

6. GEOLOGY, HYDROLOGY AND HYDROGEOLOGY

6.1 Introduction

This Chapter of the EA presents a review of baseline conditions and potential impacts on the water environment and flood risk as a result of the Project as described in Chapter 2. The ground and water environment as described in this Chapter includes geology, hydrology and hydrogeology receptors.

6.2 Baseline Survey Methodology

6.2.1 Study Area

The assessment of impacts in relation to geology, hydrology and hydrogeology receptors will be undertaken for the Proposed Development area, as shown in Figure 6.1. A study area of 2 km from the Proposed Development has been defined to assess the potential effects on private water supply (PWS) (the PWS Study Area), and a wider study area of 10 km from the Proposed Development to assess potential effects on the downstream water environment (the Wider Study Area).

6.3 Baseline Environment

6.3.1 Surface Hydrology

The Site is located within the catchments of the Kilbrannan Sound and Allt na Buaille Salaich. Several unnamed watercourses flow from to the west of the Proposed Development and flow through the Site to discharge into the Kilbrannan Sound. This includes the Allt a' Ghobhainn which rises to the north of Cnoc na Buaille Salaich before flowing east to join with the Allt na Buaille Salaich within the west of the Site. The Allt na Buaille Salaich flows south before discharging into Cour Bay and the Kilbrannan Sound. An unnamed watercourse also rises to the north of the Site and flows east, north of the proposed overhead line and overhead line access track, approximately 30 m north of the northern proposed permanent tower. Several unnamed watercourses rise to the south and east, downhill of the Proposed Development and existing access road, which also flow into the Kilbrannan Sound. The only watercourse in the surrounding area with a SEPA classification is the Crossaig Water (ID: 10243), which has an overall SEPA classification of 'Good'. The Crossaig Water is located approximately 500 m north of the Site and flows into the Kilbrannan Sound at Port nan Gamhna. Several unnamed tributaries rise to the north of the Site and flow north east before draining into the Crossaig Water. The hydrological catchments associated with these watercourses are shown in Figure 6.5.

6.3.2 Coastal Waters

The surface water from the Development drains into the Kilbrannan Sound coastal waterbody. It has an overall condition of 'Good'¹. The southern aspect of the Kilbrannan Sound, along the south coast of Arran, is classed as a Marine Protection Area (MPA).

6.3.3 Hydrogeology

The underlying Oban and Kintyre groundwater body has an overall SEPA groundwater classification of 'Good'², with a low productivity in which "*flow is virtually all through fractures and other discontinuities*".

6.3.4 Flood Risk

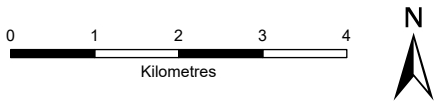
The SEPA flood map shows that no river flooding is likely within the Proposed Development. There are small, isolated areas within the substation platform area of medium to high risk of annual flooding from surface water, with surface water flooding also present at Cnoc an t-Seann-talaimh and Allt na Buaille Salaich near to the access track to the south of the site. The Proposed Development is not at risk from coastal flooding.

¹ SEPA (2014) Water Environment Hub [Online] Available at: <https://www.sepa.org.uk/data-visualisation/water-environment-hub/> (Accessed 17/11/2021)

² Scottish Government (2021) Scotland Environment Map. Available at: <https://map.environment.gov.scot/sewebmap/> (Accessed 17/11/2021)



- Town & Country Planning Boundary
- - - Hydrology Study Area - 250 m Buffer
- - - Private Water Supply - 2 km Buffer
- - - Wider Study Area - 10 km Buffer



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Figure 6.1
Hydrology Study Areas



PROJECTION: British National Grid

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6.3.5 Geology

The BGS 1:50,000 superficial geology map (shown on Figure 6.2) shows the Proposed Development area is not underlain by mapped deposits, excepting a small area of Devensian Till downhill of the northern-most tower. The 1:50,000 bedrock geology mapping (shown on Figure 6.3) shows the Proposed Development area consists of psammite and pelite of the Beinn Bheula Schist formation.

6.3.6 Soils

The National Soils Map of Scotland³ mapping indicates the Proposed Development area is underlain by peaty gleys. The Carbon and Peatland Map (SNH, 2016)⁴ indicates the Proposed Development area is underlain by Class 5 Peat Soil.

Peat probing was undertaken across several visits between November 2021 and July 2022. Throughout the peat survey, a total of 714 probes were progressed. The average peat depth across the Site is 0.40 m with greater than 77 % of probes recording peat depths of 0.5 m or less and 91 % recording depths of 1.0 m or less. Peat where the depth was greater than >1.0 m was recorded at 9 % of locations. Most of the peat with depth >1.0 m was recorded at depths between 1.0 m – 2.0 m with only 1.3 % of all probes recording depths more than 2.0 m.

The maximum peat depth recorded at the Site was 3.2 m within a clearing between trees not utilised within the commercial plantation. Topographically the area is relatively flat and surface vegetation in the form of sphagnum and high groundwater levels were recorded. The area is located between the proposed substation and the first proposed tower location north of the proposed substation, therefore there is no proposed infrastructure in this area.

6.3.7 Groundwater Dependent Terrestrial Ecosystems (GWDTEs)

In accordance with SEPA guidance⁵ the NVC communities that have the potential to be moderately or highly groundwater dependent GWDTE based on the SEPA guidance are outlined in **Table 6.1** and shown in **Figure 6.4**.

Table 6.1 Potential GWDTE Communities and Site-specific Groundwater Dependency

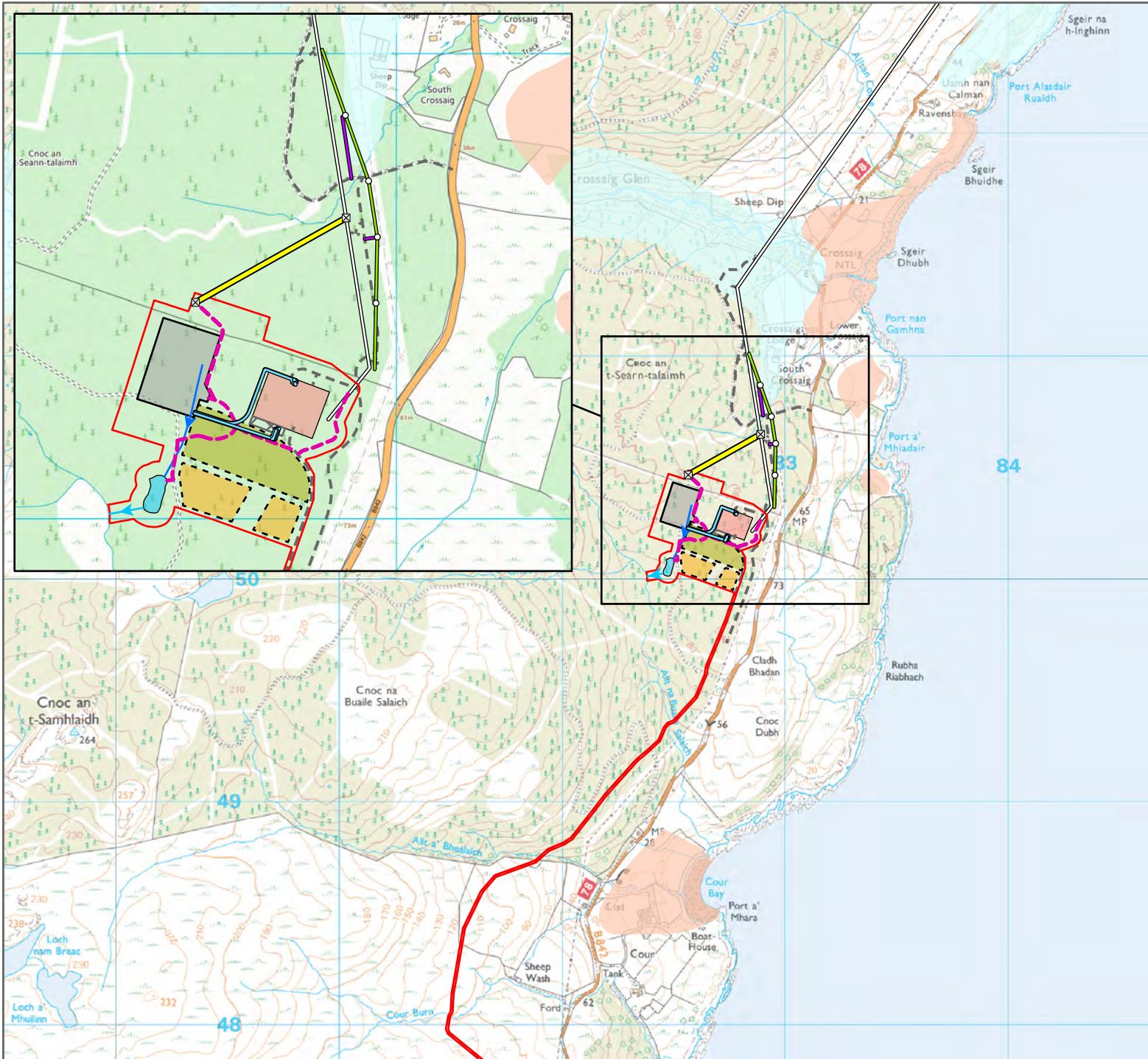
NVC class	SEPA Groundwater Dependency	Site Description	Site-specific Groundwater Dependency
M6	High	<p>Located downslope to the northeast of the Site along cleared areas associated with existing OHL and substation at boundary of forested area.</p> <p>Isolated M6 polygon located to the south along watercourses.</p>	<p>Low – altered drainage associated with forestry area feeding into cleared areas is surface water fed. Also located in riparian zone which is surface water fed.</p>

³ Scotland's Environment, National Soil Map of Scotland [online] Available at: https://map.environment.gov.scot/Soil_maps/?layer=1# (Accessed 16/12/2021)

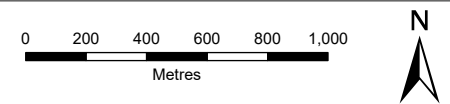
⁴ Scotland's Environment, Carbon & Peatland 2016 [online] Available at: https://map.environment.gov.scot/Soil_maps/?layer=10 (Accessed 16/12/2021)

⁵ SEPA (2017) Land Use Planning System Guidance Note 31.

Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 3 [Online] Available at: <https://www.sepa.org.uk/media/144266/lups-gu31-guidance-on-assessing-the-impacts-of-development-proposals-on-groundwater-abstractions-and-groundwater-dependent-terrestrial-ecosystems.pdf> (Accessed: 01/12/2021)



- Existing Infrastructure:**
- Existing Inverrary to Crossaig Overhead Line
 - - - Existing Access Track
- Associated Development:**
- Proposed Temporary Tower Location
 - ⊠ Proposed Indicative Tower Location
 - Proposed Temporary OHL Bypass
 - Proposed OHL Alignment
 - Temporary Access Track
- Permitted Development:**
- 132 kV Interconnector Cable Route
- Proposed Development:**
- Proposed Permanent Access Track
 - SUDs Inlet Pipeline
 - SUDs Outfall Pipeline
 - SUDs Pond
 - Proposed Substation Layout
 - Indicative Town & Country Planning Boundary
 - Proposed Substation Temporary Works Area
 - Crossaig Temporary Peat Storage Areas
 - ⊠ Proposed Platform Extension
 - Existing Substation Platform
- Superficial Geology (1:50k scale):**
- Marine Beach Deposits - Gravel, Sand and Silt
 - Raised Marine Deposits - Sand and Gravel
 - Till, Devensian - Diamicton

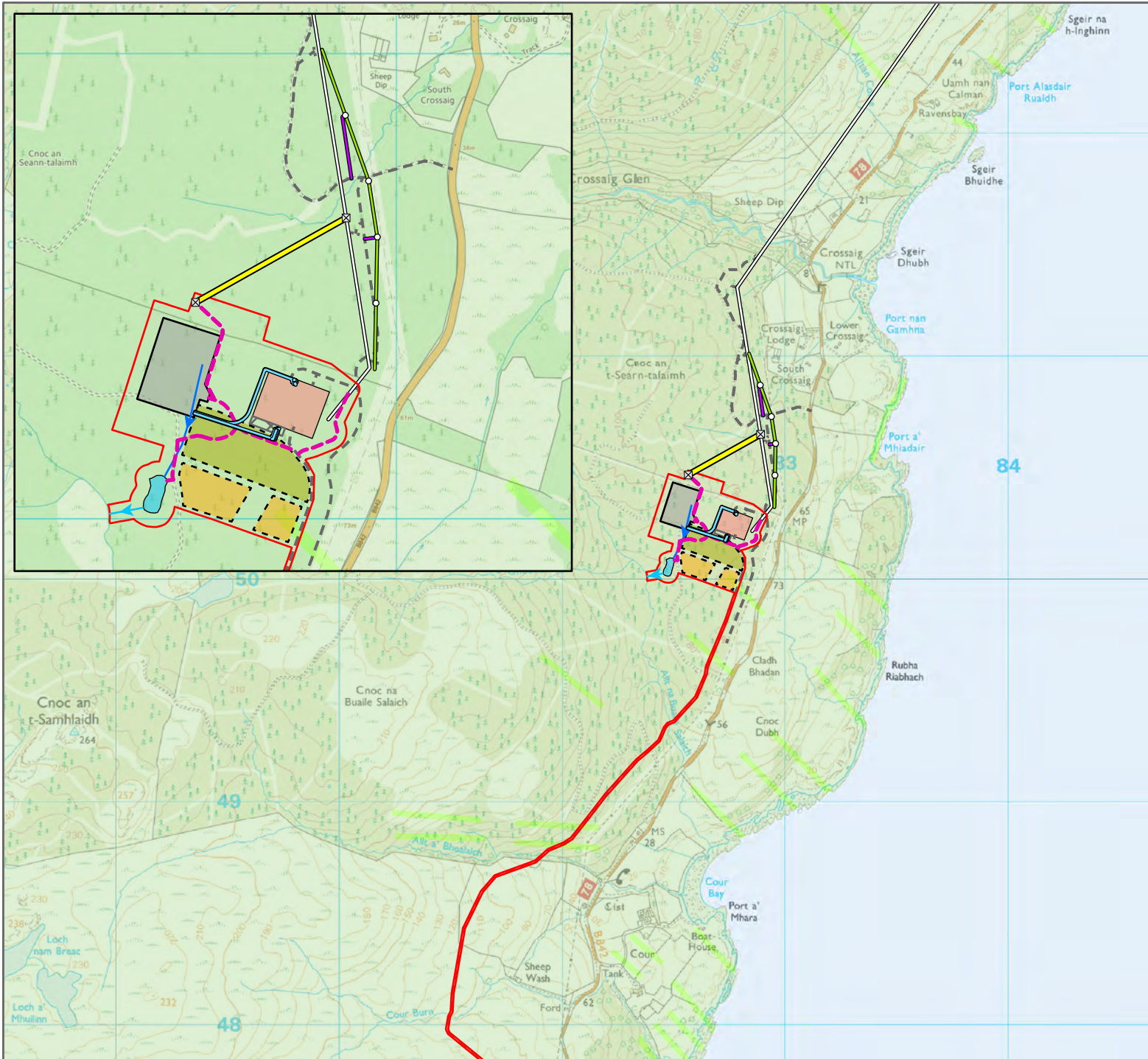


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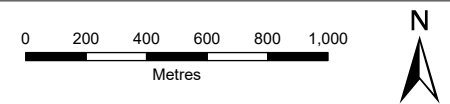
Figure 6.2
Superficial Geology



PROJECTION: British National Grid



- Existing Infrastructure:**
- Existing Inverrary to Crossaig Overhead Line
 - - - Existing Access Track
- Associated Development:**
- Proposed Temporary Tower Location
 - ⊠ Proposed Indicative Tower Location
 - Proposed Temporary OHL Bypass
 - Proposed OHL Alignment
 - Temporary Access Track
- Permitted Development:**
- 132 kV Interconnector Cable Route
- Proposed Development:**
- - - Proposed Permanent Access Track
 - SUDs Inlet Pipeline
 - SUDs Outfall Pipeline
 - SUDs Pond
 - Proposed Substation Layout
 - Indicative Town & Country Planning Boundary
 - Proposed Substation Temporary Works Area
 - Crossaig Temporary Peat Storage Areas
 - ⊠ Proposed Platform Extension
 - Existing Substation Platform
- Underlying Bedrock Geology (1:50k scale):**
- North Britain Palaeogene Dyke Suite - Olivine-Microgabbro
 - Beinn Bheula Schist Formation - Gritty Psammite and Pelite

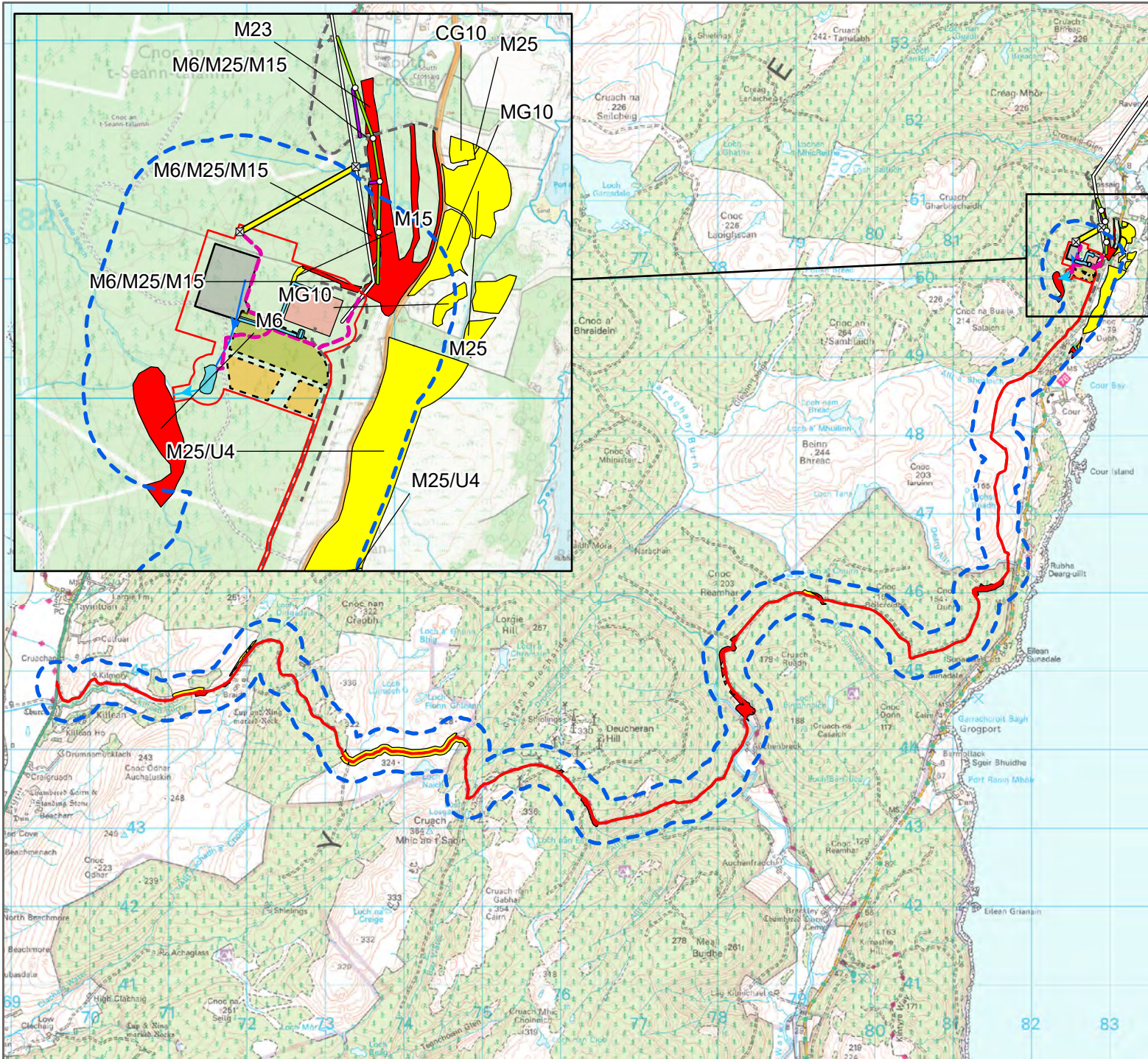


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**Figure 6.3
Bedrock Geology**



PROJECTION: British National Grid



- Proposed Development:**
- Proposed Permanent Access Track
 - SUDS Inlet Pipeline
 - SUDS Outfall Pipeline
 - SUDS Pond
 - Proposed Substation Temporary Works Area
 - Proposed Substation Layout
 - Indicative Town & Country Planning Boundary
 - Crossaig Temporary Peat Storage Areas
- Associated Development:**
- Proposed Indicative Tower Location
 - Proposed Temporary Tower Location
 - Temporary Access Track
 - Proposed Permanent Access Track
 - Proposed OHL Alignment
 - Proposed Temporary OHL Bypass
- Permitted Development:**
- 132 kV Interconnector Cable Route
- Existing Infrastructure:**
- Existing Inveraray to Crossaig Overhead Line
 - Existing Access Track
 - Existing Substation Platform
- GWDE Potential Groundwater Dependency (Based on SEPA guidance)**
- High Dependency
 - Moderate Dependency
 - Hydrology Study Area - 250 m Buffer



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Figure 6.4
Potential Groundwater Terrestrial Ecosystems



PROJECTION: British National Grid

M23	High	Located in open area cleared for residential buildings to the north, downslope of the Site. Located at boundary of forested area beside watercourse.	Low – located in areas fed by surface water, not associated with obvious, diffuse or point sources of groundwater emergence
M15	Moderate	Located downslope to the northeast of the Site along cleared areas associated with existing OHL and substation at boundary of forested area.	Low – altered drainage associated with forestry area feeding into cleared areas is surface water fed.
MG10	Moderate	Located mostly to downslope to the east of the Site, immediately downslope of the existing access road. Located beside unnamed watercourses. Isolated polygon located downslope to north of the Site at boundary of forest, likely located beside ditch.	Low –the upstream road acts as a hydrological barrier to groundwater flow from the Site, area also located in areas fed by surface water. Isolated MG10 polygon associated with forested area and therefore altered drainage preventing being groundwater fed.
U4	Moderate	Located to the southeast of the Site immediately downslope of the existing access road. Present beside unnamed watercourses.	Low –the upstream road acts as a hydrological barrier to groundwater flow from the Site, also located in an area fed by surface water.
M25	Moderate	Located downslope to the northeast of the Site along cleared areas associated with existing OHL and substation at boundary of forested area. Also located to the southeast of the Site immediately downslope of the existing access road. Present beside unnamed watercourses.	Low – located in areas fed by surface water, not associated with obvious, diffuse or point sources of groundwater emergence.

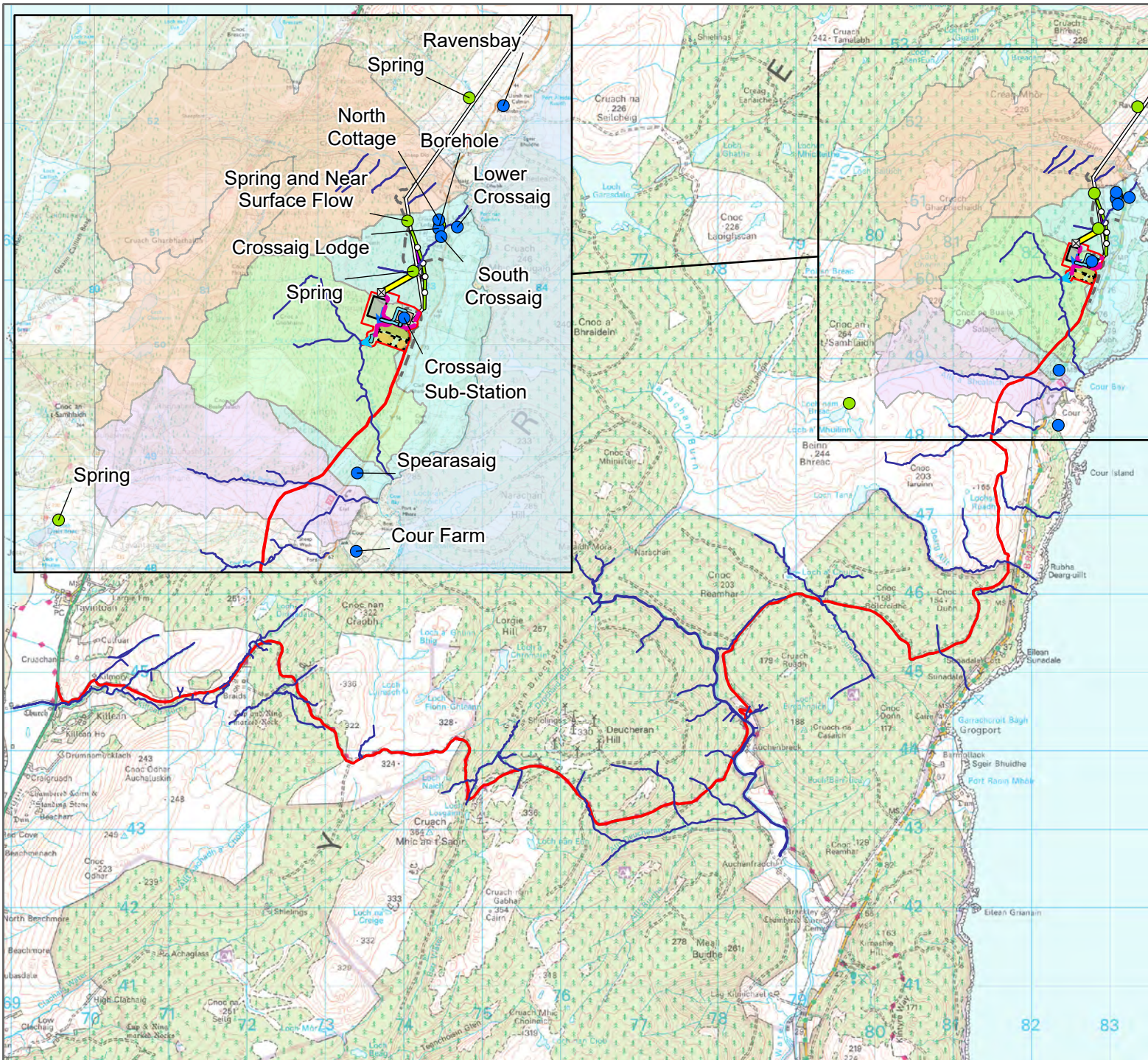
As a result of the site-specific groundwater dependency, it is considered that the above GWDTE habitats identified in the NVC survey are ombrotrophic in nature, meaning they are rain-fed as opposed to being supported by groundwater and are therefore scoped out of further assessment.

6.3.8 Public Water Supplies

Scottish Water confirmed that the Proposed Development is located within a Drinking Water Catchment Area and that this may have various impacts on their assets. No abstraction points were identified within the Proposed Development boundary, however, this could not be confirmed for the wider study area.

6.3.9 Private Water Supplies

Consultation with Argyll and Bute Council was undertaken on the 12 November 2021, to determine if any private water supplies (PWS) were recorded within 2 km of the Proposed Development boundary. Eight PWS were recorded within 2 km of the Proposed Development, as shown in **Figure 6.5** and **Table 6.2**.



- Proposed Development:**
- Proposed Permanent Access Track
 - SUDs Inlet Pipeline
 - SUDs Outfall Pipeline
 - SUDs Pond
 - Proposed Substation Temporary Works Area
 - Proposed Substation Layout
 - Indicative Town & Country Planning Boundary
 - Crossaig Temporary Peat Storage Areas

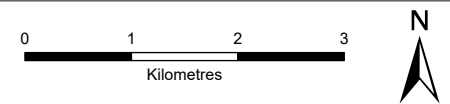
- Associated Development:**
- Proposed Temporary Tower Location
 - ⊗ Proposed Indicative Tower Location
 - Proposed Temporary OHL Bypass
 - Proposed OHL Alignment
 - Proposed Permanent Access Track
 - Temporary Access Track

- Permitted Development:**
- 132 kV Interconnector Cable Route

- Existing Infrastructure:**
- Existing Inveraray to Crossaig Overhead Line
 - Existing Access Track
 - Existing Substation Platform

- Hydrological Catchments:**
- Allt a' Bhealach
 - Allt na Buaille Salaich
 - Crossaig Burn
 - Kilbrannan Sound
 - Onsite Watercourses

- Private Water Supply - Source
- Private Water Supply - Property



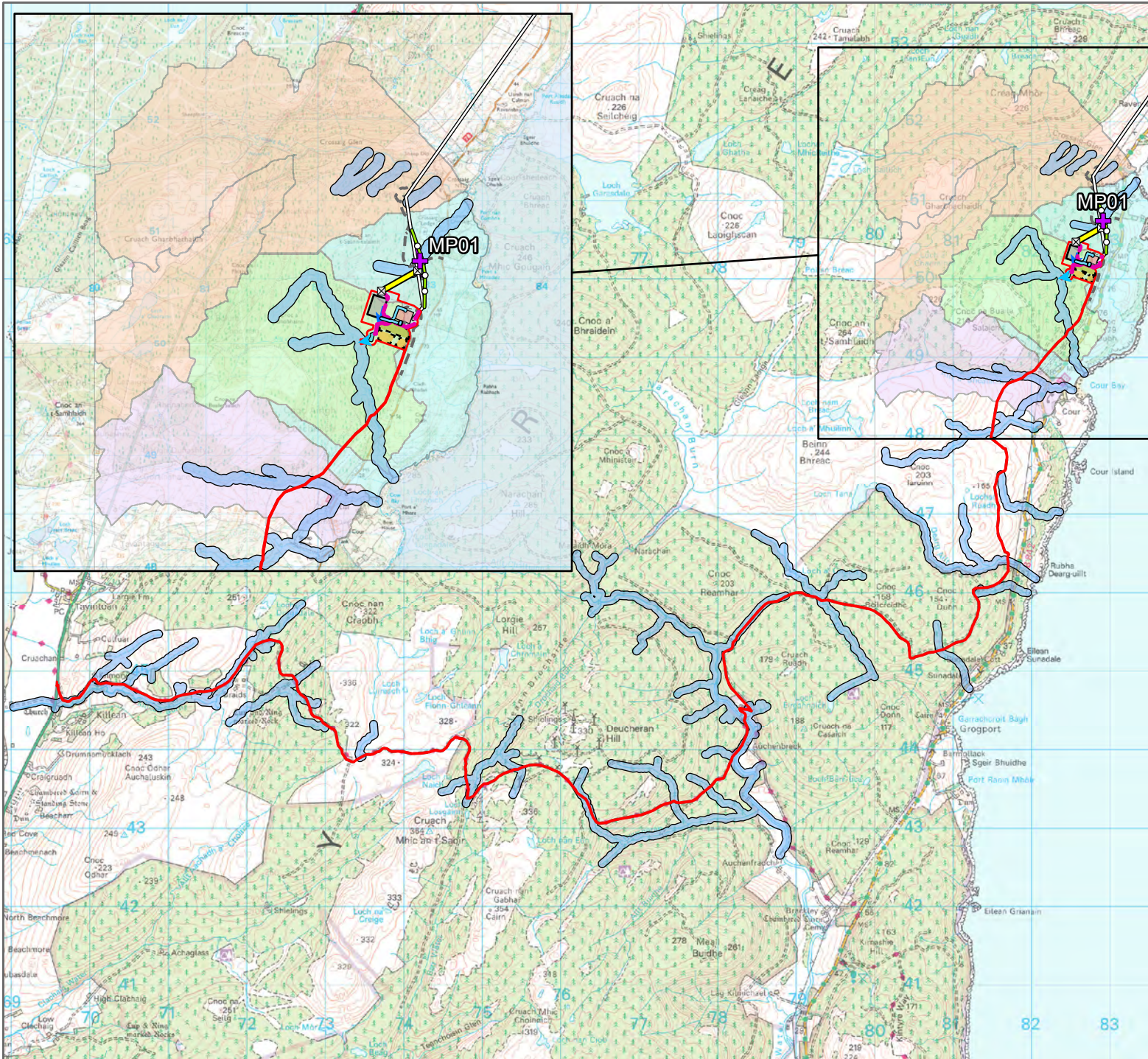
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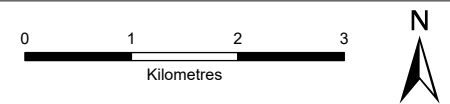
Figure 6.5
Private Water Supplies



PROJECTION: British National Grid



- Proposed Development:**
- Proposed Permanent Access Track
 - SUDs Inlet Pipeline
 - SUDs Outfall Pipeline
 - SUDs Pond
 - Proposed Substation Temporary Works Area
 - Proposed Substation Layout
 - Indicative Town & Country Planning Boundary
 - Crossaig Temporary Peat Storage Areas
- Associated Development:**
- Proposed Temporary Tower Location
 - ⊗ Proposed Indicative Tower Location
 - Proposed Temporary OHL Bypass
 - Proposed OHL Alignment
 - Proposed Permanent Access Track
 - Temporary Access Track
- Permitted Development:**
- 132 kV Interconnector Cable Route
- Existing Infrastructure:**
- Existing Inveraray to Crossaig Overhead Line
 - - - Existing Access Track
 - Existing Substation Platform
- Hydrological Catchments:**
- Allt a' Bhealaich
 - Allt na Buaille Salaich
 - Crossaig Burn
 - Kilbrannan Sound
 - Crossaig North 50 m Watercourse Buffer
 - + Existing Watercourse Crossing



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Figure 6.6
Watercourse Crossings



PROJECTION: British National Grid

Table 6.2 Private Water Supplies Hydrological Connection to the Development

Private Water Supply	Easting Northing	Source type (based on 2018 EIA data)	Approximate distance from Development	Hydrological Connection to the Development
Crossaig Lodge	183104 651196	Surface Source & Groundwater Source	260 m north-east and downslope of the Site (35 m AOD).	Hydrologically connected as located downslope within Development catchment.
North Cottage	181826 651099	Surface Source	270 m east and downslope of the Site Access track (35 m AOD).	Hydrologically connected as located downslope within Development catchment.
Crossaig Substation	182771 650236	Rainwater Source	Located within Site boundary (80 m AOD).	Hydrologically disconnected as the Project has no influence on the collection of rainwater.
Cour Farm	182342 648147	Surface Water Source (2021 resident consultation)	1.45 km south of the Substation Site (40 m AOD).	Hydrologically disconnected as source is located upslope of all Development infrastructure.
Lower Crossaig	183079 651032	Surface Water Source	406 m north-east and downslope of Site (25 m AOD).	Hydrologically connected as located downslope within Development catchment.
Ravensbay	182342 652149	Surface Water (2021 resident consultation)	1.45 km north-east of the Site (30 m AOD).	Hydrologically disconnected by Crossaig Burn.
Spearasaig	182351 648848	PWS not identified based on 2018 EIA data	0.77 km south of the Substation Site (30 m AOD).	Hydrologically disconnected by Allt na Buaile Salaich.
South Crossaig	183102 650964	Surface Source	240 m north-east and downslope of Site (35 m AOD).	Hydrologically connected as located downslope within Development catchment.

A private water supply risk assessment (PWSRA) was carried out as part of the Environmental Impact Assessment (EIA) for the Inveraray to Crossaig overhead line (OHL) project published in July 2018, which was reviewed as part of the assessment⁶. Eight PWS were identified as part of the PWSRA surrounding the Proposed Development in that EIA. The locations were found to correlate with the PWS shown in **Table 6.10.1**. They are therefore not considered to be additional to the PWS in **Table 6.10.1**.

As discussed in the PWSRA, two supplies which supplied Crossaig Lodge, North Crossaig and, South Crossaig and Lower Crossaig were found to be non-functioning and therefore are understood to be historical supplies. However, there is potential for hydrological connection between the borehole PWS source of Crossaig Lodge with the Proposed Development infrastructure.

6.3.10 Designated Sites

Review of Nature Scot (formerly Scottish Natural Heritage) GIS datasets available through the Scotland's Environment mapping service was used to identify statutory designated sites related to the water environment within the Wider Study Area.

⁶ Inveraray to Crossaig 275 kV Overhead Line Reinforcement (2018) [online] Available at: <https://www.energyconsents.scot/> (Accessed 16/11/2021)

Statutory designations within 10 km of the Project and their potential hydrological connectivity to the Project are outlined in **Table 6.3**.

Table 6.3 Statutory Designations within 10 km of the Project

Designation	Approximate distance from the Project	Qualifying Interest	Hydrologically Connected to the Project
Claonaig Woods SSSI ⁷	5 km north east	Upland oak woodland.	Hydrologically disconnected of Crossaig Burn.
Kintyre Goose Lochs SSSI ⁸	5.2 km west	Supports an internationally important population of Greenland white-fronted goose.	Hydrologically disconnected by topography.
Kintyre Goose Roosts SPA ⁹	5.2 km west	Supports an internationally important population of Greenland white-fronted goose.	Hydrologically disconnected by topography.
Kintyre Goose Roosts RAMSAR ¹⁰	5.2 km west	Qualifies by regularly supporting 1 % or more of the individuals population of waterbirds (Greenland white-fronted goose).	Hydrologically disconnected by topography.
Arran Northern Mountains SSSI ¹¹	6.7 km east	Ordovician and tertiary igneous, upland birch woodland, vascular plants, birds, dragonfly, beetle.	Hydrologically disconnected by Kilbrannan Sound.
Inner Hebrides and the Minches SAC ¹²	9.3 km west	Harbour porpoise	Hydrologically disconnected by topography.
Sound of Gigha SPA ¹³	9.3 km west	Great northern diver, Slavonian grebe, common eider, red-breasted merganser.	Hydrologically disconnected by topography.

6.3.11 Sensitivity of Receptors

The sensitivities of the identified receptors and their likelihood of being affected by the Project are detailed in **Table 6.4**

Table 6.4: Sensitivity of Receptors

Receptor	Sensitivity	Sensitivity Description
Surface Hydrology (watercourses)	High	A large, medium or small waterbody with a SEPA water quality classification of 'Good'.
Coastal Waters	High	Coastal waterbody with a SEPA water quality classification of 'Good'.
Hydrogeology (groundwater)	High	Oban and Kintyre groundwater body classified as 'Good' and as a 'low productivity aquifer'.

⁷ NatureScot (2021) Claonaig Woods SSSI [online] Available at: <https://sitelink.nature.scot/site/359> (Accessed 17/11/2021)

⁸ NatureScot (2021) Kintyre Goose Lochs SSSI [online] <https://sitelink.nature.scot/site/1680> (Accessed 10/10/2022)

⁹ NatureScot (2021) Kintyre Goose Roosts SPA [online] <https://sitelink.nature.scot/site/8518> (Accessed 10/10/2022)

¹⁰ NatureScot (2021) Kintyre Goose Roosts RAMSAR [online] <https://sitelink.nature.scot/site/8431> (Accessed 10/10/2022)

¹¹ NatureScot (2021) Arran Northern Mountains SSSI [online] Available at: <https://sitelink.nature.scot/site/90> (Accessed 17/11/2021)

¹² JNCC (2021) Inner Hebrides and the Minches SAC [online] Available at: <https://sac.jncc.gov.uk/site/UK0030393> (Accessed 17/11/2021)

¹³ NatureScot (2021) Sound of Gigha SPA [online] <https://sitelink.nature.scot/site/10486> (Accessed 17/11/2021)

Receptor	Sensitivity	Sensitivity Description
Near-surface Water	High	Supports area of carbon-rich and peaty soils.
Soils	Medium	No areas of Class 1 or 2 peat.
Private Water Supplies	High	The hydrological receptor supports abstractions for seven private water supplies within 2 km of the Proposed Development.

6.4 Embedded Mitigation

The Project has been designed to reduce potential impacts as far as reasonably practicable. This includes mitigation that is embedded into the design of the project in accordance with industry standard methods and procedures, which will reduce impacts from construction and operation. The following mitigation measures relating to the hydrological environment are embedded into the design and construction of the Proposed Development:

- 50 m watercourse buffers for construction works with the exception of watercourse crossings along access tracks and the SUDS outfall; and
- The Proposed Development will utilise much of the existing forestry track already in place at this location, this will help to minimise ground disturbance and requirement for watercourse crossings.

A Water Construction Environmental Management Plan (WCEMP) accompanies this EA Report (**Annex N**) and will form part of the embedded development design. Relevant sections of the SSEN General Environmental Management Plans (GEMPs) will inform a CEMP to be implemented by the Applicant's selected contractor post-submission. GEMPs are included as **Annex A** to this report and relevant GEMPs include the following.

- Private water supplies;
- Working in or near Water;
- Soil Management;
- Contaminated Land;
- Oil Storage and Refuelling;
- Bad Weather; and
- Working with concrete.

As detailed in the WCEMP, substation transformers will be located in secondary containment concrete bunds which will be designed to accommodate a minimum of 110% of the volume of oil in the transformers, in accordance with relevant Netregs Guidance for Pollution Prevention (GPPs) and Pollution Prevention Guidelines (PPGs), including GPP8¹⁴.

The construction phase of the works will be undertaken in accordance with good practice guidance within the following documents:

- Control of Water Pollution from Construction Sites - Guide to Good Practice, CIRIA 2002;
- Environmental Good Practice on Site C650, CIRIA 2005;
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) – A Practical Guide (Version 8.4), SEPA, October 2019; and
- Regulatory Method (WAT-RM-04) Indirect Sewage Discharges to Groundwater (Version 8.0), SEPA, April 2022.

¹⁴ NetRegs GPP 8 Safe storage and disposal of used oils (2017) [online] Available at: <https://www.netregs.org.uk/media/1435/gpp-8-v3-swini.pdf> (Accessed 10/01/2022)

The PPGs and GPPs identified below will be applied during construction and operation.

- GPP 1 Understanding your environmental responsibilities – good environmental practices General Guide to the Prevention of Pollution (GPP 1, October 2020);
- PPG3 Use and Design of Oil Separators in Surface Water Drainage Systems (PPG3, April 2006);
- GPP5 Works and maintenance in or near water (GPP5, February 2018);
- PPG6 Working at Construction and Demolition Sites (PPG6, May 2012);
- PPG 7 Safe Storage – the safe operation of refuelling facilities (PPG 7, July 2011)
- GPP8 Safe Storage and Disposal of used oils (GPP8, July 2017);
- GPP13 Vehicle Washing and Cleansing (GPP13, April 2017);
- PPG18 Managing fire water and major spillages (PPG18, June 2000);
- GPP21 Pollution Incident Response Planning (GPP21, July 2017); and
- GPP22 Dealing with Spills (GPP2, October 2018).

6.5 Appraisal - Potential Construction Effects – Proposed Development

6.5.1 Activities Assessed

The nature and magnitude of effects that could result from construction activities are assessed in the following paragraphs and include the following activities:

- Maintenance of existing forestry access tracks for the construction of the Proposed Development from the A83;
- Construction of a new substation and associated infrastructure, areas of hardstanding and temporary construction compounds for the Proposed Development;
- Construction of a SuDS attenuation pond and outfall;
- Installation of a septic tank;
- Construction of new access tracks;
- Construction of temporary access tracks; and
- Tree felling required to facilitate the new access into the Proposed Development.

Mitigation measures for the Proposed Development are outlined within the WCEMP. The requirement for upgrades to watercourse crossings, including new watercourse crossings for new access tracks (on 1:50,000 scale mapping), are shown in Figure 6.6.

Table 6.5 Summary of Effects (Construction Phase Substation)

Receptor	Development Interaction	Mitigation Measures	Receptor sensitivity	Magnitude of effect following mitigation	Significance of effect
Surface Watercourses and coastal waters	Potential for temporary impact on surface water quality during construction.	Best practice and GEMPs as implemented by WCEMP.	High	Negligible	Minor
Groundwater and Near surface water	Potential for temporary impact on groundwater quality and changes in	GEMP as implemented by WCEMP.	High	Negligible	Minor

Receptor	Development Interaction	Mitigation Measures	Receptor sensitivity	Magnitude of effect following mitigation	Significance of effect
	groundwater interflow patterns during construction.				
Soils	Direct temporary impacts during construction.	GEMP as implemented by WCEMP.	Medium	Low	Minor
Private Water Supply	Potential for impact on flow and water quality during construction.	Private water supply GEMP as implemented by WCEMP. To include preparation and implementation of private water supply protection plan.	High	Negligible	Minor

6.6 Appraisal - Potential Construction Effects – Associated Development

6.6.1 Activities Assessed

The nature and magnitude of effects that could result from construction activities are assessed in the following paragraphs and include the following activities:

- Maintenance of existing forestry access tracks for the construction of the Associated Development from the A83;
- Construction of a new permanent OHL and temporary bypass OHL;
- Construction of new OHL permanent and temporary access tracks;
- Construction of two new permanent towers and four temporary towers, and the removal of three existing towers;
- Construction of new watercourse crossing; and
- Any tree felling and vegetation clearance required to facilitate the new access to the Associated Development.

Mitigation measures for the Proposed Development are outlined within the WCEMP.

Table 6.6: Summary of Effects (Construction Phase Associated Development)

Receptor	Development Interaction	Mitigation Measures	Receptor sensitivity	Magnitude of effect following mitigation	Significance of effect
Surface Watercourses and coastal waters	Potential for temporary impact on surface water quality during construction.	Best practice and GEMPs as implemented by WCEMP.	High	Negligible	Minor
Groundwater and Near surface water	Potential for temporary impact on groundwater quality and changes in groundwater interflow patterns during construction.	GEMP as implemented by WCEMP.	High	Negligible	Minor
Soils	Direct temporary impacts during construction.	GEMP as implemented by WCEMP.	Medium	Low	Minor
Private Water Supply	Potential for impact on flow and water quality during construction.	Private water supply GEMP as implemented by WCEMP. To include preparation and implementation of private water supply protection plan.	High	Negligible	Minor

6.7 Appraisal - Potential Operational Effects – Proposed Development

Potential effects associated with the operation of the Proposed Development are:

- Increased run-off rates and volume from increased hardstanding, resulting in increased flood risk;
- Alterations to natural flow pathways from runoff from areas of hardstanding; and
- Risk of a chemical pollution event from minor spills from maintenance vehicles.

As a result of felling during the construction phase, there may be increased run-off rates. This increase will be limited by compensatory planting both on-site and off-site for woodland removed for infrastructure, and by replanting carried out on-site for areas removed for management felling. In accordance with the **Chapter 5: Forestry** there will be no net loss of woodland area.

Table 6.7 Summary of Effects (Operational Phase Proposed Development)

Receptor	Development Interaction	Mitigation Measures	Receptor sensitivity	Magnitude of effect following mitigation	Significance of effect
Surface Watercourses and Coastal Waters	Potential for impact on surface water quality during operation.	Implement best practice mitigation measures.	High	Negligible	Minor
Groundwater and Near surface water	Potential for impact on groundwater quality and changes in groundwater interflow patterns during operation.	Implement best practice mitigation measures.	High	Negligible	Minor
Private Water Supply	Potential for impact on flow and water quality during operation.	Implement best practice mitigation measures.	High	Negligible	Minor

6.8 Appraisal - Potential Operational Effects – Associated Development

Potential effects associated with the operation of the Associated Development are:

- Increased run-off rates and volume from increased hardstanding, resulting in increased flood risk;
- Alterations to natural flow pathways from runoff from areas of hardstanding; and
- Risk of a chemical pollution event from minor spills from maintenance vehicles.

As outlined in the Forestry Report (**Annex J**), while there may be increased run-off rates because of felling, there are plans for replanting which will result in no net loss of woodland area.

Table 6.8: Summary of Effects (Operational Phase Associated Development)

Receptor	Development Interaction	Mitigation Measures	Receptor sensitivity	Magnitude of effect following mitigation	Significance of effect
Surface Watercourses and Coastal Waters	Potential for impact on surface water quality during operation.	Implement best practice mitigation measures.	High	Negligible	Minor
Groundwater and Near surface water	Potential for impact on groundwater quality and changes in groundwater	Implement best practice mitigation measures.	High	Negligible	Minor

Receptor	Development Interaction	Mitigation Measures	Receptor sensitivity	Magnitude of effect following mitigation	Significance of effect
	interflow patterns during operation.				
Private Water Supply	Potential for impact on flow and water quality during operation.	Implement best practice mitigation measures.	High	Negligible	Minor

6.9 Appraisal - Cumulative Effects

A cumulative effect is considered to be an additional effect on hydrological resources (within the same hydrological catchment) arising from the Project in addition to the combination of other developments likely to affect the hydrological environment.

6.9.1 Cumulative Effect Assessment

The following developments within 10 km of the Proposed Development are identified below (scoped in):

- High Constellation Wind Farm (consented) and related substation located within 0.25 km of the Proposed Development;
- Upgrade of existing forestry track;
- Use of borrow pit at "Land South Approximately 4 km South East of Clachan and 10 km North of Carradale Argyll And Bute" (awaiting decision); and
- Formation of fish farm at 'North Kilbrannan Fish Farm' (awaiting decision).

The developments above may result in cumulative effects to downstream receptors, which include minor watercourses immediately downslope and the wider Kilbrannan Sound that they discharge into. Cumulative effects are minimal as the only construction activities will be maintenance to existing access tracks. Minimal cumulative effects are more likely in the smaller watercourses than the larger Kilbrannan Sound due to their lower dilution potential and closer proximity to the works. Due to this, mitigation measures as detailed in the WCEMP will be implemented and it is therefore considered that there is no potential for cumulative effects on receptors downstream.

6.9.2 Residual Cumulative Effects

Mitigation measures detailed in the WCEMP will be implemented and no significant residual cumulative effects are predicted.

Table 6.9 Summary of Cumulative Effects

Receptor	Potential Effect	Magnitude	Significance of Effect	Additional Mitigation Proposed	Residual Significance
Surface hydrology	Chemical Pollution	Negligible	Minor	None	Minor
	Erosion and Sedimentation.	Negligible	Minor	None	Minor

Receptor	Potential Effect	Magnitude	Significance of Effect	Additional Mitigation Proposed	Residual Significance
	Impediments to Flow.	Negligible	Minor	None	Minor
	Increase in Run-off from increase in hardstanding.	Negligible	Minor	None	Minor
	Acidification of watercourses.	Negligible	Minor	None	Minor
Coastal Water	Chemical Pollution	Negligible	Minor	None	Minor
	Erosion and Sedimentation.	Negligible	Minor	None	Minor
	Acidification of watercourses	Negligible	Minor	None	Minor
Hydrogeology (groundwater)	Chemical pollution	Negligible	Minor	None	Minor
	Erosion and Sedimentation.	Negligible	Minor	None	Minor
	Changes in Groundwater Interflow Patterns.	Negligible	Minor	None	Minor
	Acidification of watercourses.	Negligible	Minor	None	Minor
Near-surface water	Chemical pollution	Negligible	Minor	None	Minor
	Erosion and Sedimentation.	Negligible	Minor	None	Minor
	Acidification of watercourses.	Negligible	Minor	None	Minor
Soils	Compaction or loss of soil.	Negligible	Minor	None	Minor
Private Water Supplies	Chemical pollution.	Low	Moderate	Following consultation, the sources of PWS will be monitored throughout construction.	Minor
	Erosion and Sedimentation.	Low	Moderate	Following consultation, the sources of PWS will be monitored	Minor

Receptor	Potential Effect	Magnitude	Significance of Effect	Additional Mitigation Proposed	Residual Significance
				throughout construction.	
	Changes in Groundwater Interflow Patterns.	Low	Moderate	Following consultation, the sources of PWS will be monitored throughout construction.	Minor

6.10 Summary of Effects

This environmental appraisal has assessed the likely effects of the Project on geology, hydrology and hydrogeology. Following the implementation of the embedded mitigation and measures set out in accordance with industry best practice in the WCEMP, as well as the GEMP, the residual effects arising from the Project will be minor or negligible for most of the receptors. Any receptors considered at risk of impacts will be mitigated through measures outlined in the WCEMP, which includes a water monitoring schedule to be agreed with consultees.

The conclusion of this environmental appraisal is that the residual effects arising from the construction and operation of the Project would not result in a significant effect on geology, hydrological or hydrogeological resources.