STORNOWAY PORT AUTHORITY

Stornoway Deep Water Port - Environmental Impact Assessment Report

Volume 2

Main Document

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Contents

Chapter 1: Introduction

STORNOWAY PORT AUTHORITY

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1 Introduction

This Environmental Impact Assessment Report (EIAR) has been produced to support updated construction and dredging Marine Licence applications and a Harbour Revision Order (HRO) for the Stornoway Port Authority's (SPA) proposed Deep Water Port (DWP) in Stornoway Harbour limits, situated in Glumaig Harbour.

The objective of the DWP and its associated features is to facilitate sustainable economic growth, serving a number of diverse sectors in the Outer Hebrides and the Western Isles. Further detail on the project need, consideration of alternatives and construction phases is provided in Chapter 2: Project Description.

Marine Construction and Dredge Licence applications for the creation of the DWP were submitted to Marine Scotland in October 2018. The applications were accompanied by an EIAR (EnviroCentre, 2018c), a Pre-application Consultation (PAC) Report (EnviroCentre, 2018b) and a Best Practicable Environmental Option (BPEO) report (EnviroCentre, 2018a) prepared by EnviroCentre Limited. Consent through an HRO and Planning Permission in Principle (PPiP – Licence No. 19/00273) were also sought and awarded for the original design.

Since the original applications were made, discussions have been held with potential customers, who identified some design improvements for the proposed facility. This, coupled with additional ground investigations which identified ground unsuitable for piling, led to a redesign of the development. As the design developed, it became clear that the changes to the proposal were sufficient to warrant authoring of a new EIAR, in order to inform the Marine Licence and HRO determination process.

Marine licences for the construction of the Stornoway DWP located below mean high water springs (MHWS) and associated capital dredging and disposal are sought under the Marine (Scotland) Act 2010. This EIAR supports the applications as required by the Marine Works (Environmental Impact Assessment (EIA)(Scotland) Regulations 2017.

The SPA HRO (Scottish Statutory Instrument No. 76 2019) grants permission to the SPA to carry out works as detailed in Part 3 of the HRO. Works No.1 to 7 relate to Newton Marina and have been completed. Works No. 8 to 15 relate to the DWP development. The redesign of the Stornoway DWP development does not entirely align to the definition of works in the 2019 HRO. Hence, the HRO application aims to update the development rights granted by Scottish Statutory Instrument No. 76 2019, to cover the redesigned proposed works.

The PPiP allows SPA to:

> *Erect buildings and associated works for industrial, heavy engineering, fabrication and decommissioning (Class 5), and storage/distribution (Class 6) and to construct primary means of access, provide a culvert under the access road, remove an existing culvert, and re-use excavated peat; all associated with reclaimed/levelled areas of land extending to circa 30 hectares forming part of the creation of a Deep Water Port (Subject of the Stornoway Port Authority Harbour Revision Order 2019)*

The changes to the DWP plans do not affect the PPiP, as such, no application to Comhairle nan Eilean Siar (CnES) is being made at this stage. Detailed planning applications will be submitted for elements of the work consented through the PPiP at appropriate points in the project.

1.1 Objective

The objective of this EIAR is to:

- Explain the project need and alternatives considered;
- Provide a description of the proposals including features of the works incorporated to avoid, prevent or reduce significant adverse effects on the environment;
- Understand the environmental baseline for the proposed development area;
- Identify the potential direct, indirect and cumulative effects on the environment associated with the development;
- Assess the significance of the potential effects on the environment;
- Identify appropriate measures/mitigation to avoid, prevent or reduce adverse impacts and to maximise benefits; and
- Provide an appropriate level of detail to inform the Marine Licence and Harbour Revision Order decision making process.

1.2 The EIA Team

SPA commissioned Affric Limited to produce the updated EIAR for the Stornoway DWP development. Affric have worked with the following associates to complete the assessment:

- Douglas Harman Landscape Planning;
- Headland Archaeology;
- Ocean Ecology Limited;
- RPS;
- Tracks Ecology; and
- Wallace Stone LLP.

In addition, where appropriate, work previously completed by EnviroCentre has been utilised within the EIAR. Appendix A.1 provides additional information regarding each of the companies and main contributors to demonstrate their competence to complete the works.

1.3 EIAR Structure

This EIAR is made up of four volumes:

- Volume 1: Non-Technical Summary;
- Volume 2: Main Assessment;
- Volume 3: Appendices; and
- Volume 4: Drawings.

The numbering of the appendices provided in Volume 3 relates to the Volume 2 Chapters, i.e. Appendix A relates to Chapter 1 and Appendix F relates to Chapter 6. As not all chapters have appendices, not all letters are utilised.

1.4 Glossary

Acronym	Definition
BPEO	Best Practicable Environmental Option
CnES	Comhairle nan Eilean Siar
DWP	Deep Water Port
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
HRO	Harbour Revision Order
PPiP	Planning Permission in Principle
SPA	Stornoway Port Authority

Chapter 2: Project Description

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2 Project Description

This chapter provides some background context to the project, considers the project need, details the consideration of alternatives and design evolution, before getting into the detailed project component description and phasing description. The component and phasing descriptions have informed the impact assessment process detailed in the rest of the EIAR.

2.1 Background

The Isle of Lewis was sold to Sir James Matheson in 1844, who built the current Stornoway Castle replacing the old castle which dated back to the 14th Century. In the following decade, the town of Stornoway's commercial importance grew due to its reputation as the best harbour on Scotland's north-west coast. The Arnish Lighthouse, the Northern Lighthouse Boards first prefabricated lighthouse, became operational in 1852, to guide mariners safely into the natural harbour area (Canmore, 2020). The Stornoway Pier & Harbour Commission was formed in 1865. By 1881 the fishing industry was growing, driving the need for solid quays and wharves to be built to facilitate the sector, the old fish Mart opened for business in 1894 (Stornoway Port Authority, 2020).

Further developments of the harbour were authorised by the Stornoway Harbour Order Confirmation Acts 1926 and 1947. The harbour limits were extended by the Stornoway Harbour Order Confirmation Act 1976, which also created the pilotage district. The Stornoway (Ferry Terminal) Harbour Revision Order 1995 in turn facilitated the construction of the New ferry terminal (Stornoway Port Authority, 2020).

On the 1st of May 2004, Stornoway Pier and Harbour Commission became Stornoway Port Authority (SPA) under the Stornoway Harbour Revision (Constitution) Order 2003. This permitted changes to be made to allow SPA to comply with the Government's Guidelines 'Modernising Trust Ports – A Guide to Good Governance. The harbour limits were also extended by the 2003 order (Stornoway Port Authority, 2020), to those now in place (Drawing SDWP-WS2139-XX-00-DR-C-9035).

The sheltered area afforded by Glumaig Harbour and the wider Stornoway Harbour, with easy access to the Minch, has allowed the town of Stornoway to grow to have a population of 8,000 and become the main harbour for the Isles of Lewis and Harris and the wider Outer Hebrides, with the majority of freight and people accessing the islands via this route. The lifeline ferry service from Ullapool sails to Stornoway three times a day Monday to Saturday and up to twice on Sunday in the summer months.

As shown in Figure 2.1.1, the Port currently has three piers in Stornoway, all of which can be utilised on both sides, and includes two Roll-on Roll-off (Ro/Ro) linkspan facilities (West sides of No. 1 Pier and No. 3 Pier). The ferry service uses the linkspan at No. 3 Pier. The linkspan berth at No. 1 Pier cannot accommodate the Ullapool to Stornoway ferry vessel. There are three quays (Cromwell Street, North Beach and Esplanade) and two marinas, one at the Cromwell Street Quay in Stornoway Town Centre and the other, Newton Marina, to be completed shortly at Goat Island. There is an operational slipway at Goat Island used by small commercial vessels and pleasure vessels. In addition, there are piers at Arnish which are also within the Harbour limits. The lighthouse at Arnish remains operational, although it is no longer manned.

The islands are dependent on the Harbour, and its success is intertwined with the economic prosperity of the Outer Hebrides.

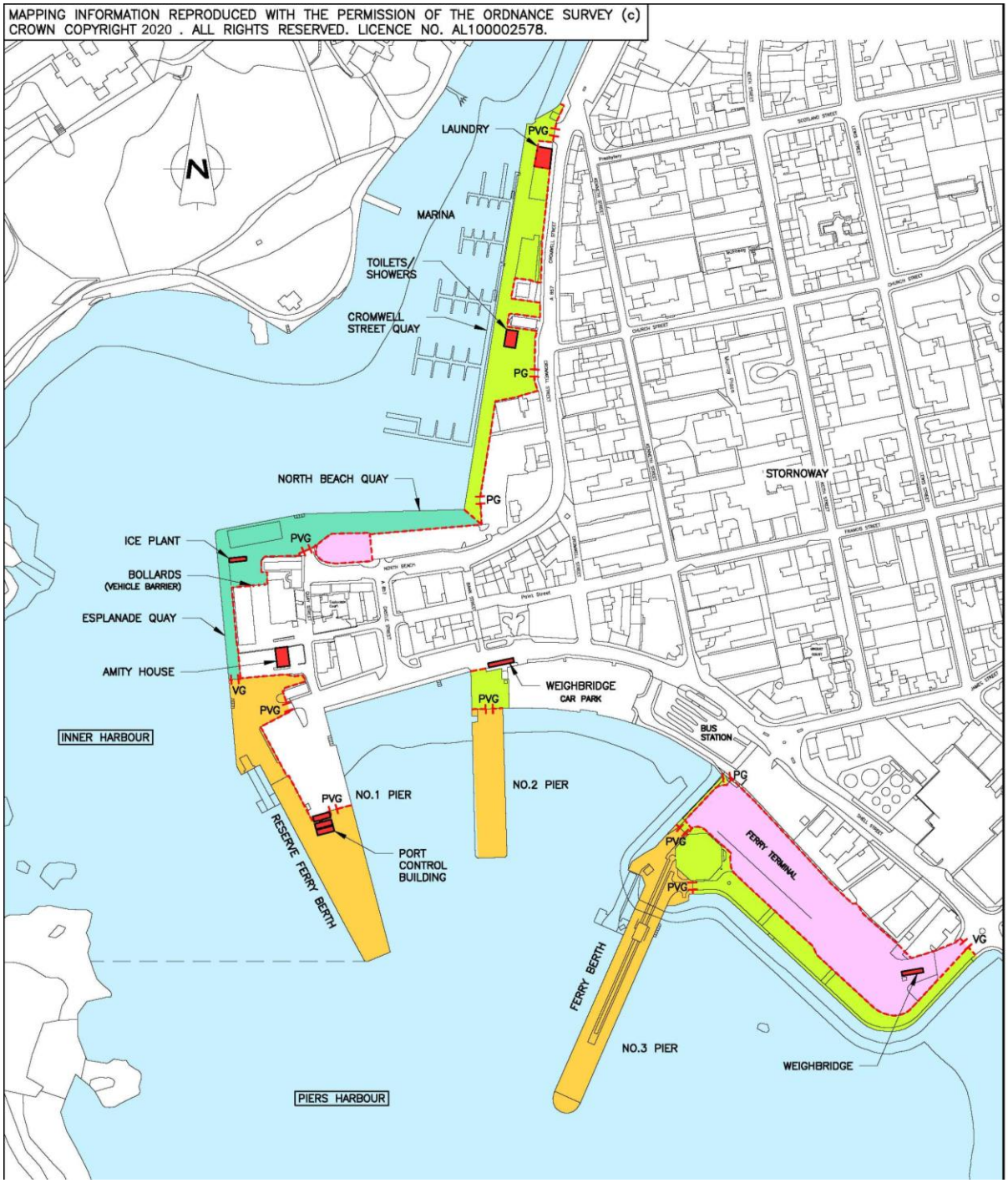

Figure 2.1.1 Stornoway Harbour Facilities

2.2 Project Need

The objective of the Deep Water Port (DWP) and its associated features is to facilitate sustainable economic growth, by serving a number of diverse sectors in the Outer Hebrides and the Western Isles. The project's socioeconomic impacts are discussed further in Chapter 16: Other Issues, Section 16.2: Socio-Economics.

2.2.1 Economic Sectors

The requirements of four economic sectors are discussed below, however the expansion of the port will also facilitate uses by other sectors, be that through their use of the proposed new DWP facilities, or the existing facilities which become more attractive or available to them as some of the vessel traffic utilises the DWP, or in the availability of new opportunities offered but the development of the sectors discussed below. For example, crafts, arts and artisan food producers may benefit from increased tourism associated with the cruise sector purchasing their goods.

2.2.1.1 Renewables

The Arnish Fabrication Yard provides an excellent facility which can be utilised by the renewable energy sector, onshore wind, offshore wind, potentially moving into wave and tidal as the technology is developed. It already handles components for renewables or offshore activities. The pier at Arnish is only 100m long with a water depth of 6.1m. Wind turbine blades lengths of 7MW wind turbines are in the region of 126m, hence the existing pier is not suitable for the renewable sector's requirements. Hence at least a 200m long berth with deep berth is required to accommodate a range of vessels used in the renewable energy sector. An appropriate link road is also required to connect the new berth to the Arnish Industrial Estate. To allow for the movement of large components the road will have to be of a suitable width with shallow angled corners and overhangs. Furthermore, due to the scale of the components associated with the renewable sector, heavy lift capabilities, and large laydown spaces are also required.

Once operational, offshore energy devices require regular maintenance, for logistical reasons the preference is to utilise a local port, hence the DWP could support developments in the Minch or west of the islands.

2.2.1.2 Tourism - Cruise Sector

Stornoway is already an established cruise destination. However, due to the lack of appropriate facilities, Stornoway is not attractive to vessels greater than 156m in length, as they must anchor in the outer harbour, an activity which is not popular with cruise companies and is not feasible in bad weather. This fact has been reflected in both the number of cruise ship and passenger numbers in recent years. For example, in 2016, Stornoway saw a total of 62 cruise ship visits, amounting to a total of around 23,585 passengers. In the following years, Stornoway experienced declines in both figures, with 2019 seeing 57 cruise ship visits and around 17,362 passengers, respectively.

As cruise ships visiting Scottish ports are increasing in size to respond to market demand, cruise operators prefer to berth alongside, for the reasons noted above. In some cases, cruise ship companies are having vessels built which will not support the option of tendering passengers to the shore.

In order to maintain and grow the cruise ship market share in Stornoway, the harbour requires a facility which can enable alongside berthing of vessels up to 360m in length. It is anticipated that this would attract 35 additional vessel visits per year and, in turn, increase the number of passenger visitors.

Discussions with cruise operators identified that although most of the larger cruise ships have drafts of less than 9m, they will not enter a port unless the water depth is at least -10m Chart Datum (CD). As such, dredging is required to be done to a depth of at least 10m to allow for successful manoeuvrability and berthing opportunities.

It is noted that the SPA has a separate project to complete the Newton Marina which will provide facilities for smaller vessels including sail boats and pleasure craft, which will also contribute to the development of tourism on the island.

2.2.1.3 Commercial Freight

The majority of commercial freight to the Outer Hebrides is routed through Stornoway. The Ullapool to Stornoway ferry carries both freight and passengers. There are six dedicated (overnight) freight sailings per week; Heavy Goods Vehicles (HGV's) are also carried out the daytime sailings of the ferry. The ferry is frequently fully booked during the summer months, restricting transport of freight as well as passengers. To have a dedicated freight berth available will create additional passenger capacity and provide flexibility for the timing of freight sailings.

Bulk goods such as coal, heating oil, gas and petrol are delivered by other vessels. There is a dedicated berth for oil and gas deliveries at No. 2 Pier. The facilities for cargo vessels are limited by the depth of water at the piers. This restricts the size of vessels used, which increases transport costs and imposes constraints on deliveries. The DWP facilities will allow use of larger vessels, easing transport of goods to support a range of industries on the islands.

The delivery of items such as fuel oils and potential export of renewable energy sources e.g. hydrogen or ammonia, are strictly regulated to minimise environmental and safety risks such as explosion, as such it is more appropriate to carry out these bunkering activities away from highly populated areas. Hence the creation of a facility out of the town of Stornoway would be beneficial.

2.2.1.4 Oil and Gas Decommissioning

As many of the existing oil and gas assets in the North Sea are aging, there is a growing need to refurbish or decommission oil rigs. This is a multibillion-pound sector, it requires harbours of suitable depth to have heavy lift capacity, and large laydown areas. The Arnish Industrial Estate provides facilities suitable for supporting the sector, but the existing quay does not meet the requirements of the sector.

2.2.2 Development Requirements

Based on the five main sectors discussed above there is a need for:

- A 10m water depth berth capable of taking a 360m long vessel;
- A 10m depth channel connecting the berth to the Minch;
- A freight ferry berth with linkspan;
- Additional berthing with water depths of 7m at all tide states.
- Heavy load/lift capabilities;
- Additional laydown space;
- Good road links to the rest of the island; and
- A road link capable of taking large components to the Arnish Industrial Estate.

2.3 Consideration of Alternatives

The consideration of alternatives has been an iterative process completed as part of the design development. The alternatives considered for the main components are discussed below. Consideration of alternatives took into account the following factors as appropriate:

- Constructability;
- Operability;
- Public safety;
- Physical constraints/ restrictions;
- Cost; and
- Environmental effects.

2.3.1 Do Nothing

The 'Do Nothing' option was ruled out due to the project needs discussed in Section 2.2. The intrinsic link between the harbour and the economy of the islands, is such that action is required to ensure continuing prosperity and to reduce the trends of depopulation and aging populations (see Chapter 16: Other Issues, Section 16.5.2 Population Effects for more detail).

2.3.2 Location

The scale of the development design requires a large area, ideally where existing water depths with a link out to the Minch are close to 10m, to minimise the dredge requirements. Sandwick Bay provides a large area, however it is shallow, whereas Glumaig Harbour is spacious and quite deep. Areas to the southeast of Arnish point provide the water depths but they do not have the natural protection from the weather and large sea states which is the main benefit of the Stornoway Harbour Area to the north and west of Arnish point. As such, Glumaig Harbour area, with the added benefit of being close to the Arnish Industrial Estate from a road link perspective, was selected.

The availability of the eleven plots within the Arnish Industrial Estate was considered to identify if there was available space to support additional quays. It identified that the main occupier BiFab have two large plots, Hebridean Seaweed Company currently utilise three smaller plots, Scottish and Sothern Energy Networks propose to build the Converter Station for the Western Isles Interconnector on two plots, and a Haulage operator leases part of another plot. The remaining three plots are adjacent to the quay and are only suitable for short-term use, as such they would not be able to support additional quays. Hence although, a new development

will benefit the users of the Arnish Industrial Estate there is no space available there to support quays. Hence there is a need to form a new onshore area as part of the project.

2.3.3 Design Evolution

An initial concept for the design was developed, incorporating the development requirements laid out in Section 2.2.2. Initially there were plans for a phased development, allowing for expansion, in line with market demand and funding availability. These are shown in Drawing 1980-2003 and were presented in an Environmental Impact Assessment Report (EIAR) produced by EnviroCentre to support a Harbour Revision Order (HRO), Planning Permission in Principle (PPiP) and initial Marine License applications. The previous EIAR focused on Phase 1 as the part of the development being progressed at that point.

Ground investigations have since been completed which identified that the seabed in the south west of Glumaig Harbour is very soft and not conducive for piling and would give rise to settlement issues associated with land reclamation. The proposals are therefore to construct further to the north partly in what was previously deemed to be the Phase 4 area, Drawing SDWP-WS2139-XX-00-DR-C-9031 shows the outline of the revised design (in red) compared to the previous design.

The design aimed to reach a cut and fill balance, such that the dredge material and rock from the land removed to create a levelled area and the roads, can be reused within the land reclamation to minimise material import and disposal.

Achieving a 360m long quay proved challenging due to the ground conditions and budget constraints. Hence the concept of creating a 'Bollard Island' ensured that a shorter quay length can be constructed while still allowing for 360m long vessels to safely berth.

The use of a finger pier to form part of the 'Main Quay' provided the opportunity to have an additional berth for use by smaller vessels.

The freight ferry berth requires a linkspan to facilitate Ro/Ro, however, to maximise the flexibility of the facility, it is preferred that a quay wall suitable for use as a berth is provided alongside it.

Input to the design was sought from the Harbour Master and pilots, who identified the navigational risk posed by the wreck of the SS Alabama. The sections of the wreck projecting above -8m Chart Datum (CD) would lead to restrictions on the operation of the freight ferry, whose dedicated berth is close by. Hence plans to reduce the height of the SS Alabama have been included within the design.

A description of the proposed design of each of the components and their optimisation is provided in Section 2.6.

2.4 Location

The proposed location for the Stornoway DWP is located on the western coastline of Cala Ghlumaig (Glumaig Harbour), on the Isle of Lewis. The DWP has a central grid reference point of NB 42333 31164 (Drawing SDWP-WS2139-XX-00-DR-C-9036). Stornoway is the main township on the Isle of Lewis and the current ferry services that run from Stornoway to the west coast of the Scottish mainland provide the shortest possible route. The DWP is located south west across Glumaig Harbour from Stornoway town centre and is a 10 – 15 minute car journey by road. Stornoway falls within the administrative area of the Comhairle nan Eilean Siar (CnES).

The DWP areas are shown in Drawing SDWP-WS2139-XX-00-DR-C-9022, this includes onshore construction areas, marine construction areas, and the areas to be dredged. The onshore construction area is bounded by Mean Low Water Springs between points SOP10 and SOP18, and further, those listed in Table 2.3.1 and detailed on Drawing SDWP-WS2139-XX-00-DR-C-9017.

Table 2.3.1: Boundary of DWP Onshore Construction Works

Point Number	Easting	Northing
SOP10	142623	930514
SOP11	142670	930464
SOP12	142580	930280
SOP13	142364	930342
SOP14	142214	930563
SOP15	142057	930579
SOP16	141575	931195
SOP17	141765	931441
SOP18	142093	931576

The dredge area and the construction area which are subject to a dredge licence and construction licence respectively under the Marine Works (Scotland) Act 2010 are detailed in Drawing SDWP-WS2139-XX-00-DR-C-9017. The dredge boundary area is approximately 54.3ha and is bounded between joining points SOP1 to SOP8 and MHWS (all points are detailed in Table 2.3.2). The Marine Construction Boundary is approximately 28.7ha and is defined by MHWS between points SOP1 and SOP9, then joining points SOP1, SOP2, SOP6, SOP7 and SOP9.

Table 2.3.2: Boundary of DWP Offshore Construction Works

Point Number	Nation Grid		Lat /Long	
	Easting	Northing	'N	'W
SOP1	142153	931537	58°11.818	006°23.388
SOP2	142439	931569	58°11.845	006°23.099
SOP3	142456	931868	58°11.715	006°23.102
SOP4	143036	931688	58°11.930	006°22.499
SOP5	143075	931286	58°11.715	006°22.433
SOP6	142838	930969	58°11.537	006°22.654
SOP7	142645	930970	58°11.533	006°22.850
SOP8	142353	931093	58°11.588	006°23.155
SOP9	142562	930632	58°11.348	006°22.912

2.5 Harbour Revision Order

The SPA Harbour Revision Order (HRO) 2019, No. 76 provided the power to construct Newton Marina and the DWP and was issued in February 2019. However, the works detailed in Part 3 of the licence were based on the original design of the DWP and do not entirely cover the revised design of the development. As such a new HRO is sought from Transport Scotland to facilitate the development, the detail of Part 3 Power to Construct Works and associated drawings are provided in Appendix B.1.

2.6 Project Components

The Stornoway DWP development comprises the following main components:

- Main Quay;
- Heavy Load Area;
- Pontoon;
- Bollard Island;
- Freight Ferry Berth and Linkspan;
- Reclaimed/Levelled Area;
- Dredging;
- Access Road;
- Link Road;
- Services; and
- Navigational Elements.

Further detail on each of the components is provided in this section. The proposed site layout is provided in Drawing SDWP-WS2139-XX-00-DR-C-9022. Design drawings are referred to in this section and provided in Volume 4: Drawings of the EIAR, to provide a greater understanding of the development to the reader. However, it should be noted that the design drawings are subject to change and as such are indicative only.

The construction approach to provide the various components is explained in Section 2.7.1.

2.6.1 Main Quay

The main quay of the DWP will be 306m long and orientated approximately north northwest to south southeast, with 10 metres of available water depth at CD (approximate lowest tide). Of the 306m length, the northern 192m will be constructed using combination wall (combi-wall) with king and sheet piles, infilled behind as part of the land reclamation section of the reclaimed/levelled area, see Section 2.6.6. The southern end of the main quay will consist of a 114m long, 15m wide open-piled finger pier (Drawings SDWP-WS2139-XX-02-DR-C-1001 and 1002).

The combi-wall will be made up of steel tube piles 1230mm in diameter at 3 metre intervals, with conventional sheet piles between them. The wall will be restrained by steel tie rods 40m long and anchor walls of steel sheet piles. The anchor wall will be fully buried in the rock fill behind the combi-wall. The combi –wall piles will be secured together by a reinforced concrete capping beam, behind which a 25m wide reinforced concrete slab will provide a solid surface for all general port operations.

The finger pier will consist of steel bearing piles, vertical steel piles to accommodate deck loadings, and angled steel raking piles to resist lateral loads from berthing forces and mooring

lines secured to deck bollards. The piles will be topped with a reinforced concrete deck. All piles will be approximately 800mm in diameter.

The main berth will serve a range of vessels up to 360m in length, and the fendering at the berth will be floating foam filled fenders, to suit the preference of the ship masters consulted. The fenders will be 2m in diameter and 4m in length and will be retained in position by heavy steel chains. At the combi-wall section of the berth, fenders will bear directly on the quay wall, while at the finger pier section, the units will bear on timber reaction panels 7m high and 6m wide secured to the concrete deck at the top, and braced back by steel tubes to the bearing piles. Quay furniture including mooring bollards will be installed.

2.6.2 Heavy Load Area

A heavy load area will be located at the southern end of the combi-wall in the reclamation area. The heavy load area will be approximately 1050m^2 and be capable of taking 20,000 tonnes in weight. The heavy load area will consist of a concrete slab 1m deep supported on 300mm diameter steel tube piles at close centres (approximately 1.5m). These piles will be fully buried in rock fill retained by the combi-wall piling. The heavy load area will facilitate very heavy cranes for large lifts and modules offloaded from barges.

2.6.3 Pontoon

A heavy duty pontoon, 100m long and 4m wide, will be located against the west side of the finger pier, secured in place by steel guide beams braced back to the finger pier structure as shown in Drawings SDWP-WS2139-XX-02-DR-C-1001 and SDWP-WS2139-XX-02-DR-C-1002. The pontoon will be a combination of reinforced concrete, steel framing, polystyrene floats and GRP mini-mesh decking, and will be equipped with high capacity, vertical rubber fender units secured to the pontoon berthing faces at 3m intervals.

Access to the pontoon will be by fabricated steel access bridge 25m long, supported on a steel support frame bolted to the pier deck at the upper end, and on wheels bearing on runners on the pontoon deck at the outer end. The pontoon will be equipped with three services pedestals, each providing power, water and lights. The access bridge will be supplied with floor lights at regular intervals on both sides. The edge of the finger pier deck above the pontoon will be protected with steel handrails, which will be de-mountable within 30m of the north end of the finger pier.

2.6.4 Bollard Island

The overall length of the main quay is 306m, and the largest cruise ships will overhang the south end of the berth by up to 54m. To provide a suitable securing point for the stern lines of these vessels, it is proposed that two bollards are secured to the highest points of rock outcrops to the south of the finger pier. Anchor bolts will secure the bollards to the rocks which will have concrete blocks sufficient for the bollard loads constructed around them. To facilitate line crew access, a short access causeway and a turning area for small vehicles, will be constructed from rock fill as detailed in Drawing SDWP-WS2139-XX-00-DR-C-9028.

2.6.5 Freight Ferry Berth and Linkspan

The freight ferry berth will be orientated approximately east west at the north end of the reclaimed/levelled area and will have eight metres of water at CD. The berth will be 140m long and will occupy the majority of a 200m long steel 'combi' sheet piled wall. The piles are of similar dimensions to those used on the main quay, 1230mm diameter 'king' piles at 3m

centres, with smaller sheet piles filling the gaps in between, and will be restrained by steel tie rods 40m long and anchor walls of sheet piles, buried in the rock fill behind the wall.

As at the main quay, the piles will be connected by a reinforced concrete capping beam, behind which a 10m wide reinforced concrete slab will provide a hard surface for all port activities.

In addition to serving the freight ferry, the berth will also accommodate oil delivery vessels and other bulk cargo vessels up to 140m long. The concrete slab will provide a suitable surface for gangways, and for mobile cranes or excavators used to load and unload cargoes.

At the ferry berth, fendering will be provided in the form of floating pneumatic fenders, retained in position by heavy steel chains. To protect the fenders from damage by drag forces from the ferry moving along the berth, they will be equipped with rubber tyre nets.

Appropriate quay furniture such as ladders and mooring bollards will be installed.

2.6.5.1 Ferry Berth Alternative Design

An alternative design for the ferry berth has been developed, and it may be adopted in the event that the combi-wall at the ferry berth is cost prohibitive. In the alternative design, the combi-wall is replaced by a rock armoured slope. Fendering is provided at the berthing face, by steel panel fenders at regular intervals, similar to those already described, except that here rubber cone units will be secured to strutted vertical steel piles driven to a suitable depth. The piles are supported at their heads by horizontal steel struts to concrete blocks cast in the armoured slope (Drawing SDWP-WS2139-XX-00-DR-C-9038 P01)

A platform 5m wide, constructed in fabricated steel, and extending along the berth, provides for gangways, and general access alongside the berthed vessel, in addition to supporting the flexible hoses used by the oil delivery vessel. The platform is accessed by a steel walkway supported on one of the horizontal struts.

2.6.5.2 Linkspan

As shown in SDWP-WS39-XX-00-DR-C-9022, the linkspan will be located to the western end of ferry berth. The linkspan bridge will be a steel structure, 40m in length and 10m in width, and will be supported on a reinforced concrete abutment at the landward end installed in the reclaimed land (see Section 2.6.6), and on hydraulic rams and steel frames mounted on two dolphins at the seaward end (Drawings SDWP-WS39-XX-04-DR-C-1001 and 1003).

The dolphins will consist of reinforced concrete blocks supported on steel tube piles 800mm in diameter (Drawing SDWP-WS39-XX-04-DR-C-1004). The piles will be driven to rock by vibrating hammer, and their loading capacity proved by impact hammer. The toes of the piles will be provided with steel toe pins grouted into holes drilled in the bedrock to sustain shear loads. The dolphins will also support mooring bollards.

2.6.6 Reclaimed/Levelled Area

A flat area of around 7 hectares will be created at a height of +7.5m CD. The area will be used for laydown of cargoes and renewables components in transit, marshalling and parking associated with the freight ferry, parking and turning of coaches serving cruise ships and general port activities (Drawing SDWP-WS2139-XX-00-DR-C-9022). Future uses (subject to appropriate planning consent) may include a building(s) for non-port industrial and storage uses (see Section 2.6.10).

The majority of the reclaimed/levelled area will be reclaimed from the sea, with the remainder to the west of the area being formed by cutting into the hillside to level an area. The rock won from the hillside will be utilised in the land reclamation along with the majority of the dredged material from the deepening of the approaches to the DWP (see Section 2.6.7).

The combi-walls associated with the main quay and the ferry berth will retain infill material to the east and part of the north of the land reclamation area. The remaining perimeter of the land reclamation will be formed by rock armoured bunds, utilising the material won from the rock cut, as shown in Drawing SDWP-WS2139-XX-03-DR-C-1003 P01.

In the region of 400,000m^3 of rock will be blasted from the hillside, the rock will be utilised for the land reclamation, link road (Section 2.5.8), and the Bollard Island causeway (Section 2.5.3).

As discussed in Sections 2.61 and 2.6.5 there will be reinforced concrete slabs adjacent to the quays. The remainder of the reclamation will be surfaced with crushed rock. In the future hard standings areas may be installed to meet specific sector needs. Drainage and services are discussed in Sections 2.6.11 and 2.6.12 respectively.

2.6.7 Dredge

The area around the main quay, and the approaches to it, require to be dredged to a depth of 10 metres below CD, to accommodate vessels associated with the renewable energy industry, large cargo ships and cruise ships. The dredge volume is estimated to be approximately 500,000m^3, and it is expected that over 90% will be re-used as infill material in the land reclamation (see Section 2.6.6).

Marine boreholes have confirmed that the dredge area is all in sand and gravel deposits with a low silt content, and that no blasting will be required. Up to 50,000m^3 of unsuitable material may require to be deposited at the Stornoway Spoil Disposal Site (HE035) site nearby. This is considered in detail in the Best Practicable Environmental Option (BPEO) Assessment (EnviroCentre, 2018), produced to support the dredge licence.

2.6.8 Access Road

Access to the DWP will be by a two-lane road from the existing access road to Arnish Industrial Estate from the Stornoway to Tarbert road. The junction is of suitable width to allow HGV's to access/egress with appropriate visibility up and down the road. The DWP access road will be at a steady downward gradient of 1 in 12 and will arrive on the west side of the reclaimed/levelled area (Drawing SDWP-WS2139-XX-00-DR-C-9022).

As shown in Drawings SDWP-WS2139-XX-01-DR-C-0051 and SDWP-WS2139-XX-01-DR-C-0052 the majority of the road will be in a cutting. It will be surfaced in bituminous material and will be drained to ditches at either side (see Section 2.6.11 for more details). The Allt Poll a'

Choire is crossed by the access road with, an open bottomed culvert will be utilised to form the crossing. The culvert has been sized for a 1 in 200-year rainfall event.

2.6.9 Link Road

The link road will connect the DWP with the Arnish Industrial Estate, to allow large and heavy components to be imported and exported to the Estate.

As modules transported around the link road on specialised trailers might be up to 40m wide, with a substantial overhang to either side of the road, the excavation area will be sufficiently wide to provide a verge 7 metres in width adjacent to the road on its landward side. This verge will carry a substantial drainage ditch, collecting runoff from the rock faces behind, and from the access road to the north. Several large diameter culverts through the road construction will carry runoff water to the sea (see Section 2.6.11).

As shown in Drawings SDWP-WS2139-XX-01-DR-C-2101 to 2103 the road route will be partly on blasted rock, and partly on reclaimed land.

2.6.10 Building(s)

There will be a need for a small office/welfare building at the DWP where Port staff will be based during berthing operations, cruise ship passenger movements and freight ferry loadings.

There is also potential for building(s) in the future to support wider uses of the DWP, the most likely location for this is shown on Drawing SDWP-WS2139-XX-00-DR-C-9037.

2.6.11 Drainage

2.6.11.1 Cut-off Drainage

Intercepting ditches are proposed at the top of cuttings, where required to intercept flow and minimise off edge run-off. These will have wide shallow sections intended to minimise run-off directly over the edge of cuttings, without over draining the peat and wet areas. Specific design detail has been developed in conjunction with the ecologists for the area in the vicinity of the high Ground Water Dependant Terrestrial Ecosystem (GWDTE) flush habitats. The detail is provided in Drawings SDWP–WS 2139–XX–03–DR–C 4051 and 4052. the aim is to prevent the dry out of the remaining flush areas and encourage the development of new flush habitat. This is discussed further in Chapter 10.

2.6.11.2 Reclaimed/Levelled Area and Quays

The proposed drainage scheme for the Reclaimed/Levelled Area is shown in Drawing SDWP-WS2139-XX-03-DR-C-9023. The intent is to utilise channel drains and gully drains, to route surface water into one of the two drainage systems, one for the Main Quay and eastern side of the development and one for the Freight Ferry Berth and the west side of the area including the Service Compound. The Class 1 oil interceptors will facilitate the removal of oils and solids, they will also include penstocks which will allow the drains to be isolated if need be in event of a pollution incident. The service trench which includes the oil pipework drains into the surface water drainage systems and hence benefits from the oil interceptors. The outfalls are located in the north west and north east corners of the Reclaimed/Levelled Area, and will be located near the high water level to prevent them becoming tide locked, and to reduce the severity of exposure to seawater of pipes and components.

The crushed rock surfaced areas will not be formally drained, surface water will infiltrate through the reclaimed material. If a future use determines that formal drainage is required, then this will be appropriately specified, designed and installed to meet the specific requirements. The two systems described above have 10% spare capacity for future development.

The finger pier and pontoon do not have engineered drainage systems, surface water will run off over the edges. Due to the lack of infrastructure to manage spillages, no fuel bunkering will be carried out in these areas.

2.6.11.3 Access Road

The access road utilises swales in line with the Sustainable Urban Drainage System (SuDS) Manual: CIRIA 753. The swales will be located both sides of the road, with the most westerly section of the road up to around chainage 100m (see Drawing SDWP-WS2139-XX-01-DR-C-0051) draining west towards the Allt Poll a' Choire. The remainder of the road swales will flow towards the sea down the road. Check dams are proposed in the roadside swales to limit velocities and for erosion potential.

The southern swale waters will drain around the Levelled Area into the Link Road Swales and discharge to sea via a culvert.

2.6.11.4 Link Road

The link road will drain to a swale on the landward side of the road. Water from the swale will be routed under the road through four culverts at the locations show in Drawings SDWP-WS2139-XX-01-DR-C-9025 to 9027. The typical culvert design is shown in SDWP-WS2139-XX-01-DR-C-4105. The unnamed streams running off the hillside will pass under the road through culverts as shown in Drawings SDWP-WS2139-XX-01-DR-C-9025 and 9026. All culverts are sized to manage a 1 in 200-year rainfall event.

2.6.11.5 Foul Drainage

The public sewage network is approximately 3km from the DWP, hence local foul drainage arrangements will need to be made to accommodate foul drainage arising from welfare facilities and any other buildings which may be constructed on the DWP. A package wastewater treatment plant will be utilised to treat wastewaters prior to discharge to sea. The size and details of the plant will be aligned to the predicted demand, the requirements of the Water Environment (Controlled Activities) (Scotland) Regulations, will be taken account of in the design process.

2.6.12 Services

Services will be available at the main quay, and the freight ferry berth, and will include the provision of power, water and gas oil. The reclaimed/laydown area will accommodate, in a single place, an electrical sub-station and storage tanks for water and for gas oil.

The fuel will be delivered to the freight ferry berth, which will be equipped with flexible hoses discharging to pipes to the storage tanks. Parallel pipes will carry the fuel back to the quayside at several locations to allow vessel bunkering.

The fuel pipes will be contained in a reinforced concrete services tunnel, which will run from the tank and sub-station area to the freight ferry quay, and around the north and east quays

to the services outlets. The tunnel will also house electrical cables. Water pipes will be buried at a suitable depth in the reclamation, for frost protection.

The pontoon will be equipped with three services pedestals, each providing power, water and lights, no fuel bunkering will be carried out on the pontoon.

Electricity will be provided to the Bollard Island for lighting purposes. Lighting will be provided at the quaysides and the storage tank/sub-station compound by area lighting towers. The light units will be angled such that they provide illumination for the quaysides and Reclaimed/Levelled Area, while minimising light visibility from the town of Stornoway and light pollution on the surrounding habitats.

Internet connectivity will be provided by connecting the DWP to the Openreach fibre network. This will allow remote monitoring and operation of Close Circuit Television (CCTV), security gates, lighting as well as connection of the office/welfare block to the Port Authority's Information and Communication Technology (ICT) systems.

2.6.13 Navigational Elements

2.6.13.1 SS Alabama

The wreck of SS Alabama lies close to the north quay of the DWP in an area of water depths of around 12m. Since its sinking in 1904, the 4000t vessel has been the subject of many attempts to reduce its potential to obstruct navigation, two using explosives, and several by dragging cables over the wreck.

Surveys show that small sections remain at depths between -3.5 and -8m CD, with larger areas below -8m CD. These projecting sections of steel present a navigational hazard to vessels drawing up to 7 metres, using the freight ferry berth. Hence, it is proposed to remove the sections projecting above -8m CD. It is expected that up to 400 tonnes of steel will require to be cleared for safe navigation.

It is proposed that sections of the wreck above -8m CD will be cut off using hot cutting techniques e.g. broco rods. The sections cut from the SS Alabama wreck will be placed within the wreck footprint at water depths below -8m CD. There is no intention to remove any elements of the wreck from the seabed.

2.6.13.2 Navigational Aids

The appropriate aids to navigation will be installed in line with the requirements of the Port Marine Safety Code in agreements with the Northern Lighthouse Board.

2.7 Project Phases

2.7.1 Construction

Generally, construction works excluding dredging will be conducted primarily between 7am to 7pm Monday to Saturday. Sunday working is not anticipated to occur. However, work outwith these hours may be required on an infrequent basis to suit tides and vessel movements.

It is expected that work will take in the region of 15 and 20 months to completed, with multiple tasks ongoing in parallel.

2.7.1.1 Access Road

The construction of the access road is likely to be one of the first activities carried out, to facilitate access to the main construction site. The route for the road will need to be excavated. This will require the removal of peat and soils, which will be relocated in accordance with the Peat Management Plan (see Chapter 14: Water Environment, Soils and Coastal Processes). Rock removal to create the road is likely to require an element of blasting. The rock removed will be utilised to create the edges of the land reclamation area. Once excavations have been completed for the access road, it will be appropriately dressed to facilitate construction access. The road will ultimately be bitumen coated, but this may not be until later in the construction period to minimise damage to the surface during the works.

The culvert and swales will be installed as early as possible in the construction process to facilitate the appropriate management of surface water run-off. Measures to manage surface water detailed in Chapter 14, to minimise sedimentation issues in the Allt Poll a' Choire will be implemented.

It is recognised that access to the Arnish Industrial Estate is required at all times, hence works on and around the bell mouth will be phased such that access is always available.

2.7.1.2 Piling

Marine piling techniques will be utilised for the Main Quay combi-wall and finger pier, the Freight Ferry Berth combi-wall and linkspan dolphins. Although the pile sizes vary the approach will be the same in that piles will be vibrated into place as far as practicable. Only if the design depths are not achieved will percussion techniques be employed.

The combi-wall piles will be installed first as the make-up part of the perimeter of the land reclamation area and hence are required to retain the infill material. The combi-wall king piles are installed first potentially utilising a piling gate which is temporarily vibrated into place to guide a number of king piles into the correct place, with sheet piles then inserted between them. The gate is then moved on to the next section and the process repeated.

Once the combi walls are completed focus will then move to the linkspan dolphin and finger pier pilling.

As piles in the combi-wall are not to be driven to rock, there is a potential for settling, hence piles will be oversized, and settling monitored, only once settling has slowed significantly/stopped will the tops of the piles be cut down to size and the capping beam be cast (see Section 2.7.1.7).

The combi-walls are supported by anchor walls, which will also be piled into place, but these are likely to be installed once land reclamation has sufficiently progressed and hence land-based plant will be used. Tie rods connect the king piles to the anchor walls.

Similarly, the heavy load piles will be placed through infill material utilising land-based piling plant.

2.7.1.3 Soil Stripping and Rock Excavation

Soil and peat will be stripped from the road areas (see Section 2.7.1.1 and 2.7.1.6) and the area to be levelled, to rock level. The removed peat and soils will be relocated in accordance with the Peat Management Plan (see Chapter 14: Water Environment, Soils and Coastal Processes). The removal will utilise heavy plant, where practicable and there is possibility of reuse of turves, the top layer will be removed as turves ideally placed where needed directly or appropriately stored.

Blasting will be utilised to break up around 400,000m^3 of rock for excavation. In the first instance rock arising from blasting will be utilised to create the perimeter of the land reclamation area, to allow infilling works to progress. Rock won will also be utilised in the creation of the causeway to the Bollard Island and in the land reclamation sections of the Link Road. The blasting design will aim to break rock into appropriate size for the reuse purpose, but there may be a need for onsite rock crushing to create material suitable for use as surface finishing for the Link Road and Reclamation/Levelled Area.

Reinstatement of disturbed areas will be carried out in accordance with the peat management plan, utilising turves where practicable.

2.7.1.4 Dredging

The dredging may be carried out on a 24-hour basis, to minimise the duration of the dredge. As discussed in Section 2.6.7 it is anticipated that the majority of the material will be suitable for reuse as infill in the land reclamation. Any unsuitable material will be disposed of to the Stornoway Spoil Disposal Area (HE035).

Dredging will most likely utilise a trailer suction dredger, due to the large volumes of material to be moved and their ability to transit from the area being dredged to the land reclamation area, and pump out the material to infill the land reclamation area directly. Unsuitable material would be discharged via the bottom doors in the disposal ground.

Alternatively, a barge mounted backhoe dredger could be used to fill barges which would be unloaded into the infill area, but this may require a temporary berth, for unloading purposes.

Dredging operations near the main vessel transiting route (over the northern third of the dredge) will require to be carefully planned and strictly controlled, to ensure no interference with the ferries and other vessels using Stornoway Harbour. This is discussed further in Chapter 16: Other issues.

2.7.1.5 Land Reclamation

As discussed in Sections 2.7.1.2 to 2.7.1.4, a perimeter bund will be created around the Reclamation Area by the combi-walls and rock armoured bunds. Once suitably progressed dredging will commence, with the dredge arisings being placed within the perimeter to reclaim the land. A weir system maybe employed to facilitate the removal of water from the perimeter

as infilling progresses. Material won from rock blasting will also be utilised as infill and surfacing for the land reclamation.

Heavy compaction of infill material above +2.0m CD level, will be employed to minimise settling once completed.

The land to be reclaimed as part of the Bollard Island and the Link Road will be gained by placing rock directly into the sea. No dredge material will be utilised in the areas, to avoid sedimentation issues in the surrounding water. The rock will be appropriately graded and compacted to provide a suitable road and working platform surface.

2.7.1.6 Link Road

The link road will be formed in part by excavating parts of the coastline (see Section 2.7.1.3), and by land reclamation (Section 2.7.1.5). The four culverts will be installed along with the swale. The infill material will be heavily compacted to provide the high loading capacity required to support the required design loadings. The road will be surfaced with crushed rock, obtained locally from the excavated material. Drawings SDWP-WS2139-XX-01-DR-C-2121 to 2126 provide cross sections for every 20m of the Link Road, showing where the ground will be removed, and the areas to be infilled.

2.7.1.7 Concrete Works

As discussed in Section 2.7.1.2. once piles are deemed to be suitably settled the tops will be cut to provide a level surface to allow surfaces to be installed.

The Main Quay and Freight Ferry Quay will have reinforced concrete capping beams installed. This will require the steel reinforcements to be placed, shuttering formed and concrete to be poured. This will be partly above the water, as such care will be taken to ensure that the shuttering is appropriately sealed to prevent leaks to the marine environment.

The linkspan dolphin reinforced concrete pile caps will be formed in a similar way to the capping beams, with reinforcing steel and shuttering formed in situ prior to concrete being poured.

The deck slabs, heavy load pad and bollard blocks (including those of bollard island) will also be poured in-situ, with reinforcement placed as required and shuttering forming the pour areas.

The finger pier and service tunnels will utilise precast reinforced concrete sections wherever practicable to minimise the need for in-situ cement pours.

The linkspan abutment is constructed with concrete poured in-situ into formworks on the rocks above MLWS.

An anti-washout additive will be used for all concrete works above or close to water to prevent loss of cement to sea.

2.7.1.8 Fendering Systems, Furnishings and Services

The installation of fendering, furnishing and services will be completed once their associated elements are at an appropriate stage. Items to be installed include:

- Drainage systems;
- Floating fenders at combi-walls, and fender panels and support steelwork at finger pier;
- The linkspan;
- The pontoon;
- Access ladders;
- Sub-station and connection to the grid;
- Water and fuel tanks; and
- Services – water, fuel, electricity, lighting, ICT and all outlet cabinets.

The services will be tested and commissioned in line with good industry practice.

2.7.1.9 Wreck removal

The removal of the sections of the wreck will be undertaken by dive teams with cutting gear and a support vessel with sufficient cranage to move the sections to deeper water within the perimeter of the wreck. On completion of the removal operations, the area of the wreck will be bar swept to prove the required depth, free from obstruction has been achieved.

2.7.2 Operations

The DWP once operational will facilitate operations by a range of users as discussed in Section 2.2.1. Operations at the new Port will be administered, overseen and controlled from the Port Control Building on No.1 Pier in Stornoway Harbour. There will be an International Ship and Port Facility Security (ISPS) boundary created within the DWP which will be utilised for the management of cruise ship passengers. Operational activities will potentially include:

- Freight ferry movements and associated parking, and marshalling areas;
- Oil delivery vessel berthing and discharging gas oil to the onshore storage tanks;
- Bunkering of vessels;
- Storage and onward distribution of renewable energy sources e.g. hydrogen or ammonia;
- General cargo handling e.g. coal, salt, timber, bulk materials;
- Unloading of renewables components (turbine tower sections, nacelles, blades, transformers etc.) with some temporary laydown and storage;
- Loading large, renewable energy components or modules fabricated at Arnish fabrication yard via the Link Road on to barges or specialist heavy lift vessels;
- Unloading oil and gas modules or components for transfer via the Link Road to Arnish yard for decommissioning; and
- Berthing of visiting supply boats, anchor handling vessels, renewable energy service vessels or other large vessels with draft in excess of the capacity of the other facilities in Stornoway Harbour.

It is recognised that some of the activities listed above, will require additional consents and compliance with relevant legislation health, safety and environmental legislation. The design has taken account the potential future requirements where practicable and aimed not to preclude any activities by retaining some flexibility e.g. not surfacing and draining all of the Reclaimed/Levelled Area. The EIAR considers likely uses but where additional consents are

required, it is assumed that the relevant additional consenting process(es) will ensure that the appropriate measures will be put in place to minimise negative environmental impacts and minimise environmental along with health and safety risks.

2.7.3 Maintenance

Although maintenance dredging is not expected, other works relating to maintenance are required during operations.

2.7.3.1 Steel Piling

The steel in the combi-walls, finger pier and linkspan dolphins will all be protected from the seabed up to mid-tide level by cathodic protection anodes, which will require replacement every 25 years.

Above mid-tide level, where the cathodic protection is ineffective, steelwork will be painted with specialist marine paint coatings. With an expected design life to first maintenance of 10 years, it can be expected that remedial work to painted areas of piles above mid-tide level will be required every 10 to 15 years.

2.7.3.2 Fendering

The fendering on the Finger Pier is complex with large, fabricated and painted steel sections supporting the timber fender panels to the pier deck. Steel paintwork will require maintenance every 10 years. Damage to panels, rubber fender units or support steelwork structure by out-of-control berthing will be more complex and expensive than at the quay wall floating fenders. Locating chains might require replacing every 20 years, with fender units damaged by out-of-control berthing easily replaced with new units.

2.7.3.3 Linkspan

The linkspan bridge itself should require no maintenance for over 30 years. However, the lifting hydraulic cylinders, pumping and control equipment will require regular inspection, testing and certification. Spare cylinders will be provided as part of the design, to allow rapid repairs to any defects that might develop. The freight ferry berth and linkspan will also serve as an alternative berth for the passenger and car ferry, should the linkspan on No.3 Pier be out of operation.

2.7.4 Decommissioning

The island will continue to need port facilities; hence, it is not considered necessary to plan for demolition and reinstatement works or closure of the DWP once in place.

2.8 References

Canmore. (2020). Lewis, Arnish Point Lighthouse.

EnviroCentre. (2018). Stornoway Deep Water Port - Best Practicable Environmental Option Report

Stornoway Port Authority. (2020). Stornoway Harbour - History.

2.9 Glossary

Acronym	Definition
BPEO	Best Practicable Environmental Option
CCTV	Close Circuit Television
CD	Chart Datum
CnES	Comhairle nan Eilean Siar
Combi-Wall	Combination Wall
DWP	Deep Water Port
EIAR	Environmental Impact Assessment Report
GWDTE	Ground Water Dependant Terrestrial Ecosystem
HGV	Heavy Goods Vehicles
HRO	Harbour Revision Order
ICT	Information and Communication Technology
ISPS	International Ship and Port Facility Security
km	Kilometres
m	Metres
MHWS	Mean High Water Spring
MLWS	Mean Low Water Spring
PPiP	Planning Permission in Principle
Ro/Ro	Roll-on Roll-off
SPA	Stornoway Port Authority
SuDS	Sustainable Urban Drainage Systems

Chapter 3: Methodology

STORNOWAY PORT AUTHORITY

Contents

3 Methodology

3.1 Overview of Approach and Methodology

One of the main purposes of the Environmental Impact Assessment (EIA) process is to influence and improve design through iteration. Environmental impacts have been considered throughout the project, from the development option stage and through into the design stages of the project as discussed in Chapter 2. Where possible, environmental considerations have been incorporated into the design. The siting and design of the improvement works has been heavily influenced by aspects identified through the EIA process, including: stakeholder opinion, possible visual and noise impacts, and the seabed conditions in the area.

Environmental specialists have been involved throughout the design process and, where necessary, appropriate topic experts have been consulted to inform the design. The project design therefore has avoided and minimised impacts wherever possible and, as such, there are embedded 'primary mitigation measures' to avoid or reduce negative effects. These have been incorporated within the assessment of effects.

In addition, it is assumed that standard construction practices, such as those outlined in Guidance for Pollution Prevention documents (tertiary mitigation), have be applied in the assessment process and these are captured within the Schedule of Mitigation.

This section sets out the process undertaken in order to provide a methodical and robust assessment of environmental impacts, that is used across all chapters of the Environmental Impact Assessment Report and aligns to the legislative requirements.

3.2 Screening

A screening request was sent to Transport Scotland under Paragraph 4 of Part 1 of Schedule 3 of the Harbours Act 1964 (as amended) in December 2017. Transport Scotland, on behalf of the Scottish Ministers, deemed that the proposed development falls within paragraph 8(b) of Annex 1 to the Directive 2011/92/EU (as amended) and therefore EIA is required.

Given the size and scale of the proposed works, the development fell under paragraph 1(e), 10(g) and 10(m) of The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017. Thus, a screening request was not submitted to Marine Scotland and the Applicant made the decision to voluntarily bypass EIA Screening and instead move directly to EIA Scoping.

3.3 Scoping

A scoping opinion was sought for the original design of the development by EnviroCentre. A scoping opinion was received from Marine Scotland in March 2018. Although the scoping opinion is more than a year old, it is still deemed that the responses received are appropriate since the location, main elements of the development and main construction techniques have not changed significantly. Hence, the topics identified as requiring assessment remain largely the same. As such all topics which were originally scoped into the previous Environmental Impact Assessment Report (EIAR) were taken forward for reconsideration. Appendix C.1 details how each of the points raised during scoping have been considered within this EIAR and

directs the reader to the relevant sections of the EIAR, while Appendix C.2 provides the Scoping Opinion document.

Notwithstanding the fact that topics originally scoped in to the previous EIAR remain relevant, it was recognised that additional topics may need to be included. Hence a full review of topics was completed by the project team, to ensure that a comprehensive EIAR was produced. A formal request for scoping was not made as part of this process.

Benthic Ecology was previously was scoped in under water environment, whereby Scottish Ministers agreed impacts from increased contaminants could potentially cause significant effects. However, the impacts of dredging and disposal activities on benthic ecology were not considered. As a result of the revised development requiring an extensive area of the sea floor to be dredged, with other parts being reclaimed (see Chapter 2: Project Description), it was deemed appropriate to consider the effects of dredging and other construction activities on benthic ecology.

A desk-based baseline benthic assessment was completed (see Chapter 9: Benthic Ecology and Appendix I.1). The assessment identified the potential for Priority Marine Features, hence the need for a benthic survey was recognised, the format of which was discussed and agreed with Scottish Natural Heritage and a benthic ecology chapter was included within this EIAR (Chapter 9).

In addition, terrestrial ecology was originally scoped out on the basis of the Preliminary Ecological Assessment completed in May 2017, due to the age of the survey it was deemed prudent to carry out new surveys to update our understanding. A Biodiversity - Terrestrial chapter (Chapter 10) has been included, this includes the consideration of otters which were identified by Scottish Natural Heritage as requiring consideration through the 2018 scoping process.

Table 3.3.1 provides a summary of the topics considered within the EIAR. Items scoped out (grey) have not been assessed through the EIAR process, and those in orange have been subject to a full assessment. Those identified in green, have been considered, but do not have a full chapter.

Table 3.3.1: Topic's Considered within the EIAR

Topic	Construction and Site Preparation	Operation
Air Quality	Considered in Chapter 16: Other Issues	
Climate Change		
Cultural and Archaeology Heritage	Chapter 13	
Biodiversity - Ornithology	Considered in Chapter 10 Terrestrial Ecology	
Biodiversity – Marine Mammals	Chapter 7	
Biodiversity – Fish	Chapter 8	
Biodiversity - Benthic Ecology	Chapter 9	

Topic	Construction and Site Preparation	Operation
Biodiversity – Terrestrial	Chapter 10	
Landscape and Visual	Chapter 5	
Population, Socio-economics and Human Health	Considered in Chapter 16: Other Issues	
Noise and Vibration – In-Air	Chapter 12	
Noise – Under Water	Chapter 11	
Resource Usage and Waste	Considered in Chapter 16: Other Issues	
Traffic & Access	Chapter 15	
Navigation	Considered in Chapter 16: Other Issues	
Water Quality, Soil and Coastal Processes	Chapter 14	
Impacts from Major Accidents and Disasters		

Key

	Negligible Effect – Scoped Out
	Potential Effect – Included within another topic area.
	Potential Significant Effect – Scoped In

3.4 Baseline Assessments

Baseline assessments have been completed for each of the EIA topic areas that were required to be considered as part of this assessment. The following sources of information have been utilised in the compilation of baseline data:

- Desk based studies, making use of publicly available reports and scientific data;
- Stakeholder dialogue, to identify additional data sources and information; and
- Site surveys and monitoring, when and where appropriate.

Full details of the data sources utilised, and survey and monitoring methods employed for each topic, are provided within the topic-specific sections.

The baseline information obtained is utilised to create an understanding of the value of each environmental receptor, and its sensitivity to the potential impacts associated with the construction of the Deep Water Port (DWP). This is then utilised to assess the significance of the effect each activity during construction or operation of the DWP, is predicted to have.

3.5 Assessment Methodology

The assessment criteria being applied to this EIA are detailed within this section. For each of the environmental topics being assessed, the appropriate professional guidelines for EIA have been applied and followed when considered necessary, along with any other relevant guidance documents and best practice techniques. As a result, where the standard assessment criteria and terminology set out below are not followed for a specific environmental topic, the

preferred assessment criteria that has been applied and utilised will be identified within the relevant environmental chapter of the EIAR. Chapter 6: Biodiversity lays out the ecological impact assessment methodology utilised within the Chapters 7 to 10, which is adapted from the methodology detailed here.

The environmental assessment is conducted in two stages. The first stage characterises the nature of the impacts (positive or negative) and the second determines the level of significance of the effects. An effect results from the consequences of a change (or impact) acting on a resource / receptor. The precise nature of the effect will depend on the interaction between the degree of impact (e.g. extent, duration, magnitude, permanence etc.) and the sensitivity, value, or number of the resources / receptor in each case.

The assessment identifies the origins of the environmental impacts (both positive (beneficial) and negative (adverse)) from the project and predicts their effects on resources or receptors. A resource is any environmental component affected by an impact (e.g. items of environmental capital such as habitats, aquifers, landscape, views and community facilities). A receptor is any environmental or other defined feature (e.g. human beings) that is sensitive to, or has the potential to be, affected by an impact.

An assessment of the effect(s) on a particular resource or receptor, as a result of construction or operational activities, are made by suitably qualified and experienced practitioner(s). Where possible, quantitative analyses was undertaken to support the impact assessments. Where the subject did not lend itself to quantitative analysis, qualitative analysis based on the relevant literature and similar studies were utilised to provide a robust assessment. This was determined for each environmental topic, depending on the nature of the receptor.

Each potential impact was assessed in terms of its receptor's sensitivity or value (e.g. nature conservation value, landscape value or amenity value), followed by an assessment of the magnitude of the impact. Thus, a determination of whether or not significant effects result was made. For each significant effect identified, appropriate secondary mitigation measures are prescribed. The residual effects are determined for each significant effect; taking into account all proposed mitigation.

3.5.1 Sensitivity / Value of Resource / Receptors

Sensitivity values were assigned to individual resources or receptors, using a set of criteria and terminology defined within each technical chapter. This is often categorised in accordance with EIA guidance documents, as appropriate for each environmental topic.

Where categories were used to describe value or sensitivity of a resource or receptor, these are defined within the 'Assessment Methodology' section of the individual chapters. Typically, receptor sensitivity or value will be classed as negligible, low, medium or high.

3.5.2 Impact Severity

In considering the impact severity, a range of factors are taken into account as applicable to the subject matter. The factors utilised are based on the Institute of Ecology and Environmental Monitoring (IEEM) guidelines of ecological assessment (CIEEM, 2018) but are applicable to most topic areas. They include the:

- Positive or Negative;
- Extent: spatial or geographical area affected;

- Magnitude (Scale): size, amount, intensity, volume;
- Duration: typically - short, medium, long-term and permanent or temporary;
- Frequency and timing: how often and when (time of day or seasonality); and
- Reversibility: can the effect be reversed or is it irreversible.

Impacts can be positive or negative, and so it is clearly stated within the assessment whether impacts are positive or negative.

The magnitude of the impact takes into account the extent, scale, frequency and timing, as applicable for the subject area. The magnitude of impact terminology and criteria will be defined within each environmental chapter, but in most cases includes an overall magnitude term of negligible; minor, small or low; moderate or medium; and major, high or large. In some instances, a fifth category of very large is utilised to align with topic specific guidance.

The duration of the impact is also noted, as permanent or temporary. Temporary impacts can be further sub-divided if necessary, in accordance with the following definitions, although use of this terminology is highly dependent on other factors within the environmental topic being assessed (e.g. lifecycle of flora and fauna species):

- Short-term: less than 1 year in duration;
- Medium-term: between one to three years in duration; and
- Long-term: more than three years in duration.

Whether or not an impact is reversible is also noted.

The initial assessment of impacts takes account of primary and tertiary mitigation (see Section 3.5.5). Potential significant adverse effects are then reassessed to understand the residual effects taking account of all mitigation proposed.

3.5.3 Indirect and Cumulative Impacts, and Impact Interactions

As well as direct impacts (resulting from the project itself), impacts can also be indirect or cumulative. There can also be interactions between multiple impacts resulting from one or more projects. Where this terminology is used within any assessment, the definitions for these are outlined below (as taken from 'Guidelines for the assessment of indirect and cumulative impacts as well as impact interactions' (European Commission, 1990)):

- Indirect: impacts on the environment, which are not a direct result of the project, often produced away from or as a result of a complex pathway. Sometimes referred to as second or third level impacts, or secondary impacts;
- Cumulative: impacts that result from incremental changes caused by other past, present or reasonably foreseeable future actions together with the project; and
- Impact interactions - the interactions between impacts whether between the impacts of just one project or between the impacts of other projects in the area.

3.5.4 Determination of Significant Effects

For each impact identified, a determination of whether or not it will result in a significant effect was made, taking into account both the sensitivity / value of the resource / receptor, and the magnitude of impact. Table 3.5.1 provides an example of how these two elements can be combined to give an overall significance category. Topic specific variations to significance determination are provided in the topic chapters.

Table 3.5.1: Categorising Significance of Effects.

Magnitude of Impact	Sensitivity/Value of Receptor			
	High	Medium	Low	Negligible
Major/Large/High	Major	Moderate	Minor	Negligible
Moderate/Medium	Moderate	Moderate	Minor	Negligible
Minor/Small/Low	Minor	Minor	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Key

	Significant Effect
	Non-Significant Effect

The categories provide a threshold to determine whether or not significant effects may result from the proposed development. A typical categorisation is shown in Table 3.5.2. Effects can be both beneficial or adverse.

Table 3.5.2 Categorisation and Definition of Effects

Category	Definition
Negligible	No detectable change to the environment resulting in no significant effect.
Minor	A detectable, but non-material change to the environment resulting in no significant effect.
Moderate	A material, but non-fundamental change to the environment, resulting in a possible significant effect.
Major	A fundamental change to the environment, resulting in a significant effect.

For the purposes of this particular EIAR, a significant effect will be defined as moderate in level or higher (Table 3.5.1 and Table 3.5.2) and considered to be a 'likely significant effect' in terms of EIA. The duration and reversibility of the effect will also be noted as discussed in Section 3.5.2.

For adverse significant effects, secondary mitigation will be proposed where practicable in order to prevent, reduce, or offset the significant adverse effect. Effects determined as minor or lower will be considered to have no likely significant effect. Where an impact could be reduced by the application of recognised best practice, this will be identified irrespective of its significance. This will assist in reducing all effects, whether they are significant in EIA terms or not.

3.5.5 Approach to Mitigation

The Institute of Environmental Monitoring and Assessment (IEMA) define three categories of mitigation in their EIA guidance for Shaping Quality Development (IEMA, 2015). These categories are used throughout this EIAR and are outlined below:

- **Primary (Inherent) Mitigation**: Modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken.
    - E.g. Identifying a key habitat or archaeological feature that should remain unaffected by the development's layout and operation.
- **Secondary (Foreseeable) Mitigation:** Actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in the EIAR.
    - E.g. Adoption of a Marine Mammal Protection Plan to limit the effects of disturbance through piling noise.
- **Tertiary (Inexorable) Mitigation:** Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects.
    - E.g. Considerate contractors' practices that manage activities which have potential nuisance effects.

As per the above IEMA categories, all the primary and tertiary mitigation embedded in the design and proposed construction techniques are set out in the Project Description (Chapter 2), with topic specific elements discussed in the individual topic chapters. The primary and tertiary mitigation measures will be used when assessing the significance of effects, since both these forms of mitigation are certain to be delivered. Thus, any effects that might arise without the primary and tertiary mitigation, do not need to be identified as potential effects, as there is no potential for them to arise.

Secondary mitigation measures will be proposed where practicable for any potential significant adverse effects that are identified. Mitigation measures will then be developed, as required, taking into account current guidance, precedents from similar projects, effectiveness and feasibility of solutions, and incremental costs.

It may only be possible to reduce the severity of potential adverse effects through secondary mitigation, as some cannot be eliminated entirely. Residual effects are those that remain after mitigation has taken place, these are assessed in the same way as detailed in Section 3.5.4.

A Schedule of Mitigation and Construction Environmental Management Document (CEMD) will be produced in line with The Highland Council (The Highland Council, 2010) and IEMA's guide to Delivering Quality Development (IEMA, 2016). Despite the Stornoway DWP development not being situated within the Highland Council area, the Highland Council are the only statutory body whom have produced guidance for the production of a CEMD. Thus, it is considered that the use of their guidance in the production of a CEMD is appropriate. Although production of the CEMD will take place at a later date, it should be noted that it is a 'live' document and as such will be updated as required to take account of additional detail from the design and specific information once the Construction Contractor is appointed. Any material changes to the content will be discussed and agreed with Marine Scotland and the relevant statutory consultees prior to implementation. Stornoway Port Authority (SPA) will manage any potential operational impacts by updating their existing environmental management systems.

3.6 Consultation

As discussed in Chapter 4: Statutory Context and Policy, the project was required to carry out Pre-application Consultation, and a Pre-application Consultation Report has been produced for submission with the Marine Licence application. It should however be noted that in addition to the scoping mentioned in Section 3.3, there has been additional dialogue with the following Marine Scotland and Statutory Consultees. Details of which are provided in Appendix C.3.

3.7 Cumulative Effects

A review of planned developments has been carried out to identify which should be considered within the EIAR. A review of those that need to be taken account of has then been completed to understand which topic-specific chapters need to be considered.

3.7.1 Onshore Developments

The Comhairle Nan Eilean Siar (CnES) eplanning website (Comhairle Nan Eilean Siar, 2020) was searched on the 10th of February 2020 for developments entering the planning system in Stornoway. The records identified dated back to the 10th February 2018.

A total of 101 applications were made to Stornoway Local Council. Of which, 9 applications were made in the last 6 months and approved within ~2km of the proposed area for construction of the DWP. Three related to the extension of housing or public service buildings and three related to the change in use of existing buildings (i.e. café to office space). One application was made to re-roof a house, another for the installation of signage to a supermarket and another was made by Lews Castle to install 'Legacy Artwork'. None of these projects in planning are of a scale to have a significant environmental effect, nor are they likely to have cumulative effects with the harbour development. The applications made relating to extensions of housing and public servicing are all further from the proposed construction area of the DWP than current construction activities at Newton Marina (see section 3.7.2) and thus are not considered to be new receptors as a result of their construction.

An application for a residential development was submitted in August 2018 proposing the construction of a care home facility, housing care unit and semi-detached housing on Perceval Road, Stornoway, Isle of Lewis. The construction of roads, foot paths, car parking spaces, retaining wall, covered cycle storage was also required as well as landscaping, public open space and drainage. Construction of this development is in progress and is due to be completed before the start of the DWP works. Due to the distance between this proposal and the DWP proposal, it is unlikely any cumulative effects will be present.

SPA received planning consent in April 2020 (application ref. 20/00006) to construct a marine engineering workshop, including an external concrete yard area, ancillary office and welfare accommodation on Goat Island. The proposed area for the marine engineering workshop is Goat Island, which is on the opposite side of Stornoway Harbour from the proposed site for the DWP. As there is potential for these works to overlap with the construction of the DWP, there could be cumulative effects with respect to construction noise at overlapping noise sensitive receptors.

Scottish and Southern Electricity Networks (SSEN) and 4C Offshore are proposing to construct a High Voltage Direct Current (HVDC) connection between Stornoway, and the Scottish

mainland. The Western Isles Connection will be used to transmit electricity generated by renewable developments on the Western Isles to areas of demand. A HVDC Converter and associated Alternating Current (AC) substation will subsequently be required at Arnish Point, Stornoway. Due to the scale and close proximity of the two projects there is a potential for cumulative effects.

3.7.2 Offshore Developments

Current marine renewable energy projects, construction, cable and National Renewable Infrastructure Plan projects are listed on the Scottish Government website and associated maps, and were accessed on the 10th February 2020 (Marine Scotland, 2020a, 2020b, 2020c, 2020d). Each project type has been considered in turn to identify projects which could have in-combination or cumulative effects.

Although the majority of potential significant environmental effects of the Stornoway DWP are associated with the construction phase, projects with the potential to overlap with both the construction period and day-today operations of the DWP and give rise to cumulative effects are identified in Table 3.7.1.

It is unlikely that the construction works currently ongoing at Newton Marina could have cumulative effects with the DWP, as the works are almost complete and will be finalised by the time the start of construction of the DWP is scheduled. That being said, it is possible that there will be operational cumulative impacts relating to navigation. This has therefore been considered in Section 3.7.3.

Construction, Cable and National Renewable Infrastructure Plan projects on the North and West coasts of Scotland are considered in more detail in Table 3.7.1 to identify whether or not there is a possibility of cumulative effects. The Marine Scotland – Marine Projects web page was utilised to identify current projects across Scotland in their Pre-Application, Determination or Post Determination stages across Scotland (Marine Scotland, 2020a, 2020b, 2020c). Projects need to be within a reasonable proximity to have cumulative effects and thus, projects on the east coast of Scotland are unlikely to have cumulative effects with the Stornoway DWP development and were not considered further. The majority of the proposed offshore renewable energy projects are on the east coast of Scotland. Two offshore energy projects were identified and considered in Table 3.7.1, but due to their location, no cumulative effects are predicted.

Table 3.7.1: Marine Projects for Cumulative Consideration

Project type	Status	Proposal	Approx. distance from Stornoway	In/Out	Reason for inclusion/exclusion
Construction	Pre-Application	Sound of Mull Artificial Reef Trust (SMART) provision of an artificial reef by sinking a decommissioned Royal Navy Vessel.	~ 165km straight line ~ 180km by sea	OUT	Scoping was carried out in 2013, it is unclear the current status of this project. Unlikely that there would be cumulative effects with the Stornoway project.
Construction	Pre-Application	Millport Coastal Flood Protection Scheme	~ 285km straight line ~ 460km by sea	OUT	Significant distance to Stornoway with land in between, unlikely to have cumulative effects.
Construction	Pre-Application	Hunterston Marine Construction Yard	~ 285km straight line ~ 460km by sea	OUT	The screening opinion as of June 2017 was that an EIA was not required, as such it was not considered to have significant effects. Significant distance apart with land in between, unlikely to have cumulative effects.
Cable	Pre-Application	Havfrue Telecommunications Cable from Norway to United States	~ 140km to nearest point	OUT	Timeline isn't clear, but potential to overlap with Stornoway DWP, impacts associated with cable lays are very localised hence it is highly unlikely there will be any cumulative effects, between the projects.
Construction	Application & Determination	Uig Ferry Terminal Development Upgrades including dredging and piling works.	~ 65km straight line and by sea	IN	As the project has not yet started, there is the possibility that these projects may overlap in their construction programme. Cumulative effects are unlikely to be associated with dredge disposal due to the utilisation of differing disposal grounds. Cumulative effects were not identified with the construction of the Stornoway DWP in the Uig Ferry Terminal Development EIAR (AECOM, 2019a, 2019b).

Project type	Status	Proposal	Approx. distance from Stornoway	In/Out	Reason for inclusion/exclusion
Construction	Application & Determination	St. Ola Pier Redevelopment - Scrabster	~ 170km straight line ~ 190km by sea	OUT	Significant distance to Stornoway with land in between, unlikely to have cumulative effects.
Construction Project	Application & Determination	Scottish Woodlands – Installation of temporary floating pier (Loch Sunart)	~ 170km straight line ~ 220km by sea	OUT	The screening opinion was that an EIAR was not required for the project, as it was not considered to have significant effects. Significant distance apart with land in between, unlikely to have cumulative effects.
Construction Project	Application & Determination	North Ayrshire Council – Coastal Protection & Footpath, Fairlie	~ 285km straight line ~ 460km by sea	OUT	Very small project not requiring and EIAR, and hence due to the distance is unlikely to have cumulative effects.
Construction Project	Application & Determination	Scottish Canals Ardrishaig Pier Repair and Extension	~ 245km straight line ~ 465km by sea	OUT	Project was screened to not need an EIAR due to the scale and lack of potential for significant effects. Due to the considerable distance it is highly unlikely that there will be cumulative effects with this project.
Construction Project	Application & Determination	Helensburgh Waterfront Development	~ 250km straight line ~ 490km by sea	OUT	Project does not require an EIAR, the main effects are associated with non-native species without proper mitigation measures implemented. Due to the distance between the developments there will be no cumulative effects.
Construction Project	Application & Determination	Stornoway Port Authority – Newton Marina Includes dredging	~1km straight line ~ 1km by sea	IN	The development is within the immediate vicinity of the DWP and will be operational by the time construction works start and as such, cumulative effects need to be considered.

Project type	Status	Proposal	Approx. distance from Stornoway	In/Out	Reason for inclusion/exclusion
Cables	Application & Determination	SSE Western Isles Interconnector. HVDC cable between mainland Scotland and Arnish.	~ <1km straight line ~ <1km by sea	IN	This is part of the project taken into consideration in Section 3.7.1. An element of that project is that the cable will run close to the Stornoway dredge disposal site; therefore, cumulative effects need to be considered but will be considered as a single project.
Construction	Licence	Tarbert Ferry Terminal Development Upgrades including dredging, land reclamation and piling works.	~ 40km straight line ~ 60km by sea	OUT	The overlap in these projects was considered in the EIAR's for both Tarbert and Lochmaddy Ferry Terminal Upgrades and no significant cumulative effects were identified (Affric Limited, 2019a, 2019b). Thus, they are not considered.
Construction	Licence	Lochmaddy Ferry Terminal Development Upgrades including dredging, land reclamation and piling works.	~ 80km straight line ~ 90km by sea	OUT	The overlap in these projects was considered in the EIAR's for both Tarbert and Lochmaddy Ferry Terminal Upgrades and no significant cumulative effects were identified (Affric Limited, 2019a, 2019b). Thus, they are not considered.
Construction Project	Licence	Kilfinichen Pier Development – Construction of a timber pier on Mull	~ 205km straight line ~ 240km by sea	OUT	Small development, the main effects are associated with otter. Due to the distance between the developments being much further than otters ranges, there will be no cumulative effects.
Construction	Licence	Clyde Waterfront Renfrew Riverside Construction of a new opening bridge across the River Clyde	~ 285km straight line ~ 590km by sea	OUT	Significant distance to Stornoway with land in between, unlikely to have cumulative effects.

Project type	Status	Proposal	Approx. distance from Stornoway	In/Out	Reason for inclusion/exclusion
Wind	Post Determination	Dounreay Tri	~ 130km straight line ~ 140km by sea	OUT	Project is currently on-hold, it is unclear if and when construction will restart, there is also a significant distance from Stornoway which make cumulative effects unlikely.
Wave	Post Determination	Lewis Wave Power, 40MW Oyster Wave Array	~ 30km straight line ~70 km by sea	OUT	Located on the west coast of Lewis, hence the land between the two projects significantly reduces the chances for interactions. Lewis Wave Power was owned by Aquamarine Power ltd, who went into administration in 2015. Hence it is unlikely that the project will be built.

3.7.3 Topic Considerations

Each of the projects identified in Section 3.7.1 and 3.7.2 as having the potential for cumulative effects have been considered in more detail to identify the environmental topic areas for which there are potential cumulative effects (Table 3.7.2). Only where there is a potential cumulative effect have the projects been taken forward for consideration in the topic-specific chapter. Those effects being taken forward for cumulative assessment are shown in light blue in Table 3.7.2. Navigational issues associated with Newton Marina and in-air noise effects of the Marine Engineering Workshop will be considered in Chapters 16 and 12 respectively.

Table 3.7.2: Environmental Topic's with Potential Cumulative Effects

Topic	Stornoway Port Authority – Newton Marina	Uig Ferry Terminal Development	SSE Western Isles Interconnector, Arnish (Onshore and Offshore Elements)	Marine Engineering Workshop, Goat Island
Air Quality	Effects localised, no cumulative effects.		It is unlikely construction activities will take place at the same time as a renewed proposal is required for this project and is currently being undertaken. As such, any potential cumulative effects associated with track-out and earthworks are unlikely.	Effects localised, no cumulative effects.
Marine Mammals	Effects localised, no cumulative effects.	Qualifying features of the same designated sites will be affected. However, dredge disposal and piling operations and will be localised. Mitigation will be in place at both locations and therefore cumulative impacts are highly unlikely.	Associated with cable laying and dredge disposal. Unlikely that programmes will overlap when these activities are operational.	Works all on land and therefore no cumulative effects.
Benthic Ecology	Construction activities will not overlap and therefore cumulative effects are unlikely.	Effects localised, no cumulative effects.	Associated with cable laying and dredge/dredge disposal activity. Unlikely that programmes will overlap when these activities are operational.	Works all on land and therefore no cumulative effects.
Fish	Effects localised, no cumulative effects.	Qualifying features of the same designated sites will be affected. However, dredge disposal and piling	Associated with cable laying and dredge disposal. Unlikely that programmes will overlap	Works all on land and therefore no cumulative effects.

Topic	Stornoway Port Authority – Newton Marina	Uig Ferry Terminal Development	SSE Western Isles Interconnector, Arnish (Onshore and Offshore Elements)	Marine Engineering Workshop, Goat Island
		operations and will be localised. Mitigation will be in place at both locations and therefore cumulative impacts are highly unlikely.	when these activities are operational.	
Noise (in-air)	Effects localised, no cumulative effects.		It is unlikely construction activities will take place at the same time as a renewed proposal is required for this project, as such, it is unlikely there will be any cumulative impacts.	Potential cumulative construction noise effects.
Noise (under-water)	Construction activity programmes which would incur additive noise issues will not overlap.			Works all on land and therefore no cumulative effects.
Traffic, Access and Navigation	Navigational issues associated with marine vessel movements in the harbour to and from both the DWP and Marina.	Effects localised, no cumulative effects.	It is unlikely construction activities will take place at the same time as a renewed proposal is required for this project. As such associated with movement of HGV's and other plant during construction will not be cumulative.	Effects localised, no cumulative effects.
Water Quality	Construction works will not overlap and thus no water quality issues will be cumulative associated with construction. Minimal operational effects will occur and thus cumulative impacts are unlikely.	Different disposal sites will be used, no overlap and thus no cumulative impacts.,	Marine cable installation gives rise to localised water quality issues; thus, it is highly unlikely to have a cumulative effect.	The workshop will have a surface water discharge into Stornoway Harbour , however no significant effects are predicted and thus no cumulative impacts are expected.
Landscape, Seascape and Visual	The previous EIAR did not identify any cumulative impacts with Newton Marina and therefore they are	Effects localised, no cumulative impacts.	It is unlikely construction activities will take place at the same time as a renewed proposal is required for this project. Any potential cumulative impacts for this project	The previous EIAR did not identify any cumulative effects associated with this development, largely due to the construction of the

Topic	Stornoway Port Authority – Newton Marina	Uig Ferry Terminal Development	SSE Western Isles Interconnector, Arnish (Onshore and Offshore Elements)	Marine Engineering Workshop, Goat Island
	considered unlikely (EnviroCentre, 2018).		are therefore not considered for landscape and visual assessment in this EIAR.	DWP introducing predominant increases in development on the western side of the harbour (EnviroCentre, 2018).

Key

	No further assessment required.
	To be taken forward for cumulative assessment.

3.8 References

AECOM. (2019a). *Uig Harbour Redevelopment: Chapters 1-10*. Retrieved from http://marine.gov.scot/sites/default/files/uig_vol2_eia_report_chapters_1_to_10_redacted.pdf

AECOM. (2019b). *Uig Harbour Redevelopment: Chapters 11-15*. Retrieved from http://marine.gov.scot/sites/default/files/uig_vol2_eia_report_chapters_11_to_15_redacted.pdf

Affric Limited. (2019a). Lochmaddy Ferry Terminal Upgrade - Environmental Impact Assessment Report.

Affric Limited. (2019b). Tarbert Ferry Terminal Upgrade - Environmental Impact Assessment Report.

CIEEM. (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine.

Comhairle Nan Eilean Siar. (2020). On-line Planning. Retrieved from http://planning.cne-siar.gov.uk/PublicAccess/

EnviroCentre. (2018). *Stornoway Deep Water Port Volume 1: Environmental Impact Assessment Report* Retrieved from http://marine.gov.scot/sites/default/files/07017_07018_-_eia_volume_1-.pdf

European Commission. (1990). Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions.

IEMA. (2015). Shaping Quality Development

IEMA. (2016). Delivering Quality Development.

Marine Scotland. (2020a). Current Construction, Cable and National Renewable Infrastructure Plan Projects. Retrieved from https://www.gov.scot/Topics/marine/Licensing/marine/current-construction-projects

Marine Scotland. (2020b). Current Marine Renewable Energy Projects. Retrieved from https://www.gov.scot/Topics/marine/Licensing/marine/scoping

Marine Scotland. (2020c). Marine Scotland Information - Marine Projects. Retrieved from http://marine.gov.scot/marine-projects

Marine Scotland. (2020d). National Marine Plan Interactive. Retrieved from https://marinescotland.atkinsgeospatial.com/nmpi/

The Highland Council. (2010). Construction Environmental Management Process for Large Scale Projects.

3.9 Glossary

Acronym	Definition
AC	Alternating Current
CEMD	Construction Environmental Management Document
CIEEM	Chartered Institute of Ecology and Environmental Monitoring
CnES	Comhairle nan Eilean Siar
DWP	Deep Water Port
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
HVDC	High Voltage Direct Current
IEEM	Institute of Ecology and Environmental Monitoring
IEMA	Institute of Environmental Monitoring and Assessment
SPA	Stornoway Port Authority
SSEN	Scottish and Southern Electricity Networks

Chapter 4: Statutory Context & Policy

STORNOWAY PORT AUTHORITY

Contents

4 Statutory Context and Policy

This chapter provides a summary of the statutory requirements for the construction of the proposed development, the Stornoway Deep Water Port (DWP), as well as highlighting the policies that may apply to the determination of the Marine Licence and Harbour Revision Order Applications. In addition, statutory requirements specific to a given topic area are discussed in the relevant topic chapters.

4.1 Marine Licence

Under the Marine (Scotland) Act 2010 a number of activities listed in Part 4, Section 21 of the Act require a Marine Licence issued by the Marine Scotland Licensing Operations Team (MS-LOT). This includes any activity where the project intends to do any of the following below the Mean High-Water Spring (MHWS):

- Deposit or remove substances or objects in the sea either on or under the seabed;
- Construct/alter/improve any works in or over the sea or on or under the seabed;
- Remove substances or objects from the seabed; or
- Dredging activity.

The deep-water berth, ferry berth, pontoon, linkspan and parts of the link road and the reclamation sections of the laydown are seaward of the MHWS and hence will require a Marine Licence. In addition, there will be a requirement for dredging and deposition of material at sea, which also requires a Marine Licence. Hence two marine licence applications have been submitted.

4.2 Harbour Revision Order

The Stornoway Port Authority Harbour Revision Order (HRO) (Scottish Statutory Instrument no.76 2019) was made on the 28th February 2019 for the Deep-Water Berth based on the original plans. The current plans are outwith the scope of the current HRO. As such an application will be made to Transport Scotland in line with the Harbours Act 1964 (as amended) for a new HRO.

4.3 Environmental Impact Assessment

Given the size and scale of the proposed works, the development fell under paragraph 1(e), 10(g) and 10(m) of The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017. As discussed in Section 3.2 of Chapter 3, this was determined by the applicant and not by Marine Scotland via screening.

Transport Scotland required an Environmental Impact Assessment Report (EIAR) to support the previous HRO as a relevant project under The Harbours Act 1964 (as amended), hence this EIAR will be submitted in support of the new HRO application

4.4 Marine Pre-Application Consultation

The Marine Licensing (Pre-application Consultation (PAC)) (Scotland) Regulations 2013, prescribe the marine licensable activities that are subject to PAC and in combination with the Marine (Scotland) Act 2010, set out the nature of the pre-application process. The Stornoway DWP falls within regulation 4(d) as a construction activity within the marine area that exceeds

1000m^2 therefore requiring the project to go through the PAC process. Consultation has been carried out to meet the requirements of the Marine Licensing (PAC) (Scotland) Regulations 2013, details of which are provided in the Stornoway Deep Water Port – PAC Report (Barton Willmore, 2018).

As the current proposal is a revision to the applications for marine licence submitted in March 2019, discussions were held with Marine Scotland as to whether the pre-existing PAC event would need to be undertaken again. Marine Scotland reviewed the case file for the proposed DWP works and The Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013 (The Regulations). They noted that the statutory consultees and placed public notice remained in line with regulations 6(2) and 7(b) of The Regulations and that the event was held in line with regulation 7(2). The previously submitted marine licence applications, which are currently being revised due to changes to the proposed works, will result in the proposed works being smaller than the sum of the 4 phases originally presented in the PAC event.

Therefore, MS-LOT were satisfied that the PAC event previously conducted remained in line with The Regulations and confirmed that no further pre-application events were required for the proposed works.

4.5 Policy Context

4.5.1 National Marine Plan

As the project is partly below the MHWS and within 12 nautical miles (nm) of the Scottish Coastline it falls within the remit of the Marine (Scotland) Act 2010. The 2015 Scottish National Marine Plan (NMP) covering inshore waters is a requirement of the Act. The NMP lays out the Scottish Minister's policies for the sustainable development of Scotland's seas and provides General Planning Principles (GENs), most of which apply to the construction and operations of the Stornoway DWP. Many GENs are specific to environmental topics; these are identified in Table 4.5.1, along with the considerations made during design development in order to meet the requirements.

The NMP lays out sector specific objectives and policies, for shipping, ports, harbours and ferries, as well as encouraging developments to contribute to increased use of renewable energy sources. Table 4.5.2 details the objectives and relevant policies and how the Stornoway DWP contributes towards these.

Table 4.5.1: Applicable Scottish National Marine Plan GENs

General Planning Principles	Requirements	Stornoway Deep Water Port Considerations	Chapter
GEN 2: Economic benefits	Sustainable development and use which provides economic benefit to Scottish communities is encouraged when consistent with the objectives and policies of this Plan.	The Stornoway Deep Water Port facility will support the burgeoning local cruise tourism industry. The proposed development will also provide additional capacity for a freight ferry, adding resilience to the current ferry service and creating berthing space for cargo ships, reducing transport costs and supporting further growth. In addition, it will support industrial activities at the Arnish fabrication yard. Hence the project is essential to facilitating the economic benefit of the tourist and other industries.	2 & 16
GEN 3: Social benefits	Sustainable development and use which provides social benefits is encouraged when consistent with the objectives and policies of this Plan.	The construction of the Stornoway DWP is essential to providing deeper berths to maintain and grow the cruise ship market. Moreover, the town requires a berthing facility for vessels 200 – 300m long, hence the project is essential to ensuring new opportunities are presented through job creation and enhancing support to the renewable industry. Other considerations relevant to this policy are outlined in Chapter 16: Other Issues.	2
GEN 4: Co-existence	Proposals which enable coexistence with other development sectors and activities within the Scottish marine area are encouraged in planning and decision-making processes, when consistent with policies and objectives of the Plan.	The project construction methods have taken account of other possible developments occurring at the same time as the construction of the DWP. Mitigation measures to minimise the effects have been taken account of. Once operational the Stornoway DWP will co-exist with other users of Stornoway Harbour.	NA
GEN 5: Climate Change	Marine planners and decision makers must act in the way best calculated to mitigate, and adapt to, climate change.	Chapter 14: Water Environment, Soils and Coastal Processes considers the need for climate change adaptation in terms of flood risk.	14
GEN 6: Historic Environment	Development and use of the marine environment should protect and, where appropriate, enhance heritage assets in a manner proportionate to their significance.enco	An undesignated shipwreck over 100 years old the 'Alabama', protected under the UNESCO 2001 Convention on the Protection of the Underwater Cultural Heritage, has been identified as being affected by the proposed works. The	13

General Planning Principles	Requirements	Stornoway Deep Water Port Considerations	Chapter
		mitigation of impacts on this wreck are in Chapter 13: Cultural Heritage and Archaeology. The Construction Environmental Management Document (CEMD) will also include a protocol for archaeological discoveries in case anything is found during the works.	
GEN: 7 Landscape/seascape:	Marine planners and decision makers should ensure that development and use of the marine environment take seascape, landscape and visual impacts into account.	The Stornoway DWP is located outwith a National Scenic Area. However, a full assessment of landscape and visual impacts has been completed due to its construction adjacent to Stornoway Harbour and Town Centre. Full details of the landscape and visual assessment are in Chapter 5.	5
GEN 8: Coastal process and flooding:	Developments and activities in the marine environment should be resilient to coastal change and flooding, and not have unacceptable adverse impact on coastal processes or contribute to coastal flooding.	The design of the DWP took account of the coastal processes and wave climate in Glumaig Harbour. Additionally, the potential for flooding is detailed in Chapter 14: Water Environment, Soils and Coastal Processes.	14
GEN 9: Natural Heritage	Development and use of the marine environment must: (a) Comply with legal requirements for protected areas and protected species. (b) Not result in significant impact on the national status of Priority Marine Features. Protect and, where appropriate, enhance the health of the marine area.	Ecological features of interest have been considered within this EIAR. Legal requirements have been taken into consideration throughout. Mitigation measures are outlined in each of the Biodiversity Chapters 6-10. There are no significant residual impacts on any Priority Marine Features due to the proposed development.	6-10
GEN 10: Invasive Non-Native Species	Opportunities to reduce the introduction of invasive non-native species to a minimum or proactively improve the practice of existing activity should be taken when decisions are being made.	The possible sources of invasive non-native species associated with the project have been identified and appropriate mitigation proposed to minimise the chance of their introduction. Mitigation measures are identified in Chapter 14: Water Environment, Soils and Coastal Processes.	14
GEN 11: Marine Litter	Developers, users and those accessing the marine environment must take measures to address marine litter where appropriate. Reduction of litter must be taken into account by decision makers.	Potential sources of litter and measures to prevent it entering the marine environment have been identified in Chapter 14: Water Environment, Soils and Coastal Processes. The measures are included in the Schedule of Mitigation (Chapter 17).	14

General Planning Principles	Requirements	Stornoway Deep Water Port Considerations	Chapter
GEN 12: Water Quality and Resource	Developments and activities should not result in a deterioration of the quality of waters to which the Water Framework Directive, Marine Strategy Framework Directive or other related Directives apply.	A Water Framework Directive Assessment has been completed in Chapter 14: Water Environment, Soils and Coastal Processes., taking into account the findings of Ecology Chapters 7-9.	14
GEN 13 Noise:	Development and use in the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects.	Underwater noise emissions from piling have been modelled as discussed in Chapter 11, and potential impacts on marine mammals and fish assessed in topic specific chapters. Marine mammal mitigation has been identified in Chapter 7, the Schedule of Mitigation (Chapter 17).	7, 11 & 17
GEN 14: Air Quality	Development and use of the marine environment should not result in the deterioration of air quality and should not breach any statutory air quality limits.	No significant effects on air quality are predicted and as such air quality was scoped out of the EIAR as discussed in Chapter 3: Methodology.	3
GEN 15: Planning Alignment A	Marine and terrestrial plans should align to support marine and land-based components required by development and seek to facilitate appropriate access to the shore and sea.	The cumulative effects of the project and impacts on other plans have been considered throughout the EIAR as discussed in Chapter 3: Methodology.	3
GEN 17: Fairness	All marine interests will be treated with fairness and in a transparent manner when decisions are being made in the marine environment.	Stornoway Port Authority and their consultants have had open and honest dialogue with stakeholders in the development of the Marine Licence submission and will publish the submission to ensure transparency.	PAC Report
GEN 18: Engagement	Early and effective engagement should be undertaken with the general public and all interested stakeholders to facilitate planning and consenting processes.	Pre-Application Consultation has been completed and a report provided to support the Marine Licence application.	PAC Report
GEN 19: Sound Evidence	Decision making in the marine environment will be based on sound scientific and socio–economic evidence.	Information provided in this EIAR is based on current available scientific evidence, to inform the decision-making process.	All
GEN 21: Cumulative Impacts	Cumulative impacts affecting the ecosystem of the marine plan area should be addressed in decision making and plan implementation.	Cumulative impacts are considered as part of the assessment as detailed in Chapter 3 and the relevant topic-specific chapters.	3

Table 4.5.2: NMP Shipping, Ports, Harbours, Ferries and Contribution to Renewable Energy Objectives

Objective/Policy	Requirements	Stornoway Deep Water Port Considerations
Objective 1	Safeguarded access to ports and harbours and navigational safety.	The construction method developed ensures access to Stornoway Harbour so that services, such as the lifeline ferry service to Ullapool can continue to operate safely during the construction works and after completion of the project.
Objective 2	Sustainable growth and development of ports and harbours as a competitive sector, maximising their potential to facilitate cargo movement, passenger movement and support other sectors.	The Stornoway DWP facility will support the growing cruise tourism industry. The proposed development will also provide additional capacity for a freight ferry, adding resilience to the current ferry service and creating berthing space for cargo ships, reducing transport costs and supporting further growth. Hence the project is essential to facilitating the economic benefit of the tourist and other industries.
Objective 3	Safeguarded essential maritime transport links to island and remote mainland communities.	The freight ferry facility will help to safeguard the delivery of essential materials to the island.
Objective 4	Linking of ferry services with public transport routes and active travel routes to help encourage sustainable travel where possible.	The development will include shuttle buses for tourists to encourage sustainable travel from cruise ships. The passenger ferry will continue to berth in Stornoway.
Objective 5	Best available technology to mitigate and adapt to climate change, where possible, supporting efficiencies in fleet management and ensuring port infrastructure and shipping services are able to adapt to the consequences of climate change. Consideration of the provision of facilities for shoreside power in new developments to allow for this to be provided when markets require it, if it becomes cost effective to do so.	Cruise ship operators have confirmed that they will not require shore power. There is insufficient capacity on Lewis to do so in any case. Shore power will be made available for smaller vessels, e.g. well boats, supply boats, workboats etc.
TRANSPORT 3	Ferry routes and maritime transport to island and remote mainland areas provide essential connections and should be safeguarded from inappropriate marine development and use that would significantly interfere with their operation. Developments will not be consented where they will unacceptably interfere with lifeline ferry services.	The construction method described in Chapter 2: Project Description ensures that access to Stornoway Harbour is maintained and so that the lifeline ferry service to Ullapool can continue to operate safely during the construction works.
TRANSPORT 5	Port and harbour operators should take into account future climate change and extreme water level projections, and where	The design of the marshalling area took account of coastal processes and flooding. The level of the piers and reclamation was set taking account of

Objective/Policy	Requirements	Stornoway Deep Water Port Considerations
	appropriate take the necessary steps to ensure their ports and harbours remain viable and resilient to a changing climate. Climate and sea level projections should also be considered in the design of any new ports and harbours, or of improvements to existing facilities.	maximum predicted tide levels in 200-year events, and of anticipated sea level rise. Details are provided in Chapter 14: Water Environment, Soils and Coastal Processes.
TRANSPORT 7	Marine and terrestrial planning processes should co-ordinate to: Provide co-ordinated support to ports, harbours and ferry terminals to ensure they can respond to market influences and provide support to other sectors with necessary facilities and transport links. Consider spatial co-ordination of ferries and other modes of transport to promote integrated and sustainable travel options.	The limitation to the length of the cruise ships that are able to be berthed at the current facilities is one of the reasons for this development. By having a facility such as the DWP that can support a larger vessel, market influences and sector support will be achieved.
RENEWABLES 7	Marine planners and decision makers should ensure infrastructure is fit for purpose now and in future. Consideration should be given to the potential for climate change impacts on coasts vulnerable to erosion.	The construction design as described in Chapter 2: Project Description, is designed to also support the development of renewable energy should the opportunity be presented. The design of the laydown area takes account of coastal processes and flooding details of which are provided in Chapter 14: Water Environment, Soils and Coastal Processes.

4.5.2 Planning Policy

It is appropriate that the planning policy context is set out in relation to both marine and terrestrial landscapes, as the proposed development construction works are necessary both on land and in the marine environment.

The development plan system in Scotland which provides the framework for considering planning applications is made up of four main documents:

- The National Planning Framework (NPF);
- Scottish Planning Policy (SPP);
- Strategic Development Plans (SDPs) produced for the Scotland's four largest cities; and
- Local Development Plans (LDPs) produced for each council area.

The Scottish Government provides advice and technical planning information in the form of Planning Advice Notes (PANs), to support the implementation of the policy.

4.5.2.1 National

The NPF is a requirement of the Planning (Scotland) Act 2006 and sets out the strategy for long-term development within Scotland. The third NPF (NPF3), was published in 2014 and sets out the strategy for development for the next 20 to 30 years (Scottish Government, 2014). Within Section 5: 'A Connected Place', it states that:

> *'We will reduce the disadvantage of distance for our coastal and island communities'*

It is specifically recognised in Section 5.36 that:

> *'Air and ferry services will continue to play an essential role – as a lifeline service but also supporting economic activity and the delivery of public services.'*

As discussed in the Project Need Section of Chapter 2: Project Description, one of the drivers for the DWP is to accelerate local growth in the burgeoning cruise business by providing improved facilities for larger ships that cannot currently berth at facilities in Stornoway. The proposed development will also provide additional capacity for a freight ferry, adding resilience to the current ferry service and creating berthing space for cargo ships, reducing transport costs and supporting further growth. It would also have the potential to expand facilities to accommodate delivery of turbine components associated with consented and potential future renewable energy development on Lewis. As such the project directly aligns with this policy.

NPF3 does not identify any national developments in the Stornoway area.

All SPP was consolidated into one overall policy document in February 2010. The SPP is also subject to regular updates, and a revised version was published in 2014 (Scottish Goverment, 2014). With regard to 'A Connected Place', the SPP identified policy principles that the planning system should support patterns of development which:

- Optimise the use of existing infrastructure;
- Reduce the need to travel;
- Provide safe and convenient opportunities for walking and cycling for both active travel and recreation, and facilitate travel by public transport;

- Enable the integration of transport modes; and
- Facilitate freight movement by rail or water.

The proposed construction of the DWP will provide the capacity for freight ferries, and as such meets the requirements of the SPP by allowing the facilitation of freight movements by water.

Relevant PANs for the Stornoway DWP development which were used to support the EIA include:

- PAN 1/2011: Planning and Noise and associated Technical Advice Note Assessment of Noise (Scottish Government, 2011);
- PAN 60: Planning for Natural Heritage (Scottish Government, 2008);
- PAN 69 Flood Risk (Scottish Government, 2015);
- PAN 75: Planning for Transport (Scottish Government, 2005); and
- PAN 79: Water and Drainage (Scottish Government, 2006).

4.5.2.2 Regional

In addition to the development plan system in Scotland, the Highlands & Islands region has its own strategic development plan which supports the National Strategic Plan and the Scottish Government's Economic Action Plan. The Highlands & Islands Enterprise (HIE) 2019-2022 Strategy identifies how industries in the region will contribute significantly to Scotland's economic development through opportunities presented by the unique natural capital of the region, which can sustainably deliver significant economic and social impacts. These contributions are anticipated by creating and maintaining valuable economic opportunities to industries such as the energy sector, tourism and wider marine economy (Highlands and Islands Enterprise, 2019).

As discussed in the Project Need Section of Chapter 2: Project Description and in Section 4.5.2.1 of this chapter, the proposed development will provide additional capacity for numerous industries. As such, the project directly aligns with the Energy, Tourism and Marine Economy strategies highlighted in the HIE 2019-2022 Strategy.

4.5.2.3 Local

Stornoway falls within the area of the Outer Hebrides Local Development Plan (LDP) (Comhairle nan Eilean Siar, 2018). The latest plan was adopted in 2018. The plan lays out visions and objectives for the Outer Hebrides and then goes on to detail policies, including those which planning applications would be assessed against. The proposed development has been aligned with the LDP where appropriate to ensure that it meets the objectives laid out for the Outer Hebrides. Table 4.5.3 details how this has been achieved.

The development is identified as taking place within the Stornoway Harbour limits and is therefore subject to alignment with Policy STY3: Development of Stornoway Port Area of the LDP. As the development of the DWP is proposed by the Stornoway Port Authority (SPA), the development will therefore take account of Policy STY3 automatically.

Table 4.5.3: Applicable Outer Hebrides Local Development Plan Policies

Policy No.	Policy	Stornoway Deep Water Port Considerations
PD1: Placemaking and Design	**Development proposals for new buildings will be permitted where they satisfy the following criteria:**	
	a) SITING – should relate to the townscape and streetscape or the settlement pattern and landform, and avoid dominating the sky line. The orientation of the development while respecting the foregoing should also relate to the characteristics of the surrounding area.	Harbour development in a coastal area, adjacent to the existing Arnish Fabrication Yard and associated quay.
	b) DESIGN – the development should be designed for the site ensuring design, scale, form and mass respects the surrounding built and natural environment. The mass of larger buildings should generally be managed by either breaking up the design elements or by use of appropriate materials. The proportions, detailing, materials and colours, should be neutral or make a positive contribution to the character of the surrounding area. For infill development, in streetscapes, details of the height of neighbouring buildings will usually be required to be shown on the proposal drawings.	Full design information has been provided in Chapter 2: Project Description and Appendix B.1. The construction design takes into account the requirements stated. Buildings such as the inclusion of a port operative welfare facility are automatically permitted under the HRO as a permitted development and is therefore not subject to planning consents.
	d) TOPOGRAPHY – on sloping ground the design of development, should generally incorporate the slope, and visible under-build should be minimised. Surplus materials from excavations should be re-graded, landscaped and utilised to backfill against areas of underbuilding and to create landform of natural appearance. The creation of artificial platforms and un-natural gradients should be avoided.	Full design information has been provided in Chapter 2: Project Description. The construction design takes into account the requirements stated. The material excavated is being utilised within the land reclamation.
	e) NEIGHBOUR AMENITY – siting, design, landscaping and boundary treatments should ensure reasonable neighbour amenity is retained. Development will not be supported where it will result in a significant detrimental impact on the amenity of neighbouring properties.	The nearest neighbouring amenity is the Arnish Fabrication Yard. The proposed development will enhance the capabilities of this facility and as such, will not have a detrimental impact.

Policy No.	Policy	Stornoway Deep Water Port Considerations
PD2: Car Parking and Roads Layout	**Road design and car parking should be suited to the type, location, scale and circumstances of the development. Subsequent development will be assessed cumulatively.**	
	Car Parking and Cycle Storage - New Development will be assessed against all of the following:	The design will incorporate the standards that are required to be met as part of the LDP. Parking and turning areas for coaches utilised for cruise passengers will be provided as part of the development. Parking for port and ferry operational staff, and for HGVs using the freight ferry will also be provided.
	a) The Car Parking Standards in Tables 1-3 (Appendix 3), subject to provisions of this policy, and redevelopment or extension or change of use which would qualify for application of the Car Parking Standards;	
	b) Car parking spaces should be a minimum of 2.5m x 5m. Specific standards for accessible parking are included at Table 4 and Fig 1 (Appendix 3);	
	c) Cycle storage will be required for new public buildings, community facilities, schools, major business premises and flatted dwellings.	
	d) Where car parking requirements cannot be met, the applicant will be required to justify the proposed provision and non-conformity with the Standard.	
	Roads Layout - All new vehicular accesses must meet the following criteria:	
	a) The access road must enter the main road at right angles. The gradient of the access should not be greater than 1 in 10 for the first 10m;	Access road entrance angles will be as close to 90 degrees as possible as a result of restricted site topography. The steepest gradient of this road will be 8% at 1 in 12.5.
	b) If a gate is to be installed, it should be located at a minimum distance of 7.5m from the main road as per Fig 4 Appendix 3;	If a gate is to be installed, it will be done so in line with PD2.
	c) Where a development accesses onto an adopted or surfaced unadopted road the first three meters on an access will be surfaced with bitumen or concrete. If the development accesses an unsurfaced unadopted road there will be no requirement to surface an access or surface the road;	All new road surfacing, including at accesses, will be bituminous surfaced.
	d) Vehicles should be visible at a minimum distance of 90m from a point on the access road, 5m back from the main road. Relaxation on visibility splays may be acceptable depending on the road status and site location. Visibility should be taken at a height of 1m;	The access road is appropriately designed to facilitate access and exit in a forward gear, as discussed in Chapter

Policy No.	Policy	Stornoway Deep Water Port Considerations
	e) Where a new vehicular access is provided, it should be possible to enter and exit the access in a forward gear. Off road turning should be provided commensurate with the parking requirements for the development; and	15. The installation of the access road will connect the DWP to the Arnish Road and the A859 during both construction and operational phases. A link road will connect the DWP to Arnish Fabrication Yard for the purpose of transporting components. The link road will be constructed so as to allow for large components to be transported between the Arnish fabrication yard and the DWP.
PD6: Compatibility of Neighbouring Uses	All development proposals shall ensure that there is no unacceptable adverse impact on the amenity of neighbouring uses. Where appropriate proposals should include mitigation measures to reduce the impact on the amenity of neighbouring uses.	Neighbouring amenities have been considered as receptor groups throughout the design and EIA process and appropriate mitigation identified to minimise effects. The previous EIA concluded that there were no adverse impacts on neighbouring uses during the operational phase of the project.
EL 1: Flooding	**Flood Risk Assessments**	
	Information which demonstrates compliance with Scottish Planning Policy (SPP) will be required for development proposals within or closely bordering a medium to high risk flood area (1:200 year extents (0.5% Annual Probability), or greater), as identified by the flood risk management dataset issued by SEPA.	Flood events and probabilities have been considered in Chapter 14: Water Environment, Soils and Coastal Processes.
	Where it can be demonstrated that the location is essential for operational reasons e.g., harbours, piers, offshore energy and fisheries related activities, development proposals will be allowed in flood risk areas subject to sustainable flood management measures being incorporated at design stage that mitigate against flood risk.	The development relates to the construction of a DWP and as such has to be located in a coastal area.
	Allowances for Climate Change.	Design has included consideration of climate change effects in relation to extreme water level, flooding and storm

Policy No.	Policy	Stornoway Deep Water Port Considerations
		events to generate a robust design as detailed in Chapter 14: Water Environment, Soils and Coastal Processes.
	The following allowances, or subsequent revised allowances, for climate change should be used when calculating estimated design flood levels: Fluvial: at least 20% should be added to the estimated design flood peak; Coastal: The following UK Climate Change Projections (UKCP09) sea level rise projections should be used to derive an allowance above the extreme still water design flood level: • Lewis and Harris (including Tarbert) - 0.55m • North Uist and Berneray - 0.53m • Benbecula, South Uist and Barra - 0.52m	This has been taken account of in the flood considerations detailed in Chapter 14: Water Environment, Soils and Coastal Processes
	New developments will be required to adopt the principles of Sustainable Drainage Systems (SuDS). The Comhairle will support retrofitting of SuDS and the controlling of surface water through the use of permeable surfaces and green roofs.	Attenuation is not considered a requirement across the whole development, given the coastal setting and nature of works, however appropriate surface water treatment has been incorporated into the drainage design.
EI3: Water Environment	Development proposals should avoid adverse impact on the water environment. All proposals involving activities in or adjacent to any water body must be accompanied by sufficient information to enable a full assessment to be made of the likely effects, including environmental effects, of the development.	Construction water management and operational drainage design, has taken account of the sensitive location in relation to the watercourses and the marine environment, to avoid adverse impacts.

Policy No.	Policy	Stornoway Deep Water Port Considerations
	Where a site contains or is adjacent to a watercourse or the sea then all the following must be demonstrated: a) the site layout avoids development within the water environment unless the location is essential for operational reasons, e.g. for navigation and water-based uses. A minimum buffer strip of 6m should be incorporated between the water body and the proposed development, to enable access and maintenance all year round. Engineering activities such as culverts, bridges, watercourse diversions, bank modifications or dams should be avoided unless there is no practicable alternative;	Further information is provided in Chapter 2: Project Description and Chapter 14: Water Environment, Soils and Coastal Processes. Due to the development type it has to be in the water environment. The effects of the development are considered in the Biodiversity Chapters 6 – 10 and Chapter 14: Water Quality and Coastal Processes.
EI4: Waste Management	Space to accommodate the provision of recycling facilities must be designed and built into all new industrial, commercial, retail and residential development proposals both during the construction phase as well as the completed development.	There is sufficient space to accommodate waste recycling.
	Preparation of a Site Waste Management Plan will be required to accompany proposals for Major developments and developments involving significant demolition works. For all other developments, waste will be managed in accordance with the Waste Hierarchy. Details of how waste is to be managed should be provided as part of the sustainability label required through Policy PD4 Zero and Low Carbon Buildings.	The preparation of a Site Waste Management Plan (SWMP) will be considered as part of the Construction Environment Management Document (CEMD) when taking into account materials and waste (Chapter 16: Other Issues).
EI5: Soils	**Development should be designed to minimise adverse impacts on soils caused by ground disturbance, compaction or excavation. Developers should assess the likely effects associated with any development work on soils, particularly machair soil, peat, or other carbon-rich soils and associated vegetation, and aim to mitigate any adverse impacts arising.**	
	Where disturbance of peat or other carbon-rich soil is likely to give rise to significant emissions of carbon dioxide, developers may be required to justify the location of the proposed development and to show how emissions will be minimised.	This has been taken account of in Chapter 14: Water Environment, Soils and Coastal Processes, and discussed in the Peat Management Plan (PMP). A Planning Permission in Principle (PPP) has been issued by CnES to allow for the re-use of excavated peat. Peat surveys have been conducted and deepest
	Large scale commercial peat extraction will not be permitted. Other commercial peat extraction will only be permitted in areas suffering historic, significant damage through human activity and where the conservation value is low and restoration is impossible.	
	For Major developments, minerals and some large scale renewable energy proposals (see Supplementary Guidance for Wind Energy Development), development will only be permitted	

Policy No.	Policy	Stornoway Deep Water Port Considerations
	where it has been demonstrated that unnecessary disturbance of carbon rich soils such as peat and any associated vegetation is avoided. A peat survey must be submitted which demonstrates that areas of deepest peat have been avoided and the impacts on carbon-rich soils and associated habitats minimised. Where required, a peat management plan must also be submitted along with any planning application which demonstrates best practice in the movement, storage, management and reinstatement of soils.	areas identified. This is discussed in the PMP.
EI9: Transport Infrastructure	**The priority areas for the upgrading and development of the transport infrastructure within, and serving the Outer Hebrides, are:**	
	c) ports and harbours, including ferry facilities for mainland and inter island connections.	The development incorporates a freight ferry berth.
NBH1: Landscape	**Development proposals should relate to the specific landscape and visual characteristics of the local area, ensuring that the overall integrity of landscape character is maintained.**	
	The Western Isles Landscape Character Assessment (WI-LCA) will be taken into account in determining applications and developers should refer to Appendix 1 of this Plan for a summary of this guidance. Development proposals should not have an unacceptable significant landscape or visual impact. If it is assessed that there will be a significant landscape or visual impact the applicant will be required to provide mitigation measures demonstrating how a satisfactory landscape and visual fit can be achieved.	Chapter 5: Landscape and Visual Considerations, considers the effects of the project on the local landscape. Very localised significant impacts are predicted (within 1.8km).
	National Scenic Areas	
	Development that affects a National Scenic Area (NSA) will only be permitted where: a) the objectives of designation and the overall integrity of the area will not be compromised; or	The DWP is outwith any National Scenic Areas, however, Chapter) 5: Landscape and Visual Considerations, considers the effects of the project on the local landscape. Very localised significant impacts are predicted.
	Wild Land	
	Development proposals should be able to demonstrate no unacceptable adverse impact on the character of areas of Wild Land, as identified on the 2014 SNH Maps, and that any significant effects on these qualities can be substantially overcome by siting, design or other mitigation.	The development is set in an area on moderate-low perceived naturalness on the basis of the SNH Maps. A full assessment in taken into consideration

Policy No.	Policy	Stornoway Deep Water Port Considerations
		in Chapter 5: Landscape and Visual Impact Assessment.
NBH3: Trees and Woodland	**There is a strong presumption against the removal of established individual trees and woodland of mixed native species which have a landscape and amenity value and/or contribute to nature conservation, unless removal would achieve significant additional economic, environmental or social benefits.**	
	In order to minimise any adverse impacts on amenity, biodiversity or landscape value, developers will be required to incorporate existing trees and woodland into developments through sensitive siting and design. Where loss is unavoidable, appropriate replacement planting should be sought through the use of planning conditions or through a legal agreement if appropriate.	The construction of the access road may require juvenile trees to be removed. Should this occur, replanting of juvenile trees will be performed in order to mitigate the potential effect of tree loss.

4.6 References

Barton Willmore. (2018). Stornoway Deep Water Port - Pre-Application Consultation Report.

Comhairle nan Eilean Siar. (2018). Outer Hebrides Local Development Plan 2018.

Highlands and Islands Enterprise. (2019). *Highlands and Islands Enterprise 2019-2022 Strategy*. Retrieved from https://www.hie.co.uk/media/5006/strategyplusplanplus2019-2022-1.pdf

Scottish Goverment. (2014). Scottish Planning Policy. In (pp. 81). Edinburgh Scottish Government

Scottish Government. (2005). *PAN 75: Planning for Transport*. Retrieved from http://www.gov.scot/Publications/2005/08/16154453/44538.

Scottish Government. (2006). *PAN 79: Water and Drainage*. Retrieved from http://www.gov.scot/Publications/2006/09/26152857/0.

Scottish Government. (2008). *PAN 60: Planning for Natural Heritage*. Retrieved from http://www.gov.scot/Publications/2000/08/pan60-root/pan60.

Scottish Government. (2011). *PAN 1/2011 Planning and Noise*. Retrieved from http://www.scotland.gov.uk/topics/built-environment.

Scottish Government. (2014). *Ambition Opportunity, Place: Scotland's Third National Planning Framework*. Retrieved from https://www.gov.scot/publications/national-planning-framework-3/.

Scottish Government. (2015). PAN 69: Flood Risk.

4.7 Glossary

Acronym	Definition
DWP	Deep Water Port
EIAR	Environmental Impact Assessment Report
GEN	General Planning Policy
HRO	Harbour Revision Order
LDP	Local Development Plan
MS-LOT	Marine Scotland Licensing Operations Team
NMP	Scottish National Marine Plan
NPF	National Planning Framework
PAC	Pre-Application Consultation
PAN 75	Planning Advice Note: Transport
PAN 79	Planning Advice Note: Water and Drainage
PAN 60	Planning Advice Note: Natural Heritage
PAN 1/2011	Planning Advice Note: Noise
PAN 69	Planning Advice Note: Flood Risk
SDP	Scottish Development Plan
SPP	Scottish Planning Policy

Chapter 5: Landscape and Visual Impact Assessment (LVIA)

STORNOWAY PORT AUTHORITY

Contents

5 Landscape and Visual Impact Assessment

5.1 Introduction

This Environmental Impact Assessment Report (EIAR) chapter sets out a Landscape and Visual Impact Assessment (LVIA) of the Stornoway Deep Water Port (DWP) project ['the proposed development']. The LVIA has been undertaken by Douglas Harman Landscape Planning (DHLP). Douglas Harman is a sole practitioner and Chartered Member of the Landscape Institute (CMLI).

Foremost, the LVIA considers any likely significant effects predicted during the construction and operational phases of the proposed development, as described in detail within Chapter 2: Project Description, on the landscape and visual resources of the site and surrounding study area. Where any adverse effects are identified, appropriate mitigation measures are considered, and where practicable, embedded within the design of the proposed development.

It should be noted that the majority of the assessment was completed in 2018. However, upon subsequent changes to the project and a revised design, further desk and field surveys required to inform this EIAR.

As an overview, the objectives of this chapter are to:

- provide a summary description of the scoping and consultation responses relating to landscape and visual issues;
- describe the assessment methodology and significance criteria used to inform the assessment process;
- identify the main landscape related policy, legislation and guidance;
- identify and assess the landscape, coastal and visual baseline conditions;
- identify and evaluate the potential landscape, coastal and visual effects, including direct, indirect and cumulative, based on the worst-case parameters as currently known;
- identify broad design principles for subsequent project development and other mitigation measures that may be appropriate to address likely residual significant effects; and
- evaluate any residual effects remaining, following the implementation of any further mitigation measures suggested.

This LVIA has been informed by a desk-based analysis of existing data and other information gathered through a comprehensive field survey. Based on a 5 km study area, the assessment identifies the baseline information against the potential effects of the proposed development and are assessed, and concentrates on predicting the likely significant effects during the operational phase.

Although inter-related, landscape effects are assessed separately to the effects on views and visual amenity. Landscape effects consider the fabric, character and quality of the site and surrounding landscape and are concerned with:

- landscape elements (e.g. hedgerows, trees and woodlands);

- landscape character (local and regional distinctiveness); and
- special interests (e.g. designations, conservation areas and cultural associations).

As part of the landscape assessment, a focused coastal assessment is also provided. Coastal character is made up of the often narrow margin of the coastal edge, its immediate hinterland, and the sea. These three key components of coastal character include what is commonly known as 'seascape'.

Visual effects are primarily concerned with the changes in people's views through intrusion or obstruction and whether important opportunities to enjoy views may be improved or reduced.

To inform the assessment, the following figures (see Volume 4 of this EIAR) are referenced throughout this chapter:

- Figure 5.1: Landscape Character;
- Figure 5.2: Coastal Character;
- Figure 5.3: Designations and Recreational Routes;
- Figure 5.4: Zone of Theoretical Visibility;
- Figure 5.5: Viewpoints with Zone of Theoretical Visibility;
- Figure 5.6: Landscape Character with Zone of Theoretical Visibility;
- Figure 5.7: Coastal Character with Zone of Theoretical Visibility;
- Figure 5.8: Designations and Recreational Routes with Zone of Theoretical Visibility; and
- Figures 5.9 – 5.19: Viewpoint Photomontages.

5.2 Scoping and Consultation

The Scoping Report (2017) identified the need for an assessment of landscape and visual effects as part of an EIAR to accompany the planning application. Responses to the Scoping Report and other consultations undertaken as part of this process are summarised in Table 5.2.1. All comments referring to the proposed viewpoint selection have also been taken into account when identifying the final viewpoint locations (see Table 5.13).

Table 5.2.1 Summary of Consultation Reponses

Organisation	Consultation Response	How and where addressed
SNH	Within the formal Scoping Response, SNH stated that: *"In our view the proposed development does not raise any concerns with regard to landscape impacts of national importance. In addition, the report correctly identifies there are no landscape designations on site (or likely to be affected to be affected by the development). The report recommends that a LVIA is undertaken as part of an EIA. We welcome that commitment as a matter of best practice for a development of this nature however we have no comment to make on it focus. The methodology proposed looks to be appropriate."*	No specific action required although in suggesting viewpoint locations, further subsequent consultation with SNH was undertaken (see below).

Organisation	Consultation Response	How and where addressed
	In addition to consultation on the Scoping Report, SNH were consulted via email on 9th March 2018 regarding the suitability of seven proposed viewpoint locations. In response, SNH note that CnES are best placed to advise on the suitability of viewpoint locations and on considering CnES's response (see below), SNH have nothing further to add.	All further viewpoint consultation was undertaken with CnES (see next table row).
CnES	CnES stated within the formal Scoping Response that: a. "It is agreed that a Landscape and Visual Impact Assessment based on the site and immediate surroundings should be scoped into the EIA, using the methodology and guidance identified. b. The proposal site is not within any areas designated for its landscape value. Although the development is likely to have a degree of adverse landscape and visual impact during its construction, the construction impacts are accepted as transitionary and the EIA focus should be to ensure that through careful design of the various elements that there will be no significant long-term landscape or visual impacts. c. It is recommended that in addition to the 'key views and visual receptors' identified in the scoping report that fuller consideration is given to the importance of the approach to Stornoway Harbour. It is a key gateway to the islands, where a significant number of residents and visitors arrive by ferry. The Deep-Water Port at Arnish will form a major component of their 'first impression' of Stornoway, the Isle of Lewis and the wider Outer Hebrides. It is recommended that consideration is given to the views from the ferry on approach and from the ferry terminal as a viewpoint. d. A ZTV will identify key viewpoints in the wider landscape. It is suggested that a small number of viewpoints are identified within the Stornoway Conservation Area and in particular the Castle Grounds."	a. In undertaking an assessment of the landscape surrounding the site, a study area of 5 km has been selected to ensure that all characteristics associated with the site's surroundings have been adequately considered. b. Although effects during the construction phase are identified (see Section 5.6.6), in order to minimise any long-term adverse effects, the assessment focuses on the landscape and visual effects during the operational phase (see Section 5.6.7) and the associated iterative design process (see Section 5.6,2). c. As part of the detailed assessment, boat work was undertaken to identify a viewpoint from the route of the ferry that represent the worst-case views of visitors to the harbour. From the harbour side, a viewpoint is also located on South Beach and further one at the ferry terminal. d. Prior to the field assessment, a ZTV analysis was undertaken (see Figure 5.4 within Volume 4 of this EIAR) to aid the identification of the viewpoints. Within the Stornoway Conservation Area, three viewpoints have been selected, including two from within the grounds of Lews Castle Garden and Designed Landscape.
	In addition to consultation on the Scoping Report, CnES were consulted via email on 9th	On undertaking further field survey, it was agreed with CnES (via

Organisation	Consultation Response	How and where addressed
	March 2018 regarding the suitability of seven proposed viewpoint locations. In response, CnES suggested that proposed viewpoints 1-5 (see Table 5.8) were suitable locations to include within the assessment. The location of viewpoint 6 (Newmarket) should be reconsidered and given the screening of intervening buildings, a suggested viewpoint on Lewis Street did not merit inclusion. Other viewpoints that CnES suggested to be considered were: • frontage of Lews Castle; • Lady Matheson's Monument; • Goathill road; • Pier No.1; • Iolaire Monument/car park; • ferry terminal roundabout; • Newton road parking bays; • ferry terminal car park; • Sandwick Cemetery; and • Lewis War Memorial.	email on the 1st May 2018) that the following viewpoints should be included in the assessment: • frontage of Lews Castle; • Ferry terminal; • Lewis War Memorial; • Iolaire Monument car park; and • Sandwick bay.

5.3 Policy, Legislation and Guidance

5.3.1 Landscape Policy Context

As detailed in the Planning Statement of the EIAR, the development plan relevant to this application consists of *The Adopted Outer Hebrides Local Development Plan 2018* ('LDP2'). Key objectives of the Plan are to facilitate:

- *a good place to live in and move to;*
- *a successful place for working in; and*
- *an attractive place enjoyed by residents and visitors.*

In taking forward these objectives, the Plan includes the following landscape-related policies to be considered as context to this LVIA:

<u>*Policy PD1: Placemaking and Design*</u>

"Development proposals must demonstrate a satisfactory quality of place-making, siting, scale and design that respect and reflect positive local characteristics and will complement or enhance the surrounding built and natural environment, while taking account of the guidance contained within the Outer Hebrides Design Guide."

<u>*Policy NBH1: Landscape*</u>

"Development proposals should relate to the specific landscape and visual characteristics of the local area, ensuring that the overall integrity of landscape character is maintained.

The Western Isles Landscape Character Assessment (WI-LCA) will be taken into account in determining applications and developers should refer to Appendix 1 of this Plan for a summary of this guidance.

Development proposals should not have an unacceptable significant landscape or visual impact. If it is assessed that there will be a significant landscape or visual impact, the applicant will be required to provide mitigation measures demonstrating how a satisfactory landscape and visual fit can be achieved."

Policy NBH6: Historic Areas

"Any proposal assessed to have a negative effect on the Conservation Area and its setting will not be permitted.

"Any development proposal must preserve and, where appropriate, seek to enhance Lews Castle and Lady Lever Park as described in the Inventory of Gardens and Designed Landscapes."

5.3.2 Policy Guidance

In support of Policy *NBH1,* Appendix I of the LDP2 provides guidance for developers on the practical application of the *Western Isles Landscape Character Assessment* (Richards, 1998). This describes in detail the key characteristics that make the landscape of the Outer Hebrides distinctive.

As Policy *NBH1* states that the *Western Isles Landscape Character Assessment* will be taken into account in determining applications, it should be noted that since the publication of the LDP2, this important baseline of landscape information has since been updated by SNH. As such, in assessing impact on landscape character, this LVIA is based on the most up to date assessment. Nonetheless, given updated LCA was undertaken by SNH as part of national programme of landscape characterisation, it provides a robust framework in which to test *Policy NHB1*.

5.3.3 Policy Summary

The preceding policy framework sets out criteria in which to assess the landscape acceptability of the proposed development. In the context of wider social and economic policy, key landscape considerations are identified as:

- development proposals must demonstrate a satisfactory quality of siting, scale and design that respects and reflects the characteristics of the surroundings;
- the landscape setting of Lews Castle Garden and Designed Landscape and Stornoway Conservation Area should be protected; and
- development proposals should relate to the specific landscape and visual characteristics of the local area, ensuring that the overall integrity of landscape character is maintained.

5.4 Methodology

5.4.1 Approach and Guidance

This LVIA follows the approach as set out in the *Guidelines for Landscape and Visual Impact Assessment* (GLVIA) (Landscape Institute and IEMA, 2013) and other current best practice guidance where relevant (Countryside Agency & SNH, 2002; SNH, 2017a). It aims to identify, predict and evaluate the key effects of the proposed development on the landscape and visual resources of the study area. In line with best practice, landscape and visual effects are considered separately throughout.

As a brief overview, the assessment involved a combination of desk study, computer analysis, field work and interpretation using professional judgement. The site and surrounding area have been visited to gain a clear understanding of the landscape and the likely effects of the proposed development. Fieldwork was undertaken during periods of good visibility during February and April of 2018, by a Chartered Member of the Landscape Institute. Further field work was also undertaken in March 2020 that took into account the design revisions since the original assessment was undertaken in 2018.

5.4.2 The Study Area and Viewpoint Selection

To ensure the extent of any potential significant effects are fully considered, the assessment is based on a 5 km study area. In selecting assessment viewpoints, a map showing the zone of theoretical visibility (ZTV), based on computer manipulation of a digital terrain model, was prepared. This indicates areas from which the proposed development may theoretically be seen and enabled the assessment to be focused upon those locations that are most likely to be affected.

The ZTV, as illustrated on Figure 5.4, is based solely on topography (5 m contours) and identifies the maximum theoretical visibility of the proposed development. When interpreting the ZTV, it is important to bear the following points in mind:

- the map is based on the potential visibility of a proposed indicative industrial/storage building with maximum height of 20.3 m Above Ordnance Datum (AOD) or 17.6 m ACD (Above Chart Datum). It does not consider visibility of other infrastructure such as the proposed access road and levelled/reclaimed platform as these elements have a significantly lower profile, and accordingly by basing the ZTV on the tallest indicative component, the worst-case visibility is incorporated into the model;
- the map does not account for any screening effects provided by vegetation, buildings or minor landforms, which are not contained within the digital terrain model;
- the map does not take the orientation of the viewer into account, for example when travelling in a vehicle; and
- the map does not convey the likely nature or magnitude of visual effects of the proposed development, which can only be determined by further assessment, including fieldwork.

As a result, the visibility shown on the ZTV map is more extensive than would actually be visible on the ground, but where the ZTV indicates no visibility, the proposed indicative industrial/storage building would not be seen.

The viewpoints used for this assessment (see Figure 5.5 and Table 5.13) were selected according to the criteria set out in the best practice guidance (SNH, 2017b) where relevant. Note that not all these criteria necessarily apply to all viewpoints:

- publicly accessible;
- reasonably high potential number of viewers or being of particular significance to the viewer(s) affected;
- range of viewing distances (i.e. short, medium and long distance views) and elevations;
- range of viewing experiences (i.e. static views, for example from settlements, recognised viewpoints, car parks or points along sequential views, for example from roads, walking and cycling routes);
- range of view types, (e.g. panoramas, glimpses);
- views with different extents of the development visible; and
- locations with potential cumulative views of the proposed development and other relevant developments.

The viewpoints have been selected to offer the clearest view within the vicinity of the chosen point where potentially significant effects are likely to occur. Viewpoints have been excluded where the ZTV indicates that the proposed development would not be visible, or where the viewpoint is too distant for any potentially significant effects to occur. The viewpoint selection has been informed by extensive field work and subsequently refined through consultation with CnES (Morag Ferguson, 2018).

5.4.3 Landscape Resources

Landscape resources within the study area that could be affected by the proposed development include:

- physical resources, such as landform, landcover, tracks, watercourses, etc.;
- landscape character types;
- landscape designations i.e. Lews Castle Garden and Designed Landscape (GDL); and
- other recreational, natural or cultural heritage interests that contribute to landscape character.

The landscape baseline (see Section 5.5) establishes the physical components of the landscape that may be directly affected by the proposed development (i.e. those within the site), as well as the landscape resources within the wider study area from which the proposed development could be visible. The ZTV analysis and field assessment studies have been used to check the potential visibility of the landscape resources within the study area.

5.4.4 Coastal Character

In addition to landscape character, this LVIA also provides an assessment of coastal character. Coastal character is made up of the often-narrow margin of the coastal edge, its immediate hinterland, and the sea. These three key components of coastal character include what is commonly known as 'seascape' which refers to "*an area, as perceived by people, from land, sea or air, where the sea is a key element of the physical environment*" (Council of Europe, 2000). 'Seascape' is a widely used term which is included in the definition of landscape within the European Landscape Convention.

In describing coastal character, there is no published report (similar to the *Western Isles Landscape Character Assessment*) on which to base this assessment on. In addressing this, a local assessment has been undertaken specifically for this LVIA, based on best practice guidance (SNH, 2017a).

- In understanding coastal character, the process focused on identifying areas of distinct character defined on the basis of:
- physical landform, degree of enclosure or openness, and an assessment of horizontal and vertical scale;
- degree of influence of the sea and 'maritime' qualities on both the landscape and coast of the area, including coastal dynamics;
- shape, scale and degree of fragmentation of the coastline;
- presence of human artefacts, distribution of settlement, pattern and degree of human activity;
- landscape features, including historic features and their setting;
- experience of the coast, landscape and seascape, including the degree of remoteness and potential opportunity to appreciate wildness; and
- visual catchments.

5.4.5 Visual Resources

Visual receptors are defined as those individuals or groups of people within the study area who may have views towards the site and are likely to be affected by the proposed development. The main groups of visual receptors in this case are considered to be:

- residents in Stornoway and other main settlements in the surrounding landscape;
- walkers and other recreational users along Core Paths and other footpath routes;
- tourists and visitors in and around Stornoway;
- road users; and
- ferry and boat users.

The visual baseline (see Section 5.5) establishes the parts of the study area from which the proposed development may be visible; the viewpoints from which different groups of people may experience views of the proposed development, and the approximate number of people who will be affected by the changes in views or visual amenity.

5.4.6 Assessment of Predicted Effects

Having established the baseline conditions, the assessment of landscape and visual effects was undertaken. Initially, the assessment focused on a viewpoint assessment to establish the potential effects on the landscape and visual resources experienced at specific locations. The field work was informed by a range of maps, photographs, the ZTV analysis and computer-generated photo annotations. The method used to create the photographs, is based wherever possible/relevant on best practice guidance (SNH, 2017b).

Existing and predicted views from each of the viewpoints were assessed in order to identify, predict and evaluate the potential effects arising from the proposed development. Wherever possible, identified effects are quantified and the prediction of magnitude and assessment of significance of the landscape and visual effects is based on pre-defined criteria in order to

provide greater consistency. Note that these criteria are not used as prescriptive tools, and the methodology and analysis of potential effects at any particular location allows for the exercise of professional judgement. In practice, all factors need to be considered in combination and applied using careful judgement, particularly in terms of the relative weight given to each. In some instances, one criterion may be considered to have a determining effect.

In addition to the viewpoint assessment, field work was also undertaken to inform the general assessment of the landscape and visual receptors as identified in the baseline assessment. The findings of the detailed viewpoint assessment were also used to inform the general assessment of landscape and visual effects within the wider study area.

The criteria used in this assessment have been based upon paragraph 3.26 of the GLVIA, which recommends that factors affecting the sensitivity of the receptor (susceptibility and value), and those affecting the magnitude of the effect (size, extent, duration and reversibility) are each assessed separately. The description of effects takes account of changing seasonal conditions and the effects of on-going changes to the landscape over time, such as the predicted growth of vegetation or woodland operations.

5.4.7 Duration and Reversibility of Effects

The construction phase is likely to take approximately 18 months, as described within Chapter 2: Project Description. Effects due to construction are considered to be short-term, whilst effects arising during the operational phase would be long-term, and in many cases, permanent.

5.4.8 Significance of Effects

All EIA Regulations require that the significance of each effect be identified. The degree of significance of effects on landscape resources and visual receptors is determined from a combined evaluation of the sensitivity of the receptor and the magnitude of the effect.

Table 5.4.1 Determining Significance of Effect

	Sensitivity of Receptor		
Magnitude of Impact	**High**	**Medium**	**Low**
Very large	Substantial	Major	Moderate-major
Large	Major	Moderate-major	Moderate
Medium	Moderate-major	Moderate	Moderate-minor
Small	Moderate	Moderate-minor	Minor
Negligible	Moderate-minor	Minor	Negligible

Key

	Significant Effect
	Non-Significant Effect

Table 5.4.1 shows how the significance of the landscape effect increases from **negligible** to **substantial** with increasing landscape receptor sensitivity and with greater magnitude of effect. The most substantial effects would occur where a receptor of highest sensitivity is affected by an effect of very large magnitude. Conversely, negligible effects would result where a receptor of lowest sensitivity is affected by an effect of negligible magnitude. Between these two extremes the significance of effect would vary continuously and the significance of any one effect is determined by professional judgement, taking into account all the relevant factors.

The assessment of significance of the landscape and visual effects is based on pre-defined criteria. Tables 5.4.2 to 5.4.6 provide a framework that helps to ensure consistency and transparency in the decision-making process but are not used as prescriptive tools, allowing for the exercise of professional judgement in determining sensitivity, magnitude and significance.

The assessment of general effects and the detailed viewpoint assessments (see Section 5.6) provide further details of how the significance of effects has been determined in each case. Where overall effects are predicted to be **moderate-major**, **major** or **substantial**, these are considered to be significant in terms of EIA regulations (highlighted in yellow in Table 5.4.1).

5.4.9 Positive and Negative Effects

Negative effects result in a direct loss of physical resources, weaken key characteristics, negatively affect the integrity of landscape designations or result in a reduction in visual amenity. Positive effects occur where a development replaces physical resources, strengthens the landscape characteristics or improves the visual amenity. Effects may also be neutral, where there is no net effect on the landscape or visual resources.

Changes to undeveloped coastal landscapes, for example, that involve the construction of engineered man-made objects of a modest or large-scale generally have a negative effect on character, although this effect can be mitigated by the contribution to the landscape that a development may make in its own right, usually by virtue of good design, even if it is in contrast to the existing character.

Changes to views and visual amenity can be more subjective, in that people may like or dislike what they see, or may be used to seeing nearby development of similar nature and therefore more ambivalent about them. Whether the visual effect is perceived as positive or negative depends upon individual preferences, the context in which a person experiences the view, and upon their attitude towards this type of development in general. It should be recognised therefore that some people may be more neutral or ambivalent in their opinions about the proposed changes in views. This assessment adopts a precautionary approach and assumes that all effects are negative.

5.4.10 Direct and Indirect Effects

Direct effects result directly from the proposed development itself. Indirect effects are consequential changes resulting from a development, such as changes to moorland vegetation following the restoration of new access tracks.

5.4.11 Acceptability of Effects

A relatively large-scale port development may be considered by some to be an unacceptable intrusion in the landscape, but could be seen as an essential contributor to the local economy. It is not the effects on the landscape that change but the judgements about the acceptability of those effects.

Acceptability is therefore a matter for the decision maker to determine, taking into account the overall balance of environmental benefits and effects of the proposed development, on the basis all of the available evidence. The GLVIA notes in paragraph 2.17 that "*it is for the competent authority to judge the balance of weight between policy considerations and the effects that such proposals may have*."

There are no specific accepted, legal requirements or published criteria to use as a basis on which to judge whether a change in the landscape, or in a view, is acceptable. Nor is there any published guidance on establishing a threshold, beyond which further changes should be prevented. This LVIA sets out, in an impartial way, the nature and extent of landscape and visual effects that are likely to result from the proposed development and does not draw conclusions as to acceptability.

5.4.12 Landscape Effects

Landscape effects arise from changes to the physical components of the landscape, its character and how this is experienced. The significance of landscape effects is assessed by considering the sensitivity of the landscape receptors and the magnitude of the landscape effect.

5.4.12.1 Sensitivity of Landscape Receptors

The GLVIA indicates that landscape receptors need to be assessed firstly in terms of their sensitivity, combining judgements of their susceptibility to the type of proposal and the value attached to the landscape.

Best practice guidance – Topic Paper 6 (Scottish Natural Heritage and Countryside Agency 2004, page 3) states that "Sensitivity is related…to landscape character and how vulnerable this is to change…Landscapes which are highly sensitive are at risk of having their key characteristics fundamentally altered by development, leading to a change to a different landscape character i.e. one with a different set of key characteristics. Sensitivity is assessed by considering the physical characteristics and the perceptual characteristics of landscapes in the light of particular forms of development."

These aspects of sensitivity distinguish one Landscape Character Type (LCT) from another, but it is important to recognise that sensitivity can also vary across a particular LCT. Some landscape assessments provide information concerning the sensitivity of LCTs to different types of development although in the case, no information is available.

This LVIA therefore includes an assessment of factors affecting the susceptibility of the landscape to the changes brought about by the proposed development. Table 5.4.2 sets out attributes of landscape character that have been considered in assessing susceptibility, adapted from best practice guidance.

Table 5.4.2: Landscape Susceptibility

Susceptibility	Lower	Higher
Scale	Large-scale or vast	Intimate or small-scale
Landform	Flat, smooth, regular, rolling, gently undulating, or flowing landform	Dramatic, steep, mountainous, rugged, or complex landform with prominent peaks or ridges
Diversity	Simple or uniform, e.g. Moorland or forestry plantations	Complex or diverse, variety of land cover
Landcover pattern and line	Sweeping lines, or indistinct or irregular patterns	Strong and regular linear features, geometric or rectilinear patterns, or planned landscapes
Settlement and infrastructure	Frequent masts, pylons, industrial elements, modern buildings, infrastructure, settlements, or main roads	No obvious modern settlement, buildings, infrastructure, or main roads
Perception of landscape change	Modern or clearly dynamic showing obvious land use changes	Little or no land use changes, or with obvious historical continuity
Tranquility	Busy, with evidence of human activity, noise, or regular movement	Remote or tranquil with strong sense of stillness or solitude
Settings and skylines	Low lying areas that do not tend to feature in views from populated areas or main transport routes	Areas with topographic features that define the setting, backdrop, outlook or skyline of populated areas or main transport routes

5.4.12.2 Landscape Value

The assessment takes as its starting point the recognised value of the landscape, for example, as identified by landscape designations.

In addition, the assessment considers the following factors, in order to identify how the relative landscape value may vary at the local scale. The factors set out in Table 5.4.3 are adapted from paragraphs 5.28-5.31 of the GLVIA and other guidance (Scottish Natural Heritage and Countryside Agency 2004 Figure 1b).

Table 5.4.3: Landscape Value

Factors affecting Landscape Value	
Condition/intactness	The degree to which the landscape is unified or intact
Scenic quality	The extent to which the landscape appeals, primarily to the visual senses
Perceptual aspects	The degree to which the landscape is recognised for perceptual qualities, such as its sense of remoteness
Rarity	The presence of unusual elements or features in the landscape or the presence of an unusual LCT
Representativeness	The degree to which the landscape contains important examples of elements or features, or is of a particular character that is considered important
Conservation interests	Cultural or natural heritage interests that add to the value of the landscape and/or are of value in themselves

Factors affecting Landscape Value	
Recreational value	Evidence of recreational activity where experience of the landscape is important, such as recognised scenic routes
Associations	Recognised cultural or historical associations that contribute to perceptions of the natural beauty of the landscape

5.4.12.3 Magnitude of Landscape Effects

Each effect on landscape receptors is also assessed in terms of its size or scale, the geographical extent of the area influenced and its duration and reversibility. Size or scale of effect is judged using the factors set out in Table 5.4.4.

Table 5.4.4: Size or Scale of Landscape Effect

Class	Criteria
Very large	Highly obvious change, affecting the majority of the key characteristics and defining the experience of the landscape
Large	Obvious change, affecting many key characteristics and the experience of the landscape
Medium	Noticeable but not obvious change, affecting some key characteristics and the experience of the landscape
Small	Minor change, affecting some characteristics and the experience of the landscape slightly
Negligible	Little perceptible change

The geographical area over which the landscape effects would be experienced (regional, local or restricted to the site) is also taken into account. This is distinct from the scale of the change. For example, a small change to the landscape over a large geographical area could be comparable to a very large change affecting a much more localised area.

5.4.12.4 Significance of Landscape Effects

The assessment of significance is based on professional judgement, considering both the sensitivity of the receptor and the predicted magnitude of effect resulting from the Development, as described in previously. A *major* loss of landscape features or characteristics across an extensive area that are important to the integrity of a nationally valued landscape are likely to be of greatest significance. Short-term effects on landscape features or characteristics over a restricted part of a landscape of lower value are likely to be of least significance.

5.4.13 Visual Effects

Visual effects result from the changes in the content or character of views and visual amenity, due to changes in the landscape. The assessment of visual effects takes account of both the sensitivity of the visual receptors (individuals or groups of people) and the magnitude of the change on their views and visual amenity.

5.4.13.1 Sensitivity of Visual Receptors

The sensitivity of each visual receptor is assessed in terms of susceptibility to change in views or visual amenity as well as the value attached to particular views.

5.4.13.2 Susceptibility to Change

People generally have differing responses to views and visual amenity depending on the context (e.g. location, time of day, degree of exposure), and their purpose for being in a particular place (e.g. whether for recreation, travelling through the area, residence or employment). Susceptibility to change is therefore a function of:

- the occupation or activity of people experiencing the view or visual amenity; and
- the extent to which their attention or interest may be focused on the landscape around them.

Table 5.4.5 illustrates some examples of the relative susceptibility of some of the key visual receptors within the Study Area. Note that different individuals or groups of people at one location may have different levels of susceptibility.

Table 5.4.5: Examples of Susceptibility to Change in Views or Visual Amenity

High	Medium	Low
Residents within dwellings or curtilage	People at their place of work, where views are an important part of the setting, such as a countryside ranger	People at their place of work whose attention is likely to be focused on their work or activity, not on their surroundings
Users of recognised footpaths paths, whose attention or interest is likely to be focused on the landscape or on particular views		People engaged in active outdoor sports or recreation and less likely to focus on the view
Road and ferry users where appreciation of the landscape is an important part of the experience, such as recognised scenic routes	Road users likely to be travelling for other purposes than just the view, such as commuter routes	
Visitors to heritage assets or to other attractions, such as recognised beauty spots, where views of the surroundings are an important part of the experience		

5.4.13.3 Value attached to particular views

Judgments are also be made about the value attached to views, based on the following considerations:

- recognised value – such as views from heritage assets or designated landscapes;
- inclusion in guidebooks or on tourist maps, the facilities provided for visitors or references to the view in literature or art; and
- the relative number of people who are likely to experience the view.

People that are more susceptible to change at viewpoints of recognised value are more likely to be significantly affected by any given change.

5.4.13.4 Magnitude of Visual Effect

The magnitude of the visual effect resulting from the proposed development is evaluated in terms of size or scale, geographical extent, duration and reversibility.

Size or scale of effect_is based on the interpretation of a combination of a range of factors, described in Table 5.4.6. Some of these are largely quantifiable and include:

- distance and direction of the viewpoint from the proposed development;
- extent of the proposed development visible from the viewpoint;
- scale of the change in the view, including the proportion of the field of view occupied by the proposed development;
- degree of contrast with the existing landscape elements and characteristics in terms of background, form, pattern, scale, movement, colour, texture, mass, line or height;
- the relative amount of time during which the effect would be experienced and whether views would be full, partial or glimpses; and
- orientation of receptors in relation to the proposed development, e.g. whether views are oblique or direct.

Table 5.4.6: Size or Scale of Visual Effect

Class	Description	Appearance in field of vision
Very large	Dominant	Commanding, controlling the view Creation/removal of a dominant visual focus Highly uncharacteristic elements or pattern introduced Most of the view affected
Large	Prominent	Major change to the view, striking, sharp, unmistakable, easily seen Creation/removal of major visual focus Uncharacteristic elements or pattern introduced Large proportion of the view affected
Medium	Conspicuous	Noticeable change to the view, distinct, clearly visible, well defined Creation or removal of a visual focus that may compete Some elements of the Development fit the existing pattern Some of the view affected
Small	Apparent	Minor change to the view but still evident Little change to focus of the view Fits intrinsic visual composition Little of the view affected
Negligible	Inconspicuous	No real change to perception of the view Weak, not legible, hardly discernible

The extent over which the changes would be visible is also taken into account.

5.4.13.5 Significance of Visual Effects

The degree of significance of effects on visual receptors is determined from a combined evaluation of the sensitivity of the visual receptor and the magnitude of the visual effect, as described in previously. Effects are more likely to be significant on people who are particularly sensitive to changes in views and visual amenity, or who experience effects at important viewpoints, or from recognised scenic routes. Large scale changes which introduce new, discordant or intrusive elements into the view are also more likely to be significant than small changes or changes involving features already present within the view.

5.5 Baseline

5.5.1 Overview

This baseline study establishes the existing landscape and visual resource against which the effects of the proposed development are predicted. It describes the site and its setting, including its landscape and coastal character, and assesses sensitivity to change. Visual receptors such as residents, road users and those undertaking recreational activity, are also assessed. Following on from this, a selection of viewpoints has been identified to help inform the assessment of landscape and visual effects.

5.5.2 Study Area

On the basis of the desk study and field work undertaken, it is considered that significant effects are very unlikely to occur beyond 5 km from the site of the proposed development. Furthermore, taking into account that theoretical visibility on terrestrial areas is almost entirely contained to within 5 km (see Figure 5.4 in Volume 4 of this EIAR), a study area of 5 km is considered appropriate for the purposes of this assessment.

5.5.3 Overview of the Site and Surrounding Landscape

The site, as illustrated within the EIA boundary (see Drawing 56/02 Deep Water Port Location within Volume 4 of this EIAR), is located approximately 1.1 km south of the town of Stornoway, within Glumaig Harbour. Glumaig Harbour is a sheltered inlet, bound by land to the west, south and east, and with aspects towards Stornoway Harbour and the town to the north. The inlet of Glumaig Harbour covers an area of just over 0.2 km^2, the western shoreline is currently undeveloped, whilst the existing Arnish fabrication yard and associated infrastructure, including existing quay of just over 100 metres in length, occupies the south-eastern shoreline.

The western, undeveloped landward side is characterised by gently undulating topography behind rocky outcrop, whilst Arnish Point comprises a current industrial land use. The Allt Poll a'Choire, a minor watercourse draining from a small lochan, enters Glumaig Harbour at the north-western extent of the bay, immediately north of the site. On the landward portion of the site, habitat is primarily a combination of wet and dry dwarf shrub heaths, and acid grasslands behind rock outcrop to sea. Shingle and bare ground characterise the area around Arnish Industrial Estate. Current access is gained via a private road from the A859.

The busy town of Stornoway and its associated port dominate the northern side of the harbour. The town can be further broken down into two distinct areas; the original central core and the later area of urban expansion, or urban fringe. The central part of Stornoway is characterised by a recognisable pattern of narrow streets, set out on a grid plan. Views along these streets frequently focus towards the harbour, increasing the town's relationship with the sea. The

historic core is designated a Conservation Area and immediately to the west of the town, Lews Castle and Lady Lever Park Garden and Designed Landscape (GDL) are situated on a heavily wooded hillside that provides an important landscape setting to the town and harbour.

Beyond the central core is an area of urban expansion, characterised by a mix of Local Authority and private housing. The pattern of settlement in this area is less dense where dwellings exhibit a greater range of size, shape and building materials with wider roads. The outer edge of Stornoway is bounded by adjacent crofting townships.

Stornoway airport is also located to the east of the town and in association with main roads, major settlement and the pattern of settled crofts; the northern part of the study area has a busy and relatively developed character. This notably contrasts with the western and southern parts of the study area that have a very low level of settlement of occasional dwellings scattered alongside the few roads that cross the prevailing undeveloped moorland landscapes.

Notable watercourses draining into the wider Stornoway Harbour, include the River Glen, which enters Stornoway Harbour at its northern tip (approximately 1.3 km north), and the River Creed, which enters Stornoway Harbour from the west, approximately 300 m north of the site at its closest point.

In general, views are largely focused on the harbour, contained by surrounding gently rising ground. From the site, Stornoway forms a dominant visual focus and from the town; views are focused towards the wooded grounds of Lews Castle and the largely undeveloped moorland that extends across the western side of the harbour. From some areas of higher ground, there are long range views across the Minch towards the north-west coast of the mainland. The combination of the harbour, wooded grounds of the castle, historic core of the town and areas of surrounding undeveloped moorland contribute to a relatively high scenic quality.

5.5.4 Landscape Character

The landscape character of the study area has been mapped and described based on information contained within the SNH Landscape Character Assessment online database (2018). As noted in Section 5.3.2 of this report, this SNH assessment provides a consistent update to the *Western Isles Landscape Character Assessment* (1998).

As illustrated in Figure 5.1 in Volume 4 of this EIAR, the proposed development is located within parts of two landscape character types (LCTs) namely *Boggy Moorland* and *Rocky Moorland*. The *Boggy Moorland* LCT forms extensive inland areas of Lewis, North Uist and Benbecula, and smaller areas which fringe the rocky moorlands of South Uist and Barra. *Rocky Moorland* forms extensive inland areas in central Lewis and South Uist and smaller areas along the east coast of Harris, North Uist, Benbecula and Barra.

The *Gently Sloping Crofting* LCT is the only other LCT with the potential to be affected and this extends across much of the north-eastern part of the study area and includes the town of Stornoway, and the surrounding pattern of crofting landscapes and associated settlement.

Table 5.5.1 sets out the key characteristics of each LCT within the study area and based on an assessment of susceptibility to change and landscape value, its overall sensitivity

Table 5.5.1: Landscape Character

LCT	Key Characteristics	Sensitivity
Boggy Moorland	• Large scale, gently undulating peat moorlands. • Relatively few landscape elements. • Numerous large and small rounded lochs, interconnected by narrow, slow-moving rivers. • Occasional small, shallow-sided hills. • Sea cliffs with eroded gullies at the coast. • Remote upland character. • Predominantly uninhabited. • Visible cultural elements dominated by shielings and township boundary dykes. • Expansive horizontal scale and remoteness.	High
Rocky Moorland	• Rocky, stepped landscape with irregular topography. • Rocky knolls interlocked with peaty moorland vegetation and small lochans. • Considerable diversity of form and texture. • Occasional areas of forestry, small woodlands and shelter planting • Medium scale. • Predominantly uninhabited and sense of remoteness.	High
Gently Sloping Crofting	• Long sweeping gentle slopes. • Large scale landscape with open views. • Dividing buffers of common land between townships. • Visually diverse due to land use management patterns. • Rectangular field patterns. • Graduation of land use in the croft inbye from crops to grazing. • Paucity of trees limited to infrequent small areas of woodland. • Crofting settlement set back from the shore. • Repetitive pattern of croft houses backed by crofting strips. • Strong simple relationship between the older croft buildings and the management of individual croft strips. • Modern croft houses located behind original houses, of diverse design and constructed using diverse range of building materials. • Occasional development of new small/medium housing schemes of contrasting layout to the original crofts. • Remains of pre-crofting and prehistoric settlement, often including chapels and burial grounds, adjacent to the shore. • Constant views outwards to the sea and open moorland, giving a sense of remoteness. • Contrasting urban settlement of Stornoway.	Medium

5.5.5 Coastal Character

Given the coastal location of the proposed development, the potential effects on coastal character are a key consideration. Coastal character is made up of the often narrow margin of the coastal edge, its immediate hinterland, and the sea. A Coastal Character Assessment therefore examines coastal influences in more detail than a Landscape Character Assessment. These three key components of coastal character include what is commonly known as 'seascape' which refers to "*an area, as perceived by people, from land, sea or air, where the sea is a key element of the physical environment*" (Council of Europe, 2000).

In describing coastal character, there is no published report (similar to the *Western Isles Landscape Character Assessment*) on which to base this assessment on. In addressing this, a local assessment has been undertaken based on best practice guidance (SNH, 2017a). This focuses on the coastal character area (CCA) in which the proposed development is located and where the large majority of theoretical visibility is predicted (see Figure 5.4). Table 5.5.2 sets out an overview its characteristics and its associated sensitivity change.

Table 5.5.2: Coastal Character

CCA	Key Characteristics	Sensitivity
Stornoway Harbour	• Visual and physical enclosure is provided by the natural form of the harbour and the containment of surrounding low rising ground. • Dominated by the open expanse of the sea, the area has a strong sense of openness and a horizontal form. • Although sheltered from the exposure of the North Sea, the influence of tides (up to 5m) marine traffic and weather contribute to a dynamic and constantly changing marine environment. • Natural/topographic features include the mouth of the Bayhead River, Goat Island, Arnish Point and Sandwick Bay. • Along western parts, the coastline has a strong semi-natural and undeveloped character composed of rocky outcrops and reefs, shingle shore, low rocky cliffs and undulating moorland slopes. • In contrast, the eastern coastline has a prevailing developed character, dominated by the busy town of Stornoway, its associated port and crofting landscapes further east. • Key landscape features include the Arnish Lighthouse located on the low-lying headland of Arnish Point, the historic core of Stornoway and the wooded grounds of Lews Castle. • Along western parts, the coast has a prevailing experience of naturalness, relatively tranquillity and sense of detachment from major settlement. • Along the eastern coast, extensive development in and around Stornoway underpin a busy and noisy experience.	Medium to high

As illustrated on Figure 5.2 in Volume 4 of this EIAR, small parts of two other CCAs are located in the study area. These are:

- Arnish Approaches Coastline - *high* sensitivity; and
- Holm/Braighe Coastline - *high* sensitivity.

5.5.6 Landscape Designations

5.5.6.1 Gardens and Designed Landscapes

The study area generally benefits from an attractive landscape and scenic quality and as illustrated on Figure 5.3 in Volume 4 of the EIAR, the largely wooded grounds of Lews Castle and Lady Lever Park are designated a Garden and Designed Landscape (GDL). GDLs are nationally important landscapes whose grounds are consciously laid out for artistic effect. Historic Environment Scotland (HES) selects nationally important sites for the Inventory under the terms of the Ancient Monuments and Archaeological Areas Act 1979. Due to their national significance, GDLs are assessed as having a *high* sensitivity to change. Table 5.5.3 sets out a summary description of the Lews Castle and Lady Lever Park GDL, based on the HES inventory.

Table 5.5.3: Landscape Designations

Designation	Description	Sensitivity
Lews Castle and Lady Lever Park Garden and Designed Landscape (GDL)	<u>Summary</u> A prime example of a mid-late 19th century ornamental and estate landscape, rare on Lewis, laid outwith coastal and riverside carriage drives and walks. The designed landscape comprises a series of distinctive wooded parklands contrasting dramatically with the prevailing openness of the island landscape. <u>The main landscape components of the designation are:</u> • A wide range of architectural features (e.g. Castle, lodges, bridges, tower, memorial and boundary/sea walls); • Drives and approaches; • Parkland; and • Mixed woodlands <u>Location and landscape setting</u> Lews Castle is situated on the north-west side of Stornoway Harbour overlooking the town. It commands panoramic views and is prominent on the sea approach to Lewis. The Castle is situated mid-way on the east-facing, heavily wooded hillside and dominates views from Stornoway. Views from Lews Castle and Lady Lever Park overlook Stornoway, the inner harbour and town. Extensive views are obtained from the summit of Cnoc Croich across to Lews Castle, the island's hinterland and Glumaig Harbour. The policy woodlands of 240 ha extend westwards to the A859 Balallan-Stornoway Road and southwards to the Greeta River (or River Creed). Thus, Cnoc Croich and the coastline north of Greeta Island and Greeta estuary lie within the extent of the designed landscape. <u>Importance</u> Of its seven evaluation criteria, the following are assessed as 'outstanding': • Artistic Interest; • Historical; • Horticultural; • Architectural; and • Scenic.	High

5.5.7 Stornoway Conservation Area

Although not specifically a landscape designation, the landscape setting of the Stornoway Conservation Area (as illustrated on Figure 5.3 in Volume 4 of this EIAR) is relevant to this assessment. The Conservation Area Appraisal (2005) recognises the importance of the town's historic core and separated by the River Creed, the influence of the wooded grounds of Lews Castle in providing a very distinctive setting and dramatic sense of arrival to the town.

A detailed assessment on the cultural significance of the designation is set out Chapter 13 of this EIAR although as part of this LVIA, effects on setting are considered as part of the landscape assessment. As a locally important designation, the sensitivity of its setting is assessed as *medium-high*.

5.5.8 Settlement

As detailed in section 5.5.3, the town of Stornoway and its associated pattern of settled crofts and townships dominates the northern part of the study area. All residential receptors are assessed as having a *high* susceptibility to change and considering the relatively high scenic quality of their surrounding landscape, a view towards the Site of *high* value. Overall sensitivity is therefore *high*. The main settlements to be considered in assessing effects on residents are set out in Table 5.5.4.

Table 5.5.4: Settlements

Settlement		
Stornoway	Holm	An Gleann Ur
Plasterfield	Melbost	Grianan
Sandwick	Steinis	Marybank
Lower Sandwick	Laxdale	
Ceann nam Buailtean	Newmarket	

5.5.9 Roads

Radiating from Stornoway, there is a relatively busy network of main roads within the study area and considering their partial importance as tourist routes, the overall sensitivity of those travelling along them is assessed as *medium-high*. The main roads to be considered in assessing effects on those travelling along them are listed in Table 5.5.5.

5.5.10 Recreational Routes

As illustrated on Figure 5.3 in Volume 4 of the EIAR, a network of footpaths within the grounds of Lews Castle and Lady Lever Park are designated Core Paths. These form a 23.3 km route designated for their circular, landscape, cultural and natural enjoyment. Located on the fringes of the town, there are other sections of a 'wider footpath network' that provide local access to surrounding settlements.

In addition to footpaths, the Stornoway to Ullapool ferry is an important recreational route for those visiting the island. The passenger ferry can operate up to 14 times a week and when travelling from the mainland, the ferry passes by the north of the site and terminates at the harbour within the town. The port also attracts a number of cruise ships and other recreational craft that pass along the ferry route. Table 5.5.5 sets out the recreational routes to be considered in assessing effects on those travelling along them.

Table 5.5.5: Road and Recreational Routes

Route	Sensitivity
A866	Medium-high
A857	Medium-high
A858	Medium-high
A859	Medium-high
Ferry	High
Lewis Castle Grounds Core Paths	High
Wider path network	Medium-high

5.5.11 Other Recreational Users

In addition to those recreational routes identified in the preceding section, the town is also a popular visitor destination and with its many hotels and other accommodation types, is frequently used a base to explore the island. Considering the importance of the scenic quality to a large number of recreational users, overall sensitivity of all visitors and tourists is assessed as *high*.

5.5.12 Viewpoint Selection

Based on the preceding identification and assessment of landscape and visual receptors, the following 11 viewpoints (see Figure 5.5 in Volume 4 of this EIAR) have been selected to undertake a detailed investigation of landscape and visual effects. These represent the typical views experienced by a variety of visual receptors, at varying distances across the study area.

The viewpoints have been selected as those which are sensitive to change and where open views towards the site are generally experienced. The locations have been carefully selected to demonstrate the worst-case scenario and in identifying these, a detailed analysis of the surrounding landscape was undertaken to establish the visibility of the site.

Table 5.5.6: Viewpoint Selection

Viewpoint location	LANDSCAPE		VISUAL	
	LCT/CCA (in which VP is located)	Sensitivity	Receptor	Sensitivity
1. Cuddy Point	Boggy Moorland LCT Stornoway Harbour CCA	High	Visitors/recreational users	High
2. South Beach	Sloping Crofting LCT Stornoway Harbour CCA	Medium-high	Residents	High
			Visitors	High
			Road Users	Medium-high
3. Newton Street	Sloping Crofting LCT Stornoway Harbour CCA	Medium	Residents	High
			Visitors	High
			Road Users	Medium-high
4. Harbour (offshore)	Stornoway Harbour CCA	High	Visitors/recreational users	High
5. Lower Sandwick	Sloping Crofting LCT Stornoway Harbour CCA	Medium-high	Residents	High
			Recreational users	High

Viewpoint location	LANDSCAPE		VISUAL	
	LCT/CCA (in which VP is located)	Sensitivity	Receptor	Sensitivity
6. Newmarket	Sloping Crofting LCT	Medium	Residents	Medium-high
			Road users	Medium-high
7. Lews Castle	Boggy Moorland LCT Stornoway Harbour CCA	High	Visitors	High
8. Ferry Terminal	Sloping Crofting LCT Stornoway Harbour CCA	Medium	Visitors	High
9. Lewis War Memorial	Sloping Crofting LCT	Medium	Visitors	High
10. Iolaire Monument Car Park	Sloping Crofting LCT Stornoway Harbour CCA	Medium-high	Visitors	High
11. Sandwick Bay	Sloping Crofting LCT Stornoway Harbour CCA	Medium-high	Recreational users	High

5.6 Impact Assessment

5.6.1 Overview

This section addresses all landscape and visual effects predicted during the construction and operational phase of the proposed development, taking into account any embedded mitigation measures designed to minimise adverse effects. This is presented in the following sub-sections:

- Design Mitigation
- Assessment Parameters and Assumptions
- Zone of Theoretical Visibility
- Viewpoint Assessment
  - Landscape and visual effects during construction phase
  - Landscape and visual effects during operational phase
  - Cumulative effects
- Construction Phase
  - Landscape effects (physical landscape resources, landscape character, coastal character and landscape designations)
  - Visual effects (residents, recreational users and road users)
- Operational Phase
  - Landscape effects (physical landscape resources, landscape character, coastal character and landscape designations)
  - Visual effects (residents, recreational users and road users)

5.6.2 Assessment Parameters and Assumptions

The purpose of this impact assessment is to establish the environmental principles based on worst case parameters as currently known. In doing so, the following assessment is based on the following assumptions:

- the proposed development would result in the excavation of approximately 300,000 cubic metres of rock from the steep slopes across the western parts of the site. This would provide part of the infill material required to construct an area of reclaimed land to the east of the site, to create a levelled area adjoining the reclaimed area, to allow construction of a new access road to the port and a link (haul) road between the port and Arnish Industrial Estate;
- parts of the proposed port, industrial and storage uses would be constructed on reclaimed land;
- within the suite of annotated photos that support this chapter (see Figures 5.9-5.19 in Volume 4 of this EIAR), the area where development could take place has been labelled 'levelled/reclaimed platform', with indicative dimensions assessed at a height of 5 m AOD (or 7.7 m ACD), a length of 300 m at the longest and a width of 310 m at the widest (approximately 7 hectares);
- a proposed industrial/storage building would be located on the landward part of the site;
- the indicative dimensions of a proposed industrial/storage building have been assessed at a height of 15 m above floor level (20.3 m AOD or 23.0 m ACD), with a length of 80 m (east-west) and a width of 60 m (north-south);
- although the location of the industrial/storage building as illustrated in the ZTV and photo annotations are based on a specific location, the written assessment acknowledges that in taking forward any subsequent design, the location of the industrial/storage building is not fixed;
- the indicative dimensions of a proposed link span have been assessed at a height of 5 m AOD (or 7.7 m ACD) with a length of 42 m and a width of 20 m at its widest point;
- The access road, which approaches from the west on a steady downward gradient of 8%, is 8 metres wide, with a tarmac surface. The link road, that connects the levelled/reclaimed platform to the Arnish fabrication yard, is 25 metres wide, level throughout its length, and is surfaced with crushed rock. Neither road has any lighting columns or other visible infrastructure;
- There will be lighting columns, 12 m high, at regular intervals along, and approx. 10 m behind, both the freight ferry and the cruise ship berths; and also at regular intervals, services outlet cabinets approx. 1.5 m long, 1m wide and 1.5 m high, each adjacent to a lighting column (two cabinets on the freight ferry berth, and four on the main cruise ship berth);
- Just south of the access road, where it projects onto the levelled/reclaimed platform, there will be a fenced services compound with water tanks, oil tanks, and an electrical sub-station (height of these items not expected to exceed 5m), overall compound around 50 m square. Between the access road and the linkspan, an area approx. 130 m

long (north/south) and 60 m wide (east/west) will be used for lorry trailer stacking and vehicle marshalling. This area, (which will be fenced off from the rest of the levelled/reclaimed platform on its east edge), and the services compound to the south of the access road, will be lit with 30 m high columns and annular area lights (estimated four in number);once operational, the assessment recognises that a number of large commercial boats, including cruise liners and oil delivery vessels, would be moored at the port, with associated movements in and of out the harbour;

- once operational, the assessment recognises that parts of the site would be used for car parking, with frequent movements of traffic, including buses for cruise liner passengers travelling in between the site and the centre of Stornoway; and
- once operational, the assessment recognises that parts of the site would accommodate the laydown and storage of materials with a dedicated heavy lift area to service renewables and decommissioning projects, with associated vehicle movements and other frequent noise and activity taking place across the site.

5.6.3 Zone of Theoretical Visibility

Figure 5.4 in Volume 4 of this EIAR illustrates the zone of theoretical visibility (ZTV) of a proposed indicative industrial/storage building, based on a maximum height of 20.3 m AOD or 23.0 m ACD. Overall, this demonstrates that from the large majority of the study area, there would be no views of the industrial/storage building.

Most notably, due to the screening effect of rising ground that contain the terrestrial parts of the site, all of the largely undeveloped moorland across the south and western parts of the study area are outside of theoretical visibility. The majority of open water to the south and east of the site is also outside of the ZTV, as are the large majority of the crofting landscapes to the north and east of Stornoway.

In general, theoretical views of the indicative industrial/storage building are focused on those parts of the landscape and seascape to the north and east of the site. Within 2 km, this includes most of the harbour, the town of Stornoway and the crofting landscapes to the east. Most of the grounds of Lews Castle are however outside of the ZTV.

Beyond 2 km from the site, theoretical visibility is mostly restricted to a relatively small area of development on the northern fringes of the Stornoway and a larger area centred on the nearby settlement of Newmarket. To the north-east, a band of theoretical visibility also extends across parts of the coastal sands and muds that contain the Abhainn Lacasdail burn. Further south, the landscape in and around Stornoway Airport is outside of the theoretical views.

In considering the ZTV, it is important to note that this does not take into account the screening effect of minor variations in landform, built development, trees and woodlands, and other vegetation and manmade features. In practice therefore, it is very likely that extensive built development in around the town of Stornoway would notably restrict the opportunity for open views towards the indicative industrial/storage building and associated development.

Although the ZTV does do not consider the potential visibility of other proposed infrastructure such as the levelled/reclaimed platform, access road and linkspan, due to their low-lying nature in relation to the indicative height of the industrial/storage building, the extent of any theoretical visibility of these elements would be less than the ZTV illustrates. In considering

the nature of landform in the locality to the site, the potential visibility of any other low-lying infrastructure would be largely restricted to the open water within Stornoway Harbour and some areas along the nearby coastline.

In analysing the ZTV, it also important to note this does not consider theoretical visibility of the proposed rock extraction although this has been considered in the Viewpoint Assessment (see Section 5.6.5).

5.6.4 Viewpoint Assessment

The Viewpoint Assessment provides a detailed understanding of landscape/coastal and visual effects predicted at 11 representative viewpoint locations (see Table 5.13 in this chapter and Figure 5.5 in Volume 4 of this EIAR). For each viewpoint, an annotated photograph has been prepared (see Figures 5.9-5.19) which indicatively illustrate the main parts of the proposed development that could be visible. These are:

- areas of rock extraction;
- indicative industrial/storage building;
- levelled/reclaimed platform;
- linkspan;
- link and access roads; and
- Occasional presence of cruise ship.

In addition to providing an assessment from specific locations, the viewpoint findings are also used to inform the general assessment of landscape, coastal and visual effects during the construction and operational phases (see Section 5.6). Where landscape/coastal effects are identified at each viewpoint, no conclusion on the overall significance are provided as this requires an analysis of the overall extent of any changes experienced across each landscape receptor.

VIEWPOINT 1 - Cuddy Point (see Figure 5.9)
Grid reference: NB 41927 32795
View direction: 150^0
Distance to nearest part of Development: 1.31 km
Landscape Character Type: Boggy Moorland
Coastal Character Area: Stornoway Harbour CCA
Landscape designations: Lews Castle GDL & Stornoway Conservation Area
Baseline Assessment
Context: At an elevation of approximately 3 m AOD, the viewpoint is located in a public car park, near to the water's edge at Cuddy Point, within the grounds of the Lews Castle and Lady Lever Park GDL and the Stornoway Conservation Area. The car park is a popular resting place to view the harbour and it provides access to the nearby castle and its associated network of footpaths, a café and a community owned slipway.
Current view: Looking south towards the Site, the foreground view is dominated by the open expanse of sea within the inner harbour. In the centre of view, the Arnish Lighthouse, located on the low-lying headland of Arnish Point, forms a visual focus on the skyline above the inner harbour and to its right, a large industrial building (BiFab plant) is prominent on the skyline. Further to the right of the view, a series of rocky cliffs and slopes provide a relatively low-lying sense of enclosure to the harbour where in the foreground, the policy woodlands in the grounds of Lews Castle provide a distinctive framed setting that contrasts with the moorland character beyond. To the left of view, a pier extends into the harbour where a cluster of industrial buildings on Goat Island are visible on the skyline beyond. This 50^0 view forms part of a wider 180^0 across the harbour with extensive nearby development in Stornoway visible to the left of view and the wooded grounds of the castle to the right.
Landscape/coastal sensitivity: The viewpoint is located within the *Boggy Moorland* LCT (high sensitivity) although in stark contrast to the typical character of large scale, gently undulating peat moorlands, indented with numerous large and small rounded lochs that define this LCT, the character of the local landscape is heavily influenced by the dense coverage of designed policy woodlands in the grounds of the nearby castle. As such, the coastal character area in which the viewpoint is located (*Stornoway Harbour* CCA) is more relevant to consider. Taking into account the composition of largely undeveloped cliffs backed by semi-natural moorland slopes, the influence of the wooded castle grounds and the open views across the inner harbour, sensitivity is assessed as **high.**
Visual sensitivity: <u>Visitors/recreational users</u> - high susceptibility. The scenic views across the harbour of those using the car park are an important part of the experience at a popular location – high value. With a high susceptibility and value, the overall sensitivity of visitors and recreational users is assessed as **high.**
Assessment of Predicted Effects
Parts of proposed development potentially visible: To the right of view, some areas of rock extraction associated with the construction of the levelled/reclaimed area would be visible, including the part of the industrial/storage building backed by rising ground. A large part of the platform and part of the associated linkspan would be visible

VIEWPOINT 1 - Cuddy Point (see Figure 5.9)
where it extends into the harbour. At times, a large cruise ship would also be visible. The access and link roads would be screed be intervening landform.
Construction effects: Construction activity, including the extraction of rock, dredging of the seabed and the reclamation of land would be very obvious across the site. These complex and large-scale engineering operations on land and sea would result in relatively widespread views of construction infrastructure, storage of materials, noise, activity and movement of large vehicles. The magnitude of landscape/coastal and visual effect is assessed as **large,** resulting in a **major** (significant) effect.
Landscape/coastal effects (operational): During the operational stages of the proposed development, the main change would result from the large-scale extraction of rock along the sensitive cliffs and associated slopes within the site. This would very noticeably change the profile of the coast across parts of the site, particularly where the extraction would extend to the skyline. In places, the natural profile of the cliffs and slopes would be completely lost. The engineered profile of the rock extraction would also contrast with the prevailing semi-natural character of the surrounding coastline and the levelled/reclaimed platform and its associated built development, and other industrial infrastructure, would detract from the undeveloped nature and simple landscape pattern of the immediate locality. With large boat movements and other activity; the relative tranquillity currently experienced in the local area would also be compromised. Considering the influence of large-scale industrial development at Arnish Point however, the changes would not be an entirely uncharacteristic addition to the western coastline of the harbour. The proposed industrial/storage building would also be less obvious in the landscape than the existing building on Arnish Point. Considering these factors, the magnitude of landscape/coastal effect is predicted to be **medium-large.**
Visual effects (operational): During the operational stages, the various components of the proposed development would be prominent in view. In particular, the rock extraction and levelled/reclaimed platform with associated infrastructure and activity would introduce a prominent visual focus that would detract from the view across open water towards the Arnish Lighthouse. Areas of rock extraction would also result in a noticeable contrast in colour and texture to the surrounding cliff faces and slopes. Although noticeable, the proposed industrial/storage building backed by rising ground is smaller in scale and much less obvious than the BiFab building to the left of view. Taken collectively, the parts of visible development and activity would only occupy a moderate part of the 50^0 view and the foreground view, including views of the nearby wooded grounds of the castle would be largely unaffected. With the presence of a very large cruise ship in view, the overall, the magnitude of visual effect is assessed as **medium-large** and considering activity and development would be experienced in the context of the busy port and nearby town centre, a **moderate-major** (adverse) and significant visual effect is predicted.

Summary	
Significance of temporary construction visual effects	Major (adverse) - **significant**
Magnitude of landscape/coastal effects (construction)	Large (adverse)
Magnitude of landscape/coastal effects (operational)	Medium-large (adverse)
Significance of visual effects (operational)	Moderate-major (adverse) - **significant**

VIEWPOINT 2 - South Beach (see Figure 5.10)
Grid reference: NB 42240 32738
View direction: 180^0
Distance to nearest part of Development: 1.22 km
Landscape Character Type: Sloping Crofting
Coastal Character Area: Stornoway Harbour CCA
Landscape designations: Stornoway Conservation Area
Baseline Assessment
Context: At an elevation of approximately 5 m AOD, the viewpoint is located on a waterside pavement alongside South Beach, in between two piers in Stornoway Harbour. With a town centre location, South Beach is very busy with passing traffic and visitors to the town. Forming the southern edge to the Stornoway Conservation Area, nearby residential dwellings and shops along South Beach provide an attractive frontage and setting to the harbour.
Current view: Looking south towards the site, two piers extend into the inner harbour frame a view of open water backed by rising ground. To the right of view, the policy woodlands in the grounds of Lews Castle provide a distinctive setting to the harbour whilst in the centre of view; the containing backdrop is dominated by a rocky coastline below undulating moorland slopes. Towards the left of view, a large industrial building (BiFab plant) is prominent on the low-lying skyline of Arnish Point and further left, a busy composition of port infrastructure dominates the foreground. This 50^0 view forms part of a wider 180^0 across the harbour with the wooded grounds of the castle to the right of view contrasting with the port, ferry terminal building and built development extending along South Beach to the left.
Landscape/coastal sensitivity: The viewpoint is located within the *Sloping Crofting* LCT (medium sensitivity) although in stark contrast to the characteristic and repetitive pattern of croft houses, backed by crofting strips within the linear arrangement of crofting townships set amongst exposed boggy moorland, the local landscape is dominated by the historic core of Stornoway. In relation to coastal character, the viewpoint is located within the *Stornoway Harbour* CCA and at this point, the surrounding area is very busy with activity, and is characterised by extensive town centre development and harbour infrastructure. Taking into account the Conservation Area status, sensitivity is therefore assessed as **medium-high**.
Visual sensitivity: <u>Visitors/residents</u> - high susceptibility. The scenic views across the harbour experienced by nearby residents along South Beach and a large number of visitors to the town are an important part of their visual amenity – high value. With a high susceptibility and value, the overall sensitivity of visitors and residential is assessed as **high.** <u>Road users</u> - medium susceptibility. Although some road users are travelling for commuting purposes, the busy road network in and around the town is also used for tourism purposes where the experience of scenic views are an important factor – high value. With a medium susceptibility and high value, the overall sensitivity of road users is assessed as **medium-high.**
Assessment of Predicted Effects
Parts of proposed development potentially visible:

VIEWPOINT 2 - South Beach (see Figure 5.10)
In the centre of view, an area of rock extraction associated with the Arnish Link Road and the construction of the main levelled/reclaimed platform would be visible, as would the industrial/storage building backed by rising ground. Most of the platform and all of the associated linkspan would be visible where it extends into the harbour. At times, a large cruise ship would also be visible.
Construction effects: Construction activity, including the extraction of rock, dredging of the seabed and the reclamation of land would be very obvious across the site. These complex and large-scale engineering operations on land and sea would result in widespread views of construction infrastructure, storage of materials, noise, activity and movement of large vehicles. The magnitude of landscape/coastal and visual effect is assessed as **large,** resulting in a **major** (significant) effect.
Landscape/coastal effects (operational): During the operational stages of the proposed development, the main change would result from the extraction of rock along the sensitive cliffs and moorland slopes within the site. This would noticeably change the profile of a small part of the coast although the sensitive skyline would remain unaffected. The engineered profile of the rock extraction would also contrast with the semi-natural character of the surrounding coastline. Furthermore, the levelled/reclaimed platform and its associated built development, and other industrial infrastructure, would detract from the undeveloped nature and simple landscape pattern of the locality. However, considering the context of the nearby harbour and busy main road, large boat movements and other activity across the site would reflect the dynamic nature of the surrounding area. Considering the influence of large-scale industrial development at Arnish Point, the changes would also not be an entirely uncharacteristic addition to the backdrop of the harbour. The proposed industrial/storage building would also be less obvious in the landscape than the existing building on Arnish Point. Considering these factors, the magnitude of landscape/coastal effect is predicted to be **medium.**
Visual effects (operational): During the operational stages, the various components of the proposed development would be quite prominent in view. In particular, areas of rock extraction and reclaimed/levelled platform with associated infrastructure and activity would introduce a visual focus that would detract from the view across open water towards the backdrop of semi-natural cliffs and moorland. Areas of rock extraction would also result in a noticeable contrast in colour and texture to the surrounding cliff faces and slopes. Taken collectively, the parts of visible development and activity would only occupy a moderate part of the 50^0 view in which port related infrastructure and activity already have a very notable influence. Views of the nearby wooded grounds of the castle would also be largely unaffected. With the presence of a very large cruise ship in view, the overall, the magnitude of visual effect is assessed as **medium-large** and considering activity and development would be experienced in the context of the busy port and nearby town centre, a **moderate-major** (adverse) and significant visual effect is predicted.

Summary	
Significance of temporary construction visual effects	Major (adverse) - **significant**
Magnitude of landscape/coastal effects (construction)	Large (adverse)
Magnitude of landscape/coastal effects (operational)	Medium (adverse)
Significance of visual effects (operational)	Moderate-major (adverse) - **significant**

VIEWPOINT 3 - Newton Street (see Figure 5.11)
Grid reference: NB 43017 32348
View direction: 220^0
Distance to nearest part of Development: 1.03 km
Landscape Character Type: Sloping Crofting
Coastal Character Area: Stornoway Harbour CCA
Landscape designations: None
Baseline Assessment
Context: At an elevation of approximately 5 m AOD, the viewpoint is located at a small area of public greenspace, alongside the eastern end of Newton Street overlooking the recently constructed marina. A row of residential dwellings along the street look onto the Newton Basin where a nearby causeway leads towards a coastguard station and industrial units on Goat Island. With a public bench, the viewpoint is a popular location for residents and visitors walking along the water's edge to rest and enjoy the view across the harbour.
Current view: Looking south-west towards the site, the foreground view is dominated by a causeway that leads from Newton Street to Goat Island. This separates the partially enclosed water of Newton Basin and the open waters of the inner harbour beyond. A coast guard building is just visible to the left of view and to the right, an industrial unit on Goat Island. Above the causeway, a containing backdrop of undulating moorland extends across the view. To the right, the policy woodlands in the grounds of Lews Castle extend across rising ground and to the left, a large industrial building (BiFab plant) is situated against a backdrop of moorland slopes. This 50^0 view forms part of a wider 180^0 across Newton Basin. The wooded grounds of the castle provide a distinctive backdrop to the right of view whilst to left; a nearby power station is prominent in view.
Landscape/coastal sensitivity: The viewpoint is located within the *Sloping Crofting* LCT although as the characteristic and repetitive pattern of croft houses, backed by crofting strips within the linear arrangement of crofting townships set amongst exposed boggy moorland are not reflected here, coastal character is more relevant to consider. Located within the *Stornoway Harbour* CCA, the surrounding area is very busy with activity, and is characterised by extensive town centre development and harbour infrastructure. As the viewpoint is outside of the Conservation Area, sensitivity is therefore assessed as **medium**.
Visual sensitivity: <u>Visitors/residents</u> - high susceptibility. The scenic views across the harbour experienced by nearby residents along Newton Street and a large number of visitors to the town are an important part of their visual amenity – high value. With a high susceptibility and value, the overall sensitivity of visitors and residential is assessed as **high.** <u>Road users</u> - medium susceptibility. Although some road users are travelling for commuting purposes, the busy road network in and around the town is also used for tourism purposes where the experience of scenic views are an important factor – high value. With a medium susceptibility and high value, the overall sensitivity of road users is assessed as **medium-high.**

VIEWPOINT 3 - Newton Street (see Figure 5.11)	
Assessment of Predicted Effects	
Parts of proposed development potentially visible: Across most of the view, areas of rock extraction associated with the Arnish Link Road and the construction of the main levelled/reclaimed platform would be visible. Most of the platform would also be visible above an intervening causeway, as would most of the industrial/storage building above an intervening rocky outcrop on Goat Island. At times, a large cruise ship would also be visible. The linkspan would be screened from view by intervening landform.	
Construction effects: Construction activity, including the extensive extraction of rock, dredging of the seabed and the reclamation of land would be very obvious. These complex and large-scale engineering operations on land and sea would result in very widespread views of construction infrastructure, storage of materials, noise, activity and movement of large vehicles. The magnitude of landscape/coastal and visual effect is assessed as **large,** resulting in a **major** (significant) effect.	
Landscape/coastal effects (operational): During the operational stages of the proposed development, the main change would result from the extraction of rock along the sensitive cliffs and moorland slopes that provide an important backdrop to the harbour. This would very noticeably change the profile of the coast although from this location, the existing skyline would be protected. The engineered profile of the rock extraction would also contrast with the semi-natural character of the surrounding coastline and the introduction of the levelled/reclaimed platform and its associated built development, and other industrial/storage infrastructure, would detract from the undeveloped nature and simple landscape pattern that is typical across most of the western side of the harbour. However, considering the context of the nearby harbour and busy road, large boat movements and other activity across the site would reflect the dynamic nature of the locality. In addition, with the influence of large-scale industrial development at Arnish Point, the changes would also not be an entirely uncharacteristic addition to the backdrop of the harbour. Nonetheless, primarily due to the large extent of rock extraction that would be prominent along the coastline, the magnitude of landscape/coastal effect is predicted to be **medium.**	
Visual effects (operational): During the operational stages, the various components of the proposed development would be quite prominent in view. Areas of rock extraction and levelled/reclaimed platform with associated infrastructure and activity would introduce a new visual focus that would detract from the view across Newton Basin to a backdrop of semi-natural cliffs and moorland slopes. Areas of rock extraction would also result in a very noticeable contrast in colour and texture to the surrounding cliff faces and slopes. Taken collectively, the parts of visible development and activity would occupy a very large part of the 50^0 view and at times, the presence of a very large cruise ship would be very prominent. Overall, the magnitude of visual effect is assessed as **medium-large,** resulting in a **moderate-major** (significant) effect.	
Summary	
Significance of temporary construction visual effects	Major (adverse) - **significant**
Magnitude of landscape/coastal effects (construction)	Large (adverse)
Magnitude of landscape/coastal effects (operational)	Medium (adverse)
Significance of visual effects (operational)	Moderate-major (adverse) - **significant**

VIEWPOINT 4 - Harbour, offshore (see Figure 5.12)
Grid reference: NB 42608 31772
View direction: 220^0
Distance to nearest part of Development: 0.32 km
Coastal Character Type: Stornoway Harbour
Landscape designations: None
Baseline Assessment
Context: The viewpoint is located in close proximity to the site within Stornoway harbour, along the approximate route of the Stornoway to Ullapool ferry. With two daily passenger departures (and usually a third dedicated for freight) and arrivals, the viewpoint therefore represents an important gateway to the town experienced by a large number of visitors, and those undertaking other water-based activity in the harbour.
Current view: Looking south-west towards the nearby site, the view is dominated by semi-natural cliffs and slopes that provide a sense of undulating containment to the inshore waters. Apart from a line of transmission poles that cross part of the skyline and some outbuildings to the left of view, the coastline appears free from noticeable development. This 50^0 view forms part of a wider 360^0 of the harbour and nearby town. To the south, the Arnish Lighthouse, located on the low-lying headland of Arnish Point, forms a visual focus on the skyline and to its right, a large industrial building (BiFab plant) is also prominent. To the north and east, the town of Stornoway and associated port are viewed against the distinctive wooded backdrop of Lews Castle.
Landscape/coastal sensitivity: The viewpoint is located within the *Stornoway Harbour* CCA where the influence of nearby undeveloped cliffs backed by undulating moorland slopes underpin a strong sense of naturalness and relatively sense of tranquillity. Detached from the busy influence of the town and port, sensitivity is assessed as **high.**
Visual sensitivity: <u>Visitors/recreational users</u> - high susceptibility. The scenic views across the harbour experienced by a large number of visitors to the town are an important part of their visual amenity – high value. With a high susceptibility and value, the overall sensitivity of visitors and recreational users is assessed as **high.**
Assessment of Predicted Effects
Parts of proposed development potentially visible: Across most of the view, large areas of rock extraction associated with the Arnish Link Road and the construction of the main levelled/reclaimed platform would be visible. Most of the platform and all of the associated linkspan would also be visible, as would most of the industrial/storage building above an intervening rocky outcrop. At times, a large cruise ship would also be visible.
Construction effects: Construction activity, including the extensive extraction of rock, dredging of the seabed and the reclamation of land would be highly obvious. These complex and large-scale engineering operations on land and sea would result in very widespread views of nearby construction infrastructure, storage of materials, noise, activity and movement of large vehicles. The magnitude of landscape/coastal and visual effect is assessed as **very large,** resulting in a **substantial** (significant) effect.

VIEWPOINT 4 - Harbour, offshore (see Figure 5.12)	
Landscape effects (operational): During the operational stages of the proposed development, the main change would result from the large-scale extraction of rock along the sensitive cliffs and associated slopes within the site. This would very noticeably change the profile of the coast, particularly where the extraction would extend to the skyline. In places, the natural profile of the cliffs and slopes would be completely lost. The engineered profile of the rock extraction would also contrast with the semi-natural character of the surrounding coastline and the levelled/reclaimed platform and its associated built development, and other industrial infrastructure, would detract from the undeveloped nature and simple landscape pattern of the locality. With large boats movements and other activity; the relative tranquillity currently experienced in the local area would also be compromised. Viewed in close proximity, the coastal character of the locality would completely change, and the magnitude of effect is therefore assessed as **very large.**	
Visual effects (operational): During the operational stages, the various components of the proposed development would occupy the entire view. In particular, the extensive areas of rock extraction and levelled/reclaimed platform with associated infrastructure and activity would introduce a dominant visual focus that would detract from the view across the water to a backdrop of semi-natural cliffs and moorland slopes. Areas of rock extraction would also result in a very noticeable contrast in colour and texture to the surrounding cliff face and slopes. Taken collectively, the parts of visible development and activity would occupy the entire 50^0 view and at times, the presence of a very large cruise ship would be very prominent. Overall, the magnitude of visual effect is assessed as **very large,** resulting in a **substantial** (significant) effect.	
Summary	
Significance of temporary construction visual effects	Substantial (adverse) - **significant**
Magnitude of landscape effects (construction)	Very large (adverse)
Magnitude of landscape effects (operational)	Very large (adverse)
Significance of visual effects (operational)	Substantial (adverse) - **significant**

VIEWPOINT 5 - Lower Sandwick (see Figure 5.13)
Grid reference: NB 43849 31643
View direction: 265^0
Distance to nearest part of Development: 1.37 km
Landscape Character Type: Sloping Crofting
Coastal Character Area: Stornoway Harbour CCA
Landscape designations: None
Baseline Assessment
Context: At an elevation of approximately 6 m AOD, the viewpoint is located on the end of a small headland to the south of Lower Sandwick. A relatively well trodden informal footpath leads around the headland and links with a designated footpath route around Sandwick Bay. Several residential dwellings are located in close proximity to the north, some of which have open views towards the site.
Current view: Looking south-west towards the site, the foreground view is dominated by open sea, near to the outer reaches of Stornoway Harbour. The view across the water leads towards a containing backdrop of undulating moorland that extends across the view. To the left, a large industrial building (BiFab plant) is situated against a backdrop of moorland slopes and partly breaks the skyline, with a lower lying building positioned below. This 50^0 view forms part of a wider 180^0 view where to the left, a rocky coastline extends out to open sea and to the right, there are views across Sandwick Bay towards a large power station building situation on a low-lying ridge.
Landscape/coastal sensitivity: The viewpoint is located within the *Sloping Crofting* LCT (medium sensitivity) where the characteristic and repetitive pattern of croft houses, backed by crofting strips within the linear arrangement of crofting townships set amongst exposed boggy moorland are clearly apparent. In terms of coastal character, the viewpoint is located within the *Stornoway Harbour* CCA, where the composition of open sea, rocky coastline, slopes of semi-natural vegetation and sandy beach contribute to a sense of relative remoteness and naturalness. Considering these factors, sensitivity is assessed as **medium-high**.
Visual sensitivity: <u>Recreational users/residents</u> - high susceptibility. The scenic views across the harbour experienced by a relatively small number of nearby residents and those undertaking informal recreational activity along the coast are an important part of their visual amenity – medium-high value. With a high susceptibility and medium-high value, the overall sensitivity is assessed as **high.**
Assessment of Predicted Effects
Parts of proposed development potentially visible: Across most of the view, large areas of rock extraction associated with the construction of the main levelled/reclaimed platform would be visible. Most of the platform and all of the associated linkspan would also be visible, as would all of the industrial/storage building. At times, a large cruise ship would also be visible. Most of the access road would be screened from view by intervening landform.
Construction effects:

VIEWPOINT 5 - Lower Sandwick (see Figure 5.13)	
Construction activity, including the extensive extraction of rock, dredging of the seabed and the reclamation of land would be highly obvious. These complex and large-scale engineering operations on land and sea would result in very widespread views of construction infrastructure, storage of materials, noise, activity and movement of large vehicles. The magnitude of landscape/coastal and visual effect is assessed as **large,** resulting in a **major** (significant) effect.	
Landscape/coastal effects (operational): During the operational stages of the proposed development, the main change would result from the extensive extraction of rock along the sensitive cliffs and moorland slopes that provide an important backdrop to the harbour. This would very noticeably change the profile of the coast although from this location, the existing skyline would be protected. The engineered profile of the rock extraction would also contrast with the semi-natural character of the surrounding coastline and the introduction of the levelled/reclaimed platform and its associated built development, and other industrial infrastructure, would detract from the undeveloped nature and simple landscape pattern that is typical across most of the western side of the harbour. The magnitude of landscape/coastal effect is predicted to be **medium-large.**	
Visual effects (operational): During the operational stages, the various components of the proposed development would be prominent in view. In particular, the extensive areas of rock extraction and reclaimed/levelled platform with associated infrastructure and activity would introduce a prominent visual focus that would detract from the view across the open water to a backdrop of semi-natural cliffs and moorland slopes. Areas of rock extraction would also result in a very noticeable contrast in colour and texture to the surrounding cliff faces and slopes. Taken collectively, the parts of visible development and activity would occupy a very large part of the 50^0 view and at times, the presence of a very large cruise ship would be very prominent. Overall, the magnitude of visual effect is assessed as **large,** resulting in a **major** (significant) effect.	
Summary	
Significance of temporary construction visual effects	Major (adverse) - **significant**
Magnitude of landscape/coastal effects (construction)	Large (adverse)
Magnitude of landscape/coastal effects (operational)	Medium-large (adverse)
Significance of visual effects (operational)	Major (adverse) - **significant**

VIEWPOINT 6 - Newmarket (see Figure 5.14)
Grid reference: NB 42378 35446
View direction: 175^0
Distance to nearest part of Development: 3.92 km
Landscape Character Type: Sloping Crofting
Coastal Character Area: N/A
Landscape designations: None
Baseline Assessment
Context: At an elevation of approximately 35 m AOD, the viewpoint is located alongside busy A857 that passes through the residential settlement of Newmarket, on the northern fringes of Stornoway. In addition to representing the views of main road users, several residential dwellings are located in close proximity, some of which have open views towards the site.
Current view: Looking south towards the site, the foreground view is dominated by built development alongside the main road. Beyond some sloping fields in the middle ground, views of extensive development across Stornoway are back by relatively distant views of rising moorland and open sea.
Landscape sensitivity: The viewpoint is located within the *Sloping Crofting* LCT (medium sensitivity) where the characteristic and repetitive pattern of croft houses, backed by crofting strips within the linear arrangement of crofting townships set amongst exposed boggy moorland are clearly apparent. Sensitivity is therefore assessed as **medium**.
Visual sensitivity: <u>Residents</u> - high susceptibility. The views across the town experienced by several nearby residents along Newton Street and a large number of visitors to the town are part of their visual amenity – medium value. With a high susceptibility and medium value, the overall sensitivity of residential is assessed as **medium-high.** <u>Road users</u> - medium susceptibility. Although some road users are travelling for commuting purposes, the busy road network in and around the town is also used for tourism purposes where the experience of scenic views are an important factor – high value. With a medium susceptibility and high value, the overall sensitivity of road users is assessed as **medium-high.**
Assessment of Predicted Effects
Parts of proposed development potentially visible: All permanent parts of built development would be screened from view by intervening development across the town although a small part of the rock extraction would be visible. At times, the upper part of a large cruise ship would also be visible.
Construction effects: Only small part of all construction activity relating to the rock extraction would be evident and the magnitude of effect is assessed as **negligible,** resulting in a **minor-moderate** (not significant) effect.
Landscape effects (operational):

VIEWPOINT 6 - Newmarket (see Figure 5.14)	
Where a small part of rock extraction would be evident, this would contrast with the surrounding moorland slopes to a very degree. Consequently, the magnitude of effect is assessed as **negligible,** resulting in a **minor-moderate** (not significant) effect**.**	
Visual effects (operational): The small part of rock extraction would be quite difficult to discern at this distance although at times, a cruise ship would be noticeable above the town. As most parts of the development would be screened from view, the magnitude of effect is judged to be **small,** resulting in a **moderate** (not significant) effect.	
Summary	
Significance of temporary construction visual effects	Minor-moderate (adverse) – **not significant**
Magnitude of landscape/coastal effects (construction)	Negligible (adverse)
Magnitude of landscape/coastal effects (operational)	Negligible (adverse)
Significance of visual effects (operational)	Moderate (adverse) – **not significant**

VIEWPOINT 7 - Lews Castle (see Figure 5.15)
Grid reference: NB 42030 33153
View direction: 170^0
Distance to nearest part of Development: 1.64 km
Landscape Character Type: Boggy Moorland
Coastal Character Area: Stornoway Harbour CCA
Landscape designations: Lews Castle GDL & Stornoway Conservation Area
Baseline Assessment
Context: At an elevation of approximately 24 m AOD, the viewpoint is located in front of Lews Castle, within the grounds of the Lews Castle and Lady Lever Park Garden and Deigned Landscape (GDL) and the Stornoway Conservation Area. With a nearby museum, café and an extensive network of Core Paths that lead through the wooded grounds, the castle is a very popular visitor attraction and an important part of the town's natural and cultural heritage.
Current view: Looking south towards the site, part of the town's historic core and port are visible above nearby intervening vegetation and framed by surrounding trees, the view is focused on the picturesque inner harbour, contained by the undulating moorland slopes above a rocky coastline. In the backdrop, a large industrial building (BiFab plant) is prominent on the skyline of the low-lying headland of Arnish Point. Most of the wider view is restricted by nearby trees and vegetation.
Landscape/coastal sensitivity: The viewpoint is located within the *Boggy Moorland* LCT (high sensitivity) although in stark contrast to the typical character of large scale, gently undulating peat moorlands, indented with numerous large and small rounded lochs that define this LCT, the character of the local landscape is heavily influenced by the dense coverage of designed policy woodlands in the grounds of the nearby castle. As such, the coastal character area in which the viewpoint is located (*Stornoway Harbour* CCA) is more relevant to consider. Taking into account the composition of largely undeveloped cliffs backed by semi-natural moorland slopes, the influence of the wooded castle grounds and the open views across the inner harbour, sensitivity is assessed as **high.**
Visual sensitivity: <u>Visitors/recreational users</u> - high susceptibility. The scenic views across the harbour of those visiting the castle and its associated attractions are an important part of the experience at a very popular location – high value. With a high susceptibility and value, the overall sensitivity of visitors and recreational users is assessed as **high.**
Assessment of Predicted Effects
Parts of proposed development potentially visible: In the centre of view, areas of rock extraction associated with the construction of the main levelled/reclaimed platform would be visible although some parts of the extraction to the right of view would be screened by intervening landform. A large part of the platform and all of the associated linkspan would be visible where it extends into the harbour. Backed by rising ground, most of the industrial/storage building would also be visible and at times, a large cruise ship.
Construction effects: Construction activity, including the extraction of rock, dredging of the seabed and the reclamation of land would be very obvious across the site. These complex and large-scale engineering operations on land and sea would result in views focused on construction infrastructure, storage of

VIEWPOINT 7 - Lews Castle (see Figure 5.15)
materials, noise, activity and movement of large vehicles. The magnitude of landscape/coastal and visual effect is assessed as **medium-large,** resulting in a **moderate-major** (significant) effect.
Landscape/coastal effects (operational): During the operational stages of the proposed development, the main change would result from the large-scale extraction of rock along the sensitive cliffs and associated slopes within the site. This would noticeably change the profile of the coast, although the extent is relatively localised from this viewpoint. The engineered profile of the rock extraction would also contrast with the semi-natural character of the surrounding coastline and the reclaimed/levelled platform and its associated built development, and other industrial infrastructure, would detract from the undeveloped nature and simple landscape pattern of the locality. With large boats movements and other activity; the relative tranquillity currently experienced in the local area would also be compromised. Considering the influence of large-scale industrial development at Arnish Point however, the changes would not be an entirely uncharacteristic addition to the western coastline of the harbour. The proposed industrial/storage building would also be less obvious in the landscape than the existing building on Arnish Point. Considering these factors, the magnitude of landscape/coastal effect is predicted to be **medium.**
Visual effects (operational): During the operational stages, the various components of the proposed development would be quite prominent in view. In particular, the rock extraction and levelled/reclaimed platform with associated infrastructure and activity would introduce a new visual focus that would detract from the setting of the town and the view across open water towards the backdrop of undeveloped moorland slopes. Areas of rock extraction would also result in a noticeable contrast in colour and texture to the surrounding cliff faces and slopes. Taken collectively, the parts of visible development and activity would occupy a moderate part of the 50^0 framed view, with a noticeable increase in visible built development. The presence of a very large cruise ship would also be very prominent. Overall, the magnitude of visual effect is assessed as **medium-large,** resulting in a **moderate-major** (significant) effect**.**

Summary	
Significance of temporary construction visual effects	Moderate-major (adverse) - **significant**
Magnitude of landscape/coastal effects (construction)	Medium-large (adverse)
Magnitude of landscape/coastal effects (operational)	Medium (adverse)
Significance of visual effects (operational)	Moderate-major (adverse) - **significant**

VIEWPOINT 8 - Ferry Terminal (see Figure 5.16)
Grid reference: 42428 32576
View direction: 170^0
Distance to nearest part of Development: 1.06 km
Landscape Character Type: Sloping Crofting
Coastal Character Area: Stornoway Harbour CCA
Landscape designations: None
Baseline Assessment
Context: At an elevation of approximately 4 m AOD, the viewpoint is located at the water's edge, immediately to south of the ferry terminal building and next to the passenger's car park. With a town centre location, the local area is very busy with activity and accommodates the passing of a large number of ferry passengers and other visitors to the town.
Current view: Looking south towards the site, a cluster of industrial buildings on Goat Island and an associated harbour wall to the left of view provide a sense of nearby containment to the inshore waters of Newton Basin. Beyond the expanse of open sea in the main harbour, the containing backdrop is dominated by rocky a coastline below undulating moorland slopes. To the left of these slopes, a large industrial building (BiFab plant) is prominent on the low-lying skyline of Arnish Point. This 50^0 view forms part of a wider 90^0 contained by the pier to the right and the car park to the left.
Landscape/coastal sensitivity: The viewpoint is located within the *Sloping Crofting* LCT (medium sensitivity) although in stark contrast to the characteristic and repetitive pattern of croft houses, backed by crofting strips within the linear arrangement of crofting townships set amongst exposed boggy moorland, the local landscape is dominated by the busy town centre. In relation to coastal character, the viewpoint is located within the *Stornoway Harbour* CCA and at this point, the surrounding area is very busy with activity, and is characterised by extensive town centre development and harbour infrastructure. Sensitivity is therefore assessed as **medium**.
Visual sensitivity: <u>Visitors/ferry passengers</u> - high susceptibility. The scenic views across the harbour experienced by a large number of ferry passengers and visitors to the town are an important part of their visual amenity – high value. With a high susceptibility and value, the overall sensitivity of visitors and ferry passengers is assessed as **high.**
Assessment of Predicted Effects
Parts of proposed development potentially visible: In the centre of view, large areas of rock extraction associated with the Arnish Link Road and the construction of the main levelled/reclaimed platform would be visible, as would the industrial/storage building. Most of the platform and associated linkspan would be visible and at times, a large cruise ship.
Construction effects: Construction activity, including the extraction of rock, dredging of the seabed and the reclamation of land would be very obvious across the site. These complex and large-scale engineering operations on land and sea would result in quite widespread views of construction infrastructure, storage of materials, noise, activity and movement of large vehicles. The magnitude of

VIEWPOINT 8 - Ferry Terminal (see Figure 5.16)
landscape/coastal and visual effect is assessed as **medium-large,** resulting in a **moderate-major** (significant) effect.
Landscape/coastal effects (operational): During the operational stages of the proposed development, the main change would result from the extraction of rock along the sensitive cliffs and moorland slopes within the site. This would very noticeably change the profile of the coast, particularly where the extraction would extend to the skyline. The engineered profile of the rock extraction would also contrast with the semi-natural character of the surrounding coastline. Furthermore, the levelled/reclaimed platform and its associated built development, and other industrial infrastructure, would detract from the undeveloped nature and simple landscape pattern of the locality. However, considering the context of the nearby harbour and busy town centre, large boat movements and other activity across the site would reflect the dynamic nature of the surrounding area. Considering the influence of large-scale industrial development at Arnish Point, the changes would also not be an entirely uncharacteristic addition to the backdrop of the harbour. The industrial/storage building would also be less obvious in the landscape than the existing building on Arnish Point. Considering these factors, the magnitude of landscape/coastal effect is predicted to be **medium.**
Visual effects (operational): During the operational stages, the various components of the proposed development would be prominent in view. In particular, the extensive areas of rock extraction and levelled/reclaimed platform with associated infrastructure and activity would introduce a prominent visual focus that would detract from the view across open water towards the backdrop of semi-natural cliffs and moorland. Areas of rock extraction would also result in a noticeable contrast in colour and texture to the surrounding cliff faces and slopes. Taken collectively, the parts of visible development and activity would only occupy a moderate part of the 50^0 view in which port related infrastructure, industrial development and other activity already have a very notable influence. The presence of a very large cruise ship would also be very prominent. Overall, the magnitude of visual effect is assessed as **medium-large** and considering activity and development would be experienced in the context of the busy port and nearby town centre, a **moderate-major** (adverse) and significant visual effect is predicted.

Summary	
Significance of temporary construction visual effects	Moderate-major (adverse) - **significant**
Magnitude of landscape/coastal effects (construction)	Medium-large (adverse)
Magnitude of landscape/coastal effects (operational)	Medium (adverse)
Significance of visual effects (operational)	Moderate-major (adverse) - **significant**

VIEWPOINT 9 - Lewis War Memorial (see Figure 5.17)
Grid reference: NB 41727 34329
View direction: 160^0
Distance to nearest part of Development: 2.85 km
Landscape Character Type: Sloping Crofting
Coastal Character Area: N/A
Landscape designations: None
Baseline Assessment
Context: At an elevation of approximately 57 m AOD, this elevated viewpoint is located alongside the Lewis War Memorial, at the western edge of Stornoway. Commemorating those who lost their lives in World War 1, the memorial takes the form of a distinctive Scottish Baronial Tower that rises to a height of 26 m. With panoramic views over the town and the sea beyond, the viewpoint is a popular visitor attraction.
Current view: Looking south-east towards the site, the foreground drops quite steeply away towards a rising middle ground of a golf course set within the wooded grounds of Lews Castle and Lady Lever Park GDL. To the left of this, the lower-lying town of Stornoway with the Eye Peninsula and open sea beyond forms a strong visual focus. Above the golf course to the right of view, the moorland slopes along the western of the harbour (out of view) provide a rising backdrop. This 50^0 view forms part of a wider 180^0 view of surrounding moorlands.
Landscape sensitivity: The viewpoint is located within the *Sloping Crofting* LCT (medium sensitivity) where the characteristic and repetitive pattern of croft houses, backed by crofting strips within the linear arrangement of crofting townships set amongst exposed boggy moorland are apparent in the wider view although considering its elevation and the scenic quality of views, sensitivity is assessed as **medium-high**.
Visual sensitivity: <u>Visitors</u> - high susceptibility. The panoramic scenic views of those visiting the memorial are an important part of the experience at a popular cultural attraction – high value. With a high susceptibility and value, the overall sensitivity of visitors is assessed as **high.**
Assessment of Predicted Effects
Parts of proposed development potentially visible: Only a relatively small part of the rock extraction associated with the levelled/reclaimed platform and access road would be visible. The industrial/storage building, platform and associated linkspan would all be screened from view by an intervening wooded ridge within the grounds of Lews Castle. At times, a large cruise ship would also be visible.
Construction effects: Some construction activity associated the extraction of rock would be evident although any activity associated with the dredging of the seabed, reclamation of land and construction of the levelled/reclaimed platform and associated infrastructure would be screened from view. The magnitude of landscape and visual effect is therefore assessed as **small,** resulting in a **moderate** (not significant) effect.
Landscape effects (operational): During the operational stages of the proposed development, the only change that would be evident is an area of rock extraction along the sensitive cliffs and moorland slopes within part of the site. At

VIEWPOINT 9 - Lewis War Memorial (see Figure 5.17)	
this distance, this would only result in a minor change to the profile of the coast and the integrity of the skyline would be unaffected. Any movement of large ships would be characteristic to harbour. Considering these factors, the magnitude of landscape/coastal effect is predicted to be **negligible-small** with a **minor-moderate** (not significant) effect**.**	
Visual effects (operational): At this distance, an area of rock extraction would be evident although this would only occupy a very small proportion of the view. As noted above, all other parts of the proposed development would be screened from view. The visual focus towards the town and sea beyond would remain unaffected and the magnitude of visual effect is assessed as **negligible-small** with a **minor-moderate** (not significant) effect.	
Summary	
Significance of temporary construction visual effects	Moderate (adverse) - **not significant**
Magnitude of landscape/coastal effects (construction)	Small (adverse)
Magnitude of landscape/coastal effects (operational)	Negligible-small (adverse)
Significance of visual effects (operational)	Minor-moderate (adverse) - **not significant**

VIEWPOINT 10 - Iolaire Monument Car Park (see Figure 5.18)
Grid reference: NB 43849 31643
View direction: 280^0
Distance to nearest part of Development: 1.89 km
Landscape Character Type: Sloping Crofting
Coastal Character Area: Stornoway Harbour CCA
Landscape designations: None
Baseline Assessment
Context: At an elevation of approximately 18 m AOD, the viewpoint is located at the edge of a visitor car park that serves a nearby Iolaire monument. Accessed by a short section of footpath, the monument commemorates the lives of those lost through the tragic sinking of the Iolaire yacht that was carrying soldiers back home to the island soon after the end of World War 1. Views towards the site from the monument are partially curtailed by intervening rising ground. Although the monument is sign-posted from the main road, considering the small size of the car park, it would only appear to attract a relatively small number of visitors.
Current view: Looking north-west towards the site, a foreground of gently undulating rough grass gives way to a view of the outer reaches of Stornoway harbour. Beyond the sea, rising moorland provides a strong containing backdrop to the harbour and to the left of view, a cluster of large industrial building (BiFab plant) are situated on the lower-lying Arnish Point at the mouth of the harbour. This 50^0 view forms part of a wider 180^0 view where further to the right, the town of Stornoway forms a visuals focus. To the left, there are long range views out to sea.
Landscape/coastal sensitivity: The viewpoint is located within the *Sloping Crofting* LCT (medium sensitivity) where the characteristic and repetitive pattern of croft houses, backed by crofting strips within the linear arrangement of crofting townships set amongst exposed boggy moorland are clearly apparent. In terms of coastal character, the viewpoint is located within the *Stornoway Harbour* CCA, where the composition of open sea, rocky coastline, slopes of semi-natural vegetation and sandy beach contribute to a sense of relative remoteness and naturalness. Considering these factors, sensitivity is assessed as **medium-high**.
Visual sensitivity: <u>Visitors</u> - high susceptibility. The panoramic scenic views of those visiting the memorial are an important part of the experience at an important cultural attraction – high value. With a high susceptibility and value, the overall sensitivity of visitors is assessed as **high.**
Assessment of Predicted Effects
Parts of proposed development potentially visible: In the backdrop to the harbour, large areas of rock extraction associated with the Arnish Link Road and the construction of the main levelled/reclaimed platform would be visible. All of the platform and associated linkspan and finger pier would also be visible, as would all of the industrial/storage building. At times, a large cruise ship would also be visible.
Construction effects: Construction activity, including the extensive extraction of rock, dredging of the seabed and the reclamation of land would be highly obvious. These complex and large-scale engineering operations on land and sea would result in widespread views of construction infrastructure, storage of materials,

VIEWPOINT 10 - Iolaire Monument Car Park (see Figure 5.18)	
noise, activity and movement of large vehicles. The magnitude of landscape/coastal and visual effect is assessed as **large,** resulting in a **major** (significant) effect.	
Landscape/coastal effects (operational): During the operational stages of the proposed development, the main change would result from the extensive extraction of rock along the sensitive cliffs and moorland slopes that provide an important backdrop to the harbour. This would very noticeably change the profile of the coast although from this location, the existing skyline would be protected. The engineered profile of the rock extraction would also contrast with the semi-natural character of the surrounding coastline and the introduction of the levelled/reclaimed platform and its associated built development, and other industrial infrastructure, would detract from the undeveloped nature and simple landscape pattern that is typical across most of the western side of the harbour. However, considering the influence of large-scale industrial development at Arnish Point, the changes would also not be an entirely uncharacteristic addition to the backdrop of the harbour. The proposed industrial/storage building would also be less obvious in the landscape than the existing building on Arnish Point. The magnitude of landscape/coastal effect is predicted to be **medium-large.**	
Visual effects (operational): During the operational stages, the various components of the proposed development would be prominent in view. In particular, the extensive areas of rock extraction and reclaimed/levelled platform with associated infrastructure and activity would introduce a prominent visual focus that would detract from the view across open water towards the backdrop of semi-natural cliffs and moorland. Areas of rock extraction would also result in a noticeable contrast in colour and texture to the surrounding cliff faces and slopes. Taken collectively, the parts of visible development and activity would occupy a moderate part of the 50^0 view in which industrial development on Arnish already has a notable influence. The presence of a very large cruise ship would also be very prominent. Overall, the magnitude of visual effect is assessed as **medium-large,** resulting in a **moderate-major** (significant) visual effect.	
Summary	
Significance of temporary construction visual effects	Major (adverse) - **significant**
Magnitude of landscape/coastal effects (construction)	Large (adverse)
Magnitude of landscape/coastal effects (operational)	Medium-large (adverse)
Significance of visual effects (operational)	Moderate-major (adverse) - **significant**

VIEWPOINT 11 - Sandwick Bay (see Figure 5.19)
Grid reference: NB 43943 32183
View direction: 235^0
Distance to nearest part of Development: 1.64 km
Landscape Character Type: Crofting One
Coastal Character Area: Stornoway Harbour CCA
Landscape designations: None
Baseline Assessment
Context: At an elevation of approximately 3 m AOD, the viewpoint is located alongside a picnic bench on a popular footpath route that leads around the shore of Sandwick Bay. Behind the footpath, a cemetery is located on gently rising ground with some residential dwellings beyond.
Current view: Looking south-west towards the site, the foreground view is dominated by open sea within Stornoway Harbour. The view across the water leads towards a containing backdrop of undulating moorland that extends across the view. To the left, a large industrial building (BiFab plant) is situated against a backdrop of moorland slopes, with a lower-lying building positioned below. To the right of view, a reef extends across the water from the southern edge of Battery Point. This 50^0 view forms part of a wider 180^0 view of the bay where to the left, the settlement of Lower Sandwick is situated on a low-lying small headland that contains the bay. To the right, the view is contained by a large power station building on Battery Point.
Landscape/coastal sensitivity: The viewpoint is located within the *Sloping Crofting* LCT (medium sensitivity) where the characteristic and repetitive pattern of croft houses, backed by crofting strips within the linear arrangement of crofting townships set amongst exposed boggy moorland are clearly apparent. In terms of coastal character, the viewpoint is located within the *Stornoway Harbour* CCA, where the composition of open sea, rocky coastline, slopes of semi-natural vegetation and sandy beach contribute to a sense of relative remoteness and naturalness. Considering these factors, sensitivity is assessed as **medium-high**.
Visual sensitivity: <u>Recreational users</u> - high susceptibility. The scenic views across the harbour experienced by a relatively large number those undertaking informal recreational activity along the coast are an important part of their visual amenity – high value. With a high susceptibility and value, the overall sensitivity is assessed as **high.**
Assessment of Predicted Effects
Parts of proposed development potentially visible: Across most of the view, large areas of rock extraction associated with the Arnish Link Road and the construction of the main levelled/reclaimed platform would be visible. Most of the platform would also be visible, as would all of the industrial/storage building. At times, a large cruise ship would also be visible but the linkspan would be screened by landform.
Construction effects: Construction activity, including the extensive extraction of rock, dredging of the seabed and the reclamation of land would be very obvious. These complex and large-scale engineering operations on land and sea would result in quite widespread views of construction infrastructure, storage of

VIEWPOINT 11 - Sandwick Bay (see Figure 5.19)
materials, noise, activity and movement of large vehicles. The magnitude of landscape/coastal and visual effect is assessed as **large,** resulting in a **major** (significant) effect.
Landscape/coastal effects (operational): During the operational stages of the proposed development, the main change would result from the extensive extraction of rock along the sensitive cliffs and moorland slopes that provide an important backdrop to the harbour. This would very noticeably change the profile of the coast although from this location, the existing skyline would be protected. The engineered profile of the rock extraction would also contrast with the semi-natural character of the surrounding coastline and the introduction of the levelled/reclaimed platform and its associated built development, and other industrial infrastructure, would detract from the undeveloped nature and simple landscape pattern that is typical across most of the western side of the harbour. The magnitude of landscape/coastal effect is predicted to be **medium-large.**
Visual effects (operational): During the operational stages, the various components of the proposed development would be prominent in view. In particular, the extensive areas of rock extraction and levelled/reclaimed platform with associated infrastructure and activity would introduce a prominent visual focus that would detract from the view across the open water to a backdrop of semi-natural cliffs and moorland slopes. Areas of rock extraction would also result in a very noticeable contrast in colour and texture to the surrounding cliff faces and slopes. Taken collectively, the parts of visible development and activity would occupy a large part of the 50^0 view and at times, the presence of a very large cruise ship would also be very prominent. Overall, the magnitude of visual effect is assessed as **large,** resulting in a **major** (significant) visual effect.

Summary	
Significance of temporary construction visual effects	Major (adverse) - **significant**
Magnitude of landscape/coastal effects (construction)	Large (adverse)
Magnitude of landscape/coastal effects (operational)	Medium-large (adverse)
Significance of visual effects (operational)	Major (adverse) - **significant**

5.6.5 Construction Phase

5.6.5.1 Physical Landscape Resources

During the 18-month construction phase, the proposed development would result in the extraction of approximately 300,000 cubic metres of rock from the steep slopes across the western parts of the site. Consequently, the natural landform would be quite dramatically altered and the landcover of primarily a combination of wet and dry dwarf shrub heaths, and acid grasslands and naturally formed rocky outcrops and shingle along the coastal edge would be lost. The construction of the proposed reclamation and the dredging of seabed would take place across an area of approximately 320,000 square metres (dredge area approximately 260,000 and reclamation area approximately 60,000).

Considering the large extent and nature of changes to the sensitive coastal landforms and associated landcover, the magnitude of direct effect on the landscape resources of the site is predicted to be very large. With a high landscape and coastal sensitivity, effects would therefore be **substantial** (adverse) and **significant.**

5.6.5.2 Landscape Character

As detailed in Section 5.5.4, the study area covers three main landscape character types (LCTs) and the indirect landscape effect on these are assessed as follows:

<u>Sloping Crofting LCT</u>

For those viewpoints located within the *Sloping Crofting* LCT, a *large* magnitude of landscape effect is predicted during the construction phase from viewpoints 5 (Lower Sandwick) and 11 (Sandwick Bay). From viewpoints 2 (South Beach), 3 (Newton Street), 8 (Ferry Terminal) and 10 (Iolaire Monument Car Park), a *medium-large* magnitude of landscape effect is predicted. From viewpoint 9 (Lewis War Memorial) this reduces to *small* and from viewpoint 6 (Newmarket), *negligible*.

Although the magnitude of landscape effect experienced at a particular location is an important factor to consider, in determining the overall significance of an effect, the extent of change experienced across a landscape is also considered. As illustrated on Figure 5.6 in Volume 4 of this EIAR, theoretically visibility across the *Sloping Crofting* LCT is largely restricted to areas within 2 km from site, with most of the landscape further to the north and east outside of the ZTV. Furthermore, from within the large majority of the built environment where theoretical visibility is predicted, intervening buildings would screen views of construction activity. In practice therefore, the overall extent of open views to the site is relatively limited.

Nonetheless, from those parts of the LCT where open views across the harbour to a backdrop of moorland provide an important setting to this landscape, some localised significant effects would be experienced but considering the relatively small proportion of the landscape affected and the decreasing magnitude of effect with distance, the overall magnitude is predicted to be *medium*. With a *medium* sensitivity, the effect would therefore be **moderate** (adverse) and **not significant**.

<u>Boggy Moorland LCT</u>

Viewpoints 1 (Cuddy Point) and 7 (Lews Castle) are both located within the Boggy Moorland LCT and from these locations, a *large* magnitude of landscape effect is predicted during the construction phase. Although locally significant, only a very small proportion of the LCT would

be affected (see Figure 5.6). From nearly all parts of this landscape, there would be no views of construction activity. As such, the magnitude of effect is predicted to be *negligible* and considering its *high* sensitivity, a **minor-moderate** (adverse) and **not significant** effect.

Rocky Moorland LCT

Although there are no viewpoints located within this LCT, only a very small part in and around the site is within theoretical visibility (see Figure 5.6). As nearly all of the landscape would be unaffected by views of construction activity, the magnitude of effect is predicted to be *negligible,* resulting in a **moderate-minor** (adverse) and **not significant** effect.

5.6.5.3 Coastal Character

As detailed in Section 5.5.5, the study area covers three coastal character areas (CCAs) and the indirect effect on these are assessed as follows:

Stornoway Harbour

Of the 11 viewpoints assessed, nine of these are within the Stornoway Harbour Coastal Character Area and from all of these; the magnitude of landscape/coastal effect predicted during the construction phase is either *large* or *very large*. As detailed in the preceding Viewpoint Assessment, the main effects arising from construction activity concern the extensive extraction of rock, dredging of the seabed and the reclamation of land. These complex and large-scale engineering operations on land and sea would result in very widespread views of construction infrastructure, storage of materials, noise, activity and movement of large vehicles. Consequently, activity would notably contrast with and detract from the character of much of the surrounding coastline around the harbour.

As illustrated on Figure 5.7, nearly all of the CCA is within theoretical visibility and considering the prevailing open nature of the coastline, most parts would experience effects from construction activity. Overall, the magnitude of effect is judged to be *large*, although considering construction would take place within a wider context of the operational port and busy town centre activity, effects would be **moderate-major** (adverse) and **significant** when taking into account the medium-high sensitivity of the CCA.

Arnish Approaches

As illustrated on Figure 5.7, only a small proportion of the Arnish Approaches CCA, focused on Arnish Point, is within theoretical visibility. All of the rocky coastline that extends further south would not experience the effects of construction activity. With a *high* sensitivity, the overall magnitude of effect is predicted to be *negligible,* resulting in a **minor-moderate** (adverse) and **not significant** effect.

Holm/Braighe

Similar to the Arnish Approaches CCA, only a very part of the Holm/Braighe CAA at the mouth of the harbour is within the ZTV. As the entire coastline that extends further east is outside of theoretical views, a **minor-moderate** (adverse) and **not significant** effect is also predicted.

5.6.5.4 Landscape Designations

Lews Castle and Lady Lever Park GDL

The detailed assessments at viewpoints 1 (Cuddy Point) and 7 (Lews Castle) provide a worst case understanding of landscape effects on the GDL during the construction phase and from both locations, a *large* magnitude of effect is predicted. Although these would be locally

significant, most of the designation (as illustrated on Figure 5.8 in Volume 4 of this EIAR), is outside of theoretical visibility. Furthermore, from most parts within the ZTV, the dense coverage of surrounding policy woodlands would tend to screen views towards the site.

Nonetheless, considering the importance of the castle to the designation and the views across the harbour experienced from parts of its frontage, the overall magnitude of effect is judged to be *medium*. With a *high* sensitivity, effects are judged as **moderate-major** (adverse) and **significant.**

Stornoway Conservation Area

Viewpoints 1 (Cuddy Point), 2 (South Beach) and 7 (Lews Castle) all provide an understanding of how the setting of the Conservation Area would be affected and from these locations, a *large* magnitude of effect is predicted. As not all parts of the setting are affected however, the overall magnitude of effect is judged to *medium* and considering a *medium-high* sensitivity, **moderate** (adverse) and **not significant** effects are likely to be experienced.

5.6.5.5 Residents

South Beach

Considering the findings of the Viewpoint Assessment, it is very likely that from some of the south facing rooms of dwellings along South Beach near to viewpoint 2 (South Beach), residents would experience views of construction activity, including the extraction of rock, dredging of the seabed and the reclamation of land across much of their view. With large scale engineering operations taking place with associated infrastructure, storage of materials and movement of large vehicles, the magnitude of visual effect is assessed as *large*. Considering their *high* sensitivity, visual effects on residents are judged to be **major** (adverse) and **significant**.

Newton Street

It is very likely that for some residents in close proximity to viewpoint 3 (Newton Street), they would experience open views from south facing rooms across the harbour to extensive construction activity, including rock extraction, dredging of the seabed and the reclamation of land. Occupying a large part of their view, activity would be highly obvious, resulting in a *large* magnitude of visual effect. With a *high* sensitivity, effects are predicted to be **major** (adverse) and **significant**.

From some dwellings further to the west of viewpoints 3 however, it likely that intervening built development on Goat Island would screen a large part of construction activity from view and where this is this case, effects are likely to be **not significant**.

Sandwick Bay & Lower Sandwick

From viewpoint 5 (Lower Sandwick) and viewpoint 11 (Sandwick Bay), a *large* magnitude of visual effect is predicted as construction activity would occupy a very large part of the view across the harbour. For those residents with south facing rooms near to these viewpoint locations, it is likely that **major** effects would be experienced.

Other settlements

Table 5.5.4 identifies all main settlements with the study area and some of these including Melbost, Marybank, Steinis, and An Gleann Ur are outside of the ZTV. For those settlements

within theoretical visibility, the large majority of views towards the site would be screened by intervening built development, including those within Stornoway. Considering the very limited scope for open views to the site across these settlements, the overall visual effect on these is judged to be **not significant.**

5.6.5.6 Recreational Users

Lewis Castle Grounds Core Paths

As illustrated on Figure 5.8, approximately half of the Core Path Network in the grounds of Lews Castle is outside of the ZTV. From the large majority of footpaths within theoretical visibility, the dense coverage of surrounding woodlands would tend to screen any construction activity from view. From some short open sections of path near to the castle however, glimpsed views, similar to those at viewpoint 7 (Lews Castle) would be experienced.

Consequently, where any open views of construction activity experienced, the localised effect on walkers is likely to be moderate (not significant) although considering the short duration of these when walking through the grounds of the castle, the overall visual effect on the Core Path network is judged to be **moderate** (adverse) and **not significant.**

Wider path network

From most of the section of wider path network that leads across Battery Point and around Sandwick Bay, walkers would experience views of construction activity in quite close proximity. From viewpoint 11 (Sandwick Bay) *a large* magnitude of effect is predicted and as most parts of the route would have open views towards activity taking place across the large site, the overall effect is assessed as **major** (significant).

Ferry passengers

As detailed in the assessment at viewpoint 4 (Harbour), ferry passengers and other boat users would experience some very close up views of construction activity including the dredging of the seabed and the construction of the reclaimed area when passing near to the site. Consequently, a localised **substantial** (adverse) and **significant** is predicated. A **major** (adverse) and **significant** effect would also be experienced from the ferry terminal (viewpoint 8)**.**

However, with increasing distance from the site, views of any construction activity when sailing near to Arnish Point and the open sea beyond would be less noticeable and sometimes, experienced in context of other existing port and town centre activity. As such, the overall visual effect on ferry passengers travelling along the entire route with the harbour is judged to be **moderate-major** and **significant**.

Road Users

When travelling along the main roads as listed in Table 5.5.6, taking into account the limited extent of theoretical visibility along these routes and the screening effect of intervening built development, effects on all road users are judged to be **not significant.**

5.6.6 Operational Phase

5.6.6.1 Scope

This section sets out an assessment of the predicted long-term effects of the proposed development during its operational phase. In addition to desk and field work undertaken across the study area, this has been informed by the findings of the preceding Viewpoint Assessment and associated annotated photos (see Figures 5.9-19 in Volume 4 of this EIAR).

5.6.6.2 Landscape Character

As detailed in Section 5.5.4, the study area covers three main landscape character types (LCTs) within the ZTV and the indirect landscape effect on these are assessed as follows:

Crofting One LCT

For those viewpoints located within the Crofting One LCT, a *medium-large* magnitude of landscape effect is predicted during the operational phase from viewpoints 3 (Newton Street), 5 (Lower Sandwick) and 11 (Sandwick Bay). From viewpoints 2 (South Beach), 8 (Ferry Terminal) and 10 (Iolaire Monument Car Park), a *medium* magnitude of landscape effect is predicted. From viewpoint 9 (Lewis War Memorial) this reduces to *negligible -small* and from viewpoint 6 (Newmarket), *negligible*.

In considering the extent of change experienced across this LCT, Figure 5.8 illustrates that theoretically visibility is largely restricted to areas within 2 km from site, with most of the landscape further to the north and east outside of the ZTV. Where theoretical visibility is predicted across parts of Stornoway and surrounding settlements, the opportunity for open views in practice is very limited due to the screening effect of intervening built development. Overall, therefore, the extent of change experienced across the landscape is relatively limited.

From those parts of the LCT where there would be open views of the operational port, these would be experienced in the backdrop to already relatively busy and partially developed landscape where extensive development in and Stornoway exert a strong influence. Although the semi-natural character along parts of the rocky coastline to the east of the LCT and some long views from higher ground would be affected to a degree, most of the key characteristics (as detailed in Table 4.5.5.1 would remain unaffected.

Considering all of these factors, the magnitude of effect is predicted to be *low-medium* and with a *medium* sensitivity, the overall effect is assessed at **minor-moderate** (adverse) and **not significant**.

Boggy Moorland LCT

At Viewpoint 1 (Cuddy Point), a *medium-large* magnitude of landscape effect is predicted, reducing to *medium* at Lews Castle. These effects are largely as a consequence of the port contrasting with the semi-natural character of the surrounding undeveloped coastline and the wooded setting of Lews Castle. Although these effects are likely to be of very localised significance, only a very small proportion of the entire LCT would be affected (see Figure 5.8) as from nearly all parts, there would be no views of the operational port. Furthermore, most of the key characteristics (as detailed in Table 5.4.3) would remain unaffected. As such, the magnitude of effect is predicted to be *negligible* and considering its *high* sensitivity, a **minor-moderate** (adverse) and **not significant** effect.

Rocky Moorland LCT

Although there are no viewpoints located within this LCT, only a very small part in and around the site is within theoretical visibility (see Figure 5.8). As nearly all of the landscape would be unaffected by views of operational development and activity, the magnitude of effect is predicted to be *negligible,* resulting in a **minor-moderate** (adverse) and **not significant** effect.

5.6.6.3 Coastal Character

As detailed in Section 5.5.5, the study area covers three coastal character areas (CCAs) and the indirect effect on these are assessed as follows:

Stornoway Harbour

As illustrated on Figure 5.9, nearly all of the CCA is within theoretical visibility and considering the prevailing open nature of the coastline, most parts would experience effects from the operation of the proposed development. Of the 11 viewpoints assessed, nine of these are within the Stornoway Harbour Coastal Character Area and from all of these; the magnitude of landscape/coastal effect predicted during the operational phase is either *medium-large* or *large*.

As detailed in the preceding Viewpoint Assessment, the main effects on coastal character would result from the extensive extraction of rock along the sensitive cliffs and moorland slopes that provide an important backdrop and setting to the harbour. There would be a very noticeable change to the profile of the coast and is some instances, the skyline would be lost. The engineered profile of the rock extraction would also contrast with the semi-natural character of the surrounding coastline and the introduction of the levelled/reclaimed platform and its associated built development, and other industrial infrastructure, would detract from the undeveloped nature and simple landscape pattern that is typical across most of the western side of the harbour. The sense of relative tranquillity experienced across parts of the harbour would also be compromised.

To some extent however, the influence of large-scale industrial development at Arnish Point would limit these changes and considering and the wider context of the busy town and existing port, the proposed development would not be an uncharacteristic addition to the harbour. Nonetheless, considering the extensive changes to the prevailing undeveloped and semi-natural western coastline, a fundamental change in the overall character of the Stornoway Harbour CCA would occur.

Overall, the magnitude of effect is judged to be *medium-large*, and with a *medium-high* sensitivity, long term effects would be **moderate-major** (adverse) and **significant.** In considering option 2 for the Arnish Link road, although the vertical extent of rock extraction would be reduced, it is very likely that effects would remain significant.

Arnish Approaches

As illustrated on Figure 5.7 in Volume 4 of this EIAR, only a small proportion of the Arnish Approaches CCA, focused on Arnish Point, is within theoretical visibility. As all of the rocky coastline that extends further south would not experience any effects from operational development, most of its key characteristics would remain intact. With a *high* sensitivity, the overall magnitude of effect is predicted to be *negligible,* resulting in a **minor-moderate** (adverse) and **not significant** effect.

Holm/Braighe

Similar to the Arnish Approaches CCA, only a very part of the Holm/Braighe CAA at the mouth of the harbour is within the ZTV. As the entire coastline that extends further east is outside of theoretical views, a **minor-moderate** (adverse) and **not significant** effect is predicted.

5.6.6.4 Landscape Designations

Lews Castle and Lady Lever Park GDL

As illustrated on Figure 5.8, most of the designation is outside of theoretical visibility. For those parts within the ZTV, the detailed assessments at viewpoints 1 (Cuddy Point) and 7 (Lews Castle) provide a worst case understanding of landscape effects and from both locations, a *medium-large* magnitude of effect is predicted. Although effects are likely to be significant from these exact locations, it is important to recognise that from most parts within the ZTV, the dense coverage of surrounding policy woodlands would tend to screen views towards the site.

Although the harbour is important to the setting of the designation, the GDL citation (as detailed Table 5.5.3 recognises that open views from Lews Castle and Lady Lever Park overlook Stornoway, the inner harbour and the town. In this context, the proposed developed would be characteristic and viewed in the backdrop to the harbour, with a good degree of separation to the grounds of the castle.

Taking all factors into account, the overall magnitude of effect is judged to be *low-medium* and with a *high* sensitivity, effects are judged to as **moderate** (adverse) and **not significant.**

Stornoway Conservation Area

Viewpoints 1 (Cuddy Point), 2 (South Beach) and 7 (Lews Castle) all provide an understanding of how the setting of the Conservation Area would be affected and from these locations, a *medium-large* magnitude of effect is predicted. However, taking into account the limited extent of where the proposed development would be experienced on the setting and the influence of the existing nearby port and marina, the overall magnitude of effect is judged to be *low-medium* and with a *medium-high* sensitivity, effects are judged to **moderate** (adverse) and **not significant.**

5.6.6.5 Residents

South Beach

From the south facing rooms of dwellings along South Beach near to viewpoint 2 (South Beach), the proposed development would be prominent in view. In particular, the extensive areas of rock extraction and levelled/reclaimed platform with associated infrastructure and activity would introduce a prominent visual focus that would detract from the view across open water towards the backdrop of semi-natural cliffs and moorland. Areas of rock extraction would also result in a noticeable contrast in colour and texture to the surrounding cliff faces and slopes.

Taken collectively, the parts of visible development and activity would only occupy a moderate part of the 50^0 view in which port related infrastructure and activity already have a very notable influence. Views of the nearby wooded grounds of the castle would also be largely unaffected. Considering their *high* sensitivity, visual effects on some residents along South Beach with open views towards the site are judged to be **moderate-major** (adverse) and **significant**. In

considering option 2 for the Arnish Link road, although the vertical extent of rock extraction would be reduced, it is very likely that effects would remain significant.

Newton Street

For those residents in close proximity to viewpoint 3 (Newton Street), the proposed development would be prominent in view. Similar to viewpoint 2, the extensive areas of rock extraction and levelled/reclaimed platform with associated infrastructure and activity would introduce a prominent visual focus that would detract from the view across Newton Basin to a backdrop of semi-natural cliffs and moorland slopes. Areas of rock extraction would also result in a very noticeable contrast in colour and texture to the surrounding cliff faces and slopes. Taken collectively, the parts of visible development and activity would occupy a large part of the 50^0 view. Considering their *high* sensitivity, visual effects on some residents along Newton Street with open views towards the site are judged to be **moderate-major** (adverse) and **significant**. In considering option 2 for the Arnish Link road, although the vertical extent of rock extraction would be reduced, it is very likely that effects would remain significant.

From some dwellings further to the west of viewpoints 3 however, it likely that intervening built development on Goat Island would screen a large part of the proposed development from view and where this is this case, effects are likely to be **not significant**.

Sandwick Bay & Lower Sandwick

From viewpoint 5 (Lower Sandwick) and viewpoint 11 (Sandwick Bay), a *large* magnitude of visual effect is predicted, largely due to the introduction of extensive development and activity in an important part of the view across the harbour. For those residents with south facing rooms near to these viewpoint locations, it is likely that **major** effects would be experienced.

Other settlements

Table 4.11 identifies all main settlements with the study area and some of these including Melbost, Marybank, Steinis, and An Gleann Ur are outside of the ZTV. For those settlements within theoretical visibility, the large majority of views towards the site would be screened by intervening built development, including those within Stornoway. Considering the distance of these settlements to the site and the very limited scope for open views of the proposed development, the overall visual effect on these is judged to be **not significant.**

5.6.6.6 Recreational Users

Lewis Castle Grounds Core Paths

As illustrated on Figure 5.8, the majority of the Core Path Network in the grounds of Lews Castle is outside of the ZTV. For the large majority of paths within theoretical visibility, the dense coverage of surrounding woodlands would tend to screen the proposed development from view. From some small sections near to castle however, glimpses views, resulting in similar effects to those predicted from viewpoint 7 (Lews Castle) would be experienced.

From some limited open parts of the grounds, the proposed development would be prominent in view. In particular, the rock extraction and levelled/reclaimed platform with associated infrastructure and activity would introduce a prominent visual focus that would detract from the setting of the town and the view across open water towards the backdrop of undeveloped moorland slopes. The parts of visible development and activity would tend occupy a relatively large part of the view, with a very noticeable increase in visible built development.

Consequently, although effects on walkers along some short sections would be significant, considering the short duration of these when walking through the grounds, the overall visual effect on the Core Path network is judged to be **not significant.**

Wider path network

As demonstrated by the findings at viewpoint 11 (Sandwick Bay), those walking along the footpath around the bay would experience open views across the harbour where the proposed development would occupy a large part of the view and introduce a prominent visual focus. As such, walkers and other recreational users along the coast are likely to experience **major** (adverse) and **significant** effects from most parts of the route.

Ferry passengers

From viewpoint 4 (Harbour), ferry passengers and other boat users would experience close up views of the proposed development and consequently, a localised **substantial effect** is predicted. With increasing distance from the site however, views of the proposed development when sailing near to Arnish Point and the open sea beyond would be less noticeable and sometimes, experienced in context of nearby existing port and town centre activity. As such, the overall visual effect on ferry passengers travelling along the entire route with the harbour is judged to be **moderate-major** and **significant**.

Road Users

When travelling along the main roads as listed in Table 5.12, taking into account the limited extent of theoretical visibility along these routes and the screening effect of intervening built development, effects on all road users are judged to be **not significant.**

5.7 Mitigation Measure

5.7.1 Design Mitigation

The site selection and outline design of the proposed development are described in full within Chapter 2: Project Description of this EIAR. This has evolved as part of an iterative process that aims to provide an optimal design in environmental terms, but also takes into account technical and economic factors. As part of this, objectives to minimise any adverse landscape and visual effects are of fundamental importance and in developing these, a review of relevant policy, the landscape character assessment and the findings of a field survey have all been considered.

To help ensure that the proposed development integrates positively with its sensitive landscape and coastal setting, the following landscape design and mitigation measures have been embedded in the outline project proposals:

- given the need to avoid use of imported rock, the requirement for any rock extraction has been minimised as far as possible and, in most instances, the skyline is protected;
- the site has been located near to other operational and consented industrial developments, but with balanced degree of separation between them;
- the indicative location of the proposed industrial/storage building has been situated so it benefits from a nearby backdrop of rising ground; and

- the indicative scale of the proposed industrial/storage building has been designed so that it does not breach the local skyline, dwarf the local landform or other nearby existing operational and consented industrial development.

In addition to above measures, it is also envisaged that further mitigation measures regarding the exact layout and location of the industrial/storage development, and its building materials and dimensions would be further developed as part of further consent applications. If consented, other landscape mitigation measures would also be incorporated into a Construction Environmental Management Plan (CEMP) at a later date.

5.7.2 Additional Mitigation

In addition to the embedded mitigation measures as described in section 5.6.2, this section identifies some suggested additional mitigation measures, which could be adopted in any subsequent project development, to help minimise the adverse effects as predicted in this LVIA. These are:

1. In taking forward any extraction, consider the introduction of ledges, varied slopes and the retention of some natural features. In addition to providing some visual diversity, this could help establish some natural regeneration of vegetation across the rock face.
2. In siting buildings on the levelled/reclaimed platform, ensure their exact location benefits from the best possible screening provided by surrounding landform.
3. The buildings should be simple in appearance with façades coloured to reflect the backdrop of rock and moorland.
4. where logistically feasible, locate any built development, above ground infrastructure and storage away from the water's edge.

With regard to point 1, benches have been incorporated into the higher slopes which will aid access and reduce safety issues, while providing visual diversity.

5.8 Summary of Effects

5.8.1 Assessment Context

The study area generally benefits from a high landscape and scenic quality. In particular, the wooded grounds of Lews Castle, designated a nationally important Garden and Designed Landscape, provide a distinctive setting to the town and its associated harbour. Along the western coastline, the containing backdrop to the harbour is dominated by undulating moorland slopes and with a rocky coastal edge below, it exhibits a strong semi-character. The town is also a very popular visitor destination and in addition to those working and living in the local area, the scenic views across the harbour are an integral part of visitor's visual amenity.

Although much of the western side of the harbour has a prevailing undeveloped character, the busy town and port of Stornoway, and a network of busy main roads and settlements scattered across much of the landscape to the north and east, exert a very strong influence on the character of the study area.

Section 5.6 of this Chapter sets out a detailed assessment of the landscape and visual effects predicted during the construction and operational phases of the proposed development. As

noted in Section 5.4.8, where overall effects are predicted to be *moderate-major*, *major* or *substantial*, these are considered to be significant in terms of EIA regulations.

5.8.2 Summary of Significant Effects - Construction Phase

During the 18 months temporary construction phase, **significant** visual effects are predicted on the receptors at the following viewpoint locations:

- Viewpoint 1: Cuddy Point - visitors and recreational users;
- Viewpoint 2: South Beach - residents and visitors;
- Viewpoint 3: Newton Street - residents and visitors;
- Viewpoint 4: Harbour (offshore) - visitors and recreational users;
- Viewpoint 5: Lower Sandwick - residents and recreational users;
- Viewpoint 7: Lews Castle - visitors and recreational users;
- Viewpoint 8: Ferry Terminal – visitors;
- Viewpoint 10: Iolaire Monument Car Park – visitors; and
- Viewpoint 11: Sandwick Bay - recreational users

In relation to the landscape and visual effects during the construction phase, these are judged to be **significant** on the following receptors:

- recreational users and some residents around Sandwick Bay;
- some residents and visitors on parts of Newton Street and South Beach;
- Stornoway Harbour CCA; and
- Lews Castle and Lady Lever Park GDL.

5.8.3 Summary of Significant Effects - Operational Phase

During the long-term operational phase, **significant** visual effects are predicted on the receptors at the following viewpoint locations:

- Viewpoint 1: Cuddy Point - visitors and recreational users;
- Viewpoint 2: South Beach - residents and visitors;
- Viewpoint 3: Newton Street - residents and visitors;
- Viewpoint 4: Harbour (offshore) - visitors and recreational users;
- Viewpoint 5: Lower Sandwick - residents and recreational users;
- Viewpoint 7: Lews Castle - visitors and recreational users;
- Viewpoint 8: Ferry Terminal – visitors;
- Viewpoint 10: Iolaire Monument Car Park – visitors; and
- Viewpoint 11: Sandwick Bay - recreational users.

In relation to the landscape and visual effects during the operational phase, these are judged to be **significant** on the following receptors:

- Stornoway Harbour CCA
- recreational users and some residents around Sandwick Bay; and
- some residents and visitors on parts of Newton Street and South Beach.

5.9 Statement of Significance

Although a number of significant landscape, visual and cumulative effects are predicted during the construction and operational phases, these are relatively localised in extent. Where significant effects have been identified as part of the Viewpoint Assessment, these are all within approximately 1.8 km from the site and considering the scale of the proposed development, significant effects would generally be expected for a project of this nature.

The Viewpoint Assessment also reflects the worst-case scenario as the viewpoint locations were carefully selected to ensure these provide the most open views towards the site. In many instances, due to the screening effect of nearby intervening built development and vegetation, the experience of any significant visual effect is often restricted to a very small part of the locality. Furthermore, it should be noted that assessment is based on the worst-case scenario of a large berthed cruise ship.

Nonetheless, it is important to recognise that where open views across the harbour are experienced, the proposed development would tend to introduce a prominent visual focus against a largely undeveloped backdrop. In many instances, the various parts of the proposed development would also occupy a large part of the view.

Overall, there would be no long-term significant landscape effects on any landscape character types or the Lews Castle and Lady Lever Park Garden and Designed Landscape. However, considering the extent and nature of change across parts of the western coastline of the harbour, the proposed development would result in a significant effect on the Stornoway Harbour coastal character area. Table 5.9.1 summarises the significance of effects.

Table 5.9.1: Summary of Effects

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Construction							
Cuddy Point	Visual effects from construction	High	Moderate-Major	Localised Mod-Major	Good housekeeping during construction.	Moderate-Major	Localised Mod-Major
South Beach	Visual effects from construction	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Newton Street	Visual effects from construction	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Harbour (offshore)	Visual effects from construction	High	Substantial	Localised Substantial		Substantial	Localised Substantial
Lower Sandwick	Visual effects from construction	Medium-High	Major	Localised Major		Major	Localised Major
Newmarket	Visual effects from construction	Medium	Negligible	Localised Minor-Moderate: non-significant		Negligible	Localised Minor-Moderate: non-significant
Lews Castle	Visual effects from construction	High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Ferry Terminal	Visual effects from construction	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Lewis War Memorial	Visual effects from construction	High	Small	Localised Moderate: non-significant		Small	Localised Moderate: non-significant
Iolaire Monument Car Park	Visual effects from construction	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Sandwick Bay	Visual effects from construction	Medium-High	Major	Localised Major		Major	Localised Major
Recreational Users and some Residents around Sandwick Bay	Landscape and Visual effects from construction	High	Major	Significant		Major	Significant
Some Residents and Visitors on parts of Newton Street and South Beach	Landscape and Visual effects from construction	High	Moderate-Major	Significant		Moderate-Major	Significant
Stornoway Harbour CCA	Landscape and Visual effects from construction	High	Moderate-Major	Significant		Moderate-Major	Significant
Lews Castle and Lady Lever Park GDL	Landscape and Visual effects from construction	High	Moderate-Major	Significant		Moderate-Major	Significant
Operations							

Cuddy Point	Visual effects from cruise ship presence and deep water port	High	Moderate-Major	Localised Mod-Major	The site has been located near to other operational and consented industrial developments, but with balanced degree of separation between them. The indicative scale of the proposed industrial/storage building has been designed so that it does not breach the local skyline, dwarf the local landform or other nearby existing operational and consented industrial development. The buildings should be simple in appearance with façades coloured to reflect the backdrop of rock and moorland. Where logistically feasible, locate any built development, infrastructure and storage away from the water's edge	Moderate-Major	Localised Mod-Major
South Beach	Visual effects from cruise ship presence and deep water port	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Newton Street	Visual effects from cruise ship presence and deep water port	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Harbour (offshore)	Visual effects from cruise ship presence and deep water port	High	Substantial	Localised Substantial		Substantial	Localised Substantial
Lower Sandwick	Visual effects from cruise ship presence and deep water port	Medium-High	Major	Localised Major		Major	Localised Major
Newmarket	Visual effects from cruise ship presence and deep water port	Medium	Negligible	Localised Minor-Moderate: non-significant		Negligible	Localised Minor-Moderate: non-significant
Lews Castle	Visual effects from cruise ship presence and deep water port	High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Ferry Terminal	Visual effects from cruise ship presence and deep water port	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major

Lewis War Memorial	Visual effects from cruise ship presence and deep water port	High	Small	Localised Moderate: non-significant		Small	Localised Moderate: non-significant
Iolaire Monument Car Park	Visual effects from cruise ship presence and deep water port	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Sandwick Bay	Visual effects from cruise ship presence and deep water port	Medium-High	Major	Localised Major		Major	Localised Major
Recreational Users and some Residents around Sandwick Bay	Landscape and Visual effects from port related infrastructure and activities	High	Major	Significant		Major	Significant
Some Residents and Visitors on parts of Newton Street and South Beach	Landscape and Visual effects from port related infrastructure and activities	High	Moderate-Major	Significant		Moderate-Major	Significant
Stornoway Harbour CCA	Landscape and Visual effects from port related infrastructure and activities	High	Moderate-Major	Significant		Moderate-Major	Significant

5.10 References

Countryside Agency and SNH (2002), 'Landscape Character Assessment Guidance for England and Scotland'

Landscape Institute and the Institute of Environmental Management and Assessment (2013), 'The Guidelines for Landscape and Visual Impact Assessment, version 3'

Morag Ferguson (2018) Email correspondence

SNH (2017a) 'Guidance Note – Coastal Character Assessment'

SNH (2017b), 'Visual Representation of Wind Farms, Good Practice Guidance'

5.11 Glossary

Acronym	Definition
ACD	Above Chart Datum
AOD	Above Ordnance Datum
CCA	Coastal Character Area
CEMP	Construction Environment Management Plan
CMLI	Chartered Member of the Landscape Institute
CnES	Comhairle nan Eilean Siar
DHLP	Douglas Harman Landscape Planning
DWP	Deep Water Port
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
GDL	Garden and Designed Landscape
GLVIA	Guidelines for Landscape and Visual Impact Assessment
HES	Historic Environment Scotland
LCT	Landscape Character Type
LDP	Local Development Plan
LVIA	Landscape and Visual Assessment
SNH	Scottish Natural Heritage
VP	Viewpoint
WI-LCA	Western Isles Landscape Character Assessment
ZTV	Zone of Theoretical Visibility

Chapter 6: Biodiversity

STORNOWAY PORT AUTHORITY

Contents

6 Biodiversity

6.1 Introduction

This general biodiversity chapter lays out the guidance and regulations relevant to ecological receptors and the impact assessment methodology that the following topic-specific chapters then utilise:

- Chapter 7: Marine Mammals;
- Chapter 8: Fish;
- Chapter 9: Benthic Ecology; and
- Chapter 10: Terrestrial Ecology.

6.2 Regulations and Guidance

6.2.1 The Habitats Directive

The European Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, also referred to as the 'Habitats Directive' (Office Journal of the European Communities, 1992) has the primary aim of maintaining biodiversity within the Member States. The Habitats Directive is transposed into Scottish law by a combination of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland), commonly known as the 'Habitats Regulations' together with the Habitats Regulations 2010 (in relation to reserved matters).

The Habitats Regulations identify several habitats or species whose conservation interest requires the designation of Special Areas of Conservation (UK Marine SAC Project), which form the Natura 2000 network of protected sites (see Section 6.3.1).

In addition, the Regulations make it an offence (subject to exceptions) to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2, or pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 4. However, these actions can be made lawful through the granting of licenses by the appropriate authorities. These species are commonly termed European Protected Species (EPS).

6.2.2 The Marine (Scotland) Act 2010

The act contains provisions for new Marine Protected Areas (MPAs) in Scottish territorial waters and sets out duties to ensure Scotland's seas are managed sustainably. In order to help meet this requirement, the Joint Nature Conservation Committee (JNCC) and Scottish Natural Heritage (SNH) have produced a list of habitats and species occurring in Scottish waters, which are noted for their conservation importance; these are referred to as Priority Marine Features (PMFs). A subset of the PMFs, called MPA search features, will be used to help identify possible areas for MPAs and develop the network in Scottish waters. MPAs are discussed further in Section 6.3.2.

6.2.3 Wildlife and Countryside Act 1981 & Nature Conservative (Scotland) Act 2004

The Wildlife and Countryside Act 1981 (WCA) (as amended in Scotland) was originally conceived to implement the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and the European Birds Directive in Great Britain. It has been extensively amended since it first came into force.

Schedule 5 of the WCA provides special protection to selected animal species other than birds, through section 9(4) of the Act, against damage to "*any structure or place which [any wild animal included in the schedule] uses for shelter and protection*", and against causing disturbance whilst in such places.

The WCA contains measures for preventing the establishment of non-native species which may be detrimental to native wildlife, prohibiting the release of animals and planting of plants listed in Schedule 9. It also provides a mechanism making the above offences legal through the granting of licenses by the appropriate authorities.

Important amendments to the WCA have been introduced in Scotland including the Nature Conservation (Scotland) Act 2004 (in Scotland) (NCSA). Part 3 and Schedule 6 of this Act make amendments to the WCA, strengthening the legal protection for threatened species. The Nature Conservation (Scotland) Act 2004 (in Scotland) is also the instrument under which Sites of Special Scientific Interest (SSSI) are protected in Scotland.

The Wildlife and Natural Environment (Scotland) Act 2011 provided a new licensing element to the WCA within Scotland, specifically for certain non-avian protected species 'for any other social, economic or environmental purpose'. This licensing purpose is qualified by two constraints; "*that undertaking the conduct authorised by the licence will give rise to, or contribute towards the achievement of, a significant social, economic or environmental benefit; and that there is no other satisfactory solution*".

6.2.4 Ecological Impact Assessment Guidance

The Chartered Institute of Ecology and Environmental Management provide Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018) , these have been utilised in the development of the methodology discussed in Section 6.5.

6.3 Designations

Designated protected areas represent the very best of Europe's landscapes, plants and animals, rocks, fossils and landforms. Their protection and management will help to ensure that they remain in good health for all to enjoy, both now and for future generations. They may be designated to meet the needs of international directives and treaties, national legislation and policies, or more local needs and interests.

6.3.1 International Designations

6.3.1.1 Natura Sites

Natura Sites include those which make up the Natura 2000 network as part of the Habitats Directive and Birds Directive. Sites included in the Natura 2000 network are Special Protected Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar sites, although the latter are included as part of SPAs or SACs in Scotland.

SACs are internationally important for threatened habitats and species. They are also selected for a number of habitats and species, both terrestrial and marine, which are listed in the Habitats Directive. Where a potential site to be designated as a SAC has been identified, and the details of that site have been put out to public consultation, it is referred to as a candidate SAC (cSAC); cSACs are afforded full legislative protection, and as such will be considered to have equal value as SACs.

Special Protection Areas (SPAs) are internationally important for threatened habitats and species. They are also selected for a number of rare, threatened or vulnerable bird species listed in Annex I of the Birds Directive, and also for regularly occurring migratory species.

6.3.1.2 Ramsar Sites

Ramsar sites are wetlands of international importance, designated under the Ramsar Convention (Ramsar, 1971). Wetlands are defined as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres. There are currently fifty one Ramsar sites designated as internationally important wetlands in Scotland, covering a total area of about 313,000 hectares (Scottish Natural Heritage, 2017). All Ramsar sites in Scotland are also either SPAs or SACs (Natura 2000 sites), and many are also Sites of Special Scientific Interest (SSSIs), although the boundaries of the different designations are not always exactly the same (Scottish Natural Heritage, 2017). It is not surprising that internationally important wetlands are also of European interest for a wide variety of water birds, bogs, lochs, coastal wetlands and other water-dependent habitats and species. Although there is no specific legal framework that safeguards Scottish Ramsar sites, they benefit from the measures required to protect and enhance the Natura sites and SSSIs which overlap them. Scottish Natural Heritage (SNH) also includes Ramsar sites in its site condition monitoring programme.

6.3.1.3 OSPAR

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the OSPAR Convention) is the mechanism by which fifteen governments of Western Europe work together to protect the marine environment of the North-East Atlantic. OSPAR incorporates a wide range of marine issues, from work on pollution and dumping at sea, to the conservation of marine biodiversity.

In 2003, the government committed to establishing a well-managed, ecologically coherent network of Marine Protected Areas (known as the OSPAR MPA commitment). Marine Special Areas of Conservation (mSACs) designated under the Habitats Directive, have been submitted as the UKs initial contribution to the OSPAR network. Whilst OSPAR covers many different issues, the focus of SNH's current work is on delivering the OSPAR MPA commitment. A list of marine habitats and species considered to be under threat or in decline within the north-

east Atlantic has been produced by OSPAR (known as the OSPAR Threatened and Declining List). The known distribution of these habitats and species in waters around the UK has been mapped on the National Biodiversity Network website. The habitats and species on the OSPAR Threatened and Declining List have been considered through SNH's Priority Marine Features (PMFs) work, as discussed in Section 6.2.1. Together with mSACs and marine Special Protection Areas (mSPAs) (also designated under the Habitats Directive) Scotland will achieve the OSPAR commitment of establishing a well-managed, ecologically coherent network of MPAs.

6.3.2 National Designations

National designations cover a range of different types of protected area and are made by a variety of local and national authorities. Some of these designations focus on nature conservation, while others are concerned with special landscapes. The management of multi-functional protected areas (such as our National Parks), seeks to balance the needs of people, landscape and nature.

6.3.2.1 Sites of Special Scientific Interest

Sites of Special Scientific Interest (SSSI) are those areas of land and water (to the seaward limits of local authority areas), that SNH considers to best represent our natural heritage; its diversity of plants, animals and habitats, rocks and landforms, or a combination of such natural features. They are the essential building blocks of Scotland's protected areas for nature conservation. Many are also designated as Natura sites (SPAs and SACs). The national network of SSSIs in Scotland forms part of the wider Great Britain series. SNH designates SSSIs under the Nature Conservation (Scotland) Act 2004. SSSIs are protected by law. It is an offence for any person to intentionally or recklessly damage the protected natural features of an SSSI.

6.3.2.2 Marine Protected Areas

Scotland (along with the rest of the UK), has designated a number of Marine Protected Areas (MPAs) which include SACs and SSSIs. The term “MPA" can be used for several different types of protected areas within the marine environment. The Marine (Scotland) Act has established a new power for MPAs in the seas around Scotland, to recognise features of national importance and meet international commitments for developing a network of MPAs. Where a potential site to be designated as an MPA has been identified, and the details of the site put out to public consultation, it is referred to as a proposed MPA (pMPA); pMPAs are afforded full legislative protection, and as such will be considered to have equal value as MPAs.

6.3.3 Local Designations

Local natural heritage designations identify areas that are important to people, generally in a Council area. Local nature conservation sites and special landscape areas may be known locally by other names, but all are used to direct local planning policies and highlight local sites of interest. Local nature reserves are areas of at least locally important natural heritage value, which local authorities own or manage, to provide opportunities for people to find out about their environment. Local designations are generally made by local authorities, though many are proposed by special interest and conservation groups, such as local Regionally Important Geological Sites (RIGS) Groups or the Scottish Wildlife Trust.

6.4 Habitat Regulation's Appraisal

When a project may have a likely significant effect on a Natura Site (SPA, SAC) or a Ramsar site, a Habitats Regulation Appraisal (HRA) and, when required, an Appropriate Assessment (AA), needs to be completed by the competent authority. The legislative context for carrying out an HRA is based on the Habitats Directive (92/43/EEC), in particular Article 6(3), and The Conservation (Natural Habitats, &c.) Regulations. Information the competent authority requires in order to carry out an HRA and AA has been provided within this EIAR. Appendix F.1 provides a Habitats Regulations Appraisal Pre-Screening Report, produced to aid the competent authority's assessment of the designated sites which may have their qualifying interests potentially affected by the proposed Stornoway DWP development.

6.5 Impact Assessment Methodology

The assessment of the significance of predicted impacts on ecological receptors is based on both the 'value' of a receptor and the 'nature and magnitude' of the impact that the development will have on it. Effects on biodiversity may be direct (e.g. the loss of species or habitats), or indirect (e.g. effects due to noise, dust or disturbance), on receptors located within or outwith the respective survey area. The Ecological Impact Assessments (EcIAs), in principle, followed the assessment methodology outlined in Chapter 3: Methodology, with the specific ecological assessment methods and criteria detailed below.

6.5.1 Evaluation of Ecological Receptors

The evaluation methodology has been adapted from the Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018). A key consideration in assessing the effects of any development on flora and fauna is to define the areas of habitat and the species that need to be considered. This requires the identification of a potential zone of influence, which is defined as those areas and resources that may be affected by biophysical changes caused by project activities, however remote from the respective survey area.

The approach that has been undertaken throughout the ecological assessments is to identify 'valued ecological receptors' i.e. species and habitats that are both valued in some way and could be affected by the proposed development and separately, to consider legally protected species. Both species populations and habitats have been valued using a broad geographical basis with full details in Table 6.5.1.

The approach taken in these assessments is that a species population or habitat area that is of 'Regional' or greater importance in biodiversity conservation terms is considered to be a valued ecological receptor. Therefore, if a species population is considered to be of High Local value or less, the proposed development is not anticipated to have as great of an effect on the species population as a whole. Exceptions are made if the species population or habitat area has been identified as having a high social or economic value, or if the species is legally protected, for example if they are a Schedule 1 or Schedule 5 species under the 1981 Wildlife and Countryside Act, or an EPS.

Table 6.5.1 Nature Conservation Receptor Evaluation Criteria.

Value	Criteria
International	• An internationally important site (UK Marine SAC Project) or a site proposed for, or considered worthy of designation; • A regularly occurring substantial population of internationally important species (E.G. EPS listed on Annex IV of the Habitats Directive).
National	• A nationally designated site3, or a site proposed for, or considered worthy of such designation; • A viable area of habitat type listed in Annex I of the Habitats Directive or of smaller areas of such habitat which are essential to maintain the viability of a larger whole; or • A regularly occurring substantial population of a nationally important species, e.g. listed on Schedule 5 & 8 of the 1981 Wildlife and Countryside Act.
Regional	• Areas of internationally or nationally important habitats which are degraded but are considered readily restored; • Viable habitats or populations of a species identified as a PMF, or smaller areas/populations which are essential to maintain the viability of a larger area/population as a whole; • Regionally important population/assemblage of an EPS, Schedule 1 and/or 5 species. • Regionally important assemblages of other species or habitats.
High Local	• Locally important population/assemblage of an EPS, Schedule 1 and/or 5 species; or • Sites containing viable breeding populations of species known to be county rarities or supplying critical elements of their habitat requirements.
Moderate Local	• Undesignated sites, features or species considered to appreciably enrich the habitat resource within the local context (within 2km radius from the site) and may benefit from mitigation as a good practice measure.
Low Local	• Undesignated sites, features or species considered to appreciably enrich the habitat resource within the immediate environs of the site and may benefit from mitigation as a good practice measure.
Negligible	• Common and widespread or modified habitats or species.
Negative	• Invasive, alien species often scheduled under Section 14, Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

The approach of these assessments is to consider the value of the site for the species under consideration, rather than the nature conservation importance of the species itself, although this is a factor in the evaluation process with the level of use of the site (number of individuals using the site and nature and level of use) taken into consideration. An assessment is then made of the value of the site to that species, based upon a combination of data sources, professional judgment and knowledge of the site and wider area.

6.5.2 Legal Protection of Species

There is a need to identify all legally protected species that could be affected by the proposed development, to ensure that the development complies with all relevant nature conservation legislation. It is, therefore, appropriate to take into full consideration the legal protection of a species within the evaluation process.

6.5.3 Nature and Magnitude of Impact

Impacts can be permanent or temporary; direct or indirect; adverse or beneficial; reversible or irreversible; and may also have a cumulative function with other activities outwith the assessed development. These factors are taken into consideration in the context of the sensitivity of the valued ecological receptor and the range of potential effects. To identify whether impacts are significant or not, it is important to undertake the assessment in terms of the integrity (coherence of the ecological structure and function), and conservation status (ability of the receptor to maintain its distribution and/or extent/size) of the receptor.

Table 6.5.2 provides an overview of the range of impact magnitudes referred to within this assessment. In addition, impacts may also be positive in nature.

Table 6.5.2 Definition of Magnitude of Impact.

Magnitude	Description
Negligible / None	Very slight change from the baseline conditions. Changes barely detectable, approximating to the 'no change' situation. Any effects likely to be reversible within 12 months and not affect the conservation status or integrity of the receptor.
Low	Minor shift away from baseline conditions. Effects will be detectable but unlikely to be of a scale or duration to have a significant effect on the conservation status or integrity of the receptor in the short term (1-5 years). Overall baseline character of site will not alter substantially.
Medium	Clear effect on the conservation status or integrity of the receptor in the short to medium term (6-15 years), although this is likely to be reversible or replaceable in the long-term (15 years plus).
High	Total loss of, or major alteration to conservation status or integrity of a receptor with situation likely to be irreversible, even in the long term. Fundamental alteration to the character and composition of the Site.

6.3.4 Impact Significance

The significance of an effect is a product of the value of the ecological receptor and the magnitude of the impact on it, moderated by professional judgment. Table 6.5.3 illustrates a matrix based on these two parameters which is used for guidance in the assessment of significance. In terms of the EIA Regulations, only effects which are 'moderate' or 'major' are considered significant, the others constituting a non-significant effect. The level of effect has been assessed as either major, moderate, minor or negligible, or beneficial in accordance with the definitions provided in Chapter 3: Methodology.

Table 6.5.3 Significance of Effects Matrix.

Magnitude of Impact	Value				
	International	National	Regional	Moderate Local/ High Local	Low Local /Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Minor
Low	Moderate	Minor	Minor	Minor	Negligible
Negligible	Minor	Negligible	Negligible	Negligible	Negligible

Key

Significant Effect
Non-Significant

6.6 Summary

The legislation, policy and guidance which are relevant to ecological receptors potentially affected by the Stornoway DWP development have been briefly stated. The definitions of the designated sites, at international, national and local levels, have been described and the individual designations will be related to the ecological topics. The impact assessment methodology specific to the ecology assessments to take place in Chapters 7-10 has been laid out.

6.7 References

CIEEM. (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine.

Office Journal of the European Communities. (1992). *Council Directive (92/43/EEC)*. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31992L0043.

Ramsar. (1971). The Convension on Wetlands (the Ramsar Convention). In.

Scottish Natural Heritage. (2017). Ramsar Sites. Retrieved from https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/international-designations/ramsar-sites

UK Marine SAC Project. (2018). PAHs (in general). Retrieved from http://www.ukmarinesac.org.uk/activities/water-quality/wq8_40.htm

6.8 Glossary

Acronym	Definition
CIEEM	Chartered Institute for Environmental and Ecological Management
cSAC	Candidate Special Area of Conservation
EcIA	Ecological Impact Assessment
EPS	European Protected Species
JNCC	Joint Nature Conservation Committee
MPA	Marine Protected Area
mSAC	Marine Special Area of Conservation
NCSA	Nature Conservation (Scotland) Act
PMF	Priority Marine Feature
pMPA	Proposed Marine Protected Area
SAC	Special Area of Conservation
SNH	Scottish Natural Heritage
SPA	Special Protected Area
SSSI	Site of Special Scientific Interest
WCA	Wildlife and Countryside Act
92/43/EEC	European Habitat's Directive

Chapter 7: Marine Mammals

STORNOWAY PORT AUTHORITY

Contents

7 Marine Mammals

7.1 Introduction

This chapter presents the marine mammal Ecological Impact Assessment (EcIA) for the construction and operational phases of the proposed Stornoway Deep Water Port (DWP) development. Marine mammal receptors are considered in this chapter and are evaluated in the context of nature conservation legislation and relevant planning policy (see Chapter 4: Statutory Context & Policy and Chapter 6 Biodiversity). Impacts on receptors are identified and subject to detailed impact assessment. Mitigation is proposed, cumulative impacts are considered, and finally the residual impacts and their significance are assessed.

This chapter is supported by Chapter 11: Underwater Noise which informs the impact assessment.

7.2 Regulations, Guidance and Sources of Information

As discussed in Chapter 6, international and national legislation assists in identifying sensitive marine mammal species whose presence on a site should be given greater consideration during assessment. This legislation also allows for designation of sites for marine mammal interests.

7.2.1 European and International Regulations and Agreements

All species of cetacean occurring in UK waters are listed in Annex IV of the Habitats Directive as European Protected Species (EPS), where the deliberate killing, disturbance or the destruction of these species or their habitat is prohibited.

Species listed in Annex II of the Habitats Directive and which are native to the UK, should be conserved through the designation of Special Areas of Conservation (SACs). Two species of cetacean present in UK waters are listed in Annex II; the bottlenose dolphin (*Tursiops truncatus*) and the harbour porpoise (*Phocoena phocoena*) along with two species of pinnipeds the grey (*Halichoerus grypus*), and common (*Phoca vitulina*) seals. Since 1994, all SACs in combination with Special Protection Areas (SPAs), comprise the UK contribution to the Natura 2000 ecological network of protected sites.

Although not afforded the strict protection of EPS through the Habitats Directive, pinniped species occurring in UK waters are listed in Annex V of the Habitats Directive, and as such are defined as species of community interest.

7.2.2 National Legislation

All cetaceans are listed under Schedule 2 of the Habitats Regulations, meaning it is an offence to:

- Deliberately capture or kill a wild animal of a European protected species;
- Deliberately disturb any such animal;
- Deliberately take or destroy the eggs of such an animal; or
- To damage or destroy a breeding site or resting place of such an animal.

The Wildlife and Countryside Act 1981, and Nature Conservation (Scotland) Act 2004 provide further protection to marine mammals. Cetaceans are listed in Schedule 5 of the Wildlife and Countryside Act 1981, which prohibits their deliberate killing, injuring or disturbance. The

Nature Conservation (Scotland) Act 2004 makes amendments to the Wildlife and Countryside Act in Scottish waters, including the addition of 'reckless' acts, to offences against species protection. This makes it an offence to intentionally, or recklessly disturb a cetacean.

The Marine (Scotland) Act 2010 makes it an offence to disturb seals at any designated haul out location and to kill, injure or take seals anywhere, regardless of whether there is a designation or not, except under licence or for welfare reasons.

7.2.3 Other Guidance

As discussed in Chapter 6: Biodiversity, the Joint Nature Conservation Committee (JNCC) and Scottish Natural Heritage (SNH) have produced a list of Priority Marine Features (PMFs) to ensure Scotland's seas are managed sustainably, as required by the Marine (Scotland) Act 2010. Thirteen cetacean species, and both grey and common seals are included in the PMF list (Tyler-Walters et al., 2016.). Inclusion in the PMF list does not provide any additional legal protection, however, due consideration must be provided in Impact Assessments, and as such all PMFs are considered sensitive for the purpose of this assessment. Further guidance for sensitive species was sought from the latest Biodiversity Action Plans (BAPs).

Guidance is also provided by JNCC and SNH regarding possible mitigation measures to reduce impacts on marine mammal species. These include:

- JNCC, 2010. JNCC Guidelines for minimising the risk of injury to marine mammals from piling noise; and
- SNH, Undated. The Scottish Marine Wildlife Watching Code.

Marine Scotland's The Protection of Marine EPSs from Injury and Disturbance: Guidance for Scottish Inshore Waters (Marine Scotland, 2014) was also considered when conducting this impact assessment.

As the project is partly below the MHWS and within 12 nautical miles (nm) of the Scottish Coastline it falls within the remit of the Marine (Scotland) Act 2010. The 2015 Scottish National Marine Plan (NMP) covering inshore waters is a requirement of the Act. The NMP lays out the Scottish Minister's policies for the sustainable development of Scotland's seas and provides General Planning Principles (GENs), most of which apply to the construction and operations of the Stornoway DWP. GEN 9 under the NMP is specific to natural heritage and refers to how developments and use of the marine environment must:

"Comply with legal requirements for protected areas and protected species; Not result in significant impact on the national status of Priority Marine Features; and, Protect and, where appropriate, enhance the health of the marine area".

7.3 Assessment Methodology

7.3.1 Desk Study

A desk study literature search was undertaken to inform the characterisation of the existing marine mammal baseline conditions. The following data sources were consulted to aid in identifying and assessing the marine mammals which may be utilising the proposed development area, and surrounding waters, including gaining information on population sizes, seasonal trends, foraging characteristics, and associated designated sites:

- SNH interactive map facility at SiteLink (SNH, 2020);
- The UK PMF list (Tyler-Walters et al., 2016.);
- National Marine Plan Interactive (Marine Scotland, 2020);
- Management Units for cetaceans in UK waters (IAMMWG, 2015);
- Scientific Advice on Matters Related to the Management of Seal Populations: 2017 & 2018 (SCOS, 2017, 2018)
- Atlas of Cetacean Distribution in North-West European Waters (Reid, Evans, & Northridge, 2003); and
- Various scientific reports and journal articles regarding marine mammal distribution and movements in the north east Atlantic region.

7.3.2 Impact Assessment Methodology

The evaluation of receptors, magnitude of impact and significance evaluation follows the methodology laid out in Chapter 6: Biodiversity, Section 6.5.

To inform the understanding of the magnitude of impact levels associated with the underwater noise on marine mammals, the National Oceanic and Atmospheric Administration (NOAA) "Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing" (NOAA, 2016) have been utilised in conjunction with the findings of Chapter 11: Underwater Noise.

The NOAA criteria, groups marine mammals into functional hearing groups and applies filters to the unweighted noise to approximate the hearing response of the receptor. The hearing groups given together with marine mammal receptors relevant to the Stornoway DWP development are summarised in Table 7.3.1.

Table 7.3.1 Functional Hearing Groups, and Relevant Marine Mammal Receptors (after NMFS, 2016).

Hearing Group		Generalised Hearing Range
Low Frequency (LF) Cetaceans	Minke Whales Humpback Whales	7Hz to 35kHz
Mid Frequency (MF) Cetaceans	All dolphins identified in Section 7.4.2 Killer Whales	150Hz to 160kHz
High Frequency (HF) Cetaceans	Harbour Porpoises Inner Hebrides and the Minches cSAC	275Hz to 160kHz
Phocid Pinnipeds (PW) (Underwater)	Grey Seals Common Seals The Ascrib, Isay, & Dunvegan SAC	50Hz to 86kHz

The guidance by the NOAA determines impact from an assessment of an area wherein the noise will induce either "Temporary Threshold Shift" (TTS) or "Permanent Threshold Shift" (PTS) as judged by the weighted Sound Exposure Level over a typical 24-hour period (dBSEL-24).

The NOAA guidance presents unweighted frequency maximal zero to peak pressure (dB_{z-p}) and frequency weighted sound exposure level (dB_{SEL}) criteria for impulsive noise. For non-impulsive noises, only cumulative, frequency weighted dB_{SEL} are provided. The NOAA (2018) injury criteria for impulsive noises and non-impulsive

noises are summarised in Tables 7.3.2 and 7.3.3 respectively. Further information is provided in Chapter 11: Underwater Noise and Appendix K.1.

Table 7.3.2 Acoustic Injury Criteria for Marine Mammals in Relation to Impulsive Noise (NOAA, 2018).

Impulsive Noise	TTS Criteria		PTS Criteria	
Functional Group	dB_{SEL-24} (weighted) dB re 1 µPa	dB_{z-p} (unweighted) dB re 1 µPa	dB_{SEL-24} (weighted) dB re 1 µPa	dB_{z-p} (unweighted) dB re 1 µPa
LF Cetaceans	168	213	183	219
MF Cetaceans	170	224	185	230
HF Cetaceans	140	196	155	202
PW Pinnipeds	170	212	185	218

Table 7.3.3 Acoustic Injury Criteria for Marine Mammals in Relation to Non-Impulsive Noise (NOAA, 2018).

Non-Impulsive Noise	TTS Criteria	PTS Criteria
Hearing Group	dB_{SEL-24} (weighted) dB re 1 µPa	dB_{SEL-24} (weighted) dB re 1 µPa
LF Cetaceans	179	199
MF Cetaceans	178	198
HF Cetaceans	153	173
PW Pinnipeds	181	201

7.4 Baseline

7.4.1 Designated Sites

There are several designated sites in the Inner and Outer Hebrides, that may be relevant to the proposed development area. The sites relevant to marine mammals are shown in Table 7.4.1, along with their marine mammal qualifying features. A description of the sites and reasons why they were or were not taken forward for assessment are provided in the remainder of this section. Drawing 56.7.1 shows the location of the designated sites for marine mammal species relative to the Stornoway DWP development.

Table 7.4.1: Designated Sites Relevant to Marine Mammal Interests

Site	Direction and Distance by Sea	Value	Marine Mammal Qualifying Feature(s)	Taken Forward for Assessment?
North East Lewis pMPA	1.5km SE	National	• Risso's dolphin (*Grampus griseus*)	Yes
Inner Hebrides & the Minches cSAC	1.8km SE	International	• Harbour porpoise (*Phocoena phocoena*)	Yes
Ascrib, Isay, & Dunvegan SAC	66km S	International	• Common seal (*Phoca vitulina*)	No
Monach Islands SAC	101km SW	International	• Grey seal (*Halichoerus grypus*)	No
North Rona SAC	107km NNE	International	• Grey seal (*Halichoerus grypus*)	No
Sea of The Hebrides pMPA	120km S	National	• Minke whale (*Balaenoptera acutorostrata*)	Yes
Sound of Barra SAC	132km SW	International	• Common seal (*Phoca vitulina*)	No
Treshnish Isles SAC	190km SSE	International	• Grey seal (*Halichoerus grypus*)	No
South East Islay Skerries SAC	282km SE	International	• Common seal (*Phoca vitulina*)	No

7.4.1.1 North East Lewis pMPA

The North East Lewis proposed MPA (pMPA) is designated for the protection of Risso's dolphins. The area is highlighted as a key area of importance to the UK as it is one of the two only places in the UK where high numbers of Risso's dolphins are recorded and thought to be resident, the other being Bardsey Island, Wales. Risso's dolphins normally favour deeper offshore waters where the continental shelf slopes off quickly, but around the Isle of Lewis they gather close to shore in water depths ranging from 20 - 200m. Sightings of Risso's dolphins have been most prominent on the eastern and northern coasts of the Isle of Lewis, with the Eye Peninsula and Butt of Lewis acting as 'hotspots' (Scottish Government, SNH, & Conservation, 2014; Weir, Hodgins, Dolman, & Walters, 2019). It is suggested that the area is an important site for feeding, particularly during summer months, due to the presence of Risso's dolphins all year-round around the Isle of Lewis, and the continued re-sighting of particular individuals (Weir et al., 2019).

Dedicated research efforts by Whale and Dolphin Conservation between 2010 and 2017 focussing on the North East Lewis pMPA area produced relative abundance values of 0.554 to 6.647 individuals per km^2 (Weir et al., 2019) with the southern coastline of the Eye Peninsula achieving the greatest relative abundance. As of 2017, a total of 113 individual Risso's dolphins have been identified in the North East Lewis pMPA (Weir et al., 2019). A study during the late 1990's however identified 142 individuals (Atkinson, Gill, & Evans, 1999), although the identification of more individuals may be attributed to greater samples of photographs taken over a longer duration of time, which does nothing to suggest there has been a decline in the number of individuals present here.

This site was taken forward for consultation in 2019 and thus was afforded policy protection. As such, this site has been taken forward for assessment. Moreover, as the site is located ~1.5km from the proposed development, with the Stornoway dredge spoil disposal ground situated within the pMPA, there is potential for connectivity between the construction operations and the designated features of the pMPA.

7.4.1.2 Inner Hebrides & the Minches cSAC

The Inner Hebrides & the Minches candidate SAC (cSAC) is designated for the conservation of harbour porpoise (*Phocoena phocoena*), under the European Habitats Directive. The area is of key importance to the UK as part of the harbour porpoise management unit. The Inner Hebrides & the Minches cSAC is estimated to support approximately 5,438 individuals for at least part of the year, equating to approximately 32% of the management unit (SNH, 2016). It is suggested that these areas, relative to the rest of the continental shelf, include the best habitat for harbour porpoises, and have been used consistently by the species over the last two decades (SNH, 2016).

The site is taken forward for assessment because it is situated within ~ 1.8km of the proposed development, and 850m of the Stornoway dredge spoil ground, hence, there is potential connectivity between the construction operations and the designated features of the cSAC.

7.4.1.3 Ascrib, Isay & Dunvegan SAC

The Ascrib, Isay, & Dunvegan SAC is designated in part due to its importance to the UK common seal (*Phoca vitulina*) population, under the European Habitats Directive. The complex of skerries, islets, undisturbed mainland shores and offshore islands in north-west Skye consistently support a breeding colony of the common seal, and represents one of the larger

discrete colonies in the UK, holding around 2% of the UK population (JNCC, 2018). This site was not taken forward for assessment as the development site is out with the known foraging range of common seals (~50km), thus it is determined there is no potential connectivity. However, common seal will be considered in the species assessments.

7.4.1.4 Monach Islands SAC

The Monach Islands SAC is designated in part due to its importance as a grey seal (*Halichoerus grypus*) breeding colony, under the European Habitats Directive. Located to the west of North Uist, the site offers a wide area of largely undisturbed habitat for breeding grey seals and there is easy access to the grassy swards and dune systems. These islands hold the largest breeding colony in the UK, contributing over 20% of annual UK pup production (JNCC, 2018). Grey seals are known to forage in the open sea but return to land regularly at haul out sites either to rest, moult or feed. Grey seal foraging ranges are wide ranging and can often extend as far as 100km (SCOS, 2018). The upper limits of the foraging range of grey seals are comparative to the distance between the Monach Islands SAC and the Stornoway DWP development, presenting the possibility that they could be present within the development site. However, as detailed in Section 7.4.2.3, grey seals are only rarely present in the waters surrounding the development and spoil ground, hence, impacts on the designated features of the SAC are very unlikely, so this site will not be considered further.

7.4.1.5 North Rona SAC

The North Rona SAC is designated as a grey seal breeding colony, under the European Habitats Directive. Located off the north-west tip of mainland Scotland, North Rona is a remote island in the North Atlantic and remains undisturbed by humans for much of the year. Grey seals utilise much of the island, which supports the third largest breeding grey seal colony in the UK, contributing approximately 5% to the UK pup production (JNCC, 2018). As detailed in Section 7.4.2.3, grey seals are only rarely present in the waters surrounding the development or spoil ground. As the upper limits of grey seal foraging ranges are noticeably less than that of the distance between the North Rona SAC and the Stornoway DWP development it is unlikely that impacts on the designated features of this SAC will occur, so this site will not be considered further.

7.4.1.6 Sea of The Hebrides pMPA

The Sea of The Hebrides pMPA is proposed to be designated for the protection of minke whales. The MPA proposal covers the Sea of the Hebrides between the east coast of the Outer Hebrides and the west coasts of Skye, Mull and the Ardnamurchan Peninsula, incorporating waters around the islands of Rum, Eigg, Muck, Coll and Tiree (SNH, 2014). Minke whale have been recorded most frequently in the north-west boundary of the Sea of The Hebrides pMPA and along the coast of the Outer Hebrides, with greatest densities on the east coast of South Uist (SNH, 2014).

Minke whales are known to be transient species and often take up long migratory routes for feeding and breeding purposes. In Scotland, individual minke whales have been identified on both the east and west coasts of Scotland, as well as being identified to be as far reaching as Iceland (Baumgartner, 2008).

This site was taken forward for consultation in 2019 and thus, was afforded policy protection. As the distance between the Sea of The Hebrides pMPA and the Stornoway DWP development

and disposal ground is some 120km away from one another, the Sea of Hebrides pMPA habitat will not be negatively impacted directly. However, due to the large distances minke whales are known to travel, they could be present within the Stornoway DWP construction area and the Stornoway disposal ground. As minke whales are a qualifying feature of the Sea of The Hebrides pMPA, both have been taken forward for assessment. Further details on minke whales are provided in Section 7.4.2.1.4.

7.4.1.7 Sound of Barra SAC

The Sound of Barra SAC is designated in part due to its importance to common seals, under the European Habitats Directive. The site comprises a mixture of islands, extensive rocky reefs, sandbanks and shallow channels in a broad stretch between the southern end of South Uist and the north coast of Barra in the Outer Hebrides (JNCC, 2018). The site is primarily designated due to the presence of the Annex I habitats including reefs and sandbanks, however common seals are included as a designated feature, since the area is considered to support a significant presence of this species (JNCC, 2018). Given the relatively short distances of common seal foraging trips, (typically 50 km) (SCOS, 2017), it is considered unlikely that common seals from the Sound of Barra SAC will be in the vicinity of the proposed development or spoil ground, so this site will not be considered further.

7.4.1.8 Treshnish Isles SAC

The Treshnish Isles SAC is designated primarily due to its importance to breeding grey seals, under the European Habitats Directive. The site comprises a chain of remote, uninhabited islands and skerries to the north-west of the Isle of Mull. The islands and skerries support a breeding grey seal colony which is estimated to contribute just under 3% of the annual UK pup production (JNCC, 2018). As detailed in Section 7.4.2.3, grey seals are only rarely present in the waters surrounding the development or spoil ground. As the upper limits of grey seal foraging ranges are noticeably less than that of the distance between the Treshnish Isles SAC and the Stornoway DWP development it is unlikely that impacts on the designated features of this SAC will occur, so this site will not be considered further.

7.4.1.9 South East Islay Skerries SAC

The South East Islay Skerries SAC is designated due to its support of a nationally important common seal population, under the European Habitats Directive. The uninhabited skerries and islands of the SAC are extensively used as pupping, moulting, and haul-out sites by the common seals, which are estimated to represent between 1.5-2% of the UK population (JNCC, 2018). Given the relatively short distances of common seal foraging trips, (typically 50 km) (SCOS, 2017), it is considered unlikely that common seals from this SAC will be in the vicinity of the proposed development or spoil ground, so the site will not be considered further.

7.4.2 Species Accounts

Stornoway is located on the north-east coast of the Isle of Lewis, on the northern shore of the Minch. The Minch is a strait in the north-east Atlantic, which is bounded to the west by the Outer Hebrides, and to the east by north-west mainland Scotland. The area comprises of a fairly shallow basin, averaging 120m in depth, but with some areas approximately 200m deep. Strong ocean currents in the waters surrounding the Minch cause turbulence, bringing nutrients to the surface, which results in enhanced productivity of plankton in the area. This in turn leads to aggregations of cephalopods and fish, providing a key food source for marine

mammals, making the Minch an important region for serval cetacean and pinniped species (Reid et al., 2003).

Eight species of cetacean are regularly recorded in the Minch (Reid et al., 2003). Five of these species are considered to occur commonly or be resident in the area including; harbour porpoises, white beaked dolphins, Risso's dolphins, killer whales, and minke whales. The remaining 3 species are regular visitors, but less common and not thought to be resident, these include; bottlenose dolphins, short beaked common dolphins, and Atlantic white sided dolphins (Reid et al., 2003). Two species of pinniped are resident in the Minch and the surrounding waters; the common and grey seal. Both species use coastal sites for breeding/pupping and hauling out, and feed in inshore and offshore waters.

As all marine mammal receptors in UK waters have a value of International, it is necessary to consider each during the impact assessments.

7.4.2.1 Regularly Occurring Cetaceans

7.4.2.1.1 Harbour Porpoise (Phocoena Phocoena)

The harbour porpoise is distributed throughout temperate and subarctic waters of the North Pacific and North Atlantic oceans and is the most abundant cetacean to occur in north west European shelf waters (P.G.H Evans, Anderwald, & Baines, 2003). They are the UK's smallest, and most abundant cetacean, with the highest densities occurring along the North Sea coast, around the Northern Isles and the Outer Hebrides (P. S. Hammond, Macleod, Northridge, Thompson, & Matthiopoulos, 2003; Reid et al., 2003). As such they are expected to be one of the most frequently encountered cetaceans during the construction of the proposed development. The harbour porpoises occurring within the vicinity of the development are likely to be members of the West Scotland management unit, which is estimated to be composed of 21,462 individuals (IAMMWG, 2015).

The harbour porpoise is found within Scottish waters throughout the year (P.G.H Evans et al., 2003), with limited information on seasonal movements of harbour porpoise (Reid et al., 2003). However, numerous studies have been conducted to model harbour porpoise distributions within Scottish waters (SNH, 2016). These studies utilised visual and acoustic harbour porpoise observation data, combined with environmental variables. The studies concluded that the waters of the Minches, together with the sea of Hebrides, provide valuable habitat to harbour porpoises, and consistently support some of highest densities of this species within the UK (SNH, 2016).

7.4.2.1.2 White-Beaked Dolphin (Lagenorhynchus albirostris)

The UK is in the Southern extent of the range of white beaked dolphins, and as such the UK distribution is centred in the north; Scottish shelf waters are considered to be the main stronghold of this species in Europe particularly in the Minch, to the north of the Outer Hebrides, the outer Moray Firth, and off the coast of Aberdeenshire (Northridge, Tasker, Webb, & Williams, 1995; Reid et al., 2003). The species typically inhabits deeper coastal waters that can hold a depth of around 200m (Reid et al., 2003).

White-beaked dolphins from British and Irish waters are considered a single population of 15,895 individuals (IAMMWG, 2015). The high densities of this species reported in the Minches make it likely that this species will be present within the vicinity of the development. Sightings

of white-beaked dolphin in the UK peak between June and October, although they are present year-round (Reid et al., 2003).

7.4.2.1.3 Risso's Dolphin (Grampus griseus)

Risso's dolphins have been identified in many parts of the UK including parts of the North Sea, the western shores of Scotland, the Outer Hebrides, the Irish and Celtic seas and around Bardsey Island, Wales. Risso's dolphins however, despite their widespread distribution throughout UK waters, are considered as a single population as a result of the lack of population estimates (IAMMWG, 2015). Although the species is comparatively uncommon when taking into account sightings of other species, there is some evidence of changes in the seasonal distribution of this species. Risso's dolphin accounts demonstrate the highest sighting rates in the Minch being recorded between May and September. Conversely, detection rates in offshore waters near the continental shelf break were more frequent during the winter months of October to May (Reid et al. 2003).

7.4.2.1.4 Minke Whale (Balaenoptera acutorostrata)

The minke whale is the most common baleen species recorded in British shelf waters, including in the north-eastern Atlantic, where high densities are present off the west coast of Scotland, particularly in the Minch (G. P. Hammond & Jones, 2008; Reid et al., 2003) They feed mainly in deep coastal waters (<200m deep) over the continental shelf, rather than out in the open ocean. They regularly appear around sandbanks or where upwellings bring nutrients and fish near the surface, or in the strong currents around headlands and small islands (Reid et al., 2003). Minke whales are considered to be a coastal species, preferentially occurring in areas closer to the coast than approximately 7km (Macleod et al., 2004; Reid et al., 2003).

Minke whales throughout British and Irish waters are considered a single population of 23,528 individuals, although this is considered to be an underestimate (IAMMWG, 2015). Densities of minke whale are found to be greatest in Scottish seas during the summer months, between May to September, although there is evidence to suggest that some individuals remain in Scottish waters all year round (Macleod et al., 2004).

7.4.2.1.5 Killer Whale (Orcinus orca)

Killer whales occur frequently in the deep North Atlantic, and in coastal waters of north-west Europe. In UK waters, the highest densities of killer whales are recorded off north-eastern Scotland and the Shetland coast, although regular sightings are also noted off north west Scotland (Reid et al., 2003). Killer whales are present all year-round throughout Scottish waters, although they are primarily recorded in coastal waters during the summer months (P.G.H. Evans, Pierce, & S., 2010).

The majority of killer whale sightings in Scottish waters are transient visitors from pods based in Iceland, the Faroe Islands, and Norway (Evans et al., 2010). However, there is a small resident pod of killer whales that are based on the west coast of Scotland, known as the 'West Coast Community'. The West Coast Community is a pod of 8 animals, and is considered to be declining, as no calves have ever been recorded within the pod (Hebridean Whale and Dolphin Trust, 2018). These resident animals are most frequency sighted in the Sea of the Hebrides, to the south of the development area, however they are known to forage in the Minch (Hebridean Whale and Dolphin Trust, 2018)

7.4.2.2 Other Cetaceans

7.4.2.2.1 Bottlenose Dolphin (Tursiops truncatus)

Bottlenose dolphins are distributed throughout the UK shelf waters, primarily close to shore. Two of the largest aggregations of bottlenose dolphins are found in the Moray Firth, in North east Scotland, as well as in Cardigan Bay, Wales (Reid et al., 2003), both of which are designated as SACs.

In total, there are six management units for bottlenose dolphins in UK waters, and as bottlenose dolphins are most commonly recorded within the 20m depth contours, they have a predominantly coastal distribution (IAMMWG, 2015). Individuals occurring within the vicinity of the development, due to its position on the Isle of Lewis are most likely to belong to Coastal West Scotland and Hebrides (CWSH) management unit, which is estimated to include 45 individuals (Cheney, Graham, Barton, Hammond, & Thompson, 2018). Bottlenose dolphins in the CWSH management unit have been shown to move throughout the west coast of Scotland (Cheney, et al., 2018), where they are most frequently sighted off the north-east coast of Lewis (Reid et al., 2003).

7.4.2.2.2 Short-Beaked Common Dolphin (Delphinus delphis)

Common dolphins are one of the most abundant cetacean species, and is the most numerous offshore cetacean in the north-east Atlantic (Reid et al., 2003). Common dolphins from British and Irish waters are considered a single population of 56,556 individuals (IAMMWG, 2015). However, the Outer Hebrides is towards the northern extent of the species' range, which, combined with the coastal nature of the Minch means that this offshore species is not present in high numbers (Reid et al., 2003). There have been few sightings in the vicinity of the development site (Marine Scotland, 2020; Reid et al., 2003). The majority of sightings on the west coast of Scotland are to the north or south of the development; at the continental shelf break, or in the Sea of the Hebrides respectively (Marine Scotland, 2018).

7.4.2.2.3 Atlantic White-Sided Dolphin (Lagenorhynchus acutus)

Atlantic white-sided dolphins are predominantly an offshore, deep-water species, and are most frequently encountered at the continental shelf break, in areas of steep seabed relief, to the north-west of the Outer Hebrides (Reid et al., 2003). Atlantic white-sided dolphins from British and Irish waters are considered a single population of 46,249 individuals (IAMMWG, 2015). Little is known about the temporal movements of this species, although they are occasionally recorded in shallower continental shelf waters, including the Minch (Reid et al, 2003).

7.4.2.2.4 Humpback Whales (Megaptera novaeangliae)

Humpback whales are a large, baleen whale, inhabiting both shallow and deep waters and capable of diving to depths of over 600m (Derville *et al*, 2020). They are a migratory species, migrating from feeding grounds in the Northeast Atlantic and Barents Sea to breeding grounds in the Caribbean, Cape Verde and the Azores. From data collected over the recent years, the Minch has been noted as a hot spot with a number of sightings concentrated in this area during late autumn and winter, and in early to mid-summer, coinciding with migration. Sightings of humpback whales in Scotland have increased along with population numbers of humpback whales globally, however, it has not been concluded whether humpbacks in Scottish waters are a result of increased shore-based sightings effort or whether this is due to an increase in the number of animals frequenting Scottish waters (WDC, 2018). It has been estimated that there are at least 35,000 humpback whales in the North Atlantic Management

Unit and that humpback whales are likely to be resident year-round in Scottish waters but in extremely low numbers (Marine Scotland Science, 2020).

7.4.2.3 Pinnipeds

7.4.2.3.1 Common Seal (Phoca vitulina vitulina)

In UK waters, common seals are widespread around the west coast of Scotland, throughout the Hebrides and Northern Isles. Common seal haul outs are generally situated in sheltered waters, on tidal sandbanks and rocky skerries. The UK common seal count population estimate for 2017 was 45,100 (SCOS, 2018).

Common seals in the UK are divided into management units; the Stornoway DWP development is situated within the Western Isles management unit, where the population is currently estimated to be at least 3,533 individuals, as of 2017 (SCOS, 2018). This latest harbour seal survey count for the Western Isles management unit is 25% higher than the previous estimate. Despite this increase, since surveys began in 1993, there has been no significant increase or decrease in the population over the survey period from 1993 – 2017 (SCOS, 2018).

Common seals present in the vicinity of the development may also be members of the large West Scotland management unit, which has an estimated population of 15,889 (SCOS, 2018).

Common seals are present in UK waters year-round. Pups are born during the summer in June and July. During this period, females spend a high proportion of time ashore with their pups (Hammond et al., 2003; SCOS, 2017). Common seals moult in August (SCOS, 2017) and numbers at haul out sites are highest at this time. There is a single designated common seal haul out site within 25km (by sea) from the DWP development, known as Broad Bay, on North East Lewis.

The Scottish government commissioned a study to combine seal tracking telemetry data with haul out specific population estimates to generate predicted at sea usage maps for both grey and common seals. This resulted in maps of predicted at-sea common seal densities in 5x5km cells in Scottish waters. (Russel et al., 2017). This showed that common seal habitat utilisation in the north-west of Scotland is concentrated to the south-east of the Outer Hebrides, with the highest usage observed in the Sea of Hebrides. Predicted common seal usage of the western Minch is comparatively low, with densities of 5 – 10 seals per 5x5km cell anticipated in the immediate vicinity of the proposed development (Russel et al., 2017).

7.4.2.3.2 Grey Seal (Halichoerus grypus)

Grey seals occur only in the north Atlantic and Barents and Baltic Seas, with their main concentrations located along the Canadian and US eastern seaboards and in north east Europe (SCOS, 2017). The UK contains around 38% of the total world breeding population of grey seals and 88% of those, breed in Scotland, with major concentrations in the Outer Hebrides and Orkney (SCOS, 2017). In 2017, the total UK population of grey seals was estimated to be 150,000 individuals (SCOS, 2018), with pup production estimated to be around ~54,000 in Scotland (SCOS, 2017).

The Stornoway DWP development is situated within the Western Isles grey seal management unit, where the population is currently estimated to be 40% higher (SCOS, 2018) than the previous estimate of 15,691 individuals (SCOS, 2017). Grey seals present in the vicinity of the

development may also be members of the large West Scotland management unit, which has an estimated population of 19,547 (SCOS, 2017).

Grey seals haul outs are generally located on remote uninhabited stretches of coast, and often in more exposed areas compared to common seals (SCOS, 2017). Breeding occurs in the autumn, with peak pupping between August and December (SCOS, 2017) although in northern Scotland most pupping occurs between October and late November (P. S. Hammond et al., 2003). Moulting occurs between December and April (P. S. Hammond et al., 2003; SCOS, 2017). Designated breeding grey seal haul out sites are concentrated in the Northern Isles, Orkney and Shetland, and in the Outer Hebrides. Non-breeding haul out sites are also concentrated at these locations, in addition to various sites along the west coast of Scotland. No designated grey seal haul outs are located within 25km by sea from the proposed development.

The at-sea grey seal usage maps commissioned by Marine Scotland show that grey seal activity in the north-west of Scotland is concentrated to the west of the Outer Hebrides, particularly around the Monach Islands (Russel et al., 2017). Grey seal densities in the Minch and Sea of the Hebrides are comparatively low when taking into account common seal densities (Russel et al., 2017. The density of grey seals was found to be 0-5 individuals per 5x5km cell; hence, it is unlikely that grey seals will be present in the immediate vicinity of the proposed development.

7.5 Impact Assessment

7.5.1 Construction

7.5.1.1 Underwater Noise

Underwater noise emissions will result from the construction activities associated with the proposed construction of the Stornoway DWP development. Further detail on the proposed construction techniques are provided in Chapter 2: Project Description. Marine mammals use acoustics for communication, navigation, and foraging, and as such are particularly sensitive to underwater noise. Underwater noise emissions can result in disruption of foraging behaviour, displacement, masking of communications, disturbance, and injury. By taking the proposed construction techniques highlighted in Chapter 2: Project Description into account, the impacts of underwater noise emissions on marine mammals will be assessed. The potential associated impacts on marine mammals are likely to arise from:

- Piling;
- Dredging; and
- Drilling.

In addition, general marine construction techniques will be required such as rock revetment and armour construction in order to facilitate land reclamation (see Chapter 2: Project Description). However, experience from previous projects have shown that these activities do not result in underwater noise emissions of a magnitude that have the potential to cause significant negative impacts on marine mammals (Affric Limited, 2015), as such, these aspects are not considered further.

7.5.1.1.1 Piling

The proposals are to utilise steel tube 123cm diameter king piles at 3 metre intervals in the combination wall for the main berth (192m long) and the freight ferry berth (140m long), whilst 80cm diameter steel tube piles will be installed in the link span dolphin and finger pier construction (114m long). It is proposed that 30cm diameter steel tube piles at close centres will be installed in the Heavy Load Area. These pile sizes are now proposed to be used as part of a revised design, as opposed to the 220cm diameter king piles originally sought.

While vibro piling will be used in preference to impact piling, ground investigations conducted to inform the design of the development have revealed that impact piling will be necessary in addition to vibro piling to drive the piles to their design depth. As such, piles will be vibrated in as far as possible prior to being impact piled.

With regard to the impact this has on marine mammals, vibro piling uses a vibrating hammer, resulting in a continuous broad band noise, which in general has a reduced sound pressure level compared to impact piling (Nedwell et al., 2003, Affric, 2015, & Graham et al., 2017). In contrast, impact piling is an impulsive noise source and has a higher chance of causing injury in comparison with other types of similar energy due to the very fast "rise time" for the sound impulse. This leaves no time for the animal to react/adapt and consequently increases the risk of acute injury to the species' hearing.

As highlighted in Chapter 11: Underwater Noise, the worst-case scenario with regards to pile noise sources for the revised design is associated with the 123cm diameter king piles. As such, the effect of piling on marine mammal receptors has been informed on this basis. The assessment of impact magnitude is based on the impact piling of a 123cm diameter pile with 1000 strikes occurring in one campaign.

As detailed in Table 11.4.4 of Chapter 11, the greatest impact ranges of TTS and PTS were predicted for HF cetaceans as a result of impact piling a 123cm pile. The only relevant HF cetacean receptors are harbour porpoise and the Inner Hebrides & the Minches cSAC. For HF cetaceans, zones of TTS encompassed the majority of the Stornoway Harbour area and further in a south easterly direction out of the entrance to the harbour. This impact range would likely encroach and extend into the area designated as the Inner Hebrides and The Minches cSAC. PTS zones were highlighted to potentially encompass the majority of the harbour area. It is recognised however that these zones are related to injury on marine mammals, and it is possible for sound levels to extend further to create a disturbance effect known as masking. Masking occurs when sound interferes with a marine mammals' ability to perceive and distinguish different sounds. Although it is still relatively unclear on how masking affects each marine mammal species in particular, it is understood that masking could inhibit vocalisations relating to foraging and breeding success (National Research Council (U.S.), 2003). Some researchers however have shown that marine mammals may have the ability to increase the amplitude of their vocalisations as a short-term response to increased noise levels (Clark et al., 2009; Parks, 2011) and prevent inhibition from occurring.

Due to the nature of and characteristics of Glumaig Harbour however, it is unlikely that harbour porpoise will be present within zones of PTS, as the area provides unsuitable habitat for them and is generally much shallower (0-15m water depth) than their preferred foraging depths (~20 – 50m). There is the possibility however for harbour porpoise to be present within zones of TTS, which are likely to extend into the Inner Hebrides and The Minches cSAC which is

designated for harbour porpoise. Despite this, densities of harbour porpoise have been recorded as low in these areas. As such, the potential impact magnitude of piling on harbour porpoise are assessed as **low, short term** and **reversible,** resulting in a **moderate: significant** effect.

As the zone of TTS for harbour porpoise and the potential for masking extend into the Inner Hebrides and The Minches cSAC, this habitat could become temporarily disturbed. Notwithstanding this, the characteristics of the bay and the position of Arnish Point to the south provide an effective barrier against masking. However, as disturbance due to piling is not a common anthropogenic occurrence already present in the Inner Hebrides and The Minches cSAC, the potential impact magnitude of piling is assessed as **low, short term** and **reversible**, and the resulting effect is **moderate: significant.**

The next largest impact range is for LF cetaceans, which in this case pertains to minke and humpback whales. Impact piling will have a range of PTS beyond 500m, with the potential to be as far reaching as 1.5km, with zones of TTS encompassing the entire harbour area. Since the waters within 500m of the works are very confined, and less than 15m deep, it is extremely unlikely that minke or humpback whales will be present in the area where they may suffer PTS. However, while still confined, the waters within the 1.5km anticipated TTS zone include depths up to 30m, making it possible that minke whales could be present, as it provides a more suitable environment for biologically important behaviours such as foraging. Sightings data of humpback whales does not suggest they would utilise this area. As with HF cetaceans, effects of masking may disturb minke and humpback whales out with Glumaig Harbour. Notwithstanding this, the characteristics of the bay and the position of Arnish Point to the south provide an effective barrier against masking. As such, the potential impact magnitude of piling on minke and humpback whales is **negligible, short term** and **reversible** and the overall effect is **minor: non-significant**. As aforementioned in Section 7.4.1.6, minke whales close to the Stornoway DWP development may belong to the Sea of The Hebrides pMPA. Taking into consideration the long migratory distances the qualifying features of the Sea of The Hebrides pMPA may travel, the potential effects of impact piling on this site are assessed as **negligible, short term** and **reversible** and the overall effect is **minor: non-significant**

Impact piling is likely to have a PTS range of no more than 500m, with zones of TTS encompassing potentially up to 1.5km for MF cetaceans. This includes Risso's dolphin (and the North East Lewis pMPA), short-beaked common dolphin, and killer whale. The areas in which dolphins and killer whales may be subject to PTS and TTS are not considered to be valuable for biologically important behaviours, and low densities of these species overall in the area suggested that the number of animals possibly subjected to disturbance will be low. As such, impact magnitudes for these species are assessed as **negligible, short term** and **reversible** and the overall effect is **minor: non-significant**. Moreover, as the zone of TTS and the potential for masking extend into the North East Lewis pMPA, this habitat could become temporarily disturbed. Notwithstanding this, the characteristics of the bay and the position of Arnish Point to the south provide an effective barrier against masking. However, as disturbance due to piling is not a common anthropogenic occurrence already present in the North East Lewis pMPA, the potential impact magnitude of piling is assessed as **low, short term** and **reversible**, and the resulting effect is **minor: non-significant.**

With regards to pinnipeds (PW), the zone of PTS extended to approximately 500 – 1000m, with zones of TTS potentially encompassing the majority of the harbour area. As detailed in Sections 7.4.1 and 7.4.2.3.2, low density distributions of grey seals have been recorded within Stornoway Harbour and as such, are extremely unlikely to be present during piling. With respect to common seals, the nearest known designated common seal haul out site lies approximately 25km away (by sea) from the DWP development, known as Broad Bay, on North East Lewis. As such, common seals are much more likely to be present in the TTS zone than grey seals due to having foraging ranges which extend some 50km from the closest haul out site 25km away. Zones of TTS also extend into areas which provide more suitable foraging grounds with water depths of up to 30m. Common seals, however, are extremely unlikely to remain in the PTS zone for long periods of time as it provides unsuitable habitat for foraging. As such, the potential impact magnitude on these species are assessed **as negligible, short term** and **reversible effect** and giving rise to an overall potential effect of **minor: non-significant**.

7.5.1.1.2 Dredging

As detailed in Chapter 2: Project Description, dredging is required to provide safe navigational access to the DWP for large vessels.

Dredging activity is likely to consist of a combination of cutter-suction and back-hoe dredging, where Chapter 11 and Appendix K.1 identifies the underwater noise levels resulting from these dredging operations. As cutter-suction dredging has the noisier output of the two dredging methods, only this technique was subject to underwater noise modelling to represent a worst-case scenario.

Noise monitoring for this technique of dredging conducted at other projects and applied to this model (as mentioned in Appendix K.1) indicated that unweighted source levels of noise would be in the region of 175 dB re 1 µPa. Comparison with the weighted NOAA guidance for impacts on marine mammals indicated that in the case of this project, it is likely that LF cetaceans would be susceptible to the greatest level of noise impacts from dredging activities, with zones of TTS anticipated to extend some 200m from the source. TTS zones were limited to 100m for other species. As discussed in Chapter 11: Underwater Noise, Section 11.4.2.1, the revised dredge design will give rise to no more than a 5% increase in these distances. However, since the probability of a LF cetacean, or any other marine mammal for that matter, to be within such close proximity to the dredging activities is exceedingly low, the impact magnitude on all marine mammal receptors is assessed as **negligible, short term** and **reversible** and the overall effect is **minor: non-significant**.

7.5.1.1.3 Drilling

As discussed in Chapter 11: Underwater Noise and Appendix K.1, source noise levels associated with Odex Piling are less than that of impact piling. Section 3.2.1.1 of Appendix K.1 shows that there is a potential for PTS for HF noise receptors if they stay within 200m of the works for long durations. Both HF and LF TTS zones extend beyond 500m of the works however this is based on them staying in the area for 24 hours, which is highly unlikely.

As the zones in which PTS and TTS are likely to occur for varying marine mammal noise receptors provide unsuitable habitat for them, along with low recorded densities of each species in the area, the impact magnitude of drilling on all marine mammal receptors is

assessed as **negligible, short term** and **reversible** and the overall effect is **minor: non-significant**.

7.5.1.2 Water Quality

During construction there could be the following effects on water quality in relation to marine mammal species:

- Increased sediment loading in the water column, resulting from dredging, spoil disposal, infilling and site surface water runoff; and
- Spillage of hazardous materials from machinery and equipment, and marine plant involved in the construction.

These potential effects will be considered in turn.

7.5.1.2.1 Increased Sediment Loading

The rock blasting/excavation, rock placement, dredging and spoil disposal operations, land reclamation and infill works, and surface water runoff, as detailed in Chapters 2: Project Description and Chapter 14: Water Environment, Soil and Coastal Processes, all have the potential to increase sediment loading in the water column. Further information is documented Chapter 14: Water Environment, Soils and Coastal Processes.

Increased sediment loading in the water column can occur through a release of fines into the marine environment. Increased sediment loading in turn can result in increased turbidity and thus, inhibit the foraging success of marine mammals, although this is more apparent in more visual predators such as seals, which do not produce sonar for detection of prey (Todd et al., 2015). As well as the inhibition of foraging in visual predators such as seals, increased turbidity may also cause seals to avoid affected areas, resulting in the displacement or interruption of transiting individuals. This is most apparent in common seals (*Phoca vitulina vitulina*), where visual acuity has been known to deteriorate as turbidity increased (Todd et al., 2015).

Many other marine mammal species however, such as cetaceans, inhabit turbid environments and are able to utilise these waters through the use of sophisticated sonar, which helps them understand the physical environment around them (Au, Popper, & Fay, 2000). Here, foraging abilities are not inhibited and there is evidence of some level of tolerance to turbidity (Au et al., 2000; Pirotta et al., 2013; Todd et al., 2015).

As such, negative effects may result for species which do not primarily use acoustics or sonar for biological functions, and which regularly utilise the waters in the vicinity of the development site and spoil ground for foraging, socialising, or migration (Pirotta et al., 2013; Todd et al., 2015).

Rock placement, infilling works, and dredging will all be conducted within the boundary of the DWP development. As discussed in Chapter 14: Water Environment, Soils & Coastal Processes, the seabed in the vicinity of the land reclamation works is primarily sand and gravel, and as such is unlikely to be resuspended significantly by rock placement. Similarly, the material to be dredged has a low silt fraction and hence will settle quickly, minimising the duration of increased sediment in the water column associated with dredging. There are no strong tidal currents in the area which could transport suspended sediments further from the site. As such, the extent of the increase in sediment loading is expected to be localised and confined to the immediate vicinity of the works.

Since the development is located in confined shallow (<15m deep) waters at the west of Glumaig Harbour, it is considered extremely unlikely that cetaceans will be present in the immediate vicinity of the works. As discussed in Section 7.4.2.3.2, grey seals are also unlikely to be present in this area, since their distribution is concentrated to the west of the Outer Hebrides. As such the potential water quality impacts on all cetacean species, the North east Lewis pMPA, the Inner Hebrides and the Minches cSAC, the Sea of The Hebrides pMPA, and grey seals are assessed as **no change**.

Due to the proximity of the Broad Bay designated common seal haul out, it is possible that common seals will be present within the immediate vicinity of the works due to their foraging range. Although localised increases in sediment loading could result in a meaningful reduction in foraging success, or displacement from a valuable area, common seal densities are low in the harbour area. Hence, the potential effects on common seals, are assessed as having an impact magnitude of **negligible, short term,** and **reversible.** The resulting effect is **minor: non-significant.**

Dredged spoil disposal will take place at the Stornoway designated disposal ground, located south of Arnish point off the Isle of Lewis coast. The spoil ground is approximately 850m from the Inner Hebrides and the Minches cSAC and within the North East Lewis pMPA, hence spoil disposals have the potential to negatively impact the harbour porpoise and Risso's dolphin features of these sites. In addition, common seals are known to regularly frequent the waters around north-east Lewis. This notwithstanding, marine mammal densities in the vicinity of the spoil ground are not expected to be high. This is the because the spoil ground is located within 200m of the coast in water less than 20m deep; such areas are not considered to be valuable habitat for cetaceans, and there are no designated seal haul outs within 25km by sea of the spoil ground.

As the material to be dredged has a low silt fraction, spoil sea-disposal operations using vessels with bottom opening doors, will not increase sediment loading. As material of low silt fraction is dropped out, it will be dispersed quickly and hence will settle quickly, minimising the duration of increased sediment in the water column, Furthermore, there are no strong tidal currents in the area which could transport suspended sediments further from the immediate spoil disposal ground (RPS, 2020). As such, the impact on all marine mammal species, the North East Lewis pMPA and the Inner Hebrides and the Minches cSAC will be localised and short term. Due to the low value habitat at the spoil ground, low predicted marine mammal densities, and the localised temporary nature of the increased sediment loading resulting from spoil disposals, the impact magnitude is assessed as **negligible, short term,** and **reversible,** and the resulting effect is **minor: non-significant.** Although the Sea of The Hebrides pMPA is a long way from the disposal site, the designated feature of Minke whales, although unlikely, could still be present in the disposal ground as they are known to travel long distances. As such, the impact magnitude is assessed as **negligible, short term,** and **reversible,** and the resulting effect is **minor: non-significant.**

Effective management of the site surface water runoff through the mitigation measures identified in Chapter 14: Water Environment, Soils and Coastal Processes, will prevent sediment laden run-off entering the marine environment. Hence no impact on marine mammals is expected from site construction surface water runoff.

7.5.1.2.2 Release of Hazardous Substances

A release of oils or other potential pollutants has the potential to result in both short and long-term impacts on both cetaceans and seals. Short term effects include reduction in the thermal properties of seals' fur, resulting in hypothermia and potentially death, as well as poisoning of both seals and cetaceans through inhalation or ingestion of the contaminant, resulting in sickness or death. Both seals and cetaceans may also avoid a contaminated area, which could impact foraging behaviour. In the longer term, both seals and cetaceans may accumulate toxic pollutants through the ingestion of contaminated food, or through a prolonged exposure to low levels of pollution. Such a toxic build-up may lead to reductions in reproductive success, illness, and increased mortality rates (Gubbay & Earll 2000).

The proposed development is not located within any of the sites designated for the conservation of marine mammals, and as explained in Chapter 14: Water Environment, Soils and Coastal Processes, it is extremely unlikely that a spill from the development would leave the immediate vicinity of the proposed development, so no direct significant effects are predicted. However, a spill could result in indirect significant effects to the mobile designated features of these sites (cetaceans and seals); if they are present within the contaminated area for long enough to ingest a toxic load of the contaminant, or for it to accumulate on their skin or fur.

For all marine mammal receptors, the magnitude of potential impacts arising from a release of contaminants would depend on the nature and quantity of material released into the environment. There is the potential for a spill of hazardous material to have long term major impacts, through changes to the health and behaviour of the receptors on a regional scale. However, the adoption of the mitigation measures and standard industry best practice techniques for pollution prevention identified in Chapter 14, as well as in Chapter 17: Schedule of Mitigation significantly reduce or remove the risk of such an event occurring. As such it is considered extremely unlikely that release of hazardous material of a scale with the potential to negatively impact marine mammals or their designated sites will occur; therefore, the potential impact magnitude is assessed as **negligible, short term,** and **reversible,** and the resulting effect is **minor: non-significant.**

7.5.1.3 Physical Injury

The concurrent underwater noise, disturbance, and increased sediment loading in the immediate vicinity of marine construction vessels and equipment make it extremely unlikely that a marine mammal would enter an area where it is at risk of being injured through a direct interaction with site equipment. This aspect will therefore not be further assessed.

During dredged spoil disposal operations however, there is the potential for a marine mammal to be directly under the disposal vessel when the spoil is released. In this event, the animal could be injured or killed by falling debris. Spoil disposal will take place at the Stornoway designated disposal ground (HE035). The spoil ground is approximately 850m from the Inner Hebrides and the Minches cSAC and within the North East Lewis pMPA, and hence spoil disposals have the potential to negatively impact the harbour porpoise and Risso's dolphin features of these sites. In addition, Risso's dolphins and common seals are known to regularly frequent the waters around north-east Lewis. As discussed in Section 7.5.1.2.1 marine mammal densities in the vicinity of the spoil ground are not expected to be high.

Therefore, the probability of a marine mammal being in the spoil ground, and directly under the spoil vessel at the time of release is extremely low. Hence it is unlikely that an animal would be injured in this way. This potential effect therefore is unlikely to affect the conservation status of a marine mammal receptor, and the magnitude of impact is assessed as **low, reversible** and **short term,** and the resulting effect is **moderate: significant**.

7.5.2 Operation

7.5.2.1 Underwater Noise

The construction of the Stornoway DWP development will allow the accommodation of a wider support network to various industries whilst maintaining support to the growing tourism trade, as highlighted in Chapter 2: Project Description and Chapter 16: Other Issues. This has the potential to increase vessel movements within the Stornoway Harbour area and in turn, underwater noise emissions relating to vessel movement. Underwater noise emissions generated by new vessel movements in the harbour area are unlikely to contribute to increased underwater noise disturbance, as it is not anticipated that additional vessel movements on top of existing movements will all occur at once. As such, underwater noise emissions associated with vessel movement are unlikely to undergo any appreciable change. Impacts on marine mammals and the associated designated sites which have marine mammal qualifying features are therefore unlikely to occur. Underwater noise emissions associated with operational vessel movements are assessed as **no change**.

7.5.2.2 Water Quality

During operation there could be effects on water quality in relation to the marine mammal species due to spillage of hazardous materials from machinery and equipment, and marine plant operating on the new facility.

The potential impacts of a release of hazardous substances during construction are discussed in section 7.5.1.2.2 and in Chapter 14: Water Environment, Soils & Coastal Processes; the impacts of such an event occurring during the operational phase are considered to be synonymous with those during construction.

Robust mitigation strategies will prevent changes from baseline conditions occurring in terms of the risk of pollution events occurring. The Stornoway DWP development therefore will take the following measures into account:

- All vessels and equipment are well maintained, operated by suitably trained personnel and with standard pollution prevention procedures outlined in Chapter 14: Water Environment, Soils and Coastal Processes, are in place;
- All vessels are required to comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) regulations. The regulations cover the prevention of chemical and hydrocarbon spills during both routine operations and incidents. The operating vessels will also have shipboard oil pollution emergency plans (SOPEP), which will minimise the potential impacts of any loss of containment that may occur; and
- The Stornoway Port Authority (SPA) operate robust pollution prevention control measures, and have comprehensive spill response procedures in place, which make the release of a hazardous substance into the Stornoway Harbour extremely unlikely.

7.5.2.3 Physical Injury

Increase vessel movements within Stornoway Harbour may also present the risk of physical injury to marine mammals. Many reports from across the world are demonstrating an increased number of reported ship strikes on marine mammals, causing physical injury or even fatality. However, as described in section 7.5.2.1, it is not anticipated that additional vessel movements on top of existing movements will all occur at once, thus increasing vessel density distribution. Moreover, the increase in reported ship strikes and large vessel-marine mammal interactions are most closely associated with larger whale species greater than 14m in length. Humpback whales can reach 16m however sightings data of the species does not suggest they would utilise the Stornoway Harbour area (WDC, 2018). Recent studies and reports across Europe support this claim by demonstrating that since the 1970's, only 7.8% of ship strike fatalities were associated with medium sized whales such as minke whale (8 – 14m), with no reports of ship strike on delphinid or pinniped species (Peltier et al, 2019). Although there is the potential for ship strikes to occur on all marine mammal species, it is thought that with little change in the density of vessel movements within the Stornoway Harbour, along with the low habitat value of the area and lack of receptors, ship strikes will be unlikely. As such, the impact of physical injury on marine mammal species will be **negligible,** and the resulting effect is assessed as **minor: non-significant**.

7.6 Mitigation Measures

Where potential significant effects on marine mammals have been identified in Section 7.5, appropriate mitigation will be provided in order to reduce the magnitude of the effect. The marine mammal mitigation proposed for the Stornoway DWP development will take the form of a Piling Marine Mammal Protocol, a Spoil Disposal Marine Mammal Protocol.

In addition, in order to prevent excessive harassment of marine mammals by vessels working on the Stornoway DWP development, all vessels will be required to follow the guidance set out in SNH's 'Scottish Marine Wildlife Watching Code' (SNH, Undated). This document provides best practice guidance on how to navigate vessels in the vicinity of marine mammals.

7.6.1 Piling Marine Mammal Protocol

The impact piling underwater noise modelling showed that there is the potential for the piling operations to cause disturbance and auditory injury to the marine mammal species in the vicinity of the development site. In line with best practice, the piling marine mammal mitigation identified below will apply to all marine mammal species and will be implemented for both vibro and impact piling operations.

The mitigation measures are aligned to the Joint Nature Conservation Committee's (JNCC) Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise (JNCC, 2010). However, in line with Section 4 of JNCC protocol, the developer may propose an amended protocol, if it is deemed that the standard protocol is unduly restrictive. Moreover, a soft start procedure is proposed and will be implemented by using a 'noise generator'. The noise generator is proposed to be operated by using an electric drill motor and generator fitted to a small tubular pile with attachment brackets. At the end of the drill motor is a hammer attachment, which makes contact with the tubular pile when the generator is running (see Figure 7.6.1). This type of noise generator has been utilised on other projects, such as Scrabster Harbour, for generating noise during soft start procedures. Previously, where the generator has produced too much noise and not remained in line with

a soft start procedure, the noise has been required to be muffled and therefore reduced by placing foam around the hammer. By placing foam around the hammer to reduce noise levels further soft start procedures are ensured and remain adequate (see Figure 7.6.2).

Figure 7.6.1 A noise generator similar to the one proposed to be used at the Stornoway DWP development to implement soft start procedures

Figure 7.6.2 Foam placed around the hammer of the noise generator to ensure noise becomes 'muffled', so soft start procedures are performed correctly

A summary of the changes made to the JNCC protocols, together with the supporting rationale is provided in Table 7.9.

Table 7.9 Summary of Modifications to the JNCC Piling Marine Mammal Protocols.

Aspect	Change	Rationale
Pre-Watch Duration	The duration of the pre watch (both visual and acoustic) is reduced from 30min to 20min.	The 30min pre watch is designed to maximise detection probability within the mitigation and allow for deeper diving marine mammals which may be present in the zone, but submerged and undetectable for extended periods. However, given that water depths within the 500m zone do not exceed 10m, prolonged deep dives cannot occur. A 30min watch will not increase detection probability but will result in unwarranted delays to operations.
Delays After Detection in Mitigation Zone	The delay following a detection within the mitigation zone during the pre-watch is reduced from 20min to 10min.	For the reasons stated above, a period of 10min following the last detection within the mitigation zone provides sufficient confidence that the mitigation zone is clear of marine mammals, allowing piling to commence.
Soft Start	No soft start will be provided for 30cm diameter piles	The purpose of the soft start is to allow animals which may be present (but undetected) within the injury zones to move away before full power piling is reached. However, given the shallow waters and that 30cm diameter piles give rise to noise levels at least four times lower than those modelled, the acoustic injury zones (compared with piles larger in diameter) are significantly lower. A 500m mitigation zone and low anticipated marine mammal densities also prevents the risk of an animal being present but undetected within the injury zone is extremely low for 30cm diameter piles. As such, additional delays resulting from implementing a soft start is not justified by a meaningful reduction in marine mammal risk for this pile size.

The impact piling marine mammal mitigation will provide the following measures:

- A 500m mitigation zone will be established around the piling rig;
- Trained marine mammal observers (MMO) will conduct a 20min pre-watch prior to the commencement of piling operations;
    - If the 500m mitigation zone remains clear of marine mammals during the watch, permission will be given to commence piling; but
    - If a marine mammal is sighted within the mitigation zone, piling will be delayed until the zone has been clear of marine mammals for at least 10min.
    - A 30minute soft start-up for 123cm and 80cm diameter king piles is required to protect HF hearing receptor groups; and

    - A soft start-up is not required for the piling of the heavy load area 30cm diameter piles.
- During periods where the visible conditions and sea state are not conducive for visual mitigation practices (i.e. darkness, fog reducing visibility to <500m, or graded sea states of 3 (>Beaufort 4)); passive acoustic monitoring (PAM) will be utilised by a trained PAM operator to monitor the mitigation zone;
    - A PAM watch of the mitigation zone will have a minimum duration of 20min;
- Once piling has commenced there will be no requirement to stop works if a marine mammal enters the mitigation zone, as long as piling has been continuous, with no breaks exceeding 10min;
- If a break in piling operations exceeds 10min the following conditions will apply:
    - During a break in piling operations, the noise generator will be utilised to produce sound at lower pressures to deter marine mammals away from the construction area and maintain a soft start procedure. Should the noise generator fail to be utilised for whatever reason, an MMO/PAM operator will be on watch during the break. The MMO/PAM operator will remain on watch during the break with or without the noise generator.
    - If an MMO/PAM operator has been on watch during the break, with or without the utilisation of the noise generator, if the mitigation zone remains clear of marine mammals, piling can recommence immediately;
    - If an MMO/PAM operator has been on watch during the break, with or without the noise generator running, and a marine mammal is observed within the mitigation, piling will not recommence until the zone has been clear of marine mammals for at least 10min; and
    - If no marine mammal observations have been conducted during a break exceeding 10min and without the noise generator running, a 20min pre-watch will be conducted before piling can recommence, as detailed above.
- All MMO/PAM operations will be recorded using the JNCC marine mammal reporting forms template and submitted to Marine Scotland once the works are complete.

7.6.2 Spoil Disposal Marine Mammal Protocol

The disposal of dredged spoil at the Stornoway designated spoil ground (HE035) has the potential to cause injury to marine mammals through contact with falling debris, as well as foraging impairment and displacement through increased sediment loading. In order to mitigate this impact, mitigation will be implemented for spoil disposal operations. As the Stornoway designated spoil ground is situated approximately ~500m from land, consideration can be given in conducting marine mammal watches from land to remove the need for watches to be conducted from the vessel. However, in unfavourable weather conditions in which MMO watches cannot occur, PAM may still be required to be utilised on the vessel.

As such, the dredged spoil disposal marine mammal mitigation will provide the following measures:

- A 200m mitigation zone will be established around the disposal vessel during disposal. A mitigation zone is placed around the vessel as opposed to the disposal site as the vessel will be in transit during disposal;

- Trained marine mammal observers (MMO) will conduct a 20min pre-watch prior to the commencement of spoil disposal, either on board the disposal vessel or from land;
    - If the 200m mitigation zone remains clear of marine mammals during the watch, permission will be given to commence disposal; and
    - If a marine mammal is sighted within the mitigation zone, disposal will be delayed until the zone has been clear of marine mammals for at least 5min.
- During periods where the visible conditions and sea state are not conducive for visual mitigation practices (i.e. darkness, fog reducing visibility to <300 on-board the vessel and <700m from the observation point on land, or graded sea states of 3 (>Beaufort 4)); passive acoustic monitoring (PAM) will be utilised by a trained PAM operator to monitor the mitigation zone, should disposals be occurring;
    - A PAM watch of the mitigation zone will have a minimum duration of 20min;
    - If a marine mammal is detected within the mitigation zone during a PAM watch, disposal will be delayed until the zone has been clear of marine mammals for at least 10min.
- All MMO/PAM operations will be recorded using the JNCC marine mammal reporting forms template and submitted to Marine Scotland once the works are complete.

7.7 Residual Effects

Following the identification of appropriate mitigation detailed in Section 7.6, for the impacts assessed to be significant in Section 7.5, these aspects have been reassessed in order to ascertain the residual impacts.

7.7.1 Piling: Underwater Noise

The implementation of piling marine mammal protocols will ensure that animals are not present within the area where they may suffer acoustic injury when piling is commenced. Moreover, a soft start procedure throughout the utilisation of a noise generator will allow for any animals to flee the area and as a result, the risk of injury is effectively removed. A residual risk remains that marine mammals may be displaced from the vicinity of the piling works during piling operations. However, this effect is expected to be limited to periods when piling operations are ongoing, and since piling operations will not be conducted on a 24hr per day basis, will be localised and temporary. The residual effect is therefore assessed as having an impact magnitude of **negligible, short term** and **reversible**, meaning that the residual effect on marine mammals and their designated sites is **non-significant.**

7.7.2 Dredged Spoil Disposal: Physical Injury

The implementation of the dredged spoil disposal marine mammal protocols will ensure that marine mammals are not present beneath the disposal vessel at the time of disposal. This effectively removes the risk of injury to marine mammals through interactions with falling debris. Therefore, the residual effect is assessed as **minor: non-significant**.

7.8 Cumulative Effects

As detailed in Chapter 3: Methodology, no cumulative effects were identified associated with marine mammals.

7.9 Summary

In total, nine significant effects on marine mammal receptors were identified from the construction of the Stornoway DWP. These were associated with two discrete activities, piling and dredge spoil disposal. Through the adoption of effective and proportional marine mammal mitigation during the construction of the development, all effects are reduced to non-significant.

Table 7.9.1 summarises the effects assessed for marine mammal receptors, the mitigation measures identified to control them and the potential for residual significant adverse effects. Significant effects are highlighted in yellow.

Table 7.9.1: Summary of Effects

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Construction							
Inner Hebrides and The Minches cSAC	**Piling Noise:** Injury/Disturbance of qualifying features.	International	Low Short-term Reversible	Moderate: significant	Piling Marine Mammal Protocol	Negligible Short-term Reversible	Minor: Non-significant
	Back-Hoe & Cutter Suction Dredging Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Drilling Noise/Odex Piling: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	specific mitigation required.	No change	Minor: Non-significant
	Rock Breaking Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Increased Sediment Loading from Site Surface Water Runoff: Disturbance/ Displacement/ Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/ Displacement/ Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/		Negligible Shot-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Displacement/ Reduced Foraging Success of qualifying features.						
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Spoil Disposal at Stornoway: Injury of qualifying features through interactions with falling spoil.		Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Negligible Short-term Reversible	Minor: Non-significant
North East Lewis pMPA	**Piling Noise:** Injury/Disturbance of qualifying features.	National	Low Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Drilling Noise/Odex Piling: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Back-Hoe & Cutter Suction Dredging Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Rock Breaking Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Increased Sediment Loading from Site Surface Water Runoff: Disturbance/ Displacement/ Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/ Displacement/ Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		Negligible Shot-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Spoil Disposal at Stornoway: Injury of qualifying features through interactions with falling spoil.		Low Short-term Reversible	Minor: non-significant	Spoil Disposal Marine Mammal Protocol	None	No Change
Sea of The Hebrides pMPA	**Piling Noise:** Injury/Disturbance of qualifying features.	National	Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Drilling Noise/Odex Piling: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Back-Hoe & Cutter Suction Dredging Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Rock Breaking Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/ Reduced Foraging Success of qualifying features.		Negligible Shot-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Spoil Disposal at Stornoway: Injury of qualifying features through interactions with falling spoil.		Low Short-term Reversible	Minor: Non-significant	Spoil Disposal Marine Mammal Protocol	Negligible Short-term Reversible	Minor: non-signioficant
Harbour Porpoise	**Piling Noise:** Injury/Disturbance of qualifying features.	International	Low Short-term	Moderate: significant	Spoil Disposal Mammal Mitigation	None	No Change

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
			Reversible				
	Drilling Noise/Odex Piling: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Back-Hoe & Cutter Suction Dredging Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Rock Breaking Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		Negligible Shot-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Spoil Disposal at Stornoway: Injury of qualifying features through interactions with falling spoil.		Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Negligible Short-term Reversible	Minor: Non-significant
Minke Whale	**Piling Noise:** Injury/Disturbance of qualifying features.	International	Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Drilling Noise/Odex Piling: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Back-Hoe & Cutter Suction Dredging Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Rock Breaking Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/Displacement/Reduc		None	No Change	No specific mitigation required.	None	No change

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	ed Foraging Success of qualifying features.						
	Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		Negligible Shot-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Spoil Disposal at Stornoway: Injury of qualifying features through interactions with falling spoil.		Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Negligible Short-term Reversible	Minor: Non-significant
Risso's Dolphin	**Piling Noise:** Injury/Disturbance of qualifying features.	International	Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Drilling Noise/Odex Piling: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Back-Hoe & Cutter Suction Dredging Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Rock Breaking Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		Negligible Shot-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Spoil Disposal at Stornoway: Injury of qualifying features through interactions with falling spoil.		Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Negligible Short-term Reversible	Minor: Non-significant
Short-Beaked Common Dolphin	**Piling Noise:** Injury/Disturbance of qualifying features.	International	Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Drilling Noise/Odex Piling:		Negligible Short-term	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Injury/Disturbance of qualifying features.		Reversible				
	Back-Hoe & Cutter Suction Dredging Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Rock Breaking Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		Negligible Shot-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Spoil Disposal at Stornoway: Injury of qualifying features through interactions with falling spoil.		Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Negligible Short-term Reversible	Minor: Non-significant
Killer Whale	**Piling Noise:** Injury/Disturbance of qualifying features.	International	Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Drilling Noise/Odex Piling: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Back-Hoe & Cutter Suction Dredging Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Rock Breaking Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		Negligible Shot-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Spoil Disposal at Stornoway: Injury of qualifying features through interactions with falling spoil.		Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Negligible Short-term Reversible	Minor: Non-significant
Humpback Whale	**Piling Noise:** Injury/Disturbance of qualifying features.	International	Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Drilling Noise/Odex Piling: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Back-Hoe & Cutter Suction Dredging Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Rock Breaking Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduc		None	No Change	No specific mitigation required.	None	No change

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	ed Foraging Success of qualifying features.						
	Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		Negligible Shot-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Spoil Disposal at Stornoway: Injury of qualifying features through interactions with falling spoil.		Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Negligible Short-term Reversible	Minor: Non-significant
Common Seal	**Piling Noise:** Injury/Disturbance of qualifying features.	International	Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Drilling Noise/Odex Piling: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Back-Hoe & Cutter Suction Dredging Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Rock Breaking Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		Negligible Shot-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Shot-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Spoil Disposal at Stornoway: Injury of qualifying features through interactions with falling spoil.		Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Negligible Short-term Reversible	Minor: Non-significant
Grey Seal	**Piling Noise:** Injury/Disturbance of qualifying features.	International	Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Drilling Noise/Odex Piling: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	Piling Marine Mammal Mitigation	No change	Minor: Non-significant
	Back-Hoe & Cutter Suction Dredging Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Rock Breaking Noise: Injury/Disturbance of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change
	Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		None	No Change	No specific mitigation required.	None	No change

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success of qualifying features.		Negligible Shot-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Spoil Disposal at Stornoway: Injury of qualifying features through interactions with falling spoil.		Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Negligible Short-term Reversible	Minor: Non-significant
Operations							
Inner Hebrides & The Minches cSAC	**Underwater Noise:** Vessel movements causing displacement/disturbance	International	None	No Change	No specific mitigation required.	None	No change
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Physical Injury: Vessel movements causing injury/fatality.		Negligible	Minor: Non-significant	No specific mitgation required.	Negligible	Minor: Non-significant
North East Lewis pMPA	**Underwater Noise:** Vessel movements causing displacement/disturbance	National	None	No Change	No specific mitigation required.	None	No change
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Physical Injury: Vessel movements causing injury/fatality.		Negligible	Minor: Non-significant	No specific mitgation required.	Negligible	Minor: Non-significant
Sea of The Hebrides pMPA	**Underwater Noise:** Vessel movements causing displacement/disturbance	National	None	No Change	No specific mitigation required.	None	No change
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Physical Injury: Vessel movements causing injury/fatality.		Negligible	Minor: Non-significant	No specific mitgation required.	Negligible	Minor: Non-significant
Harbour Porpoise	**Underwater Noise:** Vessel movements causing displacement/disturbance	International	None	No Change	No specific mitigation required.	None	No change
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Physical Injury: Vessel movements causing injury/fatality.		Negligible	Minor: Non-significant	No specific mitgation required.	Negligible	Minor: Non-significant
Minke Whale	**Underwater Noise:** Vessel movements causing displacement/disturbance	International	None	No Change	No specific mitigation required.	None	No change
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Physical Injury: Vessel movements causing injury/fatality.		Negligible	Minor: Non-significant	No specific mitgation required.	Negligible	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Risso's Dolphin	**Underwater Noise:** Vessel movements causing displacement/disturbance	International	None	No Change	No specific mitigation required.	None	No change
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Physical Injury: Vessel movements causing injury/fatality.		Negligible	Minor: Non-significant	No specific mitgation required.	Negligible	Minor: Non-significant
Short-beaked Common Dolphin	**Underwater Noise:** Vessel movements causing displacement/disturbance	International	None	No Change	No specific mitigation required.	None	No change
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Physical Injury: Vessel movements causing injury/fatality.		Negligible	Minor: Non-significant	No specific mitgation required.	Negligible	Minor: Non-significant
Killer Whale	**Underwater Noise:** Vessel movements causing displacement/disturbance	International	None	No Change	No specific mitigation required.	None	No change
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Physical Injury: Vessel movements causing injury/fatality.		Negligible	Minor: Non-significant	No specific mitgation required.	Negligible	Minor: Non-significant
Humpback Whale	**Underwater Noise:** Vessel movements causing displacement/disturbance	International	None	No Change	No specific mitigation required.	None	No change

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Physical Injury: Vessel movements causing injury/fatality.		Negligible	Minor: Non-significant	No specific mitgation required.	Negligible	Minor: Non-significant
Common Seal	**Underwater Noise:** Vessel movements causing displacement/disturbance	International	None	No Change	No specific mitigation required.	None	No change
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Physical Injury: Vessel movements causing injury/fatality.		Negligible	Minor: Non-significant	No specific mitgation required.	Negligbile	Minor: Non-significant
Grey Seal	**Underwater Noise:** Vessel movements causing displacement/disturbance	International	None	No Change	No specific mitigation required.	None	No change
	Release of Hazardous Substances: Injury/Displacement of qualifying features.		Negligible Short-term Reversible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Physical Injury: Vessel movements causing injury/fatality.		Negligible	Minor: Non-significant	No specific mitgation required.	Negligible	Minor: Non-significant

Key

Significant Effect
Non-Significant

7.10 References

Affric Limited. (2015). Analysis of the Marine Mammal and Underwater Noise Monitoring Data at the Invergordon Service Base Phase 3 Development in 2014.

Atkinson, T., Gill, A., & Evans, P. G. H. (1999). A photo-identification study of Risso's dolphins in the Outer Hebrides, Northwest Scotland. *European Research on Cetaceans, 12*(102).

Au, W. W. L., Popper, A. N., & Fay, R. R. (2000). Hearing by whales and dolphins. *Springer Handbook of Auditory Research*.

Baumgartner, N. (2008). *Distribution, Diving Behaviour and Identification of the North Atlantic Minke Whale in NorthEast Scoltand* Retrieved from

Cheney, B., Graham, I. M., Barton, T. R., Hammond, P. S., & Thompson, P. M. (2018). *Site Condition Monitoring of bottlenose dolphins within the Moray Firth Special Area of Conservation* (1021). Retrieved from Scottish Natural Heritage Research

Clark, C. W., Ellison, W. T., Southall, B. L., Hatch, L., Van Parijs, S. M., Frankel, A., & Ponirakis, D. (2009). Acoustic masking in marine ecosystems: intuitions, analysis, and implication. *Marine Ecology Progress Series, 395*, 201-222.

Evans, P. G. H., Anderwald, P., & Baines, M. E. (2003). *UK Cetacean Status Review*. Retrieved from Oxford: https://www.seawatchfoundation.org.uk/wp-content/uploads/2012/08/28.-UK-cetacean-status-review-2003.pdf

Evans, P. G. H., Pierce, R. J., & S., P. (2010). Climate change and marine mammals. *J. Mar. Biol. Assoc. UK, 90*, 1483-1488.

Hammond, G. P., & Jones, C. I. (2008). Embodied energy and carbon in construction materials. *Proceedings of the Institution of Civil Engineers - Energy, 161*(2), 87-98. doi:10.1680/ener.2008.161.2.87

Hammond, P. S., Macleod, K., Northridge, P. S., Thompson, D., & Matthiopoulos, J. (2003). *Background information on marine mammals relevant to Strategic Environmental Assessment 4*. . Retrieved from St. Andrews:

Hebridean Whale and Dolphin Trust. (2018). *Annual Report*. Retrieved from Isle fo Mull: https://static1.squarespace.com/static/595bcd2e86e6c029dc28ac1d/t/5d94bd39699c97760b53d40a/1570028918903/Hebridean+Whale+and+Dolphin+Trust+Annual+Report+2018.pdf

IAMMWG. (2015). *Management Units for cetaceans in UK Waters (January 2015)*. Retrieved from Peterborough:

JNCC. (2018). UK SAC Site List

Macleod, K., Fairbairns, R., Gill, A., Fairbairns, B., Gordon, J., Blair-Myers, C., & Parsons, E. C. M. (2004). Seasonal distribution of minke whales Balaenoptera acutorostrata in relation to physiography and prey off the Isle of Mull, Scotland. *MEPS, 277*, 263-274.

Marine Scotland. (2020). National Marine Plan Interactive. Retrieved from https://marinescotland.atkinsgeospatial.com/nmpi/

Marine Scotland Science. (2020). *Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters*. Retrieved from: https://data.marine.gov.scot/sites/default/files//Scottish%20Marine%20and%2

0Freshwater%20Science%20%28SMFS%29%20Vol%2011%20No%2012%20Regional%20baselines%20for%20marine%20mammal%20knowledge%20across%20the%20North%20Sea%20and%20Atlantic%20areas%20of%20Scottish%20waters.pdf

National Research Council (U.S.), E. (2003). Ocean Noise and Marine Mammals.

NOAA. (2016). *Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts*. Retrieved from

Northridge, S. P., Tasker, M. L., Webb, A., & Williams, J. M. (1995). Distribution and relative abundance of harbour porpoises (Phocoena phocoena L.), white-beaked dolphins (Lagenorhynchus albirostris Gray), and minke whales (Balaenoptera acutorostrata Lacepède) around the British Isles. . *ICES Journal of Marine Science, 52*, 55-66.

Parks, S. E., Johnson, M., Nowacek, D., & Tyack, P. L. . (2011). Individual Right Whales Call Louder in Increased Environmental Noise. *Biology Letters, 7*(1), 33-35.

Peltier H., Beaufils A., Cesarini C., Dabin W., Dars C., Demaret F., Dhermain F., Doremus G., Labach H., Van Canneyt O., Spitz J. (2019) Monitoring of Marine Mammal Strandings Along French Coasts Reveals the Importance of Ship Strikes on Large Cetaceans: A Challenge for the European Marine Strategy Framework Directive, *Frontiers in Marine Science, vol 6, p. 486*

Pirotta, E., Thompson, P. M., Miller, P. I., Brookes, K. L., Cheney, B., Barton, T. R., . . . Lusseau, D. (2013). Scale-dependent foraging ecology of a marine top predator modelled using passive acoustic dat. *Functional Ecology*. doi:doi: 10.1111/1365-2435.1214

Reid, J., Evans, P., & Northridge, S. (2003). *Atlas of Cetacean distribution in north-west European waters*. Aberdeen, UK: JNCC.

RPS. (2020). Deep Water Port Stornoway Stage 1 Development Hydraulic Modelling Report

SCOS. (2017). Scientific Advice on Matters Related to the Management of Seal Populations: 2017.

SCOS. (2018). *Scientific Advice on Matters Related to the Management of Seal Populations: 2018* Retrieved from http://www.smru.st-andrews.ac.uk/files/2019/05/SCOS-2018.pdf

Scottish Government, SNH, & Conservation, W. D. (2014). *North-east Lewis Possible Marine Protected Area*. Retrieved from https://www.nature.scot/sites/default/files/2019-06/North-east%20Lewis%20possible%20MPA%20-%20Site%20Summary%20Leaflet%20-%20June%202019.pdf

SNH. (2014). Scottish MPA Project Data confidence assessment - Sea of the Hebrides MPA Proposal

SNH. (2016). SAC Selection Assessment Document: Inner Hebrides and the Minches.

SNH. (2020). SNH Site Link. Retrieved from https://gateway.snh.gov.uk/sitelink/

Todd, V. L. G., Todd, I. B., Gardiner, J. C., Morrin, E. C. N., MacPherson, N. A., DiMarzio, N. A., & Thomsen, F. (2015). A review of impacts of marine dredging activities on marine mammals. *ICES Journal of Marine Science, 72*(2), 328-340. doi:https://doi.org/10.1093/icesjms/fsu187

Tyler-Walters, H., James, B., Carruthers, M. e., Wilding, C., Durkin, O., Lacey, C., . . . Crawford-Avis, O. T. (2016.). *Descriptions of Scottish Priority Marine Features (PMFs). Scottish Natural Heritage Commissioned Report No. 406.* Retrieved from

WDC. (2018). The return of the giants - humpback whales in Scottish Seas. Retrived from: https://uk.whales.org/2018/04/06/the-return-of-the-giants-humpback-whales-in-scottish-seas/

Weir, C. R., Hodgins, N. K., Dolman, S. J., & Walters, A. E. M. (2019). Risso's dolphins (Grampus griseus) in a proposed Marine Protected Area off east Lewis (Scotland, UK), 2010–2017 *Journal of the Marine Biological Association of the United Kingdom*, 12. doi:10.1017/S0025315418000516

7.11 Glossary

Acronym	Definition
BAPs	Biodiversity Action Plan
CEMD	Construction Environmental Management Document
CIEEM	Chartered Institute of Ecology and Environmental Monitoring
CWSH	Coastal West Scotland and the Hebrides
cSAC	Candidate Special Area of Conservation
dB_{z-p}	Maximum Peak Pressure
dB_{SEL}	Frequency Weighted Sound Exposure
DWP	Deep Water Port
EcIA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
EPS	European Protected Species
HF	High Frequency
HRA	Habitat Regulations Appraisal
JNCC	Joint Nature Conservation Committee
km	Kilometres
LF	Low Frequency
m	Metres
MF	Medium Frequency
min	Minutes
MMO	Marine Mammal Observer
MPA	Marine Protected Area
NOAA	National Oceanic and Atmospheric Administration
PAM	Passive Acoustic Monitoring
PMF	Priority Marine Feature
pMPA	Proposed Marine Protected Area
PTS	Permanent Threshold Shift
PW	Pinnipeds Hearing Group

SAC	Special Area of Conservation
SPA	Stornoway Port Authority
SNH	Scottish Natural Heritage
SPA	Special Protected Area
TTS	Temporary Threshold Shift
WDC	Whale and Dolphin Conservation

Chapter 8: Fish Ecology

STORNOWAY PORT AUTHORITY

Contents

8 Fish Ecology

8.1 Introduction

In this chapter the Ecological Impact Assessment (EcIA) for the construction phase of the proposed Stornoway Deep Water Port (DWP) will be considered. Fish receptors are considered in this chapter and are evaluated in the context of nature conservation legislation and relevant planning policy (see Chapter 4: Statutory Context & Policy, and Chapter 6: Biodiversity). Impacts on receptors are identified and subject to detailed impact assessment. Mitigation is proposed, cumulative impacts are considered, and finally the residual impacts and their significance are assessed.

Due to the coastal nature of the proposed development, the potential for the construction works to result in negative impacts on fish species which/that spend part or all of their lifecycle in marine waters. As such the scope of this EcIA will only include relevant species which are provided legislative protection for their conservation importance.

8.2 Regulations and Guidance

Regulations and guidance pertaining to ecology and biodiversity are outlined in Chapter 6: Biodiversity. This section specifically details the regulations and guidance relevant to fish ecology.

8.2.1 European and International Regulations

Species listed in Annex II of the Habitats Directive which are native to the UK should be conserved through the designation of Special Areas of Conservation (SACs). Atlantic salmon (*Salmo salar*) present in UK waters are listed in Annex II. Atlantic salmon are also listed in Annex V of the Habitats Directive. As such they are also defined as a species of community interest.

Following the drastic decline in European eel (*Anguilla angeuilla*) populations, the EC Regulation 1100/2007 was developed and adopted in 2010. The EC Regulations aims to restore European eel stocks to healthy levels. In 2010 Scotland published its own Eel Management Plan (DEFRA, 2010) under the EC Regulations.

8.2.2 National Legislation

The Conservation (Natural Habitats, &c.) Regulations 1994 (the Habitats Regulations) provide protection to SACs, including the qualifying features of these sites. Atlantic salmon associated with a SAC designation are therefore protected under the Habitats Regulations.

The Wildlife and Countryside Act 1981, and Nature Conservation (Scotland) Act 2004 provide further protection to certain fish species in Scotland. Basking sharks (*Cetorhinus maximus*) are afforded full protection under Schedule 5 of the Wildlife and Countryside Act 1981, which prohibits their deliberate killing, injuring or disturbance. The Nature Conservation (Scotland) Act 2004 makes amendments to the Wildlife and Countryside Act in Scottish waters, including the addition of 'reckless' acts to offences against protected species, which include basking sharks, making it an offence to intentionally or recklessly kill, injure, harass or disturb the relevant species.

The Salmon and Freshwater Fisheries Act 1975 (as amended) makes it an offence to knowingly take, kill or injure, or attempt to take, kill or injure, any salmon, trout or freshwater fish, which

is unclean or immature. The Act also makes it an offence to cause or knowingly permit to flow, or put or knowingly permit to be put, into any waters containing fish or into any tributaries of waters containing fish, any liquid or solid matter to such an extent as to cause the waters to be poisonous or injurious to fish or the spawning grounds, spawn or food of fish.

8.2.3 Other Guidance

As discussed in Chapter 6: Biodiversity, the Joint Nature Conservation Committee (JNCC) and Scottish Natural Heritage (SNH) have produced a list of Priority Marine Features (PMFs) to ensure Scotland's seas are managed sustainably as required by the Marine (Scotland) Act 2010. The PMF list includes multiple diadromous, elasmobranch, marine demersal and pelagic fish species, some of which are anticipated within the waters surrounding the proposed development, as detailed in Section 8.4.3. Inclusion in the PMF list does not provide any additional legal protection, however due consideration must be provided in Impact Assessments, and as such all relevant PMFs are considered sensitive for the purpose of this assessment. Further guidance for sensitive species was sought from the latest Biodiversity Action Plans (BAPs).

Guidance is also provided by SNH's Scottish Marine Wildlife Watching Code (SNH, 2017c) regarding possible mitigation measures to reduce impacts on basking sharks.

As the project is partly below the MHWS and within 12 nautical miles (nm) of the Scottish Coastline it falls within the remit of the Marine (Scotland) Act 2010. The 2015 Scottish National Marine Plan (NMP) covering inshore waters is a requirement of the Act. The NMP lays out the Scottish Minister's policies for the sustainable development of Scotland's seas and provides General Planning Principles (GENs), most of which apply to the construction and operations of the Stornoway DWP. GEN 9 under the NMP is specific to natural heritage and refers to how developments and use of the marine environment must:

"Comply with legal requirements for protected areas and protected species; Not result in significant impact on the national status of Priority Marine Features; and, Protect and, where appropriate, enhance the health of the marine area".

8.3 Assessment Methodology

8.3.1 Baseline Methodology

To allow the identification of relevant fish receptors, and thus assess potential impacts arising from the project, the baseline environment had to be established. A desk-based review of published literature was undertaken. Sources of information consulted included:

- SNH interactive map facility at SiteLink (SNH, 2020);
- The UK PMF list (Tyler-Walters et al., 2016);
- National Marine Plan Interactive (Marine Scotland, 2020);
- The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) List of Threatened and/or Declining Species and Habitats (OSPAR Commission, 2017b);
- OSPAR Intermediate Assessment 2017 (OSPAR Commission, 2017a);
- Scotland's Marine Atlas: Information for the National Marine Plan (Baxter et al., 2011); and

- Various scientific reports and journal articles regarding marine fish distribution and movements in the north east Atlantic region.

8.3.2 Impact Assessment Methodology

The evaluation of receptors, magnitude of impact and significance evaluation follows the methodology laid out in Chapter 6: Biodiversity, Section 6.5.

To inform the understanding of the magnitude of impact levels associated with the underwater noise on various fish species the 'Sound exposure guidelines for fish and sea turtles, proposed by Popper et al have been utilised as explained in Section 8.5.2 (Popper et al., 2014).

8.4 Baseline

8.4.1 Designated Sites

There are several designated sites in the Inner and Outer Hebrides that may be relevant to the proposed development area. The sites relevant to fish are shown in Table 8.4.1, along with their fish qualifying features. A description of the sites and reasons why they were or were not taken forward for assessment are provided in the remainder of this section. Drawing 56.8.1 in Volume 4 of this EIAR shows the location of the designated sites for fish species relative to the Stornoway DWP development.

Table 8.4.1: Designated Sites Relevant to Fish Interests

Site	Direction and Distance by Sea	Value	Fish Feature(s)	Taken Forward for Assessment?
North East Lewis pMPA	1.3km SE	National	Raitt's sandeel (*Ammodytes marinus)*	Yes
Langavat SAC	107km SW	International	Atlantic salmon (*Salmo salar*)	No
North Harris SAC	112km SW	International	Atlantic salmon (*Salmo salar*)	No
Sea of the Hebrides pMPA	120km S	National	Basking shark (*Cetorhinus maximus*)	Yes

8.4.1.1 North East Lewis pMPA

The North East Lewis pMPA encompasses a former Raitt's sandeel fishing ground that supports an important component of a larger, patchy sandeel population on the west coast. The aim of the pMPA is to aid the recovery of an otherwise declining population of Raitt's sandeels due to overfishing. More importantly, sandeels are highly nutritious and are the preferred prey for many species of fish, seabirds, seals, whales and dolphins. The well-flushed sandy seabed substrates preferred by the sandeels also form part of an internationally important assemblage of geodiversity interests present in this part of the Minch. The North East Lewis pMPA lies approximately 1.3km away by sea from the construction area boundary for the Stornoway DWP development and has some degree of connectivity with the pMPA. This site has been taken forward for assessment. Further details on Raitt's sandeel are highlighted in Section 8.4.3.

8.4.1.2 Langavat SAC

The Langavat SAC is designated for the conservation of Atlantic salmon, under the European Habitats Directive. The network of rivers and lochs provides valuable spawning habitat for Atlantic salmon. However, this site meets the marine environment at Loch Ceann Hùlabhaig, on the west coast of Lewis. This is approximately 110km by sea, and on the opposite side of the island, from the proposed development. It is therefore considered extremely unlikely that salmon migrating to or from the Langavat SAC will be present in the waters surrounding the Stornoway DWP construction site. As such, no connectivity is anticipated between the qualifying fish features of this site and the marine works at Stornoway, and hence this site is not taken forward for assessment.

8.4.1.3 North Harris SAC

The North Harris SAC is designated in part due to its importance to Atlantic salmon, under the European Habitats Directive. Located on the west coast of Harris, the site contains numerous rivers and streams which provide spawning habitat for Atlantic salmon. However, the rivers and streams within this site all feed into the west coast of Harris, which is approximately 60km by sea from the proposed development. It is considered extremely unlikely that salmon migrating to or from the rivers within this site will be present in the waters surrounding the Stornoway DWP construction site, on the east coast of the island. As such, no connectivity is anticipated between the qualifying fish features of this site and the marine works at Stornoway, and hence this site is not taken forward for assessment.

8.4.1.4 Sea of the Hebrides Proposed Marine Protected Area (pMPA)

The Sea of the Hebrides pMPA, designated in part for basking sharks, is located approximately 120km by sea from the proposed development. This site was recognised as a Nature Conservation MPA in 2014, and has since been taken forward to consultation as of 2019. As such, the designation is now a proposed MPA and qualifying species here are now afforded policy protection.

It has been shown that densities of basking sharks within the Sea of the Hebrides pMPA are consistently high, but particularly in the south and east of the pMPA (SNH, 2014). Basking sharks, however, are known to travel considerable distances while foraging, exceeding several hundred kilometres (Sims, 2008b), and as such it is possible the qualifying features of this site may be present in the vicinity of the development. Therefore, there is potential connectivity between this site of **national** value, and the proposed development, so it is taken forward for assessment.

8.4.2 Habitat

The proposed construction of the Stornoway DWP is situated on the western coastline of Glumaig Harbour. Glumaig Harbour itself is a small shallow bay, located within Stornoway Harbour, just west of the Eye Peninsula, which meets The Minch on the eastern coast of the Isle of Lewis. The waters of Glumaig Harbour are relatively shallow and very rarely reach water depths which exceed 15 metres. Within the immediate vicinity of the development, water depths rarely exceed 9 metres, hence the intent to dredge to achieve -10m Chart Datum (CD)

water depths. Most notably, two watercourses flow into Stornoway Harbour, from the north and from the west.

The River Creed (Abhainn Ghrloda) is the primary watercourse which flows into Stornoway Harbour from the west, and is situated just north of the proposed Stornoway DWP development and Glumaig Harbour. This watercourse water classification is high overall, with a high overall ecology, fish and fish barrier classification (SEPA, 2020). A high overall fish barrier classification means that <1% of the system is inaccessible due to manmade structures, and can allow for the migration of fish. Baseline data on Atlantic salmon is available for riverine systems flowing into Stornoway Harbour. The River Creed in particular, has been highlighted as a good spawning site, with gravel habitats suitable for use by both salmon and sea trout (Envirocentre, 2018). Despite the main stem of the river stretching 18km from source to mouth, high numbers of juvenile salmonids have been reported within the system.

At the very northern tip of Stornoway Harbour, otherwise known as the 'Upper Inner Harbour', a small river runs through the town of Stornoway and meets the bay, otherwise known as the Glen River. Although no information regarding the water classification of this habitat could be found, further upstream the Glen River flows into the western reaches of Loch Airigh na Lic, before continuing from the eastern reaches of the loch towards the harbour. Baseline information regarding migratory fish species is available for the Glen River. The catchment, despite being small, holds good areas of spawning gravels, potentially suitable for use by both salmon and sea trout, each of which are known to be present throughout the catchment (Envirocentre, 2018). However, the importance of the Glen River as a spawning ground for migratory fish species can be questioned, as various obstacles are present throughout the catchment which would inhibit migration. These include natural debris, water gates and accumulation of urban waste. This is most prevalent in the Bayhead River in which migratory fish would have to pass before reaching the spawning sites available in the Glen River.

8.4.3 Species Accounts

The literature review provided little specific data on fish species inhabiting the waters surrounding the Stornoway DWP construction area. However, it was identified that the relevant protected receptors that should be considered by this assessment include:

- Diadromous Fish, including: Atlantic salmon, sea trout, and European eel; and
- Basking sharks.

8.4.3.1 Diadromous Fish Species

There are two categories of diadromous fish, anadromous and catadromous: anadromous fish reproduce in freshwater rivers but spend the rest of their adult lives in salt water, while catadromous fish reproduce in saltwater, and spend the rest of their lifecycle in freshwater.

The Western Isles are known to be inhabited by three diadromous species, Atlantic Salmon, Sea Trout and European Eel.

Atlantic Salmon

Atlantic salmon are wildly distributed in Scotland's river systems but are also widely found across temperate and Arctic regions of the northern hemisphere. Salmon are anadromous, living in freshwater as juveniles then migrating to sea as post-smolts, where they mature. Once sexual maturity is reached, they return to their native rivers to spawn (Godfrey, Stewart,

Middlemas, & Armstrong, 2014). (Godfrey, Stewart, Middlemas, & Armstrong, 2014). Migratory routes of Atlantic salmon to spawning sites are poorly understood, since returns to the Scottish coast occur from a range of directions. However, the greatest returns are expected from northerly and westerly marine waters, given the distribution of marine feeding areas (Malcolm, Godfrey, & Youngson, 2010). Juvenile salmon populations within the Western Isles river systems are generally lower compared to salmon supporting rivers elsewhere in Scotland (Godfrey, 2005). The lower number of juvenile salmon within the Western Isles possibly arises from watercourse obstructions, or nutrient poor waters (OHFT, 2012). Juvenile salmon densities in the Western Isles are higher in smaller burns and tributaries, compared to the larger rivers systems of the Western Isles (OHFT, 2012), making them an important ecological feature in sustaining the local salmon populations.

Atlantic salmon however, are known to return to the River Creed annually, and of a total of eleven sites in which were surveyed to best represent the entirety of the river system, eight locations were identified as having high or very high densities of salmon fry and/or parr (Envirocentre, 2018). Salmon fry and/or parr were not identified in the Glen River.

Due to the presence of salmon fry and/or parr, the western shores of Glumaig Harbour may provide a migratory route for salmon to return to spawning sites situated in the River Creed. The routes of returning salmon to rivers systems within the Western Isles, however, are unknown. Data from 1998 to 1999 indicated that 90% of returning salmon were grilse and spend only one year at sea, with an average length of 60cm (OHFT, 2012). Adult Atlantic salmon runs usually occur between November to December, but in larger river systems it may extend from October to late February (SNH, 2017a). Data on smolt runs in the Western Isles is also limited and dated. Data from 1998 and 1999 indicated the two to three-year-old smolts migrate from freshwater systems to sea, while occasionally, fish were recorded to remain in freshwater systems for four years prior to migrating to sea. Smolt runs in the Outer Hebrides generally occur in the summer, but migrating smolts are also regularly recorded during spring months (OHFT, 2012).

Knowledge of the swimming depth of adult Atlantic salmon in Scottish waters is limited, but it is suggested extended periods are spent at shallow depth between 0 - 40m (Malcolm et al., 2010). Studies in Norwegian fjords identified that in general, migrating smolts utilise water depths which are predominantly <10m (Finstad, Økland, Thorstad, BjØrn, & McKinley, 2005). This is supported by a further study in Norwegian waters that indicated 49-99% of swimming time was at 1-3 m depth during the day (Davidsen et al., 2008). No data for post-smolt diving depth in Scottish waters exists (Malcolm et al., 2010). Similarly, no swimming depth data is available for grilse (salmon that returned to freshwater after only one-year) (Malcolm et al., 2010).

Sea Trout

Like Atlantic salmon, sea trout may spend a variable number of years in freshwater habitats prior to migrating. Sea trout post-smolts may stay within estuaries for extended periods of time, prior to moving into the wider sea (Malcolm et al., 2010). Research by Pemberton (Pemberton, 1976) on the west coast of Scotland concluded sea trout post-smolts move from rivers to sea lochs/estuaries between April and early June, prior to moving to the open sea in late June to July, eventually returning in August to September. This study, however, was very localised with overall knowledge of post-smolt migratory movement limited. Swimming depth

of sea trout post-smolts is also relatively unknown. A study from the sea Loch Ewe identified that most fish swam within 10m of the surface waters, although dives to 20m were also observed (Malcolm et al., 2010).

Similarly to salmon, trout densities in smaller streams and tributaries are higher than larger river networks in the Outer Hebrides (OHFT, 2012). Despite this, both the River Creed and the Glen River were identified as holding areas of high or very high densities of juvenile sea trout (Envirocentre, 2018).

Immature sea trout, regionally called Finnock, are young sea trout that return to freshwater after only one year at the sea. These are common in Scottish estuaries, where they move in and outwith the tides to feed (Scottish Government, 2017). Finnock may move to large freshwater bodies to over-winter, prior to returning to sea during the spring months (Malcolm et al., 2010; Scottish Government, 2017). Proportions of sea trout returning as Finnock in the Western Isles vary between years (OHFT, 2012).

Timings of runs on the west coast of Scotland are well understood, with runs generally occurring from April to June (Jonstone, Walker, Urquhart, & Thorne, 1995; Middlemas, Stewart, Mackay, & Armstrong, 2009; Pemberton, 1976; Scottish Government, 2017). Migrated fish remain in freshwaters until the autumn, waiting for river levels to rise before returning to sea (Malcolm et al., 2010). The movement of the adult fish into rivers is expected to occur with high tide and returns to sea during ebb tide, but no conclusive data is available (Malcolm et al., 2010). The mean swimming depth of adult sea trout depend on season, water temperature, habitat and time of day. However, research in Norwegian fjords concluded a mean swimming depth of mature sea trout to be 1.7m below the surface. Lower swimming depths generally occurred during night-time (Eldøy et al., 2017). Knowledge of swimming depth in Scottish waters is limited but estimated to be at <3m below surface (Malcolm et al., 2010). However, knowledge of overall swimming routes within estuaries in Scottish waters is poorly understood (Malcolm et al., 2010).

European Eel

The European eel is a critically endangered catadromous (migrates from freshwater to sea to spawn) fish which is widely distributed across European freshwater and estuarine habitats (Daverat et al., 2006; SNH, 2017b). Since the 1970s, the population of European eel has declined up to 99% in some parts of its distribution range (Correia et al., 2018). The lifecycle consists of 4 stages: Glass eel, Elver (juveniles), Yellow eel and Silver eel (adults). Adults may pass through Scottish coastal waters during migration, but no conclusive data is available (Malcolm et al., 2010).

Silver eels inhabit over 80% of catchments in the Western Isles (OHFT, 2012). Distribution and populations dynamics of European eels in the Western Isles however are poorly understood. Populations of silver eels potentially inhabiting riverine habitats near the development site are likely to enter Glumaig Harbour from the River Creed. Baseline data identified seven sites throughout the River Creed which held significant numbers of adult European eel, with the highest densities closest to the coastline (Envirocentre, 2018).

In northern mainland Europe, adult eel migratory peak rates are reported from August to October (Malcolm et al., 2010). In Scotland, data from the River Dee shows adults beginning to leave freshwaters in June, peaking in August or September, but continuing to October

(Malcolm et al., 2010). However, wide variations in migratory timings are recorded, possibly due to temperature (Vøllestad et al., 1986), rainfall or lunar cycles (Lowe, 1952; Malcolm et al., 2010). The absence of data and no alternative evidence make it reasonable to suspect that the majority of adult eels migrate to spawning sites via the north of Scotland between October and January (Malcolm et al., 2010), although migration routes from the Western Isles are unknown.

Juveniles are expected to arrive earliest in the north and west, arriving in September off Shetland and the Western Isles. The migration continues for several months after the mid-winter peak, although glass eels may arrive throughout the year (Tesch, Westerberg, & Karlsson, 1990). Upon arrival, some individuals may enter the freshwater systems within their first year of arrival, while some stay within coastal and estuarine waters until matured (Daverat et al., 2006). Their movement to freshwater systems appears to be seasonal, possibly driven by water temperature; with temperatures rising between 12-14°C increasing upstream movement (Acou, Legault, Laffaille, & Feunteun, 2009), though river flow also influences migration (Edeline, Lambert, Rigaud, & Elie, 2006).

Swimming depth of juvenile and adult eels in Scotland are also uncertain. In the North Sea, studies suggest swimming depths of 1-17m (10m average) below the surface. The study identified that eels rarely spend time in deeper parts of the water column due to it being too cold (Palstra & van den Thillart, 2010). No data regarding swimming depth for juvenile eels is available.

8.4.3.2 Basking Shark

The basking shark *(Cetorhinus maximus)* is the largest coastal-pelagic shark found within Scottish waters, growing to lengths larger than 11 meters and weighing around 4 tonnes (Sims, 2008a). The species is a 'ram filter-feeding shark' and feeds in areas of high plankton concentrations. Basking sharks are also selective zooplankton feeders, with research showing a preference for high energy calanoid copepods such as *Calanus finmarchicus* (Sims, Fox, & Merrett, 2005). Feeding generally occurs from surface waters to depths of 320m (Skomal, Wood, & Caloyianis, 2004). Monitoring of the species feeding behaviour shows that basking sharks aggregate in coastal waters of continental shelfs dominated by transitional waters, where steep bathymetry combined with strong ocean currents result in areas of high phytoplankton and zooplankton density (Drewery, 2012).

In Scottish waters, basking sharks are particularly prevalent on the west coast during summer months, with highest densities observed in the Sea of the Hebrides (Paxton, Scott, & Rexstad, 2014). There is some evidence to suggest that relatively high summer densities of this species are also found in the waters to the west of the Outer Hebrides, although the sparse availability of data casts some doubt over this finding (Paxton et al., 2014). Basking shark are not expected to be present in high densities within the Minch, to the east of the Outer Hebrides, although some sightings have been recorded (Marine Scotland, 2018). The shallow waters of Glumaig Harbour are not anticipated to provide valuable habitat for basking sharks, where no sightings have been reported (Marine Scotland, 2018). Although the wider Stornoway Harbour provides deeper waters in comparison with Glumaig Harbour, no sightings of basking shark have been recorded (Marine Scotland, 2018; NBN Atlas, 2020). As such it is considered unlikely that basking shark will be present in the immediate vicinity of the Stornoway DWP. This is also true of the Stornoway spoil ground, where basking shark densities are expected to be very low.

Seasonal oceanic cycles cause fluctuating phytoplankton and zooplankton densities in Scottish waters. These variations in phytoplankton and zooplankton availability make basking sharks a highly migratory animal, with no resident populations in UK waters (Sims, Southall, Richardson, Reid, & Metcalfe, 2003). Therefore, populations of basking sharks are not anticipated near the Western Isles in winter when phytoplankton and zooplankton levels are low (Drewery, 2012). No population estimates for basking sharks in Scotland exist and wider aspects of their ecology including reproduction in Scottish territories is relatively unknown (Drewery, 2012). However, recent research by SNH indicates basking sharks may gather in large numbers of Scotland's Western coast to potentially mate, though data is still insufficient to fully conclude mating of basking sharks in Scottish waters (Witt et al., 2016).

8.4.3.3 Raitt's Sandeel

There are five species of sandeel found around in Scottish seas. The two most common species are *Ammodytes marinus*, known as the Raitt's sandeel and *Ammodytes tobianus*, known as the lesser sandeel. The Raitt's sandeel is typically found in waters from 10 to 150m in water depth, where the sediment at the seabed is made up of sandy substrates (HELCOM, 2019). Moreover, the distribution of sandeels within Scotland's seas is patchy and is generally concentrated on or nearby banks and areas of suitable sediment.

Sandeels are a priority marine feature (PMF) in Scotland's seas and have recently been included within one of four additional Nature Conservation Marine Protected Area (MPA) proposals for designation to complete the Scottish MPA network.

The Raitt's sandeel is a short-lived species, which reaches maturity within 1 to 2 years. Generally, the lifecycle of a Raitt's sandeel lasts for 10 years, but they have been known to live for less depending on the level of change to their habitat (Froese, 2012). Spawning from November to February, eggs are deposited on sand or fine gravel bottoms. Sandeels are largely stationary after settlement and have little in the form of migration. Sandeel abundance in the North East Lewis pMPA was found to be greatest up near the Butt of Lewis, as well as directly east and north east of the Eye Peninsula, at water depths between 50 and 150m. Predominantly, coastal Raitt's sandeels were identified between Tolsta Head and the Butt of Lewis . Raitt's sandeel's were identified to be absent around the entrance to Stornoway Harbour and the Stornoway spoil disposal ground (Scottish Government, SNH, & Conservation, 2014).

8.4.4 Identification of Receptors

Table 8.4.2 provides a summary of the fish receptors relevant to the proposed development which are taken forward for assessment, together with their assigned ecological value as described in Table 6.5.1 within Chapter 6: Biodiversity.

Table 8.4.2: Summary of Identified Diadromous Receptors and their Ecological Value

Receptor	Ecological Receptor Value	Justification
Sea of Hebrides pMPA	National	National designation under the Marine (Scotland) Act (2010)
North East Lewis pMPA	National	National designation under the Marine (Scotland) Act (2010)
Atlantic Salmon (*Salmo salar)*	International	Protected species under the Habitats Directive Annex II Species
Sea Trout (*Salmo trutta* morpha *trutta)*	National	Priority Marine Feature (PMF)
European Eel (*Anguilla angeuilla)*	International	IUCN Red List "Critically Endangered" species
Basking Shark *(Cetorhinus maximus)*	National	Protected under the Wildlife and Countryside Act 1981 Schedule 5
Raitt's Sandeel (*Ammodytes marinus*)	National	National designation under the Marine (Scotland) Act (2010)

8.5 Impact Assessment

Construction activities may result in a potential variety of direct and indirect impacts on the identified receptors. The assessment of these impacts follows the methodology outlined in Chapter 6: Biodiversity and assesses the potential effects resulting from the construction phase of the project as outlined in Chapter 2: Project Description.

8.5.1 Water Quality

During construction there could be the following effects on water quality in relation to various fish species:

- Increased sediment loading in the water column, resulting from dredging, spoil disposal, infilling and site surface water runoff; and
- Spillage of hazardous materials from machinery and equipment, and marine plant involved in the construction.

These potential effects will be considered in turn.

8.5.1.1 Increased Sediment Loading

The rock blasting/excavation, rock placement, dredging and spoil disposal operations, land reclamation and infill works, and surface water runoff, as detailed in Chapters 2: Project Description and Chapter 14: Water Environment, Soil and Coastal Processes, all have the potential to increase sediment loading in the water column. Further information is documented in Chapter 14: Water Environment, Soils and Coastal Processes.

Increased sediment loading in the water column can occur through a release of fines into the marine environment. Increased sediment loading in turn can result in increased turbidity which has the ability to induce behavioural changes in fish receptors. Increased sediment loading can ultimately reduce foraging efficiencies of fish species, provoking avoidance responses to areas in which foraging is inhibited due to large sediment plumes. Likewise, sedimentation of the water column can create barrier effects for migrating species; preventing migrating fish passing through affected areas, thus blocking routes to and from the sea (Robertson, Scruton, & Clarke, 2007; Stuart-Smith, Richardson, & White, 2004; Wenger et al., 2017).

Multiple studies have highlighted that impacts on fish from increased sediment loading are dependent on the concentration of the sediment in the water column and exposure time, with avoidance responses unlikely, unless concentrations are relatively high (Wenger et al., 2017). Studies in the Dutch Wadden Sea identified shifts in local abundance of salmonids associated with increased sediment loading, although these occurred when turbidity levels remained high for several years (Jonge, Essink, & Boddeke, 1993; Wenger et al., 2017). It has been shown that outward migrating smolt are particularly sensitive to increased sediment loading (Wenger et al., 2017). Studies of increased sediment loading on elasmobranchs identified similar avoidance of areas with high water column sediment loading (Higham, Stewart, & Wainwright, 2015).

Rock placement, infilling works, and dredging will all be conducted within the boundary of the DWP development. Affric's monitoring of the sediment loading resulting from similar rock placement, infilling, and dredging activities during previous port developments showed that sediment plumes resulting from these activities dispersed rapidly and were confined to the immediate vicinity of the working areas. As discussed in Chapter 14, the seabed in the vicinity of the land reclamation works is primarily sand and gravel, and as such is unlikely to be resuspended significantly by rock placement. Similarly, the material to be dredged has a low silt fraction and hence will settle quickly, minimising the duration of increased sediment in the water column associated with dredging. There are no strong tidal currents in the area which could transport suspended sediments further from the site. As such, the extent of the increase in sediment loading is expected to be localised and confined to the immediate vicinity of the works.

Baseline data collected for the River Creed (which discharges into Stornoway Harbour from the west), alongside published scientific data, notes that there is the potential for overlap between the marine construction area for the Stornoway DWP and the possible migratory pathways of both smolt and adult salmon, as salmon migrations tend to follow shallow coastlines. Despite there being high densities of salmon fry and/or parr in the River Creed, it is important to note that 90% of Western Isles salmon are grilse and only spend one year at sea, and thus, adult salmon do not partake in annual migrations. Moreover, it was identified during baseline data collection for the River Creed, the river was heavily peat lined and provides poor in-stream habitat for juvenile salmon development. As such, it is likely that smolt present in the River Creed would migrate to mature at sea, before returning to the river for the rest of their adult life. Although any potential impacts from sedimentation will be localised and temporary, it is likely that migratory pathways for smolt and adult salmon will be impacted upon along the western shores of Glumaig Harbour if they are present in the area. Likewise, research has highlighted that short-term increases in suspended sediments decrease the

foraging ability of juvenile salmon. As any sedimentation resulting from construction activity will settle out quickly along with short timescales of dredge activity closest to the coastline, the magnitude of this effect is assessed as **negligible, short term** and **reversible.** The resulting effect is **minor: non-significant**.

Very little information is available on the sensitivity of European eels to increased water column sediment loading. As European eel are also found in the River Creed and are anticipated to follow the same migration routes as Atlantic salmon, this assessment therefore assumes that the effects of increased sediment loading from all possible sources in Glumaig Harbour on European eels are analogous to those described for salmonids. As such, the potential effect on all European eel are assessed as **negligible, short term, and reversible** and the resulting impacts are therefore **minor: non-significant.**

As sea trout are anticipated to follow different migration routes, the effects of sedimentation are not thought to be the same. Sea trout densities were found to be highest in the Glen River, north of the Stornoway DWP construction area. Sea trout at sea migrations generally occur 3m below the surface of the water, with no preference as to whether they follow the coastline or not. As such, it is possible that without specific migratory pathways, sea trout may be able to avoid sedimentation plumes. Notwithstanding this statement, sedimentation will be localised and is not anticipated to affect the mouth of the Glen River. As such, the potential effect of sedimentation on sea trout is assessed as **negligible, short term** and **reversible** and therefore **negligible: non-significant**.

Basking sharks are extremely unlikely to be present in the immediate vicinity of the works due to the shallow (<15m) confined waters, which offer no valuable habitat to the species. As such the potential impacts on basking sharks and the Sea of Hebrides pMPA are assessed as **no change.**

Absence of Raitt's sandeel is expected within Glumaig Harbour and Stornoway Harbour, as areas considered for sandeel designation within the North East Lewis pMPA lie between Tolsta Head and the Butt of Lewis. Sandeel absence is highlighted by the fact that the habitat within Glumaig Harbour and the construction area does not provide suitable substrate for Raitt's sandeels, nor does the species undertake migrations and prefers to remain in-situ from birth, making it more unlikely for them to be present. Moreover, modelling of the effects of sedimentation demonstrated that sediment plumes would remain localised within the construction area, and are therefore unlikely to extend to the North East Lewis pMPA. As such, the potential impacts on Raitt's sandeel and the North East Lewis pMPA are assessed as **no change**.

Dredged spoil disposal not utilised in the land reclamation will take place at the Stornoway designated disposal ground, located south of Arnish point off the Isle of Lewis coast. The spoil ground is approximately 105 – 120km from the Sea of the Hebrides pMPA designated for basking sharks, (see Section 8.4.1) however, due to their large migratory patterns spoil disposals do have the potential to negatively affect the basking shark which may have arrived within the spoil disposal area from the pMPA. The densities of basking sharks present within the Stornoway disposal ground area, however, will be lower than that of those within the Sea of the Hebrides pMPA. Few basking shark sightings have been reported within 5km of the

spoil disposal ground (National Marine Plan Interactive, 2020; NBN Atlas, 2020). As such, it is still considered with low probability that basking sharks will be present in the immediate vicinity of the spoil ground.

Up to 50,000m^3 of dredged spoil may need to be disposed of, at the Stornoway Dredge Deposition area. Hence the impact on all relevant fish receptors will be localised and short term, as sediment is expected to settle out quickly. Moreover, the probability of fish receptors being in the spoil ground, and directly under the spoil vessel at the time of release is extremely low and as such, it is unlikely that physical injury would occur in this way. Due to the low value habitat at the spoil ground, and the low probability of fish presence in the spoil ground, the impacts on all Atlantic salmon, European eel, sea trout, basking shark and the Sea of the Hebrides pMPA are assessed as **negligible, short term,** and **reversible.** Therefore, the resulting effect is **negligible to minor: non-significant.**

Moreover, Raitt's sandeel are identified to be absent from the Stornoway spoil disposal ground and the surrounding area just outwith Glumaig Harbour. As such, the effect of spoil disposal on Raitt's sandeel and the area of the North East Lewis pMPA designated for sandeels is **no change**.

8.5.1.2 Release of Hazardous Substances

The accidental release of hydrocarbons and other hazardous substances in the event of a loss of containment during the construction works may result in contamination of the marine environment, potentially affecting fish (Wenger et al., 2017). The impacts of a release of a hazardous substance can be acute; high concentrations or substances especially toxic to aquatic environments resulting in increased mortality rates over short periods (Hutchinson, Lyons, Thain, & Law, 2013; Wenger et al., 2017). Alternatively, spill events may cause chronic impacts, where pollutants affect species physiology over extended periods while accumulating in organic tissue, allowing contamination to pass through the wider ecosystem (Hamilton, Rolshausen, Uren Webster, & Tyler, 2017; Oleksiak, 2008). Effects including physiological harm, behavioural disturbance, reduced fertility and mortality in fish have been reported after both short and long-term exposure to contaminants following a pollution event. The studies also identified that juveniles are more vulnerable to pollution events than adults, requiring lower dosages for effects to occur (Costa et al., 2011; Limburg & Waldman, 2009; Wenger et al., 2017).

Loss of chemicals and fuels may arise from onshore equipment, vessels and marine plant utilised during the construction phase. Vessels associated with construction are expected to carry potential pollutants, with hydrocarbon-based fuels, lubricants and hydraulic fluids being the biggest potential pollution sources. The assessment assumes that all vessels and equipment are well maintained, operated by suitably trained personnel and with standard pollution prevention procedures outlined in Chapter 14: Water Environment, Soils and Coastal Processes, are in place. In addition, all vessels are required to comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) regulations. The regulations cover the prevention of chemical and hydrocarbon spills during both routine operations and incidents. The operating vessels will also have shipboard oil pollution emergency plans (SOPEP), which will minimise the potential impacts of any loss of containment that may occur.

The magnitude of potential impacts arising from a release of contaminants would depend on the nature and quantity of material released into the environment. There is the potential for a spill of hazardous material to have long term major impacts, through changes to the health and behaviour of the receptors on a regional scale. However, the adoption of the mitigation measures and standard industry best practice techniques for pollution prevention identified in Chapter 14: Water Environment, Soils & Coastal Processes, as well as in Chapter 17: Schedule of Mitigation, significantly reduces or removes the risk of such an event occurring. As such it is considered extremely unlikely that release of hazardous material of a scale with the potential to negatively impact on Atlantic salmon, European eel, sea trout, basking shark and the Sea of the Hebrides pMPA will occur; therefore, the potential effect is assessed as **negligible, short term,** and **reversible,** and the resulting effect is **negligible to minor: non-significant.**

As Raitt's sandeel are identified to be absent from the Stornoway spoil disposal ground and the surrounding area, Stornoway Harbour and Glumaig Harbour itself, it is extremely unlikely the release of hazardous substance will bear any impact. As such, the effect of hazardous substance release on Raitt's sandeel and the areas of North East Lewis pMPA designated for sandeels is **no change**.

8.5.2 Underwater Noise

Underwater noise emissions will result from the construction activities associated with the proposed construction of the Stornoway DWP development. Further detail on the proposed construction techniques is provided in Chapter 2: Project Description. Underwater noise emissions can result in disturbance, displacement, and injury of fish receptors. Underwater noise levels associated with the construction activities associated with the revised design of the DWP, have been considered in Chapter 11: Underwater Noise.

It was found that the greatest potential acoustic impacts on fish are associated with impact piling, hence this is considered as the worst-case scenario, and is taken forward for detailed ecological assessment below. All other noise sources were significantly less powerful than impact piling, and the impact range estimation did not identify any potential for significant impacts on relevant fish receptors, hence they are not considered further.

As discussed in more detail in Chapter 7: Marine Mammals and Chapter 11: Underwater Noise, noise effects include:

- Disturbance which causes a species to act differently from normal but does not cause any direct physical harm.
- Temporary Threshold Shift (TTS) – where hearing is temporarily affected but will recover once the animal is no longer exposed to the sound.
- Permanent Threshold Shift (PTS) – where hearing is permanently damaged.

Outputs of the piling noise model have been compared against the latest fish auditory injury impact criteria provide by A. Popper *et al.*, 2014, in order to estimate the ranges from the piling works at which different magnitudes of acoustic impact may occur. Estimations on how the magnitude of acoustic impacts are given consideration are further described in Chapter 11: Underwater Noise.

As highlighted in Chapter 11: Underwater Noise, the worst-case scenario with regard to pile noise source for the revised design is associated with the 123cm diameter king piles. As such,

the impact of piling on fish receptors has been informed on this basis. The impacts assessed were performed on the basis of impact piling of a 123cm pile being continuous with at least 1000 strikes occurring.

The revised outputs were compared against the latest 'Summary of Criteria for Physical Injury on Fish from Impact Piling Noise' (Popper et al., 2014), in order to estimate the ranges from the works at which different magnitudes of acoustic impacts may occur.

The criteria groups the types of fish into functional hearing groups as shown in Table 8.5.1. The specific fish receptors relevant to the Stornoway DWP development are summarised in detail in Section 8.4.3.

Table 8.5.1: Functional Hearing Groups, and Relevant Fish Receptors (after Popper et al., 2014)

Hearing Group	Relevant Fish Receptors	Sensitivity to Underwater Noise
Fish: No Swim Bladder (P-)	Basking Shark Sea of the Hebrides pMPA	Least Sensitive
Fish: Swim Bladder Not Involved in Hearing (P-)	Atlantic Salmon Sea Trout European Eel Raitt's Sandeel	↓
Fish: Swim Bladder Involved in Hearing (P+)	None	Most Sensitive

Unweighted peak criteria (dB_{z-p}) and cumulative sound exposure criteria (dB_{SEL-24}) for impact piling noise are the noise criteria used to determine the onset of mortality and potential mortal injury, recoverable injury, and Temporary Threshold Shift (Cutts *et al.*), where a temporary reduction in hearing sensitivity may occur in individual receptors. These are presented in Table 8.5.2.

Table 8.5.2: Summary of Criteria for Physical Injury on Fish from Impact Piling Noise (after Popper et al. 2014)

Impact Piling	Mortality & Potential Mortal injury	Impairment	
Type of Fish		Recoverable Injury	TTS
Fish: No Swim Bladder	> 219 dB_{SEL-24} > 213 dB_{z-p}	> 216 dB_{SEL-24} > 213 dB_{z-p}	> 186 dB_{SEL-24}
Fish: Swim Bladder Not Involved in Hearing	210 dB_{SEL-24} > 207 dB_{z-p}	203 dB_{SEL-24} > 207 dB_{z-p}	> 186 dB_{SEL-24}

Where insufficient data is available for impact piling effects on fish (behavioural and masking effects), qualitative criteria are presented, summarising the effect of the noise as having either a high, moderate or low effect on an individual in either the near-field (N)(tens of metres), intermediate-field (I)(hundreds of metres), or far-field (F)(thousands of metres) (AN Popper *et al.*, 2014)). The impact piling masking and behavioural response criteria for the hearing groups relevant to this assessment are summarised in Table 8.5.3. Note that the qualitative nature of these criteria means that impact ranges cannot be calculated.

Table 8.5.3: Summary of the Qualitative Effects on Fish from Impact Piling Noise (after Popper et al. 2014) (N=Near-field, I=Intermediate-field, F=Far-field)

Impact Piling Type of Fish	Masking	Behaviour
Fish: No Swim Bladder	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: Swim Bladder Not Involved in Hearing	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low

When the qualitative behavioural and masking criteria for impact piling are reviewed, it is shown that all relevant fish receptors within tens of metres from the pile driving will be subjected to a moderate level of masking, reducing to low level effects for animals further from the source. High behavioural responses (such as startle response, and strong avoidance resulting in exclusion) can be expected in the near field, reducing to moderate level (changes in swim speeds, and a reduction of time spent in an area) in the intermediate field, within hundreds of metres from the source. In the far field, once the range to the source exceeds 1000m, the behavioural response is reduced to low.

Further, potential fish impacts from impact piling were assessed against the unweighted dB_{z-p} ranges. As a result of the changes to the development design, the maximum expected impacts ranges of TTS and PTS on fish receptors resulting from impact piling operations from the previous design were compared against the maximum impact range which would occur from impact piling operations taking the redesign into account. This was applied to the relevant fish receptors in Section 8.4.3 and the difference in zones of TTS and PTS were presented in Table 8.5.4.

Table 8.5.4: Impact Piling 1000 Strike Considerations for 123cm pile (227.5 dB_{z-p} re 1 µPa)

Fish Hearing Group	Species Examples	123cm pile diameter	
		PTS	TTS
P+	Herring, Spratt	No Risk	Beyond 500m, potentially up to 1.5km.
P-	Salmon, Shark	No Risk	Within 150m of source

The maximum TTS impact range is predicted to extend potentially up to 1.5km from the piling works for P+, however as detailed above considerations only need to be made to the relevant receptors. As such, the maximum TTS impact range is 150m for diadromous fish and basking sharks (P-). It is predicted that any behavioural effects that may occur are to decrease to low (Table 8.5.3) within 1,000m of the works. As a single major river discharges into Glumaig Harbour, noise emissions have the potential to disrupt migrations of fish to or from their riverine habitats. However, due to the localised and temporary nature of the predicted acoustic impacts on diadromous fish, together with the low expected densities of these receptors within the affected area, the piling noise impacts are assessed as **negligible, short term,** and **reversible**. The overall effect is therefore **minor: non-significant**.

Basking sharks do not have swim bladders, making them less sensitive to underwater noise than the diadromous receptors (Table 8.5.1). In order to suffer either mortal or recoverable injury, a basking shark would need to remain within 1m of the works during 24hr of continuous

piling. This would not happen, and hence no risk of injury to this species exists. The maximum TTS range for basking sharks is predicted to extend 150m from the piling works. The waters within 150m of the works are <10m deep, and extremely confined, making them unsuitable for such a large fish. Therefore, basking sharks are not anticipated to be present in the area where they may be subject to TTS. This species may be subject to behavioural disturbance within 1,000m of the piling works, however, these waters are still shallow and confined, and do not provide any valuable habitat to basking sharks. As such, the impacts on basking shark and the Sea of the Hebrides pMPA are assessed as **negligible, short term,** and **reversible**. The overall effect is therefore **negligible: non-significant**.

As Raitt's sandeel are identified to be absent from the construction boundaries of the Stornoway DWP development, Glumaig Harbour and Stornoway Harbour itself and the southernly extents of the North East Lewis pMPA, underwater noise will not bear any impact due to limits of TTS and PTS. As such, the effect of underwater noise on Raitt's sandeel and the areas of North East Lewis pMPA designated for sandeels is **no change**.

8.6 Mitigation Measures

No significant impacts on relevant fish receptors have been identified as a result of the construction of the proposed Stornoway DWP development. As such, no specific mitigation measures are required. The reason for the lack of significant impacts is in part due to the embedded mitigation provided by the design and location of the development, together with the implementation of secondary mitigation and following standard industry good practice to minimise deterioration of water quality as detailed in Chapter 14: Water Environment, Soils & Coastal Processes.

It is however noted that as detailed in Chapter 7: Marine Mammals, pre-start watches will be conducted in order to mitigate potential impacts on marine mammals resulting from piling and spoil disposal operations. While the impacts on basking sharks resulting from piling and spoil disposal operations were assessed as being non-significant, as a matter of best practice, the marine mammal protocols will also apply to basking sharks.

8.7 Residual Effects

The potential impacts on relevant fish receptors are not assessed as significant, and no specific mitigation has been proposed, subsequently it is not necessary to assess residual effects.

8.8 Cumulative Effects

As detailed in Chapter 3: Methodology, three offshore projects were scoped into the cumulative assessment, however, cumulative impacts on all fish receptors are not predicted, as aforementioned in Chapter 3: Methodology.

8.9 Summary

No significant impacts arising from the construction phase of the Stornoway DWP development on fish receptors (Section 8.4.4) were identified. Table 8.9.1 summarises the impacts assessed for diadromous fish receptors and the mitigation measures identified to control them.

Table 8.9.1: Summary of Effects

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Construction							
Sea of Hebrides pMPA	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from rock placement, infilling works, and dredging.	National	None	No Change	No specific mitigation required	None	No Change
	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from dredge disposal.		None	No Change	Marine Mammal Mitigation protocol will apply	None	No Change
	Mortality and reduced productivity resulting from the resuspension of sediment from dredging works.		None	No Change	No specific mitigation required	None	No Change
	Mortality and reduced productivity resulting from the release of hazardous substances in the event of a loss of containment.		Negligible Short term Reversible	Minor: Non-significant	No specific mitigation required	Negligible Short term Reversible	Minor: Non-significant
	Injury/Disturbance/ disruption of migration due to underwater noise from piling operations.		Negligible Short term Reversible	Negligible: non-significant	Marine Mammal Mitigation protocol will apply.	Negligible Short term Reversible	Negligible: non-significant
Atlantic Salmon	Disturbance/foraging impairment/disruption of migration due to increased	International	Negligible Short term Reversible	Minor: Non-significant	No specific mitigation required	Negligible Short term Reversible	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	sediment loading from rock placement, infilling works, and dredging.						
	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from dredge disposal.		Negligible Short term Reversible	Minor: Non-significant	No specific mitigation required	Negligible Short term Reversible	Minor: Non-significant
	Mortality and reduced productivity resulting from the release of hazardous substances in the event of a loss of containment.		Negligible Short term Reversible	Minor: Non-significant	No specific mitigation required	Negligible Short term Reversible	Minor: Non-significant
	Injury/Disturbance/ disruption of migration due to underwater noise from piling operations.		Negligible Short term Reversible	Minor: Non-significant	No specific mitigation required	Negligible Short term Reversible	Minor: Non-significant
Sea Trout	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from rock placement, infilling works, and dredging.	National	Negligible Short term Reversible	Negligible: Non-significant	No specific mitigation required	Negligible Short term Reversible	Negligible: Non-significant
	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from dredge disposal.		Negligible Short term Reversible	Negligible: Non-significant	No specific mitigation required	Negligible Short term Reversible	Negligible: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Mortality and reduced productivity resulting from the release of hazardous substances in the event of a loss of containment.		Negligible Short term Reversible	Negligible: Non-significant	No specific mitigation required	Negligible Short term Reversible	Negligible: Non-significant
	Injury/Disturbance/ disruption of migration due to underwater noise from piling operations.		Negligible Short term Reversible	Minor: Non-significant	No specific mitigation required	Negligible Short term Reversible	Minor: Non-significant
European Eel	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from rock placement, infilling works, and dredging.	International	Negligible Short term Reversible	Minor: Non-significant	No specific mitigation required	Negligible Short term Reversible	Minor: Non-significant
	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from dredge disposal.		Negligible Short term Reversible	Minor: Non-significant	No specific mitigation required	Negligible Short term Reversible	Minor: Non-significant
	Mortality and reduced productivity resulting from the resuspension of sediment bound contaminants from dredge disposal.		Negligible Short term Reversible	Minor: Non-significant	No specific mitigation required	Negligible Short term Reversible	Minor: Non-significant
	Mortality and reduced productivity resulting from the release of hazardous		Negligible Short term Reversible	Minor: Non-significant	No specific mitigation required	Negligible Short term Reversible	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	substances in the event of a loss of containment.						
	Injury/Disturbance/ disruption of migration due to underwater noise from piling operations.		Negligible Short term Reversible	Minor: Non-significant	No specific mitigation required	Negligible Short term Reversible	Minor: Non-significant
Basking Shark	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from rock placement, infilling works, and dredging.	International	None	No Change	No specific mitigation required	None	No Change
	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from dredge disposal.		None	No Change	Marine Mammal Mitigation protocol will apply	None	No Change
	Mortality and reduced productivity resulting from the release of hazardous substances in the event of a loss of containment.		Negligible Short term Reversible	Minor: Non-significant	No specific mitigation required	Negligible Short term Reversible	Minor: Non-significant
	Injury/Disturbance/ disruption of migration due to underwater noise from piling operations.		Negligible Short term Reversible	Negligible: Non-significant	Marine Mammal Mitigation protocol will apply	Negligible Short term Reversible	Negligible: Non-significant
North East Lewis	Disturbance/foraging impairment/disruption of migration due to increased	National	None	No Change	No specific mitigation required	None	No Change

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
pMPA (areas only for sandeel considera tion)	sediment loading from rock placement, infilling works, and dredging.						
	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from dredge disposal.		None	No Change	No specific mitigation required	None	No Change
	Mortality and reduced productivity resulting from the resuspension of sediment from dredging works.		None	No Change	No specific mitigation required	None	No Change
	Mortality and reduced productivity resulting from the release of hazardous substances in the event of a loss of containment.		None	No Change	No specific mitigation required	None	No Change
	Injury/Disturbance/ disruption of migration due to underwater noise from piling operations.		None	No Change	No specific mitigation required	None	No Change
Raitt's Sandeel	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from rock placement, infilling works, and dredging.	National	None	No Change	No specific mitigation required	None	No Change
	Disturbance/foraging impairment/disruption of		None	No Change	No specific mitigation required	None	No Change

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	migration due to increased sediment loading from dredge disposal.						
	Mortality and reduced productivity resulting from the resuspension of sediment from dredging works.		None	No Change	No specific mitigation required	None	No Change
	Mortality and reduced productivity resulting from the release of hazardous substances in the event of a loss of containment.		None	No Change	No specific mitigation required	None	No Change
	Injury/Disturbance/ disruption of migration due to underwater noise from piling operations.		None	No Change	No specific mitigation required	None	No Change

Key

Significant Effect
Non-Significant

8.10 References

Acou, A., Legault, A., Laffaille, P., & Feunteun, E. (2009). *Environmental determinism of year-to-year recruitment variability of European eel Anguilla anguilla in a small coastal catchment, the Frémur River, north-west France* (Vol. 74).

Baxter, J., Boyd, I., Cox, M., Donald, A., Malcolm, S., Miles, H., . . . Moffat, C. (2011). *Scotland's Marine Atlas: Information for the national marine plan* Retrieved from Edinburgh: http://marine.gov.scot/datafiles/misc/MarineAtlas-Complete.pdf

Correia, M. J., Costa, J. L., Antunes, C., De Leo, G., Domingos, I., & Handling editor: Caroline, D. (2018). The decline in recruitment of the European eel: new insights from a 40-year-long time-series in the Minho estuary (Portugal). *ICES Journal of Marine Science*, fsy073-fsy073. doi:10.1093/icesjms/fsy073

Costa, P. M., Neuparth, T. S., Caeiro, S., Lobo, J., Martins, M., Ferreira, A. M., . . . Costa, M. H. (2011). Assessment of the genotoxic potential of contaminated estuarine sediments in fish peripheral blood: Laboratory versus in situ studies. *Environmental Research, 111*(1), 25-36. doi:https://doi.org/10.1016/j.envres.2010.09.011

Daverat, F., E. Limburg, K., Thibault, I., Shiao, J.-C., Dodson, J., Caron, F., . . . Wickström, H. (2006). *Phenotypic plasticity of habitat use by three temperate eel species, Anguilla anguilla, A. japonica and A. rostrata* (Vol. 308).

Davidsen, J. G., Manel-la, N. P., ØKland, F., Diserud, O. H., Thorstad, E. B., Finstad, B., . . . Rikardsen, A. H. (2008). Changes in swimming depths of Atlantic salmon Salmo salar post-smolts relative to light intensity. *Journal of Fish Biology, 73*(4), 1065-1074. doi:doi:10.1111/j.1095-8649.2008.02004.x

DEFRA. (2010). *Eel Managment plans for the United Kingdom: Scotland River Basin District* Unknown: Department for Environment Food and Rural Affairs Retrieved from http://www.gov.scot/Resource/Doc/295194/0118349.pdf.

Drewery, H. (2012). Basking Shark *(Cetorhinus maximus)* Literature Review, Current Research and New Research Ideas. (24/12).

Edeline, E., Lambert, P., Rigaud, C., & Elie, P. (2006). Effects of body condition and water temperature on Anguilla anguilla glass eel migratory behavior. *Journal of Experimental Marine Biology and Ecology, 331*(2), 217-225. doi:https://doi.org/10.1016/j.jembe.2005.10.011

Eldøy, S. H., Davidsen, J. G., Thorstad, E. B., Whoriskey, F. G., Aarestrup, K., Næsje, T. F., . . . Arnekleiv, J. V. (2017). Marine depth use of sea trout Salmo trutta in fjord areas of central Norway. *Journal of Fish Biology, 91*(5), 1268-1283. doi:doi:10.1111/jfb.13463

Envirocentre. (2018). Stornoway Deep Water Port: Environmental Impact Assessment.

Finstad, B., Økland, F., Thorstad, E. B., BjØrn, P. A., & McKinley, R. S. (2005). Migration of hatchery-reared Atlantic salmon and wild anadromous brown trout post-smolts in a Norwegian fjord system. *Journal of Fish Biology, 66*(1), 86-96. doi:doi:10.1111/j.0022-1112.2005.00581.x

Froese, R. D. P. (2012). *FishBase. World Wide Web electronic publication*. Retrieved from www.fishbase.org

Godfrey, J. (2005). Site Condition Monitoring of Atlantic Salon SACs.

Godfrey, J., Stewart, D., Middlemas, S., & Armstrong, J. (2014). *Depth use and movement of homing Atlantic salmon (Salmo salar) in Scottish coastal water in relation to marine renewable energy development* Retrieved from Pitlochry: http://www.gov.scot/Resource/0046/00466487.pdf

Hamilton, P. B., Rolshausen, G., Uren Webster, T. M., & Tyler, C. R. (2017). Adaptive capabilities and fitness consequences associated with pollution exposure in fish. *Philosophical Transactions of the Royal Society B: Biological Sciences, 372*(1712). doi:10.1098/rstb.2016.0042

HELCOM. (2019). *Species Information Sheet - Ammodytes marinus*. Retrieved from https://www.helcom.fi/wp-content/uploads/2019/08/HELCOM-Red-List-Ammodytes-marinus-1.pdf

Higham, T., Stewart, W., & Wainwright, P. (2015). Turbulence, Temperature, and Turbidity: The Ecomechanics of Predator–Prey Interactions in Fishes. *Integrative & Comparative Biology, 55*(1), 6-20.

Hutchinson, T. H., Lyons, B. P., Thain, J. E., & Law, R. J. (2013). Evaluating legacy contaminants and emerging chemicals in marine environments using adverse outcome pathways and biological effects-directed analysis. *Marine Pollution Bulletin, 74*(2), 517-525. doi:https://doi.org/10.1016/j.marpolbul.2013.06.012

Jonge, V. N., Essink, K., & Boddeke, R. (1993). *The Dutch Wadden Sea: a changed ecosystem* (Vol. 265).

Jonstone, A., Walker, A., Urquhart, G., & Thorne, A. (1995). The Movements of Sea Trout Smolts, *Salmo trutta L.*, in a Scottish West Coast Sea Loch Determined by Acoustic Tracking

Limburg, K. E., & Waldman, J. R. (2009). Dramatic Declines in North Atlantic Diadromous Fishes. *BioScience, 59*(11), 955-965. doi:10.1525/bio.2009.59.11.7

Lowe, R. H. (1952). The Influence of Light and Other Factors on the Seaward Migration of the Silver Eel (Anguilla anguilla L.). *Journal of Animal Ecology, 21*(2), 275-309. doi:10.2307/1963

Malcolm, I., Godfrey, J., & Youngson, A. (2010). *Review of migratory routes and behavior of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: Implications for the development of marine renewable's*. Retrieved from Aberdeen: http://www.gov.scot/Resource/Doc/295194/0111162.pdf

Marine Scotland. (2020). National Marine Plan Interactive. Retrieved from https://marinescotland.atkinsgeospatial.com/nmpi/

Middlemas, S., Stewart, D., Mackay, S., & Armstrong, J. (2009). Habitat use and dispersal of post-smolt sea trout *Salmo trutta* in a Scottish sea loch system *Journal of Fish Biology, 74*(3), 639-651.

National Marine Plan Interactive. (2020). Basking sharks (Cetorhinus maximus) sightings and distribution (Priority Marine Feature) (SNH WMS). Retrieved from https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=1180

NBN Atlas. (2020). Explore Your Area; Basking Sharks. Retrieved from https://records.nbnatlas.org/explore/your-area#58.182294455483834|-6.370106321582023|12|ALL_SPECIES

OHFT. (2012). The Outer Hebrides Fisheries Trust - Fisheries Management Plan

Oleksiak, M. F. (2008). Changes in Gene Expression due to Chronic Exposure to Environmental Pollutants. *Aquatic toxicology (Amsterdam, Netherlands), 90*(3), 161-171. doi:10.1016/j.aquatox.2008.08.010

OSPAR Commission. (2017a). Intermediate Assessment 2017.

OSPAR Commission. (2017b). List of Threatend and/or Declining Species & Habitats. Retrieved from https://www.ospar.org/work-areas/bdc/species-habitats/list-of-threatened-declining-species-habitats

Palstra, A. P., & van den Thillart, G. E. E. J. M. (2010). Swimming physiology of European silver eels (Anguilla anguilla L.): energetic costs and effects on sexual maturation and reproduction. *Fish Physiology and Biochemistry, 36*(3), 297-322. doi:10.1007/s10695-010-9397-4

Paxton, C., Scott, L., & Rexstad, E. (2014). *Statistical approaches to aid the identification of Marine Protected Areas for minke whale, Risso's dolphin, white-beaked dolphin and basking shark* (594). Retrieved from https://www.nature.scot/sites/default/files/2017-11/Publication%202014%20-%20SNH%20Commissioned%20Report%20594%20-%20Statistical%20approaches%20to%20aid%20identification%20of%20Marine%20Protected%20Areas%20for%20Minke%20whale%2C%20Risso%27s%20dolphin%2C%20White-beaked%20dolphin%20and%20Basking%20shark.pdf

Pemberton, R. (1976). Sea trout in North Argyll Sea lochs, population, distribution and movements. *Journal of Fish Biology, 9*(2), 157-179. doi:doi:10.1111/j.1095-8649.1976.tb04670.x

Popper, A., Hawkins, A., Richard, R., Fay, A., Bratol, S., Carlson, T., . . . Tavolga, W. (2014). Sound exposure guidelines for fishes and sea turtles. *Springer Briefs in Oceanography*.

Robertson, M. J., Scruton, D. A., & Clarke, K. D. (2007). Seasonal Effects of Suspended Sediment on the Behavior of Juvenile Atlantic Salmon. *Transactions of the American Fisheries Society, 136*(3), 822-828. doi:10.1577/T06-164.1

Scottish Government, SNH, & Conservation, W. D. (2014). *North-east Lewis Possible Marine Protected Area*. Retrieved from https://www.nature.scot/sites/default/files/2019-06/North-east%20Lewis%20possible%20MPA%20-%20Site%20Summary%20Leaflet%20-%20June%202019.pdf

Scottish Government. (2017, 16 February 2017). Sea trout Retrieved from http://www.gov.scot/Topics/marine/marine-environment/species/fish/freshwater/seatrout

SEPA. (2020). Water Classification Hub - Abhainn Ghrioda.

Sims, D. (2008a). Chapter 3 Sieving a Living: A Review of the Biology, Ecology and Conservation Status of the Plankton-Feeding Basking Shark Cetorhinus Maximus. In *Advances in Marine Biology* (Vol. 54, pp. 171-220): Academic Press.

Sims, D. (2008b). Sieving a Living: A Review of the Biology, Ecology and Conservation Status of the Plankton-Feeding Basking Shark *Cetorhinus Maximus*.

Sims, D., Fox, A., & Merrett, D. (2005). Basking shark occurrence off south-west England in relation to zooplankton abundance. *Fish Ecology, 51*(2), 436-440.

Sims, D., Southall, E., Richardson, A. M. M., Reid, P., & Metcalfe, J. (2003). Seasonal movements and behavior of basking sharks from archival tagging: no evidence of winter hibernation. *Marine Ecology Progress Series, 248*(2), 187-196.

Skomal, G., Wood, G., & Caloyianis, N. (2004). Archival tagging of a basking shark, *Cetorhinus maximus*, in the western North Atlantic *Journal of Marine Biology, 84*(2), 84-91.

SNH. (2014). Scottish MPA Project Data confidence assessment - Sea of the Hebrides MPA Proposal

SNH. (2017a). Atlantic Salmon. Retrieved from https://www.nature.scot/plants-and-animals/fish/freshwater-fish/atlantic-salmon

SNH. (2017b, 2017). European eel. Retrieved from https://www.nature.scot/plants-animals-and-fungi/fish/freshwater-fish/european-eel

SNH. (2017c). The Scottish Marine Wildlife Watching Code.

SNH. (2020). SNH Site Link. Retrieved from https://gateway.snh.gov.uk/sitelink/

Stuart-Smith, R. D., Richardson, A. M. M., & White, R. W. G. (2004). Increasing turbidity significantly alters the diet of brown trout: a multi-year longitudinal study. *Journal of Fish Biology, 65*(2), 376-388. doi:doi:10.1111/j.0022-1112.2004.00456.x

Tesch, F. W., Westerberg, H., & Karlsson, L. (1990). Tracking Studies on Migrating Silver Eels in the Central Baltic. *Internationale Revue der gesamten Hydrobiologie und Hydrographie, 75*(6), 866-866. doi:doi:10.1002/iroh.19900750634

Tyler-Walters, H., Carruthers, J., Wilding, C., Durkin, O., Lacey, C., Philpott, E., . . . Carawford-Avis, O. (2016). Descriptions of Scottish Priority Marine Features (PMFs). 1-149.

Urquhart, A., & Shearer, W. (2010). The Coastal Movements of Returning Atlantic Salmon, *Salmo salar L.*

Vøllestad, L. A., Jonsson, B., Hvidsten, N. A., Næsje, T. F., Haraldstad, Ø., & Ruud-Hansen, J. (1986). Environmental Factors Regulating the Seaward Migration of European Silver Eels (Anguilla anguilla). *Canadian Journal of Fisheries and Aquatic Sciences, 43*(10), 1909-1916. doi:10.1139/f86-236

Wenger, A. S., Harvey, E., Wilson, S., Rawson, C., Newman, S. J., Clarke, D., . . . Evans, R. D. (2017). A critical analysis of the direct effects of dredging on fish. *Fish and Fisheries, 18*(5), 967-985. doi:doi:10.1111/faf.12218

Witt, M., Doherty, P., Godley, B., Graham, R., Hawkes, L., & Henderson, S. (2016). Basking shark satellite tagging project: insights into basking shark (Cetorhinus maximus) movement, distribution and behavior using satellite telemetry.

8.11 Glossary

Acronym	Definition
BAPs	Biodiversity Action Plan
dB_{z-p}	Maximum Peak Pressure
dB_{SEL-24}	Cumulative Sound Exposure
DWP	Deep Water Port
EC	European Commission
EcIA	Ecological Impact Assessment
EIAR	Environmental Impact Assessment Report
EPS	European Protected Species
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
km	Kilometres
m	Metres
min	Minutes
PMF	Priority Marine Feature
pMPA	Proposed Marine Protected Area
PTS	Permanent Threshold Shift
SAC	Special Area of Conservation
SNH	Scottish Natural Heritage
TTS	Temporary Threshold Shift

Chapter 9: Benthic Ecology

STORNOWAY PORT AUTHORITY

Contents

9 Benthic Ecology

9.1 Introduction

This chapter presents the benthic Ecological Impact Assessment (EcIA) for the proposed Stornoway Deep Water Port (DWP). As discussed in Chapter 3, it was deemed appropriate to consider benthic receptors as they could be impacted by the development. Benthic Receptors are evaluated in the context of nature conservation legislation and relevant planning policy (see Chapter 4: Statutory Context & Policy, and Chapter 6: Biodiversity). Impacts on receptors are identified and subject to detailed impact assessment. Mitigation is proposed, cumulative impacts are considered, and finally the residual impacts and their significance are assessed.

9.2 Regulations and Guidance

Regulations and guidance pertaining to ecology and biodiversity are outlined in Chapter 6: Biodiversity. This section specifically details the regulations and guidance to benthic ecology.

9.2.1 Planning Framework

The Scottish National Marine Plan provides General Planning Principles (GEN), of which the following apply to the benthic ecology assessment:

- **GEN 9 Natural Heritage:** Development and use of the marine environment must:
  - Comply with legal requirements for protected areas and protected species;
  - Not result in significant impact on the national status of Priority Marine Feature (PMF)s; and
  - Protect and, where appropriate, enhance the health of the marine area.
- **GEN 10 Invasive Non-Native Species:** Opportunities to reduce the introduction of invasive non-native species to a minimum or proactively improve the practice of existing activity should be taken when decisions are being made.

9.2.2 European and International Regulations

The Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, known as the 'Habitats Directive', was adopted in 1992. The Directive is the means by which the European Union meets its obligations under the Bern Convention. In order to comply with Article 3 of the directive, Special Areas of Conservation (SAC) must be designated in UK territorial waters in order to provide a network of high-quality conservation sites for habitats and species listed under Annexes I and II of the Directive. A total of thirteen marine habitats are detailed in Annex I of the Directive, whilst eight benthic species are listed in Annex II.

As such, species listed in Annexes I and II of the Habitats Directive are considered sensitive species for the purpose of this assessment.

9.2.3 National Legislation

The Marine (Scotland) Act 2010 has established powers with regards to the designation of Marine Protected Areas (MPAs) in Scottish Territorial Waters (STW), including those for nature conservation. There are no designated MPAs for the presence of benthic or intertidal habitats or species within the vicinity of the proposed development.

9.2.4 Other Guidance

The Marine (Scotland) Act 2010 sets out duties on Scottish Ministers to ensure Scotland's seas are managed sustainably. In order to help meet this requirement, the Joint Nature Conservation Committee (JNCC) and Scottish Natural Heritage (SNH) have produced a list of habitats and species occurring in STW, which are noted for their conservation importance. These are referred to as Priority Marine Features (PMFs) (Tyler-Walters et al., 2016.). Inclusion in the PMF does not provide any additional legal protection, however, due consideration must be provided in Impact Assessments, and as such, all PMFs are considered sensitive for the purpose of this assessment.

As the project is partly below the MHWS and within 12 nautical miles (nm) of the Scottish Coastline it falls within the remit of the Marine (Scotland) Act 2010. The 2015 Scottish National Marine Plan (NMP) covering inshore waters is a requirement of the Act. The NMP lays out the Scottish Minister's policies for the sustainable development of Scotland's seas and provides General Planning Principles (GENs), most of which apply to the construction and operations of the Stornoway DWP. GEN 9 under the NMP is specific to natural heritage and refers to how developments and use of the marine environment must:

"Comply with legal requirements for protected areas and protected species; Not result in significant impact on the national status of Priority Marine Features; and, Protect and, where appropriate, enhance the health of the marine area".

9.2.5 Sources of Information

The following sources of information were consulted in the compilation of this benthic ecological impact assessment:

- Appendix I.1: Stornoway Harbour Deepwater Berth: Benthic Marine Ecology Data Review (APEM, 2019)
- Appendix I.2: Stornoway Deep Water Port Benthic Survey 2020 – Habitat Assessment Report (APEM, 2018);
- Appendix N.1: Deep Water Port Stornoway Stage 1 Development Hydraulic Modelling Report (RPS, 2020);
- Guidance on Survey and Monitoring in Relation to Marine Renewables Developments in Scotland. Volume 5: Benthic Habitats (Saunders, Bedford, Trendall, & Sotheran, 2011);
- Marine Habitat Classification of the British Islands (JNCC, 2018);
- International Convention for the Control and Management of Ships' Ballast Water and Sediments (International Maritime Organization, 2004);
- Guidance for Pollution Prevention 5: Works and Maintenance in or Near Water (NIEA, 2017);
- UK BAP Priority Species and Habitats (JNCC, 2016);
- International Union of Conservation of Nature Red List of Threatened Species (International Union of Conservation of Nature, 2016);
- SNH Site Link (SNH, 2020); and
- Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey (Davis et al., 2001).

9.3 Assessment Methodology

9.3.1 Baseline Methodology

9.3.1.1 Data Review

A desk-based review of available data included that gathered as part of the Geotechnical Survey work (see Chapter 14: Water Environment, Soils and Coastal Processes) was carried out. The aim of the assessment was to inform the project as to whether a benthic survey was warranted.

The desk-based assessment was completed by APEM Ltd (Appendix I.1), who consulted a range of data sources to obtain ecological and sediment composition data for the dredge area of the DWP and surrounding areas. This included:

- Protected site information;
- Results of project-specific geotechnical ground surveys (Causeway Geotech, 2018a, 2018b);
- Broadscale habitat maps from the HHOME (Highland, Hebridean and Orkney Marine Environment) GIS Project provided by Scottish Natural Heritage;
- Broadscale habitat map from EmodNET (EMODnet, 2014);
- Broadscale habitat map from 'Maps NMPI' Marine Scotland portal (Marine Scotland, 2016);
- SEPA Infaunal Quality Index data for Loch Erisort (used as a proxy for Water Framework Directive status assessment for Stornoway Harbour area), (SEPA, 2015);
- Underwater imagery of wreck in vicinity of the dredge area;
- National Biodiversity Network (NBN) Atlas.

Biotopes identified are classified in accordance with the Joint Nature Conservation Committee (JNCC) Marine Habitat Classification system and the European Nature Information System (EUNIS).

9.3.1.2 Benthic Survey

The desk-based assessment completed by APEM identified there was a potential for PMF to be present (see Section 9.4.3). This informed the specification for benthic survey works to be completed. The survey specification was discussed with SNH prior to being undertaken, who agreed that the features of interest should all be detectable by visual inspection. Hence, the survey took the form of video transects with still image capture.

Ocean Ecology Limited carried out the survey on the 12th March 2020 from the vessel *MV C-Fenna*. The survey was undertaken in line with the Joint Nature Conservation Committee (JNCC) epibiota remote monitoring operational guidelines (Hitchin *et al.*, 2015).

An initial five transects were proposed, which were completed. The footage from which was assessed in situ by the lead marine ecologist, which led to a further four survey transects being completed to give an appropriate understanding of the habitats present. Figure 9.3.1 shows the locations of the transects completed. Access to the west of Glumaig Bay was restricted by shallow water depth. Full details of the benthic survey operations are provided in Appendix I.2 with a summary of the survey methods outlined below.

Underwater video transects were completed using a Drop-Down Camera (DDC) system. A ROVTech subsea camera system providing 1080p High Definition (HD) video and 20 Megapixel (MP), mounted on a bespoke frame, was used to collect footage of the seabed. Footage was captured by the camera system moving along the transects, navigating using a Hemisphere V104s GPS, taking images every 10-20m over heterogenous habitat types, at the interface between different habitats, over PMFs and of any notable features.

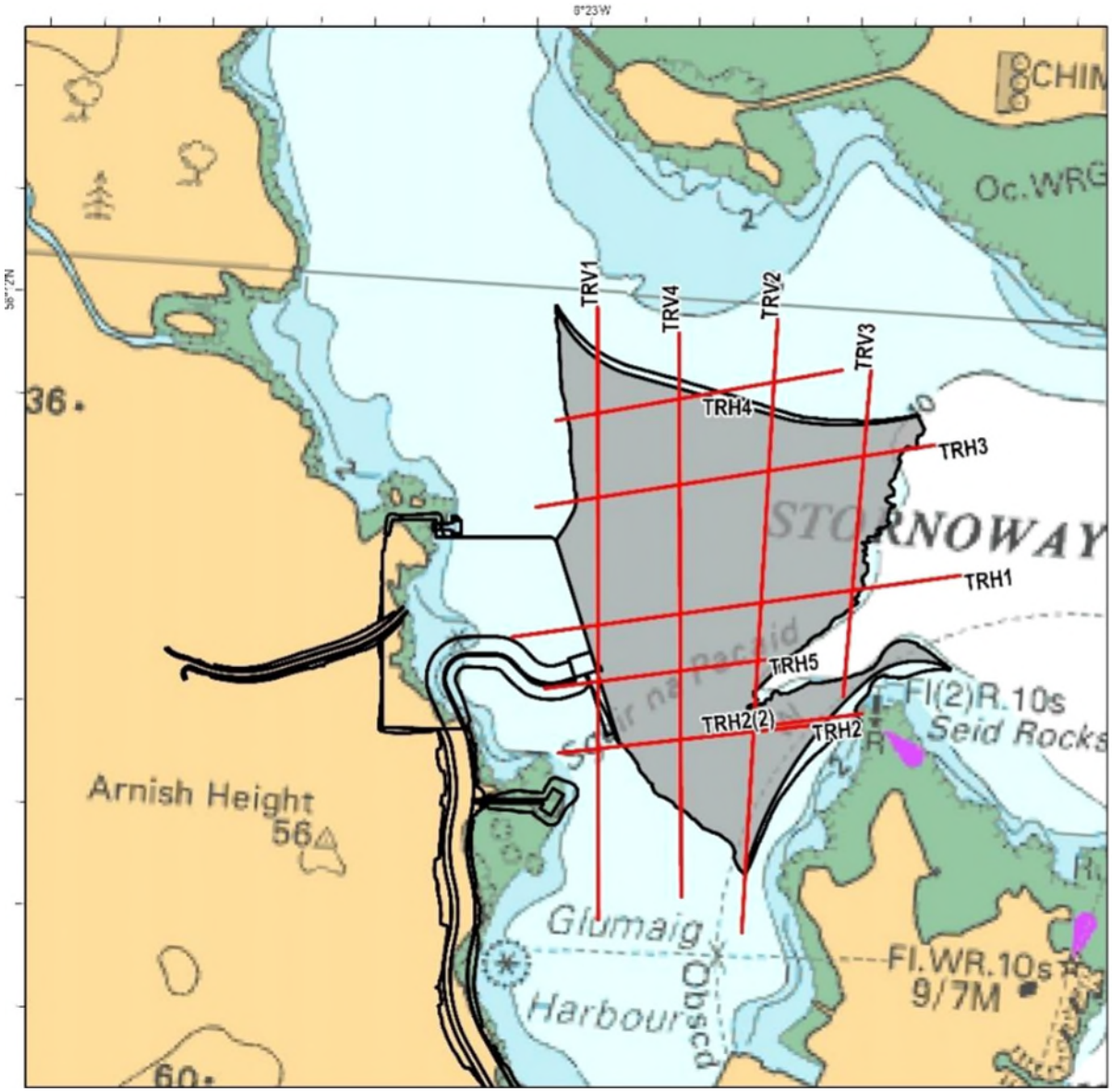

Figure 9.3.1: Benthic ecology sample transects for the proposed Stornoway Deep Water Port development (Ocean Ecology, 2020).

Analysis was undertaken using the Bio-Image Indexing and Graphical Labelling Environment (BIIGLE) annotation platform by experienced marine ecologists. Results were recorded and identified biotope complexes mapped in accordance with the European Nature Information System (EUNIS).

9.3.1.3 Dive Inspection

A dive inspection was undertaken to assess the 'Alabama,' steamship wreck to identify possible methods of managing the navigational risk. Upon inspection, various benthic species were

identified upon the wreckage. Photographs of both the wreck and the species habituating the wreck were taken. The images were subsequently submitted to APEM Ltd, whose Benthic Ecology specialist undertook species identification, to inform this assessment.

9.3.2 Method of Assessment

The methodology utilised to assess the potential effects resulting from the development on the benthic ecology of the area is described in Chapter 6: Biodiversity. Note the values of High Local to Low Local as defined in Table 6.5.1 have not been utilised as it is not practicable to sub-divide receptor value to this level. It is recognised that utilising Table 6.5.3, High Local and Moderate Local give rise to the same overall effect significances. Similarly, low local is the same as negligible value. As such if there is thought to be any potential value to a species then it has been classed as at least Moderate Local.

9.4 Baseline

9.4.1 Statutory Designated Sites

No designated sites selected specifically for benthic features were identified within the proposed development area.

The North-East Lewis possible Marine Protected Area (pMPA) lies approximately 0.6km south east of Stornoway Harbour and is designated to protected Risso's dolphin *Grampus griseus*, Raitt's sandeel *Ammodytes marinus* and some geodiversity features associated with the Quaternary of Scotland and Marine Geomorphology of the Scottish Shelf Seabed. Of the designated features only Raitt's sandeel utilise the seabed. The area covered by the North-East Lewis pMPA is extensive and incorporates the full of extent of a coastal sandeel ground and predicted sandeel habitat. As noted, the dredge area does not lie within the pMPA and does not provide suitable substrate for Raitt's sandeel. This area is therefore not considered to be predicted sandeel habitat. This is discussed further in Chapter 8: Fish Ecology and not taken forward for assessment in this chapter.

9.4.2 Environment

The proposed dredge area lies within Stornoway Harbour waters on the western coastline of Glumaig Bay, with Stornoway town centre approximately 1km to the north. The area proposed for development is largely sheltered from the main flow of the sea within the sheltered inlet of Glumaig Bay. Depths within the dredge area vary from approximately –7 to –10m Chart Datum (CD) with depths increasing out with the bay.

Geotechnical assessment indicated that the dredge area primarily consists of 'sandy Gravel' substrate along with 'gravelly Sand' (Causeway Geotech, 2018b). Nearer shore to the south and west of the dredge area more 'Clay' substrate was observed from the borehole sample analysis. Harder rocky substrates are expected to be present to the south and west of the dredge area based on predictive EmodNet mapping outputs.

9.4.3 Benthic Habitat

The full detail of the APEM Data Review and the Ocean Ecology benthic survey are provided in Appendix I.1 and I.2 with a summary of the results presented here.

APEM utilised the HHOME (Highland, Hebridean and Orkney Marine Environment) GIS project outputs to gain an understanding of potential habitats and species present. HHOME indicated

the potential presence of '*Laminaria saccharina* and red seaweeds on infralittoral sediments' (JNCC classification: SS.SMP.KSwSS.LsacR and EUNIS Code: A5.521) habitat within the dredge area which is a PMF. To the north east of the dredge area, and potentially with a very slight overlap with the dredge area, there was a rectangular area indicated to be potentially representative of a combination of the '*Laminaria saccharina* and red seaweeds on infralittoral sediments' biotope, the '*Echinocardium cordatum* and *Ensis spp*. in lower shore and shallow sublittoral slightly muddy fine sand' (SS.SSA.IMuSa.EcorEns; A5.241) biotope and the biotope '*Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand' (SS.SMP.SSgr.Zmar; A5.5331). *Z. marina* beds (seagrass beds) are also a PMF. The HHOME mapping also indicates that maerl beds could potentially be present approximately 500m to the east of the dredge area (SS.SMp.Mrl; A5.51) which are a PMF.

Video transects surveys carried out by Ocean Ecology identified the biotope SS.SMx.IMx; A5.43 Infralittoral mixed sediments, to be the most frequently observed and primarily in the northern part of the survey area. The biotope SS.SMu.ISaMu; A5.33 - Infralittoral sandy mud (possibly A5.24 infralittoral muddy sand) was identified in southern areas of the survey site. Patches of SS.SCS.ICs; A5.13 - Infralittoral coarse sediment were also observed and in the north end of the survey area, IR.MIR; A3.24 - Faunal communities on moderate energy infralittoral rock was also identified. No Annex 1 stony reef was identified during these transects. Maerl was observed in its live and dead form to the northern end of the survey area but were not deemed to meet the criteria for the PMF Maerl Bed (SS.SMp.Mrl; A5:51) due to limited coverage. No evidence of seagrass beds was observed during the survey as was identified as being potentially present from the data review. The PMF habitats, '*Laminaria saccharina* and red seaweeds on infralittoral sediments' (SS.SMP.KSwSS.LsacR; A5.521) identified in the data review was confirmed to be present within the proposed dredge area by the video transect surveys along with Kelp and seaweed communities on sublittoral sediment (SS.SMp.KSwSS; A5:52). Small patches of these biotopes were not deemed to be representative of the PMF however, a notable area of just under 7,000 m^2 of kelp and seaweed communities on sublittoral habitat (SS.SMp.KSwSS: A5:52) was identified in the eastern region of the survey area, near the Seid Rocks channel marker and representative of the PMF (see Figure 9.4.1). Mapped biotopes are shown in Drawing 56.09.01 and full details of the benthic survey are provided in Appendix I.2.

Figure 9.4.1: Stills of PMF habitats, 'Laminaria saccharina and red seaweeds on infralittoral sediments' SS.SMP.KSwSS.LsacR; A5.521) and Kelp and seaweed communities on sublittoral sediment (SS.SMp.KSwSS; A5:52) captured from video transect footage during the benthic survey (Ocean Ecology, 2020).

Fauna across the survey area were moderately scarce. Species identified included Brittlestars (*Ophiura sp.*) which were observed on mixed sediment habitats. Burrowing anemones (likely *Cerianthis lloydii*), sea pens (Pennatulacea) and the presence of burrows were observed on mud habitats. Other taxa observed within the survey area included the heart urchin (*Brissopsis lyrifera*), sand goby (*Pomatoschistus minutus*) and plumose anemones (*Metridium* sp.).

The review of photographs (Figure 9.4.2 and 9.4.3) taken during the dive inspection of the wreck of the Alabama, identified the following species:

- Plumose Anemone (*Metridium senile*)
- Dead Man's Fingers (*Alcyonium digitatum*)
- Hydroids
- Sea Squirts
- Common Sea Star (*Asterias rubens*)
- Red Algae

None of these species are of particular conservation importance.

Figure 9.4.2: Benthic organisms observed during dive inspection of the Alabama wreck (Affric Ltd, pers. comm.)

Figure 9.4.3: Benthic organisms observed during dive inspection of the Alabama wreck (Affric Ltd, pers. comm.)

Furthermore, it may be assumed on a precautionary measure that the benthic ecology identified on 'Alabama' wreck has the potential to inhabit hard habitat (e.g. boulders, bedrock) of similar light levels in the surrounding areas of Glumaig Bay. There is cohesive clay substrate identified in the south of Stornoway DWP that could also support this species assemblage, but it is unlikely this assemblage will be present in the dredge area which is predominantly characterised as 'sandy Gravel' substrate (Ocean Ecology, 2020; Causeway Geotech, 2018b).

No non-native invasive marine species were highlighted in the data review or recorded during the benthic survey within the areas of the proposed development (Ocean Ecology, 2020).

9.4.4 Identification of Receptors

Table 9.4.1 details all receptors taken forward for assessment. The benthic surveys identified multiple biotope complexes within the proposed dredge area. The data review identified the possibility of the PMF maerl beds (SS.SMp.Mrl; A5:51) within 500m of the proposed development area. Potential impacts on benthic habitats and species out with the dredge area but within vicinity of the site may be affected by works during the construction phase, such as the potential spread of sediment plumes. Therefore, benthic habitats and species in the waters directly adjacent to the proposed dredge area are also considered as receptors.

Dredged material may be required to be disposed of at the Stornoway authorised deposit area (HE035). Consequently, the benthic habitat within the disposal site is also considered as a receptor, since dredge disposal can affect primary production of phytoplankton, and the growth and survival of benthic organisms (Karel, 1999).

Table 9.4.1: Ecological Value of Receptors Considered

Receptor	Locations	Description	Receptor Value
A5.52, A5.521 SS.SMp.KSwSS, SS.SMP.KSwSS.LsacR	Within dredge area, west of Seid Rocks channel marker.	Kelp and seaweed communities on sublittoral sediment, *Laminaria saccharina* and red seaweeds on infralittoral sediments	PMF Regional (Scotland)
A5.52, A5.521 SS.SMp.KSwSS, SS.SMP.KSwSS.LsacR	Patches across northern half of survey area, small patch in land reclamation area.	Kelp and seaweed communities on sublittoral sediment, *Laminaria saccharina* and red seaweeds on infralittoral sediments but not of sufficient scale to be considered a PMF.	Moderate Local
A5:51 SS.SMP.Mrl	Potentially approximately 500m east of dredge area.	Maerl bed	PMF Regional (Scotland)
A5.43 SS.SMx.IMx	Covers a large proportion of the northern half of the survey area, some possible overlap into land reclamation area.	Infralittoral mixed sediments	Moderate Local
A5.24/A5.33 SS.SMU.ISaMu	Covers a large proportion of the southern half of the survey area, including the section for land reclamation.	Infralittoral muddy sand/ Infralittoral sandy mud	Moderate Local
A5.13 SS.ScS.ICs	Patches in northern half of survey area.	Infralittoral coarse sediment	Moderate Local
A3.24 IR.MIR	Small patches in northern half of survey area.	Faunal communities on moderate energy infralittoral rock	Moderate Local
Alabama wreck benthic communities	Inhabiting infrastructure of wreck, to the west of the dredge area	Various species including plumose anemone (*Metridium senile*), dead man's fingers (*Alcyonium digitatum*), hydroids, sea squirts, common starfish (*A. rubens*) and red algae.	Moderate Local
Dredge disposal site benthic communities	Stornoway Spoil Deposit Site (HE035)	Specific habitat and species unknown. Anticipated to be low quality due to existing use as a disposal site.	Negligible

9.5 Impact Assessment

9.5.1 Construction

Construction activities may result in a potential variety of direct and indirect impacts on the benthic environment within the proposed development area and on the identified receptors in Section 9.4.4. The assessment of these impacts follows the methodology outlined in Chapter 6: Biodiversity and assesses the potential effects resulting from the construction required for the project and operations as outlined in Chapter 2: Project Description.

9.5.1.1 Land Reclamation

The project description in Chapter 2 highlights the requirements to conduct land reclamation of 7.73 hectares areas part of the Reclaimed/Levelled Area along with sections of the link road and area associated with Bollard Island. The impact of land reclamation is certain habitat loss to the benthic environment. Habitat biotopes identified in the land reclamation area are primarily Infralittoral muddy sand/Infralittoral sandy mud (SS.SMu.ISaMu; A5.33/A5.24) with small patches of Infralittoral mixed sediments (SS.SMx.IMx; A5.43) and Kelp and seaweed communities on sublittoral sediment (SS.SMp.KSwSS; A5.52). As detailed in Table 9.4.1 all of these receptors are of moderate local value.

The direct loss of the aforementioned biotopes will result in the loss of individuals, habitats, potential spawning and foraging sites for benthic communities. Whilst there will be a loss of these biotopes within the land reclamation footprint, it is not expected that this will have population level effects on the wider area. The localised nature of the habitat loss results in this impact being assessed **permanent** but **low**. It has therefore been assessed that land reclamation in this area will have a **minor: non-significant** effect.

9.5.1.2 Dredge and Dredge Disposal

The impacts to habitats from dredging are assessed below. Dredging will directly affect the benthic flora and fauna receptors living on and within the sediments of the seabed within the dredge area of 26 hectares. Direct impacts of dredging include disturbance, habitat loss and injury and mortality of benthic organisms. As shown on Drawing 56.09.01, the first seven habitat biotopes identified within Table 9.4.1 are found within the proposed dredge area.

Kelp species are highlighted as having regional importance as they are a PMF in Scottish waters. *Laminaria saccharina,* now known as *Saccharina latissima,* is a major component of the 'Kelp and Seaweed communities on sublittoral sediment' PMF. Kelp habitat (SS.SMP.KSwwSS.LsacR; A5.521) was noted as being potentially present from the data review and confirmed to be present from the video transect footage along with the biotope kelp and seaweed communities on sublittoral sediment (A5:52, SS.SMp.KSwSS). Kelp was mapped across the survey area mostly in small and discrete patches.

As shown in Drawing 56.09.01, a notable area of 6919m^2 of kelp and seaweed communities on sublittoral sediment (SS.SMp.KSwSS: A5:52) was identified in the eastern region of the survey area, near the Seid Rocks channel marker and representative of the PMF. This area was not observed to be particularly dense and was largely made up of red and brown seaweeds. Species, *Saccharina latissima* and *Chorda filum*, within this biotope are noted as opportunistic organisms and have relatively fast growth rates with *Saccharina latissima* reaching maturity within 15-20 months (Stamp, 2015). *Laminaria saccharina* has been estimated to grow up to

4.87cm a day. A study assessing resilience of this habitat biotope recorded it as high with the potential to rapidly recover following disturbance such as substratum loss. It was also noted that *Saccharina latissima* has shown to be an early coloniser, appearing within two weeks following clearance of the area (Stamp, 2015). It is predicted that there will be a ready supply of zoopores (planktonic reproductive stages of *Saccharina latissima* life cycle capable of swimming) to repopulate the dredge area post dredging. Following dredging in this area, suitable substrate will still be available, as sand and gravel is present in similar proportions at various seabed depths as found in the core samples, discussed further in Chapter 14: Water Environment, Soils and Coastal Processes, Section 14.4.1. This substrate will allow for the settlement and attachment of zoospores and subsequent recolonisation of *Saccharina latissima*. This species has also been known to be able to form on dense sand at depths of less than 15-40m (Hardouin *et al.*, 2014). Sand grains can provide sufficient attachment for young sporophytes to segment and develop into new plants. Furthermore, large populations of loose lying *Saccharina latissima* were recorded on the Isle of Man which showed no signs of ever being attached to substrate. It was concluded aside from the early stages of sporophyte development, attachment to substrate was not essential for the growth of this species (Burrows, 1958).

Drawing 56.09.01 shows that only part of the PMF containing area which is of regional importance (see Table 4.4.1) will be removed. On identifying the area of kelp, the dredge area was reviewed to ensure that no habitat was removed unnecessarily as shown in Drawing SDWP-WS2139-XX-00-DR-C-9018. It has been calculated that approximately 77% of this habitat will be removed, leaving 23%, approximately 1,591m^2, in place adjacent to the dredged area. The dredge area will be edged with a 4 in 1 slope, as showing in Figure 9.5.1., the remaining habitat will sit at the top of the slope. It is therefore not anticipated that the remaining habitat will be susceptible to physical damage during the dredging. The slope will also provide stability for the remaining habitat and should prevent slumping and the habitat being undermined from material being removed below it, in the bulk dredge area. It is anticipated that these undisturbed organisms will be in close enough proximity to the dredged area to support recruitment and recovery of this PMF within a few years (Stamp, 2015).

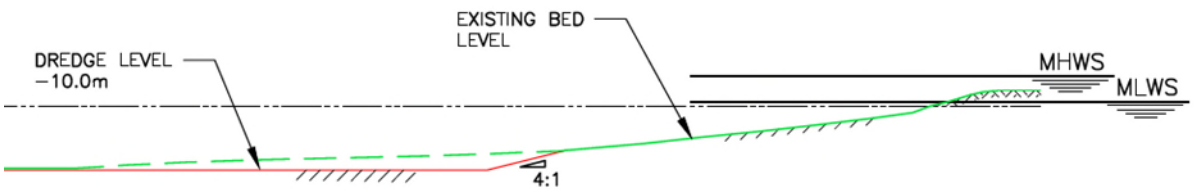

Figure 9.5.1: Example Cross Section of Dredge

The location of the PMF area of SS.SMp.KSwSS, A5:52 is located, to the east of a point of land, which provides the area a degree of protection from highest current speeds in the channel (see Figures 5.3 to 5.6 of Appendix N.1). Similarly, it will provide some level of storm protection, the reduction in area of the PMF, is therefore unlikely to affect the risk of storm damage on the remaining habitat, which are the areas closer to shore.

The magnitude of the impact on this habitat has therefore been determined as **low** at a regional level and **potentially reversible** over time**.** The impact of habitat loss from dredging therefore results in a **minor: non-significant** effect.

Studies have shown that benthic communities have the ability to recover following dredging (Goldberg *et al*., 2014). No maintenance dredging is planned following construction of the DWP, therefore allowing the benthic flora and fauna to recolonise and recover over time across the entirety of the proposed dredge area with similar species present due to the similarity of substrates (sand and gravel proportions) present (see Chapter 14: Water Environment, Soils and Coastal Processes, Section 14.4.1). The potential impact of habitat loss resulting from dredging on habitats mapped across the rest of the dredge area defined as being of moderate local value within Table 9.4.1 has been assessed as **low** and **reversible,** resulting in a **minor non-significant** effect.

The majority of the dredge material will be reused within the land reclamation, and as such the impacts of its placement have already been considered in Section 9.5.1.1. However, to allow for the potential for not all material being suitable for reuse it has been assumed that up to 50,000m^3 of unsuitable material may be required to be deposited at the Stornoway Spoil deposit site nearby. The deposit site has previously been used to dispose of dredge spoil and it is likely that previous spoil deposits at the site have reduced the quality of the benthic flora and fauna communities in the area through repeated burial and smothering of the habitat. The value of the habitat at the disposal site is therefore assessed as negligible in Table 4.4.1, the magnitude of impacts is assessed as **negligible** to **low** giving rise to a **negligible: non-significant** effect.

9.5.1.3 Wreck Section Relocation

A description of the methods proposed to remove sections of the Alabama wreck are detailed in Chapter 2: Project Description. It is likely that some individual benthic receptors may be lost permanently from the use of hot cutting techniques, but this will not have a compounding effect on benthic ecology at a population level. Potentially affected species are identified in Table 4.4.1 as being of moderate local sensitivity as they are common and widespread and removal of some individuals during removal of the wreck is not considered to have any impact on conservation status. The effect of individual loss will at a population level is **reversible** and of **negligible** magnitude and is therefore assessed as **negligible: non-significant.**

It should be noted that removal of the wreck involves only removing sections projecting above -8m CD and where habitat disruption will occur, the parts of the wreck to be cut off are to be distributed on available spaces below this depth and within the footprint of the wreck, therefore the benthic ecology occupying the Alabama will not be lost. The disruption to the habitat as a result of removal will be over a short timeframe and the habitat will not be disrupted following relocation, therefore, the impact has been assessed as **reversible** and **negligible** and having a **negligible: non-significant** effect.

9.5.1.4 Remobilisation of Sediments

Dredging, disposal of dredged materials and reclamation operations have the potential to release fines and increase sedimentation in the marine environment. When sedimentation exceeds natural thresholds, benthic ecology may be completely lost (D. Miller, C. Muir, & O. Hauser, 2002). Heavy deposition rates of sediments can increase the mortality of benthic flora and static fauna through smothering (Affric, 2019) depending upon their resilience (D. C. Miller,

C. L. Muir, & O. A. Hauser, 2002). The attenuation of light as a result of sedimentation can prevent photosynthetic benthic flora from obtaining energy (Pineda et al., 2016).

The benthic habitat biotopes within the proposed dredge area, noted in Table 9.4.1 and shown in Drawing 56.09.01, are not considered as receptors of sediment remobilisation since these habitats will be temporarily lost during the dredge works as discussed in Section 9.5.1.2. Hence only the kelp and seaweed communities on sublittoral habitat (SS.SMp.KSwSS; A5:52), representative of a PMF, not within the dredge area and the potential Maerl Bed (SS.SMp.Mrl; A5:51) outwith the development footprint are considered in terms of sedimentation.

As discussed in Chapter 14: Water Quality, Soils and Coastal Processes Sediment modelling has been completed by RPS, the results of which are provided in Appendix N.1. Figure 7.12 of the appendix shows sediment deposition levels.

The notable area of ~7,000m^2 of kelp and seaweed communities on sublittoral habitat (SS.SMp.KSwSS; A5:52), representative of a PMF and discussed in section 9.5.1.2 has been assessed with regards to dredging of the habitat itself. As noted above, this habitat has been assessed as having a high level of resilience and is expected to recover due to the presence of zoopores within the water column to repopulate the dredged area. Additionally, only part of the area will be dredged, and it is anticipated that proximity to the remaining habitat will aid recovery. However, the remaining area will be susceptible to impacts from the remobilisation of sediments both from dredging and dredge material disposal. Sediment loading resulting from dredging can reduce light penetration to seaweeds and provides a competitive advantage to filter feeding organisms competing with algal species for space (Saunders. G. and Karamita. C., 2015).

This substrate is largely made up of shallow sublittoral mixed sediments including cobbles, pebbles, gravel and shells. Materials coarser than 2mm will quickly fall back to the seabed on remobilisation (Becker *et al*., 2015) and so it is not anticipated that these will disperse and settle on the entire adjacent kelp and seaweed habitat. This was considered within the RPS modelling (Appendix N.1) and is discussed further in Chapter 14: Water Environment, Soils and Coastal Processes, Section 14.5.1.1. The dredge slope will create some distance between the bulk dredge area and the remaining habitat. It is also expected that the slope will act as a barrier with the remaining habitat situated above the bulk dredge. Due to the combination of the density of the materials and the slope creating distance and acting as a buffer, any settlement on the adjacent habitat should be minimal. Where some may settle on the adjacent habitat it has been shown that short-term burial under various sediment types including gravel, sand, silt and clay has no effect on the physiology and morphology of *Laminaria saccharina* (Roleda, M. Y. and Dethleff, D., 2011), one of the species identified in this biotope.

The recovery of benthic habitats following sedimentation events depends on multiple factors including sediment depth. If sediment depths are limited to 20-30cm, pre-existing benthos can migrate vertically within the water column (Wilber & Clarke, 2007). The results of simulations have estimated the deposition of material from dredging operations on completion of the estimated 80-day dredging period to be between 1 and 1.5mm, and generally less than 1mm, away from the immediate area of the proposed dredge area. See Figure 7.12, Appendix N.1 (RPS, 2020). It should be noted that sedimentation is a natural phenomenon in the marine environment and can build up on these habitats during storms. It should also be noted that the disposal site has been in use for some time and so some

sedimentation will have potentially already occurred. It can therefore be expected that these habitats can tolerate a certain level of sedimentation occurring.

Taking the above information into account, the magnitude of the impact on the Kelp and Seaweed PMF regional value habitat has therefore been determined as **low** and has been assessed as having a **minor: non-significant** effect.

The data review (APEM, 2019) identified the possibility of the PMF, Maerl Bed (SS.SMp.Mrl; A5:51) which would be of regional value, in the vicinity of the proposed dredge area. It is considered that there will be no risk of sedimentation impact on the potential maerl bed to the east of the dredge area due to this habitat being approximately 500m away and located within the tide-swept inlet opening of the bay. Sedimentation from both the dredging and disposal activities is predicted to be minimal or negligible in this area, see Figure 7.12, Appendix N.1 (RPS, 2020). Impacts on the potential maerl bed has therefore been assessed as **low** resulting in a **minor: non-significant** effect.

9.5.1.5 Release of Hazardous Substances

The accidental release of hydrocarbons and other hazardous substances in the event of a loss of containment during the construction works may result in contamination of the marine environment, with the potential of disrupting benthic ecosystems (Main *et al.*, 2015). Impacts of a release of hazardous substances on benthic flora and fauna can be acute, with high levels of contamination increasing mortality rates rapidly following a loss of containment (Daly *et al.*, 2016). Alternatively, contamination events may be chronic, where organisms are affected by a slow release of a hazardous substance over extended periods (Moreno *et al.*, 2013). Chronic impacts may allow the contaminants to move through the ecosystem and cause changes in morphology in benthic organisms (Lee & Lin, 2013; Main et al., 2015). Contamination can also affect primary production, oxygen availability, alter the microbial communities, and suppress microalga production (Lee & Lin, 2013).

The adoption of mitigation measures, compliance with legislation and standard industry best practice techniques for pollution prevention is discussed further in Chapter 14: Water Environment, Soils and Coastal Processes including will significantly reduce the risk of such events occurring. As such, it is unlikely that release of hazardous materials of a scale with the potential to impact negatively on the PMF habitats will occur. Therefore, the potential impact is assessed as **negligible,** resulting in a **minor: non-significant** effect.

The benthic habitat biotopes within the proposed dredge area, noted in Table 9.4.1 and shown in Drawing 56.09.01, are not considered as receptors in this case since these habitats will be removed during the construction process. However, it is noted that if a pollution incident were to occur which affected the seabed then this could delay the recolonization of the dredged area.

9.5.1.6 Introduction of Non-Native Marine Species

Non-native marine species (NNMS) are flora and fauna which have been introduced either accidentally or intentionally beyond their natural marine range (Nall *et al.*, 2015). Such species may establish themselves within a habitat without impairing the integrity of the ecosystem. However, some can drastically degrade habitats, destabilise ecosystems and decimate local biodiversity (Bax *et al.*, 2003; Groenveld *et al.*, 2018). As detailed in Chapter 14: Water Environment, Soils and Coastal Processes, there is a risk that non-native marine species could

be introduced into Stornoway Bay as detailed in Chapter 14: Water Environment, Soils and Coastal Processes.

As noted, no non-native invasive marine species were highlighted in the data review or recorded during the benthic survey (Ocean Ecology, 2020). It is not considered that there will be a risk from marine non-native species risk to the potential maerl bed or the remaining kelp and seaweed habitat. The adoption of mitigation measures outlined in Chapter 14: Water Environment, Soils and Coastal Processes including cleaning and inspection of plant and equipment, and the implementation of appropriate ballast water management systems, significantly reduces or removes the risk of such an event occurring. As such it is considered extremely unlikely that the construction works could lead to the introduction of non-native marine species. The potential impact on benthic communities is therefore assessed as **negligible**, resulting in a **negligible: non-significant** effect.

Benthic habitat biotopes within the proposed dredge area are not considered as receptors in this case since the habitats will be removed during the dredging process, however, it has been noted that there are likely to be a presence of zoopores present in the water column which will aid recovery of the seabed, see section 9.5.1.2. The adoption of mitigation measures outlined in Chapter 14: Water Environment, Soils and Coastal Processes including the implementation of appropriate ballast water management systems, significantly reduces or removes the risk of non-native species being introduced. The potential impact on benthic communities and their recovery is therefore assessed as **negligible**, resulting in **negligible: non-significant** effect.

9.5.2 Operations

9.5.2.1 Release of Hazardous Substances

The construction of a new deep-water berth will enable berthing of larger vessels, enabling up to an additional 35 cruise ship visits per year. In addition to this, the development will also support regular deliveries of freight, gas oil and renewable components as detailed in Chapter 2: Project Description.

The adoption of mitigation measures outlined in Chapter 14: Water Environment, Soils and Coastal Processes will significantly reduce or remove the risk of such an event occurring. As such it is considered extremely unlikely that operations could lead to a significant pollution event. The potential impact on benthic communities is therefore assessed as **negligible**, resulting in a **negligible: non-significant** effects on all benthic receptors.

9.5.2.2 Introduction of Non-Native Marine Species

As detailed above in section 9.5.1.6, non-native marine species can have a negative impact on marine ecosystems. As detailed in section 9.5.2.1 the construction of a new

The adoption of mitigation measures outlined in Chapter 14: Water Environment, Soils and Coastal Processes including the implementation of appropriate ballast water management systems, significantly reduces or removes the risk of non-native species being introduced. The potential impact on benthic communities is therefore assessed as **negligible**, resulting in **negligible: non-significant** effects on all benthic receptors.

9.6 Mitigation Measures

In addition to the mitigation identified within Chapter 14: Water Quality, Soils and Coastal Processes, the following mitigation will be implemented to minimise effects on benthic ecology.

- Divers will be briefed before the wreck removal to attempt to relocate individual organisms likely to be affected by the wreck section relocation works prior to them commencing; and
- The dredging will be carried out utilising positioning technology to ensure only the required dredge area is dredged.

9.7 Cumulative Impacts

As identified in Section 9.5, the effects on benthic ecology associated with the proposed development are localised. As all other projects which have the potential to result in cumulative effects, identified in Table 3.7.1. (Chapter 3: Methodology), are a considerable distance away, no cumulative effects are expected. Note the use of the Stornoway disposal site by other projects was considered to be part of the baseline case for the purpose of the benthic ecology assessment hence the negligible habitat value.

9.8 Residual Effects

Potential impacts on benthic ecology have not been assessed to have a significant effect hence it is not necessary to assess the residual effects.

9.9 Summary

The potential environmental effects on the proposed Stornoway DWP development on benthic ecology were assessed in this chapter. Several benthic receptors were identified within, and in the vicinity of the proposed development, see section 9.4.4. Potential impacts were identified as a result of the construction and operations of the development, however, as detailed in Table 9.9.1 none of the impacts were assessed to be significant. This was due to the localised nature of the impacts, the quality and value of the receptors, together with the implementation of existing mitigation identified to preserve water quality during the construction operation of the development.

Table 9.9.1: Summary of Effects

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Construction							
A5.52 SS.SMp.KSwSS Kelp and Seaweed Communities on Sublittoral Sediment	Habitat loss through reclamation from sea	Regional	Low Permanent	Minor: Non-significant	No specific mitigation required	Low	Minor: Non-significant
A5.33/A5.24 SS.SMu.ISaMu Infralittoral Sandy Mud/ Infralittoral Muddy Sand		Moderate Local	Low Permanent	Minor: Non-significant	No specific mitigation required	Low	Minor: Non-significant
A5.43 Ss.SMx.IMx Infralittoral Mixed Sediments		Moderate Local	Low Permanent	Minor: Non-significant	No specific mitigation required	Low	Minor: Non-significant
A5.52 SS.SMp.KSwSS Kelp and Seaweed Communities on Sublittoral Sediment	Habitat loss through dredging of new berth	Regional	Low Medium-term Reversible	Minor: Non-significant	Dredging will be carried out utilising positioning technology to ensure only the required dredge area is dredged.	Low Medium-term Reversible	Minor: Non-significant
A5.33/A5.24 SS.SMu.ISaMu Infralittoral Sandy Mud/ Infralittoral Muddy Sand		Moderate Local	Low Medium-term Reversible	Minor: Non-significant	Dredging will be carried out utilising positioning technology to ensure only the navigationally required dredge area is dredged.	Low Medium-term Reversible	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
A5.43 Ss.SMx.IMx Infralittoral Mixed Sediments		Moderate Local	Low Medium-term Reversible	Minor: Non-significant	Dredging will be carried out utilising positioning technology to ensure only the navigationally required dredge area is dredged.	Low Medium-term Reversible	Minor: Non-significant
A5.13 SS.SCS.ICs Infralittoral Coarse Sediment		Moderate Local	Low Medium-term Reversible	Minor: Non-significant	Dredging will be carried out utilising positioning technology to ensure only the navigationally required dredge area is dredged.	Low Medium-term Reversible	Minor: Non-significant
A3.24 IR.MIR Faunal Communities on Moderate Energy Infralittoral Rock		Moderate Local	Low Medium-term Reversible	Minor: Non-significant	Dredging will be carried out utilising positioning technology to ensure only the navigationally required dredge area is dredged.	Low Medium-term Reversible	Minor: Non-significant
A5.52 SS.SMp.KSwSS Kelp and Seaweed Communities on Sublittoral Sediment	Habitat impacts through remobilised sedimentation	Regional	Low Short-term Reversible	Minor: Non-significant	No specific mitigation required	Low	Minor: Non-significant
A5.51 SS.SMp.Mrl Maerl bed	Habitat impacts through remobilised sedimentation	Regional	Low Short-term	Minor: Non-significant	No specific mitigation required	Low	Minor: Non-significant
Benthic communities on Alabama wreck	Habitat impacts through cutting of wreck	Moderate Local	Negligible Short-term Irreversible	Negligible: Non-significant	Divers will be briefed before the wreck removal to attempt to relocate individual organisms likely to be affected by the wreck section relocation works prior to them commencing.	Low Short-term Irreversible	Negligible: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Benthic communities on Alabama wreck	Habitat impacts through distribution of cut pieces of wreck	Moderate Local	Negligible Short-term Reversible	Negligible: Non-significant	No specific mitigation required	Negligible Short-term Reversible	Negligible: Non-significant
Benthic communities at the spoil site	Habitat impacts through dredged spoil disposal at disposal site	Negligible	Negligible Medium-term Reversible	Negligible–Minor: Non-significant	No specific mitigation required	Negligible Medium–term reversible	Negligible: Non-significant
A5.52 SS.SMp.KSwSS Kelp and Seaweed Communities on Sublittoral Sediment	Impacts from introduction of Invasive Non-Native Species	Regional	Negligible	Negligible: Non-significant	No specific mitigation required	Low	Minor: Non-significant
A5.51 SS.SMp.Mrl Maerl bed	Impacts from introduction of Invasive Non-Native Species	Regional	Negligible	Negligible: Non-significant	No specific mitigation required	Low	Minor: Non-significant
Recolonisers of removed benthic biotopes from dredged area	Impacts from introduction of Invasive Non-Native Species	Negligible	Negligible	Negligible: Non-significant	No specific mitigation required	Negligible	Negligible: Non-significant
A5.52 SS.SMp.KSwSS Kelp and Seaweed Communities on Sublittoral Sediment	Impacts from release of hazardous substances	Regional	Negligible	Negligible: Non-significant	No specific mitigation required	Low	Minor: Non-significant
A5.51 SS.SMp.Mrl Maerl bed	Impacts from release of hazardous substances	Regional	Negligible	Negligible: Non-significant	No specific mitigation required	Low	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Operations							
A5.52 SS.SMp.KSwSS Kelp and Seaweed Communities on Sublittoral Sediment	Impacts from introduction of Invasive Non-Native Species	Regional	Negligible	Negligible: Non-significant	No specific mitigation required	Low	Minor: Non-significant
A5.51 SS.SMp.Mrl Maerl bed	Impacts from introduction of Invasive Non-Native Species	Regional	Negligible	Negligible: Non-significant	No specific mitigation required	Low	Minor: Non-significant
A5.52 SS.SMp.KSwSS Kelp and Seaweed Communities on Sublittoral Sediment	Impacts from release of hazardous substances	Regional	Negligible	Negligible: Non-significant	No specific mitigation required	Low	Minor: Non-significant
A5.51 SS.SMp.Mrl Maerl bed	Impacts from release of hazardous substances	Regional	Negligible	Negligible: Non-significant	No specific mitigation required	Low	Minor: Non-significant

Key

	Significant Effect
	Non-Significant Effect

9.10 References

APEM. (2019). Stornoway Harbour Deepwater Berth: Benthic Marine Ecology Data Review.

Bax, N., Williamson, A., Aguero, M., Gonzalez, E., & Geeves, W. (2003). Marine invasive alien species: a threat to global biodiversity. *Marine Policy, 27*(4), 313-323. doi:https://doi.org/10.1016/S0308-597X(03)00041-1

Burrows, E. M. (1958). Sublittoral algal population in Port Erin Bay, Isle of Man. Journal of the Marine Biological Association of the United Kingdom, 37, 678-703.

Daly, K. L., Passow, U., Chanton, J., & Hollander, D. (2016). Assessing the impacts of oil-associated marine snow formation and sedimentation during and after the Deepwater Horizon oil spill. *Anthropocene, 13*, 18-33. doi:https://doi.org/10.1016/j.ancene.2016.01.006

Davis, J., Baxter, J., Bradley, M., Connor, D., kahn, J., Murray, E., . . . Vincent, M. (2001). Marine Monitoring Handbook. In (pp. 1-8). Unknown: Joint Nature Conservation Committee.

Groenvald, R. A., Bartelings, H., Börger, T., Bosello, F., Buisman, E., Delpiazzo, E., Walker, A. N. (2018). Economic impacts of marine ecological change: Review and recent contributions of the VECTORS project on European marine waters. *Estuarine, Coastal and Shelf Science, 201,* 152-163. doi: https://doi.org/10.1016/j.ecss.2016.04.002

Hardouin, K., Bedoux. G., Burlot., A., Nyvall-Collen, P. & Bourgougnon, N. (2014). Chapter Ten – Enzymatic Recovery of Metabolties from Seaweeds: Potential Applications. *Advances in Botanical Research, 71, 279-320.*

International Convention for the Control and Management of Ships' Ballast Water and Sediments (2004).

International Union of Conservation of Nature. (2016). IUCN Red List of Threatend Species. Retrieved from http://www.iucnredlist.org/

JNCC. (2016). UK BAP priority species and habitats. *2018*(18 April).

JNCC. (2018). The Marine habitat Classification for Britain & Ireland (v15.03). Retrieved from http://jncc.defra.gov.uk/page-1584

Karel. (1999). Ecological effects of dumping of dredge sediments; options for managment. *Journal of Coastal Conservation, 5*, 69-80.

Lee, L.-H., & Lin, H.-J. (2013). Effects of an oil spill on benthic community production and respiration on subtropical intertidal sandflats. *Marine Pollution Bulletin, 73*(1), 291-299. doi:https://doi.org/10.1016/j.marpolbul.2013.05.006

Marine Scotland. (2018). National Marine Plan Interactive. Retrieved from https://marinescotland.atkinsgeospatial.com/nmpi/

Miller, D., Muir, C., & Hauser, O. (2002). Detrimental effects of sedimentation on marine benthos: what can be learned from natural processes and rates? *Ecological Engineering, 19*(1), 211-232.

Nall, C., Guerin, A., & Cook, E. (2015). Rapid assessment of marine non-native species in Scotland and synthesis of existing Scottish records. *Aquatic Invasions, 10*(1), 107-121.

Newell, R., Seiderer, L., Simpson, N., & Robinson, J. (2004). Impacts of Marine Aggregate Dredging on Benthic Macrofauna off the South Coast of the United Kingdom. *Journal of Coastal Research, 20*(1), 115-125.

NIEA, S., Natrual Resources Wales. (2017). GPP 5: Works and maintenance in or near water.

Ocean Ecology. (2020). Stornoway Deep Water Port Benthic Survey. Habitat Assessment Report.

Pineda, M. C., Strehlow, B., Duckworth, A., Doyle, J., Jones, R., & Webster, N. S. (2016). Effects of light attenuation on the sponge holobiont- implications for dredging management. *Scientific Reports, 6*.

RPS. (2020). Deep Water Port Stornoway Stage 1 Development Hydraulic Modelling Report.

Saunders, G., Bedford, G., Trendall, J., & Sotheran, I. (2011). Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 5. Benthic Habitats.

Saunders, G. and Karamita. C. (2015). A5:52 Kelp and seaweed communities on Atlantic infralittoral mixed sediment.

Stamp, T.E. (2015). *Saccharina latissima* with red and brown seaweeds on lower infralittoral muddy mixed sediment. Tyler-Walters, H. and Hiscock, K. *Marine Life Information Network: Biology and Sensivity Key Information Reviews,* (online). Plymouth: Marine Biological Association of the United Kingdom. (cited 16-04-2020). Available from: https://www.marlin.ac.uk/habitat/detail/1051

SNH Site Link. Retrieved from https://gateway.snh.gov.uk/sitelink/

Tyler-Walters, H., Carruthers, J., Wilding, C., Durkin, O., Lacey, C., Philpott, E., Carawford-Avis, O. (2016). Descriptions of Scottish Priority Marine Features (PMFs). 1-149.

Wilber, D. H. and Clarke, D. G. (2007). Defining and assessing benthic recovery following dreding and dredged material disposal. Proceedings XXVII World Dredging Congress 2007: 603-618.

Affric. (2019). Tarbert Ferry Terminal Upgrade Environmental Impact Assessment Report. *2*.

APEM. (2018). Tarbert Ferry Terminal - Subtidal Benthic Ecology Survey Report.

Causeway Geotech. (2018a). *Stornoway Deep Water Berth – Ground Investigation*. Retrieved from

Causeway Geotech. (2018b). Stornoway Deep Water Berth – Ground Investigation. *17-0769a Interpretative*, 401.

Davis, J., Baxter, J., Bradley, M., Connor, D., kahn, J., Murray, E., . . . Vincent, M. (2001). *Marine Monitoring Handbook*. Retrieved from http://jncc.defra.gov.uk/pdf/MMH-Pg%203-1.pdf

EMODnet. (2014). Seabed Habitats Phase I (2009-2013). Retrieved from http://www.emodnet.eu/seabed-habitats

International Maritime Organization. (2004). International Convention for the Control and Management of Ships' Ballast Water and Sediments Retrieved from http://www.bsh.de/de/Meeresdaten/Umweltschutz/Ballastwasser/Konvention_en.pdf

International Union of Conservation of Nature. (2016). IUCN Red List of Threatend Species. Retrieved from http://www.iucnredlist.org/

JNCC. (2016). *UK BAP priority species and habitats*. Retrieved from http://jncc.defra.gov.uk/page-5705

JNCC. (2018, 31 January). The Marine habitat Classification for Britain & Ireland (v15.03). Retrieved from http://jncc.defra.gov.uk/page-1584

Leinaas, H. P., & Christie, H. (1996). Effects of removing sea urchins (*Strongylocentrotus droebachiensis*): stability of the barren state and succession of kelp forest recovery in the east Atlantic. *Oecologia, 105*(4), 524-536.

Marine Scotland. (2016). Broad Habitat - Broad-Scale Predictive Habitat Map (EUSeaMap2 - EUNIS). Retrieved from https://marinescotland.atkinsgeospatial.com/nmpi/

Miller, D., Muir, C., & Hauser, O. (2002). Detrimental effects of sedimentation on marine benthos: what can be learned from natural processes and rates? *Ecological Engineering, 19*(1), 211-232.

Miller, D. C., Muir, C. L., & Hauser, O. A. (2002). Detrimental effects of sedimentation on marine benthos: what can be learned from natural processes and rates? *Ecological Engineering, 19*(3), 211-232. doi:https://doi.org/10.1016/S0925-8574(02)00081-2

NIEA, S., Natrual Resources Wales. (2017). *GPP 5: Works and maintenance in or near water*. Retrieved from http://www.netregs.org.uk/media/1418/gpp-5-works-and-maintenance-in-or-near-water.pdf?utm_source=website&utm_medium=social&utm_campaign=GPP5%2027112017

Pineda, M. C., Strehlow, B., Duckworth, A., Doyle, J., Jones, R., & Webster, N. S. (2016). Effects of light attenuation on the sponge holobiont- implications for dredging management. *Scientific Reports, 6*.

Saunders, G., Bedford, G., Trendall, J., & Sotheran, I. (2011). *Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 5. Benthic Habitats.*

SEPA. (2015). *Marine Invertebrate Classification of Loch Erisort 2015*. Retrieved from

SNH. (2020). SNH Site Link. Retrieved from https://gateway.snh.gov.uk/sitelink/

Tyler-Walters, H., James, B., Carruthers, M. e., Wilding, C., Durkin, O., Lacey, C., Crawford-Avis, O. T. (2016.). *Descriptions of Scottish Priority Marine Features (PMFs). Scottish Natural Heritage Commissioned Report No. 406.* Retrieved from https://www.nature.scot/snh-commissioned-report-406-descriptions-scottish-priority-marine-features-pmfs

White, N., & Marshall, C. E. (2007). Saccharina latissima Sugar kelp. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity

Key Information Reviews, [on-line]. . Retrieved from https://www.marlin.ac.uk/species/detail/1375

9.11 Glossary

Acronym	Definition
CEMP	Construction Environmental Management Plan
CD	Chart Datum
DDC	Drop Down Camera
DWP	Deep Water Port
EcIA	Ecological Impact Assessment
EUNIS	European Nature Information System
GEN	General Planning Principles
GIS	Geographic Information System
GPP	Guidance for Pollution Prevention
GPS	Global Positioning System
HD	High Definition
HHOME	Highland, Hebridean and Orkney Marine Environment
IUCN	International Union of Conservation of Nature
JNCC	Joint Nature Conservation Committee
km	kilometres
m	metres
MHWS	Mean High Water Spring
MLWS	Mean Low Water Spring
MNNS	Marine Non-Native Species
MP	Mega Pixel
MPA	Marine Protected Areas
mSAC	marine Special Area of Conservation
mSPA	marine Special Protection Areas
MSS	Marine Scotland Science
NBN	National Biodiversity Network
NIEA	Northern Ireland Environment Agency
PMF	Priority Marine Feature
pMPA	Possible Marine Protected Area
SAC	Special Areas of Conservation
SEPA	Scottish Environment Protection Agency
SNH	Scottish Natural Heritage
SPA	Special Protection Areas
SSSI	Sites of Special Scientific Interest
STW	Scottish Territorial Waters
VERs	Valued Ecological Receptors

Chapter 10: Terrestrial Ecology

STORNOWAY PORT AUTHORITY

Contents

10 Terrestrial Ecology

10.1 Introduction

This chapter presents the Ecological Impact Assessment (EcIA) for terrestrial species. Terrestrial ecology was previously scoped out of the Environmental Impact Assessment Report (EIAR) conducted for the original design of the Stornoway Deep Water Port (DWP) development. Although otters were considered as requested by Scottish Natural Heritage (SNH) in their scoping response. A Preliminary Ecological Survey was completed by EnviroCentre in May 2017 to inform the previous EIAR, due to the age of the survey it was deemed prudent to update the baseline understanding. In doing so, a number of potential receptors have been identified. As such the effects of the project on terrestrial ecology have been considered here.

Impacts on terrestrial ecology have been evaluated in the context of nature conservation legislation and relevant planning policy (see Chapter 4: Statutory Context & Policy and Chapter 6: Biodiversity). Mitigation is proposed, cumulative impacts are considered, and finally the residual impacts and their significance are assessed.

10.2 Regulations and Guidance

Regulations and guidance pertaining to ecology and biodiversity are outlined in Chapter 6: Biodiversity. This section details the regulations and guidance specific to terrestrial ecology.

10.2.1 European and International Regulations

Otters are listed under Annex II of the Habitats Directive. Annex II species, which are native to the UK should be conserved through the designation of Special Areas of Conservation (SAC). Since 1994, all SACs, in combination with Special Protection Areas (SPAs) comprise the UK contribution to the Natura 2000 ecological network of protected sites.

Otter are also listed in Annex IV of the Habitats Directive as European Protected Species (EPS) where the deliberate killing, disturbance or the destruction of these species or their habitat is banned.

Both otter and bat are included in Schedule 2 of the Habitats Regulations, meaning it is an offence to:

- Deliberately or recklessly capture, injure or kill, harness, damage or destroy a breeding site or resting place of an EPS or a group of EPS;
- Disturb an EPS while it is occupying a structure or place which it uses for shelter or protection;
- Disturb an EPS while it is rearing or otherwise caring for its young;
- Obstruct access by an EPS to a breeding or resting place;
- Disturb an EPS in a manner that is, or circumstances which are, likely to significantly affect the local distribution or abundance of that species; and
- To disturb an EPS in a manner that is, or in circumstances which are likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young.

10.2.2 National Legislation

Schedule 5 of the Wildlife and Countryside Act 1981 (WCA) provides special protection to selected animal species other than birds, through section 9(4) of the Act, against damage to "*any structure or place which [any wild animal included in the schedule] uses for shelter and protection*", and against disturbance whilst in such places. Otter, and bats are afforded protection under Schedule 5 of the WCA. Reptiles including slow worm and common lizard are offered protection through part of section 9(1) and all of section 9(5) which "*prohibit the intentional killing and injuring and trade (i.e. sale, barter, exchanges, transporting for sale and advertising to sell or to buy)*."

The WCA and the Nature Conservation (Natural Scotland) Act 2004 (Scottish Parliament, 2004) protect all wild birds. Wild birds may not be taken, injured, or killed without a licence at any time (with specific exceptions). Additionally, nests are protected from damage or destruction while in use and eggs may not be taken or destroyed without a licence. For certain species, listed on Schedule 1 of the Act, special protection is provided, and it is an offence to disturb those species at their nest site while it is in use.

Section 13 of the WCA identifies the protection measures for wild plants. It "*prohibits the unauthorised intentional uprooting of any wild plant species and forbids any picking, uprooting or destruction of plants*" listed on Schedule 8.

Habitats identified as potential Ground Water Dependent Terrestrial Ecosystems (GWDTE), are protected under the Water Framework Directive (Directive 2000/60/EC) (European Commission, 2000) and transposed into Scottish law through the Water Environment and Water Services (Scotland) (WEWS) Act 2003 (Scottish Parliament, 2003). This means any disturbance to the groundwater resource on which a particular GWDTE relies, would be a breach of legislation.

10.2.3 Planning Policy and Local Development Plan

As detailed in Chapter 4: Statutory Policy and Context, Stornoway falls within the area of the Outer Hebrides Local Development Plan (LDP) (Comhairle nan Eilean Siar, 2018) which lays out visions and objectives for the Outer Hebrides detailing policies including those which planning applications would be assessed against.

Policy no. NBH3: Trees and Woodland states which states *there is a strong presumption against the removal of established individual trees and woodland of mixed native species which have a landscape and amenity value and/or contribute to nature conservation, unless removal would achieve significant additional economic, environmental or social benefits* and in order to minimise any adverse impacts, developers will be required to incorporate existing trees and woodland into the design of development and carry out appropriate replacement planting where loss is unavoidable.

As per Condition 16 of the Planning Permission in Principal (PPIP), *within six months of commencement of the development of the primary access road, details of compensatory tree planting to compensate for the loss of trees on the site shall be submitted to the local Planning Authority for approval and implementation during the first available planting season in order to secure the visual and landscape amenity of the area and contribute to nature conservation*.

Policy no. E15: Soils states that a Peat Management Plan must be submitted demonstrating best practice in the movement, storage, management, and reinstatement of soils. As per

Condition 7, a Peat Management Plan (PMP) and Peat Reuse Strategy is being developed to allow for the reuse of excavated peat in the restoration of already degraded areas.

10.2.4 Other Guidance

In addition, to the general guidance outlined in Chapter 6, the following guidance relevant to assessment and management of terrestrial ecology was consulted:

- Scottish Biodiversity List, which comes under Section 2 (4) of the NCSA (Scottish Government, 2013);
- PAN 60: Planning for Natural Heritage (Scottish Government, 2008);
- Guidelines for Ecological Impact Assessment in the United Kingdom, (CIEEM, 2012);
- Handbook for Phase 1 Habitat Survey – a technique for Environmental Audit (Joint Nature Conservation Committee 2010); and
- Water Framework Directive (WFD) 95 A Functional Wetland Typology for Scotland (SNIFFER 2009).

10.3 Assessment Methodology

10.3.1 Baseline

This assessment is supported by Appendix J.1 – Technical Report Stornoway Deep Water Port, Lewis and Harris Phase 1 Habitat Mapping. Restrictions, including those which affect travel, put in place due to the COVID-19 pandemic, made physically surveying the site impossible, however, baseline information was collected through a desktop study and the use of UAV (unmanned aerial vehicle) mapping which was utilised to produce the Phase 1 mapping.

10.3.1.1 Desktop Study

A desktop study was carried out in order to assess the baseline of the ecology on the site of the proposed development. The desktop study was carried out by Tracks Ecology (Appendix J.1) and reviewed existing information available from the Site Link Portal provided by Scottish Natural Heritage (SNH), the National Biodiversity Network (NBN) Gateway and the Preliminary Ecological Appraisal (EnviroCentre, 2018).

10.3.1.2 UAV Mapping

Data capture flights were carried out on the 9th and 10th April 2020 by HebDrone Ltd, based on the Isle of Lewis. All aerial survey work was undertaken in accordance with Civil Aviation Authority (CAA) regulations. Full details of the data capture process and weather conditions can be found in Appendix J.1.

10.3.1.3 Phase 1 Mapping

Phase 1 mapping is a standardised method of recording habitat types and characteristic vegetation, as set out in the Handbook for Phase 1 Habitat Survey – A technique for Environmental Audit (JNCC, 2010). These guidelines allow for a suitably experienced ecologist to provide a baseline assessment of the ecology of the survey area so that it is possible to either confirm the conservation significance of an area and assess the potential for impacts on habitats and species or to ascertain the requirement for further surveys.

Standard Phase 1 methodology can also be extended to include an initial evaluation of habitats in accordance with those listed in the SNIFFER document Water Framework Directive (WFD)

95 A Functional Wetland Typology for Scotland (SNIFFER 2009) and through the recording of specific features indicating the presence, or likely presence, of protected species or other species of nature conservation significance.

Habitat mapping results were discussed with a consultant botanist experienced in habitats in the Western Isles to obtain additional input on habitat classification and delineation.

10.3.1.4 Protected Species Potential

With regards to protected species, as no recent field survey has been carried out, comments have been made based on findings of the desk study and the experience of Tracks Ecology at similar locations and habitats.

10.3.2 Impact Assessment Methodology

The evaluation of receptors, magnitude of impact and significance evaluation follows the methodology laid out in Chapter 6: Biodiversity, Section 6.5.

10.4 Baseline

10.4.1 Designated Sites

A review of the SNH Site Link Portal confirmed that there are no statutory designated sites within the immediate area of the proposed development. Two designated sites were identified within 5km, see Figure 1, Appendix J.1. These were the Tong Saltings Site of Special Scientific Interest (SSSI), located approximately 2.8km to the north east of the site and the Lewis Peatlands Special Protection Area (SPA) and Ramsar site approximately 5km to the north west at its closest point. No areas of woodland identified on the Ancient Woodland Inventory (AWI) are present within 5km of the proposed development and no Scottish Wildlife Trust reserves or Local Nature Conservation Sites were identified within the site or within a 2km buffer.

Tong Saltings SSSI contains one of the largest areas of saltmarsh and tidal flats in the Outer Hebrides and is the best representative intertidal system on the eastern seaboard. Sand dunes occur on the sand and shingle spit of Teanga Tunga and on the exposed eastern accreting spit and sandy shore at the head of Broad Bay. Maritime grassland covers Teanga Tunga and Steinish Island. The outcrops on the beaches are conglomerate rock. The site is important for wintering, breeding and feeding birds, including terns, waders and wildfowl.

Lewis Peatlands SPA comprises an extensive area of deep blanket bog, interspersed with bog pool complexes and freshwater lochs. Lewis Peatlands supports populations of European importance of the Annex 1 species red-throated diver *Gavia stellata*; black-throated diver *Gavia arctica*; golden eagle *Aquila chrysaetos;* merlin *Falco columbarius*; golden plover *Pluvialis apricaria* and dunlin *Calidris alpina schinzii*. Lewis Peatlands SPA further qualifies by regularly supporting a population of the migratory species: greenshank *Tringa nebularia*. Although over 8km to the north east the Lewis Peatlands also encompasses the Lewis Peatlands Special Area of Conservation (SAC) with the qualifying interests of blanket bog and associated habitats, wet heathland and otter *Lutra*.

10.4.2 Environment

The UAV surveyed area, shown in Figure 2, Appendix J.1., supports a wide range of habitats from coastal shingle and algal beds, to blanket bog and heathlands. The area surveyed extended over approximately 69ha, spanning an altitudinal range from sea level to approximately 62m above sea level. The topography is varied and constitutes rocky outcrop, inland cliffs and undulating slopes, mixed with areas of open blanket bog. Two relatively small watercourses run through the area and to the west of the public road small lochans are also present. The coastline is rocky with low cliffs in places and numerous small stone/shingle bays.

Surveys in 2017 (EnviroCentre, 2018) identified that the area to the east of the public road consisted of only a single habitat of wet dwarf shrub heath. Upon further investigation using the methodologies as noted above in section 10.3, results confirmed the presence of extensive wet dwarf shrub heath but identified a number of other prominent habitats.

10.4.3 Phase 1 Habitats

On completion of the mapping process, total coverage areas for each habitat were calculated and habitat maps produced. These can be found in Figure 3, Appendix J.1 with results of the classifications and total area summarised in Table 10.1.

Table 10.1: Phase 1 Habitats and Coverage within the Surveyed Area

Row Labels	Area ha	% Total
Wet dwarf shrub heath*	20.98	30.49
Wet dwarf shrub heath*/scattered scrub	1.79	2.61
Wet dwarf shrub heath*/broadleaved trees	2.64	3.83
Dry dwarf shrub heath	11.33	16.46
Dry heath/acid grassland mosaic	0.55	0.80
Dry heath/acid grassland/bracken mosaic	0.23	0.33
Dry heath/bracken	0.08	0.11
Dry heath/disturbed ground	0.06	0.08
Blanket bog	9.83	14.28
Blanket bog/disturbed ground	0.18	0.26
Dry modified bog	0.41	0.60
Bare ground	5.97	8.68
Acid grassland - unimproved	2.98	4.33
Acid grassland/bracken mosaic	1.66	2.42
Intertidal - boulders/rocks - brown algal beds	1.83	2.65
Intertidal - shingles/cobbles	1.74	2.53
Flush and spring - acid/neutral flush*	1.71	2.49
Marshy grassland*	1.12	1.63
Built environment	1.01	1.46
Hard cliff	0.81	1.17
Exposed rock	0.70	1.02
Broadleaved woodland - semi-natural	0.41	0.59
Disturbed ground/bare peat	0.28	0.40
Standing water	0.28	0.41
Mixed woodland - semi-natural	0.08	0.11
Coniferous woodland - semi-natural	0.06	0.08
Introduced shrub	0.04	0.05
Maritime cliff and slope - coastal grassland	0.04	0.05
Scrub - dense/continuous	0.03	0.04

Bracken - continuous	0.01	0.02
Intertidal - boulders/rocks	0.01	0.01
Dry modified bog/scattered scrub	<0.01	<0.01
Total	**68.83**	**100.00**

10.4.3.1 Dominant Habitats

The dominant habitats identified within the area of the proposed development include wet dwarf shrub heath, dry dwarf shrub heath and blanket bog.

Wet Dwarf Shrub Heath

Wet dwarf shrub heath is dominant throughout the majority of the site to the east of the public road totalling approximately 30% of the area surveyed, see Appendix J.1, Figure 3. It has been noted that this habitat may be underestimated with the potential for areas of dry heath to be closer to dry variants of wet heath, but this could not be confirmed with the survey methodology used. A further 5.4% of the area surveyed was mapped as wet dwarf shrub heath with the presence of scattered scrub or trees to the north of the site. Based on the knowledge of these habitats across northern Scotland, it is likely that it is typical northwest wet heath.

Due to its location, signs of disturbance can be attributed to the likely presence of significant deer densities and as such, it is expected that the area is low in the diversity of M15 *Scirpus cespitosus-Erica tetralix* wet heath. *E. tetralix* and *Calluna vulgaris* are likely to be dominant accompanied by abundant deergrass *Trichophorum cespitosum* and purple moor-grass *Molinia caerulea*.

Dry Dwarf Shrub Heath

Dry dwarf shrub heath was identified as covering approximately 16.5% of the area surveyed and appeared to be limited to the steep sided slopes of rocky outcrops, as well as some of the coastal sections. Exact plant assemblages could not be confirmed but it is likely that the heath, especially away from the coast is H12 *Calluna vulgaris-Vaccinium myyrtillus* heath. The habitat was also found in mosaics or combined with acid grassland and bracken. It is likely that that some areas of this habitat along the coast is the coastal form containing at least some component maritime species.

Blanket Bog

Blanket bog has been identified to cover approximately 14.5% of the site with the largest area located on the west of the public road in a flat basin. This area supports sections of open water and flushed habitats with the blanket bog likely to be found in transitions and mosaics as well. Areas of blanket bog were generally restricted to areas of very low slope, typically less than 10 degrees. A smaller area of blanket bog was identified in the east of the area surveyed however, it was not possible to clearly differentiate between this and the surrounding wet heath habitat. It is possible that blanket bog is more limited in this area. Mapping in this area also identified the presence of some deep peat (>0.5m), extending to greater than 1m across much of the habitat area.

A further smaller patch of bog habitat was identified to the south of the area surveyed which is likely to be found in transition from the flushed habitat identified to the west of this. Based on local knowledge and imagery it is likely that the blanket bog is formed from a mosaic of M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire with drier areas of M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire. Some further disturbance was noted including

damage to surface vegetation likely from vehicle tracking and areas of peat cutting. Two significant areas of disused peat cutting were identified within the western section of the area surveyed. These have previously been identified as the potential sites for receiving excess peat from the development site should it be required.

10.4.3.2 Other Habitats

Significant areas of bare ground and a built-up environment are present, primarily in the south of the area surveyed associated with the Arnish industrial estate. Further areas of built-up ground include the public road and associated laybys.

Numerous patches of grassland have been identified, predominantly located along the coast on the tops of low cliffs and around disturbed ground associated with the industrial estate. The vast majority of these have been mapped as unimproved acid grassland often in mosaic with bracken, see Figure 3, Appendix J.1., however, it is likely that the species composition supports a mosaic of unimproved and semi-improved grassland with a maritime influence (coastal grasslands). The presence of bracken is likely to be underestimated due to the time of image capture. In addition, a number of areas along the public road appear to support small sections of marshy grassland likely to be heavily influenced by historical drainage systems and groundworks of the road construction. It is possible that some of these areas are part of a mosaic with flush habitats.

The coast is formed by a mix of hard cliff, exposed rock, intertidal – boulders/rock – brown algal beds and intertidal – shingles/cobbles.

Flush and springs habitat have been identified in the west of the area surveyed and are located along drainage routes which feed areas of blanket bog, or where more obvious movement of water through the habitat is apparent. Some small flushed areas were identified in the east of the area surveyed within the upper reaches and source of the small watercourses and within the lower slopes and gullies. It is likely that these flushes are largely acidic in nature with significant presence of rush species.

Areas of exposed rock and hard cliff were identified across the area surveyed with the majority of these from natural landforms, however, development works in the south have exposed sections of cliff face.

Dense patches of woodland were identified but are limited with small areas supporting broadleaved species and coniferous species identified in the north of the surveyed area. The species composition is likely to be a combination of birch *Betula sp.,* rowan *Sorbus aucuparia* and willow *Salix sp.* with occasional non-native coniferous species such as Sitka spruce *Picea sitchensis* and larch *Larix sp*. Much of the northern section of the survey area supports scattered trees and scrub with species likely to be willow, birch, gorse *Ulex europeaus* and broom *Cytisus scoparius* may all be present.

Surveys identified areas of introduced scrub made up of rhododendron in the northern part of the area surveyed. It is unlikely that all locations of rhododendron have been identified from the survey due to the difficulty of differentiating it from other shrubs in the area using the aerial imagery. The Lews Castle Grounds, which cover an area of 270ha to the north of the development, were laid out in the 1850's and include gardens (Lews Castle 2020) where rhododendron were very popular at this point in time and hence a number of species were planted. It is therefore not surprising that rhododendron have been found in the survey area.

10.4.4 Hydrology

The site is located on the low-lying coast with two small watercourses draining west to east. The northern most watercourse (Allt Poll a'Choire) drains through the blanket bog areas of the wester section of the site, under the public road and through a shallow rocky gully into Glumaig Harbour. The small southern watercourse (unnamed) appears to be formed predominantly from roadside drainage then runs east north of the existing developed areas into Glumaig Harbour. The Survey Area is within the Western Isles District Salmon Fisheries Board (WIDSFB), but it is unlikely that either of these watercourses offer any significant resource for aquatic ecology including salmonids as connectivity is expected to be low and catchment sizes are very limited. Moreover, as highlighted in Chapter 8: Fish Ecology, a river further north than the Allt Poll a'Choire watercourse, also known as the River Creed, supports high densities of salmon parr and/or fry, highlighting preference to this environment.

The Lewis and Harris groundwater (SEPA ID: 150695) is identified as being in 'Good' condition within SEPA online water environment hub. The site drains to Stornoway Harbour (Stornoway Harbour is a coastal water body (SEPA ID: 200191)) which is also identified as being in 'Good' condition. For further information on water bodies see Chapter 14: Water Quality, Soils and Coastal Processes.

10.4.5 Ground Water Dependent Terrestrial Ecosystems (GWDTE)

A number of habitats were identified within the survey area that have the potential to support Ground Water Dependent Terrestrial Ecosystems (GWDTE) (see Appendix J.1, Figure 4). Highly dependent habitats include flush and springs which were identified throughout the site. Few areas of marshy grassland were recorded and recognised as being moderately dependent on groundwater, although these are likely to be present due to modified drainage systems and as such are considered to some degree as artificial.

The most significant areas in relation to GWDTE are the large areas of wet heath habitat present, which have been recorded as widespread across the site and of moderate dependence on groundwater. It has been noted that these habitats are likely to be typical species poor examples of habitats which are widespread and common throughout western Scotland.

10.4.6 Species Accounts

No records for protected mammal species were present within the Survey Area although records for otter and common pipistrelle *Pipistrellus* are located within 2km of the Survey Area.

10.4.6.1 Bats

A number of roosts of common pipistrelle have previously been identified within the Stornoway region. There are no buildings within the surveyed area. Woodland and extensive scattered trees are noted in the area, but it is unlikely that these support extensive suitability for roosting bats due to the lack of large mature trees and the exposed nature of the site. Lowland habitats within the surveyed area were identified to potentially provide suitable foraging and commuting habitat for local bat populations with connectivity to the wider landscape. Areas of open bog and standing water can also provide foraging habitat during settled weather conditions with areas of commercial woodland outwith the survey area allowing for foraging and commuting.

10.4.6.2 Otter

[redacted] The coastline is likely to offer sheltered foraging and resting sites and potential for breeding and non-breeding holts. The two small burns as noted in section 10.4.4 may be utilised by otter when requiring freshwater to clean their fur. Due to no recent physical field survey being carried out, it has not been confirmed that otters are present on the site [redacted] No signs of otter were identified during surveys carried out in 2017 or during a site visit in 2018 (EnviroCentre, 2018).

10.4.6.3 Amphibians and Reptiles

Very few reptiles and amphibians are present on Lewis and Harris, however, there is the possibility that slow worm *Anguis fragilis* are present within the survey area in low numbers most likely within areas of grassland/heath/bracken mosaics along the coast. There is also the potential for common lizard *Zootoca vivipara* to be present in these areas and heath and bog habitats as well.

10.4.6.4 Aquatic Ecology

Aquatic habitats within the terrestrial survey area were limited to the two minor watercourses and associated lochans to the west of the site. Areas of standing water are likely to be oligotrophic to mesotrophic, but it is expected that these will offer some suitability for local breeding birds and invertebrates. They may also offer limited foraging for bats during calm conditions.

10.4.6.5 Birds

A significant number of bird records are present within 2km including both notable marine and terrestrial species such as lesser redpoll *Acanthis cabaret*, razorbill *Alca torda*, dunlin *Calidris alpine*, knot *Calidris canutus*, ringed plover *Charadrius hiaticula*, purple sandpiper *Calidris maritima*, black guillemot *Cepphus grille*, corncrake *Crex*, merlin *Falco columbarius*, puffin *Fratercula arctica,* black-throated diver *Gavia arctica*, red-throated diver *Gavia stellate*, curlew *Numenius arquata*, golden plover *Pluvialis apricaria* and Arctic tern *Sterna paradisaea*. It is expected that waterbodies and habitat identified within the surveyed area offer some suitability for local breeding birds including ground nesting species.

10.4.7 Identification of Receptors

Table 10.4.1 details ecological receptors taken forward for assessment and those which have been excluded from further evaluation. The desk-based combined with the use of UAV and Phase 1 mapping identified multiple Phase 1 habitats and protected species suitability within the proposed development area.

Table 10.4.1: Evaluation of Ecological Receptors

Receptor	Evaluation Rationale	Receptor Value
Designated Sites for Nature Conservation		
Tong Saltings Site of Special Scientific Interest (SSSI)	This site lies approximately 2.8km to the north east and therefore it is highly unlikely there will be any effects on the flora or fauna the site is designated for with no connectivity identified. Mobile species protected by this designation includes some bird species however, it has already been identified that the development will not have any significant effects on ornithology due to the lack of optimal habitat (EnviroCentre, 2018). This site is therefore not taken forward for further assessment.	International: excluded from further assessment
Lewis Peatlands Special Protection Area (SPA) and Ramsar site	This site lies approximately 5km to the north west at its closest point and therefore it is highly unlikely there will be any effects on the flora or fauna the site is designated for with no connectivity identified. Mobile species protected by this designation includes some bird species however, it has already been identified that the development will not have any significant effects on ornithology due to the lack of optimal habitat (EnviroCentre, 2018). This site is therefore not taken forward for further assessment.	International: excluded from further assessment
Flora: Dominant Habitats		
Wet dwarf shrub heath	This habitat type is identified in Annex 1 of the Habitats Directive, UKBAP and Scottish Biodiversity list habitat and is typical of the west of Scotland and although quality cannot be confirmed, roads and land management practices such as peat cutting and the presence of deer, suggest that the quality is unlikely to be high and this would not classify as an Annex 1 habitat but it is likely to hold some conservation value. This habitat should be recognised as being a moderately GWDTE. GWDTEs are protected from disturbance under the Water Framework Directive.	Regional
Dry dwarf shrub heath	This habitat type is identified as Annex 1 of the Habitats Directive, UKBAP and Scottish Biodiversity list habitat and is typical of the west of Scotland, the presence of disturbance from development, roads and land management practices such as peat cutting and the presence of deer, suggest that the quality however is unlikely to be high and this would not classify as an Annex 1 habitat it is likely to hold some conservation value.	Regional
Blanket bog	This habitat type is identified as Annex 1 of the Habitats Directive, UKBAP and Scottish	Regional

Receptor	Evaluation Rationale	Receptor Value
	Biodiversity list habitat and is typical of the west of Scotland, the presence of disturbance from development, roads and land management practices such as peat cutting and the presence of deer, suggest that the quality however is unlikely to be high and this would not classify as an Annex 1 habitat but it is likely to hold some conservation value.	
Flora: Other Notable Habitats		
Flushes	Flushes are noted as being highly dependent on groundwater. GWDTEs are protected from disturbance under the Water Framework Directive. This habitat will potentially provide important habitat for nesting wading birds and habitat for varied invertebrate fauna.	National
Unimproved Acid grassland	Unimproved acid grassland is noted as a UK BAP broad habitat category. It is possible that some of this habitat may be coastal grassland with maritime species present. This habitat was also identified in combination with extensive bracken and therefore is unlikely to represent a priority habitat.	Moderate Local
Marshy grassland	Areas of marshy grassland should be considered to be groundwater dependent however, areas identified are likely to be heavily influenced by historical drainage systems and groundworks of road construction.	Low Local
Coast	This habitat, including intertidal communities of rock, shingle and brown algal beds, is likely to offer some degree of conservation value and potentially provide habitat for otter.	Moderate Local
Woodland	These habitats, including scattered trees and scrub, broadleaved woodland and coniferous woodland, are likely to offer some degree of conservation value, although this is currently limited due to the immaturity of the trees present, which are unlikely provide high quality habitat for species such as bats.	Low Local
Running water	Two small watercourses are unlikely to support aquatic ecology, however, may be an important feature utilised by otter.	High Local
Standing water	Areas of standing water may offer some suitability for local breeding birds and invertebrates and may provide foraging for bats during calm conditions.	Moderate Local
Introduced shrub	Rhododendron is a non-native invasive species and is therefore of limited ecological value.	Negative
Peat receptor sites	Likely subject to peat cutting in the past and of degraded quality.	Low Local

Receptor	Evaluation Rationale	Receptor Value
Exposed rock/hard cliff	Made up from natural landforms with some development works exposing sections of cliff face. This habitat, with some existing disturbance is of limited ecological value.	Negligible
Bare ground/built environment	This habitat is of limited ecological value.	Negligible
Fauna: Protected Species		
Otter	Otters are a UK BAP priority species and receive full legal protection as an EPS. Otters are found throughout most of Scotland. The species is considered relatively widespread and common and the Scottish population represents 90% of the total British population (SNH, 2010). [redacted]	International
Bats	All bat species receive full legal protection as an EPS. Bats are extremely restricted on the Western Isles although a number of common pipistrelle roosts are known of in the Stornoway area. Some areas of potential foraging and commuting habitat have been identified.	National
Amphibians and reptiles	All UK native amphibian and reptile species receive full legal protection under the Wildlife and Countryside Act (as amended). The naturally occurring species in Scotland are listed in the Scottish Biodiversity and the UK BAP. Very few reptiles and amphibians are present on Lewis and Harris however there is the possibility of slow worm and common lizard being present on site.	High Local
Birds	The sensitivity of ornithological receptors is species specific hence a range of values may apply.	Low Local to International

10.5 Impact Assessment

The impacts of the development on the terrestrial ecology receptors are assessed in terms of their impact magnitude and significance. This assessment is carried out following the methodology outlined in Chapter 6: Biodiversity and assesses the potential effects resulting from the construction required for the project and operations as outlined in Chapter 2: Project Description. Receptors of negligible value have not been taken forward for assessment as significant effects are not possible. However, mitigation identified for other receptors is likely to be applicable and will be implemented for all relevant areas.

10.5.1 Construction Impacts

A number of potential impacts (in the absence of secondary mitigation) have been identified in connection with the construction phase of the development. These may be direct or indirect impacts and include:

- Loss of habitat within the construction footprint due to the development and associated infrastructure;
- Disturbance to habitat within and adjacent to the construction footprint during construction works;
- Pollution incidents during construction works;
- Impacts arising from the presence of non-native invasive species.

The assessment of impacts arising from construction activities are carried out below. The project design has made all reasonable attempts to avoid significant impacts to sensitive habitats and unavoidable impacts are minimised wherever possible through embedded primary mitigation measures, which have been considered within the assessment of effects.

10.5.1.1 Habitat Loss

Permanent loss of habitat will occur due to the construction of the access and link roads, and due to the levelling of the Reclaimed/Levelled Area. Temporary habitat loss may occur on the boundary of the infrastructure due to the construction works. The total permanent habitat loss area is anticipated to be approximately 71,055m^2. A 10m wide zone around the construction works which could be subject to temporary habitat loss covers an area of 25,805m^2. Figure 7, Appendix J.1. shows the areas of habitat loss and includes calculations of specific habitat loss, buffer zones and total loss.

Wet Dwarf Shrub Heath

The development will lead to the permanent loss of 6,693m^2 of this habitat within the survey area, where the access road and levelled areas are to be formed. This habitat is generally identified as being structurally diverse with an understorey of mosses including Sphagnum species, and moderately dependent on groundwater, however it was noted that the area identified within the survey area may be relatively poor in species diversity and lacking in an understorey of extensive moss species suggesting it is not of high quality. In addition to this, it was noted that the quality is not expected to be high due to previous and ongoing disturbance. As noted in Table 10.4.1, this habitat is not representative of those listed in Annex I of the Habitats Directive and is deemed to be of **regional** value. Although in small numbers on Lewis and Harris, reptiles and amphibians could be present within this habitat. The habitat is, however, common and widespread in the wider area. It has therefore been assessed that the magnitude of the impact will be **permanent** and **low** resulting in a **minor: non-significant** effect.

Dry Dwarf Shrub Heath

The development will lead to the permanent loss of 15,180m^2 of dry dwarf shrub heath within the survey area. Similarly, to that of wet heath, dry heath may also provide habitat for small numbers of reptiles and amphibian. It should be noted that this habitat is also likely to not be of high quality due to previous and ongoing disturbance as noted in Table 10.4.1 it is of **regional** value. This habitat is widespread within the survey area and the wider area. The

impact has therefore been assessed as **permanent** and **low** resulting in a **minor: non-significant** effect.

Flush and Springs

Upland flushes receive water and nutrients from surface and/or groundwater sources as well as rainfall. These habitats are defined as peat or mineral-based terrestrial wetlands. These habitats are widespread throughout the uplands of Scotland, often small, disperse and numerous. The survey area supports a number of these features. It has been assessed that these may not be of high quality but could offer important nesting habitat for wading birds as well as for varied invertebrate fauna. Due to their dependence on groundwater, these habitats are afforded a level of protection under WEWS and are considered of **national** value. Direct or indirect impacts (through hydrological change) on these flush habitats should be minimised wherever possible. The development will lead to the permanent loss of 481m^2 of this habitat identified within the survey area.

The area to be removed is located within the area to be levelled, to the south of the access road and recognised by its 'T' shape (see Figure 7, Appendix J.1) with the lower section of the habitat being lost and not the entire flush. By removing the lower section only, where the topography slopes downwards, it is not anticipated that the loss of this section will have an impact on the flow of water within the remaining habitat. Impacts on the area which will be retained is considered in Section 10.5.2.1 it is anticipated that the primary mitigation to protect the remaining habitat will also encourage the creation of additional flush habitat, helping to offset the impacts of the habitat loss (Drawings SDWP–WS 2139–XX–03–DR–C 4051 and 4052). Impacts from the removal of this habitat have therefore been assessed as **permanent** and **low**, resulting in a **minor: non-significant** effect.

Coast

The coastal habitats recorded and considered for assessment include intertidal – boulder/rocks – brown algal beds and intertidal – shingles/cobbles. [redacted] The development will lead to the permanent loss of 17,716m^2 of this **moderate local** value habitat being removed. Intertidal rock is a widespread and common habitat and represents approximately 48% of the total Scottish coast (Government, 2011), with the specific habitats identified included in this. Approximately 1km of rock armour will be installed during construction where cavities in the primary rock armour can provide sheltered resting habitat for otter. [redacted] and the surrounding area, and the inclusion of rock armoured areas in the development design, the impacts resulting from the loss of this habitat are assessed as **permanent** and **low** resulting in a **minor: non-significant** effect.

Woodland

The development will lead to the permanent loss of 1,354m^2 of woodland from the area of the proposed development. This includes broadleaved woodland – semi-natural, mixed woodland – semi-natural and coniferous woodland – semi-natural. Areas of woodland identified may be utilised by bats for foraging and feeding and may offer some nesting habitat for local birds. It is unlikely that woodland in this area will provide roosting habitat for bats due to the lack of mature trees. As per Condition 16 of the Planning Permission in Principal, see Section 10.2.3.

Hence, the habitat will be replaced. It has therefore been assessed that impacts resulting from the removal of this **low local** value habitat will be **reversible** and **low** resulting in a **minor: non-significant** effect.

Unimproved Acid Grassland

An area of approximately 4,140m^2 of acid grassland is anticipated to be permanently lost during construction of the proposed development. This habitat can be considered a UK BAP broad habitat category however due to the scale and combination with extensive bracken is not deemed representative of a priority habitat and hence has a **moderate local** value. Unimproved acid grassland within the construction footprint represents a small proportion of the total amount of this habitat identified within the survey area. It has therefore been assessed that impacts resulting from the removal of this habitat will be **permanent** and **low** resulting in a **minor: non-significant** effect.

Marshy Grassland

Areas of marshy grassland should be considered to be groundwater dependent however this habitat identified within the survey area is likely to be heavily influenced by historical drainage and groundworks of road construction and therefore not of high quality and representative of GWDTEs. Approximately 163m^2 is estimated to be removed during the construction phase of the development making up a small proportion of the total amount of this **low local** value habitat identified within the survey area. It has therefore been assessed that impacts resulting from the removal of this habitat will be **permanent** and **low** resulting in a **minor: non-significant** effect.

10.5.1.2 Habitat Disturbance

Wet Dwarf Shrub Heath

Areas of this habitat lie within the buffer zone illustrated in Figure 7, Appendix J.1, and may be susceptible to some disturbance during construction work. Tracking over may lead to temporary damage of the habitat. Areas excavated within the vicinity may lead to edges of the habitat drying out however, this habitat is widespread across the survey area and likely to recover from disturbance. In the absence of secondary mitigation, it has therefore been assessed that impacts resulting from the disturbance of this habitat will be **reversible** and **low** resulting in a **minor: non-significant** effect.

Dry Dwarf Shrub Heath

Areas of this habitat lie within the buffer zone illustrated in Figure 7, Appendix J.1, and may be susceptible to some disturbance during construction work. Tracking over may lead to temporary damage of the habitat and areas excavated within the vicinity may lead to edges of the habitat drying out. This habitat is widespread across the survey area and likely to be recover from disturbance. In the absence of secondary mitigation, it has therefore been assessed that impacts resulting from the disturbance of this habitat will be **reversible** and **low** resulting in a **minor: non-significant** effect.

Flush and Springs

As noted above in Section 10.5.1.1., a section of flush habitat will be removed during the construction works leaving the remaining habitat in place but susceptible to some disturbance. The remaining flush will be above the reclaimed area, but could be disturbed during the

dressing of the slope required to ensure stability, and the installation of the rock bund required as part of the primary mitigation to prevent groundwater effects as discussed in Section 10.5.1.3. It has therefore been assessed that impacts resulting from the disturbance of this habitat will be **low** resulting in a **minor: non-significant** effect.

Blanket Bog

The construction of the proposed development may lead to the disturbance of 54m^2 blanket bog habitat which has been identified between 5 and 10m of the development footprint, see Figure 7, Appendix J.1. Blanket bog is an important habitat and is one of the most extensive semi-natural habitats in the UK and Ireland, providing breeding and feeding habitat for many bird species and various plants and invertebrates (The Conservation Volunteers, 2020). During construction works, there is the potential for the habitat to be disturbed. Blanket bog identified within the site has been recorded as being unlikely to be of high quality with peat cutting likely to have dried areas out. Areas excavated within the vicinity during construction may lead to edges of the habitat drying out. In addition to this, a very small proportion of the total area of blanket bog identified within the survey area has the potential to be affected, if at all. In the absence of secondary mitigation, it has therefore been assessed that impacts resulting from the disturbance of this habitat of **regional** value will be **negligible** resulting in a **negligible: non-significant** effect.

Running Water

During construction works, the installation of a culvert to form the access road will create temporary disturbance within the Allt Poll a'Choire. As discussed in Chapter 14: Water Environment, Soils & Coastal Processes this will be completed in accordance with The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) requirements. Any ecological impacts are anticipated to be **temporary** and **reversible**. Therefore, impacts have been assessed as **negligible** resulting in a **negligible: non-significant** effect.

Peat Receptor Sites

A number of potential peat receptor sites have been identified due to their currently degraded condition, see Figures 5 and 6, Appendix J.1. Use of these as peat receptors would be beneficial to the area in restoring habitat however existing vegetation could be disturbed or damaged in the process. In addition to this, accessing these areas may cause further disturbance to adjacent habitat. In the absence of secondary mitigation, impacts have been assessed as **permanent, low beneficial**, resulting in a **negligible: non-significant** effect.

10.5.1.3 Pollution Incidents

If an accidental spill was to occur during construction, it could have an impact upon the surrounding flora with potential knock on effects to fauna. Habitats potentially affected may include heathland, groundwater dependent habitats, coastal habitats and running water including the Allt Poll a'Choire towards the north of the site and a further unnamed watercourse towards the south. However, the natural topography of the site will have an impact with the majority of the construction works being carried out below the level of surrounding habitat with only the access road situated uphill.

As discussed in Chapter 14: Water Environment, Soils and Coastal Processes with mitigation including pollution prevention measures, and a pollution response plan in place, the risk of a

spill occurring and having an impact on surrounding habitat of **national** to **low local** value is **low** resulting in a **minor: non-significant** effect.

No negative implications of dust have been anticipated from the construction of the development as noted in Chapter 16: Other Issues however dust mitigation plans will be implemented in line with best practice.

10.5.1.4 Non-Native Invasive Species

Rhododendron has been identified across the north of the survey area with a very small proportion of approximately 0.03% identified within the development footprint. It is possible that additional areas of rhododendron may be present within the development area. Rhododendron is an aggressive coloniser, reducing biodiversity and obstructing growth of other species (Scottish Forestry, 2006). Consideration will be required when removing this species during construction works to ensure it is not spread to unaffected, surrounding habitat. In addition to this, in line with standard construction practice, all equipment will be clean on delivery to site so as to ensure no further non-native invasive species are introduced to the site. It has therefore been assessed that impacts resulting from the spread and introduction of non-native invasive species have been assessed as **low**, resulting in a **minor: non-significant** effect.

10.5.1.5 Effects on Protected Species

Potential construction impacts may include:

- Disturbance to species, for example habitat disturbance: noise, visual and human presence, during construction works;
- Accidental physical damage inflicted to protected species as a consequence of construction works, resulting in injury or death;
- Fragmentation of habitats and barrier effects of ecological corridors during construction.

Disturbance

Impacts from construction though disturbance to habitat, visual disturbance and the generation of noise may lead to avoidance of affected areas by certain species which may alter their spatial use of surrounding habitat, including disruption to commuting and foraging patterns.

Otters [redacted] Otter, if present, may be disturbed by construction works including noise and visual disturbance. However, with the area of the proposed development already situated nearby the Arnish Industrial site and within Stornoway Harbour area, otter inhabiting this area may already be used to relatively high noise and visual disturbance from various sources. Should otter be temporarily displaced by disturbance during construction works, sufficient alternative habitat is available locally. In addition to this, as noted in Chapter 2: Project Description, construction works with the exception of dredging, will generally be conducted between 7am to 7pm Monday to Saturday with limited Sunday working anticipated to occur and only infrequent additional works outwith these times. Disturbance is therefore not continuous and otter, if not habituated, will be able to return to the area when the site is inactive. It has therefore been assessed that general disturbance

effects displacing transiting otter will give rise to **reversible negligible** magnitude impacts, giving rise to **minor: non-significant** effects.

However if an otter couch, layup, holt or more importantly, a natal holt are present and in use during construction and no secondary mitigation is implemented, impacts on otter could give rise to impact magnitudes of **reversible, low** resulting in a **moderate: significant** effect. It is noted that an EPS licence from SNH would be required if a couch, layup, or holt were to be disturbed by the works.

Bats are by nature nocturnal and as the working hours are predominantly during the day, it is unlikely there will be disturbance to these species. The use of artificial light has the potential to cause disturbance to bats, however it is likely this would be used in times of reduced daylight during the autumn and winter months when bats would be hibernating. General disturbance to bats has been assessed as **negligible**, resulting in a **minor: non-significant** effect.

As noted in Section 10.5.1.1., bats should be considered when removing trees from the area. If a roost site is encountered and in use during construction and no secondary mitigation is implemented, impacts on bats could give rise to impact magnitudes of **reversible, low** resulting in a **moderate: significant** effect. If a roost is found an EPS licence from SNH would be required prior to any disturbance activities being carried out.

There is a potential for disturbance to amphibians and reptiles including slow worm and common lizard. These species are however more mobile in mild/warm weather during the active season (March – October, weather dependent) and should therefore, be capable of avoidance behaviour. Hence, they may be disturbed by construction works but impact magnitudes will be **reversible** and **negligible**, giving rise to **negligible: non-significant** effects.

Habitat suitable for breeding birds has been identified within the development area. Construction works being carried out during the breeding bird season (March – September) has the potential to lead to disturbance. Disturbance during works may include noise, lighting and human presence which can lead to birds abandoning nests which would be an offence under the WCA. Habitats identified for breeding birds include heathland, areas of standing water and upland flushes. In the absence of secondary mitigation, impacts on birds ranging in value from **international** to **low local** have been assessed as **low**, resulting in a **moderate: significant** effect.

Accidental Physical Damage

During construction, it is possible that protected species individuals are accidentally injured or killed through interactions with machinery or plant, or by becoming trapped in an excavation. In the absence of secondary mitigation this effect is likely to have a negative and/or permanent impact on the animal, however it is very unlikely to occur at a frequency that could result in population level effects, particularly for mobile species. For otters, of **international** value, in the absence of secondary mitigation, impacts have been assessed as **low**, resulting in a **moderate: significant** effect. For bats of **national** value, this would lead to a **minor: non-significant** effect.

Outwith the active season for amphibians and reptiles (October to March, weather dependent), when these species will be hibernating and immobile, disturbance of areas that may provide

hibernacula (e.g. tree roots, rocky areas with deep crevices, log piles) could cause individuals to perish. In the absence of secondary mitigation, impacts on amphibians and reptiles of **high local** value have been assessed as of **low** magnitude, resulting in a **minor: non-significant** effect.

Similarly, during the breeding bird season (March – September) where young birds may be less mobile and there is the chance of nests being encountered, disturbance of areas that provide nesting habitat could cause accidental physical damage and result in death of individuals. In the absence of secondary mitigation, impacts on birds potentially ranging from **international** to **low local** value have been assessed as of **low** magnitude resulting **moderate: significant** effect.

Habitat Fragmentation and Barrier Effects

It is possible that construction works could cause habitat fragmentation and barrier effects for otter, if present and if utilising either of the two watercourses on site, as the development is situated along the coast. [redacted] As noted above, working hour limits will mean the site is not under constant disturbance and otter will have opportunities to cross the site during quieter times if required. This effect is likely to be highly localised and it is anticipated that there will be ample alternative routes available if required. In the absence of secondary mitigation, impacts on otter have therefore been assessed as **negligible**, resulting in a **minor: non-significant** effect.

Areas of habitat potentially inhabited by amphibians and reptiles are likely to be susceptible to fragmentation during construction, however, these species are less far ranging and ample habitat is provided throughout the survey area. Habitat is most likely to be fragmented during the construction of the access road where it crosses heathland, however, both reptiles and amphibians are likely to transit across roads and tracks if required. Impacts have therefore been assessed **negligible**, resulting in a **minor: on-significant** effect.

10.5.2 Operational Impacts

The potential impacts during operations are:

- Ground Water Effects, due to changes in flows;
- Disturbance of species, for example habitat disturbance, noise and visual, during operations;
- Accidental physical damage inflicted to protected species as a consequence of increased traffic resulting in injury or death; and
- Fragmentation of habitats and barrier effects of ecological corridors following the completion of construction.

10.5.2.1 Ground Water Effects

As discussed in Section 10.4.5 and shown in Figure 4 of Appendix J.1, there are a range of GWDTE in and adjacent to the development footprint. Hence potential changes in groundwater which could affect these are considered in this section.

High GWDTE

As noted above in Section 10.5.1.1, a section of flush habitat will be removed during the construction works truncating the remaining habitat. Removal of the lower section of the flush could have led to the draining of the area causing the remaining habitat drying out. Primary mitigation has therefore been included in the design of the development to prevent the dry out of the remaining area of flush habitat. As shown in Drawings SDWP–WS 2139–XX–03–DR–C 4051 and 4052, this involves creating a low rock bund, approximately 35m long and 1-2m high with clay or impermeable membrane where the area will be cut through, allowing the habitat to retain water and not dry out. Allowance for some overflow has also been incorporated so as not to flood the remaining habitat, with an area of the bund where an impermeable layer is omitted to allow some water to flow through. Furthermore, the section between the two remaining flush sections will include a slightly higher bund to encourage the formation of new flush habitat, potentially linking the two remaining sections of flush. It has therefore been assessed that impacts resulting from ground water changes will be **negligible** resulting in a **negligible: non-significant** effect.

Moderate GWDTE

The access road passes through a number of moderate GWDTE, however the Sustainable urban Drainage System (SuDS) approach to the drainage along the sides of the road (Drawing SDWP-WS2139-XX-01-DR-C-0051) will ensure that there is **negligible** change to groundwater flows, resulting in a **negligible: non-significant** effect.

10.5.2.2 Disturbance

The various uses of the DWP will give rise to increased noise and visual disturbance in the area of which could affect otter. However, this is likely to be highly localised and with ample alternative habitat available and a likely degree of habituation to disturbance from regular port use it is not anticipated that this will have a large effect. Impacts have therefore been assessed as **negligible**, resulting in a **minor: non-significant** effect.

10.5.2.3 Accidental Physical Damage

Similarly, with the various uses of the DWP giving rise to increased noise and visual disturbance including an increase in traffic in the area, there is the potential for accidental damage and incidental death to occur on the roads. This refers primarily to the access road as it will have higher traffic flows, but possibly the link road as well. Otter would be anticipated to utilise watercourses to commute inland and as noted are a highly mobile species which would likely be capable of avoidance behaviour or utilise the bottomless arched culvert to transit through. During the active season for amphibians and reptiles, it is possible they will be encountered on the roads of the development however it is unlikely this will have an effect on the population level. Similarly, during the breeding bird season (March – September), it is possible chicks will cross the road however, again, taking into account likely species to nest within the vicinity of disturbance, it is unlikely this will have an effect on the population level. Impacts have therefore been assessed as **negligible** for species ranging from **international** to **low local** value, resulting in a **minor: non-significant** effect.

10.5.2.4 Habitat Fragmentation and Barrier Effects

Following completion of works, the link road may form a barrier between the coast and surrounding habitat potentially utilised by otter however as mentioned previously otter are likely to commute along watercourses which will have a bottomless arched culvert which can reduce barrier effects. It is likely otter will also cross the road directly during periods of lower activity and it is anticipated that the road will be used relatively infrequently. Impacts on otter have therefore been assessed as **negligible**, resulting in a **minor: non-significant** effect.

Areas of habitat potentially inhabited by amphibians and reptiles are likely to be susceptible to fragmentation following construction of the development, however as noted previously, these species are less far ranging and ample habitat is provided throughout the survey area including a large undisturbed area to the south east. Habitat is most likely to be fragmented where the access road crosses heathland however both reptiles and amphibians are likely to transit across this if required. Impacts have therefore been assessed **negligible**, resulting in a **negligible: non-significant** effect.

10.6 Mitigation Measures

This section outlines the proposed terrestrial ecological mitigation for the development. Mitigation measures aim to prevent or reduce any negative effects on the ecological receptors identified. As detailed in Chapter 3: Methodology, standard construction practices such as Pollution Prevention Guidance are assumed to be applied. Even where the overall impact significance is minor in EIA terms, mitigation should still be implemented to ensure high environmental working standards.

10.6.1 Habitats and Flora

Potential impacts of the development on valued ecological receptors have been minimised through careful site design and primary mitigation, resulting in no significant effects on habitats or flora being identified. Nonetheless, construction will be carried out in line with environmental best practice. With regards to heathland habitat and blanket bog, turves removed during soil stripping of nearby habitats may be utilised in sealing exposed peat if practical to prevent remaining habitat from drying out.

10.6.2 Aquatic Habitats and Ground Water Dependent Terrestrial Ecosystems

Mitigation measures identified in Chapter 14: Water Environmental, Soils and Coastal Processes will be implemented to prevent pollution associated impacts. The primary mitigation discussed in Section 10.5.2. will prevent impacts on the section of ground water dependent flush habitat which remains and encourage the creation of new flush habitat.

10.6.3 Invasive Species

The locations supporting rhododendron, an invasive non-native species, will be identified on relevant constraint drawings. If works are located within 50m of the species, then the areas containing the invasive species will be clearly marked to prevent any disturbance. Where this species needs to be removed or the habitat disturbed, a suitable method for removal will be employed in order to successfully remove the species whilst preventing re-invasion.

If rhododendron is to be removed from areas to be constructed directly upon, then re-invasion is of much less concern however the removed rhododendron will need to be appropriately handled and destroyed to prevent spread to surrounding habitat.

Standard best practice should also be employed ensuring all equipment is clean on arrival to site to prevent the introduction of further invasive species.

10.6.4 Protected Species

Potential significant impacts were identified for otter and birds, if present, resulting from the effects of habitat disturbance and accidental physical damage resulting from construction activities. In addition, during the construction phase, there is the potential for breach of wildlife legislation through the disturbance of protected species. As a result, a number of mitigation measures will be implemented to reduce impacts and ensure compliance with relevant conservation legislation. These are summarised below.

10.6.4.1 Pre-Construction Surveys

Prior to any works commencing on site, pre-construction protected mammal surveys and depending on timing of works breeding birds will be undertaken in order to determine whether any protected mammal species, or area of importance to these species are present within or in the immediate vicinity of the construction site. This will allow specifics of the mitigation to be tailored to ensure compliance with wildlife legislation and minimise impacts.

A protected mammal survey will focus on all watercourses within 200m of the proposed development for otter and assessing the suitability of trees to be removed for roosting bats. This will be completed within 6-8 weeks before construction commences. This will allow time for licences to be sought if required. Further checks closer to the time of the works should be completed as deemed appropriate by the initial survey to ensure no changes have occurred. A breeding bird survey should be carried within 2-4 weeks of construction beginning if construction will occur within the breeding bird season (March – September) and should focus on areas highlighted which could provide nesting habitat. Where nests are identified, suitable exclusion zones should be put in place, see Section 10.6.4.3.

10.6.4.2 Seasonal Considerations

Seasonal considerations should be given to nesting birds and hibernating reptiles. Where practicable, ground clearance and tree removal should be carried out, outwith the breeding bird season, September to March. Where this is not practical, bird deterrents can be utilised to discourage birds from nesting in these areas and bird surveys should be carried out regularly ahead of ground or vegetation clearance, see Section 10.6.4.3.

Pre-construction surveys should identify areas of potential reptile hibernacula. Clearance of these areas, i.e. tree roots, rocky areas with deep crevices, log piles, if identified, should be avoided where practicable during the hibernating period (October – March, weather dependent). Where this is not practical, watching briefs should be carried out and reptiles translocated to suitable receptor sites, see Section 10.6.4.3.

10.6.4.3 Species Protection Plans

Upon completion of the pre-construction surveys, detailed Species Protection Plans (SPP) will be developed in collaboration with the design and construction team to ensure compliance with wildlife legislation and the impacts on the relevant species is minimised. The SPPs will outline site specific mitigation.

An outline of the proposed SPP for each species is detailed below based upon the existing baseline data.

Otter

- Should pre-construction surveys identify use of the habitat by otter, the potential for disturbance, subsequent further survey work and/or the requirements for an EPS licence under the Conservation (Natural Habitats &c.) Regulations 1994 as amended in Scotland from SNH will be considered. Including the need for bespoke mitigation to be included into the SPP.
- It is recommended that as well as pre-construction surveys, all scrub and dense vegetation clearance is undertaken with caution and searched prior to heavy machinery entering each new area. If otter resting places are identified, then works should cease and Environmental Clerk of Works (ECoW) contacted for further advice.
- In the unlikely event that a previously undiscovered otter resting place is identified during the works, work will stop within 30m of the feature. Appropriate mitigation measures will be identified through consultation with SNH, and appropriately qualified experts, as necessary. Works will not recommence in the affected area until suitable mitigation and licencing is in place.
- Works within watercourses and associated culverts shall be undertaken following best practice techniques as discussed in Chapter 14: Water Environment, Soils and Coastal Processes and in line with SEPA guidance in line with The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended), with duration and extent of disturbance minimised and habitat reinstatement undertaken at the earliest opportunity.
- Artificial lighting within the site should only be used where required to light works sites and for safety reasons and should be directional towards the required works area.
- Any pipes or other such materials shall be stored upright, or have covers fitted to the ends, or be appropriately fenced off to prevent entrapment or occupation. Temporary ramps will be utilised within excavations to allow mammals to escape by themselves, should they fall in. Alternatively, excavations should be appropriately fenced off.

Bats

- Should pre-construction surveys identify use of the habitat by bats, the potential for disturbance, subsequent further survey work and/or the requirements for an EPS licence under the Conservation (Natural Habitats &c.) Regulations 1994 as amended in Scotland from SNH will be considered. As part of this process a bespoke mitigation strategy will be developed and incorporated into the SPP.
- Artificial lighting within the site should only be used where required to light works sites and for safety reasons and should be directional towards the required works area.

Birds

- During the breeding bird season (March – September), ongoing check for nests will be required, acknowledging that some species may nest within the construction site boundary, even once the soil is stripped.
- Suitable bird deterrents can be installed to minimise the risk of birds breeding in the area. Bird netting over trees will not be used to avoid potential risk of injury.
- On entering a new area of the site, a breeding bird survey will be required prior to mobilisation if between March and September.

- If nests are identified appropriate exclusion zones will be installed to minimise disturbance until the chicks have fledged.
- In the event that a previously undiscovered nest is identified during works, works will be stopped within an appropriate buffer, and the Contractor and Client will be informed. Appropriate mitigation measures will be identified specific to the species by the ECoW. Works will not recommence in the affected area until suitable mitigation is in place.
- Any pipes or other such materials shall be stored upright, or have covers fitted to the ends, or be appropriately fenced off to prevent entrapment or occupation.

Reptiles

- Should pre-construction surveys identify reptiles, the potential for harm, subsequent further survey work and/or the requirements for appropriate mitigation will be identified.
- If reptiles or hibernacula is identified, watching briefs during soil stripping/vegetation clearance should be carried out and reptiles translocated to suitable receptor sites where required.

10.7 Residual Effects

The construction phase of the proposed development resulted in significant effects on otter and birds.

Impacts on otter included disturbance of protected species and accidental physical damage. Through the implementation of appropriate mitigation measures including carrying out pre-construction surveys, preventing entrapment and following pollution prevention guidance, the impact magnitude on otter decreased from **low** to **negligible** giving rise to a **minor: non-significant** effect.

Similarly, impacts on birds included disturbance and accidental physical damage. Mitigation measures implemented for birds include undertaking breeding bird surveys, installing appropriate buffer zones to prevent disturbance to nests if required and measures to prevent entrapment. The impact magnitude on birds decreased from **low** to **negligible** giving rise to a **minor: non-significant** effect.

10.8 Cumulative Effects

As detailed in Chapter 3: Methodology, no cumulative effects were identified associated with terrestrial ecology.

10.9 Summary

The key habitats and species within the respective survey area were identified during the completion of baseline surveys: Desktop study, UAV mapping and Phase 1 mapping. From the baselines surveys and assessment carried out, significant effects on ecological receptors were identified. Several best practice measures have been identified along with a number of species-specific mitigation measures in order to reduce ecological effects as far as possible resulting in no significant effects from the construction and operational phases of the development. Table 10.9.1 provides a summary of the potential impacts, their levels of significance before and after mitigation, along with a summary of mitigation.

Table 10.9.1: Summary of Potential Ecological Effects

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Construction							
Wet Dwarf Shrub Heath	Permanent Habitat Loss	Regional	Low	Minor: Non-significant	Mitigation incorporated into design to minimise habitat area removed.	Low	Minor: Non-significant
Dry Dwarf Shrub Heath		Regional	Low	Minor: Non-significant	Mitigation incorporated into design to minimise habitat area removed.	Low	Minor: Non-significant
Flush and Springs		National	Low	Minor: Non-significant	Mitigation incorporated into design to minimise habitat area removed.	Low	Minor: Non-significant
Coast		Moderate local	Low	Minor: Non-significant	Rock armour revetments installed, replacing habitat for use by otters.	Low	Minor: Non-significant
Woodland		Low local	Low	Minor: Non-significant	Replacement tree planting.	Low	Minor: Non-significant
Unimproved Acid Grassland		Moderate local	Low	Minor: Non-significant	Mitigation incorporated into design to minimise habitat area removed.	Low	Minor: Non-significant
Marshy Grassland		Low local	Low	Minor: Non-significant	Mitigation incorporated into design to minimise habitat area removed.	Low	Minor: Non-significant
Wet Dwarf Shrub Heath	Habitat Disturbance	Regional	Low	Minor: Non-significant	Turves used to seal exposed peat practical.	Low	Minor: Non-significant
Dry Dwarf Shrub Heath		Regional	Low	Minor: Non-significant	Turves used to seal exposed peat practical.	Low	Minor: Non-significant
Blanket Bog		Regional	Negligible	Negligible: Non-significant	Turves used to seal exposed peat where practical.	Negligible	Negligible: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Flush and Springs		National	Low	Minor: Non-significant	Mitigation incorporated into design to retain water within remaining habitat.	Low	Minor: Non-significant
Running Water		High local	Low	Minor: Non-significant	Follow SEPA guidance in line with The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)	Low	Minor: Non-significant
Peat Receptor Sites		Low local	Low beneficial	Negligible: Non-significant	Peat Management Plan to be agreed and implemented. Existing vegetation should be removed in turves prior to peat being transported. Turves should be used to reinstate the area.	Low beneficial	Beneficial Negligible: Non-significant
Surrounding Flora	Pollution	Regional – Low local	Low	Minor: Non-significant	Pollution prevention measures, and a pollution response plan as detailed in Chapter 14: Water Environment, Soils and Coastal Processes.	Low	Minor: Non-significant
Ground Water		National	Low	Minor: Non-significant	Pollution prevention measures, and a pollution response plan as detailed in Chapter 14: Water Environment, Soils and Coastal Processes.	Low	Minor: Non-significant
Running Water		High local	Low	Minor: Non-significant	Pollution prevention measures, and a pollution response plan as detailed in Chapter 14: Water Environment, Soils and Coastal Processes.	Low	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Surrounding Flora	Non-native Invasive Species	National – Low local	Low	Minor: Non-significant	Pre-construction surveys. Exclusion zones around rhododendron. Removal of rhododendron if required, following appropriate methodology. Ensuring all equipment is clean on arrival to site.	Low	Minor: Non-significant
Otter	Disturbance of Protected Species	International	Low	Moderate: Significant	Pre-construction surveys. EPS licence sought if required. Development of Species Protection plan (SPP). Minimise area and duration of disturbance. Artificial lighting within the site should only be used where required to light works sites and for safety reasons and should be directional towards the required works area.	Negligible	Minor: Non-significant
Bats		National	Low	Minor: Non-significant	Pre-construction surveys. EPS licence sought if required. Development of Species Protection plans (SPP). Minimise area and duration of disturbance. Artificial lighting within the site should only be used where required to light works sites and for safety	Low	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
					reasons and should be directional towards the required works area.		
Amphibians and Reptiles		High Local	Low	Minor: Non-significant	Pre-construction surveys. Development of Species Protection plans (SPP). Seasonal considerations when timing works where practical. Translocation of reptiles to suitable receptor site if required. Minimise area and duration of disturbance. Watching briefs.	Low	Minor: Non-significant
Birds		International – Low local	Low	Moderate: Significant	Pre-construction surveys. Ongoing watching brief during breeding bird season. Development of Species Protection plans (SPP). Seasonal considerations when timing works where practical. Exclusion zones around any nests found. Minimise area and duration of disturbance. Artificial lighting within the site should only be used where required to light works sites and for safety reasons and should be directional towards the required works area.	Negligible	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Otter	Accidental Physical Damage	International	Low	Moderate: Significant	Measures to prevent entrapment. Pollution prevention as identified in Chapter 14: Water Environment, Soils and Coastal Processes.	Negligible	Minor: Non-significant
Bats		National	Low	Minor: Non-significant	Artificial lighting within the site should only be used where required to light works sites and for safety reasons and should be directional towards the required works area.	Low	Minor: Non-significant
Amphibians and Reptiles		High Local	Low	Minor: Non-significant	Seasonal considerations when timing works where practical. Avoidance of hibernacula outwith active season where practicable. Watching briefs.	Low	Minor: Non-significant
Birds		International – Low local	Low	Moderate: Significant	Pre-construction survey. Ongoing surveys during breeding bird season. Seasonal considerations when timing works where practical. Exclusion zones around nests. Watching briefs.	Negligible	Minor: Non-significant
Otter	Habitat Fragmentation and Barrier Effects	International	Negligible	Minor: Non-significant	Pre-construction surveys Consideration for EPS licence. Development of Species Protection plans (SPP). Minimise area and duration of disturbance. Artificial lighting within the site should only be used where required	Negligible	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
					to light works sites and for safety reasons and should be directional towards the required works area.		
Amphibians and Reptiles		High Local	Negligible	Negligible: Non-significant	Translocation of reptiles to suitable receptor site if required.	Negligible	Negligible: Non-significant
Operations							
Otter	Disturbance	International	Negligible	Minor: Non-significant		Low	Negligible: Non-significant
All Protected Species	Accidental Physical Damage	International to Low Local	Negligible	Minor: Non-significant		Low	Negligible: Non-significant
Otter	Habitat Fragmentation and Barrier Effects	International	Negligible	Minor: Non-significant		Low	Negligible: Non-significant
Amphibians and Reptiles		High Local	Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant
High GWDTE	Habitat loss	National	Negligible	Negligible: Non-significant	Installation of impermeable membrane to protect remaining habitat and encourage formation of new habitat.	Negligible	Negligible: Non-significant
Moderate GWDTE	Habitat disturbance	Regional	Negligible	Negligible: Non-significant	Installation of SuDS.	Negligible	Negligible: Non-significant

Key

Significant Effect
Non-Significant

10.10 References

CIEEM, 2016. Guidelines for ecological impact assessment in the UK and Ireland: terrestrial, freshwater and coastal. In (2nd ed.). Chartered Institute of Ecology and Environmental Management.

EnviroCentre, 2018. Stornoway Deep Water Port. Volume 1: Environmental Impact Assessment Report.

EnviroCentre, 2018. Stornoway Deep Water Port. Volume 3: Technical Appendices.

European Commission. (2000). Directive 2000/60/EC European Water Framework Directive In.

Forestry Research. (2020). Rhododendron Control. Retrieved from https://www.forestresearch.gov.uk/research/management-of-upland-native-woodlands/rhododendron-control/

Lews Castle, 2020. Castle Grounds https://www.lews-castle.co.uk/?page_id=150

National Trust for Scotland. (2019). Getting Rid of Rhodies. Retrieved from https://www.nts.org.uk/stories/getting-rid-of-rhodies

Scottish Forestry. (2006). *Managing and Controlling Invasive Rhododendron*. Retrieved from https://forestry.gov.scot/publications/93-managing-and-controlling-invasive-rhododendron

Scottish Government. (2008). *PAN 60: Planning for Natural Heritage*. Retrieved from http://www.gov.scot/Publications/2000/08/pan60-root/pan60.

Scottish Government. (2013). Scottish Biodiversity List.

Scottish Parliament. (2003). Water Environment and Water Services (Scotland) Act 2003.

The Conservation Volunteers. (2020). Blanket Bog.

10.11 Glossary

Acronym	Definition
AWI	Ancient Woodland Inventory
CAA	Civil Aviation Authority
CEMD	Construction Environmental Management Document
CEMP	Construction Environmental Management Plan
DWP	Deep Water Port
ECoW	Environmental Clerk of Works
EcIA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPS	European Protected Species
IEEM	Institute of Ecology and Environmental Management
JNCC	Joint Nature Conservation Committee
km	kilometres
LDP	Local Development Plan
m^2	metres squared
NBN	National Biodiversity Network
PPIP	Planning Permission in Principle
PMP	Peat Management Plan
SAC	Special Areas of Conservation
SEPA	Scottish Environment Protection Agency
SNH	Scottish Natural Heritage
SNIFFER	Scotland and Northern Ireland Forum for Environmental Research
SPA	Special Protection Areas
SSSI	Sites of Special Scientific Interest
SuDS	Sustainable Drainage System
UAV	Unmanned Aerial Vehicle
UK BAP	United Kingdom Biodiversity Action Plan
WCA	Wildlife and Countryside Act
WEWS	Water Environment and Water Services
WFD	Water Framework Directive
WIDSFB	Western Isles District Salmon Fisheries Board

Chapter 11: Underwater Noise

STORNOWAY PORT AUTHORITY

Contents

11 Underwater Noise

11.1 Introduction

During the construction of the Stornoway Deep Water Port (DWP), piling, dredging, and vessel movements have the potential to result in elevated levels of underwater noise. Noise has the potential to disturb and possibly injure marine mammals and fish, which can result in negative individual and population level effects (further details are in Chapters 7 and 8 respectively).

In order to inform the potential effects arising from underwater noise in the original EIAR (Envirocentre, 2018), EnviroCentre commissioned Irwin Carr Ltd. to undertake underwater noise modelling (provided as Appendix K.1 in Volume 3 of this EIAR). The noise generating activities associated with the revised development are similar to those originally planned. This chapter compares the current design to that previously modelled by Irwin Carr to identify how the modelling can be interpreted for use in Chapter 7: Marine Mammals, Chapter 8: Fish and Chapter 10: Terrestrial Ecology to determine the impacts on specific ecological receptors.

11.2 Source of Information

11.2.1 Planning and Legislative Framework

The Scottish Government has released general policies as part of the Scotland's National Marine Plan in favour of sustainable development and use of the marine environment which include:

- ***GEN 13 Noise:*** *Development and use of the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects* (Scottish Government, 2015b).

The Scottish government has released a series of good environmental status descriptors within Scotland's National Marine Plan. These include:

- ***GES 11:*** *Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment (Scottish Government, 2015a)*.

11.2.2 Relevant Guidance

There are no internationally agreed standards with regard to the assessment of underwater noise and it is current practice to undertake assessments based on criteria provided in the scientific literature or guidance published by regulatory authorities. For this assessment, the criteria are based on:

- National Oceanic and Atmospheric Administration (NOAA). *Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts (NOAA, 2016).*
- Popper *et al. Sound Exposure Guidelines for Fishes and Sea Turtles (Popper et al., 2014).*

11.3 Assessment Methodology

11.3.1 Baseline Data Collection

No baseline data has been collected in the course of this assessment and no published data is available for the existing underwater noise levels within the Stornoway Deep Water Port (DWP) construction area. It is recognised that vessels including ferries pass to the north of the development daily. There are existing quays in Glumaig Harbour for the Arnish facility and Mowi. The Mowi quay is utilised six days per week, by the vessel servicing the fish farms. Underwater noise associated with vessel movements will make up part of the existing baseline levels.

11.3.2 Impact Assessment Methodology

11.3.2.1 The Irwin Carr Model

Irwin Carr identified the likely source noise levels and frequency associated with the construction techniques originally proposed. They then utilised a model to understand how the noise would dissipate away from the noise source. Noise is absorbed and reflected differently by different substrates, be that air, water or varying seabed types. The modelling utilised the dBSea software package, which considers both the bathymetry (water depths) and local sediment types.

Different species of marine mammal and types of fish have different hearing frequency ranges hence, Irwin Carr took this into account by modelling the different frequency bands for each noise source so they could be considered for the applicable species.

As discussed in more detail in Chapter 7: Marine Mammals and Chapter 8: Fish, noise effects include:

- Disturbance which causes a species to act differently from normal but does not cause any direct physical harm.
- Temporary Threshold Shift (TTS) – where hearing is temporarily affected but will recover once the animal is no longer exposed to the sound.
- Permanent Threshold Shift (PTS) – where hearing is permanently damaged.

The noise levels which cause these effects, vary depending on the type of noise (impulse or continuous). The modelling identified the area in which noise levels caused by a particular activity, could breach the TTS or PTS threshold levels for the various species. The most appropriate noise threshold associated with the source noise type being considered were utilised.

Irwin Carr considered potential cumulative effects associated with the construction works at the Newton Marina. It is now known that these activities will not overlap and as such the cumulative construction effects do not need to be considered further.

Full details of the Irwin Carr modelling techniques are provided in Sections 1 and 2 of Appendix K.1. In addition, it introduces underwater noise, relevant terminology and criteria for underwater noise assessment on mammals and fish, as such this detail will not be repeated in this Chapter.

11.3.2.2 Underwater Noise Sources

The sources of underwater noise, considered within the Irwin Carr modelling, are similar to those currently proposed. Hence a comparison of the sources of underwater noise expected from the revised DWP proposals with those originally modelled has been completed (Section 11.4.1).

11.3.2.3 Underwater Noise Levels

The Irwin Carr noise model outputs are considered in terms of the revised underwater noise sources to provide an understanding of the likely underwater noise effects of the revised works.

The outcomes of this Chapter have informed the impacts assessments for Marine Mammals (Chapter 7), Fish (Chapter 8) and Otters included in Chapter 10.

11.3.3 Identification and Assessment of Mitigation

This Chapter only identifies the impact ranges for sensitive receptors, resulting from the construction of the Stornoway DWP. No consideration is made to the significance of these impacts with regard to marine mammals or fish at an individual or population level. The ecological assessments are conducted in Chapter 7: Marine Mammals, Chapter 8: Fish and Chapter 10: Terrestrial Ecology. Where necessary, appropriate mitigation measures are identified in the topic specific chapters. As such, no mitigation will be presented in this chapter.

11.3.4 Assessment of Residual Effects

Since no mitigation is proposed in this Chapter, the residual effects cannot be considered.

11.4 Noise Impact Assessment

11.4.1 Underwater Noise Sources

The noise modelling included in Appendix K.1, considered the three most significant sources of noise:

1. Dredging,
2. Drilling, and
3. Pile Driving.

These techniques are still applicable to the revised development; hence each has been considered in further detail to identify any changes from the initial presumptions.

11.4.1.1 Dredging

The dredging techniques of backhoe and cutter suction could still be employed during the project. As discussed in Section 2.1.3 of Appendix K.1, cutter suction is the noisier of the two techniques therefore it is appropriate to consider this as the worst-case scenario. Broadband source noise levels for the cutter suction dredger were identified to be in the region of 175dB$_{RMS}$ re 1µPa. The original intent was to dredge to -9.5m Chart Datum (CD) with a slightly deeper dredge of -10.5m CD at the berth. The intent now is to provide access to large vessels by dredging to -10m CD, the dredge area has slightly increased such that it joins into the naturally occurring -10m CD water depths in the area, as shown in Drawing SDWP-WS2139-XX-00-DC-C-9021.

11.4.1.2 Drilling

Odex piling, is a pneumatic impact drilling method suitable for softer sediments as it allows for simultaneous lining and drilling. The technique would be applied in a similar way in the re-designed development, hence the source noise levels associated with drilling will be equivalent to those assumed in Section 2.1.2 of Appendix K.1.

It was conservatively assumed in the Irwin Carr modelling that drilling would be required for all king piles associated with the original 546m of combination pile walls. The modelling was completed prior to ground investigations being completed. The ground investigations have provided an understanding of the seabed, and hence it is now known that Odex Piling will not be required for the majority of piles. It may be required for the king piles in the 140m long combination wall for the freight ferry berth, where there are softer sediments. Hence the amount of Odex Piling required has reduced to at most a quarter of that previously assumed.

As shown in Drawing SDWP-WS2139-XX-00-DC-C-9022, the freight ferry berth runs in an east/west direction to the north of the land reclaimed/levelled area, this is to the west of the end of the original finger pier location.

11.4.1.3 Pile Driving

Piles will be vibrated in as far as possible prior to being impact piled. Impact piling is likely to be the nosiest underwater activity undertaken during the construction works. Underwater noise levels generated by piling increase with pile diameter. This is due to large diameter piles having larger surface areas in contact with its surrounding, to transfer the energy of the strike hammer into the water column and seabed in the form of noise. The king pile diameter utilised by Irwin Carr in the modelling was 220cm. The previous design included 546m of combination pile walls.

The proposals now are to utilise steel tube123cm diameter king piles at 3 metre intervals in the combination wall for the main berth (192m long) and the freight ferry berth (140m long), 80cm diameter steel tube piles in the linkspan dolphins and finger pier construction (114m long) and 30cm diameter steel tube piles at close centres in the Heavy Load Area. The layout of the re-designed proposals in comparison those in the original design are shown in Drawing SDWP-WS2139-XX-00-DC-C-9032.

As detailed in Table 4 of Appendix K.1, the 220cm piles were predicted to have a single strike dBzero to peak(dB_{z-p}) level of 231.6 dB re 1 µPa ±1.38dB. Utilising Figure 4 of Appendix K.1, the dB zero-peak associated with the new pile sizes have been estimated in Table 11.4.1.

Table 11.4.1: Impact Piling Source Levels by Pile Diameter

Pile Type	Pile Diameter (cm)	Single Strike dB_{z-p} re 1 µPa	Difference from levels modelled (dB)
Original Design King Piles (546m)	220	231.6	0
Main Berth Combi-Wall and Freight Ferry Berth King Piles (332m)	123	227.5	-4.6
Finger Pier Piles (114m)	80	225.0	-6.6
Heavy Load Area Piles	30	218.0	-13.6

A similar difference on the single strike dB_{SEL} and the vibration pile noise levels are presumed, and hence impact and vibratory piling source levels are derived in Table 11.4.2 for Table 4 in Appendix K.1.

Table 11.4.2: Derived Pile Source Levels for Various diameters

Pile Diameter (cm)	Impact Piling		Vibratory Piling	
	Single Strike dB_{z-p}	Single Stirke dB_{SEL}	dB_{z-p} re 1 µPa	dB_{RMS}
220	231.6	203.2	217.7	204.8
123	227.5	225.6	213.1	200.2
80	225.0	196.6	211.1	198.2
30	218.0	189.6	204.1	191.2

11.4.2 Underwater Noise Levels

11.4.2.1 Dredging

As discussed in 11.4.1.1 the dredge techniques likely to be employed have not changed, hence a direct comparison with the Irwin Carr model can be made as the noise source is the same as previously considered. The increase in dredge depth of 0.5m, from that originally modelled will give rise to a slight decrease in the rate of noise dissipation due to the deeper water column, but only for the latter parts of the dredge. The dredge area is 16% larger so raised noise levels due to dredging will occur over a larger area (Drawing SDWP-WS2139-XX-00-DC-C-9021), although they will still radiate out from the dredge vessel. In addition, the dredge may take longer than previously predicted, due to the increased volume of material to be removed, hence the raised noise levels associated with dredging may have a longer duration.

In theory the noise levels will dissipate slightly less as the water depth increases with dredging, giving rise to higher noise levels at given distances from the works, hence increasing the area in which marine mammals would be subject to TTS. However, the depth change from -9.5m to -10m CD is unlikely to make a significant difference. The noise model showed that noise levels higher than the TTS for Low Frequency (LF) cetaceans such as minke whales was limited to an area within 200m of the dredge vessel, and within 100m for other species. Hence even a 5% increase in these distances would not make a noticeable difference to the actual impacts on marine mammals.

The model outputs provided in Section 3.2.2 of Appendix K.1 can be utilised for the assessments of impacts on marine mammals and fish (see Chapters 7 and 8). In considering Figure 17 of Appendix K.1 the Newton Marina noise sources should be ignored, and it should be recognised that the TTS area shown for LF hearing receptors, would be increased slightly to the north and east to a distance of approximately 200m from the edge of the revised dredge area (Drawing SDWP-WS2139-XX-00-DC-C-9022).

11.4.2.2 Drilling

As discussed in Section 11.4.1.2 the source noise levels associated with Odex Piling have not changed however the amount of drilling has reduced to less than 25% of that previously proposed. Section 3.2.1.1 of Appendix K.1 shows that there is a potential for PTS for High Frequency (HF) noise receptors e.g. harbour porpoises if they stay within 200m of the works

for long durations. Both HF and LF TTS zones extend beyond 500m of the works however this is based on them staying in the area for 24 hours, which is highly unlikely.

The areas of PTS and TTS denoted on Figure 9 of Appendix K.1, are larger than those now expected as the Odex piling will be limited to the freight ferry berth. It is expected that the actual PTS and TTS impact areas will be concentrated to the north of the development, with lower impacts out to the east and south than those shown in Figure 9.

11.4.2.3 Pile Driving

As discussed in Section 11.4.1.3 the design has reduced the size of piles utilised in the design, such that source noise levels could be between 4.1dB and 6.6dB lower than those previous modelled for the main berth. The piles utilised for the heavy load area could give rise to noise levels 13.6dB lower than that modelled.

As shown in Drawing SDWP-WS2139-XX-00-DC-C-9032 the re-designed main berth is orientated north-north-west/south-south-east as opposed to north/south of the original development. The northern end of the main berth is close to the northern end of the original finger pier and in fact the berth lines of the original and revised berths cross just before the end of the combination wall at the end of the revised main berth. The freight ferry berth is orientated east/west to the west of the northern end of the original finger pier. The finger pier is now at the south of the main berth and has changed from a combination wall format to a suspended deck requiring smaller piles (80cm diameter).

When considering the noise modelling outputs in Figures 10 to 16 of Appendix K.1, it should be recognised that they are based on the source noises from the original berth design. The orientation of the noise sources will change slightly with the main berth orientation, and they will not be located as far south as shown in the model, due to the main berth being shorter (Drawing SDWP-WS2139-XX-00-DC-C-9032). It is predicted that noise levels to the south into Glumaig Harbour and potentially east outward into the deeper water may be slightly reduced due to the redesign of the main berth. There will be noise sources to the west of the north end of the finger pier shown in the Appendix's figures associated with the freight ferry berth. These may increase the noise levels to the north and west of the development. Fortunately, this is away from the sea and hence an area of lower habitat value for many of the species likely to be affected by underwater noise.

As the worst-case scenario with regard to pile noise source is the 123cm diameter king piles these will be the focus of the model comparisons.

123cm diameter piles have source piling levels of 4.1db less than 220cm diameter piles for impact piling. As discussed in Section 3.2.1.2 of Appendix K.1, a reduction in noise by 3dB reduced the impact range by up to 50%. As the likely noise reduction is more than 3dB it can be safely assumed that the impact ranges modelled in Appendix K.1 will be halved.

Considering a single strike of a 123cm diameter pile, risk zones for PTS and TTS taking into account Figure 10 of Appendix K.1 are described in Table 11.4.3.

Table 11.4.3: Impact Piling Single Strike 123m Pile Considerations

NOAA Hearing Group	Species Examples	PTS	TTS
Phocidae, underwater (PW)	Harbour and Grey Seal	No Risk	Close to source only.
Otariidae, underwater (OW)	Eurasian Otter	No Risk	No Risk
Low Frequency (LF)	Minke Whale, Humpback Whale	Close to source only.	Within 500m of source.
Middle Frequency (MF)	Common, Risso's and Bottlenose Dolphin, Killer Whale	No Risk	Close to source only.
High frequency (HF)	Harbour Porpoise	Within 500m of source.	Potentially beyond 500m from source.
Demersal Fish, swim bladder assisted hearing (D+)	Cod, Haddock	No Risk	No Risk
Demersal Fish, no swim bladder assisted hearing (D-)	Plaice, Sole	No Risk	No Risk
Pelagic Fish, swim bladder assisted hearing (P+)	Herring, Spratt	No Risk	No Risk
Pelagic Fish, no swim bladder assisted hearing (P-)	Salmon, Shark	No Risk	No Risk

As previously assumed and in line with the Joint Nature Conservation Council guidance for piling (Joint Nature Conservation Committee, 2010), it is assumed that a marine mammal observer (MMO) will ensure that an area of 500m from the noise source is clear of marine mammals, prior to works commencing (see Chapter 7 for more details). As such only HF hearing group receptors could be subject to TTS noise levels associated with a single full power strike.

The cumulative effects of multiple strikes as will be required for construction works, are considered in Figures 11-15 of Appendix K.1. Figure 15 considers 1000 impact strikes, as the worst case and hence that shall be considered here. It should be noted that the risk zones presented assume that the receptors do not move away from the noise source for the duration of the multiple strikes. This approach may seem pessimistic and unrealistic, but the output gives an understanding of the distance that each hearing group would need to swim to exit the risk zone. For example, if a dolphin was 500m from source, but the TTS risk zone was calculated as being 2km from source, then the dolphin would need to swim 1.5km to avoid experiencing TTS, prior to the strikes being completed. Similar to Table 11.4.3, Table 11.4.4 considered the risk zones for 1000 strikes based on the lower noise source and Figure 15 of Appendix K.1.

Table 11.4.4: Impact Piling 1000 Strike 123m Pile Considerations

NOAA Hearing Group	Species Examples	PTS	TTS
PW	Harbour and Grey Seal	Beyond 500m, potentially up to 1km.	The majority of the harbour area.
OW	Eurasian Otter	Within 200m of source.	Beyond 500m, potentially up to 1km.
LF	Minke Whale, Humpback Whale	Beyond 500m, potentially up to 1.5km.	The majority of the harbour area.
MF	Common, Risso's and Bottlenose Dolphin, Killer Whale	Within 500m of source.	Potentially up to 1.5km from source.
HF	Harbour Porpoise	Potentially the majority of the harbour area.	The majority of the harbour area and further in the southeast direction.
D+	Cod, Haddock	No Risk.	With 600m of source.
D-	Plaice, Sole	No Risk.	Within 200m of source.
P+	Herring, Spratt	No Risk	Beyond 500m, potentially up to 1.5km.
P-	Salmon, Shark	No Risk	Within 150m of source

The PTS Risk Zone for 1000 strikes for the HF group is likely to still include the majority of the harbour area for a 123cm pile. Hence the assessment completed in Table 6 of Appendix K.1 is applicable. It demonstrates that even with an MMO protocol 500m exclusion zone, a 30-minute ramp up time for a soft start is required to allow harbour porpoise to leave the PTS area prior to full power impact piling commencing.

The 30cm diameter piles give rise to noise levels at least four times lower than that modelled, hence the PTS Risk Zone for 1000 strikes for all groups including HF will be greatly reduced to less than 500m. Hence although the MMO 500m exclusion protocol needs to be applied, there is no need to implement a soft start-up process to allow receptors to leave the wider area.

11.5 Summary

The redesign of the DWP will have the following effects on underwater noise levels from those modelled in Appendix K.1:

- Dredging:
  - Minimal increase in duration of the dredge;
  - A slightly larger area affected; and
  - No significant change to noise levels arising.
- Drilling:
  - Noise source levels have not changed;
  - The amount of Odex Piling required will be less than 25% of that previously expected; and
  - The location of the noise is slightly different as such the dissipation of the associated noise will be more to the northwest than previously identified.
- Piling
  - Piling noise levels will be reduced, due to a reduction in pile sizes;
  - The number of piles required are less due to shorter total berth lengths, hence the timescales of the impacts have also been reduced;
  - The PTS and TTS risk zones have reduced for all species;
  - The PTS and TTS risk zones may be less to the south and east due to the shorter berth length and smaller piles being used at the south end of the berth;
  - The PTS and TTS risk zones may be greater to the north and west during the freight ferry berth construction;
  - An MMO protocol including a 500m exclusion zones is still required;
  - A 30-minute soft start-up for 123cm and 80cm diameter king piles is required to protect HF hearing receptor groups; and
  - A soft start-up is not required for the piling of the heavy load area 30cm diameter piles.

11.6 References

Envirocentre. (2018). Stornoway Deep Water Port: Environmental Impact Assessment.

NOAA. (2016). *Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts*. Retrieved from

Popper, A., Hawkins, A., Richard, R., Fay, A., Bratol, S., Carlson, T., . . . Tavolga, W. (2014). Sound exposure guidelines for fishes and sea turtles. *Springer Briefs in Oceanography*.

Scottish Government. (2015a). *Scotland's National Marine Plan: A Single Framework for Managing our Seas*. Retrieved from https://www.nls.uk/scotgov/2015/9781785442148.pdf.

Scottish Government. (2015b). *Scotland's National Marine Plan: General Policies*. Retrieved from http://www.gov.scot/Publications/2015/03/6517/5.

11.7 Glossary

Acronym	Definition
CD	Chart Datum
D+	Demersal Fish, swim bladder assisted hearing
D-	Demersal Fish, no swim bladder assisted hearing
dB	Decibels
dB_{RMS}	Decibel root mean square
dB_{SEL}	Decibel Sound Exposure Level
dB_{z-p}	dBzero to peak
DWP	Deep Water Port
EIAR	Environmental Impact Assessment Report
GEN	General
GES	Good Environmental Status
HF	High frequency
km	kilometres
LF	Low Frequency
m	metres
MF	Middle Frequency
MMO	Marine Mammal Observers
NOAA	National Oceanic and Atmospheric Administration
OW	Otariidae, underwater
P+	Pelagic Fish, swim bladder assisted hearing
P-	Pelagic Fish, no swim bladder assisted hearing
PTS	Permanent Threshold Shift
PW	Phocidae, underwater
re 1µPa	Referenced to 1 micro pascal
TTS	Temporary Threshold Shift

Chapter 12: In-Air Noise

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Contents

12 In-Air Noise

12.1 Introduction

Environmental, or community noise, is a broad term that encompasses noise emitted from many sources, including road, rail & air traffic, industry, construction, public work and neighbourhood noise. All of these sources potentially contribute adversely to the overall noise environment. It is therefore reasonable to expect communities to be sensitive to any change in their acoustic environment as a result of a proposed development.

This chapter considers the likely significant noise effects associated with the proposed construction of the Stornoway Deep Water Port (DWP). Specifically, the chapter considers the construction activities that are likely to occur within the DWP as well as any changes in noise levels to sensitive receptors that may arise due to operations including increased road traffic.

This chapter considers in-air noise effects only. Marine noise effects are dealt with in Chapter 11: Underwater Noise. The Chapter does not consider decommissioning noise effects, as no decommissioning is anticipated.

In order to inform the potential effects arising from in-air noise in the original Environmental Impact Assessment Report (EIAR) (EnviroCentre, 2018), EnviroCentre completed a Noise Assessment report (NAR) (provided as Appendix L.1 in Volume 3 of this EIAR). The noise generating activities associated with the revised development are similar to those originally planned. This chapter compares the current design to that previously considered in the NAR, to ensure that the construction and operational noise levels are acceptable, and to identify appropriate mitigation where required.

12.2 Regulations and Guidance

Section 2.1 of the NAR (Appendix L.1) details the Noise Guidance utilised in the assessment. The Outer Hebrides Local Development Plan, BS5228-1:2009+A1:2014; Code of Practice for Noise and Vibration Control and Construction and Open Sites (this will be referred to as BS5224) (British Standards Institute, 2014b), Planning Advice Note (PAN) 1/2011 'Planning and Noise (Scottish Government, 2011a) and the association of Technical Advice Note (TAN) 'Assessment of Noise' (Scottish Government, 2011b) have not been updated since the assessment was completed.

BS4142:2014 'Methods of rating and assessing industrial and commercial sound' (British Standards Institute, 2014a) was amended in June 2019 and is now BS 4142:2014+A1:2019 (British Standards Institute, 2019), the amendments were to improve clarity and consistency. The underpinning fundamentals have not been changed by the amendments made and hence it doesn't change the conclusions of the NAR.

12.3 Assessment Methodology

12.3.1 Study Area

Noise Sensitive Receptors (NSRs) are properties, people or fauna which are sensitive to noise and, therefore, may require protection from nearby noise sources. The Study Area for the noise assessment has been defined through the identification of the closest NSRs to the development. Specifically, the study area has been defined on the assumption that if noise levels are within acceptable levels at the closest receptors then it is reasonable to assume, they will also be acceptable at more distant locations.

Section 4 of the NAR (Appendix L.1) identified the closest NSR's to the development for consideration within the noise impact assessment as being those detailed in Table 12.3.1 below and in Drawing 670525-028 of the NAR, they were chosen as being representative of those most exposed to noise from construction and operational industrial activities.

Table 12.3.1: NSR Locations: Construction and Industrial Noise

NSR ID	NSR Descriptor	Grid Reference
NSR01	South Beach	NB42170 32730
NSR02	Newton Street	NB42638 32548
NSR03	Newton Street	NB42805 32437
NSR04	Newton Street	NB42948 32393
NSR05	Seaview Terrace	NB43096 32312
NSR06	Builnacraig Street	NB43275 32138

Taking account of the baseline noise measurements, the NSR's 01 to 05 have been classified as Category B receptors for construction noise in line with BS5228, and NSR06 as a Category A receptor due to the lower existing noise levels measured in this location.

In addition, Section 4 of NAR identified six Traffic NSR (TNSR) that would be most exposed to any increases in noise associated with increases in road traffic generated during the operational phase of the DWP. These are provided in Table 12.3.2 below and in Drawing 670525-034 of the NAR

Table 12.3.2: TNSR Locations: Operational Road Traffic Noise

TNSR ID	NSR Descriptor	Grid Reference
TNSR01	House by Macaulay Farm	NB40148 32192
TNSR02	House at Marybank	NB40144 32604
TNSR03	Perceval Road South; West of A857	NB42455 33965
TNSR04	A857/Macaulay Road; North of Perceval Road South	NB42512 34095
TNSR05	Perceval Road South; East of A857	NB42616 33970
TNSR06	A857/Macaulay Road; South of Perceval Road South	NB42519 33935

The construction and industrial NSR's detailed in Table 12.3.1 are still relevant to the revised layout of the DWP as they are closest residential properties in the town of Stornoway, they are across the water from the development hence, there is limited screening between them and the development site. As shown in Drawing SDWP-WS2139-XX-00-DR-C-9032, some components of the DWP are closer to receptors than, they were in the original Phase 1 design.

However, as shown in Drawing 1980-2003, the original Phase 4 and the end of the original finger pier were as close to receptors as the revised design components.

As discussed in Chapter 15: Traffic and Transport the assumptions made with regard to traffic movements associated with the operational phase in 2018 are still appropriate, the TNSR's identified in Table 12.3.2 are therefore still appropriate.

12.3.2 Baseline Data Collection

Baseline data was collected to inform the NAR (Appendix L.1) at three locations as shown in Drawing 670525-027 of the NAR. Since then works have been completed on the development of Newton Marina, however it is not yet fully operational, as such no significant changes in baseline from 2018 are expected. Hence no new measurements have been carried out. It is also noted that measurements taken in 2020, are unlikely to be representative of the background noise levels experienced in previous or future years. This is due to a reduction in traffic and vessel movements, and potentially industrial noise sources associated with the COVID-19 restrictions on movement and certain activities. The 2018 baseline noise measurements detailed in Section 3 of the NAR are therefore deemed appropriate for use in this instance.

12.3.3 Impact Assessment Methodology

12.3.3.1 Noise Assessment Criteria

The noise assessment criteria are laid out in Section 2.2 of the NAR, these are based on BS5228-1:2009+A1: 2014 – Methodology (ABC Method) for construction and PAN 1/2011 Assessment Methodology using the principles defined in BS4142 for operational noise.

12.3.3.2 Noise Predictions

In order to predict the noise emission levels attributable to the construction and operational stages, noise propagation models were produced by EnviroCentre using the propriety 3D noise modelling software CadnaA. Within the software, complex models can be used to simulate the propagation of noise according to a range of international calculation standards.

Construction and operational noise model input parameters are detailed in Sections 4.2 and 4.3 of the NAR (Appendix L.1) respectively. Noise levels were calculated at the NSRs/ TNSRs. The output of the Construction and Operational Model Results and Assessments are detailed in Sections 5 and 7 of the NAR.

The redesigned development will utilise similar construction techniques requiring similar plant, carry out the same industrial activities and give rise to the same increase in operational traffic levels. Hence, instead of remodelling the revised layout a review of the relevant sections of the NAR has been completed. The noise sources have been reviewed to identify potential differences, and this has in turn been utilised to infer the likely noise effects of the revised design at the NSR's in relation to the relevant significance criteria. To inform the discussion some basic noise equations are utilised. Equation 1 is used for comparisons of noise levels associated with dissipation over different distances.

$$\Delta L = 20.\log\left(\frac{r_1}{r_2}\right)$$

Where: ΔL is the change in sound level

r_1 is a distance from the noise source

r_2 is another distance from the noise source

Equation 1: Change in Sound Level

Equation 1 assumes hemispherical dissipation of noise, with no other attenuating features, such as topography or noise absorbent surfaces.

Equation 2 is utilised to add sound levels.

$$L = 10Log_{10}\left(\sum_{i=1}^{n} 10^{(L_i/10)}\right)$$

Equation 2: Addition of Sound Levels

Equation 3 it utilised to calculated emission levels assuming simple hemispherical noise dissipation.

$$L_2 = L_1 - \left[20.\log\left(\frac{r_1}{r_2}\right)\right]$$

Where: L_1 is the sound level at distance r_1

L_2 is the sound level at distance r_2

Equation 3: Hemispherical Noise Dissipation

12.3.3.3 Cumulative Impact Assessment

The NAR considered cumulative impacts associated with the construction of the DWP overlapping with the construction of Newton Marina, it is now known that there will be no overlap between the two development construction programmes. Hence, the cumulative impacts discussed in the NAR will not occur.

The operational road traffic noise assessment completed in the NAR assumes that the marina is operational and hence takes account of predicted traffic increases associated with the marina. As such the cumulative operational traffic noise impacts are considered.

Chapter 3 identified the need to consider the potential overlap of construction activities between the DWP and the Marine Engineering Workshop, at Goat Island, these are considered in qualitative terms in Section 12.7.

12.4 Noise Impact Assessment

12.4.1 Construction Noise Assessment

A review of the construction noise model inputs has been completed to understand where the redesign of the DWP could have changed any under pinning assumptions, this has in turn informed the noise assessment.

12.4.1.1 Review of Noise Model Inputs

The NAR (Appendix L.1) identified the various construction stages and developed modelling scenarios, to take account of overlapping activities being undertaken on the site. Although the design has been revised, the majority of the construction techniques will still be required. The main difference being that there is no intent to utilise a caisson, hence activities with References 7, 9, 10 and 11 in Table 4.3 of the NAR will not be carried out.

The individual plant and activities identified in Appendix C of the NAR associated with each of the construction activities remain the appropriate pieces of equipment for the works proposed.

Since the NAR was completed additional ground investigation have been completed, these suggest that the majority of the sheet pile walls will be vibro piled with minimal requirement for impact piling. The worst-case scenario modelled is therefore now very pessimistic but will be conservatively utilised. As shown in SDWP-WS2139-XX-00-DR-C-9032 the north end of original finger pier was as close to NSR's as the piling required for the redesigned development, as such the model with regard to piling although pessimistic remains applicable for informing the assessment.

Two potential dredging techniques, backhoe and cutter suction were considered in the NAR, both of which could still be utilised to complete the dredge. As shown in Drawing SDWP-WS2139-XX-00-DR-C-9021, to achieve water depths of -10m Chart Datum (CD), the dredge area has increased, however the northern dredge boundary which is the one closest to NSR's has moved by less than 20m. The depth of material to be dredged in this area is no more than 1m, due to the existing deep-water depths, hence time spent north of the original dredge area will be minimal, hence the modelled data is still applicable.

Rock blasting will be required to cut into the hillside to create the levelled area and will be completed utilising the techniques discussed in Section 4.2.5 of the NAR. Drawing SDWP-WS2139-XX-00-DR-C-9032 shows that the area of land and volume of material to be removed is much reduced and hence the activity duration will be reduced.

The modelling scenarios detailed in Table 4.4, were based on an indicative programme for the original design. Although the time frame for various activities will have changed the activities likely to overlap have not, as such the modelled combinations for the construction stages still cover the worst-case scenarios.

12.4.1.2 Construction Noise Effects

The review of the noise modelling inputs discussed in Section 12.4.1.1, has identified that the noise modelling may be conservative with regard to piling and rock stripping activities, but is broadly applicable to the redesign and as such the outputs detailed in Section 7.6 of the NAR (Appendix L.1) can still be utilised.

The model scenarios give rise to neutral/ **no change** effects on the BS5228 Category B receptors, NSR's 01 to 05 during the day, evening and night- time periods. NSR06 is a Category A receptor in BS5228 terms and is therefore subject to lower threshold levels than the other NSR's. Model Scenarios 3A, 3B and 4 give rise to noise effects ranging from Slight to Major on NSR06, and hence warrant further consideration.

Scenarios 3A and 3B consider rock excavation and infilling of the land reclamation area (excavator rock and infill reclamation), dredging (dredger) and Linkspan support dolphin construction activities. Scenario 3A assuming the use of a cutter suction dredger, while 3B assumes the use of a backhoe dredger and hopper barge. Although the excavator rock and infill reclamation and Linkspan support dolphin activities have some loud noise sources, they are further from the NSR's and will only be carried out during the day and potential early evening, the activity which is causing exceedances of the BS5228 threshold levels is the dredging.

The cutter suction dredger is the quieter of the two techniques 82dB(A) at 10m, however as shown in Table 5-6 of the NAR it breaches the evening and night-time noise thresholds by 2.3dB and 1.3dB respectively, these levels are perceptible hence the significance level of slight adverse in BS5228 terms.

The use of the backhoe dredger (88dB(A) at 10m) is used in conjunction with a hopper barge (76db(A) at 10m), by applying Equation 2 from Section 12.3.3.2, the combined noise source level is calculated as 88.3dB(A). The use of the backhoe dredge technique gives rise to breaches of 3.4dB and 6.9dB for evening and night-time respectively, with significance's in accordance with BS5528 of moderate and large adverse.

The NAR has assessed the worst-case throughout, for the purposes of dredging it has assessed the dredge works carried out at the closest point to the receptors. As shown in Drawing SDWP-WS2139-XX-00-DR-C-9032, the revised design dredge area is between 600 and 1200m away from NSR06. Utilising Equation 1 from Section 12.3.3.2, it can be calculated that the difference in sound levels when the dredger is at the furthest and closest points to NSR06 is 6dB.

Using Equation 3 from Section 12.3.3.2, it can be calculated that for the cutter suction dredger the night-time noise threshold of 45dB(A) is only exceeded when dredging within 710m of NSR06. Hence use of the cutter suction technique is assessed as having **negligible to minor: non-significant** effects in EIA terms on NSR06 Builnacraig Street during the evening and night-times.

Use of the backhoe dredger at night at distances of greater than 785m from NSR06 would reduce noise levels at the receptor to less than 5dB above the threshold and hence be classed as moderate adverse in terms of BS5228. Only dredging at greater than 1040m from NSR06 would drop noise levels at this receptor down to the slight significance category. Hence overall evening backhoe dredge activities are assessed has having **minor: non-significant** adverse effects on NSR06 Builnacraig Street, while night-time backhoe dredging will have **minor to moderate: significant** adverse effects on NSR06 Builnacraig Street in EIA terms.

Modelling Scenario 4 considered the following activities being completed concurrently: Excavate rock and infill reclamation, Linkspan Support Dolphin and Foundations for caisson. The evening noise levels at NSR06 were calculated to be 0.1dB above the threshold level. However, there are no caissons being utilised in the design, hence this scenario will not occur.

If excavate rock and infill reclamation and Linkspan Support Dolphin activities were to be completed concurrently the noise levels at NSR06 would be **neutral, no change**.

12.4.2 Operational Industrial Noise

The NAR (Appendix L.1) considered two operational noise source scenarios, Cargo Ship Loading/Unloading, and Decommissioning of large marine structures, as these were identified as the worst-case scenarios with regard to noise sources, and hence noise impacts on receptors.

12.4.2.1 Cargo Ship Loading/Unloading

The NAR provided in Appendix L.1, considered the noise effects on NSR from the loading and unloading of cargo ships. The main quay orientation has changed slightly but as shown in Drawing SDWP-WS2139-XX-00-DR-C-9032, the location of the quay is no closer to NSR's, hence activities associated with unloading cargo from ships on the main quay will be the same as considered within the NAR. The linkspan has however moved closer to NSR's 01 to 04 and further from NSR 06.

To understand the potential change in noise levels associated with works being carried out at the revised linkspan location Equation 1 was utilised. With r_1 representing the distance from the original linkspan location to the NSR, and r_2 representing the distance from the revised design linkspan location to the NSR.

Table 12.4.1 details the r_1 and r_2 values for each of the NSR's and the calculated ΔL. The daytime and night-time Change in Level's calculated within the NAR are also provided. It should be noted that the ΔL calculated provide the change associated with noise from the loading/unloading activity, whereas the Change in Level from the NAR also takes into account background. Hence where there is a Change in Level of 0.0 in the NAR, it is not known how much below background the Loading/Unloading noise levels are hence although the ΔL suggests an increase from the activity it is not known whether or not it will take levels above background. For the purpose of the assessment a precautionary approach has been applied, and the calculated ΔL added to the NAR Change in Level's to identify the new Magnitude of Impact and Significance of Effect in PAN 1/2011 terms for day and night-time, these are provided in Table 12.4.1.

Table 12.4.1: Cargo Ship Loading/Unloading Noise Assessment

NSR ID	01	02	03	04	05	06
r_1 (m)	1380	1180	1130	1140	1120	1080
r_2 (m)	1220	1120	1050	1080	1120	1150
Distance change (m)	-160	-60	-80	-60	0	+70
ΔL (dB(A))	+1.07	+0.45	+0.64	+0.47	0	-0.55
NAR Change in Level Calculated Daytime dB(A)	0.1	0.0	0.0	0.0	0.0	0.4
Precautionary Change in Level associated with new design Daytime dB(A)	1.17	0.45	0.64	0.47	0.0	0.0
New Magnitude of Impact Daytime	Minor	Negligible			No change	
Significance of Effect (PAN 1/2011) Daytime	Slight	Neutral/Slight			Neutral	
NAR Change in Level Calculated Night-time dB(A)	0.2	0.0	0.0	0.1	0.0	2.8
Precautionary Change in Level associated with new design Night-time dB(A)	1.27	0.45	0.64	0.57	0.0	2.35
New Magnitude of Impact Night-time	Minor	Negligible			No Change	Minor
Significance of Effect (PAN 1/2011) Night-time	Slight	Neutral/Slight			Neutral	Slight

Day time noise from cargo ship loading/unloading has been assessed to have a magnitude of impact of minor on NSR01 South Beach, giving rise to a **minor: non-significant** effect in EIAR terms as the change maybe audible. Effects at noise receptors NSR02 to 04 on Newton Street have a **negligible: non-significant** as the change is less than 1dB and hence, will not be perceived by the human ear. There is **no change** on the other receptors (NSR05 and 06).

Night-time noise from cargo ship loading/unloading has been assessed to have a magnitude of impact of minor on NSR01 South Beach and NSR06 on Builnacraig Street giving rise to a **minor: non-significant** effect in EIAR terms. Effects at noise receptors NSR02 to 04 on Newton Street and have a **negligible: non-significant** effect as the change is less than 1dB. With **no change** at NSR05 Seaview Terrace.

12.4.2.2 Decommissioning

As discussed in Section 4.3.3, to ensure that worst-case was considered, it was assumed that decommissioning activities were being carried out on the original Phase 4 development (see Drawing 1980-2003) as this was the closest area to the NSR's. The revised DWP design is located partly in the Phase 4 area hence, the modelling completed in the NAR is still relevant. As such, the predicted daytime noise levels at the various NSR laid out in Table 7-3 of Section 7.1.3 of the NAR (Appendix L.1) have not changed.

The magnitude of impact at NSR03 on Newton Street was **no change.** Increases of 2.1dB(A) at NSR06 on Builnacraig Street would be perceivable and hence give rise to a minor magnitude of impact. In accordance with PAN 1/2001 the level of significance is slight, in EIAR terms the effect is **minor: non-significant**.

The noise level increase at the 4 other NSR are less than 1dB(A) and hence will not be perceivable, hence the magnitude of change is negligible, giving rise to neutral/slight effect significance in PAN 1/2001 terms, which is **negligible: non-significant** from an EIA perspective.

12.4.2.3 Cargo Unloading/Loading and Decommissioning

Section 7.1.4 of the NAR considered the combined effects of cargo being unloaded/loaded while decommissioning was being undertaken during the day. The main contribution to the noise being from the decommissioning activities. Hence the changes in noise levels associated with the change in linkspan location will not change the magnitude of impacts on the various receptors. Hence the significance of effects of the combined activities in EIAR terms are the same as those identified in Section 12.4.2.2.

12.4.3 Operational Road Traffic Noise

The operational road traffic noise assessment considered the increase in noise levels from a predicted 2021 baseline. The predicted baseline takes account of increases in noise levels associated with increased traffic due to operations at the Newton Marina. As operational traffic predictions made in 2018 are still appropriate (see Chapter 15: Traffic and Transport) the noise predictions and assessment laid out in Section 7.2 of the NAR (Appendix L.1) have not changed. The magnitude of impact on all road traffic NSR listed in Table 12.3.2, are negligible with increases in noise being less than 1dB(A) at all receptors day and night and hence are not perceptible to the listener. In accordance with PAN 1/2001 the level of significance is slight, in EIAR terms the effect is **negligible: non-significant.**

12.5 Mitigation Measures

12.5.1 Construction

The majority of the construction activities are at a sufficient distance from NSR as to not give rise to any detrimental effects, however Section 8 of BS5228 recommends a number of simple control measures, which should be implemented as a best practice, they include:

- Ensure regular maintenance of all equipment used on site, including maintenance related to noise emissions;
- Ensure that vehicles and vessels are loaded carefully to ensure minimal drop heights so as to minimise noise during this operation; and
- Ensure that machines are shut down between work periods or throttled down to a minimum.

Implementation of best practice will noise disturbance to human receptors on and off the construction site and will aid in the minimisation of disturbance to ecological receptors considered in Chapter 10: Terrestrial Ecology.

A protocol for handling any noise related complaints will be contained within the Construction Environmental Management Document (CEMD), this will be applicable for all noise complaints but of particular use in addressing any concerns associated with dredging.

In addition to the general mitigate identified above, the following specific mitigation for dredging is proposed:

- Dredging of areas to the north of the dredge area will be carried out during the day whenever practicable;
- Prior to night-time dredging in the north of the dredge area (if required), the NSR likely to be affected e.g. residents of Builnacraig Street will be informed; and
- Noise monitoring during dredge activities will be carried out to understand the actual noise levels arising at receptors.

With specific regard to blasting, as identified in the NAR (Appendix L.1) good practice guidance for blasting will be followed including:

- Restriction of blasting as far as practicable to regular daytime periods, not on Sundays and away from public holidays;
- Good community relations; informing nearby noise/vibration sensitive receptors ahead of periods of blasting;
- The choice of appropriate drilling rigs; and
- Designing blasts to maximize efficiency and reduce the transmission of noise/vibration.

12.5.2 Operation

No significant noise effects are predicted for the operational phase, however, general good practice to minimise noise levels from an employee health perspective will aid in ensuring any effects arising are minimised.

The mitigation identified in Chapter 15: Traffic and Transport to appropriately schedule traffic during the operational phase, will ensure noise effects are also minimised.

12.6 Residual Effects

Taking account of general and dredging specific mitigation identified in Section 12.5.1, the significance of backhoe dredging during evenings and at night-time reduces to **minor: non-significant**.

12.7 Cumulative Effects

As discussed in Chapter 3: Methodology there is a potential for overlap in the construction of Marine Engineering Workshop, at Goat Island to overlap, with DWP starting prior to the workshop being completed. Construction works on the Marine Engineering Workshop are highly unlikely to be carried out on evenings or during night-time hours, hence only day time effects need to be considered from a cumulative perspective.

The noisiest activity for the construction of the marine Engineering Workshop will be the foundation piling and potentially the steal erection. These activities will be carried out first and hence there is a low probability that these will overlap with the DWP construction works. If, foundation or steal erection works were to be carried out at the same time as DWP construction works, then they would be the dominant noise source at NSR, due to the close proximity of the workshop to the town of Stornoway. As discussed in Section 12.4.1 and shown in Tables 5.1 to 5.6 construction noise associated with the DWP is well below the BS5228 threshold at all NSR in Stornoway, hence cumulative effects are highly unlikely to occur.

12.8 Summary

The NAR produced to support the original layout for the DWP has been reviewed and utilised to inform an assessment of noise effects associated with the revised DWP design. Dredging

remains the only activity that has the potential to give rise to significant effects during construction, however with appropriate mitigation this can be reduced to Non-significant effects.

If construction activities were to overlap with the construction of the Marine Engineering Workshop, then the noise effects would be dominated by the Workshop construction as the DWP construction activities are too far from the NSR to be audible.

Table 12.8.1 provides a summary of impacts, mitigation and residual effects.

Table 12.8.1: Summary of Effects

Receptor	Nature of Impact	Receptor Sensitivity / Category	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Construction							
NSR01 – South Beach	Construction Noise at all times of the day	B	Neutral	No Change	Applicable best practice techniques as identified in Section 8 of BS5228. A protocol for handling any noise related complaints will be contained within the Construction Environmental Management Document (CEMD).	Neutral	No Change
NSR02 – Newton Street	Construction Noise at all times of the day	B	Neutral	No Change		Neutral	No Change
NSR03 – Newton Street	Construction Noise at all times of the day	B	Neutral	No Change		Neutral	No Change
NSR04 – Newton Street	Construction Noise at all times of the day	B	Neutral	No Change		Neutral	No Change
NSR05 – Seaview Terrace	Construction Noise at all times of the day	B	Neutral	No Change		Neutral	No Change
NSR06 – Builnacraig Street	Construction noise excluding dredging at all times of day	A	Neutral	No Change		Neutral	No Change
	Cutter-suction dredging Daytime noise		Neutral	No Change	Applicable best practice techniques as identified in Section 8 of BS5228. A protocol for handling any noise related complaints will be contained within the Construction Environmental Management Document (CEMD).	Neutral	No Change
	Cutter-suction dredging Evening noise		Slight	Minor: Non-significant		Neutral-Slight	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity / Category	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Cutter-suction dredging Nighttime noise		Slight	Minor: Non-significant	Dredging of areas to the north of the dredge area will be carried out during the day whenever practicable. Prior to night-time dredging in the north of the dredge area (if required), the NSR likely to be affected e.g. those in Builnacraig Street will be informed. Noise monitoring during dredge activities will be carried out to understand the actual noise levels arising at receptors.	Neutral-Slight	Minor: Non-significant
	Backhoe dredging Daytime noise		Neutral	No Change		Neutral	No Change
	Backhoe dredging Evening noise		Slight - Moderate	Minor: Non-significant		Slight	Minor: Non-significant
	Backhoe dredging Nighttime noise		Moderate-Large	Minor to Moderate: Significant		Slight - Moderate	Minor: Non-significant
All	Vibration associated with blasting			Minor: Non-significant	Restriction of blasting as far as practicable to regular daytime periods, not on Sundays and away from public holidays. Good community relations; informing nearby noise/vibration sensitive receptors ahead of periods of blasting. The choice of appropriate drilling rigs. Designing blasts to maximize efficiency and reduce the transmission of noise/vibration.		Minor: Non-significant
Operation							
NSR01 – South Beach	Daytime Cargo Ship Loading / Unloading	B	Minor	Minor: Non-significant		Minor	Minor: Non-significant
	Nighttime Cargo Ship Loading / Unloading		Minor	Minor: Non-significant		Minor	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity / Category	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Decommissioning		Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant
	Combined Noise from Port and Harbour Activities		Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant
NSR02 – Newton Street	Daytime Cargo Ship Loading / Unloading	B	Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant
	Nighttime Cargo Ship Loading / Unloading		Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant
	Decommissioning		Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant
	Combined Noise from Port and Harbour Activities		Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant
NSR03 – Newton Street	Daytime Cargo Ship Loading / Unloading	B	Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant
	Nighttime Cargo Ship Loading / Unloading		Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant
	Decommissioning		Neutral	No Change		Neutral	No Change

Receptor	Nature of Impact	Receptor Sensitivity / Category	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Combined Noise from Port and Harbour Activities		Neutral	No Change		Neutral	No Change
NSR04 – Newton Street	Daytime Cargo Ship Loading / Unloading	B	Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant
	Nighttime Cargo Ship Loading / Unloading		Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant
	Decommissioning		Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant
	Combined Noise from Port and Harbour Activities		Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant
NSR05 – Seaview Terrace	Daytime Cargo Ship Loading / Unloading	B	Neutral	No Change		Neutral	No Change
	Nighttime Cargo Ship Loading / Unloading		Neutral	No Change		Neutral	No Change
	Decommissioning		Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant
	Combined Noise from Port and Harbour Activities		Negligible	Negligible: Non-significant		Negligible	Negligible: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity / Category	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
NSR06 – Builnacraig Street	Daytime Cargo Ship Loading / Unloading	A	Neutral	No Change		Neutral	No Change
	Nighttime Cargo Ship Loading / Unloading		Minor	Minor: Non-significant		Minor	Minor: Non-significant
	Decommissioning		Minor	Minor: Non-significant		Minor	Minor: Non-significant
	Combined Noise from Port and Harbour Activities		Minor	Minor: Non-significant		Minor	Minor: Non-significant
TNSR1-6	Operational traffic movements		Negligible	Negligible: Non-significant	Mitigation identified in Chapter 15 with regard to the scheduling of traffic movements.	Negligible	Negligible: Non-significant

Key

Significant Effect
Non-Significant

12.9 References

British Standards Institute. (2014a). *BS 4142: 2014: Methods for rating and assessing industrial and commercial sound*. London, UK: British Standards Institute.

British Standards Institute. (2014b). *BS EN 5228-1:2009 +A1 2014: Code of practice for noise and vibration control on construction and open sites*. London, UK: British Standards Institute.

British Standards Institute. (2019). BS4142:2014+A1:2019 Method for rating and assessing industrial and commercial sound.

EnviroCentre. (2018). Stornoway Deep Water Port: Environmental Impact Assessment.

Scottish Government. (2011a). *PAN 1/2011 Planning and Noise*. Retrieved from http://www.scotland.gov.uk/topics/built-environment.

Scottish Government. (2011b). *Technical Advice Note Assessment of Noise*. Retrieved from http://www.gov.scot/Publications/2011/03/02104659/0.

12.10 Glossary

Acronym	Definition
BS	British Standard
CD	Chart Datum
dB	Decibels
dB(A)	A-weighted decibels
DWP	Deep Water Port
EIAR	Environmental Impact Assessment Report
LA_{10}	A-weighted sound pressure level exceeded for 10% of the measurement time
LA_{90}	A-weighted sound pressure level exceeded for 90% of the measurement time
LA_{eq}	Equivalent continuous A-weighted sound pressure level.
LW	Sound Power Level
m	metres
NAR	Noise Assessment Report
NSR	Noise Sensitive Receptor
PAN	Planning Advice Note
TAN	Technical Advice Note
TNSR	Traffic Noise Sensitive Receptor

Chapter 13: Cultural Heritage and Archaeology

STORNOWAY PORT AUTHORITY

Contents

13 Cultural Heritage and Archaeology

13.1 Introduction

This chapter presents an assessment of the effects of the proposed development on the historic environment with respect to the Stornoway Deep Water Port (DWP) development. The assessment was undertaken by Tom Janes of Headland Archaeology (UK) Ltd and aims to describe the location of the development, nature and extent of any known heritage assets or areas of archaeological potential, and as such, may be affected by the proposed development. Following the identification of known heritage assets and areas of archaeological potential, the objectives of this assessment are to:

- Provide an assessment of the importance of these assets;
- Assess the likely scale of any impacts on the historic environment posed by the development;
- Outline suitable mitigation measures to avoid, reduce or offset significant adverse effects; and
- Provide an assessment of any residual effects remaining after mitigation.

This chapter is also supported by the following outputs which are included in Volume 3 of the EIAR:

- Appendix M.1: Cultural Heritage and Archaeology Baseline Information; and
- Appendix M.2: Historical Maps of the Inner Study Area (ISA).

Figures are provided in Volume 4 of the EIAR.

13.2 Regulations and Guidance

The assessment has been undertaken with reference to relevant legislation, policy and guidance, relating to Cultural Heritage and Archaeology.

As Scotland has been altered by a series of historic decisions about the use of our land and sea, the UK and Scottish Governments have passed legislation for the conservation and protection of the historic environment.

13.2.1 Legislation

Scheduled Monuments and Listed Buildings are protected by statute.

- Legislation regarding Scheduled Monuments is contained within The Ancient Monuments and Archaeological Areas Act 1979; and
- Legislation regarding Listed Buildings is contained in The Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997.

The 1979 Act makes no reference to the settings of Scheduled Monuments. The 1997 Act does, however, place a duty on the planning authority with respect to Listed Buildings and Conservation Areas, and their settings.

The Historic Environment Scotland Act 2014 defines the role of the new public body, Historic Environment Scotland (HES), and the processes for the designation of heritage assets, consents and rights of appeal.

13.2.2 Scottish Planning Policy

The Scottish Government's planning policies in relation to the historic environment are set out in paragraphs 135-151 of Scottish Planning Policy (SPP) (Scottish Government, 2014a). The historic environment is defined as "*the physical evidence for human activity that connects people with place, linked with the associations we can see, feel and understand*" and includes "*individual assets, related settings and the wider cultural landscape*". The policy principles are stated in paragraph 137.

The SPP also requires planning authorities to protect archaeological sites and monuments, preserving them in situ where possible, or otherwise ensure "*appropriate excavation, recording, analysis, publication and archiving before and/or during development*" (paragraph 150). "*Non-designated historic assets and areas of historical interest, including historic landscapes, other gardens and designed landscapes, woodlands and routes such as drove roads*" should also be preserved in situ wherever feasible (paragraph 151).

Historic Environment Scotland laid out Scotland's first ever strategy for the historic environment, known as 'Our Place in Time: the Historic Environment Strategy for Scotland' (Scottish Government, 2014b), which presents the Scottish Government's strategy for the protection and promotion of the historic environment. The Historic Environment Policy for Scotland (HEPS, Historic Environment Scotland 2019a) and the Historic Environment Scotland Circular (Historic Environment Scotland 2019b) were both published in 2019. They complement the SPP providing further policy direction. In particular, HEPS provides more detailed policy on historic environment designations and consents.

13.2.3 Marine Planning

As discussed in Chapter 4: Statutory Context and Policy the General Policies of Scotland's Nation Marine Plan (NMP) include:

GEN 6 Historic Environment states that:

- "*development and use of the marine environment should protect and, where appropriate, enhance heritage assets in a manner proportionate to their significance*." (Scottish Government, 2015)

Of particular relevance to this Chapter are paragraphs 4.24 and 4.25 of GEN 6 which outline the requirement for development proposals to provide information on the significance of heritage assets and for developers to undertake suitable mitigating actions to record and advance understanding of that significance before making substantial changes to any heritage asset.

13.2.4 Outer Hebrides Local Development Plan

The Outer Hebrides Local Development Plan (Comhairle nan Eilean Siar, 2018) covers Natural and Built Heritage under Policy NBH4: Built Heritage, Policy NBH5: Archaeology and Policy NBH6: Historic Areas.

Policy NBH4 states:

- "*Where there is clear evidence of historic significance, development which would have a substantial adverse impact on this significance will only be permitted where it can be demonstrated that:*
    - *All reasonable measures will be taken to mitigate any loss of this significance; and*
    - *Any lost significance which cannot be mitigated is outweighed by the social, economic, environmental or safety benefits of the development*".

Policy NBH5 states that:

- *"Scheduled Monuments (scheduled archaeological remains) are nationally important monuments or archaeological sites. Where there is potential for a proposal to have a direct impact on a scheduled monument, the written consent of Historic Environment Scotland is required in addition to any other consent required";* and
- *"There is a presumption in favour of the in-situ preservation of all scheduled archaeological remains and the Comhairle will support proposals that seek to protect, enhance and interpret them. Development proposals that will adversely impact upon scheduled archaeological remains or the integrity of their settings will only be permitted in exceptional circumstances where there is no practical alternative site and where there are imperative reasons of overriding public interest*".

The policy also adheres to the principles that if developments have the potential to adversely impact upon the cultural significance of scheduled archaeological remains or the integrity of their settings, then this must be supported by:

- An assessment of the significance of any heritage assets which are affected by the development;
- Measures that will be taken to mitigate any adverse effect on the archaeological significance;
- Measures that will be taken to preserve and protect the special interest of the heritage asset; and
- Justification that demonstrates the social; economic; environmental, safety or other imperative reasons of overriding public interest that would outweigh any adverse effect which cannot be mitigated

Policy NBH6 states that

- "*only applications for planning permission… with full plans will be acceptable for consideration of proposed development in any Conservation Area. Developers will be expected to demonstrate how the proposal enhances or preserves the appearance or character of the Conservation Area and meets the objectives of the relevant Conservation*

Area Management Plan. The Management Plans are contained in the Conservation Area Management Plans Supplementary Guidance which forms part of the Local Development Plan."

Any proposals made should be and will be assessed against the following criteria:

- *The scale, form, proportion, materials and detailing must respect the characteristics of the historical setting;*
- *The plot layout, density and height must reflect and respond to the buildings, pattern and distinct characteristics of the area;*
- *Historically significant boundaries and other elements contributing to the established pattern of development in the area must be retained and, where possible, enhanced;*
- *Undeveloped spaces important to the character and historic value of the Conservation Area, including those within individual curtilages, are protected and, where possible, enhanced;*
- *Important views within, into and out of the Conservation Area are protected; and*
- *Landscape features and landmarks contributing to the character and appearance of the Conservation Area are protected.*

13.2.5 Guidance

13.2.5.1 Planning Advice Notes (PAN)

Planning Advice Note 2/2011: Planning and Archaeology (Scottish Government, 2011) provides technical advice to planning authorities and developers on dealing with archaeological remains. Among other issues it covers the balance in planning decisions between the preservation of archaeological remains and the benefits of development; the circumstances under which developers can be required to provide further information, in the form of a field evaluation, to allow planning authorities to reach a decision; and measures that can be taken to mitigate adverse impacts.

13.2.5.2 Chartered Institute for Archaeologists (CIfA)

Standards and Guidance published by the Chartered Institute for Archaeologists (CIfA) have been followed in preparing this assessment, in particular the 'Standard and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment' (CIfA, 2014) and the 'Standard and guidance for historic environment desk-based assessment' (CIfA, 2014 updated 2016).

13.2.5.3 United Nations Educational, Scientific and Cultural Organization (UNESCO)

In 2013 UNESCO published the 'Manual for Activities directed at Underwater Cultural Heritage' (MAUCH, UNESCO 2013). It is a companion and guide to the 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage and is intended for use as a reference tool by site managers, by stakeholders and partners in the protection of underwater cultural heritage. The UNESCO Convention on the Protection of the Underwater Cultural Heritage (2001) lays out four main principles in which member states are to adhere to (UNESCO, 2013). These are as follows:

- **Obligation to Preserve Underwater Cultural Heritage** - *States Parties should preserve underwater cultural heritage and take action accordingly. This does not mean that*

ratifying States would necessarily have to undertake archaeological excavations; they only have to take measures according to their capabilities. The Convention encourages scientific research and public access.

- **In Situ Preservation as first option -** *The in-situ preservation of underwater cultural heritage (i.e. in its original location on the seafloor) should be considered as the first option before allowing or engaging in any further activities. The recovery of objects may, however, be authorized for the purpose of making a significant contribution to the protection or knowledge of underwater cultural heritage.*
- **No Commercial Exploitation** - *The 2001 Convention stipulates that underwater cultural heritage should not be commercially exploited for trade or speculation, and that it should not be irretrievably dispersed. This regulation is in conformity with the moral principles that already apply to cultural heritage on land. It is not to be understood as preventing archaeological research or tourist access.*
- **Training and Information Sharing** - *States Parties shall cooperate and exchange information, promote training in underwater archaeology and promote public awareness regarding the value and importance of Underwater Cultural Heritage.*

Further information of the principles, guidelines and regulations of the Convention are provided in Appendix M.3.

13.2.5.4 Scottish Natural Heritage (SNH) and Historic Environment Scotland (HES)

In 2018 Scottish Natural Heritage (SNH) and HES published the fifth Edition of the Environmental Impact Assessment Handbook (SNH & HES, 2018). This edition includes discussion of cultural heritage impact assessment and complements existing HES guidance.

HES provides guidance on how to apply the policies set out in the SPP in a series of documents entitled 'Managing Change in the Historic Environment', of which the guidance note on 'Setting' (Historic Environment Scotland, 2016) is particularly relevant.

In 2019, HES published Designation Policy and Selection Guidance (DPSG, HES. 2019c) to accompany HEPS. DPSG outlines the policy and selection guidance used by HES when designating sites and places of national importance.

13.3 Assessment Methodology

13.3.1 The Assessment Process

The cultural heritage assessment has been carried out in the following stages:

- Desk-based study leading to the identification of heritage assets potentially affected by the development;
- Definition of baseline conditions based on results of the desk-based study and visits to assets;
- Assessment of the importance of heritage assets potentially affected by the development;

- Identification of potential impacts on heritage assets, informed by baseline information, site visits, Zone of Theoretical Visibility (ZTV) mapping, wireframes and photomontages;
- Proposal of mitigation measures, to eliminate, reduce or offset adverse effects;
- Assessment of the magnitude of residual effects;
- Assessment of the significance of residual effects, broadly a product of the asset's importance and the magnitude of the impact; and
- Assessment of cumulative effects.

A heritage asset (or historic asset) is any element of the historic environment which has cultural significance. Both discrete features, and extensive landscapes defined by a specific historic event, process or theme, can be defined as heritage assets; and assets may overlap or be nested within one another.

Designated assets include Scheduled Monuments, Listed Buildings, World Heritage Sites, Conservation Areas, Inventory Gardens and Designed Landscapes, Inventory Historic Battlefields and Historic Marine Protected Areas. Other assets may also be locally designated through policies in the Local Plan.

The majority of heritage assets are not designated. Some undesignated assets are recorded in Historic Environment Records or Sites and Monuments Records (HERs/SMRs) maintained by local authorities and other agencies. However, many heritage assets are currently unrecorded, and the information contained in HERs and SMRs is not definitive, since they may include features which, for instance, have been entirely removed, or are of uncertain location, dubious identification, or negligible importance. The identification of undesignated heritage assets is therefore to some extent a matter of professional judgement.

Some heritage assets may coincide with visual receptors or landscape character areas, which are assessed in Chapter 5: Landscape and Visual, and in such cases, it is important to recognise the difference in approach between these two topics. Cultural heritage assessment addresses effects on the cultural heritage significance of heritage assets, which may result from, but are not equivalent to, visual impacts. Similarly, an effect on a landscape character area does not equate to an effect on the cultural heritage significance of heritage assets within it.

13.3.2 Study Areas

Two study areas were defined and included in this assessment for the Stornoway DWP development.

The Inner Study Area (ISA) corresponds to the proposed development site boundary (illustrated on Figure 13.4.1, Volume 4). Within this area, all heritage assets are assessed for construction and operational effects.

The Outer Study Area (OSA) extends to 1km from the proposed development site boundary (illustrated on Figure 13.4.2, Volume 4), which is taken as the maximum extent of potentially significant effects on the settings of heritage assets.

13.3.3 Data Sources

The baseline for the ISA has been informed by a comprehensive desk-based study, based on all readily available documentary sources, following the Chartered Institute for Archaeologists' (CIfA) 'Standard and Guidance for historic environment desk-based assessment'. The following sources of information were referred to:

- Designation data downloaded from the Historic Environment Scotland website on 2nd February 2020;
- The National Record of the Historic Environment (NRHE), including the Canmore database and associated photographs, prints/drawings and manuscripts held by HES;
- Historic Landscape Assessment data viewed through the HLAMap website;
- The CnES Historic Environment Record (HER) – digital data extract received on 11th March 2020;
- The National Collection of Aerial Photography (NCAP);
- Geological data available online from the British Geological Survey;
- Historic maps held by the National Library of Scotland;
- Ordnance Survey Name Books;
- Unpublished maps and plans held by the National Records of Scotland;
- Readily available published sources and unpublished archaeological reports.

A site walkover and setting visits were undertaken on the 22nd February 2018. A qualified archaeologist (Tom Janes, Headland Archaeology) visited the ISA and known heritage assets in the OSA. Conditions were sunny and bright, and visibility was very good.

13.3.4 Definition of Baseline Conditions

Designated assets within both the ISA and OSA which have been previously recorded on the NRHE are labelled with the reference number assigned to them by HES (prefixed SM for Scheduled Monuments, and LB for Listed Buildings). Undesignated assets are labelled with the reference number in the HER (using the CnES prefix 'MWE'), or with the NRHE reference number (prefixed with NRHE). Historical wrecks within both the ISA and OSA have been assigned a number and prefixed with 'W' for wreck.

13.3.4.1 Known Heritage Assets within the Inner Study Area

Previously unrecorded heritage assets within the ISA have been assigned an asset number (prefixed HA for Heritage Asset). A single asset number can refer to a group of related features, which may be recorded separately in the HER and other data sources.

Assets within the ISA are listed in Table 13.4.1 and illustrated on Figure 13.4.1, with detailed descriptions in Appendix M.1.

13.3.4.2 Potential for Unknown Heritage Assets within the Inner Study Area

The likelihood that undiscovered heritage assets may be present within the ISA is referred to as archaeological potential. Overall levels of potential can be assigned to different landscape zones, following the criteria in Table 13.3.1, while recognising that the archaeological potential

of any zone will relate to particular historical periods and types of evidence. The following factors are considered in assessing archaeological potential:

- The distribution and character of known archaeological remains in the vicinity, based principally on an appraisal of data in the HER;
- The history of archaeological fieldwork and research in the surrounding area, which may give an indication of the reliability and completeness of existing records;
- Environmental factors such as geology, topography and soil quality, which would have influenced land-use in the past and can therefore be used to predict the distribution of archaeological remains;
- Land-use factors affecting the survival of archaeological remains, such as dredging, ploughing or commercial forestry planting; and
- Factors affecting the visibility of archaeological remains, which may relate to both environment and land-use, such as soils and geology (which may be more or less conducive to formation of cropmarks), arable cultivation (which has potential to show cropmarks and create surface artefact scatters), vegetation, which can conceal upstanding features, and superficial deposits such as peat and alluvium which can mask archaeological features.

Table 13.3.1: Archaeological Potential

Potential	Definition
High	Undiscovered heritage assets of high or medium importance are likely to be present.
Medium	Undiscovered heritage assets of low importance are likely to be present; and it is possible, though unlikely, that assets of high or medium importance may also be present.
Low	The study area may contain undiscovered heritage assets, but these are unlikely to be numerous and are highly unlikely to include assets of high or medium importance.
Negligible	The study area is highly unlikely to contain undiscovered heritage assets of any level of importance.
Nil	There is no possibility of undiscovered heritage assets existing within the study area.

13.3.4.3 Heritage Assets in the Outer Study Area

Assets that meet the initial criteria for assessment are described briefly in Section 13.4.3, listed in Tables 13.4.2 to 13.4.5, and illustrated on Figure 13.4.2 provided in Volume 4.

13.3.5 Identification of Potential Impacts

Potential impacts on unknown heritage assets are discussed in terms of the *risk* that a significant effect could occur. The level of risk depends on the level of archaeological potential combined with the nature and scale of disturbance associated with construction activities and may vary between high and negligible for different elements or activities associated with a development, or for the development as a whole.

Potential impacts on the settings of heritage assets are identified from an initial desk-based appraisal of data from HES, the NRHE and the CnES HER and consideration of current maps and aerial images available on the internet. Where this initial appraisal has identified the potential for a significant effect, the asset has been visited to define baseline conditions and identify key viewpoints.

Visualisations have been prepared to illustrate changes to key views, where potentially significant effects have been identified (Figures 5.9 to 5.19 in Volume 4 of this EIAR). Effects on the historic environment can arise through direct physical impacts, impacts on setting or indirect impacts.

13.3.5.1 Direct Physical Impacts

Direct physical impacts describe those development activities that directly cause damage to the fabric of a heritage asset. Typically, these activities are related to construction works and will only occur within the application site.

13.3.5.2 Impacts on Setting

An impact on the setting of a heritage asset occurs when the presence of a development changes the surroundings of a heritage asset in such a way that it affects (positively or

negatively) the cultural significance of that asset. Visual impacts are most commonly encountered but other environmental factors such as noise, light or air quality can be relevant in some cases. Impacts may be encountered at all stages in the life cycle of a development from construction to decommissioning but they are only likely to lead to significant effects during the prolonged operational life of the development.

13.3.5.3 Indirect Impacts

Indirect impacts describe secondary processes, triggered by the development, that lead to the degradation or preservation of heritage assets. For example, changes to hydrology may affect archaeological preservation; or changes to the setting of a building may affect the viability of its current use and thus lead to dereliction.

13.3.6 Mitigation Measures and Identification of Residual Effects

Proposed mitigation measures are described in Section 13.6. The preferred mitigation option is always to avoid or reduce impacts through design, or through precautionary measures such as fencing off heritage assets during construction works. Impacts which cannot be eliminated in these ways will lead to residual effects.

SPP paragraph 150 (Scottish Government, 2014a) and PAN2/2011 Sections 25-27 (Scottish Government, 2011) state that adverse effects may be mitigated by an appropriate level of survey, excavation, recording, analysis and publication of the results, in accordance with a written scheme of investigation (WSI). Archaeological investigation can have a beneficial effect of increasing knowledge and understanding of the asset, thereby enhancing its archaeological and historical interest and offsetting adverse effects.

13.3.7 Impact Assessment Criteria

13.3.7.1 Heritage Importance, Cultural Significance and Sensitivity

The impact assessment process with regard to Cultural Heritage largely concerns with the effects on *cultural significance*, which is a quality that applies to all heritage assets, and as defined by Historic Environment Scotland (SNH & HES 2018, Appendix 1 page 175) relates to the ways in which a heritage asset is valued both by specialists and the general public. Heritage asset value may derive from a varying degree of factors, including the asset's fabric, setting, context and associations.

This use of the word 'significance', referring to the range of values we attach to an asset, should not be confused with the unrelated usage in EIA where the significance of an effect reflects the weight that should be attached to it in a planning decision.

The *importance* of a heritage asset is the overall value assigned to it based on its cultural significance, reflecting its statutory designation or, in the case of undesignated assets, the professional judgement of the assessor (Table 13.3.2). Assets of national importance and international importance are assigned a high and very high level respectively. Scheduled Monuments, Inventory Gardens and Designed Landscapes, Inventory Historic Battlefields and Historic Marine Protected Areas are, by definition, of national importance. The criterion for Listing is that a building is of 'special architectural or historic interest'; following DPSG (HES, 2019c), Category A refers to 'outstanding examples of a particular period, style or building

type', Category B to 'major examples of a particular period, style or building type', and Category C to 'representative examples of a particular period, style or building type'. Conservation Areas are not defined as being of national importance and are therefore assigned to a medium level. Any feature which does not merit consideration in planning decisions due to its cultural significance may be said to have negligible heritage importance; in general, such features are not considered as heritage assets and are excluded from the assessment.

The UNESCO Convention and MAUCH define underwater cultural heritage as "all traces of human existence having a cultural, historical or archaeological character which have been partially or totally under water, periodically or continuously, for at least 100 years" (Article 1.1 (a)). In accordance with this, in this assessment undesignated underwater cultural heritage assets over 100 years old are generally considered to be of medium importance unless otherwise stated, whilst those less than 100 years old are generally considered to be of low importance unless otherwise stated.

Table 13.3.2: Criteria for Assessing the Importance of Heritage Assets

Importance of the Asset	Criteria
Very high	World Heritage Sites and other assets of equal international importance
High	Category A Listed Buildings, Scheduled Monuments, Inventory Gardens and Designed Landscapes, Inventory Historic Battlefields, Historic Marine Protected Areas and undesignated assets of national importance
Medium	Category B Listed Buildings, Conservation Areas, undesignated underwater cultural heritage assets over 100 years old, and undesignated heritage assets of regional importance
Low	Category C Listed Buildings, undesignated underwater cultural heritage assets less than 100 years old, and undesignated assets of lesser importance

Cultural significance is assessed in relation to the criteria in DPSG Annexes 1-6, which are intended primarily to inform decisions regarding heritage designations, but may also be applied more generally in identifying the 'special characteristics' of a heritage asset, which contribute to its cultural significance and should be protected, conserved and enhanced according to SPP paragraph 137. Annex 1 is widely applicable in assessing the cultural significance of archaeological sites and monuments, for instance, while the criteria in Annex 2 can be used in defining the architectural or historic interest of buildings, whether listed or not.

The special characteristics which contribute to an asset's cultural significance may include elements of its setting. Setting is defined in HES guidance as 'the way the surroundings of a historic asset or place contribute to how it is understood, appreciated and experienced' (HES, 2016, Section 1). The setting of an asset is defined and analysed according to Stage 2 of the three-stage approach promoted in 'MCHE: Setting', with reference to factors listed on pages 9-10. The relevance of these factors to the understanding, appreciation and experience of the asset determines how, and to what extent, an asset's cultural significance derives from its setting. All heritage assets have settings; however, not all assets are equally sensitive to impacts on their settings. In some cases, setting may contribute very little to the asset's cultural significance, or only certain elements of the setting may be relevant.

13.3.7.2 Assessment of the Magnitude of Impacts on Cultural Significance

The magnitude of an impact is a measure of the degree to which the cultural significance of a heritage asset will be changed by the proposed development (SNH & HES, 2018). This definition of magnitude applies to impacts on the setting, as well as impacts on the physical fabric, of an asset. Impacts on the settings of heritage assets are assessed with reference to the factors listed in 'MCHE: Setting' Stage 3 (evaluate the potential impact of the proposed changes, pages 10-11). It is important to note that the magnitude of an impact resulting from an impact on setting is not a direct measure of the visual prominence, scale, proximity or other attributes of the development itself, or of the extent to which the setting itself is changed. It is also necessary to consider whether, and to what extent, the characteristics of the setting which would be changed contribute to the asset's cultural significance (SNH & HES 2018).

Magnitude is assessed as high/medium/low/negligible, and adverse/beneficial, or 'No Impact', using the criteria in Table 13.3.3 as a guide. In assessing the effects of a development, it is often necessary to take into account various impacts which affect an asset's significance in different ways, and balance adverse impacts against beneficial impacts. For instance, there may be adverse impacts on an asset's fabric *and* on its setting, offset by a beneficial impact resulting from archaeological investigation. There may also be beneficial impacts arising from a proposed development which would not otherwise occur in a 'do-nothing' scenario; a heritage asset that might otherwise degrade over time could be preserved or consolidated as a consequence of a development. The residual effect, given in Section 13.7, is an overall measure of how the asset's significance is reduced or enhanced.

Table 13.3.3: Criteria for Assessing the Magnitude of Impacts on Heritage Assets

Magnitude of Effect	Guideline Criteria
High beneficial	Alterations to an asset and/or its setting resulting in considerable enhancement of cultural significance. *Or*: Preservation of an asset and/or its setting where it would otherwise suffer considerable loss of cultural significance in the do-nothing scenario.
Medium beneficial	Alterations to an asset and/or its setting resulting in moderate enhancement of cultural significance. *Or*: Preservation of an asset and/or its setting where it would otherwise suffer moderate loss of cultural significance in the do-nothing scenario.
Low beneficial	Alterations to an asset and/or its setting resulting in a slight enhancement of cultural significance. *Or*: Preservation of an asset and/or its setting where it would otherwise suffer slight loss of cultural significance in the do-nothing scenario.

Magnitude of Effect	Guideline Criteria
Negligible beneficial	Alterations to an asset and/or its setting resulting in a very slight enhancement of cultural significance. *Or*: Preservation of an asset and/or its setting where it would otherwise suffer very slight loss of cultural significance in the do-nothing scenario.
No Impact	The asset's cultural significance is not altered.
Negligible adverse	Alterations to an asset and/or its setting resulting in a very slight loss of cultural significance.
Low adverse	Alterations to an asset and/or its setting resulting in a slight loss of cultural significance.
Medium adverse	Changes to an asset and/or its setting resulting in a moderate loss of cultural significance.
High adverse	Alterations to an asset and/or its setting resulting in a considerable loss of cultural significance.

13.3.7.3 Assessment of the Significance of Effects

The significance of an effect (EIA 'significance') on the cultural significance of a heritage asset, resulting from a direct or indirect physical impact, or an impact on its setting, is assessed by combining the magnitude of the impact and the importance of the heritage asset. The matrix in Table 13.3.4 provides a guide to decision-making but is not a substitute for professional judgement and interpretation, particularly where the asset importance or impact magnitude levels are not clear or are borderline between categories. EIA significance may be described on a continuous scale from negligible to major; it is also common practice to identify effects as significant or not significant, and in this sense major and moderate effects are regarded as significant in EIA terms, while minor and negligible effects are 'not significant'. Significant effects are highlighted in yellow.

Table 13.3.4: Criteria for Assessing the Significance of Beneficial and/or Adverse Effects on Heritage Assets

Asset Importance	Magnitude of Impact			
	High	Medium	Low	Negligible
Very High	Major	Major	Major or moderate	Negligible
High	Major	Major or moderate	Moderate or minor	Negligible
Medium	Major or moderate	Moderate or minor	Minor	Negligible
Low	Moderate or minor	Minor	Negligible	Negligible

13.3.7.4 Assessment of Cumulative Effects

Cumulative effects can occur when other existing or proposed developments would also be visible in views that are relevant to the setting of a heritage asset. Cumulative effects are considered in cases where an effect of more than negligible significance would occur as a result of the proposed development. Other existing or proposed developments are included in the cumulative assessment where they also lie within 1km of the asset. A cumulative effect is considered to occur where the magnitude of the combined effect of two or more developments is greater than that of the developments considered separately.

13.4 Baseline

An archaeological and historical overview of the Inner Study Area is included as Appendix M.1, and extracts from historical maps are included as Appendix M.2.

13.4.1 Known Heritage Assets within the Inner Study Area

The HER records five entries, and the Canmore Maritime database records 24 wrecks and/or documented losses within the ISA. However, two of the HER entries and ten of the Canmore Maritime entries refer to finds, events and/or wrecks that have been removed or refloated. A third HER entry relates to the existing Arnish Fabrication Yard; as a modern, operational facility the yard is not considered to be a heritage asset. Therefore, thirteen of the 29 HER and Canmore Maritime entries are not considered as Heritage Assets for this assessment.

There are 16 known Heritage Assets within the ISA (illustrated on Figure 13.4.1, Volume 4). Two of them are recorded in the HER, and the remaining 14 are wrecks and/or documented losses offshore recorded in the Canmore Maritime database. All 16 Heritage Assets are undesignated and were identified during the desk-based research element of the assessment.

Table 13.4.1: Heritage Assets within the Inner Study Area

Ref.	Name/Location	Type/Date	Easting	Northing	Importance
MWE142507	Arnish	Dyke, Undated	142312	930585	Low
MWE142511	Arnish	Field System, Post Medieval	142850	930976	Low
W1	Alabama: Seid Rocks, Stornoway,	Steamship, 20th Century	142380	931550	Medium
W2	Andalina: Seid Rocks, Cala Ghlumaig,	Hulk, 20th Century	142786	931111	Low
W3	Arnish: Cala Ghlumaig,	Steamship 20th Century	142642	930735	Low
W4	Bjorn: Arnish Point,	Hulk, 20th Century	142813	931043	Low
W5	Bloom: Stornoway Harbour,	Craft, 20th Century	142548	931492	Low
W6	Comrade: Stornoway, (Arbitrary Location)	Steam Drifter, 20th Century	142000	931000	Low

Ref.	Name/Location	Type/Date	Easting	Northing	Importance
W7	Fisher Lassies: Stornoway Harbour, (Arbitrary Location)	Lugger, 19th Century	142000	931000	Medium
W8	Jane Nicholson: Stornoway Harbour Entrance, (Arbitrary Location)	Craft, 19th Century	142900	931300	Medium
W9	Laurel: Stornoway Harbour Entrance, (Arbitrary Location)	Craft, 19th Century	142900	931300	Medium
W10	Marjory: Arnish Point, Stornoway,	Motor Fishing Vessel, 20th Century	142549	931119	Low
W11	Portugal: Arnish Point, Stornoway,	Hulk, 20th Century	142723	931580	Low
W12	Rap: Stornoway, (Arbitrary Location)	Steamship, 20th Century	142000	931000	Medium
W13	Unknown: Stornoway Harbour Entrance, (Arbitrary Location)	Yawl, 20th Century	142900	931300	Low
W14	Unknown: Stornoway	Craft, Obstruction	142323	930836	Low

The onshore Heritage Assets comprise an earth and stone field boundary dyke (MWE142507) immediately adjacent to the Arnish Fabrication Yard, and the remains of a post-medieval field system (MWE142511) on a headland on the eastern side of Glumaig Harbour. As locally common examples of agricultural features, both are considered to be of Low importance.

The 14 known wrecks recorded within the ISA comprise a mixture of nineteenth and twentieth century vessels known to have sunk in and around Glumaig Harbour. The exact location of six of the wrecks (W6, W7, W8, W9, W12 and W13) is uncertain, so they have been recorded in Canmore Maritime with arbitrary co-ordinates that place them in the approximate area of their loss in the North Minch. The remaining nine known wrecks comprise seven named twentieth century vessels (W1 to W5, W10 and W11) known to have sunk in Glumaig Harbour, and one un-named undated wreck (W14) charted as an obstruction and visible at low water. As undesignated, modern shipwrecks, nine are considered to be of Low importance and five wrecks over 100 years old are of Medium importance.

Geoheritage was considered by Gavin & Doherty Geosolutions Ltd (GHG) as part of their interpretation of offshore ground investigation (see Section2.5 of the GHG Report in Appendix N.3). No heritage assets were identified.

13.4.2 Potential for Undiscovered Heritage Assets within the Inner Study Area

The south-eastern corner of the onshore ISA has already been prepared for development with extensive ground levelling followed by the establishment of hardstanding. These groundworks have effectively sterilised the ground of archaeology in this area. The western, onshore edge of the ISA comprises areas of uneven ground, exposed bedrock and waterlogged peat bog. These areas are considered unsuitable for anything but rough grazing, and unattractive for settlement. Furthermore, there have been at least three walkover surveys in and around the ISA since 1988 which are likely to have identified all the upstanding archaeological remains in the area. The maritime archaeological environment is also well-documented due to the 1976 and 2020 dive surveys (described in Appendix M.1).

It is therefore considered that, following the criteria in Table 13.3.1, the ISA is of negligible archaeological potential.

13.4.3 Heritage Assets in the Outer Study Area

13.4.3.1 Scheduled Monuments

There are three Scheduled Monuments within the OSA (illustrated on Figure 13.4.2, Volume 4). They comprise the remains of a prehistoric cairn on the summit of Cnoc na Croich (SM6550), a probable early medieval fortified islet in Loch Arnish (SM5397), and the WW2 coastal battery on Arnish Point (SM5347). As Scheduled Monuments, all three are considered to be of High importance.

Table 13.4.2: Scheduled Monuments included in the assessment

Ref.	Name & Description	Importance
SM5347	Arnish Point, gun emplacements	High
SM5397	Loch Arnish, dun	High
SM6550	Cnoc na Croich, chambered cairn	High

13.4.3.2 Listed Buildings

There are 32 Listed Buildings (LBs) within the OSA. However, all but four of them are either within the Stornoway Conservation Area (CA) or the Lews Castle and Lady Lever Park Inventory Garden and Designed Landscape (IGDL). LBs within the CA and IGDL will be discussed and assessed in relation to those assets.

The four LBs outside the CA and IGDL comprise a Category B-listed lighthouse and Category C-listed monument on Arnish point, a Category B-listed industrial building and the Category C-listed Old Co-Op Yard buildings on James Street, Stornoway (illustrated on Figure 13.4.2, Volume 4). The Category B LBs are considered to be of Medium importance, and the Category C LBs are of Low importance.

Table 13.4.3: Listed Buildings outside the CA and IGDL included in the assessment

Ref.	Name & Description	Category	Importance
LB13328	Arnish Lighthouse and attendant buildings	B	Medium
LB41696	7 James Street	B	Medium
LB13329	Arnish, monument	C	Low
LB41695	James Street and Bells Road, Old Co-Op Yard buildings	C	Low

13.4.3.3 Inventory Gardens and Designed Landscapes

There is one IGDL within the OSA. Lews Castle and Lady Lever Park (GDL00263) comprises the mid-nineteenth century landscaped grounds of Lews Castle, on the low hills west of Stornoway harbour. There are seven LBs within the IGDL. They comprise the Category A-listed Lews Castle, and the lodges, walls and tower on Cuddy Point, the Category B-listed nineteenth-century driveway bridge and Matheson memorial, and the Category C-listed eighteenth-century driveway bridge, Creed Lodge and Marybank Lodge. Some of these LBs are also within the Stornoway Conservation Area, but they will be assessed as part of the IGDL.

Table 13.4.4 Listed Buildings within Lews Castle and Lady Lever Park IGDL

Ref.	Name & Description	Category	Importance
LB18677	Lews Castle	A	High
LB19206	Lews Castle, Lodges, boundary walls, sea walls and tower near Stornoway Harbour including Cuddy Point	A	High
LB18826	Lews Castle driveway bridge at NGR NB 4210 3321 (nineteenth century)	B	Medium
LB19207	Lews Castle, Matheson memorial	B	Medium
LB18816	Lews Castle Creed Lodge including gateway and driveway bridge nearby	C	Low
LB18817	Lews Castle, Marybank Lodge including gateway	C	Low
LB18827	Lews Castle driveway bridge close to north end of mansion (eighteenth century)	C	Low

13.4.3.4 Conservation Area

There is one CA within the OSA. The Stornoway CA (CA137) encompasses the nineteenth-century planned town that forms the heart of modern Stornoway, as well as the quayside constructed by Lord Lever and some of the grounds of Lever's 1840s Lews Castle estate. There are 21 LBs within the CA (excluding five LBs that are also within the IGDL, discussed in Section 13.4.3.3), comprising 16 Category B and 5 Category C buildings.

Table 13.4.5 Listed Buildings within Stornoway Conservation Area

Ref.	Name & Description	Category	Importance
LB41674	Amity House	B	Medium
LB41679	Cromwells Building corner Cromwell Street and Francis Street	B	Medium
LB41682	16, 18 Cromwell Street, the Town House	B	Medium
LB41686	16 Francis Street, Post Office Building	B	Medium
LB41690	2 And 4 Garden Road including garden boundary wall, gates and railings	B	Medium
LB41697	18, 20 James Street including boundary walls gates and gate piers	B	Medium
LB41698	22, 24 James Street Bellevue House including boundary walls gates and railings	B	Medium
LB41699	26 And 27 James Street including boundary walls, gates and railings	B	Medium
LB41700	28 And 30 James Street, Park Guest House, including boundary walls, gates and gate piers	B	Medium
LB41703	Kenneth Street and Francis Street, Martins Memorial Church and hall including boundary walls, gates and railings	B	Medium
LB41704	7 Kenneth Street religious book shop	B	Medium
LB41732	North Beach Lewis Hotel	B	Medium
LB41733	6, 7 North Beach	B	Medium
LB41734	8 North Beach	B	Medium
LB41738	South Beach, Cromwell Street and Point Street, municipal buildings	B	Medium
LB41740	14, 15 South Beach	B	Medium
LB41678	1, 3 Cromwell Street and 20 South Beach Thorlee Guest House	C	Low
LB41684	23-29 (Odd Nos) Francis Street	C	Low
LB41701	32 James Street Tower Guest House including perimeter walls, gates and railings	C	Low
LB41705	25 Kenneth Street	C	Low
LB41739	13 South Beach, Star Inn	C	Low

13.4.3.5 Other Designated Heritage Assets

There are no World Heritage Sites, Inventory Battlefields or Historic Marine Protected Areas within the OSA.

13.4.3.6 Undesignated Heritage Assets

There are 96 entries recorded on the HER within the OSA. Three of them record findspots of artefacts and are not considered to be Heritage Assets for this assessment. Thirty-seven HER entries record buildings and features within Stornoway CA and will be assessed as part of that. The remaining 56 HER entries within the OSA and outside the CA comprise buildings, features and monuments where wider views from and towards them are of limited relevance to understanding or appreciating their cultural significance, and so they are excluded from further assessment.

13.4.4 'Do Nothing' Scenario

Conditions affecting the survival of archaeological remains within the site boundary are likely to remain unchanged in the absence of the proposed development, and no ongoing processes of change have been identified.

13.4.5 Information Gaps

Based on the results of the surveys and assessments, it is considered that enough information exists to judge the archaeological potential of the ISA and to make a reliable assessment of the potential direct and operational impacts of the proposed development.

13.5 Impact Assessment

13.5.1 Design Mitigation

The EIA process was designed to identify and evaluate the likely significant effects of the proposed development on the environment and to identify measures to mitigate or manage them. Where possible, environmental considerations were incorporated into the design. The EIA process provided an opportunity to 'design out' adverse effects wherever possible. Where adverse effects could not be designed out, mitigation measures are proposed to avoid, compensate or reduce significant environmental effects to an acceptable level.

Although the design of the proposed development has evolved during the EIA process, none of the iterations have been as a result of predicted impacts upon heritage assets.

The height reduction of the Alabama has been minimised to that required for navigational safety purposes, and hence the removal to -8m CD is considered here. No other design mitigation has been implemented for archaeological reasons.

13.5.2 Construction Phase

Likely construction effects would result from topsoil stripping, excavation and piling associated with foundations, site compounds and other infrastructure, as well as dredging and reclamation operations within the construction footprint. There is also a risk of accidental damage to heritage assets outside the construction footprint from uncontrolled plant movement.

13.5.2.1 Predicted Construction Impacts

There will be no direct construction impacts upon **MWE142507, MWE142511, W3, W4,** or **W10** as all five heritage assets are outside the footprint of proposed construction works.

W6 to **W9, W12** and **W13** are all recorded on Canmore Maritime with arbitrary locations, and so it is not certain if they are within the construction footprint. However, Canmore Maritime also records them as 'casualties', meaning that although the loss is recorded, no remains of the vessels exist at the locations. It is probable that they were refloated or otherwise removed soon after sinking. Consequently, no construction impacts are anticipated upon these seven heritage assets either.

W5's location is recorded as being within the construction footprint, but it is also recorded on Canmore Maritime as a 'casualty', and therefore no construction impacts are anticipated.

In total, thirteen heritage assets will not be subject to construction impacts.

W1 comprises the remains of the twentieth century steamship 'Alabama' known to have sunk after seeking shelter in Glumaig Harbour en-route from Copenhagen to Baltimore in 1904. **W1** has two entries on the Canmore Maritime database. One records a detailed history of dive surveys and Harbour Masters' records (Canmore, 2020a), whilst the other entry is limited to the wreck's UKHO information (Canmore, 2020b). Both entries give locational information for the wreck which places it approximately 66m offshore on the northern edge of the ISA (Figure 13.4.1, Volume 4) at a depth of 6m.

The more detailed entry for **W1** (Canmore 102827) includes a description of the wreck from a 1976 dive survey undertaken by the RAF Brize Norton Sub Aqua Club. The Canmore (2020a) report describes **W1** thus;

"The wreck located at the above position is extensive and confused, showing every sign of dispersal by explosives. The recognition of objects was difficult due to the damage and poor visibility. The wreck is covered in a fine layer of silt. The highest obstruction is believed to be a cargo boom which was at a recorded depth of 6 metres. The bulk of the wreck lies between 10.6 - 15.2 metres or the bottom (depths are not reduced to lowest astronomical tide]."

W1 as it currently survives will present a potential navigational hazard, particularly when accessing the linkspan facility on the landward side of the linkspan and the pontoon proposed for the pilot boat(s). On discussion with the Harbour Master and Pilots, it has been identified that the preference is to remove parts of the wreck protruding above the -8m Chart Datum (CD).

It is initially proposed that the sections of the wreck above -8m CD will be cut off using hot cutting techniques. It is estimated around 300 – 400 tonnes of steel will be removed from **W1**. The sections cut from the wreck will be placed within the wreck superstructure. To inform the specifics of the works to be undertaken a reconnaissance survey was carried out in March 2020 to identify elements of **W1** above -8mCD and spaces within the superstructure which items can be placed into (Leask Marine, 2019). The survey confirmed the presence, extent and condition of the wreck. It remains an extensive and confused wreck, with some elements of the ship's structure intact and recognisable. These include a propeller, some railings along the starboard side and some H-beam ribs of the hull. There is also much loose steel plate and

associated metal debris. The wreck appears to be oriented roughly NE/SW, with the bow towards the shoreline.

At present, **W1** is understood to have been partially dispersed by explosives as a result of past attempts to remove the navigational hazard posed by the wreck. The proposed reduction work will result in the wreck being partially dismantled, but no elements of the ship will be removed from the seabed. As wreck material removed above -8m CD will not be removed from the water and instead will remain in-situ through placement within the superstructure, adherence to the UNESCO Convention on the Protection of the Underwater Cultural Heritage principle of '*In-Situ Preservation as First Option'* is complied with (see Appendix M.3).

In the absence of secondary mitigation, the reduction and dismantling of **W1** would comprise an adverse impact of medium magnitude as it works affecting it should be carried out in line with the afore mentioned UNESCO convention. As such and given W1 is of medium importance and in a poor state of preservation, this would result in an effect of **moderate** significance**,** which is **significant** in EIA terms.

W2 records the wreck of the *Andalina*, a collier that sank at anchor in Glumaig Harbour in 1931. Canmore Maritime notes that the Brize Norton Sub Aqua Club (BNSAC) survey of 1976 identified the remains of her stern and a boiler, and a 2005 UKHO sonar survey confirmed that "notable debris" was present at the location. There is no record of any survey since 2005, but it is reasonable to assume that some remains of the wreck will survive within the construction footprint. Due to its poor state of preservation (likely to have degraded further since it was last surveyed) W2 is of limited intrinsic value. It derives its cultural significance largely from its associative and contextual characteristics as a reminder of the maritime heritage of Stornoway, and the continued relevance of shipping to the town. As a poorly preserved example of a common type of twentieth-century vessel, W2 is considered to be a heritage asset of low importance.

W2 is near the south-eastern edge of the area identified for dredging to a depth of -9.5m above Chart Datum (ACD, equivalent to -12.21m AOD). The remains of the wreck are believed to be at around -5m ACD (-7.71m AOD). It is likely that dredging activity would result in the total removal of any surviving parts of the wreck. However, as the wreck is likely to be in an extremely poor state of preservation, this would constitute an adverse construction impact of low magnitude, resulting in an effect of **negligible significance**.

W11 records the wreck of the *Portugal*, a collier that sank at the mouth of Glumaig Harbour in the early 1950s. Canmore Maritime records a Harbour Master's survey of 1951 that identified her mast and funnel showing above water, approximately 900m north-west of Arnish lighthouse. A 1975 sonar survey by HMS Herald detected possible remains at a depth of -6.8m ACD (-9.51m AOD) and noted that "the wreck is broken up and its coal cargo is dispersed." The year of last detection is recorded in Canmore as 1976. Due to its extremely poor state of preservation (likely to have degraded further in the 40 years since it was last surveyed) W11 is of very limited intrinsic value. It derives its cultural significance largely from its associative and contextual characteristics as a reminder of the maritime heritage of Stornoway, and the continued relevance of shipping to the town. As a poorly preserved example of a common type of twentieth-century vessel, W11 is considered to be a heritage asset of low importance.

If any remains of W11 still exist, they will be in the northern part of the area identified for dredging to a depth of -9.5m ACD (-12.21m AOD). It is likely that dredging activity would result

in the total removal of the remains. However, as the wreck is likely to be in an extremely poor state of preservation, this would constitute an adverse construction impact of low magnitude, resulting in an effect of **negligible significance**.

W14 is an un-named vessel, charted as an obstruction. In 1976 the BNSAC recorded a wreck comprising "iron ribs with a small amount of timber attached suggesting a composite construction. The wreckage is 20 metres long and dries completely at low water neaps." A 2009 dive, noted on Canmore Maritime, confirmed the length, composition and partial survival of the vessel on the western shore of Glumaig Harbour. As a very poorly preserved, and un-named, example of a common type of twentieth-century vessel, W14 is considered to be a heritage asset of low importance. The surviving remains of W14 will be within the footprint of the southern access road. It is likely that construction activity would result in the total removal of the remains. However, as the wreck has been observed to be in an extremely poor state of preservation, this would constitute an adverse construction impact of low magnitude, resulting in an effect of **negligible significance**.

The ISA is of negligible archaeological potential. According to the criteria outlined in Table 13.3.1, a direct construction impact on unknown heritage assets is highly unlikely.

13.5.3 Operational Phase

Potential operational effects may occur because of changes to views towards and from heritage assets.

13.5.3.1 Heritage Assets in the Inner Study Area subject to no Operational Impacts

MWE142507 and **MWE142511** comprise two examples of post-medieval agricultural remains and consist of a dyke and field system respectively. Neither feature was constructed with wider views in mind, and the content of these views, and the assets' setting, is of little relevance to their cultural significance which derives largely from their intrinsic characteristics.

W1 to W14 comprise wrecks and casualties within the ISA. Wider views are of little relevance to any of these wrecks, which largely derive any cultural significance that they have from their intrinsic, historical and associative characteristics.

There will be no operational impacts upon MWE142507, MWE142511 or W1 to W14.

13.5.3.2 Heritage Assets in the Outer Study Area subject to no Operational Impacts

13.5.3.2.1 Scheduled Monuments

SM5397 (Loch Arnish, dun) is 300m south of the ISA. It is outside the ZTV of the proposed development, and there are no key views from or towards it in which the proposed development will appear.

There will be no operational impacts upon SM5397.

13.5.3.2.2 Listed Buildings

Two Listed Buildings on James Street comprise the Grade B-listed former tweed works at number 7 (LB41696) and the Grade C-listed Old Co-Op Yard buildings at the junction with Bells Road (LB41695). Although the ZTV indicates that the proposed development will be partially visible from them, as former industrial buildings neither was built with regard to wider

views. Both buildings derive their cultural significance almost entirely from historical and associative characteristics relating to the island's tweed industry. The presence of the proposed development in views to the south will not hinder any attempts to appreciate or understand the buildings' cultural significance.

There will be no operational impacts upon LB41696 or LB41695.

13.5.3.3 Predicted Operational Impacts upon Heritage Assets in the Inner Study Area

There will be no operational impacts upon any of the 16 heritage assets within the ISA.

13.5.3.4 Predicted Operational Impacts upon Heritage Assets in the Outer Study Area

13.5.3.4.1 Scheduled Monuments

SM5347 (Arnish Point, gun emplacements) were built in World War Two as a coastal battery to defend Stornoway and the surrounding waters. They consist of the remains of two concrete gun emplacements, a battery observation post, two search-light platforms, an accommodation block and the remains of hut platforms. Traces of ancillary infrastructure and machinery are visible throughout the scheduled area.

The gun emplacements are located on the southern cliff tops of Arnish Point with wide views, southwest to northeast, over the Minch and along the coastline and the entrance to Stornoway Harbour. To the west the view is over rising ground to the large shed of the Arnish fabrication yard.

The gun emplacements have clear contextual value in their setting as they were deliberately placed on the cliff tops of Arnish Point, a defensive position from which to protect the island and the Minch. They are also clearly visible in approaches to Stornoway by sea. The associative value of the gun emplacements is that they provide a reminder of the Second World War and the immediate danger to the islands from what may have at times seemed a distant war.

The proposed development will be located to the west and north-west of the gun emplacements. In this location the proposed development, where visible, will be largely screened by rising ground and the large shed of the fabrication yard. This inland view is not a key view from the gun emplacements which were specifically designed to monitor and protect the seaward approaches to the island. At a distance of approximately 300m and screened by topography and existing buildings, the proposed development will not compete for prominence with the Scheduled Monument when observed from the sea.

The proposed development will be visible in views west from the emplacement, but it will not constitute an obvious or intrusive presence in these views. Furthermore, these views are not considered key to any understanding or appreciation of the monument's cultural significance. It will remain possible to understand and appreciate the structures' setting, and the reasons for their location. SM5347 will be subject to an operational effect of negligible magnitude. As it is an asset of high importance, this will result in an impact of **negligible significance**.

SM6550 (Cnoc na Croich, chambered cairn) is a prehistoric cairn on the summit of Cnoc na Croich ('Gallows Hill'). Believed to be the remains of a neolithic chambered cairn, it survives in a partially ruinous state as a low, circular mound of stones, largely overgrown with grass and turf. Approximately 30m in diameter, the stones have spread and collapsed from the mound's original diameter of 24m indicated by three surviving kerbstones. In 1902 a cylindrical cairn,

which once supported a flagpole, was built on one side of the prehistoric mound. This later cairn (which is not included in the scheduling) supposedly marks the site of a medieval gallows, from which the hill takes its name.

The cairn is at 66m AOD on a partially wooded hilltop above the western shore of Stornoway Bay. Between the tree cover, there are wide views available to the east, south-east and south across the harbour and the bay to the headlands and sea beyond. Arnish Point, and the existing fabrication yard, can be seen approximately 2.km away to the south. North-east and north, tree cover restricts views over Stornoway, but to the north-west, west and south-west, the views open up across undulating hills and peat bog. The cairn is approached along a public footpath which climbs the western slope of Gallows Hill and then encircles the summit, providing wide views (between tree cover) in all directions.

Key characteristics from which the settings of prehistoric burial cairns generally derive their cultural significance relate to their prominence in relation to their immediate surroundings, and their intervisibility with similar contemporary features such as other funerary or ritual monuments, or settlement sites. As elements within the landscape have changed so much since the prehistoric period, the detail of what is visible from such cairns is of less importance. However, open views from the cairns – where such views exist – are also considered a key characteristic, and the maintenance of these views is considered desirable, as the underlying topographic features within the landscape may be relevant to an understanding and appreciation of cultural significance.

In its current condition, the prehistoric cairn is not a prominent feature on the hilltop and is not discernible in any but short-range views. Even at a close distance, it remains difficult to determine the form and extent of the monument. No other prehistoric monuments are visible from the cairn, and there are no obvious topographic or artificial features upon which the monument could be aligned or otherwise related to. The wide, open views from the hilltop certainly contribute to the cairn's setting, and bestow a sense of place, but the detail and content of those views (across a modern rural, urban and industrial landscape) is of limited relevance to any understanding or appreciation of the prehistoric cairn's cultural significance.

The proposed development will be visible in views east from the cairn, but at a minimum distance of 950m and approximately 60m lower, it will not constitute an obvious or intrusive presence in these views. It will remain possible to understand and appreciate the cairn's setting. SM6550 will be subject to an operational effect of negligible magnitude. As it is an asset of high importance, this will result in an impact of **negligible significance**.

13.5.3.4.2 Listed Buildings

Arnish Lighthouse and attendant buildings (LB13328) is a Category B-listed collection of buildings on the tip of Arnish Point. Designed and built in the mid-nineteenth century by the Stevenson's, they comprise a cylindrical lighthouse of standard design and a single-storey block of flat-roofed houses fronted by a walled garden.

As a lighthouse, built to warn approaching ships of the hazards around the entrance to Stornoway harbour, the aspects of LB13328's setting that are of most relevance to its cultural significance are its visibility from the sea. The relationship between the houses and the tower are also of some relevance, as they would have accommodated the keepers of the, now unmanned, lighthouse.

The proposed development will be 540m to the west of the buildings, but intervening topography and existing buildings at the fabrication yard will largely screen it in views from the lighthouse. The proposed development will not interrupt or otherwise obscure views towards the lighthouse from the seaward approaches, and it will remain possible to appreciate and understand the relevance of the lighthouse's clifftop setting to its cultural significance. The relationship between the attendant buildings and the tower will also remain clear.

LB13328 will be subject to an operational effect of negligible magnitude. As it is an asset of medium importance, this will result in an impact of **negligible significance**.

Arnish, monument (LB13329) is Category C-listed and comprises a low, cylindrical stone cairn believed to have been built in the 1860s to commemorate Bonnie Prince Charlie's 1746 stay on Lewis following Culloden. An inscription recounts how the prince landed in Loch Seaforth, travelling overnight and eventually arriving at Loch Arnish where he was received at Kildun House before sailing for Skye a few days later.

Kildun House, depicted as 'Arnish' on the OS 6-inch mapping from 1851 to 1958, was demolished to enable the construction of the fabrication yard and associated works. The monument is located approximately 370m south of the house's former site, on a low clifftop knoll overlooking Loch Arnish to the west, and the Minch to the east.

The views towards important locations on the prince's journey across Lewis and onwards to Skye are a relevant aspect of the monument's setting, but the detail of those locations has changed since 1746. It is considered that associative and historic characteristics are of more relevance to the monument's cultural significance. Although Loch Arnish remains largely unchanged, Kildun House has gone, and no trace of it or its grounds is now visible. The monument was built to commemorate an event, rather than to define a specific location. The presence of the fabrication yard, and the alteration of some of the locations, does not detract from the monument's most relevant characteristics. The proposed development will be approximately 450m to the north, but will not substantively alter the monument's present setting, and will not hinder any understanding or appreciation of the cultural significance of the monument or the events it commemorates.

LB13329 will be subject to an operational effect of negligible magnitude. As it is an asset of low importance, this will result in an impact of **negligible significance**.

13.5.3.4.3 Inventory Garden and Designed Landscape

Lews Castle and Lady Lever Park IGDL (GDL00263) comprises the mid-nineteenth century landscaped grounds of Lews Castle. There are seven Listed Buildings within the IGDL. As their individual settings also relate to, and contribute to, the IGDL's setting they will be assessed as part of the IGDL.

The HES listing entry for the IGDL rates it as having 'outstanding' historical, horticultural, architectural and scenic value, in addition to as a work of art. It also has high nature conservation and archaeological value. On the low hills to the west of Stornoway harbour, the wooded hillside and occasional glimpses of architectural features and monuments provide a scenic backdrop to approaches into the harbour, as well as from the eastern shore of the bay and the inner harbour. On landward approaches along the A858 and A859, the forested hills of the IGDL offer a scenic contrast to the largely treeless expanses of peat bog and moorland which makes up the landscape around Stornoway.

The present policies of the IGDL were established in the mid-nineteenth century when James Matheson began to build Lews Castle to replace the earlier Seaforth Lodge. The land north and west of the castle was enclosed and planted with trees to create a woodland park. Ornamental planting created a small pleasure ground south-west of the castle, and carriage drives were laid out throughout the estate. By the late nineteenth century, the woodland had been extended to the south of the castle, towards and around Gallows Hill and Cuddy Point. The carriage drives and woodland paths were also extended, eventually resulting in over 10 miles of drives and 5 miles of walks winding throughout the wooded estate.

In the 1920s, the castle and estate were gifted to the town of Stornoway as a public park, and in the 1950s Lews Castle became a college, with new school buildings constructed to the north-west of it. At present, the college is entirely housed within the buildings north-west of the castle. The ground floor of Lews Castle houses a museum and café, the other floors contain a number of self-catering holiday apartments and some rooms are available for hire as a venue for functions. Stornoway golf course occupies the northern end of the IGDL, and a large quarry has been established on the western edge. Approximately 135ha of the 280ha IGDL remains largely intact as a woodland estate, and the drives and footpaths are in public use as bike trails and scenic walking routes. The woodland elements of the estate, and the public paths, are largely confined to the south-eastern half of the IGDL on the hills and slopes overlooking the bay and harbour.

The seven Listed Buildings within the IGDL comprise buildings and monuments associated with the estate and the Matheson family. Lews Castle (LB18677) and the lodges, boundary walls, sea walls and tower near the harbour (LB19206) are all Category A-listed buildings. A memorial to James Matheson (LB19207) and the north-eastern driveway bridge (LB18826) are Category B-listed, and three Category C-listed buildings comprise Creed Lodge (LB18816) and Marybank Lodge (LB18827) and the north-western driveway bridge (LB18827). As well as their architectural, historic and associative interest, these buildings derive varying degrees of cultural significance from their setting within the estate. Together, they contribute to the architectural and scenic value of the IGDL.

Views within the IGDL are often relatively restricted by topography and woodland, giving an enclosed feel to the grounds, and providing a sense of seclusion and privacy. As the footpaths ascend the hills to the south of the IGDL, or descend towards the shoreline, the views open up and wide vistas are available across Stornoway to the east, and the inland landscape of Lewis to the west. This mixture of secluded woodland walks, glimpsed views and sudden wide vistas is typical of a nineteenth century designed landscape.

At present Arnish fabrication yard and the ISA are visible from around Lews Castle and to the south-west, from the summit of Gallows Hill and Buaile na Cuthaig, and in glimpsed views along the shoreline within the IGDL. However, the ISA is not a key focus of these views, but rather forms one element of the general view across Stornoway Bay and the land- and seascape beyond. Specific views of and towards Arnish are not considered to be a key characteristic contributing to the cultural significance of the IGDL.

The proposed development will be visible from certain points within the IGDL, but it will not obstruct or otherwise obscure the wide views out across Stornoway and the landscape beyond. Views from within the IGDL will be of a functioning harbour and its associated buildings, as they have been since the estate was established in 1844.

It will remain possible to appreciate and understand the cultural significance of the IGDL and its setting, as well as the significance of the buildings and monuments within it. Lews Castle and Lady Lever Park IGDL (GDL00263) will be subject to operational effects of negligible magnitude, resulting in impacts of **negligible significance**.

13.5.3.4.4 Conservation Area

Stornoway CA (CA137) encompasses the nineteenth-century planned town, the quays and the immediate grounds and gardens around Lews Castle. The CA includes 64 LBs within its boundaries (Table 13.4.5). As these buildings contribute to and share the setting characteristics of the CA, operational impacts upon the CA as a whole shall be assessed.

The Conservation Area Character Appraisal (CACA) (Bagshaw et al, 2005) defines three Character Areas within the CA. These comprise Area A – the harbour, town centre, and commercial centre (in the south-western part of the CA); Area B – the residential area and mixed uses (along the eastern half and northern edge of the CA), and Area C – Lews Castle and Grounds (in the western half of the CA). Those areas of Lews Castle and grounds that lie within the CA are also entirely within the Lews Castle and Lady Lever Park IGDL. Since this is discussed above, the assessment of operational impacts upon the CA will concentrate on Character Areas A and B.

Excluding those parts of the CA within the IGDL, approximately 60% of the remainder is within the ZTV of the proposed development and will be subject to potential operational impacts. This area extends south from Scotland Street and north-east towards Goathill Crescent (Figure 13.4.2, Volume 4).

The CACA characterises the setting of the CA as being defined by the geology that forms the harbour and Stornoway Bay. This topography has governed the historic development of the town as a fishing port and, increasingly and more recently, a recreational harbour. The quaysides strongly define the seaward side of the town, as they extend from Bayhead and the mouth of the River Creed south and south-east along the shoreline to the ferry terminal on Shell Street. On the landward side, the gridded street plan of the nineteenth century planned town is another strong characteristic of the CA. As the CACA notes, the layout of the town worked closely and successfully with the topography of the site. Later, mid-twentieth century expansion to the east and north-east of the town centre is beyond the boundary of the CA.

The CACA goes on to note a number of views and sightlines from within the CA that add to its character and contribute to the interest and cultural significance of the CA. The gridded street plan, overlying the sloping topography tends to restrict views to the short and middle distance. The longest views available from within the CA are along Francis Street and Church Street, towards Lews Castle and the forested slopes of the IGDL beyond the harbour. Views towards the proposed development from the centre of the CA and the town centre are restricted by intervening buildings. Closer to the town centre, the streets narrow, and views are restricted even further as eighteenth century burgage plots survive in the street plan.

Character Area A (harbour and town centre) is characterised by the variation between narrow eighteenth-century streets around the harbour and the more organised and wider streets of the nineteenth century grid east of Cromwell Street. Area B is characterised by the gently rising topography which takes Keith Street, Lewis Street and Matheson uphill and north away from the quayside. Towards the northern end of these streets, the houses and buildings become

larger and detached villas tend to predominate. Gardens and roadside trees give the northern end of the CA a leafier feel.

The proposed development will only be glimpsed from within the CA. It will not be a dominate or obvious feature in views from within Character Areas A or B. From the southern edge of the CA, the intervening buildings consisting of the quaysides, sheds and the ferry terminal will largely screen views towards Arnish. Views towards Arnish, where the fabrication yard sheds are clearly visible, are out across a busy modern harbour. Where buildings do not screen the views, the existing setting of the CA is characterised by marine traffic and activity. As a deep-water port, the proposed development (and the shipping that will use it) will reflect and complement this activity.

It will remain possible to appreciate and understand the character and cultural significance of the Stornoway CA as a planned town developed from an earlier fishing port. Stornoway CA (CA317) will be subject to operational effects of negligible magnitude, resulting in impacts of **negligible significance**.

13.5.4 Cumulative Assessment

Cumulative operational impacts are considered in cases where an effect of more than negligible significance has been predicted on the setting of a heritage asset because of the proposed development.

No heritage asset will be subject to operational impacts of greater than negligible significance, and therefore no cumulative effects will result.

13.6 Mitigation Measures

13.6.1 Construction Phase Mitigation

13.6.1.1 Offshore Mitigation

In accordance with paragraph 4.24 and 4.25 of the NMP (Scottish Government, 2015, Policy GEN 6 p21) it was proposed that a programme of survey and recording work be undertaken prior to the commencement of works to reduce **W1.** Following the recommendation of HES, this programme was to comprise a 'before and after' survey of **W1** to ensure that a suitable record was made of the wreck both before dismantling, and following completion of the works in order to inform any future management of the site and the surrounding area. The measured survey was also to be supplemented by video footage of the dive survey.

A 'before' reconnaissance survey of the *Alabama* was undertaken in March 2020 in accordance with a Method Statement produced by Leask Marine (Leask Marine, 2019). The survey was recorded in video footage and its purpose was to assess the current condition and extent of the wreck, and to determine how much of the wreck projects above -8m CD.

The 'after' survey work should also be preceded and accompanied by a Method Statement detailing the proposed scope and methodology of the surveys with regard to the archaeological elements of the wreck site.

The survey and subsequent recording will be undertaken in accordance with the 36 Rules governing the management of underwater cultural heritage assets contained in the MAUCH (UNESCO, 2013).

The results of the surveys and further research into the history of **W1** will be presented in a report, in accordance with paragraph 4.24 of the NMP, providing detailed information on the significance of the wreck, as well as recording and presenting evidence of that significance in a publicly accessible report. This adheres to the *'Obligation to Preserve Underwater Heritage'* and '*Training and Information Sharing'* principles of the UNESCO Convention on the Protection of the Underwater Cultural Heritage.

A Protocol for Archaeological Discovery will be put in place, such that appropriate steps are taken in event of an archaeological find during the construction process, this will align with The Crown Estates guidance, 'Offshore Renewables Protocol for Archaeological Discoveries'.

13.6.1.2 Onshore Mitigation

No construction effects of greater than **negligible significance** have been predicted upon any other heritage assets within the ISA.

The ISA is of negligible archaeological potential. According to the criteria outlined in Table 13.3.1, a direct construction impact on unknown heritage assets is highly unlikely. However, in accordance with Conditions 14 and 15 of the Planning Permission in Principle (PPiP, 19/00273) an archaeological watching brief, preceded by a Method Statement to be approved by the CnES Archaeologist, shall be undertaken during ground breaking construction works. The CnES Archaeologist shall also be granted access to inspect any construction works and to monitor the watching brief. Such method statement shall include:

a) *identification of the organisation or person(s) that would be employed to undertake the watching brief (including their archaeological qualifications);*
b) *provisions to be made to allow access to the development site and to enable investigation recording and recovery of finds; and*
c) *terms for notification of the commencement of development and access arrangements to the site.*

13.6.2 Operational Phase Mitigation

Cultural heritage assets within the ISA and OSA will not be subject to operational impacts of greater than negligible magnitude, and therefore no mitigation is proposed in respect of operational impacts upon them.

13.6.3 Monitoring and Enhancement

During the operational lifespan of the development, **W1** will be subject to inspection from a navigational safety perspective, the opportunity will be taken to record any changes to the wreck.

As discussed in Section 13.6.1. An archaeological watching brief shall be undertaken during onshore ground breaking construction works. This watching brief shall comply with Conditions 14 and 15 of the PPiP (19/00273).

No significant construction or operational impacts upon any other known cultural heritage assets are anticipated, and no mitigation or monitoring with respect to these is proposed.

13.7 Residual Effects

13.7.1 Construction Effects

The survey and recording work proposed with respect to **W1** will ensure the preservation and enhancement of the asset's cultural significance, this will reduce impacts to a negligible magnitude, resulting in a direct construction effect of negligible significance.

No other significant construction impacts are predicted, and no other heritage asset will be subject to operational impacts of greater than negligible significance.

13.7.2 Operational Effects

No mitigation is proposed with respect to operational impacts and therefore, residual effects will be of negligible significance.

13.8 Cumulative Effects

Cumulative operational impacts are considered in cases where an effect of more than negligible significance has been predicted on the setting of a heritage asset because of the proposed development.

No heritage asset will be subject to operational impacts of greater than negligible significance, and therefore no cumulative effects will result.

13.9 Summary

Following the application of mitigation measures, no heritage asset will be subject to operational impacts of greater than **negligible significance**, therefore effects upon the cultural heritage resource are not significant

No mitigation is proposed with respect to operational impacts.

Table 13.9.1: Summary of Effects

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Construction							
W1, undesignated wreck of the *Alabama*	Reduction in height and partial dismantling	Medium	Medium	Moderate: significant	Programme of survey and recording work accompanied by a report, in accordance with paragraph 4.24 of the NMP, the results of which will be presented in a publicly accessible report.	Negligible	Negligible: Non-significant
Unknown cultural heritage assets	Very low risk of direct construction impacts	Negligible	Negligible	Negligible: Non-significant	Implementation of archaeological watching brief in accordance with Conditions 14 and 15 of PPiP. Protocol for Archaelogical Discover in place for offshore finds.	Negligible	Negligible: Non-significant

Key

Significant Effect
Non-Significant

13.10 References

Stuart Bagshaw and Associates, 2005. *Stornoway Conservation Area Character Appraisal Document*

Canmore, 2020a. Alabama: Seid Rocks, Stornoway, Lewis, North Minch. *Website Accessed: 13th February 2020. https://canmore.org.uk/site/102827/alabama-seid-rocks-stornoway-lewis-north-minch*

Canmore, 2020b. Alabama. *Website Accessed: 13th February 2020.* https://canmore.org.uk/site/321418/alabama

CIfA, 2014. *Standard and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment*

CIfA, 2014 updated 2016. *Standard and guidance for historic environment desk-based assessment*

Comhairle nan Eilean Siar. (2018). *Outer Hebrides Local Development Plan 2018*.

HES, 2016. *Managing Change in the Historic Environment: Setting*

HES, 2019a. *Historic Environment Policy for Scotland*

HES, 2019b. *Historic Environment Scotland Circular*

HES, 2019c. *Designation Policy and Selection Guidance*

Leask Marine, 2019. *Method Statement: Alabama Wreck Survey*

Scottish Government, 2011. *Planning Advice Note 2/2011: Planning and Archaeology*

Scottish Government, 2014a. *Scottish Planning Policy*

Scottish Government, 2014b. *Our Place In Time: The Historic Environment Strategy for Scotland*

Scottish Government, 2015. *Scotland's National Marine Plan: A Single Framework for Managing our Seas*

SNH & HES, 2018. *Environmental Impact Assessment Handbook* (5th Edition)

UNESCO, 2013. *Manual for Activities directed at Underwater Cultural Heritage: Guidelines to the Annex of the UNESCO 2001 Convention*

13.11 Glossary

Acronym	Definition
AOD	Above Ordnance Datum
BNSAC	Brize Norton Sub Aqua Club
CA	Conservation Area
CACA	Conservation Area Character Appraisal
CD	Chart Datum
CIfA	Chartered Institute for Archaeologists
DPSG	Designation Policy and Selection Guidance
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
ES	Environmental Statement
GDPO	General Development Procedure Order
GDG	Gavin & Doherty Geosolutions Ltd
GIS	Geographic Information System
HA	Heritage Asset
HEPS	Historic Environment Policy for Scotland
HER	Historic Environment Record
HES	Historic Environment Scotland
IGDL	Inventory Garden and Designed Landscape
ISA	Inner Study Area
LB	Listed Building
MCHE	Managing Change in the Historic Environment
NCAP	National Collection of Aerial Photography
NRHE	National Record of the Historic Environment
OS	Ordnance Survey
OSA	Outer Study Area
PAN 2/2011	Planning Advice Note 2/2011: Planning and Archaeology
RCAHMS	Royal Commission on the Ancient and Historical Monuments of Scotland
SM	Scheduled Monument
SNH	Scottish Natural Heritage
SNMP	Scotland's National Marine Plan
SPP	Scottish Planning Policy
UNESCO	United Nations Educational, Scientific and Cultural Organization
WSI	Written Scheme of Investigation
ZTV	Zone of Theoretical Visibility

Chapter 14: Water Environment, Soils & Coastal Processes

STORNOWAY PORT AUTHORITY

Contents

14 Water Quality, Soils & Coastal Processes

14.1 Introduction

This chapter provides an assessment of effects on water quality, soils and coastal processes associated with the construction and operation of the Stornoway Deep Water Port (DWP). Mitigation measures to minimise effects are identified and potential cumulative impacts are discussed. It includes consideration of the project in terms of the Water Framework Directive (WFD).

14.1.1 Legislative Framework

14.1.1.1 Water Framework Directive

The Water Framework Directive's (2000/60/EC) primary purpose is to create a framework to protect groundwater, coastal waters, transitional and inland surface waters (European Parliament & Council, 2000). The framework details multiple aims which include:

- Prevention and protection of aquatic environments and enhancement of their ecosystem status in regard to the water needs of wetland and terrestrial ecosystems which rely upon aquatic environments;
- Enhancement of aquatic environments through the introduction of measures to reduce discharges, emissions, and losses of hazardous substances; and
- Continuation of progressive reduction of groundwater pollution and further prevention of its pollution.

Under the WFD, member states are to achieve "*good ecological status*" of their coastal, transitional, and inland waters. Protection and restoration of member states' ground waters to maintain the dependent surface water and terrestrial ecosystems are also required. In Scotland, the Water Environment and Water Services (Scotland) Act 2003 transposed the Directive into Scottish Law (Scottish Parliament, 2003).

The Directive also requires that classified waterbodies are given legal protection. In Scotland this was incorporated into law under the Environmental Liability (Scotland) Regulations 2009, making it an offence to adversely affect a classified waterbody so that its status or potential under the WFD is deteriorated (Scottish Parliament, 2009).

14.1.1.2 Bathing Water Directive (2006/7/EC)

The Bathing Water Directive 76/160/EC came into force in 1975 and is a further piece of European legislation that should be considered. The main objective of the directive is to protect public health and that of the aquatic environment including coastal and inland areas, which include rivers and lakes, from pollution. It placed a mandatory duty upon member states to conduct regular monitoring of designated bathing sites which must comply with specific standards set out within the Directive. In 2006 the Directive was revised (2006/7/EC), introducing higher standards but simplifying classifications of designated bathing sites by only considering two measurements (19 laboratory tests previously), intestinal enterococci and *Escherichia coli* (Mansilha et al., 2009). New compliance categories which included excellent, good, sufficient and poor were also introduced while placing a duty upon the member state

to ensure all bathing waters meet the criteria categorised as sufficient, in addition to taking action to increase numbers of designated sites to categories of excellent and good. In Scotland the revised Directive was transposed into law through the Bathing Waters (Sampling & Analysis) Direction 2008 and the Bathing Waters Regulations 2008 (The Scottish Goverment, 2010).

14.1.1.3 The Water Environment (Shellfish Water Protected Areas: Environmental Objectives etc.)(Scotland) Regulations 2013

The Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013 (Scottish Parliament, 2013a) identifies waters as 'shellfish water protected areas'. In 2016, 84 waters were identified under the order (Marine Scotland, 2016). Under the Shellfish Regulations, specific environmental objectives are placed upon the identified designated sites (Scottish Parliament, 2013b) with regular monitoring of the water quality conducted by the Scottish Environment Protection Agency (SEPA) (Marine Scotland, 2016).

14.1.1.4 The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (As Amended)

The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR) is intended to control activities which have the potential to cause pollution to the water environment. Such activities are controlled at three different levels depending on the potential risks. These are:

- General Binding Rules (GBRs) – cover low-risk activities for which there is no need to contact the Scottish Environment Protection Agency (SEPA). However, a person undertaking an activity controlled by the GBRs must abide by any rule in the Regulations which is applicable to the activity;
- Registration – also covers low-risk activities, but those which may cause a cumulative risk to the water environment. Such activities must be registered with SEPA, who may impose conditions but only so far as to describe the activity; and
- Licensing – for higher risk activities which require site-specific rules, or where constraints on an activity are required. Such activities will be regulated through a CAR license which must be sought through SEPA.

2017 amendments to CAR included the requirements for oil storage, previously provided for in the Water Environment (Oil Storage) (Scotland) Regulations. These requirements are now included as GBR.

It should be noted that CAR does not apply to activities licenced through the Marine (Scotland) Act 2010, hence CAR is only applicable to construction activities above Mean High Water Springs (MHWS).

14.2 Relevant Guidance

14.2.1 Peat Management

When considered as part of a carbon landscape, peat has a capacity to act as a carbon sink. The management of peat therefore has implications for carbon emissions and climate change. There is a substantial body of guidance regarding climate change and carbon which is relevant to the management of peat including:

- Scotland's National Peatland Plan Working for our future (SNH, 2015);
- Developments on Peatland: Site Surveys (Scottish Government, SNH, SEPA, & James Hutton Institute, 2010);
- Peatland Survey. Guidance on Developments on Peatland (Scottish Goverment, SNH, & SEPA., 2017);
- SEPA Regulatory Position Statement – Developments on Peat (SEPA, 2010);
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste Scottish Renewables, (Scottish Government, 2012);
- Floating Roads on Peat: A Report into Good Practice in Design, Construction and Use of Floating Roads in Peat with particular reference to Wind Farm Developments in Scotland (Forestry Civil Engineering, 2010); and
- Towards an assessment of the state of UK Peatlands (JNCC, 2011).

14.2.2 Additional Guidance

The following guidance documents are relevant and were utilised in the development of this Chapter:

- GPP 5: Works and maintenance in or near water (Environment and Heritage Service, SEPA, & Environment Agency, 2017);
- Guidance on Marine Non-Native Species (GreenBlue, 2010);
- Marine Biosecurity Planning: Guidance for Producing Site and Operation-Based Plans for Preventing the Introduction of Non-native Species (Payne, Cook, & Macleod, 2014);
- The Alien Invasive Species and the Oil and Gas Industry Guidance (IPIECA & OGP, 2010);
- Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission, 1990);
- Land Use Planning System SEPA Guidance Note 17: Marine Development and Marine Aquaculture Planning Guidance (SEPA, 2014).
- Scotland's National Peatland Plan Working for our future (SNH, 2015);
- Developments on Peatland: Site Surveys (Scottish Government, SNH, SEPA & The James Hutton Institute, 2010);
- Peatland Survey. Guidance on Developments on Peatland (Scottish Government, SNH & SEPA, 2017);
- SEPA Regulatory Position Statement – Developments on Peat (SEPA, 2010); and
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste Scottish Renewables, (Scottish Government, 2012).

14.3 Assessment Methodology

14.3.1 Baseline

A desk-based review has identified relevant baseline information with regards to water quality, geology and hydrogeology. This has been augmented by Ground Investigations on land and in the marine environment, and peat probes and cores have been taken to further understand the onshore ground conditions.

14.3.1.1 Offshore Ground Investigation

Three campaigns of offshore ground investigations were undertaken between 28th November 2017 and 12th February 2018, the 6th June and 6th July 2019 and the 21st January and 29th February 2020 by Causeway Geotech. The offshore ground investigations comprised marine cable percussion boreholes, boreholes with follow-on rotary coring in bedrock and in-situ testing of soils.

A total of 62 boreholes were put down with a minimum diameter of 150mm through soils and rock strata to their completion depths, by a combination of light cable percussion boring and rotary drilling. Samples were carried out in accordance with BS EN 22476-3:2005+A1:2011.

In-situ soil testing comprises of the determination of soil classification, compressibility, permeability, and shear strength. Each test was carried out in accordance with British Standard Institute BS 377: Methods of test for soils for civil engineering purposes.

In addition to geotechnical testing on soils, environmental samples for chemical testing in relation to disposal at sea parameters were also undertaken. Sampling was carried out in accordance with Marine Scotland's 'Pre-Disposal Sampling Guidance' (Marine Scotland, 2017).

14.3.1.2 Onshore Ground Investigation

The main onshore ground investigations were conducted between 8th August and 10th September 2018 by Causeway Geotech. The onshore ground investigations comprised rotary percussion/coring sampling methods, a machine dug trial-pit and Russian peat cores.

A total of 9 rotary cut boreholes were completed and core samples of the bedrock were recovered. The core was extracted in lengths up to 1.5m. The core was subsequently photographed and examined by a qualified and experienced Engineering Geologist, thus enabling the production of an engineering log in accordance with BS 5930: 2015: Code of practice for ground investigations (Causeway Geotech, 2019).

One trial pit was completed to a depth of 0.70m and a disturbed (bulk bag) sample was taken.

A Russian peat corer was used to determine the extent of peat deposits at six locations across the site area (Causeway Geotech, 2019). The peat cores were taken to depths ranging between 0.3-1.6m. When describing the peat deposits, the Von Post Humification Scale was used in conjunction with additional descriptive guidance as contained within the following document: *Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland, on-line version only.*

All disturbed samples from borehole logs, trial pits and peat cores were sent off for analyses to determine the bedrock of the area and the composition of the soils (Causeway Geotech, 2019).

14.3.1.3 Peat Investigations

The DWP site was assessed for peat vegetation through a desktop review of available maps and plans, a walkover by a hydrologist and a detailed mapping exercise using drone photography. Intrusive site investigations were also performed in the form of peat depth probing and coring.

Peat depth surveying was undertaken at site on a 20m grid across the land-based area of the DWP development along with an additional area to the west. The investigations were completed by Breedon Hebrides Ltd in two phases during 2018 and 2019 and comprised 376 peat probes.

As discussed in Section 14.3.1.2, Causeway Geotech's ground investigation included six Russian manual cores as presented within the Stornoway Deep Water Port-Stage 2 Land Ground Investigation report (Causeway Geotech, 2019).

Fluid Environmental Consulting completed a further 7 peat probes and 7 cores for peat depth verification purposes and to further examine the peat properties.

A further 223 probes were also undertaken by Wallace Stone in 2019 and 2020.

These activities combined in:

- The completion of 606 depth of penetration peat probes;
- Development of a depth of penetration map to indicate the maximum depth of probe penetration at all investigation points across the site (Figure 14.3.1);
- Development of an interpreted maximum depth of peat contour map using ArcGIS to indicate the potential peat depth based on the depth penetration probing results and verified by coring Figure;
- Examination of the variability of the depth of the acrotelm, the thickness of the catotelm and the thickness of amorphous peat;
- Calculation of the potential peat volumes that will be removed due to excavation for infrastructure based on the depth penetration probing results; and
- Examination of areas where peat could be reused to calculation of space available.

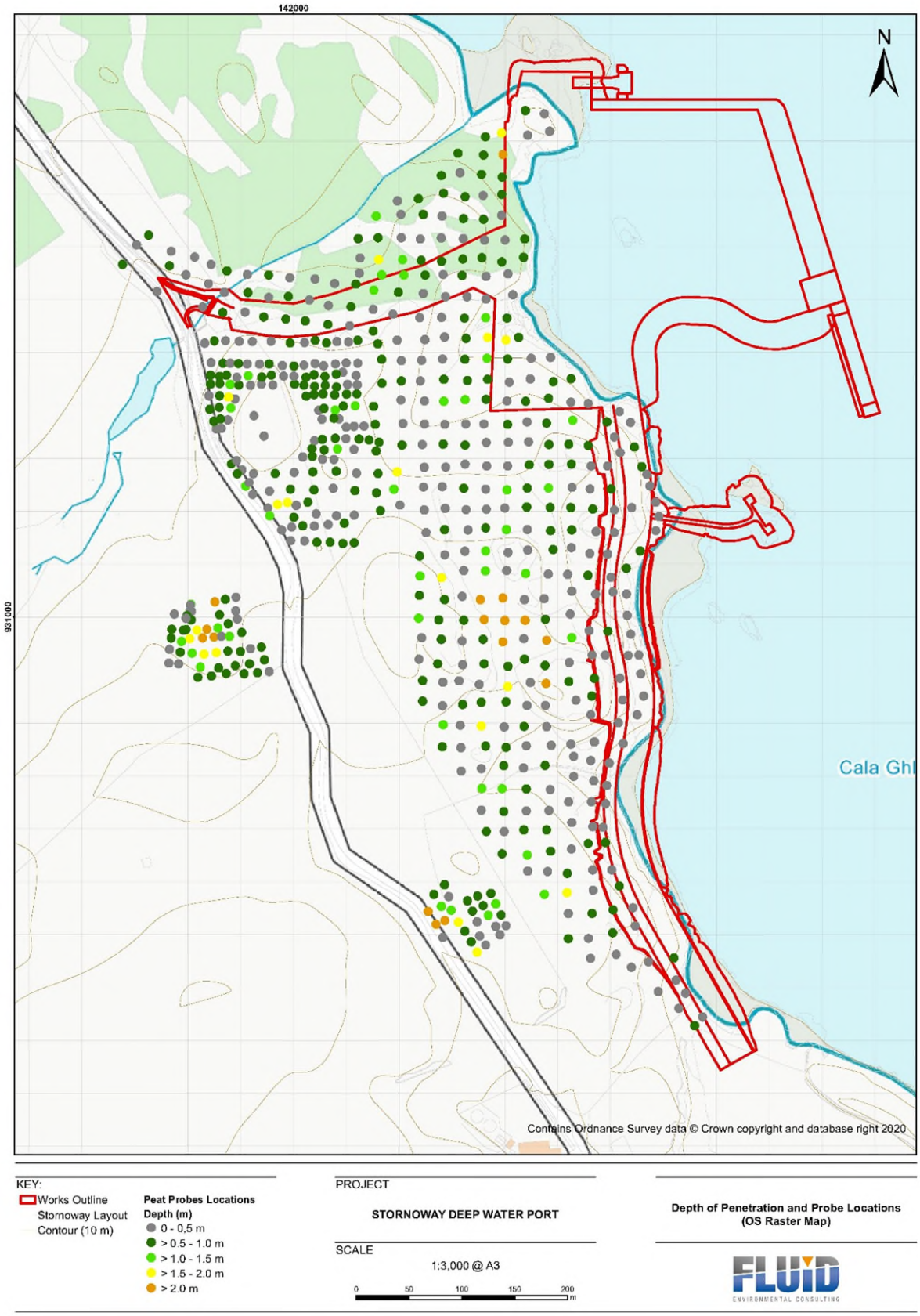

Figure 14.3.1: Peat Probe Locations

14.3.2 Impact Assessment Methodology

To inform the assessment modelling was utilised as detailed in Section 14.3.2.1. The assessment of impacts methodology outlined in Chapter 3: Methodology has been adapted to allow a risk-based approach to be utilised as detailed here.

14.3.2.1 Magnitude of Impact

To determine the risk associated with the construction and operational phases of the Stornoway DWP with regards to water quality, soils and coastal processes, a risk-based approach that uses probability and impact magnitude to determine the significance of the impact has been utilised. Table 14.3.1 provides levels of impact and examples of what would constitute these levels.

Table 14.3.1: Definitions of Magnitude of Impact

Magnitude of Impact	Examples of Impact Magnitude
High	Material change in water quality, soil health, coastal processes or flood risk. Characteristics may include: • Large increase/decrease in diffuse pollution levels. • Large increase/decrease in soil quality. • Ecological impact, increase/decrease in mortality figures. • Medium to long-term impacts on the coast. • Significant increase/decrease in flood risk.
Medium	Change in water quality, soil health, coastal processes or flood risk. Characteristics may include: • Moderate increase/decrease in soil quality. • Minor increase/decrease in diffuse pollution levels. • Measurable changes in water quality. • Minor harm to the ecosystem, increase/decrease in productivity. • Medium term reversible impacts on water quality or coast. • Minor increase/decrease flood risk.
Low	Small changes to the water quality, soil health, coastal processes or flood risk. Characteristics may include: • Localised increase/decrease in soil quality. • Increase/decrease in localised pollution levels. • Short term reversible impacts on water quality of coast. • No impacts on the ecosystem. • Minor localised increase/decrease in flood risk.

14.3.2.2 Likelihood of Impact Occurring

The likelihood of an impact occurring is also assessed. A qualitative approach is taken to predict the likelihood of an impact based on the probability of an impact occurring and professional judgement rather than data frequency. In this chapter, the likelihood categories are displayed in Table 14.3.2 with their definition.

Table 14.3.2: Likelihood Categories and their Definitions

Likelihood	Definition
Certain/near-Certain	> 1 in 1 year
Probable	< 1 in 1 year but > 1 in 10 years
Unlikely	< 1 in 10 years but > 1 in 100 years
Extremely Unlikely	< 1 in 100 years

14.3.2.3 Significance of Effect

The significance of effect is derived by considering the magnitude of the impact and probability of the impact occurring. Determination of whether the identified effect was categorised as significant or non-significant utilised the matrix set out in Table 14.3.3.

Table 14.3.3: Significance of Effects Matrix

Magnitude of Impact	Probability			
	Certain	Probable	Unlikely	Very Unlikely
High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible

Key

	Significant Effect
	Non-Significant Effect

14.3.2.4 Modelling

RPS were commissioned to carry out modelling, to understand effects of the development on the coastline and sedimentation. Coastal processes and sediment modelling utilised the MIKE coastal process modelling software developed by the Danish Hydraulic institute. The RPS modelling report is provided in Appendix N.1.

14.3.3 Identification and Assessment of Mitigation

The methodology utilised to assess the potential effects resulting from the development on the water quality of the area and the identification of mitigation is described in Chapter 3: Methodology.

14.3.4 Assessment of Residual Effects

Where mitigation has been identified, the magnitude and likelihood of the impact will be reassessed as per Table 14.3.1 and 14.3.2 and the overall significance of the effect reassessed in line with Table 14.3.3 to understand the resultant residual effect.

14.3.5 Water Framework Directive Assessment

In the absence of Scottish guidance, the Environment Agency's WFD Assessment guidance (Environmental Agency, 2017) was utilised where appropriate. As there is a potential for the DWP to give rise to potential impacts on water quality, an Environment Agency's WFD assessment scoping template was completed, to provide an understanding of the need for WFD assessment topic areas. The completed WFD scoping is provided in Appendix N.2.

Table 14.3.4 identifies the receptors and issues identified during the WFD scoping that require additional assessment. A number of the elements have been assessed in other chapters of the EIAR. These are sign posted in Table 14.3.4.

Table 14.3.4: WFD Issue Sign Posting to Where Considered

Receptor	Risk issue	Where Considered
Hydromorphology	Flood and Coastal Processes.	Considered within this Chapter.
Biology: fish	Underwater noise and sedimentation.	Chapter 11: Underwater noise predicts noise levels, effects on fish are considered in Chapter 8: Fish Ecology.
Water Quality	Loss of containment of contaminants during construction and operations.	Considered within this Chapter.
Non-Native Marine Species (NNMS)	Via ballast water and biofouling associated with equipment and vessels required for construction and operations.	The introduction of NNMS is considered in this chapter, the potential ecological effect is considered in Chapter 9: Benthic Ecology.

The Transitional and Coastal Morphological Impact Assessment System (TraC-MImAS) tool was utilised to inform the assessment of impacts within Section 14.5.3. TraC-MImAS has been developed by Scottish Environmental Protection Agency (SEPA) and is utilised by Marine Scotland when considering developments as a decision support tool. As stated in the 'How to Use' information:

The tool is not intended to be applied in isolation, and would be used to complement existing regulatory procedure. Similarly, the tool is not intended to replace expert judgement or existing impact assessments. The tool will complement these areas and provide risk-based guidance to inform regulatory decisions.

The model is based on the theory that each waterbody has a 'System Capacity' to absorb morphological alterations and that morphological status can be related to ecological status hence, the likelihood of degradation in morphological and ecological conditions increases as the system capacity is used up. Different pressures/ activities e.g. dredging, piling, land reclamation, give rise to different impact ratings. Hence an impact rating is assigned to a pressure based on; relevance, ecological and morphological sensitivity, likelihood, and the zone being impacted. Each of which is derived from a module within the model. The capacity used is then calculated utilising Equation 14.3.1, where n is the number of morphological alterations.

$$Capacity\ Used\ (\%) = \sum n \left(\frac{Impact\ rating\ x\ Footprint\ of\ morphologival\ alteration}{\frac{length}{area}\ of\ assessment\ unit} \right) x\ 100$$

Equation 14.3.1: Capacity Usage Calculation used in TraC-MImAS

Marine Scotland kindly provided the baseline information for the water body which the development details could be added to, to allow the model to be run.

As stated in the WFD, temporary effects due to short-duration activities like construction or maintenance do not count as deterioration if the water body would recover in a short time without any restoration measures. Therefore, the WFD assessment concentrates on permanent impacts associated with construction and operation.

The Joint Nature Conservation Committee's (JNCC's) Pressure-Activity Database (JNCC, 2018) has been utilised to identify potential impacts associated with construction and operational activities on the water environment. As shown in Table 14.3.4, the potential impacts are considered in the appropriate Chapters of this EIAR, hence the WFD provided in Section 14.5.3 synergising information from all the relevant chapters to give a comprehensive assessment.

14.4 Baseline

14.4.1 Seabed Geology

Causeway Geotech's interpretive report of the 2017 and 2018 Offshore Ground Investigation excluding the Appendixes is provided in Appendix N.3. As discussed in Section 6.2 of the report, four ground types were encountered:

- Recent Deposits: Very soft organic silts and sands to a maximum depth of 12m below ground level (bgl);
- Marine Sands and Gravel Deposits: Loose to medium density with low to medium cobble content, with pockets of firm sandy gravelly silts and clays throughout;
- Glacial Till: Sandy gravelly silty clay, frequently with low to medium cobble content, typically firm to stiff in upper horizons, becoming stiff to very stiff with increasing depth; and
- Bedrock (gneiss, metagabbro, amphibolite, dolerite, and pegmatite): Rockhead was encountered at depths ranging from 0.30mbgl (-10.13mCD) to a maximum depth of 51.10mbgl.

The interpretive report considered the borehole findings in terms of the original phased design plans. As highlighted in Section 7.2.1.1 the original design had constructability issue due to the variable ground conditions along the proposed line of the quay walls. The 2019 investigations were therefore commissioned to inform the revised design.

The 2019 offshore ground investigations were undertaken by Causeway Geotech and then interpreted by Gavin & Doherty Geosolutions Ltd (GDG), the main report from which without the attachments is provided as Appendix N.3. This provided additional information about the bedrock, which is mainly comprised of Stornoway Formation including Lewisian Complex which was formed 541 to 4000 million years ago (see Section 2.4 of the GDG report in Appendix N.3). The report confirmed the construction risks relating to settlement due to compressible soils. This information has informed the redesign of the DWP project.

The 2020 offshore ground investigation was targeted at understanding the conditions in the vicinity of the freight ferry berth. It identified that the conditions are suitable for the proposed construction techniques.

Particle Size Analyses (PSA) of sediment samples collected during the geotechnical survey indicated that the material in the dredge area was dominated by gravels. As detailed on the Pre-Dredge Sampling Results Form submitted in support of the dredge licence approximately 69.2% of the dredge area was made up of gravel substrates of varying sizes, followed by 26.4% being made up of sands, and 4.4% of material being composed of silts and clay.

The composition of the sediment at various depths below seabed level are considered in Table 14.4.1, based on the average sample analysis from the Pre-Dredge Sampling Results Form. The total solids content increases with depth as expected due to the compression of from the overlaying materials. Silt concentrations are highest at the surface across the dredge area.

Table 14.4.1: Average Particle Fraction at Depths Below Seabed

Sample depth (m)	Average Total solids (%)	Average Gravel (>2mm) (%)	Average Sand (>63µm <2mm) (%)	Average Silt (<63µm) (%)
0-0.5	81.94	68.78	23.20	8.02
0.5-1	88.43	75.27	21.82	2.94
1-1.5	89.65	62.64	32.40	4.98
1.5-2	86.61	60.09	37.22	2.72
2-2.5	86.80	72.90	23.20	3.90
3-3.5	92.90	66.89	32.88	0.27
3.5-4	92.73	86.67	12.59	0.76

Figure 14.4.1 provides a 'Box and Whisker' plot of the full borehole particle size data from the Pre-Dredge Sampling Results Form, showing the median (marked with a X), upper and lower quartiles (ends of the boxes) and the highest and lowest values measured (ends of the lines).

Figure 14.4.1 shows that the portions of sand and gravel present up to 3.5m below the existing seabed level are statistically very similar with significant overlaps in the boxes showing the upper and lower quartiles. There is an apart change to a higher gravel content for the deepest samples however, this is based on only 2 sample results.

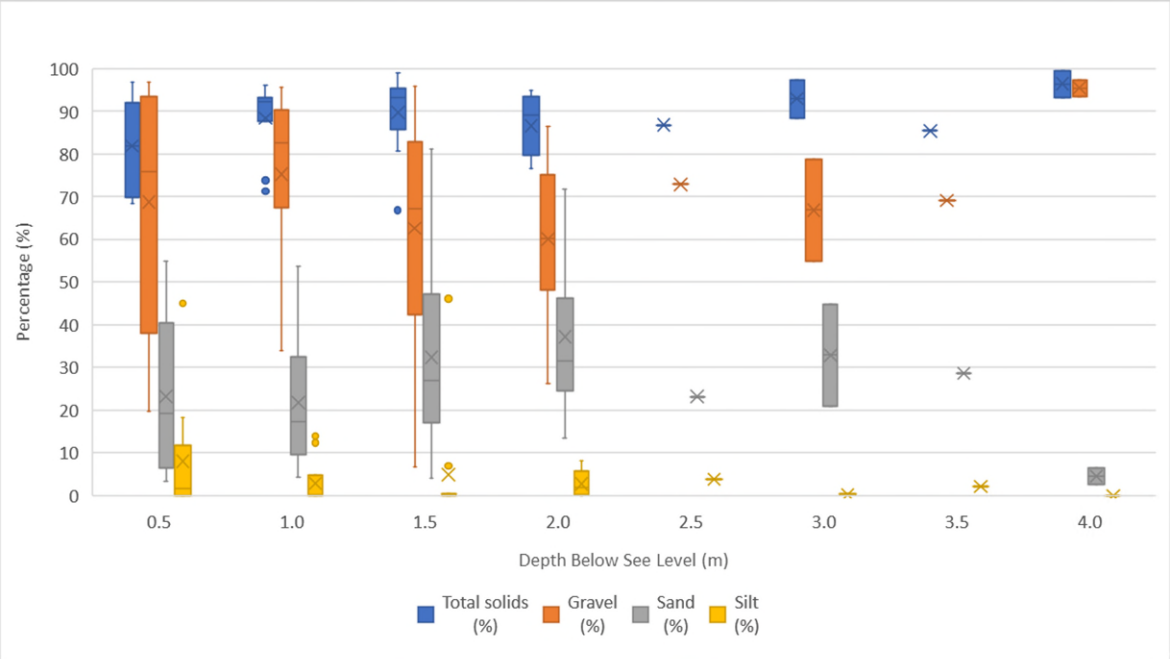

Figure 14.4.1: Box and Whisker Particle Size Fractions at Various Depths

14.4.2 Sediment Loading

Occurrence of sediment loading within the water column of aquatic bodies is a natural phenomenon due to the natural abundance of particulate matter, such as sands and minerals, with the levels of remobilised sediment fluctuating. Multiple combining factors result in naturally occurring increases of sediment loading, such as storms, which increase in frequency in winter months in the Scottish waters, resulting in remobilised sediment from the seabed entering the water column (Gohin, Bryère, & Griffiths, 2015; Schulz, Badewien, & Zielinski, 2015). The fluctuations of sediment loading levels are important to the marine ecosystem, as remobilised sediments influence primary production, heat transfer, sedimentation rates, and act as a natural cleansing cycle of the water column by attaching to some contaminates and dragging these down to the seabed, where they are buried over time (UKMMAS, 2010b). High levels of remobilised sediments can alter light penetration in the marine water column, impacting ecological process like photosynthesis and, over prolonged periods, can alter energy fluxes throughout the marine food web (Remy, Hillebrand, & Flöder, 2017).

Data on sediment loading levels in the Minch and Western Scotland is relatively scarce and fragmented to localised studies. Studies identified Suspended Particulate Matter concentrations in Western Scotland to be highly volatile and dependent on a range of physical forcing factors and seabed characteristics (UKMMAS, 2010a). Lighter sediment types like silt are more readily remobilised if disturbed and stay suspended over longer periods, allowing greater geographical dispersal. Heavier sediment types like sand require greater kinetic energy to be resuspended and, due to their greater mass, quickly fall back to the seabed, hence geographic spread is more limited (Jones, Bessell-Browne, Fisher, Klonowski, & Slivkoff, 2016).

Due to the predominantly coarse nature of the seabed in the dredge area (see Section 14.4.1), and the low energy within Stornoway Harbour, it is likely that any material suspended in the water column would drop out quickly and hence suspended solids in the water column will be very low.

14.4.3 Sediment Contaminants

To inform the condition of the marine sediment across the dredge areas, borehole samples were taken for chemical analysis. Samples from 17 boreholes were analysed with sample depths ranging from 0.5m to 4.0m. Sediment samples were tested for a suite of chemical parameters and were compared against Action Levels (AL) 1 and 2 which are prescribed by Marine Scotland in the Pre-Disposal Sampling Guidance (Marine Scotland, 2017).

As detailed in the Pre-Dredge Sampling Results Form submitted in support of the dredge licence, there are individual samples which exceed AL1's for specific elements and compounds, for metals these are:

- 7 samples above AL1 for Chromium;
- 1 sample above AL1 for Copper;
- 1 sample above AL1 for Mercury; and
- 6 samples above AL1 for Nickel.

However, none, of the samples exceed AL2 for any of the metals analysed, the average of the samples do not give rise to any exceedances of AL1 and as such metal contamination is not deemed and issue.

There are no exceedances on the Organohalogens.

Eight samples of one or more PAH species above AL1, however there are many naturally occurring PAH especially associated with peat, as the average results in the PR-Details tab of the Pre-Dredge Sampling Results Form shows not exceedances in PAH, the sediment is not considered to contaminated.

14.4.4 Waterbody Status

The Stornoway DWP development lies within the SEPA water quality monitoring zone of Stornoway Harbour (Waterbody ID: 200191). Stornoway Harbour is a coastal water body in the Scotland river basin district and is approximately 3.1km^2 in area and includes 13km of shoreline. The condition of the waterbody within this zone was categorised as 'good' overall in 2014, with the next assessment anticipated to review the status in 2021 (SEPA, 2020d). When the variables which contribute to status of the condition of the waterbody were broken down, it was identified that the degree of freedom from NNMS was classified as 'high', and water quality itself was classified as 'good' (SEPA, 2020a). Each of these classifications are required to be maintained in the long-term.

As stated in Section 8.4.2 of Chapter 8: Fish Ecology, the River Creed (Abhainn Ghrloda; Waterbody ID: 20753) is the primary watercourse which flows into Stornoway Harbour from the west, and is situated just north of the proposed Stornoway DWP development and Glumaig Bay. The River Creed is situated in the Lewis and Harris Coastal Catchment of the Scotland river basin district and the main stem of the river is approximately 18.1km long. This watercourse had a 'high' overall classification for waterbody condition, with a high overall ecology, biological elements, fish, fish barrier, hydromorphology and hydrology classifications (SEPA,

2020d). No information regarding the water classification of the River Glen could be found which flows into the northern tip of Stornoway Harbour.

The dredge spoil grounds lie in the Gob na Greige to Rubha Raerinis SEPA monitoring zone (Waterbody ID: 200188) and is 40.3km^2 in area. The zone lies just south of the Stornoway Harbour and in 2014 was classified as having an overall 'good' condition and chemical pass (SEPA, 2018). When the variables which contribute to status of the condition of the waterbody were broken down, it was identified that the physical condition of the waterbody had a 'high' quality status, the degree of freedom from NNMS was classified as 'high', and water quality itself was classified as 'good' (SEPA, 2020d). The next assessment anticipated to review the status is due in 2021.

14.4.5 Bathing Waters

No designated bathing waters are located in the vicinity of the proposed Stornoway DWP development (SEPA, 2020b). The nearest SEPA monitored bathing water is located 65km away at Achmelvich, on the west coast of mainland Scotland (Grid Reference: NC 0556 2494).

14.4.6 Shellfish Waters

Shellfish waters protected areas are locations in which waters are designated in line with the Shellfish Waters Directive (2006/113/EC) by the Scottish Government under The Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013. Waters in Shellfish waters are used for commercial shellfish cultivation and water quality in designated areas is regularly monitored by SEPA. The closest designated shellfish waters are situated approximately ~12km and ~14.5km by sea from the proposed development, respectively.

Loch Leurbost (Outer) is situated 12km away is bounded by lines drawn between NB 3700 2544 and NB 3700 2503 and between NB 3800 2476 and NB 3800 2404 extending to MHWS. Loch Leurbost is situated 10km away from the Stornoway spoil disposal ground. In 2018, this site was identified as having raised levels of shellfish toxins and harvesting was postponed until algal levels subsided (Health Protection Scotland, 2020).

Loch Erisort is situated 14.5km away from the proposed DWP and is bounded by lines drawn between NB 3642 2051, NB 3606 2136, NB 3675 2139, NB 3694 2142, NB 3794 2087, NB 3800 2055, NB 3786 2052, NB 3713 2062 extending to MHWS. The loch is situated ~12km away from the Stornoway spoil disposal ground. Between July 2014 and July 2016, this site had three short-term temporary closures due to raised levels of shellfish toxins and harvesting was postponed until algal levels subsided. Since the last temporary closure in July 2016, Loch Erisort has been fully operational for aquaculture activities (Aquaculture Scotland, 2020).

14.4.7 Non-Native Marine Species (NNMS)

Although the Western Isles is considered a suitable habitat for Wireweed (*Sargassum muticum*), Green sea-fingers (*Codium fragile subsp. Tomentosoides),* Japanese skeleton shrimp *(Caprella mutica),* and Leathery sea squirt *(Styela clava),* no non-native invasive marine species were highlighted as present in the data review or recorded during the benthic survey (Ocean Ecology, 2020) as noted in Section 9.4.3 in Chapter 9: Benthic Ecology.

The benthic assessment undertaken and described in Chapter 9: Benthic Ecology identified PMF habitats, '*Laminaria saccharina* and red seaweeds on infralittoral sediments' to be present within the proposed dredge area by the video transect surveys along with Kelp and seaweed

communities. Kelp and seaweed communities, although widespread globally, are not considered to be invasive in Scottish waters. Moreover, the review of photographs taken during a dive inspection of the wreck of the Alabama (Chapter 13: Cultural Heritage & Archaeology), identified sea squirt species present on the wreck. This fauna were inspected by a benthic ecologist and were not identified as species of particular conservation importance or being NNMS.

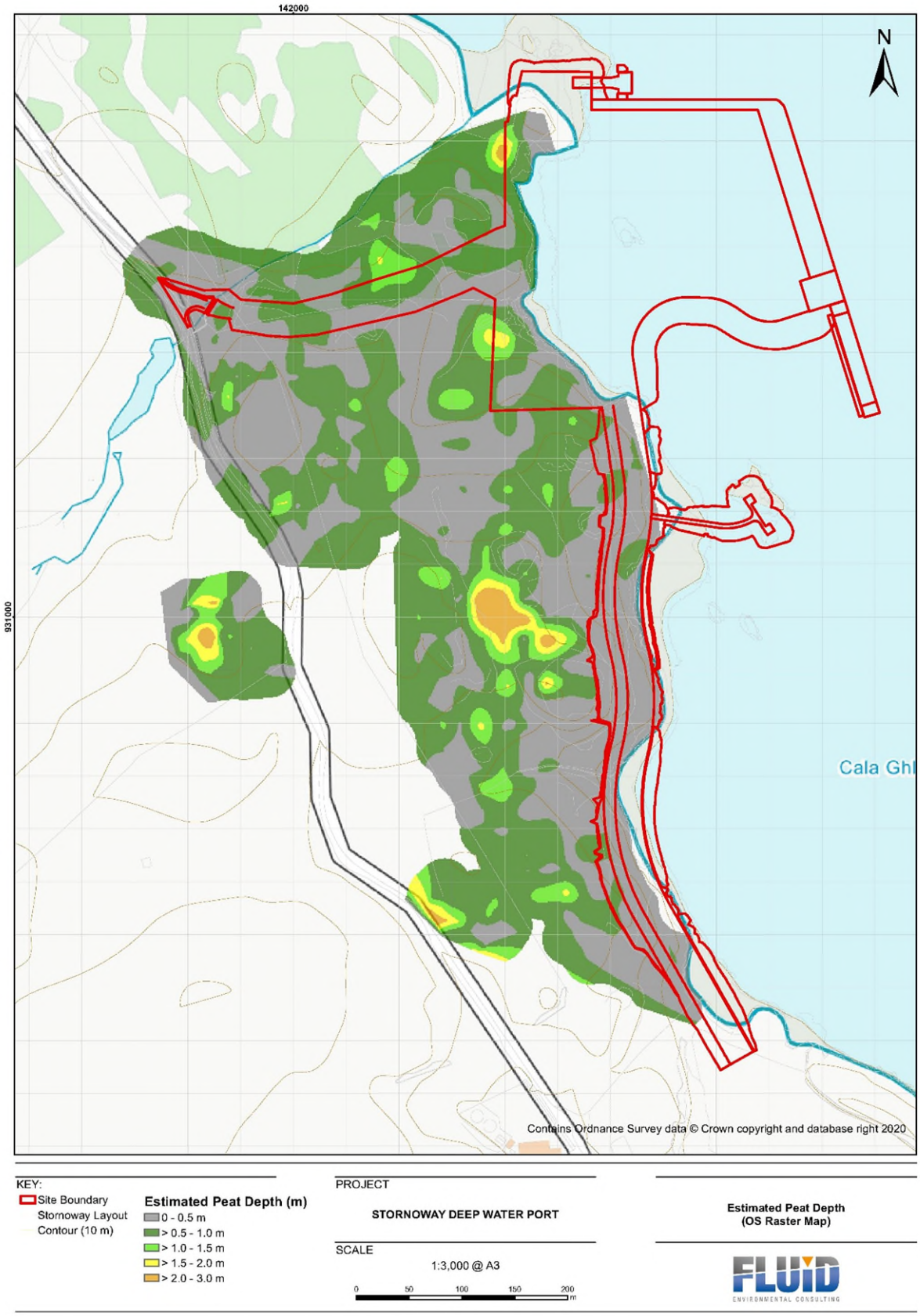

Figure 14.4.1: Peat Contour Map

14.4.8 Drainage

There is currently no man-made drainage at the site of the development. At present surface water discharges naturally into the watercourses already present in the vicinity of the development, flowing downhill towards the sea. The largest stream is Allt Poll a Choire to the northern end of the site, which drains a lochan, to the west of the Arnish access road. There are 3 further streams running off the hillside on the route of the Link Road.

14.4.9 Coastal Processes

The outer reaches of the Stornoway Harbour are open to The Minches and thus tidal and wave regimes are characteristic of open sea. However, modelling of wave regimes within Stornoway Harbour signifies that waves penetrating into the harbour area from the Minch would not affect the wave climate surrounding the DWP development in Glumaig Bay. The DWP would most likely be exposed to waves from local fetches arriving from the northeast as opposed to those from the east or southeast. Moreover, the tidal currents within Stornoway harbour are generally weak and do not tend to exceed 0.1m/s (RPS, 2020).

14.4.10 Flood Risk

SEPA provided flood levels for Stornoway based on the Flood Risk Management Plan for each local district under the Outer Hebrides Local Development Plan (LDP). It was identified that Stornoway was at risk to impacts of flooding predominantly as a result of coastal influences (75% of total impact) (SEPA, 2020c), resulting in high risk of coastal flooding (SEPA, 2020a). The Potentially Vulnerable Area (PVA) is located in the east of the Isle of Lewis which extends from Stornoway across the Eye Peninsula and covers an area of approximately 57km^2. The EA/SEPA database for the UK's Coastal Design Sea Levels indicates that by the year 2100, the projected sea level is anticipated to increase by 0.89 metres.

Review of SEPA Flood Risk maps indicated that the Stornoway DWP development lies within the medium to high flood risk category. The 1-in-200 year flood event anticipates a sea level rise of 3.4m above ordnance datum (AOD) in this area.

14.4.11 Geology

Causeway Geotech's interpretive report of the Onshore Ground Investigation excluding the Appendixes is provided in Appendix N.4. The onshore ground investigation boreholes encountered topsoil's 100-200mm in depth, recent deposits (peat) to depths of up to 1.5mbgl. Rock head was encountered at depths ranging from 0.3mbgl to 1.5mbgl. The bedrock included five main rock types these were: Gneiss, Metadiorite, Metadolerite, Metagabbro, and Metapegmatite. The rocks were subject to a variety of texts to understand their suitability for use in the development.

14.4.12 Peat

Peat probing of the development area has been carried out to identify areas of peat that may need to be removed, see Figure 14.3.1. The depth of penetration probing indicated the presence of peat across 52% of locations (probe depth greater than 0.5m) and organic soils or soft mineral soil rather than peat deposits in about 48% of probe locations. 236 probes (38.9%) recorded depths of penetration between >0.5m and 1.0m and 77 probes (12.7%) recorded depths of penetration >1.0m. The average depth of penetration across the entire probed area based on all probes undertaken was 0.72m. Fluid Environmental Consulting have interpreted the peat probe data to provide a peat contour map (Figure 14.4.1).

Inspection of the subsurface formation extracted in a total of 12 cores generally indicated the presence of organic soils where probe penetration depths were shallow (up to 0.5 m depth) and peat with a thin layer of acrotelm where probe penetration depths were over 0.5m depth. These formations are overlying either mineral rich soils or bedrock. An average acrotelm thickness of 0.06m has been estimated based on the samples taken.

Five of the 12 cores encountered peat (organic material in excess of 0.5m depth), with three of these identifying an acrotelm layer (fibrous material present) of thickness 0.06m, 0.08m and 0.60 m. The results of the second set of coring, including organic material depths that do not qualify as peat, indicate a more uniform range, of 0.04m to 0.08m with an estimated average thickness of 0.06 m which is considered to be more representative across the site.

Catotelm peat was encountered in all of the 5 cores with peat depths of 0.5m or greater. The thickness of the catotelm layer varied between 0.4m and 1.3m.

14.4.13 Contaminated Land

The onshore areas are undeveloped, and as such are not expected to be contaminated. No signs of contamination (visual or odour) were observed during the ground investigation, as such it is assumed that no contaminated land is present.

14.5 Impact Assessment

14.5.1 Construction

14.5.1.1 Increased Sediment Loading

Dredging, dredge disposal, placement of infill material and surface water run off all have the potential to increase sediments in the water column. This can cause increased sediment loading and can have negative effects on ecological receptors (see Ecology Chapters 7-9). In the case of dredging, sediments are in the water column primarily because they have been 'dropped' into it. As such they are passing down through the water column, hence, are not strictly speaking suspended solids.

Suspended solids are small solid particles which remain in suspension in the water as they are colloidal; particles which are so small that gravity doesn't cause them to settle out, or particles which remain in suspension due to the motion of the water.

Alternatively, sediments can be temporarily suspended in the water column due to agitation caused by works and drop out of suspension when agitation ceases. There may be a small proportion of sediments that are suspended due to their size, but this is unlikely to be the bulk of material. As such the terminology utilised throughout this chapter and the Ecology Chapters 7-9, refers to increased sediments in the water column to cover all aspects.

SEPA requires that any dredging activity takes place out with the bathing water season if there are bathing waters within 2km of the development. As there are no bathing waters in the vicinity of the development, no impacts on bathing waters will occur.

As discussed in Section 14.4.3, seabed sediment analysis shows that the sediments are not contaminated, as such remobilisation of contamination associated with dredging is not a concern and hence is not considered further.

Dredging

As discussed in Chapter 2: Project Description, the area around the main quay, and the approaches to it, require to be dredged to a depth of 10 metres below CD, to accommodate the large vessels which will be using the DWP. The dredge volume is estimated to be approximately 500,000m^3, and it is expected that over 90% will be re-used as infill material in the land reclamation (see Section 2.5.5 of Chapter 2). Marine boreholes have confirmed that the dredge area is all in sand and gravel deposits with a low silt content, and that no blasting will be required. Up to 50,000m^3 of unsuitable material may require to be deposited at the Stornoway dredge disposal site nearby.

RPS have modelled the dredge plumes arising from dredging utilising a cutter suction dredger (Section 7.1 to 7.3 of Appendix N.1), as this is deemed to give rise to higher levels of sediments in the water column than a backhoe dredger as explained in Section 7.2.2 of Appendix N.1. The sediment plume will be created due to losses around the cutter head and overspill of water used to pump the dredged sediment ashore into the quay area. The sediment plume will move about due to the tidal currents and the location of the dredger. A maximum value envelope of the total suspended sediment concentrations associated with an 80 day dredge model simulation are shown in Figure 7.5 of Appendix N.1. The peak value increase in suspended sediment concentration is less than 60mg/l outside the dredge area at all times during dredge operations. With values dropping rapidly with distance from the dredge area. The mean increase in total suspended sediment concentrations is less than 10mg/l away from the immediate area of the proposed DWP development (Figure 7.6 of Appendix N.1). Figure 7.7 of Appendix N.1 shows that the deposition of sediments associated with dredging will also be localised.

Disturbance of the seabed sediments due to dredging will result in **certain** sediment loading of the water column. However, the increases in sediment in the water column identified by the model are small and confined primarily to the immediate vicinity of the works and will drop out within Glumaig Harbour. As such the potential effect on water quality is assess as having a **low**, **short-term**, **reversible** magnitude of impact, giving rise to a **minor: non-significant** effect.

Dredge Disposal

Dredged spoil disposal will take place at the Stornoway designated disposal site (HE035), located south of Arnish point off the Isle of Lewis coast. Dredge disposal will be from the dredge vessel or barges via bottom opening doors. These allow materials to drop directly from the bottom of the vessel hopper/barge into the water, minimising the energy associated with the drop, as well as the duration of the disposal. It is assumed that up to 10% of the dredged material will not be suitable for reuse and as such will be disposed of at sea.

RPS have completed modelling of the dredge disposal suspended sediment plume (see Section 7.4 of Appendix N.1). The highest maximum and mean levels of suspended sediment concentrations occur in the dredge disposal area and its immediate vicinity as would be expected. Figure 7.10 of Appendix N.1 shows that the peak value of suspended sediment concentrations outside the dredged area is around 60mg/l, while Figure 7.11 shows the mean value is generally less than 18mg/l.

Deposition depths of material lost to the water column during the dredge operations area generally less than 1mm as shown in Figure 7.12 of Appendix N.1.

Due to the very localised temporary nature of the **certain** increased sediment loading resulting from spoil disposals, the magnitude of impact is assessed as **low, short term,** and **reversible,** giving rise to a **minor: non-significant** effect.

Land Reclamation

The project description in Chapter 2 highlights that an area of around 7 hectares will be created to provide a multi-user Reclaimed/Levelled Area. The combination walls associated with the main quay and the freight ferry berth will retain infill material to the east and north of the land reclamation area. The remaining perimeter of the land reclamation will be formed by rock bunds, utilising the material won from the rock cut. The placement of rock on the seabed, may cause very localised disturbance of the sediments which can in theory increase the sediment loading in the water column, this effect is negligible and short lived and hence considered to be of **no-change** in water quality terms.

Once the land reclamation area perimeter is created, infilling will start, utilising all suitable dredge material, and some of the rock won from the levelling works. As the infill area is not hydraulically isolated from the sea it will be full of water as infilling starts. Hence the water from the infill area will be displaced. The water will slowly flow out through the perimeter rock armour, however it may at some points also overtop the rock armour. To control the water levels in the infill area while ensuring adequate settling time for infill materials, it is likely that a weir system will be utilised.

As the exact sequencing and construction techniques are still to be defined, it is pessimistically assumed that there is a **probable** likelihood that small quantities of sediments will escape during infilling giving rise to an **adverse, low, reversible** magnitude of impact associated with localised increases in sediments in the water column which will have a **minor: non-significant** effect.

Surface Water Run Off

Onshore soil stripping will give rise to bare ground and exposed soils and the need to store removed materials, which when surface water runs over them will pick up solids creating silty water which can run into watercourses and out to sea. Silty water can cause deoxygenation, affect photosynthesis and lead to siltation in watercourses, all of which can have knock on ecological effects. The main risks arise during the construction of the Access Road at the junction end of the road where silty surface water could run directly in to the Allt Poll a Choire, and the Link Road where silty water could enter the streams. The creation of the levelled area is another source of silty water, however this will drain into the land reclamation area, where it will settle out and hence no affect the water quality of Glumaig Harbour.

As discussed in Chapter 2: Project Description, the design utilises a Sustainable urban Drainage System (SuDS) approach to surface water management including the use of swales (CIRIA, 2015). Once created they will aid in removing silts for surface waters, however at early stages of the works these will not be in place and temporary measures will be required. Without temporary measures (secondary mitigation) in place, silty water will have **probable** likelihood

of entering courses, this will reduce water quality in the short-term however, the streams will recover overtime and silt is washed out hence the magnitude of impact is **low** giving rise to a **minor: non-significant** effect.

14.5.1.2 Potential Loss of Containment

A number of potential pollution sources will be present on the construction site and on vessels utilised in the construction process, including:

- Fuel oil/diesel associated with construction plant, vessels and vehicles;
- Hydraulic fluids and oils associated with construction plant and vessels;
- Concrete; and
- Cement wash.

Materials will be appropriately stored and handled as discussed Section 14.6.13. However, if a loss of containment were to happen then there could be harm caused to the environment. As such the risk of pollution impacts on water quality are assessed in Table 14.5.1. It utilises the source, pathway, receptor model with Glumaig Harbour and Stornoway Harbour being the receptors considered in this chapter. Effects on other receptors are considered within the Ecology Chapters 7 to 9.

Refuelling of vessels is part of normal operations at the Stornoway Harbour and is covered under the Stornoway Port Authority's (SPA) existing procedures, and pollution management plans. As such, this activity is not a change to baseline and hence will not be considered further for the DWP.

The SPA already has in place procedures for oil spill response. This mitigates the risk posed by an accidental spill.

Table 14.5.1: Loss of Containment Impact Assessment

Source	Scenario	Pathway	Probability	Impact Magnitude	Impact Significance
Fuel Storage Bowser (20m^3 of Diesel)	Loss of full containment.	Spillage to ground potential to reach water.	**Unlikely** Oil will be stored in line with the CAR GBR's hence loss of all 20m^3 is unlikely.	**Medium** Medium term reversible impacts on water quality.	**Minor: Non-Significant**
Refuelling Activities	Loss of full containment during refuelling (<20l).	Spillage to ground potential to reach water. Or directly to water from marine plant.	**Likely** Multiple refuelling activities carried out, increasing probability of human error.	**Low** Short term localised reversible impacts on water quality.	**Minor: Non-Significant**

Source	Scenario	Pathway	Probability	Impact Magnitude	Impact Significance
Vehicles or Plant	Accidental damage to fuel tank, loss of contents (<100l)	Spillage to ground with potential to reach water.	**Unlikely** Appropriately trained and certified drivers / operators. Banksmen in place when reversing or carrying out manoeuvres.	**Low** Short term localised reversible impacts on water quality.	**Minor: Non-Significant**
Plant – Hydraulic Fluids	Loss of hydraulic fluid, due to pipe burst.	Spillage to ground with potential to reach water. Or directly to water from marine plant.	**Highly Likely** Hydraulic pipes fail from time to time.	**Low** Short term localised reversible impacts on water quality.	**Minor: Non-Significant**
COSHH Store: Hydraulic Fluids, Maintenance Oils, Chemicals.	Loss of containment during handling etc. of hydraulic fluids, maintenance oils, chemicals, will all be small volumes of 5l to 200l.	Spillage to ground with potential to reach water. Or directly to water from marine plant.	**Unlikely** Appropriate storage and usage of materials in line with COSHH assessments.	**Low** Short term localised reversible impacts on water quality.	**Minor: Non-Significant**
Large Vessel e.g. Dredger	Accidental damage to fuel tank of dredging vessels and loss of contents (<500m^3).	Spillage directly to water.	**Very Unlikely** Masters of the vessels will be appropriately trained. The cutter suction hopper dredger should not be working near submerged structures.	**High** Significant decrease in diffuse pollution levels.	**Minor: Non-Significant**

Source	Scenario	Pathway	Probability	Impact Magnitude	Impact Significance
Workboat	Accidental damage to fuel tank resulting in loss of contents (<10m^3). For example, while manoeuvring around the construction site.	Spillage directly to water.	**Unlikely** Masters of the vessels will be appropriately trained. Aware of any underwater obstacles associated with the construction site (re part completed revetments).	**Medium** Medium term reversible impacts on water quality.	**Minor: Non-Significant**
Cement and Cement Wash Outs	Loss or cement during pours (especially over water) Loss of containment of cement washing.	Spillage directly to sea or overland and into water.	**Unlikely** Cement pours and wash out are normal construction practices. Sealing of shuttering and best construction practice regarding washouts reduce probability.	**Low** High pH associated with cement and sedimentation. However, seawater will buffer pH and cement will drop out. Hence localised reversible impacts.	**Negligible: Non-significant**

14.5.1.3 Introduction of Non-Native Marine Species (NNMS)

The introduction of NNMS has the potential to result in severe ecological impacts which, in turn, can result in major costs due to the difficulty in trying to eradicate a species once it has been introduced. The vector with the greatest risk of introducing NNMS associated with the Stornoway DWP development is the vessels associated with the construction phase. Vessels travelling from already contaminated ports and harbours, or different ecoregions, can transport NNMS via their ballast water and, to a more limited extent, through biofouling (marine growth) on hulls (Yang et al., 2018). There is also the potential that other equipment could introduce NNMS via sediment trapped in the equipment from previous deployments.

The duration of an introduction of NNMS is considered to be long-term to permanent, due to the difficulties in eradicating an NNMS once it is established. As such, the magnitude of impact resulting from the introduction of an NNMS is assessed as **high.** Ecological impacts of NNMS introduction are specifically considered in Chapter 8: Fish Ecology and Chapter 9: Benthic Ecology.

With regard to the potential for the introduction of NNMS via vessel ballast water, the International Maritime Organisation (IMO) ratified the International Convention for the Control and Management of Ships' Ballast Water and Sediments Management (Ballast Water Management (BWM) Convention) in September 2017. This requires all commercial vessels to adopt an approved ballast water management plan, involving either the exchange of ballast water outwith coastal waters, or the treatment of ballast water to denature potential NNMS. The developer will require that all vessels employed to facilitate the construction of Stornoway DWP development are fully IMO compliant, including the BWM Convention. As such, the ballast water source for NNMS is effectively removed. The probability of NNMS being introduced is therefore assessed as **very unlikely**, resulting in a **minor: non-significant** effect.

Implementation of the BWM Convention does not mitigate the risk of an NNMS being introduced via biofouling on a vessel. However, this source is considered to carry a lower risk of NNMS introduction than ballast water. The vessels required for the DWP are limited to dredging vessels, work boats, piling barge and a small number of deliveries. Therefore, the probability of NNMS introduction occurring through biofouling of vessels is assessed as **very unlikely**, and the resulting effect is **minor: non-significant**.

The probability of NNMS being introduced via sediments trapped in equipment mobilised to facilitate the construction phase is considered to be **unlikely**. This is due to the fact that the sediment which could act as a source are likely to dry during transit to site, greatly reducing the probability of an NNMS surviving the transit to the development site. The resultant effect is therefore assessed as **minor: non-significant**.

14.5.1.4 Litter

Waste arising during construction may include various materials, such as wood utilised for shuttering, off-cuts of rebar metals and packaging materials associated with both the construction works and the welfare facilities. Where the waste streams are not appropriately managed, they may enter the marine environment and give rise to marine litter.

Marine litter poses a variety of short and long term adverse environmental impacts such as loss of biodiversity and degradation of ecosystem function (Potts & Hastings, 2011). Marine litter of lesser bio or photodegradability, in particular plastics, also provide dispersal opportunities for NNMS (Potts & Hastings, 2011).

Appropriate waste segregation and receptacles will be provided on the construction site to allow the waste hierarchy to be implemented. The likelihood of litter reaching the marine environment without secondary mitigation is assessed as **probable**. The quantities will be small; hence the impact magnitude is deemed to be **low**. Litter could include plastics; hence the effects are **long-term**, constituting to a **minor: non-significant** effect.

14.5.1.5 Level Platform Creation

To create the levelled platform and to win rock for the construction works, an area of hillside will be removed utilising blasting techniques. As discussed in Section 14.4.11 the rocks to be removed include Gneiss, Metadiorite, Metadolerite, Metagabbro and Metapegmatite. The rock removal is **certain** and permanent and will reduce the land quality, however the effect is very localised hence the magnitude of impact is **adverse low** giving rise to a **minor: non-significant** effect.

14.5.1.6 Peat Removal

To make way for the development peat will need to be cleared from the footprint of the onshore construction areas, and around the some of the perimeter of the working areas to facilitate the installation of drainage and to ensure stable slopes angles are achieved. It is estimated that approximately of 6,900m^2 of peat needs to be removed. The intent is however to reuse the peat within the vicinity of the development. In EIA terms the reuse of peat is secondary mitigation and as such for the purpose of initial impact assessment cannot be taken account of. The removal of peat will give rise to an **adverse medium** magnitude of impact due to the impacts on soil quality of the area, the likelihood is **certain** hence giving rise to an **adverse moderate: significant** effect.

The habitat effects of peat removal including the effects on habitat left in situ are considered in Chapter 10: Terrestrial Ecology and hence are not considered here.

14.5.2 Operations

14.5.2.1 Surface Water

The hard-standing areas including those adjacent to the quays on the Reclaimed/Levelled Area, and the Access and Link roads, will give rise to surface water run-off. Rainwater falling on the permeable areas of the Reclaimed/Levelled Area will percolate down through the land.

Reclaimed/Levelled Area

The proposed drainage scheme for the Reclaimed/Levelled Area is shown in Drawing SDWP-WS2139-XX-03-DR-C-9023. The intent is to utilise channel drains and gully drains, to route surface water into one of the two drainage systems, one for the Main Quay and eastern side of the development and one for the Freight Ferry Berth, the Marshalling Area and the Services Compound. The Class 1 oil interceptors will facilitate the removal of oils and solids. The outfalls are located in the north west and north east corners of the Reclaimed/Levelled Area and will be located near the high-water level to prevent them becoming tide locked, and to reduce the severity of exposure to seawater.

The discharge of surface water is of a scale that will fall under the GBR's of The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). As such, compliance with GBR10(a), 11 and 21 will be ensured such that there will be no degradation in water quality of the Stornoway Harbour from the development. The overall effect on water quality is identified as **no change**.

Access & Link Road Swales

The access road utilises swales in line with the Sustainable Urban Drainage System (SuDS) Manual: CIRIA 753. The swales will be located on both sides of the road, with the most westerly section of the road up to around chainage 100m (see Drawing SDWP-WS2139-XX-01-DR-C-0051) draining west towards the Allt Poll a Choire. The remainder of the road swales will flow towards the sea down the road. Check dams are proposed in the roadside swales to limit velocities and for erosion potential.

The swales will provide a single level of treatment before discharge to sea. This single level of treatment will be appropriate for low-level pollution indices associated with access and link road use. Open bottom culverts will be utilised where the roads cross watercourses. The resultant discharge will therefore give rise to **no change** in water quality.

14.5.2.2 Foul Drainage

The public sewage network is approximately 3km from the DWP, hence it is assumed that local foul drainage arrangements will need to be made, to accommodate foul drainage arising from welfare facilities and any other buildings which may be constructed on the DWP. A package wastewater treatment plant will be utilised to treat wastewaters prior to discharge to sea. The size and details of the plant developed during detailed design will be aligned to the predicted demand and the requirements of the CAR.

The foul effluent from these facilities will be discharged to sea. As the effluent will have been treated before discharge, the effects on water quality are **unlikely,** if they do occur, they will have a **low adverse reversible** magnitude of impact, giving rise to a **negligible: non-significant** effect.

14.5.2.3 Flooding

As discussed in Section 14.4.10, the 1-in-200-year flood event anticipates a sea level rise of 3.4m above ordnance datum (AOD) in this area. This has been taken account of in the design process with the quays and Reclamation/Levelled area being at +7.5m Chart Datum which is 4.79m AOD, 1.39m above the 1-in-200-year flood level. Hence, the development is unlikely to flood.

RPS considered the effects of the development on the wider Stornoway Harbour Area in terms of the tidal level difference. As shown in Figures 5.7 and 5.8 of Appendix N.1, the change is that surface elevations are between 3mm and 9mm, which in the context of predicted sea level rises of 890mm by the year 2100, (see Section 14.4.10) is deemed to be of **no change.**

14.5.2.4 Coastal Processes

The dredging and land reclamation works as part of the construction of the Stornoway DWP has the potential to alter the wave and tidal climate, wave directions and geomorphological processes within Stornoway harbour.

Within Stornoway harbour, the proposed dredging works will result in lowering the seabed levels to -10.0m CD. Wave modelling completed by RPS and provided in Section 6 of Appendix N.1, considered storms from the southeast to south direction and the north to northeast direction.

A comparison of Figures 6.2, 6.3, and 6.4 in Appendix N.1 show that the wave climate in event of a southeast to south direction is not changed for the majority of the harbour area by the development, as the waves run parallel to it. Taking account of wave reflection from the DWP quays, there is a slight increase in wave heights (approx. 30cm) to the east of the DWP during a 1 in 50-year storm. Only a short length of coast which will experience these slight increases during storm conditions, hence impacts on the coastline due to erosion are not expected.

During storms from the north to northeast, short period waves are generated within the Stornoway Harbour. The DWP doesn't affect the waves climate to the north of the harbour area in this instance, but as the waves reach the development they are reflected by the quays. Figures 6.9, to 6.12 of Appendix N.1 show the wave heights with and without the development in the event of a 1 in 50-year storms from the north and north east. The wave heights are increased in the vicinity of the quays due to reflection whilst there are decreases to the south deep into Glumaig harbour. The changes are in the order of 20-30cm, and as such are unlikely to affect the structure of the coastline.

The changes to wave climate modelled are associated with 1 in 50-year storms, which are **unlikely** and will give rise to **low** magnitude of impact hence the effects are **negligible: non-significant**.

RPS also considered changes to the tidal regime associated with the development in Section 5 of Appendix N.1. The tidal currents within Stornoway harbour are generally weak and do not tend to exceed 0.1m/s. Hydrodynamic models were utilised to simulate tidal conditions over 1 month both pre- and post-construction phase. Pre-construction, the highest current velocities are observed off the Reef Rock at Arnish Point during the peak spring flood velocities and off the Reef and Seid Rocks on the ebb velocities in the existing Stornoway harbour.

Post-construction (during operations), there is little apparent change in the flood or ebb current patterns in the majority of the harbour area as shown in Figures 5.3 to 5.6 of Appendix N.1. Local to the development, there are changes in current speeds as shown by Figures 5.9 and 5.10, however, these are small at +/-0.02 to 0.03m/s.

With regards to tidal flows, tidal differences were small and not significant in terms of altering current speeds (+/-0.005 m/s) away from the development. The impact of dredging on tidal regimes is **negligible: non-significant.**

14.5.2.5 Potential Loss of Containment

As discussed in Sections 2.2.1 and 2.7.2 of Chapter 2: Project Description, once operational, the DWP is anticipated to be able to support numerous activities. As such, a number of potential pollution sources will be present at the DWP. Operational activities will potentially include:

- Oil delivery vessel berthing and discharging gas oil to the onshore storage tanks;
- Bunkering of vessels;
- Storage and onward distribution of renewable energy sources e.g. hydrogen or ammonia;
- General cargo handling e.g. coal, salt, timber, bulk materials;
- Unloading of renewables components (turbine tower sections, nacelles, blades, transformers etc.) with some temporary laydown and storage;
- Loading large, renewable energy components or modules fabricated at Arnish fabrication yard via the Link Road on to barges or specialist heavy lift vessels;
- Unloading oil and gas modules or components for transfer via the Link Road to Arnish yard for decommissioning; and
- Berthing of visiting supply boats, anchor handling vessels, renewable energy service vessels or other large vessels with draft in excess of the capacity of the other facilities in Stornoway Harbour.

Pollution risks are determined by the volume and type of potential pollutant(s) present and the activity being undertaken. At this point it is not known exactly what activities will be carried out nor the potential pollutants involved, hence a full impact assessment on the potential loss of containment for each potential operational activity cannot be undertaken. However, a general assessment can be made taking account of the assumption primary and tertiary mitigation will be applied.

In general, materials will be appropriately stored and handled as discussed in Section 14.6, and activities which require additional consents will comply with the relevant health, safety and environmental legislation. However, if a loss of containment were to happen then there could be harm caused to the environment, including reduction in water quality and knock on ecological impacts.

The design has taken account of the potential future requirements where practicable and aimed not to preclude any activities by retaining some flexibility. This has been achieved by including two Class 1 oil interceptors in the drainage of made surface areas, which will facilitate the removal of oils and solids. Penstocks or isolation valves will also be installed allowing the drains to be isolated to retain pollutants in the event of an incident, thereby minimising the chance of pollutants reaching the sea. The un-surfaced areas could have drains installed at a later date if the planned use determines a need.

The DWP will be under the management of the SPA and its Port Safety Management System which includes procedures and protocols for dealing with pollution incidents.

The magnitude of impact associated with loss of containments from the various potential activities could range from **low** to **high.** Taking account of the primary mitigation incorporated into the design, and the assumption that tertiary mitigation required to comply with relevant legislation is in place for specific activities the likelihood of a high impact occurring is **highly**

unlikely and low to medium impacts **unlikely** hence the overall effect will be **minor: non-significant.**

14.5.2.6 Introduction of Non-Native Marine Species (NNMS)

As aforementioned in Section 14.5.1.4, the greatest risk of introducing NNMS is through vessels travelling from already contaminated ports and harbours, or different ecoregions, via ballast water and, to a more limited extent, through biofouling (marine growth) on hulls (Yang et al., 2018).

During operations, it is assumed that the introduction of NNMS is most likely to occur through vessel movements to the DWP from other regions of the UK and outside of the UK. As such, the duration of an introduction of NNMS is considered to be long-term to permanent, due to the difficulties in eradicating an NNMS once it is established. The magnitude of impact resulting from the introduction of an NNMS is assessed as **high.** Ecological impacts of NNMS introduction are specifically considered in Chapter 8: Fish Ecology and Chapter 9: Benthic Ecology.

Irrespective of where vessels will arrive from to the DWP, the International Convention for the Control and Management of Ships' Ballast Water and Sediments Management (Ballast Water Management (BWM) Convention) will be implemented. This requires all commercial vessels to adopt an approved ballast water management plan, involving either the exchange of ballast water outwith coastal waters, or the treatment of ballast water to denature potential NNMS. All vessels arriving to DWP will be required to be fully IMO compliant, including the BWM Convention. As such, the ballast water source for NNMS is effectively removed. The probability of NNMS being introduced is therefore assessed as **very unlikely**, resulting in a **minor: non-significant effect**.

14.5.2.7 Litter

Litter arising during the operation of the Stornoway DWP is anticipated to originate from members of the public associated with the cruise ships, and port and industrial activities. However, appropriate waste management will be in place including the provision of bins. As such, the likelihood of marine litter is assessed as **likely**, **low**, constituting to a **minor: non-significant** effect.

14.5.3 Water Framework Assessment

The WFD scoping assessment provided in Appendix N.2 identified the need to assess hydromorphology, fish, water quality and NNMS.

14.5.3.1 Transitional and Coastal Morphological Impact Assessment System

As discussed in Section 14.4.3, the development sits within Stornoway Harbour (Waterbody ID: 200191). The baseline information for the waterbody's current status was provided by Marine Scotland (Appendix N.5, Sheet 1). The baseline includes the Newton Marina development. It shows that the hydrodynamic, and intertidal zone are all currently classed as High, the subtidal zone is classed as Good. As the waterbody classification is based on the lowest classification give the waterbody has an overall classification of Good.

The details of the development shown in Table 14.5.1, have been incorporated into the model (Appendix N.5, Sheet 2).

Table 14.5.1: Development Detail for TraC-MImAS Model

Pressures	Pressure Source	Intertidal Area/length	Subtidal Area/Length
Land Claim - High Impact (km^2)	Land Reclamation	0.004288	0.04874
Dredging – High Impact (km^2)	-10m CD Dredge	N/A	0.26045
Flow & Sediment manipulation – submerged (high) (km^2)	Link Road Bollard Island Main Quay	0.005666	0.016746
Shoreline reinforcement – Hard engineering (high) (km)	Rock Armour: Link Road, Bollard Island, Land reclamation (southern edge), and Freight Ferry Berth	0.432	0.61
Piled Structure (high) (km)	Finger pier	N/A	0.114

Table 14.5.2 provides a summary of the outputs of the TraC-MImAS model.

Table 14.5.2: Summary of TraC-MImAS Model Output

Area	Baseline		Development	
	Capactiy Usage (%)	Status	Capacity Usage (%)	Status
Hydrodynamics	0.5	High	2.2	High
Intertidal Zone	6.1	Good	8.4	Good
Subtidal Zone	1.1	High	12.7	Good
Overall		**Good**		**Good**

According to the output of the TraC-MImAS Model summarised in Table 14.5.2, the development reduces the subtidal zone categories from high to good as the percentage usages increase to greater than 5%. However, the intertidal zone status remains good, hence overall the water body status remains good and hence there is no reduction in waterbody status.

The model 'HOW TO USE' page states that:

If the pressure activity is bigger than local unit size (i.e. 0.5km^2) or larger than 1.5% of the water body size, then an expert assessment MUST be undertaken.

The total development area is 0.336km^2 however, the Stornoway Harbour Waterbody covers an area of only 3.14km^2, of which 0.55km^2 is intertidal and 2.59km^2 is subtidal. Hence the development is 10.7% of the whole waterbody including the dredge area, 1.8% of the intertidal area and 12.6% of the subtidal area including the dredge.

Hence although the proposals are modest in port development terms, and it is well below 0.5km^2 area mentioned above, due to the small size of the waterbody the development is over 1.5% of the water body size, hence an expert assessment is required. In line with the Environment Agency Guidance an impact assessment considering impacts and mitigation has therefore been completed to understand the actual impacts on the waterbody status.

14.5.3.2 Deterioration Assessment

The Joint Nature Conservation Committee's (JNCC) Pressure-Activity Database (JNCC, 2018) has been utilised to identify potential impacts associated with construction and operational activities (Table 14.5.2) on the waterbody. The pressures have been assessed in various chapters of the Environmental Impact Assessment Report (EIAR) which has informed the deterioration assessment provided in Table 14.5.3.

Table 14.5.3: Deterioration Assessment

Activity	Pressure Theme	Pressure	Chapter and Section No.	Deterioration Assessment	Significance of Residual Effect
Land Reclamation	Hydrological Changes (inshore/ local)	Water flow (tidal current) changes – local.	14.5.2.4	Minimal localised changes to tidal and coastal processes	Adverse Permanent Negligible: Non-Significant
Land Reclamation	Physical Loss	Physical change (to another seabed type).	9.5.1.1	7.73Ha of moderate local benthic habitat lost.	Adverse Permanent Minor: Non-Significant
Piling	Physical Damage	Penetration and/or disturbance of the substrate below the surface of the seabed.		The geology of the seabed where the piling works is to be completed is not of particular value. Penetrations will cause disturbance but will not deteriorate the overall value.	No Change
Dredge, Dredge Disposal and Land Reclamation	Physical Damage	Changes in suspended solids.	14.5.1.1	Localised, short-term increases in suspended solids have been predicted, however these do not have the potential to affect the WFD status.	Adverse Short-term Minor: Non-Significant
Dredge, Dredge Disposal & Land Reclamation	Physical Damage	Smothering and siltation rate changes.	14.5.1.1 9.5.1.4	Siltation modelling and an assessment on benthic ecology have been completed. Rates are low hence effects are low.	Adverse Reversible Minor: Non-Significant

Activity	Pressure Theme	Pressure	Chapter and Section No.	Deterioration Assessment	Significance of Residual Effect
Dredging	Physical Damage	Habitat structure changes - removal of substratum.	9.5.1.2 14.4.1	The habitat within the 26hectares of the dredge area will have the top substrates removed, however the underlying substrates are similar, and as such it will recover over time.	Adverse Reversible Minor: Non-Significant
Piling	Other physical pressures	Underwater noise changes.	11 7.5.1.1 8.5.2	Increased noise levels associated with piling will be temporary and reversible and as such, will not have a long-term effect. Appropriate mitigation has been identified to minimise effects on fish and marine mammals.	Adverse Short Term Minor: Non-Significant
Operations	Other physical pressures	Above Water Noise.	12.4.2	Noise associated with operational activities has been assessed with regard to the potential to impact upon noise sensitive receptors. Due to the distance to receptors impacts are low.	No Change to Minor: Non-Significant
Dredging General Construction and Operation Activities	Pollution and Other Chemical Changes	Non-synthetic compound contamination – overall.	14.5.1.2 14.5.2.5	The ground conditions have not identified contaminates in the seabed that could be released during construction works. Appropriate material and waste management during construction works will minimise pollution risks. Potential loss of containment issues have been assessed in this chapter. Appropriate mitigation will reduce the risk of pollutants reaching a watercourse, the volumes released and the spread of pollution. Main potential pollution sources are oils, fuels and cement washings during construction activities. Potential pollution effects have been assessed in the ecological chapters.	Adverse Reversible Minor: Non-Significant
	Pollution and Other Chemical Changes	Non-synthetic compound contamination - Transition elements & organo-metals.			
	Pollution and Other Chemical Changes	Non-synthetic compound contamination - Hydrocarbon & PAH Contamination.			
	Pollution and Other Chemical Changes	Synthetic compound contamination.			

Activity	Pressure Theme	Pressure	Chapter and Section No.	Deterioration Assessment	Significance of Residual Effect
Operations	Other Physical Pressures	Introduction of light.	2.6.12	Lighting designed such that it will be focused on the operational areas and be optimised from the tasks in hand and it will be switched off when not in use thereby it should not affect ecological or human receptors.	Adverse Permanent Negligible: Non-significant
Vessel Movements	Other Physical Pressures	Death or injury by collision.	16.4	Appropriate measures are in place to ensure that risks associated with vessel collisions are minimised.	No-Change
Construction and Operations	Biological Pressures	Introduction or spread of non-indigenous species.	14.5.1.3 14.5.2.6 9.5.1.6 9.5.2.2	The introduction of NNMS is considered to be unlikely, however appropriate mitigation has been identified in line with best practice.	Adverse Permanent Minor: Non-Significant.
Operations	Port and Harbour Structures	Visual disturbance	5	A full seascape, landscape and visual impact assessment has been completed. For the operational phase, significant effects were identified for a number of receptors.	Permanent Major: Significant
Construction and operations	Shoreside Industry and operations	Litter	14.5.1.4 14.5.2.7	Sources of litter have been identified however with appropriate mitigation; litter effects can be minimised.	Adverse Minor: Non-Significant
Operational Foul Drainage	Biological Pressures	Deoxygenation	14.5.2.2	Package treatment plants will be utilised to treat foul effluents prior to disposal to sea.	Adverse Negligible: Non-significant

14.5.3.3 WFD Assessment

The Stornoway Harbour waterbody is small (3.14km^2), and as such even a small-scale development has the potential to reduce the water quality status. This is reflected in the output of the TraC-MImAS Modelling where the subtidal status is reduced from High to Good, as the small area equates to a small capacity to withstand change. Overall, the waterbody status remains good, hence there is no reduction in the waterbody status in WFD terms.

The detailed assessment of the individual aspects of the development which could impact upon the water quality status has been carried out. The outputs of which are summarised in Table 14.5.3.

The only residual significant effect arising is associated with landscape and visual effects, of the development. Landscape and visual effects do not have a direct impact on the water quality, hydrological or ecological status of the water body, as such will not change the waterbody classification.

It should also be born in mind that the Stornoway Harbour waterbody is directly connected to the much larger (40.3km^2) Gob na Greige to Rubha Raerinis (Waterbody ID: 200188) and the wider Minch and as such the chemical and ecological status of the marine environment is not solely affected by the carrying capacity of the Stornoway Harbour area.

Taking into account the lack of residual significant effects identified in the detailed assessment, the fact the dredge area will recover over time, the lack of high-quality habitats found during benthic assessment, the lack of impacts on coastal processes, and the TraC-MImAS Modelling showing that the waterbody status remains 'Good' it is unlikely that the development will cause a long-term reduction in the waterbody status. Hence the overall impact on the waterbody status is **no-change.**

14.6 Mitigation measures

14.6.1 Construction

14.6.1.1 Increased Sediment Loading

At the start of each activity that could give rise to increased sediment in the water column, the water will be observed to ensure that any plumes arising are localised and disperse quickly. If increases in sediments are not as predicted, the construction technique will be reviewed to identify areas for improvement to prevent reoccurrence.

Surface water management measures will be put in place as required. This is likely to include the use of silt fencing, prompt installation of the permanent drainage solutions, and minimisation of timescales that surfaces are left stripped but unmade. Appropriate storage of soils and peats will also be employed. The CEMD will detail the approaches to be employed while the specifics will be identified within the Risk Assessment Method Statements (RAMS) for the relevant activities.

14.6.1.2 Potential Loss of Containment

Fuels, Oils and Chemicals

The fuel bowser will be under strict management controls to prevent pollution incidents. It will be kept secure and locked when not in use to protect it from oil thefts, and to comply with the requirements of the relevant GBR's of the CAR. It will also be double skinned and stored in an appropriate area away from watercourses and drains where it cannot be 'crashed into'. Refuelling will be carried out in designated areas by trained operatives following site refuelling procedures. The refuelling procedure will take into account best practice laid out in GPP2 (SEPA, NIEA, & Wales, 2017) and PPG6 (Environmental Agency, NIEA, & SEPA, 2012).

Where practicable, bio-degradable hydraulic fluids will be utilised in machinery during construction. All oils and chemicals will be subject to Control of Substances Hazardous to Health (COSHH) assessments under the COSHH Regulations 2002 (UK Government, 2002). All COSHH assessments will include a section on the environment to highlight any precaution or mitigation requirements.

Appropriately bunded oil and chemical storage cabinets will be provided on site. These will be kept locked, with the key under management control to ensure appropriate use and accountability. Furthermore, appropriate spill plans aligned to the pollution control hierarchy and spill kits will be in place. Construction operatives will be trained in the spill plans and in the use of spill kits to ensure that loss of containment incidents can be dealt with promptly to prevent or minimise pollution.

All navigation safety procedures discussed in Chapter 16: Other Issues will be followed to minimise potential for vessel collision which could lead to loss of containment.

Cement and Cement Washings

Appropriate sealed shuttering will be utilised for all cement pours carried out close to or above water.

Cement washings will be carried out in a designated area. Washing arisings will be collected for onsite treatment. This will include settlement and, if required, pH correction. If not suitable for reuse, liquids will be tankered off site for appropriate disposal. The solids will be disposed of as solid waste.

14.6.1.3 Introduction of Non-Native Marine Species

Although there are no predicted significant effects with regard to the introduction of NNMS, best practice should still be implemented to minimise the risks posed. Contractors will be required to ensure all plant and equipment brought to site is properly cleaned prior to arrival. All equipment will be inspected prior to mobilisation on site and any equipment carrying excessive sediment deposits will be returned to the supplier.

14.6.1.4 Litter

Although no significant effects were identified with regard to litter, steps can be taken to reduce the overall risks of litter reaching the marine environment, theses have been identified, in line with best environmental practice to reduce marine litter as far as practicable.

Prior to construction works on site commencing, a litter sweep will be conducted to prevent the escape of existing litter on site into the marine environment. All personnel working on the project will undertake a site induction. This will include a section on waste management and

the use of the waste receptacles provided. It will be made clear that littering will not be tolerated. Waste receptacles shall be covered. Construction staff will be encouraged to collect any litter they see in the construction areas and, if deemed necessary, litter sweeps will be carried out. The use of single use plastics will be discouraged, reusable water bottles will be supplied to all personnel and reusable crockery and cutlery will be provided in the welfare facilities. All generated waste will be segregated to facilitate appropriate recycling.

14.6.1.5 Peat Removal

A Peat Management Plan is being developed for the DWP project. Details of this are to be agreed with Comhairle nan Eilean Siar (CnES) in consultation with SEPA to meet the requirements of the existing Planning Permission in Principle application reference number 19/00273, Condition 7(4) which required a peat management plan (PMP) and peat reuse strategy to be incorporated within the Construction Environmental Management Plan (CEMP).

The key points of the PMP are:

- To minimise peat removal as far as practicable;
- To remove intact turves for reuse onsite;
- Identify appropriate locations for peat and turve reuse onsite;
- To handle and store turves and peat appropriately to minimise carbon loss, avoid cross contamination between horizons, minimise compression, prevent drying out and to ensure the swift reinstatement of vegetation; and
- To ensure peat slides are avoided.

14.6.2 Operations

The operations at the DWP will be controlled by the SPA and fall under their Port Safety Management System, which will be updated to incorporate the DWP facility. Activities which require additional licences and permits will work to the specific requirements detailed within them.

14.7 Residual Effects

The impact giving rise to adverse significant effects without the implementation of secondary mitigation, peat removal, is reassessed in this section to identify if the mitigation measures have reduced the effect level.

14.7.1 Peat Removal

Taking account of the mitigation identified in Section 14.6.1.5 the overall site soil quality magnitude of impact will be **adverse low** and **certain** to occur, giving rise to an **adverse minor: non-significant** effect.

14.8 Cumulative Effects

As discussed in Chapter 3, no projects are expected to have cumulative effects with regard to the water environment, soil or coastal processes.

14.9 Summary

Table 1.9.1 provides a summary of impacts, mitigation and residual effects. Only the removal of peat gave rise to a significant effect, however a PMP is being developed to identify how peat will be reused in the vicinity of the development as such the resulting effect is non-significant.

It is however, recognised that a range of potentially polluting materials will be utilised during construction and operations and hence appropriate storage, handling and use arrangements will need to be employed to protect the environment. These will align with relevant legislation and guidance.

CAR GBR's will be applied to the relevant activities, and where required, registrations and licences will be sought from SEPA.

Impacts on the water environment, soil or coastal processes could cause effects on ecological receptors these have been considered in the Chapters 7 to 10.

A detailed assessment under the WFD has identified that the DWP will not change the status of the Stornoway Harbour (Waterbody ID: 200191).

Table 14.9.1: Summary of Effects

Nature of Impact	Probability	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Probability	Residual Impact Magnitude	Significance of Residual Effect
Construction							
Increased Sediment in Water Column – Dredging	Certain	Low Adverse Short-term	Minor: Non-Significant	Checks will be carried out to ensure that plumes are localised and disperse quickly as predicted.	Certain	Low Adverse Short-term	Minor: Non-Significant
Increased Sediment in Water Column – Dredge Disposal	Certain	Low Adverse Short-term	Minor: Non-Significant	Checks will be carried out to ensure that plumes are localised and disperse quickly as predicted.	Certain	Low Adverse Short-term	Minor: Non-Significant
Increased Sediment in Water Column – Land Reclamation	Probable	Low Adverse Short-term	Minor: Non-Significant	Checks will be carried out to ensure that plumes are localised and disperse quickly as predicted.	Probable	Low Adverse Short-term	Minor: Non-Significant
Increased Sediment in Water Column – Surface Water Run Off	Probable	Low	Minor: Non-Significant	Implementation of Sustainable urban Drainage System (SuDS) as per the design. Temporary surface water management requirements will be identified in the RAMS.	Probable	Low	Minor: Non-Significant
Loss of Containment: Fuel Storage Bowser (20m^3 of Diesel)	Unlikely	Medium Adverse	Minor: Non-Significant	Compliance with Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). Adoption of appropriate spill prevention and response procedures. Refuelling RAMS to be put in place aligned with GPP2.	Very Unlikely	Low Adverse	Minor: Non-Significant

Nature of Impact	Probability	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Probability	Residual Impact Magnitude	Significance of Residual Effect
Loss of Containment: Refuelling Activities	Likely	Low Adverse	Minor: Non-Significant	Compliance with Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). Adoption of appropriate spill prevention and response procedures. Refuelling RAMS to be put in place aligned with GPP2.	Unlikely	Low Adverse	Negligible: Non-Significant
Loss of Containment: Vehicles or Plant	Unlikely	Low Adverse	Minor: Non-Significant	Adoption of appropriate spill prevention and response procedures. Equipment to be well maintained.	Very Unlikely	Low Adverse	Negligible: Non-Significant
Loss of Containment: Plant – Hydraulic Fluids	Highly Likely	Low Adverse	Minor: Non-Significant	Adoption of appropriate spill prevention and response procedures. Biodegradable hydraulic fluids to be utilise where practicable. Equipment to be well maintained.	Likely	Low Adverse	Negligible: Non-Significant
Loss of Containment: COSHH Store: Hydraulic Fluids, Maintenance Oils, Chemicals.	Unlikely	Low Adverse	Minor: Non-Significant	Adoption of appropriate spill prevention and response procedures. Chemicals appropriately stored in bunded containers in line with PPG6 and COSHH requirements.	Very Unlikely	Low Adverse	Negligible: Non-Significant
Loss of Containment: Large Vessel e.g. Dredger	Very Unlikely	High Adverse	Minor: Non-Significant	Adoption of appropriate spill prevention and response procedures. Vessel appropriate maintained.	Very Unlikely	High Adverse	Negligible: Non-Significant
Loss of Containment: Workboat	Unlikely	Medium Adverse	Minor: Non-Significant	Adoption of appropriate spill prevention and response procedures. Vessel appropriate maintained.	Very Unlikely	Medium Adverse	Negligible: Non-Significant

Nature of Impact	Probability	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Probability	Residual Impact Magnitude	Significance of Residual Effect
Loss of Containment: Cement and Cement Washouts	Unlikely	Low	Negligible: Non-Significant	Sealing of shuttering and appropriate cement washout and treatment implemented in line with PPG6.	Unlikely	Low	Negligible: Non-Significant
Introduction of NNMS – Ballast Water	Very Unlikely	High Adverse Long-term	Minor: Non-Significant	Compliance with International Convention for the Control and Management of Ships' Ballast Water and Sediments Management (Ballast Water Management (BWM) Convention).	Very Unlikely	High Adverse Long-term	Minor: Non-Significant
Introduction of NNMS – Biofouling	Very Unlikely	High Adverse Long-term	Minor: Non-Significant	Vessels utilised should not have excessive biofoul.	Very Unlikely	High Adverse Long-term	Minor: Non-Significant
Introduction of NNMS – Contaminated Plant and Equipment	Very Unlikely	High Adverse Long-term	Minor: Non-Significant	All plant and equipment will be thoroughly cleaned prior to mobilisation to site.	Very Unlikely	High Adverse Long-term	Minor: Non-Significant
Litter	Probable	Low Adverse Long-term	Minor-Non-Significant	Waste receptacles will be covered, and littering will not be tolerated.	Unlikely	Low Adverse Long-term	Negligible: Non-Significant
Level Platform Creation: Loss of hillside	Certain	Low Adverse Permanent	Minor: Non-significant	Minimise area removed to that required, but the design.	Certain	Low Adverse Permanent	Minor: Non-significant
Peat Removal	Certain	Medium Adverse Permanent	Moderate: Significant	Peat Management Plan including peat reuse strategy to be developed.	Certain	Low Adverse Permanent	Minor: Non-Significant

Nature of Impact	Probability	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Probability	Residual Impact Magnitude	Significance of Residual Effect
Operations							
Surface Water: Run-off from Reclaimed/Levelled Area and Quays	No Change						
Surface Water: Run-off from Access and Link Road Swales	No Change						
Foul Drainage	Unlikely	Low Adverse Reversible	Negligible: Non-Significant	Utilisation of a package wastewater treatment plant compliant with the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended).	Unlikely	Low Adverse Reversible	Negligible: Non-Significant
Flooding	No Change						
Coastal Processes: Wave Climate	Unlikely	Low	Negligible: Non-Significant	None required	Unlikely	Low	Negligible: Non-Significant
Coastal Processes: Tidal Flows	Unlikely	Low	Negligible: Non-Significant	None required	Unlikely	Low	Negligible: Non-Significant
Potential Loss of Containment	Highly Unlikely	Low - High	Minor: Non-Significant	DWP will be under SPA management and its Port Safety Management System which will be updated to incorporate the DWP facility	Highly Unlikely	Low - High	Minor: Non-Significant

Nature of Impact	Probability	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Probability	Residual Impact Magnitude	Significance of Residual Effect
Introduction of Non-Native Marine Species	Very Unlikely	High	Minor: Non-significant	Compliance with International Convention for the Control and Management of Ships' Ballast Water and Sediments Management (Ballast Water Management (BWM) Convention).	Very Unlikely	High	Minor: Non-significant
Litter	Likely	Low	Minor: Non-significant	Appropriate waste management.	Likely	Low	Minor: Non-significant

Key

Significant Effect
Non-Significant

14.10 References

Aquaculture Scotland. (2020). Shellfish Harvesting Locations. Retrieved from http://aquaculture.scotland.gov.uk/data/shellfish_harvesting_areas_record.aspx?production_area_id=607

Causeway Geotech. (2019). *Stornoway Deep Water Port-Stage 2 Land Ground Investigation: Interpretative Report*. Retrieved from

CIRIA. (2015). *The SuDS Manual*. Retrieved from

Environment and Heritage Service, SEPA, & Environment Agency. (2017). *GPP5: Works and Maintenance in or Near Water*. Retrieved from http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/

Environmental Agency. (2017, 9 November 2017). Guidance - Water Framework Directive Assessment: eastuarine and Coastal Waters. Retrieved from https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters

Environmental Agency, NIEA, & SEPA. (2012). *PPG 6: Work at Construction and Demolition Sites*. Retrieved from http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/.

European Commission. (1990). Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions.

European Parliament, & Council, E. (2000). The Water Framework Directive. In: European Parliament and European Council

Forestry Civil Engineering, S. (2010). *Floating Roads on Peat: A Report into Good Practice in Design, Construction and Use of Floating Roads in Peat with particular reference to Wind Farm Developments in Scotland* Retrieved from http://www.roadex.org/wp-content/uploads/2014/01/FCE-SNH-Floating-Roads-on-Peat-report.pdf

Gohin, F., Bryère, P., & Griffiths, J. W. (2015). The exceptional surface turbidity of the North-West European shelf seas during the stormy 2013–2014 winter: Consequences for the initiation of the phytoplankton blooms? *Journal of Marine Systems, 148*, 70-85. doi:https://doi.org/10.1016/j.jmarsys.2015.02.001

GreenBlue. (2010). Best Practice Invasive Species. Retrieved from https://thegreenblue.org.uk/Clubs-and-Training-Centres/Antifoul-and-Invasive-Species/Best-Practice-Invasive-Species

Health Protection Scotland. (2020). Health of Shellfish Waters.

IPIECA, & OGP. (2010). *Alien Invasive Species and the Oil and Gas Industry: Guidance for Prevention and Management*. Retrieved from London, UK: http://www.ipieca.org/resources/good-practice/alien-invasive-species-and-the-oil-and-gas-industry/

JNCC. (2011). *Towards an assessment of the state of UK Peatlands* Retrieved from http://data.jncc.gov.uk/data/f944af76-ec1b-4c7f-9f62-e47f68cb1050/JNCC-Report-445-FINAL-WEB.pdf

JNCC. (2018). Pressures-Activities Database. Retrieved from http://jncc.defra.gov.uk/default.aspx?page=7136

Jones, R., Bessell-Browne, P., Fisher, R., Klonowski, W., & Slivkoff, M. (2016). Assessing the impacts of sediments from dredging on corals. *Marine Pollution Bulletin, 102*(1), 9-29. doi:https://doi.org/10.1016/j.marpolbul.2015.10.049

Mansilha, C. R., Coelho, C. A., Heitor, A. M., Amado, J., Martins, J. P., & Gameiro, P. (2009). Bathing waters: New directive, new standards, new quality approach. *Marine Pollution Bulletin, 58*(10), 1562-1565. doi:https://doi.org/10.1016/j.marpolbul.2009.03.018

Marine Scotland. (2016). Shellfish water protected areas. Retrieved from http://marine.gov.scot/information/shellfish-water-protected-areas

Marine Scotland. (2017). *Pre-Disposal Sampling Guidance*. Retrieved from https://www2.gov.scot/Topics/marine/Licensing/marine/Applications/predredge

Payne, R. D., Cook, E. J., & Macleod, A. (2014). *Marine Biosecurity Planning: Guidance for Producing Site and Operation-Based Plans for Preventing the Introduction of Non-native Species* Retrieved from https://www.nature.scot/sites/default/files/2019-02/Marine%20Biosecurity%20Planning.pdf

Potts, T., & Hastings, E. (2011). *Marine Litter Issues, Impacts and Actions*. Retrieved from https://www.gov.scot/publications/marine-litter-issues-impacts-actions/pages/4/

Remy, M., Hillebrand, H., & Flöder, S. (2017). Stability of marine phytoplankton communities facing stress related to global change: Interactive effects of heat waves and turbidity. *Journal of Experimental Marine Biology and Ecology, 497*, 219-229. doi:https://doi.org/10.1016/j.jembe.2017.10.002

Schulz, A. C., Badewien, T. H., & Zielinski, O. (2015, 2-6 March 2015). *Impact of currents and turbulence on turbidity dynamics at the time series station Spiekeroog (Wadden sea, Southern North sea).* Paper presented at the 2015 IEEE/OES Eleveth Current, Waves and Turbulence Measurement (CWTM).

Scottish Goverment, SNH, & SEPA. (2017). *Peatland Survey: Guidance on Developments on Peatland* Retrieved from https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2018/12/peatland-survey-guidance/documents/peatland-survey-guidance-2017/peatland-survey-guidance-2017/govscot%3Adocument/Guidance%2Bon%2Bdevelopments%2Bon%2Bpeatland%2B-%2Bpeatland%2Bsurvey%2B-%2B2017.pdf

Scottish Government. (2012). *Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste Scottish Renewables*. Retrieved from http://4f553fa71f6b11e5f9b0-

e9e5be702ded16836c4ccca0ea3e9a9c.r68.cf3.rackcdn.com/uploads/publications/a4_developments_on_peatland.pdf
Scottish Government, SNH, SEPA, & James Hutton Institute. (2010). *Developments on Peatland: Site Surveys* Retrieved from https://www.sepa.org.uk/media/144152/development_on_peatland_guidance_final_august_2010.pdf
Scottish Parliament. (2003). Water Environment and Water Services (Scotland) Act 2003. In: Scottish Government.
Scottish Parliament. (2009). The Environmental Liability (Scotland) Regulations 2009. In (pp. 24): Scottish Parliament.
Scottish Parliament. (2013a). The Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013. In. Edinburgh Scottish Parliament
Scottish Parliament. (2013b). The Water Environment (Shellfish Water Protected Areas: Environmental Objectives etc.) (Scotland) Regulations 2013. In. Edinburgh Scottish Parliament.
SEPA. (2010). SEPA Regulatory Position Statement – Developments on Peat In.
SEPA. (2014). Land Use Planning System SEPA Guidance Note 17, Marine Development and Marine Aquaculture Planning Guidance. Retrieved from https://www.sepa.org.uk/media/144034/lups-gu17_-marine_development_and_marine_aquaculture_planning_guidance.pdf
SEPA. (2018). RBMP Interactive Map. Retrieved from http://map.sepa.org.uk/rbmp/
SEPA. (2020a). Flood Risk Interactive Maps. Retrieved from http://map.sepa.org.uk/floodmap/map.htm
SEPA. (2020b). SEPA Bathing Waters Interactive Map. Retrieved from https://www2.sepa.org.uk/bathingwaters/Locations.aspx
SEPA. (2020c). Stornoway Flood Risk. Retrieved from https://www2.sepa.org.uk/frmstrategies/pdf/pva/PVA_02_02_Full.pdf
SEPA. (2020d). Water Classification Hub - Abhainn Ghrioda.
SEPA, NIEA, & Wales, N. R. (2017). *GPP2: Above Ground Oil Storage Tanks: Guidance on Pollution Prevention 2.* Retrieved from http://www.netregs.org.uk/media/1475/gpp-2-pdf-jan-2018.pdf
SNH. (2015). *Scotland's National Peatland Plan Working for our future* Retrieved from https://www.nature.scot/sites/default/files/Publication%202015%20-%20Scotland%27s%20National%20Peatland%20Plan%20-%20July%202015.pdf
The Scottish Goverment. (2010, 2 November 2010). Revised Bathing Water Directive (2006/7/EC). Retrieved from http://www.gov.scot/Topics/Environment/Water/15561/bathingwaters/BWD2
UK Government. (2002). The Control of Substances Hazardous to Health Regulations 2002. In *2002 No. 2677*.
UKMMAS. (2010a). *Charting Progress 2 Feeder Report: Clean and Safe Seas*. Retrieved from https://www.gov.scot/Resource/Doc/295194/0114537.pdf

UKMMAS. (2010b). *Charting Progress 2 Feeder Report: Ocean Processes*. Retrieved from London: http://www.gov.scot/Resource/Doc/295194/0108001.pdf

14.11 Glossary

Acronym	Definition
AL	Action Level
AOD	Above Ordnance Datum
BPEO	Best Practicable Environmental Option
BS	British Standards
BWM	Ballast Water Management Convention
CAR	The Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended
CD	Chart Datum
CnES	Comhairle nan Eilean Siar
DWP	Deep Water Port
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
GBR	General Binding Rules
GDG	Gavin & Doherty Geosolutions Ltd
JNCC	Joint Nature Conservation Committee
Km	kilometre
LDP	Local Development Plan
M	metres
MHWS	Mean High Water Spring
NNMS	Non-Native Marine Species
OSCP	Shellfish Waters Protected Areas
PAH	Polycyclic Aromatic Hydrocarbon
PCB	polychlorinated biphenyls
PMF	Priority Marine Feature
PSA	Particle Size Analysis
PVA	Potentially Vulnerable Area
RAMS	Risk Assessment Method Statement
SEPA	Scottish Environment Protection Agency
SNH	Scottish Natural Heritage
SPA	Stornoway Port Authority
TraC-MImAS	Transitional and Coastal Morphological Impact Assessment System
WFD	Water Framework Directive

Chapter 15: Traffic and Transport

STORNOWAY PORT AUTHORITY

Contents

15 Traffic and Transport

15.1 Introduction

This chapter of the EIAR addresses the potential impact of the proposed development of the Stornoway Deep Water Port (DWP) on the surrounding transport network. The existing Traffic and Transport assessment was conducted by SYSTRA as part of the previous EIAR (EnviroCentre, 2018) for the Stornoway DWP development and has been utilised to inform this chapter.

The assessment in this chapter was undertaken by drawing comparisons between the previous and revised designs of the Stornoway DWP in order to ascertain whether additional traffic and transport issues may arise during construction and operational phases. Such comparisons were made in Section 15.3.2 by predicting whether additional movements of construction traffic would be required for the delivery of materials. The assessment with regards to operations took into account the redistribution of pre-existing movements associated with freight ferry deliveries with the addition of coach movements associated with tourism, and are highlighted in Section 15.3.3. This chapter also provides a synopsis of the relevant information associated with the original assessment, which has been included as an Appendix to this chapter (Appendix O.1).

This chapter also outlines the regulations, guidance and policies in which are relevant to the DWP development in relation to traffic and transport, as well as summarising the key points which require further discussion from the original chapter. Conditions 9 and 10 of the Planning Permission in Principle (PPiP – Application Reference No. 19/00273) gained from Comhairle nan Eilean Siar (CnES), which takes into consideration interests of road safety and the maintenance of vehicular and public access to Arnish Point Industrial Estate, have also been considered. No reassessment was taken as part of this chapter and as such, no impact assessment methodology or baseline information has been provided here, as the baseline provided in Section 9.5 of Appendix O.1 is still relevant and the assessment summarised utilises the methodology detailed in Section 9.4 of Appendix O.1.

15.2 Regulations and Guidance

Transport policies relevant to the project included the Outer Hebrides Local Development Plan (LDP) (Comhairle nan Eilean Siar, 2018) and are identified in Chapter 4: Statutory Context and Policy. The Outer Hebrides LDP sets out a spatial strategy for the development of land in the Outer Hebrides and the LDP policy 'EI9: Transport Infrastructure' lays out the priority areas for the upgrading and development of transport infrastructure withing the Outer Hebrides, and is identified in Table 4.5.3 of Chapter 4: Statutory Context and Policy. The application of this policy with regards to traffic and transport associated with the construction and operations of the Stornoway DWP is most required to meet the obligations of *'secure, improved road safety… in particular around schools [and] communities'*.

15.2.1 Traffic and Transport Policies

15.2.1.1 Scottish Planning Policy (SPP) (Scottish Government, 2014)

The SPP states that:

> "*Where a new development or a change of use is likely to generate a significant increase in the number of trips, a transport assessment should be carried out. This should identify any potential cumulative effects which need to be addressed.*" (Scottish Government, 2014); and

> *"National maximum parking standards for certain types and scales of development have been set to promote consistency (see Annex B: Parking Policies and Standards). Where an area is well served by sustainable transport modes, planning authorities may set more restrictive standards, and where public transport provision is limited, planning authorities may set less restrictive standards. Local authorities should also take account of relevant town centre strategies when considering appropriate parking provision (see paragraphs 64-65 and Annex A: Town Centre Health Checks and Strategies)" (Scottish Government, 2014).*

15.2.1.2 The National Transport Strategy

The NTS (Scottish Executive, 2006) considers Scotland's transport needs over the medium to long-term and it sets out five high level objectives to:

- Promote economic growth;
- Promote social inclusion;
- Protect our environment and improve our health;
- Improve safety of journeys; and
- Improve integration by making journey time planning and ticketing easier.

The NTS is currently under review and a finalised NTS is due to be released in summer 2019.

15.2.1.3 Regional Transport Strategy

The Scottish Regional Transport Strategies (RTS) are part of a suite of strategies and plans ranging which embody the National Transport Strategy, National Planning Framework, National Economic Strategy and National Sustainable Development strategies, through various regional and local plans. The Strategy also seeks to promote the region's strategic priorities as policy develops at the national and local levels.

The main objectives of the Strategy are to:

- Support Sustainable economic growth across the region; and
- Reduce barriers to participation in employment, learning, social, leisure, health and cultural activities.

It aims to achieve these aims through:

- Improving/maintaining the safety of transport and travel; and
- Improving the quality, accessibility, affordability and integration of travel.

In total, there are seven Scottish RTS which set priorities for transport development and improvement.

15.2.1.4 The Transport Strategy for Highlands and Islands 2008 – 2021

The 2008-2021 Transport Strategy for the Highlands and Islands (HITRANS) is one of seven Scottish RTS. HTRANS plans to enhance economic wellbeing; promote safety, social inclusion and equal opportunity; plan for a sustainable transport system; and integrate across boundaries with other Partnerships. The HITRANS RTS takes account of and identifies the need:

"To deliver connectivity across the Highlands and Islands which enables sustainable economic growth and helps communities to actively participate in economic and social activities" (The Highland and Islands Transport Partnership, 2017).

Its strategy and relevant objectives are set out below:

1. Vision – Enhance the regions viability;
2. Delivery objective – Improving interconnectivity of the whole region to strategic services and destinations;
3. Economy (Primary outcome objective) – Enable the region to compete & support growth;
4. Supporting outcome objectives:
    a. Enable people to participate in everyday life;
    b. Improve safety and security of travel;
    c. Manage the impacts of travel on the region's environmental assets; and
    d. Improve health of the region's people.

15.2.1.5 Planning Advice Note 75 (PAN 75)

PAN 75 states that:

"*Transport assessment is a tool that enables delivery of policy aiming to integrate transport and land use planning"(Scottish Executive, 2005).*

and that

"*All planning applications that involve the generation of person trips should provide information which cover the transport implications of the development. The level of detail will be proportionate to the complexity and scale of impact of the proposal*" (Scottish Executive, 2005).

15.2.2 Traffic and Access Guidelines

The Traffic and Access guidelines that were utilised to inform the traffic and transport assessment in the previous EIAR (Appendix O.1) are as follows:

- The Outer Hebrides Local Development Plan (LDP) (2012);
- The Outer Hebrides Local Development Plan 2 (at 'Examination Stage' at time of writing);
- Institute of Highways and Transportation (IHT) publications - "Guidelines for Traffic Impact Assessment", 1998;
- Institute of Environmental Management and Assessment (IEMA) publication - "Guidelines for the Environmental Assessment of Road Traffic", 1993;
- Department for Transport (DfT) publication "Design Manual for Roads and Bridges" (DMRB); and
- DfT 2017 Average Annual Daily Flow (AADF) traffic data.

This assessment therefore takes cognisance of relevant policy documents as well as those that informed the development of the Transport Assessment.

Moreover, the Institute for Environmental Management & Assessment (IEMA) Guidelines were used in the previous EIAR to determine the effects of traffic and transport.

15.2.2.1 Guidance on the Preparation of the Transport Assessment under IEMA

Two rules are determined be followed under IEMA guidelines in order to determine the level of effects:

- Rule 1: Include road 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 any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

If HGV movements have increased by more than 30%, under Rule 1, a full assessment is required, and the level of significance falls into two categories; significant or non-significant.

Paragraph 2.5 of the IEMA Guidelines identifies groups, locations and special interests which may be sensitive to changes in traffic conditions as follows:

- People at home;
- People in workplaces;
- Sensitive groups including children, elderly and disabled;
- Sensitive locations, e.g. hospitals, churches, schools, historic buildings;
- People walking or cycling;
- Open spaces, recreational sites, shopping areas; and
- Sites of ecological / nature conservation value tourist attractions.

15.2.3 Sources of Information

As the revised design of the development is still located in the same area as was previously proposed with construction techniques remaining largely the same, traffic and transport baseline conditions have not been revised. In the intervening period there have been no changes which would under normal circumstances led to an significant change in traffic flows in the vicinity of the development. 2020 traffic flows around the island are likely to be abnormally low due to COVID-19 and as such would not be an appropriate base line measure for assessment against. Information on traffic and transport for the previous EIAR was collated through both a desk-based assessment and a site visit undertaken by SYSTRA and is still valid. As such, this information is still relevant as provides the most realistic sources of information for this chapter.

15.3 Impact Assessment

The impact assessment in the previous EIAR anticipated the potential effects during both the construction and operational phases of the DWP development. This was done on the basis of assessing the potential worst-case scenario of the impact of increased traffic. The assumptions made have therefore been reviewed to ensure they are still applicable.

15.3.1 Review of Assumptions

The previous EIAR utilised baseline traffic and transport characteristics which took into consideration annual average weekly traffic flows (AAWT) and road safety statistics to inform the assessment in compliance with IEMA guidelines. As construction traffic was anticipated to be distributed along 5 main road routes, consideration in the previous EIAR was only given to these road networks. The road networks identified as potentially requiring assessment were as follows:

- A859 South of the Access Road;
- A859 Willowglen Road;
- A857 Macauley Road (South);
- Matheson Road; and
- A857 (North).

15.3.2 Construction Impact Assessment

The construction assessment outline below provides a synopsis of Section 9.6 of Chapter 9: Traffic and Transport from the previous EIAR (Appendix O.1). This summary highlights the predicted and evaluated effects of construction traffic and transport along the 5 road networks aforementioned. Further consideration however has been given to emergency services vehicles (Section 15.3.2.2) access along Arnish Road, as consideration was not given to this in the previous EIAR. However, a full assessment has not been undertaken due to the simplicity of the issue and clear need for mitigation, which has already been agreed with CnES.

15.3.2.1 Impact Assessment

Although the revised design of the DWP development includes a differential layout to what was proposed in the previous EIAR, the traffic and transport impact assessment conducted is still relevant for both construction and operations, as the bulk of materials (i.e. for land reclamation and piling activities) will be delivered by sea. Section 9.7.1 of Appendix O.1 identified that with regard to onshore deliveries, a maximum of 100 two-way heavy good's vehicle (HGV) movements per day will be required for delivery of auxiliary materials which will make up other parts of the previous development design. The revised design of the DWP anticipates that there will be an equivalent requirement for such materials as quantities of each auxiliary material are anticipated to be equivalent, or slightly less than what was previously proposed. As such, the volumes of construction traffic anticipated to represent a worst-case scenario are considered still relevant.

Matheson Road was anticipated to experience the greatest increase in HGV movements during construction, increasing by 39% from current conditions and required a full assessment of environmental effects. Under IEMA guidelines, the A857 Willowglen Road and the A857 Macauley Road (south) would experience 17% and 13% increases in HGV movements respectively and therefore did not require a full assessment as the level of increase was below 30%. Moreover, the A859 South of the Access Road and A857 (North) were anticipated to have a 0% increase in HGV movements, and again did not require assessment under IEMA guidelines.

The evaluation of traffic and transport effects relating to HGV movements during construction will be briefly described below. A full description of the assessment outcomes are provided in Appendix O.1.

The severity of the increase of HGV movements along Matheson Road were assessed as **minor: non-significant** as a result of the road network having a good infrastructure standard of footways, pedestrian crossings and signalised junctions. Signalised junctions and good standards of pedestrian crossings and footways also meant that there would be little driver or pedestrian delay for those transiting along Matheson Road in their own vehicles or on foot during the construction period of the DWP. As such, the effect of increased HGV movements on driver delay and pedestrian delay and amenity was also assessed as **minor: non-significant**. An estimated 31,600 two-way trips including both HGV movements and staff vehicle trips along Matheson Road were predicted to occur during the construction period. Due to increased movements of vehicles over the construction period, accident rate was estimated to increase by 0.13 accidents over the total construction period due to additional movements. As such, this was assessed as **minor: non-significant**. As HGVs will be travelling to and from site, dust and dirt emissions were required to be assessed. As good standard practise will already be in place to minimise dust and dirt transfer to public roads from the construction site (see Section 16.3 of Chapter 16: Other Issues), the environmental effect was assessed as **negligible: non-significant**. The impact of dust emissions are also synonymous for all road networks assessed in the study area.

15.3.2.2 Additional Considerations

Arnish Point Industrial Estate is located at the end of the pre-existing Arnish Road, which starts at the wide bellmouth junction meeting the A859 south (Grid Reference: NB 40341 32379). The access road is currently utilised for existing construction and operational activities located at Arnish Point Industrial Estate and is frequently used by HGVs. As the proposed construction of the Stornoway DWP would require an additional access road to be constructed, access to the additional access road will meet at a junction with the pre-existing Arnish Road. As the pre-existing access road will still be in operation for current activities at the Arnish Point Industrial Estate, there is a need to ensure that access to the Industrial Estate is maintained throughout the construction of the additional access road to the Stornoway DWP. As such, considerations will be made through appropriate phasing of the works to when HGV movements to and from Arnish Point Industrial Estate are likely to occur by cooperating with local businesses. This will be done in line with Condition 10 of the PPiP (19/00273) received from CnES, where a traffic management plan shall include: "*b) Provisions for maintenance of access for emergency vehicles and to the Arnish Point Industrial Estate*".

It is also recognised that additional HGV movements along the Arnish Road during the construction phase of the DWP have the potential to affect the surface condition of the road network. In order to ensure that the surface condition of the road network does not deteriorate and therefore limiting, or even prohibiting access of emergency services vehicles and/or HGVs to and from Arnish Point Industrial Estate, a road condition survey will conducted as per the requirement of Condition 9 of the PPiP (19/00273) prior to commencement of the works. Regular observations shall also be made during the construction phase to ensure deterioration of the road network is not occurring.

15.3.3 Operations Impact Assessment

15.3.3.1 Impact Assessment

The worst-case scenario with regards to the potential effects of operational traffic were related to a maximum of 60 two-way HGV movements per day and 96 two-way coach trips (associated with tourism) per day.

Operational traffic was anticipated to be distributed along 5 main road routes and are as follows:

- A859 south of the access road;
- A859 Willowglen Road;
- A857 Macauley Road (south);
- Matheson Road; and
- A857 (north).

40 two-way HGV movements of the 60 identified are already attributed to the transfer of materials through Stornoway town centre associated with deliveries/departures from the existing port at Stornoway via freight ferry. Following construction of the DWP, it is possible that these movements will be redistributed with the freight arriving at the DWP and taking the most direct route to their destination, avoiding the town centre. As such, existing HGV movements are anticipated to be redistributed across the 5 main road routes described above, alleviating pressure off Stornoway town centre.

The assessment of HGV movements took into account the inclusion of both two-way coach movements and industrial two-way HGV movements during the operation of the DWP. Matheson Road (100% increase), the A859 Willowglen Road (63% increase) and A857 Macauley Road (33% increase) were anticipated to experience the greatest increase in HGV movements during operations and required a full assessment of environmental effects. The A859 south of the access road the A857 (north) would experience 23% and 17% increases in HGV movements respectively and therefore did not require a full assessment under IEMA guidelines as the level of increase was below 30%.

The evaluation of traffic and transport effects relating to HGV movements operations will be briefly described below. A full description of the assessment outcomes is provided in Appendix O.1.

The severity of the increase in HGV movements along the A859 Willowglen Road and A857 Macauley Road were assessed as **minor: non-significant** due to both road networks having residential properties which were either set back away from the road and/or had good footway infrastructure and signalised pedestrian crossings. Consideration of severity with regards to Matheson Road differed, however, due to the presence of both a school and a relatively dense urban/residential area. The dramatic increase in HGV movements constituted a **major-moderate: significant** effect. Mitigation was proposed and is provided in Section 15.4.

Signalised junctions and good standards of pedestrian crossings and footways also means that there would be little driver or pedestrian delay for those transiting along the A859 Willowglen Road and A857 Macauley Road in their own vehicles or on foot. The magnitude of change was assessed as moderate. As such, the effect of increased HGV movements on driver and pedestrian delay was also assessed as **minor: non-significant**. As the magnitude of change in

HGV movement along Matheson Road is considered as substantial in combination with the presence of a school, the effect of increased HGV movements on pedestrian delay and amenity and driver delay was assessed as **moderate: significant**, despite there being signalised junctions and good standards of pedestrian crossings.

An estimated 136,800 two-way trips including both HGV movements and staff vehicle trips over 12 months to/from the DWP. Each road could be classified under the same road status and as such, each assessment was synonymous with one another. Due to increased movements of vehicles over each operational period of 12months, accident rate was estimated to increase by 0.2 accidents over 12months due to additional movements to and from the DWP. As such, this was assessed as **minor: non-significant** for all road links in the study area.

Potential effects relating to dust and dirt were primarily related to the construction phase of the DWP. As it is not anticipated material movements by HGVs following freight ferry deliveries will constitute to dust and dirt effects, this was assessed as **no change**.

15.4 Mitigation measures

15.4.1 Construction

As no significant effects during construction were anticipated, no mitigation was proposed in the previous EIAR, however in line with best practice and planning in principle consent condition 9 & 10 a construction traffic management plan will be put in place.

Under condition 9 of the PPiP; *"No later than two weeks prior to the commencement of any construction works, a Road Condition Survey, to include record photographs shall be carried out along the access road taken from the junction of the A859 through to the Arnish Industrial Estate covering all of the road down to the access point located on the lower platform level to the west of the application site. A copy of the Road Condition Survey shall be submitted to, and approved in writing by the Comhairle as Planning Authority prior to any construction works commencing".*

Under condition 10 of the PPiP, a traffic management plan will be implemented and should include the following:

- *The routing on the road network of Stornoway of all construction traffic associated with the construction of the development;*
- *Provisions for maintenance of access for emergency vehicles and to the Arnish Point Industrial Estate;*
- *Measures to minimise impact on the road network of Stornoway at peak hours;*
  Identification of a nominated person to whom any road safety issues can be referred; and
- *Measures to reduce mud and spoil on the highway with wheel wash facilities, or provision of road sweeper and road cleaning schedule to ensure that the roads around the construction site are kept clear of mud and debris.*

In addition, the mitigation measures identified to minimise track out or dust and highlighted in Section 16.3 of Chapter 16: Other Issues will be implemented.

15.4.2 Operations

The possibility of HGV (including coaches) re-routing was proposed as the applicant (Stornoway Port Authority (SPA)) has the ability to determine the schedule of shuttle coach trips from the DWP to Stornoway town centre following cruise ship arrivals. As Matheson Road

would experience moderate: significant effects on pedestrian/driver delays and major-moderate: significant increases in severity if all vehicles be routed down this road system, especially during peak school hours, it is proposed that HGV/coach movements are scheduled to not coincide with school peak periods. Consultation with Comhairle nan Eilean Siar (CnES) would be required for the designation of appropriate alternative routes.

Carsharing by staff will be encouraged, if allowable under government guidance at that point in time.

15.5 Residual Effects

Following mitigation, the impact of HGV movements on severity and pedestrian/driver delay would be reduced from substantial to moderate. As such, the potential effect would be reduced to **minor: non-significant**.

Further details are provided in Appendix O.1.

15.6 Cumulative Effects

As detailed in Chapter 3: Methodology and Appendix O.1, no cumulative effects were identified associated with traffic and transport. Cumulative effects were previously assessed in combination with regards to the developments ongoing at Newton Marina in the previous EIAR. However, as the construction phase of the development at Newton Marina will have been completed by the time construction of the DWP has begun, no cumulative effects will occur.

15.7 Summary

In total, three significant effects on traffic and transport receptors were identified from the operations of the Stornoway DWP. These were associated with potential effects on driver and pedestrian delay on Matheson Road as a result of increased HGV movements. Through the adoption of effective and proportional traffic and transport mitigation during the operations of the development, all effects are reduced to non-significant.

Table 15.7.1 summarises the effects assessed traffic and transport receptors, the mitigation measures identified to control them and the potential for residual significant adverse effects. Significant effects are highlighted in yellow.

Table 15.7.1 Summary of Effects

Receptor	Nature of Impact	Receptor Sensitivity / Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Construction							
A859 south of the access road	**Severity of Traffic Increase:** Relationship between increased traffic and the infrastructure in place allowing for the ability to cope with increased pressure	Low	No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change
	Driver Delay: relating to increased journey times along road networks		No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change
	Pedestrian Delay: Level of intimidation, and/or delay experienced		No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change
	Accidents and Safety: Likelihood of an accident occurring.		No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change
	Dust and Dirt: Collection of dirt and debris on road and public surfaces.		Negligible	Negligible: Non-significant	Construction Traffic Management Plan & Dust Management Plan (e.g. cover loads likely to generate dust)	Negligible	Negligible: Non-significant
A859 Willowglen Road	**Severity of Traffic Increase:** Relationship between increased traffic and the infrastructure in place allowing for the ability to cope with increased pressure	Low	No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change
	Driver Delay: relating to increased journey times along road networks		No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change

Receptor	Nature of Impact	Receptor Sensitivity / Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Pedestrian Delay: Level of intimidation, and/or delay experienced		No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change
	Accidents and Safety: Likelihood of an accident occurring.		No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change
	Dust and Dirt: Collection of dirt and debris on road and public surfaces.		Negligible	Negligible: Non-significant	Construction Traffic Management Plan & Dust Management Plan (e.g. cover loads likely to generate dust)	Negligible	Negligible: Non-significant
A857 Macauley Road (south)	**Severity of Traffic Increase:** Relationship between increased traffic and the infrastructure in place allowing for the ability to cope with increased pressure	Low	No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change
	Driver Delay: relating to increased journey times along road networks		No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change
	Pedestrian Delay: Level of intimidation, and/or delay experienced		No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change
	Accidents and Safety: Likelihood of an accident occurring.		No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change
	Dust and Dirt: Collection of dirt and debris on road and public surfaces.		Negligible	Negligible: Non-significant	Construction Traffic Management Plan & Dust Management Plan (e.g.	Negligible	Negligible: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity / Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
					cover loads likely to generate dust)		
Matheson Road	**Severity of Traffic Increase:** Relationship between increased traffic and the infrastructure in place allowing for the ability to cope with increased pressure	Medium	Slight	Minor: Non-significant	Construction Traffic Management Plan, Under Condition 10 of PPiP.	Slight	Minor: Non-significant
	Driver Delay: relating to increased journey times along road networks		Slight	Minor: Non-significant	Construction Traffic Management Plan, Under Condition 10 of PPiP.	Slight	Minor: Non-significant
	Pedestrian Delay: Level of intimidation, and/or delay experienced		Slight	Minor: Non-significant	Construction Traffic Management Plan, Under Condition 10 of PPiP.	Negligible	Minor: Non-significant
	Accidents and Safety: Likelihood of an accident occurring.		Negligible	Minor: Non-significant	Construction Traffic Management Plan, Under Condition 10 of PPiP.	Slight	Minor: Non-significant
	Dust and Dirt: Collection of dirt and debris on road and public surfaces.		Negligible	Minor: Non-significant	Construction Traffic Management Plan & Dust Management Plan (e.g. cover loads likely to generate dust)	Negligible	Negligible: Non-significant
A857 (north)	**Severity of Traffic Increase:** Relationship between increased traffic and the infrastructure in place allowing for the ability to cope with increased pressure	Low	No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change

Receptor	Nature of Impact	Receptor Sensitivity / Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Driver Delay: relating to increased journey times along road networks		No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change
	Pedestrian Delay: Level of intimidation, and/or delay experienced		No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change
	Accidents and Safety: Likelihood of an accident occurring.		No change	No significant effect.	Construction Traffic Management Plan, Under Condition 10 of PPiP.	No change	No change
	Dust and Dirt: Collection of dirt and debris on road and public surfaces.		Negligible	Negligible: Non-significant	Construction Traffic Management Plan & Dust Management Plan (e.g. cover loads likely to generate dust)	Negligible	Negligible: Non-significant
Operation							
A859 south of the access road	**Severity of Traffic Increase:** Relationship between increased traffic and the infrastructure in place allowing for the ability to cope with increased pressure	Low	Slight	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant.
	Driver Delay: relating to increased journey times along road networks		Slight	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant.
	Pedestrian Delay: Level of intimidation, and/or delay experienced		Slight	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant.
	Accidents and Safety: Likelihood of an accident occurring.		Slight	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant.

Receptor	Nature of Impact	Receptor Sensitivity / Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Dust and Dirt: Collection of dirt and debris on road and public surfaces.		Slight	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant.
A859 Willowglen Road	**Severity of Traffic Increase:** Relationship between increased traffic and the infrastructure in place allowing for the ability to cope with increased pressure	Low	Moderate	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Driver Delay: relating to increased journey times along road networks		Moderate	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Pedestrian Delay: Level of intimidation, and/or delay experienced		Moderate	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Accidents and Safety: Likelihood of an accident occurring.		Negligible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Dust and Dirt: Collection of dirt and debris on road and public surfaces.		Slight	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant.
A857 Macauley Road (south)	**Severity of Traffic Increase:** Relationship between increased traffic and the infrastructure in place allowing for the ability to cope with increased pressure	Low	Moderate	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Driver Delay: relating to increased journey times along road networks		Moderate	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Pedestrian Delay: Level of intimidation, and/or delay experienced		Moderate	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity / Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Accidents and Safety: Likelihood of an accident occurring.		Negligible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Dust and Dirt: Collection of dirt and debris on road and public surfaces.		Slight	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant.
Matheson Road	**Severity of Traffic Increase:** Relationship between increased traffic and the infrastructure in place allowing for the ability to cope with increased pressure	Medium	Substantial	Major-moderate: significant	Carefully managed HGV and Coach schedules and route plans.	Moderate	Minor: Non-significant.
	Driver Delay: relating to increased journey times along road networks		Substantial	Major-moderate: significant	Carefully managed HGV and Coach schedules and route plans.	Moderate	Minor: Non-significant.
	Pedestrian Delay: Level of intimidation, and/or delay experienced		Substantial	Major-moderate: significant	Carefully managed HGV and Coach schedules and route plans.	Moderate	Minor: Non-significant.
	Accidents and Safety: Likelihood of an accident occurring.		Negligible	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant
	Dust and Dirt: Collection of dirt and debris on road and public surfaces.		Slight	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant.
A857 (north)	**Severity of Traffic Increase:** Relationship between increased traffic and the infrastructure in place allowing for the ability to cope with increased pressure	Low	Slight	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant.
	Driver Delay: relating to increased journey times along road networks		Slight	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant.

Receptor	Nature of Impact	Receptor Sensitivity / Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Pedestrian Delay: Level of intimidation, and/or delay experienced		Slight	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant.
	Accidents and Safety: Likelihood of an accident occurring.		Slight	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant.
	Dust and Dirt: Collection of dirt and debris on road and public surfaces.		Slight	Minor: Non-significant	No specific mitigation required.	No change	Minor: Non-significant.

Key

Significant Effect
Non-Significant

15.8 References

Comhairle nan Eilean Siar. (2018). Outer Hebrides Local Development Plan 2018.

Scottish Executive. (2005). PAN 75: Planning for Transport.

Scottish Government. (2014). Scottish Planning Policy. In (pp. 81). Edinburgh Scottish Government

Scottish Executive. (2006). National Transport Strategy

The Highland and Islands Transport Partnership. (2017). HITRANS Regional Transport Strategy Draft (HITRANS RTS).

Comhairle nan Eilean Siar. (2018). Outer Hebrides Local Development Plan 2018.

EnviroCentre. (2018). *Stornoway Deep Water Port Volume 1: Environmental Impact Assessment Report* Retrieved from http://marine.gov.scot/sites/default/files/07017_07018_-_eia_volume_1-.pdf

Scottish Executive. (2005). PAN 75: Planning for Transport.

Scottish Executive. (2006). National Transport Strategy

Scottish Government. (2014). *Scottish Planning Policy*. Retrieved from https://www.gov.scot/publications/scottish-planning-policy/.

Scottish Government. (2015). *Scotland's National Marine Plan: A Single Framework for Managing our Seas*. Retrieved from https://www.nls.uk/scotgov/2015/9781785442148.pdf.

The Highland and Islands Transport Partnership. (2017). HITRANS Regional Transport Strategy Draft (HITRANS RTS).

15.9 Glossary

Acronym	Definition
AADF	Average Annual Daily Flow
AAWF	Average Annual Weekly Flow
CnES	Comhairle nan Eilean Siar
DWP	Deep Water Port
EIAR	Environmental Impact Assessment Report
HGV	Heavy Goods Vehicle
HITRANS RTS	Highlands and Islands Transport Partnership – Regional Transport Strategy
IEMA	Institute for Environmental Management & Assessment
IHT	Institute of Highways and Transportation
LDP	Local Development Plan
NTS	National Transport Strategy
PAN 75	Planning Advice Note 75
PPiP	Planning Permission in Principle
SPA	Stornoway Port Authority
SPP	Scottish Planning Policy

Chapter 16: Other Issues

STORNOWAY PORT AUTHORITY

Contents

16 Other Issues

16.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) addresses any potential environmental effects which are relevant to the proposed development but will not give rise to any significant environmental effect in EIAR terms and hence were scoped out of the EIA. Although the topics do not warrant a full chapter and significance assessment, mitigation to minimise negative environmental effects and to maximise benefits are identified within this chapter for inclusion in the schedule of mitigation (Chapter 17).

16.2 Socioeconomics

As discussed in Section 2.1: Project Need of Chapter 2: Project Description, the main drivers for the project are to benefit the economy of Stornoway and the Outer Hebrides by providing a multipurpose facility. The Freight Berth will support commercial freight deliveries to the island, the islands tourism sector will benefit from increased visitor numbers associated with the cruise sector, and main berth, laydown area and link road to Arnish will facilitate use by the energy sector.

The population of the Outer Hebrides is just under 27,000 (Office for National Statistics, 2018) with approximately 30% of the population living in Stornoway (Fisher Associates, 2017). The Outer Hebrides have an aging population. Based on 2018 statistics, the median age was 49 compared to 42.1 for the whole of Scotland and 40.1 for the UK. 25.4% of the Outer Hebrides population was over 65 compared with 18.9% for the whole of Scotland (Office for National Statistics, 2018). This trend is predicted to continue and between 2018 and 2028, population numbers are projected to drop by 6.1% from 26,830 to 25,181. This includes a drop of 13% of 0 to 15-year olds, a drop of 30.6% of working age people 16-64, while the number of 65 to 74 year old remains static and the number of over 75's increases by 25.3% (National Records of Scotland, 2020).

In Gross Value Added (GVA) terms the Outer Hebrides' income was £460million in 2015, however £145million of that was associated with public services (Office for National Statistics, 2017). In 2011 the public sector accounted of 35% of total employment figures, with retail being the next highest at 14%. 11% were employed in construction and 7% in tourism. It is estimated that the Port accounts for 159 direct full-time equivalent (FTE) jobs, the majority of these are associated with the fishing sector (Fisher Associates, 2017).

In GVA per head comparisons the Outer Hebrides are in the bottom third Local Authority areas in Scotland, in 2015 the GVA was £16,989 significantly behind other island areas: Shetland £27,144 and Orkney £20,561. Shetland benefits from the oil and gas sector, whereas Orkney has capitalised on the tourism market including visits from large cruise vessels and day-trippers from the mainland (Office for National Statistics, 2017).

Stornoway Port Authority (SPA) have developed a Port Masterplan which not only takes account of the port's role in supporting lifeline services and assessment of market opportunities, it has considered the socio-economic context in which the port operates. 95% of all visitors to Lewis travel through the Stornoway Harbour, the Harbour is intrinsically linked to the social and economic development of Stornoway and the wider Outer Hebrides due to

its ability to facilitate industrial and fishing activities, welcome tourists and facilitate lifeline services to the mainland.

A full market assessment was completed as part of the Port Masterplan, which established priorities with regard to a range of sectors in the short, medium and long term. The DWP is key to meeting objectives with regard to cruise, renewable energy and decommissioning sectors along with freight and energy supply (Fisher Associates, 2017).

The construction of Newton Marina and the DWP are predicted to create an average of 66 FTE jobs per year for five years (2018-2022) (Fisher Associates, 2017). Newton Marina construction is close to completion, prior to works on the DWP commencing, hence the timing of the jobs may be stretched out of a longer time period but the total of 330 FTE years of work will still occur. Construction activities will draw on the resource of the local supply chain.

From 2023-2032 the direct FTE jobs associated with operations is predicted to be 203 per year, with an estimated 357 FTE additional direct and induced jobs per year under base case assumptions. The optimistic development case predicts and average of over 756 FTE jobs per year (Fisher Associates, 2017). These jobs arise from the following sectors:

- Commercial Freight – the freight berth with improve bulk-cargo handling and overall efficiency in the commercial sector, by providing a dedicated berth and add resilience by reducing reliance on the existing ferry berths. The improvements have knock on benefits to all sectors reliant on deliveries from the mainland and will benefit haulage operators.
- Tourism (Cruise) – currently larger cruise vessels have to anchor in the bay and transfer passengers in smaller vessels into Stornoway. This is time consuming process and leads to frequent cancellations, as the smaller vessels can only operate in calm sea conditions. This makes Stornoway a less attractive port to the sector when planning cruise itineraries. The new DWP will allow cruise vessels to come alongside, such that passengers can walk off the ship; the levelled/reclaimed area provides ample space for coaches to collect passengers to take them into Stornoway or on tours of the island. There is also the option of walking or cycling to Stornoway via the Castle Grounds. The aim is to attract an additional 20 to 25 vessel calls per annum, this is equivalent to an additional expenditure of £4 million per year in the Outer Hebrides economy (Fisher Associates, 2017).
- Renewables – the link road between the DWP and the Arnish Fabrication Yard will facilitate large scale manufacture, storage and assembly of components to support the renewable energy sector. The markets are likely to develop from onshore to offshore wind followed by wave and tidal power as technologies and more renewable resources become economically viable to access. Operations and maintenance support may also give rise to opportunities for projects based in the Minch and to the west of the islands.
- Oil and Gas decommissioning - is a multimillion-pound sector, with many platforms and installations reaching the end of their life. With a deep-water berth, heavy lift capabilities, and adequate space, the DWP will be able to compete in this market offering associated economic benefits.

As discussed in Section 16.5, the creation of jobs should encourage working aged people to stay or move to the Stornoway and the Outer Hebrides, helping to address the depopulation and aging population issues currently predicted for the island.

16.3 Air Quality

The main impact of construction works on air quality is normally associated with small solids becoming airborne giving rise to dust. The term dust is taken to incorporate very small particulate matter such as PM_{10}'s which have a practical size of less than 10micron as well as larger solids which may become airborne for a short period of time due to the energy they are exposed to e.g. blasting. Dust can coat surfaces such as cars and windows which can be a nuisance to neighbours and potentially 'smoother' plants. PM_{10}'s can be inhaled causing health issues, especially for those with pre-existing health conditions such as Asthma.

To have an environmental impact there is a need for a source, a pathway, and a receptor for an effect to occur. In the case of the DWP although blasting and material handling may be a source of dust, dust can only travel small distances (a few hundred meters). The location of the planned works is such that there are no sensitive receptors (residential properties, hospitals etc) close by, hence dust effects are not significant. That said, if there is no mitigation in place for dust there is a small risk that over a long period of dry weather, for issues to start to occur offsite, due to track out from vehicles. In addition, construction worker health concerns need to be considered. As such a Dust Mitigation Plan shall be developed in line with good practice for inclusion within the Construction Environmental Management Document for the project.

The proposal to utilise dredge material and locally won rock in the land reclamation will aid in the minimisation of greenhouse gas emissions arising from the construction works by minimising transport requirement.

Moving into the operational phase, sources of aerial emissions will be associated with transport, the burning of fossil fuels by vessels and vehicle movements associated with the development. The burning of fossil fuels gives rise to nitrogen oxide (NO_2), and particulate matter. As discussed in Chapter 15: Traffic and Transport, the increases in traffic levels are highest in the town of Stornoway. There are no air quality issues in Stornoway with concentrations of NO_2 well below the relevant National Air Quality Objectives (CnES, 2017). The increase in traffic volumes predicted should not change this, however it is recognised that mitigation identified in Chapter 15: Traffic and Transport will aid in ensuring that no short-term air quality issues arise.

The potential for shoreside power for smaller vessels utilising the DWP, will allow vessels to switch off their engines when alongside. Electricity has a lower associated greenhouse gas emission than the burning of fuel oil, this is in addition to the local air quality benefits of not discharging Sulphur Dioxides (SOx), PM10 and NO_2 from vessels.

16.4 Navigation

Stornoway Port Authority is responsible for navigational safety within their harbour limits as shown in Drawing SDWP-WS2139-XX-00-DR-C-9035. Safe navigation is facilitated through the implementation of the Marine Safety Management System which complies with the Port Marine Safety Code (Department for Transport and Maritime & Coastguard Agency, 2016).

The Port has three piers in Stornoway, all of which can be utilised on both sides, and include two Roll-on Roll-off (RoRo) linkspans facilities (West sides of Piers No. 1 and 3). There are three quays (Cromwell Street, North Beach and Esplanade) and two marinas, one at the Cromwell Street Quay in Stornoway Town Centre and the other, Newton Marina, to be completed shortly at Goat Island. In addition, there is a pier at Arnish which is also within the Harbour limits.

Stornoway is the main port for the Outer Hebrides. Lifeline freight and passenger ferry services to and from mainland Scotland operate from the harbour. In addition, the port provides berthing for use by bulk freight, industrial, cruise and pleasure vessels. There is also an operational slipway at Goat Island used by small commercial vessels and pleasure vessels. Industrial users are primarily the aquaculture sector and depending on market demand vessels associated with fabrication and other activities being carried out a the Arnish industrial facility in Glumaig Harbour

The main navigation route through the harbour utilises the deep water from the Minch towards the town centre. The ferry which visits three times a day, enters the Harbour Area and heads in a west north west direction past the mouth of Glumaig Harbour before turning on a more northerly course towards the linkspan on Pier No. 3.

During the proposed DWP construction works, there will be vessels associated with the delivery of materials such as piles for the construction works. These will follow standard shipping routes through the harbour area and as such do not pose a particular navigation risk. The vessels involved in the construction work will be present in the harbour area for long periods of time either in fixed locations or making short journeys. For example, the dredge works will make a short transit between the dredge location and the infill area, or if material is not suitable for reuse, to the dredge disposal area, offload the dredged material and return to the next area to be dredged.

The Port Authority will issue appropriate Notices to Mariners prior to the works to inform all vessel traffic of the construction activity and ensure that there are regular ongoing communications between the Harbour Master and the construction contractors, with regard to vessel movements, and that the construction vessels comply with the Port's Safety Management System. Contractors will be required to carry out all works without risk to the safety of other vessels.

The design of the facility in terms of water depths, layout, bollard design and access has been undertaken with input from the Port Authority's Harbour Master, pilots and potential customers. This input has been invaluable to ensuring that the project once constructed can be operated safely and meet their requirements.

From an operational perspective, the intent is to dredge to -10m Chart Datum (CD) as shown on Drawing SDWP-WS2139-XX-00_DR-C-9022 to facilitate access by large vessels such as cruise ships to the DWP and for rigs to anchor in Glumaig Harbour. The dredge area has been specifically designed to ensure safe navigation for the vessel drafts expected to be attracted to the development as demonstrated in Drawing SDWP-WS2139-XX-00_DR-C-9018.

The proposals laid out in Chapter 2: project Description to reduce the height of the SS Alabama wreck to below -8m CD will facilitate safe berthing on the Freight Ferry Berth, of the Freight Ferry and similar drafted vessels. Mitigation measures will be put in place for the removal of the 'Alabama'; these are highlighted in Section 13.6 of Chapter 13: Cultural Heritage and Archaeology. An 'after' survey of the removal work is required to detail the final positioning of items, this survey will be used to confirm that all sections of the wreck that project above -8m CD have been removed, to facilitate safe navigation.

The new facilities will be added into the Port Safety Management System, in line with standard procedures, to ensure navigational safety for DWP operations. Any new navigational markers

will be agreed with the Northern Lighthouse Board prior to installation. The as built information from a hydrographic perspective, including the berth locations, changes in water depths associated with the dredge and the height reduction of the Alabama will be provided to the Hydrographic Office, to allow the admiralty charts for the harbour to be updated.

Newton Marina will be in operation by the time that the DWP construction works start. The operation of the Port Authority's Safety Management System during construction and operation of the DWP will take account of the activities associated with Newton Marina, avoiding any negative impacts on navigational safety. The SPA has fulltime Watchkeeper coverage overseeing vessel movements and larger vessels required a pilot or a pilot exemption certificate to manoeuvre within Harbour Limits. Hence there will be no significant effects on navigation associated with the combined activities.

16.5 Population & Human Health

Population and Human Health covers a wide range of issues from depopulation to communicable diseases, relevant topics are considered within this section for construction and operations.

16.5.1 Construction Dust and Noise

Construction impacts on human health for neighbouring populations are primarily associated with in-air noise and dust. In-air noise if it is at a high enough level or includes tonal elements can cause disturbance or if arising at night affecting sleep patterns, both of which have significant effects on mental health. As discussed in Chapter 12: In-Air Noise, with appropriate mitigation no significant noise impacts are predicted during the construction of the DWP. Dust impacts on human health are discussed in Section 16.3 of this chapter, again no significant effects are predicted.

16.5.2 Population Effects

The construction and operational phases as discussed in Section 16.2 are predicted to give rise to direct and indirect jobs. Being in employment leads to positive effects on both physical and mental health, due to having the finances to improve living standards and the reduction in stress associated with unemployment. There are also population benefits associated with job creation, in that it will encourage working age people to stay or come and live on the island. In addition, with sustainable job prospects people are more likely to have and raise a family in the Outer Hebrides, helping to prevent depopulation and reverse the aging population trends which have been predicted (National Records of Scotland, 2020).

16.5.3 Communicable Diseases

The recent COVID-19 pandemic has highlighted the risk associated with communicable diseases, and how travel, including the cruise sector, can facilitate the rapid spread of infection across the globe. Cruise ships have previously been associated with local outbreaks of gastroenteritis ('norovirus'), fortunately transmission rates of gastric viruses are much lower than respiratory viruses.

Hence, it is prudent to consider the transfer of communicable diseases related to an increased inflow of people associated with jobs (particularly during construction) and tourism (during operations). With specific regard to COVID-19 it is unknown if and when a vaccine or treatment will be found, however as long as the transfer rate (the R number) is significantly

below 1, it is likely that with appropriate measures in place construction activities will be able to take place. The DWP contractor will work to government and industrial body guidance in respect of preventing infection transfer during construction activities.

The construction of the DWP will require people to travel to the island to carry out some of the works, which potentially increases the risk to the local population which has to date had very few cases. It is also recognised that the on-island National Health Service (NHS) provision is not large and access to specialist services requires transfer to the mainland. The contractor will be required to carry out a risk assessment for travel to work on the island and put in place appropriate mitigation measures to minimise the potential spread of COVID-19. The contractor will be responsible for communicating, implementing, and monitoring these risk mitigation measures.

Construction workers do not typically give rise to an increased risk of spread of other less contagious diseases, and it is noted that the COVID-19 requirements with regard to hygiene for example will also help to prevent the spread of other pathogens.

The DWP proposed development is likely to increase the number of tourists to Stornoway and the Outer Hebrides due to larger cruise vessels being able to berth. Whilst increased tourism presents the potential for a positive effect on the economic stimulus of Stornoway and the Outer Hebrides, the large numbers of passengers and crew could present a mechanism for the transmission of communicable diseases. The operational phase of the DWP will last decades, as such communicable diseases are considered here in more general terms, not just COVID-19.

The World Health Organisation (WHO) in 2005 revised International Health Regulations to address multiple health risks, including new and existing diseases (i.e. Severe Acute Respiratory Syndrome (SARS) and Ebola). These regulations are transposed into Scottish national law, including the Public Health etc. (Scotland) Act 2008.

The Harbour Master is responsible for informing the NHS local Health Protection Team and the Port Health Authority in event of suspected cases of notifiable diseases. Comhairle nan Eilean Siar is the Port Health Authority for Stornoway, they are responsible for the enforcement in the control of infectious diseases. The objective of the Port Health Authority is to prevent the introduction of dangerous epidemic diseases as a result of shipping activity, without creating unnecessary disruptions to services. These statutory powers are embodied in the Public Health etc. (Scotland) Act 2008 amendment to the Public Health (Ships)(Scotland) Regulations 1971.

Various powers are in place when considering the application of health controls on ships in Scotland. These are most notably contained within The Public Health (Ships) (Scotland) Amendment Regulations 2007. These regulations provide the overriding considerations required to be taken by Local and Port Health Authorities to specified diseases.

Although additional applications of particular measures may be put in place by a specific port authority, the mitigation highlighted here takes into consideration the main regulations in which are required in order to mitigate communicable disease.

International Health Regulations in which certain regulations are adopted by both the Public Health etc. (Scotland) Act 2008 and The Public Health (Ships) (Scotland) Amendment Regulations 2007, provide the issuance of ship sanitation control/exemption certificates.

Ship Sanitation Certificates can be issued by Port Health Authorities or Environmental Health Officers, but only at ports which have been authorised to do so. These are designed to prevent international vessels from causing public health risks and covers ship borne public health risks, vector control and food safety control.

The DWP will provide a location for cruise ships call at, as part of their itinerary, however due to the lack of other large-scale connectivity (airports), it will never be a 'start or finish' port for cruises. As such Ship Sanitation Certificates, will have been issued to vessels prior to them calling in to the DWP, this will provide some confidence with regard to the health risks posed by the vessel.

A suspected infectious disease on board amongst crew or passengers requires to be reported under The Public Health (Ships) (Scotland) Amendment Regulations 2007. If a communicable disease has been reported, no other person other than the pilot, customs officer, immigrations officer or port health officer can board or leave the ship without consent from an authorised officer. As such, the ship is required to obtain a free pratique[1] for health clearance.

In the event of a pandemic, Stornoway Port Authority will follow government guidance and that of the Association of Port Health Authorities, Health Protection Scotland and the Scottish Ports Liaison Network. A Maritime Declaration of Health is required for all vessels arriving from a foreign port.

The Port Authority is legally obliged to take steps to minimise the spread of communicable diseases and will proactively ensure all appropriate guidance is followed relevant to the specific issue. The Port Safety Management System will be updated to incorporate procedures for the control of communicable diseases at the DWP facility.

16.6 Materials & Waste

Materials required to construct the DWP, include metals for piles, bollards, linkspan and pontoon, plastics within the pontoons, fenders and drainage system, rock and aggregates for rock armour revetments and land reclamation, concretes for coping beams, and quays and tarmac for the roads.

As stated in Section 2.6.7 of Chapter 2: Project Description, it is expected that over 90% of dredge spoil material will be suitable for re-use as infill material. In addition, cutting into the hillside to produce a levelled area will provide rock for use in the revetments and infill areas. As such the bulk of the rock and aggregates required to construct the DWP are sourced locally minimising the need for transport of materials. Rock materials will however need to be appropriately managed to minimise dust as mentioned in Section 16.3 and to minimise reduction in water quality associated with suspended solids as discussed in Chapter 14: Water Environment, Soils & Coastal Processes.

[1] Pratique is the license given to a ship to enter port to show the authorities that she is free from contagious disease.

Metal and plastic components will primarily be delivered by sea, where practicable they will be delivered directly to site, or to one of the other berths in the Stornoway Harbour before being transferred by road to site. Tarmac and concrete will be produced offsite and imported by road as required.

Consumables will be delivered to site as required. As discussed in Chapter 14, there is a need to appropriately store and handle: fuels, oils and other potentially hazardous substances appropriately to minimise pollution risks. Mitigation identified within Chapter 14 will be implemented in line with industrial best practice and relevant legislation, to ensure materials are managed appropriately.

The waste hierarchy will be employed throughout the construction works and will aim to avoid, or minimise waste production where possible, re-use material where it can be, segregate waste which cannot be reused for recycling where available, and implement the correct methods of disposal should none of the aforementioned methods be feasible.

The re-use of material won from levelling the land and dredging is in line with the Waste Hierarchy. If material arising from dredging is not suitable for reuse, it will be disposed of at the Stornoway spoil disposal ground as this is the Best Practicable Environmental Option (BPEO) (EnviroCentre, 2018).

Compliance with all waste legislation will be ensured, and as described in Chapter 14 appropriate arrangements will be in place for managing cement washings and ensuring that litter is minimised.

16.7 Summary

This chapter highlights the positive environmental effects the project will have from a socioeconomic, navigation and population perspective through the construction and operational phases. It also recognises the need to implement construction best practice to minimise environmental effects, even if they are not significant.

Section 16.5 provides an overview of how communicable diseases are managed by the port sector and government agencies including their enshrinement in law, to demonstrate that the DWP will not give rise to any undue risk health risk to the Outer Hebrides population.

Table 16.7.1 summarises the other issues considered, and the mitigation measures identified to control them where relevant. The summary table differs from those summarising other chapters as effect significance has not been considered here. Mitigation identified has however been incorporated into the Schedule of Mitigation provided in Chapter 17.

Table 16.7.1: Summary of Effects

Topic	Nature of Impact	Mitigation Summary	Significance of Residual Effect
Construction			
Socioeconomics	Creation of Construction Jobs.	Encourage local supply chain involvement in the project.	Temporay Beneficial Significant
Air Quality	Dust Reducing Air Quality during Construction	Dust Management Plan	Temporary Non-significant
Navigation	Increase in collision risk during construction due to construction/dredge vessels.	Appropriate Notice to Mariners placed. Compliance with the Port Safety Management System. Good communications with the Harbour Master.	Negative Temporary Non-significant
Population & Human Health	Spread of communicable disease	All government guidance to be followed. Risk assessments to have particular regard for infection control. Working paterns for visiting workforce to take account of relevant guidance.	No change
Materials & Waste	Materials	Use of local materials where available.	Negative Temporary Non-significant
	Waste	Waste hierachy to be implemented. All relevant waste legislation to be followed.	Negative Temporary Non-significant
Operations			
Socioeconomics	Direct and indirect job creation.	None required.	Beneficial Permanent Signficant
Navigation	Increased Water Depths facilitating access by larger vessels.	Hydrographic Office made aware of changes to all charts to be updated.	Beneficial Permanent Non-Significant
	Height reduction of the Alabama reducing navigational risks.	Hydrographic Office made aware of changes to all charts to be updated.	Beneficial Permanent Non-Significant
	DWP available for larger vessels.	Hydrographic Office made aware of changes to all charts to be updated.	Beneficial Permanent Non-Significant

Topic	Nature of Impact	Mitigation Summary	Significance of Residual Effect
	Additional vessel movements in the harbour area, leading to additional navigational safety issues.	Port Safety Management System updated to incorporate the DWP facility. Navigational aids agreed with the Northern Lighthouse Board prior to installation.	No Change
Population & Human Health	Job creation, leading to reduction in depopulation and aging population issues.	None required.	Beneficial Permanent Signficant
	Spread of communicable disease	All relevant legislation and guidance to be adhered to. Port Safety Management System updated to incorporate the DWP facility.	No Change

Key

Significant Effect
Non-Significant

16.8 References

CnES. (2017). 2017 Air Quality Annual Progress Report (APR) for Comhairle nan Eilean Siar.

Department for Transport and Maritime & Coastguard Agency. (2016). *Port Marine Safety Code*. Retrieved from

EnviroCentre. (2018). Stornoway Deep Water Port - Best Practicable Environmental Option Report

Fisher Associates. (2017). *Stornoway Port Authority - Port Masterplan*.

National Records of Scotland. (2020). Na h-Eileanan Siar Council Area Profile. https://www.nrscotland.gov.uk/files//statistics/council-area-data-sheets/na-h-eileanan-siar-council-profile.html#population_projections

Office for National Statistics. (2017). Regional GVA(I) by local authority in the UK. https://www.ons.gov.uk/economy/grossvalueaddedgva/datasets/regionalgvaibylocalauthorityintheuk

Office for National Statistics. (2018). Local authority ageing statistics, based on annual mid-year population estimates: time-series.

16.9 Glossary

Acronym	Definition
DWP	Deep Water Port
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
FTE	Full Time Equivalent
GVA	Gross Value Added
PPE	Personal Protective Equipment
SPA	Stornoway Port Authority

Chapter 17: Schedule of Mitigation

STORNOWAY PORT AUTHORITY

Contents

17 Schedule of Mitigation

17.1 Introduction

Mitigation measures which have been identified throughout the Environmental Impact Assessment Report (EIAR), are collated within this Chapter to form the Schedule of Mitigation (SoM) for the Stornoway Deep Water Port (DWP).

17.2 Schedule of Mitigation

Table 17.2.1 collates all the mitigation measures identified for the construction phase of the DWP while Table 17.2.2 covers the operational phase. References to the relevant sections of the EIAR and other associated guidance documents are provided in both tables.

17.3 Mitigation Implementation

17.3.1 Construction Mitigation

A Construction Environmental Management Document (CEMD) will be drafted based on the mitigation included in Table 17.2.1. The CEMD will be a working document utilised by the construction contractor during both the construction planning and implementation phases. The CEMD will inform the production of the construction contractor Risk Assessment Method Statements (RAMS) for the works.

Appropriate resources will be put in place to ensure the CEMD requirements can be met, including appropriately trained and experienced:

- Environmental Clerk of Works (ECoW);
- Passive Acoustic Monitoring (PAM) operator; and
- Marine Mammal Observers (MMO).

The ECOW will ensure compliance by carrying out site walkovers and audits as appropriate to the construction works being carried out.

17.3.2 Operational Mitigation

The operational mitigation identified in Table 17.2.2 will be incorporated into Stornoway Port Authority's (SPA) existing management systems as required to ensure that they are implemented appropriately.

Table 17.2.1: Summary of Construction Mitigation

No.	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
C.01	Landscape and Visual	Visual impacts	Detailed design, and construction planning will ensure that the design mitigation of minimising the rock extraction to that required for the construction only.	PPiP 19/00273	EIAR Chapter 5 Section 5.7.1
C.02	Landscape and Visual	Visual impacts	In siting buildings on the levelled/reclaimed platform, ensure their exact location benefits from the best possible screening provided by surrounding landform.		EIAR Chapter 5 Section 5.7.2
C.03	Landscape and Visual	Visual impacts	The buildings should be simple in appearance with façades coloured to reflect the backdrop of rock and moorland.		EIAR Chapter 5 Section 5.7.2
C.04	Landscape and Visual	Visual impacts	Where logistically feasible, locate any built development, above ground infrastructure and storage away from the water's edge		EIAR Chapter 5 Section 5.7.2
C.05	Marine Mammals	Marine Mammals	Marine Mammal and Basking Shark Protection Plan to be implemented		EIAR Chapter 7, Section 7.6 EIAR Chapter 8, Section 8.6

C.06	Marine Mammals
	Fish Ecology (specifically Basking Shark)
	
	Fish Ecology (specifically Basking Shark)
		Marine Mammals
		Piling
			The impact piling marine mammal mitigation will provide the following measures:
			• A 500m mitigation zone will be established around the piling rig;
			• Trained marine mammal observers (MMO) will conduct a 20min pre-watch prior to the commencement of piling operations;
			  ○ If the 500m mitigation zone remains clear of marine mammals during the watch, permission will be given to commence piling; but
			  ○ If a marine mammal is sighted within the mitigation zone, piling will be delayed until the zone has been clear of marine mammals for at least 10min.
					EIAR Chapter 7, Section 7.6.1
					EIAR Chapter 8, Section 8.6

No.	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
			○ A 30minute soft start-up for 123cm and 80cm diameter king piles is required to protect HF hearing receptor groups; and ○ A soft start-up is not required for the piling of the heavy load area 30cm diameter piles. • If conditions are unsuitable for visual observations (darkness, fog reducing visibility to <500m, or sea states >Beaufort 4); passive acoustic monitoring (PAM) will be utilised by a trained PAM operator to monitor the mitigation zone; ○ A PAM watch of the mitigation zone will have a minimum duration of 20min; • Once piling has commenced there will be no requirement to stop works if a marine mammal enters the mitigation zone, as long as piling has been continuous, with no breaks exceeding 10min; • If a break in piling operations exceeds 10min the following conditions will apply: ○ During a break in piling operations, the noise generator will be utilised to produce sound at lower pressures to deter marine mammals away from the construction area and maintain a soft start procedure. Should the noise generator fail to be utilised for whatever reason, an MMO/PAM operator will be on watch during the break. The MMO/PAM operator will remain on watch during the break with or without the noise generator. ○ If an MMO/PAM operator has been on watch during the break, with or without the utilisation of the noise generator, if the mitigation zone remains clear of marine mammals, piling can recommence immediately; ○ If an MMO/PAM operator has been on watch during the break, with or without the noise generator running, and a marine mammal is observed within the mitigation,		

No.	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
			piling will not recommence until the zone has been clear of marine mammals for at least 10min; and ○ If no marine mammal observations have been conducted during a break exceeding 10min and without the noise generator running, a 20min pre-watch will be conducted before piling can recommence, as detailed above. • All MMO/PAM operations will be recorded using the JNCC marine mammal reporting forms template and submitted to Marine Scotland once the works are complete.		
C.07	Marine Mammals Fish Ecology (specifically Basking Shark)	Spoil Disposal Marine Mammal	The dredged spoil disposal marine mammal and basking shark mitigation will provide the following measures: • A 200m mitigation zone will be established around the disposal vessel during disposal. A mitigation zone is placed around the vessel as opposed to the disposal site as the vessel will be in transit during disposal; • Trained marine mammal observers (MMO) will conduct a 20min pre-watch prior to the commencement of spoil disposal, either on board the disposal vessel or from land; ○ If the 200m mitigation zone remains clear of marine mammals during the watch, permission will be given to commence disposal; and ○ If a marine mammal is sighted within the mitigation zone, disposal will be delayed until the zone has been clear of marine mammals for at least 5min. • If conditions are unsuitable for visual observations (darkness, fog reducing visibility to <300 on-board the vessel and <700m from the observation point on land, or sea states >Beaufort 4); passive acoustic monitoring (PAM) will be utilised by a trained PAM operator to monitor the mitigation zone;		EIAR Chapter 7, Section 7.6.2 EIAR Chapter 8, Section 8.6

No.	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
			○ A PAM watch of the mitigation zone will have a minimum duration of 20min; ○ If a marine mammal is detected within the mitigation zone during a PAM watch, disposal will be delayed until the zone has been clear of marine mammals for at least 10min. • All MMO/PAM operations will be recorded using the JNCC marine mammal reporting forms template and submitted to Marine Scotland once the works are complete.		
C.08	Marine Mammals	Marine Mammals	All vessels to comply with the Scottish Marine Wildlife Watching Code.	Scottish Marine Wildlife Watching Code (SNH, 2017).	EIAR Chapter 7, Section 7.6
C.09	Benthic Ecology	Benthic Species on Sections of Wreck for Relocation	Divers will be briefed before the wreck removal to attempt to relocate individual organisms likely to be affected by the wreck section relocation works prior to them commencing.		EIAR Chapter 9, Section 9.6
C.10	Benthic Ecology	Benthic Species in Dredge Area	The dredging will be carried out utilising positioning technology to ensure only the required dredge area is dredged and further impacts on benthic species are minimised.		EIAR Chapter 9, Section 9.6
C.11	Terrestrial Ecology	Permanent Loss of Habitat	Minimise the area of the habitats to be removed. Rock armour revetments will be installed replacing coastal habitats used by otter. Replacement tree planting to minimise loss of woodland.		EIAR Chapter 10, Section 10.6
C.12	Terrestrial Ecology	Habitat Disturbance	Turves removed in soil stripping will be used to seal exposed peat where practicable to prevent heathland and/or shrub habitats from drying out. Mitigation is incorporated into the construction design to help retain water in the remaining flush and spring habitats.		EIAR Chapter 10, Section 10.6

No.	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
C.13	Terrestrial Ecology	Non-native Invasive Species	Pre-construction surveys will be undertaken to identify any non-native invasive species in the onshore construction area. Exclusion zones around rhododendron found in or adjacent to the construction site. Removal of rhododendron if required, following appropriate methodology. All equipment will arrive clean to site.		EIAR Chapter 10, Section 10.6
C.14	Terrestrial Ecology	Otter	Pre-construction surveys. EPS licence sought if required. Development of Species Protection Plan (SPP). Minimise area and duration of disturbance. Artificial lighting within the site should only be used where required to light works sites and for safety reasons and should be directional towards the required works area. Measures to prevent entrapment.		EIAR Chapter 10, Section 10.6
C.15	Terrestrial Ecology	Bats	Pre-construction surveys. EPS licence sought if required. Development of Species Protection plans (SPP). Minimise area and duration of disturbance. Artificial lighting within the site should only be used where required to light works sites and for safety reasons and should be directional towards the required works area.		EIAR Chapter 10, Section 10.6
C.16	Terrestrial Ecology	Amphibians and Reptiles	Pre-construction surveys. Development of Species Protection plans (SPP). Seasonal considerations when timing works where practical. Translocation of reptiles to suitable receptor site if required. Minimise area and duration of disturbance. Avoidance of hibernacula outwith active season where practicable. Watching briefs.		EIAR Chapter 10, Section 10.6
C.17	Terrestrial Ecology	Birds	Pre-construction surveys. Ongoing watching brief during breeding bird season. Development of Species Protection plans (SPP).		EIAR Chapter 10, Section 10.6

No.	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
			Seasonal considerations when timing works where practical. Exclusion zones around any nests found. Minimise area and duration of disturbance. Artificial lighting within the site should only be used where required to light works sites and for safety reasons and should be directional towards the required works area.		
C.18	Terrestrial Ecology	Habitat Disturbance or Loss of Ground Water Dependent Terrestrial Ecosystems	Installation of impermeable membrane to protect remaining habitat and encourage formation of new habitat. Installation of SuDS.		EIAR Chapter 10, Section 10.6
C.19	Underwater Noise	Piling	The use of vibro hammers to drive the piles to refusal prior to using impact piling techniques.		EIAR Chapter 11 Chapter 7, Section 7.5
C.20	Noise and Vibration (In-Air)	Control of In-Air Noise Impacts at all times of day	Applicable best practice techniques as identified in Section 8 of BS5228: • Ensure regular maintenance of all equipment used on site, including maintenance related to noise emissions; • Ensure that vehicles and vessels are loaded carefully to ensure minimal drop heights so as to minimise noise during this operation; and • Ensure that machines are shut down between work periods or throttled down to a minimum.		EIAR Chapter 12 Section 12.5.1
C.21	Noise and Vibration (In-Air)	Noise Impacts	A protocol for handling any noise related complaints will be contained within a Construction Environmental Management Document (CEMD), this will be applicable for all noise complaints but of particular use in addressing any concerns associated with dredging.		EIAR Chapter 12 Section 12.5.1
C.22	Noise and Vibration (In-Air)	Noise Impacts associated with Dredging	Dredging of areas to the north of the dredge area will be carried out during the day whenever practicable.		EIAR Chapter 12 Section 12.5.1

No.	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
C.23	Noise and Vibration (In-Air)	Noise Impacts associated with Dredging	Prior to night-time dredging in the north of the dredge area (if required), the NSR likely to be affected will be informed.		EIAR Chapter 12 Section 12.5.1
C.24	Noise and Vibration (In-Air)	Noise Impacts associated with Dredging	Noise monitoring during dredge activities will be carried out to understand the actual noise levels arising at receptors.		EIAR Chapter 12 Section 12.5.1
C.25	Noise and Vibration (In-Air)	Noise Impacts associated with Blasting	Restriction of blasting as far as practicable to regular daytime periods, not on Sundays and away from public holidays.		EIAR Chapter 12 Section 12.5.1
C.26	Noise and Vibration (In-Air)	Noise Impacts associated with Blasting	Good community relations; informing nearby noise/vibration sensitive receptors ahead of periods of blasting		EIAR Chapter 12 Section 12.5.1
C.27	Noise and Vibration (In-Air)	Noise Impacts associated with Blasting	The choice of appropriate drilling rigs.		EIAR Chapter 12 Section 12.5.1
C.28	Noise and Vibration (In-Air)	Noise Impacts associated with Blasting	Designing blasts to maximize efficiency and reduce the transmission of noise/vibration.		EIAR Chapter 12 Section 12.5.1
C.29	Cultural Heritage and Archaeology	Archaeology – '*Alabama*' Wreck	A Method Statement detailing the proposed scope and methodology of the 'After' dismantling survey with regard to the archaeological elements of the wreck site will be developed. The survey and subsequent recording would be undertaken in accordance with the 36 Rules governing the management of underwater cultural heritage assets contained in the *Manual for Activities directed at Underwater Cultural Heritage: Guidelines to the Annex of the UNESCO 2001 Convention* (MAUCH) (UNESCO, 2013). The results of the surveys and further research into the history of the '*Alabama*' will be presented in a report, in accordance with paragraph	Policy GEN 6, paragraph 4.24 and 4.25 of the SNMP(Scottish Government, 2015). MAUCH (UNESCO, 2013)	EIAR Chapter 13, Section 13.6.1.1

No.	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
			4.24 of the Scottish National Marine Plan SNMP (Scottish Government, 2015), providing detailed information on the significance of the wreck, as well as recording and presenting evidence of that significance in a publicly accessible report.		
C.30	Cultural Heritage and Archaeology	Archaeology	In accordance with Conditions 14 and 15 of the Planning Permission in Principle (PPiP, 19/00273) an archaeological watching brief, preceded by a Method Statement to be approved by the CnES Archaeologist, shall be undertaken during ground breaking construction works. The CnES Archaeologist shall also be granted access to inspect any construction works and to monitor the watching brief.	PPiP 19/00273	EIAR Chapter 13, Section 13.6.1.2
C.31	Water Environment, Soils and Coastal Processes	Increased sediment loading	The start of each activity that could give rise to increased sediment loading in the water column will be observed, to ensure that any plumes arising are localised and disperse quickly as they occur.		EIAR Chapter 14 Section 14.6.1
C.32	Water Environment, Soils and Coastal Processes	Increased sediment loading.	Where increases in sediments are not as predicted, the construction technique will be reviewed to identify areas for improvement to prevent reoccurrence.		EIAR Chapter 14 Section 14.6.1.1
C.33	Water Environment, Soils and Coastal Processes	Increased sediment loading.	Implementation of Sustainable urban Drainage System (SuDS) as per the design. Temporary surface water management requirements will be identified in the RAMS.	The SuDS Manual (CIRIA, 2015)	EIAR Chapter 14 Section 14.6.1.1
C.34	Water Environment, Soils and Coastal Processes	Potential loss of containment: fuel on site.	Fuel bowsers on site will be under strict management controls, in compliance with the requirements of the relevant GBR's.	The Water Environment (Controlled Activities) (Scotland) Regulations	EIAR Chapter 14 Section 14.6.1.2

No.	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
				C2011 (as amended).	
C.35	Water Environment, Soils and Coastal Processes	Potential loss of containment: fuel on site.	Refuelling will be carried out in designated areas, by trained operatives following site refuelling procedures. The refuelling procedure will take into account best practice laid out in GPP2 and PPG6.	PG6: Work at Construction and Demolition Sites (Environmental Agency, NIEA, & SEPA, 2012) GPP2: Above Ground Oil Storage Tanks (SEPA, NIEA, & Wales, 2017).	EIAR Chapter 14 Section 14.6.1.2
C.36	Water Environment, Soils and Coastal Processes	Potential loss of containment: oils and chemicals on site.	Where practicable, bio-degradable hydraulic fluids will be utilised in machinery during construction.		EIAR Chapter 14 Section 14.6.1.2
C.37	Water Environment, Soils and Coastal Processes	Potential loss of containment: oils and chemicals on site.	All oils and chemicals will be subject to Control of Substances Hazardous to Health (COSHH) assessments under the COSHH Regulations 2002.		EIAR Chapter 14 Section 14.6.1.2
C.38	Water Environment, Soils and Coastal Processes	Potential loss of containment: oils and chemicals on site.	All COSHH assessments will include a section on the environment to highlight any precaution or mitigation requirements.		EIAR Chapter 14 Section 14.6.1.2

No.	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
C.39	Water Environment, Soils and Coastal Processes	Potential loss of containment: oils and chemicals on site.	Appropriately bunded oil and chemical storage cabinets will be provided on site. These will be kept locked, with the key under management control to ensure appropriate use and accountability.	PG6: Work at Construction and Demolition Sites (Environmental Agency et al., 2012)	EIAR Chapter 14 Section 14.6.1.2
C.40	Water Environment, Soils and Coastal Processes	Potential loss of containment: oils and chemicals on site.	Appropriate spill plans aligned to the pollution control hierarchy and spill kits will be in place, construction operatives will be trained in the plans and in the use of spill kits.	GPP21: Pollution Incident Response Plans (NIEA, 2017)	EIAR Chapter 14 Section 14.6.1.2
C.41	Water Environment, Soils and Coastal Processes	Cement washings.	Cement washings will be carried out in a dedicated area.	PG6: Work at Construction and Demolition Sites (Environmental Agency et al., 2012)	EIAR Chapter 14 Section 14.6.1.2
C.42	Water Environment, Soils and Coastal Processes	Cement washings.	Washing arisings will be collected for onsite treatment. This will include settlement and, if required, pH correction. If not suitable for reuse liquids will be tankered off site for appropriate disposal. The solids will be disposed of as solid waste.	PG6: Work at Construction and Demolition Sites (Environmental Agency et al., 2012)	EIAR Chapter 14 Section 14.6.1.2

No.	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
C.43	Water Environment, Soils and Coastal Processes	Introduction of non-native marine species.	Contractors will be required to ensure all plant and equipment brought to site is properly cleaned prior to arrival.		EIAR Chapter 14 Section 14.6.1.3
C.44	Water Environment, Soils and Coastal Processes	Introduction of non-native marine species.	All equipment will be inspected prior to mobilisation on site; any equipment carrying excessive sediment deposits will be returned to the supplier.		EIAR Chapter 14 Section 14.6.1.3
C.45	Water Environment, Soils and Coastal Processes	Litter	Prior to construction works on site commencing, a litter sweep will be conducted to prevent the escape of existing litter on site into the marine environment.		EIAR Chapter 14 Section 14.6.1.4
C.46	Water Environment, Soils and Coastal Processes	Litter	All personnel working on the project will undertake site induction; this will include a section on waste management and the use of the waste receptacles provided.		EIAR Chapter 14 Section 14.6.1.4
C.47	Water Environment, Soils and Coastal Processes	Litter	Waste receptacles will be covered, and littering will not be tolerated.		EIAR Chapter 14 Section 14.6.1.4
C.48	Water Environment, Soils and Coastal Processes	Litter	Construction staff will be encouraged to collect any litter they see in the construction areas and, if deemed necessary litter sweeps will be carried out.		EIAR Chapter 14 Section 14.6.1.4

No.	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
C.49	Water Environment, Soils and Coastal Processes	Litter	The use of single use plastics will be discouraged, reusable water bottles supplied to all personnel and reusable crockery and cutlery will be provided in the welfare facilities.		EIAR Chapter 14 Section 14.6.1.4
C.50	Water Environment, Soils and Coastal Processes	Litter	All generated waste will be segregated to facilitate appropriate recycling.		EIAR Chapter 14 Section 14.6.1.4
C.51	Water Environment, Soils and Coastal Processes	Litter	Staff will be encouraged to collect any litter they see on site, and if deemed necessary litter sweeps will be carried out.		EIAR Chapter 14 Section 14.6.1.4
C.52	Water Environment, Soils and Coastal Processes	Peat Removal	A Peat Management Plan is to be developed, details of which are to be agreed with Comhairle nan Eilean Siar (CnES) in consultation with Scottish Environment Protection Agency (SEPA).	19/00273, Condition 7(4)	EIAR Chapter 14 Section 14.6.1.5 Chapter 10 Section 10.6
C.53	Traffic and Transport	Road Safety and Condition	Undertake a Road Condition Survey prior to any commencement of construction works no later than 2 weeks before the anticipated start date in line with Condition 9 of the PPiP from CnES.	PPiP 19/00273	EIAR Chapter 15, Section 15.4.1
C.54	Traffic and Transport	Road Safety and Navigation	Traffic management plan to monitor the traffic movements associated with the construction of the development in line with Condition 10 of the PPiP from CnES.	PPiP 19/00273	EIAR Chapter 15, Section 15.4.1 & 15.4.2
C.55	Air Quality	Air Quality - Dust	Dust mitigation plan to be implemented.	Guidance on the assessment of dust from demolition and	EIAR Chapter 16, Section 16.3

No.	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
				construction (IAQM, 2014).	
C.56	Air Quality	Air Quality - Dust	Appropriate planning to minimise the number of times dust emitting material is moved.		EIAR Chapter 16 Section 16.3
C.57	Socioeconomics	Creation of construction jobs	Encourage local supply chain involvement in the project.		EIAR Chapter 16 Section 16.2
C.58	Navigation	Increase in collision risk during construction due to construction/ dredge vessels.	Appropriate Notice to Mariners placed. Compliance with the Port Safety Management System. Good communications with the Harbour Master.		EIAR Chapter 16 Section 16.4
C.59	Navigation	Additional vessel movements in the harbour area, leading to additional navigational safety issues.	Navigational aids agreed with the Northern Lighthouse Board prior to installation.		EIAR Chapter 16 Section 16.4
C.60	Population & Human Health	Spread of communicable disease	All government guidance to be followed. Risk assessments to have particular regard for infection control. Working patterns for visiting workforce to take account of relevant guidance.		EIAR Chapter 16 Section 16.5
C.61	Materials & Waste	Materials	Use of local materials where available.		EIAR Chapter 16 Section 16.6
C.62	Materials & Waste	Waste	Waste hierarchy to be implemented. All relevant waste legislation to be followed.		EIAR Chapter 16 Section 16.6

Table 17.2.2: Summary of Operational Mitigation

	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
O.01	Traffic and Transport	Road Safety and Navigation	HGV/coach movements are scheduled to not coincide with school peak periods, or alternative routes to be taken to avoid interface with pedestrian movements to/from schools		EIAR Chapter 15, Section 15.4.2
O.02	Navigation Population & Human Health Water Environment	Additional vessel movements in the harbour area, leading to additional navigational safety issues. Spread of communicable disease. Pollution Prevention.	Port Safety Management System and Oil Spill Response plan updated to incorporate the DWP facility.		EIAR Chapter 16 Sections 16.4 and 16.5 Chapter 14 Section 14.6.2
O.03	Navigation	Increased Water Depths facilitating access by larger vessels.	Hydrographic Office made aware of changes to all charts to be updated.		EIAR Chapter 16 Section16.4
O.04	Navigation	Height reduction of the Alabama reducing navigational risks.	Hydrographic Office made aware of changes to all charts to be updated.		EIAR Chapter 16 Section16.4
O.05	Navigation	DWP available for larger vessels.	Hydrographic Office made aware of changes to all charts to be updated.		EIAR Chapter 16 Section16.4

	Topic	Aspect	Mitigation/Enhancement	Guidance	Source
O.06	Population & Human Health	Spread of communicable disease	All government guidance to be followed. Risk assessments to have particular regard for infection control. Working patterns for visiting workforce to take account of relevant guidance.		EIAR Chapter 16 Section 16.5
O.07	Population & Human Health	Spread of communicable disease	All relevant legislation and guidance to be adhered to. Port Safety Management System updated to incorporate the DWP facility.		EIAR Chapter 16 Section 16.5

17.4 References

CIRIA. (2015). *The SuDS Manual*. Retrieved from

Environmental Agency, NIEA, & SEPA. (2012). *PPG 6: Work at Construction and Demolition Sites*. Retrieved from http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/.

IAQM. (2014). *Guidance on the Assessment of Dust from Demolition and Construction*. Retrieved from http://iaqm.co.uk/wp-content/uploads/guidance/iaqm_guidance_report_draft1.4.pdf

NIEA, S., Natrual Resources Wales. (2017). GPP 21: Pollution Incident Response Plans

Scottish Government. (2015). *Scotland's National Marine Plan: A Single Framework for Managing our Seas*. Retrieved from https://www.nls.uk/scotgov/2015/9781785442148.pdf.

SEPA, NIEA, & Wales, N. R. (2017). *GPP2: Above Ground Oil Storage Tanks: Guidance on Pollution Prevention 2*. Retrieved from http://www.netregs.org.uk/media/1475/gpp-2-pdf-jan-2018.pdf

SNH. (2017). The Scottish Marine Wildlife Watching Code.

UNESCO. (2013). Manual for Activities directed at Underwater Cultural Heritage: Guidelines to the Annex of the UNESCO 2001 Convention.

17.5 Glossary

Acronym	Definition
CAR	The Water Environment (Controlled Activities) (Regulations) 2011 (as amended)
CEMD	Construction Environmental Management Document
CnES	Comhairle nan Eilean Siar
DWP	Deep Water Port
ECoW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
GPP	Guidance on Pollution Prevention
MMO	Marine Mammal Observers
PAM	Passive Acoustic Monitoring
PPG	Pollution Prevention Guidance
PPiP	Planning Permission in Principle
RAMS	Risk Assessment Method Statement
SEPA	Scottish Environment Protection Agency
SPA	Stornoway Port Authority
SoM	Schedule of Mitigation

Chapter 18: Conclusions

STORNOWAY PORT AUTHORITY

Contents

18 Conclusion

Stornoway has been built up around the natural harbour provided by the Stornoway Port and therefore, the prosperity of the town and the wider Outer Hebrides is intrinsically linked to the harbour. The proposed Deep Water Port (DWP) development will provide facilities to maintain and grow the economic stature of the town and the wider Outer Hebrides by supporting a range of economic sectors.

The new DWP will facilitate the berthing of deep drafted vessels at a new 306m long main quay with a heavy load area. In addition, the development includes: a reclaimed /levelled area, a freight ferry berth with linkspan, a pontoon pier, an access road and a link road to the Arnish Point Industrial Estate suitable for wide/large loads. The construction of such a facility will allow ships up to 360m in length to berth. This will allow cruise ships to berth alongside, enabling passengers to disembark easily, supporting the growth of tourism. The large quay, levelled/reclaimed area and link to the Arnish Industrial Estate will facilitate local opportunities arising from the renewable energy, and oil and gas decommissioning sectors. The freight ferry berth and linkspan will accommodate commercial deliveries to the Outer Hebrides supporting a range of sectors.

The DWP development facilitates compliance with a number of Scottish Government policy commitments and targets regarding sustainable development and thereby provides economic and social benefits. The project aligns to Comhairle nan Eilean Siar (CnES) and Highlands & Islands Enterprise (HIE) policies, by providing jobs and benefit to the local economy.

A detailed master planning exercise was undertaken to understand the future requirements of SPA and consideration given to the best way to meet the requirements, taking account of physical and environmental constraints. This identified the DWP as a key development for the Outer Hebrides. The design has been an iterative process, leading to the DWP proposal which meets all the functional and policy requirements while minimising environmental effects.

It is expected that work will take in the region of 15 and 20 months to complete. Generally, construction works excluding dredging will be conducted primarily between 7am to 7pm Monday to Saturday. Sunday working is not anticipated to occur. However, work outwith these hours may be required on an infrequent basis to suit tides and other vessel movements.

A scoping exercise was undertaken and a scoping opinion received in March 2018. This Environmental Impact Assessment Report (EIAR) addresses all points raised within the scoping response, while ensuring a broad coverage of all relevant environmental topics required to be included in the Environmental Impact Assessment (EIA).

The EIAR was produced in line with the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 and the Harbours Act 1964 (as amended), in order to support the Marine Licensing and Harbour Revision Order (HRO) applications. In addition, due consideration was also given to other relevant forms of legislation applicable to the EIA process for the Stornoway DWP, these included; The Water Framework Directive (2000/60/EC) (WFD) and the Habitats Regulations Appraisal (HRA) implemented in Scotland through the Water Environment and Water Services (Scotland) Act 2003 and the Conservation (Natural Habitats, &c.) Regulations 1994 (the Habitats Regulations) respectively.

The EIAR considers likely uses but where additional consents are required, it is assumed that the relevant additional consenting process(es) will ensure that the appropriate measures will be put in place to minimise negative environmental impacts and environmental, health and safety risks.

The DWP once operational will facilitate operations by a range of users. Operations at the new Port will be administered, overseen, and controlled from the Port Control Building in Stornoway Harbour. There will be an International Ship and Port Facility Security (ISPS) boundary created within the DWP which will be utilised for the management of cruise ship passengers.

Impacts in all topic areas have been assessed and appropriate mitigation identified where required, to minimise adverse effects. The significant effects identified, taking account of primary and tertiary mitigation for all topic areas are summarised in Table 18.1.

There were 28 significant adverse effects associated with the construction works without secondary mitigation. Once secondary mitigation was taken into account, the number of residual adverse effects were reduced to 13. The 13 significant residual effects were associated with landscape and visual effects that will occur during the construction phase of the DWP.

The operational phase has 15 adverse significant effects associated with it, relating to landscape and visual effects and transport and traffic issues. The 12 significant effects associated with landscape and visual effects are not reduced through secondary mitigation, although it is identified that no long-term significant effects occur on already designated landscapes. Visual impacts on all receptors were recognised as an issue throughout the design process and efforts had been made to minimise the severity of these effects. Nonetheless, it is important to recognise that where open views across the harbour are experienced, the proposed development would tend to introduce a prominent visual focus against a largely undeveloped backdrop. In many instances, the various parts of the proposed development will also occupy a large part of the view and not all significant effects could be designed out. The other 3 significant effects which were associated with traffic and transport were all reduced to non-significant when secondary mitigation was applied. The EIAR identified 3 significant benefits of the Stornoway DWP development, each of which are associated with socioeconomics and job creation during both the construction and operational phases of the DWP. Construction jobs in the region of 66 Full Time Equivalent (FTE) per year are predicted, once operational an estimated 357FTE direct and induced jobs per year will be created. From a population and human health perspective, the creation of jobs will lead to a reduction in depopulation and aging population issues.

Cumulative effects with other projects were considered but no significant effects were identified.

Table 18.1.1: Summary of Significant Effects in the Absence of Mitigation. All effects are classified as 'adverse significant' unless it is stated that they have a positive or beneficial impact magnitude.

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Construction							
Cuddy Point	Visual effects from construction	High	Moderate-Major	Localised Mod-Major	Good housekeeping during construction.	Moderate-Major	Localised Mod-Major
South Beach	Visual effects from construction	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Newton Street	Visual effects from construction	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Harbour (offshore)	Visual effects from construction	High	Substantial	Localised Substantial		Substantial	Localised Substantial
Lower Sandwick	Visual effects from construction	Medium-High	Major	Localised Major		Major	Localised Major
Lews Castle	Visual effects from construction	High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Ferry Terminal	Visual effects from construction	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Iolaire Monument Car Park	Visual effects from construction	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Sandwick Bay	Visual effects from construction	Medium-High	Major	Localised Major		Major	Localised Major
Recreational Users and some Residents around Sandwick Bay	Landscape and Visual effects from construction	High	Major	Significant		Major	Significant
Some Residents and Visitors on parts of Newton Street and South Beach	Landscape and Visual effects from construction	High	Moderate-Major	Significant		Moderate-Major	Significant
Stornoway Harbour CCA	Landscape and Visual effects from construction	High	Moderate-Major	Significant		Moderate-Major	Significant
Lews Castle and Lady Lever Park GDL	Landscape and Visual effects from construction	High	Moderate-Major	Significant		Moderate-Major	Significant
Inner Hebrides and The Minches cSAC	Piling noise	International	Adverse Low Short-term Reversible	Moderate: significant	Piling Marine Mammal Protocol	Adverse Negligible Short-term Reversible	Minor: Non-significant
	Spoil disposal		Adverse Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Adverse Negligible Short-term Reversible	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Harbour Porpoise	Piling noise	International	Adverse Low Short-term Reversible	Moderate: significant	Piling Marine Mammal Protocol	Adverse Negligible Short-term Reversible	Minor: Non-significant
	Spoil disposal		Adverse Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Adverse Negligible Short-term Reversible	Minor: Non-significant
Minke Whale	Spoil disposal	International	Adverse Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Adverse Negligible Short-term Reversible	Minor: Non-significant
Humpback Whale	Spoil disposal	International	Adverse Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Adverse Negligible Short-term Reversible	Minor: Non-significant
Risso's Dolphin	Spoil disposal	International	Adverse Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Adverse Negligible Short-term Reversible	Minor: Non-significant
Short-beaked Common Dolphin	Spoil disposal	International	Adverse Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Adverse Negligible Short-term Reversible	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Killer Whale	Spoil disposal	International	Adverse Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Adverse Negligible Short-term Reversible	Minor: Non-significant
Common Seal	Spoil disposal	International	Adverse Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Adverse Negligible Short-term Reversible	Minor: Non-significant
Grey Seal	Spoil disposal	International	Adverse Low Short-term Reversible	Moderate: significant	Spoil Disposal Marine Mammal Protocol	Adverse Negligible Short-term Reversible	Minor: Non-significant
NSR06 – Builnacraig Street	Backhoe dredging Nighttime Noise	NSR Category A	Adverse Moderate – Large	Minor to Moderate: significant	Applicable best practice techniques as identified in Section 8 of BS5228. A protocol for handling any noise related complaints will be contained within the Construction Environmental Management Document (CEMD). Dredging of areas to the north of the dredge area will be carried out during the day whenever practicable. Prior to night-time dredging in the north of the dredge area (if required), the NSR likely to be affected e.g. those in Builnacraig Street will be informed.	Adverse Slight - Moderate	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
					Noise monitoring during dredge activities will be carried out to understand the actual noise levels arising at receptors.		
W1, undesignated wreck of the Alabama	Reduction in height and partial dismantling	Medium	Adverse Medium	Moderate: significant	Programme of survey and recording work accompanied by a report, in accordance with paragraph 4.24 of the NMP, the results of which will be presented in a publicly accessible report.	Adverse Negligible	Negligible: Non-significant
Socioeconomics	Creation of construction jobs		Temporary Beneficial	Significant	Encourage local supply chain involvement in in the project	Temporary Beneficial	Significant
Peat	Peat Removal	Certain	Adverse Medium Permanent	Moderate: Significant	Peat Management Plan including peat reuse strategy to be developed.	Adverse Certain Low Permanent	Minor: Non-significant
Operation							
Cuddy Point	Visual effects from cruise ship present and deep water port	High	Moderate-Major	Localised Mod-Major	The site has been located near to other operational and consented industrial developments, but with balanced degree of separation between them. The indicative scale of the proposed industrial/storage building has been designed so that it does not breach the local skyline, dwarf the local landform or other nearby existing operational and consented industrial development.	Moderate-Major	Localised Mod-Major
South Beach	Visual effects from cruise ship present and deep water port	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Newton Street	Visual effects from cruise ship	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	present and deep water port				The buildings should be simple in appearance with façades coloured to reflect the backdrop of rock and moorland. Where logistically feasible, locate any built development, infrastructure and storage away from the water's edge		
Harbour (offshore)	Visual effects from cruise ship present and deep water port	High	Substantial	Localised Substantial		Substantial	Localised Substantial
Lower Sandwick	Visual effects from cruise ship present and deep water port	Medium-High	Major	Localised Major		Major	Localised Major
Lews Castle	Visual effects from cruise ship present and deep water port	High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Ferry Terminal	Visual effects from cruise ship present and deep water port	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Iolaire Monument Car Park	Visual effects from cruise ship present and deep water port	Medium-High	Moderate-Major	Localised Mod-Major		Moderate-Major	Localised Mod-Major
Sandwick Bay	Visual effects from cruise ship present and deep water port	Medium-High	Major	Localised Major		Major	Localised Major
Recreational Users and some Residents	Landscape and Visual effects	High	Major	Significant		Major	Significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
around Sandwick Bay	from port related infrastructure and activities						
Some Residents and Visitors on parts of Newton Street and South Beach	Landscape and Visual effects from port related infrastructure and activities	High	Moderate-Major	Significant		Moderate-Major	Significant
Stornoway Harbour CCA	Landscape and Visual effects from port related infrastructure and activities	High	Moderate-Major	Significant		Moderate-Major	Significant
Matheson Road	**Severity of Traffic Increase:** Relationship between increased traffic and the infrastructure in place allowing for the ability to cope with increased pressure	Medium	Substantial	Major-moderate: significant	Carefully managed HGV and Coach schedules and route plans.	Moderate	Minor: Non-significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
	Driver Delay: relating to increased journey times along road networks **Pedestrian Delay:** Level of intimidation, and/or delay experienced						
Socioeconomics	Direct and indirect job creation		Positive Permenant	Signficant	None required	Positive Permenant	Signficant
Population & Human Health	Job creation, leading to reduction in depopulation and aging population issues.		Positive Permenant	Significant	None required	Positive Permenant	Significant

Key

Significant Effect
Non-Significant

18.1 Glossary

Acronym	Definition
CnES	Comhairle nan Eilean Siar
DWP	Deep Water port
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
FTE	Full Time Equivalent
HRA	Habitats Regulations Appraisal
HRO	Harbour Revision Order
SPA	Stornoway Port Authority
WFD	Water Framework Directive

Acknowledgements

The production of the Environmental Impact Assessment Report (EIAR) was led by the Affric Limited team working closely with Stornoway Port Authority and their engineers Wallace Stone. The production was a joint effort between environmental experts from various companies. The output we hope is much more than a document to support the Marine Licencing and Harbour Revision Order application processes, rather the joint iterative design process has resulted in a high-quality project with intrinsic mitigation to minimise adverse effects and maximise the benefits.

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