium* and *Ampelisca* spp.) of the SS.SSa.IFiSa.TbAmPo ('Semi-permanent tube-building amphipods and polychaetes in sublittoral sand') biotope, and the bivalve mollusc *Mytilus tenuis*. These receptors are of very low importance, as they are common and widespread native species that do not occur in unusually large numbers in this location, and because of their ability to fully recover.

9.10.18 Increased turbidity may reduce the feeding efficiency of filter and deposit feeders by reducing the nutritional value of the suspended matter. However, they are not solely reliant on organic particles and also incorporate free-floating micro-organisms into their diet. Whilst it has been observed that increased turbidity may reduce growth and increase mortality of some deposit feeders, this is in circumstances where high concentrations have occurred over protracted periods[83]. Therefore, the magnitude of change due to a temporary increase in turbidity is considered low.

9.10.19 As suspension feeders, mussels (*Mytilus* spp*)* are relatively resilient to siltation and turbidity and have been shown to tolerate up to 100 mg/l suspended sediment for one month[84,85]. Mussels can discharge sand from the mantle cavity and recoverability has been reported as immediate[86]. Mussels are generally sedentary; however, studies have shown they re-position on the shore or within the seabed when buried by sand, but burial by large-scale sand depositions may lead to mortalities[87]. They may be able to move upwards through the sediment, though some younger individuals may succumb[88].

9.10.20 The localised increased suspended sediment and re-deposition, combined with the general resilience and pre-adaptation of the benthic fauna to turbid conditions means the magnitude of change due to sediment suspension and resettlement is considered to be low.

9.10.21 The ability of benthos to recover is based on a combination of the environmental conditions of the site, the frequency (repeated disturbances versus a one-off event) and the intensity of the disturbance, as well as the resilience of the species in question. The re-colonisation potential differs between those species that recruit from dispersed larvae (such as for the *Polydora ciliata* and *Pygospio elegans* species) and those dependent on local populations (such for the infaunal deposit feeders *Scoloplos armiger* and *Arenicola marina*, and amphipods *Corophium* sp.). In high energy environments full recoverability

[81] Moy, F.E. & Christie, H., (2012*). Large-scale shift from sugar kelp (Saccharina latissima) to ephemeral algae along the south and west coast of Norway*. Marine Biology Research, 8 (4), 309-321

[82] Dieck, T.I., (1993). *Temperature tolerance and survival in darkness of kelp gametophytes (Laminariales: Phaeophyta) - ecological and biogeographical implications*. Marine Ecology Progress Series, 100, 253-264.

[83] Nicholls, P., Hewitt, J. and Halliday, J. (2003) *Effects of suspended sediment concentrations on suspension and deposit feeding marine macrofauna*. Aukland Regional Council Technical Publication No. 211 August 2003.

[84] Purchon, R.D., (1937). *Studies on the biology of the Bristol Channel*. Proceedings of the Bristol Naturalists' Society, 8, 311-329.

[85] Widdows J., Newell, R.I.E. & Mann, R., (1989). *Effects of hypoxia and anoxia on survival, energy metabolism and feeding of oyster larvae (Crassostrea virginica Gmelin).* Biological Bulletin, Marine Biological Laboratory, Woods Hole, 177, 154-166.

[86] De Vooys, C.G.N., (1987). *Elimination of sand in the blue mussel Mytilus edulis*. Netherlands Journal of Sea Research, 21, 75-78.

[87] Holt, T.J., Rees, E.I., Hawkins, S.J. & Seed, R., (1998). *Biogenic reefs (Volume IX). An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Scottish Association for Marine Science (UK Marine SACs Project), 174 pp*. (Online) Available from: http://ukmpa.marinebiodiversity.org/uk_sacs/pdfs/biogreef.pdf (Accessed 13 April 2023).

[88] Dare, P.J., (1976). *Settlement, growth and production of the mussel, Mytilus edulis L., in Morecambe Bay, England*. Fishery Investigations, Ministry of Agriculture, Fisheries and Food, Series II, 28 , 25pp.

can take <2 years and in lower energy environments this can take between 2-10 years[89]. The Works Area is a moderately high energy environment as shown by the wide presence of kelp. Recovery would be expected in approximately two years. Therefore, the magnitude of change due to physical displacement is considered to be low.

9.10.22 *Mytilus* species can recover within a good annual recruitment from substratum loss, displacement or physical disturbance, however, full recovery of the community may take 1-5 years[90] which will occur during the Quiescence period. Therefore, the magnitude of change due to physical displacement is considered to be low.

9.10.23 Any seabed disturbance will be localised and suspended sediments readily dispersed by the high water flow in the environment. Considering the very low to medium importance of the receptors and the low magnitude of change due to physical disturbance the residual effects are assessed as negligible to minor adverse (**Not Significant**).

Discharges from vessels

9.10.24 Vessels associated with the Proposed Works may produce wastes and discharges, each requiring appropriate handling and disposal, including:

- black water (i.e. sewage) which can contain harmful microorganisms, organic material with a chemical and biological oxygen demand, nutrients etc.;
- grey water (i.e. from sinks and showers); and
- deck drainage and bilge water there is potential for contamination with oils and lubricants.

9.10.25 Routine discharges from the vessels will be controlled through tertiary environmental measures adopted in order to comply with applicable legislation. It is considered that no significant changes to the environment will occur. The likelihood of non-routine events will be minimised by the implementation of appropriate management plans including a Shipboard Oil Pollution Emergency Plan. Therefore, the magnitude of change from an accidental release is considered to be low.

9.10.26 Considering the very low to regional (medium) importance of the receptors and the very low magnitude of change means that effect of vessel discharges will be negligible (**not significant**).

Demolition works and ground remediation during the Preparations for Quiescence phase and Final Site Clearance phase

9.10.27 The demolition of land-based infrastructure has limited scope to affect the marine environment, largely confined to the potential impacts of site drainage/runoff and possible non-routine events.

9.10.28 All land-based run-off will be treated using silt traps and oil separators and demolition activities managed using standard good site practice (e.g. appropriate bunds around fuel storage, etc.). Further details are provided in **Chapter 12: Soils, Geology and Hydrogeology.** No significant impacts will result from these activities.

[89] De-Bastos, E. & Rayment, W.J. (2022). *Semi-permanent tube-building amphipods and polychaetes in sublittoral sand. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews. Plymouth: Marine Biological Association of the United Kingdom*. (Online) Available from: https://www.marlin.ac.uk/habitat/detail/136 (Accessed 12 April 2023).

[90] Tyler-Walters, H. (2008). *Mytilus edulis Common mussel. In Tyler-Walters H. and Hiscock K. Marine Life Information Network: Biology and Sensitivity Key Information Reviews,. Plymouth: Marine Biological Association of the United Kingdom.* (Online) Available from: https://www.marlin.ac.uk/species/detail/1421 (Accessed 12 April 2023).

9.10.29 Due to the relatively high energy marine environment, any treated runoff will disperse rapidly with the tide. A single tidal excursion extends approximately 2.5 km in this area. The magnitude of change due to runoff is considered to be very low and the resultant effects negligible (**Not Significant**).

Migratory fish

Decommissioning and removal of marine infrastructure

9.10.30 While the wider Firth of Clyde supports several migratory fish species, as described in **Section 9.5**, there is no evidence of significant inshore migration routes along the coast near HNB, with its history of industrial use.

9.10.31 Migratory fish species are listed in the SBL[40] and protected under the Conservation (Natural Habitats, &C.) Regulations 1994[1]. The European eel, although not protected under the Habitats Regulations, is considered a critically endangered species. However, the Study area does not feature a significant population of these species and therefore the receptor is considered of regional (medium) importance. Seabed intervention, including dredging, cutting or vibro-piling may cause a temporary resuspension of solids and increased turbidity as well as underwater noise.

9.10.32 The localised scale of the Proposed Works and the low numbers of fish migrating, the seasonal nature of the sensitive period means that impacts can be readily mitigated through appropriate scheduling of the Proposed Works.

9.10.33 Moreover, the relatively short duration of marine works together with the existing high turbidity levels in the Firth of Clyde mean that any fish present should not experience a significantly elevated turbidity over long periods.

9.10.34 Noise and vibration from the removal of marine infrastructure may cause temporary behavioural disturbance and displacement of fish in the Study Area. Fish have a lower frequency auditory range than marine mammals, usually between 800 to 1,000 Hz (dependant on species)[69,91]; however, they can hear sounds over 2 km (source specific)[69]. Although fish with or without swim bladder perceive sounds differently, a precautionary threshold of 150 dB re 1 µPa for temporary risk of behavioural effects to fish and damage to eggs has been attributed for both impulsive and continuous sounds[92]. Suggested thresholds for the onset of injury to fish due to impulsive sound are 186 SEL, dB re 1 µPa2s (impairment) and a peak of 207 SEL, dB re 1 µPa2s (mortality)[93].

9.10.35 With the appropriate noise management measures in place (including the use of conventional methods described in **Table 9.11**) to not exceed these thresholds, the magnitude of change from underwater noise is low, therefore the effect on regionally important migratory fish is minor adverse (**Not Significant**).

[91] Popper AN, Hawkins AD, Sand O, Sisneros JA. (2019) *Examining the hearing abilities of fishes. J Acoust Soc Am. Aug;146(2):948*. (Online) Available at: doi: 10.1121/1.5120185. (Accessed 06 April 2023).

[92] WSDOT (2011). *Biological Assessment Preparation for Transport Projects - Advanced Training Manual*. Washington State Department of Transport.

[93] Xodus (2015). *Marine noise inputs Technical Note on Underwater Noise Statoil ASA*. (Online) Available at: https://marine.gov.scot/sites/default/files/underwater_noise_technical_assessment_a-100142-s20-tech-001-a01_0.pdf (Accessed 06 April 2023).

Demolition works and ground remediation during Preparations for Quiescence phase and Final Site Clearance phase

9.10.36 Demolition and other decommissioning activities in the terrestrial environment will be controlled through embedded mitigation measures as outlined within **Chapter 11: Surface Water and Flood Risk**, thereby reducing the risk of runoff occurring. As previously described (in paragraph 9.10.9), where runoff and site drainage does occur, this will affect a very localised area (tens of metres) and is not considered to have any implications for migratory fish. The magnitude of change due to runoff is considered to be very low and the effect negligible (**Not Significant**).

Non-migratory fish

Decommissioning and removal of marine infrastructure during Preparations for Quiescence phase

9.10.37 The kelp beds identified in the immediate vicinity of the marine infrastructure may serve as nursery and shelter areas for a variety of adult and juvenile fish, therefore, loss of this specific habitat could directly impact these species.

9.10.38 A wide variety of commercial and non-commercial species typically frequent the kelp habitats and sedimentary substrates, including species listed in the SBL, albeit in low numbers. The receptor is therefore considered of regional (medium) importance.

9.10.39 Fish are considered to be territorial, and, for example, cod generally remain within 100 km of their spawning grounds[94]. Herring is known to spawn in spring and autumn and has historically had spawning closures from October until May[43]. Spawning closures are periods when the fishery is closed to allow the stock to spawn undisturbed. Currently, cod spawning closures operate between February and April. These closures indicate that both species richness and total abundance are reached in spring and autumn.

9.10.40 As discussed under subtidal habitats above, the Proposed Works will create limited and temporary resuspension of sediments from the removal of seabed structures. These activities may result in some displacement of fish within the Study Area. The Firth of Clyde is a relatively turbid area within which the fauna are acclimated to relatively high loadings of suspended sediment. Furthermore, the habitats potentially impacted are widespread and it is expected that most fish would relocate temporarily to adjacent areas with a lower level of disturbance. As the non-migratory fish community will not experience widespread or long-term changes as a result of Proposed Works, the magnitude of change is considered low. The resultant effects are therefore assessed as minor (**Not Significant**).

9.10.41 Noise and vibration from activities such as vibro-pilling may displace fish species and induce hearing injuries. Although fish can exercise avoidance behaviour to noise, there is the potential loss of fish stock or juveniles due to impulsive localised sound for species found in the vicinity of the Proposed Works. Hearing specialists such as herring might be the most impacted. It is expected that any noise and vibration associated with the Proposed Works will be short term and localised, with activities not expected to exceed the noise thresholds described in paragraph 9.10.47 The magnitude of change from noise and vibration associated with the Proposed Works is therefore low and the effects on this receptor are minor (**Not Significant**).

[94] Wright, P. J. et. Al (2006). *Fidelity of adult cod to spawning grounds in Scottish waters* (Online) Available at: https://www.researchgate.net/publication/222547741_Fidelity_of_adult_cod_to_spawning_grounds_in_Scottish_waters (Accessed 06 April 2023).

Demolition works and ground remediation during the Preparations for Quiescence phase and Final Site Clearance phase

9.10.42 With the appropriate EMP in place, the potential for demolition of land-based infrastructure to impact the fish community is very low. Therefore, the magnitude of change is very low and there will be negligible (**Not Significant**) effects on the non-migratory fish community from deplanting and demolition works occurring.

Marine mammals

Decommissioning and removal of marine infrastructure during the Preparations for Quiescence Phase

9.10.43 Marine mammals are highly mobile species and may travel great distances searching for feeding grounds or for breeding. Critical habitats for marine mammals are those areas used regularly for feeding, breeding, raising calves and socialising, as well as for migrating. These are essential for the day-to-day well-being and survival of the species which helps maintaining a healthy population growth rate.

9.10.44 The Firth of Clyde is not known as a particularly important feeding ground for cetaceans, and there are no major seal haul outs in the inner firth. Nonetheless, harbour porpoise and common and bottlenose dolphin sightings have been recorded regularly (usually between March to September) and both common and grey seals are known to be present on Great Cumbrae. All the species mentioned are EPS, SBL features and listed in the Conservation (Natural Habitats, &C.) Regulations 1994[2]. Since the local populations are not of national importance and the species are not on the IUCN Red List, they are considered of medium importance.

9.10.45 Seabed intervention, including dredging, cutting or vibro-piling may cause a temporary resuspension of solids and increased turbidity as well as underwater noise.

9.10.46 The Firth of Clyde is turbid due to the freshwater input in the coastal area, as classified by the Scottish Marine Assessment[71]. Therefore, any marine mammals that may occasionally enter the Works Area will be habituated to the high levels of sediment within the water column. The temporary localised increase in turbidity levels from the Proposed Works will therefore not have a significant impact.

9.10.47 Underwater noise may pose various risks to marine mammals, ranging from disorientation, disturbing their prey, to causing auditory impairments leading to strandings and/or death in extreme cases. Bottlenose and common dolphins, as well as harbour porpoise are “high-frequency” marine mammals (i.e. those with a hearing range between 75 Hz-150 kHz). Underwater noise exposure sensitivity differs according to the type of fatiguing sound, however, as a precautionary measure it is considered that the harbour porpoise is sensitive to underwater noise above the 100 dB re 1 µPa threshold on a frequency range from 10 to 130 kHz. Any increase of 40-50 dB above this threshold can lead to behavioural disturbance[69,95,96]. The same noise threshold can apply to the dolphin

[95] Tougaar, J et. Al (2014). *Cetacean noise criteria revisited in the light of proposed exposure limits for harbour porpoise*. (Online) Available at: https://www.researchgate.net/publication/268526670_Cetacean_noise_criteria_revisited_in_the_light_of_proposed_exposure_limits_for_harbour_porpoise (Accessed 06 April 2023).

[96] Jakob Tougaard (2021). *Thresholds for noise induced hearing loss in marine mammals. Background note to revision of guidelines from the Danish Energy Agency*. *Aarhus University, DCE - Danish Centre for Environment and Energy, 34 s. – Scientific note no. 2021|28* (Online) Available at: https://dce.au.dk/fileadmin/dce.au.dk/Udgivelser/Notater_2021/N2021|28.pdf (Accessed 06 April 2023).

species as well[97]. It is not expected that the Proposed Works will create noise levels above these thresholds, thus the magnitude of change due to temporary, intermittent and limited duration underwater noise from decommissioning activities is considered to be low.

9.10.48 Considering the low population of marine mammals using the Study Area, the temporary nature of the Proposed Works and consequently, the impacts on marine mammals are anticipated to be low. Therefore, the resultant effects on marine mammals from the decommissioning works will be minor (**not significant**).

Demolition works and ground remediation during Preparations for Quiescence phase and Final Site Clearance phase

9.10.49 The potential for contaminated runoff (as described in paragraph 9.10.9) will be reduced through implementation of the embedded environmental measures outlined within **Chapter 11: Surface Water and Flood Risk**. Where it does occur, it would affect a very localised area only, as it will disperse rapidly due to the relatively energetic marine environment and tidal regime. Resultant water quality impacts are thus not considered to have any implications for marine mammals. The magnitude of change due to runoff is considered to be very low and the resultant effect negligible (**Not Significant**).

[97] S. H. Ridgway and D. A. Carder (1996) *Hearing deficits measured in some Tursiops truncatus, and discovery of a deaf/mute dolphin* (Online) Available at: https://www.freemorgan.org/wp-content/uploads/2012/10/ridgway___carder_1996_tursiops_deaf__mute.pdf (Accessed 06 April 2023).

9.11 Summary

Table 9.16 Summary of the assessment of effects

Receptor	Receptor importance	Activity	Magnitude of change	Significance
Intertidal habitats / species	High	Decommissioning and removal of marine infrastructure during the Preparations for Quiescence phase	Very low	Minor (not significant)
Intertidal habitats / species	High	Demolition works and ground remediation during the Preparations for Quiescence and Final Site Clearance phases	Very low	Negligible to minor (not significant)
Subtidal habitats / species	Very low to medium	Decommissioning and removal of marine infrastructure during the Preparations for Quiescence phase: Loss of habitat	Very low	Negligible (not significant)
Subtidal habitats / species	Very low to medium	Decommissioning and removal of marine infrastructure during the Preparations for Quiescence phase: Physical disturbance and degradation in habitat quality	Low	Negligible to minor (not significant)
Subtidal habitats / species	Very low to medium	Decommissioning and removal of marine infrastructure during the Preparations for Quiescence phase: Discharges from vessels	Very low	Negligible (not significant)
Subtidal habitats / species	Very low to medium	Demolition works and ground remediation during the Preparations for Quiescence phase and Final Site Clearance phase	Very low	Negligible (not significant)

Receptor	Receptor importance	Activity	Magnitude of change	Significance
Migratory fish	Medium	Decommissioning and removal of marine infrastructure	Low	Minor (not significant)
Migratory fish	Medium	Demolition works and ground remediation during Preparations for Quiescence phase and Final Site Clearance phase	Very low	Negligible (not significant)
Non-migratory fish	Medium	Decommissioning and removal of marine infrastructure during Preparations for Quiescence phase	Low	Minor (not significant)
Non-migratory fish	Medium	Demolition works and ground remediation during the Preparations for Quiescence phase and Final Site Clearance phase	Very low	Negligible (not significant)
Marine mammals	Medium	Decommissioning and removal of marine infrastructure during the Preparations for Quiescence Phase	Low	Minor (not significant)
Marine mammals	Medium	Demolition works and ground remediation during Preparations for Quiescence phase and Final Site Clearance phase	Very low	Negligible (not significant)

9.12 Assessment of cumulative effects

Inter-project effects

9.12.1 There is the potential for marine biodiversity effects associated with the Proposed Works to interact with, or combine with the effects arising from other developments or projects proposed within the relevant Zones of Influence applicable to each environmental aspect.

9.12.2 An assessment inter-project effects is considered within in **Chapter: 21: Cumulative Effects Assessment** of this ES.

Intra-project effects

9.12.3 The assessment above has inherently considered the potential impacts associated with underwater noise and changes to coastal processes, water quality and groundwater quality on sensitive marine biodiversity receptors.

9.12.4 A summary of the potential intra-project effects is provided in **Chapter 21: Cumulative Effects Assessment.**

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10.

Coastal Management and Water Quality

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10. Coastal Management and Marine Water Quality

10.1 Introduction

10.1.1 This chapter presents the assessment of effects of the Proposed Works with respect to coastal management and water quality. It describes the key receptors and coastal process pathways in the vicinity of the Indicative Dismantling Works Area (hereafter referred to as the "Works Area") and should be read in conjunction with the description of the Proposed Works presented in **Chapter 2: The Decommissioning Process** and with respect to relevant parts of other environmental aspect chapters, including in particular **Chapter 8: Marine Biodiversity** and **Chapter 11: Surface Water and Flood Risk**, where common receptors have been considered or where there is a potential inter-relationship with respect to the assessment of effects.

10.1.2 This chapter describes the existing coastal processes and marine water quality within the Firth of Clyde in North Ayrshire which could potentially be affected by the Proposed Works. It examines the potential for changes in coastal processes and marine water quality resulting from the dismantling and decommissioning of the existing marine infrastructure, comprising the cooling water intake and outfall heads (and associated infrastructure) and the jetty to the south of the Hunterston B Power Station (HNB) Nuclear Site Licence (NSL) Boundary (hereafter referred to as "the Site").

10.2 Relevant legislation, policy and technical guidance

Legislation

10.2.1 The legislation in **Table 10.1** is relevant to the assessment of the effects on coastal management and water quality receptors:

Table 10.1 Legislation relevant to coastal management and water quality

Legislation	Legislation relevance
Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy (Water Framework Directive)[1]	The Water Framework Directive 2000/60/EC (WFD) is an EU directive committing European Union member states to achieve good qualitative and quantitative status of all water bodies, including marine surface waters up to three nautical miles from shore (in Scotland), with a requirement for compliance with parameters contributing to chemical status up to 12 nautical miles from the shore. Further details of the assessment criteria are included in the Water Framework Directive compliance assessment presented in **Appendix 10B**. Although the UK has now left the EU, the provisions of the WFD are currently retained in Scottish legislation.

[1] The European Commission (2000). *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. As amended by Directives 2008/105/EC and 2013/39/EU and 2014/101/EU*. (Online) Available at: https://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC_1&format=PDF (Accessed November 2023)

Legislation	Legislation relevance
	The main aims of the WFD relevant to the coastal management and water quality assessment are to: • prevent deterioration and enhance the status of aquatic ecosystems; • promote sustainable water use; • reduce pollution; and • contribute to the mitigation of floods and droughts. The WFD requires Member States to put in place systems for managing their water environments based on natural river basin districts and underpinned by extensive environmental monitoring and scientific investigation through River Basin Management Plans (RBMP). It further requires Member States to take account of the need to recover the costs of water services as a means of encouraging sustainable use of water resources. This assessment considers whether decommissioning activity is likely to affect compliance with the aims of the WFD or implementation of the Scotland RBMP.
Flood Risk Management (Scotland) Act 2009[2]	The purpose of the Act is to improve the assessment and sustainable management of flood risk across Scotland. This is supported by a new duty on local authorities, the Scottish Environment Protection Agency (SEPA), Scottish Ministers and others to exercise their flood risk-related functions with a view to reducing overall flood risk. Flood risk is defined in the Act as '*the combination of the probability of flooding and the potential adverse consequences for human health, the environment, cultural heritage and economic activity*'. Coastal flood risk management policy is set out in the current Shoreline Management Plan (SMP)[9] and the requirements are implemented by relevant partners (including local authorities and SEPA). This assessment considers whether decommissioning activity is likely to affect the implementation of the SMP.
Water Environment and Water Services (Scotland) Act 2003[3]	The Water Environment and Water Services (Scotland) Act 2003 is the legislation which transposes the WFD and made major changes to the administration of water and sewerage provision in Scotland. It identifies SEPA as the competent authority for implementation. Part 1 makes provision for protection of the water environment, whilst Part 2 deals with water and sewerage services. The Act provides the framework for establishment of environmental quality standards against which the effects of decommissioning have been assessed.

[2] Scottish Parliament (2009). *Flood Risk Management (Scotland) Act 2009*. (Online) Available at: http://www.legislation.gov.uk/asp/2009/6 (Accessed November 2023)
[3] Scottish Parliament (2003). *Water Environment and Water Services (Scotland) Act 2003*. (Online) Available at: http://www.legislation.gov.uk/asp/2003/3 (Accessed November 2023)

Legislation	Legislation relevance
Marine (Scotland) Act 2010[4]	The Marine (Scotland) Act provides a framework which will help balance competing demands on Scotland's seas. It introduces a duty to protect and enhance the marine environment and includes measures to help boost economic investment and growth in areas such as marine renewables. Relevant to this chapter are Part 3 (provisions on marine planning) and Part 4 (requirements for marine licences for works below mean high water of spring tides). This assessment considers whether decommissioning will affect compliance with marine plans and it is anticipated that this assessment will be used by Marine Scotland to inform their decision making in the context of issuing any marine licences which may be required.
The Water Environment (Controlled Activity) (Scotland) Regulations 2011 (as amended)[5]	These Regulations provide a regulatory framework for controlling activities which could have an adverse effect on Scotland's water environment, including abstraction, impoundments, engineering, dredging, surface water drainage, and pollution. Provisions on water discharges to marine waters are relevant to this chapter.
The Bathing Waters (Scotland) Regulations 2008[6]	The Regulations require the designation of areas of surface water (coastal or inland) as a bathing water if large numbers of people are expected to bathe there, based on previous trends, infrastructure, or facilities, including measures to promote bathing at the Site. Once designated, there is a requirement for annual monitoring to be undertaken, classifying the area as excellent, good, sufficient or poor, based on measurements taken over a four-year period, and for notification of the public and implementation of management measures where quality is assessed as poor.

Policy

10.2.2 A summary of the relevant policies is presented in **Table 10.2.**

Table 10.2 Policy relevant to coastal management and water quality

Policy Reference	Policy Relevance
National Policy	
National Planning Framework 4 (NPF4)[7]	NPF4 recognises the Hunterston Strategic Asset (including Hunterston Port and Hunterston Power Station sites) as a location for nationally strategic development, including re-use of the deepwater port and development of low-carbon energy industries.

[4] Scottish Parliament (2010). *Marine Scotland Act 2010*. (Online) Available at: http://www.legislation.gov.uk/asp/2010/5 (Accessed November 2023)
[5] Scottish Government (2011). *The Water Environment (Controlled Activity) (Scotland) Regulations 2011* (as amended). (Online) Available at: http://www.legislation.gov.uk/ssi/2011/209/contents/made (Accessed 22 March 2023)
[6] Scottish Parliament (2008) *The Bathing Waters (Scotland) Regulations 2008*. (Online) Available at: https://www.legislation.gov.uk/ssi/2008/170/contents/made (Accessed 28 September 2023)
[7] Scottish Government (2023) *National Planning Framework 4.* (Online) Available at: https://www.gov.scot/publications/national-planning-framework-4/ (Accessed 22 March 2023).

Policy Reference	Policy Relevance
	More generally, the framework sets out policies for coastal areas. Of relevance in this context is: Policy 10 a) Development proposals in developed coastal areas will only be supported where the proposal: (i) does not result in the need for further coastal protection measures taking into account future sea level change; or increase the risk to people of coastal flooding or coastal erosion, including through the loss of natural coastal defences including dune systems; and (ii) is anticipated to be supportable in the long-term, taking into account projected climate change. Thus, NPF4 sets the planning context within which decommissioning will take place and this assessment has considered whether any environmental effects of decommissioning activities would conflict with framework policies.
Local Policies	
North Ayrshire Adopted Local Development Plan (LDP)[8]	The LDP includes policy references to Hunterston. Strategic Policy 3 recognises the strategic national importance of Hunterston as an energy hub and deep water port. The Hunterston Strategic Development Area includes the Site, the existing deep water port and additional employment land. Policy 22 indicates that development will be required to ensure that there is no adverse impact on the water environment by protecting and enhancing the ecological status and physical characteristics of water bodies and having regard to any designated bathing waters.
Ayrshire Shoreline Management Plan (SMP)[9]	This is a non-statutory policy document for coastal defence management planning agreed between relevant local and national authorities. The long-term plan for the coastline around HNB is to allow the existing shoreline defences to be advanced. The SMP policies take account of predicted rises in sea level, recognising that, whereas in the past the land has risen due to isostatic rebound more quickly than the eustatic rise in sea level, in more recent years sea level rise due to global climate change may be counteracting this trend. However, the SMP states that it should be seen as a live document subject to regular review as climate change predictions are updated and the actual rate of future sea level rise becomes better understood.
Clyde Regional Marine Plan[10]	The Clyde Marine Planning Partnership[11] is currently developing a marine plan which will provide a framework to manage, effectively and sustainably, the economic, social and environmental needs of the Clyde Marine Region. The policies within the draft plan are designed to guide all marine and coastal users with respect to proposed and existing developments, and any

[8] North Ayrshire Council (2019) *Adopted Local Development Plan.* (Online) Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed November 2023)
[9] North Ayrshire Council (2018) *Ayrshire Shoreline Management Plan*. (online) Available at: https://www.north-ayrshire.gov.uk/your-community/community-safety/flooding/ayrshire-shoreline-management-plan.aspx (Accessed November 2023)
[10] Clyde Marine Planning Partnership (2019) *Clyde Regional Marine Plan*. (Online) Available at: https://www.clydemarineplan.scot/marine-planning/clyde-regional-marine-plan/ (Accessed November 2023)
[11] The Clyde Marine Planning Partnership currently (as of August 2023) comprises 24 stakeholders across a range of sectors with marine and/or coastal interest in the Firth of Clyde. The principal role of the CMPP is to prepare a Marine Plan for the Clyde Marine Region (being Marine Scotland's nominated delegate for this role), as well as undertaking other aspects of Integrated Coastal Management (ICM). Further detail is available at: https://www.clydemarineplan.scot/ (Accessed November 2023)

Policy Reference	Policy Relevance
	activities associated with them. The Objective of particular relevance to the Proposed Works is CP1, which states: '*Current and new coastal zone and marine development(s) and activities, and land-based development(s) and activities near the coast, are resilient to the dynamic nature of the coast, including the impacts of climate change, using natural assets and soft engineering where possible'*. Objectives NH1 and NH2, relating to protection of the health of the marine and coastal natural heritage of the Clyde Marine Region and ensuring that development and use of the coastal and marine environment does not have significant negative impacts on biodiversity, are also relevant to indirect effects of changes in coastal management and water quality on biota. These aspects have been considered in **Chapter 9: Marine Biodiversity**.

Technical guidance

10.2.3 The technical guidance summarised in **Table 10.3** is relevant to the assessment of the effects on coastal management and marine water quality receptors.

Table 10.3 Technical guidance relevant to coastal management and water quality

Technical Guidance	Context
Guidelines for Environmental Impact Assessment (EIA)[12]	Current widely accepted best practice guidelines to undertaking all aspects of EIA.
WAT – SG – 29: Engineering in the Water Environment Good Practice Guide, Temporary Construction Methods[13]	A good practice guide which sets out mitigation methods to minimise or avoid the adverse effects of construction works on the water environment. Although specifically written in relation to rivers and lochs, much of the guidance is also relevant to discharges to marine waters.
CIRIA C532 Control of Water Pollution from Construction Sites[14]	Provides guidance on how to plan and manage construction projects to control water pollution. Although specifically addressing matters relating to rivers and lochs, much of the guidance is also relevant to discharges to marine waters.

[12] Institute of Environmental Management and Assessment. (2017). *Guidelines for Environmental Impact Assessment.* IEMA; Lincoln, UK
[13] SEPA (2009) *Engineering in the Water Environment Good Practice Guide, Temporary Construction Methods*. (Online) Available at: https://www.sepa.org.uk/media/150997/wat_sg_29.pdf (Accessed 24 March 2023).
[14] CIRIA (2001) *Control of Water Pollution from Construction Sites*. (Online) Available at: https://www.ciria.org/CIRIA/ProductExcerpts/C532.aspx (Accessed 24 March 2023).

10.3 Data gathering methodology

Study Area

10.3.1 The Study Area was defined on a precautionary basis to ensure that, as a minimum, the Zone of Influence (ZoI)[15] relevant to all marine ecological features was covered during baseline characterisation.

10.3.2 For the purposes of the assessment, allowing for inclusion of any potential changes to the sediment transport regime, a minimum of one tidal excursion from the Works Area is considered to be appropriate. The length of the spring tidal ellipse off Hunterston, based on data from tidal diamond B on UK Admiralty chart 1867 located between Hunterston and Little Cumbrae, is a narrow ellipse extending up to approximately 4 km in each direction from the Site along a north-north-east to south-south-west axis, with the principal tidal currents running parallel to the shore. Thus, the Study Area extends over a distance of 4 km to the north-north-east and south-south-west in each direction from the Works Area, as seen delimited with a discontinuous purple line in **Figure 10.1**. The tidal ellipse is narrow, extending less than 0.5 km in a west-north-west to east-south-east direction. Effects are therefore unlikely to extend offshore beyond the islands of Great Cumbrae and Little Cumbrae, so these form an appropriate offshore boundary to the Study Area. On this basis the Study Area extends to the northern edge of Southannan Sands Site of Special Scientific Interest (SSSI) (north of the Hunterston Bulk Terminal jetty) towards the north, to Seamill towards the south and offshore as far as the Cumbrae islands.

10.3.3 The topography of the area means that the principal exposure to strong winds and thus the largest waves is from the south-west, thus involving a significant longshore component at the Site.

10.3.4 The shipping channel passing between HNB and the Cumbrae islands is known as the Hunterston Channel, while the main shipping channel for the Clyde ports is to the west of the Cumbrae islands. It should be noted, however, that the WFD coastal water body occupying the area between HNB and the Cumbrae islands is known as Largs Channel (Fairlie Roads) (see **Figure 10.1** and **Appendix 10B**).

10.3.5 In addition to the effects of the Proposed Works in the marine environment, the marine water quality in the Study Area may also be affected by discharges from land, including treated sewage and surface water runoff from the Works Area. Influences on, and changes to, water quality arising from discharge of inland surface waters are taken into account in this chapter by cross-reference to **Chapter 11: Surface Water and Flood Risk**.

10.3.6 From a coastal management perspective, the ZoI is mainly within the active sediment cell 6b as identified in the SMP[9].

Desk study

10.3.7 This assessment has been undertaken with reference to **Chapter 2: The Decommissioning Process**, supported by a number of data sources which notably include:

- Ayrshire SMP 2018[9];

[15] The zone of influence is the area around the Site that may be affected by the Proposed Works in respect of the coastal management and water quality aspect.

- Strategic Environmental Assessment Site Specific Baseline for Hunterston A Site 2014;
- Admiralty Charts 2491 Ardrossan to Largs and 1867 Firth of Clyde: Hunterston Channel and Rothesay Sound;
- SEPA Water Environment Hub[16];
- Scotland's Marine Atlas[17];
- SEPA designated Bathing Waters[18];
- SEPA designated Shellfish Water Protected Areas[19]; and
- SEPA Flood Maps[20].

Survey work

10.3.8 Site-specific quarterly marine water quality surveys were undertaken during 2021 and 2022, with water samples collected from the seaward end of the HNB jetty, at location coordinates (National Grid Reference (NGR) NS175506). The findings of these quarterly surveys are presented in a series of baseline reports, which are summarised in **Section 10.5** of this chapter.

Data limitations

10.3.9 The following limitations to the baseline data are acknowledged.

- Although the water quality survey data were collected in 2021/2022, no developments have taken place in the vicinity (taken to be the Study Area) since then that have the potential to result in a significant change in the baseline water quality. Therefore, the survey data are considered to be valid for the purposes of this assessment.
- No recent data on sediment quality are available to assess potential contamination. However, the limited scope for sediment remobilisation and secondary impacts to biota means that this does not materially affect the conclusions of the EIA.

10.4 Consultation

Overview

10.4.1 The assessment has been informed by consultation responses from statutory engagement, and additional, targeted, technical engagement.

[16] SEPA (2020). *Water Environment Hub* (Online). Available at: https://www.sepa.org.uk/data-visualisation/water-environment-hub/ (Accessed November 2023).
[17] Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors), (2011). *Scotland's Marine Atlas: Information for the national marine plan*. Marine Scotland, Edinburgh. pp. 191
[18] SEPA (2020). *Bathing Waters* (Online). Available at: http://apps.sepa.org.uk/bathingwaters/ (Accessed November 2023).
[19] Shellfish Water Protected Area designated under *The Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order* (S.S.I. 2013:0324). See map at: https://www.sepa.org.uk/media/593909/swpa-16_fairlie.pdf (Accessed November 2023)
[20] SEPA (2022). *Flood Maps*. (Online) Available at: http://map.sepa.org.uk/floodmap/map.htm (Accessed November 2023).

Pre-application Opinion

10.4.2 A pre-application opinion was adopted by the Office of Nuclear Regulation (ONR), on 4 October 2022. A summary of the relevant responses received in the Pre-application Opinion in relation to coastal management and water quality and confirmation of how these have been addressed within this assessment is presented in **Table 10.4**. Also presented are comments from responses received from SEPA, in addition to those incorporated within the formal Pre-application Opinion.

Table 10.4 Pre-application Opinion responses

Paragraph Ref	Consideration	How addressed in the Environmental Statement (ES)
61	In addition to the comments raised on the resilience of the Safestore to climate change, the EIA should consider available climate change data already in the public domain, such as the 2018 Ayrshire Shoreline Management Plan. In addition to this, the EIA should take into account potential "soft" coastal management techniques deployed in the area to manage coastal flooding.	This assessment has included climate change within consideration of the future baseline (**Section 10.5**). With regards to "soft" coastal management techniques, see response to Reference 69.
69	The EIA should take into account of potential "soft" coastal management techniques deployed in the area to manage coastal flooding.	The coastal policy unit defined in the SMP alongside which HNB is located (6b2.1) currently has a policy of advance the line, irrespective of the decommissioning of HNB. The SMP notes the potential for positive impacts due to habitat creation if soft shoreline protection measures are incorporated. (See further detail in paragraph 10.5.4.)
80	During the removal of marine structures, there is a potential for nearby sediment to be disturbed and suspended in the water column. It is not clear from the scoping report whether any sampling of the sediment has been undertaken to understand the potential for the mobilisation of existing contamination in the sediments. Consideration of changes in water quality due to suspended sediments should also be included in the ES.	Due to the small footprint of works anticipated within the marine environment, site-specific sediment samples have not been collected. The assessment presented within this EIA has drawn on publicly-available information (see **Section 10.5**). Changes in water quality due to suspended sediment have been addressed in this chapter (see **Section 10.10**).
84	As the site is no longer operating, the thermal plume from the warmer cooling water effluent being discharged into the marine environment has ceased. Whilst the impact of this activity ending on marine habitats and species is out	The baseline water quality has been established by sampling close to the cooling water intake which, by design, is outside the influence of the thermal discharge.

Paragraph Ref	Consideration	How addressed in the Environmental Statement (ES)
	of scope of EIADR, it would be useful to understand how this has been considered in establishing the current baseline for the EIA	
87	ONR notes that contaminated radiological runoff is considered in Chapter 9 Coastal Management and Marine Quality. The ES should clearly demonstrate how the potential impacts of radioactive contamination of groundwater, surface water and land have been assessed and where this is described within the report.	Radiologically contaminated run-off is addressed in **Chapter 11: Surface Water and Flood Risk** and results fed into the assessment in this chapter. Discharges of treated radioactive effluent will be made through the Active Effluent Discharge Line (AEDL) and are assumed to contain less radiological load than the discharges during operation of HNB. Discharges of treated radioactive effluent were scoped out at the EIA Scoping stage.

Technical engagement and non-statutory consultation

10.4.3 **Table 10.5** summarises the technical responses that have been provided by statutory consultees which have helped inform the coastal management and water quality chapter of this ES.

Table 10.5 Consultation Responses

Consultee	Consideration	How addressed in the ES
SEPA	Surface water and coastal are the main flood sources. It is noted that these will be subject to further assessment as the decommissioning progresses.	Potential flooding risks are considered and assessed within **Section 10.10**.

10.4.4 A targeted stakeholder meeting was held with SEPA on 26 October 2023. The meeting covered a project overview, information on the decommissioning process, and additional project description information for context. An overview of the surveys undertaken with regards to marine biodiversity, and draft assessment findings were presented, along with a detailed discussion around embedded mitigation measures associated with the marine environment. SEPA raised specific points about the potential for contaminants from excavations entering groundwater or surface water drainage systems and noted that surface water drainage would enter the Firth of Clyde.

10.4.5 Similar issues were presented to the Clyde Marine Planning Partnership (CMPP) on 2 November 2023, where the findings of the assessment were discussed with CMPP representatives.

10.5 Overall baseline

Current baseline

Location

10.5.1 The majority of the Works Area is situated inland of the shoreline (mean high water springs ("MHWS")).

10.5.2 Marine infrastructure associated with HNB within the Works Area includes a cooling water outfall extending approximately 300 m into the Firth of Clyde to a seabed outfall structure and a cooling water intake structure that is sited at the end of a jetty (170 m in length), initially built in 1959 for Hunterston A power station (HNA) then extended in 1976 for HNB headworks. The landward end of the jetty is situated approximately 600 m south-west of the Site and is built over a concrete cooling water intake pipe for HNA. The cooling water intake tunnel for HNB runs under the seabed in a straight line between the intake structure at the end of the jetty and the intake land shaft, located to the south-west of the Site.

10.5.3 Surface water drainage from the Works Area is discharged through an open channel leading to the shore via oil interceptors. This discharge is located immediately to the south of the land shaft for the cooling water outfall. The access road from the north (Power Station Road) passes within 10 m of the upper shore, 90 m to the north-east of the entrance roundabout to HNB, at a point identified in the SMP (see Shoreline Management below) as being susceptible to erosion.

Shoreline management

10.5.4 The SMP[9] covers the coastline from Skelmorlie to the Galloway Burn, along with the islands of Arran and Great Cumbrae. The plan guides land use and policy in the area and recommends further studies to allow coastal protection measures to be put in place, as required in the future.

10.5.5 HNB lies within SMP sub-cell 6b2 (Hunterston Ore Terminal to Farland Head) and this is split into two policy units. Policy unit 6b2.1 (Hunterston Ore Terminal to the HNB Jetty) includes HNB and includes a long-term plan to allow the existing shoreline defences to be advanced. Policy Unit 6b2.2 (HNB Jetty to Farland Head), immediately to the south, includes a long-term plan of no active intervention. The SMP[9] recognises that implementation of the policy to advance the defences in policy unit 6b2.1 may influence the sediment regime within policy unit 6b2.2, requiring careful study prior to any physical works being undertaken.

10.5.6 These policies will apply irrespective of the Proposed Works.

Baseline flood risk

10.5.7 Risks of fluvial and pluvial flooding of the Site are addressed in **Chapter 11: Surface Water and Flood Risk**.

10.5.8 There is a low risk of coastal flooding (0.1% annual exceedance probability [AEP]) of the north-west corner of the Works Area, leading inland from the roundabout on Power Station Road for 150 m. An area with a high probability of coastal flooding (10% AEP) is situated immediately adjacent to the surface water outlet, 10 m to the north of the Site, on the grassy verge to the north of the roundabout on Power Station Road (NGR NS181515). The Works Area is protected from coastal flooding due to its elevation above sea level which ranges from approximately 5 m to 20 m Above Ordnance Datum (AOD). Moreover,

sea defences consisting of a revetment are located along the seashore from the north-west to the south-west of the Works Area. The revetment consists of boulders and concrete rubble, with its crest varying from 4.0 m AOD to 5.88 m AOD. There are also natural buffers further along the coast to the north of the Site in the form of shingle and vegetated marshlands. The sea defences are designed to prevent external flooding of the Cooling Water Pumphouse due to wave overtopping during frequent (≥10-3 pa) events, but not infrequent (≥10-4 pa) events.

Coastal management and physical processes

10.5.9 As described in the SMP[9], the shoreline in sub-cell 6b2 is predominantly composed of hard or artificial material, with less than 15% of the shoreline classified as soft. Sediment drift within this sub-cell is in a northerly direction, with a sediment sink at Hunterston Sands. The southern extent of this sub-cell is characterised by a raised rock platform that is backed by a steep raised relict cliff line. This relict cliff line can be traced from Portencross in the south to Hunterston in the north. The occurrence of soft sediment within the intertidal zone at Hunterston increases to northwards to form an area of tidal sandflats. The most exposed section of sub-cell 6b2 is the shoreline at Hawking Craig near the jetty and cooling water intake, where force 8 gales can typically produce maximum wave heights of 1 m to 1.5 m.

10.5.10 The main area of erosion risk in sub-cell 6b2 is located at Hunterston along the section of Power Station Road to the Site between Inner Brigurd Point (NGR NS184520) and the Power Station Roundabout. The SMP[9] estimates that by 2050 approximately 0.05 km of road and 0.002 km^2 of a Site of Special Scientific Interest (SSSI) are predicted to be directly affected by erosion, while approximately 0.3 km of road and 0.003 km^2 of SSSI lie within the wider zone of concern. By 2100, approximately 0.15 km of road and 0.002 km^2 of SSSI are estimated to be directly affected by erosion, with little change in the extents of assets within the zone of concern. These assets lie within Policy Unit 6b2.1, with a policy to advance the line. The SMP notes that implementation of this existing policy has the potential to result in a positive impact on road infrastructure, as this will benefit from erosion protection.

10.5.11 Policy Unit 6b2.2, to the south of the HNB Jetty, contains no assets at risk, hence the policy of no active intervention.

Water quality

WFD water bodies and designated sites

10.5.12 The unnamed drainage ditches to the north and north-east of the Works Area discharge into the Largs Channel (Fairlie Roads) coastal water body, but they are not reportable for WFD monitoring purposes (see **Appendix 10B**). They are however considered as part of the scope of the assessment within **Section 10.4** and **Section 10.9** in terms of potential for effects on coastal water quality.

10.5.13 There are two hydrologically connected coastal WFD water bodies in the Study Area (see **Figure 10.1**): the Largs Channel (Fairlie Road) coastal water body (WFD water body ID: 200026), which receives discharges from the Site, and the Seamill and Ardrossan coastal water body (ID: 200024), approximately 1.8 km to the south-west of the Works Area.

10.5.14 SEPA's Water Environment Hub[16] identifies that each of these coastal water bodies has been classified as having an overall status of good (as of 2020). The objective is therefore for these coastal water bodies to maintain their overall status of good during the period up to 2027, in line with WFD cycles (see paragraph 10.5.33).

10.5.15 There is a Shellfish Water Protected Area at Fairlie[19], at the northern end of the Study Area, designated for Pacific oyster (*Crassostrea gigas*). This is currently classified as being of good quality. The associated Shellfish Production area is classed as quality B[21] by Food Standards Scotland.

10.5.16 There are two designated Bathing Waters[18] (see **Figure 10.1**) within the Study Area at Seamill and Millport, situated approximately 5 km and 3.5 km (by sea) to the south and north of the Works Area, respectively. Both are classified as being of good bathing quality under *The Bathing Waters (Classification) (Scotland) Regulations 1991* (as amended)[22].

Site-specific monitoring data

10.5.17 As part of the baseline data collation for this assessment, four quarterly water sampling surveys (see survey results in **Appendix 10A**) were undertaken from the seaward end of the HNB jetty, over the period April 2021 to March 2022 to account for potential seasonal variations. The surveys measured water temperature, salinity, electrical conductivity, dissolved oxygen, nutrients, total metals and total suspended solids. The results are summarised in paragraphs 10.5.18 to 10.5.24 and in **Table 10.6** and **Table 10.7**. Samples were collected at depths of 1 m, 2 m and 3 m from the water surface.

Table 10.6 Key water quality parameters recorded (depth averaged)

Parameter*	Spring (Apr 2021)	Summer (Aug 2021)	Autumn (Nov 2021)	Winter (Mar 2022)	Annual range
Average temperature (°C)	8.29	15.28	12.65	7.04	Max: 15.28 Min: 6.92
Average salinity (units)	25.40	26.77	26.08	24.79	Max: 26.77 Min: 24.52
Average electrical conductivity (mS/cm)	39.90	41.75	40.82	39.30	Max: 41.76 Min: 38.96
Average dissolved oxygen (mg/l)	10.94	8.90	8.65	11.82	Max: 11.95 Min: 8.50
Average total suspended solids (TSS) (mg/l)	44.73	33.53	35.33	26.06	Max: 49.70 Min: 24.3

All the parameters have been calculated as an average of 3 depth locations at the seaward end of the jetty.
Annual range represents the range across the depth averaged mean values

[21] Shellfish Production Area classified in accordance with retained EU Regulation 853/2004. European Commission (2004) *Regulation (EC) 853/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific hygiene rules for food of animal origi*n. (Online) Available at: https://www.legislation.gov.uk/eur/2004/853/contents# (Accessed November 2023).
[22] Scottish Parliament (2012). *The Bathing Waters (Scotland) Regulations 2008* (S.S.I. 2008:0170), as amended by S.S.I. 2012:0243. (Online) Available at: https://www.legislation.gov.uk/ssi/2008/170/contents (Accessed November 2023).

10.5.18 In general, across monitored parameters, marine water quality is within the expected range for a lower estuary site and when placed within the local context, noting, for example, that salinity data show the influence of freshwater inputs (salinity in the open sea being typically 34 salinity units around the UK, with electrical conductivity of seawater typically around 50 mS/cm).

Nutrients

10.5.19 The focus of site-specific water quality surveys was on levels of nitrogen as nitrate and as ammoniacal nitrogen. Both forms are available for uptake by algae and ammoniacal nitrogen is also a specific pollutant with an Environmental Quality Standard (EQS) established in relation to its toxicity. In water, ammonium ions and un-ionised ammonia exist in an equilibrium, with the latter fraction being the more toxic of the two components, so the EQS for transitional and coastal waters is set at 0.021 mg/l of un-ionised ammonia (expressed as N).

10.5.20 The nutrient results across the survey period were consistently low, at less than the reporting limits for both nitrate and ammoniacal nitrogen (and below the relevant EQS levels) in all cases.

10.5.21 The relationship between the concentration of un-ionised ammonia and the concentration of total ammoniacal nitrogen is influenced by pH, temperature and salinity. For a typical Firth of Clyde pH value of 7.9[23], temperature (depth averaged) of 7.04°C and salinity (depth averaged) of 24.79 units, application of the Environment Agency's calculation algorithm for saline waters[24] shows that the reported total ammonia concentration of <0.2mg/l (as NH_3 - equivalent to <0.165mg/l as N) corresponds to an un-ionised ammonia concentration of <0.0019mg/l, which is of no concern in relation to compliance with the EQS.

Total metals

10.5.22 With the exception of three individual results for zinc and one for lead, concentrations of all metals recorded in samples taken throughout the quarterly surveys were below the reporting limit (sometimes referred to as the limit of detection) for the specific analysis at the time.

10.5.23 Comparison of sample analysis for metals with the associated EQS values, as shown in **Table 10.7**, show that where reporting limits were less than the EQS values (i.e. for arsenic (AA[25]), lead (MAC[26]), mercury (MAC), nickel (AA and MAC)), results demonstrate that the sample concentrations were below the relevant EQSs. Two zinc results exceeded the AA EQS but the other results were expressed as 'less than' values, so compliance on an average basis cannot be assessed. Similarly, compliance with lead (AA), cadmium (AA) and copper (AA) standards cannot be assessed, with analytical results being below the reporting limits for these metals. However, overall the data indicate low levels of metals and do not suggest the presence of significant contamination in the water column.

10.5.24 This is consistent with data provided in the current version of Scotland's Marine Atlas[17], prepared by Marine Scotland in 2011 to support preparation of the National Marine Plan, which shows water quality results for 2009 for sampling sites in the Clyde Estuary and in the Firth of Clyde, off Irvine. Results from these sites were reported as being in the

[23] Muller F.L.L, Balls P.W. and Tranter M. (1995) *Processes controlling chemical distributions in the Firth of Clyde (Scotland). Oceanologica Acta*, 18,(5), 493- 509.
[24] Environment Agency algorithm applied in this instance, as no equivalent exists in Scottish guidance.
[25] Annual average
[26] Maximum allowable concentration

highest water quality category as defined in the Atlas with cadmium reported as <0.05 µg/l, copper <1.25 µg/l, lead <1.25 µg/l and zinc <10 µg/l.

Table 10.7 Site-specific trace metal survey results associated SEPA EQS values

	Water quality survey results 2021/2022			SEPA's EQS for metals[27]		
Trace metal	**Mean (µg/l)**	**Max value (µg/l)**	**Min value (µg/l)**	**EQS(µg/l)**		
				Statutory status	**AA**	**MAC**
Arsenic	<12	<12	<12	WFD UK specific pollutant	25	-
Lead	<6.04	6.47	<6	WFD PS	1.3	14
Cadmium	<3	<3	<3	WFD PHS	0.2	-
Mercury	<0.02	<0.02	<0.02	WFD PHS	-	0.07
Chromium	<18	<18	<18	N/A	N/A	N/A
Nickel	<6	<6	<6	WFD UK specific pollutant	8.6	34
Copper	<6	<6	<6	WFD UK specific pollutant	3.76 (for DOC <1 mg/)l	-
Zinc	<37.8	93.6	<30	WFD UK specific pollutant	7.9	-

PS: Priority Substances - a group of substances shown to be of major concern for European Waters due to their toxicity, bio-accumulating properties and/or persistence in the environment.
PHS: Priority Hazardous Substances
N/A: No EQS is established in marine waters for total chromium.

Existing CAR licences

10.5.25 There are a number of CAR licences authorising discharges into the marine environment in the vicinity of the HNB Site (although it is noted that some of these are historic in nature, and no longer active). CAR licences still in force are detailed in **Table 10.8**.

Table 10.8 CAR licences issued to HNB and currently valid

Reference	Discharge covered	Date issued	NGR	Limit values
CAR/L/ 1000649 (Note 1)	Main cooling water (CW) discharge and water treatment	10/11/2010	NS17735177	Max 33°C Free Cl_2 0.5 mg/l

[27] Scottish Government (2014). *The Scotland River Basin District (Standards) Directions 2014* (Online) Available at: https://www.gov.scot/publications/scotland-river-basin-district-standards-directions-2014/ (Accessed November 2023).

Reference	Discharge covered	Date issued	NGR	Limit values
	effluent discharge (trade effluent). 3350mm outfall shaft.			Oil 10 mg/l pH 5-9
CAR/L/ 1010509 (Note 2)	Treated sewage from 2006 plant (via 3350mm concrete CW outfall shaft).	7/11/2006	NS17735177	Max 85 m^3/d $BOD_{5(atu)}$) 40 mg/l (lookup) $BOD_{5(atu)}$ 80 mg/l (max) pH 5-9
CAR/L/ 1003329	SWPH outfalls – surface water from Areas 1 & 2 plus treated sewage from former sewage treatment works (decommissioned in 2006) (3048mm twin culverts)..	24/6/2008	NS17655165	Oil 10 mg/l
CAR/L/ 1000648	Transformer cooling and other process water and surface water from Area 3. (1000 mm concrete pipe).	10/11/2010	NS18005160	TSS 150 mg/l Oil 10 mg/l pH 5-9
WPC/W/213 92	Area 4 surface water drainage via ditch and 350mm (13”) outfall	20/4/1999	NS 182 519	Oil 10 mg/l
CAR/R/ 1012347	Cooling water abstraction licence	16/10/2006	NS17545068	Maximum flow 2,570,000 m^3/d

Note 1: Replaced Ayrshire River Purification Board (Rivers [PoP] Act) consent RP914a, issued in 1969.
Note 2: Replaced treated sewage effluent component of CAR/L/1003329 when new sewage treatment works built in 2006. Discharge location changed to main cooling water outfall shaft.

10.5.26 Relevance to this assessment is as follows.

- CAR/L/1000649: This licence authorised the main cooling water and trade effluent discharge from the operating HNB power station via the long sea outfall. While discharge of heated cooling water from the condensers has already ceased, a reduced flow of abstracted sea water is maintained to assist in conveying remaining trade effluents associated with defueling and other ongoing processes, as well as treated sewage discharges authorised by CAR/L/1010509, through the existing large diameter sea outfall. The discharge of abstracted sea water will cease completely at an early stage during the Preparations for Quiescence phase of decommissioning, as discharges will be transferred to the AEDL once it has been installed. Therefore, the baseline for this ES assumes limited discharges of abstracted sea water, reducing to zero early in the programme. These discharges, including the trade effluents and treated sewage, will continue to be authorised by the existing CAR licences and changes in these discharges are characterised within the baseline and are thus outside the scope of this assessment and associated WFD compliance assessment.. The licence will need to be varied to reflect the change in the nature of the infrastructure, with the existing outfall replaced by the AEDL discharging at exactly the same location.CAR/L/1010509: This authorises treated sewage discharges from the sewage works opened in 2006, which are made through the CW Outlet Tunnel and discharges at the CW Outfall. Discharges will continue to be made at the same location through the Preparations for Quiescence phase. A modification to existing

arrangements to enable the continued discharge after the CW pumps have been turned off is required.

- CAR/L/1003329 – This authorises discharge of surface water via the offshore outfalls which were the HNA main cooling water outfalls. Treated sewage discharges, previously covered by this licence, are no longer made through these outfalls since construction of the new sewage works in 2006 but the outfall does still accommodate surface water drainage from part of the Works Area.
- CAR/L/10000648 – This authorises discharges of transformer cooling water, other process water and surface water via an outfall channel. Whilst the transformer cooling water has now ceased, there is the potential for contaminants arising from onshore works to enter the surface water flow.
- WPC/W/21392 – This authorises discharge of surface water from the northern corner of the Site, which runs via a field ditch before passing under the road and discharging to the coastal water via a concrete outfall structure.
- CAR/R/1012347 – This abstraction licence applies to abstraction of sea water via the HNB main cooling water intake. Abstraction of the full flow required for cooling the condensers during former operation of the power station has already ceased but a reduced flow is currently still abstracted to maintain adequate flow in the outfall to facilitate its operation. The abstraction will cease completely at an early stage during the Preparations for Quiescence phase of decommissioning, as discharges will be transferred to the AEDL once it has been installed. Complete cessation of abstraction will allow dismantling of the cooling water intake and jetty. Therefore, the baseline for this ES assumes limited abstraction reducing to zero early in the programme. Until it ceases completely, this abstraction will continue to be authorised by this existing abstraction licence and changes in abstraction are thus outside the scope of this assessment, as they are included in the baseline environment.

10.5.27 Where CAR licences are still active, it is assumed that the relevant inputs to the marine environment are captured within the baseline environment characterisation.

Seabed sediment quality

10.5.28 Historically the Clyde Estuary and the Firth of Clyde were contaminated by metals from many industries that have now declined. However, contamination still remains in the sediments and Scotland's Marine Atlas[17] reports that sediment concentrations (expressed as concentrations relative to aluminium) of copper, lead, mercury and zinc all exceeded the ERL[28] in 2008 in the inner Clyde Estuary between the Cumbrae islands and Gourock. Of the metals analysed, only cadmium showed low levels of contamination. Scotland's Marine Atlas[17] also reports high levels of polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and polybrominated diphenyl ethers (PDBE) in the same samples (expressed in concentrations relative to organic carbon). No more recent sediment analysis data have been identified.

10.5.29 As there are no defined standards in the UK for marine sediment quality to support aquatic life, Canadian interim marine sediment quality guidelines (ISQG)[29] are often applied to assess whether or not sediments are sufficiently contaminated to be a cause for concern. All of the sediment contaminant concentrations for the inner Firth of Clyde

[28] ERL - Effects Range Low is the 10 percentile concentration of each contaminant above which toxic effects were observed.
[29] CCME (Canadian Council of Ministers of the Environment) (2002) *Canadian Sediment Quality Guidelines for the Protection of Aquatic Life. Summary tables.* (Online) Available at: https://ccme.ca/en/summary-table (Accessed November 2023).

reported in the Atlas, with the exception of cadmium, exceed the Canadian ISQG and thus can be considered a cause for concern in relation to aquatic life.

10.5.30 Conservative contaminants, such as metals and the persistent organic compounds mentioned above, can remain locked in sediments for a long period, so it must be assumed that contaminated sediments are likely still to be present in the inner Firth of Clyde, including within the Study Area.

Statutory designations

10.5.31 Geological SSSIs are present at the Ardrossan and Saltcoats Coast SSSI (approximately 12 km southward from the Site by sea) and the Corrie Foreshore and Limestone Mines SSSI (17 km towards the south-west on Arran), although the potential for effects on these sites due to changes on coastal processes will be very low due to the distances involved, so they are not considered further. There is also the potential for impacts to arise from changes in the coastal sediment regime to biological SSSIs, particularly the Southannan Sands SSSI, designated for sandflats (see **Chapter 9: Marine Biodiversity**).

Future baseline

10.5.32 Climate change is likely to alter the status and distribution of many local habitats and coastal features in the long-term, for example through changes to the local coastline, and associated hydrodynamics / sediment regimes. The SMP[9] recognises the need for regular review, noting the current policy of advancing the line[30] within the relevant policy unit within which HNB is located (6b2.1). In the absence of the Proposed Works, requirements for maintenance of the sea defences, and enhancement as required to accommodate the effects of climate change, will remain and this situation represents the future baseline.

10.5.33 WFD water bodies have an overall target of good overall status by 2027 unless reasons of technical infeasibility or disproportionate cost justify a lower target[5]. For the purposes of this assessment, it is assumed that the identified water bodies will maintain their good status in 2027 and beyond that date, in accordance with WFD objectives, until at least the end of the Preparations for Quiescence phase of decommissioning.

10.6 Embedded environmental and good practice measures

10.6.1 As part of the design process, a number of embedded environmental and good practice measures are proposed to reduce the potential for impacts on coastal management and marine water quality. **Table 10.9** outlines how these embedded measures will influence the coastal management and marine water quality assessment.

Table 10.9 Summary of embedded environmental measures

Embedded Measure	Compliance Mechanism	Embedded or good practice measure
Limited use of anti-fouling materials The use of anti-fouling material must remain in areas which will be operational after the initial decommissioning activities, such as the AEDL, which is expected to protrude from the end of the existing outfall infrastructure. Use of the anti-fouling materials will be minimised and will not involve use of	Marine licence conditions Environmental Management Plan (EMP)	Embedded measure

[30] To 'advance the line' refers to the building / creation of coastal defences on the seaward side of the existing coastline, for example through land reclamation.

Embedded Measure	Compliance Mechanism	Embedded or good practice measure
organo-tin compounds. This measure will help to protect the water quality of the Works Area during all project phases and, in particular, will ensure avoidance of pollution by organo-tin compounds.		
Minimising subtidal working Regarding the dismantling of the jetty, as much work as possible will be carried out from the shore, including work in the intertidal zone, where working 'in the dry' will minimise sediment mobilisation and facilitate avoidance of disturbance of sensitive intertidal and subtidal features arising from works during the Preparations for Quiescence phase.	Marine licence conditions EMP	Embedded measure
The use of methods which minimise mobilisation of sediments The piles of the jetty will be removed either by cutting off piles at or just below the seabed surface or by using vibropiling techniques. There will be no use of explosives. During the installation of the AEDL, works will be undertaken from an anchored pontoon. These approaches will minimise sediment mobilisation arising from works during the Preparations for Quiescence phase.	Marine licence conditions EMP	Embedded measure
Draining down cooling system – control of biocide discharge Water drained from the cooling water system will be tested before discharge and only discharged if biocide concentrations are less than the EQS for sea water of 0.01 mg/l of total residual oxidant (TRO). This will avoid adverse impacts arising from works during the Preparations for Quiescence phase.	EMP	Embedded measure
Site surface water management measures Measures to ensure control of the quality of surface water discharges from the Works Area are described in **Table 11.7** of **Chapter 11: Surface Water and Flood Risk**.	EMP	Embedded measure
Ground water management measures Measures to ensure control of the quality of ground water from the Works Area are described in **Table 12.7** of **Chapter 12: Soils, Geology and Hydrogeology**.	EMP	Embedded measure

10.7 Assessment methodology

10.7.1 The proposed generic project-wide approach to the assessment methodology is set out in **Chapter 5: The EIA Process**, and specifically from **Section 5.3**, **Section 5.4**, **Section 5.6**, and **Section 5.7**. However, whilst this has informed the approach that has been used in this chapter, it is necessary to set out how this methodology has been applied, and adapted as appropriate, to address the specific needs of the assessment in this ES.

General approach

10.7.2 Current maintenance of the coastal defences is part of the established baseline for HNB and is not considered to be part of the Proposed Works. Regardless of the Proposed Works, the SMP policy for policy unit 6b2.1 identifies the need to strengthen coastal defences to "*advance the line*", while the policy for policy unit 6b2.2 is "*no active intervention*". This EIADR is based on the assumption that coastal defences will be retained and maintained during decommissioning, subject to any proposals to advance the line in accordance with the SMP.

10.7.3 However, decommissioning works that affect the integrity of existing coastal flood defences (for example, the removal of marine structures which may alter the existing hydrodynamic regime) may have the potential to increase the risk of coastal flooding or erosion and thus require a change in the existing coastal management regime. This aspect has been considered within the coastal management part of the assessment.

10.7.4 The removal of marine infrastructure is generally considered beneficial in terms of restoring the natural coastal regime (such as removal of the intake and associated jetty), so additional mitigation is not required for the long-term effects of absence of these structures.

10.7.5 The hydrodynamic regime (including currents and wave climate) is not considered as a receptor in itself but changes in this regime may affect other receptors, such as biota, so these changes do need to be identified and assessed in terms of magnitude, so that effects on these other receptors can be assessed.

10.7.6 Similarly, changes in water quality may also affect other receptors and this is assessed in other relevant chapters of this report (primarily **Chapter 9: Marine Biodiversity** and **Chapter 11: Surface Water and Flood Risk**). However, EQS have been established for many water quality parameters with the aim of protecting the ecological status and use of water bodies and the status of water bodies is already assessed under the WFD. It is therefore possible to assign significance to effects on water quality by assessing changes in water quality against this overall protection regime for the water environment. Indirect effects on recreational use and shellfisheries may also result if water quality changes occur that affect compliance with specific bacteriological EQS set for Bathing Waters or Shellfish Water Protected Areas.

Determination of significance

10.7.7 The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999[31] (hereafter referred to as "EIADR") recognises that decommissioning will affect different environmental elements to differing degrees, and that not all of these are of sufficient concern to warrant detailed investigation or assessment through the EIA process. The EIADR identify those environmental resources that warrant investigation as those that are "*likely to be significantly affected by the proposed project*".

10.7.8 The EIADR does not define significance. The significance of an effect resulting from a development is determined in this assessment by reference to the sensitivity (or 'importance') of a receptor and the magnitude of the effect and applying the matrix described in **Chapter 5: The EIA Process a**nd repeated here in **Table 10.10** for convenience. This approach provides a mechanism for identifying areas where mitigation measures may be required and to identify the most appropriate measures to alleviate the risk presented by the Proposed Works.

[31] UK Government (1999). *Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999.* (Online) Available at: https://www.legislation.gov.uk/uksi/1999/2892/contents/made (Accessed April 2023).

Table 10.10 Significance evaluation matrix as applied to this assessment

Sensitivity/importance/value	Magnitude of change: Very high	High	Medium	Low	Very low
Very high	Major (Significant)	Major (Significant)	Major (Significant)	Major (Significant)	Moderate (Probably significant)
High	Major (Significant)	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)
Medium	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)
Low	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)
Very Low	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)	Negligible (Not significant)

10.7.9 **Table 10.11** details the basis for assessing the level of importance/value and sensitivity of receptors.

Table 10.11 Importance/value of receptors

Level of Importance/value	Criteria
Very high	Highly managed coastal areas where erosion, coastal flood defences and land use are highly vulnerable to changes in hydrographic regime. Receiving water body required to maintain specific quality characteristics in addition to those required to support WFD high ecological status to support internationally important designated site/feature. Bathing Water Protected Areas currently at 'excellent' standard under *The Bathing Waters (Scotland) Regulations 2008* (as amended)[22]. Water bodies with very low capacity to accommodate any change to current water quality status, compared to baseline conditions.
High	Highly managed coastal areas where erosion, coastal flood defences and land use are vulnerable to changes in hydrographic regime. Water quality of receptor water body classified under the WFD as supporting high ecological status/potential. Bathing Water Protected Areas currently at 'good' standard under *The Bathing Waters (Scotland) Regulations 2008* (as amended)[22].

Level of Importance/value	Criteria
	Shellfish Water Protected Areas that meet all standards applied under the WFD. Water bodies with very low capacity to accommodate any change to current water quality status, compared to baseline conditions.
Medium	Highly managed coastal areas where erosion, coastal flood defences and land use are moderately resilient to changes in hydrographic regime. Water quality of receptor waterbody classified under WFD as supporting good ecological status/potential. Bathing Water Protected Areas currently at 'sufficient' standard under *The Bathing Waters (Scotland) Regulations 2008* (as amended)[22]. Shellfish Protected Areas where evidence suggests lack of compliance with WFD standards. Receptor has low capacity to accommodate change to water quality status.
Low	Managed coastal areas where erosion, coastal flood defences and land use are highly resilient to changes in hydrographic regime. Water quality of receptor classified under the WFD as supporting moderate ecological status/potential. Baseline conditions define an environment that has a high capacity to accommodate proposed change to water quality status, due for example to large relative size of receiving water feature and effect of dilution.
Very low	Unmanaged coastal areas where erosion and coastal flood defences are not of concern and the natural regime protects land use from changes in hydrographic regime. Water quality of receptor water body classified under the WFD as poor or bad ecological status/potential. Poor or bad status water bodies which have severely restricted ecosystems and may be very polluted. Bathing Water Protected Areas currently at 'poor' standard under *The Bathing Waters (Scotland) Regulations 2008* (as amended)[22]. Specific water quality conditions of receptor water feature likely to be able to tolerate proposed change with very little or no impact upon the baseline conditions detectable.

10.7.10 **Table 10.12** details the basis for assessing magnitude of change.

Table 10.12 Establishing the magnitude of change

Magnitude	Criteria
Very high	Changes in the hydrographic regime are sufficient to compromise effectiveness of flood defences or cause erosion to the extent that major, long-term changes in the existing coastal management regime are required. Changes in water quality result in long-term, permanent deterioration in WFD status and compromise meeting the WFD or bathing water objectives set out in the RBMP.
High	Changes in the hydrographic regime are sufficient to require minor, long-term changes in the existing coastal management regime. The change is permanently (or over the long-term) significantly outwith levels of natural variation, resulting in a long-term change in the status of an identified receptor (e.g. status of the receiving WFD or bathing water body).
Medium	The changes in the hydrographic regime are sufficient to require local remedial coastal management actions. The change is permanently (or over the long term) outwith levels of natural variation, resulting in a change in the status of an identified receptor (e.g. status of the receiving WFD or bathing water body).
Low	The changes in the hydrographic regime have minor long-term effects on coastal erosion but do not require significant changes to the existing coastal management regime. Short-term changes are likely to be within the range of natural variability and they are not expected to result in any permanent change in the status of the receiving water body.
Very low	The changes in the hydrographic regime are insufficient to require any changes in the existing coastal management regime. A change in water quality, the level of which is so low, or of such a short period, that it will not compromise compliance with any WFD standards or result in any measurable deterioration in water quality.

10.7.11 As with many aspects of decommissioning, removal of infrastructure has the potential to result in beneficial effects through restoration of a more natural environmental regime. Positive effects, as well as any adverse effects, are assessed.

10.8 Assumptions and limitations

10.8.1 The principal assumptions associated with this chapter are that the Proposed Works will be as described in **Chapter 2: The Decommissioning Process** and, in particular, that explosives will not be used for any demolition activity in the marine environment.

10.8.2 Limitations relating to the baseline data underlying the assessment are identified in **Section 10.5**.

10.8.3 It is assumed that environmental controls will be maintained so that WFD coastal water bodies currently at good ecological status and good overall status, as well as designated

bathing waters at good standard, will continue to maintain their status throughout the decommissioning programme.

10.9 Scope of the assessment

10.9.1 The Proposed Works related to the marine environment involve the demolition of the cooling water intake head, the associated jetty to the south of HNB, plugging of the HNB outfall head and installation and operation of the AEDL.

10.9.2 The effects of termination of generation at HNB in 2022 and associated cessation of major cooling water abstraction and discharge are outside the scope of the EIADR, so this aspect is not included in the assessment.

10.9.3 The scope of the assessment for coastal management and water quality is consistent with the period over which the Proposed Works would be carried out and covers all three phases of the decommissioning period (see **Chapter 2: The Decommissioning Process**).

Study Area

10.9.4 The spatial scope of the assessment covers the area as identified in **Section 10.3** and shown in **Figure 10.1** and is therefore not repeated here.

Potential receptors

10.9.5 The following key coastal management and water quality receptors have been identified as relevant to this assessment.

10.9.6 Changes in the coastal hydrodynamic regime and sediment transport processes may lead to effects on activities required to fulfil the SMP or on water quality, so require examination. The assessment includes identification of changes in these physical characteristics as a result of the Proposed Works but significance cannot be assigned to such changes, as it is not possible to determine in isolation whether a change in wave regime, currents or sediment transport is beneficial or adverse and there are no standards against which to assess significance.

10.9.7 Physical characteristics considered in this respect are:

- wave regime;
- water current (mainly tidal) regime;
- sediment transport regime; and
- coastal processes (erosion/deposition).

10.9.8 Effects of changes in these physical characteristics may have an effect on activities required to maintain coastal flood risk management objectives, thus requiring an alteration of the SMP in the longer term. Any such effects on the implementation of the SMP are assigned a level of significance.

10.9.9 From a water quality perspective, the spatial extent of potential impacts from the Proposed Works are dependent on the tidal regime and the transmission and persistence of the pressure. This is taken into account in the definition of the Study Area. Therefore, the coastal water bodies and designated sites (WFD protected areas) that could potentially be affected by changes in water quality arising from the Proposed Development are:

- two hydrologically connected coastal WFD water bodies: Largs Channel (WFD water body ID: 200026) and Seamill and Ardrossan (ID: 200024);
- a Shellfish Water Protected Area at Fairlie, situated between the Hunterston Bulk Terminal jetty and the town of Fairlie, mainly in the intertidal area;
- two designated Bathing Waters, situated at Seamill (National Grid Reference (NGR) NS198473) and Millport Bay (NGR NS166549); and
- two SSSIs with intertidal components: Southannan Sands and Kames Bay.

Locations of these receptors are shown in **Figure 10.1.**

10.9.10 In the case of water quality, where EQS have been established to protect the marine environment generally, assessment of significance has been made against these EQS. However, this does not preclude further assessment of effects of changes in water quality on receptors considered in other chapters.

10.9.11 Where a receptor is too distant (outside the Study Area) or no pathway of effect can be identified, it has not been considered in the assessment.

10.9.12 The approach to identifying receptors has taken into account the fact that environmental changes may be considered in one aspect chapter but the consequent effects may be assessed in other chapters. Changes caused by the Proposed Works considered in this chapter may result in effects on receptors assessed in other chapters. Changes considered in this chapter where potential has been identified to affect receptors considered in other chapters are:

- changes in hydrological or sediment transport regime or water quality may affect biodiversity receptors; such effects are assessed in **Chapter 9: Marine Biodiversity**;
- changes in water quality have the potential to affect recreation at coastal designated Bathing Waters; any such effects are addressed in **Chapter 17: People and Communities**; and
- changes in water quality have the potential to affect commercial shellfisheries at Shellfish Water Protected Areas; any such effects are addressed in **Chapter 17: People and Communities**.

10.9.13 Where it has been established in this chapter by comparison with relevant EQS that an effect on water quality is not significant (for example in relation to bathing water quality), this is simply recorded in the linked chapter with no need to repeat the assessment.

10.9.14 Interaction with other chapters may also occur where changes identified in those chapters may affect the coastline or coastal waters. In respect of this chapter, the following link has been identified:

- effects on inland surface water quality identified in **Chapter 11: Surface Water and Flood Risk** may affect water quality in coastal waters through runoff entering the Firth of Clyde.

Likely significant effects

10.9.15 The likely significant coastal management and water quality effects that have been taken forward for assessment in this chapter are summarised in **Table 10.13**.

Table 10.13 Likely changes/significant effects

Phase of works	Receptor	Potential changes/significant effects
Preparations for Quiescence	Wave and current regime* Sediment transport regime* Coastal processes*	Removal of the jetty and cooling water intake structure will remove an obstruction to currents and waves that could lead to long-term localised changes in the wave climate, currents (direction and speed) and associated changes in sediment transport capacity. These changes may lead to long-term changes in coastal processes (erosion deposition regime). These changes in physical processes may have indirect effects on marine biodiversity (see **Chapter 9: Marine Biodiversity**). All of these changes could be considered to represent a return to a natural situation pertaining before the jetty and HNA intake were built in 1959 (subject to climate change considerations).
	Requirement for coast protection activities	Changes in coastal processes may lead to effects on the coastal management regime required to maintain coastal defences, as set out in the SMP.
	Coastal water quality	Any mobilisation of sediments during dismantling works in the sea will cause a temporary increase in the total suspended solids concentration and turbidity. Any mobilisation of contaminated sediments during dismantling works in the sea may cause a temporary increase in contaminant concentrations in the water column. Any spillage of cement, associated chemicals or oil from vessels involved in the works will cause temporary effects on coastal water quality. Any increase in suspended solids or contaminant loads (including radiological components) in surface water runoff from the Site may cause an increase in turbidity or contaminant concentrations in the coastal waters. NDischarges via the AEDL will be subject to regulation by SEPA, probably under a variation to the existing CAR licence, which will ensure that there are no significant adverse effects. Effects on water quality may impact compliance with WFD objectives for the local coastal water bodies. Effects on water quality may have indirect effects on marine biodiversity both in the water column and through effects of redeposition of sediments on marine benthos (see **Chapter 8: Marine Biodiversity**). Any changes in discharge of treated sewage may have a long-term effect on compliance with: ● bathing water EQS at nearby designated Bathing Waters, with potential for indirect effects on coastal recreation;

Phase of works	Receptor	Potential changes/significant effects
		• EQS for a Shellfish Water Protected Area, with potential for indirect effects on the associated commercial shellfishery. (see **Chapter 17: People and Communities**).
Quiescence phase	Wave and current regime* Sediment transport regime* Coastal processes*	Position reached during preparation for quiescence phase will be maintained.
	Requirement for coast protection activities	As above, taking into account the long-term nature of the coastal management regime.
	Coastal water quality	Any increased contaminant loads (including radiological components) in surface water runoff from the Site may cause an increase in contaminant concentrations in the coastal waters. Discharges via the AEDL will be subject to regulation by SEPA which will ensure that there are no significant adverse effects. Effects on water quality may impact compliance with WFD objectives for the local coastal water bodies. Effects on water quality may have indirect effects on marine biodiversity (see **Chapter 9: Marine Biodiversity**). Any changes in discharge of treated sewage may have a long-term effect on compliance with: • bathing water EQS at nearby designated Bathing Waters, with potential for indirect effects on coastal recreation; and • EQS for a Shellfish Water Protected Area, with potential for indirect effects on the associated commercial shellfishery. (see **Chapter 17: People and Communities**).
Final Site Clearance phase	Wave and current regime* Sediment transport regime* Coastal processes*	Position reached during Preparations for Quiescence phase will be maintained.
	Requirement for coast protection activities	As above, taking into account the long-term nature of the coastal management regime.
	Coastal water quality	Any increase in suspended solids or contaminant loads (including radiological components) in surface water runoff from the Site during final site clearance may cause an increase in turbidity or contaminant concentrations in the coastal waters.

Phase of works	Receptor	Potential changes/significant effects
		Non-radioactive discharges via the AEDL will be subject to regulation by SEPA which will ensure that there are no significant adverse effects. Effects on water quality may impact compliance with WFD objectives for the local coastal water bodies. Effects on water quality may have indirect effects on marine biodiversity both in the water column and through effects of redeposition of sediments on marine benthos (see **Chapter 9: Marine biodiversity**). Any changes in discharge of treated sewage may have a long-term effect on compliance with: ● bathing water EQS at nearby designated Bathing Waters, with potential for indirect effects on coastal recreation; and ● EQS for a Shellfish Water Protected Area, with potential for indirect effects on the associated commercial shellfishery. (see **Chapter 17: People and Communities**).

* - Changes in this receptor are not assessed for significance

10.10 Assessment of effects

10.10.1 Identification of changes and assessment of significance of effects is summarised in **Table 10.14** and commentary on the various sections is provided in paragraphs 10.10.2 to 10.10.26 below.

Wave and current regime

10.10.2 Removal of the jetty and intake structure is expected to reduce shelter from the coastline immediately to the north of the jetty, which may therefore be exposed to larger waves when the wind is from the south or south-west. Similarly, the jetty and intake will currently provide some restriction to tidal flows, although this is likely to be minor due to the open (piled) structure of the jetty and the limited size of the intake structure.

10.10.3 The jetty extends for approximately 170 m from the shore (with the intake structure at its end). The width of the Hunterston Channel (the area between the mainland and Little Cumbrae) at this point is approximately 2.5 km, with a further channel also approximately 2.5 km wide to the west of Little Cumbrae. The jetty extends out to a water depth of around 4 m below chart datum (bcd), while the centre of the Hunterston Channel at this point has a maximum water depth of over 50 m bcd and the main Clyde approach channel to the west of Little Cumbrae has a depth of over 100m bcd.

10.10.4 The jetty is a piled (therefore, porous) structure as far as the intake structure at the end, which only extends for 13 m beyond the piled section, and the 13 m occupied by the redundant HNA intake. Thus, the cross-sectional footprint of the jetty and intake with respect to tidal currents and the principal direction of wave propagation (i.e. generally parallel to the shore) is negligible compared with the cross-section of the Hunterston Channel.

10.10.5 Thus, the obstruction to flows and waves caused by the presence of the jetty and intake structure is minimal in the context of the tidal flows and wave propagation into the inner

Firth of Clyde as a whole. Changes to the overall hydrodynamic regime in the vicinity will therefore be **Very Low** in magnitude and will be highly localised.

10.10.6 Following removal of the jetty and intake structure during the Preparations for Quiescence phase the changes to the wave and current regime will be permanent in nature and will persist through subsequent phases of decommissioning.

10.10.7 It should be noted that removal of the jetty and intake structure will restore a more natural hydrodynamic regime, which can be regarded as a minor beneficial change.

Sediment transport

10.10.8 As changes to the tidal current and wave regime will be highly localised (due to the nature of the Proposed Works), changes to the overall sediment transport regime in the Hunterston Channel are predicted to be of **Very Low** magnitude. This is relevant to maintenance of the Southannan Sands and Kames Bay SSSIs (see **Figure 9.1** and **Chapter 8: Marine Biodiversity**).

10.10.9 These changes will be permanent in nature and will persist through subsequent phases of decommissioning.

Shoreline processes

10.10.10 The shoreline to the north and south of the jetty is protected by rock armour, with very little sediment deposition within 200 m of the jetty. Localised increases in current velocity and wave heights along this limited section of coast are therefore not expected to result in any measurable changes in coastal erosion or sediment deposition.

10.10.11 Thus, changes in shoreline processes are predicted to be **Very Low** in magnitude.

10.10.12 These changes will be permanent in nature and will persist through subsequent phases of decommissioning.

Coastal management

10.10.13 Coastal management to comply with the SMP is a receptor classed as of medium importance/value as the coastal defences are moderately resilient to changes in the hydrographic regime.

10.10.14 None of the works proposed will involve a need to dismantle or compromise or lower the crest level of any existing coastal defences.

10.10.15 As explained above, the changes in hydrodynamic regime will be minimal and highly localised within a section of coast already defended from erosion by rock armour.

10.10.16 No additional coastal defence works will be required as a result of the Proposed Works, so this effect of **Very Low** magnitude acting upon a receptor of **Medium** importance/value will result in a conclusion that effects are negligible and **Not Significant.**

10.10.17 Although requirements for coastal management activity may need to change over the long-term in order to address issues such as climate change, the absence of any significant effect on these requirements arising from the Proposed Works will continue to be the case throughout the whole decommissioning process.

Water quality

Preparations for Quiescence phase

10.10.18 The cooling water system will be drained before it is sealed and grouted but this will only involve discharge of sea water in line with an EMP which will require confirmation of the absence of active biocide at concentrations above the EQS (10 µg/l of total residual oxidant) before discharge. Therefore, the magnitude of this potential temporary effect will be **Very Low** acting upon receptors of **Medium** importance/value (both of the relevant WFD coastal water bodies at good status), resulting in a negligible effect (**Not Significant**). Thus, compliance with WFD requirements (no deterioration and no compromise to the achievement of future objectives in relation to the coastal water bodies) will not be affected (see **Appendix 10B**).

10.10.19 As noted in **Section 10.5**, marine sediments in the vicinity of the Works Area are expected to be contaminated due to the historical presence of industry in the area, so any significant mobilisation could result in adverse effects on water quality with potential indirect effects on marine ecological features. High levels of sediment mobilisation may also lead to smothering of biota where the sediment is redeposited (see **Chapter 9: Marine Biodiversity**). For this reason, as much of the jetty as possible will be dismantled from the shore at low tide and piles will not be withdrawn but will be cut off at or just below the seabed. The concrete intake structure will be dismantled without use of explosives. Detailed methodologies will be defined in the EMP.

10.10.20 In this way, deterioration of water quality caused by mobilisation of sediment will be avoided by using working procedures that will not mobilise any appreciable amount of sediment, as detailed in **Table 10.9**. Any unavoidable mobilisation will be temporary in nature. On this basis, the magnitude of potential effect will be **Very Low** acting upon a receptor of **Medium** importance/value, resulting in a negligible effect (**Not Significant**). Thus compliance with WFD requirements (no deterioration and no compromise to the achievement of future objectives in relation to the coastal water bodies) will not be affected.

10.10.21 The seabed HNB cooling water outfall will be capped by lowering a pre-cast concrete plug into the opening. Sediment mobilisation in relation to this operation will be limited to placement of feet of a jack-up barge or anchoring a barge. The AEDL will be installed along the existing cooling water discharge tunnel and through the plug, thus avoiding any need for seabed trenching. On this basis, the magnitude of potential effect will be **Very Low** acting upon a receptor of **Medium** importance/value, resulting in negligible effects (**Not Significant**). Thus, compliance with WFD requirements (no deterioration and no compromise to the achievement of future objectives in relation to the coastal water bodies) will not be affected.

All decommissioning phases

10.10.22 **Chapter 11: Surface Water and Flood Risk** has established that, with application of agreed mitigation measures, there will be no significant change in contaminant levels (including radiological components) in surface water runoff from the Site that could lead to an adverse effect on the relevant coastal water bodies (as described within **Section 10.5**). This will apply throughout, including periods when works are taking place during the Preparations for Quiescence and Final Site Clearance phases.

10.10.23 Thus, the magnitude of potential effect will be **Very Low** acting upon a receptor of **Medium** importance/value (both of the relevant WFD coastal water bodies at good status), resulting in negligible effects (**Not Significant**). Thus, compliance with WFD

requirements (no deterioration and no compromise to the achievement of future objectives in relation to the coastal water bodies) will not be affected.

10.10.24 Discharges via the AEDL comprising operational/defueling discharges that are covered under the existing CAR licence (CAR/L/1000649) will be subject to ongoing regulation by SEPA, which will ensure no significant adverse environmental effect on the coastal water bodies.

10.10.25 It is anticipated that discharges of sewage from the site will enter the sea at the same location as currently (via the AEDL when this is in place). At the End of Generation, the HNB workforce comprised a total of 588 Full-Time Employees (FTE) (including contractors). As of May 2023, this had reduced to 550 FTE. The workforce is expected to reduce to between 220-300 employees and a maximum of 250 contractors, totalling 480-550 FTE, to deliver the Proposed Works. As the number of staff on site will be reduced compared with pre-decommissioning levels, treated sewage discharge flows may decline compared with the present situation, so no adverse effects are anticipated.

10.10.26 Thus, effects on compliance with microbiological EQS at Seamill and Millport Bathing Waters and the Fairlie Shellfish Water Protected Area will be **Very Low** in magnitude. Taking account of the **High** importance/value of these receptors (as they are currently classed as having good quality), effects are considered to be minor (**Not Significant**). Thus, compliance with the requirements of the *Bathing Waters (Scotland) Regulations 2008*[22] and the WFD requirements for Shellfish Water Protected Areas will not be affected by the Proposed works.

10.11 Summary

10.11.1 The results of the assessment of effects of the Proposed Works on coastal management and water quality are summarised in **Table 10.14**.

Table 10.14 Summary of assessment of effects

Receptor/ phase(s)	Summary of predicted effect	Importance /value of receptor	Magnitude of change	Significance	Summary of rationale
Wave and current regime All phases	Removal of the jetty and HNB intake structure would be expected to reduce shelter from the coastline immediately to the north of the jetty, which may therefore be exposed to larger waves when the wind is from the south or south west. Similarly, the jetty will provide some restrictions to tidal flows which will be removed.	N/a	Very low	N/a	Due to the open structure of the jetty, the limited size of the intake structure and the small proportion of the cross-section of the Hunterston Channel occupied by these structures, changes to the overall hydrodynamic regime in the vicinity will therefore be very low in magnitude and effects of increased waves and currents will be highly localised.
Sediment transport All phases	The absence of the jetty and intake infrastructure could change the sediment transport regime in the surrounded area.	N/a	Very low	N/a	As changes to the tidal current and wave regime will be highly localised and very small, changes to the overall sediment transport regime in the Hunterston Channel are predicted to be very low.
Shoreline processes All phases	Removal of the jetty and intake infrastructure could cause changes in levels of erosion along the shoreline.	N/a	Very low	N/a	The coast to the north and south of the jetty comprises a shoreline protected by rock armour, with very little sediment deposition within 200 m of the jetty. Small increases in current velocity and wave heights along this section of coast are therefore not expected to result in any measurable changes in coastal erosion or sediment deposition.
Ayrshire Shoreline Management Plan All phases	Any works that would compromise existing flood defence levels or lead to an increase in coastal erosion could result in a need to change actions in relation to the SMP.	Medium	Very low	Negligible (Not significant)	None of the works proposed will involve a need to dismantle or compromise or lower the crest level of any existing coastal defences. Also, the changes in hydrodynamic regime will be minimal and highly localised within a section of coast already defended from erosion by rock armour. Therefore, there will not be significant effects on coastal management which are required to comply with the SMP or any need to revise the plan due to the Proposed Works.
Water quality Preparations for Quiescence	Coastal water quality could be affected by discharges from draining down the cooling water tunnels before sealing and grouting.	Medium	Very low	Negligible (Not significant)	Discharges will comprise only sea water abstracted from the Firth of Clyde and will be made in accordance with the EMP, which will require testing to ensure that biocide (TRO) concentrations are less than the EQS for coastal waters before discharge will be permitted. Therefore, there will be no significant effects on coastal water quality.
Water quality Preparations for Quiescence	Coastal water quality could be affected by suspended sediment mobilised during marine works, with potential indirect adverse effects on marine biodiversity (addressed in Chapter 9: Marine Biodiversity).	Medium	Very low	Negligible (Not significant)	To avoid mobilisation of contaminated sediments and consequent effects on water quality, the jetty will be dismantled from the shore at low tide and piles will not be withdrawn but will be cut off at or just below seabed level. The HNB intake structure will be dismantled without use of explosives. The HNB outfall will simply be capped using a jack-up or anchored barge and the new AEDL will utilise the existing cooling water tunnel and outfall to avoid any need for trenching of the seabed. Any effects on water quality due to minor unavoidable sediment mobilisation will be temporary and minimal.
Water quality All phases	Water quality could be affected by sediment laden or contaminated runoff (including radiological contaminants being released in surface water runoff from the Site	Medium	Very low	Negligible (Not significant)	Chapter 11: Surface Water and Flood Risk has established that there will be no significant change in contaminant levels (including radiological components) in surface water runoff from the Site that could lead to an adverse effect on the relevant coastal water bodies.
Water quality	Water quality could be affected by permitted discharges via the AEDL	N/a	N/a	N/a	Discharge comprising operational/defueling discharges that are covered under the existing CAR licence (CAR/L/1000649) will continue to be subject to ongoing regulation by SEPA, which will ensure no significant adverse environmental effect on the coastal water bodies or the local environment.

Receptor/ phase(s)	Summary of predicted effect	Importance /value of receptor	Magnitude of change	Significance	Summary of rationale
Water quality	Changes in discharge of treated sewage could affect EQS compliance at Bathing Waters and Shellfish Water Protected Areas	High	Very low	Minor (Not significant)	Discharge location is expected to be unchanged and sewage flows will be reduced compared with the current situation. Therefore, the Proposed Works will not compromise maintenance of the existing good status at relevant Bathing Waters and Shellfish Water Protected Areas.

10.12 Assessment of cumulative effects

Inter-project effects

10.12.1 There is the potential for caostal management and water quality effects associated with the Proposed Works to interact with, or combine with the effects arising from other developments or projects proposed within the relevant Zones of Influence applicable to each environmental aspect.

10.12.2 An assessment of inter-project effects is considered within in **Chapter 21: Cumulative Effects Assessment** of this ES.

Intra-project effects

10.12.3 A summary of the potential intra-project effects is provided in **Chapter 21: Cumulative Effects Assessment**.

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Surface water and flood risk

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11. Surface water and flood risk

11.1 Introduction

11.1.1 This chapter presents the assessment of likely significant effects of the Proposed Works with respect to surface water and flood risk. It describes the key receptors, in relation to the Hunterston B Nuclear Site Licence Boundary (hereafter referred to as 'The Site') and the Indicative Dismantling Works Area ('Works Area'), comprising flood risk receptors, and the onshore (freshwater) aquatic environment.

11.1.2 This chapter should be read in conjunction with the project description provided in **Chapter 2: The Decommissioning Process** and with respect to relevant parts of other environmental aspect chapters, including **Chapter 10: Coastal Management and Water Quality** and **Chapter 12: Soils, Geology and Hydrogeology**.

11.2 Relevant legislation, policy and technical guidance

Legislation

11.2.1 The legislation in **Table 11.1** is relevant to the assessment of the effects on surface water and flood risk receptors.

Table 11.1 Legislation relevant to surface water and flood risk

Legislation	Legislation Issue
Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy Water Framework Directive (WFD)[1]	The WFD is transposed into Scottish law by the Water Environment and Water Services (Scotland) Act (WEWS Act) 2003[2]. It sets out the requirement to classify water bodies according to their ecological and chemical status and sets targets for the prevention of deterioration and improvement of their status. The aim of the WFD is for all reportable water bodies to achieve Good Status by 2021 or 2027 as appropriate, and to ensure no deterioration from current status. The WFD requires Member States to put in place systems for managing their water environments based on natural river basin districts and underpinned by extensive environmental monitoring and scientific investigation through River Basin Management Plans (RBMP). It further requires Member States to take account of the need to recover the costs of water services as a means of encouraging sustainable use of water resources.
Water Environment and Water Services (Scotland) Act (WEWS Act) 2003[2]	This Act sets out arrangements for the protection of the Scottish water environment. It is the legal instrument which requires the establishment and characterisation of river basin districts and requires the preparation of river basin management plans for each respective river basin district.

[1] UK Government (2000). *Water Framework Directive 2000* (Online). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060 (Accessed November 2023).
[2] UK Government (2003). *Water Environment and Water Services (Scotland) Act 2003* (Online). Available at: http://www.legislation.gov.uk/asp/2003/3/contents (Accessed November 2023).

Legislation	Legislation Issue
	The Act is the enabling legislation for the WFD in Scotland, and identifies SEPA as the competent authority for implementation. Part 1 makes provision for protection of the water environment, whilst Part 2 deals with water and sewerage services.
Water Environment (Controlled Activity) (Scotland) Regulations 2011 (as amended)[3] (CAR)	The CAR controls engineering works in the vicinity of inland surface waters as well as point source discharges, abstractions, and impoundments, supporting implementation of the WFD (2006/60/EC) in Scotland.
Flood Risk Management (Scotland) Act 2009[4]	Outlines a framework for coordination and cooperation between all relevant organisations including Scottish Environment Protection Agency (SEPA), Scottish Water and local authorities. SEPA has separated Scotland into 14 Local Plan Districts (LPDs) which have a lead local authority which is responsible for the coordination of flood risk management planning.

Policy

11.2.2 A summary of the relevant policies is given in **Table 11.2.**

Table 11.2 Policy relevant to surface water and flood risk

Policy Reference	Policy Relevance
National Policy	
Scottish Planning Policy (SPP) (2014)[5], Managing Flood Risk and Drainage.	Land with Low to Medium Risk with an Annual Exceedance Probability (AEP) of coastal or watercourse flooding between 0.1% to 0.5% will be suitable for most development. The Policy also states that the infrastructure and buildings should generally be designed to be free from surface water flooding in rainfall events where the AEP is greater than 0.5%. The policy advises that an FRA may be required at the upper end of the probability (close to 0.5%) and for 'essential infrastructure' and the 'most vulnerable' land uses classified under SEPA Land Use Planning System guidance (set out in **Table 11.3**). The current Site (which is classed as 'essential infrastructure' is situated outside of the Medium Risk of coastal and fluvial flood areas (0.5% AEP), with only limited areas at Low Risk of coastal flooding nearest to the coast. On this basis a separate FRA has not been produced; however, risk has been fully considered as a key part of this Surface Water and Flood Risk Environmental Statement (ES) Chapter. This has been carried out in line with the proposed approaches that were set out in the EIA Scoping Report both in terms of a baseline assessment and an assessment of potential effects related to the Proposed Works.

[3] UK Government (2011). *The Water Environment (Controlled Activity) (Scotland) Regulations 2011 (as amended)* (Online). Available at: https://www.legislation.gov.uk/ssi/2011/209/contents (Accessed November 2023)
[4] UK Government (2009*). The Flood Risk Management (Scotland) Act 2009* (Online). Available at: http://www.legislation.gov.uk/asp/2009/6/contents (Accessed November 2023)
[5] The Scottish Government (2014). *Scottish Planning Policy* (Online). Available at: https://www.gov.scot/publications/scottish-planning-policy/documents/ (Accessed November 2023)

Policy Reference	Policy Relevance
	On the basis of the above policy the design event for the purposes of the following assessment is the 0.5% AEP (plus climate change for the duration of the Proposed Works). Note that SPP (2014) has technically been replaced by the National Planning Policy Framework 4 which shares the same planning policy requirements with regards to flood risk assessment.
Scotland 2045 - Fourth National Planning Framework (NPF4)[6]	Policy 22: Flood Risk and Water Management sets out how local authorities should create resilience to future flood risk as a result of changing weather patterns from climate change increasing vulnerability to flooding. Policy 22 reflects the same principles of SPP from a flood risk perspective, in that it states that: "*Development proposals at risk of flooding or in a flood risk area will only be supported if they are for:* *i. essential infrastructure where the location is required for operational reasons;* *ii. water compatible uses;* *iii. redevelopment of an existing building or site for an equal or less vulnerable use; or.* *iv. redevelopment of previously used sites in built up areas where the LDP has identified a need to bring these into positive use and* *v.where proposals demonstrate that long term safety and resilience can be secured in accordance with relevant SEPA advice*." In the glossary NPF4 states that "*for planning purposes at risk of flooding or in a flood risk area means land or built form with an annual probability of being flooded of greater than 0.5% which must include an appropriate allowance for future climate change.This risk of flooding is indicated on SEPA's future flood maps or may need to be assessed in a flood risk assessment. An appropriate allowance for climate change should be taken from the latest available guidance and evidence available for application in Scotland*." As noted above the current Site (which is classed as 'essential infrastructure') is situated outside of the Medium Risk of coastal and fluvial flood areas (0.5% AEP), with only limited areas at Low Risk of coastal flooding nearest to the coast. Therefore on this basis the design event for the purposes of the following assessment is also the 0.5% AEP (plus climate change for the duration of the Proposed Works).
Local Policy	
North Ayrshire Local Development Plan (LDP)[7]	Policy 23 Flood Risk Management – "*Development proposals should be:*

[6] Scottish Government (2023). *Fourth National Planning Framework* (Online). Available at: https://www.gov.scot/publications/national-planning-framework-4/ (Accessed November 2023)
[7] North Ayrshire Council (NAC) (2019). *Adopted Local Development Plan (LDP).* (Online). Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed November 2023)

Policy Reference	Policy Relevance
	• *supported by an appropriate FRA where there is a risk of flooding from any source for developments in low to medium flood risk areas identified in the risk framework (from SPP)…and* • *Proposals should set out measures to protect against, and manage, flood risk and include Sustainable Drainage Systems (SuDS) where surface water is proposed to be discharged to the water environment , in accordance with the Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended*" This chapter incorporates an FRA, which includes the provision of various environmental measures which will be implemented as part of the Proposed Works. Policy 24 Alignment with Marine Planning – "*Generally development requiring new defences against coastal flooding will not be supported except where there is clear justification for a departure from the general policy to avoid development in areas at risk or where a scheme has already been identified in the spatial strategy or the current Ayrshire Shoreline Management Plan (SMP*)."
Ayrshire Shoreline Management Plan (SMP)[8]	Non-statutory policy document for coastal defence management planning. The guidance sets out Ayrshire Council's general approach to mitigation, including hard and soft engineering methodologies, as well as specific policies for spatial units. The Site is situated within Policy Unit 6b2.1 Hunterston which is part of the wider Cell SB2: Hunterston Ore Terminal to Farland Head. The SMP sets out that the long-term plan for this Policy Unit is to 'advance the line' (i.e. allowing new defences to be built on the seaward side of the original defences) over the next 100 years. Ayrshire Council notes that "*Use of this policy is generally limited to those policy units where land reclamation is considered likely/ desirable*" and that "*setting this policy for a section of shoreline does not represent a requirement that actions must be taken to advance the defence line, rather it indicates that these actions are considered acceptable, however it is important to note that lesser actions which will hold the existing defence line are also acceptable.*"
Clyde Regional Marine Plan[9]	The Clyde Marine Planning Partnership[10] is currently developing a marine plan which will provide a framework to manage, effectively and sustainably, the economic, social and environmental needs of the Clyde Marine Region. With respect to flood risk, the plan states the following: Policy CP1 identifies that development will be supported where it can demonstrate that the following have been accounted for: "*the latest available UKCP sea-level rise and flood risk projections, including wave overtopping impacts where possible, relevant to the full life-span of the development, including any decommissioning/remediation required*…

[8] North Ayrshire Council (NAC) South Ayrshire Council (SAC) (2018). *RPS, Shoreline Management Plan (SMP).* (Online). Available at: https://www.north-ayrshire.gov.uk/Documents/FloodProtection/ayrshire-smp.pdf (Accessed November 2023)

[9] Clyde Marine Planning Partnership (2018) *Clyde Regional Marine Plan* (online). Available at: https://www.clydemarineplan.scot/marine-planning/clyde-regional-marine-plan/ (Accessed November 2023)

[10] The Clyde Marine Planning Partnership currently (as of August 2023) comprises 24 stakeholders across a range of sectors with marine and/or coastal interest in the Firth of Clyde. The principal role of the CMPP is to prepare a Marine Plan for the Clyde Marine Region (being Marine Scotland's nominated delegate for this role), as well as undertaking other aspects of Integrated Coastal Management (ICM). Further detail is available at: https://www.clydemarineplan.scot/ (Accessed November 2023)

Policy Reference	Policy Relevance
	…the Scottish Environment Protection Agency's Development Management Guidance, the relevant Local Flood Risk Management Plan and any relevant Shoreline Management Plan… *… any potential exacerbation of flooding or coastal erosion in the wider area…* *…opportunities for Integrated Green Grey Infrastructure where natural assets cannot be used for flood alleviation.*" Policy CP2 additionally highlights that natural or man-made coastal zone features should not be removed if they provide or could provide flood defence in the future.

Technical guidance

11.2.3 The surface water and flood risk assessment has taken account of the technical guidance presented in **Table 11.3**.

Table 11.3 Technical Guidance relevant to surface water and flood risk

Technical Guidance	Context
Guidance on the Nuclear Reactors EIADR Regulations[11]	Guidance on compliance with EIADR for organisations with an interest in the environmental impact of the decommissioning of nuclear reactors. This gives information on approaches to screening out activities which will not result in significant adverse environmental impacts. It also explains interfaces with other relevant legislation, policy, and guidance. For instance, for requirements relating to the WFD it advises that the Applicant contacts SEPA for further advice in Scotland.
SEPA WAT–SG–29: Engineering in the Water Environment Good Practice Guide, Temporary Construction Methods[12]	A good practice guide which sets out mitigation measures that minimise impacts from construction works upon the water environment.
Guidance for Pollution Prevention (GPP)[13]	GPP documents presented good practice guidance to prevent pollution on-site. The documents including GPP in relation to works and maintenance activities in or near water.
Flood Risk and Land Use Vulnerability Guidance[14]	The guidance classifies land use types by their vulnerability to flood risk to help avoid and manage impacts from development in areas of flood risk.

[11] Office for Nuclear Regulation (ONR) (undated). *Guidance on the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations* (Online). Available at: https://www.onr.org.uk/eiadr.htm (Accessed November 2023).
[12] Scottish Environment Protection Agency SEPA (2009). *Engineering in the Water Environment Good Practice Guide, Temporary Construction Methods* (Online). Available at https://www.sepa.org.uk/media/150997/wat_sg_29.pdf (Accessed November 2023).
[13] Scottish Environment Protection Agency (SEPA). Natural Resources Wales (NRW). Northern Ireland Environment Agency (NIEA). (2020). *Guidance for Pollution Prevention* (Online). Available at: https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/ (Accessed November 2023).
[14] SEPA (2018) *Flood Risk and Land Use Vulnerability Guidance* (Online). Available at: https://www.sepa.org.uk/media/143416/land-use-vulnerability-guidance.pdf (Accessed November 2023)

Technical Guidance	Context
Technical Flood Risk Guidance for Stakeholders[15]	This guidance outlines what information SEPA requires to be submitted as part of an FRA. These requirements have been taken into account within the following chapter.
Climate Change allowances for flood risk assessment in land use planning[16]	This guidance sets out SEPA's recommended allowances that can be applied to FRAs. It provides guidance on climate change allowances as a prediction of anticipated change in peak river flow, peak rainfall intensity and sea level rise caused by future climate change.
CIRIA C532 Control of Water Pollution from Construction Sites[17]	Provides guidance on how to plan and manage construction projects to control water pollution.
CIRIA C741 Environmental good practice on site[18]	Provides a reference and training aid which provides practical advice about managing construction on site to minimise environmental impacts.

11.3 Data gathering methodology

Study Area

11.3.1 The surface water Study Area covers the onshore surface water catchment area of the Site and comprises adjacent drainage ditches, the sea defences and other water infrastructure (see **Figure 11.1**). The seaward boundary of the Study Area is defined as the Mean High Water Springs (MHWS) mark, beyond which the coastal and marine aspects are assessed within **Chapter 9: Coastal Management And Water Quality** and **Chapter 8: Marine Biodiversity**.

Desk study

11.3.2 The EIA has been undertaken with reference to **Chapter 2: The Decommissioning Process**, supported by a number of data sources. The principal data sources used to inform this chapter for potential effects comprise:

- OS 1:10K and 1:25K Ordnance Survey (OS) mapping;
- Met Office average rainfall data[19];
- SEPA Water Environment Hub[20];

[15] SEPA (2022) *Technical Flood Risk Guidance for Stakeholders. SEPA requirements for undertaking a Flood Risk Assessment* (Online). Available at: https://www.sepa.org.uk/media/162602/ss-nfr-p-002-technical-flood-risk-guidance-for-stakeholders.pdf (Accessed November 2023)
[16] SEPA (2022) *Climate Change Allowances for Flood Risk Assessment in Land Use Planning* (Online). Available at: https://www.sepa.org.uk/media/594168/climate-change-guidance.pdf (Accessed 25 July 2023).
[17] CIRIA (2001) *C532 Control of Water Pollution from Construction Sites*. CIRIA; London.
[18] CIRIA (2015). *C741: Environmental good practice on site*. CIRIA; London.
[19] Met Office (2022). *Historic Station Data* (Online). Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/historic-station-data (Accessed November 2023).
[20] SEPA (2022) *Water Environment Hub* (Online). Available at: https://www.sepa.org.uk/data-visualisation/water-environment-hub/ (Accessed November 2023).

- Scottish Government River Basin Management Plan (RBMP) for the Scotland River Basin District[21];
- SEPA Flood Risk Management Map[22];
- Met Office UKCP18 derived projections and climate risk indicators[23];
- Centre of Ecology and Hydrology (CEH) Flood Estimation Handbook (FEH) web service[24];
- North Ayrshire Council (NAC) Strategic Flood Risk Assessment (SFRA)[25] and Flood Risk Management Plan[26];
- NatureScot Site Webservice[27];
- NAC webservice[28];
- NAC Private Water Supply (PWS) information, received on 15 March 2022
- SEPA Scotland's Environment Web[29];
- NAC Private Water Supply (PWS) information, received on 15 March 2022;
- Wood (2021) EDF Energy Flood Hazard and Risk Review Technical Report[30];
- Amec (2012) EDF Energy Japanese Earthquake Response Flood Modelling[31];
- EDF (2014) Hunterston B Consolidated Hazards Safety Case Head Document[32];
- Environment Agency (2011) Coastal flood boundary conditions for UK mainland and islands. Project: SX060064/TR4: Practical guidance design sea levels. ISBN 978-1-84911-214-7[33];
- UK Climate Projections (UKCP) (2023)[34];

[21] Scottish Government (2021). *The River Basin Management Plan (RBMP) for Scotland 2021 – 2027*. (Online). Available at https://www.sepa.org.uk/media/594088/211222-final-rbmp3-scotland.pdf (Accessed November 2023)
[22] SEPA (2022). *Flood Risk Management Map* (Online). Available at: https://www.sepa.org.uk/environment/water/flooding/flood-maps/ (Accessed November 2023)
[23] Metoffice (2022) *UKCP18 Climate Projections and Climate Risk Indicators* (Online). Available at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/guidance-science-reports (Accessed November 2023)
[24] Centre of Ecology and Hydrology (CEH) (2022). *Flood Estimation Handbook* (Online) Available at: https://fehweb.ceh.ac.uk/ (Accessed November 2023).
[25] North Ayrshire Council (NAC) (2018). *Strategic Flood Risk Assessment* (Online). Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2/sfra.pdf (Accessed November 2023).
[26] North Ayrshire Council (NAC) (2016). *Local Flood Risk Management Plan* (Online). Available at: https://www.north-ayrshire.gov.uk/community-safety/flooding/flood-risk-management-plan.aspx (Accessed November 2023)
[27] NatureScot (2023) Sitelink webservice (Online). Available at: https://sitelink.nature.scot/map (Accessed November 2023)
[28] North Ayrshire Council (NAC) *Online Local Development Plan 2019 webservice* (Online). Available at: https://www.maps.north-ayrshire.gov.uk/Sites/LDP2/ (Accessed November 2023).
[29] SEPA (2023) *Scotland's Environment Web* (Online). Available at https://map.environment.gov.scot/sewebmap/ (Accessed November 2023)
[30]Wood. (2021) *Flood Hazard and Risk Review Technical Report*, Wood Environment and Infrastructure Solutions UK Limited; Newcastle
[31] Amec (2012) *EDF Energy Japanese Earthquake Response Flood Modelling, Flood Summary Report Hunterston*, Amec Environment & Infrastructure UK Limited and Royal Haskoning Society; Newcastle
[32] EDF Energy (2014) *Hunterston B Consolidated Hazards Safety Case Head Document – Volume 1, Appendix E-03 External Flooding Hazard.* EDF Energy; London.
[33] Environment Agency (2011) *Coastal flood boundary conditions for UK mainland islands Project: SX060064/TR4: Practical guidance design sea levels*. ISBN 978-1-84911-214-7. Environment Agency; Peterborough.
[34] Met Office (2023). *UK Climate Projections (UKCP) (2023).* (Online) Available at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/data/index (Accessed November 2023).

- Environment Agency, 2011 Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities, Environment Agency. (2011)[35];
- EurOtop (2007) Wave Overtopping of Sea defences and Related Structures: Assessment Manual[36];
- Golder (2022) Groundwater Monitoring at Hunterston B Power Station[37];
- Environment Agency (2018) Coastal flood boundary conditions for the UK: 2018 update[38];
- Royal Haskoning (2011) Hunterston B Nuclear Flood Stress Tests, Post Flood Report[39] ;
- British Geological Survey (2023) Geology Viewer[40] ;
- SEPA (2021) Flood Risk Management Plan – Ayrshire Local Plan District[41]; and
- SEPA (2023) Information on Licensed Sites[42].

Survey work

11.3.3 A site walkover was carried out on 7 October 2021 to characterise the baseline surface water environment within the Site[43] and Study Area (see **Figure 11.1** and paragraph 11.3.1).

Data assumptions and limitations

11.3.4 Several flood studies, previously produced during the operational life of the HNB Power Station, have been utilised to inform this surface water and flood risk assessment. Notably, these studies include a flood study which supported the nuclear Safety Case for HNB, and other flood studies which were carried out for the suite of EDF sites (including HNB) following the Fukushima event, hereafter referred to as the Japanese Earthquake Response (JER) studies.

11.3.5 The EDF Safety Case Flood study[32] assessed the HNB station surface water drainage arrangements as part of the assessment of extreme rainfall and surface water runoff. In the case of coastal flooding, because of the potential for debris to be brought on site, the drains were assumed to be blocked. Estimates were derived of the extent of flooding caused by a) the extreme rainfall event and b) wave overtopping. It was reasoned that the

[35] Environment Agency (2011) *Adapting to Climate Change: Advice for Flood and coastal Erosion Risk Management Authorities*. Environment Agency; Peterborough.
[36] Eurotop (2007) *Wave Overtopping of Sea defences and Related Structures: Assessment Manual*. (Online) Available at: https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/eurotop-manual-wave-overtopping-of-sea-defences-and-related-structures (Accessed November 2023).
[37] Golder (2022) *Groundwater Monitoring at Hunterston B Power Station (Monitoring Round 52 – September 2022), published 16 December 2022*. Golder; London
[38] Environment Agency (2018) *Coastal flood boundary conditions for the UK: update 2018, Technical summary report* (Online), Available at: https://www.gov.uk/government/publications/coastal-flood-boundary-conditions-for-uk-mainland-and-islands-design-sea-levels (Accessed November 2023).
[39] Royal Haskoning (2011) *Hunterston B Nuclear Flood Stress Tests, Post Flood Report, December 2011, 9W9560*. Royal Haskoning; Amersfoort, Netherlands.
[40] British Geology survey (2023) *Open Geology Viewer* (Online). Available at: https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/ (Accessed November 2023).
[41] SEPA (2011*) Flood Risk Management Plan – Ayrshire Local Plan District* (Online). Available at: https://www2.sepa.org.uk/frmplans/documents/lpd12-ayrshire-frmp-2021.pdf (Accessed November 2023).
[42] SEPA (2023) *Data Publication Site* (Online). Available at https://www.sepa.org.uk/environment/environmental-data/ (Accessed November 2023).
[43] The Works Area included land within the HNB Nuclear Site Licence (NSL) boundary.

probability of the two extreme events occurring together would be very low and therefore the two events were considered separately as part of that study.

11.3.6 The JER study[31] which was undertaken in 2012 did not account for drainage infrastructure. The base case assumption was that during extreme events the debris load in surface water runoff increases significantly, resulting in increased blockage potential, reducing the effectiveness of the drainage system. The JER[31] work recognised that the existing Hunterston drainage infrastructure will provide some drainage function, and flood alleviation even in very extreme events. As such this represents a source of conservatism as part of flood studies for the Site both in terms of the previous operational lifecycle of the HNB station and for the purposes of the Proposed Works under EIADR.

11.3.7 With respect to rainfall, the EDF Safety Case flood study[32] approach was to develop a model of the HNB drainage system to help predict surcharges (the amount of rainfall that could not be taken away by the drainage system) for defined rainfall scenarios. Hypothetical rainfall events for the Site up to the 0.01% AEP were based on Meteorological Office estimates. The surcharges were then used to calculate the depth of flooding that could arise across the Site.

11.3.8 Climate change allowances used in the previous flood modelling studies used climate change allowances which were available at the time. Climate change allowances in the 2012 JER modelling study were based on 2011 EA Coastal Flood Boundary information[33] which were superseded by an EA 2018 update for the UK[38]. The 2021 JER study[30] was subsequently carried out in order to update the predictions of different coastal flooding estimates in light of that information. SEPA have provided their guidance on climate change allowances for specific geographies of Scotland, based on the latest UKCP18[23] information.

11.3.9 Under the current and future baseline sections (set out in **Section 11.5**) each of the above sources of information (HNB Safety Case flood studies and JER reports) have been compared and taken into account to inform the assessment of effects for the Proposed Works under EIADR.

11.4 Consultation

Overview

11.4.1 The assessment has been informed by consultation responses from statutory engagement.

Pre-application Opinion

11.4.2 A Pre-application Opinion was provided by the ONR, on 4 October 2022. A summary of the relevant responses received in the Pre-application Opinion in relation to surface water and flood risk and confirmation of how these have been addressed within this assessment is presented in **Table 11.4**.

Table 11.4 Summary of Pre-application Opinion responses

Consideration	How addressed in the ES
ONR: It [is] noted that the Hunterston A and B use the same sewage treatment works; consideration needs to be given to higher tides	ONR's statement is partially incorrect given that HNB use a separate sewage treatment plant to HNA.

Consideration	How addressed in the ES
and high rainfall due to climate change, which could result in the potential increase in surface water discharges from both sites simultaneously, in the EIA.	The HNB and HNA surface water drainage systems are interconnected at one point, where an overflow structure discharges excess runoff from the HNA station system to the HNB station surface water system (as noted in **Section 11.5**). This has been considered further within **Section 11.10** with respect to the following potential effects arising from the Proposed Works: "*An increase in tidal flood risk towards the Site and surrounding areas as a result of changes in wave energy, and resultant effects on tidal erosion, sediment deposition and weakening of flood defences; and* "*An increase in surface water flood risk on-site and to surrounding areas over time due to the influence of climate change, including the potential for more intense rainfall.*" Both of these potential effects are considered for on-site infrastructure and staff and off-site people, property, and infrastructure, which includes Hunterston A (HNA). This assessment includes consideration of the potential for high tides that could impede the discharge from the sewage treatment works (via the Cooling Water outfall to sea), and the influence of climate change on this potential impediment. Previous study carried out as part of the HNB safety case[29] estimated the extent of flooding due to extreme (1 in 10,000 year return period at the 0.01% Annual Exceedance Probability (AEP)) rainfall and tidal effects including climate change up to 2035. This study assessed the capacity of the operational HNB station surface water drainage infrastructure as part of the assessment of extreme rainfall. In the case of wave overtopping, because of the potential for debris to be brought onto site, the drains were assumed to be blocked. Estimates were derived of the extent of flooding caused by a) the extreme rainfall event and b) wave overtopping. It was concluded that the probability of the two extremes would be so low as to allow this to be discounted. As a result, the two events were considered separately. The HNB Reactor building (where the Safestore building is proposed as part of the Proposed Works) were indicated to be free of flooding under both of these scenarios.
ONR: Climate Change: In addition to the comments raised on the resilience of the Safestore to climate change, the EIA should consider available climate change data already in the public domain such as the 2018 Ayrshire	The EIA has considered any relevant climate change data available in the public domain, such as the 2018 Shoreline Management Plan, as suggested. This was referenced in the Scoping Report. The future baseline section of this chapter

Consideration	How addressed in the ES
Shoreline Management Plan. In addition to this, the EIA should take into account potential "soft" coastal management techniques deployed in the area to manage coastal flooding.	(**Section 11.5**) has also considered SEPA climate change allowances based upon the latest UKCP18 climate change scenarios. In relation to the comment about coastal management techniques this has been taken into account as part of an embedded measure for future coastal protection and flood risk adaptation in paragraph 11.5.63.

11.4.3 **Table 11.5** summarises the technical responses that have been provided by statutory consultees which have helped inform the surface water and flood risk chapter of this ES.

Table 11.5 Consultation Responses

Consultee	Consideration	How addressed in the ES
SEPA	"Chapter 10 states that there are no viable hydrological pathways to the surface water environment, but it is unclear whether the potential for hydraulic connection via shallow groundwater has also been taken into consideration. Characterisation of the local groundwater flow regime, including the potential for hydraulic connection between the superficial and bedrock aquifers and between groundwater and surface waters, will be required to inform the EIA. This characterisation should include any influence on the groundwater regime from existing subsurface structures such as foundations or services."	Following further investigation in conjunction with the Soils, geology and hydrogeology assessment (**Chapter 12**) the ditches to the north of the Site have been considered as potential receptors as part of this Surface water and flood risk assessment. **Chapter 12** includes details of the borehole records on-site and descriptions of the hydrogeological regime. A summary of the underlying groundwater conditions and their interaction with the baseline surface water environment is provided in paragraphs 11.5.11 and an assessment of potential effects on surface water quality is provided in **Section 11.10**.
SEPA	We agree with the scope of the proposed flood risk assessment (FRA).	An assessment of flood risk is provided in accordance with the scope, as presented in the EIA Scoping Report.
SEPA	The specific levels of the safe store are uncertain but do look to be above the 5m contour. Based on review of Coastal Flood Boundary (CFB) extreme still water level data the 0.1 and 0.01% annual exceedance probability events are 4.0 and 4.4mOD. The flood level does not account for the effects of wave action, funnelling or local bathymetry. The applied recommended sea level rise for the area by 2100 is based on the latest UK climate change predictions published in 2018 as outlined in SEPA's guidance. The current sea	**Section 11.5** takes into account existing modelling studies including the 2012[31] and 2021[30] JER reports. It also presents the relevant results of the 0.5% AEP plus climate change up to 2120. The JER 'Best' estimates (defined as extreme sea level estimates taken at the central confidence limits) of 0.01% AEP and plausible 'high-end' climate change allowances (H++) up to 2035 were 4.82 m AOD (Amec 2012) and 4.61 m AOD (Wood 2021). The Environment Agency 2018 Catchment Flood Boundary guidance has been used to calculate a still sea level for 0.5% AEP plus climate change up to 2120 (i.e. for the lifetime

Consultee	Consideration	How addressed in the ES
	level rise allowance for the Clyde region is 0.85m.	of the Proposed Works) of 4.82 m AOD (see **Figure 11.7** and **Figure 11.8**). The Safestore will be situated well above these levels, at approximately 7.91 m AOD. The SEPA guidance notes that the impact of climate change on storm intensity are uncertain but that it is expected to be much smaller than the impact of climate change on mean sea level rise. The UKCP18 Marine Report estimates that changes in extreme sea levels due to changes in storm surge will be an order of magnitude smaller than changes in extreme sea levels due to changes in mean sea level. Wave overtopping modelling studies have been carried out as part of the HNB Safety Case and JER Studies. Both found that for higher probability (low return period) tidal events, the influence of overtopping would be small on the basis that the land behind the sea wall/revetment at points of any breach is flat/slightly depressed and that return flows would occur via a drainage system. Also, for the more extreme events, e.g. the 0.01% Best Scenario, wave overtopping would be negligible because of the large extent of the flood areas caused by direct tidal inundation. The HNB Safety Case has concluded that the plant around the main HNB buildings (where the proposed decommissioning buildings such as the Safestore are planned) would be adequately protected from an extreme 0.01% coastal flood event, even when taking into account storm surges and overtopping up to 2035.
NHS Ayrshire and Arran	Periods of heavy rain may pose more of an issue during the demolition phase due to the surrounding high ground and subsequent runoff. We would welcome a review of previous periods of heavy rain to ascertain any previous flooding or runoff issues at the Site.	**Section 11.10** considers the potential effects on surface water runoff from adjacent areas and alterations to existing surface water pathways and changes in surface water flood risk on- site. As part of the baseline (**Section 11.5**) the HNB Safety Case was reviewed, along with the NAC Strategic Flood Risk Assessment to gather data on historic flood incidents on the operational site. No previous runoff incidents on the Site were highlighted by any of these reports. The nearest flood incident reported was approximately 4 km to the north of the Site along the A78 in November 2011 (see paragraph 10.5.60), situated outside of the surface water and flood risk Study Area. The HNB Safety Case documents, JER flood studies and SEPA flood maps all contain information on predictions of pluvial flooding which has been utilised within the baseline and

Consultee	Consideration	How addressed in the ES
		future baseline sections. Information on the Proposed Works (**Chapter 2: The Decommissioning Process**), and a range of embedded environmental measures in paragraph 11.5.63 including surface water management measures, will help minimise any potential effects posed towards on-site and off-site staff and infrastructure.
NHS Ayrshire and Arran	In addition to the points raised above in relation to runoff during the demolition phase, we would welcome some review of the flood risk posed by the sea and how the deep-water sea port and in-filling of various tunnels may or may not influence this. This also relates to the climate change risk: we would welcome modelling of any rise in sea-levels or increased frequency and/or severity of extreme weather events that may impact the storage of radioactive materials during the quiescent phase in particular.	**Section 11.10** presents an assessment of potential changes in tidal flood risk towards the Site and surrounding areas as a result of changes in wave energy, and resultant effects on tidal erosion, sediment deposition and flood defences. This has taken into account existing modelling studies for coastal flood risk, which have considered the influence of coastal bathymetry, still sea level rise, storm surge activity and wave overtopping as part of the current and future baseline sections (see **Section 11.5**). In addition to this the assessment (**Section 11.10**) has considered the Proposed Works including the capping of the intake and outfall, sealing of the tunnels and removal of the jetty. None of these activities are predicted to increase the tidal flood risk on-site as they will be unintrusive with no resultant impact on the condition or integrity of existing coastal defences. The infill works for the cooling water intakes and outlets/land shafts will only occur once the need for cooling water ceases on-site, and the on-site drainage system will remain functional throughout the Quiescence phase/ Final Site Clearance phase, therefore there will not be any impact on the Site's ability to discharge surface water/foul water during decommissioning works. The findings of existing flood studies both conclude that the Site will be able to cope with the influence of climate change both in terms of tidal flooding, and surface water flooding. The proposed buildings on-site will be set back and raised above the predicted levels of extreme tidal flooding, taking into account appropriate climate change allowances for the lifetime of the Proposed Works.
NHS Ayrshire and Arran	In addition to the points noted above, we note the importance of ensuring the resilience of the Site in terms of any impacts of climate change. There was very limited information on this in the EIA scoping report and other consultation documents - we therefore	The current and future baseline (in **Section 11.5**) has been updated with a review of existing flood studies and the findings of the HNB Safety Case which concludes that the Site will be resilient during extreme events. This review has included a comparison of climate change allowances based on the current SEPA

Consultee	Consideration	How addressed in the ES
	look forward to reviewing the statement that will be added to the ES about possible projected impacts as there is some concern based on the points noted above. There are potentially significant risks and greater details on adaptation measures would be welcomed.	guidance[16]. This has included information derived from a range of coastal and pluvial modelling studies, which taken together with a range of existing and proposed embedded environmental measures will help minimise any potential effects towards flood risk receptors. Measures set out in paragraph 11.5.63 have included various measures including surface water management, future coastal protection and flood risk adaptation and emergency response planning.

Technical engagement

11.4.4 A targeted stakeholder meeting was held with SEPA on 26 October 2023. The meeting covered a project overview, information on the decommissioning process and additional project description for context. The assessment methodologies, draft findings and environmental measures were presented for a range of aspects including those from this surface water and flood risk assessment, **Chapter 12: Soils, Geology** And **Hydrogeology** and **Chapter 10: Coastal Management And Water Quality**. This informed a discussion about how the consultation responses have been addressed, and an overall summary of the technical assessment conclusions.

11.5 Overall baseline

Current baseline

Topography and climate

11.5.1 Ground levels within the Study Area range between 0 metres above Ordnance Datum (m AOD) at Mean Low Water Spring (MLWS) at Inner Brigurd Point (NS 8084,51826) to 140 m AOD at the summit of Goldenberry Hill (NS 18268 50348) to the south, and 76 m AOD at the summit of Campbelton Hill to the south-east (NS 19045 50910) of the Site.

11.5.2 Within the Site, ground levels range from a maximum of approximately 25 m AOD in the vicinity of the substations in the south-east to 4.1 m AOD in the west in the locality of the main staff car park (NS 18099 51551). The topography slopes down gradually towards the shoreline to the north and west of the Site.

11.5.3 Rainfall data was obtained from the Met Office for the rain gauge at Paisley Climate Station, which is situated approximately 30 km to the north-east of the Site. Based on this data, the annual average rainfall recorded between 1991 and 2021 was 1,263 mm. The Burn Gill catchment situated approximately 800 m to the east of the Study Area, received a standard annual average rainfall of 1,195 mm between 1961 and 1990, based on Flood Estimation Handbook estimates. Rainfall data was also obtained from a SEPA rain gauge at Hunterston Terminal, which is situated approximately 2.5 km north of the Site. Based on this data, the area received an annual average rainfall of 1332 mm between 2014 and 2022.

Surface watercourses and other features

11.5.4 There are no significant watercourses in the immediate surroundings of the Site. There are several drainage ditches in the fields to the north and south of the Site.

11.5.5 There is a ditch situated approximately 110 m to the north of the Site. The ditch is orientated east/west for approximately 310 m prior to its discharge into the Firth of Clyde at Stoney Port (NS 18148 51860) (see **Figure 11.1**, POI 1). Another ditch runs parallel to it and is situated 200 m to the north of the Site, and discharges to the Firth of Clyde at the Inner Brigurd Point (NS 18365 51988) (see **Figure 11.1**, POI 2).

11.5.6 Another ditch borders the south-east of the Site, adjacent to the Hunterston East Substation, along an access road. The ditch is orientated south-east to north-west and has a full length of approximately 140 m (see **Figure 11.1**, POI 3).

11.5.7 Surveys were also conducted in the area immediately south-west of the Site to identify any potential sources of surface water run-on from the terrain which slopes up towards Goldenberry Hill. Approximately 30 m to the east of the Western High Voltage Direct Current (WHVDC) Substation building car park, a swale captures surface water which is directed underneath Goldenberry Road and alongside the Site boundary (see **Figure 11.1**, POI 4). There is also a network of roadside drainage ditches alongside Goldenberry Road (see **Figure 11.1**, POI 5).

Existing drainage systems

Surface water drainage

11.5.8 Within the Site, the main existing surface water drainage network receives precipitation from road gullies, roof guttering and building downpipes around the buildings, roads and car park which form HNB. The HNB station drains from higher ground, under gravity, directly to the sea. The HNB and HNA systems are interconnected at one point, where an overflow structure discharges excess runoff from the HNA station system to the HNB station surface water system and its associated outlet channel (see **Figure 11.1**, POI 7) situated adjacent to the Hunterston Visitor Centre (see **Figure 11.1**, POI 6). The surface water outfall discharges via an oil/hydrocarbon separation lagoon which has a system of oil capture booms within a contained surface water outflow channel (see **Figure 11.1**, POI 7). Treated surface water is then released into the Firth of Clyde from that location.

11.5.9 Most surface water runoff from the Site is managed and discharged directly to sea, as described above. However, within the northern part of the Site there is a separate stormwater drain which drains a temporary store building (adjacent to the 11kv substation). The stormwater drain comprises of two porous concrete pipes and flows to the north-west to an outfall via agricultural land which forms part of the Hunterston Estate. It appears that this drain discharges to the unnamed ditch 110m to the north of the Site. The ditch then drains out to the Firth of Clyde (at grid reference NS 18200 51900).

Treated sewage effluent and cooling water discharges

11.5.10 Treated sewage and cooling water effluent streams are kept separate from the surface water drainage systems described above, and are discharged together into the Firth of Clyde via a long sea outfall. As a consequence, neither are considered further in this chapter. Please refer to **Chapter 10: Coastal Management and Water Quality** for further details.

Groundwater

11.5.11 Details on the geological and hydrogeological conditions of the Site are presented within **Chapter 12: Soils, Geology and Hydrogeology**.

11.5.12 There are several drainage ditches in the fields to the north and south of the Site and the nearest is located approximately 110 m north and runs for around 310 m west before it discharges to the Firth of Clyde at Stoney Port. Groundwater monitoring indicates that shallow groundwater flow in the on-Site superficial deposits and made ground has on occasion been towards the north and thus there is potential connectivity (and also potential base flow contribution) between groundwater underlying the Site and this drain.

Flood risk

Fluvial

The SEPA Flood Risk Management Maps indicate that the Site is not at risk of fluvial flooding (see **Figure 11.2**). The closest area associated with fluvial flooding is a tributary of the Burn Gill (NS 19160 51167) approximately 610 m to the east of the Site. Given that it is on the other side of Campbelton Hill from the Site, this fluvial flood source is not hydrologically connected to the Site.

Surface water

11.5.13 The SEPA surface water flood mapping (see **Figure 11.4**) indicates that many of the impermeable surfaces between buildings within the Site coincide with either a medium (0.5% AEP) or high probability (10% AEP) of surface water flooding[44].

11.5.14 The highest density of surface water flood extents are in the western and northern parts of the Site, where there are areas at a medium and high probability of surface water flooding. These areas are associated with the Site car park and hardstanding and roads between Site buildings.

11.5.15 There is a high probability of surface water flooding in the north-western corner of the Site.

11.5.16 There are also discrete areas mapped as being at medium and high probability of surface water flooding in the east, north-east and south-east of the Site. None of the mapped areas overlap with the locations of the Turbine Hall or Reactor Building. These discrete areas include:

- Within the southern area of the Site adjacent to buildings, a section of road and hardstanding (NS 18470 51356) at a high probability of surface water flooding;
- Along a road within the south-eastern area of the Site (NS 18563 51425) at a medium and high probability of surface water flooding;
- Between buildings within the north-east of the Site (NS 18507 51626) with a high probability of surface water flooding;
- To the east of buildings and a road within the north-east of the Site (NS 18573 51675) at a high probability of surface water flooding**;** and
- To the south of buildings within the south-east of the Site (NS 18335 51201) at a high probability of flooding of surface water flooding.

[44] The SEPA surface water flood map is based on national-level modelling and therefore makes simplified assumptions about losses to subsurface drainage which may not take full account of the operation of local surface water drainage systems. Therefore, the occurrence of areas of mapped surface water flood risk within the Site should be taken as indicative only.

11.5.17 The SEPA surface water flood risk mapping indicates that there are no surface water pathways from the Site leading off-site towards ditches. Therefore, it is considered likely that most surface water drainage is managed on-site and then discharged to sea via the drainage system.

11.5.18 FEH22 rainfall modelling outputs[24] indicate that design rainfall[45] for a 5-hour storm duration associated with the 0.5% AEP is 60 mm (5 hours was found to be the critical storm duration for pluvial flooding at the Site, based on hydraulic modelling carried out for the JER study[31]). Note that for the same storm duration, the design rainfall for the 0.01% AEP event (which the operational Safety Case was based upon, using the Flood Studies Report (FSR) methodology) is 148 mm. This will be considered later within the context of the future baseline section (paragraphs 11.5.64 and 11.5.66).

11.5.19 The results of flood pluvial modelling studies for the 0.01% AEP rainfall scenario were presented in the Nuclear Safety Case documents[32]. For this event a rainfall depth of 70 mm was predicted for a 1-hour event. The flood model was used to predict the level of surcharge (excess water that could not be taken away by the Site drainage systems) and the depth of water that this might result in on the Site. Simple assumptions were made about where surcharged water would go on the Site, rather than this being modelled using a hydraulic model.

11.5.20 The Safety Case[32] concluded that for the 0.01% AEP rainfall scenario the predicted depths (<5cm) around the main Site buildings (including the Turbine Hall and Reactor building) would not pose a threat to any essential plant as they are lower than the main building floor levels.

11.5.21 In the case of extreme precipitation and associated surface water runoff, the Applicant has put in place a range of existing emergency measures to help minimise risks to personnel and equipment. These include:

- inspecting for signs of flooding around areas such as the turbine hall basement, and the pipe tunnels; and
- being required to restrict vehicular movements to a minimum.

11.5.22 The Safety Case[32] concluded that these precautionary measures would help avert the worst consequences of a surface water flooding threat. These existing measures will be taken forward into the decommissioning phase by the Applicant as part of the Proposed Works along with a range of new proposed measures (as set out in **Section 11.6**), that have informed the assessment of effects under EIADR as presented later in this chapter (in **Section 11.10**).

Coastal

11.5.23 The Site is afforded protection from coastal flooding due to its elevation above sea level as it lies between approximately 3.85 m and 25 m AOD. The SEPA coastal flood mapping indicates that the north-west of the Site has a low probability of coastal flooding (0.1% AEP) (see **Figure 11.4**). The map indicates that this extends inland from the surface water outlet, via the main access road across the Power Station roundabout and main access roads and towards the facilities management offices (NS 18170 51559) (see **Figure 11.4**). There is an area of high probability of coastal flooding (10% AEP) situated immediately adjacent to the surface water outlet, 10 m to the north of the Site, on the grassed verge to the north of the Power Station roundabout (NS 17970 51592) (see **Figure 11.4**).

[45] Design rainfall is described as a rainfall event that is used for assessing the flood hydrograph of a certain return period.

11.5.24 This low-lying area of coastal frontage is where the access road approaches closest to the shoreline immediately to the north of the outfall and the Power Station roundabout to the Site's entrance. Here the elevation of the land is marginally lower (around 3.85 m AOD) than adjacent land along the shoreline to the north and south and this area was identified in the 2012 Flood Modelling report[31] as the primary pathway for seawater ingress towards the Site allowing ingress of flood water into the Site under tidal modelling scenarios for the extreme 0.01% AEP event[46].

11.5.25 There is also a parcel of land approximately 130 m to the north of the Site which is at a high probability of coastal flooding (10% AEP) (NS 18367 51766) (see **Figure 11.4**). This land between HNB and the sea is within a shallow depression (2 m – 3 m AOD). This Site is largely separated from coastal flooding in this depression by a ridge of land with an elevation of approximately 5 m AOD at this location[46].

11.5.26 The SMP[8] identifies that much of the coastline within cell 6B2.1 Hunterston is defended from erosion by sections of hard engineering revetment from the north-east to the south-west of the Site. The revetment consists of boulders and concrete rubble. There are also natural buffers further along the coast to the north of the Site in the form of shingle and vegetated marshlands. **Chapter 10: Coastal Management and Water Quality** presents further details on shoreline management and coastal engineering.

The EA 2018 Coastal Flood Boundary Conditions for the UK guidance[38] indicates that the still water level estimate for the 0.5% AEP scenario for the Site is 3.65m AOD. This will be used to inform the design coastal flood levels for the Site under the future baseline section.

11.5.27 The EDF Safety Case[32] study included a wave overtopping analysis to establish the extent to which overtopping might affect the Site in extreme conditions. This study included a detailed topographic survey of the existing coastal defence revetment. This reported that the crest level of the revetment varied along its length, from a maximum of 5.88 m AOD to 4.62 m AOD at the southern end and a minimum of 4.0 m AOD at the northern end.

11.5.28 The variation in the cross-sectional profile of the revetment along the stretch of coast was accounted for in the study. It was noted that the land behind most of the revetment rises, which would be likely to result in some return flow back out to sea. However, the study indicated that overtopping could arise at the northern and southern ends of the revetment (where the land behind is lower than the revetment crest level and is flatter and slightly depressed in its profile).

11.5.29 The overtopping study took MHWS level for the Site, combined with storm surges corresponding to different AEPs to obtain a range of still water levels. Separately, wind speeds were used together with the fetch to derive wave heights for the corresponding AEP. The wave heights were then combined with the still water levels to determine maximum potential wave plus tide heights.

11.5.30 For the combined 0.01% AEP still water level with a 1% AEP wind/wave height it was found that the flood water (<1 m in depth) would collect around the west of the Site within a low point in the vicinity of the car park. This combination was selected as being a sufficiently conservative combination of scenarios within the Safety Case on the basis of joint probability analysis. The HNB plant buildings such as the Reactor building and turbine hall were shown to be unaffected. The ground level of the area affected by flooding in this scenario is approximately 4.91 m AOD. By comparison, the Reactor

[46] Royal Haskoning Enhancing Society & Amec (2012) *EDF Energy Japanese Earthquake Response (JER) Modelling Flood Summary Report Hunterston*. Amec; UK; Newcastle.

building is located at a level between approximately 7.9 m AOD. The turbine hall is located at a level of approximately 6.23 m AOD - 7.9 m AOD.

Groundwater

11.5.31 The SEPA flood risk map[22] indicates that the Site is not within an area identified at risk of groundwater flooding. Within the SEPA's Flood Risk Management Plan[41] for the Ayrshire Local Plan District, groundwater flood risk is not indicated as a key source of flooding within the Largs to Kilwinning Potentially Vulnerable Area (PVA), and it is noted that groundwater is usually a contributing factor to flooding in the district rather than the primary source.

11.5.32 The underlying Kelly Burn Sandstone Formation is classed by the BGS as a moderately productivity aquifer with significant intergranular flow. The overlying superficial deposits are generally not thought to act as significant aquifers, though in some areas these deposits may be highly permeable and may form local aquifers, where they are laterally extensive and sufficiently thick.

11.5.33 Previous groundwater monitoring of existing monitoring wells on the Site indicates that there is limited seasonal variation in groundwater levels, which is most pronounced in the superficial deposits. Groundwater levels across the Site are typically around 2-4 m below ground level.

11.5.34 Based on the above information, it is concluded that the risk of groundwater flooding to the Site is currently low. Any groundwater emergence is likely to be localised in nature, and most likely limited to the lower lying ground to the north-west of the Site in the marshland and in the vicinity of the unnamed ditches (**Figure 11.1**, POI 1).

Historical flooding incidents

11.5.35 The EDF Nuclear Safety Case documents[32] were reviewed to identify any relevant information about previous flooding incidents on the operational HNB power station.

11.5.36 There were no incidents reported at the power station itself, and the nearest incident recorded was on 28 November 2011, when heavy downpours across North Ayrshire resulted in a number of flooding incidents along the public highway A78 (which is the main service road to the Site). The road was closed down at the time, which caused disruption to the plant as staff were unable to get to work. A post flood report was carried out to further investigate flooding of roadside drain blockages approximately 4 km to the north and 5 km south of the Site (and the Indicative Works Area)[39],which is situated well outside of the Study area.

Water quality

Water Framework Directive

11.5.37 There are no reportable river water bodies classified under the WFD within the surface water and flood risk Study Area.

11.5.38 There are, however, offshore coastal WFD water bodies which are considered within **Chapter 10: Coastal Management and Water Quality**. There is also the North Ayrshire groundwater WFD water body which is considered within **Chapter 12: Soils, Geology and Hydrogeology**.

Pollution incidents

11.5.39 Baseline information on contaminated land is presented in **Chapter 12: Soils, Geology and Hydrogeology**. Throughout the operation of HNB, EDF has commissioned routine groundwater sampling and analysis of 18 boreholes, and surface water sampling at one location from the drainage ditch 110 m to the north of the Site (**Figure 11.1**, POI 1).

11.5.40 Surface water sampling from the ditch has been carried out to establish a full suite of field parameters. During one round between 27-28 October 2022, a hydrocarbon sheen was noted by the sampling team at the surface water sampling location. The results also reported that Total Petroleum Hydrocarbons (TPH) fractions (23.3 mg/l of total TPH (C5 to C35)) were detected in the sample and the laboratory analysis indicated that it could be "possible mineral insulating oil"[37]. The localised hydrocarbon contamination (surface sheen and some dissolved phase hydrocarbons) in the ditch has been reported to SEPA and remedial work is planned to address the source of the contamination which has been identified by the Licensee as leakage of oil from a third-party transformer cable located within the Site. The third-party substation identified as the source of the oil contamination in the ditch will be decommissioned and removed. The licensee has confirmed that this is scheduled to start in Q1 2024.

11.5.41 Regular surface water sampling and laboratory testing of surface water in the ditch for hydrocarbons and radioactive contaminants will continue as part of the Licensee's ongoing environmental monitoring programme.

Conservation sites

11.5.42 The NatureScot webservice indicates that there are no nationally designated water dependent conservation sites within the Study Area. The NAC webviewer[27] indicates that there are two Local Nature Conservation Sites associated with Goldenberry Hill and Campbelton Hill, located approximately 200 m and 300 m to the south and south-east of the Site respectively. Both local conservation sites are situated upgradient of the Site and have no viable hydrological pathway interactions with the Site. Therefore, it is considered that there will be no impact on these conservation sites with respect to the surface water environment.

11.5.43 There are various offshore designated conservation sites which are considered separately within **Chapter 9: Marine Biodiversity**.

Water resources

Unlicensed Private Water Supplies (PWS) and licensed abstractions

11.5.44 NAC was contacted to obtain PWS information for the Study Area. On 15 March 2022, they confirmed that they held no records of PWS within the Study Area and that the nearest PWSs to the Site were in the locality of Meadowfoot, in West Kilbride. This location is hydrologically disconnected from the Site to the south-east and beyond the topographic barrier of Campbelton Hill.

11.5.45 There are no onshore licensed abstractions within the Study Area[42].

Future baseline

11.5.46 A range of existing studies have been utilised to enable prediction of the future baseline for the Surface Water and Flood Risk Assessment. This includes site-specific hydraulic modelling taken from the JER sudies[31] and HNB Safety Case Documents[32], which are compared against current SEPA future flood maps and projections in line with current

FRA guidance to consider the full lifespan of the Proposed Works (up to approximately 2120).

11.5.47 Flooding is a concern during the Proposed Works as outlined in the Post-Defueling Safety Case Climate Change Management Strategy[47]. Further modelling is being undertaken in 2024 to investigate the impact of sea level rise, erosion, groundwater and precipitation on site safety, to support the development of the PDSC. Any differences identified to the future baseline presented in **Section 11.5** will be considered as to their potential to change the conclusions of the EIADR assessment.

Extreme sea levels

11.5.48 Climate change is expected to increase coastal flood risk, with sea levels rising as a result of the addition of water (melting of ice) and/or thermal expansion of the sea. In addition, storm severity could also increase as weather patterns change due to climate change. Sea level change, storm surge change and wave height are all considered in this section.

Sea level rise

11.5.49 SEPA[22] has published future flood risk maps providing information on how the predictions of coastal flooding for a 0.5% AEP event may be influenced by climate change. These maps are based on the previous UKCP09 High Emissions Scenario for the year 2080. The results are shown in **Figure 11.5** and **Figure 11.6.** The results indicate that for the 0.5% event plus climate change in 2080 the northern and north-western frontage of the Site would be susceptible to tidal flooding including the outfall, perimeter road, visitor centre and car park and numerous administrative buildings. The majority of these areas were projected to have flood depths <0.3 m, with some localised areas (e.g. the access road and northern site perimeter) projected to have depths of between 0.3 m – 1 m for the 0.5% AEP plus climate change (2080) event (**Figure 11.6**). The HNB buildings such as the Reactor and turbine hall are shown to be well outside of the projected flood extent under this scenario.

11.5.50 The JER reports[31] produced a range of modelling estimates of 0.01% AEP extreme sea levels for the Site, including allowance for climate change up to 2035.

11.5.51 The design standard for this EIADR assessment will be the 0.5% AEP (plus climate change allowances) for the Proposed Works on the basis of national planning policy requirements (as noted under Policy **Table 11.2** in **Section 11.2**). However, in the following discussion, estimates of the 0.1% and 0.01% AEP event flood levels have also been provided as part of a precautionary approach to allow assessment of impacts should the design event be exceeded. Although the 0.5% AEP event has not been modelled to date, a comparison has been made with the 0.01% JER modelling studies for reference in this section.

11.5.52 Information regarding climate change was obtained from the latest UK Climate Projections (UKCP18)[20] as summarised in the latest SEPA guidance for flood risk assessment[14]. The sea level rise allowance set out in the SEPA guidance is for a cumulative sea level rise of 0.85 m between 2017 and 2100 for the Clyde River Basin Region. Within the guidance an additional allowance of 0.15 m per decade is also recommended where the anticipated lifespan of a development is known to extend beyond that date. Given that the lifespan of the Proposed Works extends to approximately 2121, an additional 0.30 m has been factored final into a total sea level rise allowance of 1.15 m for the entire decommissioning period.

[47] EDF (2023). *Post-Defueling Safety Case Climate Change Management Strategy (ND/REP/TAD/0028/AGR/23).* EDF; London.

11.5.53 This total sea level rise allowance has been combined with the median EA and DEFRA 2018 coastal flood boundary estimates for the Site covering the 0.5%, 0.1% and 0.01% AEP events to estimate the design extreme still sea level at the end decommissioning period in 2120, as presented in **Table 11.6**.

Table 11.6 Extreme Sea Level Rise Estimates for the Lifespan of the Proposed Works (2120) using 2018 Coastal Flood Boundary estimated values for Hunterston and SEPA flood risk guidance on climate change allowances[16]

Parameter	Sea Level Rise Best Estimates (Median 50th %ile Estimates)		
	0.5% AEP	0.1% AEP	0.01% AEP
Present day (2017) sea level estimate based on 2018 EA Coastal Flood Boundary Outputs (m AOD) for each respective event	3.65	3.97	4.44
Sea level rise allowance to 2120 taken from SEPA flood risk assessment guidance (m)	1.15	1.15	1.15
2120 sea level estimate (m AOD) for each respective event	4.8	5.12	5.59

11.5.54 The best estimate (4.8 m AOD) for the 0.5% AEP plus climate change up to 2120 sea level design event (in **Table 11.6**) closely resembles the 2012 JER study 'best' estimate for the 0.01% AEP plus climate change up to 2035 (4.82 m AOD). Therefore, the flood extent for the latter, as displayed in **Figure 11.7**, can be used as an analogue for the former. As noted above, the best estimates of peak tidal level for the 0.1% and 0.01% AEP plus climate change up to 2120 events (5.12 and 5.59 m AOD respectively) both respectively represent extreme cases which are considered as part of a precautionary approach (**Figure 11.8**). For comparison, ground elevations are between 6.23 m AOD and 7.9 m AOD at the Reactor Building. The Reactor Building, which will be modified into the Safestore, is located significantly above all of these levels, and is therefore considered to be at negligible risk of tidal flooding.

Storm surge and wave height

11.5.55 SEPA's recommended climate change allowance for extreme sea levels has been based on projections of mean sea level rise, as described above. As noted in the SEPA guidance[16], any change in the offshore wave height or size and number of storm surges are uncertain but are expected to have a much smaller effect on coastal flood risk than sea level rise. The UKCP18 marine report[48] also estimates that changes in extreme sea levels due to changes in storm surge will be an order of magnitude smaller than changes in extreme sea levels due to changes in mean sea level[16]. Changes in offshore wave height may be more significant for exposed coastlines but are unlikely to be significant in a sheltered water body like the Firth of Clyde. Therefore, it is considered appropriate for this

[48] Metoffice (2018) *UKCP18 Marine Report* (Online). Available at: https://www.metoffice.gov.uk/pub/data/weather/uk/ukcp18/science-reports/UKCP18-Marine-report.pdf (Accessed 13 September 2023)

Site to base future assessments of extreme sea level (reported above in paragraphs 11.5.50 – 11.5.51) on the application of a mean sea level change factor alone, in line with the SEPA FRA guidance.

11.5.56 It should be noted that the JER 2012[31] report did partly account for storm surge growth based on the previous 2011 EA guidance[35] available at the time, which implied an increase of 275 mm by the year 2035. The JER 2012[31] study also incorporated a wave overtopping assessment. The resulting overtopping rates were found to be extremely low, largely because of the relatively small wave conditions predicted at the revetment structure, which is partially protected by the shoreline towards the south. The JER study concluded that any influence of future storm surge or wave overtopping calculated under the 0.01% AEP (plus climate change up until 2035) scenario was found to be small relative to that of sea level rise. This corresponded well with the findings of the HNB Safety case study reported in paragraph 11.5.30.

11.5.57 As is noted above in paragraph 11.5.54, ground levels where the Safestore will be located are considerably above the estimated still sea level to 2120 (for 0.5%, 0.1% and 0.01% AEP events) accounting only for the impact of climate change on sea level rise. Any additional minor secondary climate change impact on storm surge severity or wave overtopping would not significantly increase the flood risk to the Safestore up to 2120.

Extreme rainfall

11.5.58 The 2012 JER flood study took account of the EA guidance for climate change impacts on extreme rainfall which was available at the time. The guidance did not provide a H++ estimate for rainfall change, but it alternatively provided an estimate of +10% for the anticipated change in rainfall. As such a 10% increase was applied to all pluvial inputs to account for climate change allowances.

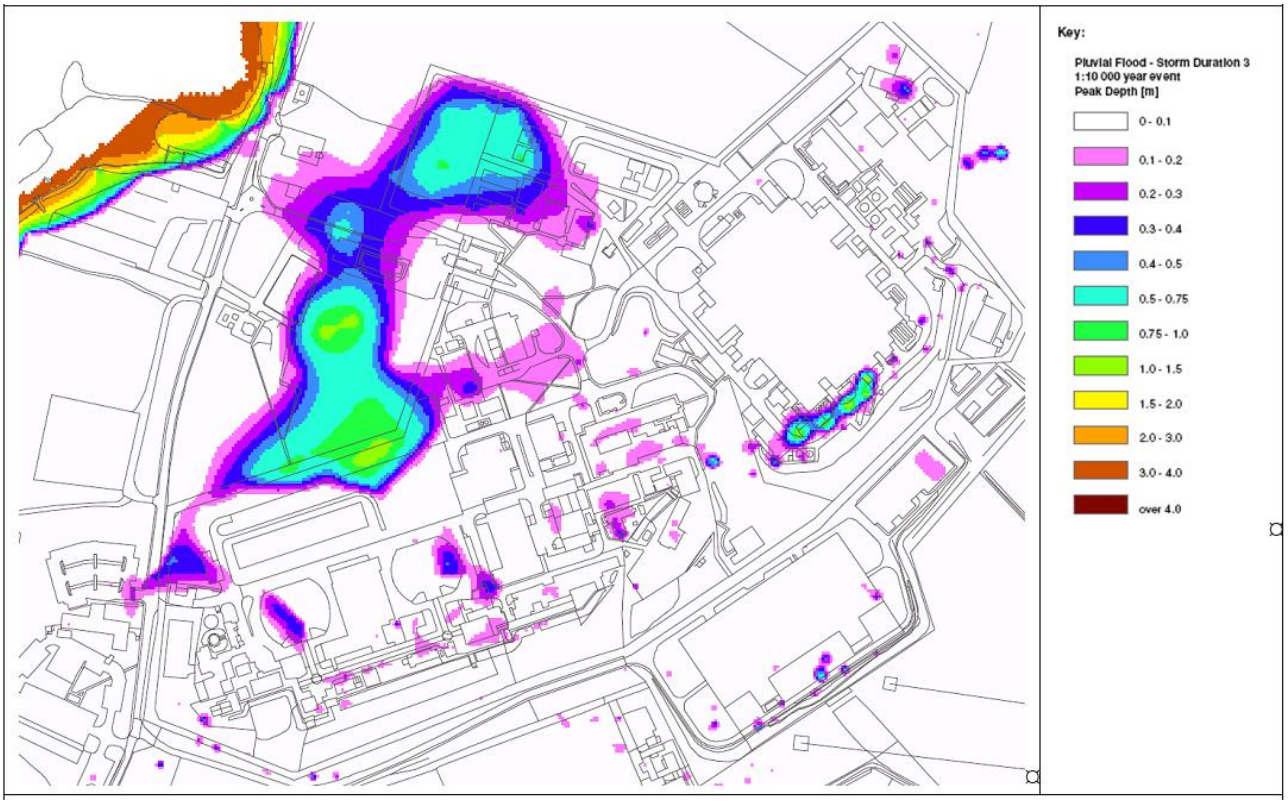
11.5.59 Hyetographs were produced to represent net rainfall i.e. the proportion of rainfall which was converted into surface water runoff using a TUFLOW two-dimensional hydraulic model. Hyetographs were produced for three pluvial storms at Hunterston including a 0.5-hour storm, 1-hour storm and 5-hour storm. Sensitivity testing for net rainfall included the climate change factor of +10% on 2011 values to account for climate change up to the year 2035.

11.5.60 The pluvial TUFLOW model extent was derived by including all land from which surface runoff could potentially reach the Hunterston complex. The model was created using a five-metre grid; the elevation of the data points for each grid cell were derived based on 5m resolution NEXTMAP data.

11.5.61 The operation of subsurface piped drainage infrastructure was not modelled in this study, based on the assumption that, during extreme events, the debris load in surface water runoff could increase significantly, resulting in blockage potential which reduced the effectiveness of the system.

11.5.62 The model results demonstrated that the Site is at some risk of flooding from a 0.01% AEP year pluvial event (plus climate change allowances) as shown below in **Graphic 11-1**. Flooding depths in the car park areas and periphery, and northern perimeter open ground could reach approximately 1.5 m. There are discrete localised flooding areas with predicted flood depths of between 0.4 and 0.75 m, with one of these being to the south-east of the future Safestore structure.

Graphic 11-1 Pluvial Peak Flood Depth Predictions, 1:10,000 year event (0.01% AEP) plus 10% climate change allowance for a storm duration of 5 hours, taken from JER report[31]



11.5.63 The pluvial flood risk areas shown in **Graphic 11-1** are indicated to be relatively minor in extent, given that it is an extreme (0.01% plus 10% climate change) scenario which is modelled under the assumption of the sub-surface drainage system being blocked up and not functioning. In addition to this, the Reactor building where the proposed Safestore infrastructure are not indicated to be at risk of pluvial flooding under this scenario.

11.5.64 As with coastal flood risk, the design rainfall event for design pluvial flood risk for this assessment is the 0.5% AEP plus climate change to 2120 event in accordance with national planning policy requirements (as set out earlier in **Section 11.2**, **Table 11.2**). The SEPA FRA guidance[16] identifies a 41% peak rainfall intensity allowance for the Clyde River Basin Region up to 2080 and recommends that sensitivity testing up to 57% (for the upper 95th percentile estimate) is carried out to a higher allowance for developments with a longer duration. Given that there is no allowance available for 2120 stated in the guidance, the higher sensitivity testing allowance (57%) has hereby been used for the lifespan of the Proposed Works.

11.5.65 It is assumed that the rainfall estimate for the 0.01% AEP storm event for the operational HNB power station exceeds that the 0.5% AEP plus 57% climate change allowance, and that, consequently, modelled flood depths and extents derived from the former (and as presented in **Graphic 11-1**) can be used as an analogue for the latter.

11.5.66 FEH22[24] was used to derive estimates of extreme rainfall for various return periods to validate this assumption. The JER report[31] rainfall depth estimates based upon the FSR methodology for the 0.01% AEP (148 mm) plus 10% were 162.8 mm. The current FEH22 rainfall modelling design rainfall estimates for the 0.5% AEP (60 mm) plus 57% is 95 mm. It can therefore be confirmed that the 0.01% AEP rainfall estimate exceeds the 0.5% AEP plus climate change allowance event, and that it can be used as a suitable analogue.

11.5.67 As noted above, the operation of the existing drainage system was not modelled in order to produce a highly conservative assessment. Therefore, this indicates that even when the on-site drainage system is not functioning, or it is completely removed, the main buildings on the Site (including the Reactor building and Turbine Hall) would not be affected by flooding from the design 0.5% AEP rainfall event plus climate change up to 2120.

11.6 Embedded environmental and good practice measures

11.6.1 A range of embedded environmental and good practice measures have been identified for the Proposed Works to manage the potential for effects on surface water and flood risk and other inter-related effects (e.g. for the coastal management and water quality, and geology and hydrogeology aspects). **Table 11.7** presents the relevant measures which have been taken into account for the assessment of effects (see **Section 11.10**).

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Table 11.7 Summary of embedded environmental and good practice measures

Embedded Measure	Compliance Mechanism	Embedded or good practice measure
Coastal Protection and Flood Risk Adaptation Measures As set out in **Section 11.5** (within the current and future baseline assessments), the existing coastal flood defences are currently designed to protect the operational HNB power station, and they will continue to protect the Site during the Proposed Works (taking into account current climate change allowances). A range of organisations have an interest in the management of the coastline in the vicinity of HNB. These include: ● NAC has responsibilities and powers to undertake and maintain coastal protection works and sea defences in accordance with their 'advance the line' policies for the short (0-20 years), medium (20-50 years) and long term (50-100 years) in their SMP for cell SB2.1[8]. This could consist of a combination of hard and soft engineering approaches as set out in their SMP; ● SEPA has responsibilities as the statutory consultee on flood risk related land use matters and are Scotland's strategic flood management authority; and ● The licensees for HNB and HNA (EDF, and Magnox L respectively) have responsibilities as operators of a nuclear site to protect them from the sea to an adequate standard under its Safety Cases. Flooding is a concern during the Proposed Works as outlined in the Post-Defueling Safety Case Climate Change Management Strategy[49]. Further modelling is being undertaken in 2024 to investigate the impact of sea level rise, erosion, groundwater and precipitation on site safety, to support the development of the PDSC. Any differences identified to the future baseline presented in **Section 11.5** will be considered as to their potential to change the conclusions of the EIADR assessment. The specification of an adequate standard of protection of HNB power station from the sea and/or surface water arises from the Safety Case process required by the nuclear site licence conditions.	Environmental Management Plan, Nuclear Site Safety Case	Embedded measure

[49] EDF (2023). Post-Defueling Safety Case Climate Change Management Strategy (ND/REP/TAD/0028/AGR/23). EDF; London.

Embedded Measure	Compliance Mechanism	Embedded or good practice measure
The EDF HNB Safety Case will continue to appraise the risks associated with external hazards. The HNB Safety Case will be updated to account for hazards on site and periodically reviewed to take account of any new data such as future updates to information on any flood defence work in the area or future updates to climate change allowances. Should changes in coastal protection be required for nuclear safety reasons then the HNB Safety Case process will ensure their timely identification.		
Emergency Plan The Site's emergency plan will ensure that appointed contractors understand the procedures in the event of potential or actual flooding from either extreme surface water or tidal flooding on site. The plan will outline arrangements for egress and safe refuge. It should be noted that whilst the majority of HNB including the Safestore is on elevated land, much of the low area along the coastal frontage (including the area for site access/egress) is at risk of extreme tidal flooding.	Environmental Management Plan	Embedded measure
Drainage Plan Where the Proposed Works have the potential to affect Site drainage inputs or change the permeability of the ground surface, the suitability of existing drainage systems, and potential requirement for alternative drainage arrangements or repairs, will be assessed, and suitable drainage systems defined in the plan prior to the relevant activity commencing.	Environmental Management Plan	Embedded measure
Drainage Surveys Drainage surveys will be completed on a prioritised basis, as required throughout the Proposed Works, and including during Preparation for Quiescence. Drainage investigation work will include confirming drainage condition and direction of flow and discharge points to offsite drains or surface water. Surveys may include CCTV camera inspections, dye tracing, confirming drain invert levels and / or sampling from drains. The findings will be used to inform the drainage planning for the Proposed Works. Liaison with the neighbouring HNA licensee will be undertaken as needed due to the connectivity of some drainage features between HNA and the Site.	Environmental Management Plan	Embedded measure

Embedded Measure	Compliance Mechanism	Embedded or good practice measure
Site Water Management Measures Site runoff will be managed within the Works Area, with turbid water collected and treated appropriately. This will include requirements with respect to discharge to the existing site drainage system, or potentially off-site disposal depending on contamination levels. Wheel washes will be used to avoid silt loads being spread away from the Works Area by vehicles. As noted in **Section 11.5** the existing drainage system includes elements to capture and treat silt. Measures will consider changes to Site drainage inputs during the Proposed Works, such as changes to water quantity , potential for silty runoff / contaminated runoff / leaching from stockpiled materials and potential for increased rainwater infiltration if hard surfaces are removed. This will include the appropriate drainage of voids that are left in situ. The potential for dewatering to be required will be considered in advance of excavation work, and if dewatering is anticipated to be needed, an assessment will be carried out in advance to identify suitable environmental measures to minimise the potential for contaminant mobilisation and to protect the water environment. Existing Controlled Activities (Scotland) Regulations (CAR) conditions will be addressed with regards to silt levels permitted in discharge of surface water via the existing outfall into the Firth of Clyde, and the ditch 110 m to the north of the Site.	Environmental Management Plan	Embedded measure
Good Industry Pollution Prevention Practices The Proposed Works will follow good industry practices as set out in CIRIA C532[17], C74[118] and Netregs guidance[13]. In addition, the appointed contractors will be required to adhere to pollution prevention measures identified in an Environmental Management Plan which will include the following: ● Bunding of new chemical and fuel stores to 110% of capacity. The bunded areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage;	Environment Management Plan	Good practice

Embedded Measure	Compliance Mechanism	Embedded or good practice measure
• Vehicle maintenance and refuelling of machinery will be undertaken within designated areas where spillages can be easily contained, and machinery will be routinely checked to ensure it is in good working condition; • Those areas at risk of spillage or containing hazardous materials, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) will comply with industry good practice, be bunded, have appropriate containment and segregation, and will be risk assessed and carefully sited to minimise the risk of hazardous substances entering the drainage system, local ditches, or sensitive land-based receptors; and • Pollution incidence response planning will deal with any accidental spillages or leaks.		
Site Protection and Monitoring Programme (SPMP) The SPMP groundwater monitoring and offsite surface water monitoring will continue for as long as required to support ongoing PPC Permit compliance and Pollution Prevention and Control (PPC) Permit Surrender. The scope of the SPMP monitoring will continue to be reviewed and any necessary changes implemented e.g., in response to changes to operations covered under the Permit or observed / suspected changes in site condition. If the SPMP monitoring indicates a deterioration in groundwater quality, appropriate measures will be undertaken to investigate, and if necessary, remediate the land, prior to PPC Permit Surrender. Records will continue to be kept of all associated monitoring, investigations and remediation. The same principles will apply to monitoring wells used to collect samples for radiological (and other non-radiological) testing (outside the scope of PPC 2012) to help support the licensee's ultimate release from RSR.	Environment Management Plan	Embedded measure
Surface Water Monitoring Surface water sampling will be carried out during the Proposed Works to help build upon the existing SPMP monitoring programme and to ensure appropriate monitoring takes place outside of the Site. This will include monitoring of authorised drainage discharges to the marine environment, and	Environmental Management Plan	Embedded measure

Embedded Measure	Compliance Mechanism	Embedded or good practice measure
sampling of surface water from the drainage ditch approximately 110 m north of the Site. Testing will continue to include radioactive isotopes and non-radiological contaminants, in line with current regular environmental monitoring protocols. This is to provide verification that the Proposed Works are not significantly impacting on surface water quality. The timing and frequency of monitoring will be risk based, and relative to the level of works activity and the level of risk of releases to ground or to the surface drainage system. It is anticipated that the monitoring frequency and scope will be addressed via the further development of the decommissioning proposals as required by the Environmental Management Plan.		

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11.7 Assessment methodology

11.7.1 The proposed generic project-wide approach to the assessment methodology is set out in **Chapter 5: The EIA Process**, and specifically in **Section 5.3** and **Section 5.4**. However, whilst this has informed the approach that has been used for this surface water and flood risk assessment, it is necessary to set out how this methodology will be applied, and adapted as appropriate, to address the specific needs of the surface water and flood risk assessment in the ES.

Determination of significance

11.7.2 The basis for the evaluation of the significance of effects used in this assessment for surface water and flood risk receptors is the change in risks from baseline conditions to the risks which are applicable to the Proposed Works and the related Site conditions.

11.7.3 The EIA Regulations recognise that developments will affect different environmental elements to differing degrees, and that not all of these are of sufficient concern to warrant detailed investigation or assessment through the EIA process. The EIA Regulations identify those environmental resources that warrant investigation as those that are "*likely to be significantly affected by the development*".

11.7.4 The significance of an effect resulting from a development during decommissioning is most commonly assessed by reference to the sensitivity of a receptor and the magnitude of change upon it. This approach provides a mechanism for identifying areas where mitigation measures may be required and to identify the most appropriate measures to alleviate the risk presented by a development. The assessment will reference appropriate embedded environmental measures (as outlined in paragraph 11.5.63) and it will assume that they will be successfully carried out as part of the works.

11.7.5 Sensitivity is assessed on a scale of high, medium, low and very low, whilst magnitude is assessed on a scale of high, medium, low and negligible. The criteria for defining sensitivity and magnitude can be found in **Table 11.8** and **Table 11.9**, along with example applications. These criteria are defined and applied based on professional judgement, using recognised approaches to classification relevant to the receptor types, based upon good practice for surface water and flood risk EIA.

11.7.6 **Table 11.8** details the basis for assessing receptor sensitivity.

Table 11.8 Establishing the sensitivity of receptors

Sensitivity	Criteria	Receptor type	Examples
High	Features with a high yield, quality or rarity, with little potential for substitution.	Aquatic Environment	Receptor water body: all relevant WFD supporting elements at least good status/potential.
	Features with a high vulnerability to flooding	Flood risk	Land use type defined as 'Essential Infrastructure' (i.e. critical national infrastructure, such as essential transport and

Sensitivity	Criteria	Receptor type	Examples
			utility infrastructure) and 'Most Vulnerable Use' (e.g. police/ambulance stations that are required to operate during flooding, mobile homes intended for permanent residential use) in the SEPA flood risk and land use vulnerability classification[14].
Medium	Features with a medium yield, quality or rarity, with a limited potential for substitution.	Aquatic Environment	Receptor water body: all relevant WFD elements at least moderate status/potential.
	Features with a medium vulnerability to flooding.	Flood risk	Land use type defined as 'Highly Vulnerable Use' in the SEPA flood risk and land use vulnerability classification[14] (e.g. most types of residential development, hostels and hotels, landfill and waste management facilities).
Low	Features with a low yield, quality or rarity, with some potential for substitution.	Aquatic Environment	Small watercourses not classified as a WFD river water body.
	Features with a low vulnerability to flooding.	Flood risk	Land use type defined as 'Least Vulnerable uses' in the SEPA flood risk and land use vulnerability classification[14] (e.g. most types of business premises).
Very Low	Commonplace features with very low yield or quality with good potential for substitution.	Aquatic Environment	Minor water features such as ditches, not classified as a WFD river water body.
	Features that are resilient to flooding.	Flood risk	Land use type defined as 'Water-compatible use' in the SEPA flood risk and land use vulnerability classification[13] and

Sensitivity	Criteria	Receptor type	Examples
			undeveloped land (e.g. flood control infrastructure, or water transmission infrastructure).

11.7.7 **Table 11.9** details the basis for assessing magnitude of change.

Table 11.9 Establishing the magnitude of change

Magnitude	Criteria	Examples
High	Results in complete loss or major change to feature, of sufficient magnitude to affect its use / integrity.	Aquatic Environment: Deterioration in river flow regime, morphology or water quality, leading to permanent downgrading (deterioration) of WFD surface water body status (including downgrading of individual WFD elements), or resulting in the inability of the surface water body to attain Good status by the relevant deadline in line with the measures identified in the RBMP. Flood Risk: Change in flood risk resulting in potential loss of life or major damage to the property or infrastructure.
Medium	Results in partial loss or noticeable change to feature, of sufficient magnitude to affect its use/integrity in some circumstances.	Aquatic Environment: Deterioration in river flow regime, morphology or water quality, leading to potential temporary downgrading of surface water body status (including potential temporary downgrading of individual WFD elements), although not affecting the ability of the surface water body to achieve future WFD objectives. Flood Risk: Change in flood risk resulting in potential for moderate damage to the property or infrastructure.
Low	Results in minor change to feature, with insufficient magnitude to affect its use/ integrity in most circumstances.	Aquatic Environment: Measurable effect on river flow regime, morphology or water quality, but with no short-term or permanent change to WFD surface water body status (of overall status or element status). Flood Risk: Change in flood risk resulting in potential for minor damage to property or infrastructure
Very Low	Results in little or no change to feature, with insufficient magnitude to affect its use/integrity.	Aquatic Environment: No measurable effect on river flow regime, morphology or water quality, and no consequences in terms of surface water body status. Flood Risk: Increased frequency of flood flows or levels, but which does not pose an increased risk to property or infrastructure.

11.7.8 For the assessment of effects for each identified receptor the sensitivity value presented in **Table 11.8** has been combined with the magnitude of change taken from **Table 11.9** to determine an overall significance rating based on the evaluation matrix shown in **Table 11.10**.

Table 11.10 Establishing the significance of effect

		Magnitude of change			
		High	**Medium**	**Low**	**Very Low**
Sensitivity	**High**	Major (Significant)	Major (Significant)	Moderate (Probably Significant)	Minor (Not Significant)
	Medium	Major (Significant)	Moderate (Probably Significant)	Minor (Not Significant)	Negligible (Not Significant)
	Low	Moderate (Probably Significant)	Minor (Not Significant)	Negligible (Not Significant)	Negligible (Not Significant)
	Very Low	Minor (Not Significant)	Negligible (Not significant)	Negligible (Not Significant)	Negligible (Not Significant)

11.8 Assumptions and limitations

11.8.1 There are uncertainties associated with the assessment of flood risk and climate change projections which are likely to be subject to change during the lifespan of the Proposed Works. The safety case flood modelling assessments used as the basis for the flood risk assessment have embodied a number of conservative assumptions to take account of the uncertainty in assessment of both present and future flood risk to the Site (such as, for example, assuming the sub-drainage system becomes blocked during every extreme events). Furthermore, the assessment of future flood risk has been based on the most up to date SEPA climate change guidance for the proposed lifetime of the Proposed Works[16.] In future the HNB Safety Case[32] will be modified to account for reduced hazard on site and periodically reviewed to take account of any updates to information around future climate change projections.

11.9 Scope of the assessment

Study Area

11.9.1 The Study Area for baseline data collation was described in paragraph 11.3.1 and delineated on **Figure 11.1** as far as the MHWS.

Potential receptors

11.9.2 Surface Water and Flood Risk receptor types fall into the following two groups:

i) Aquatic environment: Surface watercourses and WFD bodies and conditions supporting designated conservations sites;

ii) Flood risk: People, properties and infrastructure.

Aquatic environment

11.9.3 Given the current baseline conditions, only one terrestrial aquatic environment receptor has been identified for this assessment, which is the minor drainage ditch situated 110 m to the north of the Site. As noted in paragraphs 11.5.11 to 11.5.12, due to the underlying hydrogeological conditions there may be hydraulic connectivity between the Site and a ditch 110 m to the north of the Site therefore it has been scoped back in for completeness and part of a precautionary assessment approach. Furthermore, as noted in paragraph 11.5.9, the surface water drainage system for the northern part of the Site is likely to discharge into this ditch. This receptor is considered to be Very Low sensitivity in accordance with the criteria which is set out in **Table 11.8.**

Flood risk

11.9.4 The following potential flood risk receptors are considered in the following ES assessment:

i) On-site infrastructure and staff working during the Proposed Works. The Safestore infrastructure is classed as 'Essential Infrastructure' whereas other Site activities are classed as 'Highly Vulnerable Uses' under the SEPA Flood Risk and Vulnerability Guidance[14]. The other Site activities are classed as 'Highly Vulnerable Uses' as part of a precautionary approach and based upon the 'waste management facilities for hazardous waste' land use. These classifications are respectively considered to be high and medium sensitivity in accordance with the criteria set out in **Table 11.8**;

ii) Off-site people, property and infrastructure (e.g. adjacent roads, sewer networks and businesses). Land use types defined as 'Essential Infrastructure' under the SEPA Flood Risk and Vulnerability Guidance[14] e.g. adjacent HNA Safestore, Hunterston East Substation, and the HVDC Substation). The other HNA waste management facilities are also classed as 'Highly Vulnerable Uses' as part of a precautionary approach in accordance with the guidance. These classifications are respectively considered to be high and medium sensitivity in accordance with the criteria set out in **Table 11.8**;

11.9.5 Assessment of direct physical effects resulting from the Proposed Works in the Marine Area (e.g. related to the decommissioning of outfall channels, intakes and the jetty) and potential effects on marine water quality are addressed in **Chapter 10: Coastal Management and Water Quality**. Assessment of potential effects resulting from the Proposed Works on groundwater receptors is presented in **Chapter 12: Soils, Geology and Hydrogeology**. This includes consideration of sediment-laden or contaminated non-radiological or radiological runoff being released from areas of ground disturbance to the sea during demolition activities and ground reinstatement and sets out a range of equivalent embedded environmental measures which will be implemented as part of the Proposed Works.

Likely significant effects

11.9.6 The potential significant surface water and flood risk effects that have been forward for assessment in the ES are summarised in **Table 11.11**.

Table 11.11 Likely significant surface water and flood risk effects

Activity	Potential effects	Receptor
Decommissioning activities and the presence of staff working on-site	Surface water runoff from adjacent external areas (e.g. HNA) putting Site infrastructure and staff at risk.	On-site infrastructure and staff associated with the Proposed Works.
The demolition of buildings and the undertaking of temporary groundworks on–site, including the construction and removal of the Safestore and waste facilities (taking into account any voids left in situ)	Alteration of existing surface water pathways, and changes in surface water flood risk on-site and to surrounding areas.	On-site infrastructure and staff associated with the Proposed Works. Off-site people, property, and infrastructure.
New buildings and retention of existing hardstanding areas which are being left in situ to support decommissioning	An increase in surface water flood risk on-site and to surrounding areas over time due to the influence of climate change, including the potential for more intense rainfall.	On-site infrastructure and staff associated with the Proposed Works. Off-site people, property, and infrastructure.
Changes in landform resulting from potential infrastructure activities such as the decommissioning of the intake and outfall	An increase in tidal flood risk towards the Site and surrounding areas as a result of changes in wave energy, and resultant effects on tidal erosion, sediment deposition and weakening of flood defences.	On-site infrastructure and staff associated with the Proposed Works. Off-site people, property, and infrastructure.
Excavation works, and infilling activities during decommissioning	These activities have the potential to generate silty runoff. Substances may also be spilled or leaked during the infilling process. Both processes could result in a decline in surface water quality within the unnamed ditches to the north of the Site.	Unnamed ditches to the north of the Site

11.9.7 For further information on the effects which have been scoped out of the assessment please refer to the EIA Scoping Report. In response to the request of SEPA (see **Table 11.5**) the potential effects on water quality associated with the unnamed ditches located to north of the Site are included within the assessment.

11.10 Assessment of effects

Summary of the Decommissioning Process

11.10.1 Detailed information on the decommissioning process is set out in **Chapter 2: The Decommissioning Process**. A brief summary of relevant information is provided for the purposes of this assessment.

11.10.2 The Proposed Works will be undertaken in three main phases:

Preparations for Quiescence phase (approximately 12 years):

- This involves demolition of all existing buildings, except for the Reactor building and some adjoining structures which will be repurposed and modified to create a 'Safestore' to allow further radioactive decay. This will involve and the construction of several temporary buildings for the storage of radioactive waste on-site (within a Radiation Controlled Area (RCA)).
- 'Deplanting' will involve isolating, draining (if necessary) and removing plant from the Site. Deconstruction will comprise the removal of buildings and structures to ground level.
- The works below ground will create temporary voids. It is assumed that voids will then either be infilled with crushed material generated from demolition activities or made safe and abandoned.
- Existing drainage infrastructure will be left in-situ to facilitate the drainage of the Site during the subsequent phases but may need to be modified to account for changes on-site as a result of the Proposed Works.
- Prior to demolition, the satellite RCA buildings (the RCA buildings away from the former reactor building) will be de-planted, decontaminated and removed to ground level with concrete slabs left in situ.

Quiescence phase (approximately 70 years);

- The Site remains in a quiescent state to delay final reactor dismantling and site clearance following the decay of radioactive substances within the Safestore building, which will be the only structure in place during this phase. Other than routine inspections and minor maintenance, minimal activity is anticipated. This could include inspections of drains/sumps for blockages and surface water management activities for voids left in situ.

Final Site Clearance phase (approximately 10 years).

- This will include the removal of the Safestore from the Site, including the retrieval of operational wastes stored in the Higher Activity Debris Vaults (HADVs), final elements of active area deplanting and reactor dismantling. The decommissioning processes will be similar to those described for Preparations for the Quiescence phase, including a number of temporary buildings on-site to facilitate final clearance. The location of these will be confirmed closer to the time (see **Graphic 2.6** in **Chapter 2: The Decommissioning Process**). All buildings will be removed by the end of this phase with the Site then de-licensed and made available for future use. Existing drainage systems are expected to be left in place until the final end state.

Surface water runoff

Surface water runoff from adjacent external areas putting Site infrastructure and staff at risk

11.10.3 As noted in **Section 11.5** (paragraph 11.5.8), HNA and HNB each have their own drainage systems, which are interconnected at one point in the vicinity of switch houses where an overflow structure discharges excess runoff from the HNA station system to the HNB station system. As noted earlier and in **Chapter 2: The Decommissioning Process,** the drainage systems on HNB will be left in situ to facilitate drainage of the Site during the period of the Proposed Works.

11.10.4 During extreme storm events, modelling studies (paragraph 11.5.62) indicated that runoff on the Site would either pond locally around existing manholes or runoff to the low point in the vicinity of the car park. In either case, the flood studies supporting the HNB Safety Case have indicated that even during extreme rainfall events (associated with 0.01%

AEP) there would not be a threat posed towards any existing infrastructure or staff particularly on the basis of existing operational site protocols for surface water management being carried out on both sites. This includes the application of existing measures such as inspection of the signs of flooding, and minimising vehicular movement on-site. As reported in the future baseline section (paragraph 11.5.67), the operation of the existing drainage system was not modelled as part of the conservative JER pluvial assessment. Therefore, this indicated that even if the on-site drainage system was not functioning, or it is completely removed, the reactor building (and Safestore it will be modified into) would not be affected by flooding from the design 0.5% AEP rainfall event plus climate change up to 2120.

11.10.5 External risks related to ongoing activities at HNA could include activities such as dewatering or infilling. This could potentially result in additional pressures on the existing drainage system. However, the surface water flood risk map (**Figure 11.4**) indicates that runoff from adjacent areas outside of the Site are located in the vicinity of buildings, and there are no flow pathways indicated to be directed onto the Site. As such there is limited potential connectivity for surface water runoff from adjacent external areas and the Site, during all phases of the Proposed Works.

11.10.6 The potential for effects on surface water flood risk from external areas are likely to be greatest during the Preparations for the Quiescence phase as this is when most extensive site clearance and groundworks will be carried out on HNB. On the basis of the embedded measures (in **Table 11.7)**, it is considered that any potential surface water flood risk from external areas towards on-site staff and infrastructure is likely to be **Very Low** during this worst-case scenario. The Site receptors (i.e. waste facilities and Safestore) are respectively considered to have **Medium** and **High** sensitivity in the assessment (as defined in **Table 11.8**), the effects are therefore considered to be **Not Significant**. It therefore follows that any potential for surface water flood risk during the latter phases (i.e. Quiescence phase and Final Site Clearance phase) are also considered to be **Not Significant**.

Alteration to existing pathways/surface water flood risk on-site or to surrounding areas from proposed groundworks

11.10.7 Alterations to existing surface water pathways and changes in surface water flood risk could arise from several sources associated with the Proposed Works during the Preparations for Quiescence phase, including the creation and abandonment of voids from demolition activities, the removal of buildings from the Site and the remediation of land as required.

11.10.8 Alterations to the existing Site drainage system could increase the risk of surface water flooding. However, the existing drainage system is to be left in situ and modified as required based on the outcomes of the drainage surveys and any recommendations for arrangements set out in the Drainage Plan, which are both embedded environmental measures (set out in **Table 11.7**).

11.10.9 During the Preparations for Quiescence phase, where buildings are decommissioned and removed on-site they will be deplanted to slab level, voids will either be filled in with clean material or in some cases voids may be left open, made safe and left in-situ. Surface water will be appropriately managed within the voids, either to allow infiltration, or to connect into the existing drainage system. This will include the use of suitable drainage solutions which integrate with the existing drainage systems to prevent impacts from surface water accumulating and ponding on-site. Required measures will be implemented as part of overarching site water management measures and will be considered under the Drainage Plan (in **Table 11.7**).

11.10.10 During the Quiescence phase activities would be limited to inspections of drains/sumps for blockages and surface water management for any voids left in situ. The modified drainage systems are then expected to be left in place until the final end state of Final Site Clearance. The modelling presented (in **Section 11.5**) previously indicated that the reactor building (which will be modified into the Safestore during the Preparations for Quiescence phase) would remain free from surface water flooding throughout the project lifecycle, even without an operating subsurface drainage system in place.

11.10.11 The potential effects on surface water flood risk from groundworks are likely to be greatest during the Preparations for the Quiescence phase as this is when most demolition activities will be carried out. However on the basis of embedded measures including the drainage surveys, drainage plan and site water management measures (in **Table 11.7)**, any potential surface water flood risk towards on-site and off-site staff and infrastructure is likely to be **Very Low** during this worst case scenario, which in combination with the **Medium - High** receptor sensitivity, is considered to be **Not Significant**. It therefore follows that any potential for surface water flood risk during the latter phases (i.e. Quiescence phase and Final Site Clearance phase) are also considered to be **Not Significant**.

An increase in surface water flood risk on-site or to surrounding areas associated with new buildings and retention of hardstanding during the decommissioning process (due to the influence of climate change and more intense rainfall)

11.10.12 During the Preparations for Quiescence phase, the reactor building (and some adjoining structures containing Active Effluent Treatment Plan (AETP)) will be modified into a Safestore to allow for radioactive decay to occur during the Quiescence phase. The reactor building is not expected to be at risk from flooding in the Preparations for Quiescence phase which is anticipated to be complete by the end of 2037.

11.10.13 Over the course of the Preparations for Quiescence phase there will be a large net reduction in the number of buildings and there will be no net increase in impermeable areas. Waste facilities will be provided as part of the refurbishment of existing buildings and will be removed at the end of the Preparations for Quiescence phase and thus will also not increase the impermeable area on the Site. Some voids may be left un-filled during the Quiescence phase which may provide some opportunity for increased permeability on site. These voids (if present) will however require suitable drainage solutions to integrate with the existing drainage systems to prevent impacts on surface water flooding on site.

11.10.14 At the start of the Final Site Clearance phase, a new Waste Management Centre (WMC) will be required on site to process waste arising from Final Site Clearance activities such as reactor dismantling. The potential impact of the construction and operation of the WMC on surface water flooding on site will be considered in the eventual decision on the siting of the building, with suitable works to integrate it into the drainage system at the Site designed prior to construction. The Safestore is indicated to not be at risk of surface water flooding from even highly extreme storm events up until the end of the Final Site Clearance phase (0.5% AEP plus climate change allowance up to 2120) (see Graphic 10 1 and paragraphs 10.5.64 to 10.5.66). This is on the basis that existing pluvial modelling studies assumed that sub surface drainage networks would be blocked up (i.e. not operational) as part of a precautionary approach.

11.10.15 The potential effects are likely to be greatest during the latter stages of the Proposed Works (i.e. Quiescence phase and Final Site Clearance phase) due to the influence of climate change and potential for more intense rainfall. However, on the basis of the embedded measures (drainage surveys, Drainage Plan and site water management measures) in **Table 11.7**, it is considered that the potential surface water flood risk

associated with the Proposed Works towards on-site and off-site staff and infrastructure is likely to be **Very Low** during this worst-case scenario, which in combination with the **Medium** - **High** receptor sensitivity, is considered to be **Not Significant**. It therefore follows that any potential for surface water flood risk during the Preparations for Quiescence phase are also considered to be **Not Significant**.

Tidal flood risk

An increase in tidal flood risk due to changes in wave energy, and resultant effects on tidal erosion, sediment deposition and weakening of flood defences (following decommissioning of the intake and outfall).

11.10.16 As noted in **Chapter 9: Coastal Management and Water Quality** any changes to the tidal current and wave regime due to the Proposed Works will be highly localised, and the associated effects on the overall marine sediment transport regime in the vicinity are therefore predicted to be negligible. As outlined by existing safety case modelling activities, tidal flood risk is expected to be considered very low in the Preparations for Quiescence phase which is expected to complete in the late 2030s and thus is not significantly affected by climate change induced sea level rise.

11.10.17 The decommissioning proposals for works in and adjacent to the marine environment will have a very low magnitude of change on tidal flood risk. The future tidal flood risk baseline is not expected to have changed significantly by the end of the Preparations for Quiescence phase so whilst the Site is considered to have **Medium - High** sensitivity receptors, the assessment concludes a **Not Significant** effect. The works are also not anticipated to have any significant effect on flood risk at off-site people, property or infrastructure.

An increase in tidal flood risk towards the Site and surrounding areas due to climate change induced sea level rise

11.10.18 The decommissioning for the Proposed Works will be undertaken over a very long period of time and are not anticipated to complete until approximately 2117 (i.e in the 2010 - 2120 epoch) which means the assessment must consider the implications of climate change induced sea level rise.

11.10.19 Within the RCA during the Preparations for Quiescence phase (in the 2030s) the reactor building (and some adjoining structures containing AETP) will be modified into a Safestore. During the Quiescence and Final Site Clearance phase (planned between 2040 – 2117) there is likely to be an increase in the tidal flood risk, due primarily to climate-change induced sea level rise (see **Table 11.6**). However, as outlined in paragraph 11.5.54, the Safestore will remain significantly above the estimated future 0.5%, 0.1% and 0.01% AEP plus climate change tidal levels up to the end of Proposed Works on Site by 2120.

11.10.20 The HNB Safety Case will be systematically updated to account for hazards on the Site as decommissioning progresses and will also be periodically reviewed to take account of future updates to climate change allowances or further information on flood defences relevant to HNB. The safety case process, alongside other regulatory controls such as the Town and County Planning Act, will ensure new buildings associated with the Final Site Clearance phase are not located within areas affected by increased tidal flooding associated with climate change induced sea level rise. Emergency planning will also ensure that appointed contractors understand the procedures in the event of potential or actual flooding from either extreme surface water or tidal flooding on the Site.

11.10.21 The potential effects due to the influence of climate change on tidal flood risk are likely to be greatest during the latter stages (i.e. Quiescence phase and Final Site Clearance phase). As noted above, the Safestore itself is predicted to be at a negligible risk of tidal flooding and will remain outside of projected tidal levels throughout the Proposed Works. For all other activities including site access via lower lying areas (site entrance) the risk of tidal flood risk would be managed via the implementation of the emergency plan and coastal protection flood risk adaptation measures (in **Table 11.7**). Therefore, it is considered that during this worst-case scenario the potential tidal flood risk associated with climate change towards on-site and off-site staff and infrastructure is likely to be **Very Low**, which in combination with the **Medium** - **High** receptor sensitivity, is considered to be **Not Significant**.

Surface water quality

11.10.22 As noted in paragraphs 11.5.11 to 11.5.12 and **Chapter 12: Soils, Geology and Hydrogeology** the predominant groundwater flow direction beneath the Site is towards the north-west to the Firth of Clyde. **Chapter 10: Coastal Management And Water Quality** considers the potential for changes in marine water quality receptors beyond the point of the MHWS. There is however some potential for connectivity between the northern area of the Site and the ditch receptor situated 110 m to the north of the Site within the surface water and flood risk Study Area.

11.10.23 As such there is a potential risk of changes in surface water quality arising from construction and demolition activities during the Preparations for Quiescence phase which could potentially generate silty runoff or the introduction of other contaminants, passing off-site via groundwater flow pathways into the existing drainage network and the surface water ditch environment. Embedded measures will be carried out including site water management measures, drainage planning and surveys, and surface water monitoring on-site.

11.10.24 The potential effects on surface water quality are likely to be greatest during the Preparations for Quiescence phase as this is when most demolition and site clearance activities will be carried out. On the basis of the embedded measures including the drainage plan, drainage survey, SPMP, and surface water monitoring identified in **Table 11.7**, it is considered that during the worst-case scenario the potential effects associated with the Proposed Works on the surface water quality of the drainage ditch would be **Low**, which in combination with the **Very Low** receptor sensitivity, is considered to be **Not Significant**. It therefore follows that any potential for changes in surface water quality during the latter phases (i.e. Quiescence phase and Final Site Clearance phase) are also considered to be **Not Significant**.

11.11 Summary

11.11.1 The results of the assessment of effects of the Proposed Works on surface water and flood risk are summarised in **Table 11.12**.

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Table 11.12 Summary of assessment of potential effects

Activity	Summary of Predicted Effect	Receptor(s)	Receptor Sensitivity	Magnitude of Change	Significance	Summary of Rationale
Decommissioning activities and the presence of staff working on-site	Surface water runoff from adjacent external areas (e.g. HNA) putting site infrastructure and staff at risk.	On-site infrastructure and staff.	Medium - High	Very Low	Minor (Not Significant)	The new buildings on-site mostly avoid areas of existing surface water flooding and the existing drainage system will be in place throughout the Proposed Works and is designed to sufficiently accommodate surface water runoff. Embedded measures including site water management measures, flood risk adaptation measures and emergency flood response planning will further minimise risk on site.
The demolition of buildings and the undertaking of temporary groundworks on–site, including the construction and removal of the Safestore and waste facilities	Alteration of existing surface water pathways, and changes in surface water flood risk on site and to surrounding areas.	On-site infrastructure and staff. Off-site people, property and infrastructure.	Medium - High	Very Low	Minor (Not Significant)	The existing drainage system will be left in place throughout the Proposed Works and is designed to sufficiently accommodate surface water runoff. There will be no net increase in term of impermeable footprint on site. Embedded measures including the water management measures, drainage surveys and drainage plan will help further minimise risks on site.
New buildings and retention of existing hardstanding areas which are being left in situ to support decommissioning	An increase in surface water flood risk on-site and to surrounding areas over time due to the influence of climate change, including	On-site infrastructure and staff. Off-site people, property and infrastructure.	Medium - High	Very Low	Minor (Not Significant)	The new buildings on-site mostly avoid areas of existing surface water flooding and the existing drainage system will be in place throughout the Proposed Works and is designed to sufficiently accommodate surface water runoff. Previous work indicated

Activity	Summary of Predicted Effect	Receptor(s)	Receptor Sensitivity	Magnitude of Change	Significance	Summary of Rationale
	the potential for more intense rainfall.					that the key buildings (e.g. Safestore) would remain free of flooding irrespective of the operation of the drainage system. Embedded measures include site runoff management measures, drainage survey and drainage plan to help further minimise risk on site.
Changes in landform resulting from potential infrastructure activities such as the decommissioning of the intake and outfall	An increase in tidal flood risk towards the Site and surrounding areas as a result of changes in wave energy, and resultant effects on tidal erosion, sediment deposition and weakening of flood defences.	On-site infrastructure and staff. Off-site people, property and infrastructure.	Medium - High	Very Low	Minor (Not Significant)	None of the Proposed Works are expected to compromise the condition of the existing coastal flood defences. Each of the proposed new buildings (including the Safestore location) on-site are set back from all of the projected coastal flood risk spatial envelopes, taking into account climate change allowances for 2120. Embedded measures will include coastal protection and flood risk adaptation measures and emergency flood planning to further minimise risk on site. As part of the coastal protection and flood risk adaptation measures the HNB Safety Case will be periodically reviewed to take account of any new data such as future updates to information on the condition of the flood defences in the area and/or future updates to climate change allowances.

Activity	Summary of Predicted Effect	Receptor(s)	Receptor Sensitivity	Magnitude of Change	Significance	Summary of Rationale
Excavation works, and infilling activities during decommissioning	These activities have the potential to generate the mobilisation of silt or other contaminants. Substances may also be spilled or leaked during the infilling process. This could result in changes to shallow groundwater water quality with potential knock on impacts on the surface water environment.	Unnamed ditch to the north of the Site	Medium - High	Low	Negligible (Not Significant)	Embedded measures including site water management measures, drainage plan, drainage survey and surface water monitoring will help reduce any potential effects upon ditch water quality during the Proposed Works.

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11.12 Assessment of cumulative effects

Inter-project effects

11.12.1 There is the potential for surface water and flood risk effects associated with the Proposed Works to interact with, or combine with the effects arising from other developments or projects proposed within the relevant Zones of Influence applicable to each environmental aspect.

11.12.2 An assessment of inter-project effects is considered within in **Chapter 21: Cumulative Effects Assessment** of this ES.

Intra-Project effects

11.12.3 A summary of the potential intra-project effects is provided in **Chapter 21: Cumulative Effects Assessment.**

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12.

Soils, Geology and Hydrogeology

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12. Soils, Geology and Hydrogeology

12.1 Introduction

12.1.1 This chapter presents the assessment of the likely significant effects of the Proposed Works on soils, geology and hydrogeology. It should be read in conjunction with the Project Works description in **Chapter 2: Decommissioning process**.

12.1.2 The chapter should also be read in conjunction with the following chapters: **Chapter 8: Terrestrial Biodiversity and Ornithology**, **Chapter 9: Marine Biodiversity**, **Chapter 10: Coastal Management and Water Quality**, **Chapter 11: Surface Water and Flood Risk** and **Chapter 7: Climate Change**, due to the potential interactions of ground conditions with ecological receptors, the water environment, and climate change.

12.2 Relevant legislation, policy and technical guidance

Legislation

12.2.1 The legislation in **Table 12.1** is relevant to the assessment of the effects on soils, geology and hydrogeology receptors:

Table 12.1 Legislation relevant to soils, geology and hydrogeology

Legislation	Legislation Issue
European Union (EU) Water Framework Directive (WFD), 2000/60/EC [1]	A fundamental requirement of the WFD is to attain Good Ecological Status, or Good Ecological Potential within defined water bodies, by December 2027 and to ensure that deterioration in status is prevented. The WFD requires Member States to put in place systems for managing their water environments based on river basin districts. It further requires Member States to take account of the need to recover the costs of water services as a means of encouraging sustainable use of water resources. The UK left the EU on 31 January 2020, however some UK legislation transposing EU law is still retained, This includes legislation relating to the water environment, as detailed below in this table.
The European Union (EU) Groundwater Directive (GWD), 2006/118/EC[2]	The aim of the GWD (also known as the 'groundwater daughter directive' to the WFD) is to protect groundwater against pollution caused by dangerous substances. The potential for the Proposed Works to affect groundwater bodies through the introduction of hazardous substances and/or non-hazardous pollutants requires assessment. The objectives of the WFD and the GWD are

[1] European Commission (2000). *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy* (online). Available at: https://eur-lex.europa.eu/eli/dir/2000/60/oj (Accessed November 2023).
[2] European Commission (2006). *Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration* (online). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32006L0118 (Accessed November 2023).

Legislation	Legislation Issue
	implemented in Scotland through the Water Environment and Water Services (Scotland) Act 2003, and elements of the Pollution Prevention and Control (Scotland) Regulations 2012 (PPC 2012). Any activity with the potential to cause input of pollutants to groundwater, whether directly or via percolation through the soil, is a groundwater activity. Operators carrying out a groundwater activity must have an environmental permit or an exemption.
Environmental Protection Act 1990, Part IIA[3]	The Environmental Protection Act 1990 (EPA Part IIA) succeeded the Control of Pollution Act 1974 (COPA) and introduced new regulations for improved management systems relating to waste and pollution. EPA Part IIA establishes legal responsibilities for pollution control for land, air and water. In respect of waste, EPA Part IIA defines the fundamental structure and authority for waste management and control of emissions into the environment.
Water Resources Act 1991[4] as amended by the Water Act 2003[5]	The Water Resources Act 1991 states that it is an offence to cause or knowingly permit polluting, noxious, poisonous or any solid waste matter to enter controlled waters. The Water Resources Act 1991 was revised by the Water Act 2003, which sets out regulatory controls for water abstraction, water impoundment and protection of water resources.
Water Environment and Water Services (Scotland) Act 2003 (WEWS) [6]	The Water Environment and Water Services (Scotland) Act 2003 is the enabling legislation for the WFD and makes major changes to the administration of water and sewerage provision in Scotland. It identifies the Scottish Environment Protection Agency (SEPA) as the competent authority. Part 1 makes provision for protection of the water environment, whilst Part 2 deals with water and sewerage services.
The Contaminated Land (Scotland) Regulations 2000[7], as amended (The Contaminated Land (Scotland) Regulations 2005[8])	The Contaminated Land (Scotland) Regulations 2000 brought into force Part IIA EPA in Scotland in 2000. The regime places a duty on local authorities to identify and secure the remediation of contaminated land in their respective areas. The regulations provide a system for the identification and remediation of land where historical contamination is causing unacceptable risks to human health or the environment, in the context of the current use of the land. The regime is based on the polluter pays principle. The 2005 amendment to the regulations includes a change in terminology from 'controlled waters' to 'the water environment', in addition to other amendments to bring the regulations into accordance with the WEWS 2003.

[3] UK Government (1990). *Part IIA of the Environmental Protection Act 1990* (online). Available at: http://www.legislation.gov.uk/ukpga/1990/43/part/IIA (Accessed November 2023).
[4] UK Government (2009). *Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009* (online). Available at: http://www.legislation.gov.uk/uksi/2009/3104/introduction/made (Accessed November 2023).
[5] UK Government (2003). *Water Act 2003*. [online] Available at: https://www.legislation.gov.uk/ukpga/2003/37/contents. (Accessed November 2023).
[6] UK Government (2003). *Water Environment and Water Services (Scotland) Act 2003* (online), Available at: http://www.legislation.gov.uk/asp/2003/3/contents (Accessed November 2023).
[7] Scottish Government (2000) *Scottish SI 2000 No. 178, The Contaminated Land (Scotland) Regulations 2000.* (Online) Available at: https://www.legislation.gov.uk/ssi/2000/178/regulation/5/made (Accessed 16 August 2023).
[8] Scottish Government (2005) *Scottish SI 2000 No. 178, The Contaminated Land (Scotland) Regulations 2000*. (Online) Available at: https://www.legislation.gov.uk/ssi/2000/178/regulation/5/made (Accessed November 2023).

Legislation	Legislation Issue
Radioactive Contaminated Land (Scotland) Regulations (amended) 2007[9]	The Radioactive Contaminated Land (Scotland) Regulations (amended) 2007 make provision, in relation to Scotland, for the identification and remediation of contaminated land under EPA Part IIA[3]. They apply EPA Part IIA in relation to pollution of the water environment which is attributable to radioactivity and make provision for the identification and remediation of radioactive contaminated land. SEPA can inspect land where there are reasonable grounds for believing that it may be subject to radioactive contamination and has powers to investigate matters which may have given rise to harm or pollution of the water environment attributable to radioactivity.
Water Environment (Groundwater and Priority Substances) (Scotland) Regulations 2009[10]	These Regulations provide for compliance with provisions of the GWD and of the Council on the Protection of Groundwater against pollution and deterioration and Directive 2008/105/EC of the European Parliament and of the Council on Environmental Quality Standards in the Field of Water Policy[11]. The Regulations, among other things, apply modified provisions of the Water and Environment and Water Services (Scotland) Act 2003[6] and amend the Water Environment (Controlled Activities) (Scotland) Regulations 2005[12] in relation with discharges of hazardous substances.
Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy[11]	Sets out the Environmental Quality Standards (EQS) to be applied for the water environment for priority substances and priority hazardous substances. The aim of the directive is to provide standards for surface water bodies which constitute good ecological and good chemical status. In Scotland, EQS are set by SEPA based on Scottish Government directions, most recently; The Scotland River Basin District (Standards) Directions 2014[13] and The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014[14].
The Environmental Liability (Scotland) Regulations 2009	Requirement to ensure that the Proposed Works will not cause damage to habitats or protected species, the water environment or land.
The Water Environment (Controlled Activities) (Scotland)	CAR controls engineering works in the vicinity of inland surface waters as well as point source discharges, abstractions, and

[9] UK Government (2007). *The Radioactive Contaminated Land (Scotland) Regulations 2007* (online). Available at: http://www.legislation.gov.uk/ssi/2007/179/made Accessed November 2023).
[10] UK Government (2009). *The Water Environment (Groundwater and Priority Substances) (Scotland) Regulations 2009* (online). Available at: https://www.legislation.gov.uk/ssi/2009/420/contents/made (Accessed November 2023).
[11] European Commission (2008) *Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council*. (Online) Available at: https://eur-lex.europa.eu/legal-content/EN/LSU/?uri=CELEX:32008L0105 (Accessed November 2023)
[12] Scottish Government (2005) *The Water Environment (Controlled Activities) (Scotland) Regulations 2005*. (online). Available at: https://www.legislation.gov.uk/ssi/2005/348/contents/made (Accessed November 2023).
[13] Scottish Government (2014) *The Scotland River Basin District (Standards) Directions 2014*. (online) Available at: https://www.gov.scot/publications/scotland-river-basin-district-standards-directions-2014/. (Accessed November 2023).
[14] Scottish Government (2014) *The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014*. (Online) Available at: https://www.gov.scot/publications/solway-tweed-river-basin-district-standards-scotland-directions-2014/. (Accessed November 2023).

Legislation	Legislation Issue
Regulations 2011 (as amended) (CAR) [12]	impoundments, supporting implementation of the WFD [1] in Scotland.
The Water Environment (Miscellaneous) (Scotland) Regulations 2017[15]	These regulations introduce new and amended binding rules into the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR)[12]. Activities covered include: • the construction, extension and the on-going operation of a well, borehole or other works by which water may be abstracted. • the maintenance of existing man-made structures in or near any surface water or wetland. • all water run-off from specified construction sites. • the placement of trees or parts of trees in a river, burn or ditch to protect eroding banks. • the abstraction and subsequent return of groundwater as part of a cooling system. • the storage and application of fertiliser.
The Industrial Emissions Directive 2010 (IED)[16]	This directive combined and superseded a number of existing legislation on industrial emissions, including the Integrated Pollution Prevention and Control Directive[17]. The IED was transposed in Scotland by the Pollution Prevention and Control (Scotland) Regulations 2012. Details of HNB's interaction with PPC 2012 are provided below in this table.
Pollution Prevention and Control (Scotland) Regulations 2012 (PPC 2012)[18]	Several areas of HNB are regulated under PPC 2012, under Permit PPC/A/1008859, including the diesel generators, auxiliary boilers, burners and associated pumps and stores. The permit includes conditions 2.7.1 to 2.7.3 relating to the protection of soil and groundwater. These state that no emission of pollutants to soil or groundwater are permitted from the permitted installation, and that records must be kept by the Operator (which at HNB is the site licensee) of any incident known or suspected to have impacted soil or groundwater, and of investigations and remediation undertaken in response to an incident. These conditions apply up until the point that the Permit is surrendered.
The Environmental Authorisations (Scotland) Regulations 2018[19]	The term regulated activity in the Environmental Authorisations (Scotland) Regulations 2018 means a radioactive substances activity. 'Radioactive substances activity' means an activity involving either radioactive material or radioactive waste, or both. SEPA will only authorise a regulated activity if the person in control of the regulated activity passes the fit and proper person test,

[15] Scottish Government (2017). *The Water Environment (Miscellaneous) (Scotland) Regulations 2017* (online). Available at: http://www.legislation.gov.uk/ssi/2017/389/contents/made (Accessed November 2023).
[16] European Commission (2010) *Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control).* (Online) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32010L0075 (Accessed November 2023).
[17] European Community (2008) *Directive 2008/1/EC on Integrated Pollution Prevention and Control.* (online) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0001 (Accessed November 2023).
[18] Scottish Government (2012) *The Pollution Prevention and Control (Scotland) Regulations 2012*. (online) Available at: https://www.legislation.gov.uk/ssi/2012/360/contents/made (Accessed November 2023).
[19] Scottish Government (2018) *The Environmental Authorisations (Scotland) Regulations 2018.* (online) Available at: https://www.legislation.gov.uk/sdsi/2018/9780111039014/contents (Accessed November 2023).

Legislation	Legislation Issue
	which includes requirement for the environment and human health to be protected and for authorised persons to ensure compliance with the conditions of the authorisation. Under Part 5 Regulation 22, SEPA must ensure that a permit or authorisation for a radioactive substances permit which involves the disposal of radioactive waste, or introduction of radioactive material to the environment, or both, includes conditions requiring the authorised person to carry out appropriate monitoring and evaluation of radioactive discharges into the environment during the normal operations. For nuclear sites, radioactive discharges must be monitored and reported to SEPA. SEPA is the enforcing authority for regulated activities and has powers to issue regulatory notices if it is of the opinion that the activity is resulting in environmental harm. At the point of decommissioning, The Nuclear Decommissioning Authority (NDA) becomes the regulating authority for nuclear licensed sites. SEPA has a Memorandum of Understanding[20] with the NDA for nuclear sites in Scotland.
The Nuclear Installations Act 1965 (NIA65) (as amended)[21]	Provides the legal framework for nuclear safety and nuclear third-party liability and sets out the system of regulatory control based on the licensing process administered by the regulator (the ONR). Sets out the duties of licensees in respect of nuclear occurrences during the period of the licensee's responsibility. It is the duty of the licensee to ensure that no occurrence involving nuclear matter, or emissions of ionising radiation caused by the licensee, causes injury to any person, damage to the property of any person other than the licensee, or significant impairment of the environment, being injury, damage or impairment that arises out of or result from the radioactive properties, or a combination of those and any toxic, explosive or other hazardous properties, of that nuclear matter. NIA65 requires the ONR to attach conditions to a site licence, as necessary in the interests of safety. The ONR ensures compliance with site licence conditions through a programme of site inspections, and the licence conditions are supported by a framework of Safety Assessment Principles (SAPs), Technical Inspection Guides (TIGs) and Technical Assessment Guides (TAGs).
The Construction Design and Management Regulations 2015 (CDM 2015)[22]	Cover the management of health, safety and welfare when carrying out construction projects. CDM 2015 replaced the Construction (Design and Management) Regulations 2007 (CDM 2007) from 6 April 2015, from this date, the Approved Code of Practice which provided supporting guidance on CDM 2007 was

[20] Office for Nuclear Regulation, SEPA (2019) *Memorandum of Understanding between The Office of Nuclear Regulations and The Scottish Environment Protection Agency (SEPA) on Matters of Mutual Interest in Scotland*. (online). Available at: https://www.sepa.org.uk/media/399220/onr_sepa_mou_on_matters_of_common_interest_in_scotland.pdf (Accessed November 2023).
[21] UK Government (1965). *Nuclear Installations Act 1965*. (Online) Available at: https://www.legislation.gov.uk/ukpga/1965/57 (Accessed November 2023).
[22] UK Government (2015). *The Construction Design and Management Regulations 2015* (online). Available at: http://www.legislation.gov.uk/uksi/2015/51/contents/made (Accessed November 2023).

Legislation	Legislation Issue
	withdrawn. CDM 2015 aims to improve health and safety in the industry by helping to: • sensibly plan the work so the risks involved are managed from start to finish. • have the right people for the right job at the right time. • cooperate and coordinate your work with others. • have the right information about the risks and how they are being managed. • communicate this information effectively to those who need to know. • consult and engage with workers about the risks and how they are being managed.
The Control of Asbestos Regulations 2012[23]	The Regulations came into force on 6 April 2012, updating and replacing the previous 2006 law, and provide minimum standards for protecting employees from risks associated with exposure to asbestos. They contain new requirements for certain types of non-licensable work with asbestos on notification of work; designating areas where you are working on asbestos; medical surveillance and record keeping. In relation to building demolition or maintenance work at premises, or on plant or equipment that might contain asbestos, it is necessary for those carrying out the work to identify where asbestos is present, its type and condition, and then to assess the risks, and manage and control these risks. During the Proposed Works there is the potential for localised Asbestos Containing Materials (ACM) to be encountered in the ground. Asbestos can also be found as loose fibres in made ground e.g., due to historical incorporation of demolition material into made ground. Compliance with CAR 2012 during construction is an embedded measure considered in the assessment and detailed in **Section 12.6**.
The Health and Safety at Work etc.Act 1974[24]	The Health and Safety at Work etc Act 1974 is the primary piece of legislation covering occupational health and safety in Great Britain. It sets out the general duties which: • employers have towards employees and members of the public. • employees have to themselves and to each other. • certain self-employed have towards themselves and others.

Policy

12.2.2 A summary of the relevant policies is given in **Table 12.2**.

[23] UK Government (2012). *The Control of Asbestos Regulations 2012* (online). Available at: http://www.legislation.gov.uk/uksi/2012/632/contents/made (Accessed November 2023).
[24] UK Government (1974). *Health and Safety at Work etc. Act 1974* (online). Available at: http://www.legislation.gov.uk/ukpga/1974/37 (Accessed November 2023).

Table 12.2 Policy relevant to soils, geology and hydrogeology

Policy Reference	Policy Relevance
National Policy	
fourth National Planning Framework (NPF4)[25]	NPF4 presents the current planning policy for Scotland, and replaced NPF3[26] in February 2023. NPF4 details the Scottish Government's long-term plan for Scotland up to 2045. NPF4 sets out six overarching spatial principles for future places, including conserving and recycling assets, including by minimising waste, and compact urban growth, meaning limiting urban expansion and optimising the use of land to provide services and resources including carbon storage, flood risk management, blue and green infrastructure and biodiversity. NPF4 is intended to guide the preparation of Regional Spatial Strategies, and in this regional context, Hunterston is identified within the Ayrshire region as a strategic asset with deep water access, where there are plans for new economic development and employment uses, and where development will need to take account of future vulnerability to climate change.
Local Policy	
The North Ayrshire Local Development Plan (2019)[27]	Policy 16 - Protection of our Designated Sites: The protection of international, national and local designated sites and marine protected areas. Development adversely affecting priority habitats or species set out in the North Ayrshire Local Biodiversity Action Plan will not be permitted unless it can be demonstrated the impacts are clearly outweighed by social or economic benefits of local importance. Policy 22 - Water Environment Quality: States that the Council will "*support development that helps achieve the objectives of the Water Framework Directive and the River Basin Management Plan for Scotland. Generally, development which would lead to the deterioration of the water environment will be resisted unless it would deliver significant social, environmental or economic benefits".* Policy 35 - Hazardous Installations and Substances: Radioactive storage and management at Hunterston: Development for the storage and/or management of low level and intermediate level radioactive waste will be supported within the nuclear licensed area at Hunterston where the development: • Relates to low level and intermediate radioactive waste arising from Hunterston A and B only; • Is consistent with the relevant national policy and strategy for managing radioactive waste in Scotland; • Includes adequate measures to mitigate adverse impacts on the environment, transport and public health.

[25] Local Government and Housing Directorate (2023) *National Planning Framework 4*. (Online) Available at: https://www.gov.scot/publications/national-planning-framework-4/pages/5/ (Accessed November 2023).
[26] The Scottish Government (2014) *Scotland's Third National Planning Framework (NPF3)*. (Online) Available at: https://www.gov.scot/publications/national-planning-framework-3/pages/8/ (Accessed November 2023).
[27] North Ayrshire Council (2019) *North Ayrshire Local Development Plan to 2039* (online). Available at: https://preview-northayrshire.cloud.contensis.com/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed November 2023).

Technical guidance

12.2.3 A summary of the technical guidance relevant to soils, geology and hydrogeology is provided in **Table 12.3**.

Table 12.3 Technical Guidance relevant to soils, geology and hydrogeology

Technical Guidance	Context
Management of radioactive waste from decommissioning of nuclear sites: Guidance on Requirements for Release from Radioactive Substances Regulation (RSR), 2018[28]	Describes what operators of nuclear sites need to do when planning and carrying out decommissioning and clean-up. The guidance requires operators to: • Produce a waste management plan (WMP) to manage disposals of radioactive waste arising from HNB Nuclear Site Licence Boundary ("the Site") (taking account of its radiological and non - radiological hazards). • Produce a site-wide environmental safety case (SWESC) describing the level of protection during the period of the RSR and afterwards, up to the point where all planned work involving radioactive substances is complete. • Ensure the Site condition meets regulators' standards for protection of people and the environment, now and into the future, in regard to radiological and non-radiological hazards associated with radioactive substances remaining on or adjacent to the Site. Waste which is not radioactive is out of scope of the RSR and falls under UK legislation transposing the Waste Framework Directive [Directive 2008/98/EC] and is referred to in the guidance as 'directive waste'[29]. However, the guidance states that operators should take an integrated approach to the WMP for the management of radioactive wastes and directive wastes, and that the plan should be in place before demolition commences. In regulating radioactive waste on or from nuclear sites, operators must keep exposures of member of the public to ionising radiation below statutory limits and consents and as low as reasonably achievable (ALARA). Operators should carry out a programme of site characterisation (including the geological and hydrogeological conditions) and monitoring to inform the WMP and SWESC, and this should consider likely future changes (e.g., changes in hydrogeology, geological change) where these that may be significant to the SWESC. The guidance provides opportunity to leave contamination in-situ as part of the final end state, if this is deemed the optimal management strategy. The potential for the Site to be

[28] SEPA, Environment Agency, Natural Resources Wales (2018) *Management of radioactive waste from decommissioning of nuclear sites: Guidance on Requirements for Release from Radioactive Substances Regulation. Version 1.0: July 2018*. (Online) Available at: https://www.sepa.org.uk/media/365893/2018-07-17-grr-publication-v1-0.pdf (Accessed November 2023).

[29] In Scotland, the principal legislation comprises the Environment Act 1995, the Landfill (Scotland) Regulations 2003 and the Waste Management Licensing (Scotland) Regulations 2011.

Technical Guidance	Context
	disturbed in the future e.g., for exploitation of resources present on the Site, must also be taken into consideration. The licensee has produced a WMP and SWESC for HNB to satisfy the principles and requirements in the guidance. These are periodically updated. Compliance with the guidance is an embedded measure in **Table 12.7**.
Regulatory Expectations for Successful Land Quality Management at Nuclear Licensed Sites[30]	Sets out an overall objective for land quality management (LQM) on nuclear licensed sites in Great Britain and provide an overview of the regulators' expectations of nuclear site licensees and operators with respect to achieving the LQM objective. These high-level expectations have been produced to promote relevant good practice; importantly, they do not specify regulatory requirements, and are not legally binding on operators, however they set out the ONR and SEPA's expectations of licensees for the management of land quality in regard to risks to human health, safety, and the environment.
Land contamination: risk management (LCRM) (2020)[31]	Provides a technical framework for applying a risk management process when dealing with land impacted by contamination and use of LCRM is an embedded measure in **Table 12.7**.. The LCRM guidance is not formally endorsed by SEPA, however, in practical terms it generally accords with the Contaminated Land Report (CLR) 11[32] guidance it replaces. The phased approach in LCRM for assessing the risks posed by land contamination is consistent with CLR11, which is referenced by SEPA in its guidance on risk assessment[33]. LCRM states that climate change should be considered in the context of land contamination risk assessment. This is relevant to the Indicative Dismantling Works Arae ("Works Area") given its coastal location and the duration of the Proposed Works. Embedded measures relating to climate change and land contamination risk assessment are included in **Table 12.7**.
BS10175: 2011 + A2: 2017 Investigation of Potentially Contaminated Sites – Code of Practice[34] **and**	Provide guidance and recommendations for the investigation of potentially contaminated sites noting that they do not include detailed guidance on the investigation and

[30] ONR/SEPA (2014). *Regulatory Expectations for Successful Land Quality Management at Nuclear Licensed Sites*. (online) Available at: https://www.onr.org.uk/documents/2014/land-quality-management.pdf (Accessed November 2023)
[31] Environment Agency (2020). *Land Contamination: risk management (online). Published 8 October 2020, last updated 20 July 2023*. (online) Available at: https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm (Accessed November 2023).
[32] Environment Agency (2004). *[Withdrawn] Model Procedures for the Management of Land Contamination Contaminated Land Report 11*. (online). Available at: https://www.gov.uk/government/publications/withdrawn-model-procedures-for-the-management-of-land-contamination-clr11 (Accessed November 2023).
[33] SEPA (2023). *Technical concepts*. (Online) Available at: https://www.sepa.org.uk/regulations/land/contaminated-land/technical-concepts/ (Accessed November 2023).
[34] British Standards Institution (2017). *Investigation of potentially contaminated sites (BS 10175:2011+A2:2017)*. BSI; London.

Technical Guidance	Context
BS59302:199+A22010: Code of practice for site investigations (2010) [35]	assessment of radioactively contaminated sites, for which relevant guidance is provided in the BS EN ISO 18589 series of documents.
BS EN ISO 18589 Measurement of radioactivity in the environment[36]	Part 1 of BS EN ISO 18589 specifies general requirements on how to carry out radionuclide tests, including sampling of soil, rock and construction materials. Further guidance on specific testing is given in Parts 2 to 7.
Environment Agency Guidance on the design and installation of groundwater quality monitoring points. Science Report SC020093[37]	Offers practical guidance on the design, construction and installation of groundwater quality monitoring wells to ensure that representative groundwater samples can be collected. Also covers monitoring well decommissioning.
SEPA (2009) Engineering in the Water Environment Good Practice Guide: Temporary Construction Methods[38]	Provides guidance on dewatering during construction works and advice on compliance with the Water Environment Water Environment (Controlled Activities) (Scotland) Regulations 201112.
Environment Agency (2007) Hydrogeological impact appraisal for dewatering abstractions Science Report – SC040020/SR1	Provides practical guidance on assessing the hydrogeological impact of groundwater abstractions in connection with dewatering operations. Includes a methodology for conceptual modelling of dewatering effects that may be applied to the Proposed Works to minimise environmental impacts associated with dewatering.
Scottish Government (2017) Planning Advice Note 33 (PAN 33): Development of contaminated land[39]	Provides advice on the implications of the contaminated land regime for the planning system in Scotland. PAN 33 does not apply to radioactive contamination of land. Accords with LCRM and BS10175 in setting out a phased approach to site characterisation in regard to land contamination, including desk study, intrusive surveys, and development of a conceptual site model, whereby sources, pathways and receptors are identified. Describes the "suitable for use" approach used in the contaminated land regime within the planning system.
SEPA (2013) Pollution Prevention and Control (PPC) Technical Guidance Note: Content and Scope of Site Reports[40]	Sets out SEPA's expectations for site report, baseline report and closure report section of PPC applications. This guidance does not cover radioactive substances.

[35] British Standards Institution (2010). *Code of practice for site investigations (BS59302:199+A22010).* BSI; London.
[36] British Standards Institution (2021). Measurement of radioactivity in the environment — Soil.
[37] Environment Agency (2006) *Guidance on the design and installation of groundwater quality monitoring points. Science Report SC020093*. (online) Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/290727/scho0106bkct-e-e.pdf (Accessed November 2023).
[38] SEPA (2009) Engineering in the Water Environment Good Practice Guide: Temporary Construction Methods. (online) Available at: https://www.sepa.org.uk/media/150997/wat_sg_29.pdf (Accessed November 2023).
[39] Scottish Government (2017) Planning Advice Note 33: Development of contaminated land (online). Available at: https://www.gov.scot/publications/pan-33-development-of-contaminated-land/ (Accessed November 2023).
[40] SEPA (2013) PPC Technical Guidance Note: Content and Scope of Site Reports. (online). Available at: https://www.sepa.org.uk/regulations/pollution-prevention-and-control/guidance/ (Accessed November 2023).

Technical Guidance	Context
	Several areas of HNB are regulated under PPC 2012, under Permit PPC/A/1008859, including the diesel generators, auxiliary boilers, burners and associated pumps and stores. The Applicant has no permit conditions requiring regular soil or groundwater monitoring during its permitted operations, however the Applicant has voluntarily implemented a Site Protection and Monitoring Programme (SPMP) for HNB. The use of an SPMP is good practice during permitted operations as it can allow operators to pick up, and respond to, accidental releases and small / cumulative leakages that may not be obvious during normal operations (see further details in table item directly below). At permit surrender, the operator must provide a report describing the condition of the Site affected by the surrender (the "closure report"), identifying any changes from the condition of the Site as described in the site report, and where applicable, the baseline report. The closure report must demonstrate that no significant pollution has been caused and the Site is in a 'satisfactory state'. There is no strict definition of satisfactory state, however the general principle of PPC is to prevent deterioration in site condition during the permit lifespan. Deterioration in the condition of the soil and groundwater during the lifetime of the Installation could therefore be considered to be unsatisfactory. Compliance with PPC 2012 and associated horizontal guidance is an embedded measure in **Table 12.7**.
SEPA (2016) IED-TG-42 Soil and Groundwater Monitoring Technical Guidance for PPC Part A Installations[41]	Sets out SEPA's expectations on soil and groundwater monitoring at PPC Part A Installations to assist operators and SEPA staff in determining and complying with soil and groundwater monitoring conditions. The Industrial Emissions Directive (IED) and PPC 2012 introduce requirements for the protection of soil and groundwater from relevant hazardous substances (RHS). Periodic monitoring of soil and groundwater for RHS, in tandem with regular maintenance and surveillance of pollution prevention measures, provides operators with a means to identify releases to ground not easily detectable during routine operations. HNB has implemented regular groundwater monitoring since 2008 and 2018, The latest available SPMP[42] report dates from 2019 and considers groundwater monitoring and chemical analysis results obtained between 2015 and 2018.

[41] SEPA (2016) *IED-TG-42 Soil and Groundwater Monitoring Technical Guidance for PPC Part A Installations* (Online) Available at: https://www.sepa.org.uk/regulations/pollution-prevention-and-control/guidance/ (Accessed November 2023).
[42] Golder Associates (UK) Ltd (2019) *Hunterston B Nuclear Power Station Groundwater Monitoring Review (Ref. 18112281.652/A.0, June 2019).* Golder Associates; London.

Technical Guidance	Context
	The PPC Permit does not cover radioactive substances, however the Applicant has applied the SPMP to monitor concentrations of radioactive substances in groundwater. Monitoring of radioactive substances in groundwater has been carried out at HNB between 2015 and 2018 and reported as a radiological addendum to the SPMP. This work has been completed to check compliance with the HNB Nuclear License (Licence No. Sc.13) Condition (SLC) 34.
Scottish Government (2006) Environmental Protection Act 1990 - Part IIA Contaminated Land: statutory guidance edition 2[43]	Sets out how local authorities should implement the EPA Part IIA contaminated land regime, including how to decide whether land is 'contaminated land' in the legal sense. Elaborates on the remediation provisions of EPA Part IIA, such as the goals of remediation, and how regulators should ensure that remediation requirements are reasonable. Notes that under section 78YC of EPA Part IIA, the normal EPA Part IIA regime does not apply with respect to harm, or pollution of the water environment, which is attributable to any radioactivity possessed by any substance. Notes that The Contaminated Land (Scotland) Regulations 2000 made provision in relation to the circumstances in which contaminated land requires to be designated as a special site, and provides for a remediation regime, regulated by SEPA. Special sites include (but are not limited to) nuclear sites, military sites, and sites regulated under PPC 2012.
BS6031: 2009 Code of practice for earthworks[44]	Provides recommendations and guidance for unreinforced earthworks forming part of general civil engineering construction, except for dams. This standard also gives recommendations and guidance for temporary excavations such as trenches and pits.
Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites[45]	Outlines measures to protect soil resources during construction works involving soil excavation, storage, translocation/reinstatement, use in landscaping schemes etc.
Guidance for Pollution Prevention (GPP) Notes and former (now discontinued) Pollution Prevention Guidance (PPG) Notes[46]	The PPG Notes are now withdrawn however they are still available online and are referred to for good practice guidance. • PPG 1: Understanding your environmental responsibilities – good environmental practices (July 2013); • GPP 2: Above ground oil storage tanks (January 2018);

[43] Natural Scotland, Scottish Executive (2006) *Environmental Protection Act 1990 - Part IIA Contaminated Land: statutory guidance edition 2* (online) Available at: https://www.gov.scot/publications/environmental-protection-act-1990-part-iia-contaminated-land-statutory-guidance/ (Accessed November 2023).
[44] British Standards Institution (2009). *Code of Practice for Earthworks (BS 6031:2009)*. BSI; London.
[45] Defra (2009). *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*. (online) Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/716510/pb13298-code-of-practice-090910.pdf (Accessed November 2023).
[46] Netregs (2021). *Guidance for Pollution Prevention (GPPS)- Full list* (online). Available at: https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/ (Accessed November 2023).

Technical Guidance	Context
	• PPG 3: Use and design of oil separators in surface water drainage systems (April 2006); • PPG 6: Working at construction and demolition sites (2012); and • GPP 8: Safe storage and disposal of used oils (July 2017).
SEPA (2022) Water Use Guide, Construction Regulatory Guide[47]	Provides a high-level summary of SEPA's guidance and regulatory controls that may apply to construction projects affecting the water environment, including through construction run-off, permanent surface water drainage systems, and other discharges and pollution incidents.
Guidance for the Safe Development of Housing on Land Affected by Contamination (2008) (R&D 66)[48]	R&D 66 provides guidance on qualitative risk assessment by providing a phased process and definitions for qualitative parameters for assessment of contaminated land. It was designed to accord with the Model Procedures in Contaminated Land Report 11 (superseded by LCRM) and describes the processes and activities involved in hazard identification and assessment, risk estimation and evaluation and remediation (design, implementation and verification).
Framework for Assessing the Sustainability of Soil and Groundwater Remediation (2010) [49]	Provides a framework for assessing the sustainability of remediation and informing the decision-making process where remediation measures are required.
CL:AIRE Definition of Waste Code of Practice (DoWCoP) (2011)[50]	The DoWCoP sets out good practice for developers to use when assessing on a site-specific basis whether excavated materials are classified as waste or not; and, determining on a site-specific basis when treated excavated waste can cease to be waste for a particular use. The DoWCoP and associated CL:AIRE materials management plan (MMP) are not applicable in Scotland, however their principles and good practice can be used when developing and complying with a Site WMP for sites in Scotland.
SEPA Is it waste? Understanding the definition of waste [51]	Provides guidance on when a particular substance or material is likely to fall within the scope of the definition of waste given in the Waste Framework Directive (75/442 EEC as amended by 91/156 EEC) and adopted in the UK. This guidance is

[47] SEPA (2022) *Water Use Guidance: Construction Regulatory Guide, Version v1.2, Released October 2022*. (online) Available at: https://www.sepa.org.uk/media/594503/construction-regulatory-guide-ver-12-oct-2022-final.pdf (Accessed November 2023).
[48] NHBC and Environment Agency (2008). *Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66 Volume 1* (online). Available at: https://www.nhbc.co.uk/binaries/content/assets/nhbc/products-and-services/tech-advice-and-guidance/guidance-for-the-safe-development-of-housing-on-land-affected-by-contamination.pdf (Accessed 04 August 2023).
[49] Smith, J. (2010). *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation. CL:AIRE*. (online) Available at: https://www.claire.co.uk/projects-and-initiatives/surf-uk/20-framework-and-guidance (Accessed November 2023).
[50] CL:AIRE (2011). *Definition of Waste: Code of Practice* (online). Available at: https://www.claire.co.uk/projects-and-initiatives/dow-cop (Accessed November 2023).
[51] SEPA (2006) *Guidance for SEPA staff: Is it waste, understanding the definition of waste*. (online) Available at: https://www.sepa.org.uk/media/154077/is_it_waste.pdf. (Accessed November 2023).

Technical Guidance	Context
	relevant to excavated soil/materials during construction projects. Compliance with SEPA's waste management guidance is an embedded measure in **Table 12.7**.
Land remediation and waste management guidelines[52]	Provides guidance on how the waste regulatory regime will be applied by SEPA to site remediation and redevelopment activities and describes the considerations that SEPA will take into account when applying regulatory controls on waste. Compliance with SEPA's waste management guidance is an embedded measure in **Table 12.7**.
CAR-SOIL: Control of Asbestos Regulations 2012, Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials [53]	Provides interpretation and guidance to all involved in the management of asbestos in both soils and construction and demolition arisings in accordance with the Control of Asbestos Regulations 2012[54]. Compliance with the Control of Asbestos Regulations 2012 is an embedded measure in **Table 12.7**.
Site Preparation and Resistance to Contaminants and Moisture (2010) [55]	Provides guidance on the requirement for reasonable precautions to be taken to avoid danger to health and safety caused by contaminants on or in the ground covered, or to be covered by the building and any land associated with the building.
CIRIA Report C692: Environmental Good Practice on Site (2010) [56]	Provides practical advice about managing construction on site to minimise environmental impacts.
SEPA Position Statement WAT-PS-10-01 Assigning Groundwater Assessment Criteria for Pollutant Inputs (August 2014) [57]	Provides guidance on the how the prevent and limit requirements of the Water Framework Directive should be applied in Scotland to assess potentially polluting high risk point source inputs of pollutants into groundwater where a quantitative assessment is being carried out. Compliance with the approach to groundwater assessment set out in WAT-PS-10-01 is an embedded measure in **Table 12.7**.

[52] SEPA (undated). *Land remediation and waste management guidelines* (online) Available at: https://www.sepa.org.uk/media/154103/land_remediation_and_waste_management_guidelines.pdf. (Accessed November 2023).
[53] CL:AIRE (2016). *Control of Asbestos Regulations 2012 – Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry guidance*. London: CL:AIRE. ISBN 978-1-905046-30-0.
[54] UK Government (2012). *The Control of Asbestos Regulations 2012*. (online) Available at: https://www.legislation.gov.uk/uksi/2012/632/contents (Accessed November 2023).
[55] HM Government (2013). *The Buildings Regulations 2010. Site preparation and resistance to contaminants and moisture*. (online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/431943/BR_PDF_AD_C_2013.pdf (Accessed November 2023).
[56] Audus, I., Charles, P. and Evans, S. (2010). *C692 Environmental Good Practice on Site (3rd ed.).* London: CIRIA.
[57] Scottish Environment Protection Agency (2014). *Position Statement (WAT-PS-10-01) Assigning Groundwater Assessment Criteria for Pollutant Inputs* (online). Available at: https://www.sepa.org.uk/media/152662/wat_ps_10.pdf (Accessed November 2023).

Technical Guidance	Context
Institute of Air Quality Management (IAQM) (2023) Guidance on the assessment of dust from demolition and construction. V2.1[58]	Dust is relevant to contaminated land due to the potential for contaminant migration as dust (e.g., dust from construction activities or windblown dust from contaminated areas / stockpiles), and dust inhalation is a potential pathway linking a contamination source and human receptors. The IAQM guidance sets out how to undertake a construction impact assessment (including demolition and earthworks). Emphasis is on identifying mitigation measures appropriate to the risk.
Natural Scotland, SEPA (2010) Good practice for decommissioning redundant boreholes and wells[59]	A number of existing groundwater monitoring wells are present on the Site, which at some point during the Proposed Works may become redundant or no longer accessible for future monitoring. The Natural Scotland, SEPA guidance sets out a number of good practice options for decommissioning redundant boreholes or wells in order to protect groundwater from unintended releases in the future (as unmaintained wells can become a pathway to groundwater for contaminants released near surface).
Society of Brownfield Risk Assessment (2022) Guidance on Assessing Risk to Controlled Waters from UK Land Contamination Under Conditions of Future Climate Change[60]	Provides practical advice on how to include for the potential effects of climate change in the assessed stages of controlled waters risk assessment for land contamination.

12.3 Data gathering methodology

Study Area

12.3.1 Typically, because soils and geological features are geographically discrete and not substantially influenced by changes to their surroundings, the effects from development and ground works on soil or geological features tend to occur at the point where a construction activity takes place e.g., soil damage due to soil handling, breaking up of rock to facilitate its excavation, compaction of soil caused by vehicle/plant movements over the soil, permanent effects on soil such as excavation and offsite disposal or sealing of soil (or a geological feature) by covering it in hard surfacing such as concrete or a building. However, there may be instances where specific activities during the Proposed Works (e.g., dewatering of excavations) could lead to effects on soils or geological features away from the location of the Proposed Works.

12.3.2 For the assessment of effects on soils and geology (geodiversity), the Study Area has been defined as the Works Area plus a Zone of Influence (ZoI) of 100 m beyond the Works Area. Based on professional judgement, this is sufficient to allow sensitive soils

[58] Institute of Air Quality Management (2023). *Guidance on the assessment of dust from demolition and construction. V2.1.* (online) Available at: https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-dust-2023-BG-v6-amendments.pdf (Accessed November 2023).
[59] Natural Scotland, SEPA (2010) *Good practice for decommissioning redundant boreholes and wells*. (online) Available at: https://www.sepa.org.uk/media/34618/decommissioning-redundant-boreholes-and-wells.pdf (Accessed 17 August 2023).
[60] Society of Brownfield Risk Assessment (2022) *Guidance on Assessing Risk to Controlled Waters from UK Land Contamination Under Conditions of Future Climate Change. Version 1.0. August 2022*.

and geological receptors adjacent to or close to the Works Area, which have the potential to be significantly affected by the Proposed Works, to be identified.

12.3.3 For land contamination receptors there is a ZoI beyond the Works Area, which is based upon the potential for contaminants to migrate off-site or to migrate onto the Site from off-site sources. Baseline information for land contamination acquired through various surveys, is summarised below (see **Table 12.4**) and the likely maximum spatial extent (considering contaminant degradation, dilution and dispersion in the environment) at which significant land contamination effects have the potential to be realised through potentially active contaminant linkages is 250 m, which has therefore been used as the ZoI. The potential for on/off site migration depends on factors including the local topography, the geology, hydrogeology, hydrology, and presence of sensitive receptors such as nationally or internationally important ecological conservation sites, the nature and scale of the identified sources of land contamination and the Site and surrounding land use.

12.3.4 The use of a 250 m ZoI is a reduction from 1 km in the Scoping Report, based on further review of soil and groundwater data, ground conditions and conclusions in previous environmental reports produced for the Site. These are detailed in **Table 12.4.**

Desk study

12.3.5 The EIA has been undertaken with reference to **Chapter 2: The Decommissioning process**, supported by a number of data sources, referenced throughout the sections below and summarised in **Table 12.4**.

Table 12.4 Data Sources used to inform the ES assessment

Organisation	Source	Data
British Geological Survey (BGS)	GeoIndex	1:50,000 scale geological mapping, borehole records, providing information on the solid and superficial geology within the Works Area.
BGS	BGS, Natural Environment Research Council (NERC) (2015) User Guide: Aquifer Productivity (Scotland) GIS datasets, Version 2. Revised Report. Open Report OR/15/003.	Information on aquifer classification in Scotland, which is used in contaminated land risk assessment to determine the sensitivity of groundwater receptors.
The licensee	Soil and groundwater characterisation data – various reports.	Information on the land condition and historical developments of the Site and the surrounding area. Recent reports relating to the Site are referenced throughout the baseline description in **Section 12.5**. The portion of the Works Area south of the Site (includes section of Power Station Road, a portion of a compound east of Power Station Road at Hawking Craig, and the sodium hypochlorite plant west of Power Station Road) is owned by the NDA and operated by EDF, this is discussed in **Section 12.5**. These areas have not been subject to previous ground investigation by EDF.

Organisation	Source	Data
		The licensee holds the following information which informs the assessment of land condition at the Site: • historical layout plans, building histories and aerial photographs; • exploratory hole logs and previous investigation reports; • chemical and radiological soil and groundwater data (soil data from various ground investigations undertaken between 1997 and 2019, and groundwater and surface water data obtained between 1997 and the present day); • existing services plans; and • asbestos register • environment incident registers.
WSP	Golder Associates (UK) Ltd (2021) Land Quality – Tier 1 Preliminary Risk Assessment: Hunterston B Nuclear power Station. (Ref. 21468567.603/A.0, October 2021)[61].	The report details the Site's environmental setting, includes a conceptual site model (CSM) for the Site and a preliminary qualitative risk assessment based on existing land usage at HNB. The report makes reference to previous groundwater monitoring reports and ground investigations for the Site and uses the data from these reports to inform the CSM and risk assessment. EDF is in the process of having an updated Land Quality – Tier 1 Preliminary Risk Assessment produced for the Site, however this is not yet available and notwithstanding does not consider potential risks introduced by the decommissioning proposals.
WSP	Golder (member of WSP) (2022) Groundwater Monitoring at Hunterston B Power Station (Monitoring Round: 52 – September 2022) (Project No. 20448942.642/B.0)	Monitoring round with testing of water samples (groundwater and surface water) for hydrocarbon and tritium analysis.
Landmark	Envirocheck (Order Number 307895898_1_1, 1 March 2023)	Envirocheck held by EDF for the wider EDF landholding around the Site. Includes historical maps used to check for potentially contaminative historical land uses within the Works Area and wider Study Area.
SEPA	SEPA water classification hub and Scotland River Basin Management (RBMP)[62]	Regional groundwater and surface water quality, based on SEPA's most recent monitoring results.

[61] Golder (2021) *Land Quality – Tier 1 Preliminary Risk Assessment: Hunterston B Nuclear Power Station*. Golder Associates; London.
[62] SEPA (2015). *Water classification hub* (online). Available at: https://www.sepa.org.uk/data-visualisation/water-classification-hub/ and Scottish Environment Protection Agency (n.d.) *River Basin Management Planning* (online). Available at: https://www.sepa.org.uk/environment/water/river-basin-management-planning/ (Accessed November 2023).

Organisation	Source	Data
Ordnance Survey	Maps (online)[63]	OS mapping for the Works Area and surrounding area
NatureScot	SiteLink[64]	Information on geodiversity and ecological designations within the Study Area
Soil Survey of Scotland Staff	Soil Survey of Scotland Staff (1970-1987). Soil maps of Scotland (partial coverage) at a scale of 1:25,000[65]	Soil mapping for the Works Area and surrounding area, provides information on the soil types present. In some instances soil maps also show built-up land, where natural soils may have been removed or covered.

Survey work

12.3.6 Monitoring of soil conditions has been undertaken as required by the licensee in specific areas of the Site (for targeted geotechnical and environmental investigations). Monitoring of groundwater conditions within the Site is ongoing by the licensee including for the purposes of maintaining the SPMP. The 2021 Tier 1 – Preliminary Risk Assessment summarises previous ground investigations, and the updated Tier 1 – Preliminary Risk Assessment (due Q4, 2023) will include findings from ground investigations and environmental monitoring completed since the 2021 report. This is referenced in the baseline description in **Section 12.5.**

Data limitations

12.3.7 The licensee is in the process of having the land contamination assessment for the Site updated. The assessment is therefore based upon the most recent available reports, which include a Tier 1 – preliminary risk assessment completed in 2021 and groundwater monitoring completed in 2022. The updated Tier 1 – preliminary risk assessment will provide comprehensive land contamination risk assessment for the Site in its current use. This will utilise data obtained from regular groundwater and surface water monitoring carried out under the remit of the SPMP or other purposes.

12.3.8 The area of land by the Jetty and Power Station Road are not included in the 2021 Tier 1 – preliminary risk assessment. There is limited potential for land contamination at the road as this is a public area outside of the nuclear licensed sites, with no recorded pollution incidents, however some potential for land contamination to be present has been identified at the land by the jetty which includes a sodium hypochlorite plant and a compound where a building has been demolished. The embedded measures in **Table 12.7** include a commitment to expand the land contamination risk assessment to include all land within the Works Area.

[63] Ordnance Survey (2023). *Maps* (online) Available at: https://shop.ordnancesurvey.co.uk/maps/?msclkid=393fe70ec4e616bf838b858233bf0514&utm_source=bing&utm_medium=cpc&utm_campaign=aip_Ordnance-Survey_Brand-Plus_Conversion_UK_Brand_PPC_Text&utm_term=ordnance%20survey%20maps&utm_content=Maps (Accessed November 2023).
[64] NatureScot (2023) *SiteLink* (online). Available at: https://sitelink.nature.scot/map (Accessed November 2023).
[65] *The Soil Map of Scotland (partial cover)* (online). Available at https://soils.environment.gov.scot/maps/soil-maps/soil-map-of-scotland-partial-cover/ (Accessed November 2023).

12.4 Consultation

Pre-application Opinion

12.4.1 A Pre-application Opinion was adopted by the ONR on 4 October 2022. A summary of the responses relevant to soils, geology and hydrogeology received in the Pre-application Opinion is presented in **Table 12.5**.

12.4.2 During its assessment, the ONR consulted with statutory consultation bodies (as defined in Regulation 2 of the EIADR[66]) and additional consultation bodies whom the ONR considered appropriate to consult. The consultees' responses were incorporated into the ONR Pre-application Opinion where the ONR deemed this to be appropriate. Full responses from the consultees were also provided to the site licensee, and where these responses are relevant to soils, geology and hydrogeology, they are summarised in **Table 12.6**.

Table 12.5 Summary of Pre-application Opinion Responses

Paragraph Ref.	Consideration	How addressed in the ES
87	**It is unclear if radiological contamination is considered in the scope of this chapter. ONR notes that contaminated radiological runoff is considered in Chapter 9 Coastal Management and Marine Quality. The ES should clearly demonstrate how the potential impacts of radioactive contamination of groundwater, surface water and land have been assessed and where this is described within the report. A rationale should also be provided for the study area for receptors associated with contaminated land.**	Effects associated with radioactive discharges and radioactive waste management are scoped out on the grounds that they are covered by the rigorous requirements of the nuclear licencing regime for the decommissioning of nuclear sites as defined in the Management of radioactive waste from decommissioning of nuclear sites: Guidance on Requirements for Release from Radioactive Substances Regulation Version 1.0: July 2018. **Chapter 20: Radioactive Waste and Discharges** provides further discussion on the reasoning for the scoping out of radiological effects and discharges from radiological sources during defueling and Active Area Deplanting. However, the interaction of the Proposed Works with radiological contamination present in the soil or groundwater beneath the Site, or as residual contamination in below ground structures (e.g. sumps or drains), because of the historical power station operations, and potential effects on land contamination receptors are scoped in and assessed as part of this chapter of the ES in **Section 12.11**.

[66] UK Government (1999). *The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations, 1999, as amended*. (Online) Available at: https://www.legislation.gov.uk/uksi/1999/2892/contents/made (Accessed November 2023).

Paragraph Ref.	Consideration	How addressed in the ES
88	**It was identified via the consultation responses that there was a potential for cross contamination from other radioactive sources outside the current permitted site boundary, including a closed former landfill and in respect to the 39" outfall and its two associated lagoons which were not fully considered in the report. In addition, the ES should provide further detail on the interactions with Hunterston A regarding receptors and co-polluters and the interactions with potential sources of radioactive contamination. The assessment should also consider the risks posed by existing contamination and how the contamination may change over time.**	Interactions with radiological sources that will be removed during defueling and Active Area Deplanting are scoped out, as above, as these will be assessed under the nuclear licensing regime. The embedded measures in **Table 12.7** include measures to monitor for and address potential for off-site sources of contamination to migrate onto the Site.
89	**A consultee recommended that the 2020 geotechnical investigation report and previous ground investigations identified in the 2020 report referred to in the Land Quality Assessment are taken into account as part of the EIA. ONR agrees with this suggestion.**	Available and accessible sources of information have been considered and used in preparation of this chapter, see baseline information in **Section 12.5** and this includes the 2020 geotechnical investigation report and previous ground investigations identified in the 2020 assessment.
90	**The soils, geology and hydrology chapter states that there are no viable hydrological pathways to the surface water environment, but it is unclear whether the potential for hydraulic connection via shallow groundwater has also been taken into consideration as the scoping report does not review the potential for hydraulic connection between the superficial and bedrock aquifers. In addition to this, consideration of groundwater in the superficial deposits is limited to the east of the site. The ES should provide a justification as to why this is not considered for the wider site.**	Interactions with radiological sources are scoped out, as above, as these will be assessed under the nuclear licensing regime. Potential for pre-existing / legacy radiological and non-radiological contamination in the ground to affect water environment receptors is considered in the assessment in **Section 12.11.** The embedded measures in **Table 12.7** include measures to monitor for and address potential for off-site sources of contamination to migrate onto the Site and for on-site sources to migrate offsite. The 2021 Tier 1 Preliminary Risk Assessment and its update (due Q4, 2023) consider the potential for contaminant migration from the superficial aquifer to the bedrock aquifer. The 2021 report informs the baseline in **Section 12.5**. Groundwater (superficial and bedrock aquifers) and surface water are scoped in within this ES as receptors, as defined in **paragraph 12.3.3**.

Paragraph Ref.	Consideration	How addressed in the ES
91	**It is recommended that EDFE clarifies the claim that there is no private water supply within 1km of the site. A consultee identified a potential reservoir within 1km to the south-east of the site.**	NAC were contacted to obtain Private Water Supply (PWS) information (as reported in **Chapter 11: Surface Water and Flood Risk**). They confirmed in March 2022 that they held no records of PWSs within the immediate vicinity of the Works Area and that the nearest PWSs were in the locality of Meadowsfoot, in West Kilbride. It should be noted that Chapter 11 reports at paragraph 11.3.22 of the Scoping Report that 'no PWS with potential to be affected by the Proposed Works were identified'. **Figure 12.1** shows a covered reservoir to the south of the Site. This is a water tank which once supplied drinking water to properties on Hunterston Estate. Anecdotal sources[67] indicate that connections to properties for potable water supply were stopped due to the presence of lead pipework. The tank is believed to be fed from small burns on Goldenberry Hill. The water may still be used to supply cattle troughs nearby. Due to its location, which is up hydraulic gradient of the Site, and as it is no longer used for potable water supply, this tank is not considered further in the ES as a potential contaminated land receptor.
92	**EDFE should review the existing groundwater dataset for the site to identify if there are any gaps or areas of uncertainty as this will help to determine if additional investigations or monitoring is required to inform the EIA Consideration needs to be given in the EIA to the potential effects of climate change on the local hydrogeology regimes such as changes to recharge and sea level rises that may influence the groundwater regime.**	The embedded measures in **Table 12.7** include a commitment to comply with the LCRM guidance, which states that climate change should be considered in land contamination risk assessment. LCRM does not detail how this should be done, therefore there is a further commitment to give due regard in land contamination risk assessment to available guidance relating to climate change effects. This is an evolving field, however the commitment makes reference to the published SoBRA guidance on assessing risk to the water environment from UK land contamination under conditions of future climate change (detailed in **Table 12.3**).

67 Geograph (2020). *Hunterston Estate Water Tank - Broomcraigs Plantation*. (Online). Available at: https://www.geograph.org.uk/photo/6641462 (Accessed November 2023).

Paragraph Ref.	Consideration	How addressed in the ES
		A Land Quality Tier 1 Preliminary Risk Assessment was completed for HNB in 2021[61]. This is being updated and is expected to be completed in Q4 2023. Regular reviews of land condition are an embedded measure and can be achieved through updating Tier 1 (or phase 1) land quality desk studies. These reports can utilise all relevant available existing data on ground conditions (including soil and groundwater chemical analysis data) to inform an update of the environmental risk assessment and conceptual site model. Due to the Proposed Works, future assessment will need to take into account the current site condition and planned changes to the Site. Tier 1 assessments will inform the design of further investigations to confirm land quality during the Proposed Works, which may include ground investigations, surveys and more detailed risk assessments.
93	**The scoping report states in the Deplanting and Deconstruction section that below ground structures will be left in situ and voids will be backfilled with demolition material. ONR notes that the soils, geology and hydrology section considers the impacts of removing foundation slabs and drains, but not the impacts of leaving them in situ. Consideration of the re-use of site material as in-fill will require appropriate assessment and management to ensure the materials are suitable for the proposed usage and will not pose any unacceptable risks to the water environment. ONR notes that this will also require a permit and will need to be included in the Waste Management Plan and the Site-Wide Environmental Safety Case. This should be clarified and appropriately assessed in the ES.**	The embedded measures in **Table 12.7** include investigating the contents of below ground structures that are being left in situ, to ensure that these do not pose an unacceptable future land contamination risk. Consideration of the risks to soil, groundwater and surface water when generating suitability for use criteria for the potential re-use of waste materials on the Site, particularly for any void filling below the water table is an embedded measure in **Table 12.7**.
94	**In addition to this, it is recommended that the following information is included as part of the overall assessment of environmental impacts:** • **Before any works starts, the boundary of any area of SSSI**	Effects of the Proposed Works on the Southannan Sands SSSI are considered in **Chapter 9: Marine Biodiversity** and the SSSI is considered as a potential land contamination receptor in the assessment in **Section 9.10**.

Paragraph Ref.	Consideration	How addressed in the ES
	which might be affected, be clearly marked and contractors advised not to enter it or use it for storage. • **If crushed stone and recycled aggregates are to be used to construct hard-standing areas, they should be sourced from materials free from contaminants, so that there is no possibility of run-off onto the intertidal areas of the SSSI.** • **Any materials from the decommissioning of structures should be sensitively re-used on land and or disposed of appropriately and not released onto the intertidal areas of the SSSI.**	Consideration of the risks to soil, groundwater and surface water when generating suitability for use criteria for the potential re-use of waste materials on site will be undertaken at the relevant time and it is therefore recorded as an embedded measure in **Table 12.7**. Potential effects from the re-use of site derived material are included in the assessment in **Section 12.11**.

Technical Engagement and non-statutory consultation

12.4.3 Consultation responses relating to soils, geology and hydrogeology were provided by statutory consultees, as summarised in **Table 12.6**, which also describes how the comments have been addressed in this ES.

Table 12.6 Consultation responses

Consultee	Consideration	How addressed in the ES
SEPA	It is noted that radioactive waste and radioactively contaminated land have been scoped out of EIADR[66] as these will be covered by the EASR radioactive substances permit; nevertheless, the document provides further indicative information on when radioactive waste is expected to be produced and where it is expected to go.	Effects associated with radioactive discharges and radioactive waste management associated with defueling and Active Area Deplanting are scoped out on the grounds that they are covered by the rigorous requirements of the nuclear licencing regime for the decommissioning of nuclear sites as defined in the Management of radioactive waste from decommissioning of nuclear sites: Guidance on Requirements for Release from Radioactive Substances Regulation Version 1.0: July 2018. **Chapter 20: Radioactive Waste and Discharges** provides further discussion on the reasoning for the scoping out of radiological effects and discharges. However, effects of the Proposed Works in relation to radiological contamination present in the soil or groundwater beneath the Site, or as residual contamination in below ground structures, because of the historical power station operations, and potential effects on land contamination receptors operations are scoped in and assessed within this chapter of

Consultee	Consideration	How addressed in the ES
		the ES. Effects associated with the reuse of site-derived materials generated by the Proposed Works as fill materials for sub-surface voids are considered in the assessment, along with effects from residual contamination in sub-surface structures. The embedded measures In **Table 12.7** include compliance with, and the further development of, The Hunterston B Waste Management Plan and Site Wide Environmental Safety Case[68].
SEPA	It is important that the assessment process considers soil and groundwater as being receptors in their own right, as well as pathways to other receptors such as surface waters or the coastal environment, noting that there may be preferential pathways associated with subsurface structures and services. Thus, it is important that the Soils, Geology & Hydrogeology assessment considers the potential interdependencies with related topics.	The baseline information in **Section 12.5** details the ground conditions at the Works Area including soils, geology, hydrogeology and the land contamination status of the Works Area and its surrounding area within the zone of influence identified in **Section 12.3**. This information has been used to identify receptors considered in the assessment, as detailed in **Section 12.9**. The main document informing the baseline is the 2021 Tier 1 Preliminary Risk Assessment as this considers previous ground investigation data, other environmental data, and site use, to identify relevant sources, receptors and pathways to include in the land contamination risk assessment. The ongoing update to the Tier 1 Preliminary Risk Assessment (expected Q4, 2023) will include review of data obtained by the licensee since the 2021 report was produced to provide an updated assessment. Effects of the Proposed Works on the Southannan Sands SSSI are considered in **Chapter 9: Marine Biodiversity** and the SSSI is considered as a potential land contamination receptor in the assessment in **Section 9.10**. Offsite surface water and property and are also considered as potential land contamination receptors in this chapter.
SEPA	The groundwater assessment should include consideration of the potential influence of climate change on the hydrogeological regime, including potential changes in infiltration and recharge rates as well as the potential influence of sea level rise.	Consideration of changes to the existing hydrogeological regime due to climate change effects including extreme rainfall events, drought and sea level rise and potential for resulting changes to land contamination risks will be considered as part of future management of land condition risk assessments on the site and is therefore recorded as an embedded measure in **Table 12.7**.
SEPA	The potential risks to soil and groundwater must be considered when	This is included an embedded measure in **Table 12.7**.

[68] EDF (2021) *Hunterston B Power Station Report: Hunterston B Waste Management Plan and Site Wide Environmental Safety Case*. EDF; London.

Consultee	Consideration	How addressed in the ES
	generating suitability for use criteria for the potential re-use of waste materials on site, particularly for any void filling below the water table.	
Fairlie Community Council (FCC)	In regard to the proposed "approach to filling voids created by deplanting and deconstruction activity is being developed"… "having regard to ground water management considerations", FCC is wary of using site "won" material unless it is not radioactive or hazardous in any way. The main concern is that radioactive material is not used in a way that spreads it across the sites, or its treatment increases discharges to the air or waterway.	The onsite re-use of materials derived from decommissioning and demolition activity and potentially affected by radioactive and / or non-radioactive contamination will be in accordance with SEPA waste management guidance to ensure that these are suitable for use. This is an embedded measure in **Table 12.7**.
NatureScot	Southannan Sands SSSI extends for over 4km along the coast, and is approximately 170m to the north of the proposed development. NatureScot notes, that important ecological receptors, including the SSSI have been identified as being at potential risk from changes in coastal hydrodynamics as a result of any removal of existing marine infrastructure associated with the power station, and advises that an assessment including the impacts of water pollution, as well as hydrodynamic change are included in the EIA for Southannan Sands SSSI. NatureScot advises that all direct and indirect impacts are assessed and addressed through appropriate mitigation and management, to be included in a Construction Environmental management Plan (CEMP).	Risks to the Southannan Sands SSSI and its associated Priority Marine Features (PMF) are assessed in **Chapter 9: Marine Biodiversity**. The SSSI is considered as a potential land contamination receptor in the assessment in this chapter in **Section 9.10**. The embedded measures in **Table 12.7** include a commitment to comply with the LCRM guidance, which states that climate change should be considered in land contamination risk. LCRM does not detail how this should be done, therefore there is a further commitment to give due regard in land contamination risk assessment to available guidance relating to climate change effects. This is an evolving field, however the commitment makes reference to the published SoBRA guidance on assessing risk to controlled waters from UK land contamination under conditions of future climate change (detailed in **Table 12.3**).
NatureScot	NatureScot notes that Kames Bay SSSI and Ballochmartin Bay SSSI are located 3 km to the north west and 4.5 km to the north of the proposal area, respectively. The notified features of these sites are the flora and fauna of the intertidal area (the area between the highest and lowest tidal levels). NatureScot notes that water based pollution impacts may arise from the marine and terrestrial component works of the proposal and advises that these impacts are assessed and mitigation proposed if necessary.	**Chapter 9: Marine Biodiversity** states that whilst Kames Bay and Ballochmartin Bay SSSIs are considered within the baseline (**Section 9.5**), they are separated from the Works Area by a deep water channel, and there is no scope for impacts to arise on them. No potential for land contamination effects on these SSSIs has been identified from consideration of the data informing the baseline ground conditions presented in **Section 12.5** and there is no potential for the Proposed Works to create contaminant migration pathways to these SSSIs, they are therefore not referred to further in this chapter.

Consultee	Consideration	How addressed in the ES
NatureScot	In relation to coastal sea level rise impacts, NatureScot advises that information provided by the Dynamic Coast assessment should be utilised to ensure the most appropriate coastal defence techniques are employed for the site, if it is determined they are required through the proposed Flood Risk Assessment, and that an assessment of nature based solutions to managing coastal change and its impact on the adjacent Southannan Sands SSSI should also be undertaken to ensure that opportunities to utilise soft techniques to manage coastal flooding and erosion are undertaken where suitable whilst maintaining the condition of the notified features of the SSSI. NatureScot welcomes the attention given to the potential for high tide and high rainfall episodes to increasingly put the existing surface water drainage networks exiting the site under pressure, noting that both Hunterston A and B power stations share the same sewage treatment works.	Noted. Risks associated with coastal flooding are assessed in **Chapter 11: Surface Water and Flood Risk**. The embedded measures in **Table 12.7** include a commitment to comply with the LCRM guidance, which states that climate change should be considered in land contamination risk. LCRM does not detail how this should be done, therefore there is a further commitment to give due regard in land contamination risk assessment to available guidance relating to climate change effects. This is an evolving field, however the commitment makes reference to the published SoBRA guidance on assessing risk to controlled waters from UK land contamination under conditions of future climate change (detailed in **Table 12.3**).
NatureScot	NatureScot recommends that, if crushed stone and recycled aggregates are to be used to construct hard-standing areas, they should be sourced from materials free from contaminants, so that there is no possibility of run-off onto the intertidal areas of the SSSI. Any materials from the decommissioning of structures should be sensitively re-used on land and / or disposed of appropriately and not released onto the intertidal areas of the SSSI.	Compliance with SEPA's waste management guidance is an embedded measure in **Table 12.7**. Consideration of potential risks to soil, groundwater and surface water when generating suitability for use criteria for the potential re-use of waste materials on the Site is also an embedded measure.
National Health Services (NHS) Ayrshire and Arran	Some concern remains with the use of some site waste for remediation works in terms of ground contamination e.g. where is the water table situated, ease of entry into marine systems due to underground tunnels, run-off from higher ground surrounding the site which may also push waste materials into water systems etc. However, overall we commend the reusing of site materials to in-fill and site remediation works but would like to review mitigations of how all of the concerns above will be addressed and a	The onsite re-use of materials derived from decommissioning and demolition activity will be in accordance with SEPA guidance. The effects of reuse of site-won materials and the effects of some residual contamination being retained in sub-surface structures is assessed in **Section 12.11**. Compliance with the SEPA guidance for material reuse is an embedded measure for the reuse of materials outlined in **Table 12.7**. The reuse of materials during the Proposed Works will be informed by site characterisation works and assessment of land contamination risks in accordance with the measures in **Table 12.7**. These measures

Consultee	Consideration	How addressed in the ES
	description of the materials that will be used or disregarded.	include site investigation being undertaken in compliance with LCRM to inform updates to the WMP and SWESC during the Proposed Works, and consideration of the effects of climate change when undertaking land contamination risk assessment.

12.4.4 A targeted stakeholder meeting was held with SEPA on 26 October 2023. The meeting covered a project update, including information on the decommissioning process. The assessment methodologies, draft findings and proposed environmental measures were presented for a range of environmental aspects including those related to this soils, geology and hydrogeology assessment, **Chapter 11: Surface Water and Flood Risk** and **Chapter 10: Coastal Management and Water Quality**. This informed a discussion about how the consultation responses have been addressed, and an overall summary of the technical assessment conclusions.

12.5 Overall baseline

Current baseline

Topography

12.5.1 Within the Site, the ground levels fall from a maximum of approximately 25 m AOD in the south-east (at the lower slopes of Goldenberry Hill), to a minimum of 4 m AOD on the western side of the Works Area (see **Figure 12.1**). The sodium hypochlorite plant associated with the cooling water intake and the Magnox Ltd operated compound and the in the south of the Works Area are at around 5 m AOD.

Surrounding Land Use and History

12.5.2 The land within the Site remained in agricultural use until the development of the neighbouring HNA power station to the west, which was commissioned in 1960. The original footprint of HNA can be seen on historical mapping from 1965[69] to extend eastwards into the HNB Site, and electrical infrastructure is shown in the southeast of the Site, at the same location as the current 132 kV substation. The Jetty in the south of the Works Area was present by this time. Construction of HNB commenced in 1967 and HNB was commissioned in 1976. During construction of HNB, the land was levelled, excavations to bedrock were completed and land at the coast was reclaimed to extend the shoreline into the Firth of Clyde, using excavated materials[61]. HNA ceased operation in 1990 and is currently undergoing decommissioning.

12.5.3 Aerial photography on Google Earth Pro shows construction work for the Hunterston East Substation and the Western high-voltage direct current (HVDC) convertor station offsite to the south and southeast of the Site by 2014. By 2021, the Hunterston North 400 kV substation was constructed to the southeast of the Site.

12.5.4 The Magnox Ltd operated compound in the south of the Works Area dates from the construction of the HNA power station and is shown on historical maps from 1970

[69] National Library of Scotland (2023). *Map Viewer, 1965 Ordnance Survey Plan NS 1851 & NS 1951*. (online) Available at: https://maps.nls.uk/view/130197972 (Accessed November 2023).

onwards. The 1970 map shows two buildings of unknown use at the compound, the larger of which is partially within the Works Area and the other is approximately 17 m to the southeast. The larger building was demolished by 2006. The sodium hypochlorite plant associated with the cooling water intake in the south of the Works Area is shown on historical OS maps by 2006.

12.5.5 The Works Area remains in a predominantly rural setting, with fields present to the north and east of the Site, which are used for grazing. The Ayrshire Coastal Path route utilises the Power Station Access Road from the Jetty past the Works Area, through the Works Area. As noted above, industrial land uses (electrical infrastructure and HNA) are present adjacent to the Site to the southeast, south and west.

Soil

12.5.6 Soil mapping[70] shows most of the land on the Site as 'built-up land' and the generalised soil type as 'non-soil'. This category covers all areas within the Site and the northern portion of Power Station Road running southwards to the Jetty. This reflects the likelihood that all or most of the naturally occurring soils will have been removed during construction of HNB. The remainder of the Works Area, including the access road and land in the south by the jetty is shown as being underlain by 'brown soils' (soil map unit: 'Darleith') with parent material generated from drifts derived from basalts and intrusive basic igneous rocks, however, the majority of these naturally occurring soils are also likely to have been removed to construct the road and other infrastructure within the Site.

12.5.7 The Carbon and Peatland 2016 map[71] shows no peat is present within the Works Area.

Geology

12.5.8 Superficial deposits of Raised Marine Deposits (clay, silt, sand and gravel) are shown on the BGS 1:50,000 scale digital mapping[72] as underlying most of the Works Area (see **Figure 12.2a**) Where present on the Site (as some will have been removed during construction of the power station and replaced by imported fill materials / made ground), these consist of a relatively thin layer of raised beach deposits overlying glacial till and bedrock of the Kelly Burn Sandstone Formation (described by the BGS as brown, red, purple, yellow and cream coloured feldspathic sandstone, commonly containing bands of red siltstone and pebbles of silty mudstone[73]).

12.5.9 In the southeast of the Site, glaciofluvial ice contact deposits of gravel, sand and silt are shown (although these deposits are likely to have been largely removed for construction of the power station), these extend south, east and north of the Site. An unnamed igneous intrusion of microgabbro and unnamed plugs and vents of pyroclastic rock are shown in the north-west of the Site (see **Figure 12.2b**).

12.5.10 Power Station Road and land in the south of the Works Area by the jetty is shown to be underlain by the Kelly Burn Sandstone Formation.

12.5.11 During construction of HNB, the Site was reportedly levelled, and excavations to bedrock were carried out. This means that natural superficial deposits will have been removed and, in some instances replaced with imported fill materials. Additionally, land west of the

[70] Scotland's Soils (2021), *Soil map of Scotland (partial cover) 1:25,000*. (online) Available at: https://map.environment.gov.scot/Soil_maps/?layer=2# (Accessed November 2023)
[71] Scotland's Soils (2016) *Carbon and peatland 2016 map*. (online) Available at: https://map.environment.gov.scot/Soil_maps/?layer=15# (Accessed November 2023).
[72] BGS (2023) *GeoIndex*. (online) Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html (Accessed November 2023).
[73] BGS (undated), Glenvale Sandstone Formation (online) Available at: https://webapps.bgs.ac.uk/lexicon/lexicon.cfm?pub=GEF (Accessed November 2023).

Works Area is reported to have been reclaimed using the excavated materials, and a large area along the shoreline is shown on the BGS 1:50,0000 scale mapping as artificial ground (see **Figure 12.2a**). Although not shown by the BGS mapping, made ground is known to be present across the Site, and based on previous ground investigation is confirmed at up to 5 m in thickness, and this is likely to date from construction of the power station.

12.5.12 There is also potential for made ground in the south of the Works Area which includes a portion of a Magnox Ltd compound where a building was demolished, and the sodium hypochlorite plant associated with the cooling water intake.

12.5.13 The 2020 report on a geotechnical ground investigation within the Site included 16 boreholes drilled to a maximum depth of 25.1 m below ground level (bgl). This investigation recorded made ground generally at between 2.5 m and 3.0 m in thickness, and up to a maximum of 3.3 m. The made ground comprised grey or brown sandy gravel or gravelly sand with gravel including limestone, honeycomb slag and occasional brick fragments. Asbestos containing materials (ACMs) were visually identified at two exploratory holes (out of 16), BH05 in the northeast of the Site, in the hand dug services inspection pit, and BH15 in the north of the Site.

12.5.14 The made ground overlies mixed granular and cohesive raised marine deposits, which overlie glacial till (which is reported in the 2020 geotechnical report to be laterally impersistent across HNB) or glaciofluvial deposits. The superficial deposits consist of predominantly firm to stiff red brown sandy gravelly clay with occasional cobbles of red sandstone and layers or lenses of red brown sandy, clayey flint and limestone gravel or red brown gravelly clayey sand.

12.5.15 Based on the previous ground investigations, which are summarised in the 2021 Tier 1 – Preliminary Risk Assessment, the greatest thickness of superficial deposits overlying the sandstone is reported to be in the north-west of the Site, towards the shore. The thickness of the superficial deposits is 1 m to 4 m to the east and south-east of the reactor building, with a maximum thickness of approximately 17 m at the western corner of the turbine hall. To the north and north-west of the Site, between the turbine hall and the coast, the thickness of till and other superficial deposits increases further to a maximum thickness of approximately 25 m.

12.5.16 No previous investigations are known to have taken place on the (Magnox Ltd owned) land in the south of the Works Area by the jetty.

Geodiversity

12.5.17 There are no geological Sites of Special Scientific Interest (SSSIs) or Geological Conservation Review sites within the Study Area.

Hydrogeology

12.5.18 Groundwater is a potential receptor in relation to land contamination and the Study Area for hydrogeology therefore includes a 250 m buffer (see details of the ZoI in paragraph 12.3.3) around the Works Area, which is sufficient to allow potential effects due to on and offsite contaminant migration to be assessed.

12.5.19 The BGS classify raised marine deposits as a low to moderate productivity aquifer with intergranular flow, and associated borehole yields of 0.1 to 10 litres per second (l/s)[74]. Glacial Till is not classed as a significant aquifer, however, in some areas these deposits

[74] Ó Dochartaigh, B. E., Doce, D. D., Rutter, H. K., and MacDonald, A. M. (2015) *User Guide: Aquifer Productivity (Scotland) GIS datasets, Version 2. Revised Report*. Open Report OR/15/003.

may be highly permeable, and if they are thick and laterally extensive enough, they may form local aquifers. The glaciofluvial ice contact deposits shown in the southeast of the Site are classed as a high productivity aquifer with intergranular flow, with associated borehole yields of >10 l/s. The Kelly Burn Sandstone Formation beneath the Site is classed by the BGS[75] as a moderately productivity aquifer with significant intergranular flow, and with associated borehole yields of 1 to 10 l/s[74].

12.5.20 Previous groundwater monitoring of existing monitoring wells on the Site indicates that groundwater generally flows to the north-west through the sandstone beneath HNB, and ultimately discharges to sea. Monitoring well data obtained between 2015 and 2018 as part of the regular SPMP monitoring in the PPC permitted areas for wells screening bedrock shows flow consistently in a north-westerly direction towards the Firth of Clyde. Occasionally south-westerly and northerly flows were observed in the west.

12.5.21 Within the wider Site it is possible that fracturing, faulting and the position of dykes (igneous rock intrusions) within the sandstone may give rise to groundwater flows in directions that are not easily predictable from the hydraulic head data.

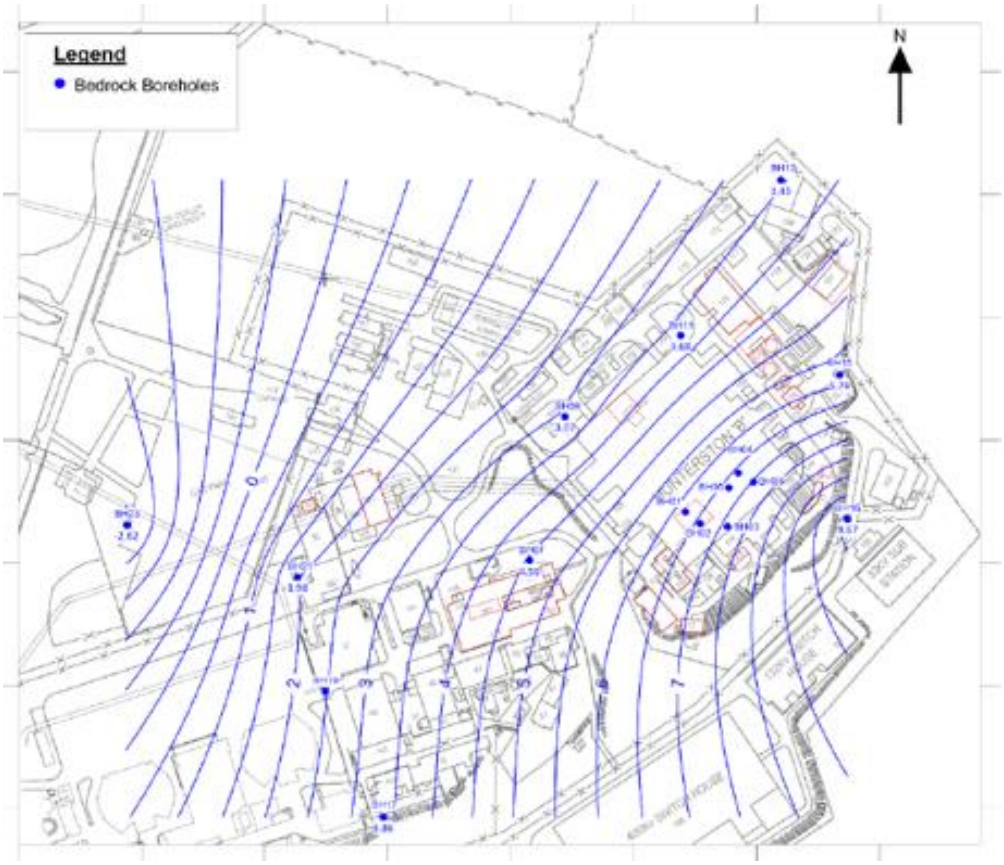
12.5.22 Monitoring well data obtained as part of the regular SPMP monitoring from wells around PPC permitted areas between 2015 and 2018 indicated variable piezometric heads within the superficial deposits / made ground, however these generally showed shallow groundwater flow to be to the north or northwest. The varying permeability of made ground and the superficial deposits and the presence of below ground infrastructure and basements will result in local variations in groundwater flow on the Site. Groundwater contours in the superficial deposits and in bedrock based on 2016 data for wells monitored for the PPC SPMP are shown in **Graphic 12.1** and **Graphic 12.2**.

12.5.23 It is assumed that groundwater flow beneath the land in the south of the Works Area will be generally west towards the Firth of Clyde.

[75] Scotland's Environment (n.d.). *Webmap*. (Online). Available at: https://map.environment.gov.scot/sewebmap/ (Accessed November 2023).

Graphic 12.1 Groundwater contours in superficial deposits / made ground (2016)

Graphic 12.2 Groundwater contours in bedrock aquifer (2016)



12.5.24 According to the SEPA water classification hub[62], the overall groundwater classification for the North Ayrshire Coastal groundwater body (superficial deposits) where the Works Area is located was 'good' for 2020. The underlying West Kilbride (bedrock) groundwater body was also classed as 'good' for 2020. This is the most recent monitoring data available.

12.5.25 Details of PWS were obtained from NAC as reported in **Chapter 11: Surface Water and Flood Risk**. No PWS with potential to be affected by the Proposed Works were identified. Details of active licensed activities (including abstractions) associated with HNB and HNA as regulated under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)[12] are described in **Chapter 11: Surface Water and Flood Risk**. No groundwater abstractions with potential to be affected by the Proposed Works have currently been identified, and the 2023 Envirocheck for the wider EDF landholding around the Site also confirms no abstractions are recorded on the Site or within 250m.

Hydrology

12.5.26 A full description of the Site hydrology is given in **Chapter 11: Surface Water and Flood Risk** and a summary is provided below in paragraphs 12.5.27 to 12.5.34. Surface water is considered as a potential receptor in relation to land contamination and this section, therefore, considers hydrology within the Study Area and including a 250 m buffer around the Works Area.

12.5.27 The Works Area is adjacent to the Firth of Clyde to the west. There are no surface watercourses on the Works Area and no other significant freshwater courses or freshwater bodies in the Study Area.

12.5.28 There are several drainage ditches in the fields to the north and south of the Site, the nearest is approximately 110 m north of the Site and runs for around 310 m west before it discharges to the Firth of Clyde at Stoney Port. Due to previous groundwater monitoring identifying that shallow groundwater flow in the onsite superficial deposits and made ground has on occasion been towards the north, there is potential connectivity between groundwater on the Site and this nearest drain.

12.5.29 The surface water drainage network on the Site carries run-off from roadways, buildings, hardstandings and miscellaneous drainage arisings from plant sources. Most existing facilities with a high potential for oil contamination drain to surface drains served by oil interceptors. The main storm water drain runs westwards alongside the main access road to discharge to the sea.

12.5.30 There is a surface water drainage connection between a small portion of the Site surface water drainage system at its northern extent and the drainage ditch approximately 110 m north.

12.5.31 Although most of the Site has hardstanding or is developed with buildings, some surface water infiltration will occur on the Site due to the presence of some landscaped grassed areas within the Site.

12.5.32 As noted in paragraph 12.5.22 there is potential for shallow groundwater on the Site to migrate towards and also to provide base flow to the nearest surface water drainage ditch approximately 110 m north. Surface water quality in the drainage ditch is not currently monitored by SEPA.

12.5.33 As noted in paragraph 12.5.48, following identification of hydrocarbon contamination in the surface water drain, monitoring, investigations and remedial actions to the Site drainage system are ongoing. Further details are provided in paragraph 12.5.48.

12.5.34 The Largs Channel (in the Firth of Clyde) immediately west of the Works Area was classed by SEPA as having overall good water quality in 2020.

Ecology

12.5.35 An assessment of the Proposed Works on terrestrial and freshwater biodiversity receptors is given in **Chapter 8: Terrestrial Biodiversity and Ornithology** and the assessment for marine biodiversity is in **Chapter 9: Marine Biodiversity**. Biodiversity receptors are considered as potential receptors in relation to land contamination and this section, therefore, considers biodiversity within the Study Area which includes a 250 m buffer (ZoI – see paragraph 12.3.3) around the Works Area.

12.5.36 The NatureScot SiteLink map shows the Portencross Woods SSSI approximately 50 m east of the Works Area at Power Station Road running south to the Jetty. The SSSI designation relates to biological features, namely semi-natural coastal upland mixed ash woodland. The Portencross Woods SSSI is approximately 325 m southwest of the Site and is at a higher elevation than the land within the Site, groundwater flow is therefore likely to be towards the HNB (and HNA) power stations from the SSSI rather than vice versa.

12.5.37 Southannan Sands is a biological and coastal SSSI located approximately 170 m north of the Site. This SSSI designation relates to biological features, namely intertidal marine habitats and saline lagoons: sandflats. The sandflats extend for over 4 km along the coast and are subdivided by industrial developments. Some groundwater from within the Site is likely to flow towards the SSSI and the surface water drain approximately 110m north of the Site appears to discharge to the Clyde estuary immediately south of the SSSI, west of Power Station Road.

12.5.38 No other sensitive local, national, or international designations relating to ecological conservation have been identified within the Study Area.

Land Contamination

12.5.39 The Site undergoes regular environmental monitoring to check groundwater quality and has also been subject to various phases of ground investigation to collect soil and groundwater data for environmental and geotechnical purposes. The licensee has produced a SWESC, last updated in 2021, and has engaged with SEPA, and the neighbouring HNA licensee, throughout its production. The 2021 update concludes that the existing and planned programmes of work to characterise the Site and monitor radiological hazards, associated non-radiological hazards and environmental parameters were fit for purpose for the operational phase of the Site's lifecycle, and that these programmes were regularly reviewed and updated in response to site changes and best practice. At the time of writing, it is noted that the licensee was proactively assessing the impact of future site states on environmental safety and considering environmental monitoring requirements for the period beyond electricity generation.

12.5.40 Information on the presence of contaminants in soil and groundwater at the Site is available in the form of previous ground investigation reports and groundwater monitoring events, and the licensee continues to regularly monitor groundwater and surface water for radioactive and non-radioactive contaminants, and to review the scope of environmental monitoring as part of ongoing characterisation to inform the SWESC and to meet company governance relating to land quality management (see **Table 12.3**).

12.5.41 Areas of HNB subject to regulation under PPC 2012 include diesel generators, auxiliary boilers, burners and associated pumps and stores. As outlined in **Table 12.3** the PPC permit is not prescriptive in terms of requirements to monitor soil or groundwater, however, regular groundwater monitoring for hydrocarbons (total petroleum hydrocarbons [TPH] and polycyclic aromatic hydrocarbons [PAH]), has been carried out voluntarily by the site licensee , and groundwater reviews (in 2010, 2015 and 2019) have been carried out to confirm the effectiveness of the pollution prevention measures at the permitted installation within HNB, and the suitability of the groundwater monitoring arrangements to provide a warning of any release of polluting substances to ground. In the 2015 review, 17 monitoring wells were recommended for continued groundwater monitoring on a quarterly basis with laboratory testing for total petroleum hydrocarbons (TPHCWG method) and polycyclic aromatic hydrocarbons (PAH).

12.5.42 Sixteen rounds of groundwater monitoring were subsequently completed between January 2015 and October 2018 by EDF Nuclear Generation Ltd. There were localised, and occasional, detections of TPH above detection limits (aromatic >EC7 to EC8 at 11 µg/l in HARBH03 in 2017, aliphatic >C5 to C6 in HARBH03 at 27 µg/l in 2018, and aliphatic >C5 to C6 in HARBH06 at 12 µg/l in 2018), with the remaining TPH results below the laboratory limit of detection. PAHs were detected on a sporadic, localised basis, with naphthalene being the most frequently detected PAH species (17 results above the limit of detection over 184 samples) with a maximum concentration of 0.19 µg/l at HNBBH10. Most of the PAH detections were in monitoring wells in the central area of the Site. No contamination in groundwater requiring additional investigation or remediation was identified[42]. Based on the results, the 2019 report recommended reducing the monitoring frequency to six monthly, and this was adopted in 2021. The next groundwater review is due in Q4 2023.

12.5.43 As noted in **Table 12.3**, the licensee also undertakes monitoring of radioactive substances in groundwater in tandem with the SPMP monitoring completed to support compliance with the PPC Permit, to check compliance with the HNB Nuclear License (Licence No. Sc.13) Condition (SLC) 34. Reporting of the most recent phase of SPMP monitoring is

ongoing at the time of writing, however the Licensee has confirmed that concentrations of radioactive isotopes, including tritium, have been below the applied action level for the past four years of monitoring.

12.5.44 During the Preparations for Quiescence phase, it is likely that the PPC Permit will need to be surrendered. This may be done partially or as a full surrender. At present, the stationary technical unit (various, mainly diesel, plant, with associated fuel storage tanks forming directly associated activities) detailed in the permit (PPC/A/1008859) is still required, and the SPMP groundwater monitoring will therefore continue until such time as the plant has been decommissioned and dismantled / removed from the Site. At this point, as the Operator of the installation, the onus is on the HNB site licensee to demonstrate to SEPA that all potentially polluting substances associated with the permitted operations have been removed from the Site, and that no deterioration in soil or groundwater quality has occurred. This is likely to require additional ground investigation, with remediation potentially needed if the investigation identifies the presence of contaminants in soil or groundwater that are likely to have been caused by the permitted operations. Cessation of the permitted activities will mean that there is improved access for ground investigation, once plant has been decommissioned and relevant hazardous substances removed from the Site. The application for Permit Surrender can only be made once the Site can be demonstrated to be in a satisfactory state (see **Table 12.3**) i.e., when ground investigations and land remediation (if needed) are complete.

12.5.45 Site records and previous ground investigation reports record several occurrences of contaminants reaching ground at the Site during its period of operation since the 1970s. Whilst in each instance the contamination was investigated at the time and remediated if required, in some instances residual contamination will be present in the soil and groundwater underlying the Site. Contaminants identified in groundwater include hydrocarbons and radioactive isotopes (e.g. tritium). Detections of radioactive contamination in soils have been limited and localised. These are detailed in the 2021 Tier 1 Preliminary Risk Assessment and relate to a Groundhog radiological survey completed in 2004 and subsequent surface soil sampling at areas of potential concern (APC): HNB_APC5 (old active laundry, gas circulator workshops and waste oil treatment plant), HNB_APC6 (embankment), and HNB_APC7 (storm water pumphouse). Radioactive contamination concentrations in soils were noted by Golder to be outside the scope of the Environmental Authorisation (Scotland) Regulations 2018.

12.5.46 As per the 2021 Tier 1 Preliminary Risk Assessment, it was concluded that the identified contamination in soils or groundwater required further investigation and assessment. Ground investigation including soil sampling was recommended by Golder within APCs as the opportunity for soil sampling presents itself during the early stages of decommissioning of HNB. Groundwater sampling is undertaken regularly from existing monitoring wells by the licensee, as detailed above (e.g. SPMP monitoring as detailed in **Table 12.3**). Continuation of the monitoring during decommissioning, and installation of some additional groundwater monitoring wells at specific APCs where limited monitoring locations are currently available, was also recommended by Golder in the 2021 report.

12.5.47 No land contamination sources likely to generate significant concentrations / volumes of ground gases (such as methane and carbon dioxide) or volatile contaminants (such as benzene, or chlorinated solvents) have been identified on the Site to date, and these substances are not known to have been stored or handled on the Site. As a precautionary measure, the 2021 Tier 1 – Preliminary Risk Assessment[61] recommends that for the Proposed Works, that groundwater monitoring coverage and testing suites at the Site should be extended, with testing to include volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). Further desk study and risk assessment may be needed if these substances are later found to be present.

12.5.48 The licensee is aware of a recent hydrocarbon detection affecting offsite surface water in the offsite ditch approximately 110m north of the Site. The localised hydrocarbon contamination (surface sheen and some dissolved phase hydrocarbons) in the ditch has been reported to SEPA and remedial work is planned to address the source of the contamination which has been identified by the Licensee as leakage of oil from a third party transformer cable located within the Site. The third-party substation identified as the source of the oil contamination in the ditch will be decommissioned and removed. The licensee has confirmed that this work is scheduled to start in Q1 2024.

12.5.49 Regular surface water sampling and laboratory testing of surface water in the ditch for hydrocarbons and radioactive contaminants will continue as part of the Licensee's ongoing environmental monitoring programme. No impact to other receptors (e.g., coastal waters or Southannan Sands SSSI) has been identified to date.

12.5.50 The Site is adjacent to the Hunterston A (HNA) nuclear power station which ceased generation in 1990 and is currently being decommissioned (by its site licensee, Magnox Ltd). The HNA site is subject to the same regulatory controls as HNB in relation to radioactive and non-radioactive contaminants affecting land quality, which limits the potential for the land condition on the HNA site to significantly impact on land condition on the Site. The potential for onsite migration of legacy contamination in the ground cannot be ruled out between HNA and HNB, given that the sites are adjacent and have some connecting infrastructure that may provide preferential migration pathways. However, the Site has a number of existing monitoring wells located close to the boundary with HNA, screening shallow groundwater and the bedrock aquifer, and these enable defensive groundwater monitoring to be undertaken, whereby if contamination is identified that is unlikely to have arisen due to activities on HNB, the HNA site can be advised to investigate possible sources and take further actions as needed. Additionally, investigative and remedial works will be undertaken as required at the HNA site in order to meet the regulatory requirements for decommissioning HNA, and this lowers the risk of the Site being significantly affected by contaminants migrating from HNA.

12.5.51 The current risk levels to human health, the water environment (including the Firth of Clyde – estuary, groundwater, and surface water in the drain approximately 110 m north of the Site) are the subject of assessment in an update to the 2021 Land Quality – Tier 1 Preliminary Risk Assessment: Hunterston B Nuclear Power Station[61], which is currently ongoing.

12.5.52 The 2021 report identified 26 areas of potential concern (APCs), none of which were identified as requiring immediate remediation. Six APCs within the Site were determined to be high risk, based upon moderate consequence, and likely likelihood. Further investigations including non-intrusive investigations (such as drainage surveys and inspections), groundwater and surface water monitoring, and intrusive ground investigations were recommended (not least to further characterise and assess these six APCs). Opportunistic soil sampling was also recommended as opportunities to access soils for excavation and sample collection arise throughout the decommissioning process. Detailed review of historical aerial photographs and records such as historical Site layout plans was recommended to check for historical APCs, and walkovers to complete visual inspections, such as checking for staining on areas of open ground at fill or draw points. Confirmation of the Site's surface radiological survey programme was also recommended to check whether additional surface radiological surveys are needed.

12.5.53 It is noted that the area in the southeast of the Site has not been subject to ground investigation. This area is used for electrical infrastructure and access for ground investigation is therefore limited on a safe working basis due to the presence of the 400 kV switch house, 132 kV switch house and 33 kV substation. Characterisation of this area will become possible as the decommissioning process progresses and will be completed

prior to works commencing in this area of the Site. This is an embedded measure in **Table 12.7**.

Future baseline

12.5.54 Irrespective of the Proposed Works the Site will remain subject to the current regulatory regimes relevant to the prevention, investigation and remediation of land contamination by radiological and non-radiological contaminants, as identified in **Table 12.1** and **Table 12.3**. It is therefore reasonable to assume that if there was a detrimental change from baseline conditions over time within the Study Area due to accidental release(s) or a change to the baseline ground conditions that mobilised contamination (e.g., other ground works), then the regulator(s) would be likely to require that remedial actions were taken by the licensee under the current permitting / licensing situation to restore conditions back to baseline..

12.5.55 With respect to land contamination management, nuclear licensed sites do not fall under the scope of Part IIA of the Environmental Protection Act[3], however they do fall within the scope of the Town and Country Planning (Scotland) Act 1997[76] under which land contamination is a material consideration. For future developments which take place within the Study Area, the Town and Country Planning (Scotland) Act 1997 requires the consideration of the potential for land contamination to be present, in order for the planning authority to assess whether the Site is suitable for development or redevelopment. Where necessary a developer would be required to carry out remediation of contamination to ensure the development site is suitable for the proposed end use. Therefore, it is reasonable to conclude that in the absence of the Proposed Works there would not be a detrimental change in baseline conditions over time within the Study Area as a result of other redevelopment of the Site.

12.5.56 Long-term changes in the baseline soil condition, and geological and hydrogeological conditions at the Site that will be relevant to land contamination during the timescale from the Preparations for Quiescence phase, though to the Final Site Clearance include:

- climate change influencing rainfall runoff and recharge,
- changes to groundwater levels and flow directions, which could in turn influence contaminant migration and land quality,
- changes to the future hydrogeological flow regime,
- some contaminants in soils and groundwater will naturally attenuate and decay over time.

12.5.57 Due to the duration of the Proposed Works, through Quiescence to the end of Final Site Clearance, consideration of climate change in future land contamination risk assessment is an embedded measure in **Table 12.7**. Without the Proposed Works it is still likely that these assessments would be needed for the licensee to comply with other environmental legislation, and therefore no detrimental change in baseline conditions over time within the Study Area would be expected. Consideration of climate change in regard to pluvial and coastal flood risk to the Proposed Works, and specifically in relation to the proposed Safestore is included in **Chapter 11: Surface Water and Flood Risk**. As noted above, further work to integrate consideration of climate change in the assessment of land contamination risks is an embedded measure in **Table 12.7**.

[76] UK Government (1997) *Town and Country Planning (Scotland) Act 1997* (online). Available at: https://www.legislation.gov.uk/ukpga/1997/8/contents (Accessed November 2023).

12.6 Embedded environmental and good practice measures

12.6.1 As part of the design process, a number of embedded environmental and good practice measures are proposed to reduce the potential for impacts, as summarised in **Table 12.7**.

Table 12.7 Summary of Embedded Environmental Measures

Ref.	Embedded Measure	Compliance Mechanism	Embedded or good practice measure
11.1	At the point of full or partial PPC Permit Surrender, assessment of land condition for the PPC permitted areas of the Site will be undertaken in accordance with SEPA's PPC guidance for site reports and permit surrender. The proposed scope of investigations to determine the site condition, including collection of soil and groundwater data, and details of proposed remediation measures (if these are needed) to restore the Site to a satisfactory state will be provided to SEPA for comment in advance of undertaking the work.	Environmental Management Plan (EMP) PPC 2012	Embedded measure
11.2	The SPMP groundwater monitoring and offsite surface water monitoring will continue for as long as required to support ongoing PPC Permit compliance and PPC Permit Surrender. The scope of the SPMP monitoring will continue to be reviewed and any necessary changes implemented e.g., in response to changes to operations covered under the Permit or observed / suspected changes in site condition. If the SPMP monitoring indicates a deterioration in groundwater quality, appropriate measures will be undertaken to investigate, and if necessary, remediate the land, prior to PPC Permit Surrender. Records will continue to be kept of all associated monitoring, investigations and remediation. The same principles will apply to monitoring wells used to collect samples for radiological (and other non-radiological) testing (outside the scope of PPC 2012) to help support the licensee's ultimate release from RSR.	EMP PPC 2012	Embedded measure
11.3	The site characterisation and assessment of land contamination risks to update and implement the WMP and SWESC during the Proposed Works (except for areas of the Site where specific requirements for the assessment of site condition apply, such as PPC 2012), will be in accordance with the phased approach set out in LCRM (and CLR11). This will inform the design of work needed to achieve the site reference state, and to validate its achievement. This characterisation work will consider potential legacy radioactive and non-radioactive contamination associated with the historical use of the Site as well as the current status. Groundwater risk assessment to inform site characterisation will be undertaken in accordance with SEPA's Position Statement (WAT-PS-10-01) Assigning Groundwater Assessment, Criteria for Pollutant Inputs (v3.0 Aug, 2014, or as amended).	EMP	Good practice measure
11.4	In accordance with LCRM, consideration will be given to climate change effects in land contamination risk assessment completed during the Proposed Works. Assessments will give regard, as appropriate, to available relevant industry guidance, such as SoBRA (2022) Guidance on Assessing Risk to Controlled Waters from UK Land Contamination Under Conditions of Future Climate Change.	EMP	Good practice measure

Ref.	Embedded Measure	Compliance Mechanism	Embedded or good practice measure
11.5	Design and construction of new groundwater monitoring wells for site characterisation or other environmental purposes will be in accordance with industry guidance such as Environment Agency Science Report SCO20093, and BS 10175, to avoid the creation of new preferential migration pathways.	EMP	Good practice measure
11.6	Available existing groundwater monitoring wells that can be retained without compromising the Proposed Works will be sampled as needed during all phases of the Proposed Works e.g., to assess for impacts on groundwater quality on the Site, to inform design of further investigation or remedial measures, and to provide verification of remediation work. If wells cannot be retained for ongoing environmental monitoring purposes, or are no longer required, these will be decommissioned in accordance with SEPA guidance for decommissioning redundant boreholes and wells. Wells that become unexpectedly damaged or unusable will be subject to assessment to confirm whether they need to be replaced.	EMP	Embedded measure
11.7	Surface water sampling will be carried out during the Proposed Works to help build upon the existing SPMP programme and to ensure appropriate monitoring takes place outside of the Site. This will include monitoring of authorised drainage discharges to the marine environment, and sampling of surface water from the drainage ditch approximately 110 m north of the Site. Testing will continue to include radioactive isotopes and non-radiological contaminants, in line with current regular environmental monitoring protocols. This is to provide verification that the Proposed Works are not significantly impacting on surface water quality. The timing and frequency of monitoring will be risk based, and relative to the level of construction activity / level of risk of releases to ground or to the surface drainage system. It is anticipated that the monitoring frequency will be confirmed prior to the commencement of the works, as part of the Environmental Management Plan.	EMP	Embedded measure
11.8	Where the Proposed Works have the potential to affect Site drainage inputs or change the permeability of the ground surface, the suitability of existing drainage systems, and potential requirement for alternative drainage arrangements or repairs, will be assessed, and suitable drainage systems defined in a decommissioning drainage plan prior to the relevant activity commencing.	EMP	Embedded measure
11.9	Drainage surveys will be completed on a prioritised basis, as required throughout the Proposed Works. Drainage investigation work will include confirming drainage condition and direction of flow and discharge points to offsite drains or surface water. Surveys may include CCTV camera inspections, dye tracing, confirming drain invert levels and / or sampling from drains. The findings will be used to inform the Drainage Plan for the Proposed Works. Liaison with the neighbouring HNA licensee will be undertaken as needed due to the connectivity of some drainage features between HNA and the Site.	EMP	Embedded measure

Ref.	Embedded Measure	Compliance Mechanism	Embedded or good practice measure
11.10	Good Industry Pollution Prevention Practices: The decommissioning work on-site will follow good industry practices as set out in CIRIA C532, C74 and Netregs guidance. In addition, the appointed contractors will be required to adhere to pollution prevention measures identified in an Environmental Management Plan which will include the following: • Bunding of new chemical and fuel stores to 110% of capacity. The bunded areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage; • Vehicle maintenance and refuelling of machinery will be undertaken within designated areas where spillages can be easily contained, and machinery will be routinely checked to ensure it is in good working condition; • Those areas at risk of spillage or containing hazardous materials, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) will comply with industry good practice, be bunded, have appropriate containment and segregation, and will be risk assessed and carefully sited to minimise the risk of hazardous substances entering the drainage system, local ditches, or sensitive land-based receptors; and • Pollution incidence response planning will deal with any accidental spillages or leaks.	EMP	Good practice measure
11.11	Best practice air quality management measures (see **Chapter 6: Air Quality**) will be applied as described in Institute of Air Quality Management (IAQM) guidance on the Assessment of Dust from Demolition and Construction 2023, version 2.1[58].	EMP	Good practice measure
11.12	Potential risks to soil, groundwater and surface water will be considered when generating suitability for use criteria for the potential re-use of waste materials on site, particularly for any void filling below the water table, and with regard to climate change effects.	EMP	Embedded measure
11.13	The licensee has an existing system for the management of land condition data for the Site. Site characterisation work undertaken during the Proposed Works will be added to this system with the aim of producing a high quality land quality management file, using systems such as Geographical Information System (GIS) to improve data access.	EMP	Embedded measure
11.14	During the Proposed Works, construction strategies will be implemented that will seek to maximise the reuse of excavated materials or demolition derived materials that are suitable for the intended re-use in the context of the future site use. Waste management planning and reuse of material will be completed in accordance with SEPA guidance[52] and the HNB WMP and SWESC. The WMP will set out how stockpiles will be managed and segregated to avoid cross-contamination, and will include the anticipated programme for storage of materials. Where it is identified that materials cannot be re-used on the Site,	EMP	Good practice measure

Ref.	Embedded Measure	Compliance Mechanism	Embedded or good practice measure
	these will be suitably contained to prevent uncontrolled releases to the environment, and an off-site disposal option at a suitably licensed facility by a licensed waste carrier will be identified and collection arranged at the earliest opportunity.		
11.15	Decommissioning plans for the Proposed Works will reflect that delicensing and surrender of the RSR permit are distinct regulatory processes with different requirements. Specifically, the plans will note that the programme of validation monitoring required to demonstrate that the Site reference state has been achieved may differ from the clearance survey required for delicensing. The Site end state description will continue to be clarified as the plans are developed during the Proposed Works, and the plans updated as and when required.	EMP	Good practice measure
11.16	All aspects of the Proposed Works will be in accordance with the Health and Safety at Work etc Act (1974)[24] and regulations made under the Act, and the Construction (Design and Management) Regulations 2015. Potential risks to human health from any unexpected ground contamination will be avoided by the use of PPE and by adopting appropriate working practices. These could include the use of field monitoring equipment if potential for vapours is anticipated, to minimise potential for personnel to come into direct contact with contaminants, and protocols for suspect materials encountered during groundworks to be characterised through sampling and testing to identify appropriate further actions.	EMP	Good practice measure
11.17	All construction work associated with the Proposed Works will be completed in accordance with the Control of Asbestos Regulations 2012 (CAR 2012[23]). With regard to asbestos containing materials or asbestos fibres encountered on or within the ground during ground works, CAR 2012 requires that measures are taken to prevent fibre release and to prevent the spread of asbestos, the location where asbestos is suspected or confirmed must be recorded and control measures put in place to prevent exposure.	EMP	Good practice measure
11.18	The potential for dewatering to be required during all stages of the Proposed Works will be considered in advance of excavation activities, and if dewatering is anticipated to be needed, an assessment will be carried out in advance to identify suitable environmental measures to minimise the potential for contaminant mobilisation and to protect the water environment and ensure compliance with water environment legislation.	EMP	Good practice measure
11.19	The 2021 Tier 1 – Preliminary Risk Assessment[61] does not currently include land adjacent to the Jetty including a compound and sodium hypochlorite plant. Contaminated land risk assessment in accordance with LCRM will be completed for these areas prior to the use of these areas or any disturbance to them (such as their being accessed by vehicles or personnel) as part of the Proposed Works.	EMP	Embedded measure

12.7 Assessment methodology

12.7.1 The proposed generic project-wide approach to the assessment methodology is set out in **Chapter 5: The EIA Process**, and specifically in **Section 5.3** and **Section 5.4**. However, whilst this has informed the approach that has been used in this soils, geology and hydrogeology chapter, it is necessary to set out how this methodology will be applied, and adapted as appropriate, to address the specific needs of the soils, geology and hydrogeology assessment in the ES.

General approach

12.7.2 The basis for the evaluation of the significance of effects used in this assessment for land contamination receptors is the change in risks from baseline conditions to the risks during the activities required for the Proposed Works (and up to the end of the Proposed Works).

12.7.3 The risk levels used in the assessment of effects on land contamination receptors, are defined using the process of land contamination risk assessment set out in the LCRM guidance[31]. The assessment of risks from land contamination is based upon the identification and subsequent assessment of a contaminant linkage. A contaminant linkage requires the presence of:

- A source of contamination;
- A receptor capable of being adversely affected by the contamination; and
- An active pathway capable of exposing a receptor to the contaminant.

12.7.4 The risk assessment aims to assess the significance of each potential contaminant linkage. The key to the classification is that the designation of risk is based upon the consideration of both of the following:

- The magnitude of the potential consequence (severity). It takes into account both the potential severity of the hazard and the sensitivity of the receptor; and
- The magnitude of probability (likelihood). It takes into account both the presence of the hazard and receptor and the potential for a pathway to be realised between them.

12.7.5 The definitions for the qualitative risk assessment have been taken from Guidance for the Safe Development of Housing on Land Affected by Contamination Annex 4[48].

12.7.6 The likelihood classifications for the contaminant linkages being realised is presented in **Table 12.8**.

Table 12.8 Likelihood classification of contaminant linkage being realised

Classification	Definition	Examples
High Likelihood	There is a contaminant linkage and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.	A) Elevated concentrations of toxic contaminants are present in soils in the top 0.5 m in a residential garden. b) Ground/groundwater contamination could be present from chemical works, containing a number of Underground Storage Tanks (USTs).
Likely	There is a contaminant linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.	A) Elevated concentrations of toxic contaminants are present in soils at depths of 0.5-1.0 m in a residential garden, or the top 0.5 m in public open space. b) Ground/groundwater contamination could be present from an industrial site containing a UST present between 1970 and 1990. The tank is known to be single skin. There is no evidence of leakage although there are no records of integrity tests.
Low Likelihood	There is a contaminant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place and is less likely in the shorter term.	A) Elevated concentrations of toxic contaminants are present in soils at depths >1 m in a residential garden, or 0.5-1.0 m in public open space. b) Ground/groundwater contamination could be present on a light industrial unit constructed in the 1990s containing a UST in operation over the last 10 years – the tank is double skinned but there is no integrity testing or evidence of leakage.
Unlikely	There is a contaminant linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.	a) Elevated concentrations of toxic contaminants are present below hardstanding and do not pose a risk to groundwater. b) Light industrial unit <10 years old containing a double skinned UST with annual integrity testing results available.

12.7.7 The classification of consequence is presented in **Table 12.9**.

Table 12.9 Classification of consequence

Classification	Human Health	Water environment	Geodiversity / Sensitive ecosystems	Property / Structures/ Crops and animals	Examples
Severe	Highly elevated concentrations likely to result in "significant harm" to human health as defined by the Environmental Protection Act (EPA) 1990, Part IIA, if exposure occurs.	Equivalent to Environment Agency Category 1 pollution incident[77] including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce.	Major damage to a geodiversity site. Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population.	Catastrophic damage to crops, buildings or property.	Significant harm to humans is defined in the Contaminated Land Statutory Guidance[78] as death, life threatening diseases (for example, cancers), other diseases likely to have serious impacts on health, serious injury, birth defects, and impairment of reproductive functions. Major fish kill in surface water from large spillage of contaminants originating from the Proposed Works. Highly elevated concentrations of Hazardous or priority substances present in groundwater close to small potable abstraction (high sensitivity). Explosion, causing building collapse (can also equate to immediate human health risk if buildings are occupied).

[77] Meaning an incident that has had a major impact on the environment. Environment Agency (undated). *Pollution incidents*. (Online) Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20141203190207/http://apps.environment-agency.gov.uk/wiyby/37821.aspx (Accessed November 2023).
[78] In Scotland, here: Natural Scotland, Scottish Executive (2006) *Environmental Protection Act 1990 - Part IIA Contaminated Land: statutory guidance edition 2* (online) Available at: https://www.gov.scot/publications/environmental-protection-act-1990-part-iia-contaminated-land-statutory-guidance/. (Accessed November 2023).

Classification	Human Health	Water environment	Geodiversity / Sensitive ecosystems	Property / Structures/ Crops and animals	Examples
Medium	Elevated concentrations which could result in “significant harm” to human health as defined by the EPA 1990, Part IIA if exposure occurs.	Equivalent to Environment Agency Category 2[79] pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce.	Significant damage to a geodiversity site. Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population.	Significant damage to crops, buildings or property.	Significant harm to humans is defined in the Contaminated Land Statutory Guidance[78] As death, life threatening diseases (for example, cancers), other diseases likely to have serious impacts on health, serious injury, birth defects, and impairment of reproductive functions. Damage to building rendering it unsafe to occupy, for example, foundation damage resulting in instability. Ingress of contaminants through plastic potable water pipes.
Mild	Exposure to human health unlikely to lead to “significant harm”.	Equivalent to Environment Agency Category 3 pollution incident[80] including minimal or short-lived effect on water quality; marginal effect on amenity value, agriculture or commerce.	Minor damage to a geodiversity site. Minor or short lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population.	Minor damage to crops, buildings or property.	Exposure could lead to slight short-term effects (for example, mild skin rash). Surface spalling of concrete.

[79] Meaning incidents that have had a significant impact on the environment. Environment Agency (undated). Pollution incidents. (Online) Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20141203190207/http://apps.environment-agency.gov.uk/wiyby/37821.aspx (Accessed November 2023).
[80] Meaning incidents that have had a minor impact on the environment.

Classification	Human Health	Water environment	Geodiversity / Sensitive ecosystems	Property / Structures/ Crops and animals	Examples
Minor	No measurable effects on humans	Equivalent to insubstantial pollution incident with no observed effect on water quality	Limited impact on a geodiversity site such that no effect is observable. Equivalent to insubstantial pollution incident with no observed effect on an ecosystem.	Repairable effects of damage to buildings, structures	The loss of plants in a landscaping scheme. Discoloration of concrete.

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12.7.8 The risk matrix to link the likelihood and consequence is shown in **Table 12.10**.

Table 12.10 Risk Matrix

Likelihood / Potential Consequence	Unlikely	Low	Likely	High
Severe	Moderate/Low Risk	Moderate Risk	High Risk	Very High Risk
Moderate	Low Risk	Moderate/Low Risk	Moderate Risk	High Risk
Mild	Very Low Risk	Low Risk	Moderate/Low Risk	Moderate Risk
Minor	Very Low Risk	Very Low Risk	Low Risk	Low Risk

12.7.9 The overall risk definitions are summarised in **Table 12.11**.

Table 12.11 Risk definitions

Risk	Definition
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the Site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to the Site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.
High	Harm is likely to arise to a designated receptor from an identified hazard at the Site without remediation action. Realisation of the risk is likely to present a substantial liability to the Site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst that this harm if realised would normally be mild. It is unlikely that the Site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.
Very Low	It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.

Determination of significance

12.7.10 There is no established guidance on how to use the LCRM risk assessment approach as the basis for the evaluation of the significance of effects within the EIA process.

12.7.11 The methodology used in this assessment has, therefore, been developed using professional judgment, evaluating the change in risk from baseline conditions to those during and following the Proposed Works. In order to define the baseline risk the initial assessment and classification of risk is carried out for the Study Area in its pre-works state. A separate assessment of risk is then conducted for the site post-works (including environmental measures inherently embedded in the development) to enable an evaluation of the change in risk due to the Proposed Development.

12.7.12 In considering the post-works risks, embedded mitigation has been taken into account. **Table 12.12** uses the risk classification pre- and post-works as the basis for a significance evaluation matrix for the purposes of EIA.

Table 12.12 Significance evaluation matrix for land contamination effects

			Risk Post-decommissioning (including embedded environmental measures)					
			Very Low	**Low**	**Moderate / Low**	**Moderate**	**High**	**Very High**
Risk Pre-development	**Existing Receptors**	**Very High**	Major Positive (Significant)	Major Positive (Significant)	Moderate Positive (Potentially Significant)	Moderate Positive (Potentially Significant)	Minor Positive (Not Significant)	Negligible (Not Significant)
		High	Major Positive (Significant)	Moderate Positive (Potentially Significant)	Moderate Positive (Potentially Significant)	Minor Positive (Not Significant)	Negligible (Not Significant)	Minor Negative (Not Significant)
		Moderate	Moderate Positive (Potentially Significant)	Moderate Positive (Potentially Significant)	Minor Positive (Not Significant)	Negligible (Not Significant)	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant)
		Moderate / Low	Moderate Positive (Potentially Significant)	Minor Positive (Not Significant)	Negligible (Not Significant)	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant)	Moderate Negative (Potentially Significant)
		Low	Minor Positive (Not Significant)	Negligible (Not Significant)	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant)	Moderate Negative (Potentially Significant)	Major Negative (Significant)
		Very Low	Negligible (Not Significant)	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant)	Moderate Negative (Potentially Significant)	Major Negative (Significant)	Major Negative (Significant)
	No Receptor Present Pre-development	**N/A**	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant)	Moderate Negative (Potentially Significant)	Major Negative (Significant)	Major Negative (Significant)	Major Negative (Significant)

	Risks that remain at moderate, high or very high post-development may require further measures during the construction phase to mitigate those risks depending on the specific circumstances (for example remediation in line with LCRM). Where effects are indicated to be Potentially Significant in EIA terms based on the change in risk from pre- to post-works, professional judgement will be applied in this ES to determine whether they are Significant or Not Significant.

12.8 Assumptions and limitations

12.8.1 The assessment in this ES assumes that ground conditions beneath the Site have not changed significantly since the 2021 Tier 1 – Preliminary Risk Assessment[61] was completed. This assumption is justified by the ongoing SPMP monitoring for hydrocarbons and radiological contaminants, which has not identified consistent increasing trends in contaminant concentrations in the Site groundwater, and offsite surface water monitoring that is also being undertaken. The regular monitoring provides assurance of the ongoing groundwater conditions within the Site, although it is acknowledged that additional ground investigation and other surveys are needed now that the HNB is entering decommissioning, and that localised contamination may therefore be found once these investigations commence, that has not been identified to date.

12.8.2 The decommissioning process will enable intrusive investigations in areas that have not been subject to ground investigation to date, e.g., due to operational safety constraints. The design of investigations will be informed by conditions encountered during decommissioning works, or the finding of surveys (such as from drainage surveys) completed to inform decommissioning works. Areas of the Site and potentially other areas within the Works Area that are outside the SPMP monitoring scope will also need to be targeted for investigation. The 2021 Tier 1 – Preliminary Risk Assessment makes recommendations for ground investigation at specific areas of potential concern (APCs) at an early stage during the decommissioning works when these locations are made available to monitor by deplanting scope.

12.9 Scope of the assessment

Study area

12.9.1 The Study Area for the assessment is as defined in paragraphs 12.3.1 and 12.3.3.

12.9.2 The elements of the Proposed Works with potential to result in effects on soils, geology and hydrogeology and land contamination receptors will mainly occur during the Preparations for Quiescence phase, with some requirement for maintenance and monitoring during the Quiescence phase, and further works with potential to interact with soils, geology and hydrogeology and land contamination receptors occurring during the Final Site Clearance phase. The temporal scope of the assessment of soils, geology and hydrogeology is therefore consistent with the entire period over which the Proposed Works will be carried out i.e., it covers all phases of decommissioning up to the end of the Final Site Clearance (see **Chapter 2: The Decommissioning Process**).

Potential receptors

12.9.3 This section details the approach to identifying receptors that could be significantly affected by the Proposed Works and that have been taken forward for further consideration.

12.9.4 The land contamination receptors identified as having potential to be affected by the Proposed Works are as follows:

- human health (current and future site users, decommissioning workforce and adjacent land users);

- property (on and offsite current and future buildings, including buried services, and agricultural property – crops / livestock on adjacent farmland to the north and east, coastal flora and fauna in the Clyde Estuary);
- groundwater in the superficial deposits and made ground;
- groundwater in the Kelly Burn Sandstone Formation aquifer (bedrock);
- unnamed surface water drainage ditch located approximately 110 m north, running 310 m west to discharge to the Clyde Estuary;
- surface water in the Clyde Estuary (coastal flora and fauna);
- ecologically sensitive sites (Southannan Sands SSSI) – this site is located at the outfall from the surface water drain approximately 110m north of the Site.

12.9.5 The land contamination receptors detailed in **Table 12.13** are applicable for all stages of the Proposed Works, although there is most potential for land contamination receptors to be affected during the Preparations for Quiescence phase (due to this being the stage with greatest requirement for ground investigation and works involving existing below ground infrastructure), then to a lesser extent during the Quiescence and Final Site Clearance phases.

Table 12.13 Receptors Subject to Potential Effects

Receptor	Reason for Consideration
Water environment: Groundwater in the superficial deposits and made ground, and groundwater in the Kelly Burn Sandstone Formation aquifer	Potential for the Proposed Works to result in changes to concentrations / presence of contaminants due to changes to existing hydrogeological conditions, or the introduction of new contaminants to groundwater during activities involving excavation dewatering / ground disturbance / physical changes to existing ground conditions.
Water environment: Surface water in the Clyde Estuary and surface water in the surface water drainage ditch approximately 110 m north of the Site	Potential for the Proposed Works to result in changes to concentrations / presence of contaminants in surface water, either by surface run-off, migration in the subsurface or via groundwater, migration via preferential pathways, or direct discharge via drainage systems.
Human health (Site users)	Potential for site users to be exposed to contaminants (by direct contact, inhalation, or ingestion).
Human health (members of the public outside the Site)	Potential for offsite migration of contaminants and offsite land users being exposed to contaminants (by direct contact, inhalation, or ingestion).
Property (HNA adjacent to the west of the Site, fields adjacent to the north and east of the Site [with crops or livestock], power transmission grid facilities to the southeast and southwest, wild fish / crustaceans in Firth of Clyde)	Potential for offsite migration of contaminants, or accidental offsite release [e.g., unauthorised drainage discharge], and subsequent damage to property.
Ecological receptors (areas with statutory designations for nature conservation)	Potential for offsite migration of contaminants towards the Southannan Sands SSSI which is approximately 180 m north of the Site and which receives discharge

Receptor	Reason for Consideration
	from the surface water drainage channel located approximately 110 m north of the Site.

Likely significant effects

12.9.6 The likely significant soils, geology and hydrogeology effects that will be taken forward for assessment in the ES are summarised in **Table 12.14**.

12.9.7 The likely significant effects detailed in **Table 12.14** are applicable for all stages of the Proposed Works, however the highest potential for land contamination effects will occur during the Preparations for Quiescence phase (due to this being the stage with greatest requirement for ground investigation and works involving existing below ground infrastructure). There will still be potential for effects during the Quiescence and Final Site Clearance phases but they are lower risk of occurring.

Table 12.14 Likely significant soils, geology and hydrogeology effects

Effect ID and activity	Likely significant effects	Receptor
A1: Land quality ground investigations (e.g. excavations/trial pits)	Contamination of soils and groundwater, deterioration in groundwater and surface water quality e.g., due to inadequate management of arisings (to prevent dust, free fibres [asbestos], run-off, release to ground surface, or creation of preferential pathways (e.g. due to poor design of groundwater monitoring installations, or these not being maintained in good condition).	• Human health (site users, offsite land users) • Groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer. • Surface water in the Clyde Estuary • Surface water in drainage ditch 110 m north • Southannan Sands SSSI • Property: agricultural crops / grazing livestock.
A2: Land quality ground investigations (e.g. excavations/trial pits)	Mobilisation of volatile contaminants beneath the surface, that may present an unacceptable risk to site users through inhalation (vapours/gases) or to offsite users by migration of volatile contaminant vapours from the Site.	• Human health (site users, offsite land users).
A3: Leaks/spills of fuels and oils from plant and storage tanks during construction work	Contamination of soils and groundwater, deterioration in groundwater and surface water quality.	• Human health (site users, offsite land users) • Groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer. • Surface water in the Clyde Estuary • Surface water in drainage ditch 110 m north • Southannan Sands SSSI • Property: on and offsite current and future buildings, and agricultural crops / grazing livestock

Effect ID and activity	Likely significant effects	Receptor
A4: Removal of foundations/ floor slabs, road surfaces	Potential to mobilise previously covered contaminated soils or contaminated fill materials, resulting in contamination of soils and groundwater, deterioration in groundwater and surface water quality.	• Human health (site users, offsite land users) • Groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer. • Surface water in the Clyde Estuary • Surface water in drainage ditch 110 m north • Southannan Sands SSSI • Property: on and offsite current and future buildings, and agricultural crops / grazing livestock.
A5: Removal of foundations/ floor slabs, road surfaces	Mobilisation of volatile contaminants beneath the surface may present an unacceptable risk to site users through inhalation (vapours/gases). Migration of volatile contaminant vapours from the Site may also present a risk to offsite land users.	• Human health (site users and offsite land users)
A6: Backfilling subsurface voids and reuse of site-derived materials, and residual contamination in subsurface structures	Contamination of soils and groundwater, deterioration in groundwater and surface water quality.	• Groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer. • Surface water in the Clyde Estuary • Surface water in drainage ditch 110 m north • Southannan Sands SSSI • Property: on and offsite current and future buildings, and agricultural crops / grazing livestock
A7: Laydown and storage, including soil and material stockpiles	Contamination of soils and groundwater e.g., by run-off, leaching or wind-blown dust, deterioration in groundwater and surface water quality.	• Human health (site users, offsite land users) • Groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer • Surface water in the Clyde Estuary • Surface water in drainage ditch 110 m north • Southannan Sands SSSI • Property: on and offsite current and future buildings, and agricultural crops / grazing livestock.
A8: Construction of sub-surface structures	There may be a requirement to construct new below ground structures such as drains. This could potentially re-mobilise or	• Human health (site users, offsite land users)

Effect ID and activity	Likely significant effects	Receptor
	change direction of contaminant plumes (including mobility of non-aqueous phase liquids (NAPL)) through creation of new migration pathways The mobilisation of existing contamination within the soils could result in leaching of contaminants to site groundwater which may migrate off site via shallow groundwater or through surface water drainage.	• Groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer. • Surface water in the Clyde Estuary • Surface water in drainage ditch 110 m north • Southannan Sands SSSI • Property: on and offsite current and future buildings, and agricultural crops / grazing livestock.
A9: Construction of sub-surface structures, concrete laying and movement of materials (general earthworks and ground preparation)	The disturbance or mobilisation of existing contamination towards buildings or service pipelines on-site or off-site may result in damage or deterioration and potential permeation of drinking water pipes by contaminants, due to aggressive conditions caused by the contaminants present or introduction of fill materials (e.g. lowering pH).	• Human health (site users, offsite land users) • Groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer. • Surface water in the Clyde Estuary • Surface water in drainage ditch 110 m north • Southannan Sands SSSI • Property: on and offsite current and future buildings, and agricultural crops / grazing livestock.
A10: Construction of sub-surface structures, concrete laying and movement of materials (general earthworks and ground preparation)	Mobilisation of volatile contaminants beneath the surface may present an unacceptable risk to site users through inhalation (vapours/gases). Migration of volatile contaminant vapours from the Site may also present a risk to offsite users.	• Human health (site users, offsite land users).
A11: Removal of drains (Active and non-active drainage)	(Note that existing plans show that some drains are to be retained for Quiescence however drains that are redundant may be removed). Change in drainage regime potentially promoting contaminant run-off, ponding or infiltration, resulting in deterioration in groundwater and surface water quality.	• Human health (site users, offsite land users) • Groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer. • Surface water in the Clyde Estuary • Surface water in drainage ditch 110 m north • Southannan Sands SSSI • Property: on and offsite current and future buildings, and agricultural crops / grazing livestock.
A12: Pumping and dewatering schemes	Re-mobilisation or change in direction of contaminant plumes (including mobility of non-aqueous phase liquids (NAPL)).	• Human health (site users, offsite land users)

Effect ID and activity	Likely significant effects	Receptor
	The mobilisation of existing contamination within soils can result in leaching of contaminants to site groundwater which may migrate offsite via shallow groundwater or through surface water drainage. Dewatering could also result in mobilisation of offsite contamination to migrate onto the Site, resulting in deterioration in groundwater and surface water quality.	• Groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer. • Surface water in the Clyde Estuary • Surface water in drainage ditch 110 m north • Southannan Sands SSSI • Property: on and offsite current and future buildings, and agricultural crops / grazing livestock.
A13: Drilling/core slab drilling	The mobilisation of existing contaminants may cause deterioration in groundwater and surface water quality.	• Human health (site users, offsite land users) • Groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer • Surface water in the Clyde Estuary • Surface water in drainage ditch 110 m north • Southannan Sands SSSI • Property: current and future buildings and agricultural crops / grazing livestock.

12.10 Receptors and effects scoped out of the assessment

12.10.1 A number of potential effects have been scoped out from further assessment, resulting from a conclusion of no likely significant effect. These conclusions have been made based on the knowledge of the baseline environment, the nature of Proposed Works and the evidence available on the potential for impact from similar projects more widely. The conclusions follow (in a site-based context) existing best practice:

- Potentially Significant effects on construction workers have been scoped out of this assessment as construction workers will be subject to the CDM Regulations 2015 and the Health and Safety at Work Act (1974) and regulations made under the Act. These legal obligations include the requirement for risk assessments and method statements for all construction related activities and the use of appropriate working methods, training and Personal Protective Equipment (PPE). Standard construction practices will also incorporate the radiological principles of managing risks to as low as reasonably practicable (ALARP) will be applied.
- Effects on soil receptors (in terms of both soil resources / soil health, crops and topsoil) - there are limited soil receptors present within the Site as it is predominantly covered by gravel and tarmac/concrete hardstanding and used for industrial purposes, with only limited landscaping and vegetation present, all of which is within an area of soil classed as 'built-up land'. Within the Study Area there are sensitive soil resources present in the form of the Portencross Woods SSSI. The SSSI is approximately 315 m from the Site and 45 m from the compound in the south of the Works Area. Given the local topography, and limited ground disturbance required for the Proposed Works in south of the Works Area and the SSSI's distance from the Site, significant effects on soils within the SSSI are unlikely and effects on soils have therefore been scoped out.

- Effects on geology and geodiversity receptors - there are no sites designated nationally or locally for conservation of geodiversity within the Study Area.
- Effects on hydrogeology such as changes to rainfall infiltration, changes to groundwater levels or the hydrogeological flow regime, as a result of the Proposed Works, are scoped out of the assessment in relation to groundwater resources on the basis that the groundwater is coastal and is not a sensitive or currently exploited resource (for potable water supply or commercial uses). Given the established use of the Site for nuclear power generation, is unlikely to be exploited as a groundwater resource in the future.
- Effects on land contamination receptors associated with the handling, storage and disposal of radioactive contaminants during the Proposed Works during defueling and Active Area Deplanting(as described in **Chapter 2: Decommissioning Process**) are scoped out; these are discussed in **Chapter 20: Radioactive Waste and Discharges**. This is on the grounds that these radioactive contaminants are covered by the rigorous requirements of the permitting and nuclear site licensing regime for the decommissioning of nuclear sites as defined in the Management of radioactive waste from decommissioning of nuclear sites: Guidance on Requirements for Release from Radioactive Substances Regulation Version 1.0: July 2018.
- Interactions between soil geology and hydrogeology receptors (including land contamination receptors) and radiological sources are also scoped out, these will also be assessed under the nuclear licensing regime.

12.11 Assessment of effects

12.11.1 As described in **Section 12.7**, the approach to evaluating the significance of effects used in the assessment is to consider the change in risks from baseline conditions to the risks during the Proposed Works (and up to the end of the Proposed Works).

12.11.2 However, this approach depends on the risk assessment being completed for the baseline condition and for a proposed end use. Details of the decommissioning works to be completed during the Proposed works are being developed and each time the environmental risk assessment for the Site is updated this will be done based on the latest design information. The licensee is currently in the process of updating Land Quality – Tier 1 Preliminary Risk Assessment (due in Q4 2023) and further updates will be completed during the Proposed Works. The updated desk-based assessment, due later in 2023 will inform further works to characterise the ground conditions of certain parts of the Site, which will then enable the environmental risk assessment to be reviewed.

12.11.3 It should be noted that at any point following ground investigation (which may be required for a Tier 2 generic assessment or a Tier 3 detailed quantitative risk assessment, as defined in LCRM[31]), it is possible (and often useful) to return to a Tier 1 preliminary risk assessment, utilising all relevant available data on site condition. This means that risk assessments can be updated considering changes to design / programmed activities during the Proposed Works, or to changes in assessment criteria (e.g., where there is a change to assessment criteria for specific hazardous / polluting substances).

12.11.4 It should also be noted that in some instances, within the Site, the risk-based approach to land contamination assessment may not apply, such as in relation to PPC 2012, where the requirement to demonstrate the Site is in a ‘satisfactory state’ requires the Operator (the licensee) to demonstrate that the permitted activities have not resulted in deterioration of soil or groundwater during the permit lifespan. This requirement can result in more stringent clean up actions being needed than where risk based remedial targets are derived.

12.11.5 The assessment below therefore considers the legislative requirements and embedded measures that will avoid, control and limit potential for effects on land contamination receptors during the Proposed Works.

A1 & A2[81]: Land quality ground investigations

12.11.6 During the Preparations for Quiescence phase, and as required in the later phases of the Proposed Works, it will be necessary to undertake ground investigations to confirm the land quality at the Site and to inform the design of further ground works or any remediation measures required prior to the surrendering of permits or de-licensing of the Site.

12.11.7 Ground investigation will necessitate disturbance to ground that has not previously been investigated and is likely to involve machine excavation of pits and borehole advancement / borehole drilling. This will produce arisings that need to be temporarily stored at surface, and potentially contaminated liquids (although this is likely to be relatively small in scale, a larger investigation could generate several cubic metres of excavated soils and / or wastewater), which could then pose a pollution risk and have potential to affect land contamination receptors.

12.11.8 Identified potential receptors include human health (site users, offsite land users), groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer, surface water in the Clyde Estuary, surface water in the drainage ditch approximately 110 m north of the Site, Southannan Sands SSSI, and property (crops / livestock on the adjacent agricultural fields).

12.11.9 Ground investigation is an established process on the Site and will be subject to compliance with the licensee's environmental management system and systems for the control of works, however the larger scale and likely increased frequency of investigation needed during the Proposed Works will increase the potential for an unintended release to the environment.

12.11.10 The embedded measures (see **Table 12.7**) that will inform the design and implementation of ground investigations to avoid the potential for contamination to occur because of ground investigation works include 11.3, 11.5, 11.6, 11.8, 11.9, 11.10, 11.11, 11.13, 11.16 and 11.17.

12.11.11 With respect to volatile contaminants, no contamination by VOCs or ground gas with the potential to significantly impact on receptors has been identified to date. However, the 2021 Land Quality – Tier 1 Preliminary Risk Assessment[61] for HNB identified the need to include testing for VOCs in the groundwater monitoring scope for the purposes of decommissioning, including in locations beyond the current monitoring focused on the PPC permitted plant and radiological reassurance monitoring completed as part of the SPMP.

12.11.12 No potentially significant risks to current site users or offsite land users were identified in relation to ground gas or VOCs in the 2021 assessment, however the embedded measures that will inform the design and implementation of ground investigations to confirm that these risks are not present include 11.3, 11.5, 11.12, 11.13 and 11.16.

12.11.13 Whilst the probability of encountering contamination during the Proposed Works increases by the act of disturbing / exposing contaminants in soils or groundwater, the result of the embedded environmental measures is that the probability of a pollutant linkage being created is reduced. As such, the overall 'likelihood' with the Proposed Works remains unchanged from that in the baseline. Therefore, the risks to the potential land

81 See **Table 12.14** for full description of effects.

contamination receptors from the Proposed Works will remain unchanged from the baseline and, therefore, the effect is **Negligible**, and **Not Significant**.

A3[82]: Leaks/spills of fuels and oils from plant and storage tanks during construction work

12.11.14 During the de-planting and demolition activities during the Preparations for Quiescence phase, and to a lesser extent in later phases of the Proposed Works, vehicles, mobile plant and machinery will be brought onto the Site to carry out the required activities.

12.11.15 Vehicles, plant and machinery using liquid fuels and oils are already used within the Site, however, as a result of the Proposed Works, use of these items will increase. Vehicles, mobile plant and machinery are also likely to be needed for demolition and associated activities in other parts of the Works Area during the Proposed Works including at the Jetty and compound in the south of the Works Area.

12.11.16 Land contamination receptors with potential to be impacted by a pollution incident during construction works include human health (site users, offsite land users), groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer, surface water in the Clyde Estuary, surface water in the drainage ditch approximately 110m north of the Site, Southannan Sands SSSI, and property (on and offsite current and future buildings, and crops / livestock on the adjacent agricultural fields).

12.11.17 With implementation of the embedded measures in **Table 12.7,** including measures 11.8, 11.9, 11.10, 11.11, and 11.16, the probability of a pollution incident taking place is reduced.

12.11.18 As such, the overall 'likelihood' with the Proposed Works remains unchanged from that in the baseline. Therefore, the risks to the potential land contamination receptors from the Proposed Works will remain unchanged from the baseline and, therefore, the effect is **Negligible**, and **Not Significant** in EIA terms.

A4 & A5[83]: Removal of foundations/ floor slabs, road surfaces

12.11.19 During the Preparations for Quiescence phase, and as required in the later phases of the Proposed Works, changes to the current ground surfacing may be needed to enable the Proposed Works.

12.11.20 The removal of some hard surfaces will expose areas of ground that have not previously been investigated and which in some instances may be contaminated. Additionally, the removal of hard surfaces can result in the creation of new contaminant migration pathways for contaminants to migrate in liquid or gaseous form, or as dust.

12.11.21 In regard to volatile contaminants, no contamination by VOCs or ground gas with the potential to significantly impact on receptors has been identified to date. However, the 2021 Land Quality – Tier 1 Preliminary Risk Assessment[61] for HNB identified the need to include testing for VOCs in the groundwater monitoring for the purposes of decommissioning, including in locations beyond the current monitoring focused on the PPC permitted plant and radiological reassurance monitoring.

12.11.22 Land contamination receptors with potential to be impacted by the required changes to the Site during the Proposed Works include human health (site users, offsite land users), groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer, surface water in the Clyde Estuary, surface water in the drainage ditch approximately

[82] See **Table 12.14** for full description of effects.
[83] See **Table 12.14** for full description of effects.

110m north of the Site, Southannan Sands SSSI, and property (on and offsite current and future buildings, and crops / livestock on the adjacent agricultural fields).

12.11.23 With the implementation of the embedded measures (See **Table 12.7**) 11.1, 11.2, 11.3, 11.4, 11.13 and 11.17, appropriate characterisation, risk assessment, and if necessary, remediation, will be completed to ensure that the overall 'likelihood' of a pollutant linkage being created with the Proposed Works remains unchanged from that in the baseline, or is reduced. Therefore, the risks to the potential land contamination receptors from the Proposed Works will remain unchanged from the baseline (or will be lower) and, therefore, the worst case effect is **Negligible** and **Not Significant**.

A6[84]: Backfilling subsurface voids and reuse of site-derived materials, and residual contamination in subsurface structures

12.11.24 During the Preparations for Quiescence phase there will be a requirement to backfill subsurface voids arising from the Proposed Works. Potential for this to be needed during the Final Site Clearance is also not ruled out. Some subsurface structure or drains may be retained on site permanently and following defueling and deplanting there is the potential for these to contain residual contamination.

12.11.25 Without adequate assessment and controls, there could be potential for site-won excavated materials or demolition materials used to backfill subsurface voids to create new contamination sources and pathways (e.g., crushed concrete in contact with rainfall or groundwater can result in highly alkaline leachate), or for residual contamination in subsurface structures to present a future land contamination risk.

12.11.26 Land contamination receptors with potential to be impacted by backfilling activities include groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer, surface water in the Clyde Estuary, surface water in the drainage ditch approximately 110m north of the Site, Southannan Sands SSSI, and property (on and offsite current and future buildings, and crops / livestock on the adjacent agricultural fields).

12.11.27 Where subsurface structures are known or suspected to contain residual contamination (radiological and / or non-radiological) suitable investigation work will be undertaken to characterise the material to enable a risk assessment to be undertaken to demonstrate that the material does not pose a significant risk to receptors or that it requires further remedial action.

12.11.28 The embedded measures (See **Table 12.7**) to ensure that adequate assessment of the suitability of materials used for backfilling include 11.12 and 11.14. The measures to ensure adequate investigation of residual contamination in sub-surface structures are 11.1, 11.3, 11.4, 11.13, and 11.14.

12.11.29 With the implementation of the embedded measures 11.1, 11.3, 11.4, 11.12, 11.13, and 11.14, the overall 'likelihood' of a pollutant linkage being created with the Proposed Works remains unchanged from that in the baseline. Therefore, the risks to the potential land contamination receptors from the Proposed Works will remain unchanged from the baseline and, therefore, the effect is **Negligible**, which is **Not Significant**.

A7[85]: Laydown and storage, including soil and material stockpiles

12.11.30 During the Preparations for Quiescence phase demolition materials will be generated by the Proposed Works and will need temporary storage, potentially as stockpiles or in skips

[84] See **Table 12.14** for full description of effects.
[85] See **Table 12.14** for full description of effects.

/ other containers prior to re-use on-site or exportation from site. Similar activities are likely to take place during the Final Site Clearance.

12.11.31 Stockpiling of demolition material will require the handling and stockpiling of materials which have potential to release contaminants as dust or via runoff / leaching, or by placement of materials onto previously uncontaminated ground surfaces.

12.11.32 Land contamination receptors with potential to be impacted by contaminants migrating from stockpiles include human health (site users, offsite land users), groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer, surface water in the Clyde Estuary, surface water in the drainage ditch approximately 110m north of the Site, Southannan Sands SSSI, and property (on and offsite current and future buildings, and crops / livestock on the adjacent agricultural fields).

12.11.33 The embedded measures (See **Table 12.7**) including 11.3, 11.4, 11.8, 11.9, 11.10, 11.11, 11.13, 11.14, 11.16 and 11.17 will all contribute to the careful management of material in stockpiles, lowering from risks to the environment.

12.11.34 With the implementation of these embedded measures, the overall 'likelihood' of a pollutant linkage being created with the Proposed Works remains unchanged from that in the baseline. Therefore, the risks to the potential land contamination receptors from the Proposed Works will remain unchanged from the baseline and, therefore, the effect is **Negligible** and **Not Significant**.

A8, A9 & A10[86]: Construction of sub-surface structures

12.11.35 During the Preparations for Quiescence phase ground works may include the construction of new sub-surface structures (such as new drainage connections or changes to existing drainage) and the creation of new buildings / hard surfaced areas. Similar activities are likely to take place during the Final Site Clearance.

12.11.36 Construction of new below ground structures such as drains could affect pre-existing contamination by changing the local hydrogeological regime and mobilising pre-existing contaminants if new contaminant migration pathways are created.

12.11.37 Land contamination receptors with potential to be impacted by changes in the subsurface include human health (site users, offsite land users), groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer, surface water in the Clyde Estuary, surface water in the drainage ditch approximately 110m north of the Site, Southannan Sands SSSI, and property (on and offsite current and future buildings, and crops / livestock on the adjacent agricultural fields).

12.11.38 The embedded measures (See **Table 12.7**) that will avoid or lower the potential for the Proposed Works to result in the mobilisation of pre-existing contaminants are 11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.8, 11.9, 11.12, 11.13 and 11.16.

12.11.39 With implementation of the embedded measures, the overall 'likelihood' of a pollutant linkage being realised with the Proposed Works remains unchanged from that in the baseline. Therefore, the risks to the potential land contamination receptors from the Proposed Works will remain unchanged from the baseline and, therefore, the effect is **Negligible** and **Not Significant**.

[86] See **Table 12.14** for full description of effects.

A11[87]: Removal of drains (active and non-active drainage)

12.11.40 Existing drains are largely to be retained for the Quiescence phase, however during the Preparations for Quiescence phase, it is likely that some existing drains will need to be decommissioned and potentially removed or capped. Changes to drainage systems may also be needed later in the Proposed Works, such as during maintenance for the Quiescence phase and during the Final Site Clearance.

12.11.41 Land contamination receptors with potential to be impacted by drainage works (and contaminants that may be released from drains) include human health (site users, offsite land users), groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer, surface water in the Clyde Estuary, surface water in the drainage ditch approximately 110m north of the Site, Southannan Sands SSSI, and property (on and offsite current and future buildings, and crops / livestock on the adjacent agricultural fields).

12.11.42 The key embedded measures (See **Table 12.7**) to lower the risk of contaminants present in drainage systems causing an impact to environmental receptors during changes to the existing drainage systems are 11.3, 11.4, 11.7, 11.8, 11.9, 11.10, 11.13 and 11.16.

12.11.43 With implementation of the embedded measures, the overall 'likelihood' of a pollutant linkage being realised with the Proposed Works remains unchanged from that in the baseline. Therefore, the risks to the potential land contamination receptors from the Proposed Works will remain unchanged from the baseline and, therefore, the effect is **Negligible** and **Not Significant**.

A12[88]: Pumping and dewatering schemes

12.11.44 During the Preparations for Quiescence phase excavations will be needed, and due to the relatively shallow water table at the Site dewatering of excavations is therefore likely to be required. Similar activities are likely to take place during the Final Site Clearance.

12.11.45 Dewatering during the Proposed Works will be subject to prior assessment to lower the risk of contaminant mobilisation as a result of dewatering. Where excavations are needed, the likely requirement for dewatering will be assessed as required, to enable suitable mitigation measures to be adopted during any dewatering activity to minimise potential for contaminant migration, and also to ensure compliance with water environment legislation in relation to discharges.

12.11.46 Land contamination receptors with potential to be impacted by pumping and dewatering works include human health (site users, offsite land users), groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer, surface water in the Clyde Estuary, surface water in the drainage ditch approximately 110m north of the Site, Southannan Sands SSSI, and property (on and offsite current and future buildings, and crops / livestock on the adjacent agricultural fields).

12.11.47 The embedded measures (See **Table 12.7**) to minimise the environmental risks associated with dewatering are 11.1, 11.2, 11.3, 11.8, 11.9, 11.13 and 11.18.

12.11.48 With implementation of the embedded measures, the overall 'likelihood' of a pollutant linkage being realised with the Proposed Works remains unchanged from that in the baseline. Therefore, the risks to the potential land contamination receptors from the Proposed Works will remain unchanged from the baseline and, therefore, the effect is **Negligible** and **Not Significant**.

[87] See **Table 12.14** for full description of effects.
[88] See **Table 12.14** for full description of effects.

A13[89]: Drilling/core slab drilling

12.11.49 During the Preparations for Quiescence phase existing hard surfaces may need to be drilled through, potential for this during Final Site Clearance is not ruled out.

12.11.50 Drilling through existing hard / impermeable structure has the potential to create new pathways for contaminants to migrate vertically downwards to reach the water table, where they may subsequently migrate via groundwater flow to surface waters.

12.11.51 Land contamination receptors with potential to be impacted by these works if contaminants are mobilised include human health (site users, offsite land users), groundwater in the superficial deposits and Kelly Burn Sandstone Formation aquifer, surface water in the Clyde Estuary, surface water in the drainage ditch approximately 110m north of the Site, Southannan Sands SSSI, and property (on and offsite current and future buildings, and crops / livestock on the adjacent agricultural fields).

12.11.52 The embedded measures (See **Table 12.7**) that will ensure adequate planning and management of drilling works to limit the potential for pollution incidents are 11.1, 11.2, 11.3, 11.5, 11.6, 11.7, 11.10, 11.11, 11.13, 11.16 and 11.18.

12.11.53 With implementation of the embedded measures, the overall 'likelihood' of a pollutant linkage being realised with the Proposed Works remains unchanged from that in the baseline. Therefore, the risks to the potential land contamination receptors from the Proposed Works will remain unchanged from the baseline and, therefore, the effect is **Negligible** and **Not Significant**.

12.12 Assessment of cumulative effects

Inter-project effects

12.12.1 There is the potential for soils, geology and hydrogeology effects associated with the Proposed Works to interact with, or combine with the effects arising from other developments or projects proposed within the relevant Zones of Influence applicable to each environmental aspect.

12.12.2 An assessment of inter-project effects is considered within in **Chapter 21: Cumulative Effects Assessment** of this ES.

Intra-project effects

12.12.3 A summary of the potential intra-project effects is provided in **Chapter 21: Cumulative Effects Assessment.**

[89] See **Table 12.14** for full description of effects.

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12.13 Summary of effects on land contamination receptors[90]

Phase of Proposed Works where effect may occur	Summary of Predicted Effect[91]	Receptors potentially affected	Magnitude of Change in the level of risk to receptors as a result of the Proposed Works	Significance	Summary of Rationale
Preparations for Quiescence, also Quiescence and Final Site Clearance	A1 & A2: Land quality ground investigations	R1, R2, R4, R6	Negligible	Not Significant	The embedded measures lowering the risk of a pollution incident impacting on environmental receptors during changes to the existing drainage systems are 11.3, 11.4, 11.7, 11.8, 11.9, 11.10, 11.13 and 11.16.
Preparations for Quiescence, also Quiescence and Final Site Clearance	A3: Leaks/spills of fuels and oils from plant and storage tanks during construction work	R1, R2, R3, R4, R6, R7	Negligible	Not Significant	The embedded measures that will reduce the probability of a pollution incident taking place are 11.8, 11.9, 11.10, 11.11, and 11.16.

[90] Receptors are defined as follows (see also, paragraph 12.9.5):
R1: human health (current and future site users, decommissioning workforce and adjacent land users),
R2: groundwater in the superficial deposits and made ground and groundwater in the Kelly Burn Sandstone Formation aquifer (bedrock),
R3: property (on and offsite current and future buildings, including buried services,
R4: agricultural property – crops / livestock on adjacent farmland to the north and east,
R5: property (coastal flora and fauna in the Clyde Estuary),
R6: surface water: unnamed surface water drainage ditch located approximately 110 m north, running 310 m west to discharge to the Clyde Estuary, surface water in the Clyde Estuary (coastal flora and fauna),
R7: ecologically sensitive sites (Southannan Sands SSSI).

[91] See **Table 12.14** for full description of effects.

Phase of Proposed Works where effect may occur	Summary of Predicted Effect[91]	Receptors potentially affected	Magnitude of Change in the level of risk to receptors as a result of the Proposed Works	Significance	Summary of Rationale
Preparations for Quiescence, also Quiescence and Final Site Clearance	A4 & A5: Removal of foundations/ floor slabs, road surfaces	R1, R2, R3, R4, R6, R7	Negligible	Not Significant	The embedded measures to ensure adequate characterisation of soil and groundwater conditions, and inform the design of remedial measures if needed, are 11.1, 11.2, 11.3, 11.4, 11.13 and 11.17.
Preparations for Quiescence, Final Site Clearance	A6: Backfilling subsurface voids and reuse of site-derived materials	R2, R3, R4, R6, R7	Negligible	Not Significant	The embedded measures to ensure adequate assessment of the suitability of materials used for backfilling are 11.3, 11.4, 11.12, 11.13, and 11.14,
Preparations for Quiescence, Final Site Clearance	A7: Laydown and storage, including soil and material stockpiles	R1, R2, R3, R4, R6, R7	Negligible	Not Significant	The embedded measures including 11.3, 11.4, 11.8, 11.9, 11.10, 11.11, 11.13, 11.14, 11.16 and 11.17 will all contribute to the careful management of material in stockpiles, lowering from risks to the environment.
Preparations for Quiescence, Final Site Clearance	A8, A9 & A10: Construction of sub-surface structures, concrete laying and movement of materials	R1, R2, R3, R4, R6, R7	Negligible	Not Significant	The embedded measures to avoid or lower the potential for the Proposed Works to result in the mobilisation of pre-existing contaminants are 11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.8, 11.9, 11.12, 11.13 and 11.16.

Phase of Proposed Works where effect may occur	Summary of Predicted Effect[91]	Receptors potentially affected	Magnitude of Change in the level of risk to receptors as a result of the Proposed Works	Significance	Summary of Rationale
Preparations for Quiescence, also Quiescence and Final Site Clearance	A11: Removal of drains (Active and non-active drainage)	R1, R2, R3, R4, R6, R7	Negligible	Not Significant	The embedded measures to lower the risk of a pollution incident relating to work on existing drainage systems are 11.3, 11.4, 11.7, 11.8, 11.9, 11.10, 11.13 and 11.16.
Preparations for Quiescence, Final Site Clearance	A12: Pumping and dewatering schemes	R1, R2, R3, R4, R6, R7	Negligible	Not Significant	The embedded measures to minimise environmental risks associated with dewatering are 11.1, 11.2, 11.3, 11.8, 11.9, 11.13 and 11.18.
Preparations for Quiescence, Final Site Clearance	A13: Drilling/core slab drilling	R1, R2, R3, R4, R6, R7	Negligible	Not Significant	The embedded measures to ensure adequate planning and management of drilling works to limit the potential for pollution incidents are 11.1, 11.2, 11.3, 11.5, 11.6, 11.7, 11.10, 11.11, 11.13, 11.16 and 11.18.

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13.

Historic Environment

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13. Historic Environment

13.1 Introduction

13.1.1 This chapter presents the assessment of the likely significant effects of the Proposed Works with respect to the historic environment. It describes the key receptors in the vicinity of the Indicative Dismantling Works Area (hereafter the 'Works Area'), inclusive of the Hunterston B Nuclear Site Licence Boundary (hereafter referred to as 'The Site') and considers the sensitivity of these receptors.

13.1.2 This chapter should be read in conjunction with the description of the Proposed Works as presented in **Chapter 2: The Decommissioning Process**, and **Chapter 14: Landscape and Visual Impact Assessment (LVIA)**.

13.2 Relevant legislation, policy and technical guidance

Legislation

13.2.1 The legislation presented in **Table 13.1** is relevant to the assessment of the effects on historic environment receptors. In summary, the relevance of Scottish legislation with respect to the assessment is through the registration of designated heritage assets (listed buildings, scheduled monuments, conservation areas); provision for the assessment of environmental effects of certain development proposals through the establishment of European Union (EU) Directive 2001/42/EC and its subsequent implementation in Scottish law and the establishment of a statutory consultation body in the form of Historic Environment Scotland (HES).

Table 13.1 Legislation relevant to historic environment

Legislation	Legislation Issue
Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997[1]	This Act covers the registration of Listed Buildings (buildings that are seen to be of special architectural or historic interest) and the designation of Conservation Areas (areas of special architectural or historic interest the character or appearance of which is desirable to preserve or enhance).
Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment[2]	This Directive aims to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development, by ensuring that, in accordance with this Directive, an environmental assessment is carried out of certain plans and programmes which are likely to have significant effects on the environment.

1 UK Government (1997). *Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997*. (Online) Available at: https://www.legislation.gov.uk/ukpga/1997/9/contents (Accessed November 2023)

2 European Parliament, Council of the European Union (2001). *Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment.*

Legislation	Legislation Issue
Environmental Assessment (Scotland) Act 2005[3]	This Act makes provision for the assessment of the environmental effects of certain plans and programmes, including plans and programmes to which Directive 2001/42/EC of the European Parliament and of the Council relates; and for connected purposes.
Ancient Monuments and Archaeological Areas Act 1979[4]	This Act sets out that sites considered to be of national importance are required to be compiled in a Schedule of Monuments. These sites are accorded statutory protection. Scheduled Monument Consent is required before any works are carried out which would have the effect of demolishing, destroying, damaging, removing, repairing, altering, adding to, flooding or covering up a Scheduled Ancient Monument. Scheduled monument protection is offered not only to the known structures and remains of a site but also to the soil under and around them to protect any archaeological interest. This Act also provided for the designation of Areas of Archaeological Interest in which statutory provisions for access to construction sites for carrying out archaeological works apply
Historic Environment Scotland Act 2014[5]	This Act establishes Historic Environment Scotland as the statutory consultation body for matters relating to the Historic Environment in Scotland and sets out its functions in pursuing the same.

Policy

13.2.2 National and local planning and development policies set out the requirements for assessment and preservation of the Historic Environment at the national and local governmental level. In the case of this assessment, they refer to requirements with respect to the avoidance of direct disturbance of archaeological remains and historic buildings, or adequate mitigation measures where this is not possible. In addition, the requirements note the importance of avoiding significant adverse effects on designated assets. This is in the case of both direct disturbance effects and through compromising the integrity of their setting.

13.2.3 A summary of the relevant policies is given in **Table 13.2.**

Table 13.2 Policy relevant to historic environment

Policy Reference	Policy Relevance
National Policy	
National Planning Framework 4 (NPF4)[6]	This planning framework covers the Historic Environment through Policy 7 (Historic Assets and Places). This notes in subsection (a) that development proposals with a potentially significant impact on heritage assets or places will be accompanied by assessment based on an understanding of the

Document 32001L0042. (Online) Available at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32001L0042 (Accessed November 2023).
[3] UK Government (2005). *Environmental Assessment (Scotland) Act 2005*. (Online) Available at: https://www.legislation.gov.uk/asp/2005/15/contents (Accessed November 2023).
[4] UK Government (1979). *Ancient Monuments and Archaeological Areas Act 1979.* (Online) Available at: https://www.legislation.gov.uk/ukpga/1979/46 (Accessed November 2023).
[5] UK Government (2014). *Historic Environment Scotland Act 2014*. (Online) Available at: https://www.legislation.gov.uk/asp/2014/19/pdfs/asp_20140019_en.pdf (Accessed November 2023).
[6] Scottish Government (2020) *National Planning Framework 4* (Online). Available at https://www.gov.scot/publications/national-planning-framework-4/ (Accessed November 2023)

Policy Reference	Policy Relevance
	cultural significance of the asset or place. Further, the assessment is required to identify likely visual or physical impacts of any proposals for change and to include cumulative effects, providing a sound basis for managing the impacts of change. Proposals should be informed by national policy and guidance on managing change in the Historic Environment, in addition to information held within Historic Environment Records (HERs). The effects of development on specific Historic Environment asset types are dealt with in subsequent subsections. Subsection (c) notes that development proposals affecting the setting of a listed building should preserve its character and special architectural or historic interest. This same principle is carried over for development proposals affecting conservation areas in subsection (d), scheduled monuments in subsection (h) and nationally important gardens and designed landscapes in subsection (i). Subsection 7(o) notes that non-designated heritage assets, places and their setting should be protected and preserved in situ wherever this is feasible. In the event of potential for non-designated buried archaeological remains to exist below a site, developers will provide an evaluation of the archaeological resource at an early stage so that planning authorities can assess impacts. In addition, non-designated historic buildings may also have archaeological significance which is not understood and may require assessment. The policy notes that where impact on such assets cannot be avoided they should be minimised. Where demonstrated that avoidance or retention is not possible, excavation, recording, analysis, archiving, publication and activities to provide public benefit may be required through the use of conditions or legal/planning obligations. Further, when new archaeological discoveries are made during the course of development works, they must be reported to the planning authority to enable agreement on appropriate inspection, recording and mitigation measures.
Historic Environment Policy for Scotland (HEPS)[7]	The Historic Environment Policy for Scotland informs this assessment through the policy positions that any decision affecting any part of the Historic Environment should be informed by an inclusive standing of its breadth and cultural significance (HEP1), that decisions affecting the Historic Environment should ensure that its understanding, enjoyment and benefits should be secured for present and future generations (HEP2) and that changes to specific assets and their context should be managed in a way that protects the Historic Environment, with opportunities for enhancement identified and the minimisation of detrimental impact where this cannot be avoided , through mitigation or the demonstrable exploration of alternatives (HEP4).
Local Policy	
North Ayrshire Adopted Local Development Plan[8]	This LDP focuses on development effects on specific Historic Environment asset types and their respective settings.

[7] Historic Environment Scotland (2019), *Historic Environment Policy for Scotland* (Online) Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=1bcfa7b1-28fb-4d4b-b1e6-aa2500f942e7 (Accessed November 2023).
[8] North Ayrshire Council (2019). *Adopted Local Development Plan, page 72*. (Online) Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed November 2023)

Policy Reference	Policy Relevance
	Policy 12 notes that any development proposals with potential to adversely affect the setting of a scheduled monument should only be granted in exceptional circumstances. Policy 13 notes that archaeological sites should be preserved in situ where possible and that proposals not preserving remains in situ will only be supported in the case of an overwhelming social, environmental or economic reason. Developers are expected to undertake appropriate excavation, recording, analysis, publication and archiving of the finds before and/or during development where in situ preservation cannot be achieved.

Technical guidance

13.2.4 A summary of the relevant technical guidance informing this chapter is given in **Table 13.3**.

Table 13.3 Technical guidance relevant to historic environment

Technical Guidance	Context
Designation Policy and Selection Guidance[9]	Sets out the policy and selection guidance used by Historic Environment Scotland when designating historic sites and places at the national level.
Managing Change in the Historic Environment[10] **– Setting**	Sets out guidance on managing change within the settings of heritage assets.
Managing Change in the Historic Environment – Engineering Structures[11]	Sets out the principles that apply to alterations to structures and works of civil engineering.
Standard and guidance for the archaeological investigation and recording of standing buildings or structures[12]	Sets out standards for archaeological building investigation and recording to establish the character, history, dating, form and archaeological development of a specified building, structure, or complex and its setting.
Standard and guidance for commissioning work or providing consultancy advice on archaeology and the Historic Environment[13]	Sets out standards for the provision of consultancy advice in the Historic Environment.

[9] Historic Environment Scotland (2019). *Designation Policy and Selection Guidance*. (Online) Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=8d8bbaeb-ce5a-46c1-a558-aa2500ff7d3b (Accessed November 2023).
[10] Historic Environment Scotland (2015). *Managing Change in the Historic Environment – Setting*. (online). Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationid=80b7c0a0-584b-4625-b1fd-a60b009c2549 (Accessed November 2023)
[11] Historic Scotland (2010). *Managing Change in the Historic Environment – Engineering Structures*. (Online) Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=7cb16af4-2d3a-4cef-8e8c-a60b008e8271 (Accessed November 2023)
[12] Chartered Institute for Archaeologists (CIfA), (2019). *Standard and guidance for the archaeological investigation and recording of standing buildings or structures*. (Online) Available at: https://www.archaeologists.net/sites/default/files/CIfAS%26GBuildings_3.pdf (Accessed November 2023)
[13] CIfA, (2014). *Standard and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment*. (Online) Available at: https://www.archaeologists.net/sites/default/files/CIfAS&GCommissioning_1.pdf (Accessed November 2023)

Technical Guidance	Context
Standard and guidance for Historic Environment desk-based assessment[14]	Sets out standards for the production of archaeological desk-based assessments.

13.3 Data gathering methodology

Study Area

13.3.1 The Study Area for this historic environment assessment has been set as a 5 km radius from the Works Area boundary. This has been derived in accordance with best practice through the application of a Preliminary Zone of Theoretical Visibility (ZTV) presented at the EIA Scoping Report stage and informed by professional judgement; see **Figure 13.1,** in order to identify designated assets which could be affected by a change in their settings. This assessment considers designated and non-designated heritage assets within and directly surrounding the Nuclear Site Licence boundary (hereafter referred to as 'the Site'), as well as designated heritage assets within the Study Area.

13.3.2 There are no designated heritage assets within the Site. Designated heritage assets are statutorily protected and include listed buildings, scheduled monuments, registered park and gardens and conservation areas, examples of which are present within the 5 km Study Area. Non-designated heritage assets can include artefacts, sites of archaeological interest or surviving structures and man-made features within the landscape that are of historic interest, but are not statutorily protected. Known non-designated heritage assets are recorded on the West of Scotland Archaeology Service Historic Environment Record within the Site and Study Area.

Desk study

13.3.3 The EIA desk study has been undertaken with reference to the guidance set out in **Section 13.2**, supported by a number of data sources. The principal data sources which were used to inform the desk study presented in this chapter comprise:

- West of Scotland Archaeology Service Historic Environment Record (WoSAS HER);
- Canmore (archaeological records, supplementary to WoSAS and HES data, not reproduced for illustration) – data obtained for an area of 5 km from the Works Area boundary;
- Historic Mapping and further information available through the National Library of Scotland;
- British Geological Survey (BGS) Mapping; and
- Observations made during the site survey of 31 August 2021 (see paragraphs 13.3.6 and 13.3.7 below for further details).

13.3.4 The WoSAS HER includes a list of assets provisionally identified by WoSAS as being of potential national importance and this is referred to as the Non-Statutory Register (NSR). Whilst these have been provisionally identified, it is understood that they have not been formally reviewed against designation criteria and they are not designated assets. Assets

[14] CIfA, (2017). *Standard and guidance for historic environment desk-based assessment*. (Online) Available at: https://www.archaeologists.net/sites/default/files/CIfAS%26GDBA_4.pdf (Accessed November 2023)

recorded on the NSR within the 5 km Study Area were reviewed as part of this assessment.

13.3.5 In response to a specific point in the ONR Pre-application Opinion (see **Appendix 5A**; Section 3.3, paragraph 125), for further consideration of '*marine archaeology and shipwrecks',* **Appendix 5B** (Section 2) presents the marine archaeology baseline assessment within a Study Area of 3 km from the HNB shoreline. The technical note concludes that no significant historic environment impacts are anticipated based on the baseline assessment and therefore no further assessment is required. Nonetheless, to ensure that unforeseen marine archaeological remains can be appropriately identified and recorded if they are encountered during the Proposed Works, a Protocol for Archaeological Discovery (PAD) setting out the approach to the reporting and subsequent treatment of unexpected archaeological discoveries should be in place during the Proposed Works within the marine environment. The PAD is included as an embedded measure in **Table 13.5** and will be secured via the Environmental Management Plan (EMP).

Survey work

13.3.6 A site visit was undertaken on 31 August 2021 to survey the buildings at the Site[15]. The Site was surveyed, with the exclusion of restricted areas that would require specific health and safety permits or training to enable entry. The exclusion of these areas had no impact on the adequacy of the survey required to support this assessment, as no relevant assets had been identified therein.

13.3.7 Using information from the preliminary ZTV which is a digitally-generated tool for the identification of development visibility focussing, in this case, on elements of the Safestore structure on a bare earth model, see **Chapter 14: Landscape and Visual Impact Assessment**, designated heritage assets within the Study Area (excluding those on Little Cumbrae which could not be accessed), were visited at the same time, and intervisibility between the Site and these features assessed. NSR features and non-designated archaeological features recorded by WoSAS as being of potential national importance, were not raised as specific receptors to be considered through pre-application consultation and were not visited during this survey.

Data limitations

13.3.8 Non-designated record data was obtained for the Study Area from WoSAS HER in April 2023. This has been refined to a 500 m buffer around the Works Area boundary for data that may feed into an assessment of effects which may arise from direct disturbance. Records formally associated with potential or almost certain national importance have been retained in the 5 km Study Area, although it is acknowledged that it cannot necessarily be assumed that all sites without the associated values within the dataset are necessarily of low importance. As part of the EIA scoping a review of assets whose settings could potentially be affected adversely by the Proposed Work was undertaken, as described in the EIA Scoping Report, and this did not identify any non-designated assets. This was not challenged by WoSAS at the scoping stage and as such no non-designated assets have been assessed for effects through change to setting. This is noted in **Section 13.9**.

[15] Wood Group UK Ltd, (2021). *Decommissioning Hunterston B Historic Environment Survey Report*, ref 807184-WOOD-XX-XX-RP-O-00003_S0_P01

13.4 Consultation

Overview

Pre-application Opinion

13.4.1 A Pre-application Opinion was adopted by the Office for Nuclear Regulation (ONR) on 04 October 2022, which included a consultation response from HES. A summary of the relevant responses received in the Pre-application Opinion in relation to historic environment and confirmation of how these have been addressed within the assessment is presented in **Table 13.4**.

Table 13.4 Summary of Pre-application Opinion responses

Paragraph Ref.	Consideration	How addressed in the ES
	Historic Environment Scotland stated that they were content with the proposed scope and assessment methodology presented in the 'Historic Environment' chapter of the scoping report, including agreement to the list of designated heritage assets in paragraph 12.6.11, recognising that those assets are the most likely to be impacted by the Proposed Works.	Noted, **Section 13.9** presents the scope of the assessment and **Section 13.10** presents the assessment of effects.
Appendix 3	The ONR report references general comments from consultees on the Scoping Report (Appendix 3). This includes a point being noted that the heritage assets highlighted in the Scoping Report were the most likely to be impacted by the Proposed Works.	Noted, **Section 13.9** presents the scope of the assessment and **Section 13.10** presents the assessment of effects.
125	Other considerations: There are some potential topics that do not appear to have been considered (or considered sufficiently) in the scoping report. These include: • Marine archaeology and shipwrecks.	Marine archaeology and shipwrecks are considered in the Pre-application Opinion Technical Note provided to the ONR (see **Appendix 5B**) and have subsequently been scoped out for further assessment.

Technical engagement

13.4.2 Preliminary technical engagement with the Nuclear Decommissioning Authority (NDA) occurred in 2021, to focus on the development of guidance for the historic environment and decommissioning of nuclear power stations. Engagement with North Ayrshire Council (NAC) was undertaken in June 2021 to discuss the scope of this assessment.

13.4.3 Informal engagement with WoSAS indicated that WoSAS considers monuments recorded on their NSR to be potentially nationally important. As described in **Table 13.9**, there is no potential for these assets to be subject to significant effects from the Proposed Works.

13.4.4 A targeted stakeholder meeting was held with Historic Environment Scotland (HES) on 08 November 2023. The meeting covered a project update, including information on the decommissioning process. The assessment methodologies, draft findings, proposed

environmental measures and an overall summary of the technical assessment conclusions were presented for this historic environment assessment.

13.5 Overall baseline

Current baseline

Location, topography and geology

13.5.1 HNB is set on the west coast of North Ayrshire, approximately 1.6 km west of the A78. The majority of the Site is occupied by built structures and hard standing (mainly access roads and car parks). The Site is bounded by agricultural land (pasture) to the north, east and south, with the decommissioned Hunterston A (HNA) to the south-west.

13.5.2 The topography of the Site is relatively level, situated on a coastal plain area north and west of two steep hills: Campbelton Hill and Goldenberry Hill. The Site's ground level varies from c. 5.0 m above Ordnance Datum (AOD) in the north to 25.0 m AOD in the south[16].

13.5.3 The bedrock geology underlying the Site comprises the Kelly Burn Sandstone Formation. This is Sedimentary bedrock formed between 382.7 and 358.9 million years ago during the Devonian period. This is overlain by Raised Marine Deposits of Holocene Age - Clay, silt, sand and gravel. This is a sedimentary superficial deposit formed between approximately 11,800 years ago and the present during the Quaternary period.[17]

Designated heritage assets

13.5.4 There are no designated heritage assets within the Works Area. Approximately 1.7km southeast of the Works Area is the scheduled monument, Castle Knowe (SM3694). The monument comprises a subcircular, grass-covered earthen mound within the field described in the scheduling entry as a "motte", interpreted in prior investigations as both a medieval fortification and prehistoric burial monument. Within the wider 5 km Study Area there are six other scheduled monuments listed in **Appendix 13A, Table A.2** and shown in **Figure 13.1**.

13.5.5 The closest listed buildings to the Works Area are over 400 m distant and as such any potential risks to these assets would be a result of visual or audible change in their settings. The listed buildings within the Study Area consist of a variety of structures ranging from isolated farmhouses and religious structures through to urban developments and manor houses listed in **Appendix 13A, Table A.1** and shown in **Figure 13.1**.

13.5.6 Two Conservation Areas are located within the 5 km Study Area as listed in **Appendix 13A, Table A.4** and shown in **Figure 13.1**. These are West Kilbride Conservation Area, which is located over 3.6 km south-east of the Works Area and Millport Conservation Area, located 2.9 km north-west of the Works Area across the Firth of Clyde. The Site is not perceptible from the West Kilbride Conservation Area but appears in views across the water from the Millport Conservation Area.

[16] Topographic Map (n.d.) *Topographic Map*. (Online). Available at: https://en-gb.topographic-map.com/.(Accessed November 2023)
[17] BGS (2023) *Geology Viewer*. (Online). Available at: https://geologyviewer.bgs.ac.uk/ (Accessed November 2023)

Non-Designated heritage records and previous investigations

13.5.7 There are seven non-designated heritage records located within the Works Area boundary. These are included in the chronology summary described below and comprise the following:

- A non-designated designed landscape associated with Hunterston House, recorded from historic mapping by WoSAS (the part of the landscape within the Works Area and Site boundary has been built over by HNA and HNB);
- Stoney Port/Hunterston, Landing Point (HER55532)
- Hunterston B Power Station/Hunterston Nuclear Generating Station (HER14108);
- Fences, Cinerary Urn, bead (findspot) (HER5235);
- Hunterston Nuclear Generating Stations/Hunterston Power Station (HER5244);
- Hunterston, Pier/Fairlie Roads, Pier (HER55535); and
- Stoney Port, Limekiln (HER66202).

13.5.8 Parts of the northern and southern fringe of the Works Area were investigated as part of the Firth of Clyde Coastal Zone Assessment Survey[18]. This desk-based and walkover survey did not include the Site itself, although it did involve a visit to the locations of Hawking Craig (HER5248).

13.5.9 A further 18 non-designated heritage records are located within a 500 m radius of the Works Area (**Appendix 13B, Table B.1**).

13.5.10 Within the 5 km Study Area, 11 records are of non-designated monuments included in the NSR as they have been provisionally identified by WoSAS to be of potential national importance (listed in **Appendix 13B, Table B.2** and illustrated in **Figure 13.1**). None of these are located within the 500 m radius of the Works Area.

Chronology

Prehistoric

13.5.11 The earliest evidence for human settlement and activity in or around the Site comprise two chance find records, both associated with an old farmstead named Fences (demolished during the construction of HNB). Immediately south-east of the Site boundary, some Mesolithic flints were recorded on land associated with Fences farm (HER5234)[19]. A cinerary urn was recorded at Fences farm, located in WoSAS HER's data within the Site (HER5253). This was inverted over a cremation on top of a few pebbles and contained a single discoidal bead of lignite or shale.[20]

13.5.12 Relatively recent archaeological investigations in the immediate surroundings south-east of the Site, within 200 m of the Works Area boundary, have recorded evidence for prehistoric activity in the form of artefacts and more substantial remains indicating later settlement. In July 2013, an archaeological evaluation (HER5359) recorded a series of stakeholes, taken as evidence for the former presence of timber structures, collectively an unenclosed settlement. This was tentatively dated to the Iron Age based on pottery

[18] Glasgow University Archaeological Research Division (GUARD), (2003). *Coastal Zone Assessment Survey, Firth of Clyde, Project 1309: A desk-based and walkover assessment carried out on behalf of Historic Scotland, Firth of Clyde Forum and the SCAPE Trust*
[19] Council for British Archaeology (1976). *'Small finds', Discovery and Excavation in Scotland, 1976,* pp.66-78.
[20] Morrison, A (1968), *'Cinerary urns and pygmy vessels in South-West Scotland', Trans Dumfriesshire Galloway Natur Hist Antiq Soc, Vol 45, 1967-8,* pp.80-140.

recorded in a hearth feature[21]. A second phase of evaluation (HER5359) recorded further timber structures indicative of an unenclosed Iron Age settlement[22]. A strip, map and sample investigation (HER5407) in 2014 recorded further pits and post holes of potential prehistoric date due to the recovery of prehistoric pottery and flint sherds from these features[23], in addition to evidence for prehistoric metalworking (HER5405) 80 m south-east of the Site [24]. A further phase of strip, map and sample with associated evaluation trenches (HER5582) recorded an apparent oval-shaped prehistoric dwelling, in addition to an area of apparent low-intensity industrial activity that may have been associated with the industrial area noted above[25].

13.5.13 The form of settlement indicated by the investigations described above appears in contrast to the known settlement evidence of the prehistoric periods in this part of Ayrshire. The earliest phases of the scheduled Auld Hill Fort (SM2175), located 1.4 km south of the Site, are associated with the late Bronze-early Iron Age.

Early historic to medieval

13.5.14 There is one record pertaining to these periods located immediately adjacent to, though outwith the Works Area. At the southern extremity, the former location of a cairn, associated in local tradition with a skirmish shortly before the battle of Larg in 1263, is recorded in the HER though no trace of this feature remains extant (HER5248).

13.5.15 The first phase of archaeological evaluation works associated with the Hunterston substation and Western High Voltage Direct Current (WHVDC) Converter Station, immediately south of the Site, recorded a rectilinear enclosure that may be of medieval date, due to an associated potsherd of 11th-13th century date[21].

13.5.16 A record of note in the immediate surroundings of the Works Area, 90 m to the south of the Works Area boundary, is the findspot (the location at which an archaeological item, or items are found) associated with the Hunterston Brooch (HER5247), an artefact discovered in 1826 or 1830 and now forms part of the National Museum of Scotland's collection. The brooch is a fine example of early Celtic craftwork and is of solid sliver, mounted with gold and ornamented with gold filigree and amber. An inscription in Scandinavian runes on the back records its later ownership by Melbrigda. It was probably made around 700AD at a royal centre such as Dunadd, Argyll[26]. Western Scotland is considered likely as its point of origin given the style of the brooch has Irish parallels, while the filigree resembles metalwork from England. In western Scotland the two traditions were joined, though the brooch was perhaps crafted in Ireland by a craftsman trained in foreign techniques[27].

13.5.17 Known settlements in the Study Area associated with the medieval period are generally characterised by fortified, dwellings frequently sited strategically upland or with reference to the Firth of Clyde. The scheduled monument at Auld Hill (SM2175) has, through

[21] Rathmell Archaeology, (2013a). *Hunterston Convertor and Substation, West Kilbride, North Ayrshire: Archaeological Mitigation Data Structure Report,* report ref RA12026
[22] Rathmell Archaeology, (2013b). *Hunterston Convertor and Substation, West Kilbride, North Ayrshire: Archaeological Mitigation Data Structure Report: Addendum*, report ref RA12026,
[23] Rathmell Archaeology, (2014a). *Hunterston Convertor and Substation, West Kilbride, North Ayrshire: Strip Map Sample Data Structure Report: Addendum*, report ref RA12026, 54
[24] Rathmell Archaeology, (2014b). *Archaeological Mitigation, Area B: Hunterston East Substation, West Kilbride, North Ayrshire*
[25] Rathmell Archaeology, (2014c). *Hunterston Convertor and Substation, West Kilbride, North Ayrshire: Archaeological Mitigation Data Structure Report: Addendum*, report ref RA14026, 32
[26] National Museum Scotland (2023). *Hunterston Brooch*. (Online). Available at: https://www.nms.ac.uk/explore-our-collections/stories/scottish-history-and-archaeology/hunterston-brooch/ (Accessed November 2023).
[27] National Museum Scotland (2023). *Hunterston Brooch Record*. (Online). Available at: http://nms.scran.ac.uk/database/record.php?usi=000-100-036-198-C&scache=1onu1712h9&searchdb=scran (Accessed November 2023).

previous archaeological investigation, yielded phases of fortified occupation from the 12th to 14th centuries, likely reflecting a repurposing of previous later prehistoric fortification. Little Cumbrae Castle (SM2195), 2.3 km west of the Works Area boundary is recorded with associations as early as the 14th century though the surviving keep structure is of 16th century date[28]. The Category A-listed Hunterston Castle 540 m east of the Works Area boundary (LB14313) sits at the heart of a historic estate first granted to the Hunter clan in the 12th century and the oldest section of the standing structure being of 15th /16th century date, likely on the former location of older structures.

Postmedieval

13.5.18 There are three records pertaining to this period located within the Works Area. The former location of a lime kiln is visible on 1st edition Ordnance Survey mapping at Stoney Port (HER66202) at the north-western extent of the Works Area, in addition to the Stoney Port landing point itself being visible in 19th century mapping and included in a gazetteer of historic Ayrshire harbours[29].

13.5.19 Moving into the postmedieval period the Hunter Estate underwent changes, with the marsh previously surrounding the castle drained to enable arable farming, the laying out of a designed landscape in the 18th century and the construction of the Category B-listed Hunterston House, supplanting the Castle, completed in 1799. The Site is likely to have mostly been cultivated fields during the early historic to postmedieval periods, with Historic Scotland's Historic Landuse Assessment project characterising the land immediately around the Site during the postmedieval period as rectilinear fields and farms. Postmedieval remains associated with agriculture have been recorded in the programme of investigation south of the Site, which would support this. The Site appears as arable land in historic Ordnance Survey mapping dated prior to the construction of the Hunterston facilities.

Modern period

13.5.20 Within the Works Area, the power stations themselves are identified within the WoSAS HER (HER14108 for HNB and HER5244 covering both generating stations). The HNA power station is identified immediately west of the Works Area under entry HER13466.

13.5.21 Construction of the HNA power station began in 1957, with the facility opened in 1964.

13.5.22 Construction of the HNB power station began in 1967, with generation beginning in 1976. HNB was one of the earliest Advanced Gas-cooled Reactors (AGR) to generate electricity to the grid in the UK [30].

Future baseline

13.5.23 Changes over time within the Study Area may occur which could change the settings of nearby heritage assets and could affect the perceptual presence of the Proposed Works in the settings of those heritage assets. This change could arise through natural processes (e.g. the maturity of woodlands) or due to human activity, land use change, management or neglect, meaning that it is not possible to make detailed predictions as to the nature of this change over the extended timescales that apply to the Proposed Works. As a result, the effects of the Proposed Works on heritage assets during all phases will be

[28] Humberts Leisure, (2006). *The Island of Little Cumbrae*, freehold sale brochure. Humberts Leisure; London.
[29] Graham, A, (1984). *Old Ayrshire harbours*, Ayrshire Archaeological and Natural History Society; Ayr.
[30] EDF Energy (2023). *Hunterston B power station* (online). Available at: https://www.edfenergy.com/energy/power-stations/hunterston-b (Accessed July 2023)

considered against the existing baseline except where significant change can reasonably be predicted.

13.6 Embedded environmental and good practice measures

13.6.1 **Table 13.5** outlines the embedded and good practice environmental measures proposed to reduce the potential for historic environment effects.

Table 13.5 Summary of embedded environmental measures

Embedded Measure	Compliance Mechanism	Embedded measure / good practice
A written scheme of building recording works for the Preparations for Quiescence phase, to be agreed with the WoSAS Archaeologist. **This scheme would allow for the identification and recording of buildings within the Site prior to Preparations for Quiescence phase, providing mitigation for adverse effects resulting from the loss of buildings with historic interest.**	Component of the EMP.	Embedded measure
A Protocol for Archaeological Discovery (PAD) is to be in place during the Proposed Works in the marine environment, to set out the approach to the reporting and subsequent treatment of unexpected archaeological discoveries.	Component of the EMP.	Embedded measure

13.7 Assessment methodology

13.7.1 The proposed generic project-wide approach to the assessment methodology is set out in **Chapter 5: The EIA Process**, and specifically in **Section 5.3** and **Section 5.4**. However, whilst this has informed the approach that has been used in this historic environment chapter, it is necessary to set out how this methodology will be applied, and adapted as appropriate, to address the specific needs of the historic environment assessment in the Environmental Statement (ES).

General approach

Determination of significance

13.7.2 The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (EIADR)[31] recognise that development proposals will affect different environmental elements to differing degrees, and that not all of these are of sufficient concern to warrant detailed investigation or assessment through the EIA process. The EIADR identifies those environmental resources that warrant investigation as those that are "*likely to be significantly affected by the development*".

13.7.3 The EIADR does not define significance of an effect and it is necessary to state how this will be defined for the EIA. The significance of an effect resulting from construction,

[31] Office for Nuclear Regulation, (1999). *Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations (EIADR)*. (Online). Available at: https://www.onr.org.uk/eiadr.htm (Accessed July 2023)

operation or dismantling of a development is most commonly assessed by reference to the importance of a receptor and the magnitude of the effect upon it. This approach provides a mechanism for identifying areas where mitigation measures may be required and to identify the most appropriate measures to alleviate the risk presented by the development.

13.7.4 **Table 13.6** details the basis for assessing receptor importance. The rationale is predominantly based on information provided within NPF4 and HEPS. Note that categorisation of those assets which are of less than national importance generally relies on professional judgement and where relevant, the policy context set out in **Table 13.2** and the relevant technical guidance set out in **Table 13.2**.

Table 13.6 Establishing the importance of receptors

Importance	Receptor type	Sensitivity
High	Designated heritage assets including Scheduled Monuments, Category A listed buildings, Inventory Battlefields and Designed Landscapes in addition to non-designated sites and monuments which are demonstrably of national importance.	These assets are considered highly sensitive due to their national importance, and it is possible that low-moderate impacts upon these assets or their settings could lead to significant effects.
Medium	Category B and C Listed Buildings, Conservation Areas, parks and historic landscapes recognised by local and regional designations and non-designated sites and monuments of regional importance.	These assets are best seen as of regional or more than local importance and their sensitivity will largely depend upon their current setting and their character. It is possible that moderate-high impacts upon these assets or their settings could lead to significant effects.
Low	Non-designated assets of local importance	These include assets of local interest, some of which no longer survive and may have limited potential for survival of archaeological material. Although these assets must be considered and mitigation may be required, significant effects are only likely if the assets were to be predominantly or totally destroyed as a result of the Proposed Works.
Negligible	Historic features of note but which cannot be considered heritage assets in their own right.	Due to its nature of form / condition / survival, the feature cannot be considered an asset in its own right, but may inform the EIA or suggest the potential for further remains (e.g. non-extant HER record, chance find, record of recorded feature that cannot be located).

13.7.5 Magnitude of change is a measure of the extent to which the significance of an asset would be disturbed or lost.

13.7.6 In respect of buried archaeological deposits, where no remains are visible above ground, this would arise from disturbance or removal of archaeological material. Loss, damage or alteration of a structure would not only affect architectural value but could also result in the loss of elements valued for their archaeological potential or historic associations.

13.7.7 The setting of any particular asset is unique and may comprise both tangible and intangible aspects of the assets' context which contribute to how they may be understood,

appreciated and experienced. The effects of change in the setting of a heritage asset depend on the contribution of that setting to the significance of the asset, and assessments must be, by their nature, specific to the individual assets being considered.

13.7.8 The magnitude of change (or impact) is based on the extent to which the significance of an asset is affected, which can be influenced by a number of factors.

13.7.9 **Table 13.7** details the basis for assessing magnitude of change:

- the permanence of the impact (temporary, permanent or reversible);
- changes caused by the impact (both positive and negative relating to differing degrees of adverse or beneficial effect); and
- the extent or aspect of the heritage asset or its setting that would be affected (for example, the whole or a very small part) and the contribution of that part to the historic value of the asset.

Table 13.7 Establishing the magnitude of change

Magnitude	Criteria (Adverse)	Criteria (Beneficial)
High	Total or substantial demolition / disturbance of a heritage asset, or disassociation of an asset from its setting.	Sympathetic restoration of an at-risk or otherwise degraded heritage asset and/or its setting. Bringing an at-risk heritage asset into sustainable use, with robust long-term management secured.
Medium	Partial disturbance or inappropriate alteration of a heritage asset. Change to the key characteristics of a heritage asset's setting, which affects the importance of the asset, but which still allows its cultural significance to be appreciated.	Appropriate stabilisation and/or enhancement of a heritage asset and/or its setting that better reveal the significance of the asset or contribute to a long-term sustainable use or management regime.
Low	Minor loss to or alteration of an asset which leave its current importance largely intact. Minor and short-term changes to setting which do not affect the key characteristics and in which the historical context remains substantially intact.	Minor enhancements to a heritage asset and/or its setting that better reveal its significance or contribute to sustainable use and management.
Negligible	Minor alteration of an asset which does not discernibly affect its importance. Minor and short term or reversible change to setting which do not affect the asset.	Minor alteration of an asset which does not affect its significance in any discernible way. Minor and/or short-term or reversible change to setting which does not affect the significance of the asset.

13.7.10 The significance evaluation matrix illustrates the determination of effects as significant or not significant based on the magnitude of change and the sensitivity of the receptor. This is presented below in **Table 13.8**.

Table 13.8 Significance evaluation matrix

Receptor Importance	Magnitude of change: High	Medium	Low	Negligible
High	Major beneficial/ adverse (Significant)	Major beneficial/ adverse (Significant)	Moderate beneficial/adverse (Significant)	Minor beneficial/ adverse (Not significant)
Medium	Major beneficial/ adverse (Significant)	Moderate beneficial/ adverse (Significant)	Minor beneficial/adverse (Not significant)	Minor beneficial/ adverse (Not significant)
Low	Moderate beneficial/ adverse (Significant)	Minor beneficial/ adverse (Not significant)	Minor beneficial/adverse (Not significant)	Minor beneficial/ adverse (Not significant)
Negligible	Minor beneficial/ adverse (Not significant)	Minor beneficial/ adverse (Not significant)	Minor beneficial/adverse (Not significant)	Minor beneficial/ adverse (Not significant)

13.8 Assumptions and limitations

13.8.1 As access to the privately owned Little Cumbrae Island is limited to private charter tours, the designated heritage assets at Little Cumbrae Island have been assessed with reference to readily available information about the assets**.** The data representing designated heritage assets and non-designated heritage records presented in this chapter represents records held at the point in time in which it was obtained. The site survey that informed the baseline assessment represented a point-in-time site attendance of August 2021 but is considered to provide a representative example of the Site in the context of designated assets.

13.9 Scope of the assessment

Study Area

13.9.1 The primary Study Area for the historic environment assessment includes a buffer distance of 5 km from the Works Area for designated assets (assessed for indirect effects arising through change to setting as shown in **Figure 13.1**), with a smaller Study Area of 500 m intended for non-designated assets.

13.9.2 The temporal scope of the assessment of historic environment effects is consistent with the period over which the Proposed Works would be carried out. This is distinguished by three phases: the Preparations for Quiescence, Quiescence and Final Site Clearance phases of the Proposed Works. Both the Preparation for Quiescence and Quiescence phases are time-limited in terms of their effects, with detail on the temporal scope and activities undertaken during each phase provided in **Section 2.3**.

13.9.3 The Safestore installation, building demolition and site clearance activities during the Preparations for Quiescence phase, would result in effects related to moving plant, associated visual and audible effects and the removal of standing structures. The effects of the Quiescence phase are predominantly visual and relate to the retention of the Safestore structure. The effects of Final Site Clearance (mobilisation and operation of moving plant on Site in the process of Safestore demolition) would bear effects during the relevant activities. At the closure of the Final Site Clearance phase (the removal of the Safestore structure and return of the former facility to brownfield status), the effects would be permanent.

13.9.4 The assessment of indirect effects arising through change to setting refers to the **Chapter 14: Landscape and Visual Impact Assessment.**

Potential receptors

13.9.5 Receptors that were considered at the EIA Scoping stage and their potential relevance for further assessment in this ES chapter are summarised in **Table 13.9**.

Table 13.9 Receptor assessment considerations

Receptor	Reason for consideration
Non-designated buried heritage assets within the Works Area	The current baseline suggests no potential for buried remains as construction of the existing power station buildings would have removed below ground deposits of potential archaeological interest. While the baseline conditions informing broader archaeological potential within the surroundings of the Works Area are set out in **Section 13.5**, such remains are not taken forward for assessment of effects. The Proposed Works would not give rise to loss of archaeological remains.
Marine archaeology	Addressed in the technical note concerning assumptions for works in the marine environment. This concluded that, while no historic environment impacts are anticipated, a PAD setting out the approach to the reporting and subsequent treatment of unexpected archaeological discoveries should be in place during the Proposed Works that are offshore (See Technical Note **Appendix 5B**).
Non-designated built heritage assets	The Proposed Works will give rise to loss of structures of limited interest for their place in the history of nuclear power generation by demolition of HNB.
Non-designated heritage assets recorded by WoSAS on the Non-Statutory Register (NSR)	NSR sites within the 5 km Study Area have been reviewed and due to a combination of distance and lack of visibility it is concluded that there is no potential for significant effects on any of these as a result of changes to their settings. Furthermore, while the "potentially nationally important" status as assigned to these assets by WoSAS may point to high importance in some cases following examination, this is not guaranteed as they are variable in condition and they have not been designated as such.
Designated heritage assets	Change to setting arising from visibility of or noise associated with the Proposed Works could affect the setting of those assets within the Study Area identified at paragraph 12.6.11 of the Scoping Report and paragraph 13.9.6 below, as agreed with HES.

13.9.6 The designated historic environment receptors that are carried forward for assessment include:

- Castle Knowe, Motte (Designation Ref: SM3694);
- The Category C listed Robertson Building, Millport Field Centre (Designation Ref: LB52288);
- The Millport Conservation Area and its associated listed buildings along the south coast of Great Cumbrae;
- Hunterston House (Designation Ref: LB14286);
- Hunterston Castle (Designation Ref: LB41313);
- Hunterston walled garden (Designation Ref: LB14288);
- The scheduled Little Cumbrae Lighthouse (Designation Ref: SM418); and
- The scheduled Little Cumbrae Castle (Designation Ref: SM2195).

Likely significant effects

13.9.7 The likely significant historic environment effects that have been taken forward for assessment in this ES are summarised in **Table 13.10**.

Table 13.10 Likely significant historic environment effects

Phase of Works	Receptor	Likely significant effects
Preparations for Quiescence phase	**Non-designated buildings of historic interest at HNB power station.** **Designated heritage assets.**	Alteration and/or concealment of power station structures. Demolition of buildings that may be considered historically or architecturally important. Change in views from surrounding assets occurring from the construction of the Safestore and demolition of uncontaminated buildings. Change of how an asset in close proximity is experienced due to noise associated with demolition and increased traffic.
Quiescence phase	**Designated heritage assets.**	The Safestore may appear in key views of and from surrounding assets.
Final Site Clearance phase	**Designated heritage assets.** **Non-designated buildings of historic interest at HNB power station**	Works to dismantle and remove the Safestore structure may change how an asset in close proximity is experienced due to noise and traffic associated with on-site works. Demolition of buildings that may be considered historically or architecturally important.

Phase of Works	Receptor	Likely significant effects
End of Final Site Clearance	**Designated heritage assets** **Non-designated buildings of historic interest at HNB power station**	Full removal of a visual element forming part of the existing setting of receptors.

13.10 Assessment of effects

Effects arising through disturbance (Preparations for Quiescence phase)

HNB buildings

13.10.1 The majority of the buildings at HNB are the original constructions of the 1960s and 1970s, interspersed with newer additions, replacements and cabins across the Site. HNB is considered to be a historic asset of **low** importance because of:

- Architectural interest: HNB is an example of power station architecture of the late 1960s and can be compared in its architectural treatment and functional layout with later coal-fired power stations of similar age and with earlier and later generations of nuclear power stations. The AGR plants and their associated landscaping schemes were a largely standardised and functional design with some changes made in architectural treatment to suit local circumstances. It has the potential to inform study of the technical processes and social/cultural functioning of a nuclear power station as reflected in building appearance and design, particularly in comparison to the earlier and subsequent generations of nuclear power stations both on this Site and more widely in the UK.
- Historic interest: The AGR plants were the second generation of nuclear power stations in the UK and reflected a changing relationship with both nuclear power generation and other power generation technology more widely, representing significant improvements in safety and efficiency over the previous generation of nuclear power generation.

13.10.2 Structures within the Site contribute in varying degrees to its historic value. The most notable are the reactor buildings and turbine halls, which present the key architectural response to the design and its location and incorporate the central elements of the power station. Ancillary buildings of different generations of primarily functional architectural treatments and often of temporary construction, while of lesser value individually, have the potential to contribute to understanding of the history and operation of the power station.

13.10.3 The key historic value associated with HNB as a whole is functional/utilitarian: The ability of a facility to generate power and the design of individual buildings and layout of the whole station facility geared toward the management and execution of that purpose. HNB was one of a number of AGR power stations built and commissioned from the 1960s to 1980s and formed part of a stage in the development of the reactor design. It has importance in relation primarily to its regional context and status associated with this function, granting it **Medium** importance as a historic environment asset. The cessation of power generation reduces the assets' status as tied to historic social and economic interest, reducing their importance from a previous **Medium** to **Low**.

13.10.4 The demolition of ancillary buildings and modification of the reactor building into a Safestore in the Preparations for Quiescence phase would see the effective removal of much of the original facility as noted above. This would constitute a **Medium** magnitude of change to a receptor of **Low** importance. This would result in a **Minor Adverse** effect and is **Not Significant**. During the Quiescence phase, the Safestore would remain unchanged, resulting In **No Effect**.

13.10.5 During Final Site Clearance, the Safestore which includes the reactors will be dismantled. This will remove the generating element of the operational power station. This would constitute a **High** magnitude of change to a receptor of **Low** sensitivity. This would result in a **Minor Adverse** effect and is **Not Significant**.

13.10.6 The good practice environmental measures detailed in **Table 13.6** will be implemented, creating a record explicitly focused on historic interest offsetting the loss and alteration of the physical assets. The resulting **Minor Adverse** effect would be **Not Significant.**

Hunterston House Designed Landscape

13.10.7 Part of the mapped non-designated designed landscape associated with Hunterston House extends into the southeast of the Works Area (see **Figure 13.1**). While North Ayrshire's formal list of designed landscapes[32], historic gardens and local landscapes of historic interest does not offer further detail on the character of the Hunterston House landscape's design, parts of this can be read by the visitor as related to ornamental tree plantation lining the roads into the estate, surrounding Hunterston House and Castle, the relative positioning of these buildings and views from both associated with surrounding pastoral land. The construction of HNB had an adverse effect on this design quality. As this part of the designed landscape has, in effect, been built over during the construction of HNB and associated infrastructure, **No Effect** is anticipated. The below assessments of effects through change to setting on Hunterston House, Castle and the Hunterston Castle walled garden incorporate the Hunterston House landscape as a key component of the setting of these assets.

Effects arising through change to setting (Preparations for Quiescence, Quiescence and Final Site Clearance phase)

Castle Knowe, scheduled monument (SM3694)

Importance and present setting

13.10.8 Castle Knowe is a scheduled monument located 1.8 km south-east of the Works Area. It is located within a pastoral field east of the A78, south of Kilrusken Toll and west of a railway. The monument comprises a subcircular, grass-covered earthen mound within the field described in the scheduling entry as a "motte". Antiquarian notes from the late 19th century reference a former stone wall which had been removed from this monument in addition to a rectangular depression within the centre of the mound. This allows for alternating interpretations of a medieval motte-and-bailey fortification or potentially a burial monument of prehistoric date. Views west and south from this monument offer an open vista of distant hills, open fields, Goldenberry Hill and the HNB reactor building, with additional power station infrastructure screened from view. Views to the east of the monument are screened periodically by passing rail traffic, but otherwise show the rising

[32] North Ayrshire Council (n.d.) *Supporting Information Paper 13: Designed Landscapes And Historic Gardens & Local Landscapes of Historic Interest.* (Online) Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/DesignedLandscapesandGardens.pdf (Accessed November 2023).

profile of land toward the Ayrshire interior. Views from the monument to the north show further hills in addition to industrial structures in the middle-distance: The Hunterston Terminal conveyor (port infrastructure which is distinct and separate from the power station) and two wind turbines. This is an asset of national importance based on archaeological and historic interest and its present setting allows factors that may have influenced its location and the changing nature of the surrounding landscape to be understood.

Change to setting

13.10.9 None of the ancillary buildings are visible from Castle Knowe and their deconstruction and demolition during Preparation for Quiescence would have no effect on views from the monument or any bearing on its setting. The modification of the reactor building into a Safestore would, while introducing a change in views of the building retain the general sense of a visibly modern, utilitarian structure and massing in these long views, prior to eventual demolition during Final Site Clearance. Due to the intervening distance between the asset and the Works Area, it is not anticipated that there will be any change to setting caused from noise emissions during the Preparations for Quiescence or Final Site Clearance phases. Change to the setting of this monument is therefore anticipated to be minimal through all phases of the proposed works. After the completion of the Proposed Works at the end of Final Site Clearance, the Safestore will disappear from the setting of the Castle Knowe Scheduled Monument.

Significance of effect

13.10.10 As the magnitude of change to this monument, a receptor of **High** sensitivity, resulting from change to setting of this monument is anticipated to be **Negligible**, the effects of the Preparations for Quiescence, would be **Minor Adverse** and therefore **Not Significant.** During the Quiescence phase effects are anticipated to be **Minor Adverse** owing to visibility of the Safestore. At the end of Final Site Clearance, the Safestore will disappear from view which would be a negligible change in setting for the asset, resulting in a **Minor Beneficial** and therefore **Not Significant** effect.

Hunterston Castle (LB14313)

Importance and present setting

13.10.11 Hunterston Castle is a Category A listed building located 560 m east of the Works Area. The building consists of a 15th-16th century keep with an attached 17th century house. The building complex was the residence of the Hunter family until the construction of Hunterston House and is still in good condition. The building is flanked by planted tree avenues to the east and west, with the Category C-listed Hunterston walled garden 50 m to the west. The building has high importance with historic and archaeological interest derived from its ability to illustrate the progression and embellishment of an early postmedieval elite residence, and of its use as the central landscape feature in a larger estate.

13.10.12 Hunterston Castle's setting can be understood through its relatively central position in the landscape between the A76 and the Ayrshire Coastal Path, being defined by small clusters of buildings and enclosed fields, with the nuclear complex at the north-west extremity. This likely reflects that the castle was intended to be a dominant presence within the immediately surrounding landscape, before the construction of the designed landscape in the 17th/18th century and its eventual repurposing as a component of the estate, subservient in importance to Hunterston House following its construction in 1799. The southern approach to Hunterston House passes close to the castle, allowing for

glimpses en-route to the house. Views from the castle are directed southward, along the driveway to the south-east and northward, through a gap in a line of planted trees toward Hunterston House. The thickness of tree plantation to the west provides screening of views toward the Hunterston nuclear complex from lower levels, with glimpsed visibility increasing at the upper floors. **Figure 14.11** provides an indicative view of Hunterston Castle and highlights the partial visibility of the Power Station from the asset. This designed landscape setting of this regionally important building is of high sensitivity and is contiguous with the historic designed landscape in its immediate and middle-distance surroundings.

Change to setting

13.10.13 The deconstruction and demolition of ancillary buildings during Preparation for Quiescence and modification of the existing reactor buildings into a Safestore are not considered to notably interact with the audible setting of Hunterston Castle via the deconstruction, demolition or associated traffic noise produced, and neither is the demolition in Final Site Clearance compared to the baseline environment. The limited activities during these phases that will be within the visual setting would result in a negligible magnitude of change. The removal of all built elements of the power station from within the visual setting of the asset by the end of Final Site Clearance will result in a further negligible beneficial magnitude of change.

Significance of effect

13.10.14 The proposed works in all three phases will produce a **Negligible** magnitude of change to a receptor of **High** sensitivity, producing a **Minor Adverse** effect that would be **Not Significant**. Following the completion of Final Site Clearance, the removal of all built elements of HNB within the visual setting of Hunterston Castle will result in negligible magnitude of change producing a **Minor Beneficial** effect that would be not significant.

Walled Garden at Hunterston (LB14288)

Importance and present setting

13.10.15 The walled garden at Hunterston is a Category C listed building, located 480 m east of the Works Area and 50 m west of Hunterston Castle, within the Hunterston House designed landscape. This is a locally important ornamental garden, thought to be of 18th century date (the HES listing entry notes some of the walls have been rebuilt more recently) surrounded and screened by tree plantation to the west and south. Its key spatial relationships, contiguous with its setting, are to Hunterston Castle and Hunterston House to the east and north respectively, with approaches linking directly to both. Elements of HNB are not visible from within the garden (see ZTV displayed in **Figure 13.1**) and do not meaningfully interact with its setting.

Change to setting

13.10.16 The setting of this walled garden is defined by its spatial relationship to Hunterston House and Hunterston Castle, position within the Hunterston House designed landscape and a general sense of concealment and seclusion as a discreet walled garden. The Proposed Works during the Preparations for Quiescence phase are not anticipated to result in any change to this setting with the exception of time-limited noise associated with deconstruction and demolition works and Safestore construction, in addition to eventual demolition associated with Final Site Clearance.

Significance of effect

13.10.17 No changes to setting are anticipated beyond short term noise effects associated with the deconstruction and demolition works and modification of the reactor buildings into a Safestore during the Preparations for Quiescence phase. Eventual removal of the Safestore during Final Site Clearance may also bring these short term noise effects. The magnitude of change associated with the Proposed Works during the Preparations for Quiescence phase, Quiescence phase and Final Site Clearance phase is anticipated to be **Negligible** toward a receptor of **Medium** sensitivity. Effects are anticipated to be **Minor Adverse,** and **Not Significant**.

Hunterston House (LB14286), North Gate (LB14314), South Gate (LB14315) and associated Category C listed Well In Front Of Mansion (LB14287)

Importance and present setting

13.10.18 Hunterston House is a Category B listed building, located 510 m east of the Works Area. The building comprises a three-storey mansion house built in 1799 with later extensions of late 19th century and later date. The principal elevation of the house faces directly northward, with far views north along the Ayrshire coastline incorporating Great Cumbrae Island and industrial infrastructure associated with Hunterston ore terminal. Views south from Hunterston House include Hunterston Castle, visible through a gap in planted woodland to the south and the two complexes are connected by driveways largely concealed by woods. The immediate surroundings to the south and west are defined by a lawn to the rear of the property, with views westward screened by tree planting.

13.10.19 The Category C listed Well is directly north of Hunterston House's north elevation. This structure's setting consists of its relationship and orientation to the mansion house and position surrounded by the driveway, as an ornamental feature.

13.10.20 The remains of two gates marking access points to the Hunter Estate are present within the Study Area. Hunterston Gate (North Pillars) is a Category B listed building 1.5 km north-east of the Works Area, consisting of two square, decorated stone piers of early 19th century date. This is located immediately west of the A78 Road at the eastern limit of Larg Avenue, a former access track to Hunterston House now repurposed as a footpath, screened on each side save the east by thick tree growth. The setting of this building consists of its relationship to the trackway and historic relationship with Hunterston House. Hunterston Gate (South Pillars) is a Category C listed building located at the junction of the A78 and U35 roads, 1.9 km south-east of the Works Area. This building consists of two decorated stone piers topped with pyramidal caps. The track from this building leads into the Hunterston estate, first passing Hunterston Castle before arriving at Hunterston House. The building's setting is defined by its relationship to these routes of travel.

13.10.21 Hunterston House and its associated gates are all buildings of **Medium** importance. Their setting is defined partly by their spatial relationship to one another. Hunterston House's setting is further associated with designed landscape to the south inclusive of tree-planting, routes of movement and Hunterston Castle and Walled Garden in addition to views northward from the north elevation.

Change to setting

13.10.22 The modification of the reactor building into the Safestore during the Preparations from Quiescence phase would change a visual element already perceptible from the upper floors, with the accompanying plant movements producing audible effects consistent with construction operation noise. Ultimately the new visual element would be read similarly in terms of massing and interpreted date and function (modern, utilitarian/industrial).

Although these views form a key component of Hunterston House's setting, this would be unaffected by the Proposed Works in the Preparations for Quiescence phase and the elements of the Site visible from Hunterston House would be removed by the end of Final Site Clearance.

Significance of effect

13.10.23 As the effects on the setting of Hunterston House, a receptor of **Medium** sensitivity, would be **Negligible**, the effects of the Preparation for Quiescence phase, Quiescence phase and the initial phase of Final Site Clearance works are considered **Minor Adverse**. However, the result of Final Site Clearance, with the removal of the Safestore structure would produce a **Minor Beneficial** effect. This would be **Not Significant**.

Robertson Building Millport Field Centre (LB52288)

Importance and present setting

13.10.24 The Robertson Building, Millport Field Centre is a Category C listed building on the south-east coast of Great Cumbrae Island, 2.9 km north-west of the Works Area. Built over the late 19th and early 20th centuries (west wing in the 1890s, east wing in 1930s), this two-storey U-shaped former marine station is of **Medium** importance and derives its historic interest from its association with the development of marine biology as a discipline, and its status as one of the two earliest permanent marine stations in Scotland.

13.10.25 The building's setting is largely defined through its location and orientation in relation to the sea. Views out from the building to the south-east keep the Fairlie Roads body of water in near and middle views (see **Chapter 14: Landscape and Visual Impact Assessment, Figure 14.3**), with further views being defined by the mainland and attendant industrial architecture associated with the Hunterston Terminal and the nuclear power stations.

Change to setting

13.10.26 The distant view of HNB from the asset includes the smaller ancillary buildings associated with the facility but the reactor building is the most perceptible feature here, similar to the case of the neighbouring HNA reactors. The demolition of the ancillary buildings during the Preparation for Quiescence phase would not affect the presence of the power station in these long views appreciably, and the modification of the reactor building into a Safestore would maintain the presence of the reactor building through massing and perceived interpretation. At Final Site Clearance, the addition of new waste processing facilities during the Proposed Works is unlikely to appreciably change the setting and views from the Robertson Building Millport Field Centre. The removal of the Safestore at the end of Final Site Clearance would remove this utilitarian structure from views completely.

Significance of effect

13.10.27 It is not anticipated that the setting of the Robertson Building Millport Field Centre, a receptor of **Medium** sensitivity, would be perceptibly altered through the removal of visible features in the form of ancillary buildings or the change in appearance of the reactor building through its modification into a Safestore during the Preparations for Quiescence phase. This change which remains through the Quiescence phase and subsequent new waste processing facilities during Final Site Clearance would lead to a **Negligible** magnitude of change and a **Minor Adverse** effect within these phases. This effect would

be **Not Significant**. The removal of the Safestore structure at the close of Final Site Clearance would produce a **Negligible** magnitude of change and a **Minor Beneficial** effect. This effect would be **Not Significant**.

Millport Conservation Area and associated listed buildings along the coast

Importance and present setting

13.10.28 The Millport Conservation Area is located 3 km north-west of the Works Area and covers the majority of the Millport village harbour area from the edge of the Lorn woodland in the west to Red Craigs in the east. This includes most of the main street frontage and a localised network of terraced streets projecting into the harbour in the centre-west of the village. Millport Conservation Area is described in the appraisal document prepared by North Ayrshire Council[33] as having social and physical significance, with the development of the town as a planned settlement in the late 18th century reflected in its physical layout. The landscape setting of the Conservation Area is identified as a key feature, and is characterised by its waterside setting on the Clyde estuary which will include views across to the mainland. These views include the existing HNA and HNB and Hunterston terminal structures (See **Chapter 14: Landscape and Visual Impact Assessment, Figure 14.14**).

13.10.29 The Millport Conservation Area contains 17 listed buildings within its boundaries. These include the Category A Episcopal Cathedral “Of The Isles” with Collegiate Buildings and Cloister (LB37824), five Category B listed buildings and eleven Category C listed buildings. The setting of these buildings is considered to be defined by the character and setting of the Conservation Area itself and as such they are discussed as part of the Conservation Area. HNA and HNB are visible from the Conservation Area’s waterfront in addition to the marine construction yard. These visibly modern, industrial components on the setting of the Conservation Area, do not make a positive contribution to the Conservation Area’s setting, owing to the distance and clear functional appearance in contrast to the “resort” character of Millport and additional views toward Little Cumbrae and down the Firth of Clyde.

Change to setting

13.10.30 Visual changes brought on by the Proposed Works during the Preparations for the Quiescence phase would be perceptible in views from Millport Conservation Area’s waterfront to varying degrees. The removal of smaller ancillary buildings would not make a clear impression on views of the Site from Millport owing to distance. The change in appearance of the reactor building via the addition of the Safestore as perceived from the Conservation Area would effectively be minimal – the feature would have the appearance of a modern, utilitarian “block”, in keeping with its present appearance in views. This would in effect provide no change to the setting of the Conservation Area or constituent listed buildings. The eventual removal of the Safestore through Final Site Clearance would entail the disappearance of this same “block” structure in long views.

Significance of effect

13.10.31 The anticipated effect on the setting of Millport Conservation Area through the Preparations for Quiescence phase, Quiescence phase and initial Final Site Clearance phase is considered to be neutral. This would be a **Negligible** magnitude of change on a

[33] North Ayrshire Council (2013). *Millport Conservation Area Appraisal. (*online) Available at: https://www.north-ayrshire.gov.uk/planning-and-building-standards/conservation/conservation-areas-and-consent.aspx (Accessed November 2023)

Medium sensitivity receptor, producing a **Minor Adverse** effect. This would be **Not Significant**. The removal of the Safestore structure at the close of Final Site Clearance would comprise a **Negligible** magnitude of change and produce a **Minor Beneficial** effect. This effect would be **Not Significant**.

Little Cumbrae Lighthouse (SM418)

Importance and present setting

13.10.32 Little Cumbrae lighthouse tower and associated buildings is a scheduled monument 3.9 km west of the Works Area. The lighthouse tower is located atop Lighthouse Hill, a high-point on the island. The original tower was constructed in 1757 and comprised a circular tower with an open coal fire at the top. The monument derives its importance from archaeological and historic interest for maritime structures – it was the second operational lighthouse in Scotland and preserves an example of rapid development in the area, reflected in the short period of this lighthouse's use before it was supplanted by the "new" Little Cumbrae lighthouse, built in 1793 (LB852). The setting of this monument comprises views across the bodies of water encircling the island and across said waters to the mainland in addition to its situation at a key vantage point on the island. The setting contributes to the monument's historic importance through communicating its utility in governing and safeguarding vessel movements in this part of the Firth of Clyde.

Change to setting

13.10.33 The Preparations for Quiescence phase entailing the removal of ancillary buildings within the Site would remove this part (non-reactor buildings) of the built element from eastward views from the Little Cumbrae Lighthouse. The construction of Safestore to the reactor building would alter its appearance without substantially changing its massing or interpreted purpose. The presence of the HNA and HNB facilities as an element of long views of the Hunterston area on the Firth of Clyde have less importance to the lighthouse's understanding and appreciation via setting than the general sense of a coastline and sea inlet. The reactor's appearance as relevant to this setting would not be substantially altered and would present as a utilitarian "block" in these views of clearly modern character. The eventual removal of the Safestore through Final Site Clearance would be effectively returning this part of views from the lighthouse to a pre-construction state.

Significance of effect

13.10.34 The effects on the setting of Little Cumbrae Lighthouse through Preparations for Quiescence, Quiescence phase and the initial phase of Final Site Clearance is anticipated to comprise a **Negligible** magnitude of change on a **High** sensitivity receptor producing a **Minor Adverse** effect. This would be **Not Significant.** The removal of the Safestore structure at the close of Final Site Clearance would comprise a **Negligible** magnitude of change and produce a **Minor Beneficial** effect. This effect would be **Not Significant**.

Little Cumbrae Castle (SM2195)

Importance and present setting

13.10.35 Little Cumbrae Castle is a scheduled monument located 2.9 km west of the Works Area. The Castle is situated on Castle Isle, a small tidal island of the east coast of Little Cumbrae. The surviving structure is characterised as a squat, square stone keep of 16th century date. The location of the castle structure indicates its key setting relationships are

to the Little Cumbrae Island interior including the beach and part of the island immediately adjacent to the monument and the Firth of Clyde. Views across the estuary toward the mainland will comprise a key component of this setting, contributing to the historic interest of the monument.

Change to setting

13.10.36 The works associated with the Preparations for Quiescence phase which entail the removal of ancillary buildings from HNB would, it is anticipated, be largely obscured in views from the monument owing to distance and the intervening presence of HNA partially obscuring views of lower lying structures. The construction of the Safestore around the reactor building would introduce a visual change though the general sense of massing and functionality would be retained. The Final Site Clearance, which would include removing the reactor building and Safestore structure, and would effectively return this part of views from Little Cumbrae as perceived to be open space.

Significance of effect

13.10.37 The effect of the proposed Preparations for Quiescence Phase, Quiescence phase and initial phase of Final Site Clearance is **Not Significant,** owing to the lack of substantial change to setting characterised as a **Negligible** magnitude of change to a receptor of **High** sensitivity. This would produce a **Minor Adverse** effect, which would be **Not Significant**. The removal of the Safestore structure at the close of Final Site Clearance would comprise a **Negligible** magnitude of change and produce a **Minor Beneficial** effect. This effect would be **Not Significant**.

13.11 Assessment of cumulative effects

Intra-project effects

13.11.1 There is the potential for historic environment effects associated with the Proposed Works to interact with, or combine with the effects arising from other developments or projects proposed within the relevant Zones of Influence applicable to each environmental aspect.

13.11.2 An assessment of inter-project effects is considered within in **Chapter 21: Cumulative Effects Assessment** of this ES.

Inter-project effects

13.11.3 Effects including noise, landscape and visual have been considered inherently within the settings assessment. A summary of the potential intra-project effects is also provided in **Chapter 21: Cumulative Effects Assessment.**

13.12 Summary

13.12.1 The results of the assessment of effects of the Proposed Works on the Historic Environment are summarised in **Table 13.11**.

Table 13.11 Summary

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor	Phase	Magnitude of Change	Significance	Summary of Rationale
HNB buildings	Demolition of ancillary buildings, Safestore construction to reactor and eventual demolition of same through Final Site Clearance.	Low	Preparations for Quiescence Quiescence Final Site Clearance	Low None High	Not Significant (Minor adverse) No Effect Not Significant (Minor adverse)	Complete removal of a facility with a limited historic interest for the history of UK energy generation and associated architecture, with appropriate mitigation through building recording.
Castle Knowe (SM3694)	Change of visual element of reactor in views through Safestore construction and eventual removal through Final Site Clearance.	High	Preparations for Quiescence Quiescence Final Site Clearance	Negligible Negligible Negligible	Not Significant (Minor Adverse) Not Significant (Minor Adverse) Not Significant (Minor Beneficial)	Minimal change to the experience of the receptor through appreciation of its setting; the general utilitarian appearance/sense of the reactor structure will remain unchanged until removal.
Hunterston Castle (LB14313)	Change of visual element of reactor in views through Safestore construction and eventual removal through Final Site Clearance.	High	Preparations for Quiescence Quiescence	Negligible Negligible	Not Significant (Minor Adverse) Not Significant (Minor Adverse)	Negligible change to the experience of the receptor through appreciation of its setting; the general

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor	Phase	Magnitude of Change	Significance	Summary of Rationale
			Final Site Clearance	Negligible	Not Significant (Minor Beneficial)	utilitarian appearance/sense of the reactor structure will remain unchanged until removal.
Walled Garden at Hunterston (LB14288)	Change of visual element of reactor in views through Safestore construction and eventual removal through Final Site Clearance.	Medium	Preparations for Quiescence	Negligible	Not Significant (Minor Adverse)	Minimal change to the experience of the receptor through appreciation of its setting; the primary relationship here is to Hunterston Castle and the surrounding designed landscape, and the asset is screened from the reactor visibility.
			Quiescence	Negligible	Not Significant (Minor Adverse)	
			Final Site Clearance	Negligible	Not Significant (Minor beneficial)	
Hunterston House (LB52288)	Change of visual element of reactor in views through Safestore construction and eventual removal through Final Site Clearance.	Medium	Preparations for Quiescence	Negligible	Not Significant (Minor adverse)	Minimal change to the experience of the receptor through appreciation of its setting; the general utilitarian appearance/sense of the reactor structure in views from the upper floor will remain unchanged until removal.
			Quiescence	Negligible	Not Significant (Minor Adverse)	
			Final Site Clearance	Negligible	Not Significant (Minor Beneficial)	

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor	Phase	Magnitude of Change	Significance	Summary of Rationale
Robertson Building Millport Field Centre (LB52288)	Change of visual element of reactor in views through Safestore construction and eventual removal through Final Site Clearance.	Medium	Preparations for Quiescence	Negligible	Not Significant (Minor Adverse)	Minimal change to the experience of the receptor through appreciation of its setting; the general utilitarian appearance/sense of the reactor structure will remain unchanged until removal.
			Quiescence	Negligible	Not Significant (Minor Adverse)	
			Final Site Clearance	Negligible	Not significant (Minor beneficial)	
Millport Conservation Area and associated listed buildings	Change of visual element of reactor in views through Safestore construction and eventual removal through Final Site Clearance.	Medium	Preparations for Quiescence	Negligible	Not Significant (Minor Adverse)	Minimal change to the experience of the receptor through appreciation of its setting; the general utilitarian appearance/sense of the reactor structure will remain unchanged until removal.
			Quiescence	Negligible	Not Significant (Minor Adverse)	
			Final Site Clearance	Negligible	Not Significant (Minor Beneficial)	
Little Cumbrae Castle (SM2195)	Change of visual element of reactor in views through Safestore construction and eventual removal through Final Site Clearance.	High	Preparations for Quiescence	Negligible	Not Significant (Minor Adverse)	Minimal change to the experience of the receptor through appreciation of its setting; the general utilitarian appearance/sense of the reactor structure will remain unchanged until removal.
			Quiescence	Negligible	Not Significant (Minor Adverse)	
			Final Site Clearance	Negligible	Not Significant (Minor Beneficial)	

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor	Phase	Magnitude of Change	Significance	Summary of Rationale
Little Cumbrae Lighthouse (SM418)	Change of visual element of reactor in views through Safestore construction and eventual removal through Final Site Clearance.	High	Preparations for Quiescence	Negligible	Not Significant (Minor Adverse)	Minimal change to the experience of the receptor through appreciation of its setting; the general utilitarian appearance/sense of the reactor structure will remain unchanged until removal.
			Quiescence	Negligible	Not Significant (Minor Adverse)	
			Final Site Clearance	Negligible	Not Significant (Minor Beneficial)	

14.

Landscape and Visual Impact Assessment

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14. Landscape and Visual Impact Assessment (LVIA)

14.1 Introduction

14.1.1 This chapter assesses the landscape and visual effects of the Proposed Works. It should be read in conjunction with the description of the Proposed Works as presented in **Chapter 2: The Decommissioning Process**. It describes the key receptors, in relation to the Hunterston B Nuclear Site Licence Boundary (hereafter referred to as 'the Site') and the Indicative Dismantling Works Area ('Works Area').

14.1.2 The Landscape and Visual Impact Assessment (LVIA) and Cumulative Effects Assessment (CEA) reported in this chapter have been produced by chartered landscape architects at WSP. The objective of this assessment has been to determine landscape and visual effects of the Proposed Works on the existing landscape resource and visual amenity.

14.1.3 This chapter is supported by **Figures 14.1 – 14.17**, and accompanied by the following technical appendices:

- **Appendix 14A**: LVIA Methodology;
- **Appendix 14B**: Viewpoint Photography Proforma Sheets;
- **Appendix 14C**: Viewpoint Analysis;
- **Appendix 14D**: Landscape and Visual Survey Report;
- **Appendix 14E**: Indirect Effects on Seascape / Coastal Character Areas;
- **Appendix 14F**: Effects on Visual Receptors; and
- **Appendix 14G:** Indicative Interim State Landscape Plan (ISLP).

14.2 Relevant legislation, policy and technical guidance

Legislation

14.2.1 The legislation and policy presented in **Table 14.1** is relevant to the assessment of the effects on LVIA receptors.

Table 14.1 Legislation and policy relevant to LVIA

Legislation	Legislation Issue
The European Landscape	The ELC is a Council of Europe initiative that provides a broad framework for landscape planning and management across all member states including the UK, which ratified the ELC in 2007. The ELC defines landscape as, "*an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors*" and is committed to several core principles and actions. The status of this convention is not affected by Brexit. These commitments are implemented by existing domestic policy and legislation rather than through any ELC-specific framework. The LVIA considers the

Legislation	Legislation Issue
Convention[1] (ELC)	character of the local landscape at Hunterston and how this may be affected by the Proposed Works.
National Policy	**Policy Relevance**
National Planning Framework 4 (NPF4)[2]	**Annex B: Hunterston Strategic Asset** The Hunterston Strategic Asset is one of 18 national developments which has been proposed to support the delivery of the spatial strategy. This proposed national development supports the repurposing of Hunterston port and the adjacent former nuclear power station site. It has the potential to be used as a port and for electricity generation from renewables given its deepwater access and existing infrastructure. There are no specific requirements relating to landscape and visual amenity, although this policy informs the future landscape and visual baseline set out in **Section 14.5**. **Policy 4: Natural Places** Part of Policy 4 d) relates to Local Landscape Areas and states that "*d) Development proposals that affect a site designated as a local nature conservation site or landscape area in the LDP will only be supported where:* *i. Development will not have significant adverse effects on the integrity of the area or the qualities for which it has been identified; or* *ii. Any significant adverse effects on the integrity of the area are clearly outweighed by social, environmental or economic benefits of at least local importance.*" The LVIA considers the special qualities of all local landscape designations within the LVIA Study Area where there are potential significant effects arising as a result of the Proposed Works (defined as a 3 km offset from the Works Area as reported in **Section 14.5**). Areas where there are potential significant effects arising from the Proposed Works are identified in **Section 14.9**.
Local Policy	
North Ayrshire Local Development Plan (LDP)[3]	**Strategic Policy 3: Strategic Development Areas (Strategic Development Area 1)** The adopted Local Plan identifies Hunterston as a Strategic Development Area, recognising the strategic national importance of Hunterston as an energy hub and deep water port. Strategic Policy 3 supports nuclear decommissioning and radioactive waste management and other facilities for large and small power generation. It requires development to take account of the special environmental constraints of Hunterston, to manage impacts on nearby communities and the natural and built heritage assets in the area. **Policy 15: Landscape and Seascape** This policy relates to landscape/seascape character and designated/ non-designated landscapes and states that a LVIA should assess impacts on designated and non-designated landscape areas and features including: National Scenic Areas, Special Landscape Areas, Wild Land and Local Landscape Features. Where impacts are identified, appropriate mitigation measures should be considered. As a consequence, the LVIA for the Proposed Works considers the effects and mitigation measures on landscape/seascape character and designated/non-designated landscapes identified in the LDP in **Section 14.10** and **Section 14.11**.

[1] Council of Europe (2000*). European Landscape Convention Statutory Instrument 2018 No. 834*. Council of Europe; Strasbourg.
[2] Scottish Government. (2021). *Scotland 2045 - fourth National Planning Framework*. (online). Available at: https://www.gov.scot/publications/national-planning-framework-4/pages/3/ (Accessed November 2023).
[3] North Ayrshire Council. (2019), *Adopted Local Development Plan*. (online). Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed November 2023).

Legislation	Legislation Issue
	Policy 17: Clyde Muirshiel Regional Park This policy relates to the statutory purpose of the Regional Park of providing recreational access to the countryside. The Works Area is located approximately 2 km from the Clyde Muirshiel Regional Park, and the LVIA for the Proposed Works considers the potential for significant effects on the landscape within the Park in **Section 14.9**, and the visual effects on its users in **Section 14.12**.

Technical guidance

14.2.2 The LVIA has been undertaken in accordance with the third edition of the Guidelines for Landscape and Visual Impact Assessment[4] (hereafter referred to as GLVIA3) produced by the Landscape Institute and the Institute of Environmental Management and Assessment. GLVIA3[4] is widely regarded by landscape and planning professions as the 'industry standard' together with best practice guidance and professional judgement. The LVIA also takes account of the technical notes published by the Landscape Institute, as set out in **Table 14.2**.

Table 14.2 Technical Guidance relevant to LVIA

Technical Guidance	Context
Technical Guidance Note 06/19 Visual Representation of Development Proposals[5]	Provides supplementary guidance to GLVIA3[4] as to appropriate techniques to capture site photography and the selection, production and presentation of types of visualisation appropriate to the circumstances in which they will be used.
Technical Information Note 01/2017 (Revised). Tranquillity – an overview[6]	Provides an overview of what is understood by the term 'tranquillity' within the landscape profession.
Technical Guidance Note 02/21 Assessing landscape value outside national designations[7]	Provides information and guidance to landscape professionals and others who need to make judgments about the value of a landscape (outside national landscape designations) in the context of the UK Town and Country Planning system.
Landscape Sensitivity Assessment Guidance[8]	Provides information and guidance on how to undertake a landscape sensitivity assessment to help planning authorities, landscape practitioners and others undertake these studies.
Draft Technical Guidance Note 05/23 Notes and Clarifications on aspects of the 3rd Edition Guidelines on	Draft version subject to consultation which closed on 4 August 2023. Provides a compilation of clarifications on the 3rd Edition Guidelines on Landscape and Visual Impact Assessment

[4] Landscape Institute and the Institute of Environmental Management and Assessment (2013). *Guidelines for Landscape and Visual Impact Assessment. 3rd edition*. Routledge; London.
[5] Landscape Institute (2019). *Technical Guidance Note 06/19 Visual Representation of Development Proposals* (online). Available at: https://www.landscapeinstitute.org/visualisation/ (Accessed November 2023).
[6] Landscape Institute (2017). *Technical Information Note 01/2017 revised. Tranquillity – an overview*. (online). Available at: https://www.landscapeinstitute.org/technical-resource/tranquillity/ (Accessed November 2023).
[7] Landscape Institute (2021). *Technical Guidance Note 02/21 Assessing landscape value outside national designations*. (online). Available at: https://www.landscapeinstitute.org/news/new-guidance-assessing-landscape-value-outside-national-designations/ (Accessed November 2023).
[8] NatureScot (2022). *Landscape Sensitivity Assessment Guidance* (online). Available at https://www.nature.scot/sites/default/files/2022-05/Landscape%20Sensitivity%20Assessment%20Guidance%20%28Methodology%29.pdf (Accessed November 2023).

Technical Guidance	Context
Landscape and Visual Impact Assessment (GLVIA3)[9]	(GLVIA3) and produced to help interpret aspects of the guidance, It should be read alongside GLVIA3.

14.3 Data gathering methodology

Study Area

14.3.1 The selection of the LVIA Study Area has been undertaken in accordance with guidance set out in Sections 5.2 and 6.2 in GLVIA3[4] which places an emphasis on a *"reasonable approach which is proportional to the scale and nature of the proposed development"* and the findings of the field survey. The definition of the Study Area has been informed by the extent of the preliminary Zone of Theoretical Visibility map (ZTV) generated for the tallest, long-term component of the Proposed Works (i.e. the maximum Safestore structure height which is assumed to be 66.5 m above ground level), described in paragraphs 14.3.4 to 14.3.6 below and by the findings of the desk and field surveys described in **Section 14.9**.

14.3.2 At scoping stage, an initial LVIA Study Area was defined to include a 5 km offset from the Nuclear Site Licence Boundary (hereafter referred to as the "Site") to ensure that the LVIA concentrates upon receptors that have the most potential to be significantly affected by the Proposed Works. Paragraph 13.6.4 of the Scoping Report states "*Further refinement of visual receptors (residential, recreational and vehicular receptors) for inclusion in the LVIA will be carried out as part of the assessment process through an analysis of the conclusions of a Viewpoint Assessment undertaken at each of the agreed viewpoints…*"

14.3.3 Viewpoint assessment has provided detailed assessment of the Site and Works Area which incorporates the Site and coastal / marine works including the dismantling of the jetty and cooling water intake structure. The viewpoint analysis in **Appendix 14C** indicates that potentially significant visual and cumulative effects resulting from the Proposed Works could occur for receptors within approximately 1 km of the Works Area particularly along the Ayrshire Coastal Path as it passes to the north-east and west of the Proposed Works. Taking a precautionary approach, drawing from best practice guidance, the Study Area has therefore been focused on receptors within 3 km of the Works Area as shown in **Figure 14.1**. The initial ('scoping') and revised Study Areas are shown in **Figure 14.2i**.

Zone of theoretical visibility

14.3.4 A ZTV was generated to illustrate the extent of potential visibility of the Proposed Works and this analysis then informed the selection of viewpoints. The ZTV is defined in GLVIA3[4] as "*a map, usually digitally produced, showing areas of land within which a development is theoretically visible*" [4] and represents the desk top component of the visibility analysis.

14.3.5 The ZTV has been calculated using specialist software together with a Digital Terrain Model (DTM) (OS Terrain 5) and height for the tallest component of the Proposed Works i.e. the Safestore (which will house the redundant reactor building) at a maximum height of 66.5 m above ground level (AGL) (based on recladding of the existing reactor building). The DTM represents the topographic constraints on the visual influence of the Proposed Works at a maximum height of 66.5 m but does not take account of the built elements or

[9] Landscape Institute (2023). *Draft Technical Guidance Note 05/23 Notes and Clarifications on aspects of the 3rd Edition Guidelines on Landscape and Visual Impact Assessment (GLVIA3)*. (online). Available at: https://www.landscapeinstitute.org/technical-resource/notes-and-clarifications-on-aspects-of-the-3rd-edition-guidelines-on-landscape-and-visual-impact-assessment-glvia3-consultation/ (Accessed November 2023).

vegetation within the Study Area, both of which can significantly reduce the area and extent of actual visibility. As a consequence, the DTM data has been amended to include areas of woodland within 11 km of the Site as depicted in OS VectorMap District to allow their screening effect to be incorporated in the preliminary ZTV calculation (see **Figure 14.2ii**). A conservative height of 12 m AGL has been used for these areas of woodland.

14.3.6 It should be noted that the ZTVs presented in **Figure 14.2i** and **Figure 14.3** do not include the potential screening effects of landscape components other than woodland that may affect visibility, such as buildings, walls, fences, hedgerows or individual trees. An understanding of the role these landscape components play in influencing visibility was therefore obtained during the field survey provided in **Appendix 14B** and is evidenced in the Viewpoint photography in **Figures 14.8 to 14.17**.

Desk study

14.3.7 The LVIA has been undertaken with reference to **Chapter 2: The Decommissioning Process**, supported by a number of data sources. The principal data sources used to inform this chapter comprise of the following:

- Scottish Landscape Character Types Map and Descriptions[10];
- Seascape Assessment of the Firth of Clyde[11];
- Clyde Muirshiel Regional Park Authority - Park Map and Information[12];
- North Ayrshire Adopted LDP[13];
- North Ayrshire Core Paths Plan[14];
- Ordnance Survey (OS) 1: 25,000 scale mapping:
  - Explorer 341 - Greenock, Largs & Millport (or digital mapping); and
- Aerial Photography (Google Earth Pro – imagery date April and September 2021) and Street View.

Survey work

Viewpoint selection criteria

14.3.8 A number of viewpoints have been selected from which a photographic record of existing views has been obtained to inform the assessment. Viewpoint selection has been informed by the desk survey with regards to access and recreation (including promoted walking and cycling routes), tourism including popular vantage points and destinations, and distribution of population and through consultation with North Ayrshire Council (NAC)

[10] NatureScot (2019). *Scottish Landscape Character Types Map and Descriptions*. (online). Available at: https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/scottish-landscape-character-types-map-and-descriptions (Accessed 20 March 2023).
[11] Grant. A & Anderson. C. (2013) *Seascape / Landscape Assessment of the Firth of Clyde - carried out on behalf of the Firth of Clyde Forum*. (online). Available at: https://www.clydemarineplan.scot/marine-planning/marine-planning-projects/#seascape (Accessed 20 March 2023).
[12] Clyde Muirshiel (2023). *Clyde Muirshiel Regional Park*. (online). Available at: https://clydemuirshiel.co.uk/about/about-clyde-muirshiel/download/ (Accessed 20 March 2023).
[13] North Ayrshire Council. (2019). *Adopted Local Development Plan*. [online]. Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf
[14] North Ayrshire Council. (2009). *North Ayrshire Core Paths Plan*. (online). Available at: https://www.north-ayrshire.gov.uk/leisure-parks-and-events/outdoor-activities/core-paths-plan.aspx (Accessed 20 March 2023).

in December 2021. Paragraph 6.20 of GLVIA3[4] describes how the selection of viewpoints should take account of a range of factors including:

- "*The accessibility to the public;*
- *The potential number and sensitivity of the viewers who may be affected;*
- *The viewing distance (i.e. short-, medium- and long-distance views) and elevation;*
- *The nature of the viewing experience (for example static views, views from sequential points along routes); and*
- *The view type (for example panoramas, vistas and glimpses).*"

14.3.9 In addition to the criteria list above, viewpoint selection is primarily concentrated on those visual receptors whose activities are influenced by the availability and quality of views (e.g. users of the Ayrshire Coastal Path), or where a sense of place is particularly important to the setting of a settlement. GLVIA3[4] describes how viewpoints selected for inclusion fall broadly into three groups as follows:

- "*representative viewpoints, selected to represent the experience of different types of visual receptor, where larger numbers of viewpoints cannot all be included individually and where the significant effects are unlikely to differ – for example, certain points may be chosen to represent the views of users of particular public footpaths and bridleways;*
- *specific viewpoints, chosen because they are key and sometimes promoted viewpoints within the landscape, including for example specific local visitor attractions, viewpoints in areas of particularly noteworthy visual and/or recreational amenity such as landscapes with statutory landscape designations, or viewpoints with particular cultural landscape associations; and*
- *illustrative viewpoints, chosen specifically to demonstrate a particular effect or specific issues, which might, for example, be the restricted visibility at certain locations*" [4]. This may occur where a highly sensitive visual receptor is shown as coinciding with the ZTV but would not be affected, or conversely where particularly unrestricted views are available.

Viewpoint photography

14.3.10 All photography was undertaken in accordance with the specification for Type 4 photography set out in the Landscape Institute's *Technical Guidance Note 06/19: Visual Representation of Development Proposals*[5]. Type 4 uses the highest specification of recording and photographic equipment of the four types defined in *Technical Guidance Note 06/19*[5] and by using this as a basis for the photography, allows flexibility later in the LVIA process when visualisation types are being determined.

14.3.11 All photographs presented in the figures accompanying the LVIA (**Figure 14.8** to **Figure 14.17**) have been taken using:

- A high resolution digital single-lens reflex (SLR) camera with a 'full frame' sensor (i.e. 36 x 24 mm) with the camera set at 1.5 m above ground level;
- A 50 mm fixed focal length (prime) lens; and
- A professional quality tripod fitted with a panoramic head.

14.3.12 Accurate locations were established using a hand-held Global Positioning System (GPS) unit and recorded on a standardised proforma. The proforma also allowed for other data to be captured, as follows:

- The date and time when the viewpoint was visited/photography taken;
- A description of the exact location; and
- Other observational comments regarding the viewpoint location including as to whether relocation was required due to the presence of immediate foreground screening which restricted views in the direction of the development, recording key reference points in the view etc. The proforma also provided a useful record of observations made in relation to landscape condition and perceptual aspects (such as remoteness and tranquillity) which are not always readily available from published sources. These are included in **Appendix 14B**.

14.3.13 In addition to the viewpoint records, there were a number of other important criteria considered when obtaining the viewpoint photography:

- Ensuring photography was undertaken on a dry, clear day with good visibility (weather and visibility is recorded on the proforma in **Appendix 14B**);
- Ensuring locations were visited from east to west as the day progressed to avoid shooting into the sun and avoiding low sun; and
- Avoidance of foreground clutter in the view.

Field survey

14.3.14 Field surveys were completed in February and March 2022 to obtain viewpoint photography at 10 viewpoint locations which were agreed with NAC during engagement via email in December 2021 (see **Section 14.4**). Photography was undertaken during the winter months thereby reflecting the maximum visibility scenario in accordance with GLVIA3[4], paragraph 4.3. The viewpoint schedule is set out in **Table 14.4**.

14.3.15 The resultant photographs from the viewpoints have been digitally joined (using Autopano Giga software) to form a panorama and the resultant annotated panoramic photographs have been presented as Type 1 Annotated Viewpoint Photographs in accordance with best practice guidelines set out in the Landscape Institute's *Technical Guidance Note 06/19 Visual Representation of Development Proposals*[5].

14.3.16 A description of the baseline views available from the agreed viewpoint locations is included in **Appendix 14C, Table 14C.2**.

Data limitations

14.3.17 As is usual practice, representative locations have been selected and not all public viewpoints from which the Proposed Works would potentially be seen have necessarily been included in the assessment. Views are from publicly accessible locations in accordance with paragraph 6.20 of GLVIA3[4]. Areas that are not publicly accessible such as the privately owned Little Cumbrae Island are therefore not included in the viewpoint assessment (although the effects on the landscape character of the island have been assessed in **Section 14.10** based on extant landscape and seascape character assessments).

14.4 Consultation

Overview

14.4.1 The assessment has been informed by consultation responses and statutory and technical engagement.

Pre-application Opinion

14.4.2 A Pre-application opinion was provided by the Office for Nuclear Regulation (ONR), on 04 October 2022. A summary of the relevant responses received in the Pre-application Opinion in relation to landscape and visual and confirmation of how these have been addressed within the assessment is presented in **Table 14.3**.

Table 14.3 Summary of Pre-application Opinion Responses

Paragraph Ref.	Consideration	How addressed in the ES
97	Consideration should be given in the ES to landscape and visual impacts on the landscape in the area including relevant Nation Science Areas (NSAs) within a 20 km zone.	It is assumed that reference is meant to be 'National Scenic Areas' as opposed to Nation Science Areas. An initial Study Area (as reported in the Scoping Report) for the assessment extended spatially to include a 5 km offset from the Site. This was reduced to a precautionary 3 km offset following analysis of viewpoint assessment which indicates potential significant effects out to 1 km of the Works Area. This has been defined to ensure that the LVIA concentrates upon receptors that have the most potential to be significantly affected. This accords to GLVIA3[4] which places an emphasis on an approach which is proportionate to the scale and nature of the project. The nearest NSAs are located at 15.9 km (North Arran NSA) to the south-west and 23 km (Kyles of Bute NSA) to the north-west from the Works Area. As a precautionary measure, a ZTV extending to 20 km is included in the assessment to indicate the potential visibility of NSAs within that zone.
98	The EIA should consider a landscape and habitat enhancement strategy including proposals for a landscape and ecology migration and monitoring arrangements.	A landscape and habitat enhancement strategy will be undertaken by landscape architects and ecologists. The strategy will comprise an interim Landscape Management Plan that will come into force at the end of Preparations for Quiescence phase. Works on the Site will be managed under an Environmental Management Plan (EMP) that will apply during the decommissioning of Hunterston B (HNB) and will be revised annually to evaluate the adequacy of any commitments with revisions to the EMP provided as necessary.

Technical engagement

14.4.3 Preliminary technical engagement was undertaken with NAC in December 2021 to agree the location of viewpoints from which to obtain baseline photography to accompany a Landscape and Visual Survey Report for the Proposed Works (**Appendix 14D**) and to inform this assessment. The photography was obtained under winter conditions (thereby

reflecting a worst-case scenario) from the viewpoints set out in **Table 14.4**. The viewpoint locations are shown in **Figure 14.2**.

Table 14.4 Viewpoint selection

Viewpoint (VP) Number	Viewpoint Location	Grid Reference	GLVIA3[4] Typology and Selection Justification
VP1	Ayrshire Coastal Path (approach from the east)	E 218825 N 652021	Representative Viewpoint – First opportunity for close-range views available to walkers along the Ayrshire Coastal Path approaching from the north-east.
VP2	Ayrshire Coastal Path (approach from the west)	E 218026 N 651519	Representative Viewpoint – Close range views available to walkers along the Ayrshire Coastal Path approaching from the south and south-west, and views for visitors / staff within the Works Area.
VP3	Goldenberry Hill	E 218310 N 650329	Representative Viewpoint – Elevated views available to walkers from a recreational location to the south of the Proposed Works.
VP4	Core Path NC36 near Hunterston Castle	E 219327 N 651497	Representative Viewpoint – Close range views available to users of Core Path NC36 and visitors and residents at Hunterston Castle, filtered through mature trees.
VP5	A78 near junction with Kilrusken Toll	E 220280 N 650918	Representative Viewpoint – Middle distance views available to drivers and their passengers travelling north along the A78.
VP6	'The Lion', Great Cumbrae	E 217991 N 654920	Specific viewpoint – Marked on OS mapping with car parking and interpretation board. Close to Core Path NC1 within the Great Cumbrae Special Landscape Area (SLA).
VP7	Millport, Great Cumbrae	E 216535 N 654978	Representative Viewpoint – Views available to residents and recreational receptors using the promenade and beach adjacent to 'Crocodile Rock'.
VP8	Kaim Hill	E 222578 N 653241	Specific viewpoint – Summit of a promoted hill walk within Clyde Muirshiel Regional Park.
VP9	West Kilbride (Portencross Road)	E 220158 N 648470	Representative Viewpoint – Views available to residents on the northern edge of West Kilbride and recreational receptors using Core Path NC122.
VP10	Fairlie (Allenton Park Terrace)	E 220835 N 655780	Representative Viewpoint – Views available to recreational receptors using the Ayrshire Coastal Path and beach at Fairlie and to residents in the north of the settlement.

14.5 Overall baseline

Current baseline

Hunterston B Power Station Site

14.5.1 The Site is located on a gentle north facing slope which rises from an elevation of approximately 5 m Above Ordinance Datum (AOD) close to the northern boundary to approximately 25 m AOD at its southern boundary. The Site predominantly features built form including the reactor building, and an expansive range of smaller ancillary buildings, warehouses and tanks. These are set within operational land-uses comprising access roads and service yards all bound by security fencing with a large car park located within the north-western corner of the Site. The remaining areas within the Site comprise amenity grassland with tree cover limited to occasional sparse belts of vegetation along the southern edge of the reactor building and along the southern perimeter of the Site. The wider Works Area extends west and south-west of the Site along the Ayrshire Coastal Path and extends into the marine area to include the HNB intake and pier structures.

14.5.2 Immediately adjacent to the Site beyond the southwest boundary, the two white clad Hunterston A reactor buildings form noticeable features in the wider landscape. The HVDC converter station buildings to the south of the HNA are located higher up the slope towards Goldenberry Hill and are also visible in some views.

Wider landscape and visual context

Topography and drainage

14.5.3 The coastal foreshore to the immediate north of the Site is low-lying with extensive tidal mudflats at Hunterston and Southannan Sands. This low-lying coastal fringe continues to the north-east of the Site along the eastern edge of the Fairlie Roads, a deep-water channel and arm of the Firth of Clyde, which separates the island of Great Cumbrae from the mainland of North Ayrshire.

14.5.4 Two discrete landforms are present to the immediate south of the Site; Goldenberry Hill, which rises to an elevation of 140 m AOD and the smaller Campbelton Hill to its east, which reaches an elevation of 76 m AOD. To the west and south-west of Goldberry Hill, the landform remains elevated, from Hawking Craig in the north to Auld Hill, near Portencross, in the south. This area is bounded by an escarpment and cliffs to the west, beyond which, the land falls steeply to the narrow coastal strip below. The topography to the south and south-east of these hills, extending between the coastline and the Ayrshire Coast Rail Line and south towards West Kilbride, is gently undulating at elevations of between 10 m and 35 m AOD. The exception within this general topographical context is the small hill known as Drummilling Hill, located on the northern edge of West Kilbride, which rises to 104 m AOD.

14.5.5 To the east of the Ayrshire Coast Rail Line, the topography rises notably to form the Crosbie Hills which include Glentane Hill (272 m AOD) and the neighbouring Caldron Hill (332 m AOD) and Little Caldron (320 m AOD) which rise above Greenside Hill (245 m AOD) and Lairdside Hill (270 m AOD) to the south. Moving northwards, the topography continues to rise to the north of the Glen Burn, to form Kaim Hill which reaches an elevation of 387 m AOD. A series of burns drain the hillsides into the Firth of Clyde.

Land use and vegetation pattern

14.5.6 Beyond the settlements and developed coastline at Hunterston, the lower slopes of the hills and the area between Hunterston and West Kilbride are dominated by improved pasture fields which range from smaller fields on the lower slopes of the hills to a large-scale field pattern west of Portencross near West Kilbride. On the upper hillsides and summits of the more elevated land to the east of the Ayrshire Coast Rail Line, the land use of predominantly open moorland grassland with occasional walled field boundaries.

14.5.7 The Study Area is not particularly wooded. The closest areas of woodland to the Works Area are those which cover the north and east facing slopes of Goldenberry Hill (Brackenbank, Goldenberry and Hawkingcraig Plantations) and are immediately adjacent to the southern boundary of the Works Area, the belt of woodland which follows the cliffs south between Hunterston A (HNA) and Portencross (approximately 50 m from the Works Area at its closest point) and the pockets of woodland associated with Hunterston Castle and Hunterston House to the east of the Works Area are over 220 m from the Works Area. Elsewhere within the Study Area, small woodlands are present on the west facing lower slopes of the hills and along the valleys of the burns.

14.5.8 Land use along the coastal edge includes areas of reclaimed land. These areas of coastal land are primarily industrial in nature and comprise Hunterston Port which lies to the north and north-east of the Works Area. This deep-water port comprises a Marine Construction Yard located between Hunterston and Southannan Sands, and the Hunterston Ore Terminal, which was once an ore and then a coal importing facility. The facilities closed in 2016 and have been largely dormant since, although the Marine Construction Yard has recently hosted a National Offshore Wind Turbine Test Facility. Now renamed Hunterston Port and Resource Centre (Hunterston PARC), there is an aim, as outlined in the North Ayrshire Adopted LDP[3] to the Site to provide an industrial and economic hub.

Settlement pattern

14.5.9 Settlement patterns reflect the isolated nature of the coastal landscape and the rising inland topography. Small villages are present along the coastal fringes of the mainland including the town of West Kilbride to the south of the Works Area and the linear village of Fairlie which spans either side of the A78 to the north-east. Millport is the only town on the island of Great Cumbrae and forms an arc of settlement around Millport Bay, which encompasses the entire south coast of the island. Beyond the main settlements, isolated properties and farmsteads are infrequent within the Study Area.

Transport network

14.5.10 The A78 is the primary transport route in the Study Area and broadly follows the coastline from Fairlie to Hunterston Roundabout where it deviates from the coastline to follow a more inland route south towards West Kilbride. Here, it meets a number of B classified roads (the B7048, B781, B782 and the B7047) which connect the A78 with the town as well as the access road to Hunsterston A and B (Oilrig Road and / or Power Station Road). The B896 is the only other B-classified route in the Study Area and follows a circular route along the coastline of Great Cumbrae. Minor, unclassified roads traverse the west facing slopes north of West Kilbride (Kilrishken Road) and cross Clyde Muirshiel Regional Park (Fairlie Moor Road). West Kilbride and Fairlie both have railway stations on the Ayrshire Coast Line which connects the Ayrshire Coast with Glasgow. The railway line closely follows the route of the A78 until it reaches a location to the south-east of the Works Area where it diverges and moves slightly further inland before reaching West Kilbride.

14.5.11 In the wider area, ferry routes are key transport links and provide access to Great Cumbrae from Largs, and to Arran from Ardrossan.

Recreational routes and destinations

Promoted routes

14.5.12 The Portencross to Largs (Stage 11) section of the Ayrshire Coastal Path, one of Scotland's Great Trails, follows the coastline through the Study Area, passing through the Works Area. The Scotland's Great Trails website[15] notes that the coastal path is better walked south to north, as this direction of travel provides better views and puts the prevailing wind behind the walker.

14.5.13 A number of locally promoted routes[16] are also present on Great Cumbrae and coincide with the Study Area. These include Cumbrae Cycle Route and Farland Point Walk with sections of all routes coinciding with the main road through Millport. With regard to the Farland Point Walk, the Hunterston Nuclear Power Stations are noted in the walk's description which states "*Cast your eye over the mainland, where you will see the Deep Water Terminal (the deepest in Britain) and the Nuclear Power Station at Hunterston. These are backed by Cloudberry Hill and on clear days the Windfarm can be seen on the skyline*."[16]

14.5.14 There are no National Sustrans Cycle Routes within the Study Area.

Core paths

14.5.15 The distribution of Core Paths is illustrated in **Figure 14.4**. This shows a network of footpaths primarily concentrated around the coastal fringe.

Landscape character

14.5.16 Landscape character is classified in the Landscape Character Assessment produced by Scottish Natural Heritage (SNH) (now NatureScot) in 2019[10]. This published assessment divides the landscape into broad Landscape Character Types (LCTs), the location and geographical extent of each LCT within the Study Area is shown in **Figure 14.5**.

14.5.17 The Works Area and coastal lowland which extends to the north and south are defined as *LCT 59 - Raised Beach Coast and Cliffs*[17]. This LCT comprises narrow strips of land on the coastal edge facing the Firth of Clyde. There are seven separate areas (units) of LCT 59 - Raised Beach Coast and Cliffs which occur along the Ayrshire mainland coastline and in North Arran. The unit within the Study Area stretches between Ardrossan and Wemyss Bay.

14.5.18 The key characteristics of this LCT, as defined by the extant assessment are as follows:

> "*Raised beach, visible as a level shelf backed by a steep, sometimes craggy escarpment representing the former cliff line, above which lies more gently rising land.*
>
> *Rocky coastline, sometimes with cliffs, with narrow sand and shingle beaches, and mud flats in estuarine locations.*

[15] Scotland's Great Trials (undated). *Ayrshire Coastal Path*. (Online). Available at: https://www.scotlandsgreattrails.com/trail/ayrshire-coastal-path/ (Accessed November 2023).
[16] Ayrshire Paths (undated). *Cumbrae Walks & Cycling*. (online). Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/CumbraeWalks.pdf (Accessed November 2023).

Varied land uses but mainly farmed; the raised beaches also provide a level terrace for settlement and communication.

Large parts of the former cliff line are also characterised by dense, often wind sheared broadleaf woodland.

A number of hillforts, promontory forts, mottes and castles reflecting the strategic importance of this coastal landscape.

Small, historic settlements sit comfortably against the steep former cliff line and use building materials which reflect the local geology.

Some modern growth has taken the form of ribbon development and includes caravan parks and holiday development; tall structures such as masts are relatively few.

Landscape of visual drama and contrast with a strong sense of seclusion, and where less accessible a strong sense of remoteness.

Views tend to be longer distance and focussed seaward."[17]

14.5.19 The *Raised Beach Coast and Cliffs* LCT occupies a large proportion of the landscape in the centre and centre-east of the Study Area. This section of the wider LCT unit comprises narrow strips of land to the north and south of the Study Area which widen in the centre to include a small coastal promontory between Hunterston and Farland Head. To the east the relatively flat landscape begins to rise and transitions into *Rugged Moorland Hills and Valleys* LCT. To the west, the Fairlie Roads waterbody forms a tidal boundary.

14.5.20 The key characteristics of the area within the 3 km Study Area is further described by SNH[17] as follows:

"*South of Hunterston, the raised beach widens, forming an area of coastal lowland between the main area of upland to the east and an outlier, Goldenberry Hill (140 metres), to the west. This hill would once have stood as an island and served as a focal point for human activity in the past, evidenced by a number of significant archaeological sites… At Portencross the raised beach and cliff line are particularly evident. Amongst the most dramatic of former cliffs are the steep hills which rise along the north Ayrshire coast near Largs. This wall of hills forms an escarpment, providing a dramatic setting for Largs and designed landscapes such as Kelburn*."[17]

14.5.21 To the east of LCT 59, beyond the A78, lies *LCT 80 - Rugged Moorland Hills and Valleys*[18]. This large area covers a series of rounded hills and moors including the Crosbie Hills closest to the Works Area. Key characteristics of this LCT are as follows:

"*Series of rounded hills and moors rising to form a dissected plateau.*

Combination of comparatively gentle hills / shallow slopes and steeper craggy escarpments.

Exposed Red Sandstone dykes, sills and intrusions give the moorlands a degree of ruggedness.

Land cover dominated by moorland vegetation, grading from heather and grass moorland, through rough grazing and abandoned pastures to improved pastures on the lower slopes.

Higher moorlands have very extensive areas of coniferous forest.

[17] NatureScot (2019). *National Landscape Character Assessment. Landscape Character Type 59 Raised Beach Coast and Cliffs.* (online). Available at: https://www.nature.scot/sites/default/files/LCA/LCT%20059%20-%20Raised%20Beach%20Coast%20and%20Cliffs%20-%20Final%20pdf.pdf (Accessed November 2023).

Field boundaries are marked by drystone dykes, post and wire fences and some hedges on lower slopes.

Some Iron Age hut circles and hill forts occur within the hills and a line of castles mark the boundary with Garnock Valley.

Modern development is generally scarce, comprising little more than a scatter of farmsteads.

Tall structures (masts, pylons and turbines) are beginning to erode some of the characteristics of remoteness from certain areas; and

Where woodland does not foreshorten views they tend to be long distance and panoramic, focused towards the islands and peninsulas in the Firth of Clyde and Kilbrannan Sound."[18]

14.5.22 To the west of the Works Area, across the Fairlie Roads water, Little Cumbrae Island and Great Cumbrae Island are defined as *LCT 61 - Coastal Fringe with Agriculture*[19]. The key characteristics of this LCT are as follows:

"*Low lying coastal fringes.*

Varied geology with a variety of sedimentary, igneous and metamorphic rocks.

Agricultural land use with improved pasture and mixed farmland all evident.

Patterns of broadleaf woodland in this landscape closely reflecting the interplay of topography and exposure, together with human land uses.

Contrasting settlement patterns on different islands. Larger settlements within these areas have experienced considerable growth recently with suburban housing developments pushing along the coast and uphill.

Small scale rural character with a fine landscape grain. However, due to their coastal location they are quite exposed and strongly influenced by changing weather conditions; and

Views tend to be open, longer distance and focused out to sea towards the mainland and surrounding peninsulas."[19]

14.5.23 LCT 61 - Coastal Fringe with Agriculture has been scoped out of the assessment. Views that "*tend to be long distance and panoramic, focused towards the islands and peninsulas in the Firth of Clyde and Kilbrannan Sound*"[19] are a key characteristic of this landscape. However, observations made during the field survey with regard to the baseline role of HNB from within this landscape and the scale of the activities proposed at HNB at a minimum separation distance of 2 km has led to the conclusion that the Proposed Works would not generate a magnitude of landscape change that is sufficient to significantly alter the character, or key characteristics of this LCT.

14.5.24 LCT 80 - Rugged Moorland Hills and Valleys has been scoped out of the assessment. Observations made during the field survey with regard to the baseline role of HNB from within this landscape and the scale of the activities proposed at HNB at a minimum separation distance of 2.5 km, has led to the conclusion that the Proposed Works would

[18] NatureScot (2019). *National Landscape Character Assessment. Landscape Character Type 80 Rugged Moorland Hills and Valleys.* (online). Available at: https://www.nature.scot/sites/default/files/LCA/LCT%20080%20-%20Rugged%20Moorland%20Hills%20and%20Valleys%20-%20Final%20pdf.pdf (Accessed November 2023).
[19] NatureScot (2019). *National Landscape Character Assessment. Landscape Character Type 61 Coastal Fringe with Agriculture*. (online). Available at: https://www.nature.scot/sites/default/files/LCA/LCT%20061%20-%20Coastal%20Fringe%20with%20Agriculture%20-%20Final%20pdf.pdf (Accessed November 2023).

not generate a magnitude of landscape change that is sufficient to significantly alter the character, or key characteristics of this LCT.

14.5.25 As a result, the assessment will focus on the host *LCT 59 - Raised Beach Coast and Cliffs.*

Seascape character

14.5.26 NatureScot guidance on coastal character assessment[20] states that "*In Scotland the focus is on the coast and its interaction with sea and hinterland, relationships that are quite distinctive in the Scottish context, especially on the West coast.*" The guidance also states that "*…the size of the development proposal being assessed and its distance from shore will influence the appropriate scale of characterisation. … also of relevance is any screening provided by coastal landform, which will limit the extent of the study area.*"

14.5.27 The assessment of effects on seascape character uses the same methodology as the assessment of Landscape Effects as reported in **Appendix 14A**. This is in accordance with paragraph 2.6 of GLVIA3[4] which notes "*This guidance is equally applicable to all forms of landscape and does not separate townscape and seascape out for special treatment*."

14.5.28 The *Seascape/Landscape Assessment of the Firth of Clyde*[11] identifies the Works Area as lying within *Section 7 - Upper Firth of Clyde and the Cumbraes*. This area of seascape includes areas of coastline on the mainland, islands of Cumbrae and Argyle and Bute. In a description of the key issues which should be considered when assessing the landscape and visual implications of development on or in the Upper Firth of Clyde, the *Seascape/Landscape Assessment of the Firth of Clyde*[11]notes that development should*:*

"*Focus … in those areas where development is already more prevalent, to reinforce the contrast with the more secluded areas of character, whilst maintaining key views. This is especially the case with large scale development, which has an existing strong focus as a cluster of large scale development at Hunterston – extending development along the coast would simply create visual clutter*"[11]

14.5.29 The extensive coastlines within *Section 7 - Upper Firth of Clyde and the Cumbraes* are further sub-divided into 14 Coastal Character Areas (CCA). Those within the Study Area are shown in **Figure 14.6**.

14.5.30 The Works Area lies within Coastal Character Area (CCA) Largs to Goldenberry, as shown in **Figure 14.6**. The description of this CCA states "*This stretch of coast, from The Pencil Monument at Largs to the coast below Goldenberry at Hunterston and pivoted on the town of Fairlie, is marked by its strong industrial and recreational relationships with the sea, and by the number and extent of infrastructure required to support these activities. The designed landscapes of Kelburn and Hunterston characterise the hinterland. The dominant element of the coast is that the shore has been so heavily modified that little of its natural form remains*"[11].

14.5.31 The Seascape/Landscape Assessment of the Firth of Clyde cites the considerations presented in **Table 14.5**, in relation to the key seascape / landscape and visual characteristics of the *Largs to Goldenberry* CCA.

[20] Scottish Natural Heritage (2017). *Guidance note: Coastal Character Assessment,* Guidance Note - Coastal Character Assessment.pdf (nature.scot) (Accessed November 2023).

Table 14.5 Key seascape /landscape and visual characteristics of the Largs to Golenberry CCA

Consideration	Description
Maritime influences and experience from the sea	"*Fairlie Roads is a narrow channel, but it is also one of the deepest sea entrance channels in northern Europe. These narrow seaways around the Cumbraes are a key transition point between the Lower and Upper Firths. The shoreline is largely dominated by imported material that emphasise the need for protection from waves, winds and tides. Yet the close proximity of Little and Great Cumbrae islands provide shelter and reduces the expansiveness of the sea.*" [11]
Maritime development and activity	"*There is frequent maritime activity, with yachts travelling to and from Largs Yacht Haven which has berths for 750 boats. There are additional serviced moorings and covered storage at Fairlie marina. Large vessels berth at Hunterston, the Clydeport deepwater terminal. …*" [11]
Character and experience of the coastline	"*While much of the coast is modified with a narrow tidal reach, there are large sandy beaches, important for birdlife, at south Fairlie, Gull's Walk and Hunterston Sands revealed at low tide. Most of the coastline between these has been very modified and is protected by rock embankments, paved revetments, rip rap, sea walls and gabion walls. There are extensive areas of reclaimed land. Jetties, piers and headlands project into the sea at regular intervals. Access to much of the shore is difficult and is frequently restricted by security fencing, with the exception of the excellent shoreline access below sea and garden walls at Fairlie. There is a car park and picnic area on headlands to north and south of Fairlie.*" [11]
Topography and land use of hinterland	"*The coast and its immediate hinterland are greatly modified especially where the industrial yards are located at Hunterston. The town of Fairlie sits on a low coastal ledge, with the Clyde Muirshiel Hills, including the prominent Kaim Hill, rising behind. The steep wooded slopes combine pasture with belts of woodland associated with the setting of Kelburn Castle and Country Park. Further policies are associated with Hunterston House. Kelburn windfarm is located behind Fairlie in the Clyde Muirshiel Regional Park. The Ayrshire Coastal path is set back from the coast along part of this stretch.*" [11]
Settlement pattern, built development and infrastructure	"*The only residential settlement is Fairlie, a small village hugging the sweeping bay between two headlands and taking advantage wherever possible of the sea views. The main road and the railway are set back from the coast, with the result that houses extend down to the shore, protected by high sea and garden walls. The area is dominated by the large infrastructure associated with two nuclear power stations, Clydeport terminal, the construction yard and turbine testing station, pylons, the conveyor to the coal railhead and the marinas.*" [11]
Setting of landmarks and features	"*The Hunterston cranes are sculptural landmarks, and the ships moored at their pier are lit at night, creating temporary features. Hunterston B is also lit at night. Kaim Hill's distinctive profile is a landmark on an otherwise unremarkable skyline. The Waste Water Treatment Works, designed to look in keeping as a Victorian red brick building, is located on the former jetty at Fairlie and is a local feature.*" [11]
Experience of isolated coast	"*There is no experience of isolation on this coast, which is limited by the amount of development and the sound of activity.*" [11]
Aesthetic qualities	"*The simplicity of Fairlie, with its buildings (including recent residential development), directly fronting the sea creates a settlement of unity and integrity.*"[11]

Consideration	Description
Visual amenity and key Viewpoints	"*The Ayrshire Coastal Path is a key viewpoint, especially around Hunterston where access by vehicle is not encouraged. The Largs marina provides a promontory viewpoint, as do the headlands to north and south of Fairlie where there are picnic sites. The recognisable profiles of the Cumbraes, Arran and the Cowal hills are visible from this coast, and can be back lit at sunset.*"[11]

14.5.32 Other CCAs within Section 7, Upper Firth of Clyde and the Cumbraes which lie within the Study Area are as follows:

- Goldenberry to Farland Head;
- Great Cumbrae island;
- Millport; and
- Little Cumbrae island.

14.5.33 South of Farland Head, the coastal edge within the Study Area lies within Section 8, Lower Firth of Clyde (East) and more specially within the Farland Head to Ardrossan Harbour CCA.

14.5.34 Sections of CCA that have no ZTV coverage (as illustrated in **Figure 14.6**) have been scoped out of the assessment. These include:

- Goldenberry to Farland Head; and
- Farland Head to Ardrossan Harbour CCA.

14.5.35 Of the remaining CCAs those within 3 km of the Proposed Works are included in the assessment as a precautionary measure.

Landscape designations

National landscape designations

14.5.36 There are no national landscape designations (National Parks and National Scenic Areas) within the Study Area. The nearest NSAs are:

- *North Arran NSA* (15.9 km to the south-west); and,
- *Kyles of Bute NSA* (23 km to the north-west).

14.5.37 Both NSAs have been scoped out of further assessment due to the long intervening distance and limited ZTV coverage as shown in **Figure 14.2**. Site surveys from these locations indicate that although HNA is visible as a minor focal point due to its white colour, the HNB reactor building is barely perceptible in views due to its muted, darker colouration. The Safestore would retain the same footprint and height of the HNB reactor building and would therefore not appear as an unfamiliar feature in the view or as a new structure that contrasted with the surrounding landscape. It would appear as an existing element in views that would be barely discernible from the *North Arran* and *Kyles of Bute* NSAs.

Regional and local landscape designations

Regional Parks

14.5.38 Regional Parks are a designation that was created to enable the coordinated management of recreation and other land uses, such as farming and forestry, and often include landscapes of regional importance.

14.5.39 The Clyde Muirshiel Regional Park covers an area of 265 sq. km and lies approximately 2 km to the east of the Works Area at its closest point, as shown in **Figure 14.7**. The overarching objectives of the Park are as follows:

> "*To conserve and enhance the natural beauty. biodiversity and cultural heritage of Clyde Muirshiel Regional Park.*
>
> *To encourage and enable learning, understanding and enjoyment of Clyde Muirshiel Regional Park; and*
>
> *To promote and foster environmentally sustainable development for the social and economic well-being of the people and communities within the Clyde Muirshiel Regional Park area.*"[21]

14.5.40 The Park Strategy 2016-2021[22] notes that the Park Authority "*recognises landscape and character as unique assets that contribute to the area's popularity and regional importance. The Park Authority will seek to maintain these assets*".

14.5.41 Clyde Muirshiel Regional Park has been scoped out of the assessment. Limited ZTV coverage, field survey observations, a baseline in which HNA and HNB are established components in the landscape together with the scale of the activities proposed at HNB, has led to the conclusion that the Proposed Works would not generate a magnitude of landscape change that is sufficient to significantly alter the natural beauty and character of the Clyde Muirshiel Regional Park. This is further demonstrated by the visual assessment at Viewpoint 8: Kaim Hill (illustrated in **Figure 14.15** and assessed in **Appendix 14C, Table 14C.2**) where the magnitude of change is assessed as Very Low resulting in a Not Significant visual effect, and similarly on visual effects from Fairlie Moor Road (assessed in **Table 14.15**) which passes through Clyde Muirshiel Regional Park where the magnitude of change is also assessed as Very Low.

Special Landscape Areas

14.5.42 SLAs are areas of locally designated landscape and are protected in North Ayrshire through Policy 15 of the *North Ayrshire Adopted LDP*[3]. Whilst the Proposed Works do not lie within an SLA, this designation covers both of the islands of Little Cumbrae and Great Cumbrae to the west and a Mainland SLA covers the rising hills and coastline to the north-east, the boundary of which coincides with the Clyde Muirshiel Regional Park. The location and geographical extent of the SLAs within the Study Area is illustrated in **Figure 14.5**.

14.5.43 Little Cumbrae, Great Cumbrae and Mainland SLAs have been scoped out of the assessment. The field survey observations, a baseline in which HNA and HNB are established components in the landscape together with the scale of the activities proposed at HNB, has led to the conclusion that the Proposed Works would not generate a magnitude of landscape change that is sufficient to significantly alter the special

[21] Clyde Muirshiel (2022). *About Clyde Muirshiel*. (Online) Available at: https://clydemuirshiel.co.uk/about/about-clyde-muirshiel/ (Accessed November 2023).
[22] Clyde Muirshiel Regional Park Authority. (undated). *Park Strategy 2016-2021*. (online). Available at: http://clydemuirshiel.co.uk/wp-content/uploads/2016/05/Park-Strategy.pdf (Accessed November 2023).

landscape qualities of these SLAs. This is further demonstrated in the visual analysis at Viewpoints 6, 7 and 8 (**Appendix 14C**, **Table 14C.2**) where effects arising from the Proposed Works were assessed as Not Significant.

Wild Land Areas

14.5.44 There are no Wild Land Areas (WLAs) within the Study Area. The nearest WLAs are:

- *Waterhead Moor - Muirshiel* WLA - 9km distance to the north-east; and
- *North Arran WLA*- 19.1 km distance to the south-west.

14.5.0 Both of these WLAs have been scoped out of further assessment due to long intervening distance and limited ZTV coverage as shown in **Figure 14.2**. Where visibility is indicated, field survey observations, a baseline in which HNA and HNB are established components in the landscape together with the scale of the activities proposed at HNB, has led to the conclusion that the Proposed Works would not generate a magnitude of landscape change that is sufficient to significantly affect the WLA.

Visual baseline

14.5.1 The Works Area has relatively low existing visibility due to its low-lying coastal location flanked to the east by the rising landform of the Clyde Muirsheil Regional Park, and to the south by Goldenberry Hill and Campbelton Hill. To the north-east of the Works Area, there are some views along the coastline looking south to the existing HNA and HNB buildings beyond disused industrial infrastructure at Hunterston Port and Bulk Terminal. To the west and north-west of the Works Area, the expanse of sea that forms the Fairlie Roads provides open views from Great Cumbrae and Little Cumbrae. In close range views, areas of woodland and mature trees within the grounds of Hunterston House and Hunterston Castle provide further screening from the east and north-east.

14.5.2 In longer range views the two white clad HNA Safestore buildings form noticeable features in views towards the Works Area. The contrast between the white clad Safestore structures and the dark, muted colours of the surrounding hills increases the prominence of the towers particularly in views from the west at the Cumbrae islands and in clear conditions from Aran and Bute.

14.5.3 The ZTV (**Figure 14.2**) reflects the underlying geology with the main areas of visibility shown to the north-east along the coastline and rising hills, and to the west across the expanse of the Fairlie Roads water to Great and Little Cumbrae. Elsewhere, there would be no visibility of the Proposed Works due to the screening by intervening landform, vegetation and/or built-form.

Future baseline

Overview

14.5.4 Landscape change is an ongoing and inevitable process and would continue across the surrounding area irrespective of whether the Proposed Works proceed. Change can arise through natural processes (e.g. the maturity of woodlands) and natural systems (e.g. river erosion) or, as is often the case, occurs due to human activity, land use, management or neglect.

Hunterston A

14.5.5 HNA lies to the immediate south-west of HNB and ceased generating electricity in 1989[23]. It is currently undergoing decommissioning and the twin reactors are contained within two white clad Safestore structures. There will be long-term gradual changes across the HNA site as the decommissioning works continue.

Wider landscape change

14.5.6 The sites of HNA and HNB are proposed as a Strategic Development Area in the North Ayrshire LDP[3]. With regard to HNA and HNB, the allocation supports the future use of this area for "*Other facilities for large and small scale power generation*". The allocation also cites support for a variety of uses for the Deep Water Port and Bulk Terminal, which lies to the north-east and east of HNB, as follows:

- renewable energy;
- grid connection for offshore renewable energy;
- maritime construction and decommissioning;
- a facility to handle all dry and bulk liquid cargoes; and
- local biomass energy generation.

14.5.7 The North Ayrshire LDP allocation also identifies the area to the south and east of HNB as '*Marketable Employment Land*'. Although timescales for development within these areas are currently unknown, any proposals would alter the landscape around the Works Area and may increase the number of visual receptors. Given the proposed land uses, the increased number of visual receptors are likely to be people at their place of work as opposed to residents or recreational visual receptors and would therefore be of lower susceptibility to visual change in accordance with paragraph 6.34 of GLVIA3[4].

14.5.8 Land management, and consequently landscape character, is dependent on the continuation of favourable development management and economic conditions, which is not a matter for this assessment. However, changes to this baseline could alter the landscape character by an increase, decrease or maintenance of current levels of surrounding forestry and other vegetation.

14.5.9 The effects of climate change are similarly difficult to predict at a local level in respect of future change to landscape character.

14.5.10 The potential long-term changes associated with the climate, land management and strategic development are unpredictable and as a consequence, it is proposed that the assessment will largely be carried out against the current landscape and visual baseline. The exception relates to HNA, where the Final Site Clearance phase is assumed for the purposes of this assessment to take approximately 10 years, concluding approximately 25 years from the end of the Quiescence phase (refer to planning application reference 17/00740/PP). As a consequence, this future landscape and visual change will be taken into consideration at the appropriate assessment phases (Quiescence Phase and Final Site Clearance Phase).

[23] Magnox Ltd (2019). *Our Sites.* (Online). Available at: https://www.gov.uk/government/collections/our-sites (Accessed November 2023).

Cumulative baseline

The cumulative baseline of all existing, consented and proposed developments (including those at scoping) within or near to the Study Area have been identified in **Table 14.6**. Judgement is made on potential effects and inclusion in the cumulative assessment.

Table 14.6 Cumulative Developments within or near to the Study Area

Application Reference and Status	Development	Distance from Site	Potential Effects	Include in the assessment
Existing	Hunterston A Safestore buildings and associated infrastructure	Adjoining Works Area boundary	Potential for significant cumulative visual, landscape and seascape effects.	Yes
22/00209/EIA Scoping	EIA Scoping Opinion request for 49.9 MW Solar Farm Development. North of Lawhill Farm, West Kilbride	4.8 km	Limited scope for inter-visibility with the Proposed Works or affected areas of landscape character	No
22/00133/PPPM Planning permission in principle	Hunterston Ore Terminal (Cable Factory) - Erection of a high voltage cable manufacturing facility, including detailed planning permission for the construction of a 185 m high extrusion tower with associated factories, research and testing laboratories, offices with associated stores, transport, access, parking and landscaping with on-site generation and electrical infrastructure and cable delivery system.	1.5 km	Potential for significant cumulative visual, landscape and seascape effects.	Yes
21/01174/PPM Pending Decision	Erection of 220 dwelling houses and associated infrastructure and landscaping west of Snowdon Terrace Seamill West Kilbride	2.9 km	Limited scope for inter-visibility with the Proposed Works or affected areas of landscape character	No
21/00622/EIA Scoping	EIA Screening Request for a proposed 49.9 MW cryogenic energy		Limited detail of proposal. Potential for cumulative effects	No

Application Reference and Status	Development	Distance from Site	Potential Effects	Include in the assessment
	storage facility. Hunterston Construction Yard Fairlie Largs Ayrshire			
21/00480/EIA Scoping	EIA screening request for proposed synchronous compensator. Former Coal Terminal Hunterston	1.3 km	Limited detail of proposal. Potential for cumulative effects	No
ECU00003319	Grid services facility comprising 2 battery storage facilities, a synchronous condenser and other associated ancillary electrical infrastructure. The electrical export capacity of the Development will be up to approximately 450 MW. Campbelton Farm, on Beech Avenue in Hunterston	0.5 km	Potential for cumulative visual and landscape effects.	Yes
20/00213/EIA Scoping	Request for EIA Screening Opinion for liquid natural gas bunkering facility for the Ardrossan to Arran Ferry Service. Ardrossan Harbour Montgomerie Street Ardrossan.	9.7 km	Limited scope for inter-visibility with the Proposed Works or affected areas of landscape character	No
23/00575/PP	Extraction and processing of stone and blending with manufactured aggregate. Biglees Quarry West Kilbride Ayrshire .	2.2 km	Existing quarry. Unlikely to introduce significant cumulative effects.	No
23/00178/EIA Scoping	Request for EIA Scoping Opinion for the realignment of the B714 between Sharphill Roundabout and Hillend Roundabout. North Of Girthill Farm Saltcoats	10.7 km	Limited scope for inter-visibility with the Proposed Works or affected areas of landscape character	No

Application Reference and Status	Development	Distance from Site	Potential Effects	Include in the assessment
23/00074/EIA Scoping	Request for EIA screening opinion for new Ardrossan Community Campus. Site To West Of 55A Montgomerie Street Ardrossan	9.6 km	Limited scope for inter-visibility with the Proposed Works or affected areas of landscape character	No
23/00024/EIA Scoping	Request for EIA screening opinion for revised solar farm application. Site To The North East Of Wee Minnemoer Millport Isle Of Cumbrae	5 km	Limited scope for inter-visibility with the Proposed Works or affected areas of landscape character	No
23/00454/EIA Scoping	Request for EIA Screening/Scoping Opinion for proposed 19.99 MW Battery Energy Storage System. East Of Wardlaw Wood Windfarm Dalry	7.9 km	Limited scope for inter-visibility with the Proposed Works or affected areas of landscape character	No
23/00528/EIA	Request for EIA Screening opinion for installation of stability island. Former Coal Terminal Hunterston	1.3 km	Limited detail of proposal. Potential for cumulative effects	No

14.5.11 The following schemes have been taken forward and considered in the cumulative impact assessment:

- HNA is located adjacent to HNB and the Proposed Works. Although it is always visible in conjunction with HNB and the Proposed Works, it is included as a separate cumulative development. For the purposes of assessment, it is anticipated that the HNA Safestore would be removed approximately 25 years before the end of the Quiescence phase for HNB. This would remove the highly contrasting white buildings from views and reduce the mass of built form adjacent to the Site;
- The development of the Hunterston Ore terminal to form a high voltage sub-sea cable factory (hereafter referred to as ‘cable factory') with associated buildings is at the consented stage. This would introduce large, relatively low-lying industrial buildings in combination with a 185 m tall tower on the reclaimed Ore terminal platform and would also introduce potential increase in maritime activity in views; and
- The energy storage facility occupying existing pasture farmland at Campbeltown Farm would introduce a range of buildings (battery storage containers and buildings housing condenser and inverter units) and electrical infrastructure across several fenced areas. The majority of the buildings would be low lying (3 - 6.5 m in height) with a maximum height of 13.15 m (Synchronous condenser).

14.6 Embedded environmental measures

14.6.1 As part of the design process, a number of embedded environmental measures are proposed to reduce the potential for Landscape and Visual effects. **Table 14.7** outlines how these embedded measures will influence LVIA.

Table 14.7 Summary of embedded environmental measures

Embedded Measure	Compliance Mechanism
Implementation of an Interim State Landscape Plan prior to the start of the Quiescence phase to soften the impact of decommissioning works on the Ayrshire Coastal Path	Interim State Landscape Plan

14.7 Assessment methodology

14.7.1 The proposed generic project-wide approach to the assessment methodology is set out in **Chapter 5: The EIA Process**, and specifically in **Section 5.3** and **Section 5.4**. However, whilst this has informed the approach that has been used in this chapter, it is necessary to set out how this methodology has been applied, and adapted as appropriate, to address the specific needs of the LVIA in this Environmental Statement (ES).

General approach

14.7.2 The assessment methodology is set out in **Appendix 14A**. The methodology for the LVIA and CLVIA has been undertaken in accordance with best practice guidance which is listed in **Table 14.2**.

1.1.1 With respect to the specific assessment methodology which applies to this chapter, GLVIA3 (paragraph 7.9-7.13), states that projects included for cumulative assessment should include "*other examples of the same type of development*" (paragraph 7.11). The guidance goes on to state that "*Stakeholders ... will be concerned about the totality of the cumulative effect of past present and future proposals. Those assessing these effects should reflect these concerns …*" (paragraph 7.16). Similar types of development within the Study Area that have a characterising effect on landscape receptors and are visible in views are therefore considered as a cumulative (existing) development in the CLVIA.

1.1.2 As stated in the Methodology (**Appendix 14A**), the assessment has adopted detailed guidance on the cumulative assessment of wind farm development, which is provided in the *Scottish Natural Heritage document 'Guidance: Assessing the Cumulative Landscape and Visual Impact of Onshore Wind Energy Developments' (2021)*[24]. This distinguishes between 'additional' cumulative effects that would result from adding the Proposed Works to other cumulative development and 'combined' cumulative effects that assess the total cumulative effect of the Proposed Works and other cumulative development. In the latter case a significant cumulative effect may result from the Proposed Works or one or more other existing, under-construction or consented developments, or other development

[24] NatureScot, (2021). *Guidance: Assessing the Cumulative Landscape and Visual Impact of Onshore Wind Energy Developments*. (Online) Available at: https://www.nature.scot/doc/guidance-assessing-cumulative-landscape-and-visual-impact-onshore-wind-energy-developments (Accessed November 2023).

applications. In those cases, the main contributing development(s) is identified in the assessment.

Determination of significance

14.7.3 The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999[25] (hereafter referred to as "EIADR") recognises that decommissioning will affect different environmental elements to differing degrees, and that not all of these are of sufficient concern to warrant detailed investigation or assessment through the EIA process. The EIADR identify those environmental resources that warrant investigation as those that are "*likely to be significantly affected by the Proposed Scheme*".

14.7.4 The EIADR does not define significance. The significance of an effect resulting from a development is determined in this assessment by reference to:

- the sensitivity (or 'importance') of a landscape or visual receptor. This considers the susceptibility of the receptor to change and the value of the receptor in accordance with paragraphs 5.39-5.47 GLVIA3[4] for landscape sensitivity and paragraphs 6.31-6.37 of GLVIA3[4] in relation to visual sensitivity. A full description of these considerations is provided in the methodology in **Appendix 14A**; and
- the magnitude of the landscape or visual change. This is assessed by considering its size and scale, geographical extent and duration/reversibility of the proposed change in accordance with paragraphs 5.48-52 of GLVIA3[4] in relation to landscape effects and paragraphs 6.38-6.41 of GLVIA3[4] concerning visual effects. A full description of these considerations is provided in the methodology in **Appendix 14A**.

14.7.5 This approach provides a mechanism for identifying areas where mitigation measures may be required and to identify the most appropriate measures to alleviate the potential effects presented by the Proposed Works.

14.7.6 In accordance with the EIADR, it is important to determine whether the effects, assessed as a result of the Proposed Works, are likely to be significant. Significant landscape and visual effects will be highlighted in bold in the text and in most cases, relate to all those effects that result in a 'Major or a 'Major / Moderate' effect as indicated in **Table 14.8** (and shaded dark grey). 'Moderate' levels of effect (shaded light grey) can also be assessed as significant, subject to the assessor's professional opinion, which should be clearly explained as part of the assessment. White or un-shaded boxes in **Table 14.8** indicate a non-significant effect.

14.7.7 In those instances where there would be no effect, the magnitude has been recorded as 'Zero' and the level of effect as 'None' or 'No View'. Intermediate levels of magnitude and levels of effect are also used in the LVIA, for example High – Medium magnitude or Major to Major/Moderate level of effect.

[25] UK Government (1999). *Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999* (Online) Available at: https://www.legislation.gov.uk/uksi/1999/2892/contents/made (Accessed November 2023).

Table 14.8 Significance evaluation matrix applicable to the LVIA

		Landscape and Visual Sensitivity		
		High	**Medium**	**Low**
Magnitude of Change	**High**	**Major (Significant)**	**Major/Moderate (Significant)**	Moderate (Potentially Significant)
	Medium	**Major/Moderate (Significant)**	Moderate (Potentially Significant)	Moderate/Minor (Not Significant)
	Low	Moderate (Potentially Significant)	Moderate/Minor (Not Significant)	Minor (Not Significant)
	Very Low	Moderate/Minor (Not Significant)	Minor (Not Significant)	Negligible (Not Significant)
	Zero	None		

14.7.8 The stages of the Proposed Works considered in the LVIA are set out in Section 13.9 (Temporal Scope).

14.8 Assumptions and limitations

14.8.1 The scope of the LVIA is based upon the following assumptions:

- As an assumption of EIADR (as outlined in **Chapter 2: The Decommissioning Process**), it is assumed that the Safestore will be coloured a dark grey-bluegreen similar to or matching the existing reactor building (visible on the existing north and west facades). This will form part of the 'EIA Baseline' for decommissioning at the Site. As such, should the Safestore cladding not come forward with a darker greyscale/blue colour, it will be subject to the process outlined in the **Appendix 5C: EIADR Compliance**.
- The visual assessment assumes winter conditions i.e. no leaf cover on deciduous trees and shrubs and therefore a worst-case scenario in accordance with GLVIA3[4] and *Technical Guidance Note 06/19 Visual Representation of Development Proposals*[5];
- Cumulative effects during the Final Site Clearance phase have not been assessed since this phase would occur in approximately 90 – 100 years time. It is not possible to predict potential cumulative development or changes to existing / proposed developments across this time period.

14.9 Scope of the assessment

Study Area

14.9.1 The LVIA has been based upon a Study Area which extends spatially to include a 3 km offset from the Works Area, as described in detail in paragraph 14.3.2.

Temporal scope

14.9.2 The temporal scope of the LVIA is consistent with the period over which the Proposed Works would be carried out and therefore covers the decommissioning phases, as follows:

- Preparations for Quiescence phase: main focus of activity with deplanting, waste processing and conversion of the reactor building into a Safestore with some activities happening concurrently;
- Quiescence phase: period of relative inactivity for ~70 years. During this period the Safestore structure would remain in place but there is minimal other activity on site; and
- Final Site Clearance phase: re-activity on site with removal of the reactors and plant housed in the Safestore, retrieval of waste from debris vaults and subsequent transfer onwards from site and final site re-instatement to end state occurring at the same time.

Potential receptors

14.9.3 Receptors that could be significantly affected are identified based on their sensitivity/importance/value and the spatial and temporal scope of the assessment.

14.9.4 The assessment of whether an effect has the potential to be of likely significance has been based upon review of existing evidence base, consideration of commitments made (embedded environmental measures), professional judgement and where relevant, recommended aspect-specific methodologies and established practice. In applying this judgement, use has been made of a simple test that to be significant an effect must be of sufficient importance that it should be taken into consideration when making a decision to grant consent.

14.9.5 The identification of geographically specific landscape and visual receptors that could be subject to potentially significant effects has been guided by review of the ZTV for the Proposed Works (see **Figure 14.2**), supported by a review of the data sources and baseline conditions set out in **Section 14.3**.

14.9.6 The ZTV determines the type and distribution of visual receptors which may be able to see one or more of the components of the Proposed Works and would therefore experience visual impacts. Further refinement of visual receptors (residential, recreational and vehicular receptors) for inclusion in the LVIA is carried out through an analysis of the conclusions of a Viewpoint Assessment undertaken at each of the agreed viewpoints included in **Table 14.4** and shown in **Figure 14.2**. A summary table of the findings of the Viewpoint Assessment is provided in **Appendix 14C, Table 14C.1** in order of distance from the Proposed Works. This informs an analysis of the direction, elevation, distance and nature of the potential visual effects and identifies the areas where potential significant effects may occur.

14.9.7 Effects upon landscape receptors are not entirely dependent on the presence of a visual effects pathway, i.e. the landscape receptor being located within the ZTV (see **Figure**

14.2). Landscape effects can also be generated by changes to other perceptual characteristics impacting upon landscape qualities such as tranquillity. Hence the scope of the landscape assessment has been determined by reviewing the defined key characteristics of the LCTs and CCAs in the Study Area and a consideration of the potential for these characteristics or the special landscape qualities of landscape designations to be impacted by the Proposed Works.

14.9.8 Landscape and visual receptors that have the potential for significant effects and are therefore being taken forward for assessment are summarised in **Table 14.9**.

Table 14.9 Receptors subject to potential effects

Receptor Group	Receptors included within the Group
Landscape Character receptors	Host LCT: LCT 59 - Raised Beach Coast and Cliffs
Seascape Character receptors	Host CCA: Largs to Goldenberry
	Other CAAs: Millport, Great Cumbrae Island and Little Cumbrae Island
Visual Receptors: Settlements and residential properties	Millport, scattered residential properties within 1km
Visual Receptors: Transport Routes	A78, C26 Kilrusken Road, Power Station Road, Fairlie Moor Road, B896, Ayrshire Coast passenger Rail Line
Visual Receptors: Recreational Routes	Ayrshire Coastal Path, Core Paths – NC14, 23, 32, 33, 34, 36, 60, 61 Core Paths Great Cumbrae – NC1, 41
Visual Receptors: Tourist and Recreation destinations	Hunterston Castle Millport

Likely significant effects

14.9.9 The likely significant effects on landscape and visual receptors that have been taken forward for assessment in this chapter are summarised in **Table 14.10**.

Table 14.10 Likely significant LVIA effects

Phase	Likely significant effects	Receptor
Preparations for Quiescence phase	Potential for significant effect. Medium-term, direct, temporary effects on perceived landscape character, arising as a result of the Proposed Works.	Effects of the Proposed Works on the landscape, seascape and visual receptors listed in **Table 14.9** and viewpoints in **Appendix 14C, Table 14C.2**.
Quiescence phase	Potential for significant effect. Long-term, direct / indirect, temporary effects on the perceived seascape, arising as a result of the Proposed Works.	Effects of the Proposed Works on the landscape, seascape and visual receptors listed in **Table 14.9** and viewpoints in **Appendix 14C, Table 14C.2**.

Phase	Likely significant effects	Receptor
Final Site Clearance phase.	Potential for significant effect. Medium-term, temporary effects on views and visual amenity experienced by people from principal visual receptors and representative viewpoints as a result of the Proposed Works.	Effects of the Proposed Works on the landscape, seascape and visual receptors listed **in Table 14.9** and viewpoints in **Appendix 14C, Table 14C.2**.

14.10 Assessment of effects

Landscape effects

14.10.1 Landscape Effects are defined by the Landscape Institute in GLVIA 3[4], paragraphs 5.1 and 5.2 as "*An assessment of landscape effects deals with the effects of change and development on landscape as a resource. The concern [...] is with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character. ... The area of landscape that should be covered in assessing landscape effects should include the site itself and the full extent of the wider landscape around it which the proposed development may influence in a significant manner.*"

14.10.2 These effects are assessed by considering the landscape sensitivity (value and susceptibility) against the magnitude of change. The type of effect is also described as temporary or permanent, direct or indirect, cumulative and beneficial, neutral, or adverse. An assessment of the cumulative landscape effects, taking account of other consented development and any current applications, has been undertaken according to the methodology detailed in **Appendix 14A**. The assessment has taken a precautionary approach and focused on the landscape character of the host LCT within 3 km. This has been guided by the results of the viewpoint analysis (**Appendix 14C**) which indicated that significant visual effects will be limited, primarily to within 1 km of the Proposed Works. Other LCTs within 3 km have been scoped out of the assessment as described in **Section 14.9**.

Landscape effects: LCT 59 - Raised Beach Coast and Cliffs

14.10.3 The location and geographical extent of LCTs within 3 km is illustrated in **Figure 14.5**.

Landscape sensitivity of the Raised Beach Coast and Cliffs LCT

Landscape susceptibility

14.10.4 Consideration of the physical, visual and perceptual characteristics of the landscape within the Site and Study Area, which includes the existing HNB reactor and ancillary buildings alongside the white-clad HNA reactors, HVDC converter station buildings and pylons, all of which are established large-scale landscape features, indicates a landscape which is of *Low* susceptibility to the type of change proposed (i.e. the decommissioning works).

Landscape value

14.10.5 In accordance with Box 5.1 of GLVIA3[4] and Technical Guidance Note 02/21 Assessing landscape value outside national designations, the landscape value of LCT 59 - Raised Beach Coast and Cliffs has been determined through consideration of the following:

- Landscape planning designations: **Figure 14.7** shows that across the majority of *LCT 59 - Raised Beach Coast and Cliffs* within the Study Area there are no areas of locally or nationally designated landscape. However, to the east and north-east, the LCT shares its border and slightly overlaps with the locally designated Special Landscape Area which coincides with the Clyde Muirshiel Regional Park to the north-east of the LCT beyond the Study Area, indicating increased landscape value in these areas of the LCT.
- Recreational value: the Ayrshire Coastal Path long distance walking route, one of Scotland's nationally promoted Great trails, passes through the area (see **Figure 14.4**) offering recreational opportunities from which to appreciate the landscape. This indicates an increased landscape value. A network of Core Paths also provides local recreational routes across the landscape.
- Perceptual (Scenic): the long distance coastal views across the Fairlie Roads and the Firth of Clyde towards the Cumbrae islands, Bute and Arran are recognised as a key characteristic of the LCT with the description also citing a "*Landscape of visual drama and contrast….*"[17] thereby indicating a landscape of higher value. However, this is countered by the presence of detracting features including the large-scale industrial elements of the reclaimed coastline and former ore / coal terminal, and the Hunterston power station buildings which occupy a large part of the Study Area and indicate a lower scenic value.
- Perceptual (wildness and tranquillity): The published description for the LCT notes that the "*Well settled sections of the coast contrast with secluded and dramatic sections of headlands and cliffs…*"[17]. This is evidenced within the Study Area with low levels of wildness and tranquillity in close proximity to the Works Area indicating lower landscape value.
- Natural and cultural heritage: in terms of nature conservation designations, the Study Area features Portencross Woods Site of Special Scientific Interest (SSSI) and Southannan Sands SSSI as illustrated in **Figure 8.2**. A number of non-statutory biodiversity conservations represented by Local Nature Conservation Sites are also present as evidenced in **Figure 8.4**. The raised beach profiles which define this LCT also provide geological interest. Cultural heritage assets include Hunterston Castle, Hunterston House and its associated gates which are all buildings of regional importance. A designed landscape extends around this cluster of buildings as shown in **Figure 13.1**. These features and assets all contribute positively to the landscape.
- Distinctiveness: The raised beaches comprise an important feature of the Ayrshire coast and represent distinctive features which define this LCT, indicating higher landscape value.
- Through consideration of the above factors, an assessment of Medium landscape value to the LCT can be applied in relation to the Study Area. This reflects the higher natural and cultural value of the landscape and both the presence of large-scale industrial elements (and corresponding lower perceptual value) and the presence of the Ayrshire Coastal Path, acknowledging the reduced scenic value as the Ayrshire Coastal Path passes through the Works Area. The closest locally designated landscapes to the east are approximately 2 km from the Works Area and the ZTV coverage is fragmented, indicating limited influence on the landscape value of the Works Area from surrounding LCTs.

14.10.6 To conclude the landscape value of *LCT 59 - Raised Beach Coast and Cliffs* within the Study Area is assessed as Medium.

Overall sensitivity

14.10.7 The overall sensitivity to change considering the assessment of Low susceptibility and Medium value is *Medium*.

LCT 59 - Raised Beach Coast and Cliffs: Magnitude of change and level of effect

14.10.8 The potential effects on the *Raised Beach Coast and Cliffs* LCT are described in this section. The effects are described separately during each of the phases of the Proposed Works (Preparations for Quiescence phase, Quiescence phase, and Final Site Clearance) and potential cumulative effects are assessed at the time they would occur in each of the phases. During the Preparations for Quiescence and Final Site Clearance phases, there are both temporary medium-term impacts associated with dismantling and deconstruction activity on the Site, as well as permanent impacts associated with a reduction in built form from the removal of buildings on the Site. The outcome of the effects on *LCT 59 - Raised Beach Coast and Cliffs* is summarised in **Table 14.11**.

14.10.9 With regards to localised direct landscape effects on the Works Area and its component landscape elements[26]. The landscape elements within the Works Area (built structures, hard standing, amenity grassland with tree cover limited to occasional sparse belts of vegetation) are of Low sensitivity and their removal would not give rise to significant effects.

Magnitude of change and level of effect during the Preparations for Quiescence phase

14.10.10 This phase of the Proposed Works focusses on the demolition and dismantling of buildings in the Works Area and the modification of the reactor building into a Safestore and other supporting infrastructure. Although these are separate components of the Proposed Works, they would occur in tandem, and their potential effect on the key characteristics and character of the *Raised Beach Coast and Cliffs* LCT are assessed together.

14.10.11 All existing buildings with the exception of the reactor building would be deconstructed to ground level, including the jetty and intake to seabed level. All of the deconstructed components would be processed in the Works Area. The processing buildings would be dismantled at the end of the Preparations for Quiescence phase. All of this activity would introduce noise, movement and demolition plant and equipment into the Works Area and would gradually alter the composition of built elements within the Works Area. However, the Works Area would retain its industrial appearance with the retention of the areas of hardstanding alongside the reactor building. The Safestore is assumed to utilise the same footprint and height of the existing reactor building and would be coloured in similar dark grey-blue hues such that its visual presence would remain similar to the existing reactor building.

14.10.12 In respect of landscape character, the Proposed Works would have the greatest effect within the local area (within approximately 1 km of the Works Area) and a limited effect on the wider landscape character due to the retention of the reactor building footprint, massing, colour and limited visibility due to the topological containment of the Works Area. This is illustrated in **Figure 14.2** which shows ZTV coverage for the highest component of

[26] Landscape elements are defined in GLVIA3[4] as "*Individual parts which make up the landscape, such as, for example, trees, hedges and buildings*". Within the HNB site, these predominantly relate to buildings, amenity grassland with tree cover limited to occasional sparse belts of vegetation as reported in paragraph 14.5.1.

the Proposed Works (the proposed Safestore at a height of 66.5 m AGL which can be used as a proxy for elevated crane and re-cladding activity) contained by the surrounding landforms and woodlands to the south and east of the Works Area with patchy visibility beyond this. It can reasonably be concluded that for ground and low-level activities, potential intervisibility would be reduced further within the LCT.

14.10.13 The magnitude of change would range from Zero before the Proposed Works begin to Medium within 1 km of the Works Area given the baseline landscape context within which crane activity and demolition works would take place, which is already dominated by large-scale infrastructure and which would continue to be present throughout the Preparations for Quiescence phase. Hence, whilst cranes and other elevated construction equipment would periodically represent new, vertical components in a landscape where "*tall structures such as masts are relatively few…*", they would not be wholly incongruous given the existing landscape context of the Site and its immediate surroundings in which landscape qualities such as scenic value are already diluted by the presence of HNA, HNB and pylons. The high levels of activity within the Works Area would intensify baseline levels of movement, and the corresponding audible and visual disturbance would likely be of a sufficient scale to partially alter the landscape character within the closest parts of the LCT to the Works Area. A review of the key characteristics which define the LCT indicates that these would remain intact during the Preparations for Quiescence phase.

14.10.14 The magnitude of change would reduce to Very Low at the end of the Preparations for Quiescence phase due to the cessation of activities, absence of lower-level buildings, retention of large hardstanding areas and the retention of the large-scale reactor building (now Safestore) within the Works Area.

14.10.15 During the Preparations for Quiescence phase, there would be a **Moderate** and Not Significant localised landscape effect (within 1 km) that would be adverse and temporary due to increased site activity, levels of disturbance and periodic deployment and presence of cranes. This would reduce to a **Minor** and Not Significant level of effect at the end of the Preparations for Quiescence phase which would be beneficial and permanent. The magnitude of change beyond 1 km would be Very Low to Zero resulting in a **Minor** and Not Significant to **None**, and neutral level of effect. Considering either the Works Area as a whole, or the wider – *Raised Beach Coast and Cliffs* LCT, this would amount to a Not Significant effect on the landscape character and the overall integrity of the host LCT.

14.10.16 The duration of these effects would be medium-term but leading on to long-term effects for those components of the Proposed Works that would be retained through the Quiescence phase of approximately 70 years.

Cumulative effects during Preparations for Quiescence phase:

14.10.17 The existing HNA Safestores are housed within temporary weather envelopes that are located immediately adjacent to the Proposed Works at ~0.3 km to the south-west of the HNB reactor building and form visible tall elements in the landscape due to their white cladding which contrasts highly with surrounding features. Although their form and colour are incongruous with most of the key characteristics of the LCT indicating a higher level of effect, the existing landscape qualities such as scenic value are already diluted by the presence of HNB, HVDC and pylons which reduces the magnitude of effect on landscape character within the Study Area, and the key characteristics include "*tall structures such as masts"*. The magnitude of change on the landscape character from HNA is therefore Medium.

14.10.18 A high voltage sub-sea cable factory occupying the Former Coal Terminal, Hunterston has been consented (22/00133/PPPM). This would introduce a tall (185 m) extrusion tower in addition to large low lying industrial buildings onto the reclaimed platform area and would potentially increase maritime activity along the coastline. The tower would be visible in

views both within the LCT and in views towards the LCT. The magnitude of change would be High within the Coal Terminal Site (Low sensitivity due to the degraded nature of the Site) and immediate surroundings beyond the Site (Medium sensitivity) reducing to Low with distance beyond.

14.10.19 The consented energy storage facility occupying pasture farmland at Campbeltown Farm, Hunterston (ECU00003319) would introduce a range of buildings and electrical infrastructure across several fenced areas and would change the use and rural character of the agricultural fields it occupies. However, it will be located in an area characterised by electricity infrastructure including HV cables, pylons, HVDC and large agricultural buildings resulting in a locally Medium magnitude of change. The energy storage facility would occupy a relatively small geographical area of the overall LCT which is also influenced by road, rail and industrial infrastructure and the magnitude of change on the LCT would be Very Low to Zero.

14.10.20 The additional effect of the Proposed Works would lead to a locally **Moderate, Adverse** and **Not Significant** localised landscape effect (within 1 km) reducing to **Minor**, neutral and **Not Significant** at the end of the Preparations for Quiescence phase (Minor to None level of effect beyond 1 km).

14.10.21 The combined landscape effect would be **Major / Moderate,** adverse and Significant (due to HNA and the cable factory, and not the Proposed Works) reducing to **Moderate / Minor** and **Not Significant** in the wider area. The nature of these effects would be long-term, cumulative, and direct.

Magnitude of change and level of effect during the Quiescence phase

14.10.22 During the Quiescence phase, the Works Area would gain a more 'settled' appearance when compared to the same area during the baseline and preceding Preparations for Quiescence phase.

14.10.23 The Safestore would be set against the rising landform of Goldenberry Hill and surrounding low-lying wooded hills which would contain and screen the lower parts of the building. This containment limits visibility from the surrounding landscape to the south, east and north-east where there is limited ZTV coverage (see **Figure 14.2**). The HNB Safestore building itself is assumed to retain the same footprint, colour pallet and massing of the previous reactor building and would not therefore present as a new feature in the landscape. Changes to the character of the LCT would be most visible within close range (1 km) of the Works Area. The magnitude of change within this area would be Very Low to Zero reducing to Zero in the wider *Raised Beach Coast and Cliffs* LCT. The level of effect within the LCT would be **Minor to None**, Neutral and **Not Significant** within 1 km of the buildings reducing to **None** in the wider LCT.

14.10.24 The duration of these effects would be long term (through the Quiescence phase of approximately 70 years). The nature of these effects would be direct. Whilst it is recognised that the reduction in built form across the Works Area would lead to a beneficial landscape effect (as assessed under the Preparations for Quiescence phase), the continued presence of the Safestore, which represents a large-scale built element within the LCA, would give rise to a neutral type of effect when considered against baseline conditions.

14.10.25 Considering the *Raised Beach Coast and Cliffs* LCT as a whole, the effects would be **Not Significant** due to limited visibility and the presence of adjacent built elements including the Safestore and infrastructure associated with the adjacent HNA.

Cumulative effects during Quiescence phase:

14.10.26 The HNA Final Site Clearance phase is assumed for the purposes of this assessment to take approximately 10 years, concluding approximately 25 years from the end of the Quiescence phase for HNB. This would reduce the massing of built form adjacent to the Site and remove the highly visible white-clad buildings that form a focal point in views along the coastline. The magnitude of change would be High-Medium during the deconstruction activity stage (within 1km of the Site) that would be adverse and temporary. This would reduce to Very Low to Zero after the Site is cleared resulting in a beneficial and permanent effect.

14.10.27 The magnitude of change of the cable factory would remain High both within the Coal Terminal Site (Low sensitivity) and immediate surroundings reducing to Medium with distance beyond (Medium sensitivity). Consent for the cable factory is 25 years after which time it would be decommissioned and removed. The magnitude of change would reduce to Zero following decommissioning.

14.10.28 The magnitude of change for the consented energy storage facility at Campbeltown Farm, Hunterston would remain Very Low to Zero whilst it is in situ.

14.10.29 The additional effect of the Proposed Works would lead to a Very Low to Zero magnitude and a **Minor**, neutral and **Not Significant** level of effect to **None**.

14.10.30 The combined landscape effect would be **Major / Moderate,** adverse and **Significant** within 1 km (due to the cable factory and the HNA demolition works, and not the Proposed Works), reducing to **Moderate / Minor,** adverse and **Not Significant** in the wider area. The nature of these effects would be long-term, cumulative, and direct.

Magnitude of change and level of effect during the Final Site Clearance phase

14.10.31 Increased site activity, including the periodic deployment of cranes and elevated demolition activities, would recommence during the Final Site Clearance phase. Waste created from deplanting and dismantling of structures within the Safestore would be processed in a newly constructed Waste Management Centre and then removed from site. The level of activity and corresponding audible and visual influence during the removal of the Safestore and any remaining built elements, would be comparable to that generated during the Preparations for Quiescence phase and would give rise to a Medium magnitude of change within 1 km of the Works Area. The Proposed Works would contribute to a **Moderate** and **Not Significant** effect during the dismantling and deconstruction that would be adverse and temporary due to increased site activity. Beyond 1 km, the effects would reduce with geographical distance and screening from intervening landform, buildings or vegetation such that the magnitude of change would range from Very Low to Zero. The type of effect beyond 1 km would be neutral whilst the Safestore is still present and deconstruction works are on-going.

14.10.32 Following cessation of the deconstruction works, the absence of the large Safestore building, which is one of the main contributors to the industrial character of the local landscape under baseline conditions, would be a noticeable change to the composition of landscape elements within the Site with corresponding changes to scenic quality and a dilution of the industrial influences within the immediate landscape. This would continue to result in a Medium magnitude of change within 1 km of the Works Area and a **Moderate**, beneficial and permanent **Not Significant** landscape effect within the local landscape. Beyond 1km, the removal of the large-scale reactor building would again reduce with geographical distance and screening from intervening landform, buildings or vegetation such that the magnitude of change would range from Very Low to Zero and **Minor** and **Not Significant** landscape effects would be beneficial and permanent.

14.10.33 Considering either the Works Area as a whole, and the wider *Raised Beach Coast and Cliffs* LCT, this would amount to a **Not Significant** effect on the landscape character or the overall integrity of the host LCT

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Table 14.11 Summary of assessment of direct landscape effects on *LCT 59 - Raised Beach Coast and Cliffs*

Phase	Impact	Extent of effect on LCT	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition plant and waste management.	Within 1km	Zero increasing to Medium	Temporary and medium term	Adverse	None increasing to Moderate to Moderate and Not Significant
		Whole receptor	Very low to zero	Temporary and medium term	Neutral	Minor and Not Significant to None
	Post removal of buildings from the Hunterston B site reducing built form within the LCT.	Within 1 km	Very Low	Permanent	Beneficial	Minor and Not Significant
		Whole receptor	Very low to zero	Permanent	Beneficial	Minor to None
Quiescence phase	Presence of Safestore	Within 1 km	Very low to zero	Long-term	Neutral	Minor and Not Significant to None
		Whole receptor	Zero	Long-term	Neutral	None
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management.	Within 1 km	Medium	Temporary and medium term	Adverse	Moderate and Not Significant
		Whole receptor	Very low to zero	Temporary and medium term	Neutral	Minor and Not Significant
	Post Removal of all buildings and de-licensing of site.	Within 1 km	Medium	Permanent	Beneficial	Moderate and Not Significant
		Whole receptor	Very low to zero	Permanent	Beneficial	Minor and Not Significant

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Seascape / coastal effects

14.10.34 As described in **Table 14.9**, four CCAs are assessed in detail in paragraphs 14.10.34 to 14.10.66 below and in **Table 14.13**, as follows:

- Largs to Goldenberry (host CCA);
- Great or Big Cumbrae island;
- Millport; and
- Little Cumbrae or Wee Cumbrae island.

14.10.35 Direct effects on the host *Largs to Goldenberry* CCA are assessed in paragraphs 13.10.34 – 13.10.61, and summarised in **Table 14.12**. Indirect effects on the remaining CCAs are assessed in detail in **Appendix 14E** and summarised in **Table 14.13**.

Largs to Goldenberry CCA

14.10.36 *Largs to Goldenberry* CCA spans the western coastline of the mainland from Blue Stones, adjacent to Goldenberry Hill to the northern edge of the Study Area at Fairlie. It is characterised by "*its strong industrial and recreational relationships with the sea, and by the number and extent of infrastructure required to support these activities. … The dominant element of the coast is that the shore has been so heavily modified that little of its natural form remains*."[11] The key characteristics of this CCA are outlined in **Table 14.5**.

Largs to Goldenberry CCA Sensitivity

Seascape susceptibility

14.10.37 The key characteristics of *Largs to Goldenberry* CCA include the existing reactor building and ancillary buildings, as well as infrastructure associated with HNA alongside modified coastline, settlement and maritime influences. However, existing industrial elements present in the CCA within Study Area reduce the susceptibility. As a result, an assessment of *Low* susceptibility is applied to *Largs to Goldenberry CCA*.

Seascape value

14.10.38 Landscape planning designations illustrated in **Figure 14.7** show that within the Study Area there are no areas of locally or nationally designated landscape. However, to the north, the CCA is overlapped by the locally designated *Mainland* SLA and Clyde Muirshiel Regional Park. In addition, the Ayrshire Coastal Path long distance walking route passes through the area (see **Figure 14.4**), indicating an increased recreational value. Scenic value is also enhanced by long distance coastal views across the Fairlie Roads and the Firth of Clyde towards the Cumbrae islands, Bute and Arran. However, scenic value is reduced within the Study Area by the presence of areas of the coastline modified by extensive areas of reclaimed land, jetties, piers, paved revetments, rip rap, sea walls and gabion walls as well as infrastructure associated with HNB and HNA. As a result, an assessment of Medium value can be applied on an overall basis in relation to the wider CCA.

14.10.39 To conclude, the landscape value of the *Largs to Goldenberry* CCA is assessed as Medium, with the most valued areas indicated on the northern boundary of the CCA where it is overlapped by locally designated landscapes, and along the Ayrshire Coastal Path.

Overall sensitivity

14.10.40 The overall sensitivity to change considering the assessment of Low susceptibility and Medium value is assessed as *Medium*.

14.10.41 This concurs with the *Seascape/Landscape Assessment of the Firth of Clyde*[11] which states that there is '*Some sensitivity*' to '*Other built development including roads and coastal infrastructure*', stating:

- "*The Hunterston peninsula is heavily industrialised and continues to be considered for further built development, which would be appropriate*."

Assessment of seascape / coastal effects

14.10.42 The Largs to Goldenberry CCA covers the coastal edge and hinterland of the coastal area to the west and north of the Site and includes the reclaimed areas of Hunterston Construction Yard and Hunterston Ore Terminal and associated pier. ZTV coverage (see **Figure 14.2**) along the coastal edge indicates theoretical visibility of the Proposed Works along the majority of the defined coastal edge, with the exception of an area to the south of Fairlie. ZTV coverage on the hinterland and inland from Hunterston Construction Yard and Hunterston Ore Terminal, by contrast, is fragmented due to intervening landform and tree cover with theoretical visibility indicated in the immediate vicinity of the Works Area, to the north of Fairlie and along steeply rising slopes that provide the backdrop to the coastline. Views from these areas of coastline and hinterland are illustrated in Viewpoints 1, 2, and 10.

14.10.43 As shown in Viewpoint 10 (see **Figure 14.17**), the coastline is influenced by settlement at Fairlie and industrial elements such as piers and geometric reclaimed areas. The hinterland comprises mixed woodland, lower lying improved grassland fields and moorland hills. The extent of reclaimed land and industrial expanse is illustrated from Goldenberry Hill (Viewpoint 3, **Figure 14.10**). Access is generally gained by walkers along the Ayrshire Coastal Path and from the settlement of Fairlie – although large parts of this coastline and hinterland around the industrial areas are inaccessible from inland due to security fencing. The A78 and Ayrshire Coast Rail Line roughly follow the coastline in this part of the CCA.

Magnitude of change and level of effect during Preparations for Quiescence phase

14.10.44 In terms of seascape character, the dismantling and demolition works and conversion of the reactor building into a Safestore would have the greatest effect on the local area (within approximately 1 km of the Works Area) and a limited effect on the wider seascape character due to the retention of the existing reactor building footprint, massing, and same colour palette. The magnitude of change would range from Zero at the start of works to Medium within 1 km of the Works Area during the demolition and construction works reducing to Very Low at the end of the Preparations for Quiescence phase. There would be a **Moderate**, adverse and **Not Significant** localised seascape effect (within 1 km) due to increased site activity including the periodic deployment of cranes and elevated re-cladding activities that would be temporary. Upon completion of the Preparations for Quiescence phase, the removal of all lower level built form within the Works Area would have a minor beneficial and not significant effect. The magnitude of change beyond 1 km would be Very Low to Zero resulting in a **Minor** level of effect to **None**, subject to visibility and distance. Considering either the Works Area as a whole, or the wider *Largs to Goldenberry* CCA, this would amount to a **Not Significant** effect on the seascape character or the overall integrity of the host CCA.

14.10.45 The duration of effects during the Preparations for Quiescence phase would be medium-term (up to 12 years) but would lead on to long-term effects for those components of the Proposed Works that would be retained through the Quiescence phase of 70 years (Safestore).

14.10.46 The nature of these effects would be direct, and both adverse – due largely to the nature of demolition and construction activity across the Works Area, before becoming beneficial – due to the removal of built elements during this phase.

Cumulative effects during Preparations for Quiescence phase:

14.10.47 The existing HNA Safestores are located immediately adjacent to the Proposed Works at ~0.3 km to the south-west of the HNB reactor building and form visible tall elements in the seascape due to their white cladding which contrasts highly with surrounding features. The magnitude of effect due to HNA is Medium.

14.10.48 The cable factory would introduce large low lying industrial buildings and a tall (185 m) tower onto the reclaimed platform area. The development would also increase maritime activity along the coastline. The tower would be visible in views both within the CCA and in views towards the CCA forming a new focal point on the coastline. The magnitude of change would be High, both within the within Coal Terminal Site (Low sensitivity due to the degraded nature of the Site) and the wider CCA (Medium sensitivity) surrounding area due to the presence and visibility of the tower and large low-lying buildings.

14.10.49 The consented energy storage facility at Campbeltown Farm, Hunterston will not be visible from the coastal edge and therefore would not have any influence on the coastal character. As a result, there will be no cumulative effects with this development.

14.10.50 The additional effect of the Proposed Works would lead to a **Moderate**, adverse and Not Significant localised seascape effect (within 1 km) reducing to **Minor**, neutral and Not Significant at the end of the Preparations for Quiescence phase, and a **Minor**, neutral and **Not Significant** effect to **None** in the wider area.

14.10.51 The combined landscape effect would be **Major / Moderate**, adverse and **Significant** (due to HNA and the cable factory, but not influenced by the Proposed Works). The nature of these effects would be long-term, cumulative, and direct

Magnitude of change and level of effect during Quiescence phase

14.10.52 During the Quiescence phase, the Works Area would gain a more 'settled' appearance when compared to the same area during the Preparations for Quiescence phase, although seascape effects would continue throughout the Quiescence phase.

14.10.53 The Safestore would be set against the rising landform of Goldenberry Hill and surrounding low-lying wooded hills which would contain and screen the lower parts of the building. The building itself would retain the same footprint, colour palette and massing of the previous reactor building and would not therefore be a new feature in the landscape. Changes to the character of the CCA would be most visible within close range of the Works Area within 1 km due to the absence of lower level built from and visual clutter present under baseline conditions. The magnitude of change within the localised area (up to 1 km of the Proposed Works) would be Very Low due to the continued presence of the large-scale Safestore which has the greatest characterising influence within the Works Area, reducing to Zero in the wider *Largs to Goldenberry CCA* subject to distance and visibility. The level of effect within the CCA would be **Minor** and Not Significant within 1 km of the Safestore reducing to **None** and **Not Significant** in the wider CCA.

14.10.54 The duration of these effects would be long term (through the Quiescence phase of 70 years). The nature of these effects would also be direct. Whilst it is recognised that the reduction in built form across the Works Area would lead to a beneficial landscape effect (as assessed under the Preparations for Quiescence phase), the continued presence of the Safestore, which represents a large-scale built element within the CCA, would give rise to a neutral type of effect when considered against baseline conditions.

14.10.55 Considering the *Largs to Goldenberry CCA* as a whole, the effects would be Not Significant in overall terms due limited visibility and the presence of adjacent built elements including the HNB Safestore and the adjacent HNA.

Cumulative Effects during Quiescence Phase:

14.10.56 The HNA Final Site Clearance phase is assumed for the purposes of this assessment to take approximately 10 years, concluding approximately 25 years from the end of the Quiescence phase for HNB. This would reduce the massing of built form adjacent to the Site and remove the highly visible white-clad buildings that form a focal point in views along the coastline. The magnitude of change would be High-Medium during the deconstruction activity stage (within 1 km of the Site) reducing to Very Low to Zero (where HNA is not visible in the baseline) after the Site is cleared.

14.10.57 The magnitude of change of the cable factory would remain High within the Coal Terminal Site and significant effects would extend into the immediate surrounding area due to the presence and visibility of the tower whilst it is in situ. The magnitude of change would reduce to Zero following the decommissioning of the cable factory which is assumed to occur during the HNB Quiescence Phase.

14.10.58 The consented energy storage facility at Campbeltown Farm, Hunterston will not be visible from the coastal edge and therefore would not have any influence on the coastal character. As a result, there will be no cumulative effects with this development.

14.10.59 The additional effect of the Proposed Works would lead to a Very Low to Zero magnitude and a **Minor to None**, neutral and **Not Significant** level of effect.

14.10.60 The combined landscape effect would be **Major / Moderate,** adverse and Significant (due to the cable factory and during the HNA dismantling and deconstruction activity, and not the Proposed Works). The nature of these effects would be long-term, cumulative, and indirect.

Magnitude of change and level of effect during the Final Site Clearance phase

14.10.61 Increased site activity including the periodic deployment of cranes and elevated demolition activities, would recommence during the Final Site Clearance phase. Waste created from deplanting and dismantling of structures within the Safestore would be processed in a newly constructed on-site Waste Management Centre and removed from site. The level of activity and corresponding audible and visual influence during the removal of the Safestore and any remaining built elements, would be comparable to that generated during the Preparations for Quiescence phase and would give rise to a Medium magnitude of change within 1km of the Works Area. The Proposed Works would contribute to a **Moderate** and **Not Significant** effect during the dismantling and deconstruction that would be adverse and temporary due to increased site activity. Beyond 1 km, the effects would reduce with geographical distance and screening from intervening landform, buildings or vegetation such that the magnitude of change would range from Very Low to Zero. The type of effect beyond 1 km would be neutral whilst the Safestore is still present and deconstruction works are on-going.

14.10.62 Following cessation of the deconstruction works, the absence of the large Safestore building, which is one of the main contributors to the industrial character of the local seascape under baseline conditions, would be a noticeable change to the composition of landscape elements within the Site with corresponding changes to scenic quality and a dilution of the industrial influences within the immediate landscape. This would continue to result in a Medium magnitude of change within 1 km of the Works Area and a **Moderate**, beneficial and permanent **Not Significant** seascape effect within the local seascape. Beyond 1km, the removal of the large-scale reactor building would again reduce with geographical distance and screening from intervening landform, buildings or vegetation such that the magnitude of change would range from Very Low to Zero and **Minor** and **Not Significant** seascape effects would be beneficial and permanent.

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Table 14.12 Summary of assessment of direct seascape / coastal effects on Largs to Goldenberry CCA

Phase	Impact	Extent of effect on CCA	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition plant and waste management.	Within 1km	Zero increasing to medium	Temporary and medium term	Adverse	None increasing to Moderate and Not Significant
		Whole receptor	Very low to zero	Temporary and medium term	Neutral	Minor and Not Significant to None
	Post removal of buildings from the Hunterston B site reducing built form within the LCT.	Within 1km	Very Low	Permanent	Beneficial	Minor and Not Significant
		Whole receptor	Very low to zero	Permanent	Beneficial	Minor and Not Significant to None
Quiescence phase	Presence of Safestore	Within 1km	Very low to zero	Long-term	Neutral	Minor and Not Significant to None
		Whole receptor	Zero	Long-term	Neutral	None
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management.	Within 1km	Medium	Temporary and medium term	Adverse	Moderate and Not Significant
		Whole receptor	Very low to zero	Temporary and medium term	Neutral	Minor and Not Significant
	Post Removal of all buildings and de-licensing of site	Within 1km	Medium	Permanent	Beneficial	Moderate and Not Significant
		Whole receptor	Very low to zero	Permanent	Beneficial	Minor and Not Significant

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Indirect effects on seascape / coastal character

14.10.63 Indirect effects on seascape / coastal character are assessed in detail in **Appendix 14E** and summarised in **Table 14.13**.

14.10.64 Due to the relatively similar seascape features of the three CCAs, the perception of the Proposed Works across the Fairlie Roads waterbody and distance of each of the CCAs from the Proposed Works, the level of effect of the Proposed Works on each the CCAs is broadly the same.

14.10.65 There would be no Significant effects on the key characteristics and features of any of the CCAs as a result of the Proposed Works. This is due to distance and separation of the CCAs from the Proposed Works. The effects from the Proposed Works on the seascape features would be **Moderate / Minor to Minor** and **Not Significant**.

14.10.66 There would also be no significant cumulative effects with other developments.

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Table 14.13 Summary of Indirect effects on CCAs

Phase	Impact	Extent of effect on CCA			Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
		Great or Big Cumbrae island CCA	Millport CCA	Little Cumbrae or Wee Cumbrae island CCA				
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition plant and waste management.	Southern edges of receptor	West and central areas of receptor	East area of receptor	Zero to Very low	Temporary and medium term	Neutral	Moderate / Minor to Minor and Not Significant to None
	Post removal of buildings from the Hunterston B site reducing built form.	Southern edges of receptor	West and central areas of receptor	East area of receptor	Very low to zero	Permanent	Beneficial to Neutral	Moderate / Minor to Minor and Not Significant to None
Quiescence phase	Presence of Safestore.	Southern edges of receptor	West and central areas of receptor	East area of receptor	Very low to Zero	Long-term	Beneficial to Neutral	Moderate / Minor to Minor and Not Significant to None
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management.	Southern edges of receptor	West and central areas of receptor	East area of receptor	Very low (Low for Millport CCA)	Temporary and medium term	Neutral	Moderate / Minor and Not Significant (Moderate to Moderate / Minor and Not Significant for Millport CCA)

Phase	Impact	Extent of effect on CCA			Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
		Great or Big Cumbrae island CCA	Millport CCA	Little Cumbrae or Wee Cumbrae island CCA				
	Post Removal of all buildings and de-licensing of the Site.	Southern edges of receptor	West and central areas of receptor	East area of receptor	Very low (Low for Millport CCA)	Temporary and medium term	Neutral	Moderate / Minor and Not Significant (Moderate to Moderate / Minor and Not Significant for Millport CCA)

Visual Effects

14.10.67 The visual assessment outlines the visual effects on the three phases of the Proposed Works and has been set out as follows:

- Visual effects from agreed Viewpoints (**Appendix 14C**);
- Visual Effects on Views from Settlements and residential properties (**Appendix 14F**);
- Visual Effects on Views from Transport Routes (**Appendix 14F**);
- Visual Effects on Views from Recreational Routes (**Appendix 14F**); and
- Visual Effects on Views from Recreational and Tourist Destinations (**Appendix 14F**).

14.10.68 Visualisations of the Proposed Works are provided from 10 viewpoint locations and illustrated in **Figures 14.8** to **14.17**.

14.10.69 The ZTV and viewpoint analysis indicates that significant visual effects likely to result from the Proposed Works would affect locations within approximately 1 km of the Works Area, particularly to the north-east and west (subject to a clear view of the Proposed Works, landform and vegetation screening). Taking a precautionary approach, drawing from best practice guidance, the visual assessment has therefore been focused on receptors within 3 km.

Visual effects from agreed viewpoints

14.10.70 The visual effects likely to be experienced at agreed viewpoints are outlined in **Appendix 14C**. This appendix provides within **Table 14C.1** the viewpoint analysis which outlines per viewpoint a:

- description of the viewpoint;
- Discussion and conclusion of the sensitivity of the view and its susceptibility to change;
- Explanation of the magnitude of change; and
- The type and level of effect both in isolation and in-combination with cumulative developments

14.10.71 A summary of the conclusions of the viewpoint analysis are provided in **Table 14.14** below.

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Table 14.14 Summary of Cumulative Viewpoint Analysis

Receptor	phase	Sensitivity/ Importance / Value of Receptor	Magnitude of Change	Significance	Type of effect	Cumulative Effects (Additional)	Cumulative Effects (Combined)
Viewpoint 1: Ayrshire Coastal Path (approach from the east)	Preparations for Quiescence phase	High	High-Medium reducing to Very Low	Major to Major /Moderate and Significant reducing to Moderate/ Minor and Not Significant.	Neutral (retention of building) and Beneficial (removal of buildings)	Major to Major /Moderate and Significant reducing to Moderate/ Minor and Not Significant	**Major to Major /Moderate** and **Significant** (HNA buildings and Proposed Works)
	Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	Moderate/ Minor and Not Significant	**Major to Major /Moderate** and **Significant** reducing to Moderate/ Minor and Not Significant (Demolition of HNA buildings)
	Final Site Clearance phase	High	High-Medium reducing to Very Low to Zero	Major to Major /Moderate and Significant reducing to Moderate/ Minor and None and Not Significant	Adverse (deconstruction activity) to Beneficial (post removal of buildings)	N/A	N/A
Viewpoint 2: Ayrshire Coastal Path (approach from the west)	Preparations for Quiescence phase	High	High-Medium reducing to Low	Major to Major /Moderate and Significant reducing to Moderate/ Minor	Neutral (retention of building) and Beneficial (removal of buildings)	Major to Major /Moderate and Significant reducing to Moderate/ Minor and Not Significant	**Major to Major /Moderate** and **Significant** (HNA buildings and Proposed Works)

Receptor	phase	Sensitivity/ Importance / Value of Receptor	Magnitude of Change	Significance	Type of effect	Cumulative Effects (Additional)	Cumulative Effects (Combined)
				and Not Significant			
	Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	Moderate/ Minor and Not Significant	**Major to Major /Moderate** and **Significant** (HNA demolition)
	Final Site Clearance phase	High	High-Medium reducing to Very Low to Zero	Major to Major /Moderate and Significant reducing to Moderate/ Minor and Not Significant and None	Adverse (deconstruction activity) to Beneficial (post removal of buildings)	N/A	N/A
Viewpoint 3: Goldenberry Hill	Preparations for Quiescence phase	High	Low reducing to Very Low	Moderate reducing to Moderate/ Minor and Not Significant	Neutral (recladding) to Beneficial (post removal of buildings).	Moderate reducing to Moderate/ Minor and Not Significant	Moderate and Not Significant (Cable facility)
	Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	Moderate/ Minor and Not Significant	Moderate and Not Significant (Cable facility)
	Final Site Clearance phase	High	High-Medium reducing to Very Low to Zero	Major to Major /Moderate and Significant reducing to Moderate/ Minor and Not	Adverse (deconstruction activity) to Beneficial (post removal of buildings)	N/A	N/A

Receptor	phase	Sensitivity/ Importance / Value of Receptor	Magnitude of Change	Significance	Type of effect	Cumulative Effects (Additional)	Cumulative Effects (Combined)
				Significant to None			
Viewpoint 4: Core Path NC36 near Hunterston Castle	Preparations for Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	No cumulative effects	No cumulative effects
	Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	No cumulative effects	No cumulative effects
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Neutral (during demolition works) to Beneficial (post Site clearance)	N/A	N/A
Viewpoint 5: A78 near junction with Kilrusken Toll	Preparations for Quiescence phase	Medium	Very Low	Minor and Not Significant	Neutral	Minor and Not Significant	Moderate and Not Significant (Cable facility)
	Quiescence phase	Medium	Very Low	Minor and Not Significant	Neutral	Minor and Not Significant	**Moderate** and Not **Significant** (Cable facility)
	Final Site Clearance phase	Medium	Low reducing to Zero	Moderate/ Minor and Not Significant reducing to None	Neutral (deconstruction activity) to Beneficial (post removal of buildings	N/A	N/A

Receptor	phase	Sensitivity/ Importance / Value of Receptor	Magnitude of Change	Significance	Type of effect	Cumulative Effects (Additional)	Cumulative Effects (Combined)
Viewpoint 6: 'The Lion', Great Cumbrae	Preparations for Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	Moderate/ Minor and Not Significant	**Moderate** and **Significant** (Cable facility)
	Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	Moderate/ Minor and Not Significant	**Moderate** and **Significant** (Cable facility)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate reducing to None	Neutral (deconstruction activity) to Beneficial (post removal of buildings	N/A	N/A
Viewpoint 7: Millport, Great Cumbrae	Preparations for Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	Moderate/ Minor and Not Significant	Moderate and Significant (HNA and Cable facility)
	Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	Moderate/ Minor and Not Significant	Moderate and Significant (Demolition of HNA buildings and Cable facility)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate reducing to None	Neutral (deconstruction activity) to Beneficial (post removal of buildings	N/A	N/A

Receptor	phase	Sensitivity/ Importance / Value of Receptor	Magnitude of Change	Significance	Type of effect	Cumulative Effects (Additional)	Cumulative Effects (Combined)
Viewpoint 8: Kaim Hill	Preparations for Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	Moderate/ Minor and Not Significant	Moderate and Not Significant (Cable facility)
	Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	Moderate/ Minor and Not Significant	Moderate/ Minor and Not Significant
	Final Site Clearance phase	High	Very Low reducing to Zero	Moderate/ Minor and Not Significant reducing to None	Neutral (deconstruction activity) to Beneficial (post removal of buildings	N/A	N/A
Viewpoint 9: West Kilbride (Portencross Road)	Preparations for Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	Moderate/ Minor and Not Significant	Moderate and Not Significant (Cable facility)
	Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	Moderate/ Minor and Not Significant	Moderate and Not Significant (Cable facility)
	Final Site Clearance phase	High	Low / Very Low reducing to Zero	Moderate/ Minor and Not Significant reducing to None	Neutral (deconstruction activity) to Beneficial (post removal of buildings	N/A	N/A
Viewpoint 10: Fairlie (Allenton Park Terrace)	Preparations for Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	Moderate/ Minor and Not Significant	Moderate and Not Significant (HNA and Cable facility)

Receptor	phase	Sensitivity/ Importance / Value of Receptor	Magnitude of Change	Significance	Type of effect	Cumulative Effects (Additional)	Cumulative Effects (Combined)
	Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Neutral	Moderate/ Minor and Not Significant	Moderate and Not Significant (HNA and Cable facility)
	Final Site Clearance phase	High	Very Low reducing to Zero	Moderate/ Minor and Not Significant reducing to None	Neutral (deconstruction activity) to Beneficial (post removal of buildings	N/A	N/A

Summary of conclusions of viewpoint analysis for the proposed works

14.10.72 The viewpoint analysis indicates that significant visual effects are likely to affect locations along the low-lying coastline to the west and north / north-east within approximately 0.6 km distance from the Proposed Works. This would mostly affect recreational walkers accessing the Ayrshire Coastal Path, where there would be clear views of the Proposed Works in Viewpoints 1 and 2 (**Figure 14.8 and 14.9**). Significant effects on views are also identified to the south, within 0.7 km of the Proposed Works at Viewpoint 3. This would affect recreational walkers accessing Goldenberry Hill.

14.10.73 Views from the wider area (for example Viewpoints 4, 5 and 9) are screened by intervening landform or vegetation such that there are only partial views of the Safestore. Views from other locations often feature HNA as a focal feature but in contrast, the dark hues of HNB often reduce its prominence such that the demolition of low-lying buildings and the retention of the re-clad reactor building would have less of a visual impact. This is the case with Viewpoints 6, 7 and 10.

Summary of conclusions of viewpoint analysis considering cumulative effects

14.10.74 Significant visual cumulative effects as a result of the introduction of the Proposed Works would occur at Viewpoints 1 and 2 where the Proposed Works would be seen in close proximity during the Preparations for Quiescence phase.

14.10.75 Significant cumulative effects as a result of other developments would occur from the existing HNA Safestore buildings which are noticeable features in views due to their white cladding, which contrasts with surrounding landscape features and draws the eye. Significant cumulative effects would also arise from the introduction of the consented high voltage sub-sea cable manufacturing facility occupying the former Ore / Coal Terminal. This would introduce large, linear low-lying buildings along the coastline to the immediate north of the Proposed Works and would include a tall (185 m) tower.

14.10.76 Cumulative effects arising from the Final Site Clearance phase of the HNA Safestore buildings are assessed as beneficial in views with temporary Significant effects occurring due to the demolition activity at close range in Viewpoints 1, 2 as well as from Millport (Viewpoint 7) where the HNA buildings form a noticeable focal point in key views.

14.10.77 As noted in the methodology in **Appendix 14A** and in paragraph 14.8.1, cumulative effects during the Final Site Clearance phase have not been assessed since this phase would occur in approximately 90 – 100 years time. It is not possible to predict potential cumulative development or changes to existing / proposed developments across this time period.

Visual effects on views from Settlements and residential properties

14.10.78 The visual effects likely to be experienced from settlements include consideration of residential areas, the public realm and public open spaces within the settlement boundaries that would be frequented by people. The effects on settlements within the Study Area that overlapped by ZTV are assessed in **Appendix 14F** and summarised in **Table 14.15**.

14.10.79 In summary, there would be no significant visual effects on the views from settlements within the Study Area including Millport.

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Table 14.15 Summary of visual effects on views from Settlements

Phase	Impact	Distance	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
Settlements: Millport						
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition plant and waste management.	4 km	Very low	Temporary and medium term	Neutral	Moderate / Minor and Not Significant
	Post removal of buildings from the HNB site reducing built form.	4 km	Very low	Permanent	Beneficial to Neutral	Moderate / Minor and Not Significant
Quiescence phase	Presence of Safestore.	4 km	Very low	Long-term	Beneficial to Neutral	Moderate / Minor and Not Significant
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management.	4 km	Low to Zero	Temporary and medium term	Neutral	Moderate and Not Significant reducing to No View
	Post Removal of all buildings and de-licensing of the Site.	4 km	Zero	Permanent	Beneficial	No View

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14.10.80 Scattered residential receptors within 1 km of the Proposed Works are very limited but include Hunterston House, Hunterston Castle, Campbelton Farm, and a cluster of residential properties at Thirdpart. ZTV analysis shows that there would be very limited theoretical visibility from these properties due to screening from intervening landform and / or woodland. This was verified on site visits. The level of effect from these properties would not be significant. This is further illustrated by viewpoint analysis of Hunterston Castle (Viewpoint 4) which illustrates the nature of the heavily filtered views through woodland in **Figure 14.11** and assesses a Very Low magnitude of change during the Preparations for Quiescence and Quiescence phases and a Low magnitude of change during the Final Site Clearance. These magnitudes are repeated in an assessment of the effects of the Proposed Works on the Core Path 111 at Thirdpart in **Table** 14**.**17. The effects of the Proposed Works on scattered residential properties within 1 km are therefore not considered further in this assessment.

Visual effects on views from Transport Routes

14.10.81 The effects on Transport Routes within the Study Area that overlapped by ZTV are assessed in detail in **Appendix 14F** and summarised in Table 14.16.

14.10.82 In summary, there would be significant visual effects from Power Station Road which is partially located within the Works Area and is the main access to the Site. There would be no significant effects from other surrounding transport routes from the Proposed Works due to intervening distance and screening from intervening trees and landform. Significant cumulative visual effects would occur as a result of other developments including the introduction of the cable factory in views from Oilrig Road, Fairlie Moor Road and the B896. Significant cumulative visual effects are also assessed at Oilrig Road for the Final Site Clearance phase of HNA.

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Table 14.16 Summary of visual effects on views from Transport Routes

Phase	Impact	Distance	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
Transport Route: A78						
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition plant and waste management	1.7-3+ km	Very low	Temporary and medium term	Neutral	Minor and Not Significant
	Post removal of buildings from the Hunterston B site reducing built form	1.7-3+ km	Very low	Permanent	Beneficial to Neutral	Minor and Not Significant
Quiescence phase	Presence of Safestore	1.7-3+ km	Very low	Long-term	Beneficial to Neutral	Minor and Not Significant
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management	1.7-3+ km	Low to Zero	Temporary and medium term	Neutral	Moderate / Minor and Not Significant reducing to No View

Phase	Impact	Distance	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
	Post Removal of all buildings and de-licensing of site	1.7-3+ km	Zero	Permanent	Beneficial	No View and Not Significant
Transport Route: C26 Kilrusken Road						
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition plant and waste management	1.7 – 3 km	Very low	Temporary and medium term	Neutral	Minor and Not Significant
	Post removal of buildings from the Hunterston B site reducing built form	1.7 – 3 km	Very low	Permanent	Beneficial to Neutral	Minor and Not Significant
Quiescence phase	Presence of Safestore	1.7 – 3 km	Very low	Long-term	Beneficial to Neutral	Minor and Not Significant

Phase	Impact	Distance	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management	1.7 – 3 km	Low to Zero	Temporary and medium term	Neutral	Moderate / Minor and Not Significant reducing to No View
	Post Removal of all buildings and de-licensing of site	1.7 – 3 km	Zero	Permanent	Beneficial	No View and Not Significant
Transport Route: Power Station Road / Oilrig Road						
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition plant and waste management	0 – 1 km	High- Medium reducing to Very low	Temporary and medium term	Adverse to Neutral	**Major to Major / Moderate** and **Significant** reducing to Moderate / Minor and Not Significant
	Post removal of buildings from the Hunterston B site reducing built form	0 – 1 km	Very low	Permanent	Beneficial to Neutral	Moderate / Minor and Not Significant

Phase	Impact	Distance	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
Quiescence phase	Presence of Safestore	0 – 1 km	Very low	Long-term	Beneficial to Neutral	Moderate / Minor and Not Significant
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management	0 – 1 km	High- Medium reducing to Very Low to Zero	Temporary and medium term	Neutral to Beneficial	**Major to Major /Moderate** and **Significant** reducing Moderate / Minor to No View
	Post Removal of all buildings and de-licensing of site	0 – 1 km	Zero	Permanent	Beneficial	No View
Transport Route: Fairlie Moor Road (incorporating Core Paths NC33 and NC34)						
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition plant and waste management	2.2–3+ km	Very low	Temporary and medium term	Neutral	Moderate / Minor and Not Significant

Phase	Impact	Distance	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
	Post removal of buildings from the Hunterston B site reducing built form	2.2–3+ km	Very low	Permanent	Beneficial to Neutral	Moderate / Minor and Not Significant
Quiescence phase	Presence of Safestore	2.2–3+ km	Very low	Long-term	Beneficial to Neutral	Moderate / Minor and Not Significant
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management	2.2–3+ km	Low to Zero	Temporary and medium term	Neutral	Moderate and Not Significant reducing to No View
	Post Removal of all buildings and de-licensing of site	2.2–3+ km	Zero	Permanent	Beneficial	No View and Not Significant
Transport Route: B896 (Incorporating Core Paths NC1, NC41)						
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition	2.4–3+ km	Very low	Temporary and medium term	Neutral	Moderate / Minor and Not Significant

Phase	Impact	Distance	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
	plant and waste management					
	Post removal of buildings from the Hunterston B site reducing built form	2.4–3+ km	Very low	Permanent	Beneficial to Neutral	Moderate / Minor and Not Significant
Quiescence phase	Presence of Safestore	2.4–3+ km	Very low	Long-term	Beneficial to Neutral	Moderate / Minor and Not Significant
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management	2.4–3+ km	Low to Zero	Temporary and medium term	Neutral	Moderate and Not Significant reducing to No View
	Post Removal of all buildings and de-licensing of site	2.4–3+ km	Zero	Permanent	Beneficial	No View

Phase	Impact	Distance	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
Transport Route: Ayrshire Coast Rail Line						
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition plant and waste management	1.6 – 3 km	Very low	Temporary and medium term	Neutral	Minor and Not Significant
	Post removal of buildings from the Hunterston B site reducing built form	1.6 – 3 km	Very low	Permanent	Beneficial to Neutral	Minor and Not Significant
Quiescence phase	Presence of Safestore	1.6 – 3 km	Very low	Long-term	Beneficial to Neutral	Minor and Not Significant
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management	1.6 – 3 km	Low to Zero	Temporary and medium term	Neutral	Moderate / Minor and Not Significant reducing to No View

Phase	Impact	Distance	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
	Post Removal of all buildings and de-licensing of site	1.6 – 3 km	Zero	Permanent	Beneficial	No View

Visual effects on views from Recreational Routes

14.10.83 The visual assessment has considered the potential visual effects likely to be experienced by people (walkers / cyclists / horse riders / joggers / others) on recreational routes within the Study Area. It includes local routes on the Core Path Network (rights of way and core paths) sourced from NAC[14] and National[15] or regional[16] long-distance routes and Sustrans cycle routes[27]. The detailed assessment outcomes are reported in **Appendix 14F** and summarised in **Table** 14.17, and the routes are shown in **Figure 14.4**.

14.10.84 In summary, there would be significant visual effects from a ~1.4 km section of the Ayrshire Coastal Path as it passes close to the Proposed Works. There would be no significant visual effects from other surrounding recreational routes from the Proposed Works due to distance and screening from vegetation and landform. Significant cumulative visual effects would occur as a result of the introduction of the consented cable factory in views from most of the Core Paths with the exception of NC111. Significant cumulative visual effects are also assessed at Ayrshire Coastal Path for the Final Site Clearance phase of HNA.

Table 14.17 Summary of visual effects on views from Recreational Routes

Phase	Impact	Distance	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
Recreational Route: Ayrshire Coastal Path (incorporating Core Paths: NC60, NC61)						
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition plant and waste management	0 – 1 km	High-Medium reducing to Very low	Temporary and medium term	Adverse to Neutral	**Major to Major / Moderate** and **Significant**
	Post removal of buildings from the Hunterston B site reducing built form	0 – 1 km	Very low	Permanent	Beneficial to Neutral	Moderate / Minor and Not Significant
Quiescence phase	Presence of Safestore	0 – 1 km	Very low	Long-term	Beneficial to Neutral	Moderate / Minor and Not Significant

[27] Sustrans (n.d.). *National Cycle Network*. (online) Available at: https://www.sustrans.org.uk/national-cycle-network [Accessed November 2023].

Phase	Impact	Distance	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management	0 – 1 km	High-Medium reducing to Very Low to Zero	Temporary and medium term	Neutral to Beneficial	**Major to Major / Moderate** and **Significant** reducing Moderate / Minor to No View
	Post Removal of all buildings and de-licensing of site	0 – 1 km	Zero	Permanent	Beneficial	No View
Recreational Route: Core Path NC36 – Hunterston Cycle Route						
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition plant and waste management	2.4–3+ km	Very low	Temporary and medium term	Neutral	Moderate / Minor and Not Significant
	Post removal of buildings from the Hunterston B site reducing built form	2.4–3+ km	Very low	Permanent	Neutral	Moderate / Minor and Not Significant
Quiescence phase	Presence of Safestore	2.4–3+ km	Very low	Long-term	Neutral	Moderate / Minor and Not Significant
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management	2.4–3+ km	Low to Zero	Temporary and medium term	Neutral	Moderate and Not Significant reducing to No View

Phase	Impact	Distance	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
	Post Removal of all buildings and de-licensing of site	2.4–3+ km	Zero	Permanent	Beneficial	No View
Recreational Route: Core Path NC111 - Thirdpart						
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition plant and waste management	1.1– 1.8 km	Very low	Temporary and medium term	Neutral	Moderate / Minor and Not Significant
	Post removal of buildings from the Hunterston B site reducing built form	1.1– 1.8 km	Very low	Permanent	Neutral	Moderate / Minor and Not Significant
Quiescence phase	Presence of Safestore	1.1– 1.8 km	Very low	Long-term	Neutral	Moderate / Minor and Not Significant
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management	1.1– 1.8 km	Low to Zero	Temporary and medium term	Neutral	Moderate and Not Significant reducing to No View
	Post Removal of all buildings and de-licensing of site	1.1– 1.8 km	Zero	Permanent	Beneficial	No View

Phase	Impact	Distance	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
Recreational Route: Core Path NC23 - Fairlie Moor Road						
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition plant and waste management	1.9– 3.3 km	Very low	Temporary and medium term	Neutral	Moderate / Minor and Not Significant
	Post removal of buildings from the Hunterston B site reducing built form	1.9– 3.3 km	Very low	Permanent	Beneficial to Neutral	Moderate / Minor and Not Significant
Quiescence phase	Presence of Safestore	1.9– 3.3 km	Very low	Long-term	Beneficial to Neutral	Moderate / Minor and Not Significant
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management	1.9– 3.3 km	Low to Zero	Temporary and medium term	Neutral	Moderate and Not Significant reducing to No View
	Post Removal of all buildings and de-licensing of site	1.9– 3.3 km	Zero	Permanent	Beneficial	No View
Recreational Route: NC32 – Fairlee Burn to Diamond Hill						
Preparations for Quiescence phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of buildings, demolition plant and waste management	2.9– 3.6 km	Very low	Temporary and medium term	Neutral	Moderate / Minor and Not Significant

Phase	Impact	Distance	Magnitude of change	Nature of Effect	Type of Effect	Level and significance of Effect
	Post removal of buildings from the Hunterston B site reducing built form	2.9– 3.6 km	Very low	Permanent	Neutral	Moderate / Minor and Not Significant
Quiescence phase	Presence of Safestore	2.9– 3.6 km	Very low	Long-term	Neutral	Moderate / Minor and Not Significant
Final Site Clearance phase	Deconstruction activity on the HNB site including presence of cranes, physical removal of the building, demolition plant and waste management	2.9– 3.6 km	Low to Zero	Temporary and medium term	Neutral	Moderate and Not Significant reducing to No View
	Post Removal of all buildings and de-licensing of site	2.9– 3.6 km	Zero	Permanent	Beneficial	No View
Recreational Route: Core Path NC33 and NC34 - Fairlie Moor Road See assessment of Fairlie Moor Road in Table 14.15.						
Recreational Route: Great Cumbrae (Core Paths NC1, NC41) See assessment of B896 in Table 14.15.						

Visual effects on views from Recreational and Tourist Destinations

14.10.85 The visual assessment has considered the potential visual effects likely to be experienced by people at recreational / visitor or tourist destinations or attractions, which are overlapped by the ZTV and within the Study Area (see **Table 14.18**). Each of these locations were visited as part of the site visits on the 4 and 23 March 2022. Detailed assessment of Recreational and Tourist Destinations is presented in **Appendix 14F**.

14.10.86 In summary, there would be no significant effects as a result of the Proposed Works on Recreational and Tourist Destinations. The greatest effect would be on Millport where there would be a Moderate / Minor and Not Significant level of effect.

Table 14.18 Visual effects on views from Recreational and Tourist Destinations

Receptor	Description of Effects
Hunterston Castle	Hunterston Castle is located ~0.5 km to the east of the Proposed Works and is accessible to visitors by appointment. The effects of the Proposed Works on Hunterston Castle are assessed in Viewpoint 4, **Appendix 14C**, Table 14C.2.
Millport	Millport is recognised as a tourist resort and includes sandy beaches, hotels, caravan parks, a golf course and features of interest such as the painted 'Crocodile Rock'. It is located on Great Cumbrae Island at approximately 4 km from the Proposed Works. The effects of the Proposed Works on Millport are assessed in Viewpoint 7, **Appendix 14C**, Table 14C.2., and above in **Table 14.14**.

14.11 Assessment of cumulative effects

Inter-Project Effects

14.11.1 There is the potential for landscape and visual effects associated with the Proposed Works to interact with, or combine with the effects arising from other developments or projects proposed in the geographical area. In accordance with GLVIA3, the landscape and visual impact assessment has inherently considered the potential landscape and visual effects of the Proposed Works on their own as well as the Proposed Works with additional cumulative development to ensure a robust assessment has been undertaken.

14.11.2 These inter-project cumulative effects are also summarised within in **Chapter 21 Cumulative Effects Assessment** of this ES.

Intra-Project effects

14.11.3 The landscape and visual assessment has considered the biodiversity baseline presented in **Chapter 8: Terrestrial Biodiversity and Ornithology** and cultural and historic designations/attributes (identified in **Chapter 13: Historic Environment**) to inform judgements concerning the impact to landscape character and features. However, the effects of the Proposed Works on these receptors area considered within their respective chapters.

14.11.4 A summary of the potential intra-project effects is also provided in Chapter 21 Cumulative Effects Assessment.

14.12 Summary of landscape, visual and cumulative effects

14.12.1 A summary of the landscape, visual and cumulative effects are provided in **Table 14.19**. Those levels of effect that are shaded in the table and shown in **bold** relate to significant effects. The development contributing most to the cumulative effects is recorded in brackets.

Table 14.19 Summary of the predicted landscape, visual and cumulative effects

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
Direct Effects on Landscape Character							
LCT 59 - Raised Beach Coast and Cliffs (host LCT)	Preparation for Quiescence phase	Medium	Medium (within 1 km) reducing to Very Low to Zero (end of the Preparations for Quiescence phase) Very Low to Zero beyond 1 km	Moderate and Not Significant (within 1 km) reducing to Minor to None and Not Significant beyond 1 km	Adverse (within 1km during Site activity) Neutral (whole receptor) Beneficial (post removal of buildings)	Moderate and Not Significant (within 1 km) reducing to Minor to None and Not Significant	**Major / Moderate** and Significant (HNA, Cable factory)
	Quiescence phase	Medium	Very Low to Zero (within 1 km) Zero beyond 1 km	Minor to None and Not Significant (within 1 km) None beyond 1 km	Neutral (within 1km) Neutral (whole receptor)	Minor to None and Not Significant (within 1 km)	**Major / Moderate to Moderate** and Significant reducing to None (Cable factory, Demolition of HNA buildings)
	Final Site Clearance phase	Medium	Medium (within 1 km) Very Low to Zero beyond 1 km	Moderate and Not Significant (within 1 km) Minor and Not Significant beyond 1 km	Adverse (within 1km during Site activity) Neutral (whole receptor)	N/A	N/A

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
					Beneficial (post removal of buildings)		
Direct Effects on Seascape / Coastal Character							
Largs to Goldenberry CCA	Preparation for Quiescence phase	Medium	Medium (within 1 km) reducing to Very Low to Zero (end of the Preparations for Quiescence phase) Very Low to Zero beyond 1 km	Moderate and Not Significant (within 1 km) reducing to Minor and Not Significant to Zero Minor and Not Significant beyond 1 km	Adverse (within 1km during Site activity) Neutral (whole receptor) Beneficial (post removal of buildings)	Moderate and Not Significant (within 1 km) reducing to Minor and Not Significant to Zero	**Major / Moderate** and Significant (HNA, Cable factory)
	Quiescence phase	Medium	Very Low to Zero (within 1 km) Zero beyond 1 km	Minor and Not Significant to None (within 1 km) None beyond 1 km	Neutral (within 1km) Neutral (whole receptor)	Minor and Not Significant to None (within 1 km)	**Major / Moderate to Moderate** and Significant reducing to Minor (Cable factory, Demolition of HNA buildings)
	Final Site Clearance phase	Medium	Medium (within 1 km) reducing to Very Low (end of the Final Site Clearance phase phase) Very Low to Zero beyond 1 km	Moderate and Not Significant (within 1 km) Minor and Not Significant beyond 1 km	Adverse (within 1km during Site activity) Neutral (whole receptor) Beneficial (post removal of buildings)	N/A	N/A

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
Great or Big Cumbrae island CCA	Preparation for Quiescence phase	High-Medium	Zero increasing to Very Low and reducing to Zero	Moderate / Minor to Minor and Not Significant to None	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor to Minor and Not Significant to None	Moderate to Moderate / Minor and Not Significant
	Quiescence phase	High-Medium	Very Low to Zero	Moderate / Minor to Minor and Not Significant to None	Beneficial to Neutral	Moderate / Minor to Minor and Not Significant to None	Moderate to Moderate / Minor and Not Significant
	Final Site Clearance phase	High-Medium	Low-Very Low reducing to Zero	Moderate / Minor and Not Significant to None	Neutral (during Site activity) Neutral (post removal of buildings)	N/A	N/A
Millport CCA	Preparation for Quiescence phase	High-Medium	Zero increasing to Very Low and reducing to Zero	Moderate / Minor to Minor and Not Significant to None	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor to Minor and Not Significant	Moderate to Moderate / Minor and Not Significant
	Quiescence phase	High-Medium	Very Low to Zero	Moderate / Minor to Minor and Not Significant to None	Beneficial to Neutral	Moderate / Minor to Minor and Not Significant	Moderate to Moderate / Minor and Not Significant
	Final Site Clearance phase	High-Medium	Low reducing to Zero	Moderate and Not Significant to None	Neutral (during Site activity) Neutral (post removal of buildings)	N/A	N/A

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
Little Cumbrae or Wee Cumbrae island CCA	Preparation for Quiescence phase	High-Medium	Zero increasing to Very Low and reducing to Zero	Moderate / Minor to Minor and Not Significant to None	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor to Minor and Not Significant	Moderate to Moderate / Minor and Not Significant
	Quiescence phase	High-Medium	Very Low to Zero	Moderate / Minor to Minor and Not Significant to None	Beneficial to Neutral	Moderate / Minor to Minor and Not Significant	Moderate to Moderate / Minor and Not Significant
	Final Site Clearance phase	High-Medium	Low reducing to Zero	Moderate and Not Significant to None	Neutral (during Site activity) Neutral (post removal of buildings)	N/A	N/A
Visual Effects on Views from Settlements							
Millport	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Moderate** and Significant (HNA and cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Moderate** and Significant (Cable factory)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
Visual Effects on Views from Transport Routes							
A78	Preparation for Quiescence phase	Medium	Very Low	Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Minor and Not Significant	Moderate and Not Significant (Cable factory)
	Quiescence phase	Medium	Very Low	Minor and Not Significant	Beneficial to Neutral	Minor and Not Significant	Moderate and Not Significant (Cable factory)
	Final Site Clearance phase	Medium	Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
C26 Kilrusken Road	Preparation for Quiescence phase	Medium	Very Low	Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Minor and Not Significant	Moderate and Not Significant (Cable factory)
	Quiescence phase	Medium	Very Low	Minor and Not Significant	Beneficial to Neutral	Minor and Not Significant	Minor and Not Significant (Demolition of HNA buildings)
	Final Site Clearance phase	Medium	Low reducing to Zero	Moderate/Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post	N/A	N/A

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
					removal of buildings)		
Power Station Road / Oilrig Road	Preparation for Quiescence phase	High	High-Medium reducing to Very Low	**Major to Major / Moderate** and Significant reducing to Moderate/ Minor and Not Significant	Adverse to Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	**Major to Major / Moderate** and Significant reducing to Moderate/ Minor and Not Significant	**Major to Major / Moderate** and Significant (HNA buildings, Cable factory and Proposed Works)
	Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Beneficial to Neutral	Moderate/ Minor and Not Significant	**Major to Major / Moderate** and Significant (HNA demolition, Cable factory)
	Final Site Clearance phase	High	High-Medium reducing to Very Low to Zero	**Major to Major / Moderate** and Significant reducing to Moderate/ Minor and Not Significant and None	Neutral to Beneficial (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Fairlie Moor Road (incorporating Core Paths NC33 and NC34)	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
B896 (Incorporating Core Paths NC1, NC41)	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Major** and Significant (HNA and Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Major** and Significant (HNA and Cable factory)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Rail Line	Preparation for Quiescence phase	Medium	Very Low	Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Minor and Not Significant	Moderate and Not Significant (Cable factory)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
	Quiescence phase	Medium	Very Low	Minor and Not Significant	Beneficial to Neutral	Minor and Not Significant	Moderate and Not Significant (Cable factory)
	Final Site Clearance phase	Medium	Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Visual Effects on Views from Recreational Routes							
Ayrshire Coastal Path (incorporating Core Paths: NC60, NC61)	Preparation for Quiescence phase	High	High-Medium reducing to Very Low	**Major to Major / Moderate** and Significant reducing to Moderate / Minor and Not Significant	Adverse to Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	**Major to Major / Moderate** and Significant reducing to Moderate / Minor and Not Significant	**Major to Major / Moderate** and Significant (HNA buildings, cable factory and Proposed Works)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Major to Major / Moderate** and Significant (HNA demolition, cable factory)
	Final Site Clearance phase	High	High-Medium reducing to Very Low to Zero	**Major to Major / Moderate** and Significant reducing to Moderate / Minor and Not Significant and None	Neutral to Beneficial (during Site activity) Beneficial (post removal of buildings)	N/A	N/A

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
Core Path NC36 - Hunterston Cycle Route	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Core Path NC111 - Thirdpart	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Neutral (post removal of buildings)	Moderate / Minor and Not Significant	Moderate and Not Significant (Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	No cumulative effects	Moderate and Not Significant (Cable factory)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Core Path NC23 - Fairlie Moor Road	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity)	Moderate / Minor and Not Significant	**Major to Major / Moderate** and

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
					Beneficial to Neutral (post removal of buildings)		Significant (Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Major to Major / Moderate** and Significant (Cable factory)
	Final Site Clearance phase	High	Very Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Core Path NC32 - Fairlie Burn to Diamond Hill	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)
	Final Site Clearance phase	High	Very Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Core Path NC33 and	See assessment of Fairlie Road (Transport Routes)						

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
NC34 - Fairlie Moor Road							
Great Cumbrae (Core Paths NC1, NC1a, NC2, NC41, NC74, NC77)	See assessment of B896 (Transport Routes)						
Visual Effects on Views from Recreational and Tourist Destinations							
Hunterston Castle	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Neutral (post removal of buildings)	No cumulative effects	No cumulative effects
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	No cumulative effects	No cumulative effects
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Millport	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Neutral (post removal of buildings)	Moderate/ Minor and Not Significant	**Moderate** and Significant (HNA and Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	Moderate / Minor and Not Significant	**Moderate** and Significant

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
							(Demolition of HNA buildings)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Adverse (during Site activity) Beneficial (post removal of buildings)	N/A	N/A

15.

Noise and Vibration

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15. Noise and Vibration

15.1 Introduction

15.1.1 This chapter considers potential noise and vibration effects associated with the Proposed Works at relevant receptors within the vicinity of the Indicative Dismantling Works Area (hereafter the "Works Area"), inclusive of the Hunterston B Nuclear Site Licence Boundary (hereafter referred to as 'The Site').

15.1.2 The chapter should be read in conjunction with **Chapter 2: The Decommissioning Process** and relevant parts of other chapters, particularly **Chapter 16: Traffic and Transport**, where common receptors have been considered with respect to a relationship between traffic generation and a change in the noise environment.

15.2 Relevant legislation, policy and technical guidance

Legislation

15.2.1 The legislation presented in **Table 15.1** is relevant to the assessment of the effects on noise and vibration receptors:

Table 15.1 Legislation relevant to noise and vibration

Legislation	Legislation Issue
Control of Pollution Act 1974 **(CoPA)**[1]	Makes provision for the agreement of noise levels and methods of working with Local Authorities such that working in accordance with the agreement is a defence against any prosecution under the Act. The Act established the concept of "Best Practicable Means" (BPM) as a defence against prosecution under the act. The Act also enables the preparation of approved codes of practice (COP) for various sources.
Environmental Protection Act 1990 **(EPA)**[2]	Further establishes the BPM defence. The Act also establishes that noise from premises and also individual vehicles on the public highways can be a statutory nuisance if they are a nuisance or prejudicial to health. The act also clarifies that noise from road traffic on the public highway is not a nuisance.
The Environmental Noise (Scotland) Regulations 2006[3]	The Environmental Noise (Scotland) Regulations 2006 introduced strategic noise mapping and noise action planning for large urban areas, major transport corridors and major airports.

[1] UK Government (1974). *Control of Pollution Act 1974*. (online) Available at: https://www.legislation.gov.uk/ukpga/1974/40 (Accessed November 2023).
[2] UK Government (1990). *Environmental Protection Act 1990*. (online) Available at: http://www.legislation.gov.uk/ukpga/1990/43/contents (Accessed November 2023).
[3] Scottish Government (2006). *The Environmental Noise (Scotland) Regulations 2006*. (online) Available at: http://www.legislation.gov.uk/ssi/2006/465/contents/made (Accessed November 2023).

Policy

15.2.2 A summary of the relevant policies is given in **Table 15.2**.

Table 15.2 Policy relevant to noise and vibration

Policy Reference	Policy Relevance
National Policy	
National Planning Framework 4 (NPF4)[4]	National Planning Framework 4 (NPF4) provides the national spatial strategy for Scotland. It sets out the spatial principles, regional priorities and national planning policy. It replaces NPF3 and Scottish Planning Policy (SPP)[5]. Policy 23 relates directly to potential noise impacts: ***"Policy 23**… e) Development proposals that are likely to raise unacceptable noise issues will not be supported. The agent of change principle applies to noise sensitive development. A Noise Impact Assessment may be required where the nature of the proposal or its location suggests that significant effects are likely. …"*
Local Policy	
North Ayrshire Local Development Plan (2019)[6], Strategic Policy 3	Strategic Policy 3: Strategic Development Areas (Hunterston) recognises the strategic national importance of Hunterston as an energy hub, with support shown for the following: • *'Appropriate development to support the operational life of the existing facility* • *Nuclear decommissioning and radioactive waste management from within the site* • *Other facilities for large and small scale power generation'* The policy further notes the requirement for all development to take account of '*the special environmental and safety constraints of Hunterston including … management of impact on nearby communities'*.

Technical guidance

15.2.3 The technical guidance contained in **Table 15.3** is relevant to the assessment of noise and vibration effects.

[4] Scottish Government (2023). *National Planning Framework 4*. (Online) Available at: National Planning Framework 4 - gov.scot (www.gov.scot) (Accessed 9 October 2023)
[5] Scottish Government (2020). *Scottish Planning Policy*. (Online) Available at: https://www.gov.scot/publications/scottish-planning-policy/ (Accessed November 2023)
[6] North Ayrshire Council (2019). *North Ayrshire Local Development Plan*. (online) Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed November 2023).

Table 15.3 Technical Guidance relevant to noise and vibration

Technical Guidance	Context
PAN 1/2011 Planning and noise[7]	Provides guidance on how the planning system helps to prevent and limit the adverse effects of noise.
TAN 1/2011 Assessment of Noise (TAN 11)[8]	Provides guidance to assist the technical evaluation of noise assessments.
Calculation of Road Traffic Noise (CRTN) [9]	Describes the procedures for calculating road traffic noise.
Design Manual for Roads and Bridges (DMRB) LA111: Noise and vibration [10]	Provides guidance on the assessment of impacts that road projects may have on levels of noise and vibration. Provides criteria for assessing changes in road traffic noise levels, which will be used in the assessment of increases in road traffic noise due to vehicle movements associated with the Proposed Works.
ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors: Part 2 General Method of Calculation[11]	Describes the method of calculating the attenuation of sound to predict environmental noise levels.
Guidelines for Environmental Impact Assessment [12]	Presents guidance on how the assessment of noise effects should be presented within the Environmental Impact Assessment (EIA) process. The Institute of Environmental Management and Assessment guidelines cover aspects such as scoping, baseline, prediction and examples of significance criteria.
British Standard (BS) 5228-1:2009+A1:2014 Noise and vibration on construction and open sites. Part 1: Noise[13]	Provides a recommended scope for construction/demolition noise assessment (the ABC Method) as presented in Annex E. The BS also provides example threshold values for potential significant effects at noise sensitive receptors based upon the results of ambient sound monitoring.
BS 5228-2:2009+A1:2014 Noise and vibration on construction and open sites. Part 2: Vibration[14]	Provides methods and criteria for assessing ground borne vibration, which have been used when considering the potential for significant effects due to vibration in **Section 15.9**.

[7] Scottish Government (2011). *Planning Advice Noise1/2011: planning and noise*. (online) Available at: https://www.gov.scot/publications/planning-advice-note-1-2011-planning-noise/#:~:text=1.,PAN%2056%20Planning%20and%20Noise (Accessed 28 July 2023).

[8] Scottish Government (2011). *Technical Advice Note Assessment of Noise 2011*. (online) Available at: https://www.gov.scot/publications/technical-advice-note-assessment-noise/ (Accessed November 2023).

[9] HMSO (1988). Calculation of Road Traffic Noise.

[10] Transport Scotland et al. (2020). *DMRB, LA111: Noise and vibration. Revision 2*. (online) Available at: https://www.standardsfor highways.co.uk/prod/attachments/cc8cfcf7-c235-4052-8d32-d5398796b364?inline=true (Accessed November 2023).

[11] International Standards Organisation (ISO). (1996). *International Standard ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*. ISO; Geneva.

[12] Institute of Acoustics, Institute of Environmental Management and Assessment (IOA, IEMA) (2016). *Guidelines for Environmental Noise Impact Assessment*. IEMA; London.

[13] British Standards Institution (BSI, 2014). *British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*. BSI; London.

[14] British Standards Institution (BSI, 2014). *British Standard BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration*. BSI; London.

15.3 Data gathering methodology

Study Area

15.3.1 At the commencement of the development of scope for the assessment of the Proposed Works, an area approximately 1 km from the boundary of the Works Area was identified as suitable for use to identify potential receptors that may require consideration in the assessment. Based upon professional experience, there is usually negligible potential for adverse effects due to noise at receptors beyond approximately 1 km from noise sources typically used at sites similar in nature to the Proposed Works.

15.3.2 However, during consultation with North Ayrshire Council (NAC) (discussed in **Section 15.4**), it was agreed that receptors on Greater Cumbrae, approximately 3 km north-west of the Works Area, and at Fairlie South, approximately 3.4 km north-east of the Works Area, should be considered in the assessment.

15.3.3 A Study Area encompassing the following buffer zones has been applied for the assessment which includes specific receptor locations and wider receptor areas which are considered in the assessment. It is defined as follows, and indicated in **Figure 15.1**:

- Approximately 2 km distance from the Works Area; and
- Approximately 50 m distance from road transport routes that may be used during the Proposed Works (see **Chapter 16: Traffic and Transport**), where additional movements are anticipated. A Basic Noise Level (BNL) assessment was undertaken to identify if any road links required detailed assessment. The results of the BNL assessment, provided in **Section 15.9**, indicate that no road links require detailed assessment.

15.3.4 In general, the closest receptors to the Proposed Works and the key road transport routes (notably Route 4 and Route 5) which may be used are included within the assessment. Technical engagement with stakeholders such as NAC has identified some additional receptors beyond the Study Area on Greater Cumbrae, at Fairlie South and West Kilbride to be included in the assessment.

Justification for determination of spatial scope of Study Area

15.3.5 With regard to noise from the Works Area, both the initial 1 km buffer and 2 km buffers are considered robust, based on professional experience as outlined in paragraph 15.3.1. The noisiest activities anticipated during the Proposed Works are related to demolition and dismantling, which are considered 'construction' type activities for the purposes of the assessment. Therefore, the main applicable guidance to assess noise from the Proposed Works is contained within BS 5228-1:2009+A1:2014[13]. The scope of BS 5228-1:2009+A1:2014[13] encompasses *"… sites where demolition, remediation, ground treatment or related civil engineering works are being carried out, and open sites, where work activities/operations generate significant noise levels …"*.

15.3.6 There is no specific guidance contained in BS 5228-1:2009+A1:2014[13] or BS 5228-2:2009+A1:2014[14] on the determination of study areas for assessment purposes. However, with regard to construction noise, DMRB LA 111[10] notes that *"A study area of 300m from the closest construction activity is normally sufficient to encompass noise sensitive Receptors."* Based on the above it is considered that the applied 2 km buffer provides a robust basis for the purposes of ensuring that any potentially affected receptor locations are included within the assessment.

15.3.7 With regard to potential noise impacts due to changes in traffic flows on vehicular access routes, DMRB LA 111[10] states that the study area for receptors near existing road links can be determined as follows: *"the area within 50m of other (i.e., not new) road links with potential to experience a short term BNL* [Basic Noise Level] *change of more than 1.0 dB(A) as a result of the project"*. DMRB LA 111[10] notes that the determination of an appropriate study area can be varied for specific projects and also to account for the risk of likely significant effects. As such, the Study Area for potential traffic noise impacts along vehicular access routes is defined as 50 m from affected road links, subject to the initial BNL assessment to identify those links where a noise change greater than 1 dBA is predicted. In accordance with DMRB LA 111[10], depending on the outcomes of the initial BNL assessment, the spatial scope of the assessments could have been expanded to account for receptors at greater distances from affected road links. However, the results of the BNL assessment indicated that no road links required detailed assessment, hence the Study Area was not expanded.

Desk study

15.3.8 A desktop study, based on review of aerial imagery, was undertaken to identify receptors that could potentially be affected by noise and vibration arising from the Proposed Works. The data source used in the desktop study was:

- Aerial imagery, Google Earth Pro[15].

Survey work

15.3.9 Baseline monitoring is required to establish baseline conditions to inform the assessment of likely effects on Noise Sensitive Receptors (NSRs) due to the Proposed Works. The baseline monitoring was undertaken when Hunterston B Power Station (HNB) was not generating to ensure a 'worst-case' baseline was collected to be used for the assessment (i.e. generation at HNB was not influencing baseline levels).

15.3.10 Baseline monitoring was undertaken in accordance with the methodology agreed with NAC. The agreed methodology, details of the surveying and the results thereof are provided in **Appendix 15A**.

15.3.11 Baseline monitoring, data processing and presentation of results has been undertaken following the guidance and requirements contained in BS 7445-1:2003[16] and BS 5228-1:2009+A1:2014[13].

15.3.12 Monitoring was undertaken at eight locations representative of the relevant NSRs to determine baseline ambient sound levels. Meteorological data (wind speed, direction, temperature, precipitation) was logged concurrently at one of the monitoring locations to allow exclusion of sound level data acquired during unrepresentative meteorological conditions. The monitoring locations are identified in **Figure 15.1** and are detailed below in **Table 15.4**.

[15] Google (2022). *Google Earth Pro Version 7.3.4.8248*. (online) Available at: https://www.google.com/earth/download/gep/agree.html?hl=en-GB. (Accessed July 2023).
[16] British Standards Institution (BSI, 2003). *British Standard BS 7445-1:2003 Description and measurement of environmental noise. Guide to quantities and procedures*. BSI; London.

Table 15.4 Summary of monitoring locations

Location Reference	Location description	Location Co-ordinates		Monitoring period
		X	Y	
LT1	Front lawn of property, in a residential area. Approximately 50 m north of the coast/high water mark. Approximately 10 m north of the carriageway edge of Marine Parade, Greater Cumbrae.	217193	654468	27 April 2022 to 4 May 2022
LT2	On grass next to car park, next to Farm, 40 m from A78 Irvine Road, cottages nearby, mostly farmland, road and trees between NSR and source, soft ground mostly.	220522	653011	27 April 2022 to 4 May 2022
LT3	Located in Hunterston Castle grounds, approximately 10 m north of cottages, wide open field/lawn.	219306	651492	27 April 2022 to 4 May 2022
LT4	Located on lawn south of cottage on A78 Irvine Road.	219846	648498	27 April 2022 to 4 May 2022
ST1	Located on Fairlie Viewpoint, adjacent to the car park. Approximately 20 m from the coast/ high water mark.	220696	654590	27 April 2022 to 28 April 2022
ST2	Located on Montgomerie Avenue, approximately 10 m east from the A78 Irvine Road. Approximately 25 m east from the coast at high tide.	220803	654280	27 April 2022 to 28 April 2022
ST3	Located approximately 10 m west from Freepart Farm properties. Surrounded by agricultural land.	218769	649936	27 April 2022 to 28 April 2022
ST4	Located 10 m north of property on Portencross Road and adjacent west of the Ayrshire Coastal Path. Approximately 15 m east from B7048 Portencross Road. Approximately 25 m east of coast.	217595	649025	27 April 2022 to 28 April 2022

Data limitations

Receptors & baseline data

15.3.13 Receptor locations were initially identified using aerial imagery and this initial identification exercise was therefore limited to the aerial imagery available. However, the receptors that should be considered were discussed and agreed with NAC.

15.3.14 Baseline data acquired in the baseline survey is limited by the sampling duration and local conditions at the time of the surveying. The baseline monitoring locations and sample durations were agreed with NAC prior to carrying out the surveying.

15.3.15 Long term monitoring was undertaken over a period of approximately seven days at four locations representative of the nearest NSRs potentially affected. Based on professional

experience of surveying for numerous other schemes, seven days is generally an adequate duration that should provide a reasonably representative sample. Review of the data indicates generally low absolute levels of ambient noise considered typical of a rural area.

15.3.16 Short term measurement locations have a greater degree of uncertainty associated with the measurement data compared to the long-term measurement locations, due to the reduced sample size. The short-term measurement data indicates generally low baseline sound levels considered typical of a rural area.

15.3.17 Measurement results acquired at LT3 and ST3 have been compared, for validation and correction purposes. Measurement results from these locations were considered valid to be compared with each other because they are in relatively close proximity (approximately 1.7 km apart) and are similar distances from nearby environmental noise sources.

15.3.18 Based on the above, the baseline data is considered to be representative of baseline conditions at the identified receptor locations. The baseline data is therefore considered robust and valid for the purposes of the assessment.

Proposed Works - Plant requirements and activity information

15.3.19 Information on the likely plant requirements and scheduling of activities associated with the Proposed Works has been used to inform the assessment. The assessment has been based on consideration of overlapping phases with all plant required in each phase operating simultaneously. The plant and activity information provided, and the assessment of all plant operating simultaneously, is considered to represent a reasonable worst-case. The plant to be used in each area and details of the associated noise emissions are presented in **Appendix 15B**.

15.3.20 If, once a contractor is appointed, the plant noise is predicted to be significantly higher than predicted in the ES, the changes to the predicted noise will be addressed in the Environmental Management Plan (EMP) and mitigation requirements will be reviewed accordingly.

15.4 Consultation

Overview

15.4.1 In addition to the Scoping exercise and non-statutory consultation, technical engagement was undertaken with a NAC Environmental Health Officer to discuss and agree the receptors to be considered for assessment purposes, and the baseline survey methodology requirements. Relevant details of the engagements are summarised in **Section 15.3**.

Pre-application Opinion

15.4.2 Based on review of the Scoping Report, a Pre-Application Opinion was issued by ONR. The comments provided by ONR relating to noise and vibration, and how these are addressed in the ES, are provided below in **Table 15.5**.

Table 15.5 Summary of Pre-application Opinion Responses

Ref.	Consideration	How addressed in the ES
99	The EIA needs to consider noise and vibrations effects on the local marine species for potential disturbance whilst carrying out pipe and below waterline decommissioning. See the additional comments on this topic area in the marine biodiversity section.	Comments in the ONR Pre-Application Opinion at paragraphs 81 and 82 regarding potential impacts to fauna as a result of underwater noise are noted. As described in **Chapter 2: The Decommissioning Process**, in order to minimise disturbance to the marine environment, no explosives will be used. The potential for disturbance to the marine environment due to underwater noise is assessed in **Chapter 8: Marine Biodiversity**.
100	ONR notes that while the study areas set out in the methodology are suitable for the assessment, there is no substantiation as to why these distances were applied. This should be provided in the ES. Further to this, it is not clear how the spatial scope of the traffic noise assessment will be determined, this should be clarified in the ES. The receptors listed in Table **15**.8 include receptors outside the 2km distance from the works area used for the study area but a rationale for this has not been included. A rationale would be useful to include in the ES to determine if the scope of the EIA is proportionate.	Justification of the applicability of the Study Area is provided in **Section 15.3**. All transport routes for the Proposed Works (as identified in the traffic and transport assessment) have been subject to an initial assessment of the anticipated change of the BNL, which is provided in **Section 15.9**. The results of the BNL assessment indicated that no road links required detailed assessment, hence the Study Area for road noise was not expanded.
101	When determining the future baseline, it is stated that the Preparations for Quiescence phase is expected to be the worst-case phase for the decommissioning project with respect to noise and vibration effects as a result of the substantial dismantling, demolition and construction activities. The ES should clarify if a specific 'worst-case' year within this phase of work has been used for the purpose of the assessment.	Two worst-case years have been selected based on the provided decommissioning schedule, by identifying those periods with the greatest number of concurrent activities, as set out in **Section 15.10**.
102	Paragraph **15**.6.6 states that potentially significant effects could occur during the decommissioning project across all three phases but the Quiescence phase and Final Site Clearance phase are then scoped out of the EIA. A clear scope should be provided in the ES along with evidence for phases of the work being scoped out.	This is a mis-interpretation of paragraph 14.6.6 of the Scoping Report which states that potentially significant effects could occur during the Proposed Works, with the Proposed Works split into three distinct phases. No phases are scoped out, though the focus of the quantitative assessment will be on the worst-case phase: the Preparations for Quiescence phase. Paragraph 14.6.8 of the Scoping Report goes on to say that "*The potential for significant effects during other activities required during the Proposed Works are considered unlikely to result in significant effects and may be addressed qualitatively.*"

Ref.	Consideration	How addressed in the ES
		The scope of the assessment provided in the ES is set out in **Section 15.9.** Evidence indicating that the Preparations for Quiescence phase is worst case is provided in **Chapter 2: Decommissioning Process**.
103	The proposed methodology meets industry good practice and follows widely accepted standards. However, the ES should provide more detail on the methodologies to define high, medium, low or negligible magnitudes of impact and receptors sensitivities have been applied in the assessment. ONR also notes that paragraph 14.5.7 and section 3.1.4 describe how uncertainty is managed if there is unavailable information on plant, however, they do not provide detail on how the assessment will accommodate this uncertainty. This should be explained in the ES.	For the methodology to define the magnitudes of impacts, British standards have been used, consistent with the way that noise assessments would be conducted in most EIAs undertaken in Scotland. The sensitivities of receptors are reproduced from Scottish planning policy and technical notes, PAN1[7] and TAN11[8]. Potential uncertainties regarding plant requirements, and how these are addressed, is described in **paragraphs 15.3.19 to 15.3.20**.

Technical Engagement

15.4.3 Technical engagement was undertaken with an Environmental Health Officer for NAC, to discuss and agree the receptors that should be considered, and the baseline survey methodology. In addition to discussions on receptors and the baseline survey methodology, comments were also provided on the assessment methodology, specifically about the criteria that should be applied, the scheduling of specific activities associated with the Proposed Works and the duration and timing of any particularly noisy works that could be required. The issues discussed with NAC, and how these are addressed in this ES, are provided below in **Table 15.6**.

Table 15.6 Summary of Technical Engagement

Consultee	Consideration	How addressed in the ES
NAC	That receptors on the island of Greater Cumbrae should be considered with regard to potential noise effects associated with works at the Works Area. That receptors in the Fairlie South area should be considered with regard to potential noise effects associated with works at the Works Area, and for potential transport noise effects associated with any off-site transport movements that may be required.	Receptors at Greater Cumbrae and in the Fairlie South area are included in the assessment provided in **Section 15.10**.
NAC	The baseline survey methodology was discussed and agreed. The following aspects were discussed and agreed: where long-term and short-term monitoring should be	Baseline surveying was undertaken in accordance with the agreed methodology as detailed in **Appendix 15A**.

Consultee	Consideration	How addressed in the ES
	undertaken, the precise locations of monitoring and the duration of monitoring.	
NAC	Having greater detail on the programme for the Proposed Works would aid understanding of the duration of specific activities.	The programme for the Proposed Works is provided in **Chapter 2: Decommissioning Process**.
NAC	Suggested that the BS 5228-1:2009+A1:2014[13] lowest threshold values for noise impacts might be inappropriate for activities which occur over extended durations (with reference to project duration of 12 years).	The durations of specific activities, and associated potential for additional impacts, have been considered in the assessment provided in **Section 15.10**.
NAC	Noted that the Local Authority allocation for days and times of noisy construction activities are Monday to Saturday 07:00 to 19:00 hours. Noted that this is generous (noisy construction works are typically restricted on Saturdays from 07:00 to 13:00 hours). Suggested that restricting noisy activities to less than the allocated hours may be appropriate if long periods of noisy works are expected.	The assessment provided in **Section 15.10** considers potentially high noise activities during the Preparations for Quiescence phase being undertaken during normal working hours between 07:30 to 18:00 hours Monday to Friday, except in cases of emergencies or works that need to be undertaken continuously, such as maintenance or concrete pouring.

Consultation

15.4.4 Relevant comments from stakeholders, and how the issues raised are addressed in this ES, are provided below in **Table 15.7**.

Table 15.7 Summary of Consultation responses

Consultee	Consideration	How addressed in the ES
NHS Ayrshire and Arran	Noted that decommissioning is likely to result in increased HGV movements on local roads, including through some residential areas (for instance, communities along the A78 such as Fairlie and West Kilbride). We would therefore recommend that HGV movements be planned in a way that minimises overall traffic and therefore associated noise, safety, and air quality impacts on local communities.	HGV movements will be managed in accordance with a Construction Traffic Management Plan (CTMP) (see **Chapter 15: Traffic and Transport**). Potential noise effects due to increases of vehicle movements on the local highway network are assessed in **Section 15.10**. Potential impacts to air quality are considered in **Chapter 5: Air Quality**.
NHS Ayrshire and Arran	Given the long timescales for the decommissioning process, we would also recommend that transport planning takes advantage of technological developments during this time (e.g. alternative fuel sources/engine types) that offer reduced emissions and noise.	There is a lack of information or guidance around the noise implications of an increased proportion of electric vehicles on the highway network. The assessment of traffic noise provided in **Section 15.10** therefore assumes typical noise generation by Internal Combustion

Consultee	Consideration	How addressed in the ES
		Engine (ICE) powered vehicles, in accordance with the nationally approved guidance, DMRB[10].

15.5 Overall baseline

Current baseline

Qualitative description of baseline conditions

15.5.1 HNB is located in a rural area approximately 3.5 km north-west of West Kilbride and 4.5 km south-west of Fairlie. Existing noise levels in the area are primarily influenced by road traffic, other transport sources (aircraft and shipping) and the sound of the sea.

15.5.2 The nearest residential properties, which are located approximately 0.45 km east of HNB, have been subject to continuous operational sound from both Hunterston A (hereafter HNA) and HNB for many years. This also includes some intermittent noise sources such as standby diesel engines and short-term steam venting.

15.5.3 There appears to be no evidence to suggest that noise or vibration from the operation of HNB, or the decommissioning and/or demolition activities at HNA, have caused any significant levels of noise or vibration in the past.

Baseline surveying

15.5.4 To inform the assessment, representative baseline data describing the ambient noise environments in the vicinity of the nearest NSRs to the Proposed Works and possible transport routes was acquired in April 2022 in accordance with the agreed methodology. Details of the baseline surveys, including determination of representative sound levels to be used in the assessment, and determination of appropriate thresholds of significance for construction noise in accordance with BS 5228-1:2009+A1:2014[13], are presented in the baseline monitoring report in **Appendix 15A**.

15.5.5 The results of the baseline surveys are generally considered to be typical of the locations where the data were acquired, and are representative of the receptors in proximity to each measurement location.

15.5.6 A summary of the baseline survey results, which have been used to determine BS 5228-1:2009+A1:2014[13] thresholds of significance for noise from demolition and deplanting activities in the Works Area, are provided in **Table 15.8**.

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Table 15.8 Representative baseline sound levels

Survey Location	Representative baseline ambient sound levels, dB $L_{Aeq,T}$								
	Weekdays				Weekends				
	Day	Evening	Night	Mon - Fri 0700 - 1900 hrs*	Day	Evening	Night	Saturday 0700 - 1900 hrs*	Sunday 0700 - 1900 hrs*
LT1	47	42	29	48	46	39	37	48	48
LT2	52	49	43	52	51	47	45	52	52
LT3	40	38	35	43	41	38	35	43	43
LT4	61	57	50	61	60	57	52	61	62
ST1	44	-	35	44	-	-	-	-	-
ST2	60	-	33	60	-	-	-	-	-
ST3	43	-	26	43	-	-	-	-	-
ST4	40	-	30	40	-	-	-	-	-
*** - Logarithmic average**									

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Future baseline

15.5.7 The main sound sources which currently influence the local acoustic environment are road traffic, and other anthropogenic and natural sound sources. It is not anticipated that this situation is likely to change in the period between now and the commencement of works in the Preparation for Quiescence or Final Site Clearance phases.

15.5.8 The Preparation for Quiescence phase is anticipated to be the worst-case in respect of traffic movements. The assessment of traffic noise is therefore based on the anticipated highest annual traffic flow associated with works during Preparation for Quiescence phase, which is anticipated in 2033. Baseline traffic data has been factored against expected traffic flow changes on the local network for 2033, to provide a 'future baseline' against which the noise generated from the additional traffic associated with the Proposed Works has been compared.

15.5.9 It is anticipated that non-traffic noise sources associated with the Proposed Works would not have a significant influence on future baseline sound levels.

15.6 Embedded and good practice environmental measures

15.6.1 The embedded environmental and good practice measures that will be used to control potential environmental impacts due to noise during the Proposed Works are set out below in **Table 15.9**.

Table 15.9 Summary of Embedded Environmental Measures

Embedded Measure	Compliance Mechanism	Embedded or good practice measure
Undertaking the Proposed Works in accordance with good practice. All noisy activities to be undertaken within hours for noisy activities for construction provided by NAC, except where works need to be undertaken continuously (e.g. for any concrete pours that may be required) or in case of emergencies. Where the potential for significant effects arises, applying Best Practicable Means in accordance with the recommendations in BS 5228:1-2009+A1:2014[13].	Requirements to undertake the Proposed Works in accordance with best practice, and any other mitigation measures that may be required, will be set out in the EMP.	Good practice
Continuous boundary noise monitoring will be undertaken during the periods of the Preparations for Quiescence phase with the greatest intensity of simultaneous works, anticipated to occur in the years 2029 and 2037.	The methodology for the monitoring, and remedial action to be undertaken in the event that the monitoring identifies a potentially significant adverse noise impact, will be set out in the EMP.	Embedded measure
In the event of receipt of a complaint relating to noise from the Proposed Works, attended monitoring should also be undertaken at a location representative of the complainant's property. Additional mitigation measures	The methodology for the monitoring, and remedial action to be undertaken in the event that the monitoring identifies a	Embedded measure

Embedded Measure	Compliance Mechanism	Embedded or good practice measure
may be specified where monitoring demonstrates that noise from the works may be giving rise to significant impacts.	potentially significant adverse noise impact, will be set out in the EMP.	

15.7 Assessment methodology

15.7.1 The proposed generic project-wide approach to the assessment methodology is set out in **Chapter 5: The EIA Process**, and specifically in **Section 5.3** and **Section 5.4**. However, whilst this has informed the approach that has been used in this noise and vibration chapter, it is necessary to set out how this methodology will be applied, and adapted as appropriate, to address the specific needs of the noise and vibration assessment in the EIAR.

General approach

Baseline survey methodology

15.7.2 Baseline surveying was undertaken in accordance with the survey methodology agreed with NAC as set out in **Section 15.3.** Baseline monitoring was intentionally undertaken when HNB was not generating to ensure a 'worst-case' baseline was collected to be used within the assessment (i.e. generation at HNB was not influencing baseline levels).

Assessment methodology

15.7.3 The assessment of any demolition, deplanting and/or other activities, technically categorised as construction activities, has been undertaken with reference to BS 5228-1:2009+A1:2014[13] on the basis of the information provided and the representative baseline sound levels.

15.7.4 The assessment of road traffic noise during activities undertaken during Preparations for Quiescence phase will be undertaken with reference to CRTN[9] and DMRB[10].

Determination of significance

15.7.5 The EIADR recognise that developments will affect different environmental elements to differing degrees, and that not all of these are of sufficient concern to warrant detailed investigation or assessment through the EIA process. EIADR identify those environmental resources that warrant investigation as those that are *"likely to be significantly affected by the development"*.

15.7.6 The EIADR do not define significance and it will be necessary to state how this will be defined for the EIA. The significance of an effect resulting from a development is most commonly assessed by reference to the sensitivity (or value) of a receptor and the magnitude of the effect. This approach provides a mechanism for identifying areas where mitigation measures may be required and to identify the most appropriate measures to alleviate the risk presented.

15.7.7 **Table 15.10** details the basis for assessing receptor sensitivity, which reproduces guidance from TAN 11[8].

Table 15.10 Establishing the sensitivity of receptors

Sensitivity	Description	Examples
High	Receptors where people or operations are particularly susceptible to noise.	• Residential, including private gardens where appropriate; • Quiet outdoor areas used for recreation; • Conference facilities; • Theatre / auditoria / studios; • Schools during the daytime; • Hospitals / residential care homes; and • Places of worship.
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance.	• Offices; • Bars / cafes / restaurants where external noise may be intrusive; and • Sports grounds where spectator noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf, bowls).
Low	Receptors where distraction or disturbance from noise is minimal.	• Buildings not occupied during working hours; • Factories and working environments with existing high noise levels; • Sports ground where spectator noise is a normal part of the event; • Night clubs; and • Other industrial sites.

15.7.8 The determination of the magnitude of change due to noise from demolition and deplanting activities in the Works Area is based on the ABC method, provided in Annex E of BS 5228-1:2009+A1:2014[13]. The method relies on comparing predicted noise levels with a significance threshold determined based on the measured baseline sound levels during the period when works would take place. The activities with the greatest potential to generate noise emissions are anticipated to occur during normal construction hours (i.e. weekday daytimes). The baseline survey results, a summary of which is provided in **Table 15.8**, indicate that, during normal construction hours, ambient sound levels rounded to the nearest 5 decibels do not exceed 60 dB $L_{Aeq,T}$. Therefore, in accordance with the ABC method, the BS 5228-1 significance threshold is 65 dB $L_{Aeq,T}$ for all receptors during weekday daytimes. **Table 15.11** details the basis for assessing magnitude of change.

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Table 15.11 Establishing the magnitude of change

Magnitude	Criteria	Receptor type	Semantic
High	Noise levels exceeding BS 5228-1 threshold for a duration which triggers the requirement to provide additional noise insulation/ temporary rehousing.	Residential buildings, hotels and hostels, buildings in religious use, buildings in educational use and buildings in health and/ or community use.	Levels very much greater than baseline and very disruptive.
Medium	Noise levels exceeding BS 5228-1 threshold for a duration which does not trigger the requirement to provide additional noise insulation/ temporary rehousing.		Levels greater than baseline and disruptive.
Low	Noise levels equal to, but not exceeding, BS 5228-1 threshold.		Levels greater than baseline.
Negligible	Noise levels not exceeding BS 5228-1 threshold.		Levels less than baseline.

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15.7.9 The methods and criteria provided in BS 5228-1:2009+A1:2014[13] do not address potential impacts to sports facilities or quiet outdoor areas used for recreation, and there are no nationally accepted guidelines for assessing noise impacts to receptors of this type. However, given that such receptors are of high sensitivity, as set out in **Table 15.10**, when determining the magnitude of change from noise from the Proposed Works, it is considered appropriate to initially apply the same criteria for magnitude of change provided in **Table 15.10**. Following this initial step, professional judgement will be applied for the final determination of the magnitude of change from noise impacts to such receptors.

15.7.10 The approach detailed above in paragraph 15.7.9 for addressing potential impacts to sports facilities or quiet outdoor areas used for recreation is considered to provide a robust assessment. This is on the basis that the receptor types listed in **Table 15.11** are typically considered to be of a greater sensitivity to noise impacts due to the permanent nature of receptors located in, for example, dwellings and hospitals, as compared to the temporary and transient nature of receptors at sports facilities and outdoor areas used for quiet recreation.

15.7.11 **Table 15.12** provides the proposed impact magnitude categories for assessing traffic noise associated with the Proposed Works, determined based on the guidance contained within DMRB[10] and using professional judgement. This is based on BNL calculations indicating the increase in road traffic noise level due to increases in flows on the highway network due to additional vehicle movements generated by the Proposed Works. The BNL is the calculated sound level due to road traffic, accounting for the traffic flow, speed and percentage of Heavy Goods Vehicles (HGVs), at 10 m from the carriageway edge, as set out in CRTN[9].

Table 15.12 Establishing the magnitude of impact at receptors due to increased road traffic noise associated with the Proposed Works

Magnitude	Increase in BNL of closest public road used for construction traffic, dB
High	Greater than or equal to 5.0
Medium	Greater than or equal to 3.0 and less than 5.0
Low	Greater than or equal to 1.0 and less than 3.0
Negligible	Less than 1.0

15.7.12 **Table 15.13** below provides the matrix which has been used to determine the significance of effects based on the sensitivity of the receptor and the predicted impact magnitude. The matrix has been modified to account for the three receptor sensitivity categories provided in TAN 11[8] detailed in **Table 15.10**.

15.7.13 The additional diagonal of 'potentially significant' effects reflects the complex nature of noise impact assessment, which often relies not only on the difference between the predicted sound level and the baseline sound level, but also on absolute levels, the total ambient sound level, and other factors such as the time of day, the character of the sound, the duration that a sound may be present for, etc. This approach allows for appropriate application of professional judgement in cases where there are various factors to consider when determining the significance of effects.

Table 15.13 Significance evaluation matrix

		Magnitude of Impact			
		High	**Medium**	**Low**	**Negligible**
Receptor Sensitivity	**High**	Major (Significant)	Moderate or Major (Potentially significant)	Moderate (Potentially significant)	Minor (Not significant)
	Medium	Moderate or Major (Potentially significant)	Moderate (Potentially significant)	Minor (Not significant)	Negligible (Not significant)
	Low	Moderate (Potentially significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)

Note: Significant effects are those identified as 'Major'. 'Moderate' effects would normally be deemed to be significant. However, there may be some exceptions, depending on professional judgment of the context of the scenario.

15.8 Assumptions and limitations

15.8.1 Baseline survey work for the noise effects associated with traffic and transport has considered the main traffic routes, as discussed in **Chapter 16: Traffic and Transport**.

15.8.2 The Proposed Works are separated into three distinct phases, as detailed in **Section 15.9**. Based on the information available, the Preparations for Quiescence phase is considered to be the worst-case with respect to potential noise and vibration effects and, therefore, this is the phase that has been taken forward in the assessment. Phases of a similar but lesser intensity than the worst-case phase are addressed qualitatively, applying professional judgement.

15.8.3 Noise and vibration emissions during the Proposed Works will be subject to control through best practice measures, and any additional measures required, that will be set out in an EMP.

15.9 Scope of the assessment

Study area

15.9.1 The Study Area has been defined with reference to the nearest noise and vibration sensitive receptors to the Works Area and the potential road transport access routes, as outlined in **Section 15.3**. Potential adverse noise effects will likely be confined to those receptors in closest proximity to the Works Area and the selected receptors on the traffic routes. Baseline data gathering has included locations which are representative of the NSRs nearest to the Works Area, and NSRs near to transport routes that may be used during the Proposed Works. The locations of the Works Area, Study Area and the nearest NSRs are shown on **Figure 15.1**.

15.9.2 The temporal scope of the assessment for noise and vibration is consistent with the period over which the Proposed Works will be carried out, as described in **Chapter 2: The Decommissioning Process**.

Potential receptors

15.9.3 Hunterston Castle, Hunterston House and Campbelton Farm are located closest to the Works Area, approximately 450 m to the east. The next nearest residential properties are on Thirdpart (accessed via Irvine Road), approximately 850 m to the south-east. Other receptors that were agreed to be included during consultation, as discussed in **Section 15.4**, include receptors on the island of Greater Cumbrae and at Fairlie South.

15.9.4 The following NSRs, listed below in **Table 15.14** (and shown on **Figure 15.1**) have been considered within the assessment of noise and vibration effects due to the Proposed Works. The receptors listed in **Table 15.14** represent all those identified as being potentially affected by noise and vibration from the Proposed Works, including those identified in the desk study referred to in **Section 15.3** and during the technical engagement with NAC discussed in **Section 15.4**.

Table 15.14 Receptors Subject to Potential Effects

ID	Receptor	Approximate distance and direction from the Works Area
R1	Dwellings on Marine Parade, Great Cumbrae	3 km north-west
R2	Dwellings on Kaim View and Fairlieburne Gardens, Fairlie	3.5 km north-east
R3	Dwellings on Main Road and Irvine Road, Fairlie	3.4 km north-east
R4	Dwellings at Fencefoot Farm, Fairlie	2.3 km north-east
R5	Dwellings at Glenside Cottage, Fairlie Moor Road, Fairlie	2.3 km north-east
R6	Hunterston House	450 m east
R7	Dwellings at Hunterston Castle (North Cottage and End Shed Hotel)	450 m east
R8	Dwellings at Campbelton Farm	600 m south-east
R9	Dwellings at 3 & 4 Thirdpart	850 m south-east
R10	Dwellings at 2 & 5 Thirdpart	900 m south-east
R11	Dwellings at 1 Thirdpart	1 km south-east
R12	Dwellings at Portencross	1.7 km south
R13	Dwelling at Carlung Lodge, Carlung Estate	2.5 km south-east
R14	Dwellings at Bogriggs, Irvine Road, West Kilbride	2.8 km south-east
R15	Golf course at West Kilbride Golf Links	2 km south

15.9.5 With reference to **Table 15.10**, all residential receptor location in **Table 15.14** are considered to be of high sensitivity to potential noise and vibration effects, and the golf course (R15) is considered to be of medium sensitivity to potential noise and vibration effects.

15.9.6 All receptor locations in **Table 15.14** have been assessed for effects due to the Proposed Works. With regard to the assessment of road traffic noise, specific receptor locations will be selected for detailed assessment, depending on the outcome of the screening assessment, the outcomes of which are discussed below under paragraph 15.9.14. The characterisation and selection of the main routes for road traffic to access the Works Area is detailed in **Chapter 16: Traffic and Transport**, specifically **Section 16.7**.

Likely significant effects

Noise emissions from Works Area

15.9.7 Potentially significant effects could occur during the Proposed Works, which are planned to occur over three phases as follows:

- Preparations for Quiescence phase:
  - Main hub of activity with deplanting, demolition, waste processing and Safestore construction, over a period of 12 years.
- Quiescence phase:
  - Works in this phase are expected to result in the lowest noise emissions as care and maintenance takes place over a duration of approximately 70 years.
- Final Site Clearance:
  - Re-activity on site with dismantling of the reactors, , retrieval of waste from debris vaults, removal of the Safestore and subsequent transfer onwards from the Site and final site re-instatement to end state occurring concurrently.

15.9.8 Based on the above, the Preparations for Quiescence phase is expected to be the worst-case phase of the Proposed Works with respect to noise and vibration effects. This is on the basis that this phase will require the most substantial dismantling, demolition and construction activities and therefore require the most plant and equipment and entail the greatest number of vehicle movements when compared to the Quiescence phase and Final Site Clearance phase.

15.9.9 During the Preparations for Quiescence phase, the majority of the Proposed Works, such as conventional deplanting and deconstruction and Safestore construction, will be limited to normal working hours between 07:30 and 18:00 hours Monday to Friday. There may be occasional infrequent exceptions to when the working day may be extended in order to complete specific items of work safely. During the Quiescence phase, works on site would be infrequent. However, it is anticipated that any site monitoring or maintenance works would also be focused within normal working hours. During Final Site Clearance, it is likely the majority of works would be focused during normal working hours similar to the Preparations for Quiescence phase, although some shift working may be required.

Increase in road traffic noise due to additional vehicle movements on the local highway network

15.9.10 Significant effects due to road traffic noise could occur at the nearest Receptors adjacent to the vehicular routes used to access the Works Area due to additional vehicle movements generated by the Proposed Works.

15.9.11 In accordance with the guidance on Study Areas at paragraph 3.8 of DMRB LA 111[10], the Study Area for traffic noise impacts is defined as 50 m from the kerb of any road with a

predicted increase in BNL of at least 1 dBA, which is considered to be the minimum perceivable increase in noise to the human ear.

15.9.12 Predictions of the increase in road traffic noise due to additional vehicle movements generated by the Proposed Works are presented below in **Table 15.15** for all road links for which flow data have been provided, which are those links falling within the Traffic and Transport Study Area set out in **Chapter 16: Traffic and Transport**.

15.9.13 The flow data considers vehicle movements on all potential route options, though it is only Route 4 and Route 5 that have been recommended, as set out in **Section 16.7** in **Chapter 16: Traffic and Transport**, which states that Route 4 and Route 5 consist of the following road links:

- Route 4 – From the M8 via the M77, A71 and A78 at Irvine north to the Hunterston roundabout access to the Site (Power Station Road).
- Route 5 – From the M6 at Gretna via the A75 to Dumfries and via the A76 to Kilmarnock and then on the A71 and the A78 to the Hunterston roundabout access to the Site (Power Station Road).

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Table 15.15 Predicted increase in road traffic noise

Link	Speed (km/h)	Baseline 2023			Future Year 2033, Without Development Traffic			Future Year 2033, With Development Traffic			Predicted increase in BNL, dB		
		18hr AAWT	HGV %	BNL, dB L_{A10}	18hr AAWT	HGV %	BNL, dB L_{A10}	18hr AAWT	HGV %	BNL, dB L_{A10}	Future year without development minus baseline year	Future year with development minus baseline year	Difference (increase due to development traffic)
Power Station Road	66	1196	5.7	60	1246	5.7	61	1370	7.0	61	0.2	0.9	0.7
A78 North of Fairlie	50	8581	6.2	68	8940	6.2	68	8940	6.2	68	0.2	0.2	0.0
A78 Seamill	50	7430	4.5	67	7741	4.5	67	7865	4.7	67	0.2	0.3	0.1
Kilrusken Road	71	509	6.7	NA*	531	6.7	NA*	531	6.7	NA*	NA*	NA*	NA*
B781 Dalry Road	62	1189	7.1	60	1239	7.1	61	1239	7.1	61	0.2	0.2	0.0
B780	69	1253	10.0	62	1306	10.0	62	1306	10.0	62	0.2	0.2	0.0
B714	84	4745	8.9	69	4943	8.9	69	4943	8.9	69	0.2	0.2	0.0
A738 Stevenson Road	41	9650	3.0	66	10053	3.0	67	10053	3.0	67	0.2	0.2	0.0
A737 North of Kilwinning	50	8409	3.8	67	8761	3.8	67	8761	3.8	67	0.2	0.2	0.0
A737 Irvine Road	43	10653	7.5	69	11098	7.5	69	11222	7.7	69	0.2	0.3	0.1

Link	Speed (km/h)	Baseline 2023			Future Year 2033, Without Development Traffic			Future Year 2033, With Development Traffic			Predicted increase in BNL, dB		
		18hr AAWT	HGV %	BNL, dB L_{A10}	18hr AAWT	HGV %	BNL, dB L_{A10}	18hr AAWT	HGV %	BNL, dB L_{A10}	Future year without development minus baseline year	Future year with development minus baseline year	Difference (increase due to development traffic)
A737 South of Beith	90	11036	2.3	72	11498	2.3	72	11498	2.3	72	0.2	0.2	0.0
A71 South of Dreghorn	97	24540	4.3	76	25565	4.3	76	25689	4.3	76	0.2	0.2	0.0
A77 Kilmarnock Bypass	102	42502	4.8	79	44278	4.8	79	44402	4.9	79	0.2	0.2	0.0
A78 Irvine Road	83	7238	3.4	69	7541	3.4	70	7665	3.6	70	0.2	0.3	0.1
A78 Irvine Rd South of B7047	81	10354	2.9	71	10787	2.9	71	10911	3.1	71	0.2	0.3	0.1
A78 East of B714	108	9501	4.8	73	9898	4.8	73	10022	5.0	73	0.2	0.3	0.1
A78 between A71 and A737	97	29657	2.9	77	30897	2.9	77	31021	3.0	77	0.2	0.2	0.0
A71 Hurlford Road	97	24540	4.3	76	25565	4.3	76	25689	4.3	76	0.2	0.2	0.0
A71 Hurlford Road East of B7038 Campbell Street	70	18106	6.0	73	18863	6.0	73	18987	6.1	73	0.2	0.2	0.0

Link	Speed (km/h)	Baseline 2023			Future Year 2033, Without Development Traffic			Future Year 2033, With Development Traffic			Predicted increase in BNL, dB		
		18hr AAWT	HGV %	BNL, dB L_{A10}	18hr AAWT	HGV %	BNL, dB L_{A10}	18hr AAWT	HGV %	BNL, dB L_{A10}	Future year without development minus baseline year	Future year with development minus baseline year	Difference (increase due to development traffic)
A77 Kilmarnock Bypass South of M77	54	40449	5.9	75	42140	5.9	75	42264	5.9	75	0.2	0.2	0.0
A76 East of A77	86	11319	5.7	72	11792	5.7	72	11916	5.8	72	0.2	0.3	0.1
A78 south of Hunterstown Roundabout	82	6361	8.3	70	6621	8.3	70	6745	8.5	70	0.2	0.3	0.1
A78 Stevenston Bypass North	90	9901	8.0	72	10307	8.0	72	10431	8.1	72	0.2	0.2	0.1
A78 Stevenston Bypass Mid	100	13376	8.3	74	13924	8.3	75	14048	8.4	75	0.2	0.2	0.1
A78 South of Stevenson	102	32813	4.0	78	34159	4.0	78	34283	4.1	78	0.2	0.2	0.0
A78 South of Eglinton Interchange-between A71 and A737 (S)	105	15767	5.0	75	16413	5.0	75	16475	5.1	75	0.2	0.2	0.0
A78 South of Eglinton	106	14960	4.7	75	15573	4.7	75	15635	4.7	75	0.2	0.2	0.0

Link	Speed (km/h)	Baseline 2023			Future Year 2033, Without Development Traffic			Future Year 2033, With Development Traffic			Predicted increase in BNL, dB		
		18hr AAWT	HGV %	BNL, dB L_{A10}	18hr AAWT	HGV %	BNL, dB L_{A10}	18hr AAWT	HGV %	BNL, dB L_{A10}	Future year without development minus baseline year	Future year with development minus baseline year	Difference (increase due to development traffic)
Interchange- between A71 and A737 (N)													
A76 Bowhouse Roundabout	60	11272	13.0	71	11734	13.0	71	11858	13.1	71	0.2	0.2	0.1
A77 North of A76	104	44463	23.8	82	46286	23.8	82	46410	23.8	82	0.2	0.2	0.0
A77 Assloss Farm	101	43751	7.6	80	45545	7.6	80	45669	7.7	80	0.2	0.2	0.0
A78 Irvine to Newhouse	103	18067	5.1	75	18808	5.1	76	18808	5.1	76	0.2	0.2	0.0
A78 Newhouse to Meadowhead Rbt	93	18621	6.5	75	19385	6.5	75	19385	6.5	75	0.2	0.2	0.0
A78 Loans Bypass at Auchengate	106	14887	5.4	75	15498	5.4	75	15498	5.4	75	0.2	0.2	0.0
A78 Loans	105	18278	5.4	76	19028	5.4	76	19028	5.4	76	0.2	0.2	0.0
A737 South of Hillend Roundabout	44	9274	12.5	69	9654	12.5	69	9654	12.5	69	0.2	0.2	0.0

Link	Speed (km/h)	Baseline 2023			Future Year 2033, Without Development Traffic			Future Year 2033, With Development Traffic			Predicted increase in BNL, dB		
		18hr AAWT	HGV %	BNL, dB L_{A10}	18hr AAWT	HGV %	BNL, dB L_{A10}	18hr AAWT	HGV %	BNL, dB L_{A10}	Future year without development minus baseline year	Future year with development minus baseline year	Difference (increase due to development traffic)
A737 Blair Road Overbridge	100	9155	11.9	73	9530	11.9	73	9530	11.9	73	0.2	0.2	0.0
A737 North of Birkentop Cottage	90	11774	11.4	73	12257	11.4	74	12257	11.4	74	0.2	0.2	0.0
A737 Beith	55	15541	11.8	72	16178	11.8	72	16178	11.8	72	0.2	0.2	0.0
A737 Lochside	78	21875	6.4	74	22772	6.4	75	22772	6.4	75	0.2	0.2	0.0
A78 Fairlie – Main Rd	49	8767	8.3	68	9127	8.3	68	9127	8.3	68	0.2	0.2	0.0

***NA – Road links with less than 1000 vehicles in an 18 hour period are 'low flow' roads in accordance with CRTN[9]. Predictions for low flow roads are unreliable.**

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15.9.14 The results in **Table 15.15** indicate that no road links are predicted to experience an increase in road noise in excess of 1 dBA. The greatest increase is predicted at Power Station Road where an overall increase of 0.9 dB is predicted, including an increase due to additional vehicle movements associated with the Proposed Works of 0.7 dBA. Based on the criteria outlined in paragraph 15.9.11 and the results of the initial BNL assessment outlined above, all road links proposed to be used during the Proposed Works are screened out, and increases in road noise are scoped out of further assessment.

15.9.15 Based on the above, and with reference to the criteria in **Table 15.12**, likely impacts due to increases in road noise are negligible. With reference to **Table 15.13**, negligible impacts to receptors of high sensitivity result in effects of **Minor Significance** and are **Not Significant.**

Summary

15.9.16 The likely significant noise and vibration effects that will be taken forward for assessment in the ES are summarised in **Table 15.16**. The potential for significant effects during other activities required during the Proposed Works are considered unlikely to result in significant effects and may be addressed qualitatively. As set out in the Scoping Report, vibration effects due to additional vehicle movements on public highways and vibration effects due to any demolition, deplanting and construction activities which may be required, are considered most unlikely, and are scoped out. Therefore, the likely significant effects listed in **Table 15.16** which are scoped-in for further assessment are limited to potential effects due to airborne noise.

Table 15.16 Potential noise and vibration effects scoped in for further assessment

Receptor	Potentially significant effects
All receptors listed in **Table 15.14**	Effects due to noise arising from demolition and deplanting activities and vehicle movements in the Works Area (i.e. not including vehicle movements on public highways, which are scoped out of detailed assessment as set out in paragraph 15.9.14).

15.10 Assessment of effects

Preparations for Quiescence phase: noise from deplanting, demolition and other decommissioning activities in the Works Area

15.10.1 Based on review of the decommissioning schedule, two years have been selected for assessment, based on identifying those periods with the greatest number of concurrent activities. The two years selected for assessment, and the activities occurring in those years in the zones identified in **Graphic 2.4 – Location of Buildings within each Managed Retreat Building Group** in **Chapter 2: The Decommissioning Process**, are as follows:

- **2029:** Operational HAW retrieval, operation of Decommissioning Waste Processing Facility (DWPF), operation of Operational Waste Processing Facility (OWPF), Conventional area deplanting and demolition in zones 4, 5, 6 and 7.
- **2037:** Demolition of DWPF, Conventional area deplanting and demolition in zones 11, 12 and 13, and construction of the Safestore.

15.10.2 Quantitative data detailing the plant requirements for the conventional area deplanting and demolition, reproduced in **Appendix 15B**, have been used to inform the assessment. The plant requirements for construction of the Safestore have been assumed based on professional judgement and experience of similar schemes.

15.10.3 Other activities (operation of the OWPF and DWPF, operational HAW retrieval and demolition of the DWPF) are considered to require significantly less plant than the other elements, or will occur within buildings which will provide noise attenuation, and therefore result in relatively insignificant noise emissions, and are addressed qualitatively.

15.10.4 On the basis of the above, predicted noise levels at the nearest receptor locations, and assessment against the BS 5228-1[13] threshold values are provided in **Table 15.17** and **Table 15.18** below, with prediction details provided in **Appendix 15B**. Predictions have been undertaken assuming sound propagation from the approximate centre of the Works Area, therefore the propagation distances considered differ slightly from those presented in **Table 15.14**, which considered distance from the boundary of the Works Area.

Table 15.17 Assessment of noise from deplanting, demolition and other decommissioning activities in the Works Area: 2029

Receptor	Predicted noise level, plant and vehicle movements, dB $L_{Aeq,T}$ (not accounting for screening or reflections)	BS 5228 threshold of significance, dBA	Threshold of significance minus predicted noise level, dBA
R1	46	65	-19
R2	44	65	-21
R3	45	65	-20
R4	48	65	-17
R5	48	65	-17
R6	63	65	-2
R7	62	65	-3
R8	58	65	-7
R9	55	65	-10
R10	54	65	-11
R11	54	65	-11
R12	48	65	-17
R13	47	65	-18
R14	46	65	-19
R15	47	65	-18

Table 15.18 Assessment of noise from deplanting, demolition and other decommissioning activities in the Works Area: 2037

Receptor	Predicted noise level, plant and vehicle movements, dB $L_{Aeq,T}$ (not accounting for screening or reflections)	BS 5228 threshold of significance, dBA	Threshold of significance minus predicted noise level, dBA
R1	45	65	-20
R2	43	65	-22
R3	44	65	-21
R4	47	65	-18
R5	47	65	-18
R6	62	65	-3
R7	61	65	-4
R8	57	65	-8
R9	54	65	-11
R10	53	65	-12
R11	53	65	-12
R12	47	65	-18
R13	46	65	-19
R14	45	65	-20
R15	46	65	-19

15.10.5 The results in **Table 15.17** and **Table 15.18** indicate that, during those years in the Preparations for Quiescence phase with the most activity, the worst case predicted sound levels due to conventional area deplanting and demolition and construction of the Safestore do not exceed the BS 5228-1[13] thresholds of significance at any receptor location. On this basis, and with reference to **Table 15.11**, the magnitude of change during the Preparations for Quiescence phase is of no greater than negligible magnitude at all receptors. With reference to **Table 15.13**, impacts of negligible magnitude to receptors of high sensitivity result in effects of **Minor Significance** and are **Not Significant**.

15.10.6 At the closest receptor (R6 - Hunterston House) predicted noise levels are 2 dB below the significance threshold in the 2029 assessment scenario and are 3 dB below the significance threshold in the 2037 assessment scenario. Though the determination of significance provided above is considered robust and accurate based on the information available, there are some elements of uncertainty associated with the prediction. There are some additional activities not accounted for quantitatively, as described in paragraph

15.10.3**,** which may contribute to noise levels at the nearest receptors, although it is anticipated that these would tend to provide a negligible contribution and would not cause a significant increase in the predicted noise levels.

15.10.7 Furthermore, the predicted noise levels in **Table 15.17** and **Table 15.18** do not include any corrections for screening, and are based on all plant listed for all the activities indicated in the schedule operating simultaneously. It is likely that a significant element of screening would be provided to certain activities due to existing structures and by local topography. It is also considered unlikely that all plant listed for each deplanting and demolition areas would actually be in operation simultaneously.

15.10.8 Therefore, whilst there is some uncertainty associated with the predicted noise levels, the prediction method is considered conservative, by omitting any screening effects and by considering all plant to be in operation simultaneously.

15.10.9 Notwithstanding the above, and as the Proposed Works are scheduled to occur over a long period of time, it is considered that careful management of activities should be implemented to ensure that noise emissions from the Proposed Works are minimised as far as reasonably practicable, in accordance with BPM. Continuous noise monitoring should be undertaken during the Preparations for Quiescence phase at the boundary of the Works Area to quantify noise levels due to deplanting and demolition activities in those years with the greatest intensity of simultaneous works, anticipated to occur in the years 2029 and 2037. This is discussed further below under the heading **'Monitoring'**. Monitoring is not recommended during the Quiescence phase, as minimal site activity is expected. The requirement for monitoring during Final Site Clearance shall be determined once a detailed methodology for the Final Site Clearance phase is available.

15.10.10 The management and monitoring outlined above should ensure that the influence of noise from the Proposed Works on the ambient noise environment is minimised and that exceedances of the significance threshold are avoided.

Quiescence phase and Final Site Clearance: noise from activities in the Works Area

15.10.11 The assessment of noise from activities in the Works Area during the Preparations for Quiescence phase indicates that significant effects are unlikely during the Quiescence phase and Final Site Clearance phase.

15.10.12 The Preparations for Quiescence phase is the most intensive phase, requiring the most significant amounts of plant and associated activity for deplanting and demolition. In contrast, the Quiescence phase is anticipated to entail relatively minimal plant requirements with minimal activity in the Works Area and the generation of fewer off site vehicle movements. Though the Final Site Clearance phase will entail more significant plant requirements than the Quiescence phase, it is anticipated this will be less than the Preparations for Quiescence phase.

15.10.13 Based on the above, the likely effects due to noise during the Quiescence phase and Final Site Clearance will be no greater than the effects predicted during the Preparations for Quiescence phase. As such, noise emissions during the Quiescence phase and Final Site Clearance will result in impacts of no greater than negligible magnitude at all receptors. With reference to **Table 15.13**, impacts of negligible magnitude to receptors of high sensitivity result in effects of **Minor Significance** and are **Not Significant**.

15.10.14 Notwithstanding the above, all activities undertaken during the Final Site Clearance phase, and any noisy activities required during the Quiescence phase, should be carefully managed to ensure that noise emissions from the Proposed Works are minimised as far as reasonably practicable, in accordance with BPM.

Monitoring

15.10.15 The assessment indicates that significant effects are unlikely. Undertaking the Proposed Works in accordance with BPM should ensure that noise emissions from the works are minimised and reduce the potential for any adverse impacts.

15.10.16 Notwithstanding the above, as the Preparations for Quiescence phase takes place over a long period of time, and as the assessment indicates that predicted noise levels are within 3 dB of the significance threshold during years of peak activity at the nearest receptors, it is recommended that continuous boundary noise monitoring be undertaken during the periods of the Preparations for Quiescence phase with the greatest intensity of simultaneous works, anticipated to occur in the years 2029 and 2037.

15.10.17 In the event of receipt of a complaint relating to noise from the Proposed Works, attended monitoring should also be undertaken at a location representative of the complainant's property. Additional mitigation measures may be specified where monitoring demonstrates that noise from the works may be giving rise to significant impacts.

15.11 Assessment of cumulative effects

Inter-Project Effects

15.11.1 There is the potential for noise and vibration effects associated with the Proposed Works to interact with, or combine with the effects arising from other developments or projects proposed within the relevant Zones of Influence applicable to each environmental aspect.

15.11.2 An assessment of inter-project effects is considered within in **Chapter 21: Cumulative Effects Assessment** of this ES.

Intra-Project Effects

15.11.3 There is the potential for intra-project effects on amenity, ecology and heritage receptors as a result of noise and vibration impacts. An assessment of intra-project effects is provided in **Chapter 21: Cumulative Effects Assessment**, as well as inherently within the following environmental aspect chapters: **Chapter 8: Terrestrial Biodiversity and Ornithology**, **Chapter 9: Marine Biodiversity**, **Chapter 13: Historic Environment** and **Chapter 17: People and Communities**.

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15.12 Summary

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor	Magnitude of Change	Significance	Summary of Rationale
All receptors listed in Table 15.14.	Noise effects due to noise arising from activities in the Works Area.	High	Negligible	Minor	Noise levels during peak years of activity are predicted not to exceed the BS 5228-1[13] thresholds of significance
All receptors listed in Table 15.14.	Noise effects due to increased road noise from vehicle movements generated by the Proposed Works.	High	Negligible	Minor	Assessment indicates no significant increases of road traffic noise due to the Proposed Works.
All receptors listed in Table 15.14.	Cumulative noise effects due to noise arising from activities in the Works Area and noise emissions from the construction and operation of other developments.	High	Negligible	Minor	Review of available information on other proposed/ consented schemes indicates that none are likely to present a significant risk of giving rise to noise emissions with the potential to cause cumulative noise effects.
All receptors listed in Table 15.14.	Cumulative noise effects due to increased road noise from vehicle movements generated by the Proposed Works and other proposed/ consented developments.	High	Negligible	Minor	Assessment indicates no significant increases of road traffic noise due to the Proposed Works. As such, any significant increases would be dominated by the other proposed/ consented developments.

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16.

Traffic and Transport

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16. Traffic and Transport

16.1 Introduction

16.1.1 This chapter considers potential traffic and transport effects associated with the Proposed Works at relevant receptors within the Study Area (see **Section 16.3**).

16.1.2 The chapter should be read in conjunction with the description of the Proposed Works presented in **Chapter 2: The Decommissioning Process**, and with respect to relevant parts of other aspect chapters, notably **Chapter 6: Air Quality** and **Chapter 15: Noise and Vibration**, where common road links apply.

16.1.3 Underpinned by the programme of works presented in **Chapter 2: The Decommissioning Process,** the quantities of materials that will require off-site disposal and are required for on-site construction of the Safestore and to potentially fill voids on site during the Preparations for Quiescence phase have been calculated (see **Chapter 19: Conventional waste**). These quantities have been translated into the number of Heavy Goods Vehicle (HGV) movements required to transport the waste arisings associated with dismantling and decommissioning, filling of voids on-site and the construction of the Safestore, to facilitate this traffic and transport assessment.

16.2 Relevant legislation, policy and technical guidance

Legislation

16.2.1 The legislation in **Table 16.1** is relevant to the assessment of the effects on traffic and transport receptors.

Table 16.1 Legislation relevant to traffic and transport

Legislation	Legislation Issue
Radioactive Materials (Road Transport) Act 1991 (as amended)[1]	These regulations govern the movement and transport of radioactive materials, setting out provisions to regulate movements via road including offences, penalties, prohibitions and enforcement.
The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment (Amendment) (EU Exit) Regulations, 2021[2]	Transport of dangerous goods by road, rail and inland waterway in the UK must be in accordance with these regulations. Radioactive material is identified as Class 7 of 9 dangerous goods.

Policy

16.2.2 Policies relating to traffic and transport and relevant to the Proposed Works comprise those outlined in **Table 16.2.**

[1] UK Government (1991). *Radioactive Material (Road Transport) Act 1991* (Online). Available at: http://www.legislation.gov.uk/ukpga/1991/27/contents/ni (Accessed November 2023).
[2] UK Government (2009). *The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009* (Online). Available at: https://www.legislation.gov.uk/uksi/2021/1370/made (Accessed November 2023).

Table 16.2 Policy relevant to traffic and transport

Policy Reference	Policy Relevance
National Policy	
National Planning Framework 4 (NPF4)[3]	National policies relating to travel and transport, including the goal for Scotland to reduce the need to travel unsustainably, decarbonise the transport system and promote active travel choices. (Policy 13 – Sustainable Transport).
Local Policy	
North Ayrshire Local Development Plan[4] (2019)	This adopted local policy document where Hunterston is identified as key employment location within North Ayrshire and North Ayrshire Council is committed to supporting Hunterston as national development as an energy hub. Policy 35 – Hazardous Installations and Substances: states that development for the storage and/or management of low level and intermediate level radioactive waste arising from Hunterston A and B will be supported within the nuclear licensed area at Hunterston where the development: i. Relates to low level and intermediate radioactive waste arising from Hunterston A and Hunterston B only; and ii. Is consistent with the relevant national policy and strategy for managing radioactive waste in Scotland; and iii. Includes adequate measures to mitigate adverse impacts on the environment, transport and health.
East Ayrshire Local Development Plan (2017)[5]	Policy T1 - Transportation requirements for New Development: Developments must meet all Ayrshire Road Alliance standards and comply with Regional and Local Transport Strategies. All new development must fully embrace active travel as the first-choice modes for meeting travel demand (by incorporating new, and linking to existing, footpaths, cycle routes and public transport routes, where appropriate, developers must enter into S75 Obligations to making financial contributions towards the provisions of transportation infrastructure. Policy T2 - Transport Requirements for New Significant Traffic Generating Uses: Development will not be supported where significant traffic generation will increase the reliance on cars and where the potential impact and potential mitigation required on the trunk road have not been identified. Policy T3 - Transportation of Freight: It will be encouraged where feasible and cost-effective, that freight is carried by rail rather than by road. Policy T4: Development and Protection of Core Paths and Natural Routes: development which disrupts, or adversely impacts, on any existing or potential core path, right of way, bridle path or footpath will not be supported. If adverse impact is unavoidable appropriate mitigation measures are required to be implemented.

[3] Scottish Government (2021) *Scotland 2045: Our Fourth National Planning Framework*. (Online) Available at: https://www.gov.scot/publications/scotland-2045-fourth-national-planning-framework-draft/documents/ (Accessed November 2023)
[4] North Ayrshire Council (2019). *Adopted Local Development Plan: Your Plan Your Future*. (Online). Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed November 2023).
[5] East Ayrshire Council (2017). *East Ayrshire Local Development Plan* (Online). Available at: https://www.east-ayrshire.gov.uk/Resources/PDF/E/EALDP-Adopted-2017-Vol-1.pdf (Accessed November 2023).

Policy Reference	Policy Relevance
North Ayrshire Transport Strategy (2015)[6]	North Ayrshire Council (NAC) recognises the importance of understanding and supporting the short to medium term transport needs of Hunterston B power station and engagement with the Nuclear Decommissioning Authority, especially with respect to providing for freight traffic on the A78(T) and the need to reduce the impacts of such traffic on local communities.

Technical guidance

16.2.3 Since the Environmental Impact Assessment (EIA) Scoping Report was submitted to the Office of Nuclear Regulation (ONR) on 01 August 2022, the Guidelines for the Environmental Assessment of Road Traffic (GEART) was superseded (in July 2023). The following **Table 16.3** sets out the most recent guidance relevant to the assessment of effects on traffic and transport receptors for this Environmental Statement (ES).

Table 16.3 Technical Guidance relevant to traffic and transport

Technical Guidance	Context
Institute of Environmental Management and Assessment (IEMA) Guidelines: Environmental Assessment of Traffic and Movement (EATM)[7]	Provides guidance to developers and Local Authorities for undertaking an EIA or non-statutory environmental assessment for traffic and movement of people associate with non-highway / road projects.
Design Manual for Roads and Bridges (DMRB): GG119 – Road Safety Audit	Provides the requirements for road safety audit for highway schemes on the trunk road and motorway network but the document is also commonly used for highway schemes on local highway roads.

16.3 Data gathering methodology

16.3.1 The following section summarises the methodology undertaken which is a combination of desk study and additional survey work to collate the relevant data for assessing the existing (baseline) conditions.

Study Area

16.3.2 The Study Area which has been adopted for the EIA has been informed by the initial discussions undertaken with North Ayrshire Council and Transport Scotland in 2021, and comprises a number of local roads as well as strategic roads around the Hunterston B Power Station (HNB) Nuclear Site Licence Boundary ("the Site") including:

- Power Station Road;
- A78;
- Kilrusken Road;

[6] North Ayrshire Council (2015). *North Ayrshire Transport Strategy* (Online). Available at: https://www.north-ayrshire.gov.uk/Documents/PropertyServices/InfrastructureDesign/Roads/lts-2015-20.pdf (Accessed November 2023)
[7] Davis, S., Hoare, D., Howard, R., Ross, A. (2023) *Institute of Environmental Management and Assessment (IEMA) Guidelines: Environmental Assessment of Traffic and Movement*. IEMA; Cambridgeshire.

- B781;
- B780;
- B714;
- A738 Stevenston Road;
- A737 (Irvine Road);
- A71; and
- A77.

16.3.3 The Study Area for data collection is shown in **Figure 16.1**

16.3.4 Although it was accepted that the traffic impact would be diluted once traffic disperses onto strategic highways, the A78, A737 and A77 runs along built-up areas comprising of residential, community amenity and road accident receptors and therefore have been included in the Study Area.

16.3.5 The Study Area has been further informed by the proposals to transport non-radioactive and waste materials arising from the demolition of all existing buildings, except for the reactor building, and deplanting in the Preparations for Quiescence phase by road. The proposed Study Area is discussed in EIA Scoping which has been included in the technical engagement with Transport Scotland and NAC.

16.3.6 **Figure 16.2** depicts travel routes used within the area to join the Strategic Road Network (SRN) for journeys to the north, south and east of the 'Indicative Dismantling Works Area (the “Works Area”). However, it should be noted that Heavy Goods (HGVs) will be required to follow the routes to and from the SRN to the Works Area.

16.3.7 Exact locations of the waste disposal sites will be confirmed once the relevant contractor is appointed. Therefore, the Study Area has covered potential routes using the A78, A737, A71 and M77 to account for different routes which could be used.

16.3.8 Justification for deselecting some of the potential construction routes and for the preferred construction routes are described in **Section 16.8**.

16.3.9 There is the potential that there would be a small number of Abnormal Indivisible Loads (AILs) required during the Preparations for Quiescence phase. An AIL study is therefore not currently considered necessary but a study will be undertaken at a later stage if AIL requirement becomes a greater necessity of the Proposed Works.

Desk study

16.3.10 A desk study was undertaken using traffic data available from existing Department for Transport (DfT)’s traffic counters within the Study Area. Additional traffic surveys have also been undertaken to cover locations where the DfT count were not available (see paragraphs 16.3.7 to 16.3.9).

16.3.11 The data gathered sets out the existing conditions of the local road network within the Study Area, as follows:

- Highway boundary data which is held by the Local Highway Authority (North Ayrshire Council (NAC)), for any locations where mitigation may be required.
- The personal injury accident (PIA) records for the last five years (2017-2021) from Crashmap Pro (also held by the local police constabulary and the Local Highway Authority).

- The calculation of the background traffic growth was undertaken as follows:
  - Growth factors were derived from the National Road Traffic Forecasts (NRTF) for the low growth scenario[8].
  - Committed developments with planning permission since 2021, when the traffic surveys were collected. Further consultation including with local highway authority will be undertaken following submission of the ES.
- Data collection of road geometries for the routes proposed to be used by articulated vehicles has been undertaken using aerial mapping derived from Google. Abnormal Indivisible Loads (AILs) (if necessary) will be undertaken separately.
- Detailed traffic flow predictions for the Proposed Works have been calculated to compare against the baseline situation.

Survey work

16.3.12 Automatic Traffic Count (ATC) surveys were undertaken at the six survey locations identified in **Figure 16.1** to record flows and speeds in both directions over a fourteen-day survey period. The surveys took place between 00:00 on Wednesday 6 October 2021 and 23:59 on Thursday 21 October 2021 and are the latest ATC surveys.

16.3.13 The ATC equipment at Site 6, located on the A737 Irvine Road as shown in **Figure 16.1** (survey ID 10), was damaged during two survey attempts. The damage coincided with a complaint to the NAC regarding the position of an ATC counter near a property on the A737 Irvine Road. To overcome the loss of data from this site, the equipment was reinstalled for a full seven-day period (Sunday 14 November 2021 to Saturday 20 November 2021) and the data was successfully collected.

16.3.14 **Table 16.4** provides a summary of the traffic data sources for the locations identified in the Scoping Report and **Figure 16.1**.

Table 16.4 Annual Average Daily Traffic (AADT) data sources

Survey	Location	Description	DfT or ATC	Department for Transport (DfT) Count Point	Year
1	Power Station Road	Between Site and A78	New ATC (Site 5)		2021
2	A78	North of Fairlie	DfT Data	10755	2022
3	A78	Seamill	DfT Data	50759	2022
4	Kilrusken Road	Between A78 and B718	New ATC (Site 1)		2021
5	B781	Between West Kilbride and B780	New ATC (Site 2)		2021
6	B780	Between A78 and B781	New ATC (Site 3)		2021

[8] Department of the Environment Transport and the Regions (1997) *National Road Traffic Forecasts (Great Britain)*. Department of the Environment, Transport and the Regions; London.

Survey	Location	Description	DfT or ATC	Department for Transport (DfT) Count Point	Year
7	B714	Between A78 and Dalry	New ATC (Site 4)		2021
8	A738 Stevenson Road	Between A78 and Kilwinning Town Centre	DfT Data	91123	2021
9	A737	North Kilwinning	DfT Data	78604	2019
10	A737 Irvine Road	South of Kilwinning Town Centre	New ATC (Site 6)		2021
11	A737	South of Beith	DfT Data	92012	2022
12	A71	South of Dreghorn	DfT Data	11025	2022
13	A77	Kilmarnock Bypass	DfT Data	20756	2022

16.3.15 Since the submission of the Scoping Report, 2022 traffic data was obtained from DfT counters, and they have been added in the baseline flow assessment.

16.3.16 **Table 16.5** below summarises additional DfT counters data within the Study Area added in the baseline assessment.

Table 16.5 Additional 2022 AADT data sources

Survey	Location	Description	DfT or ATC	DfT Count Point	Year
1	A78	Irvine Road	DfT Data	80358	2022
2	A78	Irvine Road South of B7047 Chapelton Road	DfT Data	20761	2022
3	A78	East of B714	DfT Data	80495	2022
4	A78	Between A71 and A737	DfT Data	20762	2022
5	A71	Hurlford Road	DfT Data	74357	2022
6	A71	Hurlford Road East of B7038 Campbell St	DfT Data	80235	2022
7	A77	Kilmarnock Bypass South of M77	DfT Data	90194	2022
8	A76	East of A77	DfT Data	40748	2022

16.3.17 Additionally, Transport Scotland has provided access to Transport Scotland's database (Drakewell C2-Traffic), and 2023 AADT data for 18 locations within the Study Area are available as shown in **Figure 16.1**.

Site visit

16.3.18 A site visit was conducted on 22 January 2020 and the following key observations were made:

- The A78 north of Largs is susceptible to flooding from the sea in inclement weather, flood gates are in place to prevent traffic using the road should this occur. This could limit the use of this route for movements associated with the Proposed Works.
- Direct access from the A78 to the Hunterston High Level siding is height restricted to 14'6" (approximately 4.45m) on Kilrusken Toll.
- Access from the A78 to the A737 can be taken via two routes through Kilwinning; both of which can accommodate HGVs.

16.4 Consultation

Overview

16.4.1 Engagement has been undertaken with highways officers from North Ayrshire Council (NAC) and Transport Scotland.

16.4.2 A preliminary meeting with Transport Scotland occurred on 18 June 2021 regarding the scope of the traffic and transport assessment, including the Study Area, traffic count requirements and traffic generation/distribution.

16.4.3 Engagement with NAC took place on 27 May 2021, with additional follow up discussions occurring via email correspondence to agree the traffic survey locations. As part of this engagement, it was agreed that data prior to 2019 (pre-COVID19 pandemic) could be used to inform the assessment, supplemented with traffic survey data where permanent counters were not installed. The ATC locations were agreed with NAC and Transport Scotland.

Pre-application Opinion

16.4.4 A Pre-application opinion was provided by the Office for Nuclear Regulation (ONR), on 04 October 2022. A summary of the relevant responses received in the Pre-application Opinion in relation to traffic and transport and confirmation of how these have been addressed within the assessment is presented in **Table 16.6**.

Table 16.6 Summary of Pre-application Opinion responses

Paragraph Ref.	Consideration	How addressed in the ES
16	There is limited information on the traffic and transport requirements during decommissioning. ONR understands that there are uncertainties on the levels of traffic during decommissioning and the transport requirements to support the project, however, there may be a range or an assumption on traffic levels and transport requirements, or a worst-case scenario, that the EIA can be based on. Further information on the assumptions made during the EIA should be provided in the ES.	All assumptions pertaining to traffic generation has been based on a worst-case scenario, which is anticipated to be during the Preparations for Quiescence phase as detailed in paragraph 16.8.4.

Paragraph Ref.	Consideration	How addressed in the ES
104	The use of a combination of traffic data sources with October 2021 counts, and a mix of Automatic Traffic Counts and Manual Counts ranging from 2017 to 2020 is deemed suitable data to inform the scoping process.	Noted.
105	For determining the future baseline, reference is made to estimating future year traffic flows for the years under assessment which will use growth factors based on Nature Trip End Model growth rates. Clarification on which future years will be assessed should be provided in the ES.	Noted, the ES has included assessment of the future years using the National Road Traffic Forecast (NRTF) low growth rates as detailed in paragraph 16.5.39.
106	Further information on the source of the information presented in Table 15.6 detailing Receptor Sensitivity would be beneficial. Table 15.7 details the sensitivity of roads in the study area and states whether Rule 1 or 2 of the GEART applies. In the absence of predicted traffic flows from decommissioning project, further information could be provided on the method used to determine the application of Rule 1 or 2.	Information in **Table 16.18** has been updated with the recent EATM guidance (2023). Rule 1 or 2 has been applied based on the sensitivity of the road and receptors along it as set out in **Table 16.22**.
107	Table 15.8 details the magnitude of change but does not include the potential impact of hazardous loads; ONR would expect to see the impact of hazardous loads considered in the EIA.	The hazardous loads risk assessment has been included in **Section 16.9**.
108	In terms of the assessment scope, further information should be provided on the definition of the study area and the temporal scope of traffic and transport impacts.	Paragraphs 16.3.2 to 16.3.3 describe the Study Area for the purposes of the assessment. With respect to the temporal scope of the assessment, paragraphs 16.8.3 to 16.8.8 propose that the worst-case phase has been identified and assessed. It is currently assumed that this is during the Preparations for Quiescence phase. The conclusions of this assessment are therefore considered as worst case for traffic and transport receptors across all phases of the project.
109	ONR considers the scoping out of rail and marine routes to be suitable. The A78 south of West Kilbride is scoped out as there are limited receptors along the route and much of the route is a dual carriageway. ONR considers that this is reasonable but notes that this may have been prematurely scoped out as traffic numbers are yet to be determined.	**Table 16.24** and **Table 16.25** identify that the trip generated by the Proposed Work is below 10% where it is within the day-to-day variation on traffic and therefore create no discernible environmental impact (EATM Rule 1).

Technical engagement and non-statutory consultation

16.4.5 **Table 16.7** and **Table 16.8** summarise the technical engagement undertook to inform the traffic and transport chapter of this ES.

Table 16.7 Technical engagement responses with Transport Scotland

Consideration	How addressed in the ES
Base Traffic **Transport Scotland would question the validity of data older than 5 years and would, therefore, seek more appropriate data be used. We can confirm that Transport Scotland has a traffic count site located on the A78(T) 60m south of the Hunterston Roundabout and would suggest that traffic data from this site be utilised in the assessment. Access to the database can be made available on request.**	The automatic traffic count data for 2022 was not available (from the DfT site) for the A77 and A71 at the time the EIA Scoping Report was prepared. **Table 16.10** below has been updated using the 2022 DfT data and **Table 16.11** has been added which shows 2023 data from Transport Scotland database.
Growth Factors **The Scoping Report states that base traffic data will be factored using growth factors derived from the National Trip End Model (NTEM) growth rates, extracted from the DfT's TEMPro 7.2 software. Transport Scotland would request that low growth factors from the National Road Traffic Forecast (NRTF) be used to factor base traffic to the peak design year for traffic calculations**	**Table 16.13** has been updated to use the NRTF low growth to factor base traffic to the peak design year for traffic calculations.
Transport Scotland would request that the following be quantified within the assessment: - **Scale of the above movements during construction and operation;** - **Suitability of the point of access onto the A78(T), given regards to background traffic levels and the underlying speed environment;** - **Percentage increase in traffic taking account of the above link flow information;** - **Account of accident history for the latest 5-year period available; and** - **Any measures employed to minimise the number of movements during construction.**	Noted. The assessment has quantified trip generation during the Preparations for Quiescence phase (representative of the worst-case trip movements) and is detailed in **Section 16.9**. **Section 16.4** also provides a summary of the accident data, whereas **Section 16.6** provides a summary of embedded measures which will help to manage the number of movements during the Proposed Works.
Abnormal Loads Assessment **Abnormal Indivisible Loads (AIL) will be required during the decommissioning; therefore, routing studies and swept path analysis will require to be undertaken.** **A full Abnormal Loads Assessment report should be provided that identifies key pinch points on the trunk road. Swept path analysis should be undertaken and details provided with regard to any required changes to street furniture or structures along the route.**	It is anticipated the requirement for AIL will largely be avoided by the Proposed Works. It is anticipated that large items can be cut down to smaller sizes for transportation. Based on uncertainty of proposals, the need for AILs will be reviewed when the contractor has been appointed and AIL assessment and swept path analysis will be undertaken should AILs be required. This approach has been accepted by Transport Scotland through additional technical engagement.

Table 16.8 Technical engagement with Transport Scotland on 12 October 2023

Consideration	How addressed in the ES
Growth Factor **Transport Scotland approved WSP's proposed approach to use the 2031 NRTF to inform the 2033 future baseline**	The growth factor methodology is described in **Section 16.5** and is summarised in **Table 16.13**.
Construction Traffic Management Plan (CTMP) **Transport Scotland requested to set out commitment and strategy within a draft/framework CTMP, to go along with application. Inclusive of the route selection/deselection assessed in the Environmental Statement**	A draft CTMP has been produced and included in **Appendix 16A**.
Transport Scotland noted the possible risk of not including detail on AIL, however agreed that given the uncertainty in project design at this stage, is understanding of why it is not included in the assessment.	Noted.
Transport Scotland agreed that the routes suggested (Route 4 and Route 5) in the Environmental Statement are the most sensible.	Noted.
Suggestion from Transport Scotland to ensure that the road works register is checked when planning routes, due to on-going road improvement schemes in the region.	Noted. This has been included as embedded measures in **Section 16.6**.
Transport Scotland confirmed that the North Flank of the M8 repairs will not be completed until 2025 and suggested the consideration of the A74 extension instead.	Noted. This has been included as embedded measures in **Section 16.6**.
Agreement from Transport Scotland on the approach taken to assess driver delay including suggestion to look at the percentage increase.	The percentage increase has been summarised in **Table 16.24** and **Table 16.25.** The highest percentage of impact and driver delay assessment based on junction capacity is discussed in paragraph 16.9.33.

16.4.6 Further engagements with Transport Scotland on 31 October 2023 and North Ayrshire Council (NAC) on 10 November 2023 are summarised in **Table 16.9**.

Table 16.9 Technical engagement with Transport Scotland and NAC

Consideration	How addressed in the ES
Transport Scotland **Transport Scotland agreed that the automatic assessment of 'accident and safety' and 'driver delay' effects should be avoided as it may lead to unnecessary work being undertaken in a situation**	High level impacts assessment is described from paragraph 16.9.22 to 16.9.31. Driver delay assessment is described in paragraph 16.9.33.

Consideration	How addressed in the ES
where only a small number of trips are being added to the trunk road. Instead, a pragmatic approach to identify whether there are any accident issues on the preferred route and whether there are any areas of congestion to determine whether further detailed assessment is required would be more appropriate. **In respect of the 'accident and safety' effect, Transport Scotland would be content for a high-level impacts assessment of the proposed route and identify any sections where further analysis may be required, rather than undertaking an assessment of the entire route, to be undertaken.**	
North Ayrshire Council (NAC)	
An agreement from NAC that road safety assessment on the A71 section can be scoped out unless an assessment carried out shows that there is a significant amount of vehicles using the A71. **No proposals have been submitted to NAC for proposed improvements at the Pennyburn Roundabout nor the Bellfield Roundabout.**	Noted.

16.5 Overall baseline

Road access

Local road network

16.5.1 The existing highway network within the Study Area shown in **Section 16.3** and the following sub-sections describe the key local roads and strategic road network that form part of the Study Area.

Power Station Road

16.5.2 Power Station Road connects the Site directly to the A78 which is part of the Scottish Strategic Road Network (SRN). The road has a 40 mph speed limit and overtaking is prohibited for its entire length. There is footway on one side of the road. Power Station Road becomes Oilrig Road at the approach to the Hunterston Roundabout. The section of Power Station Road south of Oilrig Road has a footway along its western side.

Strategic road network

A78

16.5.3 The A78 Irvine Road is part of the Scotland Trunk Road maintained by Transport Scotland. This is a two-way single carriageway road that connects the Site to the north and south, and it operates at the national speed limit (60mph) for much of its length

except where it approaches and within a residential area which the speed limit reduces to 30mph and has street lighting.

16.5.4 To the south, the section of the A78 from the Montfode Roundabout and the Pennyburn Roundabout, known as the A78 Three Towns Bypass, serves Ardrossan, Saltcoats and Stevenson. The Three Town Bypass connects to Kilwinning Bypass at the A78/Stevenson Road roundabout (Pennyburn Roundabout).

16.5.5 The A78 section of the Kilwinning Bypass is a dual carriageway with the national speed limit of 70 mph. The Kilwinning Bypass joins Irvine Bypass at Eglinton Interchange. Both Bypasses are dual carriageway roads with the national speed limit.

16.5.6 To the north of the Site, the A78 is a single carriageway road, of varying width, and is subject to a 30 mph speed limit in Fairlie, Largs, Skelmorlie and Wemyss Bay, and a 40 mph speed limit in Routenburn. The A78 becomes a dual carriageway north of Inverkip and narrows to a single carriageway as it approaches Branchton.

16.5.7 The section of the A78 in Greenock is subject to a 30 mph speed limit, including the dual carriageway section of Dalrymple Street, Rue End Street, Main Street, East Hamilton Street. The A78 Port Glasgow Road and Greenock Road which continues as the A8 before it joins the M8 at the West Ferry Interchange is subject to a 40 mph speed limit.

A737

16.5.8 The A737 is a single carriageway and is also part of Transport Scotland's trunk road. The A737 largely operates at the national speed limit (60 mph) except for the sections within Kilwinning which has a 30 mph speed limit and the one around Beith with a 50 mph speed limit.

16.5.9 The A737 widens to a dual carriageway at the Johnstone and Howwood Bypass and operates at the national speed limit of 70 mph. It continues as a dual carriageway to the M8.

A71

16.5.10 The A71 is part of the proposed Route 4 which is the fastest route from the M8 via the M77. The A71 meets the A77, which becomes M77 in Fenwick, at the Bellfield Interchange. From this intersection, the A71 is a dual carriageway with a 50 mph speed limit. The A71 meets the A78 at the Warrix Interchange.

A77

16.5.11 The A77 is part of the proposed Route 5 via M6/A76 and the Route 6 from Stranraer along the west coast. The A77 is Transport Scotland's trunk road and is predominantly a single carriageway with national speed limit of 60 mph, except for the section along Prestwick Bypass which is a dual carriageway with a 70 mph speed limit.

16.5.12 The section of A77 in the west coast route (Route 6) also serves Loch Ryan Port. The A77 meets the A78 at the Dutch House Roundabout in Kilmarnock.

A75

16.5.13 The A75 provides a trunk road connection from the M6 at Gretna to Dumfries. This section of the A75 is a single carriageway with a 60 mph speed limit. The A75 meets the A76 at the Cuckoo Bridge Roundabout in Dumfries.

A76

16.5.14 The A76 is part of the route from Dumfries to Kilmarnock (Route 5) and is largely a single carriageway road with a national limit of 60 mph, except for the A76 Glasgow Road, north of the Cuckoo Bridge Roundabout in Dumfries and the section in New Cumnock which operate at a 30 mph speed limit.

Rail access

16.5.15 An existing railway line (Largs branch) runs to the east of the Site parallel with the A78, terminating at Largs. This line serves passenger stations at Fairlie to the north and West Kilbride to the south of the Site.

16.5.16 There is an existing railhead located at Hunterston Port which is used for the transfer of fuel flasks from HNB via Southannan Roundabout. This railhead is connected to the Largs branch line from which linkage to the Hunterston High Level and Hunterston Low Level sidings is possible. Road access to the Hunterston High Level siding from the A78 is restricted by the overbridge on Kilrusken Toll.

Water access

16.5.17 Hunterston Port provides deep water and bulk terminal facilities and is located approximately 2.5 km north-east of the Site.

Core paths

16.5.18 There are three Core Paths which are located within the Study Area as shown in Map 11 of the North Ayrshire Core Paths Plan document[9] which are NC60, NC61 and NC36:

- NC60 is a coastal path which routes north-south direction along the coast to Portencross and West Kilbride and to other core path connections.
- NC61 routes north from the Site along Power Station Road to other core path connections near Hunterston Sands.
- NC36 routes in a north-south direction and crosses Oilrig Road and joins NC61 near Power Station Road.

Car parking

16.5.19 The HNB power station is served by two car parks. Staff and visitor parking is provided by a large car park to the south-east of the Power Station Roundabout. There is a smaller additional overflow car park provided to the north-east of the Power Station Roundabout. There are further car parks to the south which are utilised by HNA.

Bus services

16.5.20 Bus services in the area around the Site are limited due to the Site's rural location. The 585 bus serves settlements along the A78 corridor from Ardrossan to Greenock. The bus stops located closest to the Site, which are served by the 585 service, are in the

[9] North Ayrshire Council (2009). *North Ayrshire Core Paths Plan – Map 11* (Online). Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/CorePathsPlanMap11.pdf (Accessed November 2023).

settlements of Fairlie (around 4.8 km to the north) and West Kilbride (around 5.6 km to the south). These distances are longer than an acceptable walking distance.

Cycling

16.5.21 No dedicated cycling infrastructure is provided to access the Site. National Cycle Route (NCR) 753 starts/ends at Seamill, West Kilbride (7.8 km to the south-east of the Site NCR 753 routes from West Kilbride to Ardrossan and other NCR connections. The A78 between Fairlie and West Kilbride has a shared cycleway/footway located on the western side of the carriageway over approximately 360 m.

Existing highways network traffic flows

16.5.22 The results of the ATC surveys undertaken in October and November 2021, as set out in paragraphs 16.3.12 and 16.3.14, have been summarised into Annual Average Daily Traffic (AADT) flows. AADT is a measure which quantify the daily traffic experienced at a count/receptor location. AADT represents average daily traffic across the full seven days of the week and therefore weekend days are also included within the calculation.

16.5.23 The ATC counts were undertaken in October 2021 outside of the Covid-19 pandemic lockdown period when travel restrictions were lifted. Therefore, use of the recent ATC data collected will provide the basis for a robust assessment.

16.5.24 It should be noted that the ATC counts were undertaken when the Site was fully operational and, therefore, includes associated traffic which will no longer be present on the network during the Preparations for Quiescence phase, which is the phase expected to generate the highest traffic volume.

16.5.25 **Table 16.10** sets out the AADT flows from the DfT counters and the ATC surveys recorded at each location as per **Figure 16.1**. The data derived from ATC surveys are annotated with (ATC). The 2019 and 2021 data have been factored up to baseline assessment year (year 2022) using National Road Traffic Forecast (NRTF) low growth. The flows include traffic travelling in both directions. The growth factor from 2021 to 2022 is 1.005 and 1.022 from 2019 to 2022.

Table 16.10 2022 Baseline traffic flows AADT (two-way)

Survey	Location	DfT Count Point	AADT (Total)	AADT (HGV)
1	Power Station Road (ATC)		1,156	76
2	A78 North of Fairlie	10755	8,845	590
3	A78 Seamill	50759	7,659	367
4	Kilrusken Road (ATC)		525	38
5	B781 Dalry Road (ATC)		1,132	94
6	B780 (ATC)		1,153	139
7	B714 (ATC)		4,422	469
8	A738 Stevenson Road	91123	9,947	317
9	A737 North of Kilwinning	78604	8,668	355

Survey	Location	DfT Count Point	AADT (Total)	AADT (HGV)
10	A737 Irvine Road (ATC)		10,090	891
11	A737 South of Beith	92012	11,376	284
12	A71 South of Dreghorn	11025	25,295	1,163
13	A77 Kilmarnock Bypass	20756	43,810	2,265
Additional Counters				
1	A78 Irvine Road	80358	7,461	272
2	A78 Irvine Rd South of B7047	20761	10,673	330
3	A78 East of B714	80495	9,793	508
4	A78 between A71 and A737	20762	30,570	953
5	A71 Hurlford Road	74357	25,295	1,163
6	A71 Hurlford Road East of B7038 Campbell Street	80235	18,663	1,209
7	A77 Kilmarnock Bypass South of M77	90194	41,694	2,630
8	A76 East of A77	40748	11,667	710

16.5.26 The assessment of the baseline flows shows the highest amounts of traffic recorded on the A77 and it reduces as it enters urban areas while the low traffic flows on Kilrusken Road follow the pattern for smaller rural roads of this nature in the area.

16.5.27 2023 traffic flow data is also available within the Study Area from Drakewell C2-Traffic. **Table 16.11** sets out the available 2023 AADT flows on the potential routes to the SRN within the Study Area.

Table 16.11 2023 Baseline traffic flows AADT (two-way)

Survey	Location	AADT (Total)	AADT (HGV)
A	A78 south of Hunterstown Roundabout	6,589	587
B	A78 Stevenston Bypass North	10,257	883
C	A78 Stevenston Bypass Mid	13,856	1,234
D	A78 South of Stevenson	33,992	1,462
E	A78 South of Eglinton Interchange-between A71 and A737 (S)	16,333	882
F	A76 Bowhouse Roundabout	11,677	1,635
G	A77 North of A76	46,060	11,792

Survey	Location	AADT (Total)	AADT (HGV)
H	A77 Assloss Farm	45,323	3,717
I	A78 Irvine to Newhouse	18,716	1,030
J	A78 Newhouse to Meadowhead Rbt	19,290	1,351
K	A78 Loans Bypass at Auchengate	15,422	895
L	A78 Loans	18,935	1,099
M	A737 South of Hillend Roundabout	9,607	1,288
N	A737 Blair Road Overbridge	9,484	1,214
O	A737 North of Birkentop Cottage	12,197	1,489
P	A737 Beith	16,099	2,045
Q	A737 Lochside	22,661	1,564
R	A78 Fairlie - Main Rd	9,082	809

Source: 2023 traffic flow data source: Drakewell C2-Traffic

Existing accident records

16.5.28 Records of Personal Injury Accidents (PIAs) have been obtained from the CrashMap database which uses information collected from the police. This data is approved by the National Statistics Authority and reported on by the DfT each year.

16.5.29 Records have been obtained over a five-year period (2017 to 2021, the latter being the latest available verified data).

16.5.30 The impact of casualties differs according to the severity of the injuries sustained. Three groups are differentiated as follows:

- fatal: any death that occurs within 30 days from causes arising out of an accident;
- serious: casualties who require hospital treatment and have lasting injuries, but who do not die within 30 days of an accident; and
- slight: where casualties have injuries that do not require hospital treatment, or, if they do, the effects of the injuries quickly subside.

16.5.31 In total, 218 accidents were recorded within the Study Area (143 slight, 72 serious, 3 fatal) over a 5-year period from 2017 to 2021. **Table 16.12** summarises the PIA recorded within the Study Area, for road sections in the Study Area excluding clusters of accidents that were recorded at significant junctions/interchanges on these routes.

Table 16.12 Summary of accident record 2017 - 2021

Road section	Description	No. of accidents per severity of casualty injury			Total	Average accident Rate per annum
		Slight	Serious	Fatal		
Power Station Road	Between Site and A78	0	0	0	0	0
A78	North to Fairlie (between Power Station Road and the A760)	2	4	0	6	1.2
A78	South to Seamill (between Power Station Road and the B7047)	4	5	0	9	1.8
A78	Between Seamill and Kilwinning (between B7047 and A738 Stevenston Road	13	7	0	20	4
A78	Between Stevenston Road and Irvine Road	9	1	0	10	2
A78	Between Irvine Road and A71	1	3	0	4	0.8
A78	Between A71 and Loans	2	1	0	3	0.6
A760	Between A78 and A373	29	14	0	43	8.6
Kilrusken Road	Between A78 and B718	0	0	0	0	0
B781	Between West Kilbride and B780	1	0	0	1	0.2
B780	Between A78 and B781	2	0	0	2	0.4
B714	Between A78 and Dalry	8	3	0	11	2.2
A738 Stevenson Road	Between A78 and A737 Kilwinning Town Centre	7	1	1	9	1.8
A737	North of Kilwinning (between B741 and A737 Irvine Road)	3	8	0	11	2.2
A737 Irvine Road	South of Kilwinning Town Centre (between A78 and A737 Dalry Road)	11	6	0	17	3.4
A737	South of Beith (between B714 and B777)	6	2	0	8	2.6

Road section	Description	No. of accidents per severity of casualty injury			Total	Average accident Rate per annum
		Slight	Serious	Fatal		
A737	North to Caslte Semple Loch (north from Beith B777)	22	8	0	30	6
A71	South of Dreghorn (between A78 and A77)	13	4	0	17	3.4
A77	Kilmarnock Bypass (between A76 and M77 J8))	8	5	2	15	3
A76	Between A77 and Crossroads A719	2	0	0	2	0.4
Total		143	72	3	218	-

Data source: Department for Transport data published by www.crashmap.co.uk

16.5.32 The results show accident hot spots in Beith, Kilwinning and Kilmarnock which affect any route via the A737 and M77.

Future baseline

16.5.33 The future baseline represents predicted background traffic flows and any changes in the travel patterns within the Study Area even without the Proposed Development. The two road improvement schemes are relevant for this ES:

- The Den realignment scheme, Transport for Scotland - located at The Den on the A737, completed in spring 2020; and
- M8, M73 and M74 improvements, Transport for Scotland. Current scheme status is completed.

16.5.34 In addition, there were changes to bus service routes and their frequency.

16.5.35 The traffic flows with the completed highway schemes and any changes to bus service routes and their frequency which will affect the baseline traffic flows will already be captured in the ATC counts in 2021 and 2022 data from DfT counters. The future baseline flows in 2033 were estimated using the NRTF low growth rate.

Local committed development

16.5.36 Local committed development since 2021 is summarised in **Chapter 21: Cumulative Effects Assessment**.

16.5.37 As the assessment is based on a percentage change, as the traffic flow in the cumulative scenario increases, the traffic impact assessment from the Proposed Works will be lower. **Table 16.13** below summarises the future baseline traffic flows without the committed development (i.e. omitting the cumulative scenario) and therefore calculates a higher percentage of traffic impact from the Proposed Works at the Site (a worst case).

16.5.38 **Table 16.13** below presents future baseline traffic flow for 2033 which is expected to be the worst-case scenario where the Proposed Works would generate the highest traffic.

16.5.39 The 2033 future baseline traffic flow was derived using the NRTF low growth scenario. The NRTF provides growth factors between baseline and future years between 1996 and 2031. The future baseline traffic flow year for assessment is 2033 and is not within the temporal scope of the NRTF, therefore the growth factor to 2031 has been used and no further growth is assumed after 2031. This is a robust method as it would be expected that traffic flows would increase between 2031 and 2033 which would result in the Proposed Works traffic having a lower percentage impact in 2033 than 2031. This methodology was discussed and approved by Transport Scotland during the technical engagement in October 2023.

16.5.40 The NRTF low growth factor from 2022 to 2031 is 1.047. The NRTF low growth factor for 2023 to 2031 is 1.041.

Table 16.13 2033 Future baseline traffic flow (two-way)

Survey	Location	DfT Count Point	AADT (Total)	AADT (HGV)
1	Power Station Road (ATC)		1,210	80
2	A78 North of Fairlie	10755	9,261	618
3	A78 Seamill	50759	8,019	384
4	Kilrusken Road (ATC)		550	40
5	B781 Dalry Road (ATC)		1,185	98
6	B780 (ATC)		1,207	146
7	B714 (ATC)		4,630	491
8	A738 Stevenson Road	91123	10,415	332
9	A737 North of Kilwinning	78604	9,075	372
10	A737 Irvine Road (ATC)		10,564	933
11	A737 South of Beith	92012	11,911	297
12	A71 South of Dreghorn	11025	26,484	1,218
13	A77 Kilmarnock Bypass	20756	45,869	2,371
Additional Counters				
1	A78 Irvine Road	80358	7,812	285
2	A78 Irvine Road South of B7047	20761	11,175	346
3	A78 East of B714	80495	10,253	532
4	A78 between A71 and A737	20762	32,007	998
5	A71 Hurlford Road	74357	26,484	1,218

Survey	Location	DfT Count Point	AADT (Total)	AADT (HGV)
6	A71 Hurlford Road East of B7038 Campbell Street	80235	19,540	1,266
7	A77 Kilmarnock Bypass South of M77	90194	43,654	2,754
8	A76 East of A77	40748	12,215	743
A	A78 south of Hunterstown Roundabout		6,859	611
B	A78 Stevenston Bypass North		10,678	919
C	A78 Stevenston Bypass Mid		14,424	1,285
D	A78 South of Stevenson		35,386	1,522
E	A78 South of Eglinton Interchange-between A71 and A737 (S)		17,003	918
F	A76 Bowhouse Roundabout		12,156	1,702
G	A77 North of A76		47,948	12,275
H	A77 Assloss Farm		47,181	3,869
I	A78 Irvine to Newhouse		19,483	1,072
J	A78 Newhouse to Meadowhead Roundaboutt		20,081	1,406
K	A78 Loans Bypass at Auchengate		16,054	932
L	A78 Loans		19,711	1,144
M	A737 South of Hillend Roundabout		10,001	1,341
N	A737 Blair Road Overbridge		9,873	1,264
O	A737 North of Birkentop Cottage		12,697	1,550
P	A737 Beith		16,759	2,129
Q	A737 Lochside		23,590	1,628
R	A78 Fairlie - Main Rd		9,454	842

Construction vehicle routes

16.5.41 **Figure 16.2** identifies the anticipated routes to and from the Site to transport the waste materials, plant, equipment and personnel required for the delivery of the Proposed Works.

16.5.42 There are several routes which are available to access the Works Area. From Glasgow and the M8, there are four key routes:

- Route 1 - From the M8 via the A737 and onto the A760 towards Largs, and then the A78 through Fairlie to the Hunterston roundabout access to the Site. This is not appropriate for HGV access;
- Route 2 - From the M8 via the A737 all the way to Kilwinning and onto the A78 at Eglinton Interchange Roundabout (Route 2A) or A738 for a short section (Route 2B) to join the A78 north to the Hunterston roundabout access to the Site;
- Route 3 - From the M8 via the A78 along the coast road though Greenock, Inverkip and Largs to the Hunterston roundabout access to the Site; and
- Route 4 (fastest route) - From the M8 via the M77, A71 and A78 at Irvine north to the Hunterston roundabout access to the Site.

16.5.43 From the south, there are two key routes:

- Route 5 - From the M6 at Gretna via the A75 to Dumfries and via the A76 to Kilmarnock and then on the A71 and the A78 to the Hunterston roundabout access to the Site; and
- Route 6 - From the South and Stranraer and Ayr via the A77 onto the A78 and north to the Hunterston roundabout access to the Site.

16.5.44 Beyond these routes, traffic generated by the Proposed Works disperses onto the wider road network where its effect would be diluted to a point where the numbers and proportional increase would be minimal.

Justification for route deselection

16.5.45 Baseline traffic information, accident records and committed development have been used to inform the route selection for construction traffic. The following paragraphs describe the reasons for deselecting some of the routes identified in the initial six potential routes.

16.5.46 Route 1 includes B780 which also runs as a single carriageway in the middle of Dalry. Within this section of the Route, vehicles are required to navigate at signalised and priority junctions within an urban environment. The section outside Dalry, towards Giffordland, Munnoch and West Kilbride is undulating and includes narrow roads with tight bends. Route 1 is therefore considered not suitable for HGV access.

16.5.47 In the response to the planning application for the new shunt reactor at the site to West of Cambelton Farm, Hunterston (planning reference: 23/OO148/PP), North Ayrshire Council conditioned the planning approval with a restriction of construction vehicles on the following roads:

- On C26 and local unclassified roads;
- On B780/B781; and
- On the A78 through Fairlie.

For this reason, Route 3 on the A78 via Greenock, Largs and Fairlie is also no longer considered suitable for the Proposed Works.

16.5.48 No materials will be transported via Stranraer Port as part of the Proposed Works thus Route 6 is not required.

16.5.49 Route 2 from the M8 via the A78 and A737 via Beith, Kilwinning due to existing accident hot spots in Beith, Kilwinning on Stevenson Road and Irvine Road which could be exacerbated by the increase in HGV traffic.

Selected suitable routes

16.5.50 Given routes 1, 2, 3 and 6 are not considered suitable, as outlined in the previous section, this leaves:

- Route 4 as a suitable route from Glasgow and the M8 (via the M77, A71 and A78 at Irvine north to the Hunterston roundabout access to the Site); and
- Route 5 as a suitable route from the south from the M6 at Gretna (via the A75 to Dumfries and via the A76 to Kilmarnock and then on the A71 and the A78 to the Hunterston roundabout access to the Site).

16.6 Embedded environmental measures

16.6.1 Environmental measures have been embedded into the Proposed Work as summarised in **Table 16.14** below.

Table 16.14 Summary of the embedded environmental measures

Embedded measures	Compliance mechanism	Embedded or good practice measure
An outline CTMP has been developed which recognises the requirement to manage construction traffic movements (see Appendix 15A).	EMP	Embedded measure

16.6.2 The following measures have been outlined within the Draft CTMP, noting that a detailed CTMP will be finalised by the Site Licensee prior to the commencement of the Proposed Works. Key elements of the outline CTMP include:

- Approved construction vehicle routes to the Site will be identified and protocols put in place to ensure that HGV drivers adhere to these routes. The Site Licensee however needs to ensure that the road works register is checked when planning routes and drivers are informed on the diversion route.
- During the closure of the North Flank of the M8, construction vehicles will be directed to use the A74 instead.
- All contractors will be provided with a Site Induction Pack containing information on delivery routes and restriction on routing.
- All contractors will be required to give details of proposed timing of material deliveries to the Site.
- A CTMP and compliance monitoring therein will be included within all trade contractor tender enquiries to ensure early understanding and acceptance/compliance with the rules that would be enforced on this project.
- Roads will be maintained, and road sweepers deployed as required.
- Vehicles within the Site and Works Area will continue to use existing roads, with only limited transit across unmade ground. Should trackout become more likely, the use of a wheel wash facility will be installed on-site in order to reduce trackout of mud and debris onto the local road network.

- Given the rural location of the Site in relation to the public transport network, the opportunity for contractors to travel to work by public transport and alternative sustainable modes is limited. Opportunities to promote public transport and car sharing will be investigated through further development of the CTMP.

16.7 Assessment methodology

16.7.1 The proposed generic project-wide approach to the assessment methodology is set out in **Chapter 5: The EIA Process**, and specifically in **Section 5.3** and **Section 5.4**. However, whilst this has informed the approach that has been used in this traffic and transport chapter, the following sections set out how this methodology has been applied, and adapted as appropriate, to address the specific needs of the traffic and transport assessment in this ES.

General approach

16.7.2 To assess the impact at its peak, the likely percentage increase in traffic is determined by comparing estimates of traffic generated by the Proposed Works with future predicted baseline traffic flows for the roads within the Study Area.

16.7.3 The following screening rules are suggested in Chapter 2 of the EATM guidance[7] and will be used to define the assessment:

- "*Rule 1: Include highway links where traffic flows will increase by more than 30% (or where the number of heavy goods vehicles will increase by more than 30%); and*
- *Rule 2: Include highway links of high sensitivity where traffic flows are predicted to increase by 10% or more*."

16.7.4 It should be noted that EATM recognises that it is generally accepted that the day-to-day variation of traffic on a road is frequently at least + or -10%. The projected changes in traffic of less than 10% should be assumed to create no discernible environmental impact. As the predicted traffic flow increases because of the Proposed Works are below 10%, the changes in traffic flows will not be assessed. Consideration on the duration of the impact within the assessment will also be required and the assessed traffic movement volumes should be a worst-case scenario.

Environmental effects

16.7.5 The EATM[7] sets out the following environmental effects that should be considered:

Severance of communities

16.7.6 Severance is the perceived division that can occur within a community when it becomes separated by transport infrastructure. The EATM[7] states that when assessing severance, the assessor should:

- Consider the highway characteristics and features;
- Consider the traffic flow and composition;
- Define the facilities to which access is potentially impaired;
- Define the facility catchment areas from which users may be drawn; and
- Estimate the populations within those areas - both in total, and vulnerable groups (by which severance may be more impactful).

16.7.7 There is no predictive formula which gives simple relationships between traffic factors and levels of severance. EATM[7] states that while not prescriptive, the thresholds for changes in traffic flow of 30%, 60% and 90% can be regarded as a starting point to estimate corresponding 'slight', 'moderate' and 'substantial' changes in severance and the assessment should give regard to specific local conditions. In general, marginal (slight) changes in traffic flow are, by themselves, unlikely to create or remove severance.

Road vehicle driver and passenger delay

16.7.8 EATM[7] states that delays to traffic (unrelated to a development or proposed works) are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system. The capacity of a road or a particular junction can be determined by estimating vehicle time and delay through the junction as well as junction operational capacity to determine the sensitivity to development traffic.

16.7.9 Delay might be found more commonly at site entrances, on the highways passing the development sites where parked cars are present, at key intersections along a route, and at side roads where the ability to find gaps in traffic may be reduced, thereby lengthening delays.

Non-motorised user delay

16.7.10 Given the range of local factors and conditions which can influence non-motorised users, EATM does not recommend that thresholds be used as a means to establish the significance of non-motorised user delay but recommend that professional judgements be made instead.

16.7.11 Generally, increases in traffic may lead to greater delay, although this is dependent on the level of non-motorised users' activity in the area, their visibility at crossings, and wider physical conditions. In densely populated areas it may be necessary to quantify the number of non-motorised users impacted via surveys.

Non-motorised amenity

16.7.12 The EATM[7] states that non-motorised user amenity is broadly defined as the relative pleasantness of a journey, and is considered to be affected by traffic flow, composition, and separation from traffic, which includes consideration to exposure to noise and air pollution.

16.7.13 EATM[7] notes that changes in pedestrian, cyclist and equestrian amenity may be considered significant where the traffic flow is halved or doubled, with the former leading to a positive effect and the latter a negative effect.

Fear and intimidation on and by road users

16.7.14 The EATM[7] notes that the extent of fear and intimidation is dependent on:

- The total volume of traffic;
- The heavy vehicle composition;
- The speed these vehicles are passing; and
- The proximity of traffic to people – and/or the feeling of the inherent lack of protection created by factors such as a narrow pavement median, a narrow path or a constraint (such as a wall or fence) preventing people stepping further away from moving vehicles.

16.7.15 The EATM identifies that the assessment should be defined by the degree of hazards to pedestrians by average traffic flow over an 18-hour heavy vehicle flow and average speed over an 18-hour day in miles per hour.

16.7.16 A weighting system is applied to the guidelines to assign scores for each highway link of consideration.

16.7.17 **Table 16.15** provides an example of a scoring system that can be adapted to reflect local conditions.

Table 16.15 Fear and intimidation degree of hazard

Average traffic flow 18-hour day - all vehicles/hour 2-way (a)	Total 18-hour heavy vehicle flow (b)	Average vehicle speed (c)	Degree of Hazard score
+1,800	+3,000	->40	30
1,200-1,800	2,000-3,000	30-40	20
600-1,200	1,000-2,000	20-30	10
<600	<1,000	<20	0

16.7.18 The total score from all three elements is combined to provide a 'level' of fear and intimidation for all three elements. **Table 16.16** provides an example.

Table 16.16 Level of fear and intimidation

Level of Fear and Intimidation	Total hazard score (a)+(b)+(c)
Extreme	71+
Great	41-70
Moderate	21-40
Small	0-20

16.7.19 The magnitude of impact is approximated with reference to the changes in the level of fear and intimidation from baseline conditions, see **Table 16.17**.

Table 16.17 Fear and intimidation magnitude of impact

Magnitude of Impact	Change in step/traffic flows (AADT) from Baseline conditions
High	Two step changes in level
Medium	One step change in level, but with: <400 vehicle (veh) increase in average 18hr AADT two-way all vehicle flow; and/or <500 Heavy Vehicles (HV) increase in total 18hr HV flow.
Low	One step change in level, with: <400 veh increase in average 18hr AADT two-way all vehicle flow; and/or <500 HV increase in total 18hr HV flow.
Negligible	No change in step changes

16.7.20 EATM[7] notes that special consideration should be given to areas where there are likely to be particular problems, such as high-speed sections of road, locations of turning points and accesses, and the inherent lack of protection preventing people stepping further away from moving vehicles. In addition, locations where people may be unfamiliar with the locale and the movement of hazardous/large loads which will heighten people's perception of fear and intimidation.

16.7.21 Consideration should also be given to areas frequented by school children, the elderly and other vulnerable groups.

Road user and pedestrian safety

16.7.22 This is informed by a review of existing collision patterns and trends based upon the existing personal injury collision records and the forecast increase in traffic.

16.7.23 The EATM guidance[7] suggests that in addition to the calculation of collision rates and collision analysis of STATS19 data to identify any emerging patterns or factors that could be exacerbated by the increased traffic or movement, the 'Safe System' approach should be considered where proportionally appropriate. The approach is broadly as follows:

- Identify the Study Area using historic crash data.
- Undertake evidence-led, objective modelling techniques to establish a baseline road safety level for the roads within the Study Area on which the impact thresholds are exceeded in relation to either non-motorised users or motorised user traffic. This analysis can be carried out using tools such as the iRAP Star Ratings protocols or similar tools produced by individual highways authorities.
- Assess the effects of additional development traffic for all users (including vulnerable groups[10]), across the whole width of the highway corridor. This model should also assess the effect of any changes to the baseline road network, such as the provision of access junctions.

[10] IRAP (2021). *A world free of high-risk roads* (Online) Available at: https://irap.org/ (Accessed November 2023).

Road safety audit

16.7.24 The EATM[7] states that Road Safety Audits in accordance with GG119 – Road Safety Audit DMRB[11] should be undertaken for any proposed engineering changes in the adopted highway prior to submission.

Hazardous loads/large loads

16.7.25 The traffic and movement assessment needs to estimate number and composition of specialist loads which are subject to The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (as amended).

16.7.26 It also recommends including transport related hazard and accident assessment in a wider environmental assessment that contains a project-wide accident and disaster assessment.

Other effects

16.7.27 The IEMA Guidance also refers to air quality, noise and vibration, landscape and visual, biodiversity, cultural heritage and climate resilience, adaptation and GHGs, which are assessed in their respective ES chapters**.**

Receptor sensitivity

16.7.28 As set out in EATM, the impact of traffic is dependent upon a wide range of factors which include the volume of traffic, traffic speeds and operational characteristics and traffic composition (such percentage of HGVs) and future cumulative development traffic. The perception of changes in traffic varies according to factors such as:

- Existing traffic levels;
- The location of traffic movements;
- The time of day;
- Temporal and seasonal variation of traffic;
- Design and layout of the road and pavement;
- Crossing points;
- Landscape/townscape character, designated status, land use activities adjacent to the route; and
- Ambient conditions of adjacent land-uses.

16.7.29 Each highway link included in the assessment has been assigned a sensitivity in accordance with EATM based on professional judgement.

16.7.30 This is based on the proximity of sensitive receptors to the highway link and the highway environment. **Table 16.18** summarises the rationale used to determine the sensitivity against the corresponding receptors as part of the assessment as contained in EATM. Professional judgement is also used to determine the sensitivity of the receptor.

[11] Highways England (2020*). Design Manual for Roads and Bridges, GG 119 – Road Safety Audit*. (Online) Available at: https://www.standardsforhighways.co.uk/tses/attachments/710d4c33-0032-4dfb-8303-17aff1ce804b?inline=true (Accessed November 2023).

Table 16.18 Receptor sensitivity

Sensitivity	Description / Reason	Receptor
High	Schools, colleges, playgrounds, accident cluster areas, retirement homes, urban/residential roads without footways that are used by pedestrians and cyclists.	Occupants of land-uses alongside the highway link and users of the highway link
Medium	Congested junctions/highway links, places of worship, doctors' surgeries, hospitals, retail with highway frontage, roads with narrow footways, unsegregated cycleways, tourist attractions, community centres, parks and recreation facilities.	Occupants of land-uses alongside the highway link and users of the highway link
Low	Places of worship, public open space, nature conservation areas, listed buildings, tourist attractions and residential areas with adequate footway provision.	Occupants of land-uses alongside the highway link and users of the highway link
Negligible	Receptors with negligible sensitivity to traffic flows and receptors sufficiently distant from affected roads and junctions and no/very limited numbers of pedestrians/cyclists.	Users of the highway link

16.7.31 Sensitivity judged as 'High' or 'Medium' results in Rule 2 (sensitive areas where traffic flows are predicted to increase by 10% or more) being considered for that link. Sensitivity judged as 'Low' or 'Negligible' results in Rule 1 being considered for that link where traffic flows are predicted to increase by more than 30% or where the number of HGVs is predicted to increase by more than 30%.

Magnitude of change

16.7.32 EATM[7] recognises that professional judgement should be used as part of the assessment and states the following:

"*There are no simple rules or formulae that define appropriate assessment thresholds and therefore there is a need for interpretation and judgement on the part of the competent traffic and movement expert, backed up by data or quantified information wherever possible. Such judgements will include the assessment of the numbers of people experiencing an impact and the sensitivity of those people, as well as the assessment of the damage to various natural or cultural resources.*" (Paragraph 3.12).

16.7.33 Based on the Rule 1 and Rule 2 and the sensitivity of the receptors, **Table 16.19** shows the magnitude of change applied to the environmental effects to help identify levels of significance. The indicators to assess the magnitude of change are based on advice included within EATM[7] and professional judgement.

Table 16.19 Magnitude of change

	Magnitude of change			
Transport effect	**High**	**Medium**	**Low**	**Negligible**
Severance	Change in total traffic or HGV flows over 91%.	Change in total traffic or HGV flow of 61-90%.	Change in total traffic or HGV flows of 31-60%.	Change in total traffic or HGV flows of less than 30%.
	Context should also be considered including population and facilities impacts. EATM states caution should be applied with applying these thresholds to highway links with low baseline flows.			
Driver delay	High increase in queuing at junctions and/or congestion on road links.	Medium increase in queuing at junctions and/or congestion on road links.	Low increase in queueing at junctions and/or congestion on road links.	Low or no increase in queuing at junctions and/or congestion on road links.
Non-Motorised users	A halving or doubling of traffic flow (of HGV flow) can be used as a broad threshold when considered in the local context and applied with caution. Assignment based on a variety of factors including general level of pedestrian activity, visibility, and physical conditions such as traffic flow, traffic composition, crossing points and pavement width/separation from traffic.			
Non-motorised user delay	Assessed based on pedestrian delay experienced when crossing highways links considering a range of factors including crossing type, pedestrian flows, traffic levels, visibility and general highway condition.			
Fear and Intimidation	Assigned based on the levels scoring systems provided in EATM (which is dependent on 18hr average traffic flow; 18hr average HGV traffic flow and vehicle speed) extreme 71+; great (41-70); moderate (21-40) and small (0-20).			
	Two step change in level score of fear and intimidation	change in level score of fear and intimidation and >400 average 18hr vehicle increase or >500 HGV 18hr vehicle increase.	One step change in level score of fear and intimidation and <400 average 18hr vehicle increase or <500 HGV 18hr vehicle increase.	No change to step in level score of fear and intimidation
Road safety	Assignment informed by a review of existing collision patterns and trends based upon the existing personal injury accident records and the forecast increase in traffic.			
Hazardous/Large Loads	Assigned based on the nature of the load and number of trips and the result of hazard and accident assessment.			

Significance criteria

16.7.34 The classification of a likely Traffic and Transport effect is derived by considering the sensitivity of the receptor (derived from **Table 16.18**) against the magnitude of change (derived from **Table 16.19**) as defined in **Table 16.20** below. The shading indicates those significance ratings that are deemed to be 'significant' effects.

Table 16.20 Significance evaluation matrix

Nature of Impact (Magnitude / Probability / Reversibility etc)	Receptor sensitivity			
	High	**Medium**	**Low**	**Negligible**
High	Major (Significant)	Major (Significant)	Moderate (Significant)	Negligible (Not Significant)
Medium	Major (Significant)	Moderate (Significant)	Minor (Not Significant)	Negligible (Not Significant)
Low	Moderate (Significant)	Minor (Not Significant)	Minor (Not Significant)	Negligible (Not Significant)
Negligible	Negligible (Not Significant)	Negligible (Not Significant)	Negligible (Not Significant)	Negligible (Not Significant)

16.7.35 Major and Moderate effects are considered to be Significant, whilst Minor and Negligible effects are considered to be Not Significant.

Specific definition used in the assessment

16.7.36 The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999[12] (EIADR) (as amended) recognise that developments will affect different environmental elements to differing degrees, and that not all of these are of sufficient concern to warrant detailed investigation or assessment through the EIA process. The EIADR identifies environmental resources that warrant investigation as those that are likely to be significantly affected by the Proposed Works.

16.7.37 The EIADR do not define significance and it will be necessary to state how this will be defined for the EIA. The significance of an effect resulting from a development is most assessed by reference to the sensitivity (or value) of a receptor and the magnitude of the effect. This approach provides a mechanism for identifying areas where mitigation measures may be required and to identify the most appropriate measures to alleviate the risk presented by a development.

16.7.38 EATM identifies receptors that may be affected by additional traffic because of the Proposed Works which can be grouped into:

- Users of the roads which are also proposed to be utilised by development traffic; and
- Land uses and environmental resources fronting those roads, including the relevant occupiers and users.

16.7.39 Sensitivity is assigned to the road links based on road characteristics and nature of the receptors.

[12] UK Government (1999). *Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (as amended)* (Online) Available at: https://www.legislation.gov.uk/uksi/1999/2892/contents/made (Accessed November 2023).

16.8 Scope of the assessment

16.8.1 All transportation of materials, plant and equipment required for the Proposed Works will be via the road network. The highway routing for materials to and from the Site will be in north and southerly direction respectively. Neither transportation of materials via rail nor by water are considered viable. Therefore, rail and marine transport modes will not be considered further in this ES.

16.8.2 Technical engagement with Transport Scotland on 12 October 2023 confirmed an agreement on the selected preferred construction routes (Route 4 via the A77 and Route 5 via the A76) as shown in **Figure 16.2**.

Trip generation

16.8.3 The trips during the Preparations for Quiescence phase are generated from:

- The removal of conventional waste from the site created by deplanting and demolition activities
- The removal of radioactive wastes generated from deplanting activities within the Radiation Controlled Areas on site
- The filling of voids created during deplanting and demolition activities with off-site material should it not be practicable to manage open voids throughout the Quiescence phase
- The importation of plant, equipment and materials to site to undertake decommissioning activities and modify the reactor building into the Safestore structure.

16.8.4 This trip generation data for the Preparations for Quiescence phase assumes that the Safestore will house multiple elements of plant including the two reactors, AETP, boilers and HADVs throughout the Quiescence phase.

16.8.5 **Table 16.21** below summarises the trip generation during the decommissioning phases.

Table 16.21 Trip generation

Decommissioning phase	Activity	Timescale	Max HGVs (vehs/day – two ways)	Max Car/LGV traffic (vehs/ day – two ways)
Preparations for Quiescence phase	Deplanting and deconstruction, Active area deplanting, Waste processing and packaging	Y1- Y6	<11	100
	Deplanting and deconstruction (specifically, filling of turbine hall void), waste processing and processing	Y7-Y8	<24	100
	Safestore construction, deplanting and deconstruction	Y9 – Y10	<20	100
	Safestore construction, deplanting and deconstruction	Y11 – Y12	<10	100
Quiescence phase		Y13 - Y81	-	
Final Site Clearance phase	Waste management centre construction/operation and decommissioning	Y82 – Y85	<23	<99
	Retrieval of interim level waste from debris vaults	Y86 - Y93	<23	<99
	Reactor dismantling	Y86 – Y93	<23	<99
	Site remediation for future re-use	Y94 – Y96	<23	100

16.8.6 Route 2 - This leaves Route 4 and Route 5 as suitable routes from Glasgow and the M8. The scope of the assessment of traffic and transport is consistent with the period over which the Proposed Works will be undertaken (see **Chapter 2: The Decommissioning Process)**.

16.8.7 The assessment focuses on the traffic generation during the Preparations for Quiescence phase, Quiescence phase and Final Site Clearance and a worst-case will be identified. This is in accordance with the assessment approach suggested in EATM[7].

"*environmental change will generally be when the project traffic is at the largest proportion of the total flow. It is therefore recommended that the environmental assessment should be undertaken at the construction/decommissioning phase, year of opening of the project or the first full year of its opening.*"

16.8.8 It is expected that a worst-case with respect to traffic flows will be during the Preparations for Quiescence phase during times when there is potential for an overlap in deconstruction and waste management activities, and the infilling of voids using off-site material.

16.9 Assessment of traffic and transport effects

16.9.1 This section provides an assessment of the likely significant environmental effects arising from the predicted traffic generated by the Proposed Work.

Sensitivity of highway links

16.9.2 **Table 16.22** identifies the sensitivity of the relevant highway links (in vicinity of the count point and general nature of highway link as a whole) and the EATM Rule that applies. The routes via the A78 north of Fairlie and the B781 Dalry Road have been discounted and therefore have been removed from **Table 16.22**.

Table 16.22 Sensitivity of highway links (baseline situation)

Receptor	Reason for Consideration	Rule 1/2	Receptor Sensitivity
Power Station Road (Oilrig Road)	Route being the main site access road for the development traffic. 40 mph single carriageway road. No residential properties or facilities and limited access road directly joins Power Station Rd. Core Path NC61 routes north from the Site along Power Station Road and NC36 routes in a north-south direction and crosses Oilrig Road and joins NC61 near Power Station Road.	Rule 1	Negligible
A78 South to Seamill (between Power Station Road and the B7047)	30 mph single carriageway. The A78 runs through Seamill, West Kilbride including residential areas, shops and schools adjacent to the carriageway. Potential road safety concerns with an accident rate of 1.8 accidents per annum.	Rule 2	Medium
A78 between Seamill and Kilwinning	60 mph single carriageway. Rural in nature with limited residential properties. Potential road safety concerns with an accident rate of 4 accidents per annum.	Rule 1	Negligible
A78 between Stevenston Road and Irvine Road	70 mph dual carriageway. Rural in nature with no direct access to residential properties. Potential road safety concerns with an accident rate of 2 accidents per annum.	Rule 1	Negligible

Receptor	Reason for Consideration	Rule 1/2	Receptor Sensitivity
A71 South of Dreghorn	50 mph dual carriageway. Potential road safety concerns with an accident rate of 3.4 accidents per annum.	Rule 1	Negligible
A77 Kilmarnock Bypass	70 mph dual carriageway. Potential road safety concerns with an accident rate of 3 accidents per annum.	Rule 1	Negligible

Likely significant effects

16.9.3 **Table 16.23** summarises transport receptors and relevant environmental effects that have the potential to be significant resulted from the increased traffic generated by the Proposed Work.

Table 16.23 Likely significant traffic and transport effects

Activity	Effects	Receptor
Traffic generated by the Proposed Works	Environmental effects identified in EATM will be considered: • Severance; • Driver delay; • Non-motorised amenity; • Non-motorised user delay; • Fear and intimidation on and by road users; • Road users and safety; and • Hazardous/large loads	Transport receptors to be defined based on: • Users of the roads; and • Land uses and environmental resources fronting those roads, including the relevant occupiers and users

Trip generation

16.9.4 The Preparations for Quiescence phase is assumed to be the worst-case phase. During this phase, the year 2033 has been identified as the worst-case year when the Proposed Works is estimated to generate 100 cars or Light Goods Vehicles (LGVs) for operational site-based staff and 24 HGVs (including hazardous rubbles in two-way direction) daily.

16.9.5 A cumulative effects assessment (CEA) typically accounts for other developments located within the Study Area to be analysed and any potential cumulative effects assessed. **Chapter 21: Cumulative Effects Assessment** summarises medium/ large size committed developments within the Study Area. Higher baseline traffic flows however reduce the traffic impact from the Proposed Works, and therefore, the impact assessment has used the future baseline flows without committed development for 2033 assessment year. This represents the worst-case scenario in respect of traffic impact from the Proposed Works.

16.9.6 **Table 16.24** provides the worst-case percentage change in traffic flows in 2033, with traffic associated with the Proposed Works on the local road network for the selected two routes (Route 4 via M77, A71, A78 and Route 5 via M6, A75, A76, A71, A78). This is because 2033 Baseline Future year flows are lower without the addition of committed development traffic.

Table 16.24 Forecast baseline traffic 2033 with predicted Proposed Works traffic (two-way)

Receptor	2033 Future Baseline		Proposed Works Traffic	2033 + Proposed Works Traffic		% change		Further Assessment Required
	Total Vehicles	HGVs	Total / HGVs	Total Vehicles	HGVs	Total Vehicles	HGV	
Power Station Road	1,210	80	124/24	1,334	104	10%	30%	Above 30% - further assessment required
A78 Seamill	8,019	384	124/24	8,143	408	1.5%	6.2%	Below 10% - no assessment required
A78 Irvine Road	7,812	285	124/24	7,936	309	1.6%	8.4%	Below 10% - no assessment required
A78 Irvine Road South of B7047	11,175	346	124/24	11,299	370	1.1%	6.9%	Below 10% - no assessment required
A78 East of B714	10,253	532	124/24	10,377	556	1.2%	4.5%	Below 10% - no assessment required
A78 between A71 and A737	32,007	998	124/24	32,131	1,022	0.4%	2.4%	Below 10% - no assessment required

Receptor	2033 Future Baseline		Proposed Works Traffic	2033 + Proposed Works Traffic		% change		Further Assessment Required
	Total Vehicles	HGVs	Total / HGVs	Total Vehicles	HGVs	Total Vehicles	HGV	
A71 South of Dreghorn	26,484	1,218	124/24	26,608	1,242	0.5%	2.0%	Below 10% - no assessment required
A71 Hurlford Road	26,357	1,212	114/14	26,471	1226	0.43%	1%	Below 10% - no assessment required
A71 Hurlford Road East of B7038 Campbell St	19,447	1,260	114/14	26,471	1274	0.58%	1%	Below 10% - no assessment required
A77 Kilmarnock Bypass	45,650	2,360	114/14	19,561	2374	0.3%	1.0%	Below 10% - no assessment required
A77 Kilmarnock Bypass South of M77	43,654	2,754	124/24	43,778	2,778	0.3%	0.9%	Below 10% - no assessment required
A76 East of A77	12,215	743	124/24	12,339	767	1.0%	3.2%	Below 10% - no assessment required

16.9.7 As shown in **Table 16.24**, traffic flow changes on the local roads due to the Proposed Works traffic are below 10% which is within the allowance for daily variation of traffic flows for all roads excluding Power Station Road.

16.9.8 Power Station Road has a percentage increase in total traffic, with the Proposed Works traffic, of 10% in terms of total traffic flow and 30% for HGV traffic flow. EATM states that caution should be applied during the assessment of likely transport impacts, such as severance, based on proportional increase in traffic when baseline flows are low. Power Station Road in the baseline 2033 scenario has only 80 HGVs which is a relatively low number of HGVs therefore it is appropriate to investigate the context of the road beyond the Rule 1 threshold to determine if further assessment is required. The ATCs on Power Station Road were undertaken when the Site was fully operational, therefore, some of the HGV traffic present in the 2033 baseline would likely not be present due to associated delivery reductions, for example, therefore some of the Proposed Works HGV traffic would be some replacement traffic and not additional traffic thus reducing any potential impacts. Furthermore, the total traffic increase, with the Proposed Works, is well below the threshold of 30% percentage change. Therefore, it is considered that Power Station Road does not require detailed assessment relating to traffic and transport.

16.9.9 **Table 16.25** provides the worst-case percentage change in traffic flows in 2033, with traffic associated with the Proposed Works on the local road network for the selected two routes for the 2033 future year traffic flows derived from (without the addition of committed development traffic) the 2023 traffic flow data Drakewell C2-Traffic.

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Table 16.25 Forecast baseline traffic 2033 with predicted Proposed Works traffic (two-way) based on 2023 data

ID	Location	2023 Baseline		2033 Future Baseline			Proposed Works Traffic	2033 + Proposed Works Traffic		% change
		Total Vehicles	HGVs	Total Vehicles	HGVs	Total / HGVs	Total Vehicles	HGVs	Total Vehicles	HGV
A	A78 south of Hunterstown Roundabout	6,589	587	6,859	611	124/24	6,983	635	1.8%	3.9%
B	A78 Stevenston Bypass North	10,257	883	10,678	919	124/24	10,802	943	1.2%	2.6%
C	A78 Stevenston Bypass Mid	13,856	1,234	14,424	1,285	124/24	14,548	1,309	0.9%	1.9%
D	A78 South of Stevenson	33,992	1,462	35,386	1,522	124/24	35,510	1,546	0.4%	1.6%
E	A78 South of Eglinton Interchange- between A71 and A737 (S)	16,333	882	17,003	918	124/24	17,127	942	0.7%	2.6%
F	A76 Bowhouse Roundabout	11,677	1,635	12,156	1,702	124/24	12,280	1,726	1.0%	1.4%

ID	Location	2023 Baseline		2033 Future Baseline			Proposed Works Traffic	2033 + Proposed Works Traffic		% change
		Total Vehicles	HGVs	Total Vehicles	HGVs	Total / HGVs	Total Vehicles	HGVs	Total Vehicles	HGV
G	A77 North of A76	46,060	11,792	47,948	12,275	124/24	48,072	12,299	0.3%	0.2%
H	A77 Assloss Farm	45,323	3,717	47,181	3,869	124/24	47,305	3,893	0.3%	0.6%

Source: 2023 traffic flow data source: Drakewell C2-Traffic

16.9.10 **Table 16.25** shows that using the 2023 baseline data to forecast the future year at the eight locations (A to H) does not result in any Proposed Works traffic impacts of greater than 10%.

16.9.11 Therefore, the magnitude of change would be negligible and the resulting effects would also be negligible. Further assessment of severance, non-motorised amenity, non-motorised user delay, fear and intimidation on and by road users for the receptors effects is therefore scoped out.

Detailed assessment of effects

16.9.12 This section summarises potential effects **of** the assessment of road safety, driver delay and hazardous loads. The justification for this is as follows:

- EATM[7] provides two rules that are used to establish whether an environmental assessment of traffic effects should be carried out on receptors:
  - Rule 1: Include highway links where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%); and
  - Rule 2: Include highway links of high sensitivity where traffic flows have increased by 10% or more. These include locations with vulnerable road users, such as school, nursing homes, and locations with high pedestrian activity.

16.9.13 It should be noted that, according to EATM[7], predicted traffic flow increases below 10% are generally not considered to be significant as daily variations in background traffic flow may fluctuate by this amount. Changes in traffic flows below this level are, therefore, assumed not to result discernible environmental impact.

16.9.14 EATM however advises that the Rule 1 and Rule 2 ‘criteria’ process should not be applied to assessments of air quality, noise, road safety and driver delay. For these impacts, a separate study area and assessment criteria should be agreed with the relevant stakeholders.

16.9.15 In the Pre-Application Opinion, the Office for Nuclear Regulation (ONR) requested the impact of hazardous loads to be assessed.

Road safety

16.9.16 The calculation of collision rates is still considered as acceptable methodology to scope the road safety assessment in the EATM 2023 guidelines. EATM however requires a ‘collision cluster’ assessment to identity potential impacts at a more detailed level.

16.9.17 In addition, the EATM also recommends a Safe System approach to be adopted to the assessment of road safety impacts of a project. The EATM however recognises that the assessment needs to be proportionate and recommends engagement with the relevant authorities for determining the significance of road safety effects.

16.9.18 Considering the preferred construction routes include sections of the A78 and A71 which have collision rate above one accident per year, **Figure 16.1** shows the proposed road safety assessment Study Area.

16.9.19 Consultation was undertaken with Transport Scotland and in their written response received on 31 October 2023 Transport Scotland advised a requirement for a high-level impact assessment of the preferred route. On the preferred route the trunk network consists of the A78 between Power Station Road and the A77 and the A77 between the

A71 and M77. PIA data have been obtained from Transport Scotland[13] for the latest five-year period 06/09/18 to 06/09/23.

16.9.20 In the road safety assessment Study Area two roads are not on the trunk network: Power Station Road and the A77. As outlined in **Table 16.11** Crashmap does not indicate any recorded accidents on Power Station Road between the Site and the A78 between 2017 and 2021. Therefore, this road has been scoped out of the road safety assessment.

16.9.21 This section of the A71 between the A78 and A77 is dual carriageway with interspersed junctions. It considered this section of the A71 is not a sensitive area except for the Pennyburn roundabout and the Bellfield roundabout. The impact of the HGV traffic at these junctions however are minimal and therefore the A71 section and these two roundabouts have been scoped out from the road safety assessment. A confirmation from North Ayrshire Council received on 10th November confirming that the road safety assessment for the A71 section including the two roundabouts can be scoped out, and there are no proposals for improvement schemes at the Pennyburn roundabout nor the Bellfied roundabout.

16.9.22 The DfT (2023) reported road casualties for Great Britain 2022 presented in RAS0302[14] for 2013 to 2022 and includes the national accident numbers per billion vehicle kms by road classification. **Table 16.26** summarises the national accident rate per million vehicle kms by road classification for 2018 to 2022.

Table 16.26 Accident rate per million vehicle kilometres by road type

Road Type	2018	2019	2020	2021	2022	Average
Urban A-Road	0.43	0.42	0.42	0.42	0.30	0.43
Rural A-Road	0.12	0.11	0.11	0.11	0.11	0.12

Source: Department for Transport statistics (2023) RAS0302

A78 between Power Station Road and A71

16.9.23 Transport Scotland data[13] indicate 58 recorded accidents on this section of the A78 in the study time period, one of which was fatal in severity, resulting in an average annual accident rate of 11.6.

16.9.24 Given the length of the road section (approximately 24.9 km) it is prudent to compare the accident rate of the road section with average national accident rate for the road type. Based on the count points along this road section (as identified in **Figure 16.1**) the Average Annual PIA rate per million vehicle km ranges between 0.08 and 0.19 with an average of 0.12 (see **Appendix 16B** for data summary). This average is only 0.01 above the national average for an A-class road).

16.9.25 The fatal incident involved a car moving ahead in dry and daylit conditions.

16.9.26 Of the incidents recorded approximately 41% occurred in inclement weather (3% flooded, 7% frost and 31% wet/damp) and 21% in darkness in areas with no or unknown streetlighting, in total approximately 12% occurred in inclement weather conditions in

[13] Transport Scotland Accident Manager Database extracted on 24/10/23
[14] Department for Transport statistics (2023) *Road type RAS0302.* (Online) Available at: https://www.gov.uk/government/statistical-data-sets/reported-road-accidents-vehicles-and-casualties-tables-for-great-britain#road-type-ras03 (Accessed November 2023).

darkness with no/unknown streetlighting. 10% of incidents involved HGVs and 7% (4 incidents) cyclists. 16% of incidents involved vehicles moving off and/or slowing down, 10% vehicles turning left or right and a further 2% involved both turning and slowing vehicles. 5% of incidents occurred with at least one vehicle performing an overtaking manoeuvre.

16.9.27 The impact of the project construction traffic (24 HGV movements per day at peak traffic generation) would not be anticipated to significantly increase road safety issues.

A77 between A71 and M77

16.9.28 Transport Scotland data[13] indicate 18 recorded incidents on this section of the A78 in the study time period, two of which was fatal in severity, resulting in an average annual accident rate of 3.6.

16.9.29 Given the length of the road section (approximately 7 km) it is prudent to compare the accident rate of the road section with average national accident rate for the road type. Based on the count points along this road section (as identified in **Figure 16.1**) the Average Annual PIA rate per million vehicle km ranges between 0.03 and 0.07 with an average of 0.04 well below the national average.

16.9.30 One of the fatal incidents involved an HGV collided with a parked HGV and the second involved an HGV moving ahead in darkness with no street lighting.

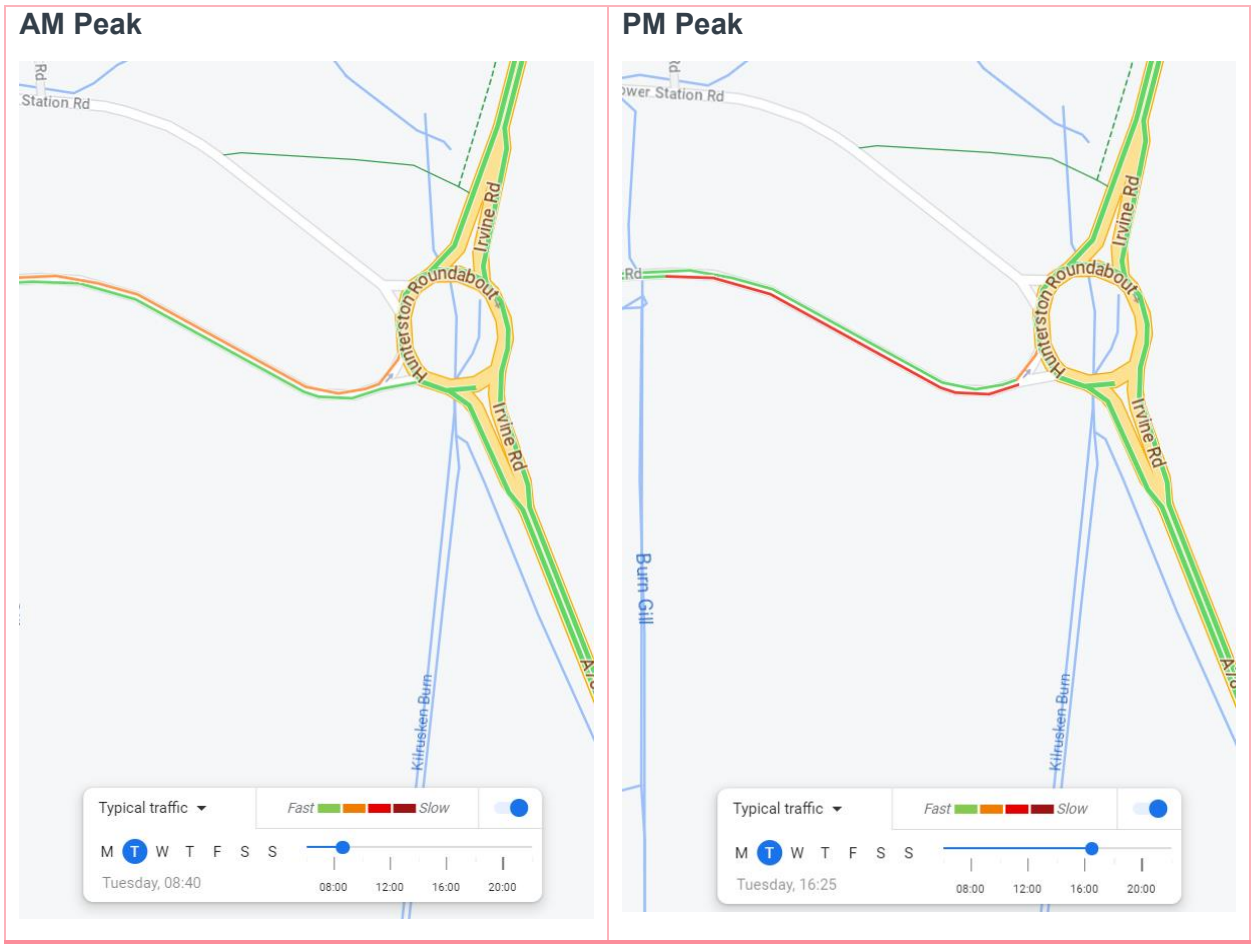
16.9.31 Of the recorded incidents approximately 50% occurred in wet/damp conditions, 56% in darkness with no streetlighting and 33% in both wet/damp and darkness conditions. 39% of incidents occurred with at least one involved vehicle performing a manoeuvre: two involved a vehicle overtaking, one slowing, two turning left and two turning right. A further five incidents (28%) involved collisions with parked vehicles. Eight incidents (44%) involved at least one HGV.

16.9.32 The impact of the project construction traffic (24 HGV movements per day at peak traffic generation) would not be anticipated to significantly increase road safety issues. However as 50% of recorded incident occurred during wet/damp conditions, the accident records could indicate the need for Transport Scotland to undertake surveys as part of their maintenance programme to determine the existing skid resistance level on this section of the A77 and whether a surfacing improvement work or high friction surfacing is required.

Driver Delay

16.9.33 The highest percentage of impact is anticipated on Power Station Road due to its low baseline traffic flows. Typical traffic conditions in the morning and evening peak periods on Power Station/Oilrig Road and at the Hunterston Roundabout have been extracted from Google Traffic.

Graphic 16.1 Power Station Rd typical AM and PM peak traffic



Source: Google Traffic

16.9.34 Based on Google Traffic, traffic on Oilrig Road approach is typically slightly slower during the morning peak but is mostly free flowing during the evening peak except for the inbound direction into the Site. All of the other arms are moving freely both the morning and evening peak periods.

16.9.35 As explained in paragraph 16.9.8, the 2033 future baseline flows do not accommodate any slight reduction in flows that would have been associated with the end of generation. Part of the trip generation during the Preparations for Quiescence phase will therefore replace some of the existing trip generation of the Site and the trip generation during the Preparations for Quiescence phase. This would reduce the effect further should this have been accounted for in the future baseline, which would reduce the impact on driver delays.

Hazardous loads

16.9.36 The hazardous loads assessment has been undertaken in accordance with the recommendations in EATM which provides guidance on the process for identifying, assessing and mitigating hazards. The scope of assessment focuses on low-likelihood but high-consequence events,

16.9.37 As there is no applicable methodology provided in the EATM[7], the likelihood calculation has been produced using the methodology in GEART. The Proposed Works are anticipated to transport 24 vehicle loads per day using a 10m^{3}HGV or equates to 756

journeys of loaded vehicles for 252 working days per year (assume 8 bank holidays per year).

16.9.38 **Table 16.27** below calculates the risk of accidents occurring at location where spillage or leak of toxic material is possible along the proposed routes (Routes 4 and 5).

Table 16.27 Calculation of risk of accidents along the proposed routes

Route	Locations	Accident Rate (per 100 million vehicles/kms)	Total Travel Length (km)	Total number of journeys in 12 years	Risk of accidents
Power Station Road	Between Site and A78	0	2.4	72576	0
A78	South to Seamill (between Power Station Road and the B7047)	1.8	6.1	72576	8.0×10^{-3}
A78	Between Seamill and Kilwinning	4	9.5	72576	2.8×10^{-2}
A78	Between Stevenston Road and Irvine Road	2	3.5	72576	5.1×10^{-3}
A71	South of Dreghorn	3.4	11.5	72576	2.8×10^{-2}
A77	Kilmarnock Bypass	3	6.6	72576	1.4×10^{-2}

16.9.39 The analysis demonstrates very small probabilities over the Preparations for Quiescence phase that an accident associated with spillage or leakage of hazardous loads would occur.

16.10 Assessment of cumulative effects

Inter-project effects

16.10.1 There is the potential for traffic and transport effects associated with the Proposed Works to interact with, or combine with the effects arising from other developments or projects proposed within the relevant Zones of Influence applicable to each environmental aspect.

16.10.2 An assessment of inter-project effects is considered within in **Chapter 21: Cumulative Effects Assessment** of this ES.

Intra-project effects

16.10.3 The traffic and transport assessment, particularly the change in trip generation as a result of the Proposed Works has been considered within the air quality (**Chapter 6 Air Quality**), ecology (**Chapter 8 Terrestrial Biodiversity and Ornithology**), and noise and vibration (**Chapter 15 Noise and Vibration**) assessments. A summary of the potential intra-project effects is also provided in **Chapter 21 Cumulative Effects Assessment**.

16.11 Summary

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor[1]	Magnitude of Change[2]	Significance[3]	Summary of Rationale
Power Station Road (Oilrig Road)					
	Driver Delay Route being the main site access	Rule 1/ Low	Low	**Minor (Not Significant)**	The probability of driver delay is calculated as very low. Whilst trip generation is an additional 10 %, this does not account for a reduction in flows in the future baseline, associated with the End of Generation at HNB.
	Hazardous load	Rule 1/ Low	Low	**Minor (Not Significant)**	The probability is calculated as very low
A78 South to Seamill (between Power Station Road and the B7047)					
	Road safety	Rule 2 / Medium	Low	**Minor** (**Not Significant**)	The collision rate is below the national average. The Proposed Work is not anticipated to impact on road safety
	Hazardous load	Rule 2 / Medium	Low	**Minor (Not Significant)**	The probability is calculated as very low

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor[1]	Magnitude of Change[2]	Significance[3]	Summary of Rationale
A78 between Seamill and Kilwinning					
	Road safety	Rule 1 / Negligible	Low	**Negligible (Not Significant)**	The collision rate is below the national average. The Proposed Work is not anticipated to impact on road safety but could potentially affected if the existing road surfacing friction level is deemed sub-standard.
	Hazardous load	Rule 1 / Negligible	Low	**Negligible (Not Significant)**	The probability is calculated as very low
A78 between Stevenston Road and Irvine Road					
	Road safety	Rule 1 / Negligible	Low	**Negligible (Not Significant)**	The collision rate is below the national average. The Proposed Work is not anticipated to impact on road safety but could potentially affected if the existing road surfacing friction level is deemed sub-standard.
	Hazardous load	Rule 1 / Negligible		**Negligible (Not Significant)**	The probability is calculated as very low

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor[1]	Magnitude of Change[2]	Significance[3]	Summary of Rationale
A71 South of Dreghorn					
	Road safety	Rule 1 / Negligible	Scoped out	**Scoped out**	
	Hazardous load	Rule 1 / Negligible	Low	**Negligible (Not Significant)**	The probability is calculated as very low
A77 Kilmarnock Bypass					
	Road safety	Rule 1 / Negligible	Low	**Negligible (Not Significant)**	The collision rate is below the national average. The Proposed Work is not anticipated to impact on road safety but could potentially affected if the existing road surfacing friction level is deemed sub-standard.
	Hazardous load	Rule 1 / Negligible	Low	**Negligible (Not Significant)**	The probability is calculated as very low

- The sensitivity/importance/value of a receptor is defined using the criteria set out in **Table 16.18** and is defined as negligible, low, medium and high.
- The magnitude of change on a receptor resulting from activities relating to the development is defined using the criteria set out in **Table 16.19** and is defined as negligible, low, medium and high.
- The significance of the environmental effects is based on the combination of the sensitivity/importance/value of a receptor and the magnitude of change and is expressed as major (significant), moderate (likely significant) or minor/negligible (not significant), subject to the evaluation methodology outlined in **Section 16.7**.

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17.

People and communities

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17. People and Communities

17.1 Introduction

17.1.1 This chapter presents the baseline and the assessment of potential significant socio-economic and health effects with respect to people and communities. It describes the key receptors within the vicinity of the Proposed Works and the sensitivity of these receptors. The change in title from "Socio-economics" used in Scoping to "People and communities" used here reflects evolving Environmental Impact Assessment (EIA) practice in response to updated legislation and does not change the scope of the issues addressed.

17.1.2 This chapter should be read in conjunction with the description of the Proposed Works as presented in **Chapter 2: The Decommissioning Process** and **Chapter 6: Air Quality** and **Chapter 15: Noise and Vibration**, which also assess relevant determinants of health and are discussed in the context of people and communities this chapter.

17.2 Relevant legislation, policy and technical guidance

Legislation

17.2.1 While socio-economic consideration is required as part of EIA via the requirement to consider effects upon 'population', there are no specific more detailed legislative requirements or guidelines for socio-economic/people and communities assessment set out in any statutory instruments or EIA advisory guidance.

Policy

17.2.2 A summary of the relevant policies is given in **Table 17.1.**

Table 17.1 Policy relevant to people and communities

Policy Reference	Policy Relevance
National Policy	
Scotland 2045 - fourth National Planning Framework 4 (NPF4)[1]	All the themes in the NPF4 are linked through Policy 1 which is for a "*plan-led approach to sustainable development*". In the section on 'Productive Places', a focus is presented regarding land and premises for business and employment stating the desire for "*places to support new and expanded businesses and investment, stimulate entrepreneurship and promote alternative ways of working in order to achieve a green recovery and build a wellbeing economy*". Policy 16 covering Business and the Environment identifies a need to reflect "*a people-centred approach to local economic development*" and notes that "*spatial strategies should support community wealth building; address economic disadvantage and inequality; and provide added social value*".

[1] The Scottish Government (2021) *Scotland 2045 – fourth National Planning Framework – draft: consultation*. (online). Available at: https://www.gov.scot/publications/scotland-2045-fourth-national-planning-framework-draft/pages/5/ (Accessed November 2023).

Policy Reference	Policy Relevance
	Policy 23 covering Health notes that developments with *significant adverse effect on health will not be supported* and explicitly mentions the effects of air quality and noise. Specifically in relation to Hunterston, NPF4 highlights that there are "*plans for new economic development and employment uses*". Aligning with the Ayrshire Growth Deal, it suggests that "*investment in this location will support a wellbeing economy by opening up opportunities for employment and training for local people*."
Local Policy	
North Ayrshire Local Development Plan[2]	The Local Development Plan (LDP) cites under Strategic Policy 1 that development should "*avoid damage to the coastline'* and that development will be supported that '*enhances existing coastal marine assets…where the development would provide jobs to North Ayrshire communities…assist to develop North Ayrshire's coastal economy and marketability*". Policy 24 highlights that developments on coastal areas would be supported in principal "*Developments on coastal areas with significant constraints will be supported, in principle, only where they would also contribute to the economic regeneration or well-being of communities whose livelihood is dependent on marine or coastal activities*." Specifically for Hunterston, the plan recognises it as "Strategic Development Area 1" noting that "*We recognise the strategic national importance of Hunterston as an energy hub and deepwater port. We strongly support the inclusion of Hunterston in the National Planning Framework 4*." Strategic Policy 3 acknowledges the decommissioning of both Hunterston A Power Station (HNA) and Hunterston B Power Station (HNB) in the near term and the desire to support the retention of the high value jobs in the energy industry sector at Hunterston.
Economic Development and Regeneration Strategy Refresh North Ayrshire 2016-2025[3]	The Strategy includes objectives: • "*provide the best conditions for business, creating a diverse and inclusive economy;* • *maximise the economic and social potential of our islands and towns [including promotion of strategic sites at Hunterston];* • *build the capacity of our communities to promote inclusive growth;* • *improve the productivity of our people and workforce through top class education and skill services; and* • *reduce significantly long-term unemployment and low incomes in working households.*"
Clyde Regional Marine Plan[4]	The Clyde Marine Planning Partnership is currently developing a marine plan which will provide a framework to manage, effectively and sustainably, the economic, social and environmental needs of the Clyde Marine Region. In Policy SHIP 3, Hunterston is identified as a port which can provide

[2] North Ayrshire Council (2019). *Adopted Local Development Plan. Your Plan Your Future.* (online) Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed November 2023).
[3] North Ayrshire Council, (no date). *Economic Development and Regeneration Strategy Refresh North Ayrshire, 2016-2025*. (Online) Available at: https://www.north-ayrshire.gov.uk/Documents/EconomyCommunities/economic-recovery-renewal-approach.pdf (Accessed November 2023).
[4]Clyde Marine Planning Partnership (2019). *Clyde Regional Marine Plan, Pre-consultation Draft*. (online) Available at: https://www.clydemarineplan.scot/wp-content/uploads/2019/06/Pre-consultation-draft-Clyde-Regional-Marine-Plan-18-March-2019.pdf (Accessed November 2023).

Policy Reference	Policy Relevance
	decommissioning services to the energy industry including oil and gas and renewables which can contribute to local regeneration.
Ayrshire Regional Economic Strategy[5]	The Strategy sets out a ten-year vision for developing a wellbeing economy for all residents in Ayrshire. Of particular relevance to this chapter is: Priority Theme 2: Fair work "*Across Ayrshire there is an existing and predicted future labour market shortage and skills gap. This causes concern for future growth and resilience of the local economy. There are initiatives that are working to tackle these issues and to create a skilled workforce accessing employment opportunities that are paid the real living wage and offer secure futures and routes for progression.*" Priority Theme 4: Good health and wellbeing "*A stronger and more inclusive economy will bring significant health benefits to Ayrshire residents. Inactivity rates in our region are high and of concern. This relates to people not in employment but not seeking work due to ill health. The mismatch between available employment and available workforce must be addressed, and this links to Priority Theme 2: Fair Work.* *HW01 Strengthened partnership working between agencies including NHS Ayrshire and Arran, to ensure a holistic and person-centred approach to support people to fully contribute to the local economy.*"
NDA Local Social and Economic Impact Strategy[6]	The strategy sets out the Nuclear Decommissioning Authority's (NDA) approach to engaging with and supporting the communities living near its. The two ways this strategy is delivered is by taking local factors into their overall decision-making framework and by using the NDA's "*grant giving powers to fund organisations with specific social, economic or environmental projects*". Whilst HNB remains under the ownership of the Applicant until fuel-free verification is achieved and is therefore not specifically included under the strategy, the HNB Nuclear Site Licence Boundary ("the Site") will transfer to Magnox Ltd at the commencement of the Proposed Works under EIADR. Therefore, the Site and the communities local to it, will be included in future iterations of the Strategy and is therefore relevant to the temporal scope of this assessment.

Technical guidance

17.2.3 A summary of the relevant technical guidance informing this chapter is given in **Table 17.2**.

[5] Ayrshire Councils (no date). Ayrshire Regional Economic Strategy. (Online) Available at: https://www.north-ayrshire.gov.uk/Documents/EconomyCommunities/ayrshire-regional-economic-strategy.pdf (Accessed November 2023).
[6] NDA (2020). NDA Local Social and Economic Impact Strategy 2020 update. (Online). Available at: https://assets.publishing.service.gov.uk/media/5efcd4b8e90e075c50609ddf/NDA_local_social_and_economic_impact_strategy_2020_update.pdf (Accessed November 2023).

Table 17.2 Technical guidance relevant to people and communities

Technical Guidance	Context
International Association for Impact Assessment: Social Impact Assessment: Guidance for Assessing and Managing the Social Impacts of Projects[7]	The guidance provides a thorough source of detailed methodologies for conducting activities supporting social assessment, particularly those for identifying and representing community issues and assessing methods of resolution.
The Green Book (and supplementary guidance) published by UK government[8]	The Green Book provides a broad framework for how policies, programmes and projects in the UK should be appraised and evaluated to inform decision making. It sets out guidelines for how the economic and social effects of policy should be assessed. It contains advice on the scoping of costs and benefits to be included in assessment, the time period for assessment and the use of discount rates. It contains various supplementary guidance on specific assessment of environmental effects, for example of health, crime and air quality.
The Additionality Guide, published by UK Government[9]	Provides more specific guidance on how to assess impact of a policy intervention (or a public or private sector investment) on the local, regional and national economy. Additionality is the "*extent to which something happens as a result of an intervention that would have not occurred in the absence of intervention*".
Public Health Scotland, Health Impact Assessment Guidance for Practitioners[10]	This guidance provides advice and data sources for Health impact Assessment in Scotland including further national and international references.
The World Health Organization Health Impact Assessment guidance, tools and methods	The guidance, tools and methods are recognised as the leading international authority on the completion of human health impact assessments. The guidance covers a number of aspect areas that are linked to health impacts from projects, including transport, housing, and water and sanitation.
International Union for the Conservation of Nature: Social Impact Assessment in Environmental & Social Management System[11]	The guidance provides a succinct summary of the key elements in assessment as well as supplementary guidance focusing on the context and use of natural resources.

[7] International Association for Impact Assessment: (2015). *Social Impact Assessment: Guidance for Assessing and Managing the Social Impacts of Projects*. (online) Available at: https://www.iaia.org/uploads/pdf/SIA_Guidance_Document_IAIA.pdf (Accessed November 2023).
[8] HM Treasury and Government Finance Function (2022). *The Green Book*. (online) Available at: https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent (Accessed November 2023).
[9] Homes and Communities Agency (2014). *Additionality Guide*. (online) Available at: https://www.gov.uk/government/publications/additionality-guide (Accessed November 2023).
[10] Scottish Health and Inequality Impact Assessment Network (SHIIAN) (2019). Health Impact Assessment Guidance for Practitioners. (Online) Available at: https://www.scotphn.net/wp-content/uploads/2015/11/Health-Impact-Assessment-Guidance-for-Practitioners-SHIIAN-updated-2019.pdf (Accessed November 2023).
[11] International Union for the Conservation of Nature (2016). Social Impact Assessment Guidance Note. (online) Available at: https://www.iucn.org/sites/default/files/2022-05/esms-social-impact-assessment-sia-guidance-note.pdf (Accessed November 2023).

Technical Guidance	Context
Glasson, J, Socio-economic impacts 1: economic impacts[12]	This source of socio-economic guidance is ab established EIA practitioners' reference for socio economic impact assessment.

17.3 Data gathering methodology

Study Area

17.3.1 The people and communities Study Area includes multiple jurisdictions at:

- National level – Scotland
- Regional level – The county of Ayrshire (defined as East Ayrshire, North Ayrshire and South Ayrshire); and
- Local level – the North Ayrshire administration area; and
- Very local - Localities within North Ayrshire at the postcode district level.

Desk study

17.3.2 The EIA has been undertaken with reference to **Chapter 2: The Decommissioning Process**, supported by a number of data sources. The principal data sources used to inform this chapter for potential effects comprise:

- UK Government Office of National Statistics (ONS); and
- the National Records of Scotland.

17.3.3 In response to a specific point in the ONR Pre-application Opinion (see **Appendix 5A**; Section 3.3, paragraph 125), for further consideration of *human health impacts* and *impacts on fishing, maritime recreation and maritime commercial services*. **Appendix 5B** presents the relevant baseline assessment and associated conclusions. With reference to *human health impacts*, the technical note concludes that these impacts are considered in this chapter, **Chapter 6: Air Quality** and **Chapter 15: Noise and Vibration** and therefore do not require a separate assessment. With reference to *impacts on fishing, maritime recreation and maritime commercial services,* the technical note concludes that due to the limited footprint and duration of the Proposed Works in the marine environment, coupled with the implementation of the good practice measures, significant impacts are not anticipated and therefore no further assessment is required.

17.3.4 To ensure that any interactions between the Proposed Works in the marine environment and maritime recreational activities are managed safely, coupled with overarching project level safety measures, the following good practice measures are proposed:

- establishment of an exclusion zone around the Indicative Dismantling Works Area ("Works Area");
- communication programmes with local ports and marine operators (including notice to mariners); and

[12] Glasson, J (2009). *Socio-economic impacts 1: overview and economic impacts*. Routledge; Oxfordshire, UK.

- measures specific to vessel movements in constrained areas (such as ports), and additional physical mitigating measures (e.g. to prevent small craft drifting onto part-finished offshore engineering works).

17.3.5 These measures are included as good practice in **Table 17.14** and will be secured via the Environmental Management Plan (EMP).

Survey work

17.3.6 No surveys have been undertaken to inform this people and communities chapter. Existing publicly available information, coupled with the information presented in **Chapter 2: The Decommissioning Process** has been utilised in this assessment.

Data limitations

17.3.7 Data limitations reflect those of the main data sources:

- Scottish government;
- ONS; and
- applying to EDF internal data (such as GDPR).

17.3.8 More specific data limitations arise for:

- information regarding future employment opportunities, and so based on more the general descriptions available; and
- the propensity for people to retire before the statutory age, and assumed to wish to retire as late as possible.

17.4 Consultation

Overview

17.4.1 No specific consultation was undertaken for the peoples and communities chapter but the assessment reflects consultation under the other environmental aspects considered.

Pre-application Opinion

17.4.2 A Pre-application opinion was adopted by the ONR, on 04 October 2022. A summary of the elements of the Pre-application Opinion that are of relevance to the assessment of effects on people and communities and confirmation of how these are addressed by the assessment is included in **Table 17.3**.

Table 17.3 Summary of Pre-application Opinion responses

Paragraph Ref.	Consideration	How addressed in the ES
110	Based on the information provided in this chapter, the potential socio-economic effects identified are appropriate. However, as the socio-economics chapter also considers health, this section would benefit from greater consideration of the health consequences of	The consequences of the Proposed Works are assessed for HNB workers who are released together with consideration of the effects of unemployment on health outcomes .

Paragraph Ref.	Consideration	How addressed in the ES
	the effects. For example, greater consideration of policy relating to health outcomes, and technical guidance relating to assessing health impacts could be included in the ES.	
111	In the data gathering methodology, reference to national statistics and datasets are appropriate. There is opportunity for the ES to expand on this by identifying local businesses, settlements and community facilities that could be impacted by the decommissioning project.	Noted. The financial effects of spending by the workforce released are assessed in the context of the local economy and the level of business rates and local taxes. Impacts on employment markets are assessed at a very local level to provide a metric of relative change. The population is assumed to remain in the area with the need for community facilities more dependent on the age profile than changes in employment and so they are not considered dependent on the Proposed Works.
112	Information provided on the current health baseline could include information on different population groups, behaviour risk factors, child health indicators and limiting long-term health problems.	HNB workers may experience impacts related to unemployment which is a recognised wider determinant of health. HNB workers have generally experienced stable employment while existing long term unemployment is associated with poor local socio-economic and health conditions. The impacts on released HNB workers are not expected to affect the conditions related to deprivation locally and potential effects on the children of the older HNB workers released are likely to be low as they are likely to be over school age. Effects on the health of HNB workers is assessed below but the indicators mentioned are not included because the baseline information is for people not expected to experience change as a result of the Proposed Works.
113	The information provided in the 'influence of Hunterston B' section to help define the current baseline is very helpful and helps to provide context for the presentation of the baseline data. The information in Table 16.10 and Table 16.11 is useful in looking from 2022 to 2026. However, no information is provided on the future decades of decommissioning activity on site that are described in Chapter 2. In addition to this, the baseline section discusses change to permanent members of staff, but it is not clear how many temporary staff will be required to undertake the activities described	Noted. The workforce profile for the decommissioning of HNB is presented in the ES. Plans available at Scoping have been further refined and confirmed with the levels of uncertainty clarified. The profile of changes include the natural reduction in workforce over time as older staff reach statutory retirement age. Residual uncertainty is addressed through a range for the workforce released of between 100 and 180

Paragraph Ref.	Consideration	How addressed in the ES
	in Chapter 2. Paragraph 16.5.3 states that 'work is on-going to estimate the workforce profile required for decommissioning'. This seems to be an information gap that may lead to a change in scope for the assessment for potential effects relating to socio-economics, communities and health. The ES should make it clear how uncertainties have been managed in the EIA, and how any assumptions will be reviewed as the decommissioning project progresses.	people[13].
114	The factors identified as influencing magnitude are considered to be appropriate. The magnitude ratings for employment are set out but not for other potential effects. Similarly, definitions for sensitivity criteria for employment receptors are provided, but not other receptors; this should be clarified in the ES.	The assessment uses ratings for effects on employment, unemployment and economy which are informed by precedents and reported at Scoping. Effects which are related to employment numbers are anticipated to arise pro-rata. Ratings for other effects have fewer precedents and may be qualitative (such as for effects on users of the coastal path).
115	In the consideration of potential receptors, ONR notes that additional consideration of specific population groups that could be more vulnerable to socio-economic impacts would be beneficial.	The population groups with particular socio-economic vulnerability are further considered in the assessment. These are predominantly older workers released from HNB in advance of retirement age.
116	There is also an opportunity to link some of the potential socio-economic effects to some likely positive outcomes, such as increased opportunities for training and skills development, which may mean that receptors such as the providers of education, training and transitional support services are introduced as receptors.	Noted. The Ayrshire Growth Deal (AGD) is a key strategic incentive which provides a framework which is directly relevant to the changes at HNB and considered in the assessment. The experienced workforce released from HNB may use training and skills services provided under the AGD and benefit the reputation of both. The AGD provides incentives for businesses planned across Ayrshire including support for training providers and new development with employment at Hunterston.
117	In receptors scoped out of the assessment, there is no discussion of whether residents and visitors to the area may experience potential socio-economic effects due to new (temporary or permanent) activities at the site. Information on distances to local residential areas, construction and commuting routes and cross-	The geographical consideration of the main centres for the employment assessment also indicates that residential areas are not within the immediate locality of the Site and residents would not be expected to experience likely significant effects.

[13] Note that the assessment below is based on a range of 100-170 people due to retirement before 2026.

Paragraph Ref.	Consideration	How addressed in the ES
	references to findings from related assessments (e.g. noise, traffic and transport) would assist in justifying if this is scoped into or out of the assessment.	As there are no notable facilities other than the coastal path that would result in visitor behaviour differing from residents, the effects on visitors are also not likely to be significant. Walkers close to the Site will retain access to the coastal path throughout the Proposed Works.
125	There are some potential topics that do not appear to have been considered (or considered sufficiently) in the scoping report. These include: ● Human health impacts; and ● Impacts on fishing, maritime recreation and maritime commercial services.	**Appendix 5B** presents the technical note which responds in detail to this Pre-Application Opinion response. The technical note identifies that human health impacts are considered in this chapter, **Chapter 6: Air Quality,** and **Chapter 15: Noise and Vibration** and therefore do not require a separate assessment. The technical note also presents a desk study with relevance to impacts of the Proposed Works on fishing, maritime recreation and maritime commercial services, which also concludes that no further assessment is required.

Technical engagement and non-statutory consultation

Table 17.4 Non-statutory consultation responses

Consultee	Consideration	How addressed in the ES
NHS Ayrshire and Arran	We would recommend that workforce planning discussions also include local authority colleagues with responsibilities for employability; colleagues from Ayrshire Growth Deal; and the Local Employability Partnership; in order to make connections with existing work on skills, training, employability, and inclusive economy. Co-ordination with Ayrshire Growth Deal activities is also likely to be valuable given that the wider Hunterston Estate has been designated as a national development in NPF4 – it may be that proposed developments there in the field of energy, circular economy, and the environment offer valuable opportunities for employment for former Hunterston staff.	Noted. The assessment acknowledges future development opportunities provided by national policy, such as the designation of Hunterston as a strategic growth area in the fourth National Planning Framework (NPF4) and regional incentives, such as the Ayrshire Growth Deal.

Consultee	Consideration	How addressed in the ES
NHS Ayrshire and Arran	Should significant external workforce be brought in as part of the decommissioning process, we note that this may have impacts on the local economy, housing market, and community – we would therefore welcome details on whether this is likely to be the case.	Noted. Effects relating to contractor deployment for decommissioning are considered in this assessment.

17.5 Overall baseline

Current baseline: the local, regional and national picture

Population

17.5.1 The current population of 134,200 in North Ayrshire makes up approximately 36% of the population in Ayrshire and 2.4% of the population in Scotland (see **Table 17.5**). There is an appreciable difference in the ratio of men and women; in North Ayrshire there are 11% more women than men while in Scotland there are 5% more.

Table 17.5 Population in North Ayrshire in 2021

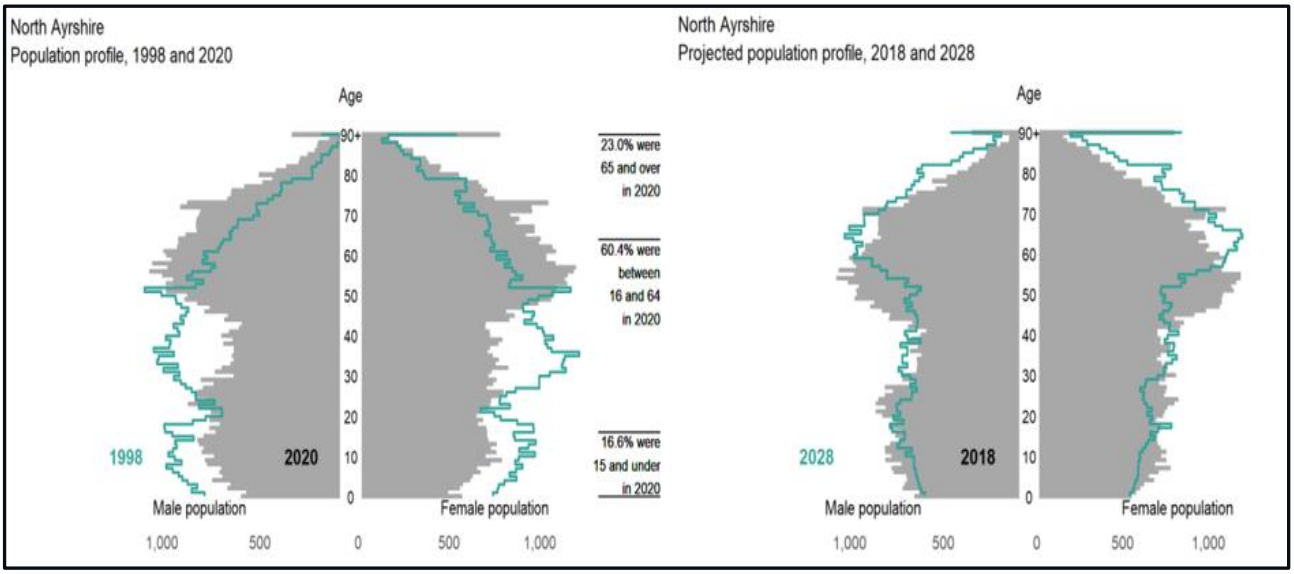
		North Ayrshire	Ayrshire	Scotland
All People	number	134,200	368,700	5,479,900
Males	number	63,700	176,000	2,672,600
Females	number	70,500	192,100	2,807,300
Number females as % of number males	%	111%	109%	105%

Source: ONS Population estimates – local authority based by five-year age band.[14]

17.5.2 **Graphic 17.1** illustrates the current and projected age distribution of the population of North Ayrshire. Alongside a declining population (see **Table 17.5**), the general trend is of an aging population, with a noticeable change in the structure of age distribution since 1998.

[14] NOMIS (2023) *Local Authority Profile* (online). Available at: https://www.nomisweb.co.uk/reports/lmp/la/contents.aspx (Accessed September 2023).

Graphic 17.1 Age distribution in North Ayrshire in 1998 and 2020 (left), and in 2018 and 2028 (right)



Source: National Records of Scotland

17.5.3 The proportion of residents of working age (aged 16-64) within North Ayrshire is the same as the regional average but is approximately 3.4% lower than the national (Scotland) average. The differences are greater for men (0.3% and 4.0% respectively) than for women (-0.1% and 2.9%) (see **Table 17.6**).

Table 17.6 Population of working age (16-64) in 2021 as % of total population

					North Ayrshire compared	
	North Ayrshire (number)	North Ayrshire (%)	Ayrshire (%)	Scotland (%)	Ayrshire (%)	Scotland (%)
All People Aged 16-64	81,000	60.4	60.3	63.8	+0.1	-3.4
Males Aged 16-64	38,500	60.4	60.7	64.4	-0.3	-4.0
Females Aged 16-64	42,500	60.3	60.2	63.2	+0.1	-2.9

Source: ONS Population estimates - local authority based by five-year age band[15]

Employment

17.5.4 The employment profile of North Ayrshire (April 2022 – March 2023) shows that there is a smaller proportion of the working age population who are economically active (72.2%)

[15] Office for National Statistics (2023). *Labour market profile – North Ayrshire*. (Online) Available at: https://www.nomisweb.co.uk/reports/lmp/la/1946157425/printable.aspx (Accessed November 2023).

compared to the regional (73.9%) and national averages (77.4%) (see **Table 17.7**). Levels of unemployment are similar in North Ayrshire at 3.4% compared to the national average of 3.5%.

17.5.5 In 2021, the job density (number of jobs per working age population) of North Ayrshire was 0.56, which is significantly lower than the national average (0.81) and indicates the low levels of economic activity[16].

Table 17.7 Employment status for working age population (16-64) (April 2022-March 2023) (%)

				North Ayrshire compared	
	North Ayrshire (%)	Ayrshire (%)	Scotland (%)	Ayrshire (%)	Scotland (%)
Economically Active	72.3	73.9	77.4	-1.6	-5.1
In Employment	71.3	71.2	74.7	+0.1	-3.4
Employees	64.3	63.6	67.3	+0.7	-3.0
Self Employed	6.4	7.1	7.1	-0.7	-0.7
Unemployed *	3.4	2.8	3.5	+1.4	-0.1
Economically Inactive	27.7	26.1	22.6	+1.6	+5.1

* Values are proportion of those economically active and over 16
Source: ONS annual population survey[14]

17.5.6 In 2021, the proportion of employment in industry was appreciably higher in the Manufacturing and Construction sectors in North Ayrshire compared to national levels (See **Table 17.8**). The service side of the economy saw much lower values with levels less than one third of national levels in the information and communication and financial and insurance activities.

Table 17.8 Employment by industry (2021)[17]

Industry	North Ayrshire (Employee Jobs)	North Ayrshire (%)	Scotland (%)	Great Britain (%)
Mining And Quarrying	150	0.4	1.0	0.1
Manufacturing	5,000	12.2	7.1	7.6
Electricity, Gas, Steam And Air Conditioning Supply	500	1.2	0.7	0.4

[16] Office for National Statistics (2021). *Jobs density.* (Online) Available at: https://www.nomisweb.co.uk/datasets/jd (Accessed November 2023).

[17] Source: Nomis official labour market statistics[15]

Industry	North Ayrshire (Employee Jobs)	North Ayrshire (%)	Scotland (%)	Great Britain (%)
Water Supply; Sewerage, Waste Management And Remediation Activities	700	1.7	0.8	0.7
Construction	3,000	7.3	6.1	4.9
Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles	7,000	17.1	14.4	14.4
Transportation And Storage	1,500	3.7	4.2	5.1
Accommodation And Food Service Activities	3,500	8.5	7.6	7.5
Information And Communication	300	0.7	3.1	4.5
Financial And Insurance Activities	300	0.7	3.1	3.6
Real Estate Activities	600	1.5	1.5	1.8
Professional, Scientific And Technical Activities	1,500	3.7	6.5	8.9
Administrative And Support Service Activities	2,500	6.1	8.0	8.9
Public Administration And Defence; Compulsory Social Security	2,500	6.1	6.6	4.6
Education	3,500	8.5	8.7	8.8
Human Health And Social Work Activities	6,000	14.6	15.9	13.7
Arts, Entertainment And Recreation	1,250	3.0	2.5	2.3
Other Service Activities	700	1.7	1.8	1.9
Total	40,500	98.7	99.6	99.7

17.5.7 North Ayrshire shows a structure of occupations which differs slightly from the structures seen in Ayrshire which differs again slightly from Scotland. The proportion of those in 'Professional Occupations' in North Ayrshire is 20.0% and in Ayrshire it is 20.3% employees compared to the 25.6% average for Scotland. In North Ayrshire, there is higher than national average employment in the 'Caring, Leisure and Other Service Occupations'. There are 15.2% of people employed in Elementary Occupations in North Ayrshire compared to 8.5% in Scotland. Differences are below 2.2% in all other occupational categories indicating that, after accounting for major differences in a few categories, occupational representation is broadly aligned with Ayrshire and Scotland (see **Table 17.9**).

Table 17.9 Employment by occupation (April 2022-March 2023)

					North Ayrshire compared	
	North Ayrshire (number)	North Ayrshire (%)	Ayrshire (%)	Scotland (%)	Ayrshire (%)	Scotland (%)
1 Managers, Directors & Senior Officials	3,500	6.0	6.9	8.2	-0.9	-2.2
2 Professional Occupations	11,700	20.0	20.3	25.6	-0.3	-5.6
3 Associate Professional & Technical	8,900	15.2	15.3	15.1	-0.1	+0.1
4 Administrative & Secretarial	4,700	8.0	8.5	9.1	-0.5	-1.1
5 Skilled Trades Occupations	5,800	10.0	11.6	9.5	-1.6	-0.5
6 Caring, Leisure & Other Service Occupations	8,900	15.2	12.5	8.5	+2.7	+6.7
7 Sales & Customer Service Occupations	4,400	7.5	8.2	7.5	-0.7	=
8 Process Plant & Machine Operatives	3,600	6.2	6.3	5.1	-0.1	+1.1
9 Elementary Occupations	6,700	11.5	9.9	10.9	+1.6	+0.6
	58,200	99.6	99.4	99.7	-	-

Notes: Totals are quoted as provided in the source and reflect the underlying statistical approaches applied by ONS, Numbers and % are for those of 16+, % is a proportion of all persons in employment

Source: ONS annual population survey[18]

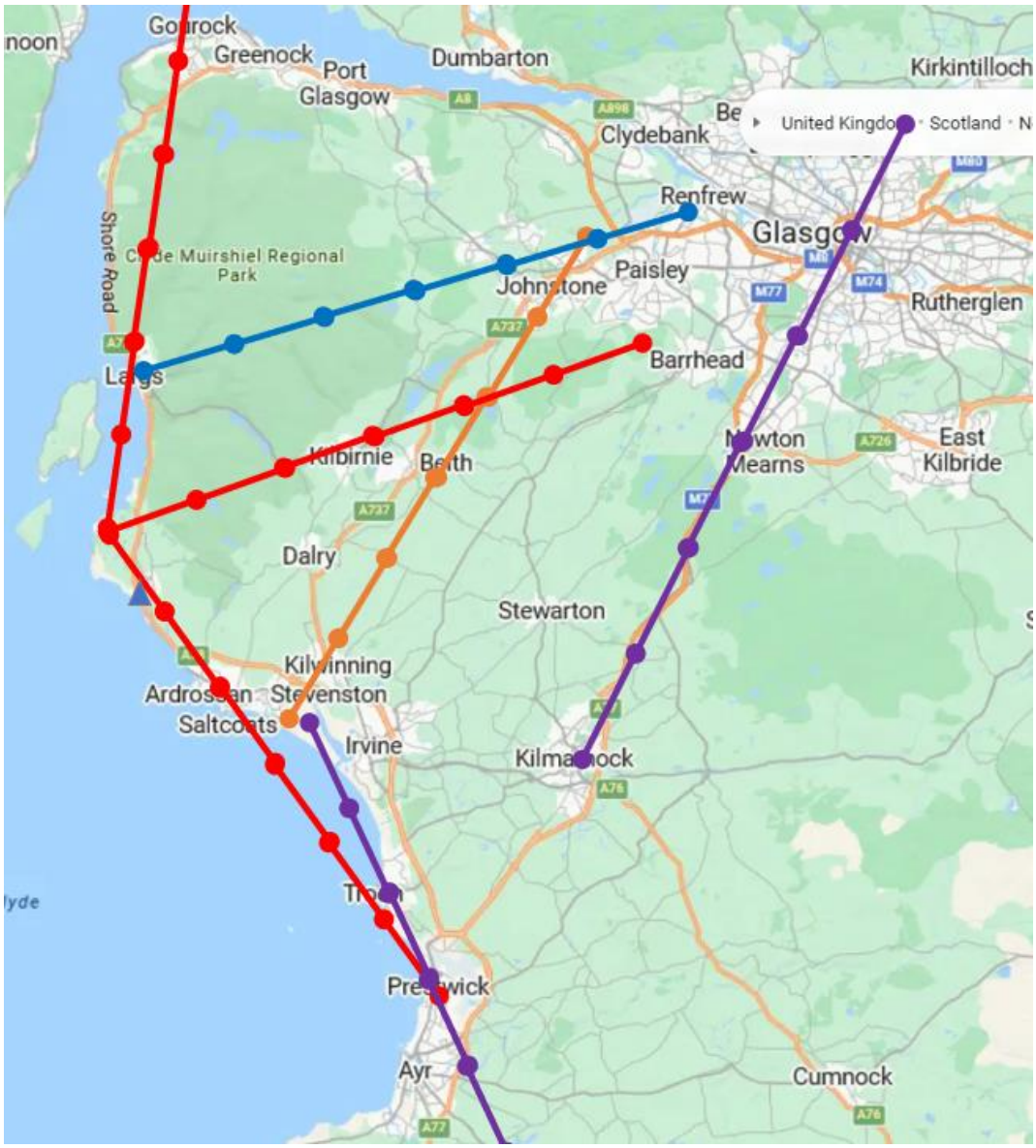
Travel to work patterns

17.5.8 Information on the commuting patterns from local settlements is provided by travel to work data from the national census. Travel to work data from the 2011 census is used in preference to 2021 as the underlying drivers reflecting geography are likely to have changed less than uncertainty introduced by Covid-19 in 2021.

17.5.9 **Graphic 17.2** is a map showing the geography of the settlements and transport connections. and includes bars showing straight line distances. Each segment of a bar is 5 km while the colours have significance only as a visual aid to distinguish them from each other. Aside from the City of Glasgow, the main settlements are along the coast, with the nearest to HNB being Largs in the North and the coastal towns of Ardrossan and Saltcoats in the south, together with nearby conurbations including Irvine, with Kilmarnock a centre to the south-east further inland.

18 Office for National Statistics (2023). Labour market profile – North Ayrshire. (Online) Available at: https://www.nomisweb.co.uk/reports/lmp/la/1946157425/report.aspx?town=North%20Ayrshire (Accessed November 2023).

Graphic 17.2 Map of travel distances and settlements near HNB



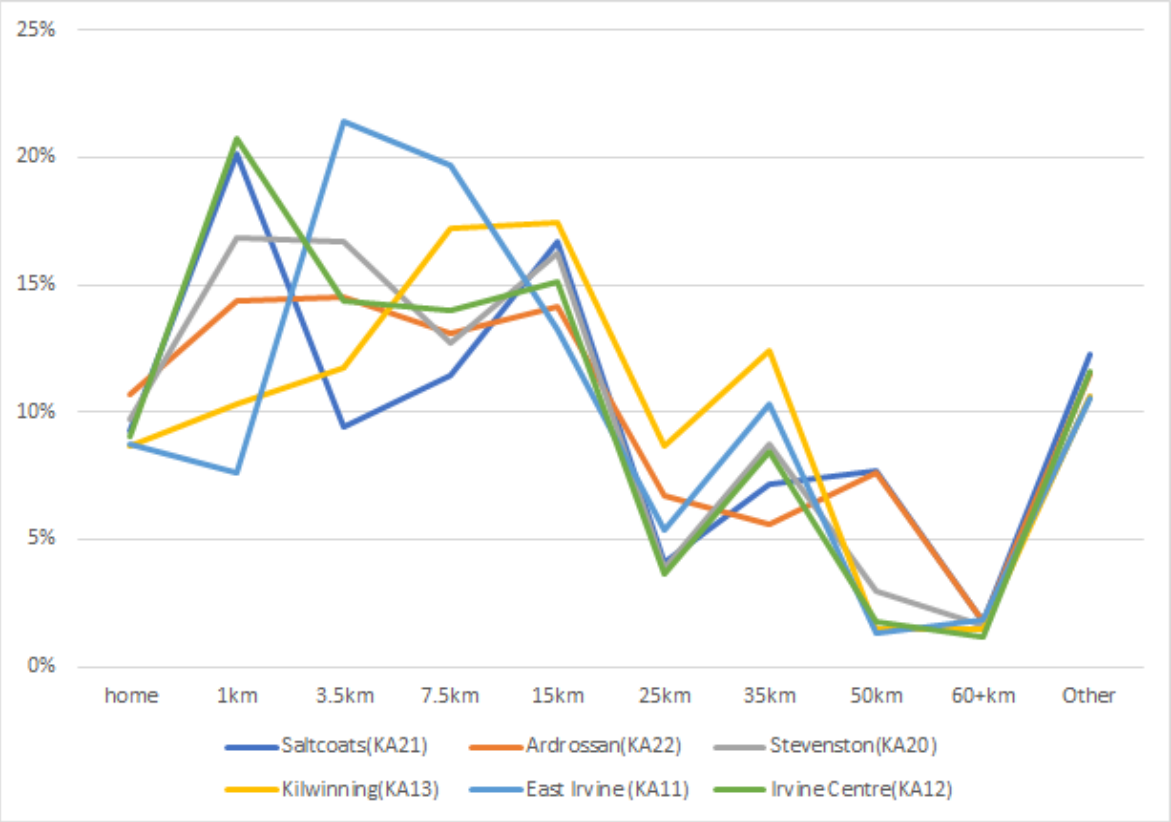
17.5.10 **Graphic 17.3** shows the number of people according to the distance they travel to work, for a group of settlements including Saltcoats, Ardrossan, and Irvine. The vertical axis shows the proportion of the total number commuting for each travel distance, shown along the horizontal axis.

17.5.11 Considering the shorter distances first, Kilwinning and Irvine East show low levels of people travelling for distances of 1 km (10% or less of the total number) while Saltcoats and Irvine Centre show levels greater than 20%. The implication is that the very local economy is of a greater size in Saltcoats and Irvine Centre while Kilwinning and Irvine East function more as residential rather than employment centres. The levels for Ardrossan and Stevenston lie in the middle of these two groups and combine residential and employment centres, with the local economies of Saltcoats, Kilwinning and Irvine Centre nearby.

17.5.12 For greater distances up to 15 km, the marked difference in travel to work patterns is between Saltcoats with levels that reach below 10% and East Irvine with levels over 20%. It indicates that there are notably fewer employment centres which are nearer than 15 km and accessible from Saltcoats, compared to those accessible from East Irvine.

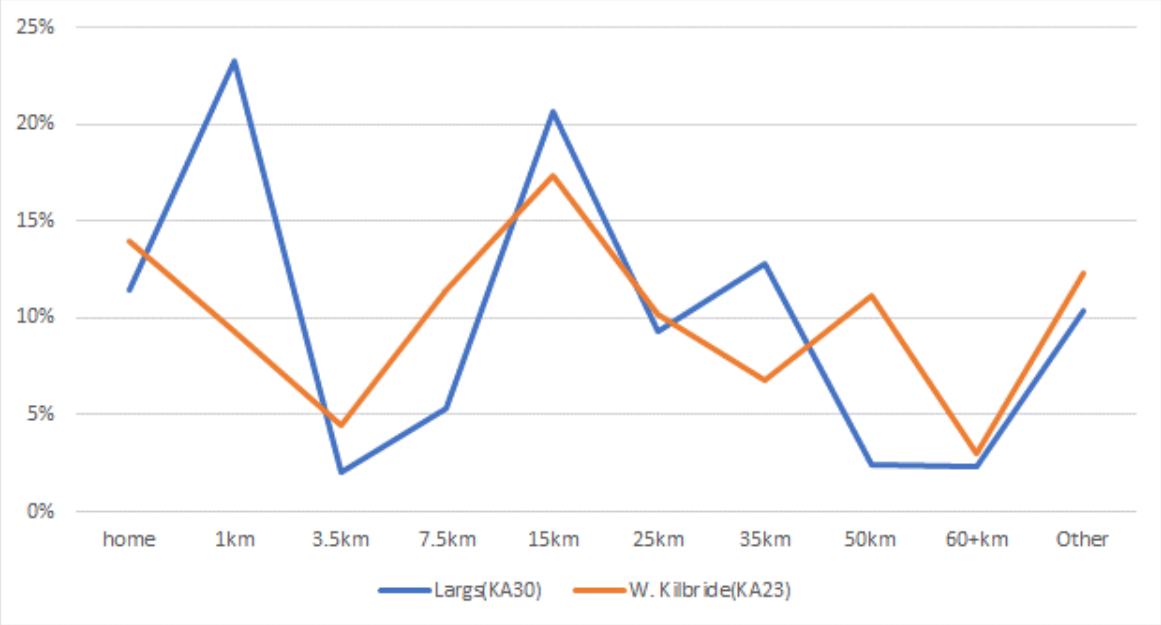
17.5.13 After 15 km, there is a decline in the level of commuting for travellers from all settlements, with a significant subsidiary peak at 35 km for all settlements except Ardrossan and Saltcoats. This peak is likely to represent commuting to locations in Glasgow and is highest for Kilwinning and East Irvine which are nearest to the city. Ardrossan and Saltcoats show some commuting at 50 km. All communities show a similar level for "Other" which may represent weekly or other commuting, and may be related to workers from outside the region.

Graphic 17.3 Travel to work distances for people in the settlements of Ardrossan, Saltcoats, and Irvine and conurbations nearby



17.5.14 **Graphic 17.4** shows the same travel to work distance data for the two settlements to the north of this group and within a similar overall distance of HNB. For Largs, there are peaks at 1 km and at 15 km which are likely to indicate the very local economy and the two approximately equidistant employment centres of Greenock to the north of HNB and the group of coastal settlements to the south starting at Ardrossan. West Kilbride shows a similar pattern to Largs. For these two settlements, the lack of main routes east to Glasgow indicates that the further distances reflect commuting using the coastal routes.

Graphic 17.4 Travel to work distances for people in the settlements of Largs and West Kilbride



Education

17.5.15 In North Ayrshire the number of schools (primary, secondary and special schools) has declined since 2001 from 67 to 59 in 2021 and now comprises 52 primary schools, 10 secondary schools and 1 Special Educational Needs (SEN) school[19]. The number of teachers per pupil is better than the national average at primary and secondary levels. Approximately 9,640 children attend primary schools in North Ayrshire, with a pupil to teacher ratio of 14.4 compared to a national (Scotland) ratio of 15.3[20] and an average class size for primary school pupils of 22.8 in North Ayrshire compared to 23.3 in Scotland[20]. At secondary school level, there are over 8,000 pupils, with a pupil to teacher ratio of 12.1 compared to the national average in Scotland of 12.4[21] (See **Table 17.10**).

Table 17.10 Number of secondary schools and pupils across North Ayrshire (2022)[22]

	Secondary Schools	Pupil Numbers	Teacher Numbers (FTE)	Pupil Teacher Ratio
North Ayrshire	10	8,023	663	12.1
Scotland	358	309,133	24,874	12.4

[19] Scottish government (2022) *Summary Statistics for Schools in Scotland 2021* (online). Available at: https://www.gov.scot/publications/summary-statistics-schools-scotland/ (Accessed November 2023).
[20] Scottish Government (undated). *Smarter Scotland, Primary School Information Dashboard*. (Online) Available at: https://scotland.shinyapps.io/sg-primary_school_information_dashboard/ (Accessed November 2023)
[21] Scottish Government (undated). *Smarter Scotland, Secondary School Information Dashboard*. (Online) Available at: https://scotland.shinyapps.io/sg-secondary_school_information_dashboard/ (Accessed November 2023)
[22] North Ayrshire Council (undated). *Secondary schools*. (Online) Available at: https://www.north-ayrshire.gov.uk/education-and-learning/school-listings/secondary-schools.aspx (Accessed November 2023).

17.5.16 North Ayrshire's educational attainment profile (2020) (see **Table 17.11**) illustrates a population with educational qualifications appreciably below those for Ayrshire and Scotland at most educational levels, although the number of teachers per pupil is similar for all three regions. At higher educational levels with fewer people, the differences become greater in relative terms. The number of people with no qualifications is notably higher than the level for Scotland (11.4% compared to 7.7%).

Table 17.11 Educational qualifications (2020) (% of resident population aged 16-64)

					North Ayrshire compared	
	North Ayrshire (number)	North Ayrshire (%)	Ayrshire (%)	Scotland (%)	Ayrshire (%)	Scotland (%)
NVQ4 And Above	29,000	37.5	43.2	50.1	-5.7	-12.6
NVQ3 And Above	39,400	51	58.3	64.9	-7.3	-13.9
NVQ2 And Above	53,800	69.5	76.9	79.6	-7.4	-10.1
NVQ1 And Above	60,700	78.5	85.1	86.5	-6.6	-8
Other Qualifications	7,800	10.1	7.4	5.8	2.7	4.3
No Qualifications	8,900	11.4	22.5	7.7	-11.1	3.7

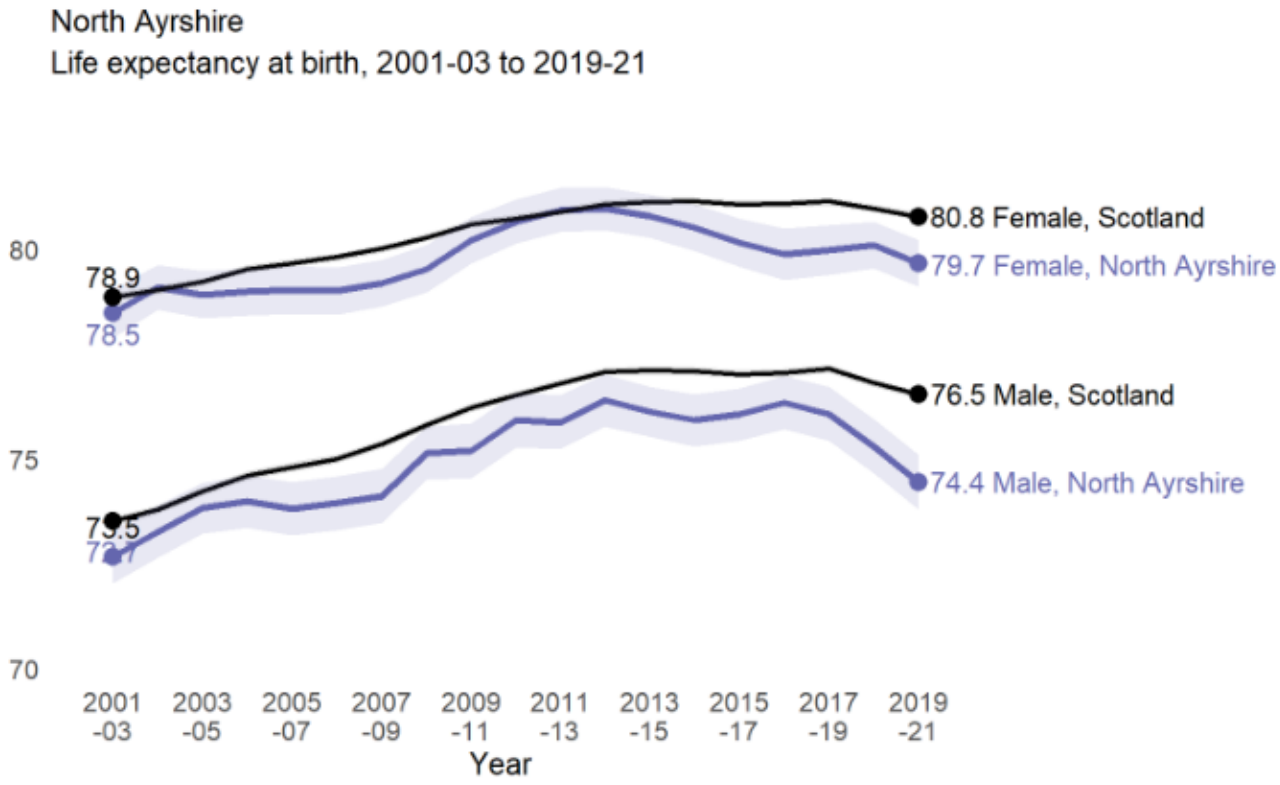
Source: ONS annual population survey[14]

Health

17.5.17 Life expectancy provides a measure of general heath. **Graphic 17.5** shows life expectancy at birth rising in line with increased life expectancy in Scotland for both males and females. However, apart from divergence in one period (2010), the trend is consistently below the national (Scotland) average and in the latest period (2021) is further below than in 2001[23].

[23] National Records of Scotland (2023) *North Ayrshire Council Area Profile* (online). Available at: https://www.nrscotland.gov.uk/files/statistics/council-area-data-sheets/north-ayrshire-council-profile.html#life_expectancy (Accessed September 2023).

Graphic 17.5 Life expectancy at birth in North Ayrshire, 2001-03 to 2019-21[21]



17.5.18 In North Ayrshire, life expectancy at birth was higher for females (79.7 years) than for males (74.4 years) in 2019-21 (with the most recent period potentially affected by Covid-19). In North Ayrshire, female life expectancy at birth is lower than at Scotland level and male life expectancy at birth is lower than at Scotland level[24].

17.5.19 Over the period between 2001-03 and 2019-21, female life expectancy at birth in North Ayrshire has risen by 1.5%. Over the period between 2001-03 and 2019-21, male life expectancy at birth in North Ayrshire has risen by 2.4%[24].

17.5.20 The leading cause of male death in North Ayrshire (14.1%) and nationally (13.7%) in 2022 was ischaemic heart diseases, followed by lung cancer (5.8%). In females, the leading cause of death in North Ayrshire is dementia and Alzheimer's disease (10.2%), which is lower than the national average (11%)[24] [25].

[24] National Records of Scotland (2022) *North Ayrshire Council Area Profile*. (Online) Available at: https://www.nrscotland.gov.uk/files/statistics/council-area-data-sheets/north-ayrshire-council-profile.html#Life_Expectancy (Accessed November 2023)
[25] National Records of Scotland (2023) *Monthly Mortality Analysis* (Online) Available at: https://www.nrscotland.gov.uk/files//statistics/vital-events/monthly-mortality/monthly-mortality-august-23-report.pdf (Accessed November 2023)

Public health services

17.5.21 Across Scotland there are 914 General Practitioner (GP) sites[26], 229 hospitals and over 1,000 dental practices[27]. It is reported that there are an estimated 3,494 General Medical Practitioners; this has decreased from an estimated 3,613 in 2019[28]. NHS Ayrshire and Arran[29] reports that there are almost 300 General Medical Practitioners across 90 GP practices (with 10 of these located across Arran and Cumbrae), 160 dental practitioners at 70 sites and more than 90 community pharmacies. North Ayrshire has a total of 26 GP practices, which support between 1,000 to 12,000 patients. All but one of the 18 GP practices are accepting new patients. There are 1,233 patients per GP in Ayrshire and Arran, close to the national (Scotland) average of 1,245[30].

Deprivation

17.5.22 General socio-economic conditions are indicated by government indices which report levels of social deprivation. The primary indicator, the Index of Multiple Deprivation (IMD), is a composite measure which has components which cover Income; Employment; Health; Education/Skills; Housing; Geographic Access and Crime. The IMD and its components are available for small geographic areas known as data zones.

17.5.23 The North Ayrshire Health and Social Care Partnership report that high levels of inequality and deprivation exist within North Ayrshire[31]. Data on IMD in Scotland indicates that of the 186 data zones in North Ayrshire, 52 are in the top 15% most deprived in Scotland[32]. This represents an increase of 19 since the index was first published in 2004. **Figure 17.1** shows that the highest levels of deprivation (in red) in the vicinity of the Site are concentrated in Saltcoats, Ardrossan and Stevenston.

Tourist attractions

17.5.24 North Ayrshire has a range of castles, museums, golf courses and landmarks. Notable tourist attractions within the vicinity of the Site include:

- Hunterston Castle, approximately 0.5 km to the west;
- Portencross Castle, approximately 2.3 km to the south;
- Kelburn Castle, approximately 6 km to the north-east;
- Kirktonhall Sundial Monument, approximately 3.6 km to the south-east;
- Seamill beach, approximately 4 km to the south;

[26] This excludes out of hours service locations and NHS board administration practices that have no registered GPs or patients.
[27] Public Health Scotland (2023) *Dental Practices June 2023* (online). Available at: https://www.opendata.nhs.scot/dataset/dental-practices-and-patient-registrations/resource/ae2b9f9a-bea7-44fd-9408-3c05b940bc1c (Accessed November 2023)
[28] National Records of Scotland (2022). *North Ayrshire Council Area Profile General Practice Workforce Survey 2022* (Online). Available at: https://publichealthscotland.scot/publications/general-practice-workforce-survey/general-practice-workforce-survey-2022/ (Accessed November 2023)
[29] NHS Ayrshire and Arran (2023) *Primary Care development* (Online). Available at: https://www.nhsaaa.net/services/services-a-z/primary-care-development/ (Accessed November 2023).
[30] Calculated from General Practice Workforce Survey 2019 (online) and Scottish Government, *Health Board Area statistics for Ayrshire and Arran*. (Online) Available at: https://statistics.gov.scot/atlas/resource?uri=http%3A%2F%2Fstatistics.gov.scot%2Fid%2Fstatistical-geography%2FS08000015 (Accessed November 2023).
[31] North Ayrshire Health and Social Care Partnership (2018) *Our Strategic Plan: the way ahead 2016-2018* (Online). Available at: https://ihub.scot/media/2031/north-ayrshire-strategic-plan.pdf (Accessed November 2023).
[32] North Ayrshire Council (2022) *Key Facts and Figures* (Online). Available at: https://www.north-ayrshire.gov.uk/council/council-information/key-facts-and-figures.aspx (Accessed November 2023).

- Portencross beach, approximately 2.2 km to the south;
- West Kilbride Golf Links, approximately 2.6 km to the south;
- Little Cumbrae Castle, approximately 2.3 km to the west; and
- Cumbrae Island and the Cathedral of the Isles, approximately 4 km to the north-west.

17.5.25 There are also national trails and walking routes in the vicinity of the Site, including the Ayrshire Coastal Path which is directly adjacent and runs along the western boundary of the Site and Works Area along the coast. This path is recognised as one of Scotland's Great Trails and runs for approximately 160 km between Glenapp in South Ayrshire and Skelmorlie in North Ayrshire[33].

Open space

17.5.26 North Ayrshire has approximately 2,410 hectares of open space, including parks, playing fields and promenades[34]. There are no designated open spaces within the Site that would be directly affected by the Proposed Works or designated open spaces within 2 km that would be indirectly affected by the Proposed Works.

Current baseline: the influence of Hunterston B[35]

17.5.27 HNB has provided long standing and high value employment opportunities within the local and regional area and is a valuable economic asset for the region. It is one of the largest employers in North Ayrshire and one of only 10 large employers in the locality[36]. As of 2021, HNB employed 448 permanent staff with 99% classified as full-time employees (see **Table 17.12**). Over half of these employees have 10+ years' service at the Site. Of these permanent staff, approximately 69% are residents of North Ayrshire and an additional 14% live within the wider Ayrshire region. A further 10% and 7% of the permanent workforce reside in Renfrewshire and Glasgow respectively. As of 2023, the workforce is just less than 400 employees which is taken as the existing level and represents 0.7%[37] of all employment across North Ayrshire.

Table 17.12 Age profile of HNB workforce (2021)

Age band	Percentage of workforce (%)
18 – 30	17
31 – 40	25
41 – 50	21
51 – 60	29
60+	7

[33] North Ayrshire Council (no date) *Path Networks* (Online). Available at: https://www.north-ayrshire.gov.uk/leisure-parks-and-events/outdoor-activities/path-networks.aspx (Accessed November 2023).
[34] North Ayrshire Council, (2016). *Open Space Strategy 2016-2026*. (Online). Available at: https://www.north-ayrshire.gov.uk/Documents/PropertyServices/EnvironmentRelated/open-space-strategy.pdf (Accessed November 2023)
[35] Ekos, NDA and North Ayrshire Council (2021) *Socio-economic impact of the defueling of Hunterston B Nuclear Power Station*. Ekos Limited; Glasgow.
[36] Defined as a company with 250+ employees.
[37] Calculated against the total number of individuals employed across all sectors in North Ayrshire, as shown in **Table 17.6**.

17.5.28 There are approximately 140 permanent core contractors on-site who deliver services from a range of sectors including facilities management, non-destructive testing and mechanical engineering. The residency of contractors is similar to that of permanent EDF employees, with over 60% residing in North Ayrshire and four out of every five living within the wider Ayrshire region.

Future baseline

Local, regional and national picture

17.5.29 Scotland's population has grown since 2018 and continuation of the current trend leads to a 2.5% increase in total population by 2043. In comparison, the regional (Ayrshire) and local (North Ayrshire) populations are in decline and this trend is projected to continue over the course of the Proposed Works. **Table 17.13** shows projections for the next 20 years. The population of working age (16-64) is expected to decline more, as the overall population ages, with a forecasted percentage change of -16.1% in the period 2018 – 2043[38].

[38] National Records of Scotland (2020) *Projected percentage change in population (2018-based), by age structure and Scottish area* (online). Available at: https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-projections/sub-national-population-projections/2018-based (Accessed November 2023).

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Table 17.13 Projected population in North Ayrshire, Ayrshire and Scotland (2018-2043)

Area	Population 2018	Projected Population 2027	Percentage Change (since 2018)	Projected Population 2033	Percentage Change (since 2018)	Projected Population 2043	Percentage Change (since 2018)
North Ayrshire	135,280	131,563	-2.7	128,310	-5.2	122,334	-9.6
Ayrshire	369,670	362,426	-2.0	355,409	-3.9	341,317	-7.7
Scotland	5,438,100	5,529,888	+1.7	5,562,901	+2.3	5,574,819	+2.5

Source: National Records of Scotland[38]

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17.5.30 The Ayrshire Growth Deal[39] was signed in 2020 and is a major 10-year government-backed programme supporting investment and economic growth across Ayrshire. It aims to generate 7,000 jobs while providing support services and investment incentives based on £251m of government funding. It includes a strong focus on manufacturing and skilled employment. The Hunterston Strategic Development Area identified in the Ayrshire Growth Deal includes facilities such as ports, rail and electricity grid connections.

17.5.31 Of 17 named projects, an appreciable number are at or near Hunterston while there are also wider supporting health and community wealth supporting programmes. The UK Government identifies investments[40] including:

- £10 million for the Ayrshire Manufacturing Investment Corridor (AMIC) to establish a new national asset at Kilmarnock which will build on Ayrshire's proud history of manufacturing;
- £5 million for the i3 Irvine Enterprise Area Advanced Manufacturing Space to create a National Digital Processing Industry Hub and advanced manufacturing flexible space;
- £18 million for a Centre for Research into Low Carbon Energy and Circular Economy (CECE) at the Hunterston Strategic West Scotland Industrial Hub;
- £6.5 million in a new International Marine Science and Environmental Centre (IMSE) based at Ardrossan; and
- Other investment planned in the area includes the XLCC cable factory[41].

Hunterston B[35]

17.5.32 As of 2021, HNB employed 448 permanent staff with 99% classified as full-time employees. The employment profile of HNB is expected to change as the station advances with defueling. Defueling will support a range of roles and employment opportunities on-site and within the wider supply chain, with most current employees retaining a role in the process. However, it is anticipated that there will be a reduction in employment opportunities which is a direct reflection of the required workforce and structure to implement defueling. Specifically, with respect to the Applicant's supply chain, it is anticipated that the total capacity and expenditure will reduce to approximately 75% of that at power generation.

17.5.33 While the workforce is expected to reduce from 2023 to 2026, it does not change the number of the workforce that may be released in 2026 as defueling is completed and the Preparations for Quiescence phase begins. Before 2026, an additional 20 workers are forecast to be released. The assessment that follows considers effects from 2026 onwards based on the current number of 400 directly employed workers at HNB.

17.6 Embedded environmental and good practice measures

17.6.1 **Table 17.14** outlines the embedded and good practice environmental measures proposed to reduce the potential effects relevant to people and communities.

[39] UK Government et al (undated). *About the Deal*. (Online) Available at: https://www.ayrshiregrowthdeal.co.uk/about-the-deal/ (Accessed November 2023).
[40] Office of the Secretary of State for Scotland et al (2020). *£251 million Ayrshire Growth Deal signed*. (Online) Available at: https://www.gov.uk/government/news/251-million-ayrshire-growth-deal-signed (Accessed November 2023)
[41] XLCC (2022). *Our mission*. (Online) Available at: https://xlcc.co.uk/ (Accessed November 2023).

Table 17.14 Summary of embedded environmental measures

Embedded Measure	Compliance Mechanism	Embedded or good practice measure
The Applicant as part of its resource planning for decommissioning will: • **Undertake career aspirational discussions with staff;** • **Offer enhanced redundancy packages;** • **Assist workers with necessary retraining to facilitate suitability for decommissioning at HNB roles or alternative roles within the Applicant organisation;** • **Work with third-parties to advertise new opportunities for staff; and** • **Continue to support staff with post employment references for alternative posts.**	EMP	Embedded measure
The NDA and Magnox Ltd operate socio-economic programmes at each of their sites. As part of this programme, Magnox Ltd operates a good neighbour scheme where individual projects up to £2,000 can be supported. In addition, there are the Magnox Ltd and NDA socio-economic schemes for more transformational projects which can see significant multi-year funding made available. A local example was the financial assistance provided to North Ayrshire college for the construction of a new centre to support students in learning construction trades. This was an NDA supported scheme administered by Magnox Ltd. **These arrangements will continue and cover Hunterston B when the site transfers to NDA ownership.**		Embedded measure

17.7 Assessment methodology

17.7.1 The proposed generic project-wide approach to the assessment methodology is set out in **Chapter 5: The EIA process**, and specifically in **Section 5.3** and **Section 5.4**. However, whilst this has informed the approach that has been used in this socio-economics chapter, it is necessary to set out how this methodology will be applied, and adapted as appropriate, to address the specific needs of the socio-economics assessment in the ES.

General approach

17.7.2 Decommissioning is intrinsic to the use of nuclear technology and a process for which operational sites make early plans. While decommissioning of HNB has long been anticipated, the exact timing of events has been subject to some uncertainty. The preparation of this ES reflects the adoption of a more defined timeframe albeit one that can be considered worst-case. Socio-economic impacts are differently influenced by the increased certainty of the decommissioning process and the following are distinguished in the assessment of effects.

- Receptors which would always have been expected to be affected by the effects of decommissioning at some point but did not know when it would occur, such as the local council and the local economy; and
- Receptors which are affected by decommissioning principally as a result of the specific effects of its timing, such as a worker near retirement.

17.7.3 In addition, the assessment takes into account:

- The different possibilities for receptors to mitigate effects; and
- The adoption of a cautious approach to the representation of effects.

Determination of significance

17.7.4 The EIADR recognise that decommissioning will affect different environmental elements to differing degrees and that not all of these are of sufficient concern to warrant detailed investigation or assessment through the EIA process. The EIADR identifies those environmental resources that warrant investigation as those that are "*likely to be significantly affected by the Proposed Scheme*".

17.7.5 The EIADR does not define significance of an effect and it is necessary to state how this will be defined for the EIA. The significance of an effect resulting from a development during construction or operation is most commonly assessed by reference to the importance of a receptor(s) and the magnitude of the change upon such a receptor(s).

17.7.6 With respect to socio-economics, there are no prescribed or established standards against which predicted effects of a development can be assessed. Criteria are typically developed which are appropriate to the circumstances of the development and used to assess significance. The range of types of potential effects may require criteria specific to individual receptors and effects.

17.7.7 The sensitivity of a receptor describes the ability of the receptor to withstand or absorb change within the period of time the effect is expected to occur and without a fundamental change to its character or attributes. The sensitivity of these receptors may depend on their current and future characteristics as well as the nature of the effect, reflecting aspects such as:

- capacity and availability of community resources;
- previous experience of socio-economic change;
- vulnerability from pre-existing social circumstances or health conditions;
- cultural values, including public interest, perceptions towards a risk or potential change, and acceptability;
- environmental vulnerability of habitats important to the socio-economic context (such as degradation of a public park from increased use); and
- the direction, duration and reversibility of the specific impacts.

17.7.8 Criteria for levels of sensitivity are often qualitative because of the diversity of effects and need for subjectivity. With reference to precedents and consideration of local circumstances, the criteria in **Table 17.15** detail the basis for assessing receptor sensitivity.

Table 17.15 Establishing the sensitivity of receptors related to impacts on employment and the economy

Sensitivity	Criteria
High	The area has high levels of unemployment and overall deprivation (ranking in top 10%).
Medium	The area has above average levels of unemployment and above average deprivation (ranking in top 50%).
Low	The area has typical levels of unemployment and deprivation is less than average (ranking below 50%).
Very Low	No discernible change.

17.7.9 The magnitude of change can often be represented with quantitative indicators, such as employment opportunities resulting from the Proposed Works relative to a national average, but other effects may need a semi-quantitative or qualitative approach to account for variation in features such as:

- a more general concept of scale or extent (for example, number of groups and/or people, households or businesses affected; spatial area affected);
- the duration and frequency of effects and whether they are permanent or time-limited (short-term, medium-term or long-term);
- the direction of change and its reversibility; and
- the probability of occurrence.

17.7.10 Criteria for the magnitude of change are informed by local circumstances and features of developments. For employment effects, these include the mix of skills required, workforce demographic characteristics, and commuting distances. Although criteria for socio-economic analysis are often case-specific and qualitative, precedents exist for thresholds of magnitudes of employment and business effects used to assess developments in the power and nuclear sectors. With reference to these precedents and consideration of local circumstances, criteria within the ranges specified in **Table 17.16** and **Table 17.17** are considered relevant.

17.7.11 **Table 17.16** details the basis for assessing magnitude of change for effects related to employment.

Table 17.16 Establishing the magnitude of change for effects related to employment

Magnitude	Criteria for employment	Criteria for Unemployment
Very High (*)	Change of more than 5%, with associated impacts	Change of more than 10%, with associated impacts
High	Change of more than 2-5% compared to baseline	Change of more than 5-10% in claimant unemployed

Magnitude	Criteria for employment	Criteria for Unemployment
Medium	Change of 1 -2% compared to baseline	Change of 5- 10% in claimant unemployed
Low	Change of 0.1-1% compared to baseline	Change of 2.5- 5% in claimant unemployed
Very Low	No discernible change	Change of less than 2.5% in claimant unemployed

(*) Changes would have wider socio-economic effects and require consideration of additional criteria

17.7.12 **Table 17.17** details the basis for assessing magnitude of change for effects related to expenditure and the wider economy.

Table 17.17 Establishing the magnitude of change for effects related to the wider economy

Magnitude	Criteria for effects related to the wider economy
High	Change of more than 2% compared to baseline
Medium	Change of 1-2% compared to baseline
Low	Change of less than 1% compared to baseline
Very Low	No discernible change

17.7.13 In line with the overarching methodology, the combination of sensitivity and magnitude of change is interpreted as a measure of the significance of effects as indicated in **Table 17.18**.

Table 17.18 Significance evaluation matrix

		Magnitude of change				
		Very high	**High**	**Medium**	**Low**	**Very low**
Sensitivity/importance/value	**High**	Major (Significant)	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)
	Medium	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)
	Low	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)
	Very Low	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)	Negligible (Not significant)

17.8 Assumptions and limitations

17.8.1 Assumptions which affect the assessment of the magnitude of employment and related effects are specified and considered in context.

17.8.2 The future transfer of HNB to the NDA to be managed by their subsidiary Magnox Ltd does provide a level of uncertainty. It is therefore the assumption of this assessment that Magnox Ltd will inherit and deliver decommissioning in-line with the description of the Proposed Works outlined in **Chapter 2: The Decommissioning Process**. This assessment assumes therefore that the workforce range assessed herein captures the worst-case scenario for employment change at the Site and subsequent impacts within the scope of this chapter.

17.8.3 A significant proportion of the UK workforce take early retirement with the Liverpool Victoria Wealth and Wellbeing Monitor (a quarterly survey of 4,000 UK adults) reporting that 47% of retirees retired earlier than planned and that one in four retired at least five years earlier than planned[42]. Early retirement is not included in the assessment as information depends on the preferences of individual workers but this could be expected to act to mitigate employment effects identified in **Section 17.10** below.

17.9 Scope of the assessment

Study Area

17.9.1 Socio-economic impacts extend from the level of the impacts on individuals working at Site to the national economy. In general, the wider impacts are less likely to be significant as HNB activities comprise a smaller proportion of overall activity at the national level. Socio-economic effects at local level would arise through changes linked to changes in employment. The nuclear industry requires a skilled workforce and employees at HNB primarily live locally. While the existing workforce reduces through retirement and the effects of employee turnover over time, there are additional reductions required as a result of the changes in activities at the Site due to decommissioning.

17.9.2 The assessment focuses on the proportionate effects of employment using a Study Area which reflects the geography of the 12 postcode districts most affected as they contain the greatest percentage of HNB staff. The assessment sets these and the related economic effects within the geography of the area of North Ayrshire which is considered to provide an appropriate proxy for the wider regional economy. The effects at the level of North Ayrshire also provide a reference for effects at national level, on the basis that if a national level effect was concentrated on a small part of the nation (taken to be North Ayrshire) and is assessed as insignificant, it can be excluded as a significant effect at national level.

Potential receptors

17.9.3 The potential receptors identified that were identified at the scoping stage were the following: as:

- People and communities in the area - who may experience a change related to a resized and reskilled workforce and associated demographic changes. These include

[42] Liverpool Victoria (n.d). *Wealth and Wellbeing Monitor*. (Online) Available at: https://www.lvadviser.com/knowledge-centre/wealth-wellbeing-hub (Accessed November 2023).

effects at the level of the local economy such as public services, housing, land and commercial services.

- Workers at the Site - who may experience a change in levels of demand for employment and/or a change in skills required reflecting the changing employment context associated with decommissioning.
- Employment markets relevant to workers at the Site - as the Proposed Works are likely to initiate a change in employment supply and demand from workers seeking new opportunities and from employers with new skills requirements.
- Businesses in the supply chain for activities at the Site - who may experience changes in demand for services related to activities no longer required at the Site or to new activities required for the Proposed Works.
- New businesses and contracted employment - which can potentially benefit from the skills and personnel made available by changes at the Site.
- Providers of education, training and transitional support services - who may see an increase in demand for reskilling and managing transition.
- Providers of public services - who may experience a change in level or type of demand associated with the changing workforce and demographics.
- The housing market - the net balance between existing workers who take up new opportunities elsewhere that may reduce demand for accommodation, and any demand for accommodation from incoming workers.
- The local economy - which will adjust to a new level of capacity and activity reflecting changes in demographics, employment and industry.
- Residents and visitors to the area - who may experience broader environmental impacts from new activities at the Site, such as from changes to commuting patterns or from change in the structure of local industry.

17.9.4 Impacts on residents and the level of local economic activity are expected to change according to the number of workers released from HNB with metrics for employment and the economy indicating the relative change in magnitudes of effects.

17.9.5 Environmental impacts on residents and visitors will depend on activities from the Proposed Works undertaken at and near the Site and are considered to be related to use of the Ayrshire Coastal Path.

17.9.6 Receptors which are subject to the direct impacts of employment changes and activities near the Site and used in the assessment below of likely significant effects are summarised in **Table 17.19** together with the effects which are related and so are not separately assessed.

Table 17.19 Receptors subject to potential effects

Receptor	Reason for Consideration	Related effects (*)
Employment Market	Travel to work data shows a local employment market based on North Ayrshire where the main effects of HNB workforce changes are likely to occur.	Effects on people and communities in the area are expected to be proportional to impacts on the employment market and the local economy.

Receptor	Reason for Consideration	Related effects (*)
Workers at HNB	The decommissioning of HNB will affect individuals with roles related to earlier phases of operation and are no longer performed on the Site. The health of workers released may be affected.	
The local economy and businesses	The local economy will see effects related to changes in employment and purchasing in local markets; additional services will be required from the local markets; workers released from HNB will become available as part of the supply side of the local economy.	Effects on local supply chains, housing markets, business rates and council taxes are expected to be proportional to effects on the local economy. Effects on providers of education, training and transitional support services are expected to be proportional to effects on the employment market.
Walkers and cyclists using the coastal path near the Site	Activities at the Site require use of Power Station Road which may affect safe use of the Ayrshire Coastal path. Dust and noise emissions from the Works Area may effect the health and wellbeing of users of the Ayrshire Coastal Path.	Effects on tourism and access for amenity purposes. Effects on the health of users of the Ayrshire Coastal Path.

(*) where applicable

Likely significant effects

17.9.7 The likely significant socio-economics effects that are taken forward for assessment in the ES based on consideration of the Proposed Works and the Receptors Subject to Potential Effects (from **Table 17.19)** are summarised in **Table 17.20**.

Table 17.20 Likely significant socio-economic effects

Activity	Effect	Receptors
Change in the activities undertaken at the Site and resulting changes affecting employment markets and the economy	Change in demand and supply of employment and skills available in the area from changes in requirements at the Site, with associated economic impacts	Employment markets; existing workers; local economy and businesses in the supply chain
Economic activity and business opportunities in the local area	Changes at the site may initiate additional economic activity in the area with requirement for labour in existing local supply chains and potentially from new businesses	Employment markets; new businesses; local economy and businesses supplying decommissioning services
Activities at the Site requiring use of Power Station Road which may affect safe use of the Ayrshire Coastal path	A foreman will supervise use of the path during occasional and brief operational activities	Walkers and cyclists using the Ayrshire Coastal Path near the Site

17.10 Assessment of effects

1.1.1 A main indicator of socio-economic effects is the proportional change in employment levels as released HNB workers retire or look for work in local labour markets. People released may also experience further effects individually related to unemployment. The impacts on the economy are assessed in terms of its size at local, regional and national level, while socio-economic effects on recreational users are assessed for people using the Ayrshire Coastal Path.

17.10.1 The current workforce (May 2023) of 400 employees includes a range of occupations that could ultimately be employed a cross a multitude of sectors. This workforce is a small percentage (0.7%) of the working population of 58,700 economically active in North Ayrshire and 5% of the 7,500 employees in the manufacturing and construction sectors.

17.10.2 The Applicant expects that by 2026 the number of workers at HNB will reduce to between 220 and 300 with a corresponding 100 to 180 people (full time equivalent) released from employment compared to levels in 2023. After gradual reduction over the subsequent 11-12 years planned for the Preparations for Quiescence phase, a similar number are likely to be released in 2038, beginning the Quiescence phase, which has 68 years with a negligible workforce. A final phase of 10-12 years is planned for Final Site Clearance with similar activities to those of the Preparations for Quiescence phase and with likely slightly lower workforce requirements.

17.10.3 **Graphic 17.6** shows the age structure of the current workforce and the anticipated levels of future full-time employment at HNB. The employees aged 60+ retire first with the graph showing the corresponding fall of 28 employees from the current value of 400 employees to 372 in 2026, the year that the average member of this group (aged 60-67) retires. By 2026, half this group on average will have retired, reducing the workforce by 14 employees. The subsequent falls reflect the retirement ages for the younger age groups in the current workforce, by 10-year age bands. The overall reduction would be more gradual than the graph which is based on the data available which specifies the average level for each age band.

17.10.4 The green arrows show anticipated workforce levels at the times of the two reductions in workforce, in 2026 and 2038. In 2106 there would be an increase of a similar magnitude followed by a final decrease which are not shown on the graph.

17.10.5 The current number of 400 employees in 2023 is planned to reduce to between 220 and 300 in 2026. As a number, conservatively assumed to be 10 (rather than 14) retire before 2026, the reduction assessed below is of 100-170 employees and occurs in 2026, with a similar reduction in 2038 and the range shown by the dotted section of the arrows.

Graphic 17.6 HNB workforce levels and effects of statutory retirement age

17.10.6 Assuming all workers intend to work until the statutory age for receiving a pension, half (14) of the number in the oldest age group (28) would retire before 2026 and so would be unaffected by the reduction in HNB workforce. The remaining 14 would retire within the next 3-4 years and, assuming they were economically active and wanted a job, would experience a maximum of between zero and 3-4 years of unemployment depending on their age of retiral, if they never worked again.

17.10.7 There are 116 employees in the next age band (51-60) who would all expect to retire over the next 10-year period with an average retiral date of 2035. As of 2023, this group has a currently expected future working life of between 7 to 17 years. This group of people are likely to have substantial experience and are those most likely to consider taking enhanced redundancy terms for early retirement or work offered through wider national or international specialist markets, according to personal circumstances.

17.10.8 The 60+ and 50-59 groups make up 144 employees over age 50 (28 + 116) and is a similar number to the planned workforce reduction of 100-170. The majority of these would be retired at the next planned workforce reduction in 2038 (latest in 2040) at which time the 84 people in the next 10-year age band (41-50) would have an expected future working life of between 3 to 13 years with a similar possibility of taking early retirement according to personal circumstances. The workforce reduction in 2038 would release all remaining employees, all with expected future working lives of more than 13 years.

17.10.9 It would be anticipated that over 55% of the existing workforce would be over 45 (based on the 2021 data outlined in **Table 17.12**) by 2026.

17.10.10 The assessment is based on the first period of workforce reduction, in 2026. It also provides an indication of the magnitude of the similar reduction in 2038 as well as of the minimum magnitude of the increase in employment for the phase of Final Site Clearance, though this too would also eventually end. Recognising their similarity, a change in the number of employees of 100-170 is used for the assessment of the magnitude of each of these impacts, with two reductions, in 2026 and 2038, an increase in 2106, and a final reduction in approximately 2116. The impact in 2026 is likely to represent a worst case amongst these because:

- It is nearest in time;
- Workforce plans for 2026 are dependent on already timetabled transitional agreements between organisations with dates which are unlikely to be changed to mitigate socio-economic impacts;
- Mitigating measures can be implemented only over the 3 years remaining before 2026 rather than over the longer periods that precede other phases; and
- While the overall project life for HNB was always known to require decommissioning at some date, the reduction by 2026 is the first future workforce reduction in the decommissioning plan after defueling.

17.10.11 Successful mitigation of the impacts of the change in workforce numbers is expected to result in an outcome of shorter periods of unemployment for people released from HNB.

17.10.12 The applicant is keen to assist staff and the local community in this transition to a decommissioning workforce. Enhanced redundancy terms will help to soften unemployment and also provide the opportunity for some staff to take early retirement. The applicant is committed to helping staff undertake re-training where necessary to increase their suitability for roles within the HNB decommissioning staff or alternate roles located elsewhere within the applicant's organisation. It will also work with third working parties to help identify and advertise new appropriate opportunities for departing staff.

1.1.2 Shorter periods of unemployment will also be assisted by improvements within the local economy. As such, the future prospects for HNB employees depend on overall economic conditions in North Ayrshire. Significant economic support is already planned for the area under the government £251m Ayrshire Growth Deal which itself will have included the expectation of decommissioning HNB.

17.10.13 Whilst the day to day management of the Site after transfer will be by Magnox Ltd, the HNB site will become part of the NDA estate. The NDA and Magnox Ltd operate socio-economic programmes at each of their sites and are therefore already familiar with the socio-economic challenges in the Hunterston area. There are Magnox Ltd and NDA socio-economic schemes for more transformational projects which can see significant multi-year funding made available. A local example was the financial assistance provided to North Ayrshire college for the construction of a new centre to support students in learning construction trades. This was an NDA supported scheme administered by Magnox Ltd. These arrangements will continue and cover Hunterston B when the Site transfers to NDA ownership and may provide opportunity for reduction in effects of employment change at HNB in the future.

Effects on the employment market

Characteristics of local employment markets affecting resilience and sensitivity

17.10.14 The travel to work baseline data indicates most workers commute to places of employment within North Ayrshire and predominantly use private vehicles. The area covers a variety of rural areas, towns and wider conurbations and has a mixed economy with strengths in industrial and related activities. Manufacturing and construction make up 12.2% and 7.3% of employee jobs respectively compared to 7.6% and 4.9% in Great Britain.

17.10.15 The local employment market of North Ayrshire is more sensitive than the Great Britain average due to the greater dependency on factors related to a dominant (industrial) sector. These include government ambitions and financial support but also uncertainty as significant future programmes such as Hunterston PARC are still at the planning stage.

17.10.16 The high levels of deprivation in the local area affect employment markets as there is less resilience at the household level which increases the pressure to migrate away, reducing the size of the market, and contributes to difficulties accessing employment and acquiring new skills (See **Figure 17.1**). Whilst therefore unemployment in North Ayrshire is marginally less than the national average, it is sensitive to change.

17.10.17 These aspects lead to an assessment of the sensitivity of employment markets as **Medium** at the local and very local level, and as **Low** at regional level (Ayrshire) and above in line with the criteria set at scoping and outlined in **Table 17.17**.

17.10.18 There is also potential for more concentrated effects at smaller communities which hold a greater percentage of the existing HNB workforce than other areas within these local (North Ayrshire) and regional (Ayrshire) level receptors. These are represented by 'postcode districts'.

17.10.19 Of the 400 full time staff currently employed at HNB, 294 reside in the 12 postcode districts listed in **Table 17.21**, amounting to 74% of the total. Assuming that the higher level of change in workforce numbers of 170 people would be distributed according to the same geographic pattern, 125 (74%) would be affected within the same 12 postcode districts. The other 45 staff would be affected across 40 other postcode districts. The 12 postcode districts are those where the proportionate impacts from the change in workforce are greatest. The sensitivity of these postcode districts has principally been set on the basis of their comparison to the national average for unemployment of 3.5%.

Table 17.21 Very local level receptor sensitivity[43]

Postcode district	District	2011 Census – Unemployment (%)	2023 - Unemployment (%)	Receptor sensitivity
KA21	Saltcoats	13.18%	3.73%	Medium
KA30	Largs	9.62%	2.73%	Low
KA23	W. Kilbride	6.09%	1.73%	Low
KA22	Ardrossan	6.07%	1.72%	Low
KA20	Stevenston	15.79%	4.47%	Medium
KA13	Kilwinning	13.22%	3.74%	Medium
KA11	East Irvine	15.71%	4.45%	Medium
KA10	Troon	5.87%	1.66%	Low
KA12	Irvine Centre	7.19%	2.04%	Low
KA3	Kilmarnock	6.30%	1.79%	Low
PA16	Greenock	9.06%	2.57%	Low
KA1	Kilmarnock [C]	8.19%	2.32%	Low

[43] **Table 17.21** is ordered by % of HNB Workers to employed population.

Changes in the employment market at a local and regional scale

17.10.20 The potential reduction in workforce of 100-170 by 2026 amounts to between 0.17% and 0.29% of the economically active population in North Ayrshire. The change in the larger regional employment market of Ayrshire (including North, East and South Ayrshire) is proportionately smaller at between 0.06% and 0.11%. When compared with the criteria for employment in **Table 17.16**, the magnitude of change in North Ayrshire is assessed as **Low**, as it falls between 0.1% and 1%. Within Ayrshire the effect is assessed as **Very Low** with a change below 0.1% identified as not being discernible. The trends in regional and local unemployment in North, East and South Ayrshire and in Glasgow City are shown in **Graphic 17.6**.

17.10.21 In the North Ayrshire local market, change at the higher level of the range (170 staff) is 8.5% of the current level of unemployment of approximately 2,000[44]. The unemployment rate is currently 3.4% but with the reduction in staff from the Proposed Works, the unemployment rate would rise to ~3.7%. Over the last 19 years, the unemployment rate has reached 12.9% (at the time of the 2011 Census) in North Ayrshire corresponding to over 7,000 people out of work, and of which 170 staff would make up 2.4%.

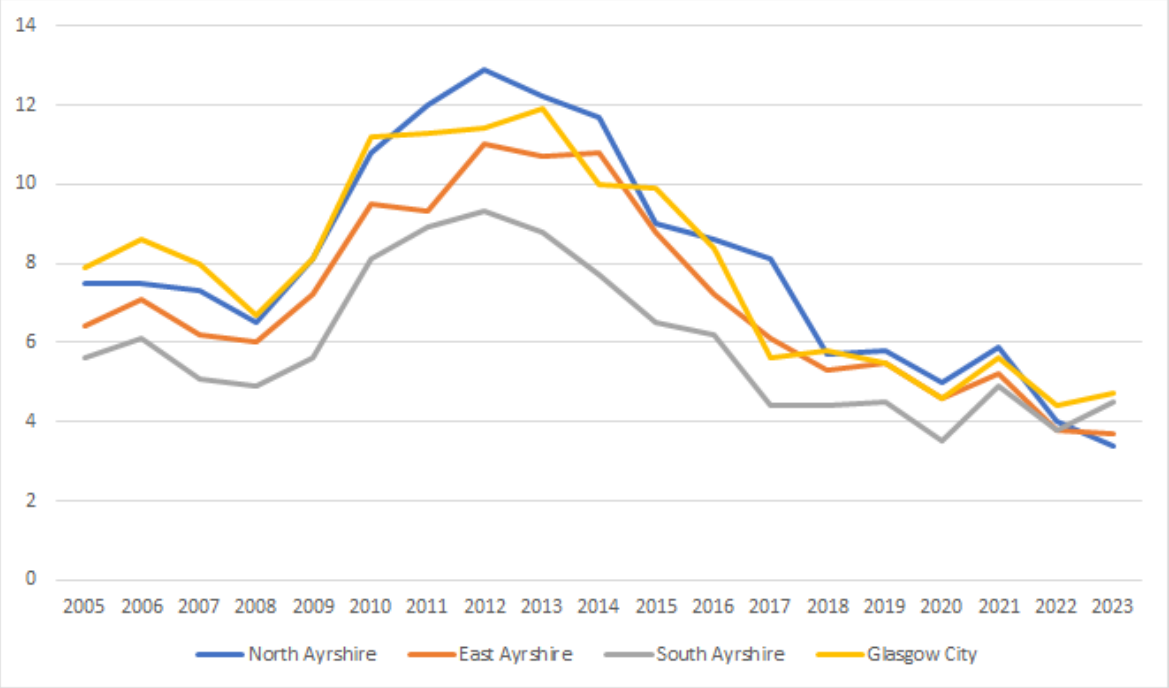
17.10.22 The assessment of a change of 170 workers is a conservative worst case as only 117 workers (69%) of current workers are resident in North Ayrshire. The magnitude of the effect of 117 workers would be 5.9% based on the current level of unemployment and 1.7% based on the level in 2011.

17.10.23 At the level of North Ayrshire, the range of between 2.4% and 8.5% (based on 170 workers) or a range of between 1.7% and 5.9% (based on 117 workers) indicates a magnitude of change related to unemployment which is between **Low** and **Medium**. While the high level of change (8.5%) in the worst case appears greater using the current 2023 figures for worklessness of 2,000 people, the lower level of unemployment in fact indicates a more buoyant market and a greater likelihood of obtaining work. The worst case of 170 staff released can also be compared with the greatest change in unemployment between consecutive years within the 19-year period. **Graphic 17.5** demonstrates this greatest annual change is approximately 1,500, and with the annual migratory flows of approximately 4,000 people in and out of North Ayrshire[45].

17.10.24 At the Ayrshire regional level, the magnitude of change for the worst case is approximately 3 times lower with a range of between 0.8% and 3.1% which is between **Very Low** and **Low**.

[44] Office of National Statistics (2023). *Employment, unemployment and economic inactivity in North Ayrshire*. (Online) Available at: https://www.ons.gov.uk/visualisations/labourmarketlocal/S12000021/ (Accessed November 2023)
[45] 4,340 into NA and 3,540 out in 2020-21 (National Records of Scotland (2022). *North Ayrshire Council Area Profile*. (Online) Available at: https://www.nrscotland.gov.uk/files/statistics/council-area-data-sheets/north-ayrshire-council-profile.html#Migration) (Accessed November 2023).

Graphic 17.1 Unemployment rates in North Ayrshire and nearby regions



Localised effects from changes in employment

17.10.25 As outlined in paragpraph 17.10.21, a change of 125 people would be assumed to lose their current employment at HNB by 2026 within the 12 districts outlined in **Table 17.22**.

17.10.26 **Table 17.23** compares the change in the workforce numbers with the total population, the population of working age (reported in relevant statistical sources as of ages 16-74) and the number in full time employment. The postcode districts are ranked based on the number of HNB employees per head of population so that the district with the greatest impact is in the top row. The last column specifies the impact as a percentage of the numbers of people in full time work in each postcode district. The greatest change is 1.3% in Saltcoats while two other settlements (Largs and West Kilbride) also experience a change of more than 1%. Using the criteria in **Table 17.16**, the magnitude of change at the very localised level would be assessed as **Medium** in these three settlements and **Low** in the other nine.

Table 17.22 Change in HNB workforce compared with localised population indicators

Rank	Postcode district	Settlement	Change in workforce	Population All	*Change as %*	Population Age 16-74	*Change as %*	Population FTEs	*Change as %*
1	KA21	Saltcoats	17	5,801	0.40%	4,311	0.65%	1,343	1.30%
2	KA30	Largs	22	8,296	0.37%	5,801	0.63%	1,852	1.17%
3	KA23	W. Kilbride	11	4,091	0.37%	3,071	0.57%	1,047	1.10%
4	KA22	Ardrossan	19	9,762	0.25%	7,446	0.39%	2,501	0.75%
5	KA20	Stevenston	10	8,450	0.16%	6,241	0.26%	1,950	0.50%
6	KA13	Kilwinning	11	10,460	0.14%	7,836	0.21%	2,966	0.37%
7	KA11	East Irvine	11	11,231	0.12%	8,570	0.18%	3,336	0.32%
8	KA10	Troon	5	10,753	0.06%	8,038	0.10%	2,872	0.18%
9	KA12	Irvine Centre	5	13,213	0.05%	9,747	0.08%	3,181	0.15%
10	KA3	Kilmarnock	5	11,110	0.06%	8,301	0.08%	3,330	0.14%
11	PA16	Greenock	6	18,742	0.04%	13,770	0.06%	5,503	0.10%
12	KA1	Kilmarnock [C]	4	20,191	0.03%	15,042	0.04%	5,780	0.07%
		total	**125**	**132,100**	**0.09%**	**98,172**	**0.13%**	**35,659**	**0.35%**

WSP calculations based on 2011 Census data

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Localised effects from changes in unemployment

17.10.27 The reduction of employment at HNB in 2026 and 2038 at the beginning of the Preparations for Quiescence phase will result in increased unemployment until workers take up opportunities with new employers.

17.10.28 **Table 17.23** and **Table 17.24** show the change in workforce as a percentage of the numbers of unemployed people within the working age population. It includes the same 12 Postcode Districts used above and shows results using both 2011 and 2023 references for comparison. For Saltcoats, the change of 17 currently employed workers has an effect amounting to an increase of 4.1% in unemployment when compared to 2011, but an increase of 14.6% when compared to 2023.

17.10.29 When set in the context of a wider market there is the possibility that workers look for opportunities across a wider geographic region including a number of settlements. If the top four impacted postcode districts comprised an accessible employment area, the increase in unemployment as a percentage change of between 4.9% (based on 2011) and 17.2% (2023) can be compared with the high range of 5-10% for unemployment (see **Table 17.17)**. As the higher estimate of 17.2% change is appreciably greater than this level, as well as individual districts potentially experiencing increases of over 30% change in unemployment, the magnitude of change in these four settlements is considered **Very High**. Such effects are expected when impacts are concentrated within a small area. For the group of twelve districts, the range of between 2.1% (2011) and 7.4% (2023) falls between criteria for a **Low** and **Medium** magnitude of change and will be lower outside the top four. For settlements outside these twelve, the effects will be **Low**.

17.10.30 **Table 17.24** shows the same changes in workforce (e.g. 17 for Saltcoats) expressed as a change in the unemployment rate[46]. Using the 2011 reference, the rate in Saltcoats would rise from 13.18% to 13.83%, an increase of 0.65%. Using 2023, the rate would rise from 3.73% to 4.38%, with the same increase.

17.10.31 The geographical considerations related to the locations and distances of settlements equally affect unemployment with the concentration of impacts likely to lead to effects which are localised. Unemployment is a contributing 'domain' defined within the index of mutiple deprivation (IMD) and a wider determinant of health. It leads to an increasing risk of ill health as the duration of unemployment increases[47]. In aggregate the increase in unemployment due to released HNB workers is not expected to affect the economic and employment conditions related to deprivation locally and effects will fall on workers themselves which are considered as a specific receptor below. Effects on the potentially vulnerable group of dependent children of workers are likely to be low as a large extent of the workers released by 2026 are likely to be older with children now over school age.The geographical considerations related to the locations and distances of settlements equally affect unemployment with the concentration of impacts likely to lead to effects which are localised.

17.10.32 The conditions for future employment will be appreciably enhanced through the Ayrshire Growth Deal which aims to provides employment of a type which is likely to require skills which overlap with the diverse skills of the HNB workforce. The Ayrshire Growth Deal includes clear plans for development nearby at Hunterston as well as supporting health and community programmes which would be applicable to any HNB employees which were released from their current employment.

[46] The headline unemployment rate, a percentage of the economically active population.
[47] Scottish Government (2011). *Social determinants of health, Chief Medical Officer's Report 2011*. (Online) Available at: https://assets.publishing.service.gov.uk/media/5a7b359340f0b66eab99fb88/CMO_Annual_Report_2011_Chapter_4.pdf (Accessed November 2023)

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Table 17.23 Change in HNB workforce compared with localised unemployment indicators (1)

Rank (*)	Postcode district	District	Change in workforce	Unemployed (2011 Census)	*Change as %*	Unemployed (2023 estimated)*	*Change as %*
1	KA21	Saltcoats	17	422	4.1%	120	14.6%
2	KA30	Largs	22	248	8.7%	70	30.8%
3	KA23	W. Kilbride	11	122	9.4%	35	33.2%
4	KA22	Ardrossan	19	631	3.0%	179	10.5%
5	KA20	Stevenston	10	601	1.6%	170	5.7%
6	KA13	Kilwinning	11	507	2.2%	144	7.7%
7	KA11	East Irvine	11	480	2.2%	136	7.8%
8	KA10	Troon	5	305	1.7%	86	5.9%
9	KA12	Irvine Centre	5	796	0.6%	226	2.1%
10	KA3	Kilmarnock	5	354	1.3%	100	4.7%
11	PA16	Greenock	6	586	0.9%	166	3.3%
12	KA1	Kilmarnock [C]	4	915	0.5%	259	1.6%
		Total	**125**	**5,966**	**2.1%**	**1,690**	**7.4%**
		Total (just top 4)	**69**	**1,423**	**4.9%**	**403**	**17.2%**

WSP calculations based on 2011 Census data; (*) Ranking based on HNB employees per head of population; (**) Estimation based on employment rates for North Ayrshire

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Table 17.24 Change in HNB workforce compared with localised unemployment indicators (2)

Rank	Postcode district	District	Change in workforce	Change as % active workforce	2011 - based Unemployment [persons]	2011 - based Unemployment [rate] - before	2011 - based Unemployment [rate] - after	2023 - Unemployment [persons]	2023 - based Unemployment [rate] - before	2023 - based Unemployment [rate] - after
1	KA21	Saltcoats	17	0.65%	422	13.18%	13.83%	20	3.73%	4.38%
2	KA30	Largs	22	0.63%	248	9.62%	10.25%	70	2.73%	3.35%
3	KA23	W. Kilbride	11	0.57%	122	6.09%	6.67%	35	1.73%	2.30%
4	KA22	Ardrossan	19	0.39%	631	6.07%	6.46%	79	1.72%	2.11%
5	KA20	Stevenston	10	0.26%	601	15.79%	16.05%	170	4.47%	4.73%
6	KA13	Kilwinning	11	0.21%	507	13.22%	13.43%	144	3.74%	3.95%
7	KA11	East Irvine	11	0.18%	480	15.71%	15.89%	136	4.45%	4.63%
8	KA10	Troon	5	0.10%	305	5.87%	5.97%	86	1.66%	1.76%
9	KA12	Irvine Centre	5	0.08%	796	7.19%	7.27%	226	2.04%	2.11%
10	KA3	Kilmarnock	5	0.08%	354	6.30%	6.38%	100	1.79%	1.87%
11	PA16	Greenock	6	0.06%	586	9.06%	9.12%	166	2.57%	2.63%
12	KA1	Kilmarnock [C]	4	0.04%	915	8.19%	8.23%	259	2.32%	2.36%
		Total	125							

WSP calculations based on 2011 Census data

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Indirect and induced employment effects

17.10.33 The effects assessed above are 'direct effects' on employment arising from the change in the staff directly employed by the Applicant. There are in addition, 'indirect effects' arising from changes in employment in the supply chains for HNB products and services. A further category of 'induced effects' results from personal spending by HNB and supply chain workers from their salaries. The level of indirect and induced effects is commonly estimated using a factor (a 'multiplier') of the direct effects.

17.10.34 Multipliers for the nuclear industry near Hunterston have recently been used in analysis published by Magnox Ltd in 2022 of the effects of the 141 workers employed at HNA[48]. These provide the basis for the estimation of indirect and induced effects and, together with the direct effects, of a total effect. The multipliers used for HNA are considered appropriate for use in assessing the effects of HNB as the geographic area they cover is effectively the same and the quantitative estimates using them, when scaled to the size of the HNB workforce align with other sources.

17.10.35 Using the multiplier of 1.7 applied by Magnox Ltd for the total level of employment effects within the labour market of North Ayrshire, the 170 potential employment reductions at HNB in 2026 and 2038 are also associated with 99 workers employed indirectly in the supply chain and 24 employed as a result of induced expenditure, to give a total of 293. While the 170 employees make up 0.29% of the economically active workforce in North Ayrshire, the additional 123 employees make up an additional 0.21% to give a total of 0.5% of the North Ayrshire workforce being affected by the change in employment at the Site. In addition, new contracted employment is expected to be required at the Site. When compared to the criteria for employment (See **Table 17.16**), the total (including all direct, indirect and induced) effects are at a **Low** magnitude compared to local markets.

17.10.36 The nuclear industry uses capital-intensive specialised equipment and processes and does not require a large tonnage of fuel or other commodities. The supply chain used by HNB is predominantly based on the use of technical design and engineering services which are used more widely across the UK nuclear industry and are supplied in a national market. As such, the indirect supply chain effects from the changes at HNB are likely to be distributed and so will not have the same concentrated local impact as seen for the direct effects. Using the same multipliers as in the HNA analysis, the overall effect at national level is 598 employees, with 170 resulting from direct effects, 244 from indirect, and 184 from induced effects. These amount to negligible percentages at national level. The difference in totals for the national impact of 598 employees and the impact in North Ayrshire of 293 employees indicates that indirect supply chain and induced effects are not geographically concentrated in the same way as for direct effects.

17.10.37 The timetable for decommissioning and the expected effects are likely to have been clear to the companies and people working in the supply chain as the required expenditure programmes are decided appreciably in advance. The fuel (uranium) is purchased on timescales reflecting a fuel cycle which includes a known decommissioning plan and does not include recent orders. Operations and maintenance programmes are closely linked to the fuel cycle and have a similarly anticipated purchasing programme. These factors will reduce the effects in the supply chains. Additionally, HNB is part of a fleet of Advanced Gas Reactors in the UK. Four of these are still generating with the earliest of these not anticipated to end generation until 2026 which will then be followed by a period of defueling, whilst other sites at Hinkley Point B and Dungeness B are at an earlier stage of

48 Magnox Ltd (2022). *Magnox Economic Impact Assessment*. (Online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1106369/Magnox_economic_impact_assessment_2022.pdf (Accessed November 2023).

defueling than HNB. Due to this anticipated demand, the supply chain for the UK nuclear industry is unlikely to be appreciably affected by the changes at HNB.

Effects from change in use of contracted employment (contractors)

17.10.38 There is widespread use of contractors in the nuclear industry, primarily to meet specialised needs and shorter fixed term requirements. The socio-economic impact of contractors differs from full time employees, as it varies according to the type of work contracted. In general, the use of contractors provides additional employment at a particular site such as HNB, but the variety of work and skills required means that individual contractors are likely to be temporarily required and temporarily resident within the area local to the Site. Contractors at HNB will expect to be contracted for a finite period of work and then to look for work within a wider market. As this situation does not change with the changes at HNB, the effects on contractors currently working on contracts already agreed is considered to be immaterial and are considered negligible. There is a effect from the additional contracts which are required as a result of the decommissioning programme which is expected to increase the numbers of contractors on-site compared to the baseline dependent upon the proposed works on-site at given periods. This effect is not assessed quantitatively but considered to be substantially smaller than the direct effects and positive in adding to local employment opportunities. The overall effect on contractors is expected to reflect no change.

17.10.39 The magnitude of change on contractors is assessed as **Very Low,** as conditions for contracted employment are not anticipated to change substantially.

Summary of Effects on Employment Markets

17.10.40 Local employment markets reflect the regional economic structure with higher representation of industrial and construction sectors and lower than average levels of diversity. These employment markets will experience planned transition and will be enabled by new government funding, principally through the Ayrshire Growth Deal, over the next 10 years. These aspects lead to an assessment of the sensitivity of employment markets as **Medium** at the local and very local level, and as **Low** at regional level and above.

17.10.41 Employment markets near HNB include significant proportions of people who live and commute to work in the local area and where effects on employment are also indicative of the levels of relative change in related socio-economic impacts. The magnitude of change is **Low** for effects of HNB workforce changes by 2026 in the local (North Ayrshire) employment market. At the regional (Ayrshire) and national level, the magnitude of change is **Very Low** (negligible). At the very local level, individual settlements, as well as the combined group of the top four settlements, may experience a magnitude of change across a wide range up to **Very High**, depending on the prevailing level of unemployment, when compared using quantitative criteria (See **Table 17.16**).

17.10.42 In summary, at the very local level, the effects of the staff reductions at HNB on very local level employment markets for the 4 settlements of Saltcoats, Ardrossan, West Kilbride and Largs are assessed as adverse and **Major (Significant)** . Noting the quantitative influence of the high level of effects in the top four districts, the assessment based on a typical district across the group of twelve most affected districts is assessed as adverse and **Minor (Not Significant)**. For the local North Ayrshire market and wider regions, effects would be considered as adverse and **Minor** or **Negligible (Not Significant)**. Including indirect and induced effects does not alter the assessment, primarily as they are not concentrated locally.

Effects on staff released from the HNB workforce

Characteristics of HNB staff affecting resilience and sensitivity

17.10.43 The HNB staff who are released are likely to have been in employment for an appreciable period and to have experienced stable residential and financial circumstances arising from the long-term planning and operations required in the nuclear sector. HNB workers have skills and recent experience relevant to local opportunities enabled by the Ayrshire Growth Deal as well as access to a network of relationships including support through transition from the Applicant as outlined in **Table 17.14**. An appreciable proportion of the workforce are nearing retirement and national trends indicate that more workers are retiring earlier than the retirement age. These aspects indicate that these workers have a higher than average level of resilience to a change in employment. The high levels of deprivation in the local area (See **Figure 17.1**) may reduce aspects of this resilience and the overall sensitivity of HNB workers is assessed as **Medium**.

Economic effects on released HNB staff

17.10.44 The opportunities for the workforce released from HNB depend on access to local and wider labour markets. The wider nuclear sector is expected to continue to require a sizeable workforce at various locations in the UK and HNB employees would have skills and experience likely to be relevant if they chose to take up opportunities outside the area local to HNB.

17.10.45 On the assumption that the released employees would look for work within the local area and would not form part of the migratory flows leaving the region, they would participate in the local North Ayrshire employment market as assessed above. Workers at HNB are likely to have skills and suitability for a range of employment roles in the wider employment market across employment sectors such as:

- Managers, Directors & Senior Officials;
- Associate Professional & Technical;
- Administrative & Secretarial;
- Skilled Trades Occupations; and
- Process Plant & Machine Operatives.

17.10.46 Whilst availability of these types of roles in North Ayrshire and the wider commuting zone has not been analysed for this assessment, the baseline data presented in **Section 17.5** does not indicate a significant lack of these types of roles in the North Ayrshire and Ayrshire regions currently compared to the National average. This indicates that there will be availability of roles suitable for HNB workers who have left employment by the Site via natural employment churn.

17.10.47 The Applicant has implemented a programme of career aspiration meetings with staff in recent years to address employment prospects in the longer term in the wider market and transitional career pathways to work as HNB decommissioning staff, along with supporting training requirements.

17.10.48 Taking into account the range of determinants and possible personal alternatives, the magnitude of change for economic effects on released workers is assessed as **Medium**.

Effects on health of workers released from HNB

17.10.49 The relationships between health and work are referenced across multiple government documents and the supporting evidence base[49]. They cover both the effect of ill-health on employment prospects and the effect of employment on health.

17.10.50 The sources of evidence are often based on the link between ill-health and indices of deprivation calculated locally for geographic areas. As such they represent the general characteristics of the area rather than specific groups of individuals within that area (See **Figure 17.2**). Also, the more specific research is often focused on the characteristics of existing out-of-work groups rather than on the effects on groups currently in-work.

17.10.51 The health effects of unemployment have been academically assessed with a wide range of research perspectives. One reference specifically identifies key determinants as being the duration for which an individual is out of work and the period between the unemployment and the onset of related health conditions[50]. Ischaemic heart disease is specifically quoted as related to employment and levels for this condition are high for North Ayrshire (see **Figure 17.2**).

17.10.52 In the case of HNB staff, people over 50 years of age will have substantial experience relevant to work in wider national or international specialist markets, but are also in the group where personal circumstances may most allow early retirement. The effect is seen at national level where the employment rate for over 50s in Scotland is 68.1% in 2021, compared to 83.0% for 35-49 year olds[51].

17.10.53 Statistics on the duration of periods of unemployment are only available at national level. For Scotland, in 2021, 52% of unemployed people were out of work for less than 6 months, while 18% of people were unemployed for 6-12 months, 16% for 12-24 and 15% for more than 2 years[51]. These proportions may have significant variation at the detailed geographic level but provide a general indication that longer periods of unemployment are likely for an appreciably smaller proportion of affected workers. While being potentially older, HNB workers have experience and references which will enhance job prospects and are likely to lead to shorter periods out of work.

17.10.54 The effects on health are expected to be related to a period of unemployment for individuals which have also experienced stable and secure employment working at HNB. The Stevenson/Farmer review from UK government[52] identifies Employment and Support Allowance claims with mental health as the primary condition in the assessment of "*Lost output due to worklessness*".

17.10.55 While quantitative assessment is difficult, the physical heath effects on workers released from HNB are expected to be limited as the period of unemployment is expected to be an interruption to a longer period of stable employment which is beneficial to health rather than a long-term condition associated with poorer health overall. Effects on mental health are possible due to the known links with worklessness, but will vary by the individual and

[49] For example, see: Public Health England (2019). *Health matters: health and work* (Online) Available at: https://www.gov.uk/government/publications/health-matters-health-and-work/health-matters-health-and-work (Accessed November 2023).

[50] Forbes, J & McGregor, A (1984) *Unemployment and mortality in post-war Scotland* (Online) Available at: https://www.sciencedirect.com/science/article/abs/pii/0167629684900134 (Accessed November 2023).

[51] Scottish Government (2022). *Scotland's Labour Market: People, Places and Regions – Protected Characteristics. Statistics from the Annual Population Survey 2021* (Online) Available at: https://www.gov.scot/publications/scotlands-labour-market-people-places-regions-protected-characteristics-statistics-annual-population-survey-2021/pages/6/ (Accessed November 2023).

[52] Scottish Government (2017). *Thriving at Work: The Independent Review of Mental Health and Employers*. (Online) Available at: https://assets.publishing.service.gov.uk/media/5a82180e40f0b6230269acdb/thriving-at-work-stevenson-farmer-review.pdf (Accessed November 2023).(See Annex C: Analytical evidence and Methodology)

their circumstances. The magnitude of change on the health of released workers and on the associated need for health service provision is assessed as **Low**.

17.10.56 Greater availability of jobs that may arise through the delivery of the Ayrshire Growth Deal are likely to reduce the potential for these effects through the stimulation of the employment market and associated greater employment opportunities.

Summary of effects on workers at HNB

17.10.57 The overall effect on Workers at HNB recognises that while the average employee is likely to have experienced a better quality of life than many people living in the same communities and has skills and experience of high relevance to future opportunities supported by the Ayrshire Growth Deal and in the wider labour market of North Ayrshire, the local socio-economic conditions include a range of challenges which add to the vulnerability of employees who are released, particularly regarding mental health.

17.10.58 The conclusion is that the Workers at HNB are a receptor with a sensitivity which is assessed as **Medium** and experience a magnitude of change relating to economic effects which is **Medium** and magnitude of change relating to health effects which is **Low.** The combined effects on Workers at HNB are effects which are conservatively assessed as **Adverse** and **Moderate (Likely Significant)**.

Effects on the local economy and businesses

Characteristics of the local economy and businesses affecting resilience and sensitivity

17.10.59 From the perspective of the local economy, the North Ayrshire market is of appreciable size and diversity and has a population of over 130,000 people. The long-term planning required in the nuclear sector gives early indications to companies in the supply chain and informs business expectations leading to mitigation of overall economic effects.

17.10.60 The Local Economy is conservatively assessed as of **Medium** sensitivity primarily as a result of the underlying conditions of deprivation (See **Figure 17.1**) which are a reason for the establishment of the Ayrshire Growth Deal, together with the potential effects of the Ayrshire Growth Deal itself.

Economic impacts

17.10.61 The main economic impacts are proportionate to changes in employment but result in an effect which is small in percentage terms because of the markets being larger and less localised than the employment markets at the level of settlements.

17.10.62 The main impacts of HNB on the local economy are related to the participation of the workforce in the purchase of local goods and services and the participation of HNB through supply chain purchases. In general, a larger workforce contributes a greater economic effect (greater added value) to the economy with the effect scaling directly with the number of people in employment. These effects can be represented using a similar method as employment based on multipliers.

17.10.63 Because the economy includes purchases from individuals additional to the full-time employees used to assess direct and indirect employment effects (such as part time employees, retired people and people receiving benefits), the effects on the economy, as a percentage change, will be at a lower overall level than the effects seen for employment. Furthermore, while the direct effects on employment are presented above for postcode districts, the local economy operates at a wider geographic scale as businesses typically have larger catchments than a single postcode district.

17.10.64 Using the corresponding multipliers as used in the recent Magnox Ltd work[48] the impact of the reduction of 170 employees at the Site leads to a direct effect on the economy in terms of gross value added (GVA) of approximately £11m, with indirect and induced effects of £6m at the level of North Ayrshire and £22m at national level. The total GVA effect is £17m at the North Ayrshire level and £33m at national level. For North Ayrshire, the £17m makes up 0.7% of the total GVA, with 0.4% due to direct effects.

17.10.65 Businesses that serve the personal requirements of employees will be partially subject to the same uncertainty as employees regarding the timescales for decommissioning, but will also continue to meet the needs of residents regardless of their employment status.

17.10.66 Businesses in the supply chain for HNB which are established and are expecting to endure are likely to have anticipated the need to adjust to a change in HNB purchasing despite not knowing exactly when it would occur. However, as purchasing in the nuclear sector has to meet long term planning needs, suppliers are likely to have experienced advance indications of change which enhances their ability to plan for any effects.

Effect on local council business rates

17.10.67 Local authority receipts and spending form part of the local economy which is affected by changes in employment status of local residents as well as potentially by changes in local business rates.

17.10.68 The levels of council tax paid by employees and business rates are estimated in the work for Magnox Ltd on HNA[48]. Council tax is not paid by people who are unemployed and this effect is valued as £157k for the 170 people released from HNB, assessed on a pro-rata basis to the effect estimated at HNA.

17.10.69 The level of business rates is established by the Ayrshire Valuation Joint Board and is estimated as £403k for HNA. The HNA site is larger at 36 hectares[53] compared to approximately 30 hectares for HNB, but generated about one quarter of the electrical output. While both sites no longer generate electricity, they are still operating as industrial premises. Business rates are expected to reflect the size of the Site, its use and the level of turnover.

17.10.70 Using the precedent of HNA and allowing for the Site areas being of equivalent size and a higher workforce number of 400 employees at HNB compared to 141, an effect of £1.5m is made for HNB. However, the reduction in local government receipts would be less than this as a proportion would continue to be paid reflecting the level of activity. Furthermore, the local council would have expected decommissioning to lead to a reduction in revenues from a change in business conducted at the Site, as expected in the Ayrshire Growth Deal, and is in a position to mitigate effects through contributing to the development of local business activity.

Summary of effects on local economy and businesses

17.10.71 The overall effects on Local Economy and Businesses mainly follow from and are proportional to changes in employment but occur within a market of an appreciably greater size while the long-term planning required in the nuclear sector gives early indications to companies in the supply chain and will mitigate overall economic effects. Similarly, the effects on local taxes are expected and understood by public bodies and other organisations. Developments planned under the Ayrshire Growth Deal are complementary to the changes anticipated at the Site and have the potential to contribute to greater overall activity within local markets North Ayrshire. As such, effects on other

53 NRSSG (n.d). *Hunterston Site.* (Online). Available at: https://nrsssg.com/site/hunterston-a/ (Accessed November 2023).

parts of the local economy, such as housing and the provision of services such as education and health is not expected to be appreciably affected.

17.10.72 The quantitative criteria for the wider economy indicates that the magnitude of change of 0.7% is less than the 1% indicating a low effect. The Local Economy is conservatively assessed as of **Medium** sensitivity primarily as a result of the underlying conditions which have led to the establishment of the Ayrshire Growth Deal, together with the potential effects of the Ayrshire Growth Deal itself.

1.1.3 The conclusion is that the Local Economy and Businesses are a receptor with a sensitivity which is assessed as **Medium** and experience a magnitude of change which is **Low** and results in **Minor** (**Not Significant**) effects.

Effects on walkers and cyclists using the coastal path near the Site

Characteristics affecting resilience and sensitivity of walkers and cyclists using the coastal path near the Site

17.10.73 The users of the Ayrshire Coastal Path are a receptor with appreciable sensitivity to activities at the Site as the path forms part of a continuous long distance trail as well as being part of the recreational facilities accessible to people in an appreciable number of towns and other settlements in the area. The sensitivity of Walkers and cyclists using the coastal path near the Site is assessed as **High**.

Effects from activities on the Site

17.10.74 Public access along the Ayrshire Coastal Path near the Site will be maintained throughout all phases of the Proposed Works. The onshore elements of the Proposed Works predominantly take place within the boundaries of the Nuclear Site Licence boundary while the marine elements of the Proposed Works are predominantly to the seaward of the path. The path is located along the route to and from the site to the marine decommissioning area. However, the marine elements of the works are temporary and comprise a small part of the total programme of the decommissioning works at HNB. During this time, the Ayrshire Coastal Path will remain open and accessible, with a foreman provided when necessary to ensure the safety of members of the public using the path. The magnitude of change is assessed as **Very Low**.

17.10.75 The Largs to Portencross section of the Ayrshire Coastal Path is routed along the coastline, travelling north from Largs. The route passes Portencross Woods SSSI and joins Power Station Road from the HNB jetty, passing between the HNA Offices and HNA and the Site, travelling north. The Ayrshire Coastal Path continues along Power Station Road, with Southannan Sands SSSI to the north/west. Users of the Ayrshire Coastal Path are ‘transitory’ receptors, that will not experience the same magnitude of impact when compared with those at specific fixed locations. In this context, the wider effects of the Proposed Works associated with dust deposition are assessed on human and ecological receptors in **Chapter 6: Air Quality** and are concluded to be negligible with the application of standard mitigation measures, as included in the EMP. Similarly, the risk of increased accidents and increases in fear/intimidation of pedestrians, is outlined in **Chapter 16: Traffic and Transport** and concluded a Minor (not significant) effect. **Chapter 15: Noise and Vibration** identifies that when good practice measures to control noise are implemented, no significant effects would be experienced by receptors in the vicinity of the Proposed Works.

Summary of effects on walkers and cyclists using the coastal path near the Site

17.10.76 The users of the Ayrshire Coastal Path while considered a receptor with appreciable sensitivity, are unlikely to be inconvenienced by the development due to the intention to maintain public access throughout the development phases.

17.10.77 The conclusion is that walkers and cyclists using the coastal path near the Site are a receptor with a sensitivity which is assessed as **High** but will experience a magnitude of change which is **Very Low** and results in **Minor** (**not significant**) effects.

17.10.78 Users of the path could also be considered as receptors for potential health effects. As outlined in **Chapter 6: Air Quality** and **Chapter 15: Noise and Vibration**, effects on receptors in proximity to the Ayrshire Coastal Path are considered negligible. In conclusion, the transitory nature of use of this path, would represent a **Very Low** to neutral magnitude of change, which would result in **Minor**/ neutral effects on health of users, that is concluded to be **Not Significant**.

17.11 Assessment of cumulative effects

Inter-project effects

17.11.1 The HNA site is undergoing decommissioning with a current published schedule of changes that do not coincide with those at HNB. The decommissioning schedule at HNA indicates entering into Care and Maintenance (Magnox Ltd' terminology for 'Quiescence') in approximately 2030. This programme would be likely to lead to a substantial reduction in the 141 employees currently employed at the Site[54] approximately four years after the workforce reduction at HNB in 2026. Magnox Ltd may also choose to adopt more gradual workforce changes in line with a potential lengthening of their programme. 85% of people in Scotland find work within 2 years[51], a percentage likely to apply to the HNB workers and so the cumulative effects from HNA reductions are expected to be minimal. The workforce reduction at HNB in 2038 also does not coincide with the subsequent Final Site Clearance for HNA which is intended for a 10-year period beginning in approximately 2080 and overlaps with the Quiescence phase for HNB. As such no cumulative effects are anticipated as a result of HNA.

17.11.2 The conditions for future local employment are appreciably enhanced through the Ayrshire Growth Deal (AGD) which has clear plans for development nearby at Hunterston with a number of projects likely to offer employment of types which overlap with the skills and experience of the HNB workforce. The Ayrshire Growth Deal also plans to provide supporting health and community programmes which would be applicable to any HNB employees which were released.

17.11.3 At the level of the nuclear industry, the NDA Local Social and Economic Impact Strategy is effectively a project which runs alongside nuclear decommissioning work in the UK and provides further cumulative benefits in terms of community and employee support.

17.11.4 At national level, NPF4 explicitly identifies Hunterston as a strategic development area and supports future development at the Site which is ideally located for workers resident at locations used by HNB staff. The plans and activities in the area are expected to produce positive cumulative effects which have not been further assessed.

[54] See Figure 4: *Projected Site Activity* in: Economic Insight (2022). *Updated economic impact assessment of Magnox sites*. (Online) Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1106369/Magnox_economic_impact_assessment_2022.pdf (Accessed November 2023).

Intra-Project Effects

Disturbance, nuisance and health effects from Site activities

17.11.5 There are no anticipated cumulative significant effects for receptors overlapping with other environmental aspects. The same receptors in close proximity to the Works Area may experience dust, noise disturbances. The assessments within **Chapter 6: Air quality** and **Chapter 15: Noise and vibration** respectively conclude that no significant effects would be experienced at these receptors when suitable mitigation measures are applied to working practices on site. Health impacts are not associated with the local communities outside of the HNB Worker receptor group as defined in this assessment and intra-project effects are therefore considered **Not Significant**.

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17.12 Summary

Table 17.25 Summary of socio-economic effects

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor	Magnitude of Change	Significance	Summary of Rationale
Employment Market	There are concentrated effects on employment in settlements of Ardrossan, Largs, Saltcoats and West Kilbride which have challenging socio-economic conditions and travel to work constraints. Within wider local and regional geographies effects are not likely to be noticeable.	Very Local Level - **Medium** Local Level - **Medium** Regional Level and above - **Low**	Very Local Level - up to **Very High** Local Level - **Medium** Regional Level and above - **Low**	Very Local Level - **Adverse and Major (Significant)** Local Level - **Adverse and Minor (Not Significant)** Regional Level and above - **Adverse and Minor/Negligible (Not significant)**	The HNB workforce predominantly lives locally and local employment markets will see a transition with potential growth in demand from opportunities from the Ayrshire Growth Deal. Negative impacts from loss of employment will occur in 2026 and 2038 during the phase “Preparations for Quiescence”, with positive impacts from new employment in 2106 for Final Site Clearance and a negative impact in 2116 at Project end.
Workers at HNB	Workers may experience variable periods of unemployment and associated mental health impacts, while some may take early retirement. Workers have skills likely to be relevant to growth	**Medium**	Economic effects - **Medium** Health effects - **Low**	**Adverse and Moderate** (**Likely Significant**)	Employee household resilience and health is likely have benefited from stable employment. Employees are skilled and experienced and may have the option of early retirement according to personal circumstances.

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor	Magnitude of Change	Significance	Summary of Rationale
	under the Ayrshire Growth Deal.				
The local economy and businesses	Economic impacts are closely aligned with changes in employment and occur at the same times in the Project phases.	**Medium**	**Low**	**Minor (Not significant)**	The North Ayrshire market is of appreciable size and diversity and economic agents have appreciable information about schedules and have time to plan for change.
Walkers and cyclists using the coastal path near the Site	Users of the Ayrshire Coastal Path will pass close to the Site throughout all phases.	**High**	**Very Low**	**Minor (not significant)**	Public access along the Ayrshire Coastal Path near the Site will be maintained throughout all phases with work taking place within defined areas onshore and offshore.

18.

Major Accidents and Disasters

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18. Major Accidents and Disasters

18.1 Introduction

18.1.1 This chapter of the ES assesses the likely significant effects of the Proposed Works arising from the potential for Major Accidents and Disasters (MA&D), and in the context of the Indicative Dismantling Works Area (hereafter referred to as 'the Works Area'). The chapter should be read in conjunction with the description of the Proposed Works presented in **Chapter 2: The Decommissioning Process**.

18.1.2 A Scoping Report was submitted to the ONR on 01 August 2022 which included an initial assessment of the potential for significant effects arising from MA&D. This process evaluated and identified the scenarios which had the potential for significant effects, and set out the proposed methodology to assess them. The Scoping Report was reviewed by the ONR and other stakeholders, and in their Pre-Application Opinion (included in **Appendix 5A**), the ONR agreed to the proposed scope and approach for the completion of the EIA and ES.

18.1.3 As Hunterston B (HNB) is managed under strict regulatory regimes which will control almost all the activities in the Works Area, only a small number of potential effects and activities were scoped into the assessment. These relate to potential Major Accident or Disaster Scenarios which are outwith the scope of the regulatory regimes. It should be noted that all accidents involving radiological hazards are scoped out as they are deemed to be regulated under the provisions of the Nuclear Site License and permitting regime.

18.1.4 The Scoped in scenarios are:

- Major accidents associated with the Proposed Works resulting from a fire/explosion and caused by accidental release of substances not regulated under The Control of Major Hazards Regulations 2015 (COMAH)[1], or when HNB is no longer regulated under COMAH.
  Major accidents associated with the Proposed Works resulting from an accidental release of a hazardous chemical not regulated under COMAH or firewater run-off contaminated with non-COMAH Dangerous Substances, or when HNB is no longer regulated under COMAH.
- Major accident i.e., environmental release of a substance which is not regulated under COMAH or an accident that occurs when HNB is no longer a COMAH Establishment;
- Major accidents caused by physical effects associated with the Proposed Works, (structural collapse, impact, dropped or swung load, high energy pipe/equipment failure, collapse of excavation);
- Natural disasters where the Proposed Works have a material effect on the extent and severity of the disaster; and
- Major accidents caused by events external to the decommissioning process and where the Proposed Works have a material effect on the extent and severity of the accident: This includes aircraft crash, projectiles, domino effects from an industrial accident in the vicinity, and loss of key utility (power supply, water supply) etc; This excludes security, cybersecurity and malicious acts.

[1] UK Government (2015). *The Control of Major Accident Hazards Regulations 2015* (Online) Available at: https://www.legislation.gov.uk/uksi/2015/483/contents/made (Accessed November 2023).

18.2 Relevant legislation, policy and technical guidance

Legislation

18.2.1 The legislation presented in **Table 18.1** is relevant to the assessment of the effects on major accidents and disasters receptors:

Table 18.1 Legislation relevant to major accidents and disasters

Legislation	Legislation Issue
Health and Safety at Work (etc) Act 1974 (HSAW)[2] and regulations made thereunder including: • **Lifting Operations and Lifting Equipment Regulations 1998 (LOLER)[3]** • **Provision and Use of Work Equipment Regulations 1998 (PUWER)[4]** • **The Management of Health and Safety at Work Regulations 1999 (MHSAW)[5]** • **The Control of Substances Hazardous to Health Regulations 2002 (COSHH)[6]** • **The Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002[7]** • **The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009[8]** • **The Control of Major Accident Hazards Regulations 2015[9]** • **The Construction (Design and Management) Regulations 2015 (CDM)[10]** • **Nuclear Industries Security Regulations 2003 (as amended 2017)[11]**	HSAW and the associated regulations represent the baseline regulatory environment for workplace activities. Together they form the regulatory requirements for workplace Health, Safety and Security in the UK Nuclear Industry. These requirements drive the baseline standards for good practice and mitigation.

[2] UK Government (1974). *Health and Safety at Work etc. Act 1974* (SI 1974/C.37). (online). Available at: http://www.legislation.gov.uk/ukpga/1974/37/contents (Accessed 10 August 2023).
[3] UK Government (1998). *The Lifting Operations and Lifting Equipment Regulations 1998* (SI 1998/C.66). (online). Available at: http://www.legislation.gov.uk/uksi/1998/2307/contents/made (Accessed 10 August 2023).
[4] UK Government (1998). *The Provision and Use of Work Equipment Regulations 1998 (SI 1998/2306).* (online). Available at: http://www.legislation.gov.uk/uksi/1998/2306/contents/made (Accessed 10 August 2023).
[5] UK Government (1999). *The Management of Health and Safety at Work Regulations 1999 (SI 1999/3242).* (online). Available at: http://www.legislation.gov.uk/uksi/1999/3242/contents/made (Accessed 10 August 2023).
[6] UK Government (2002). *The Control of Substances Hazardous to Health Regulations 2002 (SI 2002/2677).* (online). Available at: http://www.legislation.gov.uk/uksi/2002/2677/contents Accessed 10 August 2023).
[7] UK Government (2002). *The Dangerous Substances and Explosive Atmospheres Regulations 2002 (SI 2002/2776).* (online). Available at: http://www.legislation.gov.uk/uksi/2002/2776/contents (Accessed 10 August 2023).
[8] UK Government (2009). *The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009*. (online). Available at: https://www.legislation.gov.uk/uksi/2009/1348/contents/made (Accessed 10 August 2023).
[9] UK Government (2015). *The Control of Major Accident Hazards Regulations 2015 (SI 2015/483).* (online). Available at: https://www.legislation.gov.uk/uksi/2015/483 (Accessed 10 August 2023).
[10] UK Government (2015). *The Construction (Design and Management) Regulations 2015 (SI 2015/51).* (online). Available at: http://www.legislation.gov.uk/uksi/2015/51/contents (Accessed 10 August 2023).
[11] UK Government (2003). *The Nuclear Industries Security Regulations 2003*. (online). Available at http://www.legislation.gov.uk/uksi/2003/403/contents/made (Accessed 10 August 2023).

Legislation	Legislation Issue
• **The Ionising Radiation Regulations 2017 (IRR)[12]** • **The Carriage of Dangerous Goods (Amendment) Regulations 2019 (CDG19)[13]** • **The Radiation (Emergency Preparedness and Public Information) Regulations 2019 (REPPIR)[14]**	
The Nuclear Installations Act (NIA) 1965 (as amended)[15]	The NIA provides the nuclear site licensing regime which requires operators to comply with various license conditions as set by the Office for Nuclear Regulation (ONR).
Civil Contingencies Act 2004 (CCA)[16] and The Civil Contingencies Act 2004 (Contingency Planning) (Scotland) Regulations 2005[17]	The CCA and associated regulations provide the requirements for emergency responders to have appropriate risk assessments and contingency plans for foreseeable emergency scenarios in their area including Major Accidents and Disasters.
Fire (Scotland) Act 2005[18]and The Fire Safety (Scotland) Regulations 2006[19]	These items form the requirements for building fire safety in Scotland. They represent the baseline standard required to be achieved for all qualifying structures which are applicable to the Proposed Works.
The Energy Act 2013[20]	The Energy Act creates and empowers the ONR as the primary regulator of safety and security in the UK with respect to nuclear facilities.
The Town and Country Planning (Hazardous Substances) (Scotland) Regulations 2015[21]	The regulations require that all sites carrying significant quantities of hazardous substances i.e., those which could cause a major accident to apply

[12] UK Government (2017). *The Ionising Radiation Regulations 2017* (SI 2017/1075). (online). Available at: http://www.legislation.gov.uk/uksi/2017/1075/contents (Accessed 10 August 2023).

[13] UK Government (2019). *The Carriage of Dangerous Goods (Amendment) Regulations 2019* (SI 2019/598). (online). Available at: http://www.legislation.gov.uk/uksi/2019/598/contents/made (Accessed 10 August 2023).

[14] UK Government (2019). *The Radiation (Emergency Preparedness and Public information) Regulations 2019* (SI 2019/703). (online). Available at: http://www.legislation.gov.uk/uksi/2019/703/contents/made (Accessed 10 August 2023).

[15] UK Government (1965). *The Nuclear Installations Act 1965* (SI 1965/c.57). (online). Available at: https://www.legislation.gov.uk/ukpga/1965/57/contents (Accessed 10 August 2023).

[16] UK Government (2004). *Civil Contingencies Act 2004* (SI 2004/c.36). (online). Available at: http://www.legislation.gov.uk/ukpga/2004/36/contents (Accessed 10 August 2023).

[17] UK Government (2005). *The Civil Contingencies Act 2004 (Contingency Planning) (Scotland) Regulations 2005.* (online). Available at: http://www.legislation.gov.uk/ssi/2005/494/contents/made (Accessed 10 August 2023).

[18] UK Government (2005). Fire (Scotland) Act 2005. (Online). Available at: https://www.legislation.gov.uk/asp/2005/5/contents (Accessed November 2023)/

[19] UK Government (2006). *The Fire Safety (Scotland) Regulations 2006*. (online). Available at: http://www.legislation.gov.uk/ssi/2006/456/contents/made (Accessed 10 August 2023).

[20] UK Government (2013). *Energy Act 2013* (SI 2013/c.32) (online). Available at: http://www.legislation.gov.uk/ukpga/2013/32/contents (Accessed 10 August 2023)

[21] UK Government (2015). *The Town and Country Planning (Hazardous Substances) (Scotland) Regulations 2015*. (online). Available at: http://www.legislation.gov.uk/ssi/2015/181/contents/made (Accessed 10 August 2023).

Legislation	Legislation Issue
	for consent from their local Hazardous Substance Authority.
The Environmental Authorisations (Scotland) Regulations 2018[22]	The regulations empower the Scottish Environment Protection Agency (SEPA) to enforce environmental standards for regulated activities and installations.

Policy

18.2.2 A summary of the relevant policies is given in **Table 18.2.**

Table 18.2 Policy relevant to major accidents and disasters

Policy Reference	Policy Relevance
National Policy	
National Planning Framework 4 (NPF4)[23]	Policy 23 considers developments in the vicinity of major accident hazard sites which includes the Hunterston Nuclear Power Station and requires HSE, ONR and SEPA to be consulted and states that permission should not be granted against the advice of these three agencies without 'careful consideration'. However, it should be noted that the ONR is the consenting authority for this application. NPF4 also makes policy related to safety but only in some focused topic areas such as road infrastructure design, flood risk and health inequality.
Local Policy	
North Ayrshire Council (NAC) Adopted Local Development Plan 2 [24]	This plan provides a commitment by NAC to promote sustainable development and a framework for determining planning applications. The relevant sections applicable to major accident and disasters are: Policy 35 Hazardous installations and substances *"Proposals for development in the vicinity of major accident hazard sites for example within Health and Safety Executive consultation zones, or the designated safeguarding areas for civilian infrastructure (such as pipelines, airports, power stations) or other sites should take into account the potential impacts on the proposal and the major-accident hazard site of being located in proximity to one another.* *Proposals for development involving the use, transmission or storage of hazardous substances will not be supported where there would be significant adverse impacts on the environment or health and safety.* ***Radioactive storage and management at Hunterston***

[22] UK Government (2018). *The Environmental Authorisations (Scotland) Regulations 2018* (online). Available at: https://www.legislation.gov.uk/ssi/2018/219/contents/made (Accessed 10 August 2023).

[23] Scottish Government (2023). *National Planning Framework 4*. (Online). Available at: https://www.gov.scot/publications/national-planning-framework-4/documents/ (Accessed August 2023)

[24] North Ayrshire Council (2019). Adopted Local Development Plan 2. (online) Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed 5 May 2022).

Policy Reference	Policy Relevance
	Development for the storage and/or management of low level and intermediate level radioactive waste will be supported within the nuclear licensed area at Hunterston where the development: • *Relates to low level and intermediate radioactive waste arising from Hunterston A and B only; and* • *Is consistent with the relevant national policy and strategy for managing radioactive waste in Scotland; and* • *Includes adequate measures to mitigate adverse impacts on the environment transport and public health.* *Proposals will not be supported for the storage and/or management of low level and intermediate level radioactive waste arising from other nuclear installations."*

Technical guidance

18.2.3 The technical guidance contained in **Table 18.3** is relevant to the assessment of major accident and disaster effects.

Table 18.3 Technical Guidance relevant to major accidents and disasters

Technical Guidance	Context
Licence condition handbook[25]	This guidance provides the baseline standards for safety which will be in place at Nuclear Licensed Sites ensured by the ONR regulatory process.
Tolerability of Risk from Nuclear Power Stations[47]	This guidance informs the criteria for tolerability (significance) of risk for major accidents affecting human receptors, especially those related to nuclear power stations.
Guidance on the Interpretation of Major Accidents to the Environment for the purposes of COMAH Regulations[26]	This guidance provides the thresholds of a major accident for environmental receptors.
Reducing Risks Protecting People (R2P2)[3]	This guidance informs the criteria for tolerability (significance) of risk for major accidents affecting human receptors.
Guidelines for Environmental Risk Assessment and Management Green Leaves III[27]	This guidance provides supporting information for environmental risk assessment.
Guidance Emergency Preparedness: Guidance on part 1 of the Civil Contingencies Act 2004	This guidance sets out requirements for risk assessment of emergencies (which include major accidents and disasters) by

[25] ONR (2017). *Licence condition handbook*, Office of Nuclear Regulations (online) Available at: www.onr.org.uk/documents/licence-condition-handbook.pdf (Accessed 10 August 2023).

[26] Department for the Environment, Transport and Regions (1999). *Guidance on the Interpretation of Major Accident to the Environment for the Purpose of the COMAH Regulations* (online). Available at: https://www.sepa.org.uk/media/219153/detr-guidance-1999.pdf (Accessed 10 August 2023).

[27] UK Government (2011). *Guidelines for Environmental Risk Assessment and Management Green Leaves III* (online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69450/pb13670-green-leaves-iii-1111071.pdf (Accessed 10 August 2023).

Technical Guidance	Context
(CCA), its associated regulations and non-statutory arrangements[28]	local resilience forums. It provides additional criteria which inform the harm criteria for human receptors.
A guide to the Control of Major Accident Hazards Regulations (COMAH)[29]	This guidance provides interpretation of how the COMAH regulations should be applied for a COMAH establishment and how this is ensured by the regulatory process for major hazard sites.
All Measures Necessary – Environmental Aspects Guidance to the Competent Authority Inspectors and Officers, 2016. COMAH Competent Authority[30]	This guidance provides the baseline standards for safety which will be in place at the COMAH establishment ensured by the regulatory process for major hazard sites.
Chemicals and Downstream Oil Industry Forum (CDOIF) – Environmental Risk Tolerability for COMAH establishments V2, 2016[31]	This guidance provides detail on the harm criteria and risk tolerability for environmental receptors.
Environmental Impact Assessment of Projects, Guidance on the Preparation of the Environmental Impact Assessment Report[32]	This guidance allows for the use of risk-based criteria in EIA assessments and provides detail about the purpose of including major accidents and disasters in EIA.
Guide to Predicting Environmental Recovery Durations for Major Accidents[33]	This guidance supports the assessment of major accidents affecting environmental receptors.
Planning Inspectorate Advice Note 11 Annex G – The Health and Safety Executive[34]	This guidance informs how the HSE will engage with EIAs.
External Hazards, Nuclear Safety Technical Assessment Guide NS-TAST-GD-013 Revision 7[35]	This guidance provides the baseline standards for safety which will be in place at Nuclear Licensed Sites ensured by the ONR regulatory process.

[28] Cabinet Office (2012). *Guidance Emergency Preparedness: Guidance on part 1 of the Civil Contingencies Act 2004*. (CCA) (online) Available at: https://www.gov.uk/government/publications/emergency-preparedness (Accessed 10 August 2023).

[29] HSE (2015). *The Control of Major Accident Hazards Regulations 2015 Guidance on Regulations*, Ed 3 (online). Available at: https://www.hse.gov.uk/pubns/priced/l111.pdf (Accessed November 2023).

[30] SEPA (2016). *All measures necessary*. (online). Available at: https://www.sepa.org.uk/media/219152/d130416_all-measures-necessary-guidance.pdf (Accessed 10 August 2023).

[31] Chemical and Downstream Oil Industries Forum (n.d.). *Environmental Risk Tolerability for COMAH Establishments* (online). Available at: https://www.sepa.org.uk/media/219154/cdoif_guideline__environmental_risk_assessment_v2.pdf (Accessed November 2023)

[32] European Commission (2017). *Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report*. (online). Available at: http://publications.europa.eu/resource/cellar/2b399830-cb4b-11e7-a5d5-01aa75ed71a1.0001.03/DOC_1 (Accessed 02 August 2023).

[33] Energy Institute (2017). *Guide to Predicting Environmental Recovery Durations for Major Accidents*. Energy Institute; London.

[34] HSE (2017). *Annex G – The Health and Safety Executive, The Planning Inspectorate Advice Note* (online) Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2018/03/Advice-note-11-Annex-G.pdf (Accessed 10 August 2023).

[35] ONR (2018) *Office for Nuclear regulation External Hazards* (online). Available at: http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-013.pdf (Accessed 10 August 2023).

Technical Guidance	Context
Internal Hazards, Nuclear Safety Technical Assessment Guide NS-TAST-GD-014 Revision 7[36]	
Land Use Planning and the Siting of Nuclear Installations, ONR Guide, NS-LUP-GD-001 Revision 0[37]	
Guidance on the Demonstration of ALARP (As Low As Reasonably Practicable), Nuclear Safety Technical Assessment Guide NS-TAST-GD-005 Revision 11[38]	
Safety Assessment Principles for Nuclear Facilities[39]	
Major Accidents and Disasters in EIA: A Primer[40]	This document provides specific guidance with respect to the consideration of major accidents and disasters in the context of EIA.

18.3 Data gathering methodology

Study Area

18.3.1 The Study Areas below are to identify receptors which could be affected by internal Major Accidents arising from the Proposed Works. The spatial extent of the areas are based on professional judgment taking into account the extent of the potential major accidents and disasters and the sensitivity of the relevant receptors. These are largely aligned to the Study Areas identified in the Scoping Report submitted to ONR 01 August 2022, but the Study Area for human populations and the historic environment have been reduced to 1km based upon a better understanding of the potential MA&D effects that has been achieved following the submission of the Scoping Report.

- Marine receptors – 10 km;
- Surface water receptors – 10 km;
- Land based ecological receptors – 10 km;
- Human population receptors – 1 km;

[36] ONR (2021) *Office for Nuclear regulation Internal Hazards* (online). Available at: http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-014.pdf (Accessed November 2023).

[37] ONR (2018). *Land use planning and the siting of nuclear installations* (online). Available at: http://www.onr.org.uk/documents/2018/ns-lup-gd-001-land-use-planning-and-the-siting-of-nuclear-installations.pdf (Accessed 10 August 2023).

[38] ONR (2020). *Office for Nuclear Regulation Guidance on the Demonstration of ALARP (As Low As Reasonably Practicable)* (online). Available at: http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-005.pdf (Accessed 05 November 2023).

[39] ONR (2020). *Safety Assessment Principles for Nuclear Facilities, Revision 1* (online) Available at: http://www.onr.org.uk/saps/saps2014.pdf (Accessed 10 August 2023).

[40] IEMA, (2020). *Major Accidents and Disasters in EIA: A Primer*. (online) Available at: https://www.iema.net/document-download/48915 (Accessed November 2023).

- Historic environment receptors – 1 km; and
- Groundwater receptors – 1km.

18.3.2 The following Study Areas have been applied to sources of external Major Accidents and Disasters, these are consistent with those applied in the Scoping Report:

- Airports – 20 km;
- External hazardous sites – 10 km;
- Hazardous pipelines – 1 km; and
- Natural disasters – not applicable – the vulnerability to natural disasters will be reviewed based upon the potential effects as geographic location is less applicable to some forms of disaster e.g., high winds.

18.3.3 The extents of the Study Areas are based on the extent of the potential major accidents and disasters and the sensitivity of the receptors. The Study Areas have been applied throughout the temporal scope of the Proposed Works.

Desk study

18.3.4 The assessment has been undertaken with reference to **Chapter 2: The Decommissioning Process**, supported by a number of data sources. The principal data sources used to inform this chapter for potential effects comprise of the following:

- European Commission (EC) - Major Accident Reporting System (eMARS);
- ONR quarterly statements of nuclear incidents at nuclear installations[41];
- Information provided by the Applicant regarding to the baseline decommissioning plan for HNB;
- West of Scotland Community Risk Register[42]; and
- National Risk Register [43].

Survey work

18.3.5 No survey work has been undertaken for the assessment of Major Accidents and Disasters.

Data limitations

18.3.6 There are currently no known limitations on the baseline data that impact the validity of this assessment.

[41] ONR (2022). *Quarterly statements of nuclear incidents at nuclear installations*. (Online). Available at: http://www.onr.org.uk/quarterly-stat/index.htm (Accessed 10 August 2023)

[42] WoSRRP (2021) *West of Scotland Regional Resilience Partnership, West of Scotland Community Risk Register* (online). Available at: https://www.firescotland.gov.uk/media/2383444/west_community_risk_register.pdf (Accessed 05 April 2022).

[43] Cabinet Office (2023). *National Risk Register 2023 edition*. (online) Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1175834/2023_NATIONAL_RISK_REGISTER_NRR.pdf (Accessed on 10 August 2023).

18.4 Consultation

Overview

18.4.1 Two consultations on the Proposed Works were held 08 August 2022 to 19 September 2022, and 30 May 2023 to 10 July 2023.

Table 18.4 Summary of Consultation Responses

Stakeholder	Consideration	How addressed in the ES
SEPA		
NHS Ayrshire and Arran	We note that the section on 'Major accidents and disasters' does not make reference to the Preparing Scotland suite of guidance documents, including 'Responding to Emergencies' and STAC guidance. Moreover, the definitions provided in this chapter do not correspond to the definitions set out in the Civil Contingencies Act (2004). We recommend that consideration is given to aligning definitions with those of the Civil Contingencies Act and to referencing the Preparing Scotland guidance. NOTE: NHS Ayrshire and Arran are referring to the Scoping Report submitted to the ONR on 01 August 2022.	The purpose of EIA in the context of Major Accidents and Disasters is to identify where there is a significant i.e. intolerable risk of serious harm occurring to people or the environment. The Civil Contingencies Act 2004 defines only the term 'emergency' and it does not define the concepts of major accident or disaster. There are risk assessment criteria provided for use by Category 1 Responders in Annex 4D of the UK Wide Emergency Preparedness guidance[28].It is noted that Major Accident and Disasters are broadly but not completely aligned to Level 3, 4 & 5 emergencies in the health and environment categories. The Preparing Scotland guidance[44] provides a number of example consequence categories but does not provide a basis for risk assessment of major accidents and disasters to determine the level of risk that would represent a significant effect. It is noted that Categories 1, 2, 9, 11 and 12 could represent a Major Accident or Disaster depending on the exact scenario to be considered.
NHS Ayrshire and Arran	We also note that the EIA refers to the Detailed Emergency Planning Zone as being 2.4km – however this has now been redetermined by North Ayrshire Council as being no greater than 1.08km. We recommend that this is corrected accordingly.	2.4km as described in the Scoping Report, submitted to the ONR on 01 August 2022, was correct at the point of submission. However this has been updated to 1.08 km in this chapter to reflect the subsequently agreed changes to the Detailed Emergency Planning Zone (DEPZ).

[44] Preparing Scotland (2021). *Regional Resilience Partnerships' Risk Preparedness Assessment Guidance*. (online) Available at: https://ready.scot/sites/default/files/2022-04/PreparingScotland-RegionalResiliencePartnerships%E2%80%99RiskPreparednessAssessmentGuidance2021_0.pdf (Accessed 18 Sep. 2023).

Stakeholder	Consideration	How addressed in the ES
NHS Ayrshire and Arran	Although the risks associated with radiological materials are likely to decrease over the course of decommissioning, other hazards may emerge or persist – in particular those associated with demolition and with COMAH-regulated substances. While infrequent, the potential scale of such incidents can have significant implications for worker health, community wellbeing, and surrounding health and care services – for instance, the Didcot power station collapse in 2016. Public concern is a key consideration, especially as this may generate significant burden on other agencies including the NHS. We therefore welcome the inclusion of such hazards in the scope of the EIA and recommend that planning for decommissioning should ensure to address the public communications aspects of major incidents, including in relation to risks to other public services.	This comment is noted and these hazards are assessed in **Section 18.9**
NHS Ayrshire and Arran	We note that despite increased frequency of material being moved by road to the railhead (albeit for a short distance), radiological incidents during road transport movements is considered out with the scope of the EIA ¬ - with the rationale given being the existence of legislation such as Carriage of Dangerous Goods Regulations (CDG19) and policies and procedures. However, many of the other issues that are included in the EIA scope would also be mitigated to an extent by legislation and existing policies and procedures (such as the Health & Safety at Work etc Act 1974 (HASWA) and the legislation sitting underneath this, plus processes such as risk assessments, permit to work, hot permit to work etc). We would therefore welcome further consideration being given to inclusion of this element of the decommissioning process in the EIA.	Radiological accidents in transport were scoped out of the assessment on the basis of the continued application of a comprehensive regulatory regime covering the transportation of radioactive materials. A risk assessment covering the transportation of materials must be produced by the Site Licensee and approved by ONR under different legislation. CDG19 requires a specific emergency plan to be defined for radiation emergencies. This justification was accepted by the ONR, who did not challenge this justification in their Pre-Application Opinion. Therefore, this regulatory process has not been duplicated for the EIA.

Pre-application Opinion

18.4.2 Based on review of the Scoping Report, a Pre-Application Opinion was issued by ONR. The ONR made no comments relating to Major Accidents and Disasters.

18.5 Overall baseline

Current baseline

Internal factors

18.5.1 HNB is a 1,320 MW twin reactor Advanced Gas Cooled Reactor (AGR) site, which supplied the grid via two steam turbine generator systems. The power station facilities include the reactors, the turbines, an electricity sub-station connecting to the grid, and associated plant, equipment and infrastructure equipment to safely support the operations of the systems. The power station commenced generation in 1976 and ended generation in January 2022.

18.5.2 HNB is a licensed nuclear site. It is also a Lower Tier establishment[45] under the COMAH regulations[9], holding quantities of fuel oil/diesel, sodium hypochlorite, ammonia, hydrazine, hydrogen, oxygen, propane and methane.

18.5.3 Hazardous Substances Consent (HSC) is in place at HNB. The consent permits the storage of hazardous substances at the station.

18.5.4 A description of the process drains and surface drainage system is provided in **Chapter 10: Surface Water and Flood Risk**.

External factors – manmade

18.5.5 There are no airports located within 20 km of the Works Area, with the closest being Glasgow Prestwick and Glasgow International, which are located 28 km south-east and 33 km north-east of the Site respectively.

18.5.6 No COMAH or Major Accident Control Regulation (MACR) sites, other than HNB itself have been identified within 10 km of the Works Area.

18.5.7 No sites with HSC, other than that of HNB itself, have been identified within 10 km of the Works Area.

18.5.8 There are no Major Accident Hazard Pipelines (MAHP) identified within 1 km of the Works Area.

18.5.9 Hunterston Port lies to the north and north-east of the Works Area and is a deep-water port which has previously served as ore-import, coal import and wind turbine test facility. The port is also used as a maritime construction and decommissioning site and has bulk handling facilities for importing, processing and distributing cargo.

18.5.10 There are emergency response arrangements in place for HNB, as required by the Nuclear Site Licence and under REPPIR[13]. The emergency arrangements provide a state of preparedness to respond to radiological and non-radiological events. Station personnel are trained for roles in emergency response. The plans are integrated with those of the local authority, and the emergency services (including police, fire, ambulance and NHS, and Maritime and Coastguard Agency as applicable). The emergency plan and the arrangements made to implement the plan are rehearsed and reviewed to maintain an adequate state of readiness. Exercises provide a thorough test of emergency arrangements and are required as part of the Nuclear Site Licence and under REPPIR.

[45] There are two types (tiers) of establishment which are subject to COMAH, known as 'Upper Tier' and 'Lower Tier' depending on the quantity of dangerous substances they hold. Upper Tier establishments will hold greater quantities of dangerous substances meaning that additional requirements are placed on them by the Regulations.

External factors – environment conditions

18.5.11 The prevailing wind for the Works Area comes from the south-west; the highest wind speeds also originate from this direction.

18.5.12 The power station has been designed to allow for extreme weather events as part of the design basis and has specific operating instructions in place for extreme weather conditions, e.g., for extreme winds, extreme flooding, rainfall and seismic events.

18.5.13 The projected impact of climate change on the environmental conditions is uncertain, but estimates of the potential impact have been undertaken on the basis of the available climate projections. Information regarding the impact on environmental conditions is provided in **Appendix 6B: Climate Change Resilience of the Proposed Works**.

18.5.14 The relevant ecological baseline is described in **Chapter 7: Terrestrial Ecology and Ornithology**.

18.5.15 Conditions for tidal and coastal flooding are provided in **Chapter 10: Surface Water and Flood Risk**.

18.5.16 Burn Gill is the nearest freshwater watercourse receptor and is approximately 610 m to the east of the Site, but the Site does not lie within its catchment or within the fluvial flood extent area, as detailed in the SEPA flood extent map. There are small areas within the Site which are highlighted as surface water flooding zones by SEPA, with the majority of these zones being located in the Hunterston A (HNA) site and likely to be less than 1 m in depth. Operational experience indicates that the Site has not been subject to flooding in these areas as the site surface water drainage system has been effective at preventing water build up. Conditions for surface and fluvial flooding are provided in the **Chapter 10: Surface Water and Flood Risk**.

18.5.17 There are no significant freshwater watercourses or water bodies in the Works Area with hydraulic connectivity to the marine environments. There are some drainage ditches in the fields to the north and surface water occasionally ponds in low lying land adjacent to the access road along the coast, these are anticipated to flow to the marine environment.

18.5.18 Geology and hydrology baseline conditions are described in **Chapter 11: Soils, Geology and Hydrogeology** and the surface water drainage is described in **Chapter 10: Surface Water and Flood Risk**. The information is relevant to major accidents and disasters in respect of the pathways by which releases to ground and surface water could reach receptors. In summary, the key points are that groundwater will flow to the north-west to discharge to the sea, although fracturing, faulting and the position of dykes within the sandstone may give rise to groundwater flows in directions that are not easily predictable from the hydraulic head data. Future baseline

18.5.19 As part of the Proposed Works, new arrangements for waste management may be required with corresponding needs for compliance under separate consenting regimes. The nature and extent of the major accidents from the Proposed Works and any new arrangements for waste management will be considered as components of the future baseline.

18.5.20 Hunterston Port is being developed and promoted by Peel Ports Group as a Hunterston Port and Resource Centre (Hunterston PARC) for the maritime economy. The proposed uses are similar to current usage with additional manufacturing facilities, but these are not anticipated to introduce Major Accidents which could affect the Proposed Works. There is potential for handling Dangerous Substances (as defined in Schedule 1 of the COMAH Regulations[9]) within Hunterston Port, with Peel actively seeking to attract the hydrogen industry and others viewing the port facility as a potential import/export location for

hydrogen or hydrogen carriers as considered in the Scot2Ger Study[46]. This could introduce Major Accident potential to this facility, but given the distance (~3 km) from the Works Area, it is not anticipated to present a potential major accident to the Proposed Works.

18.5.21 The other key factors that may alter the future baseline conditions and that could therefore influence the nature, exposure, likelihood and consequences of major accidents and disasters at the Site and that have been considered in the assessment of likely significant effects in the ES are:

- Climate change –Climate change is expected to change the temperatures experienced over the duration of operation of the Proposed Works with an increase in peak temperatures, particularly the extreme high ambient temperature. Climate change is expected to alter the prevalence of extreme weather conditions which could lead to a disaster. This is described in further detail in **Chapter 6: Climate Change**.
- Coastal Flooding – climate change analysis indicates a significant change in the risk of coastal flooding during the period of the Proposed Works. Coastal flood risk is assessed in detail in **Chapter 11: Surface Water and Flood Risk**, so that analysis is not repeated here to prevent duplication.
- Changing land use may mean that the surrounding environment could become more agricultural, industrial, residential or recreational in use. Changing ecological baselines resulting from the land use and climate change factors may also impact the local ecology and associated environmental designations of the land. As the surrounding environment changes, so do the receptors which could be affected. If land adjacent to the Proposed Works were to become designated or receive a higher level of designation than described in the current baseline, then the sensitivity of receptors could increase, there are already several sites which have national designations such as SSSI but these could be upgraded to sites of international significance. It is not anticipated that there will be a significant increase in human population receptors in the vicinity of the Works Area.
- Technological improvement - it is anticipated that there will be substantial technological improvement over the lifetime of the Proposed Works. This could lead to other ways of approaching the final decommissioning, however, as a bounding case for assessment, the Proposed Works as described in **Chapter 2: The Decommissioning Process** are based upon established techniques and technologies. These improvements could include advances in remote handling, robots or decontamination techniques. These may reduce the risk posed to the environment (human and non-human receptors); however, they may also introduce new hazards that would need to be managed at the appropriate time.

18.6 Embedded environmental and good practice measures

18.6.1 A range of environmental and good practice measures have been embedded into the Proposed Works.

[46] Scottish Government (2022). *Hydrogen Action Plan*. (online) Available at: https://www.gov.scot/publications/hydrogen-action-plan/pages/6/ (Accessed November 2023)

Table 18.5 Summary of embedded environmental measures

Embedded Measure	Compliance Mechanism	Embedded Measure or Good Practice
The Site is currently a Lower Tier establishment maintaining a Major Accident Prevention Policy (MAPP) and will move out of scope of COMAH during the Preparation for Quiescence phase due to a significant reduction in fuels and chemicals, but the Safety and Environmental Management System (SEMS) will be maintained to an equivalent standard by the Site Licensee for the full duration of the Proposed Works.	Environmental Management Plan (EMP)	Embedded Measure
The Works Area will remain a licensed nuclear site throughout the Proposed Works until the completion of the Final Site Clearance phase, and the licensing requirements include maintaining a suitable Safety Case in accordance with the Nuclear Installations Act[10] and approved Security Plan in accordance with Nuclear Industries Security Regulations[14].	EMP	Embedded Measure
The design standard of built structures enabling the structures to withstand external loads, such as wind or precipitation and will be maintained up to the point of decommissioning that structure, considering any foreseeable changes to design loads.	EMP	Good Practice
The Site Licensee will ensure through its contractual arrangements that any contractor appointed to deliver the Proposed Works has suitable management systems in place to ensure compliance with all regulatory requirements.	EMP	Embedded Measure
The Site Licensee will adapt the current arrangement systems and processes in place for the avoidance, prevention, control and mitigation of major accidents and disasters from the operational site conditions in respect of the Proposed Works, and revise these as necessary for the duration of the Proposed Works.	EMP	Embedded Measure
The Applicant will ensure that all activities are subject to a suitable and sufficient risk assessment and with full consideration of the hierarchy of controls, ensure that the residual risk arising from all major accidents and disasters is reduced to As Low As Reasonably Practicable.	EMP	Good Practice
The decommissioning of the surface water drainage, bunding and containment, and any other safeguards will be assessed against the ongoing risk of major accidents, and the residual risk will be maintained at a level that is ALARP, throughout the duration of the proposed works.	EMP	Embedded Measure
Emergency response procedures will consider the potential for releases of hazardous materials and will define the actions to be taken to minimize the risk arising from potential releases.	EMP	Embedded Measure

Embedded Measure	Compliance Mechanism	Embedded Measure or Good Practice
Hazardous works such as some within active area deplanting and in areas with volumes of flammable substances be undertaken by appropriately SQEP and trained operators will ensure that risks are minimised.	EMP	Embedded Measure
Structural surveys will be undertaken before commencement of dismantling operations. Furthermore, the dismantling has been designed to minimise the risks associated with structural failure (e.g., of support systems).	EMP	Good Practice
The Site Licensee will provide access to reliable meteorological forecasting services to inform work planning and controls to prevent undertaking works in inappropriate conditions such as heavy crane lifts in high winds.	EMP	Good Practice
The Site Licensee will review all planning applications in the vicinity of the Proposed Works and object to any proposed development which would lead to a significant increase in risk at the Works Area.	EMP	Good Practice
The Site Licensee will liaise with other local businesses and the local authorities to identify any potential hazards which arise over the course of the Proposed Works.	EMP	Good Practice

18.7 Assessment methodology

18.7.1 This section describes the assessment approach and methodology which has been applied for this ES. The assessment of effects related to the works has considered the different phases of the Proposed Works.

18.7.2 The proposed generic project-wide approach to the assessment methodology is set out in **Chapter 2: The Decommissioning Process** and specifically in **Section 2.3**. However, whilst this has informed the approach that has been used in this major accidents and disasters chapter, it is necessary to set out how this methodology will be applied, and adapted as appropriate, to address the specific needs of the major accidents and disasters assessment in this ES.

18.7.3 In summary, the method for assessment of MA&D for this ES involves qualitative assessment of the risks related to the 'scoped in' potential major accidents and disasters (found in **Table 18.10**) and comparison of such risks against recognised risk tolerability criteria (given in **Table 18.7**) to identify significant effects. If required, additional environmental measures have been considered to ensure that relevant effects are not significant.

Definition and context

18.7.4 For the purposes of this chapter, a major accident and disaster is defined as:

- major accident - a reasonably foreseeable but unintended event caused by a manmade activity or asset that leads to serious damage on receptors, either

immediate or delayed. The activity causing the event may be either within the project, or external to it; and

- disaster – a natural occurrence that is reasonably foreseeable and leads to serious damage on receptors, either immediate or delayed.

18.7.5 Where serious damage is defined, for the purpose of this assessment, as:

- serious damage to human populations – this includes harm which would be considered substantial i.e., death(s), multiple serious injuries or a substantial number requiring medical attention; and
- serious damage on the environment – loss or significant detriment to populations of species or organisms, valued sites (including designated sites), valued cultural heritage sites, contamination of drinking water supplies, ground or groundwater, or harm to environmental receptors.

18.7.6 An immediate effect is one that is self-evident at the time of the event (e.g., fire damage, or injury to persons). A delayed effect is one which becomes evident only after time (e.g., loss of feeding ground leading to a change in the ecosystem).

18.7.7 The threshold at which the consequences of an event can be considered a major accident or disaster varies by receptor to reflect the sensitivity of the receptor and its intrinsic value.

18.7.8 The applied threshold criteria are aligned to UK criteria, and they are outlined in **Appendix 18A** of this ES for consequence. For each type of receptor, the threshold of a major accident or disaster has been defined with due regard to relevant major hazard legislation and supporting guidance; in particular Chemical and Downstream Oil Industries Forum (CDOIF) Guideline for Environmental Risk Tolerability Assessment1 , Reducing Risks Protecting People (R2P2)[49] and the Tolerability of Risk from Nuclear Power Stations[47] . The judgement as to whether a major accident or disaster meets or exceeds the threshold is qualitatively based on the inherent consequences, without accounting for embedded environmental measures.

18.7.9 This chapter considers potential major accidents and disasters that originate from:

- internal events e.g., loss of containment of chemical storage for the Proposed Works or un-planned collapse of a building during demolition; and
- external events (including natural disasters), where the Proposed Works have a material effect on the extent or severity of the major accident or disaster e.g., an incident off-site causes failure of chemical storage used for decommissioning activities that impacts on receptors within the Proposed Works.

18.7.10 Major accidents and disasters are by their nature of high consequence (if they occur) and are not intended or planned to occur as part of the operation or design of a project (in this case the Proposed Works). They are typically, by their nature, very infrequent, but are important considerations so that resilience against them can be built into the delivery of a project at the planning stage. Resilience is established by ensuring that high consequence events are eliminated through location, layout or design options, or, where elimination is not possible, reduced to such an extent that the chance of them occurring is so small that they can be deemed not to be significant.

18.7.11 The ‘effects’, in EIA terms, arising from major accidents and disasters equate to the ‘risk’ (i.e., the potential for serious damage to a receptor before embedded environmental measures are considered, coupled with the likelihood of the damage being realised when

[47] HSE (1992). *The tolerability of risk from nuclear power stations* (online). Available at: http://www.onr.org.uk/documents/tolerability.pdf (Accessed November 2023).

planned environmental measures are taken into account) of the major accident/disaster being realised, rather than simply its consequence so that scenarios of infrequent likelihood but with potentially high consequence can be appropriately included.

18.7.12 In this respect, the major accidents and disasters aspect differs from other EIA aspects: most other aspects predict and assess the effects from planned actions, whereas major accidents and disasters considers the effect of unintended events that are not expected to occur.

General approach

18.7.13 The requirement for consideration of MA&D in the ES is relatively new and definitive guidance on the assessment of major accidents and disasters within the context of the ES has yet to be published in the UK[48]. Two clear principles have however emerged from existing technical and ES guidance and have been adopted in the methodology adopted here:

- The notion of proportionality; and
- The established principle that only those effects which are identified as being likely to be significant need to be assessed within the ES.

18.7.14 Guidance provided by the European Commission (EC)[32] highlights that the context for inclusion of MA&D in the ES, is to ensure that adequate focus is given to the provisions for events leading to significant risk with an objective of building resilience into proposed development activities (the Proposed Works in this case), against such effects. The approach that has been adopted is aligned to the EC guidance. The scope covers those events which could impede the Proposed Works and may have adverse effects on receptors. The focus of the assessment is therefore to recognise any potential MA&D scenarios which may lead to significant environmental effects and mitigate against them, thereby building resilience into the Proposed Works and reducing vulnerability. The threshold for what may be considered significant (i.e., intolerable) includes much less frequent effects than are addressed in many other aspect chapters. Lesser magnitude events are generally tolerated much more readily than those of higher magnitude.

18.7.15 The assessment of significant effects for major accidents and disasters focuses on risk (i.e., the combination of the serious damage arising from a potential event and its likelihood of occurrence), rather than the magnitude of harm/damage only. Therefore, not every possible event needs to be assessed, only those with the significant effects.

18.7.16 Risk tolerability for MA&D in the UK is built on the principle of eliminating intolerable risks and ensuring, particularly at iterative design stages, that any residual risks, while small are further minimised where practicable. This principle has been applied in the assessment here, with ‘intolerable risk’ referred to as the ES term ‘significant effect’ for the purposes of consistency with other topic assessments considered in this ES.

18.7.17 The methodology adopted for the assessment is qualitative as the design is at the planning stage. After consent is granted and as the design advances through further engineering design stages, the process of risk management will continue to ensure risk in the design will be reduced to ALARP as part of the routine design and regulatory process.

18.7.18 The following approach has been applied to the scoped-in MA&D scenarios (listed in **Table 18.10**):

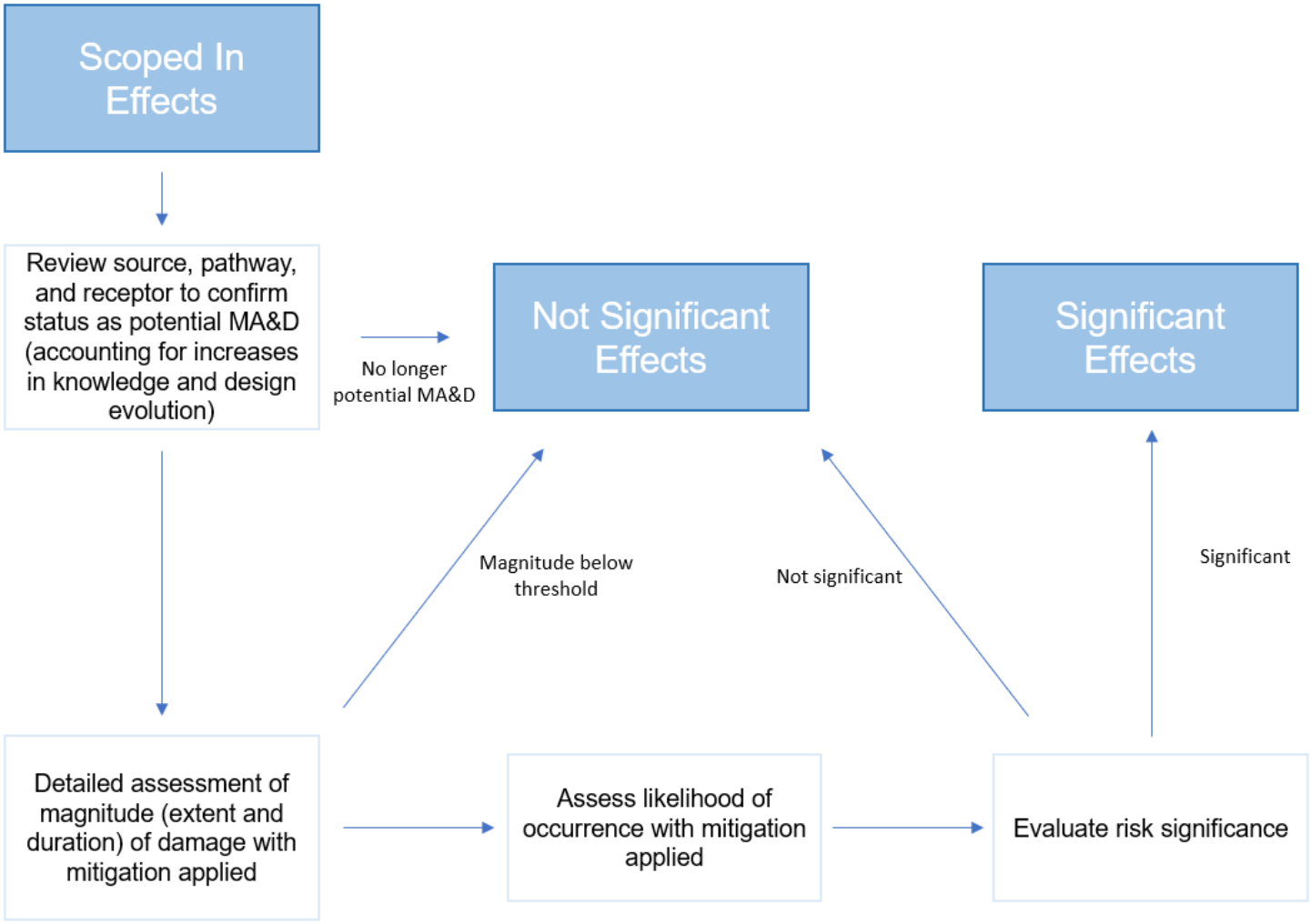
- Identify relevant potential receptors;

[48] A short summary document comprising a variety of approaches has been published by IEMA. See footnote 37.

- Identify relevant potential MA&Ds arising from or affecting the Works Area; and
- Assess whether any credible pathways exist (i.e., the link between a source of an event and a receptor).
- Qualitatively assess the harm/ damage which could be caused to the receptor to:
  - Eliminate those effects which do not meet the minimum threshold of serious damage/ harm from a major accident/ disaster; and, if the threshold is met;
  - Estimate the magnitude of accidents and disasters (if they were realised) at the receptor.
- Qualitatively assess the likelihood of the effect, considering the range of impacts which may be associated with the source of an accident or disaster and taking into account the measures embedded in the Proposed Works which would reduce their occurrence and/or severity; and
- Establish whether significant (i.e., intolerable) effects from major accidents and disasters exist.

18.7.19 This approach is summarised in **Graphic 18.1**.

Graphic 18.1 Process for Assessment in ES



Determination of significance

18.7.20 The CDOIF[30] and R2P2[49] risk tolerability criteria have been used in this assessment for establishing significance (risk tolerability) and to provide a consistent basis for the study against common benchmarks for MA&D applied across the UK in regulatory guidance and industry standards.

18.7.21 The factors in defining the risk criteria can be found in **Table 18.6**.

Table 18.6: Defining risk criteria for human and non-human receptors

Receptor Type	Magnitude	Likelihood
Human Receptor	Severity of harm/damage The number of people affected	Likelihood of the event occurring
Non-human Receptor	Severity of harm/damage Duration of harm (i.e., its persistence – the recovery period over which the environment would recover or be restored)	Likelihood of the event occurring

18.7.22 For non-human environmental receptors, the severity of harm/ damage, and how readily recovery is possible, varies by the receptor grouping. For this reason, criteria are established for a range of receptor types, with the most onerous criteria applied to those receptors which are most sensitive.

18.7.23 The magnitude and likelihood of a scenario combine to provide a measure of risk (i.e., the combination of the harm/ damage arising from a potential event and its likelihood of occurrence). The fact that the Proposed Works are currently in the planning stage means that the estimates are necessarily qualitative and based on expert judgement informed by comparison against experience in similar industries and for similar developments, where practical.

Magnitude

18.7.24 The criteria used to establish magnitude, and its basis, are presented in Appendix 17A.

18.7.25 Potential major accidents or disasters are assessed against the magnitude criteria given in **Table 18.A3** (non-human receptor groups) and **Table 18.A6** (human receptor groups) of **Appendix 18A**, so that a magnitude level can be assigned (**Low, Medium, High, and Very High**), unless they are eliminated under any of the following cases:

- The magnitude, when assessed without taking into account embedded environmental measures, does not meet the threshold for major accident or disaster;
- If the 'source' does not directly cause a major accident, but influences the sequence of events leading to a major accident/ disaster being realised, the influence of the source is integrated into the event scenario assessment, but is not assessed further as a standalone scenario. This includes:

[49] HSE (2001). *Reducing Risk Protecting People (R2P2), HSE. (R2P2)* (online) Available at: https://www.hse.gov.uk/enforce/expert/r2p2.pdf (Accessed 15 August 2023).

- conditions such as snow and rain that make driving more dangerous, but do not directly cause accidents – these are considered as causal factors; and
- impairment of an embedded environmental measure such as damage to a secondary containment designed to contain hazardous spillages – this does not cause release, but if a spillage occurs while it is damaged the consequences are more likely to be major accident – these are considered in the assessment of likelihood.

18.7.26 Any scenario which is excluded for the above reasons is assigned a category of Not MA&D (i.e., not major accident and disaster).

Determination of risk significance

18.7.27 Risk in the terminology of this assessment is a combination of magnitude and likelihood. **Table 18.7** gives the magnitude and a qualitative likelihood scale that is used to determine the level of risk and whether it is 'significant' or 'not significant' in the context of EIA. In the MA&D assessment, a significant effect would represent a level of risk that would generally be considered intolerable aligned to other UK Health and Safety regulatory regimes.

18.7.28 The assessment applies expert judgement to evaluate the likelihood of each potential major accident and disaster occurring, once embedded environmental measures are applied. The likelihood and risk reported is that above the baseline (i.e., the incremental likelihood and risk). This is the risk that can be attributed to the Proposed Works directly or indirectly.

18.7.29 While qualitatively stated, the definition and classifications used for likelihood are designed to be compliant with HSE's R2P2[45] for societal risk, and CDOIF[30] for environmental tolerability, if considered on a per effect basis rather than in terms of aggregated risk. Expert judgement has been used to establish the appropriate qualitative parameters for likelihood categorisation, with levels used ranging from 'Remote chance of occurring' through to 'Reasonable chance of occurring.' These then provide an allocation of likelihood against magnitude to determine risk significance, which in turn is an approach that is consistent with major accident tolerability perceptions commonly applied elsewhere in the UK.

Table 18.7: Significance matrix – major accidents and disasters

Magnitude	Likelihood (per receptor per effect)				
	Remote chance of occurring	**Very small chance of occurring**	**Small chance of occurring**	**Chance of occurring**	**Reasonable chance of occurring**
Very high	Not significant	Significant	Significant	Significant	Significant
High	Not significant	Not significant	Significant	Significant	Significant
Medium	Not significant	Not significant	Not significant	Significant	Significant
Low	Not significant	Not significant	Not significant	Not significant	Significant

Assumptions and limitations

18.7.30 There are no assumptions or limitations which limit the validity of the assessment of the effects arising from major accidents and disasters.

18.8 Scope of the assessment

Study area

18.8.1 The Study Areas for receptors include both those within the Works Area and those within the ranges summarised in **Table 18.8**. The extents of the areas are based on the extent of the potential major accidents and disasters and the sensitivity of the receptors. The Study Areas have been applied throughout the temporal scope of the Proposed Works. The basis for these areas is described in Section 18.3.

Table 18.8: Size of Study Area for each Receptor Type

Receptor type	Receptors in this group	Distance from Works Area
Marine receptors	Marine environment including designated sites.	10 km
Human population	Human populations.	1 km[50]
Land based receptors	Ecological receptors including designated sites, habitats and species. Non-designated land.	10 km
Surface water receptors	Surface water bodies, habitats and species where not considered under marine, including drinking water sources.	10 km
Historic environment receptors	Designated heritage assets including conservation areas, scheduled monuments and listed buildings (Category A).	1 km
Groundwater receptors	Groundwater bodies.	1 km

18.8.2 The assessment has considered sources of MA&Ds within the Site with buffers for external sources of MA&Ds as follows:

- airports: 20 km in line with the guidance for Nuclear Safety Cases[51];
- external sites holding hazardous materials (sites with hazards substances consent (including COMAH sites), licensed explosives sites, and MACR sites): 10 km in line with the Outline Emergency Planning Zone (OEPZ) and the COMAH Safety Report Assessment Manual (SRAM); and
- major accident hazard pipelines: 1 km, consistent with maximum hazard distance identified for hazardous pipelines in CRR82/1994[46].

18.8.3 The potential effects assessed have been considered across the three phases of the Proposed Works, nominally; Preparation for Quiescence, Quiescence, and Final Site Clearance phases, as described in **Chapter 2: The Decommissioning Process**.

18.8.4 During the Quiescence phase, the presence of workers present within the Site will be substantially reduced which reduces the impact of the disasters as the number of receptors is decreased. Additionally, the presence of stored chemicals and combustible

[50] Based on the DEPZ, which was reduced to 1.08km in 2022. Note: this is smaller than the COMAH Consultation Distance for the Site.
[51] HSE (1994). *Risks from Hazardous Pipelines in the United Kingdom. Contract Research Report 82*. (online) Available at: https://www.hse.gov.uk/research/crr_pdf/1994/crr94082.pdf (Accessed August 2023)

materials will be minimal as they will have been removed during the Preparations for Quiescence phase.

Potential receptors

18.8.5 Information about receptors that could be subject to effects arising from MA&Ds associated with the Proposed Works is provided in other aspect chapters, such as **Chapters 8: Terrestrial Biodiversity and Ornithology** and **Chapter 9: Marine Biodiversity**, which provide an overview of the baseline marine and terrestrial ecology; and **Chapter 13: Historic Environment** which provides details of the baseline historic environment.

18.8.6 The environmental receptors identified include:

- The key designated sites of interest for land and water receptors within the Study Area;
  - Hunterston to Portencross and Goldenberry Hill Listed Wildlife Site (LWS);
  - Sites of Special Scientific Interest (SSSI) including Portencross Woods (<100 m), Southannan Sands (<100 m), Kames Bay (~3.2 km), Ballochmartin Bay (~4.4 km), and Lynn Spout (~10 km); and
- Widespread (non-designated) land and water receptors in relation to biodiversity, which are described in **Chapter 8: Terrestrial Biodiversity and Ornithology** and **Chapter 9: Marine Biodiversity**;
- The baseline groundwater and aquatic environment is described in **Chapter 10: Coastal Management and Water Quality**, **Chapter 11: Surface Water and Flood Risk**, and **Chapter 12: Soils, Geology and Hydrogeology**. The key points for major accidents and disasters are:
  - drinking water – the following reservoirs are designated as drinking water sources: Busbie Muir Reservoir (7.3 km), Camphill Reservoir (9.5 km), Muirhead Reservoir (9.4 km), Knockendon Reservoir (6.0 km), CAAF Reservoir (6.7 km), Munnoch Reservoir (7.5 km)and Mill Glen Reservoir (8.3 km);
  - the nearest Designated Bathing Waters are Millport Bay on Cumbrae (3.7 km) and Largs (pencil beach) (7.4 km) to the north (there are also designated bathing waters further south at Seamill (4.7 km)); and
  - fish and shellfish waters - the Firth of Clyde Coast, which borders the Site is used by the fishing industry and for recreational uses. Additionally, there is a Shellfish Waters protected area to the north of HNB near Fairlie.
- Particular species – **Chapters 8: Terrestrial Biodiversity and Ornithology** and **Chapter 9: Marine Biodiversity** identifies species of interest, primarily associated with Southannan Sands SSSI including Hunterston Sands;
- Designated heritage assets are statutorily protected and include listed buildings, scheduled monuments, registered park and gardens and conservation areas all of which are present within 5 km of the Works Area. These are described further within **Chapter 13: Historic Environment** and **Appendix 13A**. The methodology included within CDOIF[30] considers that accidental damage to historic and heritage assets of the highest significance as applied in Scotland, notably scheduled monuments, protected wreck sites, registered battlefields, Category A listed buildings, gardens and designed landscapes, and World Heritage Sites. Associated conservation areas that contribute to their significance are also included.

18.8.7 The nearest human populations have been identified as potential receptors and are listed in **Table 18.9**.

Table 18.9 List of human populations identified as being potential receptors

Human Receptors	Description
Workers in the Works Area	There are currently ~550 FTE personnel employed at HNB and this is anticipated to decrease through the Preparations for Quiescence phase. There will be a small population of workers at the start of the Quiescence phase but these are likely to be removed after the first five years subject to regulatory approvals (Chapter 2: The Decommissioning Process). Site presence will then be rare until the Final Site Clearance phase.
Workers on the adjacent HNA site	HNA is going through a similar decommissioning programme managed by the Nuclear Decommissioning Authority (NDA). It is currently in the Preparations for Quiescence phase[52] []. It is our understanding that HNA is expected to enter Care and Maintenance in approximately 2030 and Final Site Clearance will be completed by 2080. It is not clear when the Final Site Clearance phase will commence but this phase is anticipated to overlap with the Quiescence phase of the Proposed Works. Until the HNA site enters Care and Maintenance phase in 2030, there is likely to be a workforce present 24/7, with over 141 staff directly employed at the Site and additional contractors, although the typical population will be much lower to account for shift patterns.
Nearby residential populations	There are five residential receptors within 1 km of the Works Area including Hunterston House and Hunterston Castle.
Transport users	There are only minor roads within 1km of the Works Area with the majority of road users relating to either the Proposed Works or the adjacent HNA station. There are no A roads or railway lines within 1km of the site.

Scoped in effects

18.8.8 The potentially significant major accidents and disasters effects that have been assessed are summarised in **Table 18.10**. Detailed source-pathway-receptor linkages have been developed, where they are credible, and are given in **Appendix 18B Impact Assessment of scoped-in scenarios**.

18.8.9 The term ‘Likely significant major accident and disaster effect’ is defined to mean a major accident or disaster for which the risk of harm has not yet been demonstrated to be not significant. In this context, the term ‘likely’ is not a reference to the likelihood of occurrence but the potential for an event to occur.

[52] Quiescence is called Care and Maintenance Phase on Magnox licensed sites.

Table 18.10 Likely significant major accidents and disaster effects

Activity	Effect	Receptors
Major accidents associated with the Proposed Works resulting from a fire/explosion and caused by accidental release of substances not regulated under COMAH8, or when HNB is no longer regulated under COMAH.	Serious or fatal injuries to human populations.	Human receptors (**Table 18.9**) Historic environment receptors.
Major accidents associated with the Proposed Works. An accidental release of hazardous chemical(s) not regulated under COMAH or firewater run-off contaminated with non-COMAH Dangerous Substances, or when HNB is no longer regulated under COMAH.	Serious or fatal injuries to human populations. Serious harm to or contamination of non-human receptors.	Human receptors (**Table 18.9**) Water and land receptors (including habitats, particular species, and designated sites).
Run-off of contaminated fire water from non-process/non-rad fire/explosion (e.g., building fires) associated with the Proposed Works.	Serious harm to or contamination of non-human receptors.	Water and land receptors (including habitats, particular species, and designated sites).
Major accidents caused by physical effects associated with the Proposed Works, (structural collapse, impact, dropped or swung load, high energy pipe/equipment failure, collapse of excavation).	Serious or fatal injuries to human populations Serious harm to or contamination of non-human receptors.	Human receptors (**Table 18.9**) Historic environment receptors.
Natural disasters where the Proposed Works have a material effect on the extent and severity of the disaster.	Serious or fatal injuries to human populations. Serious harm to or contamination of non-human receptors.	Human receptors (**Table 18.9**) Water and land receptors (including habitats, particular species, and designated sites).
Major accidents caused by events external to the decommissioning where the Proposed Works have a material effect on the extent and severity of the accident. This includes aircraft crash, projectiles, domino effects from an industrial accident in the vicinity, and loss of key utility (power supply, water supply) and this excludes security, cyber-security and malicious acts.	Serious or fatal injuries to human populations. Serious harm to or contamination of non-human receptors.	Human receptors (**Table 18.9**) Water and land receptors (including habitats, particular species, and designated sites) Historic environment receptors.

18.8.10 Each major accident listed in **Table 18.10** was assessed with the temporal effects of the Proposed Works being considered.

18.8.11 It was identified that all activities listed in Table 17.10 are relevant during the Preparations for Quiescence phase of the project, which is expected to last 12 years. This is due to the presence of combustible and explosive materials being stored on the Site, alongside potential uses of firewater and also the presence of workers on the Site.

18.8.12 During the Quiescence phase, the only credible major accident or disasters to be considered are natural disasters. This is due to the reduction in human receptors in the Works Area, and the reduction in stored chemicals and fuels.

18.8.13 During Final Site Clearance, most of the activities are relevant although the inventories of hazardous materials are significantly reduced compared to the Preparations for Quiescence phase.

18.9 Assessment of effects

The summary of the assessment as to whether the scoped in scenarios are significant can be found in **Table 18.11** below.

18.9.1 The full explanation of results with justifications can be found in **Appendix 18B**.

18.9.2 The summary of the assessment as to whether the scoped in scenarios are significant can be found in **Table 18.11** below.

Table 18.11: Summary table of significance for scoped in scenarios

Scoped in scenario	Potential impact on receptors (worst case)	Significance
Major accidents associated with the Proposed Works resulting from a fire/explosion and caused by accidental release of substances not regulated under COMAH, or when HNB is no longer regulated under COMAH.	Human population receptors	**Not Significant**
	Historic environment receptors	**Not Significant**
Major accidents associated with the Proposed Works. An accidental release of hazardous chemical not regulated under COMAH or firewater run-off contaminated with non-COMAH Dangerous Substances, or when HNB is no longer regulated under COMAH.	Human population receptors	**Not Significant**
	Water and land receptors	**Not Significant**
Run-off of contaminated fire water from non-process/non-rad fire/explosion (e.g., building fires) associated with the Proposed Works.	Water and land receptors	**Not Significant**
Major accidents caused by physical effects associated with the Proposed Works, (structural collapse, impact, dropped or swung load, high energy pipe/equipment failure, collapse of excavation).	Human population receptors	**Not Significant**

Scoped in scenario	Potential impact on receptors (worst case)	Significance
	Historic environment receptors.	**Not Significant**
Natural disasters where the Proposed Works have a material effect on the extent and severity of the disaster.	Human population Receptors	**Not Significant**
	Water and Land Receptors	**Not Significant**
Major accidents caused by events external to the decommissioning where the Proposed Works have a material effect on the extent and severity of the accident. This includes aircraft crash, projectiles, domino effects from an industrial accident in the vicinity, and loss of key utility (power supply, water supply) and this excludes security, cyber-security and malicious acts.	Human population Receptors	**Not Significant**
	Water and Land Receptors	**Not Significant**
	Historic environment Receptors	**Not Significant**

18.10 Assessment of cumulative effects

Inter-project effects

18.10.1 There is the potential for major accident and disaster effects associated with the Proposed Works to interact with, or combine with the effects arising from other developments or projects proposed within the relevant Zones of Influence applicable to each environmental aspect.

18.10.2 An assessment of inter-project effects is considered within **in Chapter 21: Cumulative Effects Assessment** of this ES.

Intra-project effects

18.10.3 The assessment has inherently considered intra-relationship effects with other topics being assessed as part of the EIA which have the potential to lead to a risk event or to affect identified receptors.

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19.

Conventional Waste

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19. Conventional Waste

19.1 Introduction

19.1.1 This chapter presents the assessment of the likely significant effects of the Proposed Works with respect to the potential impacts of conventional waste management during the Proposed Works and should be read in conjunction with the description provided in **Chapter 2: The Decommissioning Process**.

19.1.2 The focus of the waste assessment will be on the ability and capacity of existing waste management infrastructure to accommodate waste generated by the Proposed Works. The assessment will consider the role and function of existing and proposed on-site facilities in the context of overall waste management. The proposed waste assessment scope for the Environmental Statement (ES) does not include specific assessment of the potential effects of waste management in the context of the aspects in the bullet points below as these are assessed within the relevant individual aspect chapters:

- **Chapter 6: Air Quality**;
- **Chapter 12: Soils, Geology and Hydrogeology**;
- **Chapter 15: Noise and Vibration**;
- **Chapter 11: Surface Water and Flood Risk**; and
- **Chapter 16: Traffic and Transport**.

19.1.3 Radiological effects, including radioactive waste are considered within **Chapter 20: Radioactive Waste and Discharges** and are therefore excluded from this assessment.

19.1.4 Moreover, aqueous discharges are considered within **Chapter 10: Surface Water and Flood Risk** and **Chapter 10: Coastal Management and Water Quality** and are also therefore also excluded from this assessment.

19.1.5 Furthermore, the assessment of contaminated soils and materials is addressed in **Chapter 11: Soils, Geology and Hydrogeology**. Only the effects of contaminated soils and waste materials requiring off-site disposal are within the scope of the waste assessment set out in this chapter.

19.2 Relevant legislation, policy and technical guidance

Legislation

19.2.1 The legislation in **Table 19.1** is relevant to the assessment of the effects on waste and material assets receptors:

Table 19.1 Legislation relevant to conventional waste

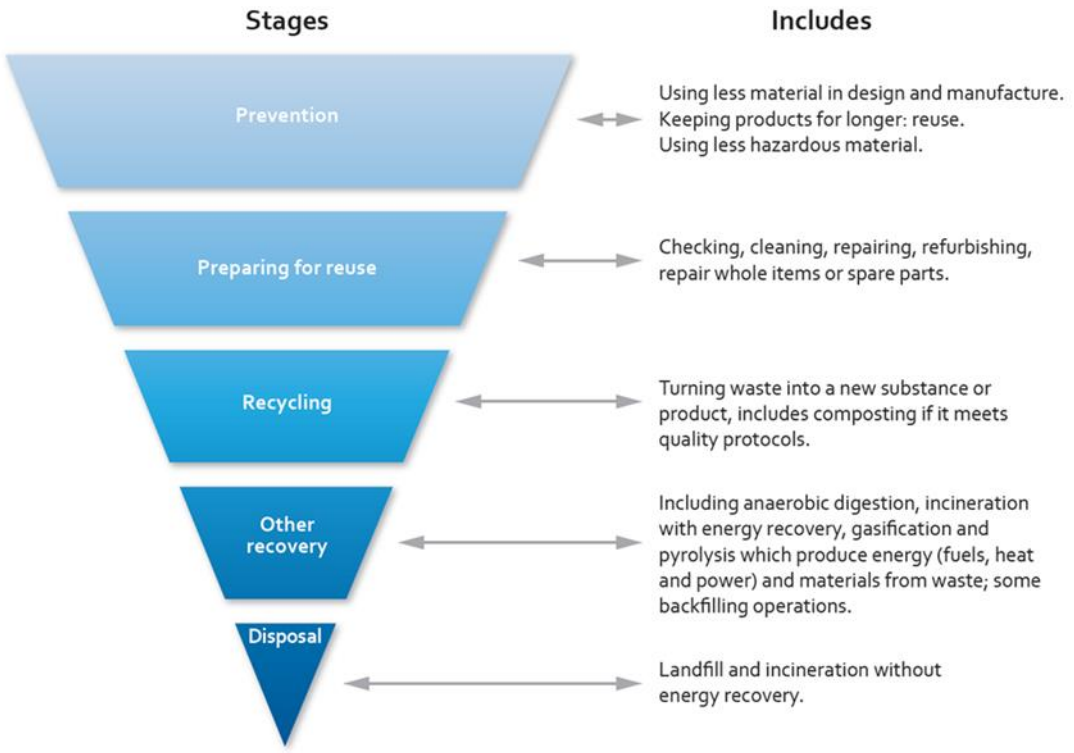
Legislation	Legislation Issue
Environmental Protection Act 1990 (EPA)[1]	The Environmental Protection Act 1990 (EPA) succeeded the Control of Pollution Act 1974 (COPA) and introduced new regulations for improved management systems relating to waste and pollution. The EPA establishes legal responsibilities for pollution control for land, air and water. In respect of waste, the EPA defines the fundamental structure and authority for waste management and control of emissions into the environment.
Special Waste Regulations 1996 (as amended for Scotland in 2004)[2]	In Scotland, the Special Waste Regulations 1996 (and their amendments) set out procedures to be followed when disposing of, carrying and receiving special waste. The regulations are the principal piece of legislation covering special waste arising in Scotland.
The Environmental Protection (Duty of Care) (Scotland) Regulations 2014[3]	These regulations amend Section 34 of the Environmental Protection Act 1990 to implement a number of actions in the Scottish Government's Zero Waste Plan[4]. Under these amendments, holders of waste, including producers, have a duty to take reasonable steps to increase the quantity and quality of recyclable materials.
The Waste (Scotland) Regulations 2012[5]	The regulations (amongst other things) make the following provisions of relevance to the Proposed Works: • All businesses, public sector and not-for-profit organisations are required to present metal, plastic, glass, paper and card (including cardboard) for separate collection from 1 January 2014. • A ban on any metal, plastic, glass, paper, card and food collected separately for recycling from going to incineration or landfill from 1 January 2014. • A ban on biodegradable municipal waste going to landfill from 1 January 2021.

Policy

19.2.2 The principal objective of sustainable waste and material resource management is to use material resources more efficiently. The management of waste in accordance with a clearly defined hierarchy forms a fundamental cornerstone of waste planning and management policy (see **Graphic 19.1**). Application of the principles laid down in the waste hierarchy model seek to minimise the quantity of waste that requires final disposal and by seeking to divert waste from requiring final disposal, to reduce the impact of operational and future developments on waste management facilities.

[1] UK Government (1990). *Environmental Protection Act 1990* (Online). Available at: http://www.legislation.gov.uk/ukpga/1990/43/contents (Accessed November 2023)
[2] UK Government (1996). *Special Waste Regulations 1996* (Online). Available at: http://www.legislation.gov.uk/uksi/1996/972/contents/made (Accessed November 2023).
[3] UK Government (2014). *The Environmental Protection (Duty of Care) (Scotland) Regulations 2014* (Online). Available at: http://www.legislation.gov.uk/ssi/2014/4/contents/made (Accessed November 2023).
[4] Scottish Government (2010). *Scotland's Zero Waste Plan* (Online). Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2010/06/scotlands-zero-waste-plan/documents/00458945-pdf/00458945-pdf/govscot%3Adocument/00458945.pdf (Accessed November 2023)
[5] UK Government (2012). *The Waste (Scotland) Regulations 2012* (Online). Available at: https://www.legislation.gov.uk/sdsi/2012/9780111016657/contents (Accessed November 2023).

Graphic 19.1 The waste hierarchy[4]



19.2.3 Policies relating to conventional waste and relevant to the Proposed Works are described in **Table 19.2**.

Table 19.2 Policy relevant to conventional waste

Policy Reference	Policy Relevance
National Policy	
National Planning Framework (NPF) 4[6]	Adopted by Scottish Ministers in February 2023, in respect of waste NPF4 states that "*We will make productive use of existing buildings, places, infrastructure and services, locking in carbon, minimising waste, and building a circular economy.*" [page 4, *Spatial Principles*]. Specifically, Policy 12 of NPF4 (Zero Waste) states that proposals will be supported where they: i. reuse existing buildings and infrastructure; ii. minimise demolition and salvage materials for reuse; iii. minimise waste, reduce pressure on virgin resources and enable building materials, components and products to be disassembled, and reused at the end of their useful life; iv. use materials with the lowest forms of embodied emissions, such as recycled and natural construction materials; v. use materials that are suitable for reuse with minimal reprocessing.

[6] Scottish Government (2023). *National Planning Framework 4*. (Online) Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2023/02/national-planning-framework-4/documents/national-planning-framework-4-revised-draft/national-planning-framework-4-revised-draft/govscot%3Adocument/national-planning-framework-4.pdf (Accessed November 2023)

Policy Reference	Policy Relevance
	Policy 12(c) states that development proposals that are likely to generate waste when operational will set out how much waste the proposal is expected to generate and how it will be managed, including: i. provision to maximise waste reduction and waste separation at source, and ii. measures to minimise cross-contamination of materials, through appropriate segregation and storage of waste; convenient access for the collection of waste; and recycling and localised waste management facilities.
Scotland's Zero Waste Plan[4]	This plan sets out the Scottish Government's vision for a zero-waste society, where the most efficient use of resources is achieved. This would be achieved by minimising Scotland's demand on primary resources and maximising the reuse, recycling and recovery of resources instead of treating them as waste. The principle of the waste hierarchy as set out in the European Waste Framework Directive[7] and replicated at **Graphic 19.1** above is central to this vision. The hierarchy identifies the prevention of waste as the highest priority, followed by reuse, recycling, recovery of other value (e.g. energy), with disposal as the least desirable option.
Climate Change Plan: third report on proposals and policies 2018-2032 (RPP3)[8]	In relation to waste management, this plan requires that by 2032 landfilling of biodegradable municipal waste will have ended and food waste reduced. Additionally, more of Scotland's waste will be recycled and a more circular economy will present significant economic opportunities.
A Green Future: Our 25 Year Plan to Improve the Environment[9]	This 25 Year Environment Plan sets out government action to help the natural world regain and retain good health. This plan includes reducing pollution and waste.
Local Policy	
North Ayrshire Local Development Plan (LDP) (adopted November 2019)[10]	Policy 30 (Waste Management Facilities): supports proposals that align with Scotland's Zero Waste Plan and the Council's Waste Management Strategy where: • Proposals are compatible with surrounding existing and allocated land uses; and • Any environmental effects are satisfactorily mitigated. Strategic Policy 3 (Strategic Development Areas): • Supports Hunterston Development with new land uses such as Hunterston Deep Water Port and Bulk Terminal, and creating more marketable and employable land.

[7] European Commission (2008). *Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives*. (Online) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0098 (Accessed November 2023).
[8] Scottish Government (2018*). Climate Change Plan: third report on proposals and policies 2018-2032 (RPP3)* (Online). Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/corporate-report/2018/02/scottish-governments-climate-change-plan-third-report-proposals-policies-2018/documents/00532096-pdf/00532096-pdf/govscot%3Adocument/00532096.pdf (Accessed November 2023).
[9] Department for Environment, Food and Rural Affairs (2018) *A Green Future: Our 25 Year Plan to Improve the Environment* (Online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf (Accessed November 2023)
[10] North Ayrshire Council (2019). *Adopted Local Development Plan* (Online). Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed November 2023).

Policy Reference	Policy Relevance
	• Supports nuclear decommissioning and radioactive waste management from within the Hunterston B (HNB) Nuclear Site Licence Boundary. Policy 35 (Hazardous Installations and Substances): supports development for the storage and/or management of low level and intermediate level radioactive waste within nuclear licensed areas at Hunterston where development: i. relates to low level and intermediate radioactive waste arising from Hunterston A and B only; and ii. is consistent with the relevant national policy and strategy for managing radioactive waste in Scotland; and iii. includes adequate measures to mitigate adverse impacts on the environment, transport and public health. Policy 35 outlines that proposals will not be supported for the storage and/or management of low level and intermediate level radioactive waste arising from other nuclear installations.

Technical guidance

19.2.4 A summary of the relevant technical guidance informing this chapter is given in **Table 19.3**.

Table 19.3 Technical Guidance relevant to conventional waste

Technical Guidance	Context
Duty of care: code of practice for managing controlled waste[11]	The code of practice (the Code) sets out practical guidance on how to meet the waste duty of care requirements. The Code applies to any party who imports, produces, carries, keeps, treats, disposes of or, as a dealer or broker has control of, certain waste in Scotland.
Guidelines for Environmental Impact Assessment[12]	This Environmental Impact Assessment (EIA) guidance sets out key principles and direction to ensure that environmental mitigation identified during the pre-application assessment process (including design and EIA) is delivered once consent has been granted.
Site Waste Management Plans 2008 (revoked in 2013 but still considered best practice)[13]	Covers the requirements for a site waste management plan including preparation, content, reviews and updates, records and the duties of the Applicant and principal contractor. These (now revoked) regulations set out a baseline standard for a site waste management plan.

[11] Scottish Government (2018) *Duty of care: code of practice for managing controlled waste* (Online). Available at: https://www.gov.scot/publications/duty-care-code-practice/ (Accessed November 2023).
[12] Institute of Environmental Management and Assessment (IEMA) (2016) *Environmental Impact Assessment Guide to: Delivering Quality Development* (Online). Available at: https://www.iema.net/download-document/328273 (Accessed November 2023).
[13] *The Site Waste Management Plans Regulations 2008* (Online). Available at: http://www.legislation.gov.uk/uksi/2008/314/contents/made (Accessed November 2023).

19.3 Data gathering methodology

Study Area

19.3.1 The Study Area for the conventional waste assessment focuses on the administrative area of the appropriate Waste Planning Authority (WPA) – in this case, North Ayrshire Council (NAC). This is because whilst waste will always flow across WPA boundaries for management, treatment and, where appropriate, disposal, WPAs seek to be self-sufficient in waste management terms and make provision for the equivalent of their locality's waste arisings.

Desk study

19.3.2 The waste assessment has been undertaken with reference to **Chapter 2: The Decommissioning Process** and supported by publicly available data sources. The principal data sources used to inform this chapter comprise:

- North Ayrshire LDP20[14], which has been used to establish existing waste management capacity across the Study Area; and
- Scottish Environment Protection Agency (SEPA) waste data returns (online tool) – 2021 data[15], which has been used to establish the throughput and capacities of the existing waste management infrastructure.

Survey work

19.3.3 Due to the quantitative nature of the waste impact assessment and its reliance on publicly available data sources, the assessment has been based upon published data sources only and has not necessitated the carrying out of any survey work.

Data limitations

19.3.4 The key limitation to the data relied on by this assessment is that whilst the most up to date SEPA waste data returns allow analysis of waste inputs and capacities at landfill sites according to whether that capacity is inert[16], non-hazardous[17] or hazardous[18]; the same has not been possible for non-landfill sites.

[14] North Ayrshire Council (2020). *North Ayrshire Local Development Plan (LDP20)*. (online). Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf. (Accessed November 2023).
[15] Scottish Environment Protection Authority (SEPA) (2023). *Waste Sites and Capacity Data Tool*, (Online). Available at: https://www.sepa.org.uk/data-visualisation/waste-sites-and-capacity-tool/ (Accessed November 2023)
[16] Inert waste is waste which is neither chemically nor biologically reactive and will not decompose or only very slowly. Examples of this are rubble and soils.
[17] Non-hazardous waste includes any rubbish or recycling that causes no harm to human or environmental health. This can be from business or household producers. This can include general household waste like food or bathroom rubbish and recycling, and business wastes including any that come from industrial or agricultural sources. Waste can be offensive but not hazardous.
[18] Hazardous wastes, or special waste in Scotland, are materials that contain substances or have properties that might make it harmful to human health or the environment.

19.4 Consultation

Pre-application Opinion

19.4.1 A Pre-application Opinion was adopted by the Office for Nuclear Regulation (ONR) on 04 October 2022. A summary of the relevant responses received in relation to conventional waste and confirmation of how these have been addressed within the assessment is presented in **Table 19.4**.

Table 19.4 Summary of Pre-application Opinion Responses

Paragraph Ref.	Consideration	How addressed in the ES
119	To provide context for the scope of the EIA, it would have been useful to provide information and assumptions on the types and volumes of waste that will be generated throughout the decommissioning project.	Noted, this information has been provided as part of the ES to enable the assessment to be completed – see **Section 19.9**, **Section 19.10.**
122	The ES should include the potential environmental benefits of managing waste via off-site facilities (for example waste sent off-site for incineration, storage and disposal), rather than building new facilities on site.	The conventional waste impact assessment assumes a worst-case scenario that all non-hazardous and hazardous conventional waste will be transported off site for treatment and disposal. **Table 19.10** specifies these quantities. This table also confirms that quantities of inert 'rubble' waste will be re-used onsite and as such, will not require off-site disposal.
124	It is also not clear how the potential impacts of the waste generated from the remediation of contaminated land will be considered in the assessment; if this will be included in the scope of the waste chapter then this should be made clear in the ES.	**Table 19.6** specifies that assumed off-site disposal would be of inert, non-hazardous and hazardous conventional waste. In this regard, any contaminated soils – which would be regarded as hazardous waste – are included in the conventional waste assessment.

19.4.2 In response to a specific point in the ONR Pre-application Opinion (see **Appendix 5A**; Section 3.3, paragraph 125), for further consideration of *material and resource use*. **Appendix 5B** presents the relevant baseline assessment and associated conclusions. With reference to material and resource use, the technical note concludes that on a precautionary basis, material resource use is scoped into the Environmental Statement. This assessment is presented in **Appendix 19A**.

19.5 Overall baseline

Current baseline

19.5.1 The Hunterston B Nuclear Power Station (HNB) produces a limited amount of non-radioactive wastes each year, which are managed and controlled under the Duty of Care Regulations[19]. To follow the principles of the waste hierarchy (see **Graphic 19.1**), options to reduce and reuse waste on site have been examined and this assessment takes account of anticipated quantities of clean/inert waste that will be reused on site. Where possible, wastes (such as metal, cardboard and wood) will be segregated and sent off-site for reuse or recycling. The bulk of the remaining waste will be sent off-site to a registered landfill site or other suitable waste management facility. Prior to the end of generation, up to 125 tonnes of non-recyclable 'conventional' waste was landfilled each year.

19.5.2 Certain wastes, such as oil, oily materials, aerosols and chemicals are managed and disposed of under the more onerous requirements of the Special Waste Regulations 1996. Prior to end of generation, about 245 tonnes of special wastes[20] was produced each year. The bulk of this was oily material and, where possible, oil was sent off-site for recycling.

19.5.3 All conventional waste presently sent off-site for reuse, recycling or final disposal is despatched to facilities primarily located either within the WPA area catchment (i.e. North Ayrshire), or for more specialist wastes such as hazardous materials, within the wider region (i.e. the South West Scotland). Importantly, the WPA has a statutory duty to provide for an appropriate amount of waste infrastructure capacity to be available over a defined time period according to projected waste arisings, to meet national targets to divert waste from landfill, and to adhere to regulatory requirements with regard to the separate collection of waste types (as part of their statutory development plans).

19.5.4 Provision for existing and future waste management needs across North Ayrshire is set out in the North Ayrshire LDP[10]. This strategy is underpinned by an evidence base relating to existing waste management capacities, which is updated by SEPA on an annual basis.

19.5.5 The current evidence base, which relates to the position in 2021, records 49 operational waste facilities across North Ayrshire (15 landfill sites and 34 other waste management facilities). Together, these facilities provide waste management capacity for inert, non-hazardous and hazardous waste streams.

19.5.6 SEPA's annual waste data[15] summaries provide details on the throughput and capacities of these facilities, with the latest data being available for 2021. **Table 19.5** summarises this data, which shows that overall, 2021 throughputs made up 56% of North Ayrshire's total waste management capacity.

[19] UK Government (2014). *The Environmental Protection (Duty of Care) (Scotland) Regulations 2014* (Online). Available at: http://www.legislation.gov.uk/ssi/2014/4/contents/made (Accessed November 2023).
[20] In Scotland "special waste" means any waste that is hazardous waste as defined by Article 1 (4) of the Hazardous Waste Directive. This includes substances or categories of substances that are waste and are marked with an asterisk in the European Waste Catalogue (EWC).

Table 19.5 Baseline conventional waste throughput and capacity in North Ayrshire (2021)

Facility type	No of facilities	2021 throughput (tonnes per annum)	Total capacity (tonnes per annum / tonnes)
Non-landfill:			
Anaerobic digestion	1	24,346	75,000
Civic amenity	4	14,934	35,791
Metal recycling	8	1,388	275,090
Other treatment	6	1,339,957	1,496,640
Pet crematoria	2	252	981
Transfer station	10	206,370	907,475
Composting	1	75	36,900
Other treatment	2	207,526	70,000
Non-landfill sub-total	***34***	***1,794,848***	***2,897,877***
Landfill only:			
Landfill	***15***	***218,090***	***685,000***
TOTAL	**49**	**2,012,938**	**3,582,877**

19.5.7 Further information is available via SEPA's annual waste data on the type of landfill capacity available within the Waste Planning Authority. This is set out in **Table 19.6** below. Comparable data has not been available for the non-landfill facilities.

Table 19.6 Baseline conventional waste throughput and capacity in North Ayrshire landfills (2021)

Facility type	2021 throughput (tonnes per annum)	Total annual permitted capacity (tonnes)	Remaining capacity (tonnes)
Inert landfill	169,262	500,000	5,500,000
Non-hazardous landfill	40,443	160,000	120,000
Hazardous landfill*	0	0	0

*There is no hazardous waste disposal capacity within North Ayrshire.

Future baseline

19.5.8 In the absence of the Proposed Works, there are unlikely to be any notable changes to the existing waste infrastructure capacity, particularly as the WPA is statutorily required to accommodate projected waste arisings. The end points to which different waste types are directed may, however, change in line with national recycling and recovery targets. It is therefore assumed that similar levels of waste capacity to the existing baseline will be made available to manage wastes, during the Final Site Clearance phase of the Proposed Works.

19.6 Embedded environmental measures

19.6.1 **Table 16.15** outlines the embedded environmental measures proposed to reduce the potential effects relevant to conventional waste.

Embedded Measure	Compliance Mechanism
A Site Waste Management Plan (SWMP) will be developed for the Proposed Works, which seeks to re-enforce the principles of the waste management hierarchy i.e. reduce the amount of waste generated where possible; maximise the reuse and recycling of waste; and then only send waste for final disposal if all other alternatives have been exhausted.	Environmental Management Plan (EMP)

19.7 Assessment methodology

19.7.1 The proposed generic project-wide approach to the assessment methodology is set out in **Chapter 5: The EIA Process**, and specifically in **Section 5.3** and **Section 5.4**. However, whilst this has informed the approach that has been used in this waste and material assets chapter, it is necessary to set out how this methodology will be applied, and adapted as appropriate, to address the specific needs of the waste and material assets assessment in the ES.

General approach

19.7.2 Guidance on how to assess the likely significant effects of waste generation from the Proposed Works is set out in the Institute of Environmental Management and Assessment (IEMA) guide to *Materials and Waste in Environmental Impact Assessment*[21]. The proposed assessment methodology is based on this guidance as well as professional judgement and experience with the application of EIA to decommissioning projects - in the context of prevailing relevant waste management legislation, policies and guidance applicable to the Proposed Works.

19.7.3 For the assessment of waste impacts, assumptions regarding the type and quantity of waste requiring management has been applied. Following this, the type and quantity of materials requiring off-site treatment and/or disposal has been assessed in relation to the projected capacity in the Study Area. Importantly, this has been based on the effects that the management of waste from the Proposed Works would have on existing and committed waste infrastructure in the Study Area. Assessment is made on the scale of the

[21] Institute of Environmental Management and Assessment (IEMA) (2020). *IEMA Guide to: Materials and Waste in Environmental Impact Assessment.* IEMA; Cambridgeshire

additional burden that waste requiring management would have on the available capacity within the Study Area.

Determination of significance

19.7.4 The significance of an effect resulting from a development is most commonly assessed by reference to the sensitivity (or value) of a receptor and the magnitude of the effect. This approach provides a mechanism for identifying areas where mitigation measures may be required and to identify the most appropriate measures to alleviate the risk presented by the development.

19.7.5 Other summaries of significance assessments in other chapters of this ES include consideration of 'sensitivity'. This is where the value of a receptor may be ranked, for example a nationally significant ecological designation versus a locally important one. In respect of the receptors identified for the waste impact assessment, there is no distinction between the importance of different types of waste management capacity. As such, no receptor sensitivity or value has been considered in this assessment.

19.7.6 Thresholds of magnitude have, however, been established, and these are set out in **Table 19.7**. These thresholds are based on whether the burden equates to:

- the need to construct a new waste management facility (major);
- the need for an extension to existing infrastructure (moderate); or
- whether the additional waste could be adequately managed by the existing network of waste management capacity (minor and negligible).

19.7.7 **Table 19.7** details the basis for assessing the magnitude of change for conventional waste.

Table 19.7 Establishing the magnitude of change[22]

Magnitude	Criteria	Receptor type
Major negative	Net increase in waste arisings relative to the future baseline leading to a severe, national and regional scale reduction in landfill void space or a severe capacity gap in treatment infrastructure within the spatial scope. Need for additional large-scale waste treatment and/or disposal capacity of: 1. Greater than 250,000 tonnes per annum for non-hazardous waste; 2. Greater than 100,000 tonnes per annum of hazardous waste; or 3. Greater than 10,000,000 tonnes per annum, of inert waste. Effect may be judged to be of importance in the planning context and, therefore, of potential concern to a project depending upon the importance attached to the issue in the decision-making.	All waste receptors (see **Table 19.8**)
Moderate negative	Net increase in waste arisings relative to the future baseline leading to regional scale reduction in landfill void space or a capacity gap in treatment infrastructure within the spatial scope.	All waste receptors (see **Table 19.9)**

[22] **Table 19.7** criteria has been informed by IEMA guidance. However, as the IEMA guidance is landfill only based, professional judgement has also been used to define criteria for other forms of waste management.

Magnitude	Criteria	Receptor type
	Need for additional large-scale waste treatment and/or disposal capacity of: 1. Between 50,000 and 250,000 tonnes per annum for non-hazardous waste; 2. Between 20,000 and 100,000 tonnes per annum of hazardous waste; or 3. Between 2,000,000 tonnes and 10,000,000 tonnes per annum, of inert waste. Effect may be judged to be of importance in the planning context (for example where effects are permanent or long-term and the effect on local waste treatment and disposal infrastructure is such that additional capacity may be required).	
Minor negative	Net increase in waste arisings relative to the future baseline leading to regional scale reduction in landfill void space or a capacity gap in treatment infrastructure within the spatial scope. Need for additional large-scale waste treatment and/or disposal capacity of: 1. Less than 50,000 tonnes per annum for non-hazardous waste; 2. Less than 20,000 tonnes per annum of hazardous waste; or 3. Less than 2,000,000 tonnes per annum, of inert waste. Effect is of low importance in the decision-making process but may be of relevance to the detailed design and mitigation of a project.	All waste receptors (see **Table 19.8**)
Negligible	No increase in waste arisings relative to the future baseline or reduction in landfill void space capacity for landfill void space or a capacity gap in treatment infrastructure in the spatial scope. No appreciable positive or negative effects.	All waste receptors (see **Table 19.8**)
Positive	Net reduction in waste arisings and diversion of waste from landfill relative to the future baseline resulting in an environmental improvement. Positive effect on waste arisings overall and available capacity in landfill void space or in treatment infrastructure.	All waste receptors (see **Table 19.8**)

19.7.8 For most assessments, sensitivity of the receptor + the magnitude of the likely impact = the level of significance of effect. However, as noted above, no receptor sensitivity has been applied in this assessment. As such, for the purposes of this assessment, the overall conclusions on significance are based entirely on the predicted magnitude of effect. Where the magnitude of effects is deemed to be Major and Moderate the overall impact will be Significant. Minor or Negligible effects are deemed to be Not Significant.

19.8 Assumptions and limitations

19.8.1 The following assumption applies in this waste assessment chapter:

- All waste activities will be carried out in accordance with the relevant environmental regulatory requirements, for example, waste transferred off-site will be handled by a registered waste carrier under authorisation by SEPA. This waste would be taken to a

permitted or exempt facility authorised to receive and handle that waste under Duty of Care[3] arrangements.

- In establishing the baseline position (for waste arisings, existing waste management capacity and future requirements), it should be noted that the WPA's Local Plan assumes that the net equivalent of all waste arising from their area is treated in their area, and that all capacity is available for their waste. It may not account for cross border exports and imports.

19.8.2 The following limitations are also noted:

- In the absence of any clearly defined thresholds relating to the magnitude of effect, professional judgement must be applied.

19.8.3 The baseline data presented in this assessment relating to existing waste management capacities and throughputs, represents the picture at a fixed point in time. Capacities and throughputs are continually changing as new facilities come on stream or are closed. Similarly, throughputs are linked to economic activity and changing patterns of disposal are commonplace. To reflect this, underpinning data on capacities and disposals is updated on an annual basis.

19.9 Scope of the assessment

Scope of waste types considered

19.9.1 Before waste assessment receptors can be identified, it is important to establish the types of waste that the Proposed Works could generate. This is because the types of waste that will require management will have a direct bearing on the receptors considered in this assessment.

19.9.2 All conventional waste is categorised by SEPA as being either inert; non-hazardous or special/ hazardous. With this in mind, the following types of inert, non-hazardous and special/ hazardous waste which may be generated by the Proposed Works are considered to come from the following key sources:

- excavation wastes, including soils, overburden etc. This is predominantly clean/ inert material, but there is the possibility that small fractions of this could be contaminated;
- demolition wastes including asbestos contaminated material and inert materials such as rubble and brick, wood, glass and metals, etc; and
- decommissioning staff waste, including food waste, general refuse and paper/card, metals, etc.

19.9.3 Within these sources of waste arisings from the Proposed Works, material may be inert, non-hazardous or special/ hazardous – for example: demolition material can comprise clean/ inert rubble; non-hazardous metals and special wastes such as asbestos.

19.9.4 Arisings of excavation materials which are suitable for beneficial use on-site without treatment (i.e. inert materials) are not within the scope of this assessment, only those fractions treated as waste or requiring off-site disposal are therefore within the scope of the assessment.

Potential receptors

19.9.5 The waste assessment addresses the effects of the waste that would be generated by the Proposed Works. The assessment will consider the types of waste that will be generated and evaluate the effects that the management of these wastes will have on the existing and committed network of waste management infrastructure in the Study Area. Specifically, the focus of this assessment will be on the capability and capacity of the existing and committed network of waste management facilities to accommodate the quantity and types of waste potentially be generated.

19.9.6 The associated effects of managing waste per se (for example transportation of wastes and any effects on amenity from deconstruction activities and operation of waste processing facilities on-site) will not be considered in this assessment and are covered within **Chapter 6: Air Quality, Chapter 15: Noise and Vibration** and **Chapter 16: Traffic and Transport.**

19.9.7 **Table 19.8** shows the receptors that form the focus of this assessment.

Table 19.8 Receptors Subject to Potential Effects

Receptor	Reason for Consideration
Conventional waste: Third party (off-site) inert waste facilities	Existing and planned waste management capacity within spatial scope (using total capacity reported by NAC).
Conventional waste: Third party (off-site) non-hazardous waste facilities	Existing and planned waste management capacity within spatial scope (using total capacity reported by NAC).
Conventional waste: Third party (off-site) hazardous waste facilities	Existing and planned waste management capacity within spatial scope (using total capacity reported NAC).

Likely significant effects

19.9.8 The potential significant waste and material assets effects that have been taken forward for assessment in the ES are summarised in **Table 19.9**.

Table 19.9 Likely significant waste effects

Receptor	Likely significant effects
Conventional waste: Third party (off-site) inert waste facilities	Full use of existing facilities within the Study Area and consequential need to seek additional treatment capacity.
Conventional waste: Third party (off-site) non-hazardous waste facilities	Full use of existing facilities within the Study Area and consequential need to seek additional treatment capacity.
Conventional waste: Third party (off-site) hazardous waste facilities	Full use of existing facilities within the Study Area and consequential need to seek additional treatment capacity.

19.10 Assessment of effects

Waste generation as part of the Proposed Works

19.10.1 As detailed in **Section 2 – The Decommissioning Process**, the Proposed Works will be undertaken in three sequential phases, which will commence upon the completion of defueling:

- Preparations for Quiescence phase (to be carried out of a 12 year period);
- Quiescence phase (~70-year period); and
- Final Site Clearance phase (~10 year period).

19.10.2 It is anticipated that the first stage – the Preparations for Quiescence phase - will result in the generation of several different types of waste, which will require off-site treatment/disposal. Detailed analysis of the types and quantities of waste that are likely to be produced has been prepared in conjunction with the Applicant. Aa summary of the anticipated waste arisings requiring off-site disposal are set out at **Table 19.10**. The focus of this waste assessment is on this first stage of the Proposed Works. The Quiescence phase is not anticipated to result in the generation of any notable quantities of waste and so has been scoped out of this assessment.

19.10.3 In terms of the Final Site Clearance phase, whilst this will result in the generation of some wastes as part of activities such as site remediation, reactor dismantling and Safestore deconstruction, it is anticipated that the quantities of waste will be much less than the quantity of non-hazardous and hazardous materials that will require off-site management in the Preparations for Quiescence phase which is therefore considered the worst-case. It is anticipated that some of the demolition material generated from Final Site Clearance activities will be suitable for use as infill material for voids.

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Table 19.10 Waste generation from the Proposed Works (Preparations for Quiescence stage) requiring off-site treatment or disposal

Waste type	Tonnage of waste requiring off-site disposal (years 1-11 of the Proposed Works)											
Years***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
Inert*	0	0	0	0	0	0	0	0	0	0	0	0
Non-hazardous**	4,388	21,253	17,780	12,646	6,931	1,680	1,026	2,465	2,154	1,291	861	72,474
Hazardous (including contaminated rubble)	8	1,249	891	2,136	4,418	0	147	252	424	197	131	9,852
TOTAL	**4,396**	**22,502**	**18,672**	**14,781**	**11,349**	**1,680**	**1,174**	**2,716**	**2,577**	**1,487**	**992**	**82,326**

**It is anticipated that ~17,209tt of clean rubble will be generated on site but will remain on site and used as a fill material.*

***Of the non-hazardous material, this is anticipated to comprise 63% metals; 35% miscellaneous materials; and 2% glass, plastic and cables*

**** As per the demolition plan presented in **Chapter 2: The Decommissioning Process**, no demolition works are anticipated in year 1.*

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Conventional waste: Third party (off-site) inert waste facilities

19.10.4 As set out in **Table 19.10**, it is not anticipated that any clean, inert materials – predominantly rubble - will be despatched off-site for final disposal. Whilst it is anticipated that the Proposed Works will result in the generation of approximately (~) 17,210 tonnes of inert material over the 12-year Preparations for Quiescence phase, all of this material will be retained on-site for use as infill and/or landscaping material. With this in mind, it is predicted that the Proposed Works will have a **Negligible** magnitude of impact on third party inert waste facilities in the Study Area, and as such, the predicted effect is **Not Significant.**

19.10.5 It is assumed that as in the Preparations for Quiescence phase, no clean, inert materials will be dispatched off-site for final disposal during the Final Site Clearance, as it will be retained on-site for us as infill and/or landscaping material. Therefore, as the impact on inert waste facilities during the Preparations for Quiescence phase is concluded to be **Not Significant**, the lower quantities expected during the Final Site Clearance can be qualitatively assessed as **Not Significant,** based upon the assumption outlined in the future baseline (paragraph).

Conventional waste: Third party (off-site) non-hazardous waste facilities

19.10.6 The increase in waste arisings brought about by the Proposed Works will lead to a greater requirement for treatment capacity at non-hazardous waste facilities in the Study Area relative to the current and anticipated future baseline position outlined in **Section 19.5** of this chapter. However, as set out in **Table 19.10**, it is predicted that only ~73,000 tonnes of non-hazardous waste will be despatched off-site for final treatment/disposal over the 12-year Preparations for Quiescence phase. In the worst-case year (year 3) ~18,000 tonnes of non-hazardous waste will require off-site management. Whilst it is recognised that non-hazardous landfill capacity in the Study Area is limited (see **Table 19.6**), it is also acknowledged that 65% of the non-hazardous waste arising from the Proposed Works comprises metals of varying types. As **Table 19.6** demonstrates, there is significantly more available metal recycling capacity in the Study Area (in excess of 275,000 tonnes per annum) than is currently utilised (only ~1,400 tonnes per annum of this capacity was used in 2021 and there is no evidence to suggest that moving forwards, this is likely to increase significantly). Furthermore, whilst landfill capacity is limited, **Table 19.6** demonstrates that there are sufficient alternative waste management capacities available (including transfer stations), which could accommodate the limited levels of non-hazardous waste to be generated by the Proposed Works.

19.10.7 Finally, the predicted worst-case year for the generation of non-hazardous waste would result in ~18,000 tonnes of waste requiring management. This is significantly less than 50,000 tonnes per annum (the threshold of magnitude of impact set out in **Table 19.7** above), therefore, it is predicted that the Proposed Works will have a **Minor Negative** impact on third party non-hazardous waste facilities in the Study Area, and thus, the predicted effect is **Not Significant.**

19.10.8 As the impact on non-hazardous waste facilities during the Preparations for Quiescence phase is concluded to be **Not Significant**, the lower quantities expected during the Final Site Clearance can be qualitatively assessed as **Not Significant**, based upon the assumption outlined in the future baseline (paragraph 19.5.8).

Conventional waste: Third party (off-site) hazardous waste facilities

19.10.9 The increase in waste arisings brought about by the Preparations for Quiescence phase of the Proposed Works, will lead to a greater requirement for treatment capacity at hazardous waste facilities in the Study Area relative to the current and anticipated future baseline position outlined in **Section 19.5** of this chapter. However, as set out in **Table 19.10**, it is predicted that only ~10,000 tonnes of hazardous waste will be despatched off-site for final treatment/ disposal over the 11-year period of this stage. In the worst-case year (year 5) ~4,500 tonnes of hazardous waste will require off-site disposal. Whilst it is recognised that there is no hazardous landfill capacity in the Study Area (see **Table 19.6**), it is also acknowledged that there are sufficient alternative means to access waste management capacities – most notably transfer stations capacity, which could accommodate the small quantities of hazardous waste to be generated by the Proposed Works. Indeed, hazardous waste management facilities are specialist facilities, which tend to serve regional, rather than local markets. In this context, it would not be unusual for any hazardous waste generated by the Proposed Works to be transferred out of the Study Area for final disposal.

19.10.10 Finally, as the predicted worst-case year during the Preparation for Quiescence period for the generation hazardous waste would see ~4,500 tonnes of waste requiring management, this is significantly less than 20,000 tonnes per annum (the threshold of magnitude of impact set out in **Table 19.7** above), it is predicted that this stage of the Proposed Works will have a **Minor Negative** impact on third party non-hazardous waste facilities in the Study Area, and as such, the predicted effect is **Not Significant.**

19.10.11 As the impact on hazardous waste facilities during the Preparations for Quiescence phase is concluded to be **Not Significant**, the lower quantities expected during the Final Site Clearance can be qualitatively assessed as **Not Significant**, based upon the assumption outlined in the future baseline (paragraph 19.5.8).

19.11 Assessment of cumulative effects

Inter-project effects

19.11.1 There is the potential for conventional waste effects associated with the Proposed Works to interact with, or combine with the effects arising from other developments or projects proposed within the relevant Zones of Influence applicable to each environmental aspect.

19.11.2 An assessment of inter-project effects is considered within in **Chapter 21: Cumulative Effects Assessment** of this ES.

Intra-project effects

19.11.3 Consideration has been given as to whether any of the receptors identified (offsite waste management facilities) are likely to be subject to cumulative intra-project effects because of other environmental topic effects upon the same receptor. However it is expected that there would be no intra-project effects on these receptors.

19.11.4 However, the management of conventional waste is related to the assessment of impacts set out in the air quality, noise and vibration and transport assessments.

19.12 Summary

19.12.1 The results of the assessment of effects of the Proposed Works (Preparation for Quiescence phase) are summarised in **Table 19.11**.

Table 19.11 Summary

Receptor	Summary of Predicted Effect	Magnitude of Change	Significance	Summary of Rationale
Conventional waste: Third party (off-site) inert waste facilities	No inert waste to be despatched off-site for final treatment/ disposal. All such material (~127,000 tonnes in total) to be managed on site.	Negligible	Not Significant	No inert waste is to be despatched off-site for disposal.
Conventional waste: Third party (off-site) non-hazardous waste facilities	~73,000 tonnes of non-hazardous waste to be despatched off-site for final treatment/ disposal over a 12-year decommissioning period. In the worst-case year (year 3) ~22,000 tonnes of non-hazardous waste will require off-site disposal.	Minor Negative	Not Significant	The quantities of non-hazardous waste to be despatched off-site in the worst-case year is significantly less than 50,000 tonnes per annum.
Conventional waste: Third party (off-site) hazardous waste facilities	~4,000 tonnes of hazardous waste to be despatched off-site for final treatment/ disposal over a 12-year decommissioning period. In the worst-case year (year 6) ~3,000 tonnes of non-hazardous waste will require off-site disposal.	Minor Negative	Not Significant	The quantities of hazardous waste to be despatched off-site in the worst-case year is significantly less than 20,000 tonnes per annum.

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20. Radioactive waste and discharges

20. Radioactive waste and discharges

20.1 Introduction

20.1.1 This chapter presents the baseline context with specific reference to the EIADR consenting requirements as they apply to the management of radioactive waste and radioactive discharges which are applicable to the Proposed Works.

20.1.2 The chapter should be read in conjunction with the description provided in **Chapter 2: The Decommissioning Process** (see **Section 2.4**), **Chapter 12: Soils, Geology and Hydrogeology** and **Chapter 19: Conventional waste**. It should be noted that **Chapter 12: Soils, geology and hydrogeology** provides an assessment of the effects related to radioactively contaminated soils and groundwater as they apply to the Proposed Works.

20.2 Relevant legislation, policy and technical guidance

Legislation

20.2.1 The legislation in **Table 20.1** is relevant to the assessment of the effects with respect to radioactive waste management and discharges.

Table 20.1 Legislation relevant to radioactive waste

Legislation	Legislation issue
The Environmental Authorisations (Scotland) Regulations 2018[1]	The Environmental Authorisations (Scotland) Regulations 2018 provide a framework of common procedures relating to the authorisation of activities concerning water, waste management, radioactive substances and pollution prevention and control. The regulations identify the process that the Scottish Environment Protection Agency (SEPA) applies when determining whether to grant authorisation, variation or surrender of permitting concerning a regulated activity.
The Nuclear Installations Act 1965[2] **(NIA)**	This legal instrument controls the installation and operation of nuclear sites and imposes duties on holders of nuclear site licences and makes provision for compensation where injury or damage has been caused in breach of certain duties. It references the requirements for disposal and handling of nuclear waste.

1 UK Government (2018). Environmental Authorisations (Scotland) Regulations 2018 (Online). Available at: https://www.legislation.gov.uk/sdsi/2018/9780111039014/contents (Accessed 18 March 2022).

2 UK Government (1965). Nuclear Installations Act 1965 (Online). Available at: http://www.legislation.gov.uk/ukpga/1965/57 (Accessed 18 March 2022).

Legislation	Legislation issue
The Ionising Radiations Regulations 2017, SI 2017 No 1075[3] (IRR)	Identifies the requirements for the use and control of ionising radiation in the United Kingdom. The regulations require that radiation exposure to workers and members of the public are restricted so far as is reasonably practicable.
Ionising Radiation (Basic Safety Standards) (Miscellaneous Provisions) Regulations 2018, SI 2018 No 482[4]	Address issues arising from the withdrawal of Scotland from the EU and provide revisions to two existing sets of UK Regulations for Ionising Radiation that include devolved responsibilities, as follows: the Ionising Radiation (Basic Safety Standards) (Miscellaneous Provisions) Regulations 2018; and the Justification of Practices Involving Ionising Radiation Regulations 2004.

Policy

20.2.2 The UK has been producing and managing radioactive waste and discharges from a wide range of facilities and specific sources for many decades. Management of waste and discharges is subject to the policies presented in **Table 20.2**.

20.2.3 The principal objective of radioactive waste and discharges management is to use material resources efficiently and to minimise contamination (or activation) wherever practicable. Overarching waste management principles are presented in **Graphic 19.1** within **Chapter 19: Conventional waste**. This waste hierarchy model seeks to minimise the quantity of waste that requires final disposal and to reduce the impact on receptors.

Table 20.2 Policy relevant to radioactive waste and discharges

Policy reference	Policy issue
National Policy	
National Planning Framework (NPF) 4[5]	Adopted by Scottish Ministers in February 2023, in respect of waste NPF4 states that "*We will make productive use of existing buildings, places, infrastructure and services, locking in embedded carbon and minimising waste, and building a circular economy.*" [page 4, *Spatial Principles*]. Allied to this, the emerging policy document commits to the achievement of zero waste. Specifically, Policy 12 of NPF4 supports proposals which: • "*reuse existing buildings and infrastructure;*

3 UK Government (2017). The Ionising Radiations Regulations 2017 (Online). Available at: http://www.legislation.gov.uk/uksi/2017/1075/contents/made (Accessed 18 March 2022).

4 UK Government (2018). The Ionising Radiation (Basic Safety Standards) (Miscellaneous Provisions) Regulations 2018 (Online). Available at: http://www.legislation.gov.uk/uksi/2018/482/contents/made (Accessed 18 March 2022).

5 Scottish Government (2023). National Planning Framework 4. Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2023/02/national-planning-framework-4/documents/national-planning-framework-4-revised-draft/national-planning-framework-4-revised-draft/govscot%3Adocument/national-planning-framework-4.pdf (Accessed 03 August 2023)

Policy reference	Policy issue
	• *minimise demolition and salvage materials for reuse;* • *minimise waste, reduce pressure on virgin resources and enable building materials, components and products to be disassembled, and reused at the end of their useful life;* • *use materials with the lowest forms of embodied emissions, such as recycled and natural construction materials;* and • *use materials that are suitable for reuse with minimal reprocessing*."
Scotland's Zero Waste Plan[6]	This plan sets out the Scottish Government's vision for a zero waste society, where the most efficient use of resources is achieved. This would be achieved by minimising Scotland's demand on primary resources and maximising the reuse, recycling and recovery of resources instead of treating them as waste. The principle of the waste hierarchy as set out in the European Waste Framework Directive[7] is central to this vision. The hierarchy identifies the prevention of waste as the highest priority, followed by reuse, recycling, recovery of other value (e.g. energy), with disposal as the least desirable option.
Policy for the long-term management of solid low-level radioactive wastes[8]	This policy was published by the UK Government and Devolved Administrations and required the Nuclear Decommissioning Authority (NDA) to develop a UK wide strategy. The policy statement covers all aspects of the generation, management and regulation of solid Low-Level Waste (LLW), including the role of the NDA. It is acknowledged that each LLW management need will have its own approach and the development of solutions on a case-by-case basis is a matter for waste managers, therefore this policy is not prescriptive in its approach. The key aim of this policy statement is to provide a high-level framework within which individual LLW management decisions can be taken to ensure safe, environmentally acceptable and cost-effective management solutions that appropriately reflect the nature of the LLW concerned.

[6] Scottish Government (2010). Scotland's Zero Waste Plan (Online). Available at: https://www.gov.scot/publications/scotlands-zero-waste-plan/ (Accessed 07 April 2022)

[7] European Commission (2008). Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives. (Online) Available at: EUR-Lex - 02008L0098-20180705 - EN - EUR-Lex (europa.eu) (Accessed 07 April 2022).

[8] Department for Environment, Food and Rural Affairs, DIT and the Devolved Administrations (2007). Policy for the Long Term Management of Solid Level Radioactive Waste in the United Kingdom (Online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/254393/Low_level_waste_policy.pdf (Accessed 18 March 2022)

Policy reference	Policy issue
UK strategy for the Management of Solid Low-level Waste from the nuclear industry[9]	This document sets out the UK strategy for the management of solid low-level radioactive wastes arising from the nuclear industry. While the scope and direction of the original strategy remain unchanged, this document reflects the progress that has been made since 2010. It also reflects the expected direction for LLW management in the future. Central to the strategy is the implementation of the waste hierarchy (see **Graphic 18.1**), which supports the provision of continued capability and capacity for managing LLW in the UK.
NDA Integrated Waste Management: Radioactive Waste Strategy[10]	This strategy applies to all radioactive waste generated within the NDA estate (including materials that may become waste at some point in the future). It provides a high-level framework for flexible decision-making, to ensure safe, environmentally acceptable and cost-effective solutions that reflect the nature of the radioactive waste concerned. A single radioactive waste strategy replaces the previous NDA strategy for Higher Activity Waste (HAW) and is consistent with the UK strategy for solid LLW.
Scotland's higher activity radioactive waste policy[11]	Provides the framework within which regulators, facility operators, waste producers will take decisions on the long-term management of the waste. The Scottish Government Policy states that long term management of HAW should be near surface disposal as opposed to the deep geological disposal approach that is the approach in England and Wales. The waste hierarchy ranks waste management options in order of what is best for the environment, these being the following ranked from best to worst; prevention, preparing for re-use, recycling, recover other value and disposal. Furthermore, the proximity principle in Scotland requires the waste be dealt with as close to the site of origin as possible.

[9] Department of Energy and Climate Change (2016). UK Strategy for the Management of Solid Low Level Waste from the Nuclear Industry (Online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/497114/NI_LLW_Strategy_Final.pdf (Accessed November 2023).

[10] Nuclear Decommissioning Authority (2019) Integrated Waste Management Radioactive Waste Strategy (Online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/831727/Radioactive_Waste_Management_Strategy_September_2019.pdf (Accessed November 2023).

[11] Scottish Government (2011). Scotland's higher-activity radioactive waste policy (Online). Available at: https://www.gov.scot/publications/scotlands-higher-activity-radioactive-waste-policy-2011/ (Accessed November 2023).

Policy reference	Policy issue
UK Strategy for Radioactive Discharges (2009)[12]	The UKSRDS09 sets out the UK Government policy on radioactive discharges: that the unnecessary introduction of radioactivity into the environment is undesirable, even at levels where doses to humans and other species are low and, on the basis of current knowledge, are unlikely to cause harm. The UKSRDS09 is based on the use of Best Available Techniques to prevent, and where this is not practicable, minimise waste generation and discharges to the environment. The Strategy describes how the UK will implement the agreements made at the 1998 OSPAR Ministerial meeting (and subsequent meetings and reviews).
The Transboundary Radioactive Contamination (Scotland) Direction 2021[13]	The Direction states its purpose is to "*ensure that SEPA considers whether plans to dispose of radioactive waste are liable to result in the radioactive contamination, significant from the point of view of health, of water, soil or airspace of notifiable countries … unless the proposed variation will not increase any authorised limits placed on radioactive waste disposal activities.*" In the context of the Proposed Works, there will not be an increase in any authorised limits placed on existing radioactive waste disposal activities.
Local policy	
North Ayrshire Local Development Plan (LDP) (adopted November 2019)[14]	Policy 30: Waste supports proposals that align with Scotland's Zero Waste Plan where: ● proposals are compatible with surrounding land uses; and ● any environmental effects are satisfactorily mitigated. Policy 35 of the LDP states support for the storage and/or management of low level waste (LLW) and intermediate level waste (ILW) within nuclear licensed areas at Hunterston where development: *i) relates to low level and intermediate radioactive waste arising from Hunterston A and B only; and* *ii) is consistent with the relevant national policy and strategy for managing radioactive waste in Scotland; and*

[12] Department of Energy and Climate Change (2009) UK Strategy for Radioactive Discharges [online]. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/249884/uk_strategy_for_radioactive_discharges.pdf (Accessed November 2023).

[13] Scottish Government (2021). The Transboundary Radioactive Contamination (Scotland) Direction 2021. (Online). Available at: https://www.gov.scot/publications/the-transboundary-radioactive-contamination-scotland-direction-2021/. (Accessed October 2023)

[14] North Ayrshire Council (2019). Adopted Local Development Plan (Online). Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed 07 April 2022).

Policy reference	Policy issue
	iii) includes adequate measures to mitigate adverse impacts on the environment, transport and public health. *Policy 35 outlines that proposals will not be supported for the storage and/or management of low level and intermediate level radioactive waste arising from other nuclear installations*." It is noted that whilst the storage of waste from other nuclear installations is not supported by the LDP, the Environmental Authorisations (Scotland) Regulations (EASR) permit does allow HNB to receive LLW from Torness for interim periods to ensure efficiencies in loading and storing waste. This permitted activity has never been undertaken to date and is not currently envisaged as part of future site activities.

Technical Guidance

20.2.4 A summary of the relevant technical guidance informing this chapter is given in **Table 20.3.**

Table 20.3 Technical Guidance relevant to waste

Technical Guidance	Context
Management of radioactive waste from decommissioning of nuclear sites: Guidance on Requirements for Release from Radioactive Substances Regulation 2018[15]	This is a guidance document for the regulation of decommissioning sites. This guidance specifically requires operators to: ● produce a waste management plan; ● produce a site wide environmental safety case; and ● make sure the condition of their sites meets standards for protection of people and the environment, now and into the future. This guidance document helps: *'i) the requirement for optimised plans for the management of the radioactive wastes from decommissioning and clean-up of a nuclear site* *ii) the standards that must be met if those optimised plans identify that radioactive wastes are best managed by on-site disposal;* and *iii) the standards that a nuclear site must meet to enable it to be released from RSR'*

[15] SEPA (2018) Management of radioactive waste from decommissioning of nuclear sites: Guidance on Requirements for Release from Radioactive Substances Regulation. (Online). Available at: https://www.sepa.org.uk/media/365893/2018-07-17-grr-publication-v1-0.pdf (Accessed July 2022).

Technical Guidance	Context
Decommissioning Nuclear Safety Technical Assessment Guide, NS-TAST-GD-026 Revision 5[16]	This technical assessment guide advises and informs the regulatory judgements of the Office for Nuclear Regulation inspectors in relation to decommissioning at nuclear licensed sites. This guidance contains principles that relate to the management of radioactive waste at all stages of the lifecycle of a facility. This guidance is applicable to all nuclear sites throughout the UK.
Management of Radioactive Material and Radioactive Wastes on Nuclear Licensed Sites, Nuclear Safety Technical Assessment Guide, NS-TAST-GD-24 Issue 7.1[17]	This technical assessment guide advises and informs the regulatory judgements of the Office for Nuclear Regulation inspectors in relation to the management of nuclear matter on nuclear licensed sites. This guidance contains principles that relate to the management of radioactive waste at all stages of the lifecycle of a facility. This guidance is applicable to all nuclear sites throughout the UK.
Joint Regulatory Guidance on Management of Higher Activity Waste on Nuclear Licensed Sites[18]	This document provides guidance covering the management of HAW on nuclear licensed sites. The document describes the regulatory process and expectations in the regulatory process, integrated waste strategies (IWS), radioactive waste management cases (RWMCs), waste minimisation, characterisation and segregation, waste conditioning and disposability, storage, and managing information and records relating to radioactive waste. The guidance can be used equally in England, Scotland and Wales, but any references to geological disposal will mean long-term management when applied to Scotland.

[16] Office for Nuclear Regulation (2019) Decommissioning Nuclear Safety Technical Assessment Guide, NS-TAST-GD-026 Revision 5 (Online) Available at: ns-tast-gd-026.docx (live.com) (Accessed 01 April 2022).

[17] Office for Nuclear Regulation (2019) Management of Radioactive Material and Radioactive Wastes on Nuclear Licensed Sites Nuclear Safety Technical Assessment Guide, NS-TAST-GD-24 Issue 7.1 (Online) Available at: ns-tast-gd-024.docx (live.com) (Accessed 17 June 2022)

[18] Office for Nuclear Regulation, Natural Resources Wales, Scottish Environment Agency, Environment Agency (2021) The Management of Higher Activity Waste on Nuclear Licensed Sites. Joint guidance (Online) Available at: http://www.onr.org.uk/wastemanage/waste-management-joint-guidance.pdf (Accessed 01 April 2022).

20.3 Data gathering methodology

Desk study

19.1.1 This chapter of this Environmental Statement has been undertaken with reference to **Chapter 2: The Decommissioning Process,** supported by a number of data sources including:

- North Ayrshire LDP[14];
- Supporting evidence of the North Ayrshire LDP;
- Scottish Environment Protection Agency (SEPA) waste data returns (online tool)[19];
- Radioactivity in food and the environment (RIFE) reports[20]; and
- UK Radioactive Waste Inventory 2019[21].

Survey work

20.3.1 No specific survey work has been undertaken to inform the development of this chapter of the Environmental Statement with the conclusions based upon published data sources only.

Data limitations

20.3.2 The project description provides information regarding current quantities of radioactive waste identified as part of HNB's submission to the UK Radioactive Waste Inventory in 2022 (hereafter 'UK RWI 22'). These quantities are provided as a conservative estimate of waste volumes prior to future work required to characterise these wastes. Best Practicable Means (BPM) studies to understand the most appropriate radioactive waste management solution are also in most cases not yet complete, and thus UK RWI 22 volumes are understood to be bounding. As decommissioning proposals further develop, it is anticipated that these studies will identify changes in the quantities of ILW and LLW and changes in how these wastes will be processed, packaged, transferred and disposed of.

20.4 Consultation

Overview

20.4.1 Given that the management of radiological waste and discharges for nuclear licensed sites and facilities is subject to current and ongoing governance and oversight by the licensee, no specific consultation has been undertaken to inform this ES chapter.

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[19] Scottish Environment Protection Agency (2022). Waste data returns (Online) Available at: https://www.sepa.org.uk/environment/waste/waste-data/ (Accessed April 2022).

[20] Environment Agency, Food Standards Agency, Food Standards Scotland, Natural Resources Wales, Northern Ireland Environment Agency and the Scottish Environment Protection Agency. Previous RIFE reports can also be found [ARCHIVED CONTENT] Radioactivity in food and the environment (RIFE) reports - GOV.UK (nationalarchives.gov.uk)

[21] NDA (2019). UK Radioactive Waste Inventory 2019. Available at: https://ukinventory.nda.gov.uk/ (Online). (Accessed 23 June 2022).

Pre-application opinion

20.4.2 A Pre-application Opinion was adopted by the Office for Nuclear Regulation (ONR) on 04 October 2022. A summary of the relevant responses received in the Pre-application Opinion in relation to waste and confirmation of how these have been addressed within the assessment is presented in **Table 20.4**.

Table 20.4 Summary of Pre-application Opinion Responses

Ref.	Consideration	How addressed in the ES
87	It is unclear if radiological contamination is considered in the scope of this chapter. ONR notes that contaminated radiological runoff is considered in **Chapter 10: Coastal management and marine quality**. The ES should clearly demonstrate how the potential impacts of radioactive contamination of groundwater, surface water and land have been assessed and where this is described within the report. A rationale should also be provided for the study area for receptors associated with contaminated land.	The identified matters are primarily addressed in **Chapter 12: Soils, Geology and Hydrogeology** and also considered in **Chapter 10: Coastal Management and Water Quality** with respect to wider considerations of the behaviour of discharges in the marine environment.
88	It was identified via the consultation responses that there was a potential for cross contamination from other radioactive sources outside the current permitted site boundary, including a closed former landfill and in respect to the 39" outfall and its two associated lagoons which were not fully considered in the report. In addition, the ES should provide further detail on the interactions with Hunterston A regarding receptors and co-polluters and the interactions with potential sources of radioactive contamination. The assessment should also consider the risks posed by existing contamination and how the contamination may change over time.	The identified matters are addressed in **Chapter 12: Soils, Geology and Hydrogeology**.
120	Clarity is required regarding the use of the Safestore and whether it will also include storing debris waste.	Noted. This information has been provided in **Chapter 2: The Decommissioning Process** with specific reference to the debris vaults. Material already in the debris vaults will be retained in this location and remotely monitored until Final Site Clearance.

Ref.	Consideration	How addressed in the ES
123	The scoping report states that on-site disposal of low activity waste is not part of the current proposals but may be considered in the future for the decommissioning process and therefore is scoped out of Environmental Impact Assessment for Decommissioning Regulations (EIADR). As raised in the comments on the Soil, Geology and Hydrology chapter, the use of in-situ disposal for below ground structures should be clarified in the ES and should be assessed if this approach is being taken.	On-site disposal of low activity waste is not part of the decommissioning works at this stage, hence there is nothing to assess at the moment. It will be assessed at the appropriate time in the future using appropriate contemporary information should it be evidenced that it is considered BAT for that waste stream and becomes part of the decommissioning proposals for the Site.

20.5 Overall baseline

Current baseline

20.5.1 At the time of writing (October 2023) defueling of the reactors at HNB is ongoing following the end of generation in early 2022. Defueling is due to be completed in 2025. The defueling process will significantly reduce the radioactive inventory present within the Site. Defueling and the related interim arrangements to manage waste arisings during the defueling process are not regulated under EIADR.

20.5.2 The regulation and impact of solid, liquid and gaseous discharges of radioactive waste on the environment and human health is undertaken through a permitting regime under the Environmental Authorisations (Scotland) Regulations 2018[1]. These discharges (or disposals) and their impacts are assessed in detail during the process for applying for a permit (or a variation) and are regulated by the Scottish Environment Protection Agency (SEPA) through routine regulatory interactions. Discharges of radioactive waste are currently well within permitted limits.

20.5.3 The effects of working with ionising radiation are specifically regulated by the UK Office for Nuclear Regulation (ONR) under the Ionising Radiation Regulations 2017 and through safety cases developed in accordance with the Applicant's requirements made to comply with the conditions of the Nuclear Site Licence granted under the Nuclear Installations Act 1965. Ionising radiation exposures to workers at HNB are currently well within the relevant dose limits.

20.5.4 The environmental regulators (including SEPA) and food standards agencies (including Food Standards Scotland) publish annual reports under the Radioactivity in Food and the Environment (RIFE) programme which present the radiation doses to members of the public who live and work near nuclear sites in the UK. Radiation dose estimates are based upon sampling and analysis of foodstuffs and environmental media and surveys of the habits of members of the public which include those persons who may be most exposed to radiation.

20.5.5 The RIFE report (RIFE 27)[20,22] from 2021 indicates that for the Hunterston locality, which includes contributions the HNA and HNB sites, 'Total dose' resulting from exposure to radioactivity in food and environment sources for the representative person (i.e. representative of people in the population most exposed to radiation) was 0.006 millisieverts (mSv) per year which is well below the legal limit of 1 mSv per year for exposure to artificial sources of radioactivity. For context, on average, public exposure to radiation amounts to about 2.3 mSv per year which is mostly due to natural sources.

Radioactive waste

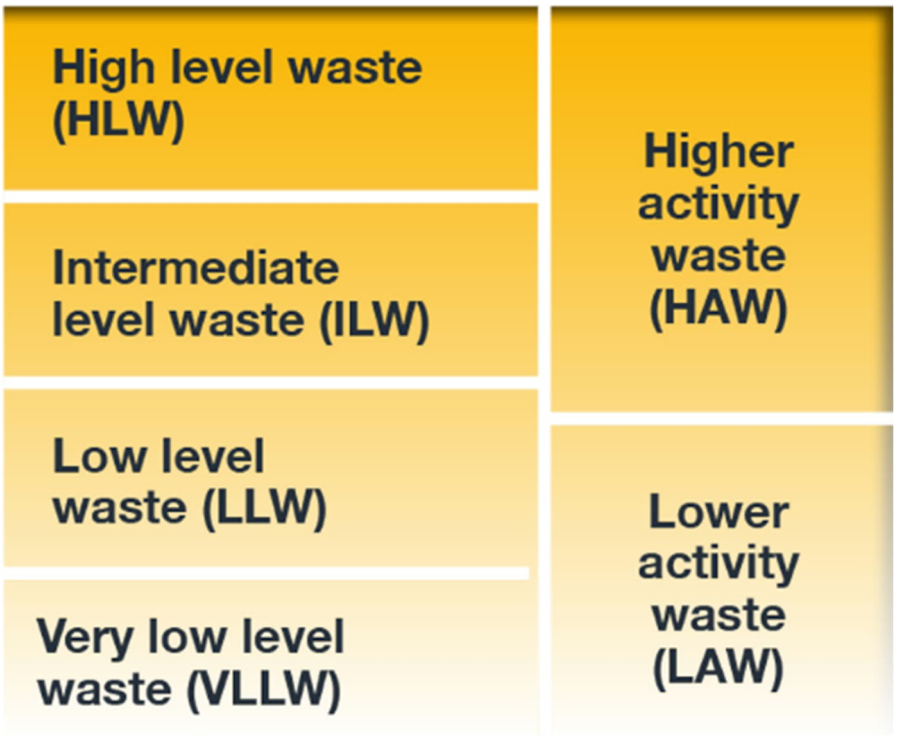
20.5.6 A number of radioactive wastes are created on Advance Gas-cooled Reactors (AGR) nuclear power stations as part of normal operation. The types of waste arising include Low Level Waste (LLW)[23] and Intermediate Level Waste (ILW)[24] which are defined in Paragraph 20.5.7 and Paragraph 20.5.8 respectively. There is no requirement to process High Level Waste (HLW) during the Proposed Works. On EDF sites, there is no distinguishment between LLW and VLLW. **Graphic 20.1** highlights how VLLW, LLW, ILW and HLW are separated into a further categorisation of Lower Activity Waste (LAW) and Higher Activity Waste (HAW).

[22] At the time writing, RIFE report (RIFE 27) was the latest report. However, it is understood that RIFE 28 is now available. 'Total dose' for the representative person was less than 0.005mSv and decreased in 2022. Gaseous discharges of carbon-14 and sulphur-35 from Hunterston B decreased in 2022. Liquid discharges of tritium and sulphur-35 from Hunterston B decreased in 2022.

23 LLW is defined as waste containing radioactive materials not exceeding 4 gigabecquerels per tonne (GBq/te) of alpha radioactivity or 12 GBq/te of beta/gamma radioactivity. The term is usually taken to refer to solid wastes that are not exempt under the RSA93 but which are suitable for disposal or treatment at various off-site locations across the United Kingdom.

[24] ILW is defined as waste in which radioactivity levels exceed the upper boundaries for LLW, but which does not require its heat-generating properties to be taken into account in the design of storage or disposal facilities. In addition to the terms LLW and ILW, there are also some solid wastes that are potentially radioactive but which can be shown to contain radioactivity at levels below the relevant exemption level specified under the Environmental Authorisations (Scotland) Regulations 2018, such that they become out of scope of the Regulations and therefore are suitable for disposal as non-radioactive waste. In respect of their radioactive content these wastes are often described as being 'below regulatory concern'. Such wastes can be and are (as soon as possible after they arise) re-used, recycled or disposed of by whatever routes are appropriate, taking account of their non-radioactive characteristics and the Waste Hierarchy.

Graphic 20.1 Radioactive waste categorisation



20.5.7 LLW is defined as waste containing radioactive materials not exceeding 4 gigabecquerels per tonne (GBq/te) of alpha radioactivity or 12 GBq/te of beta/gamma radioactivity. The term is usually taken to refer to solid wastes that are not exempt under the RSA'93 but which are suitable for disposal at various off-site locations across the United Kingdom.

20.5.8 ILW is defined as waste in which radioactivity levels exceed the upper boundaries for LLW, but which does not have heat generating properties and therefore does not require this issue to be taken into account in the design of storage or disposal facilities.

20.5.9 Solid and non-aqueous liquid radioactive waste generated at HNB during operation included compactible and combustible waste (e.g. PPE, cleaning wipes etc) which are typically sent for incineration or disposal to an appropriate facility to be managed; activated and contaminated metals which can either be recycled via a metals recovery facility or disposal to an appropriate landfill; and, desiccant and catalysts and wet sludges (including potable water treatment plant (PWPT) sludge). Whilst decommissioning wastes may be similar to those that have arisen during operation, they may have a different radionuclide fingerprint. The selection of the optimal disposal routes and whether on-site or off-site treatment techniques are utilised is subject to the application of Best Available Techniques (BAT) and the waste hierarchy (see **Graphic 19.1** in **Chapter 19: Conventional Waste**). The two overarching waste management principles (i.e. the waste hierarchy and the proximity principle) also affect the management, storage and disposal of waste.

20.5.10 There is currently no permanent ILW store in Scotland. Scottish Government's Higher-activity radioactive waste: implementation strategy (2016) outlines the intention for the creation of a long-term Near Surface Facility for HAW. To facilitate the decommissioning process at Hunterston A, an ILW store was built to store ILW that could not be further processed or disposed of, pending the availability of a future permanent disposal route.

Future baseline

20.5.11 It is expected that the radiological discharges during the Proposed Works will be lower than the currently authorised operational discharges from the Site. Discharges of treated radioactive effluent will be made through the Active Effluent Discharge Line (AEDL) and will operate within the limitations of the EASR permit. As a result, it is reasonable to expect that the radiation exposure to members of the public will remain well below the statutory dose constraints.

20.5.12 In the absence of the Proposed Works, there are unlikely to be any notable changes to the existing radioactive waste infrastructure capacity.

20.6 Justification for scoping out radioactive waste and discharges

20.6.1 A Scoping Report was submitted by EDF to the ONR on 01 August 2022. The Scoping Report outlined that radioactive wastes and discharges should be scoped out of the EIA for the Proposed Works due to the extensive regulations and processes already in place to manage their environmental effects and thus ensuring no significant effects on the environment. These are discussed in Paragraphs 20.6.2 to 20.6.9.

20.6.2 HNB's Environmental Permit EAS/P/1173596 issued under the Environmental Authorisations (Scotland) Regulations 2018[1] sets out limits and conditions relating to the disposal of solid and non-aqueous liquid radioactive wastes including those relating to wastes arising during decommissioning. To satisfy the conditions related to the obligations applicable to the licensee, waste will be managed utilising Best Practicable Means (BPM) in order to minimise the volume and activity of waste discharges to the environment. The permitting regime ensures that effects from radioactive discharges and disposals to the environment are tolerable and acceptable. As the permitting regime covers assessment of radioactive discharges and disposals to prevent significant effects, such discharges and disposals have been scoped out of this assessment.

20.6.3 Data on total volumes of waste and materials arising at HNB are provided to the UK Government sponsored Radioactive Waste & Materials Inventory (UKRWI), on a three yearly basis. The UKRWI helps the UK plan safe and efficient management routes and is used to support the planning, operation and performance of supply chain waste management facilities. By providing data to the UKRWI, HNB helps ensure that there is sufficient availability in the UK supply chain for its wastes. HNB will continue to forecast waste arisings from decommissioning and will provide data on its forecasted waste streams throughout the duration of the Proposed Works, thus ensuring its wastes are considered in the planning and operation of the UK's radioactive waste facilities.

20.6.4 Estimated quantities of radioactive waste which are anticipated to be generated during the Proposed Works are presented in **Section 2.4** of **Chapter 2: The Decommissioning Process**.

20.6.5 HAW (which includes ILW) is subject to an assessment process which, when decided it requires long-term management, helps minimise its impact on the capacity and function of the future Scottish NSDF for HAW. The process results in the requirement for a Letter of Compliance (LoC) being approved for each waste stream at each site which confirms its acceptability at the future NSDF for disposal and allows Nuclear Waste Services to plan for sufficient capacity and timely availability for disposal. The impact from ILW on the future capacity of the NSDF has therefore been scoped out of this assessment as this process will ensure ILW produced during HNB decommissioning is managed and packaged in a manner suitable for long-term disposal/storage.

20.6.6 Some operational ILW processed during the Preparations for Quiescence phase may require long-term storage prior to disposal at the NSDF in line with Scottish Policy (see **Table 20.2**). NDA, the Applicant and Magnox Ltd. have come to an agreement that ILW requiring long-term storage processed during the Preparations for Quiescence phase can be stored in the ILW Store at the HNA site utilising existing capacity. Further development work is being undertaken to support the necessary regulatory approvals, therefore the impact of ILW on interim storage facilities has been scoped out of this assessment.

20.6.7 The Management of Radioactive Waste from Decommissioning of Nuclear Sites: Guidance on Requirements for Release from RSR22 produced by SEPA, the Environment Agency and Natural Resources Wales sets out the standards that must be met to release the site from its nuclear site license and the associated conditions of its EASR permit. This guidance, in line with UK Policy[9], does outline that the on-site disposal of LAW is a potential mechanism for the disposal of some LAW generated from the decommissioning process. On-site disposal of LAW would only be considered should BAT assessments conclude it is safe to do so and is the preferred method of managing LAW disposal from the Proposed Works. On-site disposal of LAW does not form part of the current proposals and is therefore scoped out of the EIADR assessment of the Proposed Works.

20.6.8 However, should on-site disposal of LAW become part of the works to decommission HNB, such disposal would require prior agreement with SEPA following the BAT process to satisfy the requirements of the EASR18 permit. At this stage, the operator of the Site may be required to submit a change to the EIADR under Regulation 13 which may be accompanied by a relevant assessment. In addition to the regulatory expectations and requirements discussed above, an Integrated Waste Strategy (IWS) will be prepared which will help set out how waste will be managed in accordance with regulatory expectations. A Radioactive Waste Management Case (RWMC) will be used to demonstrate the longer-term safety and environmental performance of the planned management of specific waste (s) and provide a transparent demonstration of optimised radioactive waste management, compliance with regulatory requirements, policy, national and international standards and how waste management operations are integrated across the lifetime plans for the waste and/or Site as a whole.

20.6.9 Using an IWS and the RWMCs, waste management activities can be shown to be optimised as to minimise its negative impacts and how the requirements of UK policy are met. These will be made available for regulatory scrutiny at an appropriate point of maturity and together with the regulatory regimes discussed above, it is considered that there is sufficient scrutiny and oversight of radioactive waste management such that further assessment is not required.

21.

Cumulative Effects Assessment

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21. Cumulative Effects Assessment

21.1 Introduction

21.1.1 There is the potential for effects associated with the Proposed Works to interact with, or combine with the effects arising from other developments or projects proposed in the geographical area which may be subject to effects as a result of the Proposed Works. This therefore may result in greater significance of effect than when considered in isolation. These are referred to as cumulative effects.

21.1.2 This chapter of the Environmental Statement (ES) presents the cumulative effects assessment (CEA) for the Proposed Works. Two types of cumulative effects have been considered within the CEA:

- Intra-project effects: effects that occur as a result of two or more environmental aspect effects acting together (i.e. combined), to result in a new or changed effects on a single receptor.
- Inter-project effects: effects that arise as a result of the Proposed Works in combination with other large-scale developments or projects (termed 'other developments').

21.2 Relevant legislation, policy and technical guidance

21.2.1 **Chapter 4: Policy and Legislation** of the ES identifies and describes legislation, planning policy and guidance of relevance to the assessment of likely significant effects associated with the Proposed Works. Each of the environmental aspect chapters of this ES (**Chapters 6 - 20**) also provide detail on the legislation, planning policy and guidance relevant to the assessment of the environmental aspect being considered.

21.2.2 This section provides an overview of the specific legislation, policy and guidance of relevance to the assessment of cumulative effects.

Legislation

21.2.3 Legislation relevant to the assessment of cumulative effects is provided in **Table 21.1**.

Table 21.1 Legislative context for the CEA

Legislation	Legislation Issue
Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (EIADR) (as amended)[1]	Schedule 1 (para 5) of the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1991 (EIADR) (as amended) states that ES should present "*A description of the likely significant effects of the project on the environment resulting from, among other things … (e) the cumulation of effects with other existing or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.*

[1] UK Government (1999). *Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (as amended)* (Online) Available at: https://www.legislation.gov.uk/uksi/1999/2892/contents/made (Accessed November 2023).

Legislation	Legislation Issue
	Para 5 in Schedule 1 goes on to state that a description of the likely effects of the proposed project on the environment should *'cover the direct effects and any indirect, secondary, cumulative, transboundary*, *short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project*"

Policy

21.2.4 Policy relevant to the assessment of cumulative effects is provided in **Table 21.2**.

Table 21.2 Policy context for the CEA

Policy	Context
National Planning Framework 4[2]	National Planning Framework 4 (NPF4) presents the national spatial strategy for Scotland. It sets out the spatial principles, regional priorities, national developments and national planning policy. It replaces NPF3 and Scottish Planning Policy. Development 16. Hunterston Strategic Asset within NPF4, supports the "*repurposing of Hunterston port as well as the adjacent former nuclear power station sites and marketable business land of the Hunterston Estate.'* NPF4 also states that *'New development will need to optimise the capacity of the transport network, include active travel links and be compatible with a location adjacent to sites with nuclear power uses. … Aligned with the Ayrshire Growth Deal, jointly funded by the Scottish and UK Governments, investment in this location will support a wellbeing economy by opening up opportunities for employment and training for local people. A community wealth building approach has been embedded within the Deal and Regional Economic Strategy within Ayrshire, and would be expected to form a part of future development proposals to ensure the economic benefits are retained locally as far as possible, strengthening local supply chains and supporting businesses and communities across Ayrshire."*
North Ayrshire Local Development Plan (Adopted 2019)[3]	The adopted North Ayrshire Local Development Plan (LDP) and associated planning guidance documents[4] sets out how North Ayrshire Council aims to guide development over the next 20 years and includes its spatial development strategy, placemaking policy and strategic development areas, as well as detailed policies. Hunterston forms Strategic Development Area 1 within the LDP, which recognises its national importance as an energy hub and deep-water port and supports its inclusion within NPF4. Regarding the nuclear stations at Hunterston B (HNB), the LDP supports the following:

[2] Local Government and Housing Directorate (2023). *National Planning Framework 4*. (Online) Available at: https://www.gov.scot/publications/national-planning-framework-4/ (Accessed November 2023).
[3] North Ayrshire Council (2019). *Adopted Local Development Plan Your Plan Your Future*. (Online) Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/ldp2.pdf (Accessed November 2023).
[4] The associated planning guidance within the North Ayrshire Local Development Plan can be found at: North Ayrshire Council (2021). *Other Planning Guidance*. (Online) Available at: https://www.north-ayrshire.gov.uk/planning-and-building-standards/ldp/other-planning-guidance.aspx (Accessed November 2023).

Policy	Context
	• "*appropriate development to support the operational life of the existing facility;* • *nuclear decommissioning and radioactive waste management from within the Site; and* • *other facilities for large and small-scale power generation.*" Whilst the Proposed Works do not include a proposal for future use it is assumed, for the purposes of this ES, that the HNB Nuclear Site Licence Boundary (hereafter "the Site") will be left in a brownfield state recognising the future development potential envisaged in the LDP.

Technical guidance

Intra-project effects

21.2.5 There is no single agreed EIA methodology for assessing and quantifying effects on sensitive receptors or resources resulting from the interaction of different impacts from the same project. The intra-project effects assessment has therefore been based on professional judgement and previous experience.

Inter-project effects

21.2.6 A summary of the technical guidance for the assessment of inter-project effects is given in **Table 21.3**.

Table 21.3 Technical guidance relevant to inter-project effects

Technical Guidance	Context
Planning Inspectorate in Advice Note Seventeen[5]	Advice Note 17 presents a four-stage approach to the assessment of inter-project effects, as follows • Stage 1 – establish the project's zone of influence (ZoI) and identify a long list of 'other development'; • Stage 2 – identify a shortlist of 'other development' for the cumulative impact assessment; • Stage 3 – information gathering; and • Stage 4 – assessment. It is acknowledged that Advice Note 17 applies to Development Consent Order applications in England and Wales. However, Advice Note 17 provides a structured approach to the assessment of cumulative effects. Therefore, the assessment of inter-project effects has been undertaken in line with this guidance.

[5] The Planning Inspectorate (2019). *Advice note seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects*. (Online) Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-17/ (Accessed November 2023).

21.3 Intra-project effects assessment

Study Area and methodology of the intra-project effects

Study area

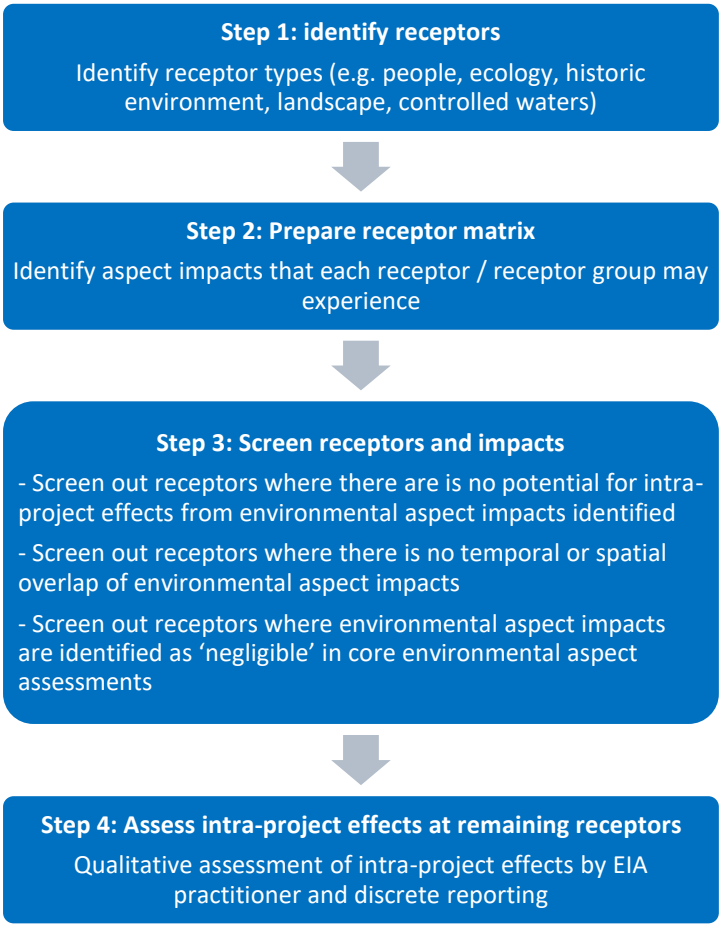
21.3.1 The Study Area for the intra-project CEA has been based on the study areas set out within each the environmental aspect chapter, which are relevant to specific receptors or resources and define the maximum area within which potential effects of the Proposed Works could occur.

Methodology

21.3.2 As there is no standard approach to the assessment of intra-project effects it has been undertaken with reference to previous experience and professional judgement.

21.3.3 As set out in **Chapter 5: The EIA Process** of this ES, the proposed approach used for the assessment of intra-project effects for the Proposed Works is shown in **Graphic 21-1**. This follows a receptor-based approach for the consideration of intra-project effects.

Graphic 21-1 Intra-project effects assessment process



Assessment of intra-project effects

Step 1

21.3.4 Step 1 of the intra-project related effects assessment requires the identification of the potential receptors which may experience intra-project effects. This step involves reviewing the identified environmental receptors, within **Chapters 6-20** of the ES, across all phases of the Proposed Works, to identify which are common across multiple environmental aspect assessments.

21.3.5 The common receptors include:

- Workers of Hunterston B (HNB) power station;
- Hunterston A (HNA) power station site (workers);
- Residents within rural communities in the vicinity of HNB, as well as residents within the local communities of Millport, Fairlie and West Kilbride;
- Visitors to the area (including the users of public rights of way, local walks and roads);
- Statutory and Non-Statutory Biodiversity Conservation Sites – Terrestrial;
- Statutory and Non-Statutory Biodiversity Conservation Sites – Marine;
- Habitats – Terrestrial;
- Habitats – Marine;
- Protected Species – Terrestrial;
- Protected Species – Marine;
- Landscape Character;
- Above and below ground heritage assets;
- Coastal Protection;
- Surface water;
- Ground Water; and
- Soils.

Step 2

21.3.6 Step 2 of the intra-project CEA comprises a review of the residual effects on the common receptors (identified in Step 1) across **Chapters 6-20** of the ES.

21.3.7 **Table 21.4** and **Table 21.5** below summarises the effects different environmental aspects have identified on the same receptors or receptor groups, and the potential for likely significant effects during the Proposed Works. Where environmental aspect assessments have scoped out the Proposed Works (for example during the Quiescence phase) it is expected there would be no or negligible effects on a receptor and therefore not considered further.

21.3.8 In all cases, the likely effects follow the application of environmental embedded and good practice measures in respect of the assessment aspects for the Proposed Works, where required.

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Table 21.4 Common receptors and the significance of identified effects during Preparations for Quiescence and Final Site Clearance phases

Receptors	Air quality	Terrestrial biodiversity and ornithology	Marine biodiversity	Coastal Management and Water Quality	Surface Water and Flood Risk	Soils, Geology and Hydrogeology	Historic Environment	Landscape and Visual	Noise and vibration	People and Communities	Traffic and Transport
Workers of HNB power station	NS				NS	NS			NS	S to NS	NS
Hunterston A station site (workers)	NS				NS	NS		NS	NS		NS
Rural communities in the vicinity of HNB site	NS							S	NS	S	NS
Communities and residential receptors within Millport	NS							NS	NS	NS	NS
Communities and residential receptors within Fairlie	NS							NS	NS	S to NS	NS
Communities and residential receptors within West Kilbride	NS							NS	NS	S to NS	NS
Users of public rights of way, local walks and roads	NS							NS to S	NS	NS	NS
Statutory and Non-Statutory Biodiversity Conservation Sites – Terrestrial	NS	NS									
Statutory and Non-Statutory Biodiversity Conservation Sites – Marine			NS	NS	NS						
Habitats – Terrestrial	NS	NS									

Receptors	Air quality	Terrestrial biodiversity and ornithology	Marine biodiversity	Coastal Management and Water Quality	Surface Water and Flood Risk	Soils, Geology and Hydrogeology	Historic Environment	Landscape and Visual	Noise and vibration	People and Communities	Traffic and Transport
Habitats – Marine			NS	NS	NS						
Protected Species – Terrestrial	NS	NS							NS		
Protected Species – Marine			NS	NS	NS				NS		
Landscape Character		NS						NS			
Above and below ground heritage assets							NS	NS			
Coastal Protection				NS	NS						
Surface water				NS	NS	NS					
Ground Water				NS	NS	NS					
Soils					NS	NS					

S = Significant; NS = Not Significant

Table 21.5 Common receptors and the significance of identified effects during Quiescence phase

Receptors	Historic Environment	Landscape and Visual	Coastal Management and Water Quality	Surface Water and Flood Risk	Soils, Geology and Hydrogeology
Landscape Character	NS	NS			
Above and below ground heritage assets	NS	NS			
Coastal Protection			NS	NS	
Surface water			NS	NS	NS
Ground Water			NS	NS	NS
Soils				NS	NS

S = Significant; NS = Not Significant

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Step 3

21.3.9 Based on the methodology detailed in the previous section, each of the identified receptors and likely effects they may experience has been reviewed and screened for potential intra-project effects. This screening is provided in **Appendix 21A** and summarised in **Table 21.6**.

21.3.10 Where more than one effect on a particular receptor / resource has been identified, the potential for combined effects has been assessed, with consideration given to the nature of the impact and the potential to combine with other impacts on a receptor or resource. Where there is considered to be no potential for effect interactions that lead to a combined effect, or the environmental aspect assessment presented in **Chapters 6-20** have already considered the potential for intra-project effects within their respective assessment, this is stated. Where screened in, the potential effect interactions are further discussed in Step 4.

Table 21.6 Summary of Stage 3 screening exercise

	Taken forward to Stage 4		
Receptors	**Preparations for Quiescence**	**Quiescence**	**Final Site Clearance**
Workers of HNB power station	N	N/A	N
Hunterston A station site workers	N	N	N/A
Rural communities in the vicinity of HNB site	Y	N/A	Y
Communities and residential receptors within Millport	N	N/A	N
Communities and residential receptors within Fairlie	N	N/A	N
Communities and residential receptors within West Kilbride	N	N/A	N
Visitors to the area (including users of public rights of way, local walks and roads).	Y	N/A	Y
Statutory and Non-Statutory Biodiversity Conservation Sites – Terrestrial	N	N/A	N
Statutory and Non-Statutory Biodiversity Conservation Sites – Marine	N	N/A	N
Habitats – Terrestrial	N	N/A	N
Habitats – Marine	N	N/A	N
Protected Species - Terrestrial	N	N/A	N
Protected Species – Marine	N	N/A	N

	Taken forward to Stage 4		
Receptors	**Preparations for Quiescence**	**Quiescence**	**Final Site Clearance**
Landscape Character	N	N	N
Above and below ground heritage assets	N	N	N
Coastal Protection	N	N	N
Surface water	N	N	N
Ground Water	N	N	N
Soils	N	N	N

Step 4

21.3.11 The preceding steps identified that there is the potential for significant intra-project effects in relation to residents within the rural communities close to the HNB and visitors to the area (including the users of public rights of way, local walks and roads) during the Preparations for Quiescence and Final Site Clearance phases.

Rural communities in the vicinity of Hunterston B power station site

Preparations for Quiescence phase

21.3.12 Residents within rural communities in the vicinity of HNB would experience up to minor adverse effects arising from dust emissions resulting from activities in the Indicative Dismantling Works Area (hereafter the “Works Area”) and minor adverse effects from noise generated by activities undertaken during the Proposed Works and road traffic noise. Residents within these communities would experience up to minor adverse effects on their visual amenity from properties, and may also use recreational facilities such as Ayrshire Coastal Path and Public Rights of Way (PRoW) on Goldenberry Hill, from which there may be up to major adverse effects on views.

21.3.13 In addition, there would be a reduction in the number of workers during the Preparations for Quiescence phase, resulting in major adverse effects on employment on these rural communities. This may lead to variable periods of unemployment. Effects on mental health are possible due to the known links with worklessness, but will vary by the individual and their circumstances

21.3.14 Considered cumulatively, impacts resulting in these effects are likely to lead to an increased sense of disturbance and discontent within local rural communities, during the Preparations for Quiescence phase. Noise, dust emissions and visual amenity effects arising from the Proposed Works would be transient in nature due to the phased approach to deconstruction, dismantling and decommissioning.

21.3.15 Temporary effects from noise and dust emissions were assessed as minor to negligible. Impacts to visual amenity will also be temporary over the Preparations for Quiescence phase. However, the loss of employment from HNB would be permanent during worker

lifetimes, although the majority of workers would be expected to be employed elsewhere in the local area (North Ayrshire) within 2 years after termination of work at the Site.

21.3.16 With the adoption of good practice environmental management and the incorporation of proposed embedded measures, noise, dust emissions and visual amenity effects communities would be minimised as far as is reasonably practicable. In addition, the conditions for future employment are appreciably enhanced through the Ayrshire Growth Deal which aims to provides employment which is likely to require skills which overlap with the skills of the HNB workforce. The Ayrshire Growth Deal includes clear plans for development nearby at Hunterston as well as supporting health and community programmes which would be applicable to any HNB employees which were released.

21.3.17 Overall, in the context of the current baseline (that HNB was until recently an operating power station, and is now undergoing defueling), the decommissioning works being undertaken at HNA, and opportunities arising from the Ayrshire Growth Deal, it is considered that the intra-project effects on rural communities during the Preparations for Quiescence phase are not likely to be significant.

Quiescence phase

21.3.18 No likely significant intra-effects associated with the Quiescence Phase was identified in Step 3 and not considered further.

Final Site Clearance phase

21.3.19 During the Final Site Clearance phase, there is the potential for significant intra-effects associated on residents within rural communities in the vicinity of HNB as receptor groups would experience similar noise, emissions to air and landscape and visual amenity effects observed (but no worse than) the Preparations for Quiescence phase. Considered cumulatively, the impacts resulting in these effects are likely to lead to an increased sense of disturbance and discontent within local communities. However, any effects would be transient in nature and would result in the culmination of the decommissioning works, releasing the Site for future use. With the adoption of good practice environmental management and the incorporation of embedded measures (which will include the use of future technologies) effects on rural communities would be minimised as far as is reasonably practicable. It is considered that these communities are not likely to experience significant intra-project effects.

Visitors to the area (including users of public rights of way, local walks and roads)

Preparations for Quiescence phase

21.3.20 Access along the Ayrshire Coastal Path near the Site will be maintained throughout all phases of the Proposed Works. Due to local conditions (potential noise/dust effects) already experienced due to the decommissioning of HNA, users of the coastal path and other nearby rights or way and roads, are unlikely to be further inconvenienced. Similarly, with the adoption of good practice environmental management and the incorporation of proposed embedded measures, noise, dust emissions and visual amenity effects on users arising from the Proposed Works would be minimised as far as is reasonably practicable. Overall, it is considered that the Proposed Works are not likely to have a significant intra-project effect on users.

Quiescence phase

21.3.21 No likely significant intra-effects associated with the Quiescence phase was identified in Step 3 and not considered further.

Final Site Clearance phase

21.3.22 Users of Ayrshire Coastal Path and Power Station Road would experience similar noise, dust, and landscape and visual amenity effects observed (but no worse than) in the Preparations for Quiescence phase. With the adoption of good practice environmental management and the incorporation of proposed embedded measures, noise, dust emissions and visual amenity effects on users arising from the Proposed Works would be minimised as far as is reasonably practicable. Overall, it is considered that the Proposed Works are not likely to have a significant intra-project effect on users.

21.4 Inter-project effects assessment

Study Area and methodology of the inter-project effects assessment

Study Area

21.4.1 The cumulative effects assessment has considered effects that are predicted to arise as a result of the Proposed Works, in combination with other projects, plans and/or programmes, that have the potential to result in a larger, or different, effect on a given receptor.

21.4.2 Other projects, plans and programmes have been identified through EIA Scoping, stakeholder discussion and a review of publicly available information. Schemes have been included on the basis that they are:

- under construction or undergoing decommissioning such as HNA;
- permitted application(s), but not yet implemented (those from the past three years have been considered);
- submitted application(s) not yet determined;
- developments where EIA Screening and/or Scoping has been undertaken but a full planning application has not yet been submitted;
- identified on the National Planning Framework 4; and
- identified within the North Ayrshire Local Development Plan.

General methodology

21.4.3 While there is no standard approach to the CEA, this assessment follows the guidance set-out by the Planning Inspectorate (PINS) in Advice Note Seven: EIA: Process, Preliminary Environmental Information (PINS Advice Note 7) and Advice Note Seventeen (PINS Advice Note 17). Advice Note 17 provides useful guidance, setting out a four-stage process for the identification and assessment of other developments. It is acknowledged that Advice Note 17 applies to Development Consent Order applications in England and Wales. However, Advice Note 17 provides a structured approach to the assessment of cumulative effects and therefore aspects of this approach have been applied to the Proposed Works.

21.4.4 The approach to the CEA generally follows PINS Advice Note 17 which includes four stages:

- Stage 1: Establishing the long list of 'other existing development and/or approved development';
- Stage 2: Establishing a shortlist of 'other existing development and/or approved development';
- Stage 3: Information gathering; and
- Stage 4: assessment.

21.4.5 Further detail on each of these stages, and how these have been applied to this CEA are described in detail below.

Stage 1: Establishing the long list of 'other existing development and/or approved development

21.4.6 The first step of Stage 1 is to identify a Zone of Influence (ZoI) within which an initial long list of projects can be identified. The ZoI has been based off the largest Study Area of the environmental aspect chapters, as the maximum area within which potential effects of the Proposed Works could occur. The ZoI within which any potential effects may combine with the effects arising from other developments, has been broadly defined by a nominal search area extending up to 10 km from the Works Area. This search area is approximately double the largest terrestrial study area used within the technical aspect assessment.

21.4.7 PINS Advice Note 17 acknowledges that certain assessments, such as transport and associated operational assessments of vehicular emissions (including air and noise) may inherently be cumulative assessments. This is because they may incorporate modelled traffic data growth for future traffic flows. Where these assessments are comprehensive and include a worst-case within the defined assessment parameters, no additional cumulative assessment of these aspects is required.

21.4.8 The initial long list, provided in **Appendix 21B**, has been determined under the three tiers based on the PINS Advice Note 17 as set out in **Table 21.7**.

Table 21.7 'Other Development' for inclusion in the inter-project cumulative effects assessment

Hierarchy of other developments	Proposed criteria of other developments	
Tier 1	Under construction or currently undergoing decommissioning such as HNA	Decreasing level of detail likely to be available.
	Permitted application(s), where the project is classified as 'major development', whether under the Town and Country Planning (Scotland) Act 1997, or other consent regimes, but not yet implemented.	
	Submitted application(s), where the project is classified as 'major development', whether under Town and Country Planning (Scotland) Act 1997 or other consent regimes, but not yet determined.	

Hierarchy of other developments	Proposed criteria of other developments
Tier 2	National developments identified on the National Planning Framework 4[6] and/or the relevant local planning authorities planning portal where the project is classified as 'major' development' and a scoping report has been submitted.
Tier 3	National developments identified on the National Planning Framework 4 and/or the subject of pre-application discussion with a relevant Local Planning Authority (LPA), where a scoping report has not been submitted. Projects registered on the LPA's portal classed as major development but do not require EIA.
	Identified in the relevant Local Development Plan (and emerging Development Plans - with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited.
	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.

Stage 2 Establishing a shortlist of 'other existing development and/or approved development'

21.4.9 The long list of other developments was further refined into a 'short list' to establish which other developments may result in likely significant cumulative effects and should therefore be taken forward for further assessment. The following factors were considered when establishing the short list:

- Temporal scope: whether other development has overlapping construction and operation phases with the Preparations for Quiescence and Quiescence phases of the Proposed Works. As the Final Site Clearance phase would occur in approximately 90 – 100 years time, it is not possible to predict potential cumulative development or changes to existing / proposed developments across this time period.
- Scale and nature: whether the scale and nature of the other development identified in the Zone of Influence (ZoI) was likely to interact with the Proposed Works;
- Other factors: whether any other factors, such as the sensitivity of the receiving environment or uncertainty in the potential effects merit further assessment of the potential cumulative effects; and
- Consultation: requests from Stakeholders for the inclusion of specific projects and/or plans within the CEA.

21.4.10 The long list has been evaluated to produce a short list of other developments which will be assessed within the inter-project CEA.

[6] Hunterston Strategic Asset is identified on the National Planning Framework 4 to support re-use the port and wider site, engaging in new technologies and creating opportunities from nuclear decommissioning to make best use of existing infrastructure and provide local benefits. Development being brought forward as part of this redevelopment has been considered on an individual basis.

Stage 3: Information gathering

21.4.11 Information on the short-listed developments has been gathered to inform the final CEA where this is available. This includes:

- Proposed design and location information;
- Construction and operational timescales; and
- Results of any environmental assessments completed for the other developments.

21.4.12 Information and data sources used to inform the assessment has been obtained from publicly available sources.

Stage 4: Assessment

21.4.13 The approach to Stage 4 of the assessment accords with the suggested approach in PINS Advice Note 17. The assessment is commensurate with the information available at the time of assessment. Information on some proposals may be limited and such gaps are acknowledged within the assessment. The assessment includes all short-listed Tier 1 and Tier 2 other development, where possible. For short listed other development falling into Tier 3 the assessment presented may be high level, reflective of the level of information available.

21.4.14 The significance criteria used to identify likely significant effects is consistent with the general approach described in **Chapter 5: The EIA process**, as adapted for specific environmental aspects.

21.4.15 Any measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant cumulative effects and, where appropriate, any proposed monitoring arrangements are identified.

Assessment of inter-project effects

21.4.16 A long list of developments has been produced based on the methodology set out above. This is provided in **Appendix 21B: Other Developments within the 10 km search radius for Hunterston B Decommissioning** of this chapter and was shared with North Ayrshire Council in summer 2023.

21.4.17 **Figure 21.1: Other developments within the 10 km cumulative search radius of the Proposed Works** identifies the location of these.

21.4.18 The potential effects of the Proposed Works in conjunction with the committed developments listed and described above are discussed below in relation to each of the technical aspects identified as having potential cumulative effects.

Assumptions

21.4.19 The following assumptions have been made in the assessment of cumulative effects:

- It is assumed that all of the developments identified within **Appendix 21B** would be complete during the Quiescence phase.
- It is anticipated, as for the Proposed Works, that other proposed/committed developments will implement appropriate embedded measures during their respective construction phases which will help to prevent/minimise adverse effects during construction and avoid potential cumulative effects should construction periods overlap with that of the Proposed Works; and

- The assessment has been completed based on information relating to the committed developments which is available within the public domain.

21.5 Aspect assessment of cumulative effects

Air Quality

21.5.1 Other developments have the potential for generating cumulative air quality effects in a number of ways:

- Generation of additional road traffic. The impacts from road traffic emissions associated with the Proposed Works to human and ecological receptors has been considered by undertaking a screening assessment. The need to undertake a detailed assessment of these emissions was scoped out and the potential impacts are not expected to be significant. It is therefore not necessary to consider these separately.
- Generation of dust during construction. The impacts of the dust emissions expected during the Proposed Works have been assessed and are reported within **Chapter 6: Air Quality, Section 6.8.**

21.5.2 A short list of other development has been devised by screening each within the long list. A ZoI has been considered and those within the ZoI have been screened into the short list of other development. The ZoI that has been used is that which relates to impacts from dust emissions. For air quality, a ZoI of 250 m (as reported in **Chapter 6: Air Quality, Section 6.7**) has been applied for the CEA to ensure direct and indirect cumulative effects can be appropriately identified and assessed.

21.5.3 The following 'other development's' have been brought forward for consideration in the CEA after applying a ZoI of 250 m from the Proposed Works comprise:

- ID 6; Energy Consents Unit; ECU00003319; and
- Ongoing HNA Decommissioning Works.

21.5.4 ID 6 reported a 10-month construction plan and that this will commence during May 2023. This construction programme therefore does not overlap with the Preparations for Quiescence phase (considered for the dust assessment in this ES chapter). Therefore, there are no cumulative effects expected with this development.

21.5.5 The sizeable works associated with Final Site Clearance at HNA are expected to take place during the Quiescence phase of the Proposed Works, therefore there are no cumulative effects expected with this other development with regard to impacts from dust emissions. Notwithstanding, the above it is anticipated that dust mitigation measures would be implemented during potentially dusty activities at HNA which would limit the potential for significant effects in-combination with the Proposed Works.

21.5.6 **No Significant** inter-project air quality effects between the Proposed Works and other developments are anticipated.

Climate Change

21.5.7 All global cumulative greenhouse gas (GHG) sources are relevant to the effect on climate change, and this is taken into account in defining the receptor as being of 'high' sensitivity'.

21.5.8 Effects of GHG emissions from specific cumulative projects are not assessed, as there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other.

21.5.9 Additionally, the contextualisation of GHG emissions, by its nature, incorporates the cumulative contributions of other GHG sources which make up that context. Therefore, it has not been necessary to carry out a separate CEA of GHG emissions as part of this ES. This approach is in accordance with IEMA guidance.[7]

Terrestrial Biodiversity and Ornithology

21.5.10 Cumulative effects on terrestrial ecological features could occur due to the combination of the Proposed Works and other plans and projects. This includes the development of Hunterston Port and Resource Campus (Hunterston PARC), one of Scotland's largest brownfield sites, which, along with HNB and HNA form the two main components of the Hunterston Strategic Development Area (Hunterston SDA).

21.5.11 With the exception of the Cable Factory within the former Hunterston Coal Yard within Hunterston PARC, at the time of writing, there is limited detail to define the precise works planned. Both the Works Area and the site of the Cable Factory, are confined within existing areas of hardstanding and built infrastructure, with minimal areas of semi-natural to natural habitat loss, only relating to losses of habitats of low biodiversity conservation importance that prove to be unavoidable. Neither the Proposed Works or this scheme would require the direct loss of or result in potential of degradation of designated sites (Southannan Sands Site of Special Scientific Interest (SSSI)). There is not anticipated to be an overlap between the construction programme of the Cable Factory with the Proposed Works and therefore disturbance during the Preparations for Quiescence would arise from the Proposed Works alone (which was considered to be Not Significant on protected species).

21.5.12 Whilst there is the potential for further works to come forward as part of the Hunterston PARC during the Proposed Works, the intervening distance between HNB and Hunterston PARC and natural barriers makes cumulative effects unlikely. This is combined with the long Quiescence phase when disturbance of the Works Area will be substantively reduced.

21.5.13 Decommissioning works at HNA are already progressing, adjacent to the Works Area, and therefore any associated disturbance that may arise from these works inherently forms part of the baseline for the main assessment already presented in **Chapter 8: Terrestrial Biodiversity and Ornithology**. The effects of the Proposed Works on ecological features predicted to be of **Very Low** magnitude or **Neutral** and **Not Significant**. In addition, non-operational areas of the Site currently continue to be managed for biodiversity conservation by EDF in accordance with the HNB ILMP and the site's certification under the Wildlife Trusts' Biodiversity Benchmark. Biodiversity monitoring in these areas is undertaken annually to assess progress against management plan objectives and is reported in Land Management Annual Reviews (LMARs).

21.5.14 Upon transfer to Magnox after the completion of defueling, the Site will come under the responsibility of the Magnox Sustainability Strategy. As part of this strategy, there is a commitment to nurture biodiversity on their decommissioning sites. This strategy will drive the creation of a Biodiversity Plans for the Site which will be frequently reviewed to respond to new opportunities for biodiversity enhancement over the decommissioning

[7] IEMA (2022). *Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance – 2nd Edition* (online). Available at: https://www.iema.net/resources/blog/2022/02/24/launch-of-the-updated-eia-guidance-on-assessing-ghg-emissions (Accessed November 2023).

period and actively seek synergies with biodiversity conservation plans and strategies associated with neighbouring development areas and local plans.

21.5.15 The biodiversity net gain (BNG) metric, approved by Defra for calculating biodiversity net gain in England and Wales, is to be applied to calculate the anticipated loss of biodiversity units to the Proposed Works and a proportionate level of compensatory habitat creation that will seek to deliver BNG. BNG plans will similarly seek synergies with biodiversity conservation plans and strategies associated with neighbouring development areas and local plans.

21.5.16 **No Significant** cumulative effects on terrestrial biodiversity and ornithology in conjunction with the Proposed Works are considered likely. This is primarily because of the confinement of the Proposed Works within areas of hard standing, minimal habitat loss affecting habitats of low biodiversity conservation importance, reduced Site disturbance during the Quiescence phase and the management of the Site for biodiversity conservation, synergised with biodiversity conservation plans associated with neighbouring development areas and local plans.

Marine Biodiversity

21.5.17 Cumulative effects on marine ecological features could occur due to the combination of the Proposed Works and other plans and projects. A list of projects and plans considered within the inter-project cumulative effects assessment is presented within **Appendix 21B**. This includes a small number of projects which interact with the marine environment such as the ongoing development at the Hunterston Deep Water Port and Bulk Terminal, and the Hunterston Construction Yard. Other projects listed are all terrestrial in nature and will have no substantial interaction with the marine environment through run-off or piped discharges and therefore are not considered further.

21.5.18 Both the Hunterston Deep Water Port and Bulk Terminal, and the Hunterston Construction Yard have the potential to expand and/or refurbish their infrastructure within the coming years. With the exception of the Cable Factory within the former Hunterston Coal Yard, at the time of writing, there is limited detail to define the precise works planned at these two sites. There is not anticipated to be an overlap between the construction programme of the Cable Factory with the Proposed Works. Whilst there would be an overlap between the operation of the Cable Factory and the Proposed Works, there is limited potential for significant cumulative effects on marine biodiversity to arise in conjunction with the Proposed Works, due to the design and management measures implemented by the scheme such as treatment of surface water prior to discharge into the Firth of Clyde and treatment of foul and trade effluent off-site. With respect to other potential developments being brought forward at these sites, it is considered that the potential for significant cumulative effects to arise in conjunction with the Proposed Works is unlikely, based on the small area to be affected by the Proposed Works, and their short-term temporal nature.

21.5.19 Decommissioning of HNA by Magnox Ltd is ongoing adjacent to the Works Area. While the removal of the HNA cooling water intake and section of the jetty will be removed as part of the Proposed Works, any physical decommissioning works associated with the removal of the HNA outfall, a substantial marine structure extending above the waterline, do not form part of the Proposed Works. It is unknown whether Magnox intend to remove the HNA outfall structure within the duration of the HNB Preparations for Quiescence phase or their proposed methodology for removal. If such works were undertaken, they would be localised to HNA, and subject to their own assessment process, and could be timed to avoid overlap with marine decommissioning activities associated with the Proposed Works to minimise cumulative effects on the marine environment.

21.5.20 **No Significant** inter-project marine biodiversity effects between the Proposed Works and other developments are anticipated.

Coastal Management and Water Quality

21.5.21 Cumulative effects on coastal process and water quality could occur due to the combination of the Proposed Works and other plans and projects. This includes a small number of projects which interact with the marine environment. Other projects listed are all terrestrial in nature and will have no substantial interaction with the sea through run-off or piped discharges and therefore are not considered further.

21.5.22 The ongoing development at the Hunterston Deep Water Port and Bulk Terminal, and the Hunterston Construction Yard, both of which have the potential to expand and/or refurbish their infrastructure within the coming years. At the time of writing, with the exception of the Cable Factory within the former Hunterston Coal Yard, there is limited detail to define the precise works planned at these two sites. There is not anticipated to be an overlap between the construction programme of the Cable Factory with the Proposed Works. Whilst there would be an overlap between the operation of the Cable Factory and the Proposed Works, there is limited potential for works to require a change to the sea defences or changes to sediment regime along the coastline, due to the design and management measures implemented by the scheme such as management of surface water prior to discharge into the Firth of Clyde and treatment of foul and trade effluent off-site.

21.5.23 For the other potential schemes which may come forward as part of the redevelopment of the former Hunterston Coal Yard it is assumed that any works would not lead to sizeable changes in coastal processes and sediment regimes. However, any developments brought forward as part of the redevelopment of Hunterston Construction Yard and Hunterston PARC that may impact flood defences, coastal processes and/or sediment transport would require approval from the relevant authorities. There would be a need to determine the potential effects on the coastal marine environment and demonstrate the approach to avoid, minimise, restore any likely significant effects. It is considered therefore that the potential for significant cumulative effects to arise in conjunction with the Proposed Works is unlikely, based on the small area to be affected by the Proposed Works at HNB, and their short-term temporal nature.

21.5.24 Decommissioning of HNA by Magnox Ltd is ongoing adjacent to the Works Area. While the removal of the HNA cooling water intake and section of the jetty will be removed as part of the Proposed Works, any physical decommissioning works associated with the removal of the HNA outfall, a substantial marine structure extending above the waterline, do not form part of the Proposed Works.

21.5.25 It is unknown whether Magnox intend to remove the HNA outfall structure within the duration of the HNB Preparations for Quiescence phase or their proposed methodology for removal. Changes in hydrodynamic conditions due to the HNB Proposed Works are predicted to be of very low magnitude, with no significant effect on coastal management requirements, and effects on water quality (including sediment mobilisation) will be temporary and short-term in nature. Therefore, cumulative effects with removal of the HNA outfall would not be expected unless the marine works on the two projects coincided temporally and opportunities for embedded mitigation were not utilised for HNA works. As this is highly unlikely to be the case, there are no likely significant cumulative effects.

21.5.26 **No Significant** inter-project coastal processes and water quality effects between the Proposed Works and other developments are anticipated.

Surface Water and Flood Risk

21.5.27 With the exception of the ongoing decommissioning works at the HNA Site, each of the other projects listed in **Appendix 21B** are sited outside of the Study Area for the Surface water and flood risk aspect.

21.5.28 The decommissioning works at the neighbouring HNA Site are interconnected with HNB. As noted in **Chapter 11: Surface Water and Flood Risk, Section 11.5,** HNA and HNB stations each have their own drainage systems, which are interconnected where an overflow structure discharges excess runoff from the HNA station system to the HNB station system. The HNA station is currently being decommissioned by Magnox Ltd and is part way through its care and maintenance preparations (i.e. equivalent to the Proposed Works, Preparations for Quiescence phase described above), which is currently forecasted to be complete around 2030[8]. It will then enter the Care and Maintenance phase (i.e. equivalent to the Proposed Works Quiescence phase) which is scheduled to last until the 2070s after which Final Site Clearance (equivalent to HNB Final Site Clearance) will take place and all remaining structures will be cleared on HNA around the 2080s[9].

21.5.29 On the basis of this information, there is some potential for impacts (set out in **Chapter 11, Section 11.10**) from the schemes to overlap. Environmental measures will be implemented on both sites to ensure that there will be no significant cumulative effects arising from the decommissioning of the HNA and HNB power stations on surface water quality.

21.5.30 The works associated with HNA decommissioning are not anticipated to alter existing coastal flood defences or increase the amount of hardstanding within the catchment area. It is therefore not anticipated that HNA decommissioning activities could combine with HNB Proposed Works to cause additional flooding either at the HNB site or on adjacent land. **Figure 11.4** in **Chapter 11: Surface Water and Flood Risk** of the ES indicates that there is little potential for surface water flow pathways between HNA and HNB.

21.5.31 **No Significant** inter-project surface water and flood risk effects between the Proposed Works and other developments are anticipated.

Soils, Geology and Hydrogeology

21.5.32 For land contamination receptors the ZoI beyond the Works Area used in the assessment is 250 m. This is based upon the potential for contaminants to migrate off-site or to migrate onto the Site from off-site sources. Based on this ZoI the Proposed Works have the potential to result in inter-project cumulative effects with works at the neighbouring HNA site. On this basis, the 'other development' with most potential to interact with soil, geology and hydrogeology in the Works Area is the decommissioning work at the adjacent HNA Site, and this has therefore been considered as an inter-project CEA.

21.5.33 With the embedded measures for the Proposed Works, and as the Site and the HNA site are both subject to the specific environmental and operational controls applied within nuclear power generation sites, it is considered that the potential for significant cumulative effects to arise from other projects and plans in conjunction with the Proposed Works is

[8] Magnox (2021) *Hunterston A Site Stakeholder Group Report* (Online). Available at: https://community.magnoxsocioeconomic.com/wp-content/uploads/2020/10/Hunterston-A-Site-Director-Report-SSG-March-2021.pdf (Accessed November 2023).
[9] Magnox (2014) *Strategic Environmental Assessment Site Specific Baseline* (Online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/732415/Hunterston-A-SEA-FINAL.pdf (Accessed November 2023)

unlikely. Embedded measure **Ref. 12.3**[10] identified in **Table 12.7** of **Chapter 12: Soils, Geology and Hydrogeology** relates to the licensee's compliance with the EASR 2018, and this also applies at the neighbouring HNA station, notably requiring the condition of both sites to meet regulators standards for the protection of people and the environment, now and into the future. Therefore, as the HNA site is subject to the same regulatory controls as HNB, it is anticipated that contamination will be actively managed to prevent it having significant effects on the environment.

21.5.34 For other developments on non-nuclear sites, the planning regime for land contamination requires that development sites are demonstrated to be 'suitable for use' and that they are not capable of being designated as Part IIA Contaminated Land. The use of industry guidance for land contamination assessment such as Land contamination: risk management (LCRM) (2020)[11] (embedded measure **Ref. 12.4**[12] identified in **Table 12.7** of **Chapter 12: Soils, Geology and Hydrogeology**) and British Standard BS10175 (embedded measure **Ref. 12.5**[13] identified in **Table 12.7** of **Chapter 12: Soils, Geology and Hydrogeology**) is standard within the contaminated land industry (and typically conditioned as part of planning approvals). Alongside compliance with Construction Design and Management Regulations 2015 and the Health and Safety at Work etc Act (1974) (embedded measure **Ref. 12.16**[14] identified in **Table 12.7** of **Chapter 12: Soils, Geology and Hydrogeology**) is a legal requirement for all construction projects, these lower the potential for inter-project effects.

21.5.35 Overall it is considered that **No Significant** inter-project effects between the Proposed Works and other developments are anticipated.

Historic Environment

21.5.36 Other developments within or near to the Study Area are detailed in **Chapter 14: Landscape and Visual Impact Assessment, Table 14.6**. Of these, the ongoing decommissioning of the neighbouring HNA station site, development of Hunterston Ore Terminal to form a high voltage sub-sea cable factory (22/00133/PPPM - planning permission in principle) and energy storage facility at Campbeltown Farm (ECU00003319 - consented) were considered likely significant.

21.5.37 In the case of HNA station site, the removal of the HNA Safestore building is anticipated to take place approximately 25 years before the end of the HNB Quiescence phase ends.

21.5.38 Cumulative effects associated with the cable factory and energy storage facility would arise primarily from the construction and operation phases of those respective projects.

21.5.39 The assessment feeding into **Chapter 14: Landscape and Visual Impact Assessment** identified potential receptors of cumulative effects overlapping with historic environment effects in Millport (assessed therein separately as a settlement and recreational/tourist destination) and Hunterston Castle. Landscape and Visual cumulative effects on Millport were identified for the Preparation for Quiescence phase in interaction with HNA decommissioning and cable factory construction, and in the Quiescence phase in

[10] Embedded measure Ref. 12.3 relates to the site characterisation and assessment of land contamination risks to update and implement the waste management plan (WMP) and site-wide environmental safety case (SWESC) during the Proposed Works
[11] Environment Agency (2023). *Land Contamination: risk management* (online). Available at: https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm (Accessed November 2023).
[12] Embedded measure Ref. 12.4 relates to consideration of climate change effects in land contamination risk assessment completed during the Proposed Works.
[13] Embedded measure Ref. 12.5 relates to the design and construction of new groundwater monitoring wells for site characterisation or other environmental purposes
[14] Embedded measure Ref. 12.6 relates to the sampling of existing groundwater monitoring wells that can be retained without compromising the Proposed Works.

interaction with the cable factory. From a Historic Environment perspective, the Millport Conservation Area would be subject to a **Low** magnitude of change during the Preparations for Quiescence and Quiescence phases, producing a **Minor Adverse** effect during the Preparations for Quiescence phase and **Minor Beneficial** effect during the Quiescence phase. No cumulative Historic Environment effects were identified in relation to Hunterston Castle.

21.5.40 Additional potential cumulative Historic Environment receptors have been identified in Little Cumbrae Lighthouse (SM418), Little Cumbrae Castle (SM2195) and Robertson Building Millport Field Centre (LB52288).

21.5.41 Robertson Building Millport Field Centre (LB52288) is anticipated to be exposed to cumulative effects through interaction with HNA decommissioning and the cable factory construction and operation. The Field Centre would be subject to a **Low** magnitude of change through setting during the Preparations for Quiescence and Quiescence phases, producing a **Minor Adverse** effect during the Preparation for Quiescence phase and **Minor Beneficial** effect during the Quiescence phase. These effects would be **Not Significant.**

21.5.42 Little Cumbrae Lighthouse (SM418) and Little Cumbrae Castle (SM2195) are anticipated to be exposed to cumulative effects through interaction with HNA decommissioning. These assets would be subject to a **Negligible** magnitude of change through setting during the Preparations for Quiescence and Quiescence phases, producing a **Minor Adverse** effect during the Preparations for Quiescence phase and **Minor Beneficial** effect during the Quiescence phase. These effects would be **Not Significant**.

Landscape and Visual

21.5.43 The landscape and visual impact assessment presented in **Chapter 14: Landscape and Visual Impact Assessment** of this ES has inherently considered the potential landscape and visual effects of the Proposed Works on their own as well as the Proposed Works with additional cumulative development to ensure a robust assessment has been undertaken. The assessment has adopted detailed guidance, relating to the cumulative assessment of wind farm development, provided in the *Scottish Natural Heritage document 'Guidance: Assessing the Cumulative Landscape and Visual Impact of Onshore Wind Energy Developments' (2021)*[15]. This distinguishes between 'additional' cumulative effects that would result from adding the Proposed Works to other cumulative development and 'combined' cumulative effects that assess the total cumulative effect of the Proposed Works and other cumulative development. In the latter case a significant cumulative effect may result from the Proposed Works or one or more other existing, under-construction or consented developments, or other development applications. In those cases, the main contributing development(s) is identified in the assessment.

A summary of the inter-project cumulative landscape and visual effects potentially arising from the Proposed Works interacting with other developments is set out in **Table 21.8**. Those levels of effect that are shaded in the table and shown in **bold** relate to significant effects. The development contributing most to the cumulative effects is recorded in brackets.

[15] NatureScot, (2021). *Guidance: Assessing the Cumulative Landscape and Visual Impact of Onshore Wind Energy Developments.* (Online) Available at: https://www.nature.scot/doc/guidance-assessing-cumulative-landscape-and-visual-impact-onshore-wind-energy-developments (Accessed November 2023).

Table 21.8 Summary of the predicted landscape and visual cumulative effects

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
Direct Effects on Landscape Character							
LCT 59 - Raised Beach Coast and Cliffs (host LCT)	Preparation for Quiescence phase	Medium	Medium (within 1 km) reducing to Very Low to Zero (end of the Preparations for Quiescence phase) Very Low to Zero beyond 1 km	Moderate and Not Significant (within 1 km) reducing to Minor to None and Not Significant beyond 1 km	Adverse (within 1km during Site activity) Neutral (whole receptor) Beneficial (post removal of buildings)	Moderate and Not Significant (within 1 km) reducing to Minor to None and Not Significant	**Major / Moderate** and Significant (HNA, Cable factory)
	Quiescence phase	Medium	Very Low to Zero (within 1 km) Zero beyond 1 km	Minor to None and Not Significant (within 1 km) None beyond 1 km	Neutral (within 1km) Neutral (whole receptor)	Minor to None and Not Significant (within 1 km)	**Major / Moderate to Moderate** and Significant reducing to None (Cable factory, Demolition of HNA buildings)
	Final Site Clearance phase	Medium	Medium (within 1 km) Very Low to Zero beyond 1 km	Moderate and Not Significant (within 1 km) Minor and Not Significant beyond 1 km	Adverse (within 1km during Site activity) Neutral (whole receptor)	N/A	N/A

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
					Beneficial (post removal of buildings)		
Direct Effects on Seascape / Coastal Character							
Largs to Goldenberry CCA	Preparation for Quiescence phase	Medium	Medium (within 1 km) reducing to Very Low to Zero (end of the Preparations for Quiescence phase) Very Low to Zero beyond 1 km	Moderate and Not Significant (within 1 km) reducing to Minor and Not Significant to Zero Minor and Not Significant beyond 1 km	Adverse (within 1km during Site activity) Neutral (whole receptor) Beneficial (post removal of buildings)	Moderate and Not Significant (within 1 km) reducing to Minor and Not Significant to Zero	**Major / Moderate** and Significant (HNA, Cable factory)
	Quiescence phase	Medium	Very Low to Zero (within 1 km) Zero beyond 1 km	Minor and Not Significant to None (within 1 km) None beyond 1 km	Neutral (within 1km) Neutral (whole receptor)	Minor and Not Significant to None (within 1 km)	**Major / Moderate to Moderate** and Significant reducing to Minor (Cable factory, Demolition of HNA buildings)
	Final Site Clearance phase	Medium	Medium (within 1 km) reducing to Very Low (end of the Final Site Clearance	Moderate and Not Significant (within 1 km) Minor and Not Significant beyond 1 km	Adverse (within 1km during Site activity) Neutral (whole receptor)	N/A	N/A

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
			phase phase) Very Low to Zero beyond 1 km		Beneficial (post removal of buildings)		
Great or Big Cumbrae island CCA	Preparation for Quiescence phase	High-Medium	Zero increasing to Very Low and reducing to Zero	Moderate / Minor to Minor and Not Significant to None	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor to Minor and Not Significant to None	Moderate to Moderate / Minor and Not Significant
	Quiescence phase	High-Medium	Very Low to Zero	Moderate / Minor to Minor and Not Significant to None	Beneficial to Neutral	Moderate / Minor to Minor and Not Significant to None	Moderate to Moderate / Minor and Not Significant
	Final Site Clearance phase	High-Medium	Low-Very Low reducing to Zero	Moderate / Minor and Not Significant to None	Neutral (during Site activity) Neutral (post removal of buildings)	N/A	N/A
Millport CCA	Preparation for Quiescence phase	High-Medium	Zero increasing to Very Low and reducing to Zero	Moderate / Minor to Minor and Not Significant to None	Neutral (during Site activity) Beneficial to Neutral (post	Moderate / Minor to Minor and Not Significant	Moderate to Moderate / Minor and Not Significant

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
					removal of buildings)		
	Quiescence phase	High-Medium	Very Low to Zero	Moderate / Minor to Minor and Not Significant to None	Beneficial to Neutral	Moderate / Minor to Minor and Not Significant	Moderate to Moderate / Minor and Not Significant
	Final Site Clearance phase	High-Medium	Low reducing to Zero	Moderate and Not Significant to None	Neutral (during Site activity) Neutral (post removal of buildings)	N/A	N/A
Little Cumbrae or Wee Cumbrae island CCA	Preparation for Quiescence phase	High-Medium	Zero increasing to Very Low and reducing to Zero	Moderate / Minor to Minor and Not Significant to None	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor to Minor and Not Significant	Moderate to Moderate / Minor and Not Significant
	Quiescence phase	High-Medium	Very Low to Zero	Moderate / Minor to Minor and Not Significant to None	Beneficial to Neutral	Moderate / Minor to Minor and Not Significant	Moderate to Moderate / Minor and Not Significant
	Final Site Clearance phase	High-Medium	Low reducing to Zero	Moderate and Not Significant to None	Neutral (during Site activity) Neutral (post	N/A	N/A

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
					removal of buildings)		
Visual Effects on Views from Settlements							
Millport	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Moderate** and Significant (HNA and cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Moderate** and Significant (Cable factory)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Visual Effects on Views from Transport Routes							
A78	Preparation for Quiescence phase	Medium	Very Low	Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post	Minor and Not Significant	Moderate and Not Significant (Cable factory)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
					removal of buildings)		
	Quiescence phase	Medium	Very Low	Minor and Not Significant	Beneficial to Neutral	Minor and Not Significant	Moderate and Not Significant (Cable factory)
	Final Site Clearance phase	Medium	Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
C26 Kilrusken Road	Preparation for Quiescence phase	Medium	Very Low	Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Minor and Not Significant	Moderate and Not Significant (Cable factory)
	Quiescence phase	Medium	Very Low	Minor and Not Significant	Beneficial to Neutral	Minor and Not Significant	Minor and Not Significant (Demolition of HNA buildings)
	Final Site Clearance phase	Medium	Low reducing to Zero	Moderate/Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
Power Station Road / Oilrig Road	Preparation for Quiescence phase	High	High-Medium reducing to Very Low	**Major to Major / Moderate** and Significant reducing to Moderate/ Minor and Not Significant	Adverse to Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	**Major to Major / Moderate** and Significant reducing to Moderate/ Minor and Not Significant	**Major to Major / Moderate** and Significant (HNA buildings, Cable factory and Proposed Works)
	Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Beneficial to Neutral	Moderate/ Minor and Not Significant	**Major to Major / Moderate** and Significant (HNA demolition, Cable factory)
	Final Site Clearance phase	High	High-Medium reducing to Very Low to Zero	**Major to Major / Moderate** and Significant reducing to Moderate/ Minor and Not Significant and None	Neutral to Beneficial (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Fairlie Moor Road (incorporating Core Paths NC33 and NC34)	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
B896 (Incorporating Core Paths NC1, NC41)	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Major** and Significant (HNA and Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Major** and Significant (HNA and Cable factory)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
Rail Line	Preparation for Quiescence phase	Medium	Very Low	Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Minor and Not Significant	Moderate and Not Significant (Cable factory)
	Quiescence phase	Medium	Very Low	Minor and Not Significant	Beneficial to Neutral	Minor and Not Significant	Moderate and Not Significant (Cable factory)
	Final Site Clearance phase	Medium	Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Visual Effects on Views from Recreational Routes							
Ayrshire Coastal Path (incorporating Core Paths: NC60, NC61)	Preparation for Quiescence phase	High	High-Medium reducing to Very Low	**Major to Major / Moderate** and Significant reducing to Moderate / Minor and Not Significant	Adverse to Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	**Major to Major / Moderate** and Significant reducing to Moderate / Minor and Not Significant	**Major to Major / Moderate** and Significant (HNA buildings, cable factory and Proposed Works)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Major to Major / Moderate** and Significant (HNA demolition, cable factory)
	Final Site Clearance phase	High	High-Medium reducing to Very Low to Zero	**Major to Major / Moderate** and Significant reducing to Moderate / Minor and Not Significant and None	Neutral to Beneficial (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Core Path NC36 - Hunterston Cycle Route	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
Core Path NC111 - Thirdpart	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Neutral (post removal of buildings)	Moderate / Minor and Not Significant	Moderate and Not Significant (Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	No cumulative effects	Moderate and Not Significant (Cable factory)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Core Path NC23 - Fairlie Moor Road	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Major to Major / Moderate** and Significant (Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Major to Major / Moderate** and Significant (Cable factory)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
	Final Site Clearance phase	High	Very Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Core Path NC32 - Fairlie Burn to Diamond Hill	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)
	Final Site Clearance phase	High	Very Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Core Path NC33 and NC34 - Fairlie Moor Road	See assessment of Fairlie Road (Transport Routes)						
Great Cumbrae	See assessment of B896 (Transport Routes)						

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
(Core Paths NC1, NC1a, NC2, NC41, NC74, NC77)							
Visual Effects on Views from Recreational and Tourist Destinations							
Hunterston Castle	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Neutral (post removal of buildings)	No cumulative effects	No cumulative effects
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	No cumulative effects	No cumulative effects
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Millport	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Neutral (post removal of buildings)	Moderate/ Minor and Not Significant	**Moderate** and Significant (HNA and Cable factory)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	Moderate / Minor and Not Significant	**Moderate** and Significant (Demolition of HNA buildings)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Adverse (during Site activity) Beneficial (post removal of buildings)	N/A	N/A

Noise and Vibration

Cumulative road traffic noise

21.5.44 The additional traffic movements generated by the Proposed Works indicates that the anticipated number of additional traffic movements will be negligible compared to baseline flows, and would not cause a significant increase in road traffic noise. On this basis there is negligible potential for cumulative effects due to traffic noise from the Proposed Works. Any cumulative road traffic noise effects would be dominated by vehicle movements associated with other developments, and the requirement to control any such effects would therefore lie with the other developments. An **Outline Construction Traffic Management Plan** has been prepared for the Proposed Works (included within **Appendix 16B** of the ES) that sets out the proposed approach the traffic associated with the Proposed Works will be managed to minimise disruption on the road network.

21.5.45 The cumulative effects due to traffic noise are therefore considered to result in impacts of negligible magnitude. With reference to **Chapter 15: Noise and Vibration, Table 15.12**, impacts of negligible magnitude to receptors of high sensitivity result in effects of **Minor Significance** and are **Not Significant**.

Cumulative noise from activities in the Works Area and construction of other developments

21.5.46 When considering the potential for cumulative effects during construction, it has been assumed that other proposed and committed developments will implement appropriate embedded measures during their respective construction phases. This will help to minimise adverse noise effects and avoid potential cumulative effects, where any construction periods overlap with the Proposed Works.

21.5.47 With regard to potential cumulative construction noise effects, it is noted that only those receptors in close proximity to the Proposed Works would have any potential for significant cumulative effects. This is on the basis that, as indicated by the results provided in **Chapter 15: Noise and vibration, Table 15.16** and **Table 15.17**, there are only three receptor locations where the predicted noise levels from the Proposed Works are within 10 dB of the significance threshold:

- R6 – Hunterston House;
- R7 – Hunterston Castle; and
- R8 – Campbelton Farm.

21.5.48 Because of the logarithmic nature of the summation of sound levels, only locations where noise levels from the Proposed Works are within 10 dB of the significance threshold have the potential to experience significant effects due to cumulative noise from construction of other developments and noise arising from the Proposed Works.

21.5.49 Therefore, only those developments which are considered to have the potential to influence receptors R6, R7 and R8 have been considered in detail. At all other receptor locations, cumulative noise effects are likely to result in effects of no greater than negligible magnitude. With reference to **Chapter 15: Noise and vibration, Table 15.12** of the ES, impacts of negligible magnitude to receptors of high sensitivity result in effects of **Minor Significance** and are **Not Significant**.

21.5.50 The developments identified in **Appendix 21B** that are considered to have the potential to result in cumulative inter-project effects at receptors R6, R7 and R8 are addressed in

Table 21.9 below. Consideration has also been given to the ongoing decommissioning works being undertaken at HNA.

Table 21.9 Assessment of inter-project noise cumulative effects

ID	Address/ Post code	Description of development [Application ref.]	Assessment of cumulative effects
	HNA	Decommissioning works associated with HNA station.	Decommissioning works at HNA are already progressing adjacent to the Works Area, and therefore any associated disturbance that may arise from these works inherently forms part of the baseline for the main assessment already. There appears to be no evidence to suggest that noise or vibration from the operation of HNB, or the decommissioning and/or demolition activities at HNA, have caused any significant levels of noise or vibration in the past. HNA site is part way through its Care and Maintenance Preparations (C&MP) phase of decommissioning which, is currently forecast to complete by October 2030. Final site clearance will overlap with the HNB Quiescence phase. This will be when, outside of maintenance works, activities at HNB will be minimal and likely to result in negligible noise effects. Therefore, potential for cumulative effects during this phase is minimal.
6	Campbelton Farm, on Beech Avenue in Hunterston, North Ayrshire	Grid services facility comprising 2 battery storage facilities, a synchronous condenser with flywheel designed to adjust and support frequency and voltage conditions on the electrical grid and other associated ancillary electrical infrastructure. The electrical export capacity of the Development will be up to approximately 450 MW. [ECU00003319]	A review of the noise impact assessment[16] indicates that the potential for cumulative effects is minimal. Therefore, the likely cumulative effects due to noise emissions arising from this development are considered to be of negligible magnitude.
13	Site To West Of Campbelton Farm Hunterston Estate West Kilbride North Ayrshire	Construction of 200 Mega volt amps (MVar), 400 kilovolt (kV) shunt reactor as an extension to the existing substation and ancillary development including construction of new access track and realignment of an existing track, construction of retaining walls and drainage	A noise assessment submitted with the application for this site determined the Rating Level is below the background sound level at all locations, which is an indication of low impact and the proposed development has a 'Negligible' magnitude of noise impact and a 'Neutral / Slight' significance of effect

[16] Arcus Consultancy Services, (2021). *Hunterston Grid Services Complex, Noise Impact Assessment*. Arcus Consultancy Services; London.

ID	Address/ Post code	Description of development [Application ref.]	Assessment of cumulative effects
		facilities, and installation of security fencing [23/00148/PP]	Therefore there is negligible potential for cumulative effects. Therefore, the likely cumulative effects due to noise emissions arising from this development are considered to be of negligible magnitude.
23	Hunterston	277 ha [n/a - Employment Location]	The design of this scheme would need to consider potential noise impact from the Proposed Works. Potential for cumulative effects negligible. Therefore, the likely cumulative effects due to noise emissions arising from this development are considered to be of negligible magnitude.

21.5.51 The assessment of cumulative effects presented in **Table 21.9** indicates that the likely cumulative effects from other developments will be of no greater than negligible magnitude. With reference to **Chapter 15: Noise and Vibration, Table 15.2,** impacts of negligible magnitude to receptors of high sensitivity result in effects of **Minor Significance** and are **Not Significant**.

People and Communities

21.5.52 The HNA site is undergoing decommissioning. The current published schedule for decommissioning at HNA indicates entering into Care and Maintenance (Magnox' terminology for 'Quiescence') in approximately 2030. This programme would be likely to lead to a substantial reduction in the 141 employees currently employed at the Site[17], three years after the changes in 2026 at HNB. Furthermore, the Final Site Clearance for HNA is intended for a 10-year period beginning in approximately 2080, which is during the Quiescence phase for HNB. As such no cumulative effects are anticipated as a result of HNA.

21.5.53 The conditions for future local employment are appreciably enhanced through the Ayrshire Growth Deal (AGD) which has clear plans for development nearby at Hunterston with a number of projects likely to offer employment of types which overlap with the skills and experience of the HNB workforce. The Ayrshire Growth Deal also plans to provide supporting health and community programmes which would be applicable to any HNB employees which were released.

21.5.54 At the level of the nuclear industry, the NDA Local Social and Economic Impact Strategy is effectively a project which runs alongside nuclear decommissioning work in the UK and provides further cumulative benefits in terms of community and employee support.

21.5.55 At national level, NPF4 explicitly identifies Hunterston as a strategic development area and supports future development at the Site which is ideally located for workers resident

[17] See Figure 4: *Projected Site Activity* in: Economic Insight (2022). Updated Economic Impact Assessment of Magnox sites. (Online) Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1106369/Magnox_economic_impact_assessment_2022.pdf (Accessed November 2023)

at locations used by HNB staff. The plans and activities in the area are expected to produce positive cumulative effects which have not been further assessed.

Traffic and Transport

21.5.56 **Table 21.10** summarises the cumulative inter-project effects with traffic and transport for each development (listed in **Appendix 21B**) where sufficient detail is available via the relevant planning portal. It should be noted that the traffic assessment provides a worst-case scenario in terms of percentage change in traffic flows. This is because baseline future year flows are lower without the addition of committed development traffic, resulting in, potentially, higher proportional impact of the development traffic.

Table 21.10 Summary of traffic and transport inter-project effects

Development	Route Overlap	Anticipated Impact
23/00575/PP Biglees Quarry West Kilbride Ayrshire	A78 (south of Power Station Road) and A737	The approved subject to condition application includes a Transport Statement indicating an average of 12.3 HGV movements per day associated with this site. This level of HGV movements would not be anticipated to generate an impact on the road network or in cumulation with the Proposed Works traffic. No significant inter-project effect identified.
23/00528/EIA Former Coal Terminal Hunterston West Kilbride Ayrshire	A78 south of Power Station Road	Information for this development consists of EIA screening request and therefore is not a committed or approved development. While the screening request indicates use of the A78 route this is not definitive and there is no agreed timescale to determine overlap of use, furthermore current estimates of peak HGV construction traffic are 4 HGV daily and negligible operational traffic which would not be anticipated to result in significant cumulative impacts.
23/00178/EIA Site To North Of Girthill Farm Saltcoats Ayrshire	A78/B714 Junction	Information for this realignment of the B714 consists of EIA screening request and therefore is not a committed or approved development. Transport effects are not anticipated however.
22/00133/PPPM Former Coal Terminal Hunterston West Kilbride Ayrshire	A78 and A737	The approved subject to conditions (including prohibition of routing construction traffic via the A78 through Fairlie, the B780/B781, the C26 and local non-classified roads) application includes a Transport Assessment and EIA traffic and transport chapter. The Transport Assessment details a two year construction period with a daily maximum HGV movements of 159 and LV movements of 173 and operational traffic modelled for 2024 outlined as low level impact. It is unlikely the construction phases would overlap and therefore no significant cumulative impact is anticipated.
21/01174/PPM Site to the north of Summerlea Road and west of Snowdon Terrace Seamill West Kilbride Ayrshire	A78	The submitted Transport Assessment for the planning application for residential dwellings adjacent to the A78 in West Kilbride, with access onto and crossing of the A78(T) provided traffic flows based on a future year of opening of 2024. As the planning application

Development	Route Overlap	Anticipated Impact
		is pending it is unknown if there would be overlap between the peak traffic generation of the Proposed Works and this development.
23/00148/PP Site to West of Cambelton Farm, Hunterston	A78	Planning application granted on 20 March 2023 for construction of a shunt reactor and ancillary development including construction of new access trach and realignment of existing track, construction of retaining wall and drainage facilities and installation of security fencing. In the consultation response North Ayrshire considers routes on C26 and unclassified roads, on B780/B781 and on the A78 through Fairlie are not suitable for construction vehicles. It is unlikely the construction phases would overlap and therefore no significant cumulative impact is anticipated.
22/00137/MSCM West Byrefill Industrial Estate, Kilwinning, Ayrshire	A78	Approval of matters for a planning application granted (20/00323/PPM) on 28 October 2022 for residential development comprising the erection of 426 dwelling houses and associated infrastructure. The planning approval requires commitments for modifications at the A78(T) /A738(T) roundabout to be signalised. The technical engagement response from North Ayrshire Council received on 10 November 2023 states that no proposals for modification at the Pennyburn Roundabout have been submitted. .However, it is not anticipated any significant cumulative impact will arise with the Proposed Works.
22/00522/PP Site to West of 1 Macintosh Place, South Newmoor, Industrial Estate, Irvine, Ayrshire	A78 and A71	Planning application granted on 16 September 2022 for erection of builders merchants to include associated external storage yard, access, car parking and associated ancillary development. The development is expected to generate 741 vehicles per day (arrivals of 368 vehicles and departures of 373 vehicles). The busiest hour is expected to be between 10:00 and 11:00 hrs with 42 vehicles (arrivals) and 39 vehicles (departure) or a total of 81 vehicles per hour. The TA distributed the generated vehicle trips to be split along MacKintosh Place and then along the B7081 Annick Road. A small proportion of the generated vehicle trips would use the A71, the A78 and the A737 which would increase the future baseline traffic flows for two counters: counter 12 - A71 South of Dreghorn and counter 10 – A737 Irvine Road (ATC).

21.5.57 Overall it is considered that **No Significant** inter-project effects between the Proposed Works and other developments are anticipated.

Conventional Waste

21.5.58 Other developments have the potential for generating cumulative effects through the generation of additional conventional waste arisings, which will require management at

the same network of local waste management infrastructure which the Proposed Works will be reliant upon.

21.5.59 Consideration of those identified 'other developments' within North Ayrshire has been considered, and particular regard has been given to the extent to which these developments may generate conventional waste arisings both during their construction and operational phases.

21.5.60 The only development where potential cumulative effects could occur with the Proposed Works is the ongoing decommissioning operations at Hunterston A (HNA). The Preparations for Quiescence phase has been underway since the 1990s and has involved the generation of various quantities and types of waste. However, as this waste is already being managed by the local, regional and national infrastructure, account of this has already been considered in the baseline of this assessment. In this regard, the decommissioning of Hunterston A would not have any additional cumulative adverse effects in respect of waste that have not already been assessed as part of this chapter.

21.5.61 Looking ahead to the Final Site Clearance phase for HNA – the next stage at which this development could generate waste – this is scheduled to take place from 2080. This is some time before the Final Site Clearance phase for the Proposed Works. As such, given the anticipated lack of overlap between this stage of the Proposed Works and the HNA decommissioning project, no cumulative waste effects are anticipated at the Final Site Clearance phase.

21.5.62 In respect of all the 'other developments', due to the nature of these, it is not considered that they would give rise to any significant adverse effects in conventional waste management terms alongside the Proposed Works. This is because the nature of these is such that they are unlikely to generate significant quantities of waste – most notably, they do not require any significant demolition or site clearance works.

21.5.63 Overall it is considered that **No Significant** inter-project effects between the Proposed Works and other developments are anticipated.

Major Accidents and Disasters

21.5.64 Other developments could introduce new receptors for major accidents and disasters hazards and/or introduce new sources of hazards that the Proposed Works might be susceptible to. In addition, **Chapter 19: Major Accidents and Disasters** of the ES identifies resources and receptors within the Study Area which could be impacted in the event of a major accident or disaster due to the Proposed Works.

21.5.65 No adjacent developments have been identified in the ZoI that have not already been considered inherently within the development.

Summary of inter-project cumulative effects

21.5.66 **Table 21.11** presents a summary of the likely inter-project cumulative effects of the Proposed Works interacting with 'other development and plans' in the ZoI.

Table 21.11 Summary of inter-project cumulative effects

Aspect	Assessment of inter-related effect
Air quality	Not significant
Climate change	Not significant*

Aspect	Assessment of inter-related effect
Terrestrial biodiversity and ornithology	Not significant
Marine biodiversity	Not significant
Coastal Management and water quality	Not significant
Surface water and flood risk	Not significant
Soils, geology and hydrogeology	Not significant
Historic environment	Not significant
Landscape and visual	Likely significant
Noise and vibration	Not significant
People and communities	Not significant
Traffic and transport	Not significant*
Conventional waste	Not significant
Major accidents and disasters	Not significant

* Inter-relationship effects have been inherently considered within the aspect assessment

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22.

Summary of effects

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22. Summary of Effects

22.1 Introduction

22.1.1 This chapter of the Environmental Statement (ES) summarises the residual effects and conclusions of the Environmental Impact Assessment (EIA) for the Proposed Works.

22.1.2 Residual effects are defined as those effects that remain following the implementation of mitigation measures. A summary of the mitigation measures, relevant to the Proposed Works is discussed in detail in the relevant environmental aspect chapters of this ES (**Chapters 6** to **21**). The criteria applied to define the significance of residual effects are outlined within **Chapter 5: The EIA Process**, with further detail provided within the individual environmental aspect chapters of the ES (**Chapters 6**-**21**).

22.2 Summary of Effects

22.2.1 Each environmental aspect chapter considers both the beneficial and adverse residual effects likely to arise from the Proposed Works. The residual effects listed are described with reference to:

- The scale of effect (e.g. negligible, minor, moderate or major) and whether this is significant or not. Where it has been concluded that there will be no effect/no change in relation to specific effects, this has been stated.
- The duration of the effect (i.e. temporary or permanent).
- The nature of the effect (i.e. adverse, neutral or beneficial).

22.2.2 **Tables 22.1** to **Table 22.14** below provide a summary of the residual effects likely to arise from the Proposed Works on an aspect by aspect basis.

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Table 22.1 Summary of residual effects for air quality

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor	Magnitude of Change	Significance	Summary of Rationale
Human	Fugitive dust emissions contributing to loss of amenity and effects on human health.	Medium sensitivity	Medium risk from demolition activities associated with the Proposed Works. Low risk from construction activities associated with the Proposed Works. Negligible risk from earthworks and trackout activities associated with the Proposed Works.	Not Significant	The risk of effects has been concluded without consideration of the application of mitigation measures. With the embedded measures reported within Chapter 6 Air Quality applied, the risk of impact from fugitive dust emissions will be not significant. In accordance with the IAQM guidance[1], significant effects on receptors are prevented through the application of effective mitigation. Therefore, the residual effect is 'not significant'.
Ecological	Fugitive dust emissions contributing to loss of amenity and effects on biodiversity areas.	Low sensitivity	Medium risk from demolition activities associated with the Proposed Works. Low risk from Earthworks and Construction activities associated with the Proposed Works. Negligible risk from trackout activities associated with the Proposed Works.	Not Significant	The risk of effects has been concluded without consideration of the application of mitigation measures. With the embedded measures reported within Chapter 6 Air Quality applied, the risk of impact from fugitive dust emissions will be not significant. In accordance with the IAQM guidance, significant effects on receptors are prevented through the application of effective mitigation. Therefore, the residual effect is 'not significant'.

[1] IAQM (2023). *IAQM Guidance on the assessment of dust from demolition and construction* (Online). Available at: https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-dust-2023-BG-v6-amendments.pdf (Accessed 09 August 2023).

Table 22.2 Summary of residual effects for climate change

Receptor	Summary of Predicted Effect	Magnitude of Effect	Significance	Summary of Rationale
UK Carbon Budget	Lifetime GHG emissions associated with the Proposed Works are estimated to be 70.4 ktCO2e.	Minor Adverse	Not Significant	The Proposed Works are fully in line with the trajectory of the UK and Scottish Governments meeting their carbon budgets / targets. Adverse GHG impacts are minimised with good practice design standards and meet the requirements of national, regional and local policy.

Table 22.3 Summary of residual effects for terrestrial biodiversity and ornithology

Receptor	Summary of Predicted Effect	Importance of ecological feature	Magnitude of Effect	Significance	Summary of Rationale
Statutory biodiversity sites (Portencross Woods SSSI and Southannan Sands SSSI	Habitat degradation due to dust and plant/vehicle emissions to air	National	Neutral	Not Significant	Embedded measures will minimise dust mobilisation and dust deposition on SSSIs is likely to be negligible. No substantive changes in concentration of airborne pollutants at SSSIs is predicted.
Non-statutory biodiversity sites and Ancient Woodland	Habitat degradation due to dust and plant/vehicle emissions to air	County	Very Low (Kilruskin Wood Local Nature Conservation Site (LNCS)/ Ancient Woodland Inventory (AWI) site and Southannan LNCS/AWI site only).	Not Significant	Embedded measures will minimise dust mobilisation and dust deposition on LNCSs is likely to be negligible. No substantive changes in concentration of airborne pollutants at LNCSs is predicted.

Receptor	Summary of Predicted Effect	Importance of ecological feature	Magnitude of Effect	Significance	Summary of Rationale
					It is concluded on a precautionary basis that there is only limited risk of baseline levels NOx/Ammonia approaching 1% of CL over small areas of Southannan LNCS/AWI site and Kilruskin Wood LNCS/AWI. It is therefore reasonable to conclude on a precautionary basis that the Proposed Works are predicted to have a very low magnitude effect on these two LNCS/AWI sites.
Habitats	Habitat loss	Local	Very low (adverse)	Not Significant	The Proposed Works are mainly confined to hard standing. Any unavoidable habitat loss will be limited to small areas of habitat types that are common and widespread. Embedded measures will limit the risk of importing or spreading invasive non-native species.
Otter	Disturbance and displacement from shelter, resting and foraging habitats, with associated effects on otter populations	County	Very Low (adverse)	Not Significant	The Proposed Works are likely to have a temporary, localised displacement effect on a small number of otters. This highly mobile species ranges over a wide area and will be able to disperse into suitable similar habitats adjacent to the Works Area.
Bats (Common pipistrelle; soprano pipistrelle; Noctule)	Loss of potential roost habitat; and foraging habitat rendered inhospitable/unsuitable due to changes to artificial lighting regime	Local	Very Low (adverse)	Not Significant	No bat roosts will be lost. The habitats within the Works Area are generally of low suitability for bats. The majority of the buildings are of low suitability for roosting bats. The three bat species that occur in proximity to the Works Area are common and widespread and the Proposed Works are likely to result in only limited localised

Receptor	Summary of Predicted Effect	Importance of ecological feature	Magnitude of Effect	Significance	Summary of Rationale
					displacement of small numbers of foraging bats.
Hedgehog	Loss of habitat and harm and/or displacement of hedgehog	Local	Neutral	Not Significant	The habitats within the Site are relatively poor hedgehog habitat and the Proposed Works incorporate embedded measures to limit the risk to this species.
Breeding birds (black guillemot)	Habitat loss/ displacement of breeding pairs and displacement of diving/foraging birds	Up to County	Very Low (adverse)	Not Significant	Preparations for Quiescence will lead to the loss of nesting habitat associated with the jetty (not the offshore platform), resulting in displacement of small numbers of breeding/nesting black guillemot. Embedded environmental measures will avoid harming birds and dependant young and the relatively small number of birds that are displaced are likely to find alternative nesting habitat elsewhere along the coastline. Limited, localised mobilisation of sediment and localised short-term elevation in noise will result in a low risk of displacing small numbers of diving birds and limited, localised displacement of prey species.
Breeding birds (herring gull)	Habitat loss, and displacement of breeding territories	Local	Very Low (beneficial)	Not Significant	Preparations for Quiescence and Final Site Clearance will lead to loss of nesting habitat and displacement of breeding territories of small numbers of herring gull that are of local biodiversity conservation importance. The longer Quiescence phase will lead to a general improvement in the available habitat for breeding birds

Receptor	Summary of Predicted Effect	Importance of ecological feature	Magnitude of Effect	Significance	Summary of Rationale
					and a substantive reduction in disturbance within the Works Area.
Breeding birds (dunnock, house sparrow, linnet, reed bunting and song thrush)	Habitat loss, and displacement of breeding territories	Local	Very Low (beneficial)	Not Significant	Preparations for Quiescence and Final Site clearance will lead to temporary displacement of breeding territories of small assemblages of birds that are of local biodiversity conservation importance. The longer Quiescence phase will lead to a general improvement in the available habitat for breeding birds and a substantive reduction in disturbance within the Works Area.
Wintering and passage birds	Habitat loss, and displacement of bird species and assemblages	Local	Neutral	Not Significant	Preparations for Quiescence and Final Site clearance will lead to temporary displacement of small assemblages of birds that are of local biodiversity conservation importance. The longer Quiescence phase will lead to a general improvement in the available habitat for wintering/passage birds and a substantive reduction in disturbance within the Works Area.

Table 22.4 Summary of residual effects for marine biodiversity

Receptor	Summary of Predicted Effect	Receptor importance	Magnitude of Change	Effect and Significance	Summary of Rationale
Intertidal habitats / species	Decommissioning and removal of marine infrastructure during the Preparations for Quiescence phase	High	Very low	Minor (Not Significant)	Due to location of the Proposed Works and the distance from the sandflats and seagrass beds associated with Southannan Sands SSSI (0.2 km), the magnitude of change on littoral transport to these beds is considered to be within the range of natural variability, i.e. very low. Similarly, it is considered that a temporary and localised increase in suspended sediment levels as a result of the Proposed Works will not directly impact the sandflats and seagrass beds. This is because the existing background level of suspended material is high and the small quantity that might be transported as far as the sandbanks does not represent an appreciable increase.
Intertidal habitats / species	Demolition works and ground remediation during the Preparations for Quiescence and Final Site Clearance phases	High	Very Low	Negligible to minor (Not Significant)	Run-off from potentially contaminated land due to the demolition of land-based infrastructure will be controlled using standard site management practices and the risk of such run-off is thus considered to be low be low risk with the appropriate measures in place.
Subtidal habitats / species	Loss of habitat during decommissioning and removal of marine infrastructure during the	Very low to medium	Very low	Negligible (Not Significant)	Whilst the removal of structures at seabed level or below the seabed, and minor dredging interventions will affect kelp communities and a variety of sandy and muddy biotopes, the works are

Receptor	Summary of Predicted Effect	Receptor importance	Magnitude of Change	Effect and Significance	Summary of Rationale
	Preparations for Quiescence phase				considered to be short term, and studies have shown the kelp communities high recovery rates. Given the wide distribution of this habitat and the small proportion that will be impacted, the magnitude of change is considered to be very low. As the Proposed Works will not result in significant habitat damage or loss, the effects on benthic species associated with these habitats as a result of seabed works will similarly be insignificant.
Subtidal habitats / species	Physical disturbance and degradation in habitat quality during decommissioning and removal of marine infrastructure during the Preparations for Quiescence phase	Very low to medium	Low	Negligible to minor (Not Significant)	Any seabed disturbance will be localised and suspended sediments readily dispersed by the high water flow in the environment. Considering the very low to medium negligible to regional (medium) importance of the receptors and the very low to low magnitude of change due to physical disturbance, the residual effects are assessed as negligible to minor adverse (not significant).
Subtidal habitats / species	Discharges from vessels during decommissioning and removal of marine infrastructure during the Preparations for Quiescence phase:	Very low to medium	Very low	Negligible (Not Significant)	Routine discharges from the vessels will be controlled through tertiary environmental measures, adopted in order to comply with applicable legislation. The likelihood of non-routine events will be minimised by the implementation of appropriate management plans including a Shipboard Oil Pollution Emergency Plan. Therefore, the magnitude of

Receptor	Summary of Predicted Effect	Receptor importance	Magnitude of Change	Effect and Significance	Summary of Rationale
					change from an accidental release is considered to be low.
Subtidal habitats / species	Demolition works and ground remediation during the Preparations for Quiescence phase and Final Site Clearance phase	Very low to medium	Very low	Negligible (Not Significant)	The demolition of land-based infrastructure has limited scope to affect the marine environment, largely confined to the potential impacts of site drainage/runoff and possible non-routine events. All land-based run-off will be treated using silt traps and oil separators and demolition activities managed using standard good site practice (e.g. appropriate bunds around fuel storage, etc.).
Migratory fish	Decommissioning and removal of marine infrastructure	Medium	Low	Minor (Not Significant)	The localised scale of the Proposed Works and the low numbers of fish migrating, the seasonal nature of the sensitive period means that impacts can be readily mitigated through appropriate scheduling of the Proposed Works. Moreover, the relatively short duration of marine works together with the existing high turbidity levels in the Firth of Clyde mean that any fish present should not experience a significantly elevated turbidity over long periods.
Migratory fish	Demolition works and ground remediation during Preparations for Quiescence phase and Final Site Clearance phase	Medium	Very Low	Negligible (Not Significant)	The runoff and treated site drainage will affect a very localised area (tens of metres) and is not considered to have any implications for migratory fish.

Receptor	Summary of Predicted Effect	Receptor importance	Magnitude of Change	Effect and Significance	Summary of Rationale
Non-migratory fish	Decommissioning and removal of marine infrastructure during Preparations for Quiescence phase	Medium	Low	Minor (Not Significant)	The Proposed Works will create limited and temporary resuspension of sediments from the removal of seabed structures. These activities may result in some displacement of fish within the Study Area. The Firth of Clyde is a relatively turbid area within which the fauna are acclimated to relatively high loadings of suspended sediment. Furthermore, the habitats potentially impacted are widespread and it is expected that most fish would relocate temporarily to adjacent areas with a lower level of disturbance. On this basis, the effects are considered to be non-significant.
Non-migratory fish	Demolition works and ground remediation during the Preparations for Quiescence phase and Final Site Clearance phase	Medium	Very Low	Negligible (Not Significant)	With the appropriate EMP in place, the potential for demolition of land-based infrastructure to impact the fish community is very low.
Marine mammals	Decommissioning and removal of marine infrastructure during the Preparations for Quiescence Phase	Medium	Low	Minor (Not Significant)	The Firth of Clyde is not known as a particularly important feeding ground for cetaceans, and there are no major seal haul outs in the inner firth. Whilst harbour porpoise and common and bottlenose dolphin sightings have been recorded regularly, it is not expected that the Proposed Works will create noise level frequencies that would lead to behavioural disturbance and thus the magnitude of change due to temporary,

Receptor	Summary of Predicted Effect	Receptor importance	Magnitude of Change	Effect and Significance	Summary of Rationale
					intermittent and limited duration underwater noise from decommissioning activities is considered to be low. The Firth of Clyde is turbid due to the freshwater input in the coastal area and therefore any marine mammals that may occasionally enter the Works Area will be habituated to the high levels of sediment within the water column. The temporary localised increase in turbidity levels from the Proposed Works is considered to be not significant.
Marine mammals	Demolition works and ground remediation during Preparations for Quiescence phase and Final Site Clearance phase	Medium	Neutral	Negligible (Not Significant)	Runoff and treated site drainage will affect a very localised area as it will disperse rapidly due to the relatively energetic marine environment and tidal regime

Table 22.5 Summary of residual effects for coastal management and water quality

Receptor/ phase(s)	Summary of predicted effect	Importance /value of receptor	Magnitude of change	Effect and Significance	Summary of rationale
Wave and current regime All phases	Removal of the jetty and HNB intake structure would be expected to reduce shelter from the coastline immediately to the north of the jetty, which may therefore be exposed to larger waves when the wind is from the south or south west. Similarly, the jetty will provide some restrictions to tidal flows which will be removed.	N/A	Very low	N/A	Due to the open structure of the jetty, the limited size of the intake structure and the small proportion of the cross-section of the Hunterston Channel occupied by these structures, changes to the overall hydrodynamic regime in the vicinity will therefore be very low in magnitude and effects of increased waves and currents will be highly localised.
Sediment transport All phases	The absence of the jetty and intake infrastructure could change the sediment transport regime in the surrounded area.	N/A	Very low	N/A	As changes to the tidal current and wave regime will be highly localised and very small, changes to the overall sediment transport regime in the Hunterston Channel are predicted to be very low.
Shoreline processes All phases	Removal of the jetty and intake infrastructure could cause changes in levels of erosion along the shoreline.	N/A	Very low	N/A	The coast to the north and south of the jetty comprises a shoreline protected by rock armour, with very little sediment deposition within 200 m of the jetty. Small increases in current velocity and wave heights along this section of coast are therefore not expected to result in any measurable changes in coastal erosion or sediment deposition.
Ayrshire Shoreline Management Plan All phases	Any works that would compromise existing flood defence levels or lead to an increase in coastal erosion	Medium	Very low	Negligible (Not Significant)	None of the works proposed will involve a need to dismantle or compromise or lower the crest level of any existing coastal defences. Also, the changes in hydrodynamic regime will be

Receptor/ phase(s)	Summary of predicted effect	Importance /value of receptor	Magnitude of change	Effect and Significance	Summary of rationale
	could result in a need to change actions in relation to the current Ayrshire Shoreline Management Plan (SMP).				minimal and highly localised within a section of coast already defended from erosion by rock armour. Therefore, there will not be significant effects on coastal management which are required to comply with the Ayrshire Shoreline Management Plan (SMP) or any need to revise the plan due to the Proposed Works.
Water quality Preparations for Quiescence	Coastal water quality could be affected by discharges from draining down the cooling water tunnels before sealing and grouting.	Medium	Very low	Negligible (Not Significant)	Discharges will comprise only sea water abstracted from the Firth of Clyde and will be made in accordance with the EMP, which will require testing to ensure that biocide (TRO) concentrations are less than the Environmental Quality Standard (EQS) for coastal waters before discharge will be permitted. Therefore, there will be no significant effects on coastal water quality.
Water quality Preparations for Quiescence	Coastal water quality could be affected by suspended sediment mobilised during marine works, with potential indirect adverse effects on marine biodiversity (addressed in **Chapter 9: Marine Biodiversity**).	Medium	Very low	Negligible (Not Significant)	To avoid mobilisation of contaminated sediments and consequent effects on water quality, the jetty will be dismantled from the shore at low tide and piles will not be withdrawn but will be cut off at or just below seabed level. The HNB intake structure will be dismantled without use of explosives. The HNB outfall will simply be capped using a jack-up or anchored barge and the new active effluent discharge line (AEDL) will utilise the existing cooling water tunnel and outfall to avoid any need for trenching of the seabed. Any effects on water quality due to minor unavoidable sediment mobilisation will be temporary and minimal.

Receptor/ phase(s)	Summary of predicted effect	Importance /value of receptor	Magnitude of change	Effect and Significance	Summary of rationale
Water quality All phases	Water quality could be affected by sediment laden or contaminated runoff (including radiological contaminants being released in surface water runoff from the Site.	Medium	Very low	Negligible (Not Significant)	**Chapter 11: Surface Water and Flood Risk** has established that there will be no significant change in contaminant levels (including radiological components) in surface water runoff from the Site that could lead to an adverse effect on the relevant coastal water bodies.
Water quality	Water quality could be affected by permitted discharges via the AEDL	N/A	N/A	N/A	Discharge comprising operational/defueling discharges that are covered under the existing CAR licence (CAR/L/1000649) will continue to be subject to ongoing regulation by SEPA, which will ensure no significant adverse environmental effect on the coastal water bodies or the local environment.
Water quality	Changes in discharge of treated sewage could affect EQS compliance at Bathing Waters and Shellfish Water Protected Areas	High	Very low	Minor (Not Significant)	Discharge location is expected to be unchanged and sewage flows will be reduced compared with the current situation. Therefore, the Proposed Works will not compromise maintenance of the existing good status at relevant Bathing Waters and Shellfish Water Protected Areas.

Table 22.6 Summary of residual effects for surface water and flood risk

Receptor(s)	Activity	Summary of Predicted Effect	Receptor Sensitivity	Magnitude of Change	Effect and Significance	Summary of Rationale
On-site infrastructure and staff.	Decommissioning activities and the presence of staff working on-site	Surface water runoff from adjacent external areas (e.g. HNA) putting site infrastructure and staff at risk.	Medium - High	Very Low	Minor (Not Significant)	The new buildings on-site mostly avoid areas of existing surface water flooding and the existing drainage system will be in place throughout the Proposed Works and is designed to sufficiently accommodate surface water runoff. Embedded measures including site water management measures, flood risk adaptation measures and emergency flood response planning will further minimise risk on site.
On-site infrastructure and staff. Off-site people, property and infrastructure.	The demolition of buildings and the undertaking of temporary groundworks on–site, including the construction and removal of the Safestore and waste facilities	Alteration of existing surface water pathways, and changes in surface water flood risk on site and to surrounding areas.	Medium - High	Very Low	Minor (Not Significant)	The existing drainage system will be left in place throughout the Proposed Works and is designed to sufficiently accommodate surface water runoff. There will be no net increase in term of impermeable footprint on site. Embedded measures including the water management measures, drainage surveys and drainage plan will help further minimise risks on site.
On-site infrastructure and staff. Off-site people, property and infrastructure.	New buildings and retention of existing hardstanding areas which are being left in situ to support decommissioning	An increase in surface water flood risk on-site and to surrounding areas over time due to the influence of climate change, including the potential for more intense rainfall.	Medium - High	Very Low	Minor (Not Significant)	The new buildings on-site mostly avoid areas of existing surface water flooding and the existing drainage system will be in place throughout the Proposed Works and is designed to sufficiently accommodate surface water runoff. Previous work indicated that the key buildings (e.g. Safestore) would remain free of flooding irrespective of the operation of the drainage system. Embedded measures include site runoff management measures, drainage

Receptor(s)	Activity	Summary of Predicted Effect	Receptor Sensitivity	Magnitude of Change	Effect and Significance	Summary of Rationale
						survey and drainage plan to help further minimise risk on site.
On-site infrastructure and staff. Off-site people, property and infrastructure.	Changes in landform resulting from potential infrastructure activities such as the decommissioning of the intake and outfall	An increase in tidal flood risk towards the Site and surrounding areas as a result of changes in wave energy, and resultant effects on tidal erosion, sediment deposition and weakening of flood defences.	Medium - High	Very Low	Minor (Not Significant)	None of the Proposed Works are expected to compromise the condition of the existing coastal flood defences. Each of the proposed new buildings (including the Safestore location) on-site are set back from all of the projected coastal flood risk spatial envelopes, taking into account climate change allowances for 2120. Embedded measures will include coastal protection and flood risk adaptation measures and emergency flood planning to further minimise risk on site. As part of the coastal protection and flood risk adaptation measures the HNB Safety Case will be periodically reviewed to take account of any new data such as future updates to information on the condition of the flood defences in the area and/or future updates to climate change allowances.
Unnamed ditch to the north of the Site	Excavation works, and infilling activities during decommissioning	These activities have the potential to generate the mobilisation of silt or other contaminants. Substances may also be spilled or leaked during the infilling process. This could result in changes to shallow groundwater water quality with	Medium - High	Low	Negligible (Not Significant)	Embedded measures including site water management measures, drainage plan, drainage survey and surface water monitoring will help reduce any potential effects upon ditch water quality during the Proposed Works.

Receptor(s)	Activity	Summary of Predicted Effect	Receptor Sensitivity	Magnitude of Change	Effect and Significance	Summary of Rationale
		potential knock on impacts on the surface water environment.				

Table 22.7 Summary of residual effects for soils, geology and hydrogeology

Receptors potentially affected[2]	Phase(s)	Summary of Predicted Effect[3]	Magnitude of Change in the level of risk to receptors as a result of the Proposed Works	Significance	Summary of Rationale
R1, R2, R4, R6	Preparation for Quiescence, also Quiescence and Final Site Clearance	A1 & A2: Land quality ground investigations	Negligible	Not Significant	The embedded measures lowering the risk of a pollution incident impacting on environmental receptors during changes to the existing drainage systems are set out in **Chapter 12 Soils, Geology and Hydrogeology, Table 12.7** such as measures identified by Ref. 12.3, Ref. 12.4, Ref. 12.7, Ref. 12.8, Ref. 12.9, Ref. 12.10, Ref. 12.13 and Ref. 12.16.

[2] Receptors are defined as follows (see also **Chapter 12 Soils, Geology and Hydrogeology, paragraph 12.8.5**):
R1: human health (current and future site users, decommissioning workforce and adjacent land users),
R2: groundwater in the superficial deposits and made ground and groundwater in the Kelly Burn Sandstone Formation aquifer (bedrock),
R3: property (on and offsite current and future buildings, including buried services,
R4: agricultural property – crops / livestock on adjacent farmland to the north and east,
R5: property (coastal flora and fauna in the Clyde Estuary),
R6: surface water: unnamed surface water drainage ditch located approximately 110 m north, running 310 m west to discharge to the Clyde Estuary, surface water in the Clyde Estuary (coastal flora and fauna),
R7: ecologically sensitive sites (Southannan Sands SSSI).

[3] See **Chapter 12 Soils, Geology and Hydrogeology, Table 12.14** for full description of effects.

Receptors potentially affected[2]	Phase(s)	Summary of Predicted Effect[3]	Magnitude of Change in the level of risk to receptors as a result of the Proposed Works	Significance	Summary of Rationale
R1, R2, R3, R4, R6, R7	Preparation for Quiescence, also Quiescence and Final Site Clearance	A3: Leaks/spills of fuels and oils from plant and storage tanks during construction work	Negligible	Not Significant	The embedded measures that will reduce the probability of a pollution incident taking place are set out in **Chapter 12 Soils, Geology and Hydrogeology, Table 12.7** such as Ref. 12.8, Ref. 12.9, Ref. 12.10, Ref. 12.11, and Ref. 12.16.
R1, R2, R3, R4, R6, R7	Preparation for Quiescence, also Quiescence and Final Site Clearance	A4 & A5: Removal of foundations/ floor slabs, road surfaces	Negligible	Not Significant	The embedded measures to ensure adequate characterisation of soil and groundwater conditions, and inform the design of remedial measures if needed, are set out in **Chapter 12 Soils, Geology and Hydrogeology, Table 12.7** such as Ref. 12.1, Ref. 12.2, Ref. 12.3, Ref. 12.4, 12.13 and Ref. 12.17.
R2, R3, R4, R6, R7	Preparation for Quiescence, Final Site Clearance	A6: Backfilling subsurface voids and reuse of site-derived materials	Negligible	Not Significant	The embedded measures to ensure adequate assessment of the suitability of materials used for backfilling are set out in **Chapter 12 Soils, Geology and Hydrogeology, Table 12.7** such as Ref. 12.3, Ref. 12.4, Ref. 12.12, Ref. 12.13, and Ref. 12.14,
R1, R2, R3, R4, R6, R7	Preparation for Quiescence, Final Site Clearance	A7: Laydown and storage, including soil and material stockpiles	Negligible	Not Significant	The embedded measures set out in **Chapter 12 Soils, Geology and Hydrogeology, Table 12.7** such as Ref. 12.3, Ref. 12.4, Ref. 12.8, Ref. 12.9, Ref. 12.10, Ref. 12.11, Ref. 12.13, Ref. 12.14, Ref. 12.16 and Ref. 12.17 will all contribute to the careful management of material in stockpiles, lowering from risks to the environment.

Receptors potentially affected[2]	Phase(s)	Summary of Predicted Effect[3]	Magnitude of Change in the level of risk to receptors as a result of the Proposed Works	Significance	Summary of Rationale
R1, R2, R3, R4, R6, R7	Preparation for Quiescence, Final Site Clearance	A8, A9 & A10: Construction of sub-surface structures, concrete laying and movement of materials	Negligible	Not Significant	The embedded measures to avoid or lower the potential for the Proposed Works to result in the mobilisation of pre-existing contaminants are set out in **Chapter 12 Soils, Geology and Hydrogeology, Table 12.7** such as Ref. 12.1, Ref. 12.2, Ref. 12.3, Ref. 12.4, Ref. 12.5, Ref. 12.6, Ref. 12.8, Ref. 12.9, Ref. 12.12, Ref. 12.13 and Ref. 12.16.
R1, R2, R3, R4, R6, R7	Preparation for Quiescence, also Quiescence and Final Site Clearance	A11: Removal of drains (Active and non-active drainage)	Negligible	Not Significant	The embedded measures to lower the risk of a pollution incident relating to work on existing drainage systems are set out in **Chapter 12 Soils, Geology and Hydrogeology, Table 12.7** such as Ref. 12.3, Ref. 12.4, Ref. 12.7, Ref. 12.8, Ref. 12.9, Ref. 12.10, Ref. 12.13 and Ref. 12.16.
R1, R2, R3, R4, R6, R7	Preparation for Quiescence, Final Site Clearance	A12 : Pumping and dewatering schemes	Negligible	Not Significant	The embedded measures to minimise environmental risks associated with dewatering are set out in **Chapter 12 Soils, Geology and Hydrogeology, Table 12.7** such as Ref. 12.1, Ref. 12.2, Ref. 12.3, Ref. 12.8, Ref. 12.9, Ref. 12.13 and Ref. 12.18.
R1, R2, R3, R4, R6, R7	Preparation for Quiescence, Final Site Clearance	A13 : Drilling/core slab drilling	Negligible	Not Significant	The embedded measures to ensure adequate planning and management of drilling works to limit the potential for pollution incidents are set out in **Chapter 12 Soils, Geology and Hydrogeology, Table 12.7** such as Ref. 12.1, Ref. 12.2, Ref. 12.3, Ref. 12.5, Ref. 12.6, Ref. 12.7, Ref. 12.10, Ref. 12.11, Ref. 12.13, Ref. 12.16 and Ref. 12.18.

Table 22.8 Summary of residual effects for Historic environment

Receptor	Impact	Sensitivity / Importance / Value of Receptor	Phase	Magnitude of Change	Significance	Summary of Rationale
HNB buildings	Demolition of ancillary buildings, Safestore construction around reactor and eventual demolition of same asset through Final Site Clearance.	Low	Preparation for Quiescence Quiescence Final Site Clearance	Low None High	Not Significant (Minor adverse) No effect Not Significant (Minor adverse)	Complete removal of a facility with a limited historic interest for the history of UK energy generation and associated architecture, with appropriate mitigation through building recording.
Castle Knowe (SM3694)	Change of visual element of reactor in views through Safestore construction and eventual removal through Final Site Clearance.	High	Preparation for Quiescence Quiescence Final Site Clearance	Negligible Negligible Negligible	Not Significant (Minor adverse) Not Significant (Minor adverse) Not Significant (Minor beneficial)	Minimal change to the experience of the receptor through appreciation of its setting; the general utilitarian appearance/sense of the reactor structure will remain unchanged until removal.
Hunterston Castle (LB14313)	Change of visual element of reactor in views through Safestore construction and eventual removal	High	Preparation for Quiescence Quiescence	Negligible Negligible	Not Significant (Minor adverse) Not Significant (Minor adverse)	Negligible change to the experience of the receptor through appreciation of its setting; the general utilitarian appearance/sense of the reactor structure will remain unchanged until removal.

Receptor	Impact	Sensitivity / Importance / Value of Receptor	Phase	Magnitude of Change	Significance	Summary of Rationale
	through Final Site Clearance.		Final Site Clearance	Negligible	Not Significant (Minor beneficial)	
Walled Garden at Hunterston (LB14288)	Change of visual element of reactor in views through Safestore construction and eventual removal through Final Site Clearance.	Medium	Preparation for Quiescence	Negligible	Not Significant (Minor adverse)	Minimal change to the experience of the receptor through appreciation of its setting; the primary relationship here is to Hunterston Castle and the surrounding designed landscape, and the asset is screened from the reactor visibility.
			Quiescence	Negligible	Not Significant (Minor adverse)	
			Final Site Clearance	Negligible	Not Significant (Minor beneficial)	
Hunterston House (LB52288)	Change of visual element of reactor in views through Safestore construction and eventual removal through Final Site Clearance.	Medium	Preparation for Quiescence	Negligible	Not Significant (Minor adverse)	Minimal change to the experience of the receptor through appreciation of its setting; the general utilitarian appearance/sense of the reactor structure in views from the upper floor will remain unchanged until removal.
			Quiescence	Negligible	Not Significant (Minor adverse)	
			Final Site Clearance	Negligible	Not Significant (Minor beneficial)	
Robertston Building Millport	Change of visual element of reactor in views through	Medium	Preparation for Quiescence	Negligible	Not Significant (Minor adverse)	Minimal change to the experience of the receptor through appreciation of its setting; the general utilitarian appearance/sense of

Receptor	Impact	Sensitivity / Importance / Value of Receptor	Phase	Magnitude of Change	Significance	Summary of Rationale
Field Centre (LB LB52288)	Safestore construction and eventual removal through Final Site Clearance.		Quiescence	Negligible	Not Significant (Minor adverse)	the reactor structure will remain unchanged until removal.
			Final Site Clearance	Negligible	Not Significant (Minor beneficial)	
Millport Conservation Area and associated listed buildings	Change of visual element of reactor in views through Safestore construction and eventual removal through Final Site Clearance.	Medium	Preparation for Quiescence	Negligible	Not Significant (Minor adverse)	Minimal change to the experience of the receptor through appreciation of its setting; the general utilitarian appearance/sense of the reactor structure will remain unchanged until removal.
			Quiescence	Negligible	Not Significant (Minor adverse)	
			Final Site Clearance	Negligible	Not Significant (Minor beneficial)	
Little Cumbrae Castle (SM2195)	Change of visual element of reactor in views through Safestore construction and eventual removal through Final Site Clearance.	High	Preparation for Quiescence	Negligible	Not Significant (Minor adverse)	Minimal change to the experience of the receptor through appreciation of its setting; the general utilitarian appearance/sense of the reactor structure will remain unchanged until removal.
			Quiescence	Negligible	Not Significant (Minor adverse)	
			Final Site Clearance	Negligible	Not Significant (Minor beneficial)	

Receptor	Impact	Sensitivity / Importance / Value of Receptor	Phase	Magnitude of Change	Significance	Summary of Rationale
Little Cumbrae Lighthouse (SM418)	Change of visual element of reactor in views through Safestore construction and eventual removal through Final Site Clearance.	High	Preparation for Quiescence Quiescence Final Site Clearance	Negligible Negligible Negligible	Not Significant (Minor adverse) Not Significant (Minor adverse) Not Significant (Minor beneficial)	Minimal change to the experience of the receptor through appreciation of its setting; the general utilitarian appearance/sense of the reactor structure will remain unchanged until removal.

Table 22.9 Summary of residual effects for landscape and visual

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
Direct Effects on Landscape Character							
LCT 59 - Raised Beach Coast and Cliffs (host LCT)	Preparation for Quiescence phase	Medium	Medium (within 1 km) reducing to Very Low to Zero (end of the Preparations for Quiescence phase)	Moderate and Not Significant (within 1 km) reducing to Minor to None and Not Significant beyond 1 km	Adverse (within 1km during Site activity) Neutral (whole receptor) Beneficial (post removal of buildings)	Moderate and Not Significant (within 1 km) reducing to Minor to None and Not Significant	**Major / Moderate** and Significant (HNA, Cable factory)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
			Very Low to Zero beyond 1 km				
	Quiescence phase	Medium	Very Low to Zero (within 1 km) Zero beyond 1 km	Minor to None and Not Significant (within 1 km) None beyond 1 km	Neutral (within 1km) Neutral (whole receptor)	Minor to None and Not Significant (within 1 km)	**Major / Moderate to Moderate** and Significant reducing to None (Cable factory, Demolition of HNA buildings)
	Final Site Clearance phase	Medium	Medium (within 1 km) Very Low to Zero beyond 1 km	Moderate and Not Significant (within 1 km) Minor and Not Significant beyond 1 km	Adverse (within 1km during Site activity) Neutral (whole receptor) Beneficial (post removal of buildings)	N/A	N/A
Direct Effects on Seascape / Coastal Character							
Largs to Goldenberry CCA	Preparation for Quiescence phase	Medium	Medium (within 1 km) reducing to Very Low to Zero (end of the Preparations for Quiescence phase)	Moderate and Not Significant (within 1 km) reducing to Minor and Not Significant to Zero Minor and Not Significant beyond 1 km	Adverse (within 1km during Site activity) Neutral (whole receptor) Beneficial (post removal of buildings)	Moderate and Not Significant (within 1 km) reducing to Minor and Not Significant to Zero	**Major / Moderate** and Significant (HNA, Cable factory)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
			Very Low to Zero beyond 1 km				
	Quiescence phase	Medium	Very Low to Zero (within 1 km) Zero beyond 1 km	Minor and Not Significant to None (within 1 km) None beyond 1 km	Neutral (within 1km) Neutral (whole receptor)	Minor and Not Significant to None (within 1 km)	**Major / Moderate to Moderate** and Significant reducing to Minor (Cable factory, Demolition of HNA buildings)
	Final Site Clearance phase	Medium	Medium (within 1 km) reducing to Very Low (end of the Final Site Clearance phase phase) Very Low to Zero beyond 1 km	Moderate and Not Significant (within 1 km) Minor and Not Significant beyond 1 km	Adverse (within 1km during Site activity) Neutral (whole receptor) Beneficial (post removal of buildings)	N/A	N/A
Great or Big Cumbrae island CCA	Preparation for Quiescence phase	High-Medium	Zero increasing to Very Low and reducing to Zero	Moderate / Minor to Minor and Not Significant to None	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor to Minor and Not Significant to None	Moderate to Moderate / Minor and Not Significant
	Quiescence phase	High-Medium	Very Low to Zero	Moderate / Minor to Minor and Not Significant to None	Beneficial to Neutral	Moderate / Minor to Minor and Not Significant to None	Moderate to Moderate / Minor and Not Significant

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
	Final Site Clearance phase	High-Medium	Low-Very Low reducing to Zero	Moderate / Minor and Not Significant to None	Neutral (during Site activity) Neutral (post removal of buildings)	N/A	N/A
Millport CCA	Preparation for Quiescence phase	High-Medium	Zero increasing to Very Low and reducing to Zero	Moderate / Minor to Minor and Not Significant to None	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor to Minor and Not Significant	Moderate to Moderate / Minor and Not Significant
	Quiescence phase	High-Medium	Very Low to Zero	Moderate / Minor to Minor and Not Significant to None	Beneficial to Neutral	Moderate / Minor to Minor and Not Significant	Moderate to Moderate / Minor and Not Significant
	Final Site Clearance phase	High-Medium	Low reducing to Zero	Moderate and Not Significant to None	Neutral (during Site activity) Neutral (post removal of buildings)	N/A	N/A
Little Cumbrae or Wee Cumbrae island CCA	Preparation for Quiescence phase	High-Medium	Zero increasing to Very Low and reducing to Zero	Moderate / Minor to Minor and Not Significant to None	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor to Minor and Not Significant	Moderate to Moderate / Minor and Not Significant
	Quiescence phase	High-Medium	Very Low to Zero	Moderate / Minor to Minor and Not	Beneficial to Neutral	Moderate / Minor to Minor	Moderate to Moderate / Minor and Not Significant

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
				Significant to None		and Not Significant	
	Final Site Clearance phase	High-Medium	Low reducing to Zero	Moderate and Not Significant to None	Neutral (during Site activity) Neutral (post removal of buildings)	N/A	N/A
Visual Effects on Views from Settlements							
Millport	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Moderate** and Significant (HNA and cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Moderate** and Significant (Cable factory)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Visual Effects on Views from Transport Routes							
A78	Preparation for Quiescence phase	Medium	Very Low	Minor and Not Significant	Neutral (during Site activity)	Minor and Not Significant	Moderate and Not Significant (Cable factory)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
					Beneficial to Neutral (post removal of buildings)		
	Quiescence phase	Medium	Very Low	Minor and Not Significant	Beneficial to Neutral	Minor and Not Significant	Moderate and Not Significant (Cable factory)
	Final Site Clearance phase	Medium	Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
C26 Kilrusken Road	Preparation for Quiescence phase	Medium	Very Low	Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Minor and Not Significant	Moderate and Not Significant (Cable factory)
	Quiescence phase	Medium	Very Low	Minor and Not Significant	Beneficial to Neutral	Minor and Not Significant	Minor and Not Significant (Demolition of HNA buildings)
	Final Site Clearance phase	Medium	Low reducing to Zero	Moderate/Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
Power Station Road / Oilrig Road	Preparation for Quiescence phase	High	High-Medium reducing to Very Low	**Major to Major / Moderate** and Significant reducing to Moderate/ Minor and Not Significant	Adverse to Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	**Major to Major / Moderate** and Significant reducing to Moderate/ Minor and Not Significant	**Major to Major / Moderate** and Significant (HNA buildings, Cable factory and Proposed Works)
	Quiescence phase	High	Very Low	Moderate/ Minor and Not Significant	Beneficial to Neutral	Moderate/ Minor and Not Significant	**Major to Major / Moderate** and Significant (HNA demolition, Cable factory)
	Final Site Clearance phase	High	High-Medium reducing to Very Low to Zero	**Major to Major / Moderate** and Significant reducing to Moderate/ Minor and Not Significant and None	Neutral to Beneficial (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Fairlie Moor Road (incorporating Core Paths NC33 and NC34)	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
	Final Site Clearance phase	High	Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
B896 (Incorporating Core Paths NC1, NC41)	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Major** and Significant (HNA and Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Major** and Significant (HNA and Cable factory)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Rail Line	Preparation for Quiescence phase	Medium	Very Low	Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	Minor and Not Significant	Moderate and Not Significant (Cable factory)
	Quiescence phase	Medium	Very Low	Minor and Not Significant	Beneficial to Neutral	Minor and Not Significant	Moderate and Not Significant (Cable factory)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
	Final Site Clearance phase	Medium	Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Visual Effects on Views from Recreational Routes							
Ayrshire Coastal Path (incorporating Core Paths: NC60, NC61)	Preparation for Quiescence phase	High	High-Medium reducing to Very Low	**Major to Major / Moderate** and Significant reducing to Moderate / Minor and Not Significant	Adverse to Neutral (during Site activity) Beneficial to Neutral (post removal of buildings)	**Major to Major / Moderate** and Significant reducing to Moderate / Minor and Not Significant	**Major to Major / Moderate** and Significant (HNA buildings, cable factory and Proposed Works)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Major to Major / Moderate** and Significant (HNA demolition, cable factory)
	Final Site Clearance phase	High	High-Medium reducing to Very Low to Zero	**Major to Major / Moderate** and Significant reducing to Moderate / Minor and Not Significant and None	Neutral to Beneficial (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Core Path NC36 - Hunterston Cycle Route	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity)	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
					Neutral (post removal of buildings)		
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Core Path NC111 - Thirdpart	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Neutral (post removal of buildings)	Moderate / Minor and Not Significant	Moderate and Not Significant (Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	No cumulative effects	Moderate and Not Significant (Cable factory)
	Final Site Clearance phase	High	Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Core Path NC23 - Fairlie Moor Road	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Beneficial to Neutral (post	Moderate / Minor and Not Significant	**Major to Major / Moderate** and Significant (Cable factory)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
					removal of buildings)		
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Beneficial to Neutral	Moderate / Minor and Not Significant	**Major to Major / Moderate** and Significant (Cable factory)
	Final Site Clearance phase	High	Very Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Core Path NC32 - Fairlie Burn to Diamond Hill	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Neutral (post removal of buildings)	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	Moderate / Minor and Not Significant	**Major** and Significant (Cable factory)
	Final Site Clearance phase	High	Very Low reducing to Zero	Moderate / Minor and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Core Path NC33 and NC34 - Fairlie Moor Road	See assessment of Fairlie Road (Transport Routes)						

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
Great Cumbrae (Core Paths NC1, NC1a, NC2, NC41, NC74, NC77)	See assessment of B896 (Transport Routes)						
Visual Effects on Views from Recreational and Tourist Destinations							
Hunterston Castle	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Neutral (post removal of buildings)	No cumulative effects	No cumulative effects
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	No cumulative effects	No cumulative effects
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Neutral (during Site activity) Beneficial (post removal of buildings)	N/A	N/A
Millport	Preparation for Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral (during Site activity) Neutral (post removal of buildings)	Moderate/ Minor and Not Significant	**Moderate** and Significant (HNA and Cable factory)
	Quiescence phase	High	Very Low	Moderate / Minor and Not Significant	Neutral	Moderate / Minor and Not Significant	**Moderate** and Significant (Demolition of HNA buildings)

Receptor	Phase	Sensitivity	Magnitude of Change	Level of Effect	Type of Effect	Cumulative Effects (Additional)	
	Final Site Clearance phase	High	Low reducing to Zero	Moderate and Not Significant reducing to None	Adverse (during Site activity) Beneficial (post removal of buildings)	N/A	N/A

Table 22.10 Summary of residual effects for noise and vibration

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor	Magnitude of Change	Significance	Summary of Rationale
All receptors listed in Chapter 15, Table 15.3.	Noise effects due to noise arising from activities in the Works Area.	High	Negligible	Minor adverse (Not Significant)	Noise levels during peak years of activity are predicted not to exceed the BS 5228-1 thresholds of significance
All receptors listed in Chapter 15, Table 15.3.	Noise effects due to increased road noise from vehicle movements generated by the Proposed Works.	High	Negligible	Minor adverse (Not Significant)	Assessment indicates no significant increases of road traffic noise due to the Proposed Works.

Table 22.11 Summary of residual effects for traffic and transport

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor[1]	Magnitude of Change[2]	Significance[3]	Summary of Rationale
Power Station Road (Oilrig Road)	Driver Delay Route being the main site access	Rule 1/ Low	Low	Minor (Not Significant)	The probability of driver delay is calculated as very low. Whilst trip generation is an additional 10 %, this does not account for a reduction in flows in the future baseline, associated with the End of Generation at HNB.
	Hazardous load	Rule 1/ Low	Low	Minor (Not Significant)	The probability is calculated as very low
A78 South to Seamill (between Power Station Road and the B7047)	Road safety	Rule 2 / Medium	Low	Minor (Not Significant)	The collision rate is below the national average. The Proposed Work is not anticipated to impact on road safety
	Hazardous load	Rule 2 / Medium	Low	Minor (Not Significant)	The probability is calculated as very low
A78 between Seamill and Kilwinning	Road safety	Rule 1 / Negligible	Low	Negligible (Not Significant)	The collision rate is below the national average. The Proposed Work is not anticipated to impact on road safety but could potentially affected if the existing road

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor[1]	Magnitude of Change[2]	Significance[3]	Summary of Rationale
					surfacing friction level is deemed sub-standard.
	Hazardous load	Rule 1 / Negligible	Low	Negligible (Not Significant)	The probability is calculated as very low
A78 between Stevenston Road and Irvine Road	Road safety	Rule 1 / Negligible	Low	Negligible (Not Significant)	The collision rate is below the national average. The Proposed Work is not anticipated to impact on road safety but could potentially affected if the existing road surfacing friction level is deemed sub-standard.
	Hazardous load	Rule 1 / Negligible		Negligible (Not Significant)	The probability is calculated as very low
A71 South of Dreghorn	Road safety	Rule 1 / Negligible	Scoped out	Scoped out	
	Hazardous load	Rule 1 / Negligible	Low	Negligible (Not Significant)	The probability is calculated as very low
A77 Kilmarnock Bypass	Road safety	Rule 1 / Negligible	Low	Negligible (Not Significant)	The collision rate is below the national average. The Proposed Work is not anticipated to impact on road safety but could potentially affected if the existing road

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor[1]	Magnitude of Change[2]	Significance[3]	Summary of Rationale
					surfacing friction level is deemed sub-standard.
	Hazardous load	Rule 1 / Negligible	Low	Negligible (Not Significant)	The probability is calculated as very low

Table 22.12 Summary of residual effects for people and communities

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor	Magnitude of Change	Significance	Summary of Rationale
Employment Market	There are concentrated effects on employment in settlements of Ardrossan, Largs, Saltcoats and West Kilbride which have challenging socio-economic conditions and travel to work constraints. Within wider local and regional geographies effects are not likely to be noticeable.	Very Local Level - **Medium** Local Level - **Medium** Regional Level and above - **Low**	Very Local Level - up to **Very High** Local Level - **Medium** Regional Level and above - **Low**	Very Local Level - **Adverse and Major (Significant)** Local Level - **Adverse and Minor (Not Significant)** Regional Level and above - **Adverse and Minor/Negligible (Not significant)**	The HNB workforce predominantly lives locally and local employment markets will see a transition with potential growth in demand from opportunities from the Ayrshire Growth Deal. Negative impacts from loss of employment will occur in 2026 and 2038 during the phase "Preparations for Quiescence", with positive impacts from new employment in 2106 for Final Site Clearance and a negative impact in 2116 at Project end.

Receptor	Summary of Predicted Effect	Sensitivity / Importance / Value of Receptor	Magnitude of Change	Significance	Summary of Rationale
Workers at HNB	Workers may experience variable periods of unemployment and associated mental health impacts, while some may take early retirement. Workers have skills likely to be relevant to growth under the Ayrshire Growth Deal.	**Medium**	Economic effects - **Medium** Health effects - **Low**	**Adverse and Moderate** (**Likely Significant**)	Employee household resilience and health is likely have benefited from stable employment. Employees are skilled and experienced and may have the option of early retirement according to personal circumstances.
The local economy and businesses	Economic impacts are closely aligned with changes in employment and occur at the same times in the Project phases.	**Medium**	**Low**	**Minor (Not significant)**	The North Ayrshire market is of appreciable size and diversity and economic agents have appreciable information about schedules and have time to plan for change.
Walkers and cyclists using the coastal path near the Site	Users of the Ayrshire Coastal Path will pass close to the Site throughout all phases.	**High**	**Very Low**	**Minor (not significant)**	Public access along the Ayrshire Coastal Path near the Site will be maintained throughout all phases with work taking place within defined areas onshore and offshore.

Table 22.13 Summary of residual effects for major accidents and disasters

Major Accident and Disaster Scenario	Receptor	Phase(s)	Severity	Likelihood	Significance	Summary of Rationale
Major accidents associated with the Proposed Works resulting from a fire/explosion and caused by accidental release of substances not regulated under COMAH, or when HNB is no longer regulated under COMAH.	Human population receptors	Preparations for Quiescence, Final Site Clearance	High	Very small chance of occurring	Not significant	The majority of chemicals and fuels will be removed during the Preparations for Quiescence phase but there will be some residual inventories of hazardous substances that will be removed during Final Site Clearance phase. The Site Licensee will implement management measures so the residual risk of harm from all activities to human population will be reduced to As Low As Reasonably Practicable (ALARP). These are set out in **Chapter 18, Appendix 18B.**
	Historic environment receptors	Preparations for Quiescence, Final Site Clearance	NA	No MA&D	Not Significant	The nearest historic environment receptor (Hunterston Castle) is ~500m from the Works Area. Given the distance between the Proposed Works and the receptors and the low level of hazardous chemicals on site, it is not considered credible that a fire on site could damage a historic environment receptor sufficiently to lead to a loss of classification.

Major Accident and Disaster Scenario	Receptor	Phase(s)	Severity	Likelihood	Significance	Summary of Rationale
Major accidents associated with the Proposed Works. An accidental release of hazardous chemical not regulated under COMAH or firewater run-off contaminated with non-COMAH Dangerous Substances, or when HNB is no longer regulated under COMAH.	Human population receptors	Preparations for Quiescence, Final Site Clearance	Medium	Very small chance of occurring	Not significant	The majority of chemicals and fuels will be removed during the Preparations for Quiescence phase but there will be some residual inventories of hazardous substances that will be removed during Final Site Clearance phase. The Site Licensee will implement management measures so the residual risk of harm from all activities to human population will be reduced to As Low As Reasonably Practicable (ALARP). These are set out in **Chapter 18, Appendix 18B.**
	Land receptors	Preparations for Quiescence, Final Site Clearance	Not MA&D	N/A	Not significant	
	Water receptors	Preparations for Quiescence, Final Site Clearance	High	Very small chance of occurring	Not Significant	A spill of hazardous chemicals or fuels not regulated by COMAH could be caused by a variety of factors including corrosion, human error or fire. The most likely release pathway is entrained in firewater. All of the measures above will also apply to land and water receptors. Additionally, the site will maintain an effective emergency response plan to prevent the contamination of land. In addition, the Site Licensee will maintain a Safety Management System for the full life of the Proposed Works.

Major Accident and Disaster Scenario	Receptor	Phase(s)	Severity	Likelihood	Significance	Summary of Rationale
Run-off of contaminated fire water from non-process/non-rad fire/explosion (e.g., building fires) associated with the Proposed Works.	Water and land receptors	Preparations for Quiescence, Final Site Clearance	Not MA&D	N/A	Not significant	A building fire on site would be tackled with local and portable firefighting equipment. There is the potential for some firewater to contain combustion products but should not contain any significant chemical or fuel inventory (see scenario above) Worst credible consequence: Contaminated firewater, if released overland, could impact the adjacent Southannan Sands SSSI but the area affected would be limited and short term. If released via the surface water drainage, then it could impact the marine receptor but the area affected would be limited and short term. The Site Licensee will implement management measures so the residual risk of harm from all activities to human population will be reduced to As Low As Reasonably Practicable (ALARP). These are set out in **Chapter 18, Appendix 18B.**
Major accidents caused by physical effects associated with the Proposed Works, (structural collapse, impact, dropped or swung load, high energy pipe/equipment failure, collapse of excavation).	Human population receptors	Preparations for Quiescence, Final Site Clearance	High	Very small chance of occurring	Not Significant	The Proposed Works will require a significant amount of construction and demolition with associated earthworks. These works will require the use of significant heavy plant vehicles, lifting equipment and temporary structures which are well recognised hazards in the demolition industry. All of the Proposed Works will be undertaken within the Works Area and

Major Accident and Disaster Scenario	Receptor	Phase(s)	Severity	Likelihood	Significance	Summary of Rationale
						this will be physically segregated from third party populations and any sensitive receptors. All of the Proposed Works will be managed and comply with a Construction Management Plan and relevant regulations such as the Construction (Design and Management) Regulations 2015 (CDM). The Site Licensee will maintain a Safety Management System for the full life of the Proposed Works.
	Historic environment receptors.	Preparations for Quiescence and Final Site Clearance	Not MA&D	N/A	Not Significant	The nearest historic environment receptor (Hunterston Castle) is ~500m from the Works Area. Given the distance between the Proposed Works and the receptors it is not considered credible that a physical accident on site could damage an historic environment receptor sufficiently to lead to a loss of classification.
Natural disasters where the Proposed Works have a material effect on the extent and severity of the disaster.	Human population Receptors	Preparations for Quiescence and Final Site Clearance	Not MA&D	N/A	Not significant	The potential effects of flooding are considered in **Chapter 11: Surface Water and Flood Risk**. The design of the Proposed Works will make due allowance for the effects of climate change altering the environmental conditions and loads in which the works may be carried out including consideration of wind, temperature, precipitation, flooding, and drought etc.

Major Accident and Disaster Scenario	Receptor	Phase(s)	Severity	Likelihood	Significance	Summary of Rationale
						The Site Licensee will implement management measures so the residual risk of harm from all activities to human population will be reduced to As Low As Reasonably Practicable (ALARP). These are set out in **Chapter 18, Appendix 18B.** A significant seismic incident affecting the Proposed Works leading to a loss of life is not considered to be credible.
	Water and Land Receptors	Preparations for Quiescence, Final Site Clearance	High	Remote chance of occurring	Not significant	Potential flooding of area leading to contamination of water supply/ ground conditions of site. The majority of chemicals and fuels will be removed during the Preparations for Quiescence phase but there will be some residual inventories of hazardous substances that will be removed during Final Site Clearance phase. The Site Licensee will implement management measures so the residual risk of harm from all activities to human population will be reduced to As Low As Reasonably Practicable (ALARP). These are set out in **Chapter 18, Appendix 18B.**
Major accidents caused by events external to the decommissioning where the Proposed Works have a material effect on the extent and severity of the	Human population Receptors	Preparations for Quiescence, Quiescence, Final Site Clearance	Not MA&D	N/A	Not significant	There are some industrial activities in the vicinity of the Works Area, especially around the Hunterston Port area, an accident at one of these facilities is not likely to extend significantly beyond the boundaries of these facilities. This means

Major Accident and Disaster Scenario	Receptor	Phase(s)	Severity	Likelihood	Significance	Summary of Rationale
accident: This includes aircraft crash, projectiles, domino effects from an industrial accident in the vicinity, and loss of key utility (power supply, water supply) etc; This excludes security, cyber-security and malicious acts.						that it is extremely unlikely that an accident on one of these sites could lead to a major accident, either by directly impacting people or by initiating a domino accident. No potential scenario identified. The design of the Proposed Works will account for the potential loss of utilities e.g. power and communications. The majority of process systems will be regulated by the Nuclear Safety Case or COMAH Regulations and will therefore be out of scope. All systems will be designed to fail safe and therefore loss of utilities should not lead to a major accident. In addition, the Site Licensee will maintain a Safety Management System for the full life of the Proposed Works. The SMS will be maintained to the same standard as currently implemented for complying with the COMAH Regulations.
	Water and Land Receptors	Preparations for Quiescence, Quiescence, Final Site Clearance	Not MA&D	N/A	Not Significant	Potential damage and contamination of land and water supply on the site from external hazard, potential delay to operation. The potential for an external hazard such as a plane crash to impact directly on the Proposed Works workforce is so low, it is not considered a credible major accident. No credible major accident scenarios identified

Major Accident and Disaster Scenario	Receptor	Phase(s)	Severity	Likelihood	Significance	Summary of Rationale
	Historic environment Receptors	Preparations for Quiescence, Quiescence, Final Site Clearance	Not MA&D	N/A	Not Significant	The nearest historic environment receptor (Hunterston Castle) is ~500m from the Works Area. Given the distance between the Proposed Works and the receptors it is not considered credible that a physical accident on site could damage an historic environment receptor sufficiently to lead to a loss of classification.

Table 22.14 Summary of residual effects for conventional waste

Receptor	Summary of Predicted Effect	Magnitude of Change	Significance	Summary of Rationale
Conventional waste: Third party (off-site) inert waste facilities	No inert waste to be despatched off-site for final treatment/ disposal. All such material (~127,000 tonnes in total) to be managed on site.	Negligible	Not significant	No inert waste is to be despatched off-site for disposal.
Conventional waste: Third party (off-site) non-hazardous waste facilities	~73,000 tonnes of non-hazardous waste to be despatched off-site for final treatment/ disposal over a 12-year decommissioning period. In the worst-case year (year 3) ~22,000 tonnes of non-hazardous waste will require off-site disposal.	Minor negative	Not significant	The quantities of non-hazardous waste to be despatched off-site in the worst-case year is significantly less than 50,000 tonnes per annum.
Conventional waste: Third party (off-site) hazardous waste facilities	~4,000 tonnes of hazardous waste to be despatched off-site for final treatment/ disposal over a 12-year decommissioning period. In the worst-case year (year 6) ~3,000 tonnes of non-hazardous waste will require off-site disposal.	Minor negative	Not significant	The quantities of hazardous waste to be despatched off-site in the worst-case year is significantly less than 20,000 tonnes per annum.

22.3 Summary of significant effects

22.3.1 Throughout the Preparation for Quiescence, Quiescence and Final Site Clearance phases, several adverse and beneficial residual effects have been identified. With the exception of visual effects on views from Power Station Road / Oilrig Road and the Ayrshire Coastal Path and socio-economic effects on Workers at HNB and the employment market at a very local level, all residual effects arising from the Proposed Works are considered to be not significant following the implementation of embedded measures and mitigation measures outlined within each of the technical aspect chapters (Chapters 6 – 20) of the ES.

22.3.2 Due to the proximity of the Proposed Works to Power Station Road / Oilrig Road and the Ayrshire Coastal Path, there is limited scope to provide further mitigation over and above those measures identified within **Chapter 14: Landscape and Visual Impact Assessment**. However, whilst significant effects are likely on views from the receptors to the Proposed Works, these effects are transient in nature due to the phased approach to deconstruction, dismantling, decommissioning, and construction works, and would reduce to not significant upon culmination of the Preparation for Quiescence and Final Site Clearance phases.

22.3.3 At the very local level, the effects of the HNB staff reductions would result in a significant effect on employment markets and Workers at HNB. Embedded measures to reduce these socio-economic effects as reasonably practicable include the following:

- The Applicant as part of its resource planning for decommissioning will:
  - Undertake career aspirational discussions with staff;
  - Offer enhanced redundancy packages;
  - Assist workers with necessary retraining to facilitate suitability for decommissioning at HNB roles or alternative roles within the Applicant organisation;
  - Work with third-parties to advertise new opportunities for staff; and
  - Continue to support staff with post employment references for alternative posts.
- The NDA and Magnox Ltd operate socio-economic programmes at each of their sites. As part of this programme, Magnox Ltd operates a good neighbour scheme where individual projects up to £2,000 can be supported. In addition, there are the Magnox Ltd and NDA socio-economic schemes for more transformational projects which can see significant multi-year funding made available. A local example was the financial assistance provided to North Ayrshire college for the construction of a new centre to support students in learning construction trades. This was an NDA supported scheme administered by Magnox Ltd. These arrangements will continue and cover Hunterston B when the site transfers to NDA ownership.

22.4 Summary of assessment of cumulative effects

22.4.1 **Chapter 21: Cumulative Effects Assessment** of the ES presents the cumulative effects assessment of the Proposed Works, including an assessment of potential intra-effects which may occur due to multiple impacts on a single receptor and potential inter-project cumulative effects with other developments.

Intra-project effects

22.4.2 **Chapter 21: Cumulative Effects Assessment** identifies that there is the potential for intra-effects in relation to residents within the rural communities close to HNB and visitors to the area (including the users of public rights of way, local walks and roads), during the Preparations for Quiescence and Final Site Clearance phases.

22.4.3 These receptors are likely to experience combined effects from noise, reduced visual and recreational amenity, and changes to landscape character, albeit on a temporary basis. With the adoption of good practice environmental management as set out within the Environmental Management Plan (EMP) the combined effect would be minimised as far as practicable. No significant intra-project effects are anticipated.

Inter-project effects

22.4.4 The inter-project cumulative effects assessment with other developments considered the potential for significant effects of the Proposed Works in-combination with other developments and plans. With the exception of landscape and visual, the assessment demonstrates that the Proposed Works is not likely to result in cumulative significant effects arising from the effects of the Proposed Works combining with the effects of the identified cumulative schemes.

22.4.5 The landscape and visual impact assessment identified the likely cumulative significant effects on the following receptors:

- LCT 59 - Raised Beach Coast and Cliffs (host LCT);
- Largs to Goldenberry CCA;
- Views from the Settlement and recreational and tourist destination of Millport;
- Views from Power Station Road / Oilrig Road, Fairlie Moor Road (incorporating Core Paths NC33 and NC34) and B896 (Incorporating Core Paths NC1, NC41);
- Views from Ayrshire Coastal Path (incorporating Core Paths: NC60, NC61), Core Path NC23 - Fairlie Moor Road, Core Path NC32 - Fairlie Burn to Diamond Hill and Core Path NC36 - Hunterston Cycle Route.

22.4.6 With the exception of visual effects on views from Power Station Road / Oilrig Road and the Ayrshire Coastal Path, these effects would likely occur with or without the Proposed Works and therefore cannot be reduced by the delivery of further mitigation measures as part of the Proposed Works.

22.4.7 Effects arising on views from Power Station Road / Oilrig Road and the Ayrshire Coastal Path have been identified in **Section 22.2** above. Whilst there is potential for further cumulative effects on these viewpoints as a result of the Proposed Works interacting with other development in the area, it would not materially alter the significance of effect when considering the effects of the Proposed Works in isolation.

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