XLCC CABLE FACTORY - HUNTERSTON

EIA Report Appendix 8.1: Flood Risk Assessment

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Quality Management

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1 INTRODUCTION

1.1 RPS was commissioned to prepare a Flood Risk Assessment (FRA) on behalf of Xlinks Cable Company Limited (XLCC) in relation to the proposed High-Voltage Cable Manufacturing Facility at Hunterston Port.

1.2 The aim of the FRA is to outline the potential for the Project site to be impacted by flooding, the impacts of the Project on flooding in the vicinity of the Project site, and the proposed measures which could be incorporated into the Project to mitigate the identified risk. The report has been produced in accordance with the guidance detailed in Flood Risk Management (Scotland) Act 2009, National Planning Framework 3 (NPF; Scottish government, 2014a), the Scottish Planning Policy (SPP) (Scottish Government 2014b) and associated Technical Flood Risk Guidance for Stakeholders (SEPA, 2019a). Reference has also been made to the CIRIA SuDS manual (C753; CIRIA, 2015A) and the Sewers for Scotland Manual v4.0 guidance (Scottish Water, 2018).

1.3 This report has been produced in consultation with the Scottish Environment Protection Agency (SEPA) and the Local Authority.

1.4 The desk study was undertaken by reference to information provided / published by the following bodies:

- SEPA;
- North Ayrshire Council;
- Centre for Ecology and Hydrology;
- British Geological Survey (BGS);
- Ordnance Survey (OS); and
- Scottish Water (SW).

2 PLANNING POLICY CONTEXT

National Planning Policy

National Planning Framework 3

2.1 The National Planning Framework 3 (NPF3) was published by the Scottish Government in June 2014 and sets out the spatial expression of the Government Economic Strategy, and of the plans for infrastructure investment (Scottish Government, 2014a).

2.2 NPF3 supports a catchment-scale approach to sustainable flood risk management. The spatial strategy aims to build the resilience of cities and towns, by encouraging sustainable land management in rural areas and addressing the long-term vulnerability of parts of the coast and islands. In achieving sustainable development, planning was noted to play an important part in reducing the vulnerability of existing and future development to flooding.

2.3 It was acknowledged that flooding can impact on people and businesses and that climate change will increase the risk of flooding in some parts of the country.

Scottish Planning Policy

2.4 The (SPP) was published by the Scottish Government in June 2014 and was revised and updated in December 2020 (Scottish Government, 2014b). The purpose of the SPP is to set out national planning polices which reflect the priorities of the Scottish Ministers' for operation of the planning system and for the development and use of land. The document advises of the following requirements for managing flood risk and drainage including the promotion of:

- *"a precautionary approach to flood risk from all sources, including coastal, water course (fluvial), surface water (pluvial), groundwater, reservoirs and drainage systems (sewers and culverts), taking account of the predicted effects of climate change;*
- *flood avoidance: by safeguarding flood storage and conveying capacity, and locating development away from functional flood plains and medium to high risk areas;*
- *flood reduction: assessing flood risk and, where appropriate, undertaking natural and structural flood management measures, including flood protection, restoring natural features and characteristics, enhancing flood storage capacity, avoiding the construction of new culverts and opening existing culverts where possible; and*
- *avoidance of increased surface water flooding through requirements for Sustainable Drainage Systems (SuDS) and minimising the area of impermeable surface.*

2.5 To achieve this the planning system should prevent development which would have a significant probability of being affected by flooding or would increase the probability of flooding elsewhere. Piecemeal reduction of the functional floodplain should be avoided given the cumulative effects of reducing storage capacity.

2.6 Alterations and small-scale extensions to existing buildings are outwith the scope of this policy, provided that they would not have a significant effect on the storage capacity of the functional floodplain or local flooding problems. […]

2.7 Local development plans should use the following flood risk framework to guide development. This sets out a flood risk framework to guide development. This framework sets out three categories of coastal and watercourse flood risk, together with guidance on surface water flooding, and the appropriate planning approach for each. The framework outlines:

- *Little or No Risk – annual probability of coastal or watercourse flooding is less than 0.1% (1:1000 years)*
    - *No constraints due to coastal or watercourse flooding.*
- *Low to Medium Risk – annual probability of coastal or watercourse flooding is between 0.1% and 0.5% (1:1000 to 1:200 years)*
    - *Suitable for most development. A flood risk assessment may be required at the upper end of the probability range (i.e. close to 0.5%), and for essential infrastructure and the most vulnerable uses. Water resistant materials and construction may be required.*
    - *Generally not suitable for civil infrastructure. Where civil infrastructure must be located in these areas or is being substantially extended, it should be designed to be capable of remaining operational and accessible during extreme flood events.*
- *Medium to High Risk – annual probability of coastal or watercourse flooding is greater than 0.5% (1:200 years).*
- *May be suitable for:*
    - *residential, institutional, commercial and industrial development within built-up areas provided flood protection measures to the appropriate standard already exist and are maintained, are under construction, or are a planned measure in a current flood risk management plan;*
    - *essential infrastructure within built-up areas, designed and constructed to remain operational during floods and not impede water flow;*
    - *some recreational, sport, amenity and nature conservation uses, provided appropriate evacuation procedures are in place; and*
    - *job-related accommodation, e.g. for caretakers or operational staff.*
- *Generally not suitable for:*
    - *civil infrastructure and the most vulnerable uses;*
    - *additional development in undeveloped and sparsely developed areas, unless a location is essential for operational reasons, e.g. for navigation and water-based recreation, agriculture, transport or utilities infrastructure (which should be designed and constructed to be operational during floods and not impede water flow), and an alternative, lower risk location is not available; and*
    - *new caravan and camping sites.*
- *Where built development is permitted, measures to protect against or manage flood risk will be required and any loss of flood storage capacity mitigated to achieve a neutral or better outcome.*
- *Water-resistant materials and construction should be used where appropriate. Elevated buildings on structures such as stilts are unlikely to be acceptable.*

Surface Water Flooding

- *Infrastructure and buildings should generally be designed to be free from surface water flooding in rainfall events where the annual probability of occurrence is greater than 0.5% (1:200 years).*
- *Surface water drainage measures should have a neutral or better effect on the risk of flooding both on and off the site, taking account of rain falling on the site and run-off from adjacent areas. […]*

2.8 *The flood risk framework set out above should be applied to development management decisions. Flood Risk Assessments (FRA) should be required for development in the medium to high category*

of flood risk, and may be required in the low to medium category in the circumstances described in the framework above, or where other factors indicate heightened risk. FRA will generally be required for applications within areas identified at high or medium likelihood of flooding/flood risk in SEPA's flood maps.

2.9 *Drainage Assessments, proportionate to the development proposal and covering both surface and foul water, will be required for areas where drainage is already constrained or otherwise problematic, or if there would be off-site effects.*

2.10 *Proposed arrangements for SuDS should be adequate for the development and appropriate long-term maintenance arrangements should be put in place."*

National Planning Framework 4

2.11 The draft National Planning Framework 4 (NPF4) was laid down before the Scottish Government in November 2021, with addressing and mitigating climate change as a material consideration within. NPF4 seeks to make Scotland resilient to future flood risk, as well as making efficient and sustainable use of water resources. It seeks to avoid development in areas of future functional floodplain and also balance sustainable development with flood risk in coastal communities, to help enable economic prosperity.

2.12 The use of green and blue infrastructure is promoted throughout, in particular for surface water drainage and natural flood risk management. The importance of not increasing pressure on existing sewer networks is also outlined and ensuring new developments can utilise public water mains, rather than relying on local water sources.'

2.13 The site lies within one of the eighteen national developments proposed to support the delivery of the national spatial strategy. The Scottish National Planning Framework has identified Hunterston Port as a national development to deliver sustainable, productive places. This national development supports the repurposing of Hunterston port as well as the adjacent former nuclear power station site. The location and infrastructure offer potential for electricity generation from renewables, and a variety of commercial uses including port, research and development, aquaculture, circular economy.

Policy 13 – Flooding

2.14 Policy 13 addresses sustainable flood risk and water management:

A. *"Local development plans should strengthen community resilience to the current and future impacts of climate change, including identifying opportunities to implement natural flood risk management and blue green infrastructure. Plans should take into account the probability of flooding from all sources. New development proposals in flood risk areas, or which can impact on flood risk areas, should be avoided. A cautious approach should be taken, regarding the calculated probability of flooding as a best estimate, not a precise forecast.*

B. *Development proposals should not be supported within the Future Functional Floodplain unless they are for:*

- *essential infrastructure where the location is required for operational reasons;*
- *water compatible uses;*
- *redevelopment of an existing building or site within a built-up area for an equal or less vulnerable use; and*
- *the site is within a built up area and has protection from an existing or committed flood protection scheme.*

Any of the above exceptions must meet the following criteria:

- *all risks have been fully assessed and understood;*
- *any first occupied /utilised floor of a development is above the future flood level, plus an allowance for freeboard;*
- *there is no reduction in floodplain capacity, increased risk for others, or a need for future flood protection schemes;*
- *safe operation and access/egress can be achieved during the design flood event;*
- *flood-resistant and resilient materials and construction methods are used; and*
- *the ability to make future adaptations to accommodate the effects of climate change can be demonstrated.*

C. *Small scale extensions and alterations to existing buildings are outwith the scope of this policy, provided that they would not have a significant effect on the storage capacity of the functional floodplain or local flooding problems.*

D. *Development proposals for Most Vulnerable and Civil Infrastructure uses in areas outwith the functional floodplain should incorporate additional measures to ensure that they remain safe and operational during more extreme events up to and including the 0.1% design flood.*

E. *Development proposals should not be supported:*

- *within areas at risk of surface water flooding unless the risk can be successfully mitigated;*
- *where the design for surface water drainage and ground water drainage increases discharge to the public sewer network; and*
- *where the proposed drainage solution has a negative impact on the overall catchment; unless adequate land is set aside for blue and green infrastructure and the design and construction permits safe operation and function of the proposal in a storm event and that managed water flow is not impeded.*

F. *To avoid increased surface water flooding development proposals should only be supported if they:*

- *minimise the area of impermeable surface; and*
- *provide adequate drainage of surface water wherever practicable by blue and green infrastructure (such as Sustainable Drainage Systems (SuDS) including raingardens).*

G. *Development proposals should only be supported if they can be connected to the public water mains. If connection is not feasible, connection to a wholesome supply of drinking water that is resilient to periods of water scarcity can be supported in exceptional circumstances.*

H. *Development proposals which create, expand or enhance opportunities for natural flood risk management and blue-green infrastructure should be supported."*

National Guidance

2.15 The Flood Risk: Planning Advice note was published in June 2015 (Scottish Government, 2015) as part of a collection of Planning Advice Notes (PANs). With respect to when a Flood Risk Assessment is required to support a planning application, the PAN states that if a site is adjacent to a minor / culverted watercourse then it may be at risk of flooding. As such, further investigation would be required.

2.16 As the Project site partially lies within the extent of fluvial and coastal flooding, an FRA is required to support the application.

Local Planning Policy

2.17 North Ayrshire Council adopted a new Local Development Plan on the 28th November 2019 (North Ayrshire, 2019) and contains the following Policies relating to flood risk and drainage:

Policy 14 – Green and Blue Infrastructure

2.18 *"All proposals should seek to protect, create, enhance and/or enlarge our natural features and habitats which make up our green and blue infrastructure (including open space), ensuring no unacceptable adverse environmental impacts occur. Green and blue infrastructure should be multi-functional, accessible and integral to its local circumstances. For example, Sustainable Urban Drainage Systems (SuDS) have the potential to play a key role in the delivery of meaningful blue and green infrastructure, providing amenity and improving biodiversity as well as providing a sustainable flood risk solution. We will require details of the proposed arrangements for the long-term management and maintenance of green infrastructure, and associated water features, to form a key part of any proposal. Our Open Space Strategy (2016-2026) highlights the need for an audit which identifies valued and functional green and blue infrastructure or open space capable of being brought into use to meet local needs. We will support the temporary use of unused or underused land as green infrastructure including where it consists of advanced structure planting to create landscape frameworks for future development. Support will be given to proposals which seek to enhance biodiversity from new development where possible, including the restoration of degraded habitats and the avoidance of further fragmentation or isolation of habitats. We will also support proposals that are in accordance with the vision and outcomes of the Central Scotland Green Network as well as those of the Garnock Connections Project."*

Policy 23 – Flooding and the Water Environment

2.19 The Council "*will support development that demonstrates accordance with the Flood Risk Framework as defined in Scottish Planning Policy and shown in schedule 7, relevant flood risk management strategies and local flood risk management plans. They will also support schemes to manage flood risk, for instance through natural flood management, managed coastal realignment, wetland or green infrastructure creation. Generally, development should avoid locations of flood risk and should not lead to a significant increase in the flood risk elsewhere. Land raising and elevated buildings will only be supported in exceptional circumstances, where it is shown to have a neutral or better impact on flood risk outside the raised area.*

2.20 *Development proposals should:*

- *Clearly set out measures to protect against, and manage, flood risk;*
- *Include sustainable urban drainage systems (SuDS) where surface water is proposed to be discharged to the water environment, in accordance with the Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended;*
- *Include provision of temporary/construction phase SuDS;*
- *Include appropriate long-term maintenance arrangements;*
- *Be supported by an appropriate flood risk assessment where at risk of flooding from any source in medium to high risk areas and for developments in low to medium risk areas identified in the risk framework (schedule 7); and*
- *Take account of SEPA's flood risk and land use vulnerability guidance (2018) and any relevant updates to, or replacements of this guidance*."

2.21 North Ayrshire Council has produced a developer's guide for developments that include:

- the provision sustainable drainage systems (SuDS);

- notable surface water infrastructure; and
- where the proposal is at risk of flooding or is likely to result in an increase in flood risk elsewhere.

2.22 This FRA has been undertaken with reference to the above policies and associated guidance.

3 CONSULTATION

Scottish Environment Protection Agency

3.1 The FRA has been produced in consultation with SEPA. Information on defences, modelled flood levels and historic flooding has been requested to SEPA. SEPA is unable to provide modelled river levels and flows, as their flood hazard maps have been produced using methods and data appropriate for national scale mapping rather than detailed local models. In addition, SEPA is not aware of any flood defences relevant to this site.

Scottish Water

3.2 The public sewer network within the vicinity of the site is operated by Scottish Water. Sewer and water mains plans have been obtained from a Utility Search Map reference no. US_98123; however, no sewers have been identified within the site. Therefore, no further consultation has been undertaken with Scottish Water during this assessment.

3.3 A water main has been identified below the access road of the site in the north east. It runs along the eastern boundary of the site beneath A78.

3.4 A pre-development enquiry has not been undertaken as part of the preparation of the FRA as it was not in the scope of the FRA.

Local Planning Authority

3.5 The site is within the administrative boundary of North Ayrshire Council. The FRA has been produced in consultation with the Council. Modelled flood levels and flood history of the site have been requested to the local flood team. The NAC Flooding Team unfortunately does not have any modelling work, watercourse details or understanding of ground water flooding issues, historic floodplain extent / levels and property flooding history at this area.

Internal Drainage Board

3.6 The Project site is not located within an IDB District.

4 SITE DESCRIPTION

Site Description

4.1 The Project site is located at National Grid Reference NS 20238 53343 (Grid Reference Finder, 2021), is irregular in shape and occupies an area of approximately 50.7 hectares (ha). The Project site location is presented in Figure 4.1.

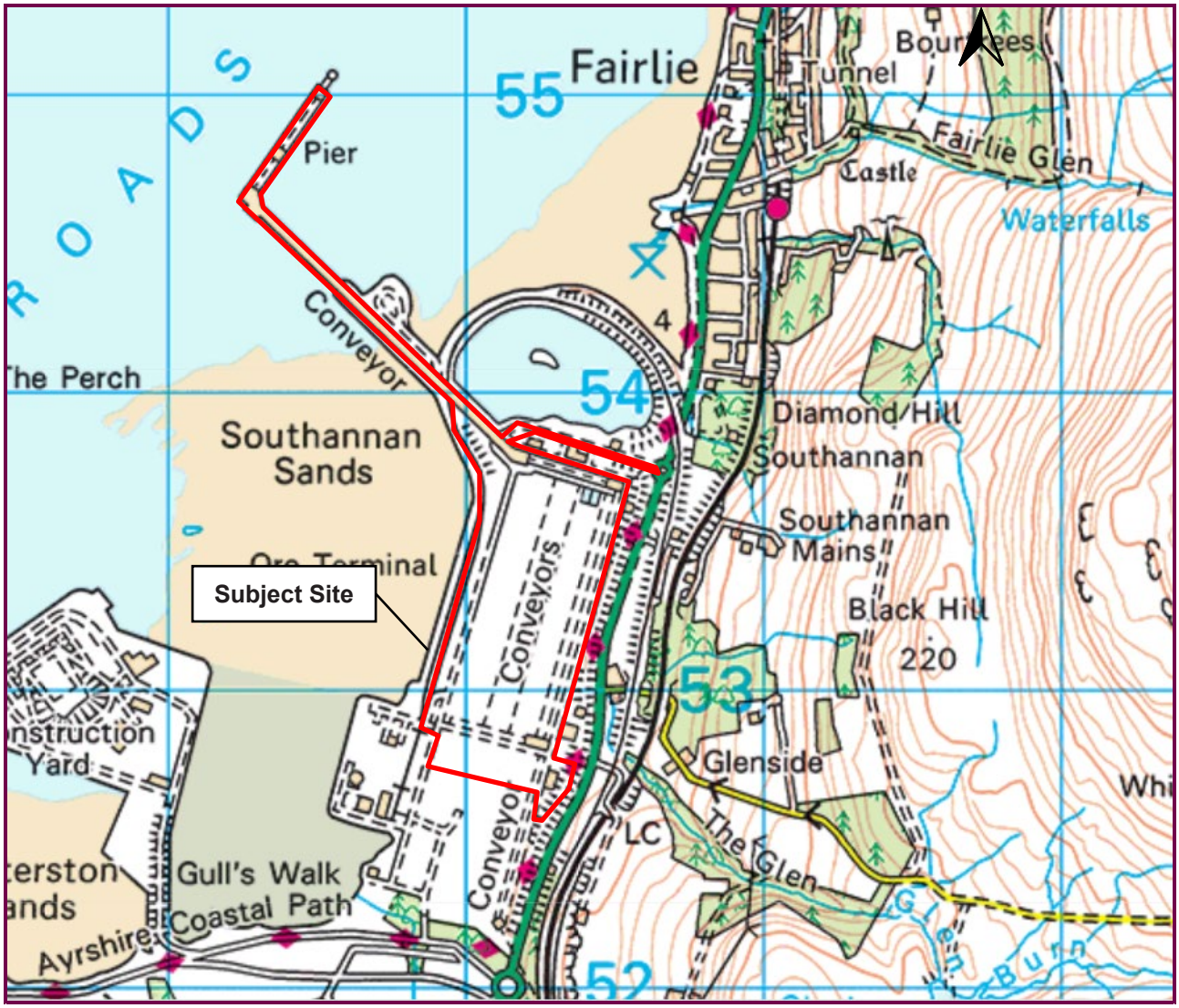


Figure 4.1: Site Location

4.2 The Project site is located on part of the former Hunterston Coal Yard within the wider Hunterston Port and Resource Centre, located on the coast of the West of Scotland, south of the settlement of Fairlie, and north of the EDF Hunterston Power Station.

4.3 Primary vehicular access to the site can be gained from the exiting site access to the Hunterston Yard via Irvine Road (A78).

4.4 The Project site is currently 100% impermeable, surfaced with a mix of concrete, tarmacadam and compacted demolish material.

Surrounding Land Uses

4.5 The area surrounding the Project site is dominated by port infrastructure.

4.6 To the west of the Project site is the location of the former SSE National Offshore Wind Turbine Test Facility, which was decommissioned in 2018.

4.7 Hunterston Nuclear Power Station is located approximately 2.7km to the south west of the Project site. A number of electrical substations and a HVDC converter station lie adjacent to the Nuclear Power Station.

4.8 The nearest residential property is located approximately 157m east of the Project site, on the other side of the A78 on Fairlie Moor Road.

4.9 The Project site itself comprises a former coalfield in the first stages of succession with infrequent stands of vegetation. The habitats to the south are similar though slightly more vegetated, and to the north there is car parking and office facilities associated with the former coalfield site.

4.10 Southannan Sands SSSI lies immediately to the west. Designated for its intertidal sand flats, the Project site has particular interest as a host for nationally scarce dwarf eelgrass *Zostera noltei*.

Topography

4.11 A topographic survey was completed at the Project site by Survey Solutions in November 2021, reference 37006GLLS, and indicates that the levels at the Project site predominantly range between 5m AOD to 6m AOD. The access road to the north of the Project site sits at elevation ranging from 5.46m AOD in the east to 6.09m AOD in the west. Levels of the concrete bridge (pier) in the north west of the site vary from 5.95m AOD in the east to 7.49m AOD in the west. The majority of the development would occur in the rectangular central area of the site. Levels in this area range between 4.90m AOD in the north east and 5.07m AOD in the south west to approximately 6.30m AOD along the west boundary. The majority of the Project site sits between 5.20m AOD and 5.80m AOD.

4.12 The east and west boundaries lie on slightly higher elevation at approximately 5.95m AOD and 6.35m AOD respectively.

5 PROPOSED DEVELOPMENT

5.1 XLCC aims to construct a state-of-the-art high-voltage cable manufacturing facility at Hunterston Port. The factory will manufacture High Voltage (HV) cables for use in distributing renewable energy from a variety of sources.

5.2 Cable manufacturing facilities require immediate access to a deep-water port and a large skilled workforce, both of which are satisfied by the choice of location at Hunterston Port.

5.3 It is proposed that access will be gained from the existing port access road via Irvine Road (A78) for both the construction and operational phases.

5.4 The Project will be designed to operate for approx. 25 years, after which time ongoing operation and market conditions will be reviewed. If it is not appropriate to continue operating after that time, the Project may be decommissioned in full or in part.

5.5 The Project would not increase the impermeable area at the site given that the Project site currently comprises 100% hardstanding.

5.6 The proposed use of the Project site is classified as ‘Least Vulnerable’ within the SEPA guidance and SPP.

5.7 The potential to provide surface water attenuation, including the use of SuDS, has not been considered in this report as it is outside of the scope of this FRA. A surface water drainage strategy has been undertaken by Pick Everard and it is available as a separate report.

6 HYDROLOGICAL SETTING

Nearby Watercourses

6.1 The Project site is located on land 50m to the west of the Ayrshire Coastal path, adjacent to the Largs Channel, approximately 950m to the south west of Fairlie Railway Station. It is part of the Hunterston port.

6.2 The Burn Grill runs along the south boundary of the Project site. The Burn Grill catchment covers an area of 8.99 km^2 and flows from West Kilbride in the south to the south of the site, discharging to the sand. A tributary of the Burn Gill, known locally as the Kilruskin Burn drains the east of the catchment.

6.3 The Glenn Burn runs along the east boundary of the Project site. Its catchment covers an area of 4.9 km^2 flowing west before passing under the A78 at Glenburn Bridge, where it is diverted north, around the Hunterston Terminal, before finally flowing out onto Southannan Sands.

6.4 No significant artificial watercourses / features (e.g. canals, reservoirs) have been identified within 1 km of the Project site. The closest reservoirs identified in the vicinity of the Project site are the Glenburn Reservoir and the Knockendon Reservoir located at approximately 1.6 km to the south east and 3.4 km to the east respectively.

Fluvial Flood Risk Classification

6.5 The SEPA Flood Map (SEPA, 2021a) which is available online, indicates that the majority of the Project site is located within an area which is designated as having little to no risk of fluvial flooding, whereby the annual probability of flooding is classified as less than 0.1%. The SEPA fluvial flood map is provided in Figure 6.1. A linear area in the north of the Project site, including part of the access road and the water sump identified in the north east of the Project site, is however classified as being at high risk of fluvial flooding with an annual probability of flooding accounting for 10%. Flood depths along the access road would not exceed 300mm during all scenario, with the other areas in the north potentially be impacted by depths ranging from 300mm to 1m.

6.6 An analysis of the topographic survey however indicates that fluvial flooding would potentially impact the northern area of the Project site including part of the access road up to a level of approximately 5.70m AOD. However, the flood is unlikely to extend to water sump and to the location of the Project as this is bounded to the north by higher elevations. Additionally, the topographical analysis confirms shallow flood depths along the access road, unlikely to exceed 300mm.

6.7 The emergent Masterplan shows that all built development has been steered to areas of lowest flood risk, beyond the fluvial flood extent.

6.8 The SEPA Future Flood Maps (SEPA, 2021a) illustrate the 0.5% annual probability of flood extents for the 2080s epoch. The maps indicate that the flood extents would not increase beyond the present scenarios described above at the Project site for fluvial future events.

6.9 The emerging Masterplan also indicates that the Project would occur in areas which are not shown to be impacted by fluvial sources in future scenarios (2080).

6.10 SEPA online mapping does not identify the presence of flood defences at or in the vicinity of the site.

Tidal Flood Risk Classification

6.11 The SEPA Flood Map (SEPA, 2021a) also indicates that the Project site is located within an area which is designated as having little to no risk of coastal flooding, whereby the annual probability of flooding is classified as less than 0.1%. The SEPA coastal flood map is provided in Figure 6-2. Only

the pier is identified as being at high risk from coastal flooding with an associated annual probability of flooding of 10%. The majority of the Project site, including the access road, will remain dry.

6.12 The SEPA Future Flood Maps (SEPA, 2021a) illustrate the 0.5% annual probability of flood extents for the 2080s epoch. The maps indicate that the flood extents would not increase beyond the present scenarios described above at the Project site for fluvial future events.

6.13 The emerging Masterplan indicates that the Project would occur in areas which are not shown to be impacted by coastal sources in future scenarios (2080).

6.14 The 2018 update to the Coastal Design Sea Levels dataset was carried out in partnership for the UK Coastal Flood Forecasting partnership, which includes the Environment Agency (EA), Scottish Environment Protection Agency (SEPA), Natural Resources Wales (NRW) and the Department for Infrastructure Northern Ireland (DfINI). Extreme Sera Level values (Environment Agency, 2018) around the coastline of the UK, including Scotland describes the extreme sea levels for 16 different annual probabilities of exceedance.

6.15 Hunterston Port is located on the open coast and so is within the coverage of this dataset. The closest node to the site is identified with reference no.1784. Extreme sea levels at this location during different return periods are summarised in the table below.

Table 6.1. Predicted Extreme Sea Levels in m AOD during different AEP events

AEP	Extreme Sea Level (m AOD)
1 in 20	**3.22**
1 in 50	**3.39**
1 in 100	**3.52**
1 in 200	**3.65**
1 in 1000	**3.97**
1 in 10000	**4.44**

6.16 Sea level rise due to climate change has not been captured in the above figures.

6.17 The allowances set out in the SEPA's 2019 Guidance on Climate Change Allowances for Flood Risk Assessment in Land Use Planning (SEPA, 2019b) give the cumulative sea level rise from 2017 to 2100 based on the outputs from UK Climate Projections 2018 (UKCP18). The cumulative sea level rise allowance for this region up to 2100 is 0.85m. As such, the extreme sea level in the vicinity of the site could potentially reach 4.50m AOD during the 1 in 200-year (2100) coastal event.

6.18 As the pier is elevated above 5.95m AOD and the lowest level within the site sits at approximately 4.90m AOD, the Project will remain flood free during the 1 in 200-year coastal event including climate change (2100).

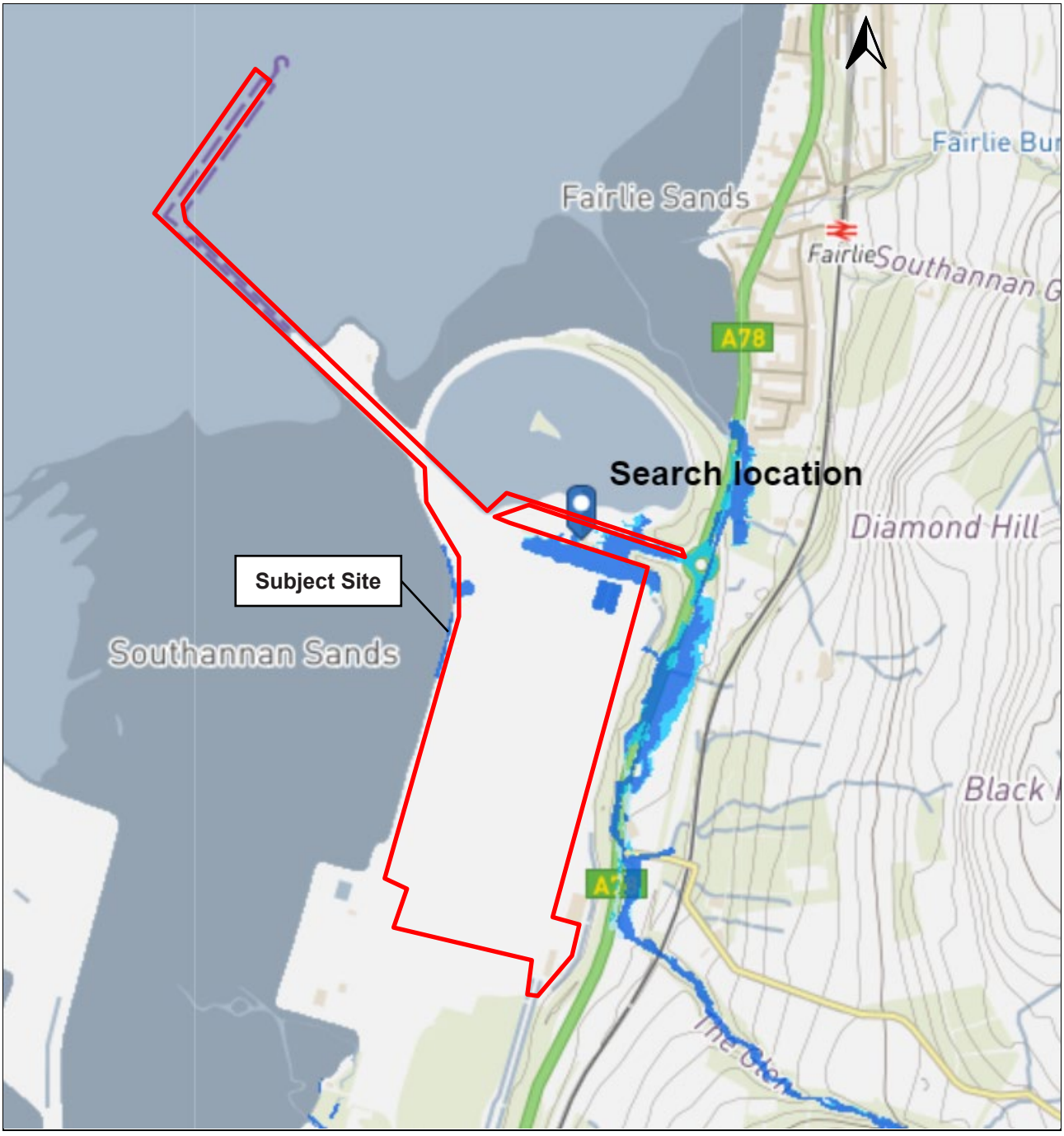


Figure 6.1. SEPA Fluvial Flood Map

Figure 6.2. SEPA Coastal Flood Map

Surface Water Flood Risk Classification

6.19 The SEPA Flood Map for Surface Water (SEPA, 2021a), which is available online, indicates that the Project site is predominantly located in an area at little to no risk of flooding from surface water. This corresponds with an annual probability of flooding that is less than 0.1%. The northern boundary is partially at a high and medium risk of surface water flooding, with annual probabilities of flooding of 10% and between 10% and 0.5% respectively. Localised areas across the Project site are also classified as having medium to high risk from surface water flooding. The area of high risk appears to correlate with low-lying areas (localised depressions) within the site.

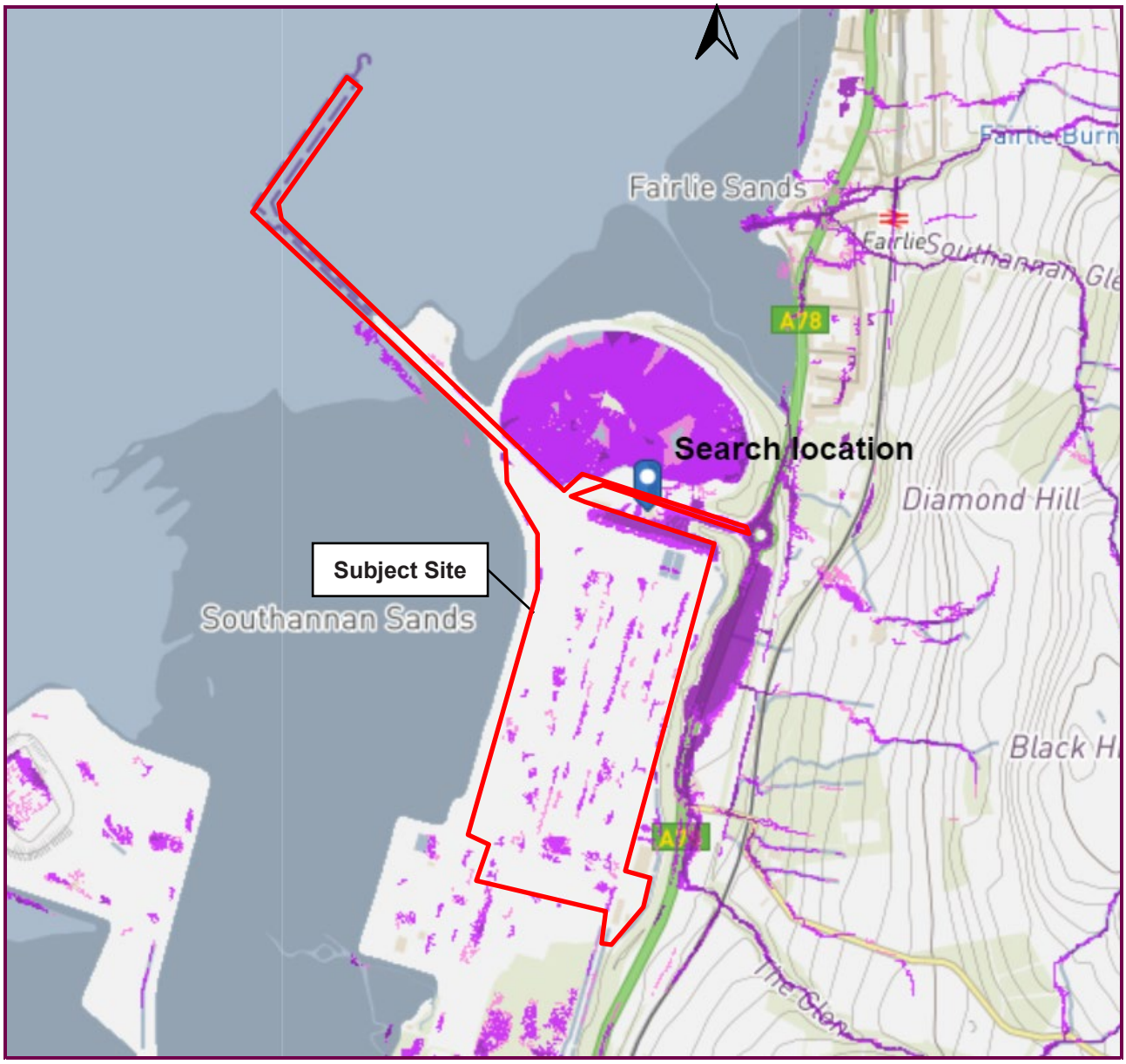


Figure 6.3. Updated Flood Map for Surface Water

6.20 In a 1 in 10 year (10%) event, surface water flood depths are indicated to be between 0.3m and 1m in the area at 'high' risk. In both the 1 in 200 year (0.5% - medium risk) and 1 in 1000 year (0.1% - low risk) events, flood depths remain less than 1m in the respective affected areas. The Project site will predominantly remain dry during all modelled scenarios.

6.21 The topographic survey at the Project site confirms that the majority of the areas impacted by surface water flooding are currently located at or below 5.20m AOD. As the majority of the Project site sits between 5.00m AOD and 6.00m AOD flood depths are unlikely to exceed 200mm during extreme surface water events except from some site-specific depression where flood depths could potentially reach 500-600mm. The updated Flood Map for Surface Water is presented in Figure 6.3.

Reservoir Flood Risk Classification

6.22 SEPA mapping also indicates that the access road to the site and the area along the east boundary lie within the extent from reservoir flooding. The map shows that the potential source of flooding in

this instance is the Glenburn reservoir which is located at approximately 1.6km to the southeast of the site.

6.23 Flooding from reservoirs is however extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925.

Local Authority Flood Risk Assessment

6.24 No Strategic Flood Risk Assessment – or equivalent – document was available from North Ayrshire Council.

7 HYDROGEOLOGICAL SETTING

7.1 British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is situated on Marine Beach Deposits comprising of sand and gravel. This is underlain by bedrock geology classified as Kelly Burn Sandstone Formation. The bedrock is classified as a Secondary A Aquifer, defined as 'formations formed of permeable layers capable of supporting water supplies at a local scale, in some cases forming an important source of base flow to rivers'.

7.2 There are two designated Sites of Special Scientific Interest (SSSI) within close proximity to the site indicated as Southannan Sands and Hunterston Sands to the west and southwest of the site respectively. They are marine water dependent SSSI.

7.3 A number of BGS publicly available borehole records are available within the Project site boundary. Boreholes record reference no. NS25SW73 indicate the following:

- Loose brown clayey fine to medium sand up to 2.45m bgl;
- Medium dense brown clayey fine to medium sand with fine to coarse gravel-size fragments of sandstone up to 3.65m bgl;
- Medium dense brown clayey fine to medium sand up to 6.40m bgl;
- Firm brown very sandy silty clay up to 6.7m bgl;
- Medium dense fine to coarse gravel-size fragments of sandstone with traces of sand below up to 8.55m bgl; and
- Red-brown fine to medium grained sandstone up to 9.45m bgl.

7.4 Water in the boreholes is subject to tidal fluctuations.

7.5 The soils beneath the site are described as 'Raised beach sands and gravels derived from Carboniferous rocks with some Old Red Sandstone material' by the National Soils of Scotland Map (Scottish Government, 2021).

7.6 According to the BGS Aquifer Designation Mapping (BGS 2021, online), the bedrock is classified as a moderately productive aquifer.

8 FLOOD RISK AND LAND USE VULNERABILITY

Vulnerability Classification

8.1 In accordance with the SEPA's land use vulnerability classification outlined with the Flood Risk and Land Use Vulnerability Guidance (SEPA 2018), state-of-the-art high-voltage cable manufacturing facility should be classified as 'least vulnerable'. The SEPA matrix of Flood Risk outlines that the Project type has no constraints within a little to no flood risk area (<0.1% AEP) and is generally suitable for development in low to medium risk areas (0.1% AEP – 0.5% AEP). Given that the Project is within the aforementioned categories – with only low and medium risk areas resulting from surface water flooding and fluvial flooding in limited areas within the site and the built-up area is proposed within area at little to no risk – the Project is considered to be acceptable in accordance with the matrix.

9 FLOOD RISK AND MITIGATION

9.1 The key sources of flooding that could potentially impact the site are discussed below:

Fluvial Flooding

9.2 The SEPA Flood Maps, as seen in Figure 6.1, indicates that the majority of the Project site is located within an area with no risk of flooding from fluvial sources. The annual probability of flooding is classified as less than 0.1% in the absence of any defences. The SEPA Flood Map shows that the main source of fluvial flooding within the wider area is from the Glenn Burn.

9.3 A linear area in the north of the Project site, including part of the access road is however classified as being at high risk of fluvial flooding with an annual probability of flooding accounting for 10%. Flood depths along the access road would not exceed 300mm during all scenario, with the other impacted areas in the north potentially being affected by depths ranging from 300mm to 1m.

9.4 A topographic analysis confirms that the fluvial extent is likely to be confined to this area and not affect the proposed location of the Project. Flood levels in the north of the Project site may reach approximately 5.70m AOD with flood depths not exceeding 300mm along the access road.

9.5 Information on defences, modelled flood levels and historic flooding has been requested to SEPA. SEPA is unable to provide modelled river levels and flows, as their flood hazard maps have been produced using methods and data appropriate for national scale mapping rather than detailed local models. SEPA is not aware of any flood defences relevant to this site.

9.6 SEPA has produced fluvial future flood risk maps for 0.5% flood events for the 2080s scenario. The SEPA maps indicates that the flood extents will not increase within the Project site during fluvial future scenarios.

9.7 Based on the information outlined above, and the elevation and location of the site, it is determined that the Project is at low risk of fluvial flooding and very low risk of coastal flooding.

9.8 The SPP details the suitability of different land uses within each flood zone. The proposed land use is classified as ‘least vulnerable’ and such uses are generally considered appropriate within areas of low fluvial and coastal flood risk.

Tidal Flooding

9.9 The SEPA Flood Maps, as seen in Figure 6.2, indicates that the majority of the Project site is located within an area with no risk of flooding from coastal sources. The annual probability of flooding is classified as less than 0.1% in the absence of any defences.

9.10 The majority of the Project site, including the access road, will remain dry during all coastal scenarios. Only the pier is identified as being at high risk from coastal flooding with an associated annual probability of flooding of 10%.

9.11 SEPA has produced coastal future flood risk maps for 0.5% flood events for the 2080s scenario. The SEPA maps indicates that the flood extents will not increase within the Project site during coastal future scenarios.

9.12 The 2018 update to the Coastal Design Sea Levels dataset show that the extreme sea level in the vicinity of the site could potentially reach 4.50m AOD during the 1 in 200-year (2100) event following SEPA’s 2019 Guidance on Climate Change Allowances for Flood Risk Assessment in Land Use Planning (SEPA, 2019b). This indicates that the Project site will not be impacted by flooding during this event given that the topographic survey shows site levels to be higher than the predicted coastal designed flood level.

Flooding from Sewers

9.13 Sewer flooding can occur during periods of heavy rainfall when a sewer becomes blocked or is of inadequate capacity. As detailed in Section 3 Consultation, there are no public sewers within the Project site. The risk of flooding from sewers is therefore considered to be low.

9.14 There are two options for the discharge of the foul water from the site:

- Option 1 – treat onsite domestic flows and discharge treated effluent to the sea, attenuate flows from processing and any contaminated flows, dispose offsite. The onsite treatment plant will be operated by a third party and subject to an independent planning application.
- Option 2 – discharge to the nearest Scottish Water sewer.

9.15 Further details can be found in Annex A: Conceptual Drainage Strategy.

Surface Water Flooding (Overland Flow)

9.16 This can occur during intense rainfall events, when water cannot soak into the ground or enter drainage systems.

9.17 The SEPA surface water flood risk map shows that the Project site is predominantly located in an area at little to no risk of flooding from surface water. This corresponds with an annual probability of flooding that is less than 0.1%. The northern boundary and localised areas across the site are classified as having medium to high risk from surface water flooding. The area of high risk appears to correlate with low-lying areas (localised depressions) within the site. Flood depths however are not predicted to exceed 300mm at the majority of the areas impacted during these extreme events.

9.18 Localised flooding along the northern area is likely associated with the Glenn Burn and is addressed above. The other isolated areas of risk within the development extent are likely to be alleviated by the installation of a surface water drainage system on-site and site profiling.

Groundwater Flooding

9.19 This can occur in low-lying areas when groundwater levels rise above surface levels, or within underground structures.

9.20 SEPA identifies the site as lying within a potential vulnerable area to groundwater flooding. However, BGS data with regards to groundwater levels was not available at the Project site. Water in the boreholes was subject to tidal fluctuations.

Other Sources

9.21 There is a limited risk of flooding occurring as a result of a break in a water main. Chapter 2 indicates that there is a water supply pipe beneath the Project site access road. However, should a water main break, water would flow in a north easterly direction away from the Project site as shown from the surface water flood risk map.

9.22 The risk of flooding associated with reservoirs, canals and other artificial structures is considered to be low as flooding from reservoirs is extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. Reservoirs are inspected regularly and essential safety

Proposed Mitigation

9.23 The Project is located within an area which has a potential for groundwater and surface water flooding. In line with standard building practices and as a precautionary measure, it is recommended that ground floor threshold levels are raised a minimum of 150mm above external ground levels,

where feasible. This will provide a degree of mitigation should groundwater emergence occur. All key external infrastructure should be elevated at least 150mm on plinths and / or adequately bunded.

9.24 It is recommended that consideration is given to a Flood Management Plan to manage fluvial flood risk.

9.25 Flood resilience and resistant measures are recommended to be incorporated into construction where feasible and finished floor levels to be set to a minimum of 6.00m AOD.

9.26 It is recommended that non-return valves are fitted to all pipes

9.27 The drainage strategy and site profiling should be designed to mitigate any residual risk from surface water. Further details can be found in Annex A: Conceptual Drainage Strategy.

9.28 The proposal includes a basement unit. Therefore, flood resilience and resistance measures are recommended to be incorporated into the construction of the basement areas, where practicable. These could include:

- Ensuring that all airbricks which are less than 500mm above ground level are flood proof to prevent water ingress;
- Use of reinforced concrete flooring with a continuous damp proof membrane and / or 'Tanking Slurry'. Tanking slurry is a mixture of cements, aggregates and chemicals that combined prevent water ingress through walls. This is also known as a 'Type A' waterproofing system, to prevent the ingress of moisture (if the groundwater pressure is low and the building is sufficiently above the water table). Particular care should be taken when applying to the wall floor joint, which is vulnerable to groundwater ingress;
- Use of a 'Type C' waterproofing system. Such systems are designed to be waterproof as far as possible but also to manage water ingress and use a combination of structural waterproofing (cavity drainage) membrane, basement floor drainage channels and a sump pump (if the groundwater level is at or above the base level of the building). Water would collect in the cavity drainage membrane, be directed to the floor drainage channels, collect in the sump and ultimately be pumped up to ground level once the water reaches a specified height within the liner. It will be necessary to consider battery back-up protection in the event of a failure of electricity to power the pump, with an alarm to trigger the manual involvement;
- Should a Type C system be included, a maintenance plan will be required to be prepared so that site management can ensure the continued operation of the system; and
- During construction of the basement areas dewatering may be required.

Event Exceedance

9.29 The mitigation measures proposed as part of the development scheme are considered appropriate to help mitigate against flood event exceedance scenarios.

10 SUMMARY AND CONCLUSIONS

10.1 The aim of the FRA is to outline the potential for the Project site to be impacted by flooding, the potential impacts of the development on flooding both onsite and in the vicinity, and the proposed measures which can be incorporated into the development to mitigate the identified risks. The report has been produced in accordance with the guidance detailed in the SPP.

10.2 The potential flood risks to the site, and the measures proposed to mitigate the identified risks, are summarised in Table 10.1.

Table 10.1: Proposed Mitigation

Source of Flooding	Identified Risk			Mitigation Proposed	Residual Risk		
	L	M	H		L	M	H
Fluvial	✓			✓ No built development should occur in the northern part of the Project site within the fluvial flood extent. ✓ Flood management Plan. ✓ Flood resilience and resistance measures into the construction where feasible. ✓ Finished floor levels to be set to a minimum of 6.00m AOD	✓		
Tidal	✓			None required.	✓		
Sewers	✓			Non return valves.	✓		
Surface Water	✓			A surface water drainage strategy will be developed for the Project.	✓		
Groundwater	✓			✓ Ground floor threshold levels are raised a minimum of 150mm above external ground levels and bunding will be included where appropriate ✓ Flood resilience and resistance measures at basement levels	✓		
Other Sources (e.g. reservoirs, water mains)	✓				✓		

10.3 The majority of the Project site is located in an area identified by SEPA to be at little to no risk from fluvial and coastal flooding. A linear area within the north of the site is classified as being at high risk from fluvial flooding and the pier is considered to be located within a high risk tidal flooding area. The proposed built development is however located outside of the flood risk extents for both tidal and fluvial events and is therefore considered to be at low risk itself and would not cause an increase in flood risk off-site.

10.4 The areas of surface water flood risk within the Project site are isolated and not considered to present a significant risk. Further, the installation of a formal surface water drainage system would likely manage these areas of risk. Details on surface water and foul drainage can be found in Annex A: Conceptual Drainage Strategy.

10.5 In order to help mitigate against residual flood risks from fluvial, surface water and groundwater sources, it is recommended that threshold levels of the buildings are elevated a minimum of 150mm and bunding is included, as appropriate, on any qualifying external features. Flood resilience and resistant measures are recommended to be incorporated into construction where feasible and finished floor levels to be set to a minimum of 6.00m AOD.

10.6 Overall, it has been demonstrated that the development would be safe, without increasing flood risk elsewhere. A positive reduction in flood risk would be achieved through surface water management.

11 REFERENCES

British Geological Survey (BGS) (2020a) Geology of Britain Viewer. [Online] Available at: https://mapapps.bgs.ac.uk/geologyofbritain/home.html

British Geological Society (2020b) BGS Aquifer Designation Mapping. [Online] Available at: https://www.bgs.ac.uk/datasets/hydrogeological-maps-of-scotland/

British Geological Survey (BGS) (2021) Geology of Britain Viewer: 1:50,000 Geological Mapping. [Online] Available at: https://www.bgs.ac.uk/datasets/bgs-geology-50k-digmapgb/

Centre for Ecology & Hydrology (2011) An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change

Environment Agency Coastal Design Sea Levels – Coastal Flood Boundary Extreme Sea Levels Dataset. [Online] Available at: https://data.gov.uk/dataset/73834283-7dc4-488a-9583-a920072d9a9d/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018

Environment Agency Coastal flood boundary conditions for the UK: update 2018 User Guide (2018) [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/827779/Coastal_flood_boundary_conditions_for_the_UK_2018_update_-_user_guide.pdf

Ordnance Survey (2021) Ordnance Survey Mapping. [Online] Available at: https://osdatahub.os.uk/downloads/openScotland's Nature Agency (2021) Nature Scot Site Link (Designated Sites) Mapping. [Online] Available at: https://sitelink.nature.scot/map

North Ayrshire Council (2019) Adopted Local Development Plan [Online] Available at: https://www.north-ayrshire.gov.uk/planning-and-building-standards/ldp/local-development-plan.aspx

Scottish Environment Protection Agency (2012) SEPA Guidance Note 8 standing advice for planning authorities and developers on development management consultations

Scottish Environment Protection Agency (2015) Natural Flood Management Handbook

Scottish Environment Protection Agency (2017) Development Management Guidance: Flood Risk

Scottish Environment Protection Agency (2018) SEPA Flood Risk and Land Use Vulnerability Guidance. [Online] Available at: https://www.sepa.org.uk/media/143416/land-use-vulnerability-guidance.pdf

Scottish Environment Protection Agency (2019b) Climate Change Allowances for flood risk assessment in land use planning

Scottish Environment Protection Agency (2021a) SEPA Flood Hazard and Risk Information Mapping. [Online] Available at: https://www.sepa.org.uk/environment/water/flooding/flood-maps/

Scottish Environment Protection Agency (2021b) SEPA Scotland's Environment Data Centre. [Online] Available at: https://map.environment.gov.scot/sewebmap/

Scottish Environment Protection Agency (2021c) SEPA Water Environment Hub. [Online] Available at: https://www.sepa.org.uk/data-visualisation/water-environment-hub/

Scottish Environment Protection Agency (2021d) SEPA Reservoir Flood Map. [Online] Available at: https://map.sepa.org.uk/reservoirsfloodmap/Map.htm

Scottish Government (2001) Flood Risk Management (Scotland) Act 2009: Delivering Sustainable Flood Risk Management

Scottish Government (2006) The Private Water Supplies (Scotland) Regulations 2006

Scottish Government (2009) Flood Risk Management (Scotland) Act

Scottish Government (2011) Flood Risk Management (Scotland) Act 2009: Delivering Sustainable Flood Risk Management

Scottish Government (2013) Flood Risk Management (Scotland) Act 2009: Surface Water Management Planning Guidance

Scottish Government (2014a) The National Planning Framework 3 (NPF3) for Scotland

Scottish Government (2014b) Scottish Planning Policy (SPP)

Scottish Government (2014c) Public Water Supplies (Scotland) Regulations 2014

Scottish Government (2017) The Water Environment (Miscellaneous) (Scotland) Regulations

Scottish Government (2021a) The National Planning Framework 3 (NPF3) for Scotland

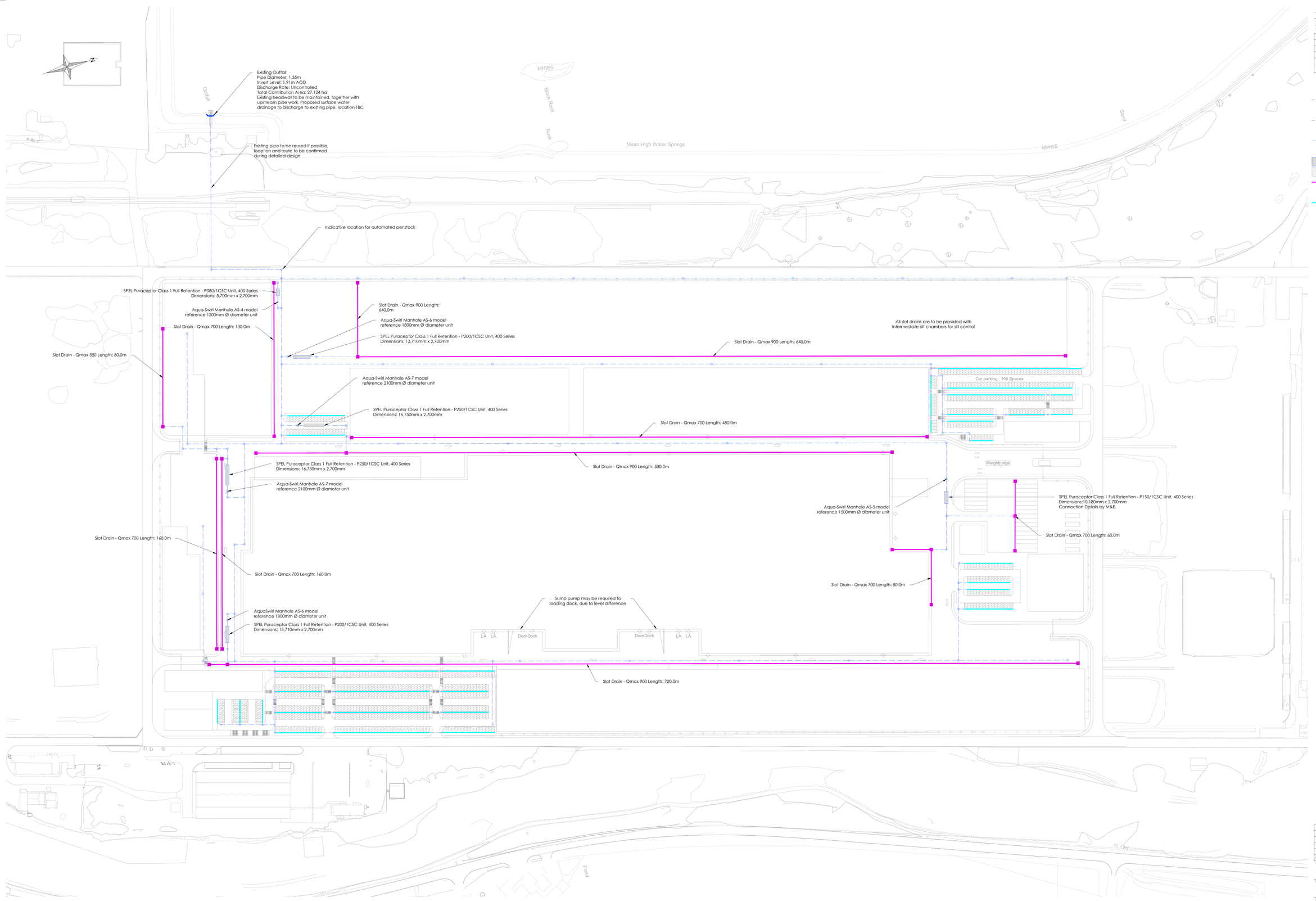
Scottish Government (2021b) Scotland's Environment – Scotland's Soils. [Online] Available at: https://soils.environment.gov.scot/

Scottish Water (2021) Scottish Water Webpage. [Online] Available at: https://www.scottishwater.co.uk/

ANNEXES

Annex A

Conceptual Drainage Strategy



NO DIMENSIONS TO BE SCALED FROM THIS DRAWING

CDM - RESIDUAL HAZARDS The following are considered to be significant risks relevant to this drawing, which could not be fully mitigated or removed through design:

CDM - RESIDUAL HAZARDS	
1	To be completed at detailed design.
2	
3	
	Further possible control measures have been identified within the Design Risk Assessments which may help to mitigate these and other identified risks further during the construction / maintenance process.

KEY:

- Existing Foul Water Drain/ Sewer
- Existing Foul Water Manhole/ PPIC
- Existing Surface Water Drain/ Sewer
- Existing Surface Water Manhole/ PPIC
- Surface Water Drain
- Surface Water Manhole (dia Varies)
- Full Retention Separator
- Permeable Surface
- Slot Drain
- Slot Drain Access/ Silt Chamber
- Filter Drain
- Existing Headwall

NOTES

1. All dimensions in millimetres unless otherwise stated.
2. This drawing is to be read in conjunction with all relevant drawings.
3. Topographical survey based on Survey Solutions drawing 370065GLLS dated November 2021. Layout based on SGP drawing XLHU-SGP-00-ZZ-DR-A-10002.
4. This drainage strategy drawing shows how surface water run-off could be managed on site with a unrestricted off-site discharge for all rainfall events up to and including the 200 year return period event plus 40% climate change to ensure no increased flood risk to others as a result of the proposed development.
5. This is not intended to be a detailed design at this stage. Please note that the final layout may be subject to refinement to meet certain technical criteria.
6. The size and location of attenuation shown is subject to confirmation at detailed design.
7. Levels shown are indicative and subject to change at detailed design.

Revision	Date	Drn	Chk
P01 For Information	2021/12/16	JAS	TJH

Client
XLinks

Project
XLCC Hunterston

Drawing Title
Surface Water Drainage Strategy

Suitability Status
S2 - Suitable for Information

Job No.	Scale	Size	Rev
210685	**1 : 1000**	**@ A0**	**P01**

Drawing Number
XLHU - PEV - XX - XX - DR - C - 00500
Project Code - Originator - Zone - Level - Type - Role - Number

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