

Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment
Report

Volume 5: Appendices
Appendix 4.1: Balliemeanoch Pumped
Storage Hydro Scoping Report

ILI (Borders PSH) Ltd

July 2024

Balliemeanoch Pumped Storage Hydro

Scoping Report

ILI (Borders PSH) Ltd

10 June 2022

Quality information

Prepared by	Checked by	Verified by	Approved by
October 2021	26-10-2021	02-02-2022	07-02-2022
Marianne Brownlee Victoria Deacon Ryan Blair James Scott Aimee Kilcoyne Tony Marshall Peter Cowley Dylan Huws Debbie Hay-Smith Ruth Mauritzen John Devenny Johnnie Shipley Mark Romanowski Debbie Preston Neil Mackenzie Sally Homoncik Owen Tucker Andy Wakefield Laura Brankin Jackie Hill Paul Norton Alexandra Hiley	Victoria Deacon	David Ritchie Ian Gillies	David Lee

Revision History

Revision	Revision date	Details	Authorized	Name	Position
DRAFT	23 November 2021	Client Review	Y	David Lee	Project Manager
01	10 June 2022	Submission	Y	David Lee	Project Manager

Prepared for:

ILI (Borders PSH) Ltd

AECOM Limited
1 Tanfield
Edinburgh EH3 5DA
United Kingdom

T: +44 131 301 8600
aecom.com

© 2022 AECOM Limited. All Rights Reserved.

This document has been prepared by AECOM Limited ("AECOM") for sole use of our client (the "Client") in accordance with generally accepted consultancy principles, the budget for fees and the terms of reference agreed between AECOM and the Client. Any information provided by third parties and referred to herein has not been checked or verified by AECOM, unless otherwise expressly stated in the document. No third party may rely upon this document without the prior and express written agreement of AECOM.

Table of Contents

1.	Introduction.....	7
2.	Project Description	12
3.	Scope of the Environmental Impact Assessment.....	24
4.	Planning Policy	31
5.	Landscape and Visual Assessment.....	38
6.	Terrestrial Ecology	45
7.	Aquatic Ecology.....	50
8.	Marine Ecology.....	53
9.	Ornithology	60
10.	Geology and Ground Conditions	63
11.	Water Environment.....	67
12.	Flood Risk and Water Resources	79
13.	Cultural Heritage.....	87
14.	Access, Traffic and Transport	93
15.	Noise and Vibration	101
16.	Socio-Economics, Recreation and Tourism	105
17.	Climate	110
18.	Arboricultural Impact Assessment	118
19.	Marine Physical Environment & Coastal Processes	119
20.	Shipping and Navigation.....	127
21.	Commercial Fisheries.....	129
	Appendix A Figures	134
	Appendix B Aquatic Ecology Survey Methodology	135

Glossary

Abbreviation	Term	Abbreviation	Term
AADT	Annual Average Daily Traffic	EU	European Union
ABC	Argyll and Bute Council	FRA	Flood Risk Assessment
AIA	Arboricultural Impact Assessment	GDL	Garden and Designed Landscape
AIL	Abnormal Indivisible Loads	GET	Golden Eagle Territory
AIS	Automatic Identification System	GHG	greenhouse gas
AOD	Above Ordnance Datum	GLVIA	Guidelines for Landscape and Visual Impact Assessment
APQ	Area of Panoramic Quality	Ground Investigation	Ground Investigation
ASL	Above Sea Level	GWDTE	Groundwater Dependent Terrestrial Ecosystems
ATC	Automated Traffic Counts	HER	Historic Environment Record
AWI	Ancient Woodland Inventory	HES	Historic Environment Scotland
BAP	Biodiversity Action Plan	HESP	Historic Environment Policy for Scotland
BATNEEC	Best Available Technique Not Entailing Excessive Cost	HGV	Heavy Goods Vehicle
BGS	British Geological Society	HLA	Historic Landscape Assessment
BMP	Biosecurity Management Plan	HRA	Habitats Regulations Appraisal
BS	British Standard	ICCI	In-combination Climate Change Assessment
CAR	Controlled Activities Regulations	IEA	Institute of Environmental Assessment
CCP	Climate Change Plan	IEMA	Institute of Environmental Management & Appraisal
CCR	Climate Change Risk	INNS	Invasive Non-Native Species
CD	Chart Datum	IUCN	International Union for Conservation of Nature
CEMP	Construction Environment Management Plan	JNCC	Joint Nature Conservation Committee
CIEEM	Chartered Institute of Ecology and Environmental Management	LBAP	Local Biodiversity Action Plan
CIHT	Chartered Institution of Highways and Transportation	LCA	Landscape Character Area
CRTN	Calculation of Road Traffic Noise	LCT	Landscape Character Type
CTMP	Construction Traffic Management Plan	LDP	Local Development Plan

Abbreviation	Term	Abbreviation	Term
DETR	Department for Environment, Transport and the Regions	LEMP	Landscape and Ecological Management Plan
DMRB	Design Manual for Roads and Bridges	LVIA	Landscape and Visual Impact Assessment
DTM	Digital Terrain Model	MMA	Materials Management Appraisal
EA	Environment Agency	MW	MegaWatt
EC	European Commission	NCAP	National Collection of Aerial Photographs
EclA	Ecological Impact Assessment	NCMPA	Nature Conservation Marine Protected Area
ECU	Energy Consents Unit	NPF	National Planning Framework
EIA	Environmental Impact Assessment	SPP	Scottish Planning Policy
EIAR	Environmental Impact Assessment Report	SPZ	Source Protection Zone
NRTF	National Road Traffic Forecasts (Great Britain)	SSSI	Site of Special Scientific Interest
NVC	National Vegetation Classification	SuDS	Sustainable Drainage Systems
ONS	Office for Nations Statistics	TBM	Tunnel Boring Machine
OS	Ordnance Survey	TMP	Traffic Management Plan
PAN	Planning Advice Notes	TSS	Total Suspended Solids
PSH	Pumped Storage Hydro	TWL	Top Water Level
PWS	Private Water Supplies	UK	United Kingdom
RAG	Red, Amber, Green Analysis	UKCP	UK Climate Change Projections
RBD	River Basin District	UN	United Nations
RBMP	River Basin Management Plan	VA	Volt-ampere
RIGS	Regionally Important Geological Sites	VP	Vantage Point
SAC	Special Area of Conservation	WeBS	Wetland Bird Survey
SBL	Scottish Biodiversity List	WFD	Water Framework Directive
SCL	Sprayed Concrete Lining	WML	Waste Management Licence
SEPA	Scottish Environmental Protection Agency	WMP	Waste Management Plan
SES	Scottish Energy Strategy	WoSAS	West of Scotland Archaeology Service
SHA	Statutory Harbour Authority		
SPA	Special Protected Area		

1. Introduction

1.1 Overview

This Scoping Report has been prepared by AECOM on behalf of ILI (Borders PSH) Ltd (hereafter referred to as the 'Applicant'). The purpose of the report is to request a Scoping Opinion, pursuant to Regulation 12 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, and the Marine Works (Environmental Impact Assessment) (Amendment) Regulations 2017 with respect to the scope of and approach to the Environmental Impact Assessment (EIA) of the proposed Balliemeanoch Pumped Storage Hydro (PSH) scheme (hereafter referred to as the proposed 'Development').

1.1.1 The Applicant

The Applicant has been developing renewable energy projects for over 15 years, including single medium sized wind turbines that benefited from the UK's Feed-in Tariff. The Applicant has since diversified into PSH as it seeks to play its part in meeting Scotland's future energy needs. The Applicant has one PSH project in development: the proposed 450MW Red John PSH scheme located near Dores, south of Inverness; and a second PSH at pre-application stage: the proposed Corrievarkie PSH scheme located at Loch Ericht, south of Dalwhinnie, north of Bridge of Ericht.

1.2 Background

The Applicant proposes to construct a PSH scheme close to Lochan Airigh approximately 4.4 km to the south of the village of Portsonachan and 9 km northwest of Inveraray in Argyll and Bute as shown on *Figure 1.1 Location Plan*. The Development Site was identified from a Scotland-wide site search exercise and is considered suitable due to a number of factors such as topography, underlying geology, and an appropriately sized catchment. The proposed Development will discharge water from its tailrace back into Loch Awe which is also utilised by the existing Cruachan scheme. Cruachan is a 440 MW pumped storage hydro-electric scheme which has been operating since 1965. There is a Scoping Opinion request with the Scottish Government for an expansion of the Cruachan scheme. The proposed expansion of that scheme will provide up to 600 MW of new generating capacity, resulting in a total generating capacity of up to 1,040 MW. Further details can be found within Section 2.4 Existing and Potential Cumulative Developments.

Throughout this Scoping Report, the term 'the Development Site' is used to refer to the area encompassed by the Development Site red line boundary as shown on *Figure 1.1 Location Plan*. Both *Figure 1.2 Above Ground Infrastructure (Sheets 1 and 2)* and *Figure 1.3 Below Ground Infrastructure* show indicative infrastructure including the headpond, headrace, power cavern, tailrace, spillway, access, and other associated permanent and temporary infrastructure. The total area within the Development Site boundary is approximately 3,054 hectares (ha). Not all of this area within the Development Site boundary will be developed.

Balliemeanoch PSH will have a storage capacity of up to 45,000 megawatt hours (MWh) with up to 1,500 MW installed electrical generation capacity (subject to further investigation and feasibility works).

1.3 Development Components

Table 1.1 below describes the component parts of the PSH scheme and provides the terminology applicable to the proposed Development, and which is used throughout this report. Further detail on each of these components can be found within Chapter 2 Project Description, Table 2.1 Development Parameters (limits of deviation).

Table 1.1 Development Components

Component	Description
Headpond	The upper reservoir, including embankment or dam.
Embankment	Embankments or dams around the headpond reservoir/water body.
Reservoir	Water body retained within the headpond embankments and the tailpond.
Tailpond	The lower reservoir. In this case this is the existing water body of Loch Awe.

Inlet / Outlet	The location where the tunnels (headrace / tailrace) enter the headpond and tailpond.
Headrace	The underground high-pressure tunnel connecting the headpond to the power cavern.
Tailrace	The underground low-pressure tunnel connecting the power cavern to the tailpond.
Power Cavern	This is a below-ground component that will contain the combined pump / turbines, generators, switchgear and transformers.
Cable Tunnel	The underground tunnel hosting the power cables which will export the generated power from the underground power cavern to the surface at the sub/ switching station.
Access Tunnel	The underground tunnel providing access (construction and operation) to the power cavern.
Sub / switching station	This station will be an above-ground component that will consist of a secure electrical compound in which electrical equipment will be housed.
Spillway / Spillway Channel	This spillway will consist of a buried pipeline and will be used as a system to drain any excess water from the headpond as well as being used for the scouring and draining down of the headpond in an emergency situation.
Surge Shaft(s)	Structures that are provided along the waterways to contain pressure fluctuations within the hydraulic system. The low-pressure tunnel surge shaft will be underground. The high-pressure tunnel surge shaft will be underground but may have section cut into the hillside (subject to design).
Marine Facility	Located on the coast near Inveraray, this facility is predominately temporary and will be used for large deliveries to site. The marine structure will be a pier structure that will project into Loch Fyne. The height / depth of the structure is determined by the seabed and tidal range. Dolphin structures, or equivalent, could be associated with the marine structure. These will be used for mooring larger vessels to the structure.
Access Tracks	There will be both temporary and permanent access tracks required to be constructed as part of the proposed Development. The alignment of existing access tracks will be utilised as far as possible. Any existing access track will be upgraded to accommodate the size and number of vehicles required to travel to, from and around the proposed Development.
Compounds	Temporary and permanent compounds will be required across the proposed Development. Some will be used for construction related activities such as laydown areas, work yards and for general site maintenance. Others will be used for office space, parking areas, welfare areas, and accommodation. These may include electric charging points for electric shuttle cars/buses.
Temporary Accommodation	Some temporary accommodation will be provided within the above compounds, with an additional offsite camp required. It is estimated that the potential footprint of the offsite camp could be approximately 50,000 m ² (subject to design). This temporary accommodation will likely be located close to the Development Site and/or along one of the construction access routes. This offsite location has yet to be identified with the relevant studies currently being undertaken.

1.4 Environmental Impact Assessment Legislative Context

As the proposed Development will comprise an electricity generating plant with a gross electrical output in excess of 50 MW, consent to construct and operate will be required from the Scottish Ministers under Section 36 of the Electricity Act 1989 (the Act). The Section 36 application will be prepared in accordance with the requirements of the Electricity Act 1989 and submitted to the Energy Consents Unit (ECU) of the Scottish Government. The Scottish Ministers will also be requested to give a direction for planning permission to be deemed granted under Section 57(2) of the Town and Country Planning (Scotland) Act 1997.

The Electricity Works (EIA) (Scotland) Regulations 2017 apply to applications under Section 36 of the Act. The proposed Development constitutes a Schedule 2 development under Regulation 2(1) of the Electricity Works (EIA) (Scotland) Regulations 2017; an EIA is not mandatory for Schedule 2 developments. As there is potential for the proposed Development to have significant effects on the environment, the Applicant considers it appropriate to undertake an EIA.

1.5 Withdrawal of the United Kingdom from the European Union

As of 23:00 on 31 January 2020, the UK is no longer a Member State of European Union (EU). However, in accordance with the transitional arrangements provided for in Part 4 of the Withdrawal Agreement as implemented

into domestic law by the European Union (Withdrawal Agreement) Act 2020 (“the 2020 Withdrawal Agreement Act”), the UK entered an implementation period which ended on 31 December 2020. During the implementation period the UK continued to be treated as if it were still an EU Member State for many purposes with most EU law (including as amended or supplemented) continuing to apply to the UK. The Withdrawal Act retained the body of existing EU-derived law (which includes EIA Regulations and other relevant environmental legislation) within UK domestic law. These regulations provide for the EIA Regulations to be amended to ensure they function correctly following the implementation period. In particular, the amendments update references in the EIA Regulations to EU law, Member States and related terms to reflect the UK leaving the EU. The regulations do not make substantive changes to the way the EIA regime operates following the UK’s withdrawal from the EU.

1.6 The Scoping Report

This Scoping Report sets out the proposed scope of the assessments to be included within the EIA Report (EIAR) to be submitted as part of the Section 36 application for the proposed Development.

As required under Regulation 12 (2) of the Electricity Works (EIA) (Scotland) Regulations 2017, this Scoping Report contains the following as set out within Table 1.2 Scoping Report Requirements, below.

Table 1.2 Scoping Report Requirements

Requirement	Found within Scoping Report
<i>A description of the location of the development, including a plan sufficient to identify the land</i>	Chapter 2 Project Description, <i>Figure 1.1: Location Plan</i>
<i>A brief description of the nature and purpose of the development and of its likely significant effects on the environment</i>	Chapters 5 to 21 of this Scoping Report
<i>Such other information or representations as the developer may wish to provide or make</i>	Chapters 3 and 4 of this Scoping Report

The remainder of this report is structured as follows:

- Chapter 2: Project Description
- Chapter 3: Scope of the Environmental Impact Assessment
- Chapter 4: Planning Policy
- Chapter 5: Landscape and Visual Assessment
- Chapter 6: Terrestrial Ecology
- Chapter 7: Aquatic Ecology
- Chapter 8: Marine Ecology
- Chapter 9: Ornithology
- Chapter 10: Geology and Ground Conditions
- Chapter 11: Water Environment
- Chapter 12: Flood Risk and Water Resources
- Chapter 13: Cultural Heritage
- Chapter 14: Access, Traffic and Transport
- Chapter 15: Noise and Vibration;
- Chapter 16: Socio-economics Recreation and Tourism
- Chapter 17: Climate
- Chapter 18: Arboricultural Impact Assessment
- Chapter 19: Marine Physical Environment and Coastal Processes
- Chapter 20: Shipping and Navigation
- Chapter 21: Commercial Fisheries

This Scoping Report is supported by the following Figures found within Appendix A.

Table 1.3 Scoping Report Figures

Chapter	Fig No.	Title
Introduction	1.1	Location Plan
	1.2	Above Ground Infrastructure (Sheets 1 and 2)
	1.3	Below Ground Infrastructure
Project Description	2.1	Site Constraints
	2.2	Design Evolution
Landscape and Visual Amenity	5.1	Zone of Theoretical Visibility (Headpond)
	5.2	Zone of Theoretical Visibility (Tailpond)
	5.3	Zone of Theoretical Visibility (Headpond and Tailpond)
	5.4	Landscape Designations
	5.5	Landscape Character Type
	5.6	Representative Viewpoint Locations
Terrestrial Ecology	6.1	Statutory Designated Sites
	6.2	Ancient Woodland
	6.3	Terrestrial Ecology Survey Areas
	6.4a	Bat Activity Survey
	6.4b	Butterfly, Dragonfly and Damselfly Survey Transect Routes
Aquatic Ecology	7.1	Electric Fishing and eDNA Survey Locations
Marine Ecology	8.1	Marine Facility Study Area and Protected Sites
	8.2	Scottish Priority Marine Features
	8.3	Distribution of protected features of the Upper Loch Fyne and Loch Goil NCMPA within the vicinity of the proposed Development at Inveraray
Ornithology	9.1	Statutory Designated Sites
	9.2	Ornithology Survey Areas
Water Environment	11.1	Waterbody Classifications
	11.2	Bedrock Geology
	11.3	Superficial Geology
Flood Risk and Water Resources	12.1	Loch Awe Catchments
Cultural Heritage	13.1	Heritage Designations Within 1km Study Area
	13.2	Heritage Designations Within 3km Study Area
Access Traffic & Transport	14.1	Proposed ATC Locations and Local Highway Network
Noise and Vibration	15.1	Noise Sensitive Receptors
Commercial Fisheries	21.1	Commercial Fisheries

This Scoping Report is also supported by Appendix B Aquatic Ecology Survey Methodology, which can be found at the end of this document.

1.7 Consultation

The Applicant is committed to ongoing engagement with statutory and non-statutory consultees and interested parties throughout the consenting process. The Applicant has scheduled informal consultation with the ECU and

Argyll and Bute Council (ABC) and undertook initial high-level consultation with local communities through an interactive online presentation on 13th September 2021. A project website has also been created to provide information and updates: <https://www.balliemanochpsh.co.uk>

A Pre-Application Consultation report will be submitted with the Section 36 application which will detail the informal and formal consultation held, and how this has informed the project development of all elements of the scheme, including the marine facility in accordance with the Marine Licensing (Pre-application Consultation) (Scotland) Regulations.

2. Project Description

2.1 Site Description

The proposed Development is located at central national grid reference NN 03615 17578 approximately 4.4 km to the south of the village of Portsonachan and 9 km northwest of Inveraray in Argyll and Bute as shown on *Figure 1.1 Location Plan*. The Development Site is generally characterised by upland moorland plateau grazing land. The headpond location at Lochan Airigh sits at approximately 360 m above ordnance datum (AOD) and 3 km to the east of the village of Balliemanoch. The marine facility is located south of Inveraray off the A83.

There is no woodland within the main area of the Development Site, with woodland pockets restricted to those located along proposed access tracks. These woodlands include: plantation woodland along the existing, to be upgraded, access track off the A819 at the north; along the proposed new and upgraded existing tracks proposed to the west of Inveraray; and along the upgraded access to the north of Inveraray Castle.

The proposed Development is predominantly located within the catchment of the Allt Beochlich watercourse. The catchment consists of a number of small streams which ultimately flow into Loch Awe, these originate from smaller Lochs (Airigh, Dubh and Romach).

2.2 Environmental Designations

There are no statutory environmental designations within the main area of the Development Site, with Inveraray Castle Garden and Designed Landscape located within the red line boundary along the existing access track north of Inveraray Castle. However, the proposed marine facility would be situated within the Upper Loch Fyne and Loch Goil Marine Protected Area (MPA) which is located to the west of Inveraray.

Within the wider area, Glen Etive and Glen Fyne Special Protected Area (SPA) is located approximately 5 km to the east of the proposed headpond and is designated for breeding golden eagle (*Aquila chrysaetos*).

Non-statutory long established (of plantation origin) woodland is located to the north and south of stretches of the proposed access route to the north of Inveraray Castle, in addition to a number of scattered Category A and B Listed Buildings. There is one Scheduled Monument within the main Development Site - Balliemanoch chapel and burial ground which is located approximately 500 m north of the proposed tailrace tunnel.

Further details on designated sites and their sensitivity to the proposed Development are addressed within Chapters 5-17 of this Scoping Report.

2.3 Site Access

There are no classified roads or tracks within the Development Site at the headpond or tailpond location. However, at Inveraray there is a <1 km section of classified road (A83) at the proposed pier location.

Site access is proposed off the A819 which links the strategic trunk roads A85 to the north at Dalmally and A83 to the south at Inveraray. It is anticipated the general construction access will come from the north and south along the A819. Construction access from the south will bypass Inveraray via a section of unclassified existing track (to be upgraded) north of Inveraray Castle which will connect the A83 to the A819.

Larger construction traffic, such as abnormal loads, will be delivered by boat to the proposed pier, where they would be transported to site via the A819. Access to the A819 will be via an upgraded existing access track that runs to the north, then east, from the A83, around the north of Inveraray. There are proposed upgrades to the existing unclassified road "Upper Avenue" at Inveraray and a new track linking this to the A83 at the proposed pier location.

These upgrades are proposed to ease traffic and to avoid sensitive bridges within the area of Inveraray.

2.4 Existing and Potential Cumulative Developments

There is an existing small-scale hydro scheme in operation within the Development Site known as Beochlich. The Beochlich hydropower project was constructed in 1998 and has an installed capacity of 1 MW. The scheme

incorporates a storage reservoir, with water extracted from the Beochlich Burn (Allt Beochlich) and returned to the same watercourse downstream.

In addition, there are other existing hydro schemes in the River Awe catchment and in surrounding area; namely Cruachan, Inverawe, and Nant. Cruachan is a 440 MW pumped storage hydropower scheme operated by Drax Group plc which is located approximately 12 km to the north of the proposed Development. It has been operating since 1965 and comprises an upper reservoir with its turbine hall located in a cavern constructed within Ben Cruachan and discharges into Loch Awe. A Scoping Opinion request has recently (September 2021) been submitted to the Scottish Government for an expansion of the Cruachan scheme, proposed to be developed on land around and to the east of the existing Cruachan Power Station. The Proposed Cruachan development seeks to optimise use of the existing Cruachan reservoir and dam through development of a new underground power station and associated infrastructure. The existing Cruachan Power Station pumped storage facility has a maximum generating capacity of 440 MW and the proposals will provide up to 600 MW new generating capacity, resulting in an increased generating capacity of up to 1,040 MW.

Inverawe is a conventional 25 MW run of river hydropower scheme operated by SSE which is fed by a barrage constructed across Loch Awe approximately 12 km north of the proposed Development. Nant is a conventional 15 MW hydropower scheme operated by SSE. The scheme uses Loch Nant as its headpond (approximately 8 km northwest of the Development Site) and discharges into Loch Awe and the River Nant.

The proposed Development is located immediately north of the proposed Blarghour wind farm. Blarghour wind farm comprises 17 wind turbines and ancillary infrastructure with a total installed capacity of 57.8 MW and has recently (November 2021) been granted consent by the Scottish Ministers.

Further details on cumulative projects in proximity to the proposed Development which are to be assessed within the scope of the EIA are discussed in Chapter 3 Scope of the Environmental Impact Assessment.

2.5 Identification of Alternatives

Under Schedule 4, parts 2 and 3 of the Electricity Works (EIA) (Scotland) Regulations 2017, the Applicant is required to provide “a description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.” As well as “a description of the relevant aspects of the current state of the environment (the “baseline scenario”) and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of relevant information and scientific knowledge.”

The proposed Development was identified as part of a Scotland wide review of potential PSH locations conducted by the Applicant. There is a precedent for renewable energy generation in the Argyll and Bute region and specifically for pumped storage hydro. The topography and geology of Loch Awe provide suitable conditions for pumped storage hydro in this location.

Consideration was given to the option to increase capacity of existing schemes as part of a review of alternatives, however the Applicant is not the owner of any existing assets that could be expanded upon. The nearby Cruachan scheme was already being investigated, and no other suitable PSH sites were identified that would fit with both the project and Applicant’s needs or ability to develop due to ownership.

There are few, if any, energy storage technologies which can provide the grid scale services of pumped storage hydro. Alternative storage technologies are either too small (batteries) to provide the necessary long durations required, or largely unproven (compressed air) and, in the case of ancillary services such as fast response, more carbon intense (open cycle gas).

PSH schemes provide benefits by balancing the electricity supply and demand. Recharge occurs at periods of low demand and stores excess energy generated by baseload and intermittent power stations so that this energy can be re-released at peak times. This is especially beneficial in Scotland where an increasing percentage of electricity is coming from wind power, the delivery of which is intermittent and therefore PSH schemes support renewable energy generators by providing greater stability to the grid. PSH can also provide ancillary services to the grid.

2.6 Design Evolution

The proposed Development has evolved through an iterative design process resulting in the layout presented in this report. The design will continue to be informed by and refined throughout the EIA process. The headpond area has evolved through consideration of engineering feasibility and environmental constraints. Where possible, mitigation has been embedded into the design to reduce any potential significant effects from the proposed Development on identified receptors. Consultation responses, stakeholder feedback, and collation of baseline surveys results will continue to influence the final design for the proposed Development.

The following sections below describe the design process for the proposed Development to date.

2.6.1 Design I: Feasibility

During a Scotland-wide review of PSH potential conducted by the Applicant, a PSH scheme utilising Loch Awe was identified. An indicative arrangement of the proposed Development was then developed which is based on two provisional headpond locations as shown in *Figure 2.2: Design Evolution*. During the pre-feasibility stage, the buildability and landscape and visual aspects were considered for both of these headpond locations.

2.6.2 Design II: Scoping

An engineering assessment and initial landscape and visual appraisal were carried out for the two provisional headpond areas. The results from both assessments showed that the southern headpond location was more favourable from an engineering and landscape perspective and was therefore taken forward as the proposed headpond location. During the above assessment, the Applicant engaged with the developers of the Blarghour wind farm on the interface of the two developments within close proximity. The Applicant is seeking to enter into a co-operation agreement with the Blarghour developers, which aims to result in collaborative benefits and enhancements to the environment.

At this stage the southern headpond location was further reviewed. The outcome from this review was to increase the overall headpond storage capacity. In doing so, the height of the embankment which impounds the headpond increased in height accordingly (by 40 m, compared to the feasibility design). In addition to this, two smaller embankments will be required to impound the water at the higher level, please refer to *Figure 2.2 Design Evolution*.

Following headpond sizing and location selection, the access requirements were then reviewed from the potential port of entry to the Development Site. This assessment initially considered existing ports such as Corpach and Grangemouth. However, the routes from these ports were deemed to be constrained in terms of the abnormal load dimensions required. Other ports or new marine facility locations were therefore considered, as listed below:

- Taynuilt, Loch Etive;
- Ardfern, Loch Craignish;
- Achnaba, Loch Fyne;
- Furnace, Loch Fyne;
- Kenmore, Loch Fyne; and
- Inveraray, Loch Fyne.

Upon assessing the feasibility of each of the proposed marine facility locations and the subsequent improvement works required to the road network in order to transport large components to the Development Site, the Inveraray location was found to be the most feasible from an engineering and transport perspective. Associated with this marine facility location is a proposed new access route that will join the A83 and A819 via new access track from the south as shown in *Figure 2.2 Design Evolution*.

2.7 The Proposed Development

Figure 1.2 Above Ground Infrastructure (Sheet 1) provides the indicative layout for the headpond. A Rochdale Envelope approach (identifying maximum worst case parameters for structures to allow a degree of flexibility to address uncertainty) will be taken for all built features.

Following consultee comments and stakeholder feedback in addition to ongoing baseline surveys, the Applicant will confirm the headpond layout that will be progressed at design freeze. It is also the intention of the Applicant to refine the envelopes further as the design evolution progresses.

The indicative dimensions of the component parts are detailed in Table 2.1 Development Parameters (limits of deviation), below. The dimensions listed here are subject to refinement through the EIA process and final dimensions will be as listed in the EIAR. These should be seen as the worst-case enveloped parameters but also as indicative at this stage.

Table 2.1 Development Parameters (limits of deviation)

Component	Detail (Approximate Parameters)
Headpond – Location	Location: NN 04594 16411
Headpond Reservoir	Working volume of water up to 58 Mm ³
Headpond Embankment	There are three proposed embankments. The maximum embankment height is 110 m high above existing ground level. (425m AOD) Embankment Height 1 (Main) 110 m Embankment Height 2 (North) 15 m Embankment Height 3 (East) 20 m
Headpond Inlet Outlet	Intake tower height: Total estimated height is 60 m. Approximately 40 m below water and 20 m above top water level.
Headrace surface surge shaft	Location: NN 03884 16785 A buried shaft that may have an at surface structure.
Tailpond (Loch Awe)	Location: NN 00908 16232
Tailpond Inlet Outlet	Location: NN 00916 16283 Dimensions: Approximately 20 x 70 x 15 m (WxLxH)
Headrace	Length: 600 m
Tailrace	Length: 2,800 m
Power Cavern	Dimensions: 150 x 50 x 25 m
Access Tracks (new temporary)	Total length: 12 km Running width: maximum 7 m
Access Tracks (new permanent)	Total length: 14 km Running width: maximum 10 m
Access Tracks (upgrade)	Total length: 15 km Running width: maximum 10 m
Construction Compounds	Total no. compounds: 10 (6 temporary, 4 permanent) Total area: 450,000 m ²
Temporary Accommodation	Some temporary accommodation will be provided within the above compounds, with an additional offsite camp required, location tbc, size circa 8,000 m ² .
Switching Station	Area: 8,000 – 10,000 m ²
Marine Facility – Location (Loch Fyne)	NN 08608 07178
Marine Facility – Size	The final design of the marine facility is to be confirmed but anticipated dimensions are noted below. Distance from shoreline: Approximately 400 m Width: 25 m Height: 7 m (above mean high water springs)

2.7.1 Pre-Construction (Site Establishment)

2.7.1.1 Permanent and Temporary Access Tracks

It is anticipated that all site traffic, construction vehicles and deliveries will avoid the village of Inveraray by utilising the two access routes shown in *Figure 1.2 Above Ground Infrastructure* which avoids the town centre. These routes will divert traffic around the town of Inveraray onto the A819.

Table 2.2 Access Tracks sets out the proposed access tracks location, state of construction (temporary/ permanent) and type (new/ upgrade).

Table 2.2 Access Tracks

Track Location / Use	New / Upgrade	Permanent/ Temporary	Approximate Location (NGR)
Three Bridges	Upgrade	Permanent	NN 08846 12462
Balliemeanoch Farm	Upgrade/ New	Permanent	NN 01173 16475
West edge of Headpond	New	Permanent	NN 03564 16465
Military Road	Upgrade/ New	Permanent	NN 10049 19967
A83 to A819	Upgrade	Permanent	NN 10613 09928
Upper Avenue, Inveraray	Upgrade	Permanent	NN 08318 07602
A83 to Upper Avenue, Inveraray	New	Permanent	NN 08432 07065

From the A819, it is proposed that access will be gained from two existing forestry tracks located at NN 08853 12473 and NN 10064 19980. Each of the proposed access routes will utilise existing forestry tracks as far as possible with some stretches of new track to be constructed. Both access tracks will link the A819 with the proposed headpond area located near Lochan Airigh as shown in *Figure 1.2 Above Ground Infrastructure*.

Internal site access tracks will be required linking the Development components. These will be a mixture of permanent and temporary tracks to enable construction. These tracks will either be sealed or unsealed in nature. Existing access tracks and infrastructure will be utilised as far as possible; however, it is noted that the existing infrastructure such as bridges, culverts, and roads may require upgrade. The material that will be used to construct the tracks will be made up of both imported material and material that is sourced from within the Development Site.

Access requirements between the construction compounds and the various work areas will change throughout the construction period. The majority of the traffic will be general construction vehicles such as dump trucks, HGV's and general large plant and equipment. General site traffic such as vans, minibuses, and four-wheel drive vehicles will also use the road network.

Construction traffic routes will be developed in parallel with the EIA and will take account of the suitability and capacity of local roads. If any existing roads need to be crossed, they will be crossed perpendicular so as to reduce the potential impact from construction traffic.

2.7.1.2 Construction Compounds

It is anticipated that ten compounds will be required for the construction period and that four of these would be retained for the full duration of the proposed Development. The proposed locations use and approximate size of each of the compounds are detailed in Table 2.3 Proposed Construction Compounds and are shown on *Figure 1.2 Above Ground Infrastructure*.

Table 2.3 Proposed Construction Compounds

Compound No.	Usage	Approximate Location	Approx. Max Size (m²)
1	Temporary & Permanent construction compound (Permanent storage area, access to inlet / outlet structure at Loch Awe)	NN 00986 16180	10,000
2	Temporary construction compound (Permanent access to tunnel portal)	NN 01179 15768	6,000
3	Temporary construction compound (Permanent access to tunnel portal.)	NN 01775 15514	6,000
4	Temporary & Permanent construction compound (Permanent hard standing for car park and/or maintenance and servicing)	NN 03687 15980	15,00
5	Temporary & Permanent construction compound (Permanent hard standing for car park and/or maintenance and servicing)	NN 03677 16433	8,000
6	Temporary construction compound	NN 03094 15804	5,000
7	Temporary construction compound	NN 06486 19265	2,500
8	Temporary construction compound	NN 09734 20177	2,500
9	Temporary construction compound	NN 08415 07191	8,000
10	Temporary construction compound	NN 08425 07645	25,000
TOTAL AREA (m²)			73,000

The proposed construction compounds will be constructed with a mixture of imported material at the commencement of construction works, following which material that is generated from the tunnelling activities will be used. The compound surfaces are anticipated to be unsealed (stone, metallised or gravel surface) in nature and will be either floated (over peat) or built into the hillside depending on the site conditions and anticipated loads. Compounds 5, 6, 7, 8, 9, and 10 will be removed and the areas reinstated once construction is complete.

2.7.2 Construction

2.7.2.1 Programme

The main construction works, including commissioning, are likely to take approximately five years but there will be some necessary enabling and ground investigation works which will involve intermittent activity in the preceding two years. The construction activity is anticipated to peak at around years 3 and 4 during the construction of the tunnels, waterways, and headpond. The tunnelling work is expected to be a 24-hour operation and headpond construction is anticipated to be undertaken during working hours (typically between 0800 to 1800). The indicative programme shown in Table 2.4 is intended to demonstrate a reasonable worst case.

This programme will be updated, and further detail provided, as the EIA process progresses.

Table 2.4 Indicative Construction Programme

	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction																												
Construction Design																												
Site investigation																												
Electrical and Mechanical procurement																												
Construction design																												
Enabling Works																												
Mobilisation																												
Access Roads																												
Construction Camps																												
Marine Facility																												
Headpond																												
Preparation and area set up																												
Dam construction including lining																												
Catchment works																												
Inlet/outlet works																												
Reinstatement																												
Tailpond																												
Diversion works																												
Inlet/outlet works																												
Tunnelling																												
Powerhouse access tunnel																												
Construction tunnel																												
Cable/ ventilation/ emergency access tunnel																												
Headrace tunnel																												
Tailrace tunnel																												
Powerhouse																												
Tunnelling around powerhouse																												
Surge tank (headrace and tailrace)																												
M&E Installation																												
Balance of plant																												
Other works																												
Control Building																												
Switching station																												
Grid Connection Construction																												
Pre-commissioning																												
Commissioning																												
Completion of project																												

2.7.2.2 Construction Vehicles, Plant and Equipment

Several different types of plant and equipment will be required for construction of the proposed Development. These include, but are not limited to:

- Bulldozers;
- Mobile cranes;
- Mobile crushing and screening plant;
- Dump trucks – for the transportation of materials within the proposed Development Site;
- Electric shuttle cars;
- Excavators;
- Graders;
- Low loaders – for delivery of plant and equipment;
- Mechanical breaking plant;
- Pumps;
- Drilling, piling and blasting rigs;
- Rollers;
- 8-wheel tippers;
- Tractors and trailers;
- Temporary concrete batching plant;
- Temporary bonded fuelling station;
- Temporary floating track – i.e. bogmats or trackway system;
- Tunnel services – i.e. lighting, electricity, ventilation etc.;
- Silt busters, silt curtains and dewatering tubes;
- Water bowsers and water cannons;
- Wheel wash facilities; and
- Tunnel Boring Machine (TBM) – or equivalent.

Specialised types of the plant listed above may be required for the construction of specific components of the proposed Development and the most suitable equipment for the task will be identified.

The main vehicle movements would occur during the middle of the construction period, whilst the major earthworks above and below ground are underway. It is anticipated that the large plant and equipment will remain inside the construction areas for each component of the proposed Development and the operators and staff will be shuttled around site via light vehicles such as vans, minibuses and pickup trucks. Also included in the areas will be temporary fuelling stations with fuel bowsers and pumps although it is hoped that alternative fuels will be available in time for construction.

The tunnel boring machine (required if drill and blast construction of the tunnels not suitable) will be transported to the new marine facility, located on Loch Fyne, in a vessel. The components will then be transferred to land by either a roll on roll off vehicle or heavy lift equipment from a vessel to a transporter on land. The components will then be transported to site on the back of a specialised transporter either via the northerly or southerly access route from the A819 to the main Development Site.

The marine facility area, as shown in *Figure 1.2 Above Ground Infrastructure*, will consist of a marine facility that is expected to have both temporary and permanent components. The marine facility will accommodate the delivery of large components associated with the tunnelling and mechanical and electrical components. Several different types of plant and equipment will be required for the construction and operation of the proposed marine facility. These include, but are not limited to:

- Barges;
- Long reach excavators;
- Tugs;
- Jack up barges;

- Workboats;
- Temporary harbour cranes;
- Mobile cranes; and
- Piling rigs.

2.7.2.3 Materials Management

Due to the nature of the proposed Development, it is recognised that the generation and handling of material will require suitable management to minimise any likely significant adverse effects to the environment, surrounding landscape, and project cost in addition to minimising transport movements on the local road network from offsite disposal. It is anticipated that a Waste Management Licence (WML) will be required for carrying out this operation in addition to a Waste Management Plan (WMP).

The proposed Development requires a significant amount of material to construct the impoundment structures of the headpond. The design, shape, and size of the impoundment will be confirmed through the EIA process. However, at this stage, it is anticipated the main embankment structure could be around 110 m high and have a volume of around 4,600,000 m³.

Due to the volume of material anticipated to be required for the construction of various components, a Materials Management Appraisal (MMA) will be undertaken as part of the EIA process and updated prior to construction, to ensure that the material that is generated from construction is classified and reused as far as practically possible. The MMA will ensure that the best practical option is secured by:

- Determining the final volumes and likely nature of the rock that will be excavated from the different excavation operations;
- Determine final volumes of other materials such as vegetation and suitable management routes such as local biomass supply and reinstatement;
- Classification of the excavated rock to determine the use in the proposed Development as well as outside on other construction projects;
- Identifying temporary or long-term storage requirements on or off-site;
- Traffic analysis of the impact of hauling material through the existing local road network; and
- Assessment of the environmental impacts of each option highlighting the need for any additional primary consents or licences.

The approximate material volume calculations are provided in Table 2.5. This is indicative at this stage until preliminary site investigation works have been undertaken in order to inform the design of the proposed Development and the cut and fill balance calculations. Therefore, it is proposed to provide an MMA as part of the EIAR which will provide additional information on the type and volume of materials generated from the proposed Development. This will also determine the requirement for any permanent storage of material which could be considerably landscaped, as opposed to significantly impacting the local transport network with movements off-site.

Table 2.5 Indicative Material Volumes

	Waterways	Power Cavern	Construction Tunnel	Access Tunnel	Headpond Embankments
Volume (m3)	270,000	325,000	184,000	115,000	4,600,000
Bulking Factor	1.64	1.64	1.64	1.64	-
Estimated Bulk Volume (m3)	442,000	533,000	302,000	189,000	-

Note: The volume given in the 'Headpond Embankments' column is a high-level estimate of volume of the embankment structures. The volume of material required to construct the embankments will be subject to ground investigation and embankment design.

The headpond embankment will be constructed with a mixture of material that is generated from the underground activities and material that will be sourced within the proposed impounded area of the headpond. Excess material

that is surplus to requirements is anticipated to be able to be stored within areas of the impounded area. With smaller amounts of excess material required to be permanently stored on site. It may be possible to use this surplus material for landscaping purposes and reinstatement across the Development Site. The design philosophy is to reduce the amount of excess material by:

- Incorporating space in the design of components such as the headpond to accommodate as much of the excess material as possible; and
- Reducing the amount of imported material.

The intention is to use as much of the rock / surplus material generated on site to construct the proposed Development components (embankment, roads, and concrete structures) whilst reducing the excess material to a minimum.

2.7.2.4 Power Requirements

Electrical power will be required on the Development Site for various aspects of construction. A temporary grid connection will be required to the local distribution network. The temporary grid connection would reduce fuel consumption and noise associated with on-site generators. Prior to the availability of the temporary grid connection, it is anticipated during the enabling works that the majority of the power will be supplied by portable generators. It is assumed that most of the smaller works will use mobile petrol generators and equipment, or greener solutions such as zero-emission hydrogen fuel cells where feasible. Table 2.6 the sources of power for large construction operations.

Table 2.6 Estimated Electrical Power Requirements of Portable Generators

Usage	Fuel Type	Range (kVA)	Estimated number of units
Construction compounds	Natural Gas, Diesel	40 -100	6 -10
Pumping	Diesel	250 - 500	4 -8
Tunnelling	Natural Gas, Diesel	100 – 1250	6 -10

2.7.2.5 Construction Workforce

The number of construction staff on site will vary according to the construction phase and activities being undertaken and will be confirmed by the primary contractor upon instruction. However, it is expected that up to 500 people will be employed onsite during the construction phase at its peak, after which it will then generally decrease as construction is progressed through to the commissioning phase. This will be subject to the requirements of the primary contractor and therefore may vary.

Due to the distance from any major town or city, it is anticipated that a temporary workers' accommodation camp will be required for the duration of the major construction works. It is estimated that the potential footprint of the camp will be around 50,000 m². This temporary camp will likely be located close to the Development Site and consist of the following:

- Housing and cabins for workforce accommodation;
- Welfare facilities, i.e. kitchens, shower blocks, rest and recreation spaces;
- Utilities and services, i.e. power, telecoms and water;
- Car parking; and
- Facilities to enable bus Park & Ride/Park & Share to the Development Site e.g. space will be provided for a bus to enter, turn and exit the site.

The offsite location for temporary workers' accommodation has yet to be identified with the relevant studies currently being undertaken. The Applicant will continue to liaise with the relevant stakeholders to determine this location. As part of this, the Applicant is committed to investigating the provision of permanent housing to the local market.

2.7.2.6 Switching Station and Grid Connection

The grid connection for the proposed Development would be via a new switching station located within the Development Site. An indicative switching station would consist of control building(s), switchgear, busbars,

perimeter fence, and overhead or underground cables. This is likely to comprise a hard-standing area of approximately 8,000 – 10,000 m².

The location of the grid connection has not yet been confirmed, but two potential locations have been identified - these are set out in Table 2.7.

Table 2.7 Potential Grid Connection Locations

Route Option	Grid Connection	Location	Approximate Distance (km)
1	Creag Dhubh (proposed)	NN 08603 19212	9
2	Dalmally Substation	NN 14234 29398	20

The grid connection will be subject to a separate consenting arrangement and undertaken by the statutory undertaker. Notwithstanding this, information will be provided within the EIAR on the most likely grid connection route and method, including a high-level assessment of any likely significant cumulative effects on the information known at the time of submission.

2.7.3 Commissioning

The proposed Development will be commissioned in stages commencing with a period of “dry commissioning”. During this period the components (dam leakage control, valves, motors, pumps, and electrical control systems) will be tested for functionality with no water in the headpond. Once satisfied that everything is in order, the reservoir will be filled by allowing rainwater to pond in the headpond and by pumping water from Loch Awe. Once there is sufficient water, there will be a period of wet commissioning that will repeat the dry commissioning tests with water in the system to allow the full functionality of the pump and turbines to be tested. This, together with commissioning of the grid connection will allow the facility to operate in a reduced capacity until full functionality testing can occur when the water in the system is at capacity volume.

2.7.4 Operation

Regular operation of the proposed Development will be relatively unobtrusive. The pump / turbine will generally operate automatically based on response signals from the operator and electronic sensing equipment, generating or pumping as requirements dictate. Depending on the mode of operations there may be a short start up and shut down sequence at the beginning of every generation and pump cycle.

2.7.4.1 Operational Lifetime

The expected lifetime of a PSH scheme is reported in academic literature to be around 80 years. This is considered to be a conservative estimation as Ffestiniog PSH Station in Wales and Cruachan PSH Station were commissioned in 1963 and 1965 respectively and are still in good operational condition having had some phased refurbishment works. It is expected that the civil works (tunnels and dams) will last for up to 100 years. However, throughout this period it is expected that the electrical plant will require refurbishment or reconditioning every 25 years.

2.7.4.2 Maintenance Requirements

Once commissioned, PSH plants typically require very little maintenance. Table 2.8 below sets out the expected maintenance requirements for the proposed Development.

Table 2.8 Anticipated Maintenance Requirements

Component	Objectives	Inspections Carried out by:	Frequency
Headpond (Embankment)	Examine the critical safety features including, embankment, overflow, and scour arrangements, the condition of the major elements and the operating records.	A qualified third-party Panel Engineer, Supervising Engineer and or the Operator	Routine surveillance (Operator) – Minimum once or twice weekly. Inspection (Supervising Engineer) – Annually Inspection (Panel Engineer) – 10 years

Tunnels	Tunnel integrity and performance	Operator	10 years
Pump/ Turbines and Generators	Reliable operation of equipment in the service environment – achieved through planned, periodic inspection and checking of components and systems, together with replacement or rectification of parts wherever required. Maximum availability of equipment and a minimum of unplanned shutdowns by using planned/periodic shutdowns to inspect all equipment.	Operator	As recommended by the manufacturer, likely to be daily, weekly, monthly, and quarterly checks as per the maintenance schedules, with major refurbishment works not expected more frequently than five-year intervals
Marine Facility	Examine the marine structure to ensure the integrity and operation is maintained.	Operator	Annual inspection of structure. 10 years detailed inspection.

2.7.4.3 Operational Workforce

Following completion of construction it is not anticipated that the proposed Development would require a large number of personnel for its operation. It is expected that there will be approximately 5 - 10 permanent on site jobs created as a result of the operation of the facility, there is also likely to be additional jobs created in a remote-control centre. More jobs would be created if a visitor centre or similar is considered viable, such as is popular at Cruachan.

2.7.4.4 Lighting Requirements

It is expected that there will be a requirement for internal lighting within the access tunnels, and the power cavern. Further to this, external lighting is expected to be at the tunnel entrances and along the perimeter fence of the access compound, focused around the entry gate. During operation of the marine facility it is anticipated that there will be navigational lights required to be used in the dark along with navigational buoys.

2.7.4.5 Operational Water Discharge and Abstraction

Once the proposed Development is fully commissioned, the working water volume will pass between the headpond and Loch Awe in order to provide the storage and generate electricity at peak times.

It is anticipated that the average drawdown level of the headpond will be between 420 and 340 m AOD. The estimated drawdown in Loch Awe, when at Top Water Level (TWL), is estimated to be around 1 m. A management/water use agreement will need to be agreed with other water users in the Awe catchment to ensure there is sufficient water resource for all parties. It should be noted that a PSH scheme will tend to operate on cycles that are dictated by the energy markets, it is therefore considered unlikely that the scheme will fully empty then immediately fill.

2.7.5 Decommissioning

The decommissioning of large-scale pumped storage hydro projects is extremely rare due to the long operational lifespan of the facility. However, at the end of its operational life, the proposed Development can either be refurbished, or be decommissioned which would involve the following activities:

- Water would be drained from the headpond and released at an agreed rate and timescale through the appropriate licensing regime into Loch Awe;
- The pump turbines, and associated mechanical and electrical plant would be removed;
- The tunnel and power cavern entrances will be blocked off with local soil;
- The tailpond inlet outlet structure will be removed;
- All surface structures will be removed after appropriate ecological assessment. However, the embankment and access tracks may remain;
- Should the embankment remain in situ, the scour valves will remain open, reducing the risk of any build-up of water behind the decommissioned embankment.
- Security fences can be removed, although access through the headpond structures will be secured; and
- Removal of the marine facility.

Under the Reservoirs Act, the headpond does not need to be drained, as long as ongoing maintenance is undertaken. However, the assumption has been made that the reservoir will be drained.

3. Scope of the Environmental Impact Assessment

3.1 Overview

This chapter outlines the proposed scope and approach to the EIA.

3.2 EIA Regulations 2017

Under Part 1 section 3 of the Electricity Works (EIA) (Scotland) Regulations 2017, the following factors and the interaction between these factors are to be considered within any EIA submitted for Scoping after the 16 May 2017:

- *Population and human health;*
- *Biodiversity, and in particular species and habitats protected under Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora(a) and Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds(b);*
- *Land, soil, water, air and climate; and*
- *Material assets, cultural heritage and the landscape.*

In addition, EIA Reports are to include the expected effects deriving from the vulnerability of the proposed Development to major accidents and disasters.

The chapter titles included within this Scoping Report and proposed for the EIAR do not directly correspond with the list of factors in the Electricity Works (EIA) (Scotland) Regulations 2017. However, all of the factors are addressed so far as relevant to the proposed Development within the Scoping Report. Table 3.1 sets out where each of the factors are addressed within this Scoping Report and under which environmental topic they are included.

While the majority of the scheme will require consent under the Electricity Act 1989, with the relevant regulations being the Electricity Works (EIA) (Scotland) Regulations 2017, the marine facility will require consent under the Marine (Scotland) Act 2010 and the Marine Works (Environmental Impact Assessment) Regulations 2007 have been taken into account as applicable.

Table 3.1 Summary of Factors and Environmental Topics

Chapter	Environmental Topic	Factor
5	Landscape and Visual Amenity	Landscape
6	Terrestrial Ecology	Biodiversity
7	Aquatic Ecology	Biodiversity
8	Marine Ecology	Biodiversity
9	Ornithology	Biodiversity
10	Geology and Ground Conditions	Land and Soils
11	Water Environment	Water and human health
12	Flood Risk and Water Resources	Water, climate, major accidents and disasters, and human health
13	Cultural Heritage	Cultural heritage
14	Access Traffic & Transport	Material assets
15	Noise and Vibration	Human health
16	Socio-Economics, Recreation and Tourism	Population, human health and material assets

17	Climate	Climate
18	Arboricultural Impact Assessment	Biodiversity and landscape
19	Marine Physical Environment & Coastal Processes	Water and biodiversity
20	Shipping and Navigation	Material assets
21	Commercial Fisheries	Material assets and biodiversity

3.3 Scope of the EIA

Unless stated to the contrary, the scope of the EIA for each of the environmental topics set out within this Scoping Report will include an assessment of the construction and operation phases of the proposed Development. Given the approximated operational lifetime of PSH is in the region of 80 years, a decision would be made in the future whether to refurbish the PSH or to decommission the scheme. The refurbishment plan or if the latter, a detailed decommissioning plan, would be prepared as required as this may be subject to a separate planning application at the time.

Table 3.2 summarises the proposed scope of the EIAR. Further details for specific environmental topics can be found in Chapters 5 to 17 of this Scoping Report.

Table 3.2 Summary, Proposed EIA Scope

Environmental Topic	Proposed Scope of Assessment	Element Proposed to be Scoped Out
Landscape and Visual Assessment	Assessment of the effects on landscape character and visual amenity for construction, operation and decommissioning of the proposed Development.	Decommissioning
Terrestrial Ecology	Survey and assessment of: <ul style="list-style-type: none"> Habitats, including NVC; Protected mammals; Butterflies, dragonflies and damselflies; and Terrestrial and riparian invasive non-native species. 	Decommissioning
Aquatic Ecology	Survey and assessment of: <ul style="list-style-type: none"> Habitats Fish Aquatic macrophyte Macroinvertebrate Freshwater invasive non-native species 	Decommissioning
Marine Ecology	Assessment of marine designated sites, benthic habitats and species, marine fish, elasmobranchs, marine mammals and marine invasive non-native species.	Decommissioning
Ornithology	Survey and assessment of habitats and breeding birds including raptor survey (including eagles), diver survey and moorland bird survey.	Decommissioning
Geology and Ground Conditions	Assessment of geology and hydrogeology including ground investigations and peat assessments.	Assessment of operational effects. Decommissioning
Water Environment	Assessment of water quality and water resource, hydrological assessment and a Water Framework Directive (WFD) assessment.	Decommissioning
Flood Risk and Water Resources	Production of Flood Risk Assessment and hydrological assessment	Breach analysis. Decommissioning
Cultural Heritage	Assessment of effects on cultural heritage assets and their setting that are within the zone of theoretical visibility up to up to 3km of the Development Site Boundary.	Decommissioning

Environmental Topic	Proposed Scope of Assessment	Element Proposed to be Scoped Out
Access, Traffic and Transport	Details of the proposed access route from the principal road network, the point(s) of access to the proposed Development Site and an indication of the likely number of vehicle movements and traffic management plans required during construction.	Assessment of operational and decommissioning effects.
Noise and Vibration	Assessment of construction and operation noise and vibration.	Baseline vibration survey. Decommissioning
Socio-economics, Recreation and Tourism	Assessment of the effects on the local community, local economy, recreation and tourism in the area.	Effects on business within the proposed Development Site. Population demographics. Decommissioning
Climate	Greenhouse Gas impact assessment.	Decommissioning
Arboricultural Impact Assessment	Identify trees to be removed and will consider any impacts to retained trees including how they can be protected.	Operation and Decommissioning
Marine Environment & Coastal Processes	Potential impacts of the proposed Marine Facility on physical and marine and coastal processes.	Decommissioning
Shipping and Navigation	Potential impacts on current shipping and sea users from the movement of plant / material by sea and from construction of the marine facility.	Decommissioning
Commercial Fisheries	Potential impacts of the proposed Development on the receptor commercial fisheries.	Decommissioning

3.3.1 Factors to be Scoped Out

Some factors are not relevant to the proposed Development as there is limited scope for likely significant effects. For instance, no significant air quality effects are anticipated as emissions to air are restricted to construction plant and construction dust, which can both be mitigated through good practice measures (e.g., dust management plan through a Construction Environmental Management Plan) of which outline plans will be provided to support the application. In addition, there is the possibility to connect to local mains electricity, which would minimise the need for on-site electrical generators during construction.

As detailed within Section 3.3 Scope of the EIA above, the decommissioning phase has been scoped out of the assessment.

3.4 Approach to EIA

The EIA will identify and assess the likely environmental effects of the proposed Development. A key aim of EIA is to integrate environmental considerations into the design process. Through the identification of likely significant adverse environmental effects, mitigation measures which will avoid, reduce or offset adverse environmental effects or maximise environmental benefits can be incorporated into the project design. The main steps to be followed in the EIA are as follows:

- Baseline surveys will be undertaken in order to identify and describe the environmental character of the area potentially affected by the proposed Development. This information is provided to the scheme designers at the earliest opportunity;
- Relevant natural and manmade processes that may change the character of the site are identified;
- Consideration is then given to the possible interactions between the proposed Development and both existing and future site conditions. These interactions or effects are assessed using stated criteria based on accepted guidance and good practice;
- Using the initial designs of the proposed Development, the possible environmental effects, both direct and indirect, are predicted;
- Recommendations can then be made to avoid, minimise or mitigate adverse effects and enhance positive effects. Alterations to the design can then be reassessed and the significance of potential environmental effects assessed; and
- The results of the EIA are set out in an EIAR that will accompany the Section 36 application to the ECU.

3.4.1 Approach to the Assessment

3.4.1.1 Overview

The determination of the significance of the impacts arising from the proposed Development is a key stage in the EIA process. In order to assess the overall significance of an impact it is necessary to establish the magnitude of the effect occurring i.e. the change to the existing baseline conditions as a result of the proposed Development and the sensitivity or importance of the receiving environment or receptor. Assessment of significance for environmental topics will combine professional judgement with consideration of a number of factors including the:

- The type of effect, i.e., whether it is adverse, beneficial, neutral, or uncertain;
- The probability of the effect occurring based on the scale of certain, likely, or unlikely;
- The sensitivity of the resource or receptor under consideration;
- The magnitude of the potential effect in relation to the degree of change which occurs as result; and
- Whether the effect is temporary, permanent, and/or reversible.

3.4.1.2 Sensitivity or Importance of Receptors

The sensitivity of the baseline conditions is assessed according to the relative importance of existing environmental features on or near to the site, or by the sensitivity of receptors which would potentially be affected by the proposed Development. Criteria for the determination of sensitivity or of the importance or value of receptors are established based on approved guidance, legislation, statutory designation, and/or professional judgment.

The criteria in Table 3.3 provides a general definition for determining the sensitivity of receptors.

Table 3.3 Sensitivity

Sensitivity	Definition
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value or is of regional importance.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.
Negligible	The receptor is resistant to change and is of little environmental value.

3.4.1.3 Magnitude of Effect

The magnitude of potential effects on environmental baseline conditions is identified through consideration of the proposed Development taking into account the scale or degree of change from the existing baseline as a result of the effect. Consideration is given to the duration and reversibility of the effect as well as consideration of relevant legislative or policy standards or guidelines.

Table 3.4 provides a general definition for determining the magnitude of a particular effect.

Table 3.4 Magnitude of Effect

Magnitude	Definition
High	Total loss or major alteration to key elements/features of the baseline conditions such that post development character/composition of baseline condition will be fundamentally changed.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition of the baseline condition will be materially changed.
Low	Minor shift away from baseline conditions. Changes arising from the alteration will be detectable but not material; the underlying character/composition of the baseline condition will be similar to the pre-development situation.
Negligible	Very little change from baseline conditions. Change is barely distinguishable, approximating to a "no change" situation.

3.4.1.4 Significance of Effect

The general approach adopted in the assessment of significance is outlined in Table 3.5 below. A combination of the magnitude of the impact under consideration and the sensitivity of the receiving environment determines the significance of effect. For some specialist topics, additional categories have been added where a greater level of definition is required. It should be noted that this general approach is a framework and should not be treated as a matrix.

Table 3.5 Significance of Effects

Magnitude	Sensitivity				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

The significance of the effects arising from the proposed Development will be reported using a seven-point scale, as follows:

- Major Adverse, Moderate Adverse, Minor Adverse;
- Negligible; and
- Major Beneficial, Moderate Beneficial, Minor Beneficial.

Effects predicted to be Minor are considered to be manageable and such effects are 'Not Significant'. Effects assessed as Moderate or Major are considered to be 'Significant'. When the significance of impacts is assessed this takes into account mitigation, i.e., the assessment applies to the residual impacts of the proposed Development, which can be defined as any impact that would remain following the implementation of proposed mitigation measures.

These may differ between the specialist topics, but where this occurs, the variation will be explained clearly and fully.

3.4.1.5 Cumulative Effects

The effects of the proposed Development will be assessed in combination with other projects that are either under construction or currently going through planning. Those approved or under construction will be considered as part of our baseline, those still going through the planning process will be considered as part of our cumulative assessment. Projects to be included within the cumulative assessment will be identified through consultation and a search of the ABC planning portal as well as that of the ECU.

Cumulative effects will be considered for each of the environmental topics, unless stated otherwise within Chapters 5 -17 of this Scoping Report. The cumulative assessment will take into account any existing environmental problems and any areas of particular environmental importance such as designated sites and landscapes. The cumulative assessment will also consider effects between the different environmental topics (intra-project effects) for the proposed Development as well as the effects from other projects (inter-project effects).

Cumulative effects will also consider the operational effects related to the water catchments with other hydro schemes such as Cruachan and Inverawe. Whilst their operation is considered baseline, the cumulative operation in terms of drawdown and discharge on the hydrology and water balance of the receiving catchments will be considered although could be controlled through the conditions of the Controlled Activities Regulations (CAR) licence and abstraction licence.

Table 3.6 lists other developments that have been identified as either going through screening or scoping, with a granted planning application, or under construction at present to be included within the cumulative assessment.

Table 3.6 Cumulative Developments

Development	Description	Location*	Status	Shared Receptors	Distance from Development
Beochlich Hydro Scheme	Small-scale hydropower scheme.	NN 19598	06779 Operational	Environment, roads and amenity	3.77 km
Cruachan Hydro Scheme	440 MW pumped storage hydro scheme that uses Loch Awe as a tailpond.	NN 26802	07807 Operational	Water	10.00 km
Cruachan II Hydro Scheme	Increasing the capacity of the existing PSH scheme by up to 600 MW.	NN 26802	07807 Scoping	Water	10.00 km
Inverawe Hydro Scheme	25 MW hydro scheme on Loch Awe.	NN 28697	04537 Operational	Water	11.00 km
Nant Hydro Scheme	15 MW hydropower scheme that uses Loch Nant as its headpond.	NN 24107	00127 Operational	Landscape, water	7.34 km
Lochan Shira (Reservoir)	Reservoir of the Clachan hydro scheme.	NN 16367 20210	Operational	Landscape	13.00 km
Blarghour Windfarm	Wind farm development comprising 17 turbines with a total installed capacity of 57.8 MW.	NM 97219 20733	Planning	Landscape	7.15 km
Beinn Ghlas Windfarm	Wind farm development comprising 14 turbines with a total installed capacity of 7.8 MW.	NM 97811 25815	Operational	Landscape	10.00 km
Upper Sonachan Windfarm	Wind farm development comprising 19 turbines with a total installed capacity of 65 MW.	NN 06500 18800	Planning	Landscape, roads.	3.18 km
An Suidhe Windfarm	Wind farm development comprising 23 turbines with a total installed capacity of 19 MW.	NN 00865 08283	Operational	Landscape	9.70 km
Carraig Gheal Windfarm	Wind farm development comprising 20 turbines with a total installed capacity of 46 MW.	NM 97219 20733	Operational	Landscape	10.00 km
Clachan Windfarm	Flats Wind farm development comprising 9 turbines with a total installed capacity of 15 MW.	NN 16367 20210	Operational	Roads	13.00 km
Ladyfield Farm	Wind farm development comprising 22 turbines, with a total capacity of between 50 and 100 MW.	NN 1050 1549	Scoping		7.20 km

* Distances are calculated from the central grid reference of the proposed Development.

3.4.1.6 Mitigation

Some mitigation measures to avoid, reduce, or offset the consequences of the proposed Development will be embedded within the Development design whilst others may require adherence to particular requirements on construction methodology or mode of operation. The final assessment of significance will consider the mitigation measures and requirements that have been incorporated into the proposed Development – this will be the assessment of residual likely significant environmental effects.

It is likely that the following management plans will be submitted as part of the EIA or as a pre-construction condition:

- Archaeology and Heritage Plan;

- Construction Environment Management Plan (CEMP), which will be supported by;
 - Dust Management Plan;
 - Recreation and Access Plan;
 - Noise Management Plan;
 - Water Quality Management Plan;
 - Emergency Response Management Plan;
 - Construction Traffic Management Plan (CTMP); and
 - Materials Management Plan.
- Landscape and Ecological Management Plan (LEMP).

3.5 Secondary Consents

It is recognised that other consents and licenses will be required for the construction and operation phase of the proposed Development. At present it has been identified that the following may be required:

- Marine Licence;
- CAR Licences, including abstraction licence;
- European Protected Species licences;
- Reservoir registration under the Reservoir (Scotland) Act 2011; and
- Waste Management Licence.

This list is not exhaustive and will be updated as required. Information on when and who will gain the relevant consents and licences will be included within a Schedule of Mitigation in the EIAR. As much information as possible will be provided within the EIAR towards the application for these secondary consents.

4. Planning Policy

4.1 Introduction

The Planning Statement accompanying the EIAR and Section 36 application will summarise the national, regional, and local planning policy guidance and development plan policies that are relevant to the proposed Development. The Planning Statement will also consider International, EU and National mechanisms which influence energy policy and associated climate change targets in Scotland. The Planning Statement will assess the proposed Development against the relevant policies and plans identified. Policies related to individual disciplines will be examined within the relevant technical chapters.

This chapter of the EIA Scoping Report will identify the land-use policies and strategies applicable to the proposed Development via a review of documents and consultation with Argyll and Bute Council and other statutory consultees. The policies and plans which will be considered as part of the assessment are outlined below. These documents reflect the current direction of the UK and Scottish Government's objectives for accommodating a project such as a pumped hydro storage scheme. The Planning Statement will demonstrate the considerable need for this project as identified through UK and Scottish legislation, policy, and plans.

4.2 National Planning Policy

4.2.1 Energy Policy

4.2.1.1 The Scottish Climate Change Plan (CCP)

Energy is a devolved matter for the Scottish Government, who declared a state of climate emergency in April 2019, making Scotland one of the first nations in the world to make this declaration. In doing so, climate change is placed at the centre of all policy decisions. As a result, amendments were made to the Climate Change (Scotland) Act 2009 in the form of the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019. To reflect these new legislative changes, the Scottish Government produced the Update to the Climate Change Plan 2018 – 2032: Securing a Green Recovery on a Path to Net Zero (CCP; 2020a).

The CCP is a plan for meeting the Scottish Government's greenhouse gas emission reduction targets to 2032. It was updated in December 2020 to incorporate the new targets resulting from the climate emergency declaration to reduce emissions by 75% by 2030 (compared with 1990) and to net zero by 2045. The CCP explores a variety of ways to achieve this target, including highlighting the important role that pumped storage can play in decarbonising the electricity system, maintaining security of supply and helping to create a more resilient system due to its ability to release stored energy when there is high demand. The CCP goes on to say:

“We will continue to fight hard for measures to unlock investment in Pumped Storage Hydro (PSH)... We have asked the UK Government to bring forward mechanisms, potentially similar to those available for interconnectors, which will enable the substantial investment needed to develop PSH; we will work with the developers to ensure that this can deliver sustainable and secure jobs and supply chain benefits to Scotland's rural areas.”

Collaborating on actions to support investment in new PSH is one of the proposals linked to Outcome 2 in the CCP, which relates to a secure and flexible electricity supply which is able to manage fluctuations and interruptions.

4.2.1.2 The Scottish Energy Strategy

The Scottish Government published the Scottish Energy Strategy: The Future of Energy in Scotland (SES) in 2017 to provide long term guidance to detailed energy policy decisions. The forecast and targets within the SES were in line with the Climate Change (Scotland) Act (2009), however this was amended by the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 which brought in the new targets to reduce emissions by 75% by 2030 (compared with 1990) and to net zero by 2045, reflected by the updated CCP.

In March 2021, the Scottish Government published Scotland's Energy Strategy Position Statement to provide an overview of its key priorities for the short to medium-term. The 2017 SES remains in place, however the statement provides an overview of the approach towards economic recovery from the COVID-19 pandemic in the context of national net zero ambitions in the lead up to the UN Climate Change Conference (COP26) which was held in November 2021.

With regard to PSH, the statement identifies the commitment to: “*Renew our calls for urgent action by UK Government to unlock investment in new pumped storage hydro capacity*” as one of its key priorities.

Nevertheless, the 2017 SES remains a committed strategy to taking a whole system energy approach which encourages different sectors to collaborate. As with the CCP, the importance of PSH to provide flexibility to the energy system is recognised, with the need for investment in increased PSH capacity throughout the 2020s identified. A comparison from 2014 is provided, with the energy storage at that time for coal, gas and other petroleum-based products amounting to hundreds of TeraWatt Hours (TWh) of storage, similar to the total demand for electricity, with PSH accounting for only 30 GigaWatt hours (GWh). As 1 TWh equals 1,000 GWh, PSH represents only a tiny fraction of the fossil fuel storage capabilities. A significant increase in capacity in PSH is therefore clearly needed to move away from fossil-fuel reliant energy storage and achieve the 2045 net zero target.

4.2.1.3 Energy Legislation, Policies and Plans

The following list of UK and Scottish Government legislation, policies, and plans regarding energy will be included and summarised in the Planning Statement:

- Climate Change (Scotland) Act 2009 as amended by the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 and annual progress report to the Scottish Parliament required under the legislation;
- Department of Energy & Climate Change (2011) Planning our Electric Future: A White Paper for Secure, Affordable, and Low-carbon Energy;
- BEIS and Ofgem (2017) Upgrading our Energy System: Smart Systems and Flexibility Plan;
- Committee on Climate Change (2019) Net Zero: The UK’s Contribution to Stopping Global Warming;
- Scottish Government (2017; or as updated) Scottish Energy Strategy: The Future of Energy in Scotland;
- Department for Business, Energy & Industrial Strategy (BEIS, 2020) The Energy White Paper: Powering our Net Zero Future;
- Scottish Government (2019) A vision for Scotland’s electricity and gas networks.
- Scottish Government (2020a) Update to the Climate Change Plan 2018 – 2032: Securing a Green Recovery on a Path to Net Zero; and,
- The Scottish Government (2020b) Protecting Scotland, Renewing Scotland: The Government’s Programme for Scotland 2020-2021.

The following document is also considered relevant:

- National Grid Electricity System Operator (2021; or as updated) Future Energy Scenarios. Updated each year, this provides forecasts relating to the need for renewable energy and storage technologies in order to meet UK decarbonisation targets. PSH is identified as a key component of energy system flexibility which will become increasingly more important as society reduces reliance on fossil fuels. Significant growth in PSH is therefore anticipated, with a need for storage capacity increasing from the approximate 4GW currently available to between 20 and 43 GW by 2050.

4.2.2 National Planning Policy

Applications for energy developments in Scotland with an electrical generation capacity in excess of 50 MW are made to and determined by the Scottish Ministers in accordance with the provisions of Section 36 of the Electricity Act (1989), as outlined in Section 1. Deemed planning permission will also be sought under Section 57(2) of the Town and Country Planning (Scotland) Act 1997 (as amended).

The key legal, policy, and advice documents of relevance to the proposed Development which are material considerations to the decision-making process are outlined below.

4.2.2.1 The Planning (Scotland) Act 2019 and the Town and Country Planning (Scotland) Act 1997

Developed as a central part in reforms to the planning system, the Planning (Scotland) Act 2019 amends many of the provisions of the Town and Country Planning (Scotland) Act 1997. Elements of the 2019 Act have been introduced gradually since it gained Royal Assent in July 2019 through a reform programme, among the first of which were amendments to the contents and procedures for preparing the National Planning Framework, which has led to the commencement of National Planning Framework 4 (NPF4; see Section 4.2.2.4 National Planning Framework 4 (NPF4)). Key changes will include the incorporation of Scottish Planning Policy (SPP) into NPF4, and that NPF4 will have an enhanced status as part of the statutory development plan.

The reform programme was due to be completed in early 2021, however it was delayed due to Covid-19 and as a result, amendments are expected to continue throughout the remainder of 2021. The Town and Country Planning (Scotland) Act 1997, as amended, remains the principle legislation in Scotland governing the use and development of land.

Consent for the proposed Development will therefore be sought during a time of change in relation to planning policy and guidance. Relevant changes will be taken into account for the future application, however the method of applying for deemed planning consent under Section 57(2) of the Town and Country Planning (Scotland) Act 1997 (as amended) is expected to remain constant. It is also expected that NPF4 will continue to provide policy support for developments such as PSH, as it will be developed with reference to energy policy. Therefore, whilst any available early publications of NPF4 will be taken into account when assessing the proposed Development, the general support for this type of project as described is not anticipated to greatly change.

4.2.2.2 National Planning Framework 3 (NPF 3)

NPF3 (Scottish Government, 2014a) is the strategy for the direction of development and infrastructure investment in Scotland, as identified by the Scottish Government for the purpose of economic and sustainable growth. It has a statutory basis and as such is a material consideration. NPF3 sets out a strategy for Scotland's development over 20 to 30 years, helping to inform the wider programmes of government, public agencies and local authorities. It is the spatial expression of the Scottish Government's Economic Strategy and informs plans for infrastructure investment. As a statutory document, NPF3 has a central role to play in ensuring that spatial development is promoted in such a way as to best meet Scotland's ambitious climate change and renewable energy aspirations.

The Scottish Government sets out their vision for future development in Scotland through two connected publications, NPF3 and Scottish Planning Policy (SPP; discussed in Section 4.2.2.3 Scottish Planning Policy (SPP)). This vision centres on:

1. A successful sustainable place;
2. A low carbon place;
3. A natural resilient place; and,
4. A connected place.

Specific reference is given to the energy sector as one of seven sectors to accelerate economic recovery. It is also noted that development will need to facilitate adaptation to climate change, reduce resource consumption, and lower greenhouse gas emissions.

NPF3 recognises that (at the time of publication) the Scottish Government has set a target of at least an 80% reduction in greenhouse gas emissions by 2050. It is expected that strategic and local development plans will take into account the strategy, actions, and developments set out in NPF3.

Paragraphs 3.1 to 3.6 of NPF3 discuss how planning will play a key role in delivering on the commitments set out in Low Carbon Scotland. The priorities identified in this spatial strategy set a clear direction, consistent with climate change legislation. Currently the energy sector accounts for a significant share of greenhouse gas emissions.

Within NPF3, national developments are identified which formally establish the need for a specific development or development type needed to help deliver the spatial strategy. One of the 14 developments identified is PSH at new or existing sites throughout Scotland that would exceed 50 MW (p. 73), the statement of need is shown in the illustration below: Excerpt from NPF3 of the Statement of Need and Description for PSH. The proposed Development is therefore classified as a national development, with NPF3 further supporting this as a need.

5. STATEMENT OF NEED AND DESCRIPTION – Pumped Hydroelectric Storage

1 – Location: Throughout Scotland.

2 – Description of Classes of Development: Development for pumped hydroelectric storage which would be or exceed 50 megawatts consisting of:

- a. new and/or expanded and/or refurbished water holding reservoir and dam.
- b. new and/or refurbished electricity generating plant structures or buildings.
- c. new and/or expanded and/or refurbished pump plant structures or buildings.
- d. new and/or expanded and/or refurbished water inlet and outlet pipework.
- e. new and/or refurbished substations and/or transformers directly required for the pumped hydroelectric schemes which fall within the description.
- f. new and/or replacement transmission cables directly linked to the pumped hydroelectric schemes which fall within the description.

3 – Designation: A development within one or more of the Classes of Development described in paragraph (2) (a) to (f) is designated a national development.

4 – Need: These classes of development are needed to support the strategic role of pumped hydroelectric storage within our electricity network by increasing the capacity through new or expanded sites. This promotes security of electricity supplies and will help to balance electricity demand with intermittency of some types of generation.

4.2.2.3 Scottish Planning Policy (SPP)

SPP (Scottish Government, 2014b) sets out national planning policies which reflect Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. SPP firmly establishes the Scottish Government's purpose to achieve sustainable economic growth and its commitment to sustainable development. Indeed, SPP commits to a *"presumption in favour of development that contributes to sustainable development"* (p. 9, para. 27).

The SPP shares the vision of NPF3 as per Section 4.2.2.2 National Planning Framework 3 (NPF3) and, with regards to the vision of 'a low carbon place', states: *"By seizing opportunities to encourage mitigation and adaptation measures, planning can support the transformational change required to meet emission reduction targets and influence climate change. Planning can also influence people's choices to reduce the environmental impacts of consumption and production, particularly through energy efficiency and the reduction of waste."* (p. 7, para 19).

With regard to energy storage projects, Paragraph 156 of SPP refers to these being amongst the national priorities for energy infrastructure improvement. Paragraphs 167 and 168 reiterate the above and voice the Scottish Government's support for energy storage schemes in general due to their ability to support the development of renewable energy and maintain the stability of the electricity network.

4.2.2.4 National Planning Framework 4 (NPF 4)

The preparation of NPF4 has begun, with a draft published in November 2021 and final version expected for adoption in 2022 following Scottish Ministers approval. On adoption, it will replace NPF3 and SPP.

NPF4 will direct focus to *"improve health and well-being for the people of Scotland... and provide a spatial planning response to the Global climate emergency"* (Scottish Government, 2021d) putting climate change at the heart and top of the planning agenda.

The Ministerial Foreword of the draft identifies that the central purpose of NPF4 is to align with and ensure planning policy is oriented towards the delivery of Scotland's national emissions targets: *"our fourth National Planning Framework, sets out how our approach to planning and development will help to achieve a net zero, sustainable Scotland by 2045"* (Scottish Government, 2021d). NPF4 will be part of a wider package to deliver the reform envisaged by the Planning (Scotland) Act 2019.

Part 3 of the draft NPF4 sets out policies for the development and use of land, to be used by planning authorities in development plan production and in development management decisions. The proposed 'Policy 2: Climate

Emergency' states that when considering all development proposals, significant weight should be given to the Global Climate Emergency.

The draft NPF4 presents a consistent approach with NPF3 and identifies PSH as a national development. The draft identifies the significant role PSH will play in progress towards net zero: *"This national development will play a significant role in balancing and optimising electricity generation and maintaining the operability of the electricity system as part of our transition to net zero. This is necessary as we continue to move towards a decarbonised system with much more renewable generation, the output from which is defined by weather conditions."* (p.56).

The national development supports PSH development throughout Scotland, however specific emphasis is placed on Argyll: *"This national development supports additional capacity at existing sites as well as new sites. Cruachan in Argyll is a nationally important example of a pumped storage facility with significant potential for enhanced capacity that could create significant jobs in a rural location."* (p. 56).

While the draft NPF4 has now been published it is unlikely to be adopted by the time of submission of the section 36 application for the proposed Development. However, whilst NPF3 and SPP will remain current policy, the draft NPF4 is an increasingly important consideration. Nevertheless, with the emphasis on net zero emissions NPF4 continues to support the CCP, both highlighting the need for and expansion of PSH capacity.

4.2.2.5 Planning Advice Notes and Specific Advice Sheets

Planning Advice Notes (PAN) and Specific Advice Sheets set out detailed advice from the Scottish Government in relation to a number of planning issues. PANs and Specific Advice Sheets relevant to the proposed Development could include:

- PAN 50 Planning, Environmental Protection and Regulation;
- PAN 60 Planning for Natural Heritage;
- PAN 65 Planning and Open Space;
- PAN 68 Design Statements;
- PAN 75 Planning for Transport;
- PAN 79 Water and Drainage;
- PAN 1/2011 Planning and Noise;
- PAN 1/2013 Environmental Impact Assessment (Including Annex A: Further Reading);
- PAN 2/2011 Planning and Archaeology;
- PAN 3/2010 Community Engagement;
- Flood Risk;
- Hydro Schemes;
- Energy Storage; and
- Planning and waste management.

4.2.2.6 Circulars

Circulars contain policy from the Scottish Government (2021c) on the implementation of legislation or procedures. The circular particularly relevant to the proposed Development is Planning Circular 1/2017: Environmental Impact Assessment regulations.

4.3 Local Development Planning Policy

4.3.1 Argyll and Bute Local Development Plan

The Argyll and Bute Local Development Plan (LDP) was formally adopted on 26 March 2015 and provides the land use policy framework to guide development decision making in the locality (excluding the area covered by the Loch Lomond and Trossachs National Park, which has its own Development Plan). The next plan (LDP 2) which will provide a land use framework for the next 10 years is currently under preparation and a draft has been made available for consultation. According to the Development Plan Scheme, adoption of the plan is scheduled for January 2022. Provided this timeline is achieved it will therefore provide the relevant local planning framework at the time application for consent is submitted.

The current plan LDP is divided into the written statement and proposals maps. The written statement provides the general policy context against which planning applications for new development proposals should be assessed. This is supported by the proposals maps which show the range of development opportunities and land use designations within the area.

As outlined in Section 25(1) of the Town and Country Planning (Scotland) Act 1997 (as amended), planning determinations should be made in accordance with the LDP unless material considerations indicate otherwise; LDP 2 being a material consideration of significant weight. Whilst consent is sought under Section 36 of the Electricity Act (1989), compliance with local development policy remains an objective.

Current policies relevant to the proposed Development within the Argyll and Bute LDP include:

- Policy STRAT 1– Sustainable Development
- Policy LDP DM1– Development within the Development Management Zones
- Policy LDP 3 – Supporting the Protection, Conservation and Enhancement of our Environment
- Policy LDP 5 – Supporting the Sustainable Growth of Our Economy
- Policy LDP 6 – Supporting the Sustainable Growth of Renewables
- Policy LDP 9 – Development Setting, Layout and Design
- Policy LDP 10 – Maximising our Resources and Reducing Our Consumption
- Policy LDP 11 – Improving our Connectivity and Infrastructure

The draft LDP 2 includes various policy allocation changes as well as new additions that may be of relevance to the proposed Development and will therefore be considered following its adoption.

Argyll and Bute Council has also prepared Supplementary Guidance which sets out additional detailed policies against which development proposals will be assessed in relation to their environmental impacts. The Argyll and Bute Local Development Plan Supplementary Guidance was published in March 2016. Supplementary Guidance 2, which covers coastal development, piers and harbours, aquaculture and renewable energy, was adopted in December 2016.

4.4 References

Argyll and Bute Council (2012). Local Development Plan: Written Statement. [Online]. Available: https://www.argyll-bute.gov.uk/sites/default/files/written_statement_0.pdf. Accessed 11/10/2021

Argyll and Bute Council. (2019). Argyll and Bute Local Development Plan 2: Development Plan Scheme. [Online]. Available at: https://www.argyll-bute.gov.uk/sites/default/files/dps_approved_2019_online.pdf. Accessed 20/02/20

Committee on Climate Change (2019) Net Zero: The UK's Contribution to Stopping Global Warming. [Online] Available: <https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/> Accessed 11/10/2021

Department for Business, Energy and Industrial Strategy and Ofgem (2017) Upgrading our Energy System: Smart Systems and Flexibility Plan. [Online] Available: <https://www.gov.uk/government/publications/upgrading-our-energy-system-smart-systems-and-flexibility-plan> Accessed 11/10/2021

Department for Business, Energy & Industrial Strategy (2020) The Energy White Paper: Powering our Net Zero Future. [Online] Available: <https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future> Accessed 11/10/2021

Department of Energy & Climate Change (2011) Planning our Electric Future: A White Paper for Secure, Affordable, and Low-carbon Energy. [Online] Available: <https://www.gov.uk/government/publications/planning-our-electric-future-a-white-paper-for-secure-affordable-and-low-carbon-energy> Accessed 11/10/2021

National Grid Electricity System Operator (2020) Future Energy Scenarios. [Online] Available: <https://www.nationalgrideso.com/future-energy/future-energy-scenarios/fes-2020-documents> Accessed on 11/10/2021

Scottish Government (2013) Low Carbon Scotland – Meeting our emissions reduction targets 2013-2027: Second report. [Online] Available at <https://www.gov.scot/publications/low-carbon-scotland-meeting-emissions-reduction-targets-2013-2027-second/pages/18/>. Accessed 11/10/2021

Scottish Government (2014a) National Planning Framework 3 [Online] Available: <https://www.gov.scot/publications/national-planning-framework-3/> Accessed 11/10/2021

Scottish Government (2014b) Scottish Planning Policy [Online] Available: <https://www.gov.scot/publications/scottish-planning-policy/> Accessed 11/10/2021

Scottish Government (2017) Scottish Energy Strategy: The Future of Energy in Scotland. [Online] Available: <https://www.gov.scot/publications/scottish-energy-strategy-future-energy-scotland-9781788515276/> Accessed 11/10/2021

Scottish Government (2019) A vision for Scotland's electricity and gas networks. [Online] Available: <https://www.gov.scot/publications/vision-scotlands-electricity-gas-networks-2030/> Accessed 11/10/2021

Scottish Government. (2020a). Update to the Climate Change Plan 2018 – 2032: Securing a Green Recovery on a Path to Net Zero. Available: <https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/> Accessed 04/11/2019

Scottish Government (2020b) Protecting Scotland, Renewing Scotland: The Government's Programme for Scotland 2020-2021. [Online] Available: <https://www.gov.scot/publications/protecting-scotland-renewing-scotland-governments-programme-scotland-2020-2021/> Accessed 11/10/2021

Scottish Government (2021a) Scotland's Energy Strategy Position Statement [Online]. Available: <https://www.gov.scot/publications/scotlands-energy-strategy-position-statement/> Accessed 11/10/2021

Scottish Government (2021b) Planning advice notes (PANs): A list of current planning advice notes (PANs). [Online] Available: <https://www.gov.scot/collections/planning-advice-notes-pans/> Accessed 11/10/2021

Scottish Government (2021c) Planning circulars: index. [Online] Available: <https://www.gov.scot/collections/planning-circulars/> Accessed 11/10/2021

Scottish Government (2021d) Scotland 2045 - fourth National Planning Framework - draft [Online] Available: <https://www.gov.scot/binaries/content/documents/govscot/publications/consultation-paper/2021/11/scotland-2045-fourth-national-planning-framework-draft/documents/scotland-2045-fourth-national-planning-framework/scotland-2045-fourth-national-planning-framework/govscot%3Adocument/scotland-2045-fourth-national-planning-framework.pdf?forceDownload=true> Accessed 17/12/2021

5. Landscape and Visual Assessment

5.1 Introduction

The Landscape and Visual Impact Assessment (LVIA) will assess the effects of the proposed Development on the landscape resource of the site and its environs and on the visual amenity of the site and surrounding area. The approach and methodology to the LVIA is continuously reviewed and updated to comply with current practice.

Landscape and visual effects are interrelated with other environmental effects but will be assessed separately. Landscape effects associated with a development relate to the changes to the fabric, character, and quality of the landscape and how it is experienced. Visual effects relate closely to changes to the landscape, but also concern changes in people's views as a result of the introduction of the proposed Development.

This chapter is supported by the following Figures:

- Figure 5.1 Zone of Theoretical Visibility (Headpond);
- Figure 5.2 Zone of Theoretical Visibility (Tailpond);
- Figure 5.3 Zone of Theoretical Visibility (Headpond and Tailpond);
- Figure 5.4 Landscape Designations;
- Figure 5.5 Landscape Character Types; and
- Figure 5.6 Representative Viewpoint Locations.

Various technical terms are used throughout this chapter, which are defined below:

- Landscape Character Area (LCA): areas of relatively homogenous landscape which are defined by a combination of physical and cultural elements including landform, hydrology, vegetation, land cover, land use pattern, cultural and historic features combine to create a common 'sense of place' and identity that is experienced as landscape character. Definable units (character areas) can be used to categorise the landscape and the level of detail and size of unit can be varied to reflect the scale of definition required. It can be applied at national, regional, and local levels.
- Zone of Theoretical Visibility (ZTV): a digitally produced map showing areas of land within which the proposed Development will theoretically be visible.
- Visual receptors: people who will have views of the proposed Development. Visual receptors have been identified through desk study and an initial site visit undertaken in April 2019.
- Representative viewpoints: locations selected to represent the experience of different types of visual receptor, where larger numbers of viewpoints cannot all be included individually and where the levels of significance of effects are unlikely to differ.

5.1.1 Guidance

The landscape and visual assessment will be carried out in accordance with the following good practice guidance documents:

- The Landscape Institute and Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment (GLVIA), Third Edition;
- Landscape Institute (2019) Technical Guidance Note 06/19, Visual Representation of Development Proposals;
- Landscape Institute (2021) Technical Guidance Note 02/21, Assessing landscape value outside national designations
- Landscape Character Assessment Guidance (2002) Countryside Agency in conjunction with SNH;
- Scottish Natural Heritage, (2015). Hydroelectric Schemes and the Natural Heritage; and
- NatureScot (2019) Landscape Character Assessment digital map of Landscape Character Types.

5.2 Baseline Conditions

An initial study will be carried out to gain an understanding of the landscape and visual resource and the extent of likely significant effects. The baseline study within the LVIA chapter will consist of two parts.

- Landscape character; and
- Visual amenity.

5.2.1 Study Area

An initial 15 km study area has been established based on initial desk-based study. This will be refined during the assessment processes if necessary, to focus on areas where significant landscape and visual effects are likely. This will be informed by on site survey and consultation with NatureScot and ABC.

5.2.2 Zone of Theoretical Visibility

Initial ZTV mapping has been undertaken to establish the theoretical extent of visibility of the primary Development components within the wider landscape. This is based on the headpond and tailpond inlet/outlet scoping design in chapter 2 Project Description. The ZTV has been used to inform the extent of the study area and the identification of landscape and visual receptors.

The ZTV maps indicate areas from where it may be possible to view the proposed headpond including the embankment structures and the tailpond. It should be considered as a tool to assist in assessing the theoretical visibility of the proposed Development and not a measure of the visual effect. The use of these maps needs to be qualified by the following considerations:

- The ZTV is based on a bare ground model – Ordnance Survey (OS) Terrain 5 DTM data which does not take account of the screening effects of vegetation, buildings or other structures;
- The headpond ZTV has been calculated based on a maximum dam height of 425.37m AOD (western embankment), 425m AOD for the eastern and northern embankments and a maximum surface height of the waterbody of 420m AOD;
- The tailpond ZTV has been calculated based on maximum height of 51m AOD for the tailpond inlet/outlet structure;
- Some areas of theoretical visibility may comprise forestry, moorland or agricultural land, which don't tend to be visited and the likelihood of views being experienced is consequently low;
- The ZTV maps do not take account of the likely orientation of a viewer, such as the direction of travel and there is no allowance for reduction of visibility with distance, weather, or light; and
- Not all elements of the proposed Development have been accounted for in the initial ZTV, such as the marine facility, access tracks, buildings within compounds or tunnel portal structures. However, all of the project components will inform the scope of the LVIA.

Further ZTV analysis will also be undertaken as part of the LVIA in parallel with the iterative design process to refine the landscape fit of the various development components.

ZTVs are shown on *Figures 5.1 Zone of Theoretical Visibility (Headpond), 5.2 Zone of Theoretical Visibility (Tailpond) and 5.3 Zone of Theoretical Visibility (Headpond and Tailpond)*.

5.2.3 Landscape Designations

Information about areas which contribute to the value of the landscape can be recognised by statute and / or in local plans. Information on these areas and their status forms a landscape designation. A preliminary review has identified that the majority of the Development components do not fall within any recognised landscape designations.

However, the marine facility located on the shore Loch Fyne and upgrades to some existing tracks are located within the Inveraray Castle Garden and Designed Landscape (GDL) and the West Loch Fyne Area of Panoramic Quality (APQ) and North Argyll APQ. The sections of woodland track upgrade to the north of the headpond are also located within the North Argyll APQ.

The scope of assessment will include potential effects on the following designated areas which are also shown on *Figure 5.4 Landscape Designations*:

- Inveraray Castle GDL
- Ardanaiseig House GDL;
- Ardkinglas and Strone GDL;
- North Argyll APQ;

- West Loch Fyne APQ; and
- East Loch Fyne APQ.

5.2.4 Landscape Character

The landscape baseline will review published landscape character assessments. This will be supported by a survey of the existing land use, landscape elements and features to establish the present landscape character, quality, and condition within the study area and in relation to the site itself.

NatureScot published an updated set of national Landscape Character Types (LCTs) in 2019 which superseded the earlier SNH landscape character descriptions and mapping. A review of the LCT digital mapping shows that the site and wider study area are covered by a number of LCTs. However, due to the nature of the proposed Development not all LCTs within the study area warrant detailed assessment.

The landscape assessment will consider the LCTs the proposed Development is located within and the surrounding LCTs where there is theoretical visibility of the Development components and has the potential to result in significant landscape effects.

The proposed Development is located within the following LCTs:

- LCT 40 - Craggy Upland - Argyll (headpond, access tracks and compounds);
- LCT 53 - Rocky Coastland - Argyll (tailpond, access tracks, compounds and marine facility); and
- LCT 39 - Plateau Moor and Forest - Argyll (access tracks).

LCTs are shown on *Figure 5.5 Landscape Character Type*.

5.2.5 Visual Amenity

The visual assessment will determine the degree of anticipated change to visual amenity experienced by people (visual receptor) that would occur as a result of the proposed Development, considering views from dwellings, areas of public open space, roads, and footpaths. The visual assessment considers static and sequential effects through analysis of individual viewpoints, considered representative of the range of views within the study area.

Representative viewpoints have been provisionally selected to represent views from a range of different types of visual receptor. At each of the agreed viewpoint location, the following factors which influence the assessment of visual effects will be considered:

- Receptor type (dwelling / road / footpath / open space etc.) and relative numbers of people likely to be affected;
- Relative elevation to the proposed Development;
- Existing views (composition, quality, visual characteristics - nature and extent of skyline, aspects of visual scale and proportion and key foci);
- Distance of viewpoint to nearest point of the proposed Development;
- Percentage and elements of proposed Development potentially visible;
- Angle of view (narrow / wide / view up / view down / level);
- Type and nature of view (foreground / midground / background / direct / oblique/ screened/ partial screening);
- Duration of view i.e., continuous such as a house, or transient such as a pedestrian / vehicular traveller; and
- Analysis of potential visual effects. The analysis relates to each of the identified receptors and concludes with an evaluation of the significance of effects related to each receptor / groups of receptors.

Visual receptors included in the scope of assessment:

- Residential receptors are located west of Loch Awe at Dalavich and Inverinan with mid-to-low level views extending across the loch;
- Residential receptors located on the east side of Loch Awe including individual properties located in close proximity to the tailpond inlet / outlet area;
- Residential receptors in Inveraray with views towards the marine facility and widened access tracks;
- Visitors to Inveraray Castle, GDL and Inveraray town with views of the access tracks;

- Visitors to Ardanaiseig GDL with views of the headpond;
- Recreational routes including: National Cycle Route Network Route 78-The Caledonia Way and a number of core paths located on the west side of Loch Awe; and C173 (a, b, c, d, e), C490, C305, and long-distance walks including the summit of Ben Cruachan; and
- A83, A85 and minor roads throughout the study area where views of the landscape are an important and valued part of the experience.

5.2.5.1 Representative Viewpoints

The following table provides a list of the eleven proposed representative viewpoints and the receptor groups to be covered in the LVIA. These viewpoints have been selected based on a desktop study, analysis of the ZTVs and targeted site work. They have been selected to provide a representative range of viewing distance and viewing experience of the different scheme components (both during construction and permanent structures in operation). These will be refined as necessary during the iterative design progresses and will be agreed with NatureScot and ABC. These viewpoints are shown on *Figure 5.6 Representative Viewpoint Locations*.

Table 5.1 Representative Viewpoints

ID	Location	Receptor Type	Location	
			Eastings	Northings
1	Dun Na Cuaiche, Inveraray	Recreational	208984	710655
2	Minor road - near A815	Residential	210267	705799
3	Kilmaha- rest stop	Recreational	194046	708443
4	Dalavich Jetty	Residential	197030	712771
5	NCN 78 - Loch Shore	Recreational	199591	715686
6	Inverinan	Residential	199947	717730
7	Eilean na Moadail Peninsula	Recreational	200845	716960
8	Ben Cruachan	Recreational	206969	730467
9	Dorlin Point	Recreational	191465	713740
10	Ardanaiseig GDL	Recreational	209228	724574
11	A85 layby	Road Users	209907	725889

5.2.5.2 Visualisations

Visualisations will be prepared in accordance with the Landscape Institute Technical Guidance Note 06/19 Visual Representation of Development Proposals (2019). The proposed Development is considered to fall within Category A as visualisations will accompany the LVIA as part of a formal EIA.

Baseline photography will be undertaken from all of the proposed viewpoints along with Type 3-Photomontage and Photowire (photographs with wireline overlays) visualisations. Visualisations will be accompanied with a technical visualisation methodology. Not all viewpoints will require full photomontages due to the nature of the view from some viewpoints, where wireline overlays will be a more appropriate method of illustrating the change to the view.

Visualisations will include the following:

- Baseline photographs;
- Photomontage at year 1 of operation (or wireline from applicable viewpoints);
- Photomontage at year 15 (demonstrating the effects of mitigation planting); and
- Cumulative wirelines (from applicable viewpoints).

Where relevant, from elevated viewpoints, photomontages will depict the full headpond water level and the lower draw down limit. The refined selection of viewpoints that require full photomontages and/ or cumulative photomontages will be agreed in advance with relevant stakeholders including NatureScot and ABC.

5.3 Methodology

Consultation will be carried out with the ECU, ABC and NatureScot to discuss landscape and visual considerations relating to the proposed Development as part of the assessment process. A more detailed methodology will be included within the LVIA and can be summarised into five key stages:

- Establishment of baseline conditions relating to landscape character and the visual context, including judgements on value and susceptibility which contribute to the sensitivity to change of the existing landscape and visual resource. Identification of main areas where effects would occur through ZTV analysis and the identification of potential landscape and visual receptors;
- Evaluation of potential significant effects anticipated to result from the introduction of the proposed Development into the baseline context. Layout and site design advice to create the most sympathetic layout in response to the key landscape and visual constraints to help mitigate potentially significant effects;
- Assessment of landscape and visual effects based on the sensitivity to change and magnitude of effect. The assessment would take into account the potential for mitigation measures to reduce these effects;
- Description of the anticipated effects and their significance based on a five-point scale in which the nature of effects can be either adverse or beneficial;
 - During construction;
 - Year 1 of operation; and
 - Year 15 of operation once any mitigation planting has established.
- Assessment of cumulative landscape and visual effects based on applications for schemes of a similar type, nature and scale agreed with the ECU and ABC.

5.4 Likely Significant Effects

Potential significant effects on landscape and visual amenity which will be considered include the following:

5.4.1 Construction

- Landscape character:
 - Temporary physical effects on the landscape fabric as a result of the construction plant and activities associated with the various Development components including; headpond, tailpond inlet / outlet, marine facility, tunnelling, power cavern and associated built infrastructure, compounds and access tracks;
 - Temporary effects on the physical fabric or setting of landscape designations including the Inveraray Castle GDL and the three APQs within the study area; and
 - Temporary effects on the LCTs within the study area as a result of the above construction operations;
- Visual amenity:
 - Temporary disruption to views for, residential and recreational receptors and road users due to construction plant and activities associated with the various project components including; headpond, tailpond inlet / outlet, marine facility, tunnelling, power cavern and associated built infrastructure, compounds and access tracks.

5.4.2 Operation

- Landscape character:
 - Long term effects on the physical landscape fabric including loss of landscape elements together with landform changes due to the introduction of the above ground operational Development components including; headpond including embankments and inlet outlet structure, infrastructure associated with the tailpond, tunnel portals, surge shafts, marine facility, permanent infrastructure including buildings, access tracks and permanent compounds;
 - Long term effects on the physical fabric and setting of the Inveraray Castle GDL, as a result of the introduction of the marine facility and permanent up-graded track; and
 - Long term effects on the LCTs within the study area including perceptual changes to the character as a result of the above operational project components. This will also include the effects associated with draw down of the water level in the headpond;

- Visual amenity:
 - Long term changes to views from residential and recreational receptors and road users due to the introduction of the above ground operational project components including; headpond as well as embankments and inlet outlet structure, infrastructure associated with the tailpond at Loch Awe, the marine facility, permanent infrastructure including buildings, access tracks and compounds; and
 - Consideration will also be given to the effects and appearance associated with draw down in the headpond which has the potential to effect views from more elevated visual receptors.

5.4.3 Decommissioning

Decommissioning of large-scale pumped storage hydro projects is extremely rare due to the long operational lifespan of the facility. Potential decommissioning effects are therefore considered to be similar to and associated with the components described in the operational project phase and as such will not be considered as an assessment phase of the proposed Development.

5.5 Likely Mitigation Measures

Primary mitigation measures will be the steps taken during the iterative design phase of the proposed Development to help influence the design in order to minimise potential effects, based on key sensitivities, constraints, and opportunities as part of an iterative process of design and assessment. These measures are embedded in the scheme design. Secondary mitigation measures are those that are not built into the final development proposals and seek to further reduce potential effects that could not be entirely designed out.

Potential mitigation measures will be developed further to ensure that the proposed Development is integrated into the surrounding landscape and views. We will do this through a thorough understanding of the special landscape qualities, scenic and recreational value inherent in the landscape and opportunities for enhancement and restoration. Specific embedded mitigation measures will include the following:

- Siting of above ground features to minimise effects on the landscape and visual resource and supporting design development;
- Reducing the size, scale and impression of change resulting from the introduction of buildings and permanent structures;
- Vegetation reinstatement and earthwork profiling surrounding buildings, compound areas and access tracks to blend into the existing landscape;
- Reinstatement of temporary tracks and compounds; and
- Consideration of the materials and appearance of buildings and any other hard engineered features such that they are sympathetic to the context and local vernacular.

Those potentially significant effects that cannot be designed out would require further, secondary mitigation measures, these may include:

- Potential off-site planting to screen temporary construction works and long-term operational elements from nearby residential receptors; and
- Any other secondary measures that are considered necessary to reduce any residual significant landscape and visual effects.

5.6 Summary and Conclusions

The focus of the LVIA will be to minimise potentially significant effects on the landscape and visual resource through the iterative process of design and assessment. The LVIA will be undertaken in accordance with GLVIA 3 and all good practice guidance. Developing mitigation strategies which positively respond to the landscape qualities including those associated with the designated aspects of the landscape will be central to the design development process. This will be undertaken in parallel with more detailed consultation with NatureScot and ABC to ensure that key areas of concern are appropriately and proportionality addressed and mitigation opportunities realised in the LVIA and design development process.

5.7 References

Landscape Character Assessment Guidance. (2002). Countryside Agency in conjunction with Scottish Natural Heritage.

Landscape Institute and Institute of Environmental Management and Assessment. (2013). Guidelines for Landscape and Visual Impact Assessment (GLVIA), Third Edition.

The Landscape Institute. (2019). Visual representation of development proposals Technical Guidance Note 06/19.

SNH. (2015). Hydroelectric Schemes and the Natural Heritage.

6. Terrestrial Ecology

6.1 Introduction

This chapter addresses terrestrial ecology. It does not include aquatic ecology, marine ecology or ornithology, which are the subjects of chapters 7, 8 and 9 of this EIA Scoping Report, respectively. Throughout this chapter the term 'ecological feature' is used to refer to sites designated for nature conservation, habitats, and species.

The approach to Scoping for terrestrial ecology accords with the Guidelines for Ecological Impact Assessment in the UK and Ireland, published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018).

This chapter has been informed by a desk study and data collected during field surveys conducted at the Development Site in 2019 and in 2021.

This chapter is supported by the following Figures:

- Figure 6.1: Statutory Designated Sites
- Figure 6.2: Ancient Woodland
- Figure 6.3: Terrestrial Ecology Survey Areas
- Figure 6.4a: Bat Activity Survey
- Figure 6.4b: Butterfly, Dragonfly and Damselfly Survey Transect Routes

6.2 Baseline Conditions

A desk study was carried out to identify nature conservation designations and protected and notable habitats and species potentially relevant to the proposed Development. A stratified approach was taken when defining the desk study area, based on the likely zone of influence of the proposed Development on different ecological features and an understanding of the maximum distances typically considered by statutory consultees. Accordingly, the desk study identified:

- Any international nature conservation designations within 10 km of the Site;
- Other statutory nature conservation designations within 2 km of the Site; and
- Local non-statutory nature conservation designations, and protected and notable habitats, within 1 km of the Site.

Two statutory designated sites were identified within the likely zone of influence (Zol) of the proposed Development. These are described in Table 6.1 listed in ascending order of distance from the Development Site, and shown on *Figure 6.2 Ancient Woodland*.

Table 6.1 Statutory Designated Sites Within the Zone of Influence

Designation	Reason(s) for Designation	Relationship to the Development
Loch Etive Woods Special Area of Conservation (SAC)	Supports the following habitats and species: <ul style="list-style-type: none"> • Tilio-Acerion forests of slopes, screes and ravines - ash <i>Fraxinus excelsior</i> woodland with a hazel <i>Corylus avellana</i> understorey and a rich field layer • Old sessile oak woods with Ilex and Blechnum in the British Isles • Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae) • Otter 	A multi-part site of which two parts are within the study area. Both are located on the opposite bank of Loch Awe, with one approximately 6.3 km north-west of the Development Site and the other approximately 6.8 km north-east. Both are separated by Loch Awe, farmland, moorland and conifer plantation.
Glen Shira SAC	Old sessile oak woods with Ilex and Blechnum in the British Isles	A two-part site with its components on opposite sides of a burn. The nearest point is

approximately 5.5 km from the Development Site, separated by broadleaved woodland, moorland and conifer plantation.

Woodland which is classified as being ancient and semi-natural on the Ancient Woodland Inventory (AWI) exists within the Development Site as shown on *Figure 6.2: Ancient Woodland*. No ancient woodland is present in the Headpond location, but ancient woodland does exist in the vicinity of the location of the proposed Inlet / Outlet on the banks of Loch Awe and on the banks of the Allt Beochlich Burn. This forms part of a wider network of extensive fragments of ancient woodland along the south bank of Loch Awe. Ancient woodland is present around the town of Inveraray and the banks of Loch Fyne. The majority of this is long-established woodland of plantation origin but some semi-natural ancient areas are present. In addition, the AWI does not include all small patches of woodland and it is possible that other thin strips of woodland along the lower streams within the Development Site may also be ancient.

Access infrastructure proposed largely follows existing tracks and as such construction requirements in the vicinity of ancient woodland will be limited to minor widening, replacement of watercourse crossings, a potential need for realignment along short sections (e.g. where corners are too sharp to be used by expected construction vehicles), and the subsequent use of the access routes by vehicles and plant. The potential for direct impacts to ancient woodland is therefore limited and likely to be restricted to pruning / loss of a small number of trees.

Habitat information for the proposed Development has been derived from Phase 1 habitat survey and National Vegetation Classification (NVC) survey carried out in 2019 and 2021. In summary, the Development Site consists largely of moorland, with the dominant habitat being blanket bog. Some of this is degraded by grazing, drainage and/or burning. The variable terrain often results in numerous patches of other habitat amongst the blanket bog, especially acid grassland which is also dominant on the steep slopes near Loch Awe. There are numerous strips and patches of rushy acid flush vegetation. Basic flush occurs rarely (including in the vicinity of the Headpond). There are two substantial and very wet basin mires, both incorporating standing water (one in the Headpond vicinity). Other moorland habitats include dry heath, wet heath and (very locally, including in the vicinity of the Headpond) basic grassland. In the small area below the moorland line, the dominant habitats are acid and improved grassland, with substantial areas of semi-natural broadleaved woodland along watercourses and beside Loch Awe. Around Inveraray there are areas of mature broadleaved woodland and marshy fields used for livestock grazing, in addition to the improved grassland fields within the grounds of Inveraray Castle. Along the other access track off the A819, the main habitat is conifer plantation forest, some of which has been clear-felled in the relatively recent past.

There are a number of waterbodies in the vicinity of the proposed Development, including large oligotrophic lochs as well as smaller bog pools.

The habitats present within the boundary of the Development Site which are considered to be notable in terms of their conservation value and/or in relation to relevant legislation / planning policy, are described in Table 6.2.

Table 6.2 Notable Habitats Present

Habitat	Reason for Consideration as Notable
Ancient semi-natural woodland	Ancient semi-natural woodland is a priority for conservation under the Scottish Biodiversity List (SBL). There is also a presumption against effects on all ancient woodland in Scottish Planning Policy. Semi-natural woodland which is not classified as being ancient is still of relatively high conservation value and typically supports a diverse range of native flora and fauna.
Unimproved grassland	In general, acid grassland is not a notable habitat. However, some of the acid grassland on the hill slopes and at the west edge of the Headpond is more species-rich than is typical. Species-rich mat grass <i>Nardus stricta</i> grassland constitutes part of the Annex I habitat of that description.
Basic grassland	Very small patches of basic grassland occur in the vicinity of the Headpond. Upland calcareous grassland is of principal importance for conservation in Scotland under the SBL.
Dry and wet heath	Both wet heath and dry heath are listed on Annex I of the Habitats Directive. However, these habitats are ubiquitous across much of northern Scotland and are not of exceptional value at the Site.

Acid / neutral flush	Acid / neutral flush occurs regularly and is a priority for conservation identified by its presence on the SBL.
Blanket bog	Blanket bog is a priority habitat under the SBL, and an Annex I habitat under the Habitats Directive. There is also a presumption against development on peat in Scottish Planning Policy. Blanket bog is the dominant habitat above the moorland line and occurs in a few smaller patches at lower altitude, although it is often modified / degraded in these areas.
Basic flushes	These were recorded rarely within the Development Site. They also constitute Annex I habitats of the Habitats Directive and are priorities under the SBL.
Basin mire	There are two substantial basin mires within the Development Site. These support a mosaic of habitats, are scarce in the local area and have the potential to support notable flora and fauna (including water vole).
Watercourses and waterbodies	Rivers are of principal importance for conservation under the SBL. There are also obligations under the Water Framework Directive to maintain water quality in freshwater systems.
Groundwater Dependent Terrestrial Ecosystems (GWDTE)	GWDTE are protected under the Water Framework Directive (WFD) and can be sensitive to the impacts of development activities. GWDTEs at the Development Site include extensive flushes, wet heath and basin mires which are listed separately above under their own merits.

As described below, survey for protected and notable species has been carried out for the proposed Development in 2019 and 2021. Evidence of the following mammal species has been identified within the potential Zol of the proposed Development:

- Otter *Lutra lutra*;
- Water vole *Arvicola amphibius*;
- Pine marten *Martes martes*;
- Red squirrel *Sciurus vulgaris*; and
- Badger *Meles meles*.

At least five species of bats were identified by activity surveys carried out in 2019: soprano pipistrelle *Pipistrellus pygmaeus*, common pipistrelle *Pipistrellus pipistrellus*, Daubenton's bat *Myotis daubentonii*, Natterer's bat *Myotis nattereri*, and brown long-eared bat *Plecotus auritus*.

Two tree roosts were also found, in semi-natural woodland near Loch Awe. One was used by two soprano pipistrelles, the other was believed to be a maternity roost used by Daubenton's bats.

Flush and unimproved acid grassland provide good habitat for a range of butterfly species and the watercourses, waterbodies and other wetland areas support a variety of butterfly, dragonfly and damselfly species. Notable species recorded during 2019 surveys include small heath butterfly *Coenonympha pamphilus* which is of principal importance for conservation in Scotland under the SBL.

6.3 Methodology

Targeted field surveys for the ecological features described in Section 6.2 Baseline Conditions above were predominantly carried out within the main part of the Development Site (i.e. in the area within which the Headpond and associated infrastructure lies) in 2019. To update the results of those surveys done in 2019, a high-level walkover of this area was carried out in 2021. The purpose of this walkover was to a) complete habitat mapping started in 2019, and b) to ensure that there had been no substantial changes to the baseline conditions identified in 2019. This did not involve a full re-surveying for target ecological features. Rather, it involved assessing the habitat features known to be used by protected and/or notable species in 2019 to confirm that they had not substantially changed, and searching for new features that may not have been present in 2019 but which could now support protected and/or notable species.

The following surveys were carried out in 2021 in the area around Inveraray and the access track from the A819, south-east of the main part of the Development Site:

- Phase 1 habitat and NVC survey;
- Bat activity survey and bat roost survey (involving bat roost suitability assessment and tree climbing inspections); and
- Survey for protected mammals, including otter, water vole, badger, and pine marten.

All surveys were carried out in accordance with industry-standard best practice. The survey areas are shown on *Figure 6.3: Terrestrial Ecology Survey Areas*. The bat activity transect route and the transect routes used to survey butterflies, dragonflies and damselflies are shown on *Figure 6.4a: Bat Activity Survey* and *6.4b Butterfly, Dragonfly and Damselfly Survey Transect Routes*.

The results of the desk study and of the field surveys carried out in 2019 and 2021 will be used to inform the Ecological Impact Assessment (EclA) component of the EIA. This will be conducted in accordance with the guidelines produced by the Chartered Institute of Ecology and Environmental Management (CIEEM) (CIEEM, 2018). Where significant effects on an ecological feature are predicted by the EclA, appropriate mitigation measures will be proposed. Likely mitigation measures are outlined in Section 6.5 Likely Mitigation, below. Ecological enhancement measures that are proportionate to the impact of the proposed Development (e.g. habitat improvements for invertebrate species) will also be considered in pursuance of the objective of Scottish Planning Policy to achieve biodiversity benefits from development.

6.4 Likely Significant Effects

The significant effects of the proposed Development can be categorised as follows:

- Permanent habitat loss (e.g. the loss of blanket bog, ancient semi-natural broadleaved woodland or other notable habitats including flush and unimproved acid grassland due to inundation behind the newly constructed embankment);
- Temporary habitat loss (e.g. the temporary loss of grassland or heath habitat to accommodate temporary construction compounds or other works areas);
- Permanent or temporary changes to hydrological conditions which may affect vegetation and habitats (e.g. where tracks intercept flushes or if conditions within waterbodies downstream of the Headpond are significantly altered);
- Loss of habitat which supports notable species (e.g. the loss of habitat which supports bat foraging or butterflies);
- Creation of a barrier to animal movements (e.g. the construction of the Embankment may hinder commuting by species including otters and bats along the Allt Beochlich Burn and its tributaries);
- Temporary disturbance to and/or displacement of species during construction (e.g. disturbance of protected species whilst occupying places of shelter);
- Disturbance and/or displacement of species during operation (e.g. if permanent lighting is required this could interfere with bat foraging behaviour);
- Potential for direct mortality of species during construction (e.g. as a result of increased vehicular traffic); and
- Potential spread of invasive non-native species.

Two SACs exist within 10 km of the proposed Development: the Loch Etive Woods SAC and Glen Shira SAC. These sites are designated for habitats and, in the case of Loch Etive Woods, otter. As there is a hydrological connection between the proposed Development and the Loch Etive Woods SAC, the potential for effects on this (and other) European sites will be considered as part of a Habitats Regulations Appraisal (HRA) exercise. This will seek to identify whether there may be significant effects on the qualifying features of any such site and, where this possibility cannot be excluded, to devise mitigation measures which avoid adverse effects on the integrity of the site in question.

6.5 Likely Mitigation Measures

Compliance with planning policy requires that the proposed Development considers and engages the following mitigation hierarchy where there is potential for impacts on relevant ecological receptors:

1. Avoid features where possible;
2. Minimise impact by design, method of working or other measures (mitigation), for example by enhancing existing features; and

3. Compensate for significant residual impacts (e.g. by providing suitable habitats elsewhere).

This hierarchy requires the highest level to be applied where possible. Only where this cannot reasonably be adopted should lower levels be considered.

SPP requires that significant effects on the qualities of 'areas of significant protection' (i.e. active blanket bog on deep peat, if present) be 'substantially overcome by siting, design or other mitigation'

It is likely that the following generic mitigation measures will be required and implemented to reduce the impacts of the proposed Development. Note that the measures described as follows, in addition to those which are designed as part of the EIA process, will be incorporated into a Landscape and Ecological Management Plan (LEMP). The measures below also apply to aquatic ecology and ornithological features at the Site, as discussed in chapters 7 Aquatic Ecology and 9 Ornithology:

- Minimising the loss of notable habitats through project design and micro-siting;
- Providing compensatory habitat for any which is permanently lost to the proposed Development (e.g. replanting of native broadleaved tree species to replace any felled to accommodate construction activities);
- Restoring areas of habitat temporarily lost during the construction period;
- Maintaining the hydrological regime, particularly in GWDTE and in the Allt Beochlich Burn;
- Implementing standard pollution prevention measures to protect habitats, surface water systems, groundwater and species;
- Avoiding key areas and/or features used by notable and protected species through project design and micro-siting;
- Timing of construction activities to minimise impacts upon species;
- Pre-construction checks for protected species;
- Implementing works exclusion zones around specially protected species to ensure that they are not disturbed or otherwise directly harmed during construction; and
- Avoiding impacts on identified invasive non-native species.

A Construction Environment Management Plan (CEMP) will be prepared detailing pollution prevention measures to be implemented during the construction phase of the proposed Development.

Key to managing the risks associated with invasive non-native species will be a Biosecurity Management Plan (BMP) to minimise the risk of species being carried off and onto the Development Site.

6.6 Summary and Conclusions

It is possible that there may be permanent and temporary adverse effects on ecological features as a result of the proposed Development.

These will be fully investigated as part of the Ecological Impact Assessment which will be based on desk study and field survey data collected in 2019 and 2021, inclusive.

Appropriate mitigation will be developed and implemented to minimise the impacts of the proposed Development. Where significant effects cannot be avoided, proportionate compensatory measures will be provided. Where possible, ecological enhancement will also be suggested and incorporated into the proposed Development.

6.7 References

CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Version 1.1, September 2019. Chartered Institute of Ecology and Environmental Management, Winchester.

Directive 2000/60/EC establishing a framework for Community action in the field of water policy 'Water Framework Directive'.

7. Aquatic Ecology

7.1 Introduction

To inform this chapter, a desk study and a suite of aquatic surveys were completed in 2019. The aim of the surveys was to identify whether there are known or potential protected, notable and / or invasive aquatic species which may constrain or influence the design of the proposed Development, and which could be subject to significant effects as a result of its construction and operation. Terrestrial habitats and species are addressed within chapter 6 Terrestrial Ecology, Marine habitats and species are addressed within chapter 8 Marine Ecology and water birds are addressed within chapter 9 Ornithology of this Scoping Report.

For brevity, details of the methods adopted for the aquatic surveys and detailed survey results are summarised in this Scoping Report and will be detailed in full within the EIAR. Details of the survey methodology can be found within Appendix B, with a summary of results below.

Further surveys have been completed in 2021 following recommendations of the 2019 baseline surveys, in the form of electric fishing surveys in watercourses within the Development Site, and environmental DNA (eDNA) sampling in Loch Awe. This chapter is supported by the following figure: *Figure 7.1 Electric Fishing and eDNA Survey Locations*.

7.2 Baseline Conditions

A catchment-wide desk study was carried out to identify nature conservation designations, and records of protected, notable and / or invasive species potentially relevant to the proposed Development.

No statutory designated sites relevant to aquatic ecology are present. Records provided by the Scottish Environment Protection Agency (SEPA) did not highlight the presence of protected or notable aquatic macrophyte or macroinvertebrate species. However, records of notable fish species, including Atlantic salmon *Salmo salar*, European eel *Anguilla anguilla* and lamprey species, were provided from Loch Awe, and it is considered likely that these migratory species will also be utilising tributary watercourses of the Loch.

Field survey recorded potential salmonid spawning habitats and live juvenile brown trout *Salmo trutta* (parr) were found. It is also possible that Atlantic salmon and sea trout utilise some of the watercourses within the Development Site and limited habitat was recorded which could support small numbers of European eel. Little habitat likely to be utilised by lamprey species was recorded due to the lack of sand and silt substrates. No optimal freshwater pearl mussel (FWPM) *Margaritifera margaritifera* habitat was observed and no evidence of this species was found either through desk study or survey. Potential sub-optimal habitats that may support small numbers of adult mussels were noted at a few sites, however no evidence of FWPM (mussels, shells) was found at any site, and no historical records were found in the proposed development area during the desk study. FWPM are therefore scoped out for further assessment.

No protected or notable aquatic macrophyte or macroinvertebrate species were recorded.

A number of non-native aquatic and terrestrial species were recorded during field survey. Aquatic species include waterweed species *Elodea* sp. and the freshwater shrimp *Crangonyx* sp. within Loch Awe. Terrestrial species recorded include Japanese knotweed *Reynoutria japonica* and Himalayan balsam *Impatiens glandulifera*, which both occurred on the banks of Loch Fyne. Terrestrial species will be assessed within the Terrestrial Ecology chapter of the EIAR.

7.3 Methodology

Field surveys were carried out in September 2019 to assess the current status of fish habitat, the macrophyte assemblage, aquatic macroinvertebrate community and the presence of invasive non-native species at the Development Site. Survey areas of electric fishing and eDNA surveys can be found on *Figure 7.1 Electric Fishing and eDNA Survey Locations*. The results of these surveys will be used to inform the potential impacts of the proposed Development on aquatic ecology features.

Further to those surveys already completed, electric fishing surveys have been commissioned to be carried out late October 2021 in discrete locations identified on watercourses within the Development Site where suitable fish

spawning habitat was observed. The aim of these surveys is to identify if any notable fish species are present and to determine whether a fish rescue will be required prior to construction works, where direct impacts to watercourses are possible.

The results of the field surveys carried out in 2019 and further field survey, in combination with the outcomes of desk study and on-going consultation, will be used to inform the EclA component of the EIA. This will be conducted in accordance with the guidelines produced by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018). Where significant effects on an aquatic feature are predicted by the EclA, appropriate mitigation measures will be proposed. Likely mitigation measures are outlined below. Enhancement measures that are proportionate to the impact of the proposed Development will also be considered in pursuance of the objective of the Town and Country Planning (Scotland) Act 1997 as amended by the Planning (Scotland) Act 2019 to achieve positive effects for biodiversity from development.

7.4 Likely Significant Effects

The potential significant effects of the proposed Development can be categorised as follows:

- Loss or deterioration of habitat which supports protected and / or notable fish and aquatic macroinvertebrate species;
- Disruption to fish movement during construction through the creation of physical barriers such as the Headpond or watercourse crossings, and during operation via significant changes in hydrology / flow of the Allt Beochlich Burn;
- Changes to water quality and nutrient conditions which could impact aquatic communities that are dependent on oligotrophic to mesotrophic nutrient conditions;
- Entrainment, impingement or disruption of behaviour of fish at the inlet / outlet on Loch Awe;
- Spread of invasive non-native species (INNS) such as the freshwater shrimp *Crangonyx* sp. and non-native waterweed species through pumping of water from Loch Awe to the Headpond; and
- Spread of freshwater INNS during construction.

7.5 Likely Mitigation Measures

Good practice dictates that the proposed Development considers the following mitigation hierarchy where there is potential for impacts on relevant aquatic receptors:

- Avoid features where possible;
- Minimise impact by design, method of working or other measures (mitigation), for example by enhancing existing features; and
- Compensate for significant residual impacts (e.g., by providing suitable habitats elsewhere).

This hierarchy indicates the highest level to be applied where possible.

At this stage in the design of the proposed Development, it is not possible to make detailed recommendations for mitigation. The requirement for specific mitigation will be determined based on the results of desk study and field survey work and the subsequent EclA. A Landscape and Ecological Management Plan (LEMP) will be produced to support the planning application, in addition to an outline CEMP.

However, it is likely that the following generic mitigation measures will be required and implemented to reduce the impacts of the proposed Development:

- Minimising the loss of habitats which support protected and / or notable fish, macroinvertebrate and other aquatic species through project design;
- Restoring areas of habitat temporarily lost during the construction period;
- Avoiding key areas and / or features used by aquatic species through project design, and through the appropriate timing of works under a CAR Licence;
- Ensuring water used as part of the proposed Development is taken from within the local catchment to reduce the risk of spreading non-native species and help maintain the current nutrient balance and chemical water quality;
- Implementing pollution prevention measures such as temporary silt fencing, silt curtains, Sustainable Drainage Systems (SuDS) features and attenuation ponds during construction works;

- Suitably sized fish screens to be installed at the inlet / outlet to prevent fish entrainment and impingement; and
- Biosecurity measures to be implemented throughout the Development Site to reduce the risk of spreading freshwater non-native invasive species.

7.6 Summary and Conclusions

Baseline aquatic ecology surveys were completed in 2019 for aquatic macrophytes and macroinvertebrates (including INNS), fish habitat assessment, and preliminary appraisal for freshwater pearl mussel. Baseline assessment was informed by a comprehensive desk study for species records within the Development Site and a 2 km buffer, including the area between Loch Awe and Loch Fyne, and the Lochs themselves.

Further species surveys for fish were recommended in 2019 and electric fishing surveys have been completed, together with eDNA sampling in Loch Awe, in 2021. The results of these further surveys and the aquatic ecology baseline assessment will inform the EclA.

Watercourses and water bodies within the Development Site were found to have the potential to support migratory fish species including Atlantic salmon, lamprey spp. and European eel. No protected or notable macroinvertebrate or macrophyte species were identified, however the INNS Canadian waterweed, the crustacean *Crangonyx pseudogracilis/floridanus*, Japanese knotweed and Himalayan balsam were identified within the Development Site. No optimal habitat for freshwater pearly mussel was identified, and it is considered likely that this species is absent from the Development Site.

Likely significant effects and mitigation measures have been proposed above; however, the final assessment will be presented in the EclA, with mitigation measures to be detailed in the LEMP and outline CEMP. It is considered that likely significant effects may include the loss or disruption to fish habitat and fish passage, changes to water quality or hydrological regime, potential impacts to fish and other fauna at the inlet / outlet on Loch Awe during construction and operation, and constraints resulting from the potential spread of INNS.

7.7 References

CIEEM. (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.

8. Marine Ecology

8.1 Introduction

This chapter is informed by a desk study and considers the potential impacts of the proposed Development on marine ecological receptors including marine designated sites, benthic habitats and species, marine fish, elasmobranchs, marine mammals (excluding otters (*Lutra lutra*)) and marine invasive non-native species.

The 'marine fish' receptor group includes life stages of diadromous fish species known to occur in marine environments. Freshwater life stages of these species are considered within chapter 7 Aquatic Ecology. Similarly, otters are considered in chapter 6 Terrestrial Ecology. Birds typically associated with coastal and marine habitats (e.g. waterbirds and waders) are considered in chapter 9 Ornithology.

The marine ecology scope for the proposed Development is primarily concerned with the construction and operation of the marine facility which shall be situated at Inveraray on Loch Fyne.

This chapter is supported by the following Figures:

- Figure 8.1: Marine Facility Study Area and Protected Sites
- Figure 8.2: Scottish Priority Marine Features
- Figure 8.3: Distribution of protected features of the Upper Loch Fyne and Loch Goil NCMPA within the vicinity of the proposed Development at Inveraray

8.2 Baseline Conditions

8.2.1 Study Area

For the purpose of this scoping exercise, a broad study area encompassing the upper region of Loch Fyne has been adopted within which the marine ecological baseline condition have been described. The upper Loch Fyne is considered to extend upstream of Strachur to the furthest inland extension of the loch (*Figure 8.1 Marine Facility Study Area and Protected Sites*).

8.2.2 Designated Sites

The proposed Development is situated within the Upper Loch Fyne and Loch Goil Nature Conservation Marine Protection Area (NCMPA) (*Figure 8.1 Marine Facility Study Area and Protected Sites*) which was designated in July 2014 under the Marine (Scotland) Act 2010 and came into force in August 2014. This site is designated for the following protected features (SNH, 2013):

- Burrowed mud (habitat)
- Flame shell (*Limaria hians*) beds (habitat);
- Horse mussel (*Modiolus modiolus*) beds (habitat)
- Ocean quahog (*Arctica islandica*) (low or limited mobility species);
- Sublittoral mud and specific mixed sediment communities (habitat).

Burrowed mud and horse mussel beds occur on the OSPAR list of Threatened and/or Declining species and habitats (OSPAR, 2008). Although ocean quahog is also listed, this species is not considered by OSPAR to be under threat / in decline in OSPAR Region III (which encompasses the Development Site). However, this species and flame shell beds are recognised as being under threat and / or in decline within Scottish waters (SNH, 2013). Burrowed mud, flame shell beds, horse mussel beds and ocean quahog are also Priority Marine Features (Tyler-Walters, 2016).

Figure 8.3 Distribution of protected features of the Upper Loch Fyne and Loch Goil NCMPA within the vicinity of the proposed Development at Inveraray shows the distribution of features protected by the Upper Loch Fyne and Loch Goil NCMPA. Upper Loch Fyne Marine Consultation Area. The Upper Loch Fyne area is designated mainly for its dense populations of the fireworks anemone, and because the sublittoral communities present are characteristic of deep-water sea lochs (Argyll and Bute Council, 2009). It is evident that burrowed mud and species associated with this habitat (e.g. the tall seapen, *Funiculina quadrangularis*; fireworks anemone, *Pachycerianthus*

multiplicatus; and the mud burrowing amphipod, *Maera loveni*) could be present within the Development Site and surrounding area.

8.2.3 Benthic Habitats and Species

Most of the intertidal zone in Loch Fyne is rocky, consisting of either bedrock or boulders (BSG, no date). These substrates support communities typically associated with rocky shores in temperate latitudes, being dominated by lichens, barnacles, brown algae (e.g. furoids), limpets (*Patella vulgata*) and dogwhelks (*Nucella lapillus*) (Wilding et al., 2005). Sediment shores characterised by cobbles to fine sand and muds can be found at the head of the loch and within local embayments. In fine substrates, high densities of the lugworm *Arenicola marina* can frequently occur whereas the blue mussel (*Mytilus edulis*) can be found where substrates are slightly coarser (e.g. cobbles) (Wilding et al., 2005).

Within the subtidal zone (i.e. below mean low water springs), substrates typically comprise of poorly sorted 'muddy sandy gravel', 'gravelly muddy sand, slightly gravelly muddy sand', 'muddy sand' and 'mud' (Davies, 1989, OEL, 2015). Within shallow subtidal areas (i.e. the infralittoral zone), the dominant habitat known to be present is 'low energy infralittoral seabed' with some area's representative of 'rocky reef' which is an Annex I habitat under the Habitats Directive (EUSeaMap, 2019). The abundance of foliose brown and foliose red algae increases within the shallow sublittoral zone with anemones, brittlestars and ascidians typically present. Soft mud habitats are characterised by sea pens and the thalassinidean mudshrimp *Calocaris macandreae* and the firework anemone (Wilding et al., 2005; JNCC, 2015). Shellfish known to be present include squat lobster (*Munida rugosa*) and Norway lobster (*Nephrops norvegicus*) (JNCC, 2015).

In deeper subtidal areas (i.e. the circalittoral zone) sediments are characterised by a mix of mud, sand, gravel, pebbles and cobbles. Here benthic communities become animal dominated with anemones, brachiopods, polychaetes, ascidians and encrusting sponge species most common (Wilding et al., 2005). Squat lobster also frequently occurs between larger boulders.

Several of the benthic habitats and species present in the study area are considered representative of Annex I habitats under the Habitats Directive with several recognised as Priority Marine Features for Scotland (SNH, 2014), UK BAP habitats and species (JNCC, 2007) and listed on the Scottish Biodiversity List (Marine Scotland, 2013) as well as the Argyll and Bute Local Biodiversity Action Plan (LBAP) (Argyll and Bute Council, 2009).

8.2.4 Marine Fish

Four diadromous fish species are known to occur in Loch Fyne including Atlantic salmon (*Salmo salar*), brown/sea trout (*Salmo trutta*), European eel (*Anguilla anguilla*), and lamprey (*Lampetra* spp.) (Argyll Fisheries Trust, 2012). These species possess several national and European conservation designations (see Table 8.1).

Table 8.1 Diadromous Fish Species Known to Occur in Loch Fyne and their Conservation Designations

Common name	Latin Name	Conservation Designations
Atlantic salmon	<i>Salmo salar</i>	<ul style="list-style-type: none"> • UK Biodiversity Action Plan (BAP) Priority Species • Scottish Biodiversity List • Priority Marine Feature – Scotland • Argyll and Bute LBAP • OSPAR list of Threatened and/or Declining species and habitats
Brown / sea trout	<i>Salmon trutta</i>	<ul style="list-style-type: none"> • UK BAP Priority Species • Scottish Biodiversity List • Priority Marine Feature – Scotland
European eel	<i>Anguilla anguilla</i>	<ul style="list-style-type: none"> • Priority Marine Feature – Scotland • 'Critically Endangered' IUCN Red List

Common name	Latin Name	Conservation Designations
Lamprey	<i>Lampetra</i> spp.	<ul style="list-style-type: none"> • UK BAP Priority Species (river lamprey (<i>Lampetra fluviatilis</i>) only) • Scottish Biodiversity List • Priority Marine Feature – Scotland (river lamprey only) • Annex II of the Habitats Directive • Annex V of the Habitats Directive (river lamprey only) • Environmental Liability Directive (brook lamprey (<i>Lampetra planeri</i>) only)

Sources:

UK BAP Priority Species (JNCC, 2007)

Scottish Biodiversity List (Marine Scotland, 2013)

Priority Marine Features – Scotland (SNH, 2014)

Argyll and Bute (LBAP) (Argyll and Bute Council, 2009)

For commercial finfish species, no important functional habitats (i.e. spawning and nursery grounds) are known to occur within the study area (Coull et al., 1998; Ellis et al., 2012). However, Loch Fyne is recognised as being suitable habitat for Nephrops (i.e. Norway lobster) (Scottish Government, 2013). Furthermore, the lower region of Loch Fyne represents a spawning ground for sprat (*Sprattus sprattus*) and Nephrops as well as a nursery ground for saithe (*Pollachius virens*), herring (*Clupea harengus*) and cod (*Gadus morhua*). The proximity of these functional habitats to the study area suggests that these species are likely to occur within the vicinity of the Development Site.

Historical dive survey data (1988 and 1999) from the study area found general fish communities within the intertidal and shallow subtidal zone (i.e. <40 m) were characterised by species typically associated with the rocky and sedimentary substrates including gobies, dragonets, scorpionfish, blennies, butterflyfish, sandeels and plaice (JNCC, 2015). Flounder (*Platichthys flesus*) is also known to occur within the study area (Argyll Fisheries Trust, 2012).

Herring, cod, saithe, and sandeels (*Ammodytes* spp.) all represent Priority Marine Features in Scottish Waters (SNH, 2014). Herring, cod, plaice and sandeels (*Ammodytes* spp.) also features on the Scottish Biodiversity List (Marine Scotland, 2013).

8.2.5 Elasmobranchs

Basking shark (*Cetorhinus maximus*) is known to occur around the whole Scottish coast with sightings peaking in the summer months, particularly on the west coast (Scottish Government, 2011). There are several records of basking shark sightings within the study area with some records occurring in close proximity to the Development Site (i.e. within ~2 km). The only other species which have been recorded in Loch Fyne historically is the small-spotted catshark (*Scyliorhinus canicula*) and common skate (*Dipturus batiscomplex*) (JNCC, 2015) although the western coast of Scotland is considered to be used by various other species of shark, skate, and ray (Scottish Government, 2011).

Several species of shark, skate, and ray likely to occur within the study area represent Priority Marine Features in Scottish Waters (SNH, 2014). Several are also listed on the Scottish Biodiversity List (Marine Scotland, 2013) and occur on the OSPAR list of Threatened and/or Declining species and habitats (OSPAR, 2008).

8.2.6 Marine Mammals

Several marine mammals are known to commonly occur in the outer Loch Fyne area (e.g. south of Otter Ferry) including harbour porpoise (*Phocoena phocoena*), bottlenose dolphins (*Tursiops truncatus*), grey seal (*Halichoerus grypus*) and harbour seal (*Phoca vitulina*) (Argyll and Bute Council, 2009). Minke whales (*Balaenoptera acutorostrata*) and other species of dolphin are also sighted on occasion as well as humpback whale (*Megaptera novaeangliae*) although sightings of this species are rare.

There is very little information regarding marine mammal sightings within upper Loch Fyne and the study area although evidence suggest that harbour porpoise, dolphins, and seals are all likely to be present albeit in low abundance and / or sporadically (SNH & SMRU, 2015; Hammond et al., 2017; Russell et al., 2017). For example, mean estimated at-sea density (seals per 5 x 5 km) data from 1991 – 2016 published by the Sea Mammal Research Unit (SMRU) suggests that < 5 harbour seals and < 5 grey seals per 5 x 5 km are thought to occur in the area (Russell et al., 2017). This corresponds to summer counts recorded by SMRU between 2011 and 2015 which observed <=10 individuals of each species within the upper region of Loch Fyne (SNH & SMRU, 2015).

All marine mammal species listed above are protected by The Wildlife and Countryside Act 1981. In addition, all cetaceans are European Protected Species (EPS) under Annex IV of the EC Habitats Directive. Harbour porpoise and bottlenose dolphin are also listed under Annex II of the EC Habitats Directive. With the exception of grey seal, all species identified above are UK BAP Priority Species and feature on the Scottish Biodiversity List. Grey seals are protected by the Conservation for Seals Act 1970 and are listed as protected species under Annex II and V of the EC Habitats Directive. Finally, all marine mammal species represent Priority Marine Features in Scotland (SNH, 2014) with bottlenose dolphin and harbour porpoise also listed as Priority Species in the Argyll and Bute LBAP (Argyll and Bute Council, 2009).

8.2.7 Marine Invasive Non-Native Species

Several marine invasive non-native species (INNS) are known to be present in Loch Fyne. The most notable species is the carpet sea squirt (*Didemnum vexillum*) which was confirmed as being present in Loch Fyne in 2018. Carpet sea squirt spreads rapidly and can form dense colonies on the seabed and other substrates which can lead to the exclusion of other benthic species, degradation of functional habitats for fish (e.g. spawning grounds) and the creation of a homogenous habitat. It proliferates particularly on man-made submerged structures including docks, moorings, vessel hulls and aquaculture equipment (Argyll and Bute Council, 2009).

Other species known to either be present within the study area or nearby and therefore represent species of concern include the leathery sea squirt (*Styela clava*) and wireweed (*Sargassum muticum*). The leathery sea squirt attaches to solid surfaces in shallow waters and can develop extensive populations on man-made structures and natural rocky substrates. This species was recorded just south of the study area during a Seasearch survey in 2006 (Marine Conservation Society, 2016). Wireweed was first recorded in Loch Fyne in 2006 and is known to be prevalent within the lower and middle reaches of Loch Fyne (SNH, 2018) and may be present within the study area. Wireweed can impact biodiversity by outcompeting native seaweeds and seagrasses. It can become a nuisance in harbours and marinas where it forms large floating masses which can clog propellers and impede recreational water use.

8.3 Methodology

The following surveys are scheduled to be undertaken at the Development Site in 2021/2022 prior to production and submission of the EIAR.

- Intertidal Phase 1 Survey; and
- Subtidal Benthic Survey comprising:
 - Drop down camera survey along transects to collect seabed imagery for identification of sensitive epifaunal communities and to determine the final location for grab sampling stations (to ensure sensitivity PMF can be avoided; and
 - Grab sampling for macrofauna, particle size and sediment chemistry analysis.

Survey methodologies, sample analysis and data analysis will follow good practice guidance such as Saunders et al. (2011) and Noble-James et al. (2018) and reference to Nature Scot (2021) guidance on the assessment of impacts to Priority Marine Features (see: <https://www.nature.scot/professional-advice/protected-areas-and-species/priority-marine-features-scotlands-seas>). Survey results shall be presented in standalone reports which will be appended to the EIAR and summarised within the marine ecology chapter of the EIAR.

Following determination of the baseline conditions and identification of the key marine ecology features, the methodology for identifying the potential ecological impacts of the proposed Development will include:

- Determination of the magnitude of change of the potential impacts of the proposed Development on the key marine ecology features;
- Evaluation of the significance of the effects, relative to the receptor sensitivity;
 - Identification of suitable and appropriate mitigation measures for the demolition and construction of the proposed Development; and
 - Assessment of the significance of any residual effects.

The assessment will consider both direct and indirect effects of the proposed Development on the important marine ecological features. Furthermore, an assessment of potential cumulative effects with other developments nearby will also be made. This approach is in accord with the overarching EIA methodology outlined in chapter 3 Scope of the Environmental Impact Assessment for the proposed Development.

The 2018 CIEEM guidance on EclA discourages the use of the matrix approach for determining the significance of effects on ecological features (CIEEM, 2018). It is considered that this approach can lead to value-based judgements and an evaluation which is subjective and not underpinned and supported by a clear evidence base. Hence, an alternative approach to that set out in chapter 3 Scope of the Environmental Impact Assessment is proposed here. The CIEEM guidelines state that:

“For the purposes of the EclA, a ‘significant effect’ is an effect that either supports or undermines biodiversity conservation objectives for ‘important ecological features’ (i.e. relevant ecological features) or for biodiversity in general...”

For designated sites the assessment will consider how the proposed Development is likely to affect the conservation objectives for the site and/or its interest/qualifying features. For ecosystems, consideration is given to whether the proposals are likely to result in a change in ecosystem structure and/or function.

For species and habitats, the effects of impacts on individual habitats and species are considered in relation to their ‘conservation status’ which is defined in the CIEEM guidelines as follows:

“For species: conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area; and

For habitats: conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area.”

In considering effects on conservation status, reference will be made to relevant available guidance on the existing conservation status of a feature. Conclusions on the significance of effects are related to the concepts of ‘structure and function’ or ‘conservation status’ as being either:

- Not-significant (i.e. no effect on structure and function, or conservation status); or
- Significant (i.e. structure and function, or conservation status is affected).

8.4 Likely Significant Effects

The Proposed Development may impact marine ecology during the construction and operation phases as follows:

8.4.1 Construction phase

- Loss of benthic habitats and species, including Priority Marine Features, under the direct footprint of the marine structures (e.g. jetty piles);
- Disturbance of habitats and species, including Priority Marine Features, in areas subject to dredging (if required);
- Disturbance to marine receptors, particularly fish and marine mammals, from underwater sound generated during installation of marine structures;
- Changes in water quality from suspended sediments generated during dredging (if required); and
- Changes to marine water quality from accidental spillages or leaks from construction vessels.

8.4.2 Operational phase

- Disturbance of habitats and species, including Priority Marine Features, in areas subject to sediment scour from hydrodynamic changes around marine structures;
- Changes in water quality from suspended sediments generated from hydrodynamic scour around marine structures;
- Disturbance to marine receptors from underwater sound generated by vessel movements; and
- Changes to marine water quality from accidental spillages or leaks from construction vessels.

8.5 Likely Mitigation Measures

The following mitigation measures may be required, depending on final project design, to minimise impacts to sensitive marine receptors:

- Minimising the loss of notable seabed habitats and species through project design and micro-siting;
- If impact piling is required for the construction of the marine facility a seasonal restriction may be required to avoid the migration season of salmon and trout;
- Where impact piling is required for the construction of the marine facility the project will adopt JNCC mitigation protocols to minimise disturbance to marine mammals from piling sound (JNCC, 2010), including a marine mammal observer monitoring a 500 m mitigation zone and a soft-start;
- Pollution prevention strategies would also be set out within a CEMP in accordance with the relevant Guidance for Pollution Prevention to reduce the potential for, and the scale of any environmental impacts. This will include adherence to industry best practices (e.g. OSPAR, International Maritime Organisation and the International Convention for the Prevention of Pollution from Ships (MARPOL) guidance for pollution at sea) and adoption of measures to avoid deterioration in water quality with subsequent impacts on marine ecology.

8.6 Summary and Conclusions

It is possible that there may be permanent and temporary adverse effects on ecological features as a result of the proposed Development.

These will be fully investigated as part of the Ecological Impact Assessment which will be based on desk study and field survey data collected in 2019 and 2021, inclusive.

Appropriate mitigation will be developed and implemented to minimise the impacts of the proposed Development. Where significant effects cannot be avoided, proportionate compensatory measures will be provided. Where possible, ecological enhancement will also be suggested and incorporated into the proposed Development.

8.7 References

Argyll Fisheries Trust (2012). Loch Fyne Rivers Project: Summary of 2011 fish populations, Habitat Surveys and Potential Habitat Management Initiatives. Argyll Fisheries Trust, Inveraray, Argyll

Argyll and Bute Council. (2009). Integrated Coastal Zone Management Plan. Loch Fyne. A Spatial Planning Framework for Future Development. Marine & Coastal Development Unit, Planning Services. Argyll & Bute Council. 67 pp.

British Geological Survey (BSG). (No date). Intertidal Substrate Foreshore (England and Scotland). [Online]. Available at: <https://magic.defra.gov.uk/MagicMap.aspx> [Accessed 06/04/2020].

Chartered Institute of Ecology and Environmental Management (CIEEM). (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.

Davies, L.M. (1989). Surveys of Scottish sealochs: Loch Fyne. (Contractor: University Marine Biological Station, Millport). Nature Conservancy Council CSD Report No. 984.

Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Börjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann, J., Vingada, J. and Øien, N. (2017). Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. 40 pp.

Joint Nature Conservation Committee (JNCC). Species point records from 1988-90 UMBSM Loch Fyne survey. [Online]. Available at: <https://data.gov.uk/dataset/989bcf8f-354c-41ec-b6b1-a410494c2de3/species-point-records-from-1988-90-umbsm-loch-fyne-survey> [Accessed 06/04/2020].

Joint Nature Conservation Committee (JNCC). (2010). Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise. August 2010.

Marine Conservation Society (2016). Seasearch Marine Surveys in Scotland. [Online]. Available at: <https://www.gbif.org/dataset/990e845f-836b-4467-bc5f-46c8495259ec> [Accessed 08/04/2020].

Marine Scotland. (2013). Scottish Biodiversity List. [Online]. Available at: <https://www.webarchive.org.uk/wayback/archive/20160402063428/http://www.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL> [Accessed 06/04/2020].

Noble-James, T., Jesus, A. & McBreen, F. 2018. Monitoring guidance for marine benthic habitats (Revised 2018). JNCC Report No. 598. JNCC, Peterborough. [Online]. Available from: <https://data.jncc.gov.uk/data/9ade4be8-63dd-4bbc-afd0-aefe71af0849/JNCC-Report-598-REVISED-WEB.pdf>. [Accessed 27-10-21].

Ocean Ecology Limited (OEL). (2015). Ardcastle Floating Pier – Subtidal Benthic Report & Impact Assessment. Ref: PARLFN0715_TR. Prepared for Partrac and submitted as an appendix to the Environmental Statement.

OSPAR Commission. (2008). List of Threatened and/or Declining Species and Habitats. Reference Number: 2008-6. [Online]. Available at: <https://www.ospar.org/work-areas/bdc/species-habitats/list-of-threatened-declining-species-habitats> [Accessed 06/04/2020].

Russell, D. J. F., Jones, E. L. and Morris, C. D. (2017). Updated Seal Usage Maps: The Estimated at-sea Distribution of Grey and Harbour Seals. Scottish Marine and Freshwater Science. Vol 8 No 25, 25 pp.

Saunders, G., Bedford, G.S., Trendall, J.R., and Sotheran, I. (2011). Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 5. Benthic Habitats. Unpublished draft report to Scottish Natural Heritage and Marine Scotland. [Online]. Available from: <https://www.nature.scot/sites/default/files/2017-07/A585079%20-Guidance%20on%20survey%20and%20monitoring%20in%20relation%20to%20marine%20renewables%20deployments%20in%20Scotland%20-%20Vol%205%20-%20Benthic%20Habitats.pdf>. [Accessed 26-10-21].

Scottish Government. (2013). Nephrops - Functional Units derived from sediment and VMS data. [Online] Available at: <http://marine.gov.scot/node/12830> [Accessed 07/04/2020].

Scottish Government. (2011). Scottish Marine Atlas. [Online] Available at: <https://www.gov.scot/publications/scotlands-marine-atlas-information-national-marine-plan/> [Accessed 07/04/2020].

Scottish Natural Heritage (SNH). (2013). Upper Loch Fyne and Lock Goil Possible Nature Conservation MPA. Assessment against the MPA Section Guidelines. 23 pp.

Scottish Natural Heritage (SNH). (2014). Priority Marine Features in Scotland seas. [Online]. Available at: <https://www.nature.scot/priority-marine-features-scotlands-seas> [Accessed 07/04/2020].

Scottish Natural Heritage (SNH) and Sea Mammal Research Unit (SMRU). (2015). SMRU coordinated summer counts of Common/Harbour seals (*Phoca vitulina*) in period 2011 to 2015 (SNH WMS). [Online]. Available at: <https://marinescotland.atkinsgeospatial.com/nmpi/> [Accessed 08/04/2020].

Scottish Natural Heritage (SNH). (2018). Species data for Scottish waters held and managed by Scottish Natural Heritage, derived from benthic surveys 1993 to 2014. [Online]. Available at: <https://www.gbif.org/dataset/edd017b6-bf00-4b00-93ad-9789c42a36b1> [Accessed 08/04/2020].

Tyler-Walters, H., James, B., Carruthers, M. (eds.), Wilding, C., Durkin, O., Lacey, C., Philpott, E., Adams, L., Chaniotis, P.D., Wilkes, P.T.V., Seeley, R., Neilly, M., Dargie, J. & Crawford-Avis, O.T. 2016. Descriptions of Scottish Priority Marine Features (PMFs). Scottish Natural Heritage Commissioned Report No. 406. [Online]. Available from: <https://www.nature.scot/sites/default/files/Publication%202016%20-%20SNH%20Commissioned%20Report%20406%20-%20Descriptions%20of%20Scottish%20Priority%20Marine%20Features%20%28PMFs%29.pdf>. [Accessed 26-10-21]

Wilding, T.A., Duncan, J., Nickell, L.A., Hughes, D.J., Gontarek, S.J., Black, K.D., Sayer, M.D.J. (2005). Synthesis of Information on the Benthos of SEA 6 Clyde Sea Area. 41 pp.

9. Ornithology

9.1 Introduction

This chapter addresses ornithology. It does not include terrestrial ecology or freshwater ecology, which are the subjects of chapters 6 and 7 of this EIA Scoping Report, respectively. Throughout this chapter the term 'ornithological feature' is used to refer to sites designated for nature conservation, habitats, and species.

The approach to Scoping for ornithology accords with the Guidelines for Ecological Impact Assessment in the UK and Ireland, published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018). It is also based on the Recommended bird survey methods to inform impact assessment of onshore wind farms, published by NatureScot (SNH, 2017).

This chapter has been informed by a desk study and data collected during field surveys conducted at the Development Site in 2019 and in 2021.

This chapter is supported by the following Figures:

- Figure 9.1: Statutory Designated Sites
- Figure 9.2: Ornithology Survey Areas

9.2 Baseline Conditions

A desk study was carried out to identify nature conservation designations and protected and notable species potentially relevant to the proposed Development. A stratified approach was taken when defining the desk study area, based on the likely zone of influence of the proposed Development on different ornithological features and an understanding of the maximum distances typically considered by statutory consultees. Accordingly, the desk study identified:

- Any international nature conservation designations within 10 km of the Development Site;
- Other statutory nature conservation designations within 2 km of the Development Site; and
- Local non-statutory nature conservation designations and protected and notable habitats within 1 km of the Development Site.
- The only statutory designated site within 10 km of the proposed Development for which birds are a notified feature is the Glen Etive and Glen Fyne Special Protection Area (SPA) (see *Figure 9.1: Statutory Designated Sites*). This site is designated for regularly supporting a population of European importance of golden eagle *Aquila chrysaetos*.

The habitats within the Development Site are suitable for supporting a range of breeding bird species. During the 2019 surveys birds listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) and Annex I of the European Union Birds Directive[1] were recorded, including golden eagle. Other species such as hen harrier *Circus cyaneus* and osprey *Pandion haliaetus* were also recorded within the Development Site and its immediate surrounds. The moorland habitat is suitable for breeding wader species and probable breeding by several species was confirmed. The ancient semi-natural woodland within the site may contain breeding populations of species of conservation concern such as spotted flycatcher *Muscicapa striata* and wood warbler *Phylloscopus sibilatrix*. At the jetty location on Loch Fyne, small numbers of waterbirds were recorded, including oystercatcher *Haematopus ostralegus* and redshank *Tringa totanus*.

To complement the targeted field survey, and following advice provided by NatureScot, data from satellite tagged golden eagle(s) which inhabit the area covered by and surrounding the proposed Development will be obtained. This will provide additional information on the level of use of the habitats within the potential ZoI of the proposed Development. In addition, Golden Eagle Territory (GET) modelling will also be undertaken. The purpose of this exercise will be to predict the total loss of habitat which is suitable for use by territory-holding golden eagles from the proposed Development. The information obtained from both exercises will be reported and used to inform the EIA.

9.3 Methodology

Surveys for ornithological features within the main part of the Development Site (i.e. in the area within which the Headpond and associated infrastructure lies) were carried out over the course of a single year in 2019. This included survey for moorland breeding birds, breeding raptors (including eagles), breeding divers and lekking black grouse *Tetrao tetrix*. Vantage point (VP) watches were conducted monthly between November 2018 and October 2019, inclusive, to establish flight activity levels over the Development Site. All ornithological surveys were carried out following the methods described in SNH (2017) and other industry-standard best practice guidelines.

In 2021, survey for breeding birds was carried out in the areas of the Development Site around Inveraray. This was limited to a Common Bird Census (as described in Bibby et al, 2000) within those habitats suitable for supporting nesting birds, in particular the semi-natural woodland and areas of semi-improved grassland.

During the 2020/21 non-breeding season, a programme of monthly waterbird surveys were carried out within 500 m of the proposed jetty location on Loch Fyne. These generally followed the methodology used for the British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS). Surveys were timed to take place either around low or high tide, and all waterbirds observed foraging or roosting on the shore or sea were recorded.

The survey areas used for ornithological features in 2019 and 2021 are shown on *Figure 9.2 Ornithology Survey Areas*

The results of the desk study and targeted field surveys carried out in 2019 and 2020/21 will be used to inform the Ecological Impact Assessment (EclA) component of the EIA. This will be conducted in accordance with the guidelines produced by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018). Where significant effects on an ornithological feature are predicted by the EclA, appropriate mitigation measures will be proposed. Likely mitigation measures are outlined in Section 9.5 Likely Mitigation Measures, below. Enhancement measures that are proportionate to the impact of the proposed Development will also be considered in pursuance of the objective of Scottish Planning Policy to achieve biodiversity benefits from development.

9.4 Likely Significant Effects

The significant effects of the proposed Development can be categorised as follows:

- Loss of habitat which supports protected and/or notable bird species;
- Disturbance to and/or displacement of species whilst at the nest, displaying or foraging (e.g. noise disturbance to breeding birds which are of conservation concern);
- Loss of habitat used for foraging and/or roosting; and
- The accidental destruction of active bird nests.

9.5 Likely Mitigation Measures

Compliance with planning policy requires that the proposed Development considers and engages the following mitigation hierarchy where there is potential for impacts on relevant ornithological features:

- Avoid features where possible;
- Minimise impact by design, method of working or other measures (mitigation), for example by enhancing existing features; and
- Compensate for significant residual impacts (e.g. by providing suitable habitats elsewhere).

This hierarchy requires the highest level to be applied where possible. Only where this cannot reasonably be adopted should lower levels be considered.

Refer to chapter 6 Terrestrial Ecology of this Scoping Report for details of generic mitigation measures to be implemented to minimise the effects of the proposed Development on ornithological features. In addition, the following measures would apply specifically to birds:

- Removal of habitat which may be suitable for nesting birds outside of the breeding season;
- Construction of the jetty on Loch Fyne to take place outside of the non-breeding season, if possible;
- Pre-construction checks for nesting birds; and
- Implementing works exclusion zones around specially protected species to ensure that they are not disturbed or otherwise directly harmed during construction.

9.6 Summary and Conclusions

It is possible that there may be permanent and temporary adverse effects on ornithological features as a result of the proposed Development.

These will be fully investigated as part of the Ecological Impact Assessment which will be based on desk study and field survey data collected between 2019 and 2021, inclusive.

Appropriate mitigation will be developed and implemented to minimise the impacts of the proposed Development. Where significant effects cannot be avoided, proportionate compensatory measures will be provided. Where possible, enhancement measures will also be suggested and incorporated into the proposed Development.

9.7 References

Bibby, C.J., Burgess, N.D., Hill, D.A. and Mustoe, S (2000). Bird Census Techniques, 2nd Edition. Academic Press, London.

CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Version 1.1 – updated September 2019. Chartered Institute of Ecology and Environmental Management, Winchester.

Directive 2009/147/EC on the conservation of wild birds ('Birds Directive').

SNH (2017). Recommended bird survey methods to inform impact assessment of onshore wind farms. Version 2, March 2017.

10. Geology and Ground Conditions

10.1 Introduction

This chapter will consider the potential issues arising from the construction and operation of the proposed Development in relation to existing and future potential geological and ground condition impacts.

The assessment will provide baseline information; discuss potential mitigation and management and assess the significance of residual impacts assuming the proposed mitigation is implemented.

10.2 Baseline Conditions

The geology of the area is shown on Geological Maps Sheet No. 37E – Lochgoilhead (British Geological Society; BGS, 1990), Sheet No. 29 – Rothesay (BGS, 1892) and Sheet No. 37W – Furnace (BGS, 2008) and on the Geology of Britain GeoIndex Viewer (BGS, 2021).

The bedrock geology of the proposed Development Site is dominated by formations mostly Pre-Cambrian in age that are part of the Dalradian Supergroup. Some of these formations are part of the Tayvallich volcanic formation, which is composed of amphibolitic mafic rocks intercalated with metasedimentary rocks including conglomerates, and the Tayvallich slate and limestone formation. The thickness of the Tayvallich Subgroup is in the range of 100m – 250m in the area, with the parent unit being the Argyll Group which has a thickness up to 9km (BGS, 2021). On the edge of Loch Awe, in the Balliemeanoch region, is the Loch Avit Grit formation, consisting of psammites and pelites.

To the south of the Development Site, along the proposed southern access track, the bedrock is primarily metamorphic rocks, including quartzite, limestone and phyllite, with occurrences of the Loch Tay and Shira Limestones; Tayvallich Slate and Limestone; and the Tayvallich and Loch Avich volcanics. There is an inferred fault line that runs approximately south west to north east through the southern edge of the proposed Development Site, for approximately 10km and terminates approximately 1km north of Eredine, under Loch Awe. A larger inferred fault runs along the edge of the site under Loch Awe coming within 200m of the site boundary for 5km.

A dyke is present within the site boundary, about 2km north of the fault line, the dyke is estimated to be around 5km long. Silurian – Devonian period age range and composed of micro diorite and appinitic-dioritic rock, this igneous rock acts as an intruder to the characteristic sedimentary bedrock in the area.

The superficial deposits in the area appear to be limited, particularly in the areas of higher elevation. On the shore of Loch Awe, there is a mix of till, alluvium, and peat. The glacial history of the area has led to Hummocky Glacial Deposits, made up of diamicton, sand and gravel and formed up to 3 million years ago. On the shore of Inveraray there are raised marine deposits of clay, silt, and sand. Although the British Geological Survey not mapped peat across the majority of the site, AECOM's experience of the area indicates that peat is present onsite, this will be confirmed by on site peat probing.

Data retrieved from the British Geological Survey identified several records of minor seismic activity within the area, including 2021.

10.3 Methodology

The study area will include the Development Site as shown on *Figure 1.1 Location Plan*, plus a 250 m buffer.

It is recognised that a variety of data is available from third parties i.e. NatureScot, SEPA, and ABC. It is therefore proposed that the following tasks will be undertaken to ensure the baseline data informs the impact assessment:

- Review of solid and drift geology maps; and
- National Soil Map of Scotland.

The data review will include a search for nationally protected geological SSSI or Regionally Important Geological Sites (RIGS) or protected geo-morphological features within the vicinity of the Development Site. There are no records of coal mine workings in the vicinity of the Development Site.

In addition to the impacts on any sensitive receptors, this chapter will also review the impacts of the geology on the design and construction of the proposed Development. The proposed Development will look to utilise as much of the material excavated for below ground infrastructure in the construction of above ground infrastructure, such as the embankments for the headpond. In order to do this, this chapter will include an assessment of reuse of excavated material on site through a Materials Management Assessment (MMA).

The design of all infrastructure, particularly the headpond embankments, will be designed with due consideration of potential seismic activity. For the headpond embankments, these will be designed and constructed in line with the Reservoirs (Scotland) Act 2011.

There are no recognised standards or methodologies for assessing the ground conditions effects of PSH projects. However, a method for the ground conditions assessment has been broadly derived from the Design Manual for Roads and Bridges (DMRB), LA 109 Geology and Soils (formally Volume 11, Section 3, and Part 11 (Geology & Soils) and Part 6 (Land Use)).

10.4 Site Walkover Survey

Following a review of the desk-based assessment, a site walkover survey will be undertaken across the study area. The depth and variability of drift deposits including the possibility of peat and soft or waterlogged ground and shallow rock will be determined based on any existing historical on-site quarries, cuttings, exposures, and surface (peat) features.

10.5 Peat Assessment

Given the anticipated presence of peat across the Development Site an assessment on the impacts of peat will be undertaken. Depending on the extent of the peat the following assessments may be undertaken:

- Preliminary Peat Slide Risk Assessment; and
- Preliminary Peat Management Plan, including peat balance.

The approach taken in the EIA will be guided by relevant legislation (including waste management legislation) and the following good practice guidance documents:

- Peatland Survey – Guidance on Developments on Peatland, Scottish Government, SNH and SEPA (2017);
- Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste, Scottish Renewables and SEPA, Version 1 (2012); and
- Peat stability will be assessed in accordance with Peat Landscape Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (2017).

A number of ground surveys will be undertaken during the EIA which will determine the extent of peat across the Development Site.

10.6 Ground Surveys

In order to determine the characteristics of the geology within the Development Site Ground Investigation (GI) surveys will be phased during and after the EIA. Table 10.1 shows the different GI surveys that may be undertaken.

Table 10.1 Potential Ground Surveys

Phase	Example Ground Investigation Method	Requirement for Survey
1 (During EIA)	Peat Probing (phase 1 and 2)	Avoidance of deep peat, peat slide risk assessment and peat management plan
2a (Post EIA)	Client Led – Cable percussive boreholes and material sampling	Detailed design (30%)
2b (Post EIA)	Contractor Led – Rotary drilled boreholes and material sampling	Completion of detailed design and micro sitting of underground structures and location of fault lines

10.7 Assessment Methods and Guidance

The assessment method that will be followed is described in chapter 3 Scope of the Environmental Impact Assessment and, where necessary, further refined below.

The assessment of the significance of individual impacts on the receiving environment will be based on criteria for the sensitivity or importance of the resources as described in Table 10.2.

Table 10.2 Sensitivity Definition

Sensitivity	Description
Very High	Geology/ Soils The area occupied by the proposed Development is protected by International EU legislation (World Heritage Sites, Geopark).
High	Geology/ Soils Feature of national importance, for example a SSSI.
Medium	Geology/ Soils Site of local geological importance (Local Geological Site – previously Regionally Important Geological Site).
Low	Geology/ Soils Sites with local geology/ soils interest.

10.8 Likely Significant Effects

10.8.1 Construction

The construction of the proposed Development will result in the expected excavation of peat and release of carbon into the atmosphere. In addition, construction activities may result in the pollution of surface water within the peat.

The initial construction of access tunnels may require some dewatering around the entrance portals and during the initial stages of the tunnel borings. However, once the TBM has started boring it can cope with hydrostatic pressures by virtue of its earth pressure balancing systems behind the cutting face. No dewatering is therefore required for tunnel construction. In certain instances, grouting or freezing of the ground may be required in front of the TBM where heavily fractured rock material is encountered.

The drill and blast methods for constructing the power cavern, surge shafts and possibly the headrace tunnel will generally require competent rock i.e., without significant amounts of fracturing. If water is encountered or rock is not deemed competent enough to support itself, then a lining may be required such as rock anchors, rebar and / or shotcrete. Temporary dewatering around fracture to reduce pressures and enable the Sprayed Concrete Lining (SCL) to cure may be required. An assessment on the competency of rock is not part of the scope of the EIAR as it will be mitigated by inherent safety and engineering design solutions.

Impacts from seismic activity are scoped out as they will be mitigated by inherent safety and engineering design solutions secured under the Reservoirs (Scotland) Act 2011 and are therefore scoped out of the EIAR.

10.8.2 Operation

Following completion of the construction phase, areas impacted by the proposed Development, such as peatlands, will either be reinstated or will be unchanged. As such, significant effects on geology and soils during the operational phase are unlikely; and this is therefore scoped out for this phase.

10.8.3 Decommissioning

The decommissioning phase has been scoped out as no additional excavation is required and as the main structures would remain in situ.

10.9 Likely Mitigation Measures

The proposed Development will have embedding environmental design measures as part of its design. This will ensure that good practice is adopted at the Development Site throughout the construction and operation phases.

The purpose of embedding environmental design measures as part of the design will be to minimise the impacts on peat, including the release of carbon, and to balance, as well as possible the material being excavated on site with what is being reused.

The CEMP will address geology and soils issues, including measures to protect geology and peat from the any potentially pollution activities.

The MMA will demonstrate how the project will utilise the reuse of excavated material on site, as part of the construction of the proposed Development.

10.10 Summary and Conclusions

The geology around the Development Site will be further investigated in order to inform the geo-environmental and geotechnical assessments. This is to minimise the impact of the proposed Development on the surrounding geology, carbon resource and to reduce the potential amount excess material that is generated from the construction activities.

The operational and decommissioning phase of the proposed Development is unlikely to result in any significant effects geological features and is therefore proposed to be scoped out of the EIAR.

10.11 References

GeoIndex Onshore. [online] Available at:

<https://mapapps2.bgs.ac.uk/geoindex/home.html?_ga=2.144506237.991962451.1634552312-128843483.1632149854> [Accessed 20 October 2021].

Geological Survey of Scotland, 1:63,360/1:50,000 geological map series. 1990. 37E Lochgoilhead. [online] Available at:

<<https://webapps.bgs.ac.uk/data/maps/maps.cfc?method=listResults&mapName=&series=S50k&scale=&pageSize=100>> [Accessed 20 October 2021].

Geological Survey of Scotland, 1:63,360/1:50,000 geological map series. 1892. 29 Rothesay. [online] Available at:

<<https://webapps.bgs.ac.uk/data/maps/maps.cfc?method=listResults&mapName=&series=S50k&scale=&pageSize=100>> [Accessed 20 October 2021].

Geological Survey of Scotland, 1:63,360/1:50,000 geological map series. 2008. 37W Furnace. [online] Available at:

<<https://webapps.bgs.ac.uk/data/maps/maps.cfc?method=listResults&mapName=&series=S50k&scale=&pageSize=100>> [Accessed 20 October 2021].

Guidance on Developments on Peatland, Scottish Government, SNH and SEPA, 2017, [online],

<https://www.gov.scot/publications/peatland-survey-guidance/>

Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste, Scottish Renewables and SEPA, Version 1, 2012, [online], <https://www.gov.scot/publications/assessment-of-peat-volumes-reuse-of-excavated-peat-and-minimisation-of-waste-guidance/>

Best Practice Guide for Proposed Electricity Generation Developments, 2017, [online],

<https://www.gov.scot/publications/peat-landslide-hazard-risk-assessments-best-practice-guide-proposed-electricity/>

11. Water Environment

11.1 Introduction

This scoping assessment is based on a desk study and considers the potential for impacts of the proposed Development on surface and groundwater bodies, including their water quality, hydromorphology, role supporting ecological habitats and the quality of any licenced or private water supplies (PWS). It describes the water environment baseline and receptors before setting out the potential for significant environmental effects and the scope for mitigation. It goes on to describe the surveys and assessment that will be undertaken as part of the EIA.

Please refer to chapter 6 Terrestrial Ecology for the assessment of any ground water dependent terrestrial ecosystems (GWDTE), chapter 7 Aquatic Ecology in relation to the assessment of flora and fauna associated with the freshwater aquatic environment, chapter 8 Marine Ecology for the marine environment, chapter 10 Geology, Soils and Carbon in relation to the assessment of geology, bedrock, peat and carbon, chapter 12 Flood Risk and Water Resources for consideration of flood risk and surface water resources, and chapter 16 Socio-economics, Recreation and Tourism in relation to impacts on recreational uses within the site.

This chapter is supported by the following Figures:

- Figure 11.1 Waterbody Classifications
- Figure 11.2 Bedrock Geology
- Figure 11.3 Superficial Geology

11.2 Baseline Conditions

11.2.1 Study Area Overview

The Development Site lies within the Argyll and Bute region of western Scotland, south of Portsonachan on the southern margin of Loch Awe, and Inveraray on the north-western side of Loch Fyne.

For the purpose of this scoping report, a 1 km study area around areas of new development or temporary works has been used within which waterbodies that may be affected by the proposed Development have been identified. For these waterbodies, the baseline also considers downstream attributes since water quality impacts can sometime propagate along watercourses.

The study area is determined by the location of new development and construction works and access routes as described earlier and presented in *Figure 1.2 Above Ground Infrastructure*. This consists of a new inlet and outlet structure to Loch Awe at Balliemanoach, the proposed headpond area located near Lochan Airigh, a new marine facility extending out into Loch Fyne, and new and improved access tracks and tunnels in between the headpond and inlet / outlet structures, new and improved access tracks to the north-east and south-east to connect to the A819 and the A83 respectively, together with up to ten temporary compound areas.

The study area is characterised by hilly upland with elevations up to approximately 570 m AOD. The land use is predominantly open moorland, interspersed with large areas of coniferous plantations, and with improved grassland for livestock and small urban developments along the fringes of Loch Awe and Loch Fyne. A complex pattern of watercourses and small lochs drain this upland area towards Loch Awe and Loch Fyne.

The Lephinmore Met Office station records for the period 1981-2010 an annual average rainfall of over 1900 mm, meaning the site is particularly wet in the UK context, which will influence pollution control during construction.

11.2.2 Surface Waterbodies

From a review of online Ordnance Survey maps and aerial imagery, the main waterbodies located within 1 km of the Development Site and which are thought to have some form of hydrological connectivity include:

Table 11.1 Surface Waterbodies**Loch Awe Catchment****Loch Fyne Catchment**

Loch Awe	Loch Fyne
Loch Breac-liath	River Aray and tributaries (including Erallich Water)
Keppochan River and tributaries	Crom Allt
Archan River and tributaries	
Allt na Cùile Riabhaiche and tributaries	
Allt Ban	
Allt na Dail-Fearna	
Sonachan Burn	
Allt Mòr	
Allt na Fainge	
Allt a Gheataich	
Allt a Chrosaid	
Allt Beochlich and tributaries	
Allt Blarghour and its tributaries	
Lochan Airigh	
Lochan Dubh	
Lochan Romach	
Lochan Uaine	
Lochan Breac-liath	
Lochan Cruaiche Bige	
Multiple small watercourses (unnamed) on east sites of Loch Awe	

Loch Awe is located approximately 2 km west of the proposed headpond location. The proposed Development is predominantly located within the catchment of the Allt Beochlich watercourse. The catchment consists of a number of small streams which ultimately flow into Loch Awe, these originate from smaller Lochans (Airigh, Dubh and Romach). Other watercourses are only likely to be affected by works associated with providing access, temporary compounds, and works to construct new structures along Loch Awe and Loch Fyne.

The baseline environment of key surface waterbodies, and those identified as WFD waterbodies, are included in the following sections. Further desk study will be undertaken to provide a baseline for the other waterbodies listed in Table 11.1 for which there is less readily available online data. This will include review of online aerial and Ordnance Survey Maps, data requests to SEPA, SNH and local authorities, and site surveys. This information will be presented in full in the EIAR.

11.2.2.1 Loch Awe

Loch Awe is a lake waterbody within the River Awe catchment of the Scotland River Basin District (RBD) (ID: 10085). The lake covers an area of 38 km² making it the third largest freshwater loch in Scotland. At approximately

41 km in length, it is also the longest freshwater loch in Scotland, on a southwest to northeast axis typically 1 km wide, with Balliemanoach located approximately in the middle on the southern bank.

Maximum water depths in the centre of the loch are around 90 m south of Eredine, up to 60 m off Balliemanoach, before shoaling to less than 22 m but more typically less than 10 m around Black Islands and Inishail. Further north, they deepen again to around 70 m before shallowing on approach to the overflow to the River Awe. Given the size, depth and bathymetry of Loch Awe, it is expected that water chemistry is significantly influenced by thermal stratification, which is most likely to be of a monomictic character (i.e. mixing fully from late autumn and being thermally stratified during the warmer summer months).

The waterbody is designated under the WFD as a heavily modified waterbody due to morphological (impoundment) pressures for hydropower power generation, which cannot be addressed without a significant impact on water storage for hydroelectricity generation. The overall status of the waterbody has remained as moderate ecological potential between 2015 to 2018, as not all mitigation measures have been implemented. However, the overall ecological status is currently Poor, and has been since 2011. The chemical status of Loch Awe is Good (since 2014). The hydromorphology of Loch Awe is also classed as Poor, with the overall hydrology of the waterbody is classed as Poor. Water quality of Loch Fyne is monitored by SEPA and we will request and review relevant data as part of the impact assessment.

There is an existing small-scale hydro scheme in operation within the Development Site known as Beochlich. The Beochlich hydropower project was constructed in 1998 and has an installed capacity of 1 MW. There are three additional existing hydro-electric power schemes operating on Loch Awe and the surrounding area. SSE plc operate the 25 MW Inverawe Power Station, which is a run of river hydropower scheme, which abstracts water from the River Awe Barrage at the Pass of Brander. The scheme at Cruachan is a 440 MW pumped storage scheme operated by Scottish Power Drax Group plc. The third scheme is Nant, which is a 15 MW hydropower scheme that uses Lock Nant as the headpond and discharges into Loch Awe at the River Nant.

A review of online aerial photography and SEPA's Scotlands Aquaculture website has identified two commercial fish farms. The first is approximately 10 km southwest of the proposed inlet / outlet structure of the proposed Development into Loch Awe and is Braevallich Fish Farm, operated by Dawnfresh Seafoods Ltd under CAR licence CAR/L/100232. The second is located at the mouth of the River Awe, on the opposite bank of the Falls of Cruachan, and is Tervine Farm operated by Dawnfresh Farming Ltd (CAR/L/100236). Both farms are for rainbow trout. Elevated phosphorus levels from fresh water fish farming has been identified by SEPA as a pressure on this waterbody, although measures have been put in place to resolve this by 2024.

Finally, Loch Awe is also an important waterbody for tourism and recreation, including scenic views and heritage. Boats, kayaks and canoes can be hired, and although it is not a designated bathing water, it is known to be popular for wild swimming. Migrating salmon also pass through the loch, which is also an important location for trout fishing with the season running from the 15 March to 06 October each year. Impacts on landscape and visual receptors will be assessed within chapter 5 Landscape and Visual, impacts on heritage will be assessed within chapter 13 Cultural Heritage and impacts on tourism and recreation will be assessed within chapter 16 Socioeconomics, Recreation and Tourism.

11.2.2.2 Loch Fyne

Loch Fyne is a sea loch off the Firth of Clyde and forms part of the coast of the Cowal peninsula. Loch Fyne is both the longest and the deepest of Scotland's sea lochs (Davies 1989), with a length of approximately 70 km and a maximum depth of around 185 m (Edwards & Sharples 1985, Dipper & Beaver 1999). Water depths are in excess of 130 m off Inveraray in the upper loch, becoming shallower (i.e. < 50 m) in the lower loch, before deepening again at the loch widens south of Castleton.

According to the Integrated Coastal Zone Management Plan (Argyll and Bute Council, 2009):

"The loch is entirely marine, apart from the north of Newton Bay and in the upper reaches of Loch Gilp, where the salinity can vary. The tidal range in Loch Fyne is 3.1 m during spring tides at Tarbert and Inveraray, and ranges between 1.8 and 2.5 m for these sites during neap tides. It has an estimated water exchange period of 13 days (Edwards & Sharples 1985), but deep water within the basins is subject to an annual cycle of flushing. A summer thermocline separates warmer surface water from colder deeper waters which stagnate until winter, when the thermal layering breaks down and water body circulation flushes the basins. Loch Fyne is generally sheltered from prevailing south-westerly winds by Kintyre and Mid Argyll, but may on occasion develop larger waves or swells due to the orientation of the upper loch. Tidal streams are generally quite weak with the exception of the Otter Spit

narrows where flow rates may reach 1.1 knots. Tidal currents are on average stronger and the seabed profile becomes deeper closer to the shore on the western side of the loch.”

Loch Fyne is a coastal waterbody of the Scotland RBD (ID: 200334). The waterbody is not heavily modified and is currently at good ecological status (2018 classification). Water quality of Loch Fyne is monitored by SEPA and we will request and review relevant data as part of the impact assessment.

In 2014, the northeast portion of Loch Fyne, from just south of Inveraray was declared as the ‘Upper Loch Fyne and Loch Goil’ Nature Conservation Marine Protected Area (NCMPA). Protected features include: Burrowed mud, flame shell beds, horse mussel beds, ocean quahog aggregations, sublittoral mud and specific mixed sediment communities. The conservation and management objectives of this NCMPA will need to be taken into account by the proposed Development. There are also Sites of Special Scientific Interest along its banks, but none appear to include the waterbody itself and are distant from the location of any works near Inveraray.

No designated bathing waters have been identified within Loch Fyne. Similarly, at this stage we are not aware of any designated shellfish beds that are present, although aquaculture, and particularly shellfish farming are important commercial industries that depend on high quality water (Integrated Coastal Zone Management Plan, Argyll and Bute Council, 2009). Loch Fyne also has restricted areas that are used by the Royal Navy for submarine exercises.

Citing the Argyll Fisheries Trust, the Integrated Coastal Zone Management Plan (Argyll and Bute Council, 2009) states that “*The abundance of salmon in most of Argyll’s rivers have severely declined in recent years.*” However, “*many of the rivers of the Loch Fyne area are part of a juvenile salmon and brown trout restoration project funded by Argyll Fisheries Trust.*” The current status of this initiative will be considered during the full baseline to be presented in the EIAR.

Recreational fishing, scuba diving, sailing, charter boat operations and tourism are also other relevant attributes of Loch Fyne that need to be taken into account in its importance setting and will be assessed within chapter 16 Socio-economics, Recreation and Tourism.

11.2.2.3 Allt Beochlich

The Allt Beochlich watercourse is designated under the WFD (ID: 10275) as a river within the River Awe catchment of the Scotland RBD. The river flows from Lochan Dubh in a westerly direction for approximately 7.7 km towards Loch Awe, where it discharges. The overall status of the waterbody is ‘moderate’, due to ecological status with the chemical status being ‘good’. Temperature, dissolved oxygen and reactive phosphorous are all classed as being at ‘high’ status. However, the modelled hydrology and hydrology (medium / high flows) are both classed as ‘Bad’.

11.2.2.4 Allt Blarghour

The Allt Blarghour is a river designated under the WFD (ID: 10274) as a river within the River Awe catchment of the Scotland RBD. The river flows from Craig Dhudh in a westerly direction for approximately 8.5 km towards Loch Awe, where it discharges. The overall status of the waterbody is ‘moderate’, due to the water flows at levels, water quality is ‘good’, and physical conditions, access for fish and freedom from invasive species is ‘high’.

11.2.2.5 River Aray and Erralich Water

The River Aray is designated under the WFD (ID: 10224) as a river within the Loch Fyne Coastal catchment of the Scotland RBD. The river flows from Craig nan Sassanach in a south-westerly easterly direction for approximately 13.4 km to Loch Fyne. The overall status of the waterbody is ‘good’, due to physical condition and water quality, with the flows and access for fish migration classified as high.

Erralich Water is a tributary of the River Aray, and is crossed by the proposed southern access route. Erralich Water is designated under the WFD (ID: 10225) as a river within the Loch Fyne Coastal catchment of the Scotland RBD. The river flows from Beinn Bhreac in an easterly direction for approximately 8.4 km to the River Aray. The overall status of the waterbody is ‘good’, due to physical condition, with the chemical status, flows and access for fish migration all high.

11.2.3 Geology

The geology of the study area is an important consideration for determining the potential for adverse impacts on groundwater quality, including any local abstractions. chapter 10 Geology and Ground Conditions provides full details of the Development Site’s geology, which is only summarised below.

The geology of the area is shown on the Geological Map Sheet No. 37 W – Furnace (Geological Survey of Scotland, 2008) and also on Geology of Britain GeoIndex Viewer (BGS, 2020).

The bedrock geology of the proposed Development Site is dominated by formations mostly Pre-Cambrian in age (>540 Million years) that are part of the Dalradian Supergroup. Some of these formations are part of the Tyvallich Subgroup, made up of limestones and slates. Another formation in the area is the Loch Avich Grit Formation, consisting of Psammites and Pelites. The thickness of the Tyvallich Subgroup is in the range of 100-250 m in the area, the parent unit being the Argyll Group has a thickness of up to 9 km. To the south of the proposed Development Site there are younger units, in the form of an igneous dyke suite injected into the country rocks. This is the North Britain Siluro-Devonian Calc-Alkaline Dyke Suite formed approximately 398-423 million years ago in the Devonian and Silurian periods.

A fault runs approximately southwest to northeast through the southern edge of the proposed Development Site for approximately 11 km and terminates approximately 1 km north of Eredine, under Loch Awe.

The superficial geology in the area is limited, particularly in the areas of higher elevation. On the shore of Loch Awe, there is a mix of till, alluvium, and peat. The glacial history of the area has led to Hummocky Glacial Deposits, made up of diamicton, sand and gravel and formed up to 3 million years ago.

11.2.4 Hydrogeology

The bedrock hydrogeological information is relatively limited but seems to show the Pre-Cambrian rocks to be in a region underlain by impermeable rocks, generally without groundwater except at shallow depths (BGS, 1988). MacDonald (2005) lists the bedrock aquifer productivity of Dalradian rocks as being in the low category (in some cases very low category). For these categories, low is defined as 0.1 to 1 l/s and very low as <0.1 l/s. These quantities would only be suitable for supplying private resources and even then resources may tend to be variable. The presence of fracture zones in a locality may enhance the yields from any wells, but locating these zones can be difficult. Although hydraulic property information is very difficult to obtain in these areas, it is likely that the permeabilities of the bedrock will be low.

The superficial deposits which are present in the area are likely to contain groundwater at shallow depths. The Phase 1 Ecology survey (reported in chapter 6 Terrestrial Ecology) has identified large areas of blanket bog in the higher elevation areas around Lochan Airigh of the proposed Development Site. The presence of shallow groundwater would support the view of bedrock in the area being generally impermeable.

The whole area is within the Oban and Kintyre groundwater body (ID: 150698) designated under the River Basin Management Plan (RBMP) for Scotland (Ref. SEPA Water Classification Hub). This groundwater body covers an area of approximately 2,663 km² and is currently classed as 'good'.

11.2.5 Water Supplies

Groundwater Drinking Water Protected Areas are areas that have been defined by SEPA in line with the requirements of The Water Environment (Drinking Water Protected Areas) (Scotland) Order 2013 to fulfil the requirements of the WFD. These are areas where land use is causing pollution of the raw water and action is being undertaken to reduce this risk to reduce the need for extra treatment of raw water. The entire study area (excluding Loch Fyne) is within the Oban and Kintyre Groundwater Drinking Water Protected Area.

At the time of the assessment no information on licenced water abstractions was available. The location and data on licenced abstractions has been requested from SEPA.

According to SEPA's Scottish Environment Map only the town of Inveraray is included within a Water Regulation Zone (i.e. an area where Scottish Water provides a domestic drinking water supply). This implies that the isolated small properties found elsewhere within the study area are served by private water supplies (PWS). They are also likely to have non-public sewer domestic sewerage systems, that are common in rural areas. A full record of all PWS has yet to be requested from ABC.

11.2.6 Ecological Potential of Water Bodies

It is important that any water dependent nature conservation sites and protected species are identified for each water body receptor so that they may be taken into account by the impact assessment (i.e. a water body that has a higher conservation status will be considered a more important and as a potentially sensitive receptor).

Table 6.1 in chapter 6 Terrestrial Ecology and chapter 8 Marine Ecology describes the statutory nature conservation sites within the study area. However, there are no chapter specific relevant protected nature conservation areas in the area of the Development Site or Study Area other than that applies to the Upper Loch Fyne and Loch Goil NCMPA (see Section 11.2.2.2).

Note that the ecological assessment of all impacts on nature conservation sites is discussed in chapter 6 Terrestrial Ecology and chapter 7 Aquatic Ecology. They are only referenced here in the context of determining the importance and sensitivity of water bodies to pollution risks and physical changes to morphology that may occur as a consequence of the proposed Development.

Chapter 6 Terrestrial Ecology, chapter 7 Aquatic Ecology and chapter 8 Marine Ecology set out the scope of protected species surveys, including those relevant to waterbodies within the study area. The results of these surveys will inform the important setting of waterbodies for the full impact assessment.

11.3 Methodology

11.3.1 Water Environment Impact Assessment

The spatial extent of the studies to inform the EIA will cover the Development Site and nearby waterbodies which could potentially be impacted by it (such as Lochan Airigh, Loch Awe, Loch Fyne, Lochan Breac-liath, Lochan Dubh, Lochan Romach, Allt Beochlich, and other watercourses along the access routes or close to proposed temporary construction compounds).

Further desk study will be undertaken of readily available data from online sources providing information on local climate, topography, soils, hydrogeology, and land use. An online literature search will also be undertaken to identify relevant studies relating to the hydrology, water quality, and aquatic ecology of the potentially affected waterbodies. In addition, a data request will be made to the SEPA and SNH for any relevant hydrological, water quality, water resource and aquatic ecology data that they hold, and to ABC for information on any known local PWS. Further data requests and consultations will be made to other third parties where necessary (e.g. Scottish Water).

Following a review of available information and data, a gap analysis will be undertaken to determine the need for further surveys. These could include a programme of water quality and level monitoring (surface and groundwater), aquatic ecological and hydromorphological surveys. The scope of surveys will be developed in consultation with regulators and relevant third parties. However, at this stage it is assumed that adequate data would be available from the desk study and a site walkover survey of the main development sites and along access routes. A hydromorphological survey would be carried out focusing on those watercourses and waterbodies that may be directly impacted by the proposed Development (e.g. Allt Beochlich). This will be determined following design freeze and scoping consultation. The requirement for further surveys, field work and assessment would be determined following completion of the baseline desk study, walkover survey, and scoping consultation. The scope of any more detailed surveys and assessment would be agreed in advance with statutory consultees, as required.

The identification of impacts will be undertaken using the source-pathway-receptor model. This model identifies the potential sources or 'causes' of impact as well as the receptors (e.g. surface water resources) that could potentially be affected. The presence of a potential impact, source and a potential receptor does not always infer an impact; there needs to be an impact pathway or 'mechanism' via which the source can have an impact on the receptor. The assessment will be primarily qualitative and informed by existing data and information.

The importance of a water body will be determined by applying the criteria in Table 11.2 below. The magnitude of effect will be determined based on the criteria in chapter 3 Scope of the Environmental Impact Assessment, Table 3.4 taking into account the likelihood of the effect occurring. The likelihood of an effect occurring is based on a scale of certain, likely or unlikely. Finally, the significance of effects will be determined using the matrix presented in Table 3.5. Only those effects moderate or greater are considered significant.

Table 11.2 Receptor Importance

Importance	General criteria	Category		
		Groundwater	Surface Water	Hydromorphology
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.	<p>Source Protection Zone (SPZ) 1 within a Principal Aquifer.</p> <p>Feature of international importance, for example a SAC.</p> <p>Alternatively, groundwater is critical to designated sites of nature conservation.</p> <p>Water abstraction¹ >1000 m³/day.</p>	<p>Q95² ≥ 1.0 metres cubed per second (m³/s).</p> <p>Receptors to flood risk: essential infrastructure or highly vulnerable development.</p> <p>Watercourse having a WFD classification shown in a RBMP. Site protected/ designated under EC or UK legislation (SAC, SPA, SSSI, Ramsar site, salmonid water)/ Species protected by EC legislation.</p>	Unmodified, near to or pristine conditions, with well-developed and diverse geomorphic forms and processes characteristic of river and lake type
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance.	<p>Principal Aquifer (not within SPZ 1).</p> <p>Sensitive habitats of national importance.</p> <p>Groundwater is a locally valuable resource because of its moderate quality and / or yield, or is known to be locally exploited for water supply.</p> <p>GWDTE with high dependency on groundwater.</p> <p>Water abstraction: 1000-500 m³/day.</p>	<p>Q95 < 1.0 m³/s.</p> <p>Watercourse having a WFD classification shown in a RBMP. Species protected under EC or UK legislation</p>	<p>Conforms closely to natural, unaltered state and will often exhibit well-developed and diverse geomorphic forms and processes characteristic of river and lake type.</p> <p>Deviates from natural conditions due to direct and/or indirect channel, floodplain, bank modifications and/or catchment development pressures.</p>
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value or is of regional importance.	<p>Secondary Aquifer.</p> <p>Groundwater of limited value because its quality does not allow potable or other quality sensitive uses.</p> <p>Exploitation of local groundwater is not extensive and / or local areas of nature conservation known to be sensitive to groundwater impacts.</p> <p>GWDTEs with moderate dependency on groundwater.</p> <p>Water abstraction: 50-499 m³/day.</p>	Watercourses not having a WFD classification shown in a RBMP	Shows signs of previous alteration and / or minor flow / water level regulation but still retains some natural features, or may be recovering towards conditions indicative of the higher category.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.	<p>Unproductive Strata - rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.</p> <p>Changes to groundwater not expected to impact on local ecology.</p> <p>Limited economic or social uses.</p> <p>GWDTE with minimal dependency on groundwater i.e. fed by</p>	Watercourses not having a WFD classification shown in a RBMP.	<p>Substantially modified by past land use, previous engineering works or flow / water level regulation.</p> <p>Watercourses likely to possess an artificial cross-section (e.g. trapezoidal) and will probably be deficient in bedforms and bankside vegetation.</p> <p>Watercourses may also be realigned or channelised with hard bank protection, or culverted and enclosed. May be significantly impounded or abstracted</p>

¹ Water abstraction – in addition a higher value may be placed on a source where it is the only available practical water supply

² Q95 is the flow equalled or exceeded 95% of the time

Importance	General criteria	Category		
		Groundwater	Surface Water	Hydromorphology
		rain and natural surface drainage. Water abstraction: <50 m ³ /day.		for water resources use. Could be impacted by navigation, with associated high degree of flow regulation and bank protection, and probable strategic need for maintenance dredging. Artificial and minor drains and ditches will fall into this category.

Note 1: Professional judgement is applied when assigning an importance category to all water features. The WFD status of a watercourse is not an overriding factor and in many instances it may be appropriate to upgrade a watercourse which is currently at poor or moderate status to a category of higher importance to reflect its overall value in terms of other attributes and WFD targets for the watercourse. Likewise, a watercourse may be below Good Ecological Status, this does not mean that a poorer quality discharge can be emitted.

Note 2: Based on the water body 'Reach Conservation Status' presently being adopted for HS2 (and developed originally by Atkins) (and based on Geomorphological approaches to river management. Project record W5A/i661/1 (Environment Agency, 1998b) and River Geomorphology: a practical guide (Environment Agency, 1998a).

Adapted from LA113 (UK Highways Agencies, 2020)

11.3.2 Water Framework Directive Assessment

The proposed Development must not cause further deterioration of any relevant WFD parameter (i.e. the reduction in class of any parameter or prevent the improvement) to meet future WFD objectives. This also means that any discharges to the non-WFD waterbodies must not impact on the WFD waterbodies further downstream.

The WFD assessment will be undertaken in two stages: An initial screening and scoping assessment would be undertaken to identify components of the proposed Development and impacts that could potentially lead to non-compliance with WFD objectives for relevant waterbodies. This would be based on gathering and evaluating existing data and determining qualitatively the potential for non-compliance with WFD objectives for the various designated waterbodies within the study area. The assessment will consider biological, physico-chemical (water quality) and hydromorphological (physical) elements, for surface water and groundwater bodies at the site of interest, and for connecting waterbodies. It will also consider the objectives of any protected areas and mitigation measures proposed by SEPA to improve water body status.

Depending on the outcome of the screening and scoping study, and after consultation with SEPA, a 'detailed' assessment may be required and then undertaken. This will focus on the critical issues of concern to SEPA and the scope would be agreed with them in advance.

11.4 Likely Significant Effects

11.4.1 Construction

During the construction phase there is the potential for adverse effects on the water environment (including any PWS and other uses of water) from contamination and high levels of fine sediment in runoff (including the potential wash out of fine sediment from temporary spoil heaps, embankments, and access tracks), chemical spillages, and physical changes to waterbodies as a consequence of:

- Creation of the headpond at Lochan Airigh, which will need dewatered during construction, and will result in the loss of the lochan once the impoundment is flooded;
- The construction and operation of temporary and permanent compounds, particularly those that are close to waterbodies including alongside Loch Awe, Lochan Airigh, (risks include construction site runoff, storage and use of fuel and chemicals, water from welfare facilities, concrete wash out and other waste facilities);
- Permanent or temporary diversion of watercourses;
- Temporary dewatering and longer-term abstraction operations (latter to be addressed in chapter 12 Flood Risk and Water Resources);
- Works directly within water bodies, including construction of the dam structure, inlet / outlet structures, permanent and temporary crossings and the new marine facility at Loch Fyne;

- Excavation and crushing of rock which can lead to runoff containing excessive quantities of fine sediment and potentially elevated levels of certain chemical substances;
- Construction of temporary access tracks which cross watercourses and may require upgrades to existing structures (e.g. culverts) or installation of new structures;
- The excavation and dewatering of borrow pits;
- Earthworks, embankment construction and the creation of spoil heaps;
- Other general construction activities (e.g. stripping of vegetation, movement of plant and possible batching of concrete etc.); and
- Subsurface construction including: power cavern, surge shaft, tailrace tunnel, headrace tunnel, tunnel portals.

Without appropriate mitigation, significant residual effects could adversely affect the natural attributes of water bodies, WFD status, and socio-economic uses of waterbodies (e.g. commercial fisheries, water sports / recreation activities, and any potential surface water PWS which are yet to be confirmed). Socio-economic impacts will be addressed within chapter 16 Socio-economics, Recreation and Tourism.

In terms of groundwater resources (quantity), no significant effects are expected from the construction phase. Any dewatering around the initial construction of the entrance portals for the tunnel to the power cavern will be temporary in nature until either some sheet piling or secant pile walls are constructed. By locating the construction / access tunnels away from any sensitive receptors as much as possible given the extent of peat in the area, this should avoid any significant effects.

11.4.2 Operation

During operation of the proposed Development there is the potential for direct impacts on Loch Awe from operational discharges, although there is a significant buffering potential due to the large size and volume of the waterbody. This may include local changes to water quality, water temperature and sensitivity to algal blooms, and the potential to scour the loch bed in the vicinity of the outlet, under both normal operation, routine maintenance, and emergency situations (i.e. in the unlikely event that the water level in the headpond needs to be drawn down quickly).

During operation there would be the loss of Lochan Airigh, as the construction of the embankment will flood the pond, resulting in a loss of the hydrological, hydromorphological, water quality and ecological character of the lochan. Alteration of flows and sediment dynamics would also impact Allt Beochlich. The altered flow regime has the potential to impact hydromorphology, water quality, water temperature and hence ecological habitats and composition. Impacts on ecological habitats will be assessed within chapter 6 Terrestrial Ecology and chapter 7 Aquatic Ecology, with impacts on effects on other hydro schemes within chapter 12 Flood Risk and Water Resources. Impacts in relation to changes in water flows and levels and associated effects on other relevant hydro schemes will be assessed within chapter 12 Flood Risk and Water Resources.

Other permanent physical changes include new inlet /outlet structures, a spillway and tailrace at Loch Awe, creation of a new marine facility at Loch Fyne (south of Inveraray), upgrades to existing watercourse crossings for permanent site access, creation of new watercourse crossings for new access tracks.

Increased areas of hardstanding associated with access roads and compounds have the potential to increase runoff to surface waterbodies and may include pollutants such as dissolved metals and hydrocarbons, as well as particulates, which may need to be treated using sustainable drainage measures, depending on the level of risk (which will largely depend on the volume of traffic).

From the groundwater perspective, the fact that the site is underlain by generally impermeable rocks, with limited groundwater present except at shallow depths should mean that significant groundwater effects are unlikely during the operational phase, and this is therefore scoped out for this phase.

11.4.3 Decommissioning

The potential impacts that may occur during decommissioning would be similar to those described above from construction, plus the need to fully dewater the headpond. Decommissioning of the Development Site should seek to restore the Development Site to its pre-development form, restoring waterbodies and features. A pre-decommissioning survey will be required with the relevant requirements included within the decommissioning plan. As such, it is proposed to scope the decommissioning phase out of the EIAR assessment.

11.5 Likely Mitigation Measures

11.5.1 Construction

The need for mitigation measures to avoid, minimise and reduce potential adverse effects will be developed iteratively with the design and alongside further baseline data collection, surveys, impact assessment and consultation.

This will include the appropriate siting of new infrastructure to avoid water bodies where possible, the position, depth and design of temporary and permanent inlet / outlet structures, the design of watercourse crossings, and surface water management. Sustainable drainage systems will be included to mitigate for increased runoff (including pollutants) from areas of hardstanding.

Additional regulatory processes will apply to the proposed Development. Temporary and permanent works affecting watercourses will require a CAR Licence from SEPA under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). Temporary and permanent abstractions and discharges will also require an abstraction licence and CAR licence from SEPA. Through consultation with SEPA, appropriate treatment measures for construction site runoff, conditions on operational discharges, limits and conditions on abstractions will be determined.

Construction works will be implemented in accordance with a CEMP that will describe the management arrangements for the site and the principles of mitigation that will be adopted. It is envisaged that the CEMP will be supported by a number of management plans prepared with reference to best practice guidance and including:

- **Water Management Plan** – describing the construction phase mitigation measures that will be implemented to protect the surface water environment and any pre-, during and post-construction monitoring requirements. This plan will also describe specific measures for the management of fine sediment in construction site runoff. It is expected that a range of methods will be used including construction processes, timing of works, the use of coffer dams, silt curtains, silt fences, lamella clarifiers, silt dewatering tubes / bags, and settlement lagoons etc.).
- **Emergency Response Management Plan** – describing the approach to a pollution incident to minimise adverse environmental effects.

The groundwater mitigation methods for dealing with an adverse construction impacts could include the following measures to reduce any impact on PWS (if present) which will be secured via the Water Management Plan for construction:

- The provision of a temporary bowser with drinking water;
- Remediation of the borehole supply (either cleaning or deepening the borehole);
- The provision of an alternative water supply if serious long-term derogation were to take place; and
- Monitoring of the PWS.

•

11.5.2 Operation

It is proposed that the water quality within the headpond is monitored on a routine basis including observations, in-situ measurements using an installed or hand-held multiparameter instrument, and regular water samples for laboratory analysis. The purpose of the monitoring is to build up an understanding of how water quality changes whilst stored in the headpond in comparison to the background water quality in Loch Awe.

These measures are in addition to the operational requirements and daily observations which will be undertaken in the headpond and tailpond inlet / outlet, and the introduction of the screens at both inlet / outlets to prevent debris entrainment. The design of the headpond access is such that a full observation of the headpond waterbody can be made from all angles.

This preventative measure will support decisions about operation to ensure that unforeseen water quality impacts on Loch Awe are avoided. If water quality monitoring results remain stable and operation of the proposed Development is consistent it may be possible to reduce or even stop routine water quality monitoring.

11.6 Summary and Conclusions

The proposed Development has the potential to have direct and indirect water quality and hydromorphological effects during the construction operation and decommissioning phases.

During construction there is the risk of pollution of waterbodies, particularly for works within or close to waterbodies. The impermeable nature of the bedrock in the Balliemanoach area would suggest little groundwater at depth. Similar effects are predicted to occur during future decommissioning of the Development Site as described for construction works, although restoration of waterbodies would be a beneficial outcome

Any groundwater abstractions by PWS are likely to be quite shallow, with the number and location of any PWS to be confirmed via future consultation with stakeholders. Any impacts from the proposed Development on PWS would be mitigated by measures such as provision of temporary bowsers, modifying boreholes or providing alternative supplies.

During operation there would also be direct hydrological, hydromorphological and water quality impacts to surface waterbodies. Construction of the headpond embankment would result in the loss of Lochan Airigh and a various channel reaches within the impoundment footprint. Other new structures are proposed which would affect the hydromorphology of a number of waterbodies. There is also the potential for direct impacts on Loch Awe from operational discharges, although at this stage it is considered that there is likely to be a significant buffering potential due to the large size and volume of the loch relative to the headpond and volumes of water to be transferred under normal operation

Overall, a water environment impact assessment will be included in the EIAR covering water quality (surface water and groundwater) and hydromorphology. This will include details of proposed mitigation or environmental enhancement measures, stating the residual effects. At this stage, further desk study and potentially site surveys are required to gather additional data in order to evaluate the magnitude and therefore significance of potential effects.

The impact assessment will be supported by a WFD assessment, which will consider the potential for deterioration or prevention of improvement in the status of WFD waterbodies that are potentially affected by the proposed Development.

11.7 References

Argyll and Bute Council. (2009). Integrated Coastal Zone Management Plan.

Bing Maps. [Online]. Available: <https://www.bing.com/maps/> [Accessed October 2021].

BGS. (2020). Geology of Britain Viewer, Surface Geology, Bedrock and Superficial Maps. [Online]. Available: <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> [Accessed September 2021].

BGS. (1988). Hydrogeological Map of Scotland, NERC.

Google Maps website. [Online] Available: <https://www.google.co.uk/maps> [Accessed October 2021].

Geological Survey of Scotland (1888). 1:50,000 Map – Sheet No. 37 W – Furnace.

Navionics. Chart View. [Online]. Available: (<https://webapp.navionics.com>) [Accessed March 2020].

SEPA Water Classification Hub. [Online] Available: <https://www.sepa.org.uk/data-visualisation/water-classification-hub/> [Accessed October 2021].

SEPA. online Scottish Environment Map. [Online] Available: (<https://map.environment.gov.scot/sewebmap>) [Accessed September 2021].

NatureScot Online designations map. (<https://sitelink.nature.scot/map>) [Accessed March 2020].

MacDonald, A et. Al. (2005). An overview of groundwater in Scotland. QJEG Vol. 41 (1), pp 3-11.

Environment Agency. (1998a). River Geomorphology: a practical guide.

Environment Agency. (1998b). Geomorphological approaches to river management. Project record W5A/i661/1, prepared by Thorne, C., Downs, P.W., Newson, M.D., Clarke, M.J., and Sear, D.A., EA, Bristol.

Balliemanoch Pumped Storage Hydro

Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended).

Water Framework Directive (2000/60/EC).

12. Flood Risk and Water Resources

12.1 Introduction

This chapter has been informed by a desk study and considers flood risk and the impact on the hydrological parameters and behaviour of catchments and waterbodies potentially impacted by the proposed Development. It describes the baseline sources, the surveys and assessment that will be undertaken as part of the EIA and the potential for significant environmental effects and the scope for mitigation.

This chapter is supported by Figure 12.1 Loch Awe Catchments.

12.1.1 Guidance

The following regulations and guidance docs are pertinent to the Flood Risk and Water Resources chapter, including;

- Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended).
- Water Framework Directive (2000/60/EC).
- Flood Risk Management (Scotland) Act 2009 and the Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Regulations 2010
- Reservoirs (Scotland) Act 2011
- Scottish Planning Policy (SPP) 2014
- PAN 511 – Planning, Environmental Protection and Regulation (Revised 2006)
- PAN 61 – Planning and Sustainable Urban Drainage Systems (2001)
- PAN 79 – Water and Drainage (2006)
- SEPA Flood Risk Standing Advice for Planning Authorities and Developers (2020)
- SEPA Policy 41 - Planning Authority Protocol (2016)
- SEPA Engineering activities in the water environment: Good practice guide – River Crossings
- SEPA Technical Flood Risk Guidance for Stakeholders (Version 12, 2019)
- Flood Risk & Drainage Impact, Supplementary Guidance, The Highland Council (2013)
- Flood Risk and Flood Risk Assessments, Supplementary Guidance, Perth & Kinross Council (2021)
- SuDS Manual (C753), CIRIA (2015)

This chapter has been informed by a desk study and considers flood risk and the impact on the hydrological parameters and behaviour of impacted catchments and waterbodies from potentially impacted by the proposed Development. It describes the baseline flooding sources, describes the surveys and assessment that will be undertaken as part of the EIA and then setting out the potential for significant environmental effects and the scope for mitigation.

12.2 Baseline Conditions

Due to the nature of the proposed Development and the size of the proposed impoundment within the embankment, the study area for the Flood Risk Assessment (FRA) is defined as the Development Site and the downstream flood receptors. The following section describes the results of an initial desktop baseline study.

12.2.1 Watercourses Within the Development Site Boundary

The Development Site is located on the eastern shore of Loch Awe. The Development Site includes the Allt Beochlich stream along its full length to the point at which it discharges to Loch Awe at NN 00384 15284 (44 m AOD).

The Development is located within the catchment of the Allt Beochlich. This catchment consists of several small streams that flow generally in a westerly direction from the lower slopes of Cruach na Gearr-choise and northern slopes of Cruach Mhor. This includes several small waterbodies including Lochan Airigh, Lochan Dhub, Lochan Dubh and its principal tributary the Buinne Dhubh.

Two access tracks are proposed to the headpond and the generating station works. Further access works are proposed near Inveraray to allow access to proposed quay facility and to avoid existing constraints in the town.

The access tracks to the headpond and the generating station works will cross a number of watercourses including Archan River, Keppochan River and a tributary of Allt na Cuile Riabhaiche.

The access routes at Inveraray will cross the River Array and a number of small watercourses to the south west of the town.

A site visit will be undertaken during the EIA to gather further baseline information on all waterbodies in the study area.

12.2.1.1 Loch Awe

Loch Awe is a loch waterbody within the River Awe catchment of the Scotland River Basin District (RBD) (ID: 10085). The loch covers an area of 38 km² making it the third largest freshwater loch in Scotland. At approximately 41 km in length, it is also the longest freshwater loch in Scotland, on a southwest to northeast axis typically 1 km wide, with Balliemanoch located approximately in the middle on the southern bank.

Maximum water depths in the centre of the loch are around 90 m south of Eredine, up to 60 m off Balliemanoch, before shoaling to less than 22 m but more typically less than 10 m around Black Islands and Inishail. Further north, they deepen again to around 70 m before shallowing on approach to the overflow to the River Awe. Given the size, depth and bathymetry of Loch Awe, it is expected that water chemistry is significantly influenced by thermal stratification, which is most likely to be of a monomictic character (i.e mixing fully from late autumn and being thermally stratified during the warmer summer months).

The waterbody is designated under the WFD as a heavily modified waterbody due to morphological (impoundment) pressures for hydropower power generation, which cannot be addressed without a significant impact on water storage for hydroelectricity generation.

There is an existing small-scale hydro scheme in operation within the Development Site known as Beochlich. The Beochlich hydropower project was constructed in 1998 and has an installed capacity of 1 MW. There are three additional existing hydro-electric power schemes operating on Loch Awe and the surrounding area. SSE plc operate the 25 MW Inverawe Power Station, which is a run of river hydropower scheme, which abstracts water from the River Awe Barrage at the Pass of Brander. The scheme at Cruachan is a 440 MW pumped storage scheme operated by Scottish Power Drax Group plc. The third scheme is Nant, which is a 15 MW hydropower scheme that uses Lock Nant as the headpond and discharges into Loch Awe at the River Nant.

A review of online aerial photography and SEPA's Scotland's Aquaculture website has identified two commercial fish farms. The first is approximately 10 km southwest of the proposed inlet / outlet structure of the proposed Development into Loch Awe and is Braevallich Fish Farm, operated by Dawnfresh Seafoods Ltd under CAR licence CAR/L/100232. The second is located at the mouth of the River Awe, on the opposite bank of the Falls of Cruachan, and is Tervine Farm operated by Dawnfresh Farming Ltd (CAR/L/100236). Both farms are for rainbow trout.

12.2.1.2 Loch Fyne

Loch Fyne is a sea loch off the Firth of Clyde and forms part of the coast of the Cowal peninsula. Loch Fyne is both the longest and the deepest of Scotland's sea lochs (Davies 1989), with a length of approximately 70 km and a maximum depth of around 185 m (Edwards & Sharples 1985, Dipper & Beaver 1999). Water depths are in excess of 130 m off Inveraray in the upper loch, becoming shallower (i.e. < 50 m) in the lower loch, before deepening again at the loch widens south of Castleton.

12.2.1.3 Allt Beochlich

The Allt Beochlich watercourse is designated under the WFD (ID: 10275) as a river within the River Awe catchment of the Scotland RBD. The river flows from Lochan Dubh in a westerly direction for approximately 7.7 km towards Loch Awe, where it discharges.

12.2.1.4 Allt Blarghour

The Allt Blarghour is a river designated under the WFD (ID: 10274) as a river within the River Awe catchment of the Scotland RBD. The river flows from Craig Dhudh in a westerly direction for approximately 8.5 km towards Loch Awe, where it discharges. The overall status of the waterbody is 'moderate', due to the water flows at levels, water quality is 'good', and physical conditions, access for fish and freedom from invasive species is 'high'.

12.2.1.5 River Aray and Erralich Water

The River Aray is designated under the WFD (ID: 10224) as a river within the Loch Fyne Coastal catchment of the Scotland RBD. The river flows from Craig nan Sassanach in a south-westerly easterly direction for approximately 13.4 km to Loch Fyne.

Erralich Water is a tributary of the River Aray, and is crossed by the proposed southern access route. Erralich Water is designated under the WFD (ID: 10225) as a river within the Loch Fyne Coastal catchment of the Scotland RBD. The river flows from Beinn Bhreac in an easterly direction for approximately 8.4 km to the River Aray.

12.3 Methodology

The spatial extent of the studies to inform the EIA will cover the Development Site, as well as nearby watercourses which could potentially be impacted by the Development. This will include desk studies to obtain and evaluate readily available data and information and a site visit.

Further desk study will be undertaken to determine the impact on water resources and flood flows of the proposed Development as a result of alterations to the contributing areas feeding the watercourses and waterbodies, and the variation in level of Loch Awe as a result of operation of the Development.

12.3.1 Water Resources Assessment

The impact on water resources from the isolation of the upper parts of Allt Beochlich catchment from its natural catchment will be determined by desk study to estimate the pre and post development flow duration curves at the various locations down the watercourse and on the overall inflow into Loch Awe.

To determine the impact on flooding and water resources at Loch Awe through the generating cycle, two levels of assessment are proposed, based on the availability of data. In the first instance, a generic assessment on the likely variation in water levels in Loch Awe will be made, based on the pumped and generating volumes and surface area of the lochs. In the event that the outcomes are found to be significant, further modelling of the impact will be required or mitigation measures put in place to reduce the impact.

Further modelling would involve behaviour analysis of Loch Awe requiring a long period of historic records (daily or sub-daily) comprising loch levels and details of outflows from Loch Awe. River Awe Barrage overflow details would also be required in order to estimate flow over the spillway, in order to confirm the spatial extent of any impact. This data is not in the public domain but is likely to be held by SSE. If made available by SSE to the Applicant, this would allow the historic behaviour of Loch Awe and downstream watercourses and waterbodies to be compared with the post development scenario over the same historic period. An assessment could then be made of the impact of the Development on both water resources, flood risk, and generation at Inverawe Power Station, and development of operational rules to mitigate impact. Discussions are ongoing with the water users on the data that is required to carry out the water resource assessment. Should any data that is required for the assessment be unavailable, SEPA will be consulted about alternative methodologies for carrying out the assessment.

Cruachan Pump Storage hydro-electric scheme abstracts and discharges into Loch Awe. The generating cycle between Loch Awe and Cruachan Reservoir will impact on the behaviour of water levels in Loch Awe. Historic generating information will be required to build a full picture of historic behaviour of Loch Awe. This data is not in the public domain, but is likely to be held by Scottish Power Drax Group plc. The Cruachan Reservoir direct catchment is isolated from the Loch Awe catchment. The extent of the catchment can be seen on *Figure 12.1 Loch Awe Catchments*.

In the event this data is not made available, in the absence of data in the public domain, the Applicant will engage with SEPA to agree on an appropriate assessment methodology.

Loch Awe is fed by a number of watercourses. A number of these watercourses are gauged by SEPA. Long term historic inflows into Loch Awe will be generated based on gauged data with these sites being used as donners sites for the wider catchment.. SEPA operate 6 gauging stations with the Loch Awe catchment. These are summarised in Table 12.1 below.

Table 12.1 SEPA Gauging Station in Loch Awe Catchment

Gauge Number	Gauge Name	Operating period
8904	Strae at Glen Strae	01/1977 - Current
89003	Orchy at Glen Orchy	01/1977 - Current
89008	Eas Daimh at Eas Daimh	01/1981 - Current
89005	Lochy at Inverlochy	01/1978 - Current
89006	Avich at Barnaline Lodge	01/1980 - Current
89007	Abhainn a' Bhealaich at Braevallich	01/1981 - Current

12.3.2 Flood Risk Assessment

A further desk study will be undertaken to determine the impact on flood flows from the Development as a result of alterations to the contributing areas feeding the watercourses and waterbodies. This will include an assessment of the flood flows both local to the Development and at potential major flood receptors. The impact on the peak flood flows will be assessed and determined whether this results in a material change to flood risk at these receptors.

In addition to natural runoff during flood events an assessment of the discharge of water through the generation cycle into Loch Awe during a flood event will be undertaken to assess the impact on flood flows leaving Loch Awe. In the event that the outcomes are found to be significant, further hydraulic modelling of the impact may be required or mitigation measures put in place to reduce the impact.

In the event of a breach of the embankment associated with the headpond, a significant area would be at risk of flooding. The likelihood of such an eventuality is however extremely low and the headpond will be designed, constructed, operated, and managed in line with the guidance set out under the Reservoirs Act (Scotland) 2011. On the basis of the extremely high standard of protection provided by the Reservoirs Act (Scotland) 2011 no further analysis is proposed to flood risk associated with a breach of the reservoir.

A flood risk assessment (FRA) will be included in the EIA Report. This will be supported by a detailed FRA, the scope of which will be in accordance with SEPA's Technical Flood Risk Guidance for Stakeholders (2019) and will comply with the relevant policies by ABC.

The identification of impacts will be undertaken using the source-pathway-receptor model. This model identifies the potential sources or 'causes' of impact as well as the receptors that could potentially be affected. The presence of a potential impact, source and a potential receptor does not always infer an impact; there needs to be an impact pathway or 'mechanism' via which the source can have an impact on the receptor.

The significance of an effect will be assessed with reference to best practice guidance. The assessment will firstly consider how important or how sensitive the receptor is, and secondly and independently, the likely magnitude or extent of the impact on the receptor. By combining these two elements, the significance of an effect can be derived. The assessment will take account of embedded mitigation (that incorporated within the design or delivered via management plans). Where adverse effects remain, further mitigation measures will be proposed to minimise, reduce, or offset them in that hierarchy.

Information regarding the current arrangement at the River Awe Barrage and feeding catchments will be required to undertake such studies. This will provide data to assess the pass forward flow and flood lift within Loch Awe.

For all new watercourse crossings, a hydrological and hydraulic assessment will be undertaken to size any proposed crossing in line with SEPA latest guidance for watercourse crossing.

12.3.3 Hydrological Assessment

An assessment of low flows from the contributing areas will be made based on current and future contributing areas. This will be undertaken for both the area local to the Development and at the main receiving water bodies. In the event that the impacts are found to be significant a further assessment will be undertaken including the impact on water levels in Loch Awe.

An assessment on the impact of the Development on the existing downstream abstraction arrangements within the catchment will be undertaken.

12.3.4 Headpond Design

An assessment of potential flood lift within the headpond will be undertaken together with wave carry over. The findings will feed into the headpond design and the required freeboard allowance provided between top water level and top of the embankment.

12.4 Assessment Methods and Guidance

The assessment method that will be followed is described in chapter 3.4.1: Approach to EIA and, where necessary, further refined below.

The assessment of the significance of individual impacts on the receiving environment will be based on criteria for the sensitivity or importance of the resources as described in Tables 12.2 and 12.3 below.

Table 12.2: Sensitivity

Sensitivity	Flood Risk and Water Resources
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character or functionality, is of very high environmental value, or of international importance. Flood risk - essential infrastructure or highly vulnerable development (e.g. nurseries)
High	The receptor has low ability to absorb change without fundamentally altering its present character or functionality, is of high environmental value, or of national importance. Flood risk - more vulnerable development (e.g. residential properties)
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character or functionality, has some environmental value or is of regional importance. Flood risk - less vulnerable development (e.g. offices)
Low	The receptor is tolerant of change without detriment to its character or functionality, is low environmental value, or local importance. Flood risk – water compatible development (e.g. essential transport infrastructure)
Negligible	The receptor is resistant to change and is of little environmental value (e.g. flood control infrastructure)

Source: Adapted from LA113 Revision 1 (UK Highways Agencies, 2020)

Table 12.3: Magnitude of Effect

Magnitude	Definition
Major Adverse	Increase in peak flood level (> 100mm) Major impact on licenced water resource available
Moderate Adverse	Increase in peak flood level (> 50mm) Moderate impact on licenced water resource available
Minor Adverse	Increase in peak flood level (> 10mm) Minor impact on licenced water resource available
Negligible	Negligible change to peak flood level (\leq +/- 10mm) No impact on licenced water resource available
Minor Beneficial	Creation of flood storage and decrease in peak flood level (> 10mm) Minor improvement in water resource available for licenced activities
Moderate beneficial	Creation of flood storage and decrease in peak flood level (> 50mm) Moderate improvement in water resource available
Major beneficial	Creation of flood storage and decrease in peak flood level (> 100mm) Major improvement in water resource available

Magnitude	Definition
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction

Source: Adapted from LA113 Revision 1 (UK Highways Agencies, 2020)

The significance of effects will be determined using the matrix presented in Table 3.5. Only those effects moderate or greater are considered significant.

12.5 Likely Significant Effects

12.5.1 Construction

During construction there is potential increase in flooding due to:

- Increased runoff due to increased area of hardstanding and compacted ground from site clearance, access tracks and compounds;
- Temporary water storage (in attenuation ponds and drainage systems); and
- Increased flows due to dewatering activities.

This has the potential to affect the Allt Beochlich watercourse and Loch Awe downstream, access routes and possibly potentially vulnerable areas (PVA), as defined by SEPA, PVA 1/34 Loch Awe and PVA 01/37 Inveraray.

12.5.2 Operation

The Development will result in the isolation of the headpond area from the local catchment. This will lead to a reduction in flow in the Allt Beochlich watercourse and Loch Awe downstream. A detailed assessment of the pre and post Development contributing areas and flows will be undertaken to determine this and flow duration curves will be compared.

The discharge of water from the headpond into Loch Awe during both normal operation and during flood events will result in a significant volume of additional water being discharged into Loch Awe, resulting in an increase in loch level. This will have an impact on the overflow discharge at River Awe Barrage into the River Awe downstream. A further assessment is required to determine the spatial extent of that impact and the consequence of such increases.

During periods of normal flows or drought, abstraction of water from Loch Awe to the headpond will reduce water levels in Loch Awe. As under such conditions there would be no flow over the spillway and flows in the downstream watercourse are entirely controlled by compensation flow release from River Awe Barrage, this will not impact flows in the downstream watercourse. However, it will reduce levels in Loch Awe, with potential consequences for ecology, amenity and hydro generation at Inverawe Power Station. Further study is required to assess the significance of these consequences and develop a management regime to minimise them.

During periods of extreme rainfall, runoff from any small remaining natural catchment of the headpond and direct rainfall on its surface will result in an increase in water level and potential overtopping of the embankment. An appropriately sized spill arrangement, and conveyance route to the receiving water body will be provided together with an appropriate freeboard to prevent overtopping from both still water level and wave carryover. A further review will be undertaken based on other possible scenarios such as over pumping from Loch Awe.

In the event of a breach of the embankment associated with the headpond, a significant area would be at risk of flooding. The likelihood of such an eventuality is however extremely low and the headpond will be designed, constructed, operated, and managed in line with the guidance set out under the Reservoirs Act (Scotland) 2011. On the basis of the extremely high standard of protection provided by the Reservoirs Act (Scotland) 2011 no further analysis is proposed to flood risk associated with a breach of the reservoir.

12.5.3 Decommissioning

Decommissioning is explained in Section 2.6.5 of chapter 2. It is assumed that the decommissioning of the Development will require similar activities to construction, potentially with additional crushing of some construction materials and removal of drainage pipework containing residual water and sediment.

The headpond will be drained by releasing water into Loch Awe in line with normal operational parameters. The headpond is a non-impounding reservoir and therefore loss of storage will not have an impact on flood risk downstream. Decommissioning is excluded from the assessment given the approximated operational lifetime of PSH is in the region of 80 years. A decision would be made in the future as to refurbish the PSH or to decommission the scheme. The refurbishment plan and if the latter a detailed decommissioning plan would be prepared as required as this would be subject to a separate planning application at the time.

12.6 Likely Mitigation Measures

12.6.1 Construction

Additional regulatory processes will apply to the development. Temporary and permanent works affecting watercourses will require a CAR Licence from SEPA under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). Temporary and permanent abstractions and discharges will also require an Abstraction Licence and CAR Licence from SEPA.

New or upgraded tracks adjacent to watercourses or lochs will be designed in such a way to ensure that they do not result in an elevation of the land within the functional floodplain as well as ensuring that they have minimal impact on natural drainage patterns.

Through consultation with SEPA and other relevant stakeholders, appropriate treatment measures for construction site runoff, conditions on operational discharges, limits and conditions on abstractions will be determined.

Construction and permanent site workers may be sensitive to flood risk and use of the site may be restricted during severe weather due to severe weather to reduce this risk.

12.6.2 Operation

The need for mitigation measures to avoid, minimise and reduce potential adverse effects will be developed iteratively with the design and alongside further baseline data collection, surveys, impact assessment and consultation. This will include the appropriate siting of new infrastructure to avoid water bodies where possible, the position, depth and design of temporary and permanent inlet / outlet structures, the design of watercourse crossings, and surface water management and spill containment for new sub-stations.

In the event that the impacts to existing downstream abstraction arrangements are found to be significant operational rules will be developed to minimise impact, assuming the required level and flow records can be made available by other hydroelectric operating companies in the Loch Awe catchment.

The headpond will be designed, constructed, operated, and managed in line with the guidance set out under the Reservoirs Act (Scotland) 2011.

Permanent works affecting watercourses will require a CAR Licence from SEPA under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). Permanent abstractions and discharges will also require an Abstraction Licence and CAR Licence from SEPA.

In accordance with CAR Regulations, suitable compensation flow from the headpond eastwards into Allt Beochlich will be determined to mitigate the absence of natural runoff from Allt Beochlich.

Through iterative design and the development of robust management and monitoring strategies the potential for significant increase in flood risk and impact on water resources will be avoided, minimised, and reduced.

12.6.3 Decommissioning

Works affecting watercourses will require a CAR Licence from SEPA under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). Temporary abstractions and discharges will also require an Abstraction Licence and CAR Licence from SEPA.

Decommissioning of the headpond will comply with the Reservoirs (Scotland) Act 2011 to ensure mitigation of any temporary impacts.

12.7 Summary and Conclusions

The Development has the potential to have direct and indirect effects during both the construction, operation, and decommissioning phases on the hydrology of a number of different water bodies including small and large lochs, and watercourses. In particular, the lochs in the study area are important for a range of attributes including nature conservation and hydroelectricity generation. The proposed Development also sits within the upper catchment that feeds into identified Potentially Vulnerable Areas from a flood risk perspective.

A water quality and water resource impact assessment will be included in the EIA Report. This will be supported by an FRA and hydrological assessment.

12.8 References

EU Directive 2000/60/EC (Water Framework Directive (WFD), transposed into the Water Environment and Water Services Act (Scotland) 2003 ('the WEWS Act').

Flood Risk Management (Scotland) Act 2009 and the Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Regulations 2010 ('the Flood Risk Management Act').

Scottish Executive (2011). Reservoirs (Scotland) Act 2011.

Scottish Executive (2011). The Water Environment (Controlled Activities) (Scotland) Regulations 2011.

Scottish Environment Protection Agency (2009). *Interim Position Statement on Planning and Flooding*.

Scottish Environment Protection Agency (2018). *Flood Risk and Land Use Vulnerability Guidance*.

Scottish Environment Protection Agency. (2019). *Technical Flood Risk Guidance for Stakeholders*.

Scottish Environment Protection Agency. (2010). *Engineering in the water environment: good practice guide River crossings*

13. Cultural Heritage

13.1 Introduction

Cultural heritage in this context refers to the above and below-ground archaeological resource, built heritage, the historic landscape, and any other elements which may contribute to the historical and cultural heritage of the area. The aim of this chapter is to:

- Describe the cultural heritage assets within the study area and the surrounding vicinity;
- Identify the potential effects on cultural heritage assets that may arise as a result of the proposed Development; and
- Outline the methods and assessment to be undertaken for inclusion within the EIAR.

This chapter is supported by the following Figures:

- Figure 13.1 Heritage Designations within 1km Study Area
- Figure 13.2 Heritage Designations within 3km Study Area

13.1.1 Legislation

Legislation and planning documents and guidance of relevance to this assessment include the following:

- Historic Environment Scotland Act 2014;
- Ancient Monuments and Archaeological Areas Act 1979;
- Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997;
- Scottish Planning Policy 2014;
- Historic Environment Policy for Scotland 2019;
- Planning Advice Note 2/2011: Planning and Archaeology;
- Planning Advice Note 71: Conservation Area Management 2004;
- Argyll and Bute Local Development Plan, 2015; and
- Argyll and Bute Historic Environment Strategy 2015 - 2020 .

13.2 Baseline Conditions

As part of this scoping exercise, a high-level search has been undertaken with material collected from online sources for sites within the proposed Development Site boundary. These included:

- PastMap (www.pastmap.org.uk);
- Historic Environment Scotland website (www.historicenvironment.scot); and
- West of Scotland Archaeology Service (WoSAS) Historic Environment Record (www.wosas.net).

Asset number, where they are mentioned in the text, are the official asset numbers assigned by Historic Environment Scotland, for designated assets, and by the West of Scotland Archaeology Service for non-designated sites.

The main Development Site is located within rugged moorland on a high plateau used currently, and historically, for pastoral activities (*Figure 13.1 Heritage Designations within 1km Study Area*). The site is predominantly a mix of upland craggy outcrops with areas of deep and shallow peat as well as areas of blanket bog. The north east of the site is occupied by an area of sitka spruce plantation woodland.

A full search of the Historic Environment Record (HER) has not been undertaken as part of the scoping exercise. However, a review of online sources identified a number of assets linked with the management of the uplands, and specifically the seasonal use of the rough grazing with a number of shielings recorded. Historic Landscape Assessment (HLA) mapping (Historic Environment Scotland (HES)) records that the majority of the site comprises 20th century to present day moorland and rough grazing with 20th to 21st century woodland and forestry plantation to the northeast and southwest. A number of wind farm developments also occupy upland locations in the wider area.

The Marine Facility is located on the south side of the settlement of Inveraray which is located to the south east on the main Development Site (*Figure 13.1 Heritage Designations Within 1km Study Area*). The settlement of Inveraray forms part of the Registered Garden and Designed Landscape associated with Inveraray Castle a short distance to the north of the settlement, and large sections are also a conservation area. The two upgraded access tracks also pass through the Registered Garden and Designed Landscape, with one passing near Inveraray Castle to the north of the settlement, while the second runs through the edge of forestry land to the south and west of the town.

13.2.1 Designated Assets

There is one Scheduled Monument within the main Development Site. This is the site of Balliemeanoch chapel and burial ground (SM4227) which is located approximately 500m north of the proposed waterway. There are no Listed Buildings, Conservation Areas, Inventory Battlefields or Inventory Gardens and Designed Landscapes within the main Development Site, although a number of designated assets are recorded within the 1 km study area as shown on *Figure 13.1 Heritage Designations Within 1km Study Area*.

There are no designated assets within the footprint of the Marine Facility or access tracks to be upgraded near Inveraray, however, there are a number of designated within the 500m study area adopted for these elements of the scheme. These include South Cromallt Lodge (LB11521) and North Cromallt Lodge (LB13768), both of which are Category B listed and are located adjacent to the Marine Facility.

A large number of listed buildings forming part of the Inveraray Castle complex are also located near the proposed access track upgrading to the north of Inveraray. These includes the Category A listed Inveraray Castle (LB11552), as well as number of associated structures including the Category B listed walled garden (LB11530), gate piers (LB11553), and Beehive Cottage (LB11542). There are also a number of Category C listed structures including No. 6 Castle Gardens (LB11531), former lime kilns (LB11541), and the bothy (LB11533). The associated grounds of the castle are recorded on the Inventory of Gardens and Designed Landscapes (DGL00223), and both the Marine Facility and access tracks to be upgraded fall within the limits of the designed landscape.

Furthermore, there are also a large number of other designated assets within the settlement of Inveraray, which is also a conservation area.

13.2.2 Non-Designated Assets

A review of PastMap data, which includes HER data supplied by WoSAS, shows that the majority of assets recorded within the Development Site, as well as the 1 km study area, are linked to post-medieval agriculture. The review of online data identified at least one shieling ground within the main Development Site boundary near the area of the proposed headpond (HER No. 44155), with further assets located near the shore of Loch Awe. These include remains linked to the former settlement of Balliemeanoch Cottage (HER Nos. 44157, 15379, and 15380), as well as features associated with Balliemeanoch settlement (HER Nos. 43241, 44156, and 48744). Further non-designated assets in the main Development Site include possible cultivation remains and a stone dyke (HER No. 48743), while a large number of assets linked to agriculture and land management have been recorded within the 1 km study area.

No non-designated assets have also been recorded within the footprint of the Marine Facility or access tracks to be upgraded, although a number of assets have been identified in the 500m study area. These are largely linked to the settlement of Inveraray, such as the war memorial (HER No. 66814), but also include a small cluster of possible cairns (HER No. 1503).

13.3 Methodology

The following methodology is proposed for undertaken the assessment of potential effects on cultural heritage as a result of the proposed Development.

13.3.1 Study Area

A study area of 1 km from the main proposed Development Site boundary will be used to provide a detailed baseline information for the assessment, with a reduced 500 m study area used for the Marine Facility. This is due to the nature of the development near Inveraray as well as the large number assets in settlement. A wider 3 km study area will be used to identify assets where there may be change to their setting. The study area for the assessment of setting will be limited to 3 km. The setting assessment will be guided by assets which fall within the ZTV. Some assets beyond this distance may also be considered where elements of their setting extend closer to the proposed Development.

Desk-based research will be undertaken as part of the EIA. Additional information will be gathered from the following sources:

- Argyll and Bute Historic Environment Record managed by WoSAS;
- Argyll and Bute Archives Service, Lochgilphead;
- PastMap website and database (www.pastmap.co.uk) for the National Monuments Record, Scheduled Monuments, listed buildings, Inventory of Designed Landscapes and Registered Battlefields;
- Historic Environment Scotland;
- National Library of Scotland for plans and maps of the study area and its environs;
- Aerial photographs available from National Collection of Aerial Photographs (NCAP) archive, Edinburgh;
- Geotechnical data and other assessments as appropriate and available;
- A site visit setting assessment of assets in the surroundings of the site; and
- An archaeological walkover survey to assess known sites and to determine the potential for previously unrecorded heritage sites. This will not be an exhaustive survey of the entirety of the proposed Development Site and will focus on the headpond area, the spillways/waterways, access roads and other infrastructure.

The results of the desk-based research and the layout design will be discussed with WoSAS, who act as advisors for ABC, to agree any requirement for additional field evaluation, such as geophysical survey or evaluation excavation, prior to determination.

While geophysical survey may not be an appropriate method of archaeological evaluation within the main Development Site, it could potentially be used in an attempt to identify previously unrecorded buried remains within the area of the Marine Facility.

13.3.2 Impact Assessment

The value (significance) of a heritage asset is determined by professional judgement, guided but not limited to any designated status the asset may hold. The value of an asset is also judged upon a number of different factors including the special characteristics the assets might hold which can include evidential, historical, aesthetic, communal, archaeological, artistic and architectural interests. This value of a heritage asset is assessed primarily in accordance with the guidance set out in SPP and the Historic Environment Policy for Scotland (HESP) (HES, 2019). The value (significance) is defined by the sum of its heritage interests. Taking these criteria into account, each identified heritage asset can be assigned a level of value (significance) in accordance with a three-point scale as set in Table 13.1.

Table 13.1 Criteria for Determining the Value (significance) of Heritage Assets.

Value (significance)	Criteria
High	Assets of inscribed international importance, such as: <ul style="list-style-type: none"> • World Heritage Sites; • Category A and B listed buildings; • Landscapes on the Inventory of Gardens and Designed Landscapes; • Inventory of Historic Battlefields; • Scheduled monuments; and • Non-designated archaeological assets of schedulable quality and importance.
Medium	<ul style="list-style-type: none"> • Category C listed buildings; • Conservation Areas; • Locally listed buildings included within a conservation area; and • Non-designated heritage assets of a regional resource value.
Low	<ul style="list-style-type: none"> • Non-designated heritage assets of a local resource value as identified through consultation; • Locally listed buildings; and • Non-designated heritage assets whose heritage values are compromised by poor preservation or damaged so that too little remains to justify inclusion into a higher grade.

Having identified the value of the heritage asset, the next stage in the assessment is to identify the level and degree of impact to an asset arising from the proposed Development. Impacts may arise during construction or operation and can be temporary or permanent. Impacts can occur to the physical fabric of the asset or affect its setting.

When professional judgement is considered, some sites may not fit into the specified category in this table. Each heritage asset is assessed on an individual basis and takes account of regional variations and individual qualities of sites.

The level and degree of impact (magnitude of impact) is assigned with reference to a four-point scale as set out in Table 13.2. In respect of cultural heritage, an assessment of the level and magnitude of impact is made in consideration of any scheme design mitigation (embedded mitigation).

Table 13.2 Criteria for Determining the Magnitude of Impact on Heritage Assets.

Magnitude of Impact	Description of Impact
High	Change such that the significance of the asset is totally altered or destroyed. Comprehensive change to setting affecting significance, resulting in a serious loss in our ability to understand and appreciate the asset.
Medium	Change such that the significance of the asset is affected. Noticeably different change to setting affecting significance, resulting in erosion in our ability to understand and appreciate the asset.
Low	Change such that the significance of the asset is slightly affected. Slight change to setting affecting significance resulting in a change in our ability to understand and appreciate the asset.
Negligible	Changes to the asset that hardly affect significance. Minimal changes to the setting of an asset that have little effect on significance resulting in no real change in our ability to understand and appreciate the asset.

An assessment of the level of significant effect, having taken into consideration any embedded mitigation, is determined by cross-referencing between the significance (heritage value) of the asset (Table 13.1) and the magnitude of impact (Table 13.2). The resultant level of significant effect (Table 13.3) can be negligible, minor, moderate or major and adverse or beneficial.

Table 13.3 Criteria for Determining the Significance of Effect

Value (significance)	Magnitude of impact			
	High	Medium	Low	Negligible
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Minor
Low	Moderate	Minor	Minor	Negligible

Effects of major or moderate significance are considered to be significant.

An assessment of the predicted significance of effect is made both prior to the implementation of mitigation and after the implementation of mitigation to identify residual effects. This first highlights where mitigation may be appropriate and then demonstrates the effectiveness of mitigation and provides the framework for the assessment of significance which takes mitigation measures into consideration.

All archaeological work will be undertaken in line with guidance published by the Chartered Institute for Archaeologists (20194 and 202017). The setting assessment should follow the Historic Environment Scotland Guidance on Managing Change in the Historic Environment: Setting (2016).

13.4 Likely Significant Effects

The proposed Development has the potential to result in physical impacts and change to the settings of previously identified heritage assets, as well as sites that have not yet been identified within the area of the main Development Site. However, the initial examination undertaken as part of the scoping exercise would suggest that physical impacts will be limited to non-designated assets based on the current layout and known archaeology identified. It is, however, possible that the scheme will result in the complete loss of non-designated assets, resulting in significant adverse effects.

There is also the potential for physical impacts on non-designated assets resulting from the construction of the marine facility near Inveraray, as well as the upgraded access tracks in the area around Inveraray. These works also have the potential to result in impacts on the setting of designated assets around the settlement of Inveraray, as well as Inveraray Castle which contains a number of listed buildings and is also on the Inventory of Gardens and Designed Landscapes.

Two ZTVs have been produced for the current layout covering the visibility of the headpond (*Figure 5.1 Zone of Theoretical Visibility (Headpond)*), and the tailpond inlet/outlet (*Figure 5.2 Zone of Theoretical Visibility (Tailpond)*), with a final ZTV showing the combined visibility (*Figure 5.3 Zone of Theoretical Visibility (Headpond and Tailpond)*). These suggest that views of the headpond and inlet / outlet structures will be limited to the south western side of Loch Awe, as well as the northern end of Loch Awe, approximately 5-10 km away, and therefore significant effects due to change to the setting of designated assets are not predicted as any impacts are considered to be minor beyond 3 km due to the form of the proposed Development. There is also the potential for impacts on the setting of the scheduled Balliemanoch chapel and burial ground (SM4227), although this should be limited to the tailpond inlet/outlet, and should be reduced due to topography of the land between the asset and the proposed Development, and elements such as vegetation and tree cover. A setting assessment of assets within 3 km of the Development Site will be carried out.

13.5 Likely Mitigation Measures

Mitigation measures could include further design intervention to avoid physical impacts on known heritage assets through micro siting of supporting infrastructure such as access tracks. If it is not possible to avoid heritage assets, mitigation will include detailed landscape / topographic survey, archaeological excavation of features being removed and archaeological monitoring/watching brief.

Mitigation in the area of the Marine Facility and access track upgrade around Inveraray might also include detailed landscape / topographic survey, archaeological excavation of features being removed and archaeological monitoring/watching brief.

13.6 Summary and Conclusions

This chapter was prepared using data available from online resources. A single scheduled monument has been recorded within the main Development Site, with a limited number of designated assets in the wider 3 km study area.

Initial ZTV data based on the current design would suggest that views of the headpond and inlet / outlet will be limited, and as a result, impacts on the setting of designated assets in the wider landscape are not predicted. It should, however, be noted that the design has not been finalised.

There is the potential for physical impacts on non-designated assets as well as previously unrecorded remains, in the main Development Site resulting in significant adverse effects.

There is also the potential for physical impacts on previously unrecorded remains in the area of the Marine Facility, as well as impacts on the setting of designated heritage assets resulting from the upgraded access tracks around Inveraray and Inveraray Castle.

As a result, a cultural heritage assessment will be completed as part of the EIA.

13.7 References

Ancient Monuments and Archaeological Areas Act (1979).

CIfA. (2019). Code of Conduct Reading. [Online]. Available: <https://www.archaeologists.net/sites/default/files/CodesofConduct.pdf> Accessed: September 2021

CIfA. (2020). Standard and Guidance for Historic Environment desk-based Assessment Reading. [Online]. Available: https://www.archaeologists.net/sites/default/files/CIfAS%26GDBA_3.pdf Accessed: September 2021.

Argyll and Bute Council. (2015). Local Development Plan.

Argyll and Bute Historic Environment Strategy 2015 - 2020 [Online].

Available: https://www.argyll-bute.gov.uk/sites/default/files/hist_env_strat_combined.pdf Accessed: March 2020.

Historic Environment (Amendment) (Scotland) Act 2014.

Historic Environment Scotland. (2019). Historic Environment Policy for Scotland.

Historic Environment Scotland. (2016). Guidance on Managing Change in the Historic Environment: Setting.

Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997.

Scottish Government. (2004). Planning Advice Note 71: Conservation Area Management.

Scottish Government. (2011). Planning Advice Note 2/2011: Planning and Archaeology.

14. Access, Traffic and Transport

14.1 Introduction

This chapter is based on a desk study and considers the potential for impacts of the proposed Development on traffic and transport. Construction of the proposed Development is expected to result in the highest volume of traffic generation with negligible traffic impacts expected during operation therefore it is proposed that operational and decommissioning transport impacts are scoped out of the EIA; further justification for scoping out these phases would be further detailed within the EIAR.

There is no published guidance on the assessment of traffic impacts specifically associated with temporary construction activities. However, the methodology detailed in the Chartered Institution of Highways and Transportation (CIHT) 'Guidelines for Traffic Impact Assessments' (1997), recommends that the environmental impact of the traffic generated by a proposed Development should be assessed taking cognisance of the Institute of Environmental Assessment (IEA), now the Institute of Environmental Management & Assessment (IEMA), 'Guidelines for the Environmental Assessment of Road Traffic, 1993'. The guidelines provide a basis for a comprehensive and consistent approach to the appraisal of traffic and transport impacts.

This chapter will therefore follow the methodology set out in the IEMA Guidelines as well as utilising professional judgement.

This chapter is supported by *Figure 14.1 Proposed ATC Locations and Local Highway Network*.

14.2 Baseline Conditions

14.2.1 Road Network

Road access to the proposed Development is possible via a network of roads (The Study Network). These are presented below.

14.2.1.1 A85 Trunk Road (T)

The A85 (T) runs east-west from Oban to Perth for approximately 150 km. The A85 (T) is generally a good standard two-lane single carriageway road with a varying speed limit ranging from 30 mph in sections through settlements, up to the National Speed Limit in more rural sections (60 mph). Construction traffic associated with the proposed Development would utilise the A85 (T) from Tyndrum and route west through Dalmally. To the west of Dalmally, the vehicles would turn left to join the A819 towards the site access. A large proportion of general construction traffic would route from the wider road network onto the A85 (T), likely coming from both the east and west, to reach the A819 and the site access.

14.2.1.2 A83 (T)

The A83 runs from Tarbet to Campbeltown at the southern end of the Kintyre peninsula. The route passes through Inveraray approximately 8 km to the southeast of the site. The A83 (T) has similar characteristics to the A85 (T) in that it is generally a good standard two-lane single carriageway road with a varying speed limit of 30 mph through settlements and the National Speed Limit in rural sections (60 mph). In the town of Inveraray, there are footways on at least one side of the A83 (T) throughout and street lighting. The A83 (T) would likely be used by a proportion of general construction traffic coming to the site from the east or southwest. From the A83 (T), construction vehicles would turn onto the A819 at Inveraray. It is not envisaged that abnormal load vehicles would use the A83 (T).

14.2.1.3 A819

The A819 is a two-lane single carriageway road and provides a link between the A85 (T) and the A83 (T) in Inveraray running in a north-south direction. The A819 generally follows the National Speed Limit (60 mph) except for the small section of road within Inveraray which has a 30 mph limit and increases to 40 mph until approximately 1.5 km north of Inveraray.

Very few properties take access from the A819 and there are no settlements along the road, apart from Inveraray at the southern end where the A819 meets the A83 (T). Within Inveraray there is a footway on the southern side of the A819 and street lighting, but these facilities cease beyond the Inveraray boundary.

From the A819, it is proposed that access will be gained from two existing forestry tracks located at NN 08853 12473 and NN 10064 19980. Each of the proposed access routes will utilise existing forestry tracks as far as possible with some stretches of new track to be constructed. Both access tracks will link the A819 with the proposed headpond area located at Lochan Airigh.

14.2.1.4 B840

From the west, the site can be accessed by the B840 which is approximately 3 km to the west and runs parallel to Loch Awe then joins the A85 to the north.

14.2.1.5 Inveraray Marine Facility

As previously discussed in chapter 2 Project Description, the Inveraray location was identified as the most suitable in terms of the abnormal load dimensions for the proposed Development. The Inveraray location also includes a proposed new access route that will join the A83 and A819 via a new access track from the south of the marine facility.

It is anticipated that AILs will be transported via the marine facility.

14.3 Methodology

14.3.1 Proposed Surveys and Baseline Studies

The main data considered fundamental to the assessment of traffic and transport effects will be traffic flow data and personal injury accident data (PIA).

Information from a number of sources will be collected as part of the baseline assessment of the proposed Development. This will include the collection of road accident data and traffic flow data as well as further information from Transport Scotland.

It is anticipated that the PIA data will be obtained from the local authority for the most recent five-year period ending in 2021 (where available), which will provide information on each collision including severity as well as factors which attributed the collision.

With regard to traffic flow data, it is recognised that Transport Scotland has an extensive network of data collection sites from which data could be requested, however this is unlikely to include the minor roads.

It is anticipated that Automated Traffic Counts (ATCs) will be required to obtain more up to date traffic flow data for the minor roads. It is anticipated that ATCs will be undertaken during a neutral month during 2022 and will provide two-way traffic flows and be classified by vehicle type, including HGVs. In line with DMRB TAG Unit M1.2, neutral periods are defined as Monday to Thursday from March through to November (excluding August) and avoiding the weeks before / after Easter; surveys may be carried out outside these months if the conditions being surveyed are representative.

The locations and timings of the surveys will be agreed with the relevant local highway authorities. The ATC locations that have been selected will provide a basis for the analysis and incorporate local routes within the corridor close to potential sensitive receptors and routes along key strategic links to provide a robust baseline for assessment. The proposed ATC locations are shown on *Figure 14.1 Proposed ATC Locations and Local Highway Network*.

The traffic flow data collected will be used to assess the predicted impact on traffic flows resulting from the proposed construction traffic associated with the proposed Development.

Background traffic flows are predicted to increase on the local road network regardless of the proposed Development. The future design year traffic flows will be forecast utilising the Department for Environment, Transport and the Regions (DETR) publication, "National Road Traffic Forecasts (Great Britain)," (NRTF) 'low' growth assumptions.

Discussions would be held with ABC to identify any cumulative development and associated traffic flows which would require to be considered within the study. Known cumulative developments are outlined in chapter 2 Project Description.

14.3.2 Assessment Method

The methodology for assessing the impact of development-generated traffic will be based on that outlined in Institute of Environmental Assessment's (IEA, now known as the Institute of Environmental Management and Assessment - IEMA) 'Guidelines for the Environmental Assessment of Road Traffic' (January 1993).

The IEMA guidelines state that the study area for assessment has been defined by the following guidelines. The guidelines set out two rules:

- Rule 1: Include highway links where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%); and
- Rule 2: include any other specifically sensitive areas where the traffic flow (or HGV component) are predicted to increase by more than 10%.

The IEMA guidelines recommend that several environmental effects may be considered important when considering traffic from an individual development. These are considered as the following effects:

- Impact of HGV construction traffic;
- Severance;
- Pedestrian delay;
- Pedestrian amenity; and
- Accidents and safety.

The type of traffic which is anticipated to be generated by the proposed Development will be categorised as follows; primarily general traffic, LGVs, HGVs and Abnormal Indivisible Loads (AILs). The vehicle routing and movement associated with the proposed Development construction will be considered in detail and developed parallel with the EIA and will take account of suitability and capacity of local roads. The routing plan will be a high-level assessment which will provide detailed information on the condition of the links, any restrictions present and overall suitability. For example, a Red, Amber, Green (RAG) Analysis will also be undertaken using the following criteria to assess the road suitability for HGV use:

- Green – No issues identified – road suitable for HGV use
- Amber – Limited problems / limitations identified – road potentially suitable for HGV use, following additional assessment
- Red – Existing problems including likely capacity issues identified – road not suitable for HGV use / too difficult and costly to be mitigated

A site visit will also be undertaken to inform / evidence the routing plan and suitability of the road links as well as observations of any existing issues such as on-road parking etc.

Once the volumes of the proposed traffic have been identified it will be necessary to identify receptors that may be impacted, due to the increase in vehicle movements. This will be done by identifying the percentage increase in vehicular activity along the identified construction routes following the collection of traffic data. The ATCs will be used to derive Annual Average Daily Traffic (AADT) for individual links, subdivided into 24 hour and 18 hour counts for total traffic and HGVs.

In order to calculate the trip distribution of workers travelling to and from the proposed Development and the construction compounds each day, a simple gravity model will be developed. Construction traffic associated with the proposed Development will be distributed onto the local highway network to calculate the resultant percentage increase on each link.

Assessments will be undertaken for one or several years throughout the construction period, this is because the peak year for traffic volumes can vary along different routes depending on which section of the proposed Development they serve.

Currently, it is anticipated that the construction may take up to seven years. The peak construction traffic flows will be derived by analysing construction traffic data and construction programmes. At this stage it is anticipated that the peak is likely to occur around year 3 and 4 during the construction of the tunnels, waterways, and headpond.

It is anticipated that an AIL report will be needed to assess the delivery of AILs to the proposed Development. This will need to demonstrate that a suitable route is available from the Inveraray marine facility to the proposed

Development, supported by desk based swept path analysis and a record of consultation and agreement with the key highway authorities.

14.3.3 Sensitivity, Value or Importance

The general criteria for defining the importance or sensitivity of receptors are set out in Table 14.1 Key factors influencing this include:

- The value of the receptor or resource based upon empirical and / or intrinsic factors - for example considering any legal or policy protection afforded which is indicative of the receptor or resources' value internationally, nationally, or locally; and
- The sensitivity of the receptor or resource to change - for example is the receptor likely to acclimatise to the change. This will consider legal and policy thresholds which are indicative of the ability of the resource to absorb change.

Table 14.1 Sensitivity of Receptors

Sensitivity	Receptor Description
Very High	Schools, colleges, playgrounds, hospitals, retirement homes.
High	Heavily congested junctions, residential properties very close to carriageway.
Medium	Congested junctions, shops / businesses, areas of heavy pedestrian / cycling use, areas of ecological / nature conservation, residential properties close to carriageway.
Low	Tourist / visitor sites, places of worship, residential areas set back from the highway with screening.
Negligible	Those people and places located away from the affected highway link.

The link sensitivity will be based upon an average sensitivity of the whole link with a separate assessment of high/very high receptors. Some links will be broken down into sensible sections where appropriate i.e. between two main junctions or villages etc.

14.3.4 Magnitude

General criteria for defining the magnitude of an impact are set out in Table 14.2. Key factors influencing this include:

- The physical or geographical scale of the impact - note that this will be relative to the scale of the receptor or resource affected;
- The duration of the impact - will it be short term, lasting for a few days or weeks, or long term, lasting for several years;
- The frequency of the impact - will it occur hourly, daily, monthly, or will it be permanent lasting for the duration of the development; and
- The reversibility of the effect - can it be reversed following completion of construction of the development.

Table 14.2 Magnitude of Change

Magnitude	Description
High	Total loss or major alternation to key elements / features of the baseline conditions such that post development character / composition of baseline condition will be fundamentally changed.
Medium	Loss or alteration to one or more key elements / features of the baseline conditions such that post development character / composition of the baseline condition will be materially changed.
Low	Minor shift away from baseline conditions. Changes arising from the alteration will be detectable but not material; the underlying character / composition of the baseline condition will be similar to the pre-development situation.
Negligible	Very little change from baseline conditions. Change is barely distinguishable, approximating to a "no change" situation.

-

Information provided in Table 14.3 expands on the information from Table 14.2 and shows further details of the individual aspects of the assessment and the thresholds to be applied for each.

Table 14.3 Impact Magnitude Criteria

Magnitude	Description	Illustrative Criteria
High	HGV Construction Traffic	High number of construction vehicles using roads over a protracted period of time. More than a 40% increase for more than 6 months.
	Pedestrians/Cyclists	Limited or no facilities for pedestrians and cyclists with limited crossing facilities and low-quality linkages to the local facilities.
	Severance	Increase in total traffic flows of 90% and above (or increase in HGV flows over 10% based on the sensitivity of the receptors).
	Road Safety	High increase in traffic at known collision locations.
Medium	HGV Construction Traffic	Moderate number of construction vehicles using roads over a protracted time period. <ul style="list-style-type: none"> • 16-39% increase for more than 6 months; or • More than 40% increase for 3-6 months.
	Pedestrians/Cyclists	Few facilities for pedestrians and cyclists with limited crossing facilities and linkages to the local facilities.
	Severance	Increase in total traffic flows of 60-89% (or increase in HGV flows over 10% based on the sensitivity of the receptors).
	Road Safety	Moderate increase in traffic at known collision locations.
Low	HGV Construction Traffic	Small number of construction vehicles using roads over a short period of time. <ul style="list-style-type: none"> • 6-15% increase for more than 6 months; • 31-39% for 3-6 months; or • >40% increase for less than 3 months.
	Pedestrians/Cyclists	Facilities for pedestrians and cyclists with safe and convenient crossing facilities and good linkages to the local facilities.
	Severance	Increase in total traffic flows of 30-59% (or increase in HGV flows over 10% based on the sensitivity of the receptors).
	Road Safety	Minor increase in traffic at known collision locations.
Negligible	HGV Construction Traffic	Occasional construction vehicles using roads over a short period of time. <ul style="list-style-type: none"> • Less than 5% Increase for more than 6 months; or • Between 6-30% increase for 3- 6 months; • Between 31-40% for less than 3 months.
	Pedestrians/Cyclists	Dedicated facilities for pedestrians and cyclists with safe and convenient crossing facilities and good linkages to the local facilities.
	Severance	Increase in total traffic flows of 29% or under (or increase in HGV flows under 10%).
	Road Safety	Negligible increase in traffic at known collision locations.

14.3.5 Defining Significance

Criteria are applied to the percentage increases to establish whether significant environmental effects are likely. These criteria take into account the sensitivity of the receptors or the resources likely to be affected and any changes in the composition of traffic, specifically if more Heavy Goods Vehicles (HGVs) are anticipated. The criteria are a 30% or more increase in total movements or of HGVs, or a 10% increase where sensitive locations are present such as schools.

The significance of each impact is considered against the criteria within the Institute of IEMA Guidelines, where possible. However, the IEMA guidelines state that:

'For many effects there are no simple rules or formulae which define the thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed-up by data or quantified information wherever possible. Such judgements will include the assessment of the numbers of people experiencing a change in environmental impact as well as the assessment of the damage to various natural resources.'

The assessment of the significance of the effect of traffic changes along roads identified within the study network as a result of the proposed Development should have regard to both the magnitude of the traffic increase (change) and the receptor environmental value (sensitivity). The level of significance can be determined from the matrix in Table 14.4.

Table 14.4 Significance of Effects

Magnitude of Change **Sensitivity or Value of Resource / Receptor**

	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

The significance of the effects on receptors will therefore be evaluated against the IEMA Guidelines and, where possible, in line with the criteria used for the other environmental topic areas covered in the EIAR. These criteria are subjective but take into account the number of receptors affected, their sensitivity and the length of the period for which they will be impacted. Mitigation, where appropriate, will be identified and incorporated into the construction planning and design of the proposed Development.

14.4 Likely Significant Effects

The potential effects as listed in the IEMA Guidelines are as follows:

- Noise and Vibration (this is considered in *chapter 15 Noise and Vibration*);
- Visual impact (this is considered in *chapter 5 Landscape and Visual Assessment*);
- Severance (for motorists or pedestrians);
- Increased journey times for non-construction traffic;
- Pedestrian delay, intimidation, loss of amenity;
- Road accidents and safety;
- Hazardous loads (not considered as no hazardous substances will be transported to the site);
- Air quality;
- Dust and dirt;
- Ecological impact (this is considered in *chapter 6 Terrestrial Ecology*); and
- Heritage and conservation areas (this is considered in *chapter 13 Cultural Heritage*).

It is likely that the main transport impacts will be associated with the movement of HGVs and Light Goods Vehicle (LGVs) travelling to and from the proposed Development Site as well as vehicles associated with construction staff.

At this stage air quality is included within the potential effects, however it is anticipated that this could potentially be scoped out, as within the IEMA guidance as previously discussed in section 14.3.2, two broad rules are suggested which can be used to limit the scale and extent of the assessment:

- Rule 1: include highway links where traffic flows will increase by more than 30% (or the number of HGVs will increase by more than 30%);
- Rule 2: include any other specifically sensitive areas where traffic flows have increased by 10% or more.

Where the predicted increase in traffic flows is lower than the above thresholds, the IEMA guidelines suggest the significance of the effects can be stated to be negligible and further detailed assessments are not warranted. Furthermore, increases in traffic flows below 10% are generally considered to be insignificant in environmental terms given that daily variations in background traffic flow may vary by this amount. On this basis it is anticipated that the effect on air quality will be negligible and no further assessments will be required.

The traffic and transport chapter will also investigate any potential impacts to the condition of roads utilised by the construction traffic.

Once the proposed Development is operational, it is envisaged that the amount of traffic associated with the development will be minimal (restricted to occasional service vehicles such as 4x4s with occasional need for larger

vehicles). Therefore, it is not proposed to undertake any detailed assessment of the operational or decommissioning phase as part of the EIAR.

14.5 Likely Mitigation Measures

A Construction Traffic Management Plan (CTMP) will be developed in consultation with ABC, Transport Scotland (as necessary), Police Scotland, and other stakeholders following award of consent. Likely topics to be included in a CTMP would include, but not limited to, the following:

- The agreed route for construction traffic including any abnormal loads;
- The necessary agreements and timing restrictions for construction traffic, for example Monday – Friday working only, prohibition during school drop-off and pick-up times, and prohibition during loading times at commercial premises;
- Details of a proposed condition survey on access routes;
- Proposals for maintenance of the agreed routes for the duration of the construction phase;
- Proposals for monitoring and agreeing maintenance costs;
- Escort arrangements for abnormal loads;
- Route signing;
- Maintaining access to commercial / business premises. For example, temporary accommodation works and additional information signing;
- Details of the advanced notification to the general public warning of any construction transport movements, specifically abnormal loads;
- Details of information road signage warning road users of forthcoming abnormal load transport and construction traffic movements;
- Arrangements for regular road maintenance and cleaning, e.g. road sweeping in the vicinity of the site access point as necessary, wheel cleaning / dirt control arrangements;
- Contractor speed limits; and
- Community and emergency services liaison details.

The hours for which construction can take place, and therefore the hours for which construction traffic will be travelling to and from the proposed Development Site, will be agreed with relevant parties before construction commences.

In proximity of the proposed Development Site, access signs will be present warning vehicles of an increased risk of construction traffic in accordance with the proposals within the agreed CTMP.

Wheel cleaning facilities will be present on the proposed Development Site to prevent the depositing of dirt onto the local road network. Arrangements for road sweeping will be in place as required. Loads that may produce excessive dust during transport will be covered.

The number of construction staff on site will vary according to the construction phase and activities being undertaken and will be confirmed by the primary contractor upon instruction. It is expected that up to 500 people will be employed onsite during the construction phase at its peak, after which it will then generally decrease as construction is progressed through to the commissioning phase. The construction activity is anticipated to peak at around year 3 and 4 during the construction of the tunnels, waterways and headpond.

It is anticipated that a temporary worker's accommodation camp will be required for the duration of the major construction works. It is estimated that the potential footprint of the camp will be around 8,000m². This temporary camp will likely be located close to the Development Site and will include car parking for the housing and cabins for workforce accommodation as well as a park and ride.

14.6 Summary and Conclusions

This chapter of the scoping report sets out the traffic and transport baseline, outlines assessment methodology, and discusses potential mitigation measures to reduce significant effects of the proposed Development. The assessment will be undertaken within the IEMA guidelines.

The proposed study network would cover an extensive network of roads providing potential access routes to the proposed Development Site. These being: A85 (T), A83 (T), A819, and the B840.

The assessment will provide details of the proposed access route from the principal road network (and trunk road, if required), the point(s) of access to the proposed Development Site and an indication of the likely number of vehicle movements and traffic management plans required during the process.

The EIAR will assess the potential effects on local roads due to construction traffic. There are very few operational and decommissioning traffic movements so it is proposed to scope out the effects of these traffic movements.

14.7 References

IHT. (1994). Guidelines for Traffic Impact Assessment.

IEMA. (1993). Guidelines for the Environmental Assessment of Road Traffic.

DETR. (1997). National Road Traffic Forecasts (Great Britain) 1997.

DMRB. (2020). LA 104 – Environmental Assessment and Monitoring.

15. Noise and Vibration

15.1 Introduction

The following potential noise and vibration effects may result from the construction and operation of the proposed Development:

- Noise and vibration impacts during the construction phase which could affect existing nearby noise sensitive receptors;
- Changes in road traffic noise levels at noise sensitive receptors in proximity to routes used by construction traffic;
- Operational airborne noise impacts from any openings to underground plant or any surface plant if required at nearby sensitive receptors; and
- Ground borne noise and vibration impacts from underground plant at nearby noise sensitive receptors.

This chapter is supported by *Figure 15.1: Noise Sensitive Receptors*.

15.2 Baseline Condition

The nearest potentially sensitive receptors to the proposed Development are shown in *Figure 15.1. Noise Sensitive Receptors* and have been identified as the following:

- Balliemanoach Farm;
- Loch Awe House;
- Rural houses and static caravans on the banks of Loch Awe; and
- Rural houses along the A819.

The proposed Development Site is in a rural area. Baseline noise levels at the above receptors are likely to be affected by noise from local agricultural activities and road traffic. The potential for noise from nearby wind farms to affect baseline noise levels at receptors has also been investigated. The closest operational wind farms to the proposed Development have been identified as:

- Blarghour Farm (2 turbines at 35 m blade tip height) – approximately 3 km from the nearest shared receptor with the proposed Development; and
- Carraig Gheal (20 turbines at 125 m blade tip height) – approximately 4 km from the nearest shared receptor with the proposed Development.

Due to their distance, these wind farms are unlikely to affect baseline noise levels at the identified receptors when wind speeds meet the criteria for performance of baseline measurements (not exceeding 5 m/s).

Noise-sensitive ecological receptors within the vicinity of the proposed Development will be identified in conjunction with the ecology assessment.

15.3 Methodology

15.3.1 Baseline Noise Monitoring

Baseline noise monitoring will be undertaken to establish baseline conditions. Monitoring locations and the monitoring regime to be employed will be agreed in advance with the ABC environmental health department. The monitoring procedures will conform to the requirements of British Standard (BS) 7445: 2003 'Description and Measurement of Environmental Noise'.

It is proposed to undertake long-term unmanned baseline monitoring at the receptors to include weekend and weekday times. Ideally, and subject to adequate security, a minimum five-day unmanned monitoring period is preferred (Thursday – Monday suggested) but if secure locations cannot be identified this may not be possible and a shortened manned monitoring regime may be necessary. The following noise monitoring locations are proposed:

- M1 – representative of the properties to the west of the proposed Development, next to Loch Awe; and
- M2 – representative of the properties to the east of the proposed Development near to the A819.

The monitoring will be undertaken on dates that are considered likely to be representative of the typical baseline noise climate at the receptors, this may require avoidance of school holidays.

It is assumed that there are no existing sources of vibration and therefore a baseline vibration survey is scoped out.

15.3.2 Construction Noise and Vibration

The assessment of construction impacts will be based on the available information on the likely construction programme and activities. A quantitative assessment including predicted construction noise and vibration levels at selected residential receptors will be completed following the methodology presented in BS 5228-1: 2009 + A1 2014 'Code of practice for noise and vibration control on construction and open sites'.

Additionally, noise increases at sensitive receptors due to any construction traffic on public roads will be calculated according to the methods given in Calculation of Road Traffic Noise (CRTN) (Department of Transport / Welsh Office, 1998). The significance of the effect of these changes will be assessed based on a range of relevant guidance including the 'Design Manual for Roads and Bridges: 2019' (Highways England, 2019).

15.3.3 Operational Airborne Noise

The impact of the operational noise from the proposed surface plant or openings to the surface from underground plant will be predicted using computer noise modelling software, based on information on the operating conditions and the levels of noise generated by the plant. By incorporating good engineering design, operational airborne noise emissions are anticipated to be minimal. Noise modelling will also allow the investigation of noise mitigation measures should any be required.

The significance of the noise impact of the plant will be assessed using the method given in British Standard BS 4142: 2014 'Method for rating noise affecting mixed residential and industrial areas'. This standard details a method for rating the acceptability of increases in existing noise levels at noise-sensitive receptors affected by noise from fixed plant at proposed developments. If details of fixed plant are not available, a recommendation of maximum noise levels from fixed plant based on measured background noise levels will be made. BS 4142 is interpreted differently by different Local Authorities therefore the assessment methodology will be discussed with the relevant environmental health department to determine any local requirements.

It is assumed that once operational, the proposed Development would not produce significant road traffic on local public roads and therefore an operational road traffic noise assessment is scoped out.

15.3.4 Operational Ground Borne Noise and Vibration

A qualitative analysis of operational ground borne vibration and ground-borne noise will be completed. There will not be sufficient information available at this stage on the detailed design of the scheme to perform a quantitative analysis. Suitable guidance including BS 6472-1:2008 'Guide to evaluation of human exposure to vibration in buildings' will be considered. By incorporating good engineering design, operational ground borne noise and vibration emissions are anticipated to be minimal.

15.4 Likely Significant Effects

15.4.1 Construction

The proposed Development is located in a rural area where baseline noise levels are likely to be low. Construction of the proposed Development may therefore give rise to temporary noise and vibration impacts upon the closest noise sensitive receptors. An assessment of construction noise and vibration is scoped into the assessment.

15.4.2 Operation

With careful consideration of the location and design of any noise producing equipment (e.g. pumps) and the incorporation of appropriate mitigation measures (where required), operational airborne noise and ground borne noise and vibration impacts are not anticipated to be significant. However, an assessment of these impacts is included within the scope of the assessment.

15.4.3 Decommissioning

Decommissioning of large-scale pumped storage hydro projects is extremely rare due to the long operational lifespan of the facility. If required, this would involve the drainage of water from the headpond, the removal of equipment, blocking of waterways and tunnel entrances and the removal of above ground structures. These activities would not be expected to emit high levels of noise or vibration and it is considered that the effects of such activities would be negligible. Therefore, decommissioning is excluded from the assessment scope.

15.5 Likely Mitigation Measures

Specific mitigation measures to be adopted will be identified following the results of the detailed assessment.

Mitigation of construction noise and vibration will largely rely on the implementation of a CEMP which will detail good practice measures to mitigate potential noise and vibration effects, including:

- Fixed and semi-fixed ancillary plant such as generators, compressors etc. which can be located away from receptors to be positioned so as to cause minimum noise disturbance. If necessary, acoustic barriers or enclosures to be provided for specific items of fixed plant;
- If necessary, use of site boundary acoustic barriers / hoarding to screen neighbouring receptors;
- All plant used on the Development Site will comply with the EC Directive on Noise Emissions for Outdoor Equipment (2000/14/EC), where applicable;
- Operation of plant in accordance with the manufacturer's instructions;
- Selection of inherently quiet plant where appropriate. All major compressors to be 'sound reduced' models fitted with properly lined and sealed acoustic covers which are kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools to be fitted with mufflers or silencers of the type recommended by the manufacturers;
- All plant used on the Development Site will be regularly maintained, paying particular attention to the integrity of silencers and acoustic enclosures;
- Machines in intermittent use to be shut down in the intervening periods between work or throttled down to a minimum;
- Drop heights of materials from lorries and other plant will be kept to a minimum;
- Adherence to the codes of practice for construction working given in BS 5228 and the guidance given therein for minimising noise and vibration emissions from the Development Site;
- Provision of rest periods during any prolonged noisy activities;
- Prohibition of the use of stereos and radios on the Development Site;
- Implementation of a TMP;
- All blasting will be carried out using BATNEEC where available, to ensure that the resultant noise, vibration and air overpressure are minimised in accordance with current British Standards and Mineral Guidelines
- Compliance with ABC's preferred working hours where feasible; and,
- Keeping local residents informed and provision of a contact name and number for any queries or complaints.

15.6 Summary and Conclusions

This chapter of the scoping report sets out the existing acoustic baseline, outlines the proposed assessment methodology, potential likely significant effects, and discusses the potential mitigation measures to reduce the significant effects of the proposed Development.

The following will be assessed in the EIAR:

- Noise and vibration impacts during the construction phase which could affect existing nearby noise sensitive receptors;
- Changes in road traffic noise levels at noise sensitive receptors in proximity to routes used by construction traffic;
- Operational airborne noise impacts from any openings to underground plant or any surface plant if required at nearby sensitive receptors; and
- Ground borne noise and vibration impacts from underground plant at nearby noise sensitive receptors.

The operational traffic noise assessment has been scoped out of the EIAR.

15.7 References

British Standards Institute. (2003). BS7445 'Description and Measurement of Environmental Noise. Part 2: Guide to the Acquisition of Data Pertinent to Land Use'.

British Standards Institute. (2008). BS 6472 'Guide to Evaluation of Human Exposure to Vibration in Buildings'.

British Standards Institute. (2014a). BS 5228-1:2009 + A1 2014: 'Code of Practice for noise and vibration control on construction and open sites: Part 1: Noise'.

British Standards Institute. (2014b). BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound'.

Department of Transport / Welsh Office. (1998). Calculation of Road Traffic Noise.

Highways England. (2019). Design Manual for Road and Bridges Volume 11 Section 3 Part 7- LA 111, Noise and Vibration.

16. Socio-Economics, Recreation and Tourism

16.1 Introduction

This chapter considers the socio-economic, recreation and tourism impacts resulting from the construction, operation and decommissioning of the proposed Development. A project such as a PSH scheme has the potential to provide beneficial effects to a local area such as job creation through use of local contractors for construction, increased spending in the local area, and use of local accommodation during the construction phase. There is also the potential for adverse effects such as impacts to tourism, community facilities, recreational routes, and associated impacts on the local economy.

16.2 Baseline Conditions

16.2.1 Existing Land Use

The proposed core Development Site is located within mid Argyll, between Loch Awe and Loch Fyne, and lies approximately 9.5 km to the north west of Inveraray and approximately 4.5 km to the south of Portsonachan (*Figure 1.1. Location Plan*). The land within the proposed headpond Development Site comprises an upland plateau moorland with craggy outcrops, used mainly for sheep grazing. The land capability for agriculture is class 6.3 “capable of only rough grazing due to intractable physical limitations; semi-natural vegetation provides grazing of low value” (Hutton Institute).

The highest point on the site is approximately 400 m Above Sea Level (ASL). There are no public rights of way, cycle routes or formal recreation receptors within the core Development Site. Loch Awe (the tailpond) is used for recreational activities such as boating, water sports and angling. The development components located around Inveraray, including the marine facility and the upgraded access tracks, intersect with a number of core paths listed in Section 16.2.2 and the existing tracks at Inveraray Castle GDL (the visual amenity of which is assessed in chapter 5 Landscape and Visual Assessment).

16.2.2 Socio-Economics, Tourism and Recreation

The core Development Site is located in a rural area. Isolated dwellings (static caravans) are situated at the west of the site on the banks of Loch Awe in proximity to the proposed tailpond inlet outlet. There are also two houses in this area close to the proposed western access track linking the headpond and tailpond; a detached bungalow and Balliemanoach farm.

In addition to Balliemanoach farm, there are also several other businesses near the core Development Site supported by leisure and tourism such as self-catering accommodation sites on the banks of Loch Awe and hotels which will be included as part of the assessment.

In addition, there are numerous guest houses, hotels and self-catering accommodation businesses within Inveraray and wider study area.

As described in *chapter 2 Project Description*, there is an existing small-scale hydro scheme in operation within the Development Site known as Beochlich. The Beochlich hydropower project was constructed in 1998 and has an installed capacity of 1 MW.

Tourism is an important contributor to the local economy. Tourism and recreation features in the area include (as shown on *Figure 2.1 Site Constraints*, and *Figure 13.2 Heritage Designations within 3km Study Area*).

- The Loch Lomond and Cowal Way; a long-distance footpath linking Portavadie in the south of Cowal with Inveruglas at Loch Lomond, approximately 16.5 km to the southeast of the headpond;
- Kilchurn Castle, approximately 14.5 km to the northeast of the headpond;
- Argyll and Bute Core Path network; the proposed access routes at Inveraray cross the following Core Paths:
 - C200: Coille Bhraghaid-Queens Drive;

- C201: Dun Na Cuaiche;
- C203: Bealach an Fhuarain;
- National Cycle Network Route 78 to the west of Loch Awe;
- A number of core paths located on the west side of Loch Awe; and C173 (a, b, c, d, e), C490, C305, and long-distance walks including the summit of Ben Cruachan; and
- Loch Awe is utilised by a range of water sport enthusiasts including anglers, sea kayakers and pleasure boaters;
- Inveraray Castle and Gardens;
- The Cruachan Pumped Storage Hydro Power Station visitor centre;
- Inveraray Jail; and
- St Conans Kirk.

The wider area is also used for hill walking the various nearby Munro, Corbett and Graham hills.

16.3 Methodology

There are no recognised standards or methodologies for assessing the socio-economic effects of PSH projects. However, a method for the socio-economic assessment has been broadly derived from the Design Manual for Roads and Bridges (DMRB), LA112 Population and Human Health (Highways Agency 2020). This includes consideration of job creation, local expenditure, and potential effects on community facilities. This guidance also promotes the consideration of effects on tourism including, core paths, footpaths, cycle ways, and recreational or tourist facilities.

16.3.1 Scope of Assessment

The assessment will consider the effects of the construction and, operation of the proposed Development on the local communities and associated economies in the vicinity of the proposed Development. Additionally, tourist and visitor attractions and recreational land uses such as walking or cycling routes will also be assessed. The study area will extend to 5 km from the proposed Development Site in order to ensure consideration of the local area not just the immediate Development location.

Effects on visual amenity of tourism and recreation receptors are considered in chapter 5 Landscape and Visual Assessment. Impacts on hydropower schemes within the area, such as Beochlich, will be addressed within chapter 12 Flood Risk and Water Resources. Impacts on heritage assets will be address within chapter 13: Cultural Heritage. Effects on increases in traffic volumes on the local road network and severance for motorists, cyclists and pedestrians will be assessed within chapter 14: Access, Traffic and Transport.

16.3.2 Baseline Information

Baseline information will be collated from a variety of publicly available sources as well as through consultation with Argyll and Bute Council and local tourism and recreational stakeholders. Some information will also be obtained through the collection of survey data. Information sources may include:

- Existing land-use
 - Review of local development plans and consultation with landowners
- Socio-economic elements:
 - Scottish Government statistic publications;
 - Databases and reports from the Office for Nations Statistics (ONS); and
 - National Records for Scotland.
- For tourism and recreation:
 - Consultation with Scotways and local tourism groups
 - Core Paths Plan Review;
 - Undiscovered Scotland;
 - Visit Scotland research and statistics reports.

16.3.3 Assessment Methodology

The proposed Development has the potential to result in both adverse and beneficial impacts on a wide range of recreational infrastructure, tourism assets, and economic activities. In order to assess the overall significance of an effect it is necessary to establish the magnitude of the effect occurring i.e. the change to the existing baseline conditions as a result of the development and the sensitivity or importance of the receiving environment or receptor. The assessment for this chapter will follow the approach set out in Section 3.4 chapter 3: Scope of the Environmental Impact Assessment. Definitions of sensitivity criteria and magnitude criteria will be developed to be included in the EIAR.

The assessment will report the residual effects of the proposed Development on the socio-economic and tourism receptors and any mitigation proposed.

16.4 Likely Significant Effects

16.4.1 Construction

There is the potential for the following possible effects as a result of the proposed Development:

Potential Adverse Effects

- There will be some land use change from current grazing land to built ground for the compounds, access tracks, and headpond;
- There will likely be localised disruption to public access along the B840, A819 and A83 as a result of increased vehicle movements (impacts to road users will be assessed within chapter 14. Access, Traffic and Transport);
- There is the potential for visitors to be deterred due to construction activities such as from views and traffic nuisance along construction routes;
- There will likely be localised disruption to Core Path users at intersections with site access routes; and
- In the interest of public safety, there will be restricted access for water pursuits around the tailpond works. There will also be amenity effects on recreational loch users in proximity to the works. The visual amenity effects will be assessed in chapter 5 Landscape and Visual Assessment.

Potential Beneficial Effects

- It is likely that there will be significant beneficial effects during the construction period as a result of workers staying in the area. The construction period is anticipated to be approximately seven years. During this time, workers will need to stay in the area Monday to Friday and will likely make use of local accommodation as well as a workers accommodation camp. This will also lead to a greater use of local shops and restaurants, which will be especially beneficial outside of the high tourist season.
- There is also potential long term beneficial effects to the town of Inveraray as the provision of workers accommodation could be utilised as part of Inveraray's masterplan to expand the town
- There is also potential for significant beneficial effects as a result of the offer of apprenticeships during the construction phase. This would enable young people in the local area to obtain new skills at the beginning of their careers.

16.4.2 Operation

Potential Adverse Effects

- There is the potential for visitors to be deterred from the Inveraray Castle GDL, as a result of the construction of the marine facility and access tracks. The visual impact is addressed in chapter 5 Landscape and Visual Assessment and heritage setting impact in chapter 13 Cultural Heritage.
- During operation use of the pier structure will likely be minimal and restricted to the replacement of equipment and as such any disturbance to tourists and recreational loch users will be infrequent and dependant on if the pier is used for other purposes beyond the proposed PSH scheme.
- There will be permanent land use change from sheep grazing land to compounds, access tracks and headpond.

Potential Beneficial Effects

Operation of the proposed Development is likely to result in the generation of approximately ten full time jobs on site, there is also likely to be additional jobs created in a remote control centre.

The pier at Inveraray could bring benefits as there is the potential for it to align with Argyll & Bute's pier improvement plan and to utilise it for purposes additional to the proposed construction and maintenance activities.

16.4.3 Decommissioning

Decommissioning of large-scale pumped storage hydro projects is extremely rare due to the long operational lifespan of the facility. The potential impacts that may occur during decommissioning would be similar to those described above from construction. The beneficial effects of a temporary workforce required for the decommissioning of the site would be temporary in nature and upon completion of the decommissioning all socio-economic benefits from the project would cease. Decommissioning of the Development Site should seek to restore the Development Site to its pre-development form, restoring waterbodies and features that would be of interest to recreation and tourism.

16.5 Likely Mitigation Measures

16.5.1 Construction

The Applicant will establish a Community Liaison Group (CLG) comprised of local interested parties to facilitate direct, two-way discussion between the Applicant and the local community during the construction phase.

The Applicant will seek to consult and maintain an open dialogue with other hydro power operators throughout the design development and production of the EIA for the proposed Development.

The Applicant will liaise and continue to consult with the operators of nearby restaurants, hotels and B&B's through the application process. Through the implementation of the TMP and the implementation of a CEMP to ensure that there is no impact to amenity, it is not anticipated that there will be any interruption to the operation of nearby businesses during construction. It is therefore anticipated that there will not be any significant effects to either socio-economic or as tourist resources. The inclusion of impacts to B&B's and hotels in proximity to the Development Site is therefore proposed to be scoped out of the EIAR.

The potential mitigation for screening (i.e. offsite screen planting) nearby residents and business, from visual, noise and dust disturbance will be investigated in the EIAR.

TMP will be used during the construction period. The TMP will ensure that deliveries and plant movement occur at set times which will avoid peak periods to maintain road safety and ensure users of amenities are minimally impacted during construction.

A temporary works site will likely be required to house the vast majority of construction workers throughout the construction period. This would allow for local hotels/holiday lodges and other accommodation to be readily available for tourists.

16.5.2 Operation

Apprenticeship initiatives exist through organisations such as Argyll and Bute Council and Skills Development Scotland. The Applicant proposes to work with these initiatives to enable people in the local area to obtain new skills.

Potential for a landing area for canoeists is another option for improvement that the Applicant is considering and will be addressed within the EIAR.

16.6 Summary and Conclusions

The focus of the socio-economic assessment will be to ensure potentially significant negative effects on the local community, local economy and tourism in the area are identified and minimised. The assessment will be based upon the guidelines set out in the DMRB LA 112 Population and human health (Highways Agency 2020) and will follow the approach to assessment detailed in *chapter 3 Scope of the Environmental Impact Assessment*. Further consultation will be carried out with Scotways, local interest groups, and the local community.

Significant effects to the operation of the B&B's and other businesses within proximity to the Development Site are not predicted as a result of proposed mitigation and therefore are not proposed to be included in the EIAR.

16.7 References

Highways Agency (2020) DMRB, LA 112 Population and Health

Argyll and Bute Adopted Core Paths [Online] <https://data-argyll-bute.opendata.arcgis.com/datasets/open-data-adopted-core-paths/explore> Accessed: 01/11/2021

The Macaulay Land Use Research Institute (2010). Land Capability for Agriculture in Scotland. [Online]. Available at: https://www.hutton.ac.uk/sites/default/files/files/soils/lca_map_hutton.pdf [Accessed 13/03/2020].

17. Climate

17.1 Introduction

This chapter of the Scoping Report addresses the potential for likely effects to the climate as a result of the proposed Development and effects (adverse or beneficial) to the proposed Development and surrounding environment as a result of climate change.

To align with the requirements of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 (the 'EIA Regulations') (Town and Country Planning, 2017), consideration has been given within this chapter to the following aspects of climate change assessment:

- **Greenhouse Gas (GHG) Impact Assessment:** The effects (adverse or beneficial) on the climate of GHG emissions arising from the Proposed Scheme over its lifetime, including how the scheme would support the ability of government to meet its carbon reduction plan targets.
- **Climate Change Risk (CCR) Assessment:** The resilience of the proposed Development to future climate impacts
- **In-combination Climate Change (ICCI) Assessment:** The combined impact of the proposed Development and future climate change on receptors in the surrounding environment.

17.2 Baseline Conditions

17.2.1 GHG Emissions

The current and future baseline for the assessment of the impact of the project on the climate is a 'business as usual' scenario where the proposed Development is not constructed and operated. The baseline comprises of existing carbon stock and sources of GHG emissions within the boundary of the existing site activities.

The baseline for the lifecycle GHG impact assessment will be established by quantifying the GHG emissions through a desk-based study, and analysis of data from other relevant technical disciplines, for example, traffic and transport, and geology and ground conditions.

17.2.2 Climate

The current baseline for the assessment of climate change risks to the proposed Development (the CCR assessment) and combined risks to surrounding receptors (the ICCI assessment) will be based on historical climate data obtained from the Met Office (2021) recorded by the closest meteorological station to the proposed Development (Lepimore, Argyll and Bute).

The future climatic baseline for Site will be determined through the UK Climate Impacts Programme UK Climate Projections 2018 (UKCP18). To provide context, projections for Scotland highlight the following changes to the climate relative to the 1981-2010 baseline, under the Representative concentration pathway (RCP) 8.5:

- Mean temperatures are expected to increase in both summer and winter;
- Mean daily maximum and minimum temperatures to increase across the UK in both summer and winter;
- Winter precipitation is expected to increase, and summer precipitation decrease; and
- Increased frequency of extreme weather events.

17.3 Methodology

17.3.1 GHG Emissions

A lifecycle approach will be used that considers emissions from different lifecycle stages of the proposed Development as a whole: pre-construction and construction stage (likely 7 years) and operation stage (likely around 80 years).

The proposed scope of the GHG emissions impact (adverse or beneficial) to be assessed are described in Table 17-1, below.

Table 17-1 Proposed Scope of the GHG Emissions Impact Assessment

Lifecycle Stage	Stage Activities	Scoped In or Out	Rationale
Pre-construction	Any enabling works, land clearance, and disposal of waste generated during the enabling works.	In	Material GHG emissions are expected from fuel use, electricity use, loss of carbon sink and waste disposal
Construction	Raw material extraction, product manufacture of construction materials, electricity use, on-site fuel use, waste disposal, and transport	In	Material GHG emissions are expected from embodied carbon of materials, electricity use, fuel use, and waste disposal
Operation	Raw material extraction, product manufacture for operational materials, electricity use, fuel use onsite, waste disposal, landscaping or other offsets	In	Material GHG emissions are expected from embodied carbon of materials, electricity use, fuel use, waste disposal, gain of carbon sinks

Where activity data allows, expected GHG emissions arising from the lifecycle activities associated with the proposed Development scoped in above, will be quantified using a calculation-based methodology as per the following equation as stated in the BEIS emissions factors guidance (BEIS, 2021).

$$\text{Activity data} \times \text{GHG emissions factor} = \text{GHG emissions values}$$

BEIS (2021) GHG emissions factors and embodied carbon data from the Inventory of Carbon and Energy (University of Bath, 2019) will be used as the source data for calculating GHG emissions. Where data are not available, a qualitative approach to addressing GHG impacts will be followed, in line with IEMA Guidance (2017).

In line with The GHG Protocol (WRI & WBCSD, 2004), when defining potential impacts (or hot spots), the seven Kyoto Protocol GHGs will be considered, specifically:

- Carbon Dioxide (CO₂)
- Methane (CH₄)
- Nitrous oxide (N₂O)
- Sulphur hexafluoride (SF₆)
- Hydro fluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Nitrogen trifluoride (NF₃)

Due to the absence of any defined industry guidance or associated thresholds for assessing the significance of GHG emissions impacts for EIA, standard GHG emissions accounting and reporting principles will be followed to determine the impact magnitude. In GHG accounting, it is common practice to consider exclusion of emission sources that are <1% of a given emissions inventory on the basis of a de minimis contribution.

Both the Department of Energy and Climate Change (2013) (now part Department for Business, Energy & Industrial Strategy (BEIS)) and Publicly Available Specification (PAS) 2050 (BSI, 2011) specification allow emissions sources of <1% contribution to be excluded from emission inventories, and these inventories to still be taken into account for verification purposes. This would, therefore, suggest that a development with emissions of <1% a relevant carbon budget would be minimal in its contribution to the wider national GHG emissions. This criteria will be used to contextualise the significance of the GHG emissions, as outlined in Table 17-2 Significance criteria for the GHG impact assessment.

The global climate has been identified as the receptor for the purposes of the lifecycle GHG emissions impact assessment. However, to enable significance evaluation of the estimated GHG emissions arising from the proposed Development, the Scottish carbon reduction targets (compared to a 1990/95 baseline, 75% reduction by 2030, 90% reduction by 2040 and net-zero by 2045) will be used as a proxy for the global climate.

There is no standard definition for receptor sensitivity to GHG emissions set out in the IEMA guidance. The sensitivity of the receptor, the Scottish carbon reduction targets (as a proxy for the global climate), has been defined as high. The rationale is as follows:

- Any additional GHG impacts could compromise Scotland's ability to reduce its GHG emissions and therefore meet its future carbon reduction targets; and
- The extreme importance of limiting global warming to below 2°C above industrial levels, while pursuing efforts to limit such warming to 1.5°C as set out in the Paris Agreement and a recent report by the Intergovernmental Panel on Climate Change highlighted the importance of limiting global warming below 1.5°C.

Table 17-2 Significance criteria for the GHG impact assessment

Significance	Magnitude Criteria
Major	GHG emissions represent equal to or more than 1% of total emissions from the relevant Scottish carbon budget in which they arise
Minor	GHG emissions represent less than 1% of total emissions from the relevant annual Scottish carbon budget in which they arise

Table 17-3 Scottish carbon reduction target shows the current and future Scottish carbon targets, which at present have only been calculated up to 2045 when net zero is anticipated. These annual targets have been extrapolated from a 1990/1995 baseline of 75.5 Mt CO_{2e}, and annual percentage reductions from the baseline, as described by the Scottish Government (Scottish Government 2020a and 2020b).

Table 17-3 Scottish carbon reduction target

Year	Annual reduction target from baseline (%) and extrapolated upper target value in parentheses (Mt CO _{2e})
2021	57.9% (31.87Mt CO _{2e})
2022	59.8% (30.43Mt CO _{2e})
2023	61.7% (28.99Mt CO _{2e})
2024	63.6% (27.55Mt CO _{2e})
2025	65.5% (26.12Mt CO _{2e})
2026	67.4% (24.68Mt CO _{2e})
2027	69.3% (23.24Mt CO _{2e})
2028	71.2% (21.8Mt CO _{2e})
2029	73.1% (20.36Mt CO _{2e})
2030	75% (18.93Mt CO _{2e})
2031	76.5% (17.79Mt CO _{2e})
2032	78% (16.65Mt CO _{2e})
2033	79.5% (15.52Mt CO _{2e})
2034	81% (14.38Mt CO _{2e})
2035	82.5% (13.25Mt CO _{2e})
2036	84% (12.11Mt CO _{2e})
2037	85.5% (10.98Mt CO _{2e})
2038	87% (9.84Mt CO _{2e})
2039	88.5% (8.71Mt CO _{2e})
2040	90% (7.57Mt CO _{2e})
2041	92% (6.06Mt CO _{2e})
2042	94% (4.54Mt CO _{2e})
2043	96% (3.03Mt CO _{2e})
2044	98% (1.51Mt CO _{2e})
2045	100% (net-zero emissions) (0Mt CO _{2e})

17.3.2 CCR Assessment

An assessment of the resilience of the proposed Development to climate change will be undertaken to identify potential climate change impacts, and to consider their potential consequence and likelihood of occurrence, taking account of the adaptation measures incorporated into the design of the proposed Development.

The types of receptors considered vulnerable to climate change are:

- Construction phase receptors (e.g. workforce, plant and machinery); and,
- The proposed Development assets and their operation, maintenance and refurbishment (e.g. electrical equipment, the headpond embankment, tunnel, pump/turbines and generators and the marine facility).

The scope of the CCR assessment is set out in Table 17-4.

Table 17-4 Proposed scope of the CCR assessment

Climate Parameter	Proposed to be Scoped In or Out	Rationale
Extreme weather events	In	The proposed Development may be vulnerable to extreme weather events such as storm damage, coastal erosion and storm surge to structures and assets.
Precipitation change	In	The proposed Development may be vulnerable to changes in precipitation, for example, pressure on water supply during periods of reduced rainfall, and damage to structures and drainage systems during periods of heavy precipitation.
Temperature change	In	Increased temperatures may increase cooling requirements, alter the power plant efficiency of the proposed Development and could impact on structural integrity of buildings and materials.
Sea level rise	Out	The proposed Development is not located in a coastal area so it was concluded that the Proposed Development is not susceptible to sea level rise.
Sea temperature rise	Out	The proposed Development will not likely to be affected by the small increase in sea temperature during its operational life.
Wind	Out	Currently, there is no evidence of compelling trends in storminess when considering maximum gusts over the last five decades (Kendon et al., 2020).

The approach outlined below is aligned with existing guidance such as that of IEMA (IEMA, 2020). The CCR assessment identifies potential climate change impacts and considers their potential consequence and likelihood of occurrence. Once potential impacts have been identified, the likelihood and consequence of each impact occurring to each receptor (where relevant) are assessed for the selected future time frame for operation.

Criteria used to determine the likelihood of an event occurring, based on its probability and frequency of occurrence, are detailed in Table 17-5 Description of likelihood for climate change hazard.

Table 17-5 Description of likelihood for climate change hazard

Likelihood Category	Description (probability and frequency of occurrence)
Very likely	90-100% probability that the hazard will occur.
Likely	66-90% probability that the hazard will occur.
Possible, about as likely as not	33-66% probability that the hazard will occur.
Unlikely	0-33% probability that the hazard will occur.
Very unlikely	0-10% probability that the hazard will occur.

The consequence of an impact has been measured using the criteria detailed in Table 17-6 Measure of consequence for climate change risk. The probability and consequence will take into account embedded design and impact avoidance measures.

Table 17-6 Measure of consequence for climate change risk

Consequence of Impact	Measure of Consequence for Climate Change Resilience
Very high	Permanent damage to structures/assets; Complete loss of operation/service; Complete/partial renewal of infrastructure; Serious health effects, possible loss of life; Extreme financial impact; and Exceptional environmental damage.
High	Extensive infrastructure damage and complete loss of service; Some infrastructure renewal; Major health impacts; Major financial loss; and Considerable environmental impacts.
Medium	Partial infrastructure damage and some loss of service; Moderate financial impact; Adverse effects on health; and Adverse impact on the environment.

Low	Localised infrastructure disruption and minor loss of service; No permanent damage, minor restoration work required; and Small financial losses and/or slight adverse health or environmental effects.
Very low	No damage to infrastructure; No impacts on health or the environment; and No adverse financial impact.

Engagement will be undertaken with relevant environmental disciplines and the engineering design team to discuss the CCR assessment and identify mitigation measures for incorporation into the design of the proposed Development.

The significance will be determined using the matrix in Table 17-7 CCR significance matrix, where anything identified as moderate or major is considered significant.

Table 17-7 CCR significance matrix

		Likelihood of climate change hazard occurring				
		Very unlikely	Unlikely	Possible	Likely	Very likely
Consequence	Very low	Negligible	Negligible	Negligible	Negligible	Negligible
	Low	Negligible	Minor	Minor	Minor	Minor
	Medium	Negligible	Minor	Moderate	Moderate	Moderate
	High	Negligible	Minor	Moderate	Major	Major
	Very high	Negligible	Minor	Moderate	Major	Major

Where required, additional mitigation measures to adapt the proposed Development are identified where potential climate change consequences are identified as being significant.

17.3.3 ICCI Assessment

The ICCI assessment considers the ways in which projected climate change will influence the significance of the impact of the proposed Development on receptors in the surrounding environment. The scope of the ICCI assessment is detailed in Table 17-8 Proposed scope of the ICCI assessment.

The ICCI assessment considers the existing and projected future climate conditions for the geographical location and assessment timeframe. It identifies the extent to which identified receptors in the surrounding environment are potentially vulnerable to and affected by these factors. The receptors for the ICCI assessment are those that will be impacted by the proposed Development. These impacts will be assessed in liaison with the technical specialists responsible for preparing other technical chapters.

Table 17-8 Proposed scope of the ICCI assessment

Climate Parameter	Proposed to be Scoped In or Out	Rationale
Extreme weather events	In	An increase in the likelihood and severity of extreme weather events could lead to damage to ecosystem stability. In combination with sea level rise, the likelihood and severity of acute coastal impacts such as erosion, loss of habitats, destabilisation and damage to infrastructure. These impacts may be exacerbated by the proposed Development.
Precipitation change	In	Climate change may lead to both an increase in substantial precipitation and drought events. The combination of the proposed Development and its water requirements and climate change may cause increased risk of impacts.
Sea Level rise	Out	The proposed Development is not located in a coastal area so it was concluded that the proposed Development or receptors in the surrounding environment are not susceptible to sea level rise.
Sea temperature rise	Out	The receptors in the surrounding environment to the proposed Development will not likely to be affected by the small increase in sea temperature during its operational life.
Temperature change	In	Fluctuating levels of temperature may lead to: <ul style="list-style-type: none"> Increase in likelihood and severity of heat waves which might have a negative impact on biodiversity and health; and Increase in likelihood and severity of freezes which might have a negative impact on biodiversity and health.

Wind Out Currently, there is no evidence of compelling trends in storminess when considering maximum gusts over the last five decades (Kendon et al., 2020).

Criteria used to determine the likelihood of an event occurring, based on its probability and frequency of occurrence, are detailed in Table 17-5 Description of likelihood for climate change hazard. The likelihood of an in-combination climate impact occurring is determined based on the likelihood of a climate hazard occurring (Table 17-5 Description of likelihood for climate change hazard) combined with the sensitivity of the receptor as defined by the relevant environmental disciplines, using professional judgement. Consideration is given to any increase in the impact of the proposed Development. The likelihood of an ICCI occurring will be determined as per Table 17-9 Level of likelihood of an ICCI occurring.

Table 17-9 Level of likelihood of an ICCI occurring

		Likelihood of climate hazard occurring				
		Very unlikely	Unlikely	Possible	Likely	Very likely
Sensitivity of receptor	Very low	Very unlikely	Very unlikely	Unlikely	Possible	Possible
	Low	Very unlikely	Unlikely	Unlikely	Possible	Likely
	Medium	Unlikely	Unlikely	Possible	Likely	Likely
	High	Unlikely	Possible	Likely	Likely	Very likely
	Very high	Possible	Possible	Likely	Very likely	Very likely

Once the likelihood of an in-combination climate impact occurring on a receptor has been identified, the discrete environmental assessment should consider how this will affect the significance of the identified effects.

The ICCI consequence criteria are defined in Table 17-10 Measure of consequence for an ICCI and are based on the change to the significance of the effect already identified by the environmental discipline. To assess the consequence of an ICCI impact, each discipline will assign a level of consequence to an impact based on the criteria description in Table 17-10 Measure of consequence for an ICCI and their discipline assessment methodology.

Table 17-10 Measure of consequence for an ICCI

Consequence of ICCI	Measure of Consequence for an ICCI
High	The climate change parameter in-combination with the effect of the proposed development causes the significance of the effect of the proposed scheme on the resource/receptor, as defined by the topic, to increase from negligible, minor or moderate to major.
Medium	The climate change parameter in-combination with the effect of the proposed development causes the effect defined by the topic, to increase from negligible or minor to moderate.
Low	The climate change parameter in-combination with the effect of the proposed development, causes the significance of effect defined by the topic, to increase from negligible to minor.
Very low	The climate change parameter in-combination with the effect of the proposed development does not alter the significance of the effect defined by the topic.

The significance of potential effects is determined by the environmental disciplines using the matrix in Table 17-11 ICCI significance matrix. As a general rule, where an effect has been identified as moderate or major, this has been deemed significant. However, professional judgement will be applied where appropriate.

Table 17-11 ICCI significance matrix

		Likelihood of ICCI occurring				
		Very unlikely	Unlikely	Possible	Likely	Very likely
Consequence	Very low	Negligible	Negligible	Negligible	Negligible	Negligible
	Low	Negligible	Minor	Minor	Minor	Minor
	Medium	Negligible	Minor	Moderate	Moderate	Moderate

High	Negligible	Minor	Moderate	Major	Major
Very high	Negligible	Minor	Moderate	Major	Major

17.4 Likely Significant Effects

17.4.1 Construction

17.4.1.1 GHG Emissions

The potential impacts from the GHG emissions from both direct and indirect activities associated with pre-construction activities and the construction of the proposed Development, are the contribution to global warming and climate change, and the ability of local, sectoral, or national authorities to meet their carbon reduction targets.

17.4.1.2 Climate

The potential impacts of climate change on any pre-construction activities and the construction of the proposed Development include programme delays, increased costs, or safety risks to construction workers, materials, plant, and vehicles.

17.4.2 Operation

17.4.2.1 GHG Emissions

The potential impacts (adverse or beneficial) of the GHG emissions from operational activities associated with the proposed Development will be assessed to understand the impact on the climate, and the ability of local, sectoral, or national authorities to meet their carbon reduction targets. This will include a comparison of the emissions intensity of electricity produced by the proposed Development compared to other types of generation e.g. gas and also the current carbon intensity of the grid as well as assessing the wider benefits of project, in terms of allowing more renewable energy developments to connect to the grid.

17.4.2.2 Climate

The potential impacts of climate change on the construction and operation of the proposed Development include increased costs, functionality of the proposed Development, safety risks or functionality to workers, users, materials, plant and vehicles.

17.5 Likely Mitigation Measures

17.5.1 GHG emissions

A number of mitigation measures to reduce GHG emissions from the construction and operations of proposed Development will be considered, many of which will be addressed through the design of the proposed Development. These may include

- Designing, constructing and operating the proposed Development in such a way as to minimise the creation of waste and maximise the use of materials with lower embodied carbon such as locally sourced products and materials with a higher recycled content;
- Conducting regular planned maintenance of the proposed Development to optimise efficiency;
- Use of hybrid or electrical plant and equipment where possible; and
- Identify, assess and integrate measures to further reduce carbon through on or off-site offsetting or sequestration.

17.5.2 CCR

A number of general mitigation and adaptation measures to increase the resilience of the proposed Development will be considered, many of which will be addressed through the design of the proposed Development. The assessment will consider existing resilience measures for each climate variable and associated risks either already in place or in development for infrastructure and assets.

Potential mitigation measures may include, but are not limited to:

- Taking into account the dangers associated with working in more extreme weather conditions during construction;
- Use of construction materials with superior properties that are more resilient to a changing climate;
- Sustainable drainage systems to mitigate for increased runoff (including pollutants) from areas of hardstanding; and
- Taking into account climate change projections within maintenance and refurbishment plans.

17.5.3 ICCI

Mitigation measures to reduce ICCIs will be discussed with the relevant disciplines as appropriate.

17.6 Summary and Conclusions

In summary, it is proposed that the GHG impact assessment, CCR and ICCI assessments are scoped in to determine the potential for likely significant effects to and from climate change as a result of the proposed Development. Whilst there will be GHG emissions associated with the construction of the proposed Development, operationally, it will contribute to the decarbonisation of Scotland's grid electricity and help meet the increasing demand for low and zero carbon electricity generation; thus supporting Scotland's transition towards achieving net-zero by 2045. Best practice methods and guidance will be used in these assessments.

17.7 References

BEIS (2020). Greenhouse Gas Reporting: Conversion Factors 2020 (online). Available: <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020> [Accessed 20 October 2021]

IEMA (2017). Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (online). Available: <https://www.iema.net/preview-document/assessing-greenhouse-gas-emissions-and-evaluating-their-significance> [Accessed 20 October 2021]

IEMA (2020) Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (online) Available: <https://www.iema.net/resources/reading-room/2020/06/26/iema-eia-guide-to-climate-change-resilience-and-adaptation-2020> [Accessed 20 October 2021]

Kendon, M., McCarthy, M., Jevrejeva, S., Matthews, A., Sparks, T., and Garforth, J. (2020). State of the UK Climate 2019. International Journal of Climatology. Volume 40, Number S1, July 2020. The Royal Meteorological Society Journal of Climate Science (online). Available: <https://rmets.onlinelibrary.wiley.com/doi/epdf/10.1002/joc.6726> [Accessed 20 October 2021]

Met Office (2021). UK Climate Averages (online). Available: <https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages> [Accessed 20 October 2021]

The Town and Country Planning (Environmental Impact Assessment) Regulations 2017

UK Climate Impacts Programme (UKCIP) (2018) UK Climate Projections

University of Bath (2019). The Inventory of Carbon and Energy. Version 3 (online). Available: <https://circularecology.com/embodied-carbon-footprint-database.html> [Accessed 20 October 2021]

WRI & WBCSD (2015). The GHG Protocol. A Corporate Accounting and Reporting Standard. Revised Edition (online). Available: <https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf> [Accessed 25 October 2021]

18. Arboricultural Impact Assessment

18.1 Introduction

The proposed Development will require some tree removal to facilitate access track improvements around Inveraray. From the A819, it is proposed that access will be gained from two existing forestry tracks located at NN 08853 12473 and NN 10064 19980 at Inveraray. Each of the proposed access routes will utilise existing forestry tracks as far as possible with some stretches of new track to be constructed. Both access tracks will link the A819. The study will identify trees to be removed and will consider any impacts to retained trees including how they can be protected.

18.2 Methodology

A desk study focussing on statutory and non-statutory designations and relevant planning policy will be undertaken. This will be followed by a detailed walkover tree survey for key defined areas around the proposed access track improvements at Inveraray.

The tree survey will include trees along the route of the proposed upgraded existing access track and the route of the new access track within the 100m micro-siting boundary as indicated on *Figure 1.2 Above Ground Infrastructure, Sheet 2*. The data collected from the desk study and field survey will form the baseline for the arboricultural impact assessment (AIA) and Tree Protection Plan which will assess the likely direct and indirect impacts of the proposed Development on trees.

Data collected will be used to identify potential tree losses and provide advice on tree removals and retention, in combination with providing input into the design evolution and informing the final design. The assessment will be undertaken to recent and relevant guidance *BS5837:2012 Trees in relation to design demolition and construction – Recommendations*.

The AIA will be produced as an appendix to the main EIAR.

In summary, the key elements of the AIA will include:

- Tree Survey Fieldwork to identify the quality and benefits of the trees on or immediately adjacent to the site. To include collection of measurements/photographic and observational data on site.
- Report including schedule of existing trees and baseline notes for the design team in relation to tree related opportunities and constraints.
- Arboricultural Constraints Plan(s), showing the principal above and below ground spatial constraints affecting construction operations within the site.
- Arboricultural Impact Assessment (AIA) Report - describing the potential direct and indirect impacts of the development proposals upon the existing trees including identification of those to be removed and measures for the safe retention of those retained on site in this context.
- Tree Protection Plan(s) - illustrating trees for retention and removal and demonstrating how existing trees to be retained will be spatially protected during the construction stage including the location of any temporary protective fencing for this purpose.

19. Marine Physical Environment & Coastal Processes

19.1 Introduction

This chapter is informed by a desk study to consider the potential impacts of the proposed Marine Facility on physical marine and coastal processes.

19.2 Baseline Conditions

19.2.1 Study Area

The proposed Marine Facility consists of a pier structure to the south of Newtown at the northern end of an extended embayment along the northern shore of Loch Fyne. The pier will consist of a 25m wide elevated deck supported by an open-piled structure 7m above the local Mean High Water Springs (MHWS) level. The pier structure will extend up to 400m into Loch Fyne from the shoreline.

The Marine Facility is located within the Upper Loch Fyne and Lock Goil Marine Protected Area and also sits within Policy Zone J (*Rubha Nam Frangach* to Strone Point) of the Local Development Plan (Argyll & Bute Council, 2015). Appropriate consideration will therefore need to be given due to the sensitive nature of the local and wider study area.

19.2.2 Bathymetry

A bathymetric survey around the marine facility area will be undertaken as required to fully understand potential constraints at the site, in particular relating to vessel access. Electronic chart data from Jeppesen's C-Map database, as shown in Figure 19.1 Location of Study Area and Bathymetry (m), has been used to provide an initial assessment of water depths close to the study area. In the central section of Loch Fyne, adjacent to the proposed Marine Facility, depths are in excess of 100m CD (i.e. below Chart Datum) reducing to 2m CD close to the shore. More detail on the transition between these depths is required to establish the potential requirement for dredging, as needed to provide vessel access.

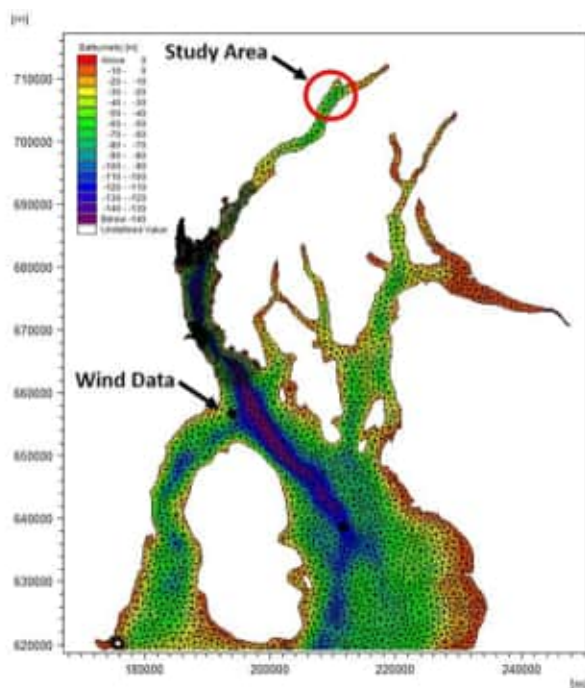


Figure 19.1. Approximate Location of Study Area and Bathymetry (m)

19.2.3 Water Levels

Water level variations at the site will be dominated by tidal influences but may also be subject to surge effects due to variations in atmospheric pressure and local wind effects. Mean tidal ranges at Inveraray are approximately 2.4m on neap and 3.2m on spring tides, respectively. Fluctuations due to positive and negative surge effects are likely to be in the range $\pm 0.75\text{m}$.

Table 19.1. Tidal heights and levels for Inveraray (source: UKHO, 2021)

Description	Tidal Height (m CD)	Level ¹ (m ODN)
Highest Astronomical Tide (HAT)	3.6	1.98
Mean High Water Springs (MHWS)	3.3	1.68
Mean High Water Neaps (MHWN)	2.9	1.28
Mean Sea Level ² (MSL)	1.8	0.18
Mean Low Water Neaps (MHWN)	0.5	-1.12
Mean Low Water Springs (MLWS)	0.1	-1.52
Lowest Astronomical Tide ² (LAT)	0.0	-1.62

Notes:

1. Based on -1.62m CD to ODN correction (UKHO, 2021).
2. Estimated Values

19.2.4 Currents

There is no readily available information on local currents. However, given the location of the proposed Marine Facility towards the northern limit of Loch Fyne, tidal currents are likely to be relatively weak (i.e. less than 0.5 m/s) and are subject to confirmation by some form of in-situ measurement. During storm conditions surface currents will be enhanced by the action of strong winds. Flood flows from drainage channels will also have an influence on local currents, again mainly at the surface due to the lower density of fresh water relative to the saline water in the loch.

19.2.5 Winds

Figure 19.2 Wind Rose for UK Met Office Data, shows a wind rose based on a 38-year hindcast (1980 to 2017) obtained from the UK Met Office for the position identified in Figure 19.1 Location of Study Area and Bathymetry (m), above. Winds are shown to be predominately from the north-westerly to southerly sectors with an average wind speed of approx. 6 m/s and a maximum of 30 m/s from the south-west.

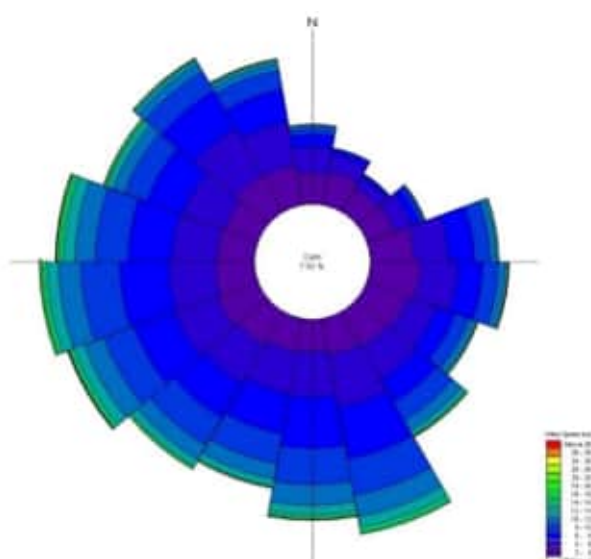


Figure 19.2. Wind Rose for UK Met Office Data (source: AECOM, 2018)

19.2.6 Waves

In terms of local wave conditions, Inveraray is approximately 50km from the open sea and therefore beyond the limit of offshore swell wave penetration. Only locally generated wind waves will be present at the location of the proposed Marine Facility and will be limited by the available fetch lengths within Loch Fyne which are less than 10 km. However, Loch Fyne has a south-west to north-east alignment which coincides with the strongest winds. Using a fetch-based approach to estimate wave conditions (see Figure 19.3 Graph for Estimation of Fetch-Based Wave Heights), an extreme wind speed of 30m/s and fetch length of 10km can result in a significant wave height in the range 1-2m which would have a relatively short period of less than 5s. Loading/unloading operations may therefore need to be restricted to the when wave activity is much lower as a form of embedded mitigation, thus avoiding the requirement to provide protection for vessels at berth.

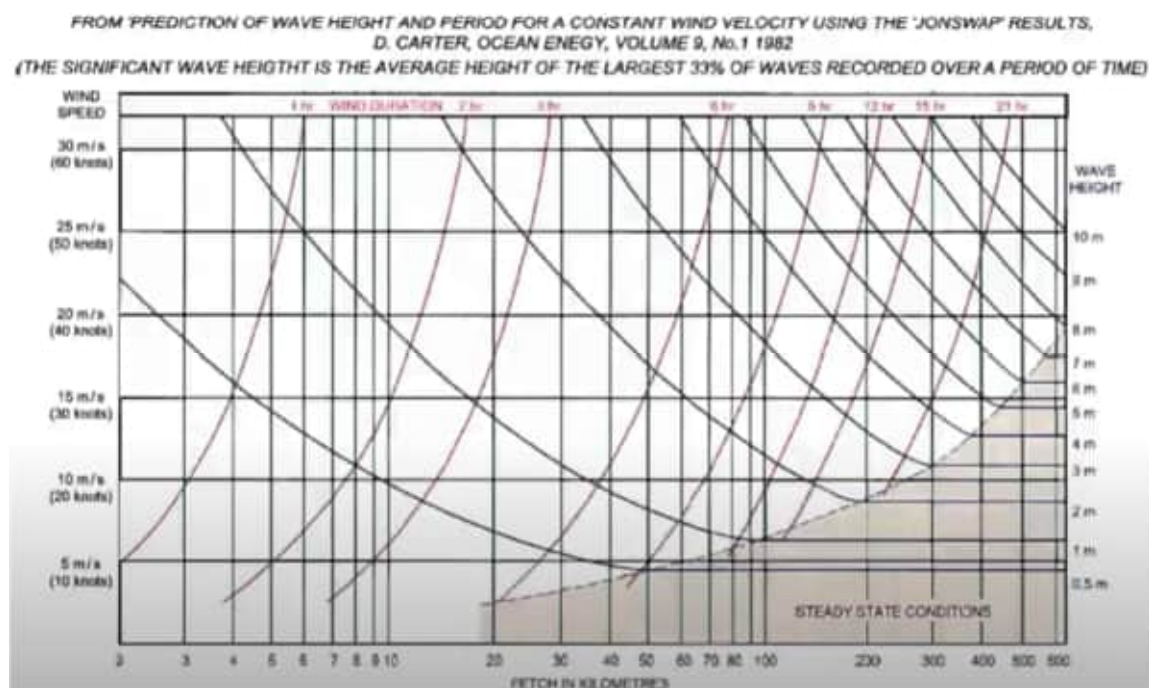


Figure 19.3. Graph for Estimation of Fetch-Based Wave Heights (source: Carter, 1982)

19.2.7 Coastal Morphology

A review of coastal monitoring data (Dynamic Coast, 2022) confirmed that the coastal frontage along the northern shore of Loch Fyne is predicted to be generally stable up to the year 2100, even under a high emissions scenario (i.e. RCP8.5 95th percentile), with negligible landward retreat. The only exception is a 100m section of the south-facing coastline, as shown on Figure 19.4 Predicted Erosion Lines for the Study Area (source: Dynamic Coast, 2022), which is predicted to retreat a distance of 60m by 2100 assuming a sea level rise of 0.91m over this period.

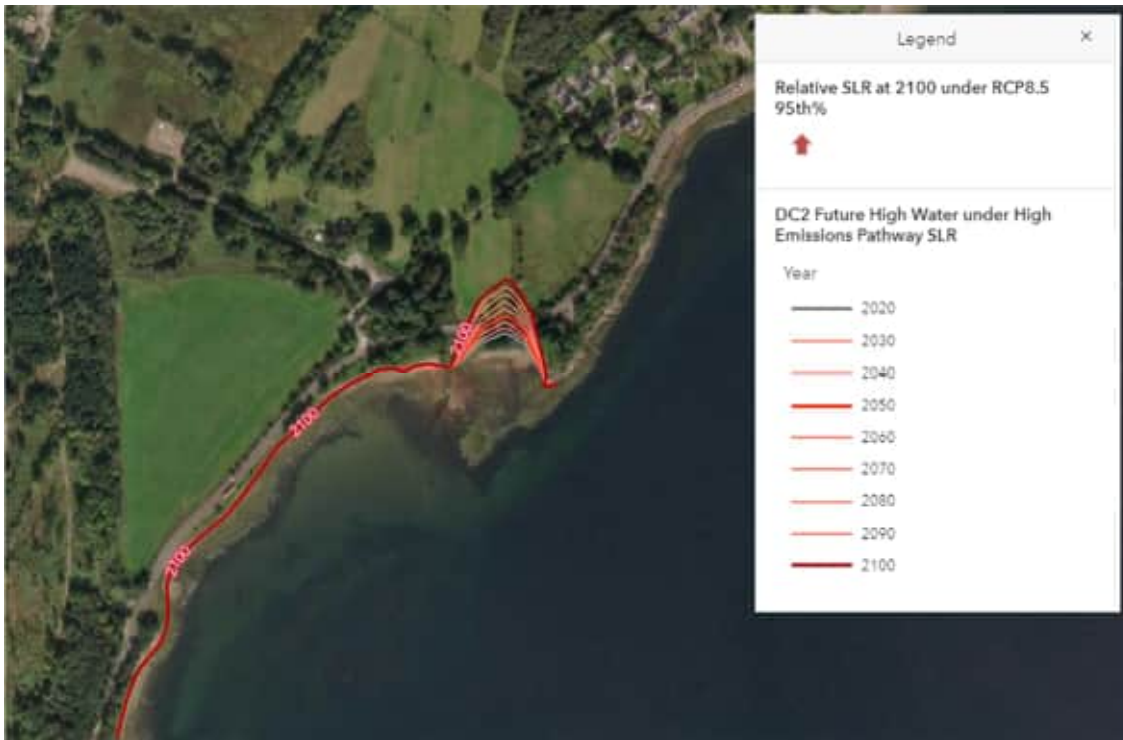


Figure 19-4. Predicted erosion lines for the study area (source: Dynamic Coast, 2022)

19.2.8 Sediment Transport

Based on mapping of the superficial geology (Figure 11.3 Superficial Geology), the coastal and nearshore areas around Inveraray consist of raised marine deposits comprising sand and gravel. Although not shown, these can be expected to extend southwards as far as the location of the proposed Marine Facility. This is consistent with the description of a shingle foreshore and stony beaches for the northern shoreline of Loch Fyne provided for Policy Zone J in the Local Development Plan (Argyll & Bute Council, 2015).

Based on currently available information, scouring of sediment around piles is considered unlikely to be a significant issue since shingle-type material will be resistant to erosion and even if it is mobilised, is unlikely to be transported more than a few metres. Also, if the piles required to support the deck structures are in relatively deep water (i.e. >20m), the risk of scour with the relatively weak currents at this depth will be significantly reduced.

It will therefore be important to have a better understanding of the hydrodynamic regime within the local study area, informed by marine surveys as a minimum and possibly supported by numerical modelling. A review geotechnical information will also be required to confirm the proportion of fine material (i.e. clays and silts) that could lead to increased turbidity levels (and thus reduced water quality). If this material has the potential to be re-suspended, a study of sediment dispersion would be required.

19.2.9 Marine Water Quality

The nearshore area to the south of Newtown, including the site of the proposed Marine Facility, is identified in the LDP as a potential shellfish growing area although this is also within a defined MOD exercise area and not therefore considered suitable for development (Argyll & Bute Council, 2009). There are also a number of sea outfalls along this section of the shoreline which will need to be taken into consideration depending on the nature of effluent and their proximity to the proposed Marine Facility.

The current condition of the 'Loch Fyne – Upper Basin' water body (ID: 200334) is classified as being 'Good' (SEPA, 2022). Careful consideration will therefore need to be given to any adverse effects resulting from the proposed Marine Facility that might have a detrimental impact on water quality.

19.2.10 Sediment Quality

There is currently no readily available information on sediment quality. Sediment sampling and analysis will therefore be required to establish sediment quality within the proposed footprint of the proposed Marine Facility as a minimum.

19.3 Methodology

19.3.1 Key Data Sources

Key data sources used for the assessment will include the following:

- Marine Facility Project Description
- Admiralty predicted tides for Inveraray
- Admiralty Chart No.5610 (10A Loch Fyne continuation)
- Coastal Flood Boundary dataset of extreme sea levels for Scottish Waters
- Bathymetric survey of study area
- Geophysical and geotechnical survey of study area
- Particle size and contaminant analysis for bed sediments
- Current, wave and water level measurements

19.3.2 Data Review

A desk-based review of available information on the physical marine and coastal environment will be undertaken. A site walkover survey will be undertaken at low water to identify any important intertidal features that will need to be taken into consideration. Particular focus will be given to the section of shoreline which is predicted to be subject to high levels erosion in the future.

The bathymetric survey will be reviewed to identify any relevant sub-tidal features together with geotechnical/geophysical data to provide an understanding of variations in bed material with depth. Analysis of surficial sediment samples collected at locations within the study area (i.e. within the footprint of the Marine Facility and adjacent areas) will be undertaken to confirm the nature of the material on the bed of Loch Fyne.

The bathymetric survey is also needed to establish the requirement for dredging which may be required to provide sufficient under-keel clearance for vessels accessing the facility. Local tidal conditions and the draft of vessels using the facility will also be required.

19.3.3 Marine Surveys

Unless suitable data can be identified from a previous survey, the measurement of local currents for a fixed location close to the proposed Marine Facility will be required to inform the understanding of baseline conditions. The deployment of a surface or bottom mounted ADCP type instrument is recommended which should include a pressure sensor so that water level variations are recorded as well as currents at intervals through the water column.

If dredging is required to accommodate larger draft vessels, this would create an artificially deepened channel and/or basin which may be subject to siltation. Water sample data will therefore be needed to determine background levels of Total Suspended Solids (TSS).

19.3.4 Numerical Modelling

The size and density of piles used to support the pier deck together with information on the local currents will be used to determine whether it is necessary to use the hydrodynamic model to investigate the drag effect of these structures on the local flow regime. If the structures block more than 5% of the flow cross-section at mean sea level, then a detailed assessment of this effect using the numerical model would be required.

The requirement for sediment dispersion modelling will be established based on the findings from the sediment sample analysis and geotechnical/geophysical surveys. The construction methodology will also be reviewed which might identify the potential for fine sediment dispersion resulting from the drilling process required for installation of the piles. Alternatively, if the bed material is suitable allowing the piles to be driven into the bed, then there would be negligible release of fine sediments.

If required a numerical hydrodynamic model will be developed to provide a detailed description of variations in water levels and currents covering a full spring-neap tidal cycle. Measured data from marine surveys will be used to calibrate and validate the model.

19.4 Likely Significant Effects

19.4.1 Construction

The requirement for dredging is subject to confirmation and will depend on the draft of vessels that will be using the Marine Facility to offload large equipment. At this stage it is assumed that if dredging is required, this will be undertaken using a cutter dredger and there will be no need for blasting of bedrock.

Drilling is likely to be required to install piles to support the pier structure and mooring dolphins. The drilling process is likely to result in the release of fine material into the water column which will subsequently be carried in suspension by the local currents and potentially dispersed more widely before settling on the bed.

There will inevitably be a degree of disturbance of bed sediments during the construction phase due to the presence of vessels and marine plant involved in construction.

Due to the increased vessel activity and the presence of marine plant during the construction period, there will be an increased risk of accidental spills. Construction vessels will be required to have IMO certification and implement MARPOL guidance for pollution control.

19.4.2 Operation

During the operational phase there will be a direct impact due to the loss of both intertidal and subtidal habitat caused by the physical 'footprint' of the piles required to support the pier deck. The total of these areas will be calculated as part of the impact assessment. Other potential impacts are classified as indirect.

The piles used to support the proposed pier structure will provide a physical obstruction to current flows within Loch Fyne. There will therefore be potential for localised scour around any marine structures due to an acceleration of the currents as they pass around the piles.

The drag effect of the pier could reduce currents and create a 'sink' encouraging siltation of fine suspended sediment having a smothering effect as well as reducing safe navigation depths. Due to the anticipated low magnitude of the currents, this potential impact is expected to be a low risk. However, it cannot be discounted without a better understanding of local currents.

It is known that there are numerous sea outfalls within the wider study area. The Marine Facility has the potential to modify current patterns and could therefore have a negative impact on water quality by reducing natural dispersion process and encouraging the localised accumulation of contaminants.

19.4.3 Decommissioning

The Marine Facility is, in part, a temporary structure required for the transport of large equipment to site. Post construction, it is anticipated that the scale of the marine facility will be reduced, however elements will remain to allow potential transport of machinery and materials required for maintenance phases during the lifespan of operation.

If fine sediment is found to accumulate within sheltered areas of the Marine Facility during operation, this may require maintenance dredging if rates of accumulation are high or alternatively this could remain in-situ until decommissioning when the piled structures will be removed. After removal of the piles the accumulated sediment may be remobilised due to the increased exposure to current and wave effects.

The dispersion of fine sediment from the location of the Marine Facility may therefore also need to be considered at the decommissioning stage in which case modelling carried out for the construction phase can be used to inform an assessment of likely effects. However, given the approximated operational lifetime of PSH is in the region of 80 years, a decision would be made in the future whether to refurbish the PSH or to decommission the scheme. The refurbishment plan or if the latter, a detailed decommissioning plan, would be prepared as required as this may be subject to a separate planning application at the time. Decommissioning is therefore scoped out of assessment.

19.5 Likely Mitigation Measures

The design of an open piled structure to support the pier deck will minimise any direct impact on seabed and is therefore considered as providing a form of embedded mitigation.

Whilst it is proposed to use numerical modelling techniques to investigate the potential dispersion of fine sediment in suspension, monitoring of TSS levels during construction is also recommended as mitigation to confirm that the predicted levels above background are not exceeded. If levels are exceeded, appropriate action can then be taken to ensure the significance of any adverse impact is minimised.

19.6 Summary & Conclusions

A summary of potential impacts along with a justification for these being either scoped in or out of the impact assessment is provided in Table 19.2 Identification of Potential Impacts, below.

Table 19.2 Identification of Potential Impacts

Project Phase	Potential Impact	Scoped In/Out with Justification
Construction	Fine sediment dispersion during drilling for piled pier supports	Scoped in – subject to confirmation of construction method.
	Fine sediment dispersion during dredging (if required)	Scoped out – subject to confirmation that dredging not required.
	Fine sediment dispersion due to propeller wash	Scoped in – results to be inferred from other modelling scenarios.
	Accidental spill from vessels	Scoped out – construction vessels will be required to have IMO certification and implement MARPOL guidance for pollution control.
Operation	Direct habitat loss due to newly installed piles	Scoped in – hand calculation based on project details.
	Modified coastal erosion	Scoped in – potential positive impact of reduced erosion informed by site walkover.
	Interaction with existing sea outfalls	Scoped in – potential for this to be informed by site walkover with further studies if required.
	Reduced currents due to drag effect of the pier structure	Scoped out – not required unless open piled structure provides significant blockage effect to flows.
	Fine sediment dispersion due to scour processes	Scoped in – subject to confirmation of geophysical and geotechnical information. Results to be inferred from other modelling scenarios.
	Fine sediment dispersion due to maintenance dredging and disposal	Scoped out – subject to confirmation of low levels of suspended sediment from analysis of water samples.
	Accidental spill from vessels	Scoped out – construction vessels will be required to have IMO certification and implement MARPOL guidance for pollution control.
Decommissioning	Climate change effects.	Scoped out – not relevant due to temporary nature of structure.
	Fine sediment dispersion following removal of piles	Scoped out – given lifespan of operation. A decision would be made in the future whether to refurbish the PSH or to decommission the scheme, which would be subject to a separate planning application at the time
	Accidental spill from vessels	
	Climate change effects	

The following concluding remarks are provided based on findings from the desk study, as summarised in this chapter:

- New surveys are required to provide a more detailed understanding of baseline conditions and to confirm the scope of work in terms of the impacts to be assessed;
- A detailed Project Description is required to confirm which of the potential impacts identified can be ‘scoped out’ of further assessment;
- Numerical modelling may be required to support the impact assessment although this will be subject to confirmation of project details and findings from marine surveys.

- A detailed assessment based of the potential impacts identified will be carried out forming the basis of the EIA.

19.7 References

AECOM (2018). Lochgilphead Flood Study.

Argyll & Bute Council (2009). Marine & Coastal Development Unit Report.

Argyll & Bute Council (2015). Local Development Plan.

Dynamic Coast <https://www.dynamiccoast.com/> [Accessed May 2022]

UKHO (2021). Admiralty Tide Tables, United Kingdom and Ireland, NP201B, Volume 1B, 2022.

SEPA (2022). Water Classification Hub (<https://www.sepa.org.uk/data-visualisation/water-classification-hub/>).

20. Shipping and Navigation

20.1 Baseline Conditions

Inveraray harbour is located within the statutory harbour limits of Clyde Port. The statutory harbour authority (SHA), Clyde Port, administers the majority of port operations.

For the purposes of the EIA, the study area will encompass Loch Fyne from Inveraray southwards to the Firth of Clyde at the Isle of Arran. Baseline data has been reviewed in consideration of the proposed marine facility just south of Inveraray, and transport of materials, primarily large machinery such as the tunnel boring machine, to site via sea.

It is proposed to construct a new marine facility just south of Inveraray which will extend approximately 400m from the shoreline, be 25m in width and 7m high (above mean high water springs). Detailed design of the marine facility is yet to be completed, and will be designed taking into account known constraints within the area.

Key shipping routes within the study area includes the ferry service between Tarbert and Portavadie. The ferry typically runs hourly from 0800 to 1900 from Tarbert, and 0830 to 1930 from Portavadie, with each journey taking approximately 25 minutes³.

Data from Marine Scotland maps database⁴ identified the following vessel usage within the study area:

- 2 transit or less of average weekly density of recreational vessels 2012-2017 at Inveraray, up to 50 further south down Loch Fyne in the region of Tarbert
- 2 transit or less of average weekly density of passenger vessels 2012-2017 at Inveraray, to over 50 between Tarbert and Portavadie.
- Inshore fishing vessels: 4 at Inveraray, up to 15 at Port Ann southwards to 28 at Kilbride Bay.
- Average weekly density of fishing vessels: 0 up at Inveraray, up to 50 at Tarbert.
- Nephrops mobile fishing (trawling) is greatest south of Castleton, with static (creels) present in the majority of Loch Fyne, however no records north of Creggans towards Inveraray.
- Low levels of crab and lobster pots and scallop divers and towed dredges within the mid and southern reaches of Loch Fyne
- Average weekly density of cargo vessels: 0 at Inveraray, but up to 20 further south in Loch Fyne from Minard southwards.
- Average weekly density of tankers: 0 on Loch Fyne, but up to 20 between Isle of Arran and West Kilbride.

The above results in an average of all vessel types at 5 transits or less at Inveraray, with up to 20 south to Lochgair, and up to 50 further south to Tarbert where it increases to 50-150 transits per week.

There is a recommended navigation channel just north of Furnace, and south of Inveraray to consider in regards to vessel size and navigation.

There are leisure mooring agreements at a number of locations on both banks of Loch Fyne, with the largest area at Strachur. All leisure activities from the Marine Recreation and Tourism Survey 2015 indicated that low levels of recreation activities throughout the study area, with the exception of at Tarbert where medium levels were recorded. Impacts on tourism and recreation will be assessed within Chapter 16 Socio-economics, Tourism and Recreation.

Loch Fyne is a designated defence military exercise area, but is not designated as a danger area.

³ <https://www.calmac.co.uk/article/7716/Cowal--Kintyre-Tarbert-Loch-Fyne--Portavadie>

⁴ <https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=841>

20.2 Likely Significant Effects

The key potential impacts relating to shipping and navigation include impacts on current shipping and sea users from the movement of plant/material by sea and from construction of the marine facility. These impacts are considered likely as a result of:

- Risk of collision of a passing (third party) vessel with a vessel associated with delivery of materials
- Disruption to passing vessel routeing/timetables
- Disruption to fishing and recreational activities
- Disruption to military exercises
- Risk of restriction on vessel size with regards to navigating Loch Fyne to Inveraray

There are no significant operational effects anticipated. Some replacement components may be required to be delivered to site as part of maintenance phases, however the number of vessels are considered to be minimal and effects mitigated through good practice.

20.3 Mitigation

Taking into consideration each of the bullet points above setting out likely effects, it is proposed to scope out shipping and navigation from further assessment for the following rationale:

- The new marine facility proposed just south of Inveraray is to be located at the northern extent of Loch Fyne, and not situated near or within any shipping routes. It is therefore considered likely that there would not be any significant effects on existing shipping activity.
- Vessel movements are anticipated to be circa no more than 10 per day during limited periods during construction. This is considered to be a low level increase in vessel movements and therefore unlikely to cause disruption to existing uses within Loch Fyne. It is expected that during machinery/material delivery all the vessels approaching the area will be made aware of the temporary additional vessels through embedded mitigations such as circulation of information. Automatic Identification System (AIS) broadcast, marking and lighting of construction vessels will also raise awareness to passing vessels. Communication with Clyde Port when a detailed construction plan is available should help to minimise collision risk associated with the navigational approach channels
- Vessel movements within the study area are considered to be low levels of usage which can be mitigated through scheduled timing on vessels delivering materials to site, in particular to avoid the ferry movements between Tarbert and Portavadie.
- The Ministry of Defence will be consulted as part of the scoping exercise and advise on any considerations in relation to Loch Fyne being a designated defence military exercise area, but as is not within a danger area and is an active sea loch for commercial and recreational use, that no significant impacts are considered likely. There may be restrictions on when materials can be delivered to site as a result of training exercises being carried out, however it is anticipated that these will be notified in advance and material delivery can be scheduled around this.
- The navigation channel just north of Furnace, and south of Inveraray will be reviewed, including consultation with potential shipping contractors (if required), to establish feasibility of delivery of materials to site. It is considered likely that utilising this recommended navigation channel would avoid any issues in relation to restrictions in channel depth and associated size of vessel and impact on feasibility of delivery of materials to site.

20.4 Scope of Assessment

It is considered that all significant potential impacts can be mitigated with no resulting significant residual effects likely. It is therefore proposed to scope Shipping and Navigation out of any further assessment. As noted, impacts on tourism and recreation uses of Loch Fyne will be assessed within the separate Socio economics, tourism and recreation chapter.

21. Commercial Fisheries

21.1 Introduction

This chapter is informed by a desk study and considers the potential impacts of the proposed Development on the receptor commercial fisheries. The marine fish ecology baseline is considered in Chapter 8 Marine Ecology section 8.2.4 Marine Fish. However, the 'marine fish' receptor group includes life stages of diadromous fish species that also occur in freshwater environments at certain life stages. Freshwater fish life stages of these species are considered within Chapter 7 Aquatic Ecology.

The commercial fisheries scope for the proposed Development is primarily concerned with the construction, operation and decommissioning of the marine facility which shall be situated at Inveraray on Loch Fyne.

21.2 Methodology

21.2.1 Assessment Approach

The assessment methodology for commercial fisheries will follow the standard methodology outlined in Section 3.4 Approach to EIA. The identification and assessment of effects and mitigation are based on expert judgment and following relevant available guidance.

The potential magnitude of environmental feature sensitivity and potential effects will be assessed using similar terminology outlined in Chapter 3, and tailored with specific reference to aspects of relevance to commercial fishing, as set out below:

- Magnitude:
 - Area affected: Extent of area affected in the context of available grounds and level of fishing activity that the area affected sustains.
 - Duration and frequency: Time and frequency of the effect.
 - Liaison and management: Range of fisheries liaison and management measures that are implemented.
- Sensitivity:
 - Operational range: Extent of the area over which vessels normally operate relevant to the Study Area.
 - Operational versatility: Ability to deploy different fishing methods/target different species
 - Adaptability: Ability of vessels to adapt to the potential impact. Degree to which fishing vessels can avoid or adapt to changing circumstances, including their capacity to accommodate change.
 - Importance: The economic value of the fishery at local, national, and international level.

This chapter of the Scoping Report has identified potential impact pathways to commercial fisheries during the construction and operation of the marine facility. Decommissioning has been scoped out as the lifetime of the project is estimated to be around 80 years.

Impacts arising from potential indirect effects (e.g., through sedimentation or effects on fish or shellfish as ecological receptors) will be primarily documented in the relevant receptor chapters of the EIA. Any residual effects once mitigation measures have been applied will then, if necessary, be considered for their secondary impact on commercial fishing activity.

21.2.2 Data Sources

To complete a baseline study and inform the impact assessment, further research will be required. As part of a detailed desk-based fisheries assessment, published data and reports will be used to generate an understanding of key fishing grounds, seasonality, fishing effort, and the most prevalent gear types used, relative to the Study Area, and the proposed Development potential interactions with them. Key data sources will include, but will not be limited to:

- Project-specific survey data (where applicable)

- ICES fisheries survey data (e.g. important species, gear type, spawning and nursery areas, species distribution; Marine Scotland 2021)
- Non-UK landings by ICES Rectangles (2018) – source: European Commission, Scientific, Technical and Economic Committee for Fisheries (STECF);
- UK Annual fisheries Statistics (MMO, 2021a)
- UK Fishing Vessel Lists (MMO, 2020; MMO 2021a)
- UK and foreign vessels landings by UK port and UK vessel landings abroad (MMO, 2021b)
- Vessel Density Grid (MMO, 2017)
- Vessel Monitoring System data (MMO, 2021c)
- Other publicly available reports and information received from consultations.

21.2.3 Consultation

During the EIA process, an appropriate level of engagement with fisheries stakeholders at national, regional, and (if possible) targeted local level, will be undertaken to obtain an understanding of the characteristics of fishing activity and the Project's potential interactions with them. Consultee stakeholders, fisheries organisations, and representatives include, but are not limited to:

- National Federation of Fishermen's Organisations
- Scottish Fisherman's Organisation;
- West Coast Regional Inshore Fisheries Group;
- Argyll and Bute Council; and
- Marine Scotland.

21.3 Baseline Conditions

21.3.1 Study Area

For the purpose of this scoping exercise, a broad study area encompassing the whole of Loch Fyne has been adopted within which commercial fisheries baseline conditions have been described. Given the semi-enclosed nature of this sea loch, it is likely that the ecology of the upper loch is closely tied with that of the lower loch, and as such the entire loch is considered for the study area; Upper and lower Loch Fyne falls within the International Council for the Exploration of the Sea (ICES) sub-rectangles 40E4 and 41E4 . The upper Loch Fyne is considered to extend upstream of Strachur to the furthest inland extension of the loch.

At this stage, the Zone of Influence (Zoi) for commercial fisheries is anticipated to include areas of fishing grounds which the proposed Development is located within and / or passes through. It is these areas which may be directly affected by the Project's construction, operation & maintenance and decommissioning. The Zoi will also include the commercial fisheries fleet segments (defined by vessel size and gear type, incorporating target species), whose fishing activities may either be directly affected by Project activity or indirectly through potential disruption to steaming routes.

21.3.2 Baseline

The marine facility for the proposed Development is situated within the Upper Loch Fyne and Loch Goil Nature Conservation Marine Protected Area (NCMPA) which was designated in July 2014 under the Marine (Scotland) Act 2010 and came into force in August 2014. It extends inland from the Firth of Clyde on the west coast of Scotland. Please refer to Figure 21.1 Commercial Fisheries, in Appendix A Figures.

The fish species of commercial importance, present in Loch Fyne, are primarily diadromous fish species, such as Atlantic salmon (*Salmo salar*), brown/sea trout (*Salmo trutta*), European eel (*Anguilla anguilla*), and lamprey (*Lampetra* spp.) (Argyll Fisheries Trust, 2012).

The benthic environment has also been recognised as being suitable habitat for Nephrops (i.e. Norway lobster; Scottish Government, 2013). Furthermore, the lower region of Loch Fyne provides spawning grounds for sprat (*Sprattus sprattus*) and Nephrops, as well as a nursery ground for saithe (*Pollachius virens*), herring (*Clupea harengus*) and cod (*Gadus morhua*). The presence of these functional habitats within the Study Area suggests that these species are likely to occur within the vicinity of the Development Site.

The main harbour in Loch Fyne is Tarbert, with a few vessels registered to Ardishaig and Inveraray (Argyll & Bute Council 2009). Landings occur primarily at Tarbet and Ardishaig, with some landings from port of Carradale also associated with the loch.

The principal target of fishing activity in Loch Fyne is shellfish species, with the primary target species being scallops and Nephrops. Other fauna often targeted include crabs, lobsters, and razor fish. The upper loch has primarily been used for Nephrops trawling/creeling, as has lower Loch Fyne but with a higher proportion of scallop dredging occurring in coastal areas (Figure 1; Argyll & Bute Council 2009).

Upper Loch Fyne falls within the ICES rectangle 41E4. Within this rectangle, UK fishing vessels landed an annual average weight of 788 tonnes with an average annual value of over £4 million between 2016 and 2020 (Scottish Government 2020). Lower Loch Fyne, which connects upper Loch Fyne to the Firth of Clyde, occurs in the adjacent rectangle 40E4. Within this rectangle, UK fishing vessels landed an average annual weight of 2,333 tonnes worth over £8 million between 2017 and 2020 (Scottish Government 2020).

In both rectangles, Nephrops accounts for the greatest proportion of landed weight, accounting for 64% in 40E4 and 52% in 41E4 (Scottish Government 2020). The remaining total landed weight is primarily composed of scallops (16% and 20% respectively) and crabs (7% and 15% respectively) for both regions. Despite the lower region of Loch Fyne providing important spawning and/or nursery grounds for sprat, saithe, herring and cod landings for these species have not been significant in the region. There were no records of herring, saithe, or sprat landings; some cod was recorded, but landings were less than one tonne in both 40E4 and 41E4 (Scottish Government 2020).

Loch Fyne has also been classified as a Shellfish Water Protected Area (SWPA), designated by the Scottish Environmental Protection Agency (SEPA) under the Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order (2013). This legislation seeks to protect and improve important shellfish growing waters. The most recent assessment of Loch Fyne has indicated the loch is of good status (SEPA, 2022). Additionally, five shellfish sites occur within Loch Fyne. Of these five, only four have reported production in the last three years: Arkinglas, Barmore North, Barmore South, and Otter Spit. The species reported at these sites include flat oyster *Ostrea edulis*, Pacific oyster *Magallana gigas*, purple sea urchin *Paracentrotus lividus*, and queen scallop *Aequipecten opercularis* (Marine Scotland, 2022).

A review of the characteristics of the commercial fleet in Loch Fyne will be included in the baseline of the EIAR following the necessary consultation.

21.4 Likely Significant Effects

The Proposed Development may impact commercial fisheries ecology during the construction and operation phases as follows:

21.4.1 Construction Phase

- Temporary loss or restricted access to commercial fishing grounds due to movement of vessels involved in construction
- Displacement of commercial fishing activities
- Obstruction of navigation / steaming routes to commercial fishing grounds
- Indirect effects on commercial fisheries due to changes in fish behaviour and distribution
- Potential for small scale employment of local boat(s)

21.4.2 Operational Phase

- Permanent loss or restricted access to commercial fishing grounds due to the placement of the marine facility
- Permanent displacement of commercial fishing activities
- Obstruction of navigation / steaming routes to commercial fishing grounds
- Indirect effects on commercial fisheries
- Potential for small scale employment of local boat(s)

21.5 Likely Mitigation Measures

Given that the final design of the marine facility has yet to be confirmed, the embedded and good practice measures have not been finalised at this stage. Any measures in relation to commercial fisheries will need to be discussed with statutory consultees and stakeholders throughout the EIA process. If required, appropriate mitigation would follow an evidence-based approach, in line with Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW) guidance (FLOWW, 2015).

21.6 Summary and Conclusions

In summary:

- The waters of Loch Fyne support valuable shellfish fisheries, particularly Nephrops and scallops, which are of key importance as they support local communities providing a valuable socio-economic function;
- The marine facility will likely interact with the inshore and intertidal fisheries;
- The baseline assessment will include a more detailed review of commercial fisheries within the Zol of the proposed Development;
- A detailed assessment based on the potential impacts identified above will be carried out, forming part of the basis of the ensuing EIA; and
- The proposed Development, through the proposed scope of the EIA will seek to work with the fishing community to manage potential interactions during installation and to ensure that, once installed, the proposed Development will operate safely and un-intrusively alongside the commercial fisheries activities within the area.

21.7 References

Argyll and Bute Council. (2009). Integrated Coastal Zone Management Plan. Loch Fyne. A Spatial Planning Framework for Future Development. Marine & Coastal Development Unit, Planning Services. Argyll & Bute Council [Online] Available at: <https://www.argyll-bute.gov.uk/lochfyne>

Argyll Fisheries Trust (2012). Loch Fyne Rivers Project: Summary of 2011 fish populations, Habitat Surveys and Potential Habitat Management Initiatives. Argyll Fisheries Trust, Inveraray, Argyll.

FLOWW, 2015. FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds [Online]. Available at: <https://www.thecrownestate.co.uk/media/1776/floww-best-practice-guidance-disruption-settlements-and-community-funds.pdf>. Accessed 25/05/2022.

Scottish Government. (2013). Nephrops - Functional Units derived from sediment and VMS data. [Online] Available at: <http://marine.gov.scot/node/12830> [Accessed 07/04/2022].

Marine Management Organisation (2014a). Vessel lists 10 metres and under. [Online] Available at: <https://www.gov.uk/government/statistical-data-sets/vessel-lists-10-metres-and-under>.

Marine Management Organisation (2014b). Vessel over 10 metres. [Online] Available at: <https://www.gov.uk/government/statistical-data-sets/vessel-lists-over-10-metres>.

Marine Management Organisation (2017). Vessel Density Grid 2015. [Online] Available at: <https://data.gov.uk/dataset/b7ae1346-7885-4e2d-aedf-c08a37d829ee/vessel-density-grid-2015>.

Marine Management Organisation (2020). United Kingdom Single Issuing Authority (UKSIA). [Online] Available at: <https://www.gov.uk/guidance/united-kingdom-single-issuing-authority-uksia#access-to-uk-and-eu-6-12nm-waters>.

Marine Management Organisation (2021a). UK Sea Fisheries Statistics 2020. 66 pp. [Online] Available at: <https://www.gov.uk/government/collections/uk-sea-fisheries-annual-statistics>

Marine Management Organisation (2021b). 2021 UK and foreign vessels landings by UK port and UK vessel landings abroad: provisional data. [Online] Available at: <https://www.gov.uk/government/publications/uk-and-foreign-vessels-landings-by-uk-port-and-uk-vessel-landings-abroad-provisional-data>.

Marine Management Organisation (2021c). Vessel Monitoring Systems Data. [Online] Available at: <https://environment.data.gov.uk/arcgis/rest/services/MMO/AnonymisedAISderivedTrackLines2019/MapServer>.

Marine Scotland. (2022). Site Details. Scotland's Aquaculture. [Online] Available at: http://aquaculture.scotland.gov.uk/data/site_details.aspx [Accessed 24/05/2022]

Scottish Government. (2013). The Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order.

Scottish Government. (2020). Scottish Sea Fisheries Statistics Landing Data. [Online] Available at: <https://data.marine.gov.scot/dataset/2020-scottish-sea-fisheries-statistics-fishing-effort-and-quantity-and-value-landings-ices-1> [Accessed 09/05/2022].

SEPA. (2022). Shellfish Water Protected Area (SWPA) 39: Loch Fyne. Scottish Environment Protection Agency. [Online]. Available from: https://www.sepa.org.uk/media/593932/swpa-39_loch-fyne.pdf. Accessed 24/05/22.

Appendix A Figures

Appendix B Aquatic Ecology Survey Methodology

Desk Study

The desk study used data requested from the Scottish Environment Protection Agency (SEPA), NatureScot (formerly Scottish Natural Heritage, SNH) and online sources to assess the distribution of protected aquatic species and INNS in and around the proposed Development Site.

As under the WANE Act it is an offence in Scotland to spread any non-native species in the wild, all species of UK concern, such as those identified on Schedule 9 of the WCA (although this no longer legally applies in Scotland) and those considered species of European Union (EU) concern under the EU Invasive Alien Species Regulation have been collated.

Survey sites

Survey sites in the Balliemanoach area (*Figure 7.1 Electric Fishing and eDNA Survey Locations*) were selected according to the proximity of waterbodies to areas of proposed works such as watercourse crossings, intake/outfall location, shoreline constructions etc. Overall, 20 sites were selected; refer to Table A1.1).

Table A1.1 Balliemanoach aquatic survey sites

Site Reference	Waterbody name (where known)	Central Site NGR
BL-01	Allt Criche (trib. of Erralich Water)	NN 08167 12302
BL-02	Erralich Water	NN 07790 11867
BL-03	Allt Blarghour	NN 02880 13037
BL-04	Buinne Dhubh (Allt Beolich)	NN 03197 15552
BL-05	Allt Beolich	NN 01347 15431
BL-06	Unnamed (direct into Loch Awe)	NN 01175 15660
BL-07	Allt a' Chrosaid	NN 01127 16082
BL-14	Loch Fyne Wharf*	NN 08537 07116
BL-15	Loch Fyne*	NN 08202 07116
BL-16	Loch Fyne*	NN 11301 09358
BL-17	Loch Awe Inlet/Outlet	NN 00948 16290
BL-18	Loch Awe	NN 00683 15657
BL-19	Loch Awe	NN 00977 16932
BL-20	Lochan Airigh	NN 04278 16416
BL-21	Lochan Breach-liath	NN 03430 16457
BL-22	River Aray	NN 09062 18945
BL-23	Unnamed (trib. of River Aray)	NN 09795 19225
BL-24	Unnamed (trib. of Achan River)	NN 07687 19480
BL-25	Unnamed (trib. of Keppochan River)	NN 06895 19355
BL-26	Unnamed (trib. of Allt na Cuile Riabhaiche)	NN 05988 18950

*Sites BL-14, BL-15 and BL-16 are marine. All other sites are freshwater.

Macrophyte Survey

The watercourses were surveyed between 23 and 26 September 2019. The survey methodology undertaken varied depending on the type of watercourse. Survey of flowing watercourses followed the method outline in UKTAG River Assessment Method Macrophytes and Phytobenthos (WFD-UKTAG, 2014).

The survey was made by walking within the channel of each watercourse along a 100 m transect, where safely accessible. Any inaccessible areas were bypassed as necessary before re-entering the channel at the next available access point. A list of all macrophytes encountered was made and their relative abundance was recorded using Taxon Cover Values (TCV), detailed below in Table A1.2.

Table A1.2 Taxon Cover Values (TCV) and their associated percentage cover

TCV	Percentage cover for the macrophyte species
C1	<0.1%
C2	0.1 to 1%
C3	1 to 2.5%
C4	2.5 to 5%
C5	5 to 10%
C6	10 to 25%
C7	25 to 50%
C8	50 to 75%
C9	>75%

Further 100 m transects were undertaken at potential construction sites on the shores of Loch Awe. All macrophytes encountered were recorded and their relative abundance was noted using the DAFOR scale. The strandline was also inspected for plant fragments. The relative abundance of each species present was recorded according to the criteria below. If a species appears to be intermediate between two categories, it is generally assigned to the lower category.

- D = Dominant (greater than 75% total cover);
- A = Abundant (51 to 75% total cover);
- F = Frequent (26 to 50% total cover);
- O = Occasional (11 to 25% total cover; and
- R = Rare (1 to 10% total cover).

The macrophyte survey within BL-20 and BL-21 (Lochan Airigh and Lochan Breach-liath respectively) were based on the PSYM (Predictive SYstem for Multimetrics) pond survey methodology (Pond Action, 2002). The survey was undertaken by walking the perimeter of these waterbodies and recording all wetland plants present within their outer edge (This is defined as the upper level which water stands in winter). Deeper water areas were sampled by grapnel, thrown from shallow water. This method was developed to provide a method for assessing the biological quality of still waters in England and Wales. Due to the location, therefore the PSYM metrics could not be calculated, however the survey methodology remains valid. The relative abundance of each species present was recorded using the DAFOR scale.

All non-native species adjacent and within the watercourse were also recorded as part of the assessment.

Macroinvertebrate Survey

Aquatic macroinvertebrate sampling was undertaken by two suitably experienced aquatic ecologists to assess the biological quality of the surveyed waterbodies. Macroinvertebrate samples were taken using a standard Freshwater Biological Association (FBA) pattern pond net (mesh size: 1mm) in line with the standardised methodology (UKTAG, 2008). The instream habitats were 'kick sampled' where practicable, or 'sweep sampled', for 3 minutes followed by a 1-minute hand search of larger substrates.

This method allows characterisation of the macroinvertebrate communities and establishes the biological quality of freshwater habitats. It does not generate a comprehensive list of every taxon present within the watercourse. To attempt to detect all species that occur, including those at low abundance, or occurring sporadically, would be impractical, would generate unnecessary information and would not significantly improve the quality assessment of the waterbodies.

The collected samples were then preserved in Industrial Methylated Spirits (IMS) prior to laboratory processing.

Analysis of Aquatic Macroinvertebrate Samples

Each of the samples collected was sorted and analysed in a laboratory setting by suitably trained and experienced aquatic ecologists. Lists of the aquatic macroinvertebrate taxa present were produced in line with Environment Agency guidance (Environment Agency, 2014). The aquatic macroinvertebrate samples were identified to 'mixed taxon level' using stereo-microscopes. Most groups were identified to species level (where practicable), with the exception of the following:

- amber snail (Succineidae) which were identified to family;
- pea mussels (Sphaeriidae) which were identified to family;
- worms (Oligochaeta) which were identified to order;
- mites (Hydracarina and Oribatei) which were identified to order;
- truefly larvae, which were identified to the maximum resolution possible;
- springtails (Collembola) which were identified to order; and
- immature or damaged specimens, which were identified to the maximum resolution possible on a case-by-case basis.

The survey data were then used to calculate various biotic indices, as set out below. To inform an assessment of relative nature conservation value, the Community Conservation Index (CCI) (Chadd & Extence, 2004) was calculated for each waterbody. The CCI classifies many groups of freshwater macroinvertebrates according to their scarcity and nature conservation value in Great Britain as understood at the time that the classification was developed. Species scores range from 1 to 10, with 1 being very common and 10 being Endangered (Table A1.3). However, in some cases, the references used in the CCI classification to define scarcity and value have since been superseded by more recent assessments. To account for this, updated species scores have been used. These have been provided by the author of the initial assessment allowing current information on status and distribution to be accounted for (R Chadd, pers. comm., 2018). This has resulted in updates for eleven species. Details of these changes are provided in Annex 1 and where applicable, specific changes are referred to within the results section.

Table A1.3 Conservation Scores from the Community Conservation Index

Conservation Score	Conservation Status
10	RDB1 (Endangered)
9	RDB2 (Vulnerable)
8	RDB3 (Rare)
7	Notable (but not RDB status)
6	Regionally notable
5	Local
4	Occasional (species not in categories 10-5, which occur in up to 10% of all samples from similar habitats)
3	Frequent (species not in categories 10-5, which occur in up to >10-25% of all samples from similar habitats)
2	Common (species not in categories 10-5, which occur in up to >25-50% of all samples from similar habitats)
1	Very common (species not in categories 10-5, which occur in up to >50-100 % of all samples from similar habitats)

The overall CCI derived provides an indication of the conservation value of the community sampled, based on a combination of the rarity of the different aquatic macroinvertebrate taxa present and overall community richness, as shown in Table A1.4. In some cases, expert judgment may be needed to moderate these assessments.

Table A1.4 Community Conservation Index Interpretation Guidance (Chadd & Extence, 2004)

Community Conservation Index (CCI)	Expected conservation value
< 5	Low conservation value
5 to 10	Moderate conservation value

10 to 15	Fairly high conservation value
15 to 20	High conservation value
> 20	Very high conservation value

The aquatic macroinvertebrate data were analysed to generate Whalley, Hawkes, Paisley & Trigg (WHPT) and Average Score Per Taxon (ASPT) values (WFD-UKTAG, 2014). This assigns numerical value to taxa according to their sensitivity to organic pollution. The average of the values for each taxon in a sample, known as ASPT is a stable and reliable index of organic pollution. Therefore, these assessments indicate to what extent an aquatic macroinvertebrate community is exposed to organic pollution (further information is provided in Annex B). It is important to note that these indices can vary between geological regions and habitat types.

Fish Habitat Assessment

Fifteen survey sites potentially impacted by the Development were assessed during 23–27 September 2019.

At each site, fish spawning habitat potential was assessed over a 100 m downstream stretch of the watercourse. Key aquatic features such as channel dimensions, mesohabitat coverage, habitat features, substrate composition, accessibility for migratory species and potential spawning areas for salmonids were analysed following SEPA's Guidance for applicants on supporting information requirements for hydropower applications (SEPA, 2005).

FWPM Habitat Assessment

At each site, FWPM habitat potential was also assessed over a 100 m downstream stretch. Key habitat requirements include riverbed substrate diversity and stability, high water quality and the presence of host fish (salmon and trout). Pockets of clean sand, stabilised by boulders and cobbles in moderate- to fast-flowing waters create optimal microhabitats for FWPM (Hastie et al., 2000, 2003).

Limitations

The aim of a desk study is to help characterise the baseline context and provide valuable background information that would not be captured by a single site survey alone. Information obtained by desk study is dependent upon local recorders and organisations having submitted records for the area of interest. As such, a lack of records for a species does not necessarily mean that the habitats or species do not occur in the study area. Likewise, the record of a species does not automatically mean that these still occur within the area of interest or are relevant in the context of the Development.

In terms of aquatic macroinvertebrates, fish, FWPM habitat assessments and INNS surveys, the surveys were limited to 100 m sections of water course. Surveys were completed during the appropriate survey season and during good weather conditions.

Some survey stretches were quite inaccessible and others difficult to survey, and although suitable riverbed habitats were unlikely to be missed, this possibility cannot be discounted.

All plant species found were identified to species level, where technically feasible based on the material available and the season of survey. Although there were no major limitations, a few minor issues were encountered during the macrophyte surveys, these are detailed below:

- Even though the original BL-05 site had to be relocated due to inaccessibility, there were still severe access issues limiting the macrophyte survey at the new location. As such, macrophytes within this section may have been missed. Furthermore, due to this, TCV could not be assigned.
- BL-25 was in spate at the time of the survey. Given flow conditions, not all areas of the watercourse could be surveyed safely, which may have resulted in macrophytes within this watercourse being missed.

Although it is possible that macrophytes may have been missed due to the limitations described above, given the habitat conditions most vascular plants are confined to the margins. Therefore, the risk that notable and invasive macrophytes species were missed is reduced and therefore it is not considered a significant limitation.

Given the nature of biological survey it is not possible that all species present in a waterbody will be detected. Where juvenile or damaged specimens were collected, species level identification is not always possible. Not all macroinvertebrate species that use waterbodies are present at all times of year and therefore some may be overlooked when surveying. Other species that may be present at other times of year, sporadically and/or in low

numbers may not have been recorded. This is not considered a significant limitation as standard methods were applied and the data collected is considered representative of the conditions present and appropriate for assessment of value.

The marine sites were briefly visited and not surveyed per se. The purpose of these visits was simply to provide general site descriptions, and to inform marine ecological surveys of these sites if required at a later date.

References

Chadd, R. & Extence, C. (2004) The conservation of freshwater macro-invertebrate populations: a community-based classification scheme. *Aquatic Conservation: Marine & Freshwater Ecosystems* 14: 597-624

Foster, G. & Friday, L. (2011) Keys to adults of the water beetles of Britain and Ireland (Part 1). Field Studies Council. Telford.

Hastie, L.C., Boon, P.J. & Young, M.R. (2000). Physical microhabitat requirements of freshwater pearl mussels, *Margaritifera margaritifera* (L.). *Hydrobiologia* 429: 59–71.

Hastie, L.C., Cooksley, S.L., Scougall, F., Young, M.R., Boon, P.J. & Gaywood, M.J. (2003). Characterisation of freshwater pearl mussel (*Margaritifera margaritifera*) riverine habitat using River Habitat Survey data. *Aquatic Conservation: Marine and Freshwater Ecosystems* 13: 213–224.

JNCC, (2007). List of UK Local Biodiversity Action Plan (LBAP) Priority Fish Species. <http://data.jncc.gov.uk/data/98fb6dab-13ae-470d-884b-7816afce42d4/UKBAP-priority-fish.pdf>

Jonsson, B. and Jonsson, N. (2011) *Ecology of Atlantic Salmon and Brown Trout: Habitat as a Template for Life Histories*. Fish & Fisheries Series 33, Springer Science+Business Media B.V.

Macadam, C. (2015) A review of the stoneflies (Plecoptera) of Great Britain. Species Status No.20. Natural England, Peterborough

Mauvisseau, Quentin & Davy-Bowker, John & Bryson, David & Souch, Graham & Burian, Alfred & Sweet, Michael. (2018). First detection of a highly invasive freshwater amphipod (*Crangonyx floridanus*) in the United Kingdom. 10.1101/437301.

Pond Action (2002) A Guide to Monitoring the Ecological Quality of Ponds and Canals Using PSYM. Pond Action, Oxford

SEPA (2005) *Guidance for applicants on supporting information requirements for hydropower applications*. The Water Environment (Controlled Activities) (Scotland) Regulations 2005 (CAR).

Seddon, M.B. Killeen, I.J. & Fowles, A.P. (2014). A Review of the Non-Marine Mollusca of Great Britain: Species Status No. 17. NRW Evidence Report No 14. Natural Resources Wales, Bangor

Water Framework Directive – United Kingdom Advisory Group (WFD-UKTAG) (2014) *UKTAG River Assessment Method (Benthic Invertebrate Fauna Invertebrates (General Degradation): Whalley, Hawkes, Paisley & Trigg (WHPT) metric in River Invertebrate Classification Tool (RICT)* July 2014

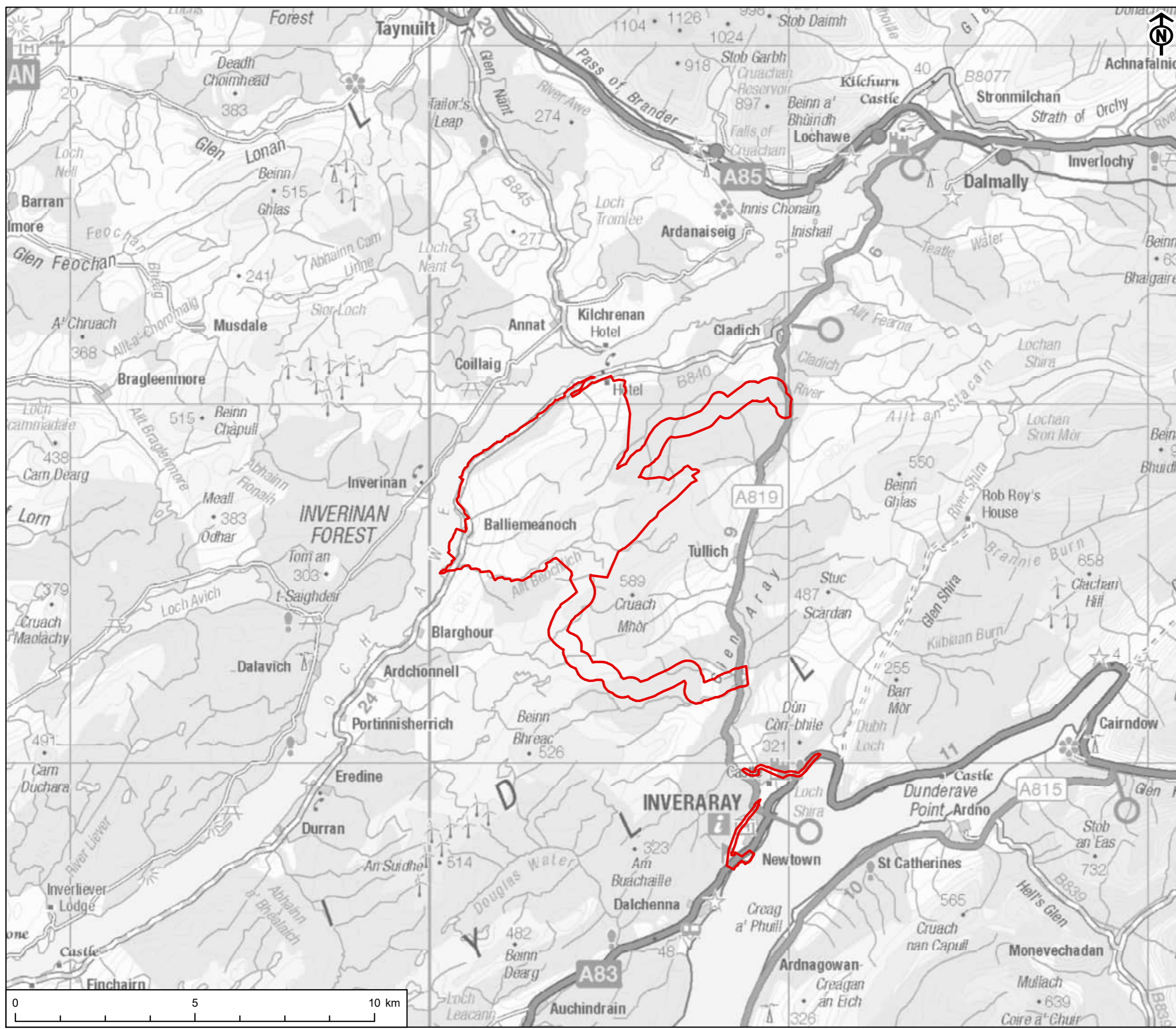
Water Framework Directive – United Kingdom Advisory Group (WFD-UKTAG) (2014) UKTAG River Assessment Method Macrophytes and Phytobenthos

PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

KEY
Proposed Development Boundary

Project Management Initials: MB Designer: NS Checked: LC Approved: VD



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673

TITLE
Figure 1.1
Location Plan

REFERENCE
BM_220208_SC_1.1_v2

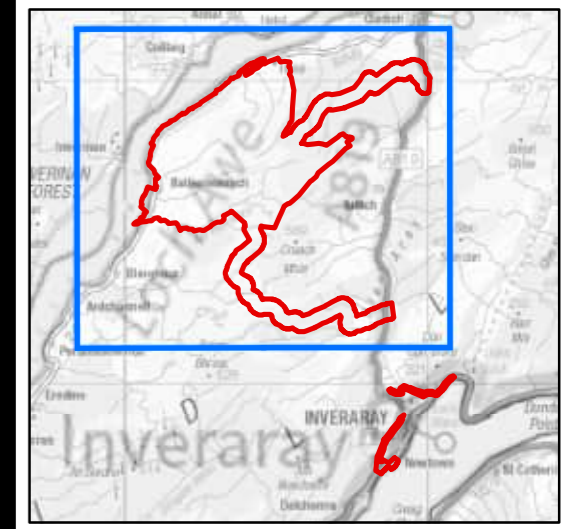
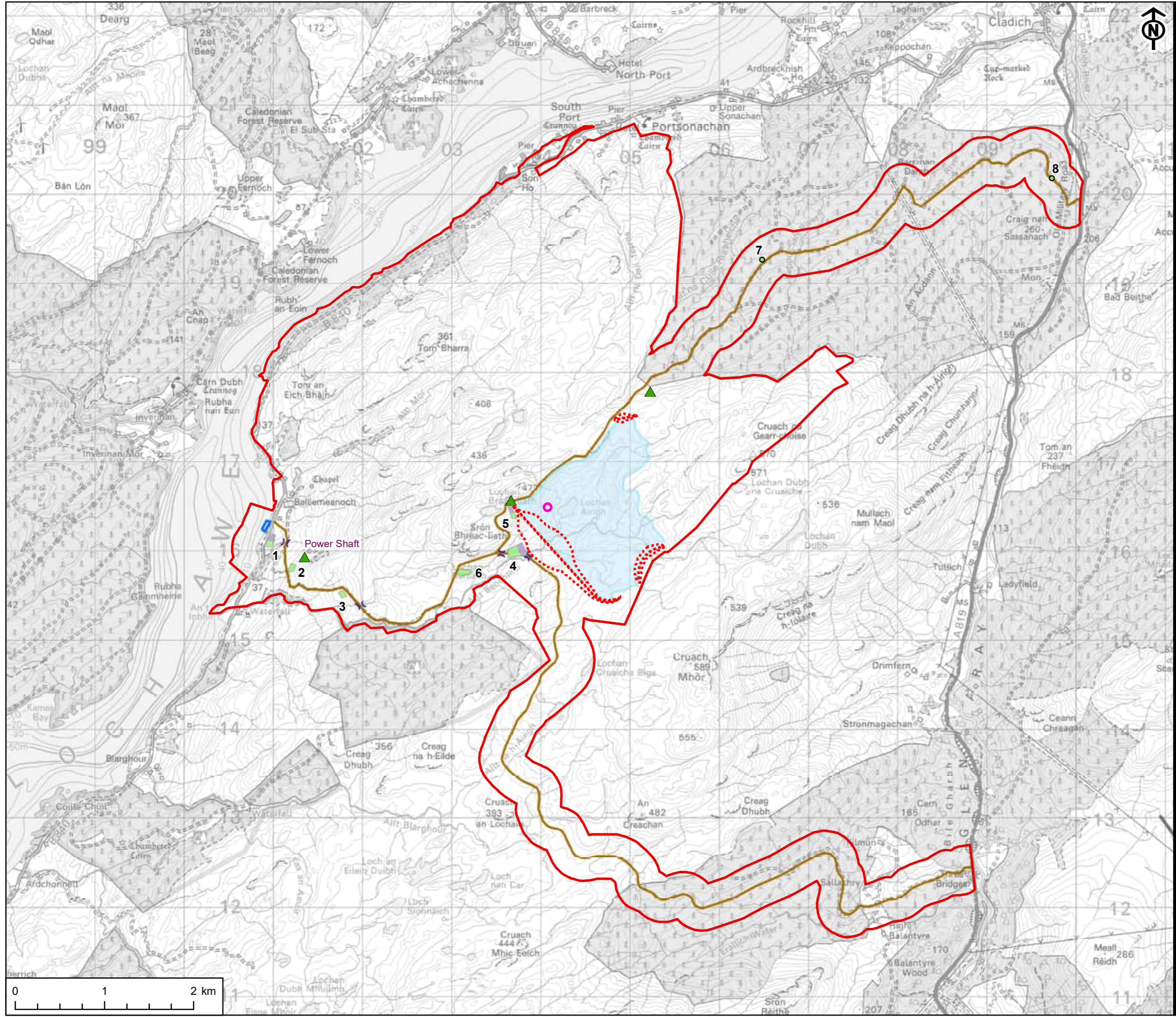
SHEET NUMBER
1 of 1

DATE
08/02/22

Scale @ A3 1:100,000

- KEY**
- ▭ Proposed Development Boundary
 - ⋯ Indicative Embankment
 - ▭ Indicative Headpond Location
 - ▭ Permanent Construction Compound
 - ▭ Temporary Construction Compound
 - ▭ Tailpond Outlet
 - Access Track Bridges
 - Access Track to be Upgraded
 - ▭ Intake Tower
 - ▲ Possible Substation Locations
 - Indicative Construction Compound Location

Project Management Initials: MB Designer: NS Checked: LC Approved: RB



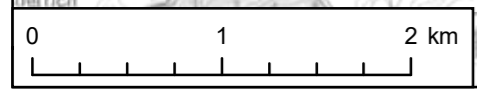
Contains Ordnance Survey Data © Crown copyright and database rights 2020 Ordnance Survey 0100031673

TITLE
Figure 1.2
Above Ground Infrastructure

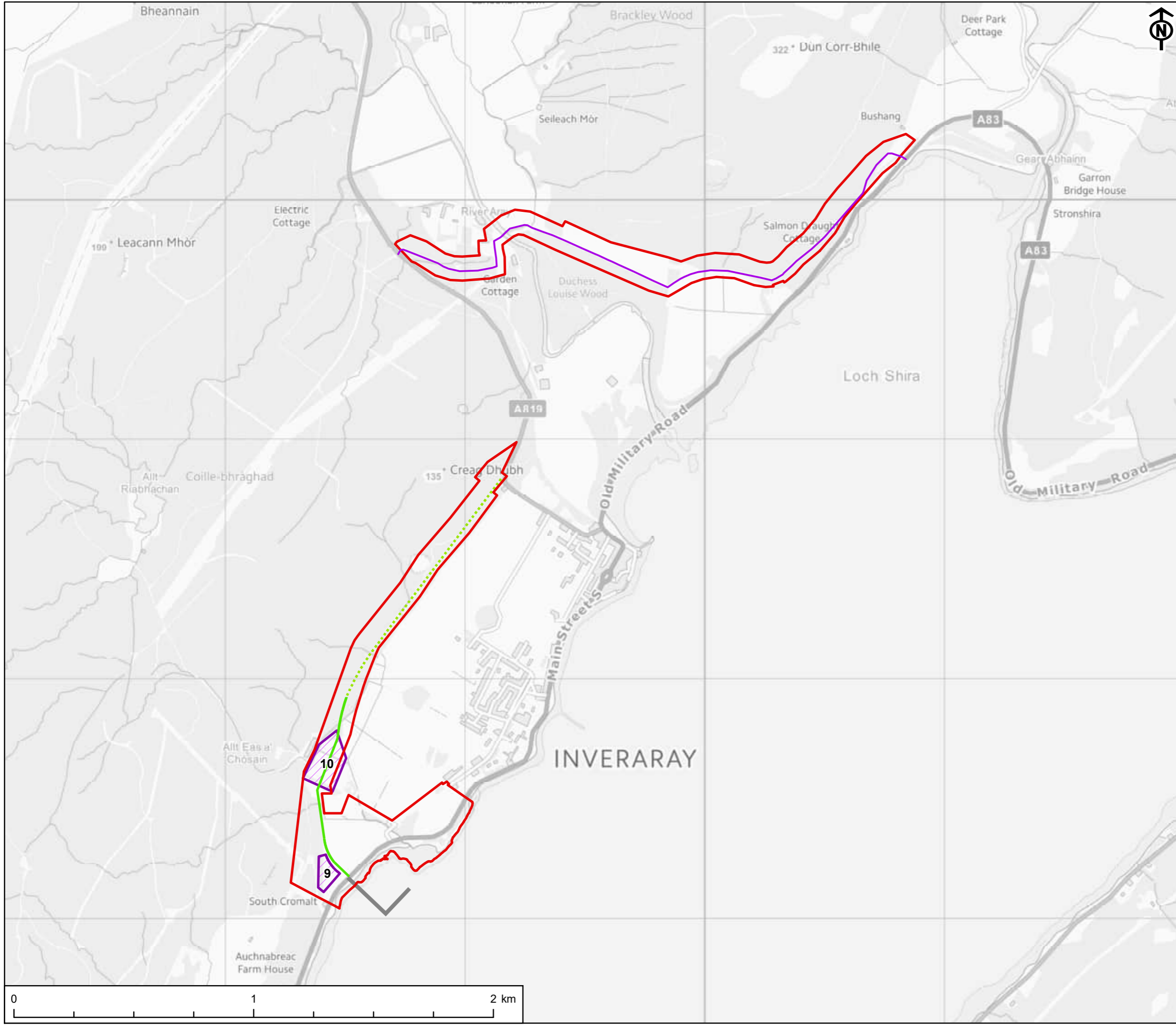
REFERENCE
BM_211217_SC_1.2_v1

SHEET NUMBER 1 of 2 **DATE** 17/12/21

Scale @ A3 1:40,000



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

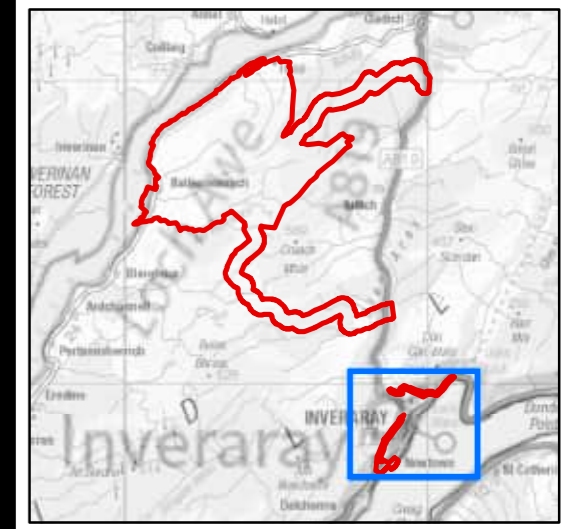


PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

KEY

- Proposed Development Boundary
- Temporary Construction Compounds for Welfare and Offices
- Upgrade Existing Track
- New Access
- Upgrade Existing Access
- Proposed Pier

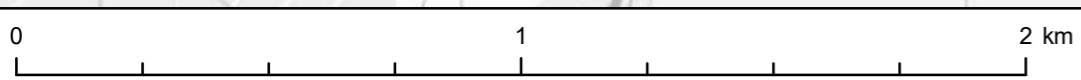


Contains Ordnance Survey Data © Crown copyright and database rights 2020 Ordnance Survey 0100031673

TITLE
Figure 1.2
Above Ground Infrastructure

REFERENCE
BM_211217_SC_1.2_v1

SHEET NUMBER 2 of 2 **DATE** 17/12/21



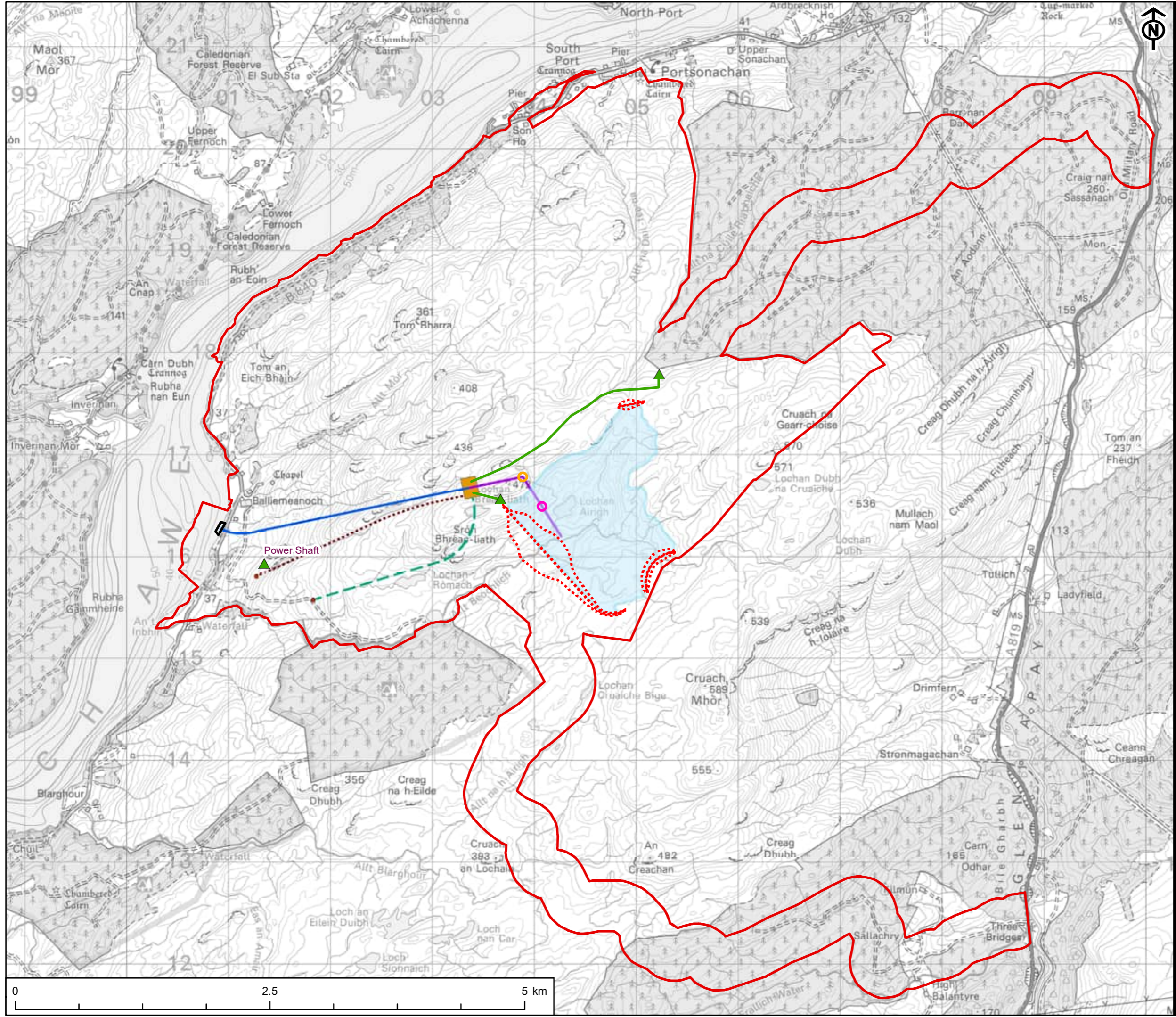
This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

- KEY
- Proposed Development Boundary
 - Indicative Embankment
 - Indicative Headpond Location
 - Underground Power Cavern
 - Tunnel Portal
 - Access Tunnel
 - Construction Tunnel
 - Surge Shaft
 - Intake Tower
 - Headrace
 - Tailrace
 - Power Tunnel
 - Spillway
 - Possible Substation Locations

Project Management Initials: MB Designer: NS Checked: LC Approved: VD



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

Contains Ordnance Survey Data © Crown copyright and database rights 2020 Ordnance Survey 0100031673

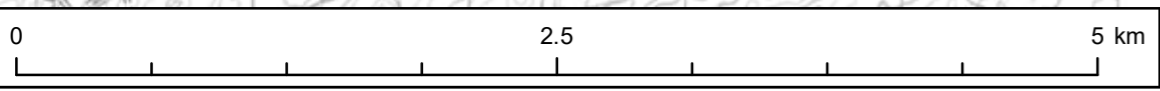
TITLE
Figure 1.3
Below Ground Infrastructure

REFERENCE
BM_211117_SC_1.3_v2

SHEET NUMBER
1 of 1

DATE
17/11/21

Scale @ A3 1:35,000

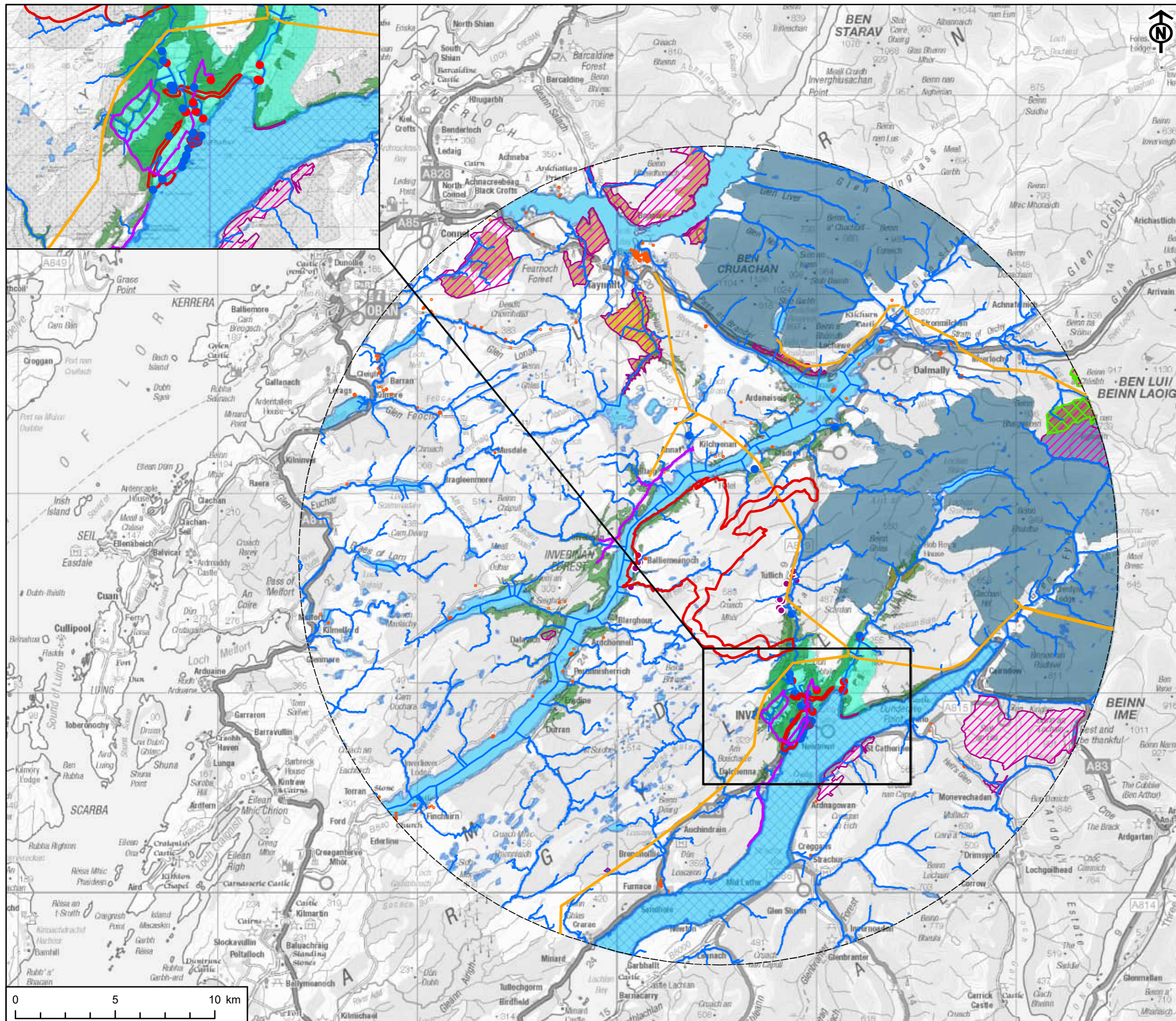


PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

- KEY**
- Proposed Development Boundary
 - 20km Study Area
 - Historic Conservation Areas
 - Local Nature Reserve (LNR)
 - Sites of Special Scientific Interest (SSSI)
 - Garden and designed landscape
 - Scheduled Monument
 - Ancient Woodland
 - National Nature Reserve (NNR)
 - Special Area of Conservation (SAC)
 - Special Protection Area (SPA)
 - Marine Protected Areas
 - Waterbody
 - Electricity Transmission Line
 - River
 - Core Path
 - Noise Sensitive Receptors
 - Noise Sensitive Receptors

- Listed Buildings by Category**
- A
 - B



Contains Ordnance Survey Data © Crown copyright and database rights 2020 Ordnance Survey 0100031673
Copyright Argyll and Bute Council, contains OS data © Crown copyright and database right 2021
Contains Historic Environment Scotland and Ordnance Survey data © Historic Environment Scotland - Scottish Charity No. SC045925 © Crown copyright and database right 2021

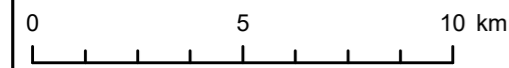
TITLE
Figure 2.1
Site Constraints

REFERENCE
BM_211116_SC_2.1_v3

SHEET NUMBER 1 of 1 **DATE** 16/11/21

Project Management Initials: MB Designer: NS Checked: LC Approved: VD

Scale @ A3 1:180,000

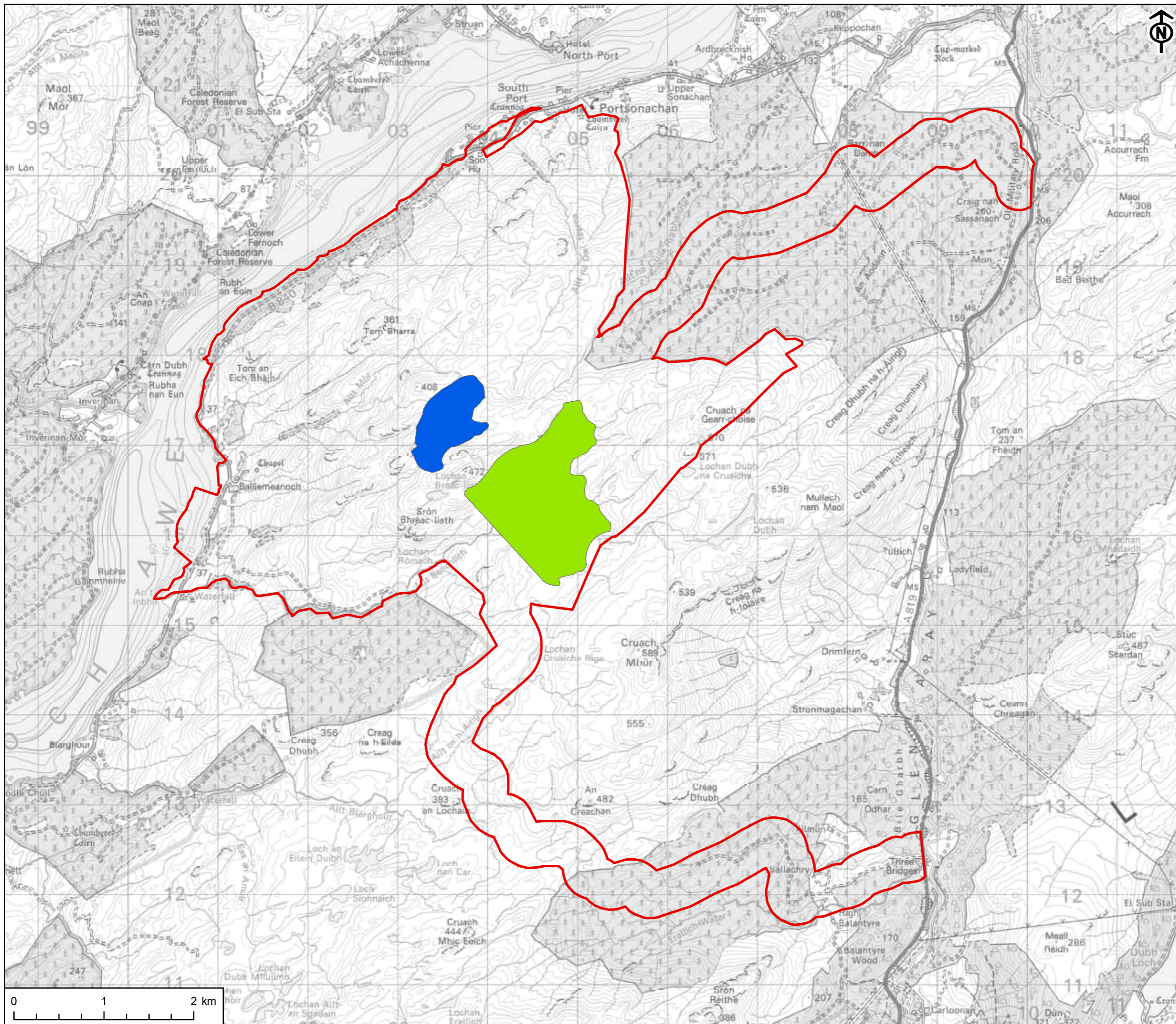


This drawing has been produced for the use of AECOMs client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOMs express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

KEY
Proposed Development
Headpond Option
Headpond Option B



Contains Ordnance Survey Data © Crown copyright and database rights 2020 Ordnance Survey 0100031673

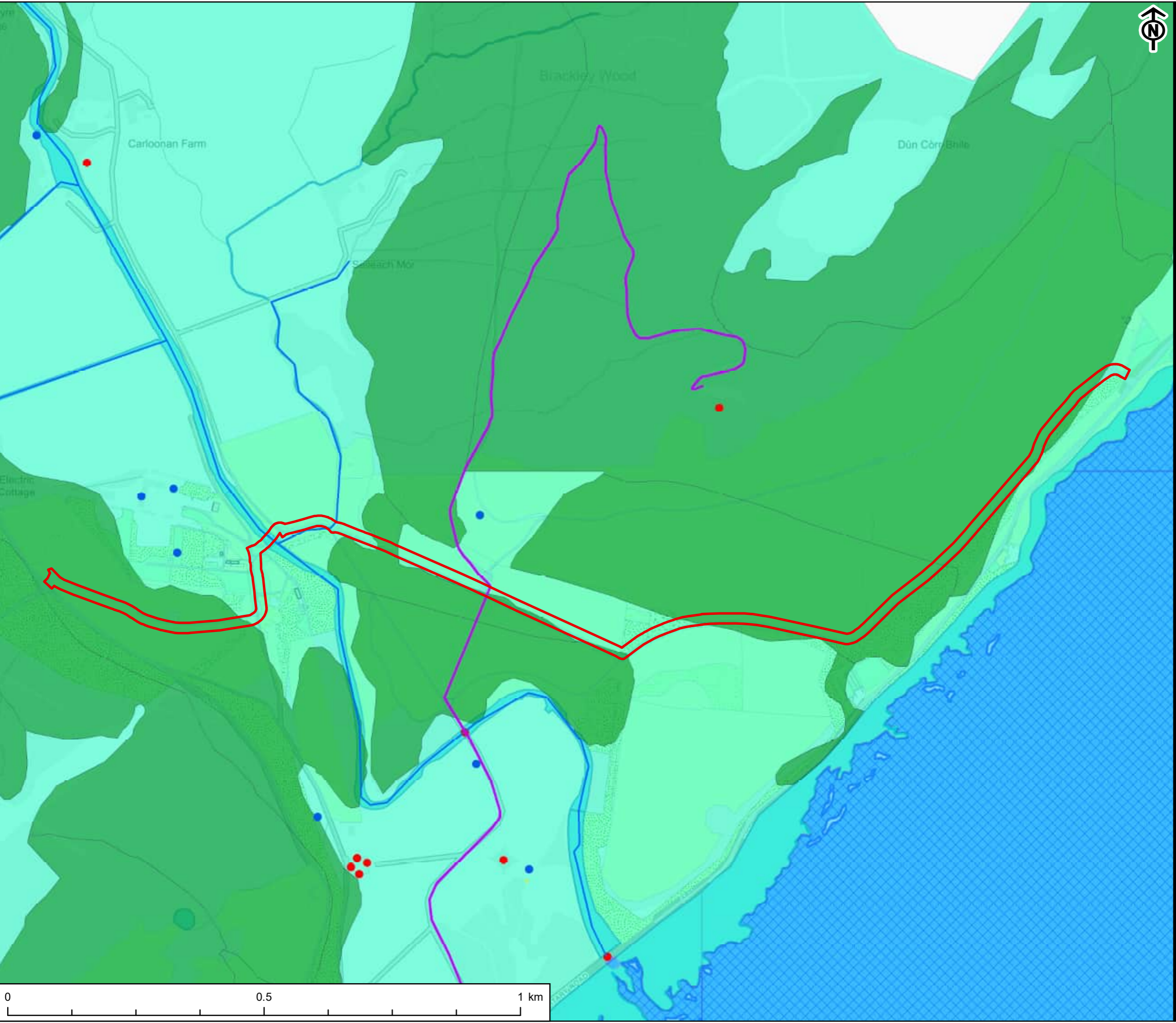
TITLE
Figure 2.2
Design Evolution

REFERENCE
BM_211117_SC_2.2_v1

SHEET NUMBER
1 of 1

DATE
17/11/21

This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.



PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

- KEY**
- Access Track Construction Corridor
 - Scheduled Monument
 - Ancient Woodland
 - Garden and designed landscape
 - Marine Protected Areas
 - Waterbody
 - Core Path
 - River
 - A
 - B

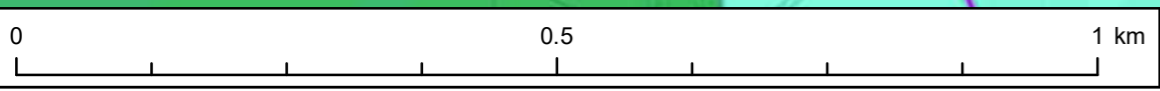
This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

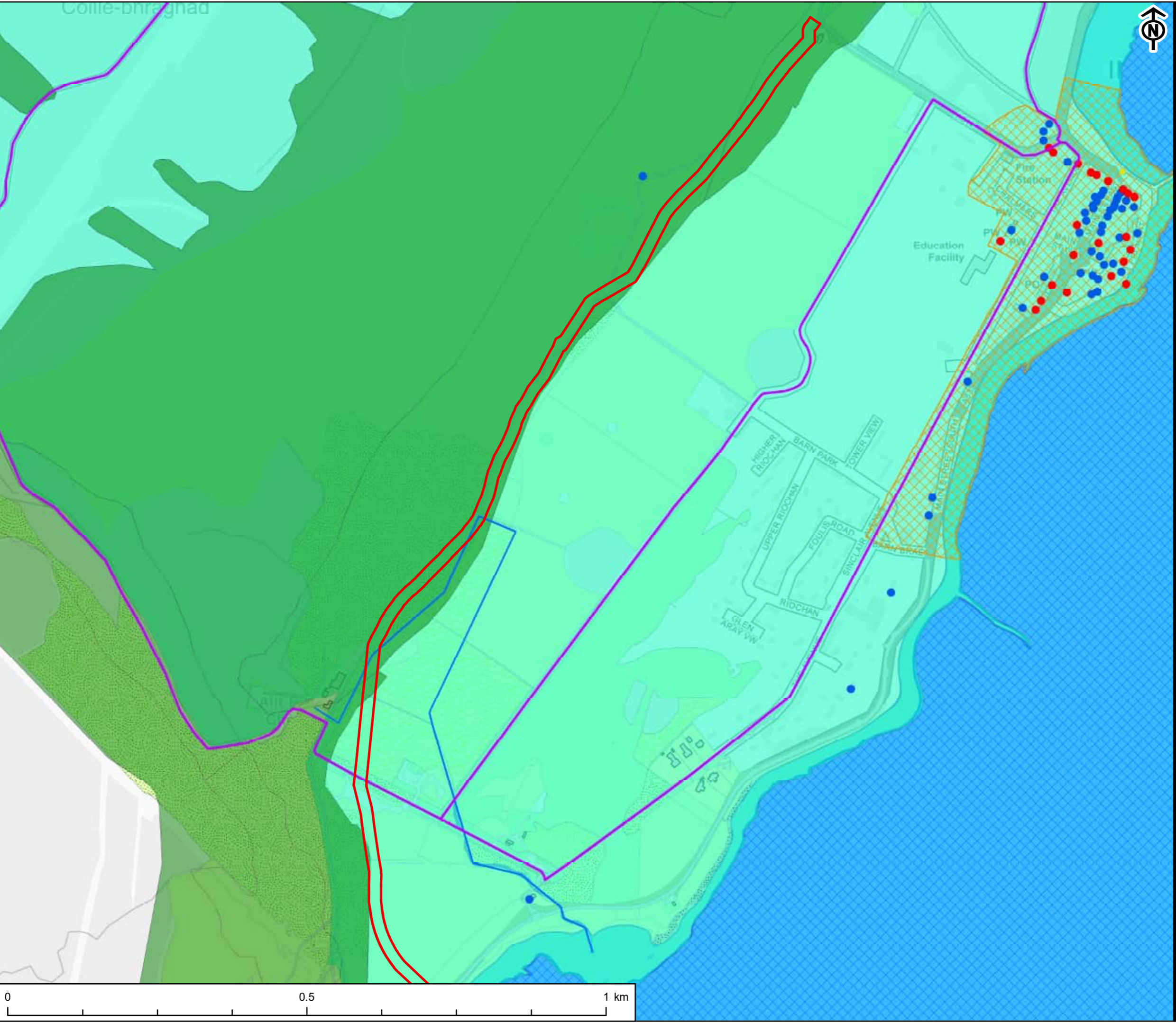
Contains Ordnance Survey Data © Crown copyright and database rights 2022 Ordnance Survey 0100031673
Copyright Argyll and Bute Council, contains OS data © Crown copyright and database right 2022
Contains Historic Environment Scotland and Ordnance Survey data © Historic Environment Scotland - Scottish Charity No. SC045925 © Crown copyright and database right 2022

TITLE
Figure 2.3
Access Track Construction Corridor

REFERENCE
BM_220218_SC_2.3_v2

SHEET NUMBER 1 of 2 **DATE** 18/02/22





AECOM

PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

KEY

- Access Track Construction Corridor
- Scheduled Monument
- Historic Conservation Areas
- Ancient Woodland
- Garden and designed landscape
- Marine Protected Areas
- Waterbody
- Core Path
- River
- A
- B

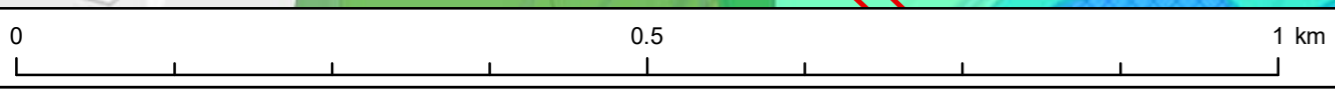
This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

Contains Ordnance Survey Data © Crown copyright and database rights 2022 Ordnance Survey 0100031673
 Copyright Argyll and Bute Council, contains OS data © Crown copyright and database right 2022
 Contains Historic Environment Scotland and Ordnance Survey data © Historic Environment Scotland - Scottish Charity No. SC045925 © Crown copyright and database right 2022

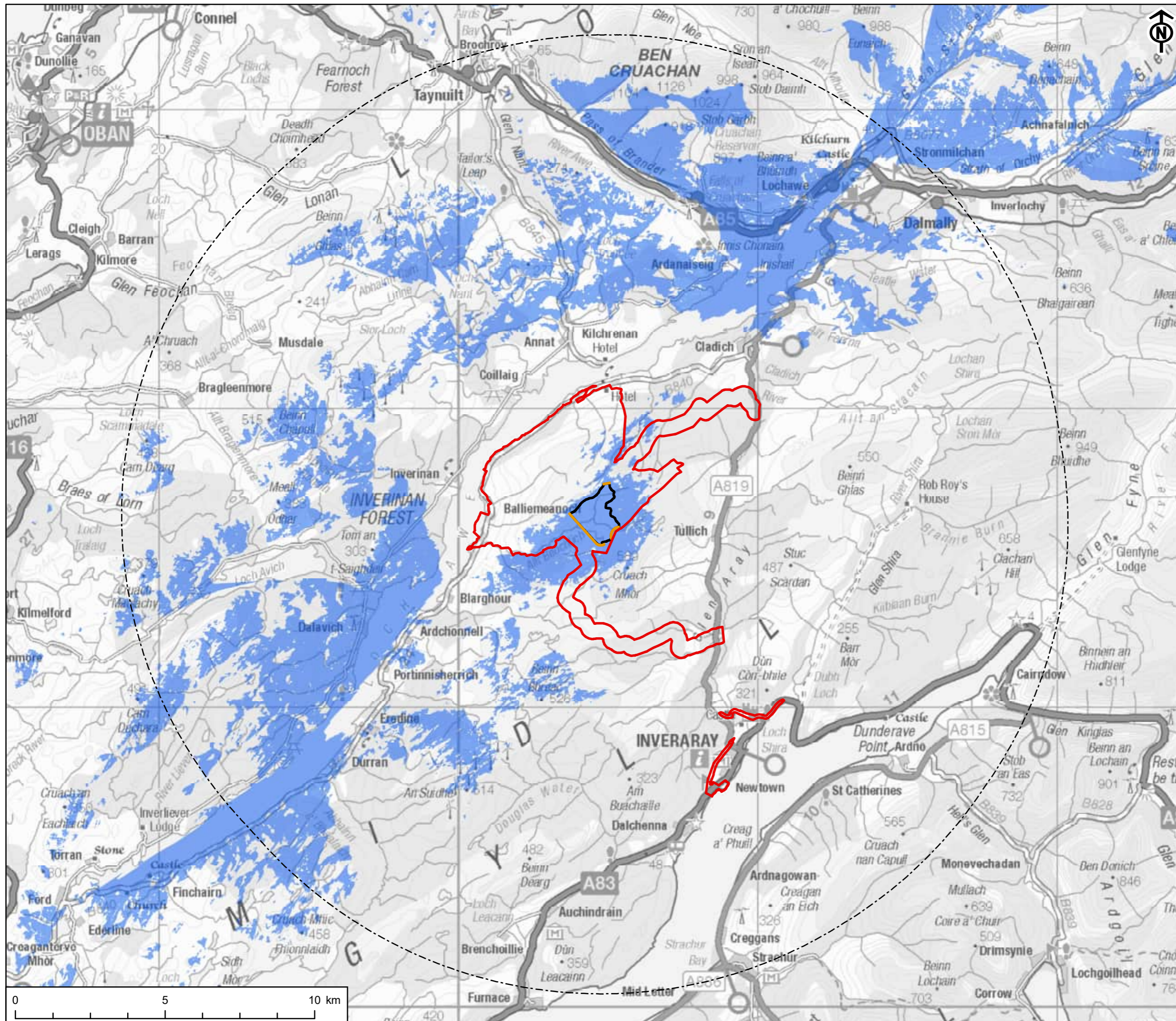
TITLE
 Figure 2.3
 Access Track Construction Corridor

REFERENCE
 BM_220218_SC_2.3_v2

SHEET NUMBER 2 of 2 DATE 18/02/22



- KEY
- Proposed Development Boundary
 - 15km Study Area
 - Indicative Embankment
 - Indicative Headpond
 - Zone of Theoretical Visibility



NOTE:
Zone of Theoretical Visibility (ZTV) has been generated using Ordnance Survey Terrain 5 digital terrain model which does not take account of the screening effects of vegetation, buildings or other structures. ZTV is based upon a series of points along the headpond wall spaced 50m apart and a 50m grid of points across the surface of the headpond with an observer eye height of 1.6m. All measurements are above ground level (AGL) unless specified otherwise.

Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673

TITLE
Figure 5.1
Zone of Theoretical Visibility (Headpond)

REFERENCE
BM_211117_SC_5.1_v2

SHEET NUMBER
1 of 1

DATE
17/11/21

This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

Project Management Initials: VD Designer: LC Checked: AR Approved: RM

Scale @ A3 1:120,000

PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

- KEY
- Proposed Development Boundary
 - 15km Study Area
 - Indicative Tailpond Inlet / Outlet
 - Zone of Theoretical Visibility

NOTE:
Zone of Theoretical Visibility (ZTV) has been generated using Ordnance Survey Terrain 5 digital terrain model which does not take account of the screening effects of vegetation, buildings or other structures. ZTV is based upon a series of points around the tailpond structure spaced 5m apart with an observer eye height of 1.6m. All measurements are above ground level (AGL) unless specified otherwise.
Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673

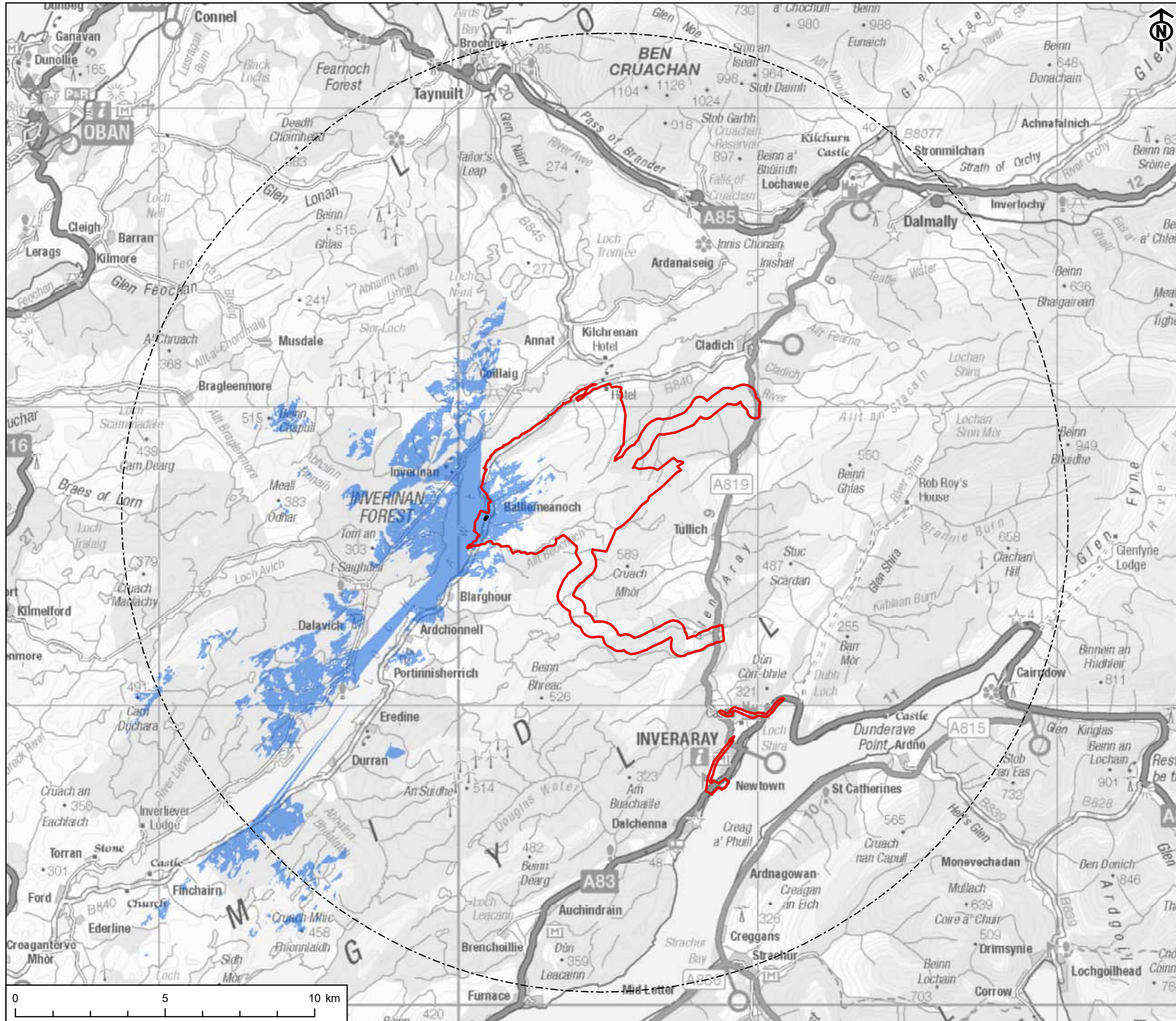
TITLE
Figure 5.2
Zone of Theoretical Visibility (Tailpond)

REFERENCE
BM_211117_SC_5.2_v1

SHEET NUMBER DATE
1 of 1 17/11/21

Project Management Initials: VD Designer: LC Checked: AR Approved: RM

Scale @ A3 1:120,000



PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

- KEY
- Proposed Development Boundary
 - 15km Study Area
 - Indicative Embankment
 - Indicative Headpond
 - Indicative Tailpond Inlet / Outlet
 - Zone of Theoretical Visibility
 - Headpond Visible
 - Tailpond Inlet / Outlet Visible
 - Headpond and Tailpond Visible

NOTE:
Zone of Theoretical Visibility (ZTV) has been generated using Ordnance Survey Terrain 5 digital terrain model which does not take account of the screening effects of vegetation, buildings or other structures.
ZTV is based upon a series of points along the headpond wall spaced 50m apart, a 50m grid of points across the surface of the headpond and a series of points around the tailpond structure spaced 5m apart with an observer eye height of 1.6m.
All measurements are above ground level (AGL) unless specified otherwise.
Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673

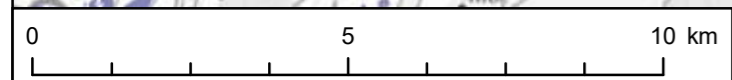
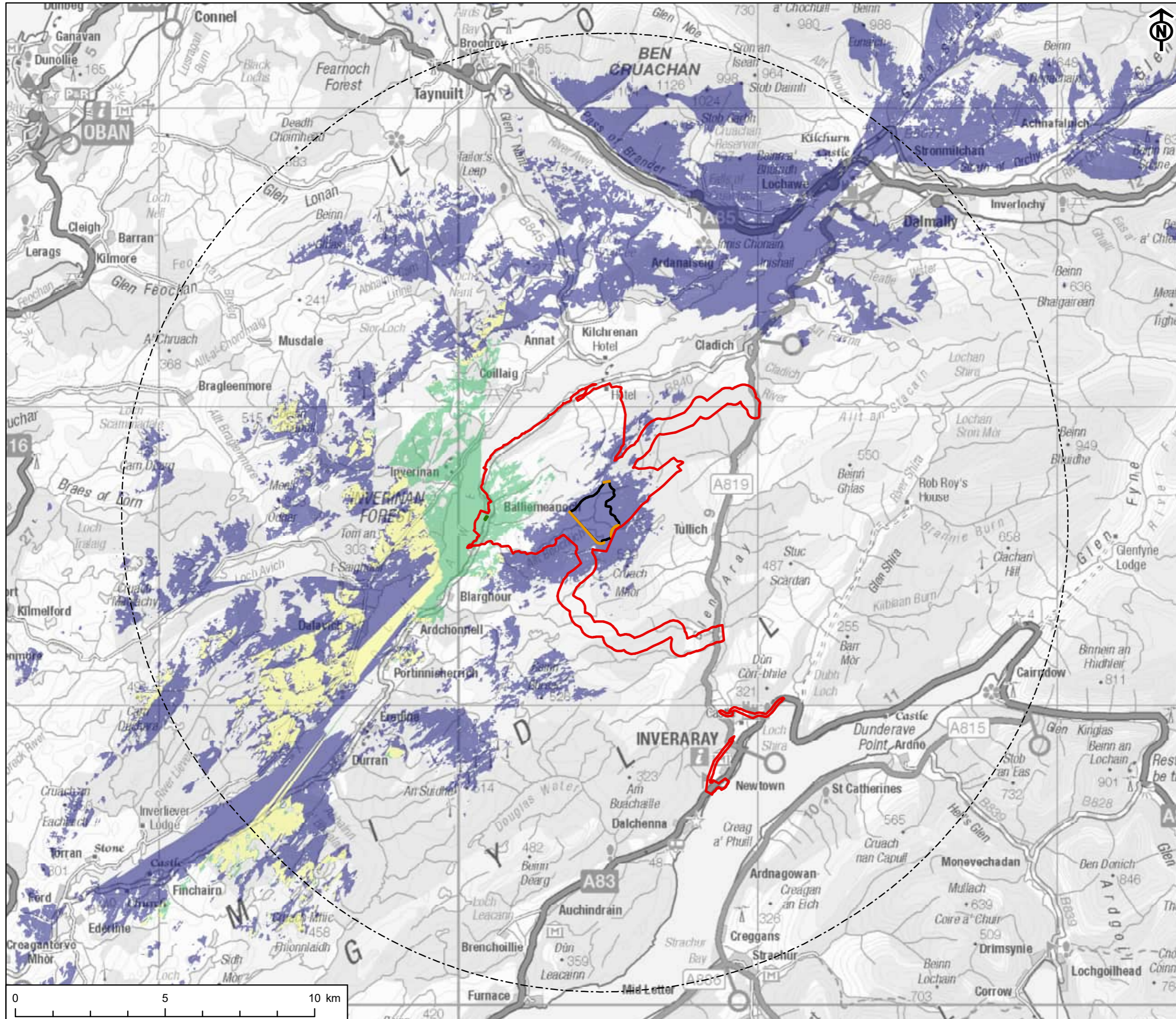
TITLE
Figure 5.3
Zone of Theoretical Visibility (Headpond and Tailpond)

REFERENCE
BM_211117_SC_5.3_v3

SHEET NUMBER DATE
1 of 1 17/11/21

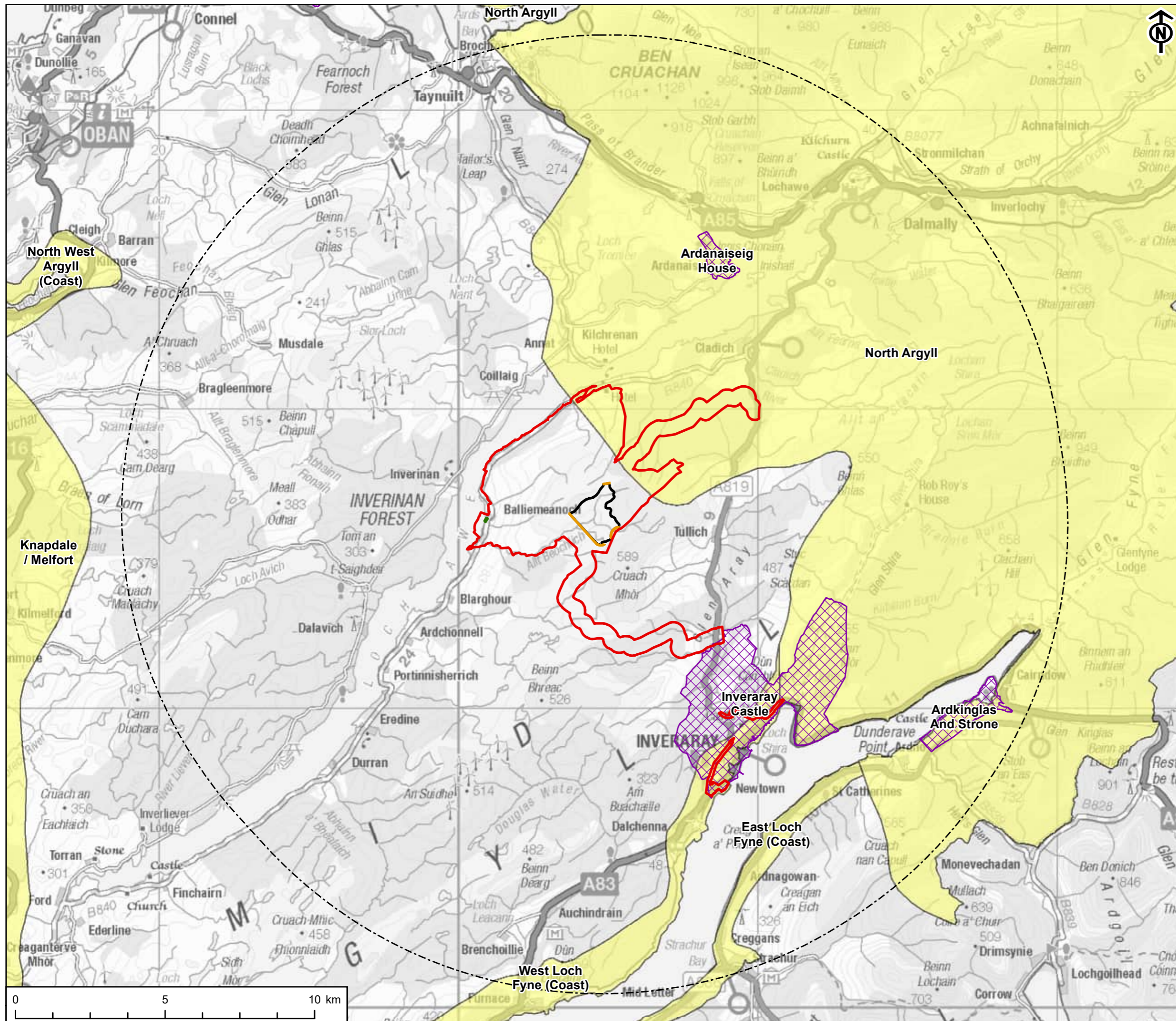
Project Management Initials: VD Designer: LC Checked: AR Approved: RM

Scale @ A3 1:120,000



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

- KEY
- 15km Study Area
 - Proposed Development Boundary
 - Indicative Embankment
 - Indicative Headpond
 - Indicative Tailpond Inlet / Outlet
 - Area of Panoramic Quality
 - Garden and Designed Landscape



Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673
 Copyright Argyll and Bute Council, contains OS data © Crown copyright and database right 2021
 Contains Historic Environment Scotland and Ordnance Survey data © Historic Environment Scotland - Scottish Charity No. SC045925 © Crown copyright and database right 2021

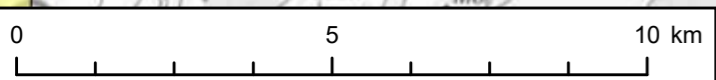
TITLE
Figure 5.4
Landscape Designations

REFERENCE
BM_211116_SC_5.4_v3

SHEET NUMBER 1 of 1 DATE 16/11/21

Project Management Initials: VD Designer: LC Checked: AR Approved: RM

Scale @ A3 1:120,000



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

- KEY
- 15km Study Area
 - Proposed Development Boundary
 - Indicative Embankment
 - Indicative Headpond
 - Indicative Tailpond Inlet / Outlet

- Landscape Character Type
- LCT 34 - Steep Ridges and Mountains
 - LCT 35 - Rugged Mountains
 - LCT 37 - Upland Glens - Argyll
 - LCT 38 - Open Ridges
 - LCT 39 - Plateau Moor and Forest - Argyll
 - LCT 40 - Craggy Upland - Argyll
 - LCT 43 - Upland Parallel Ridges - Argyll
 - LCT 50 - Stepped Rocky Coastlands
 - LCT 51 - Lowland Ridges and Moss - Argyll
 - LCT 53 - Rocky Coastland - Argyll
 - LCT 55 - Coastal Parallel Ridges
 - LCT 56 - Flat Moss and Mudflats
 - LCT 57 - Craggy Coast and Islands
 - LCT 250 - Steep Ridges and Hills
 - LCT 251 - Highland Summits
 - LCT 252 - Upland Glens - Loch Lomond & the Trossachs
 - LCT 253 - Straths and Glens
 - LCT 254 - Straths and Glens with Lochs
 - LCT 265 - Settled Coastal Fringe

Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673
Contains SNH information licensed under the Open Government Licence v3.0

TITLE
Figure 5.5
Landscape Character Types

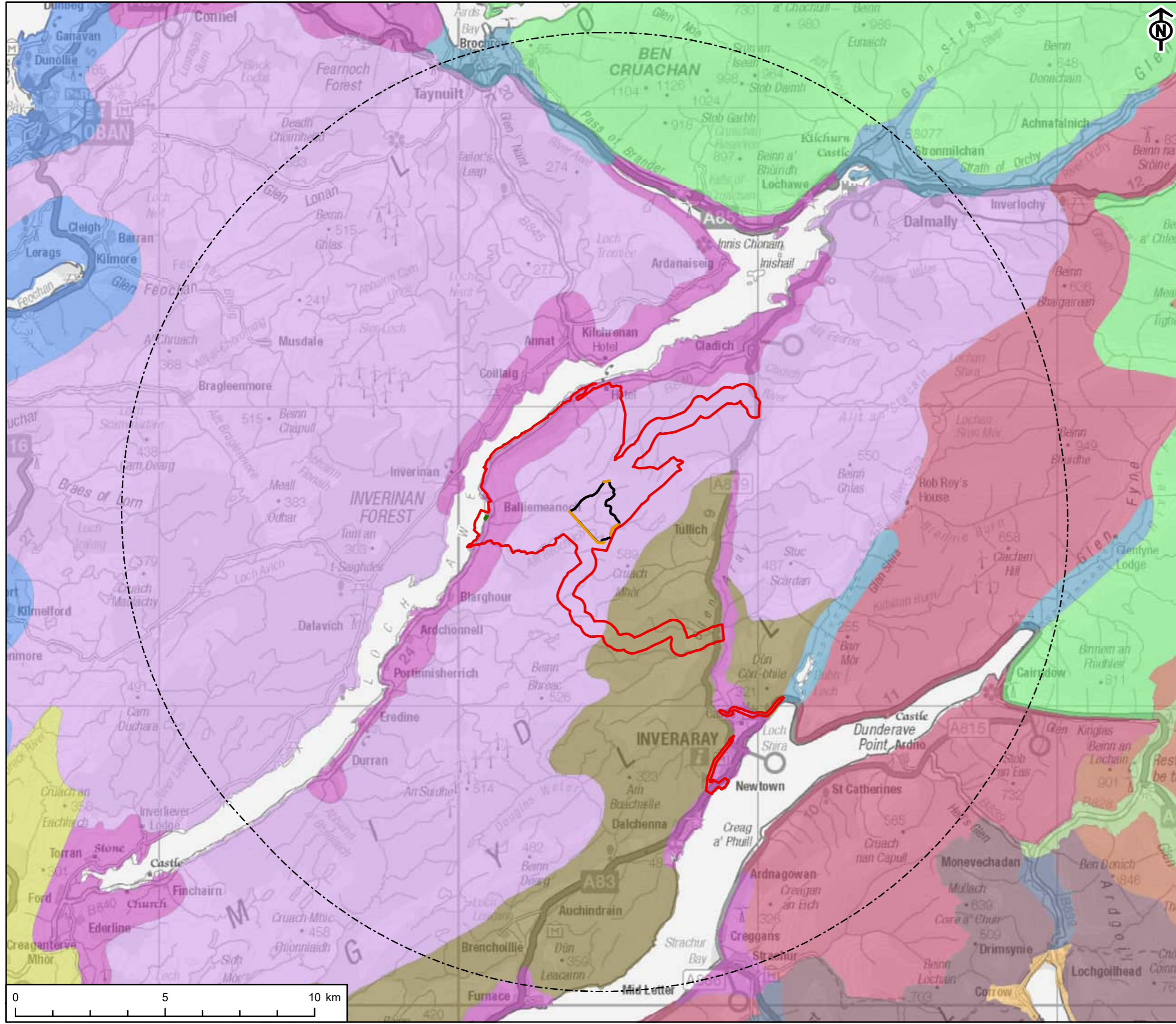
REFERENCE
BM_211116_SC_5.5_v3

SHEET NUMBER
1 of 1

DATE
16/11/21

Project Management Initials: VD Designer: LC Checked: AR Approved: RM

Scale @ A3 1:120,000



PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

- KEY**
- 15km Study Area
 - Proposed Development Boundary
 - Indicative Embankment
 - Indicative Headpond
 - Indicative Tailpond Inlet / Outlet
 - Viewpoint Location
- Zone of Theoretical Visibility**
- Headpond Visible
 - Tailpond Inlet / Outlet Visible
 - Headpond and Tailpond Visible

NOTE:
Zone of Theoretical Visibility (ZTV) has been generated using Ordnance Survey Terrain 5 digital terrain model which does not take account of the screening effects of vegetation, buildings or other structures. ZTV is based upon a series of points along the headpond wall spaced 50m apart, a 50m grid of points across the surface of the headpond and a series of points around the tailpond structure spaced 5m apart with an observer eye height of 1.6m. All measurements are above ground level (AGL) unless specified otherwise.
Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673

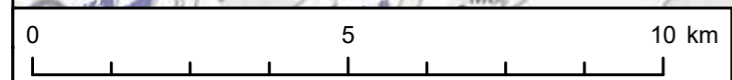
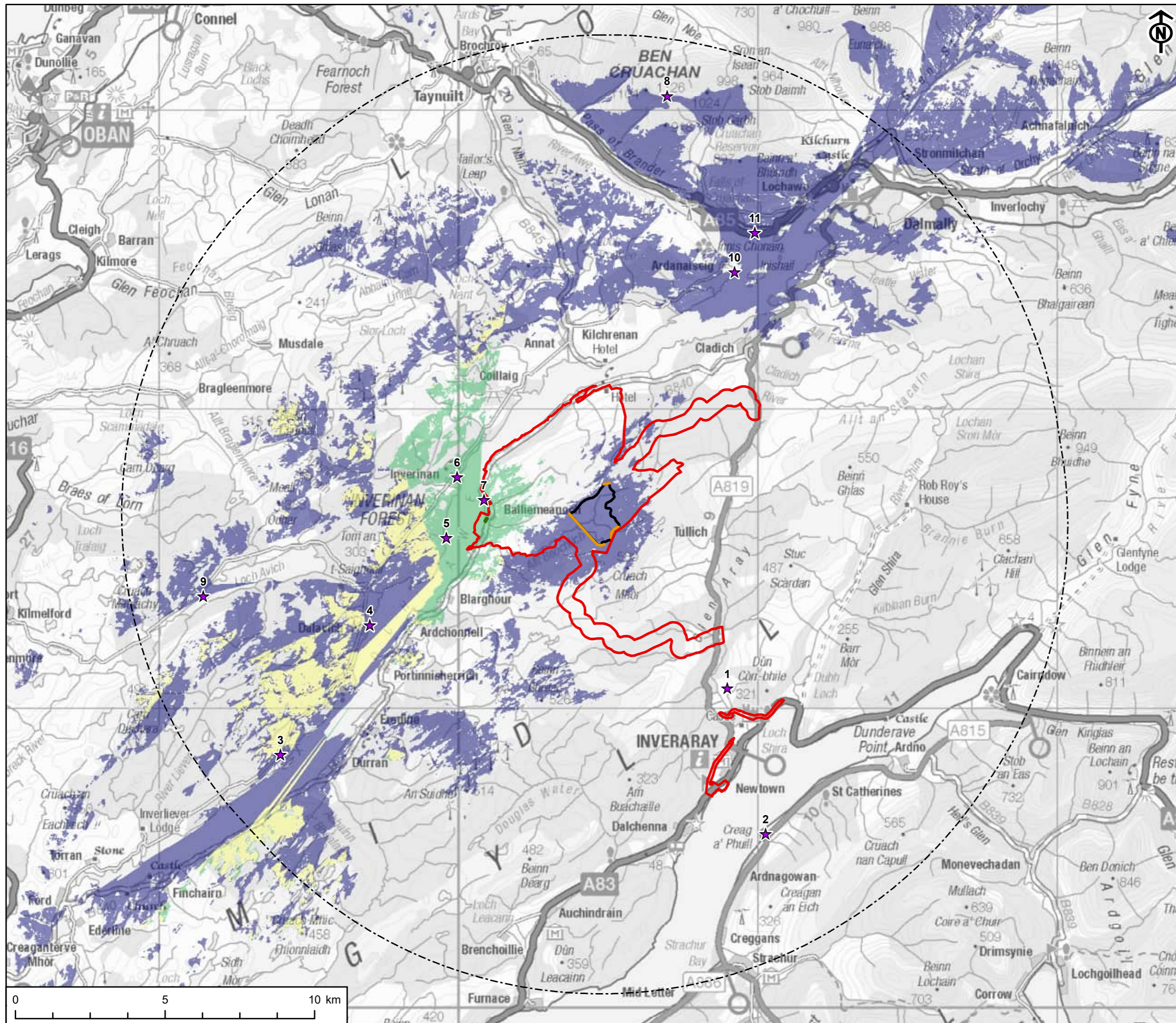
TITLE
Figure 5.6
Representative Viewpoint Locations

REFERENCE
BM_211116_SC_5.6_v2

SHEET NUMBER 1 of 1 **DATE** 16/11/21

Project Management Initials: VD Designer: LC Checked: AR Approved: RM

Scale @ A3 1:120,000



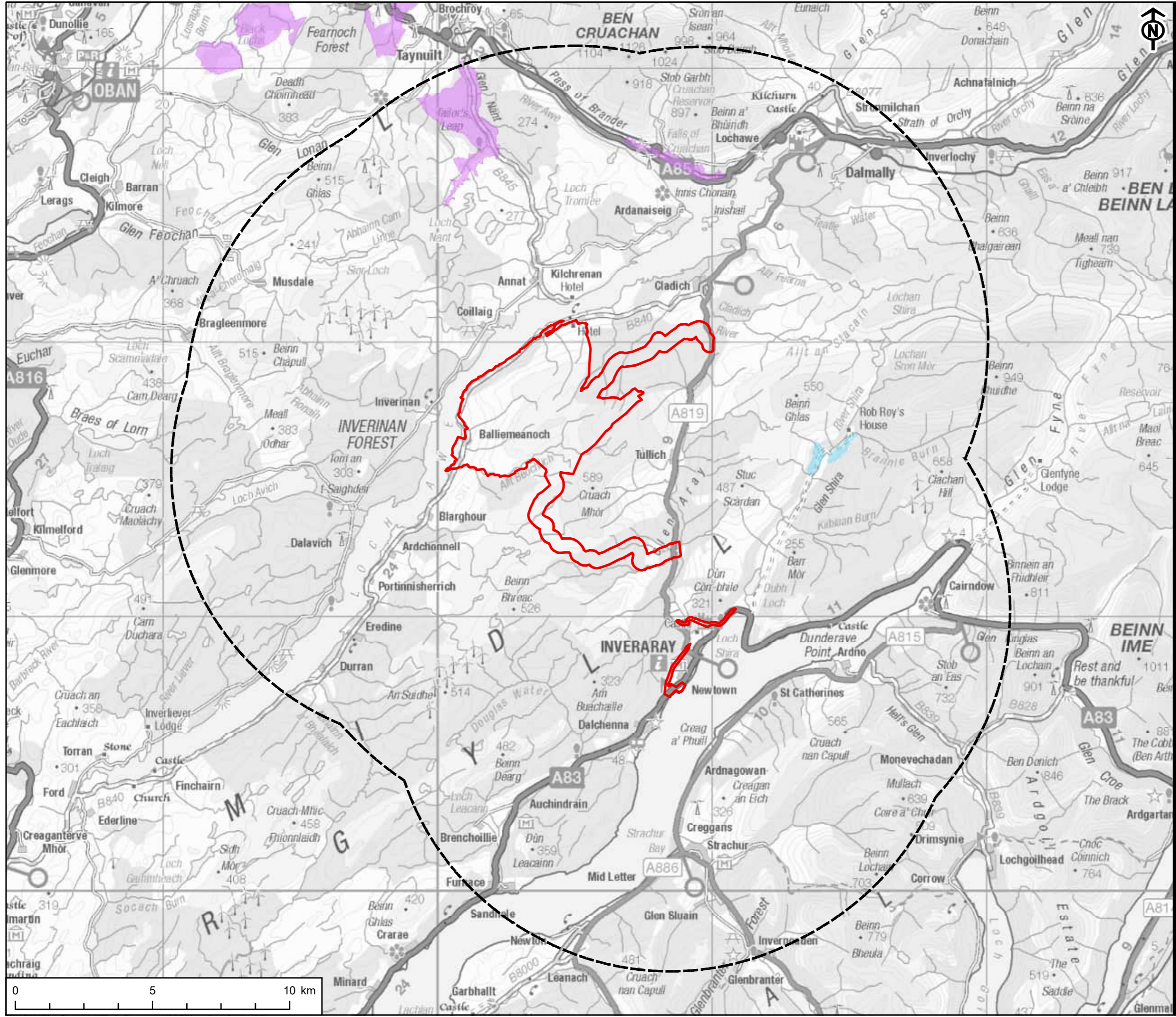
This drawing has been produced for the use of AECOMs client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOMs express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

- KEY
- Proposed Development Boundary
 - 10km Study Area
 - Loch Etive SAC
 - Glen Shira SAC

Project Management Initials: MB Designer: ER Checked: NS Approved: VD



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

Contains Ordnance Survey Data © Crown copyright and database rights 2020 Ordnance Survey 0100031673
Contains SNH information licensed under the Open Government Licence v3.0.

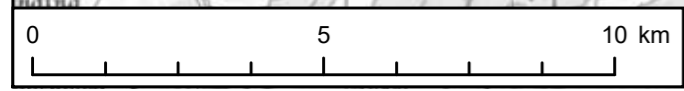
TITLE
Figure 6.1
Statutory Designated Sites

REFERENCE
BM_211116_SC_6.1_v3

SHEET NUMBER
1 of 1

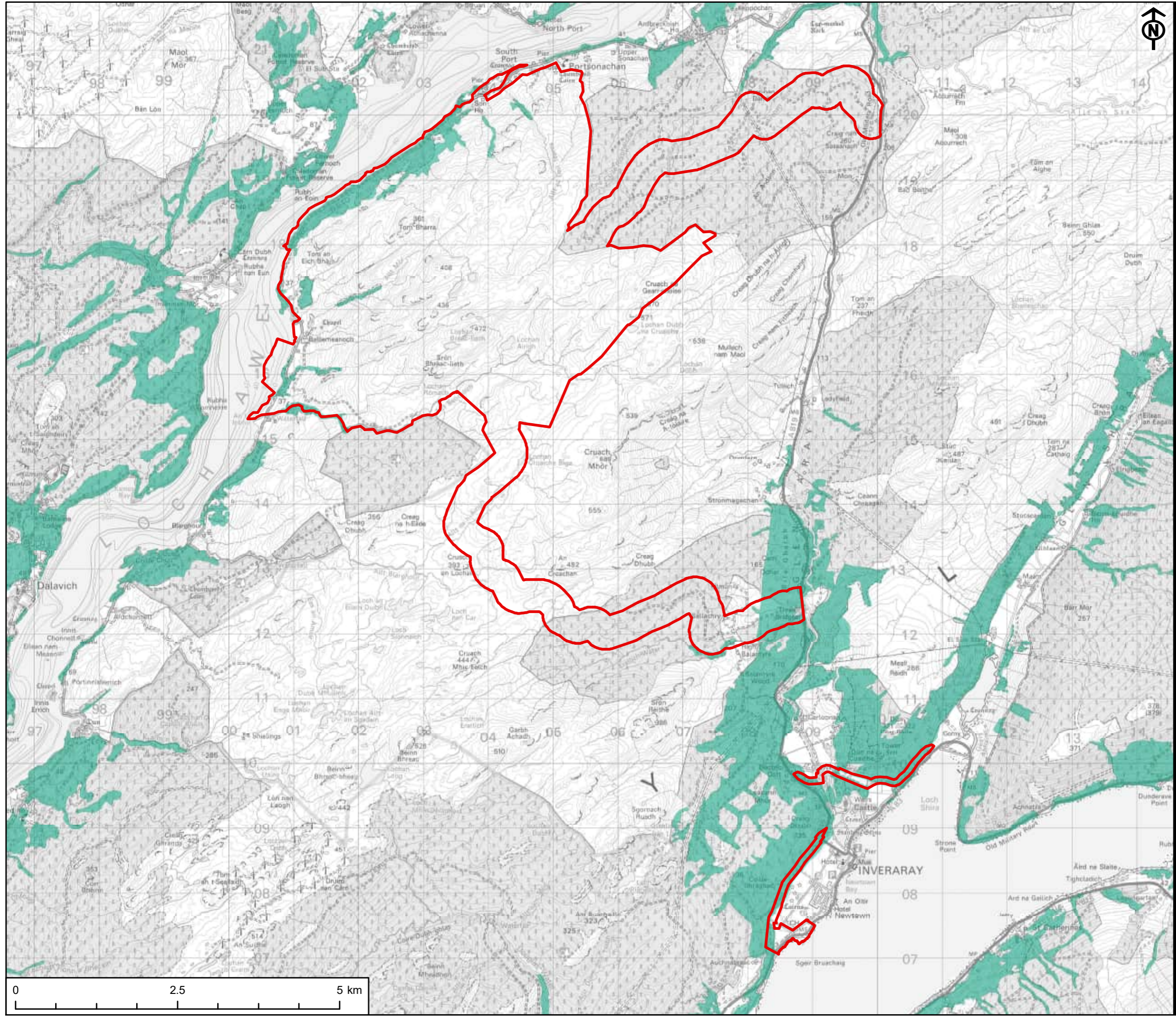
DATE
16/11/21

Scale @ A3 1:130,000



PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO
CLIENT
ILI (Borders PSH) Ltd.

KEY
[Red Outline] Proposed Development Boundary
[Green Area] Ancient Woodland

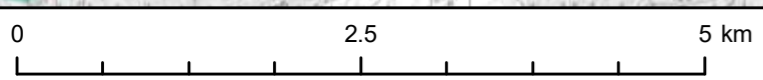


Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673
Contains SNH information licensed under the Open Government Licence v3.0.

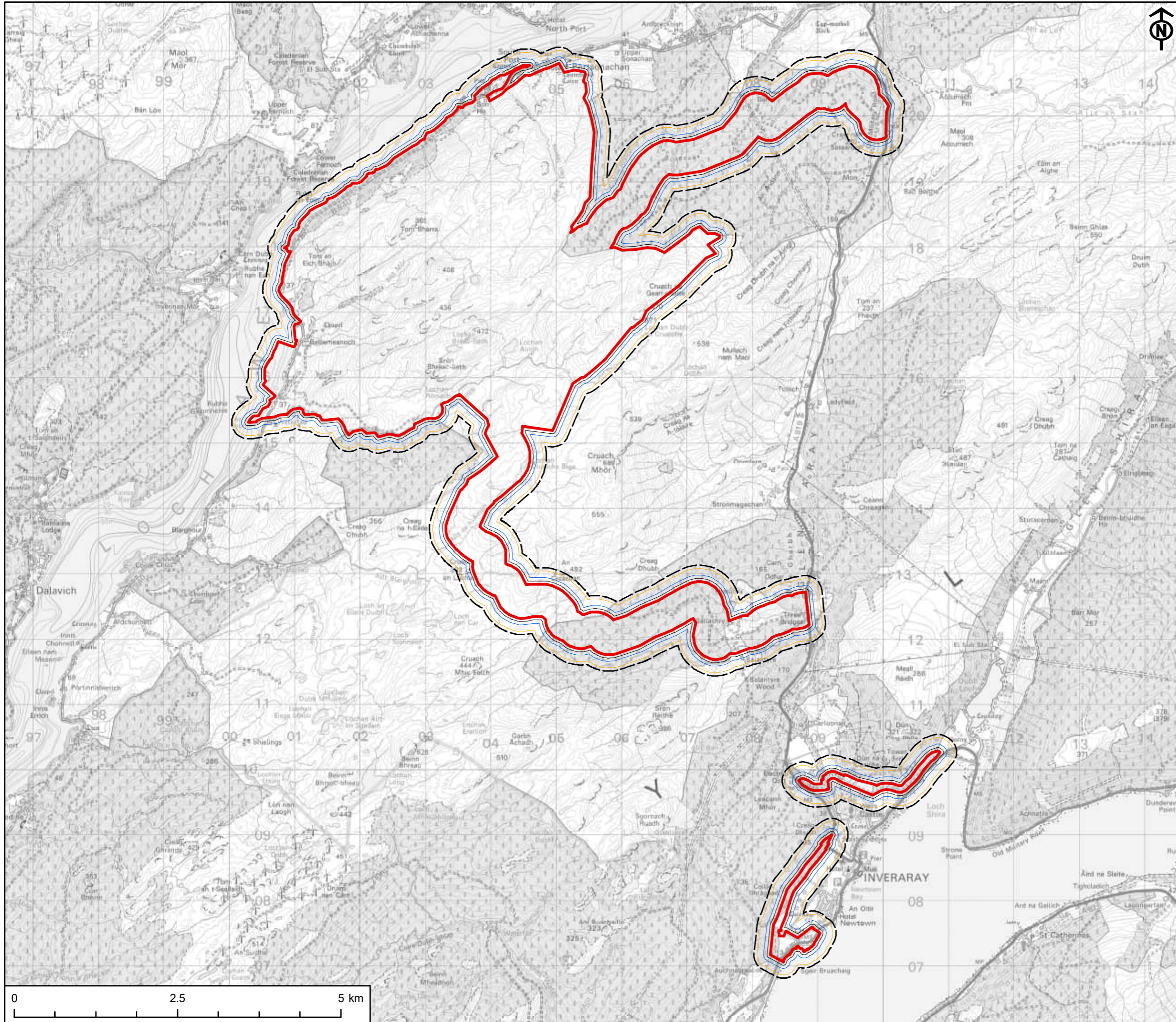
TITLE
Figure 6.2
Ancient Woodland

REFERENCE
BM_211026_SC_6.2_v2

SHEET NUMBER
1 of 1
DATE
26/10/21



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.



PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

KEY

- Proposed Development Boundary
- Bat 50m Survey Area
- Badger 100m Survey Area
- Otter, Water Vole, Pine Marten and Wildcat 200m Survey Area
- Phase One Habitat / NVC 250m Survey Area

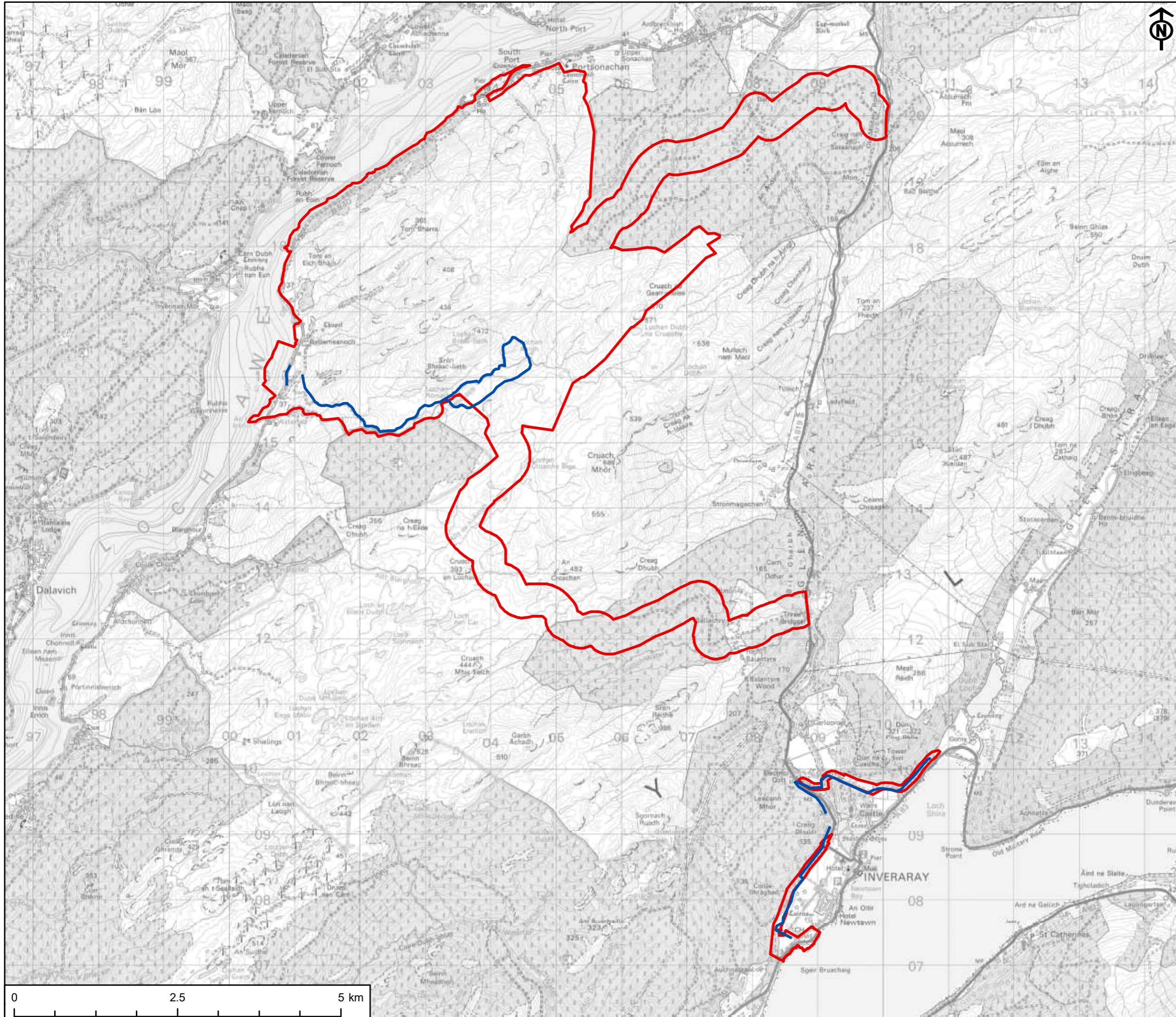
Contains Ordnance Survey Data © Crown copyright and database rights 2020 Ordnance Survey 0100031673

TITLE
Figure 6.3
Terrestrial Ecology Survey Areas

REFERENCE
BM_211026_SC_6.3_v2

SHEET NUMBER 1 of 1 **DATE** 26/10/21

This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.



PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

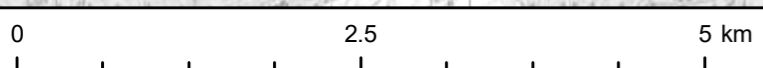
KEY
▭ Proposed Development Boundary
▬ Bat Activity Transect Route

Contains Ordnance Survey Data © Crown copyright and database rights 2020 Ordnance Survey 0100031673

TITLE
Figure 6.4a
Bat Activity Survey

REFERENCE
BM_211026_SC_6.4a_v2

SHEET NUMBER 1 of 1
DATE 26/10/21



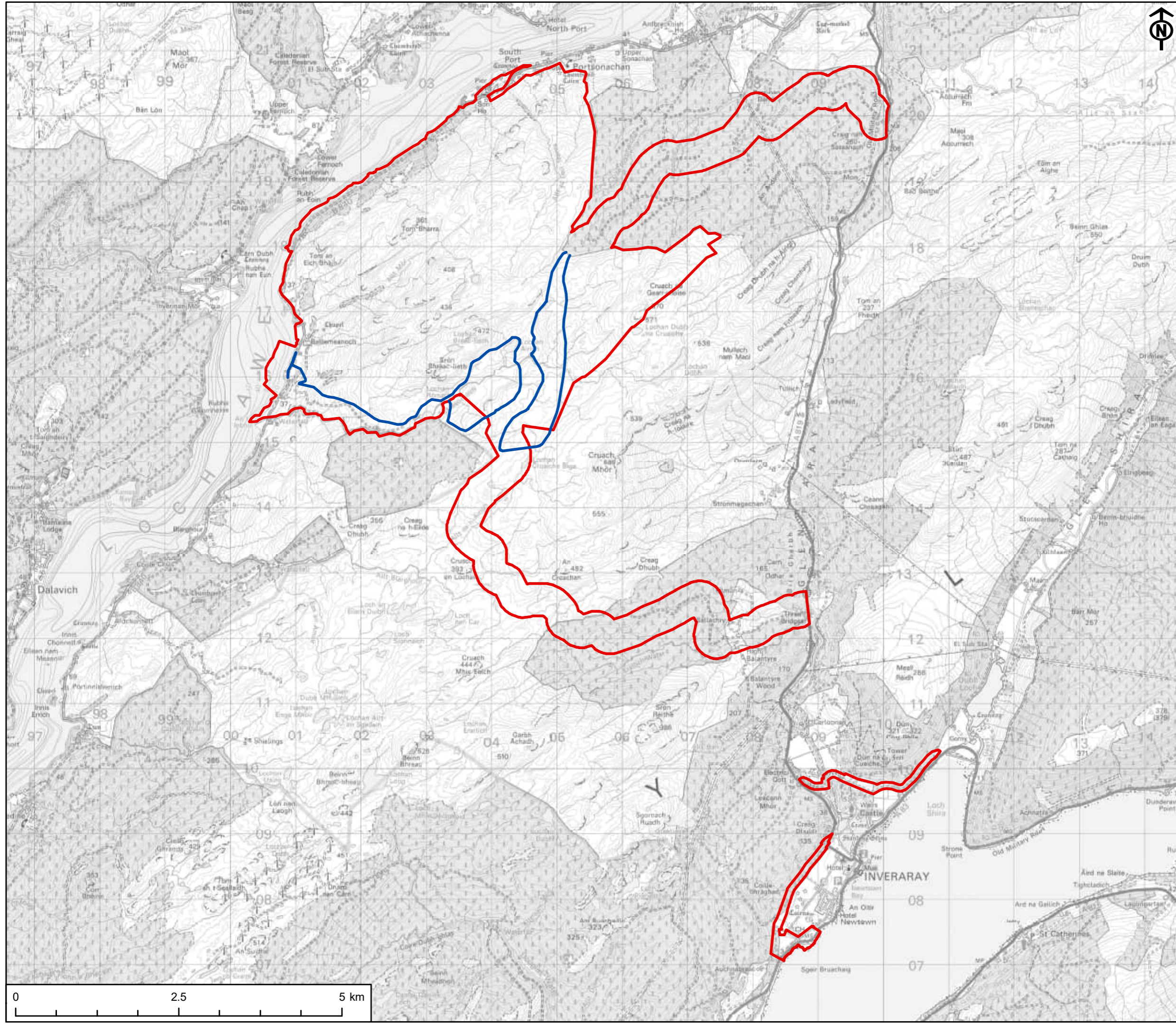
PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

KEY

- Proposed Development Boundary
- Butterfly, Dragonfly and Damselfly Survey Transect Route

Project Management Initials: MB Designer: ER Checked: NS Approved:VD



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673

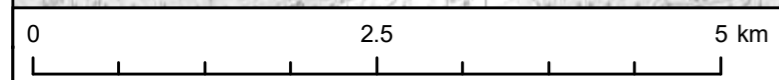
TITLE
Figure 6.4b
Butterfly, Dragonfly and Damselfly Survey Transect Routes

REFERENCE
BM_211026_SC_6.4b_v2

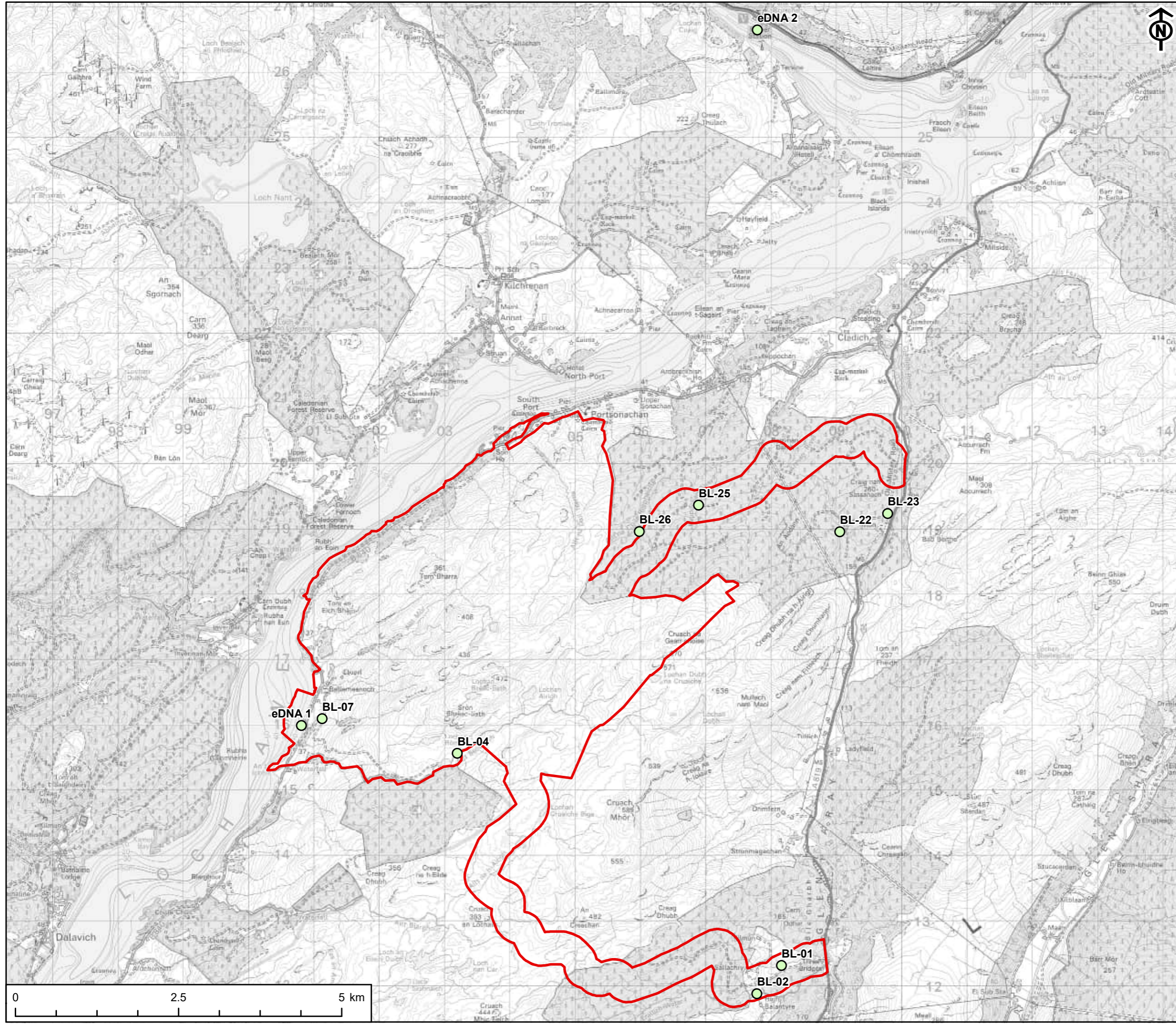
SHEET NUMBER
1 of 1

DATE
26/10/21

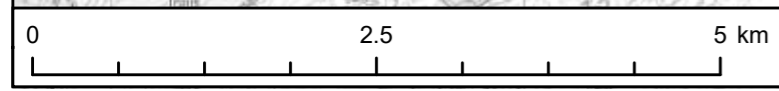
Scale @ A3 1:55,000



Project Management Initials: MB Designer: ER Checked: NS Approved: VD



Scale @ A3 1:55,000



This drawing has been produced for the use of AECOMs client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOMs express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673

TITLE
Figure 7.1
Electric Fishing and eDNA Survey Locations

REFERENCE
BM_211116_SC_7.1_v3

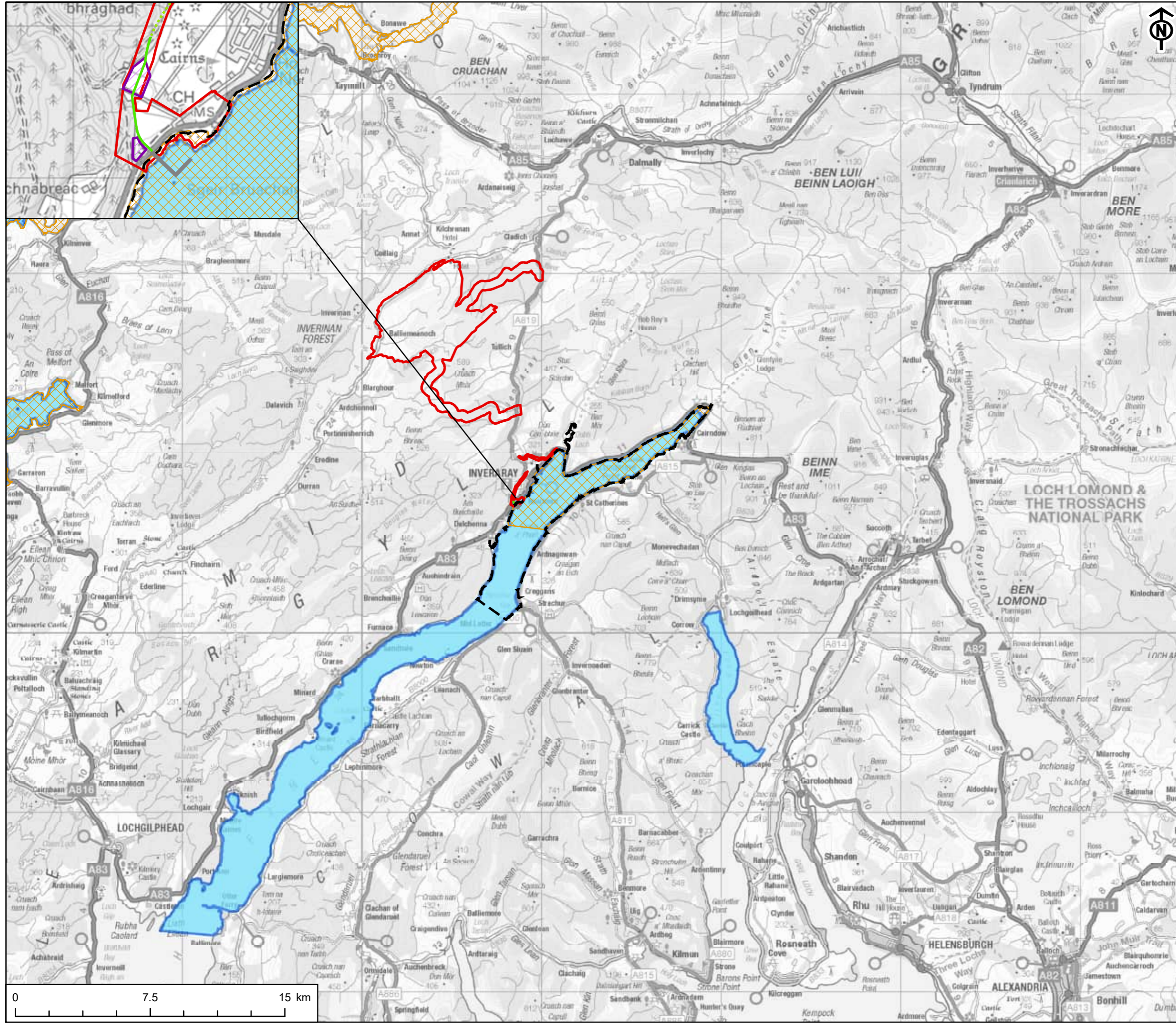
SHEET NUMBER 1 of 1 DATE 16/11/21

PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

- KEY
- Proposed Development Boundary
 - Marine Study Area
 - Marine Consultation Areas
 - Marine Protected Areas
 - Temporary Construction Compounds for Welfare and Offices
 - New Access Track
 - Upgrade Existing Access Track
 - Proposed Pier

Project Management Initials: MB Designer: NS Checked: LC Approved: VD



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673

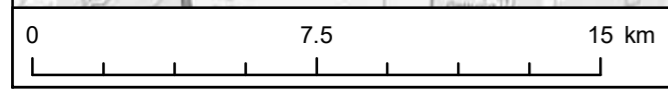
TITLE
Figure 8.1
Marine Facility Study Area and Protected Sites

REFERENCE
BM_211117_SC_8.1_v2

SHEET NUMBER
1 of 1

DATE
17/11/21

Scale @ A3 1:200,000



PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

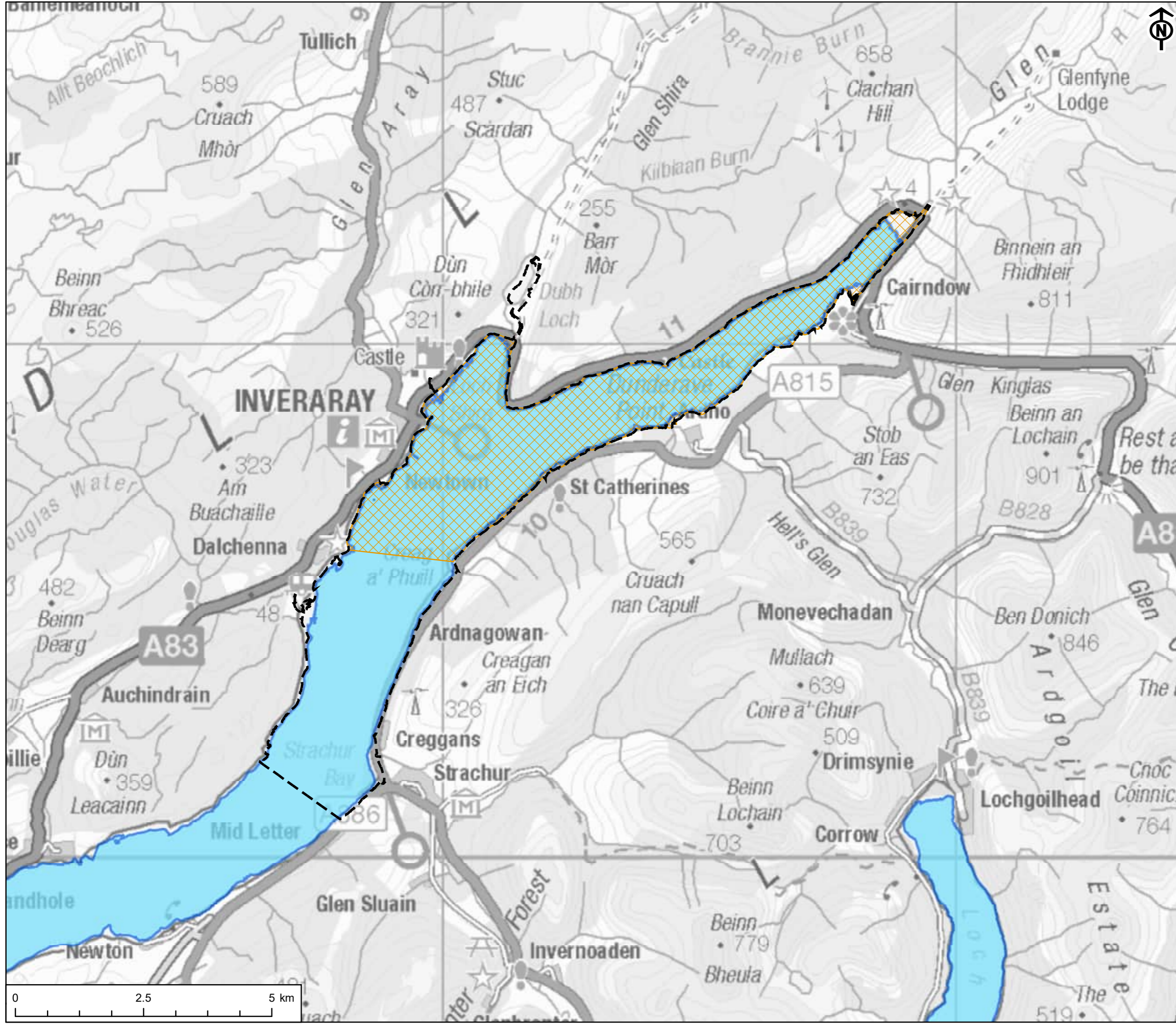
- KEY
- Proposed Development Boundary
 - Marine Study Area
 - Marine Consultation Areas
 - Marine Protected Areas

Image

Value



Project Management Initials: MB Designer: NS Checked: LC Approved: VD



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

Contains Ordnance Survey Data © Crown copyright and database rights 2020 Ordnance Survey 0100031673

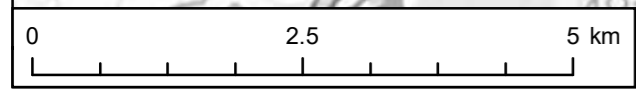
TITLE
Scottish Priority Marine Features

REFERENCE
BM_220208_SC_8.2_v2

SHEET NUMBER
1 of 1

DATE
08/02/22

Scale @ A3 1:70,000

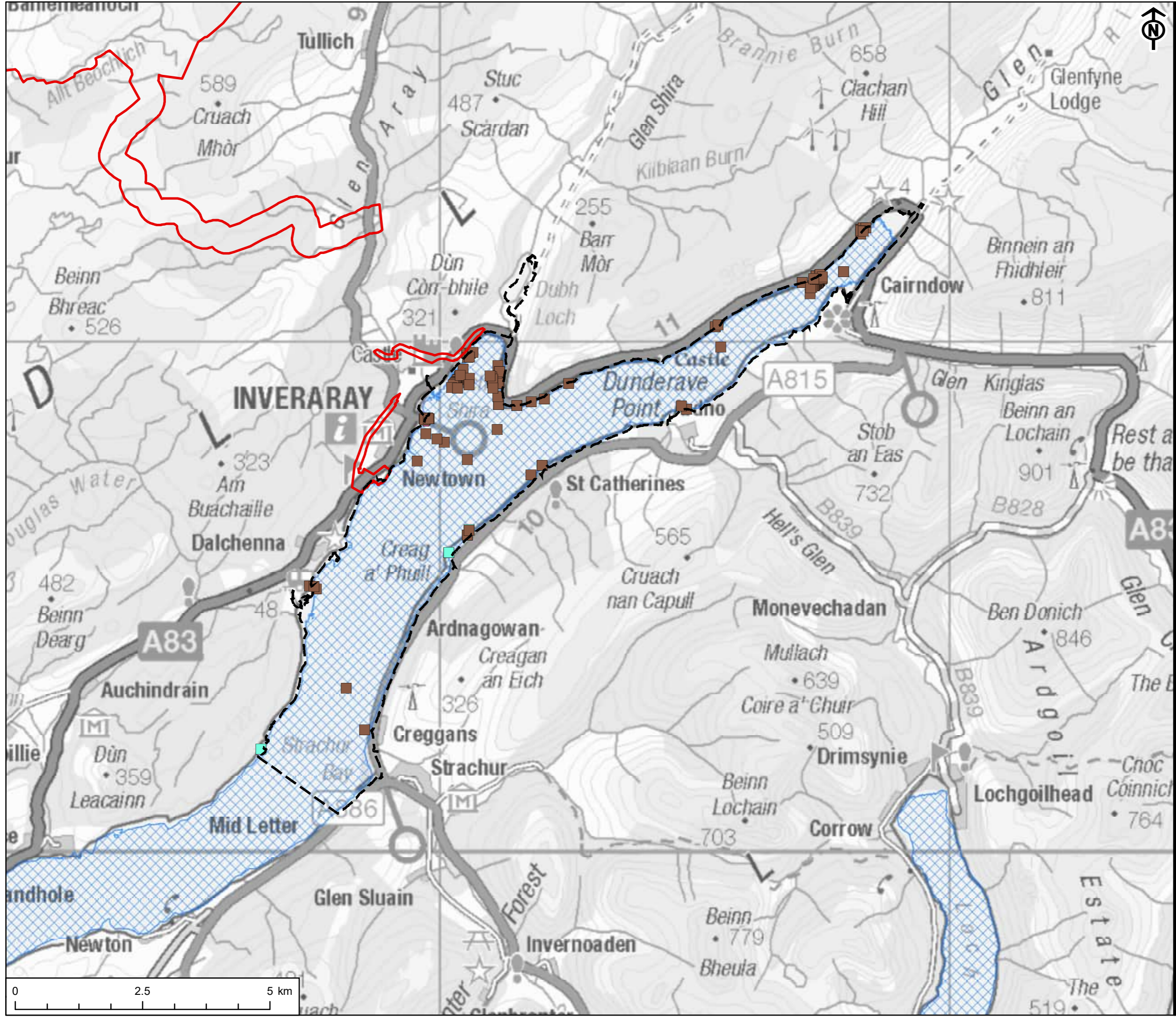


PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

- KEY**
- Proposed Development Boundary
 - Marine Study Area
 - Upper Loch Fyne and Loch Goil MPA
 - Horse Mussel Beds
 - Ocean Quahog (*Arctica Islandica*)
 - Flame Shell Beds
 - Burrowed mud

Project Management Initials: MB Designer: NS Checked: LC Approved: VD



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

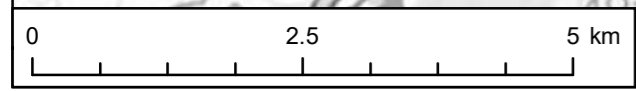
Contains Ordnance Survey Data © Crown copyright and database rights 2020 Ordnance Survey 0100031673

TITLE
Distribution of Protected Features of The Upper Loch Fyne and Loch Goil NCMPA Within the Vicinity of the Proposed Development at Inveraray

REFERENCE
BM_211118_SC_8.3_v2

SHEET NUMBER 1 of 1 **DATE** 18/11/21

Scale @ A3 1:70,000

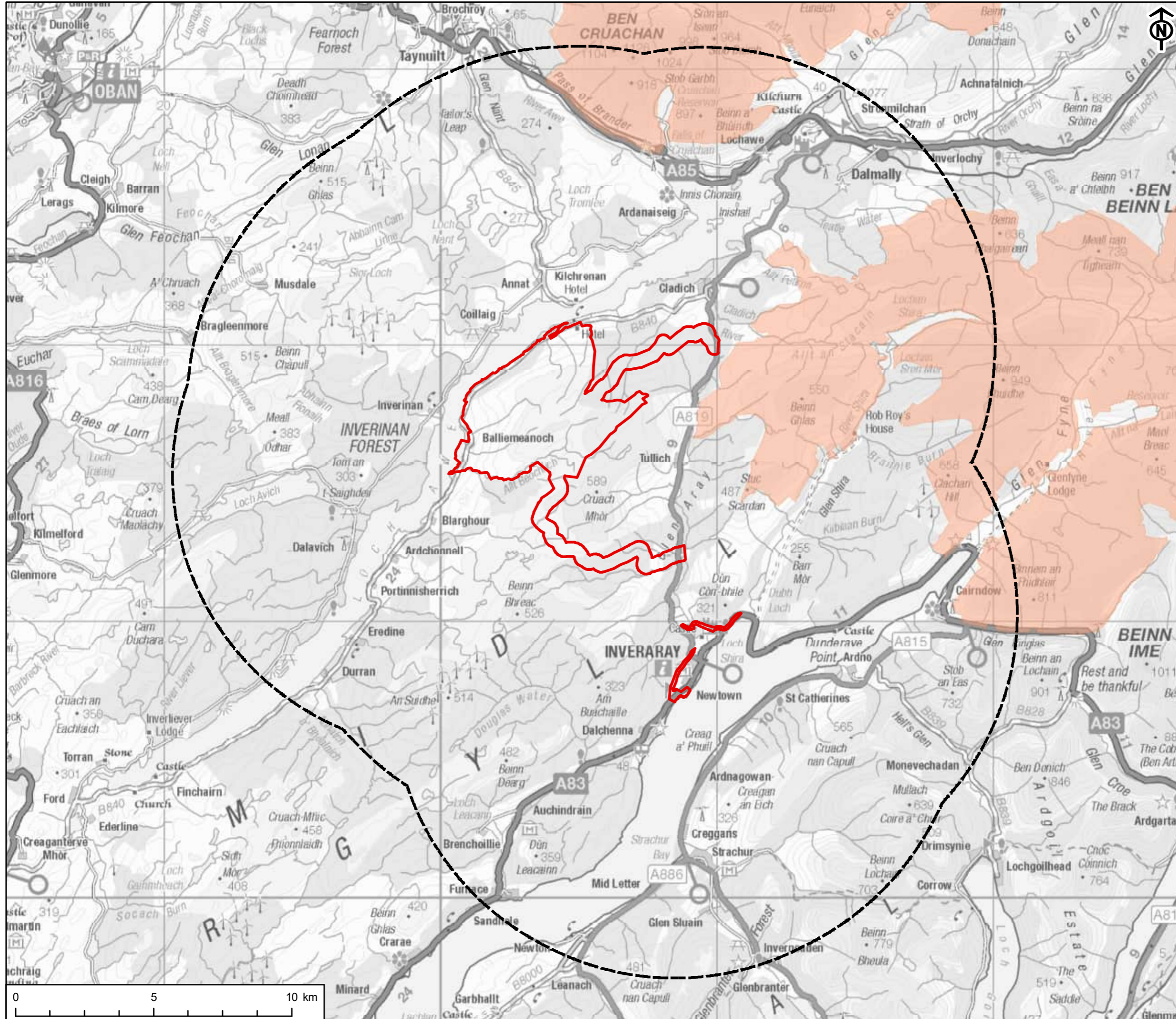


PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

KEY
[Red outline] Proposed Development Boundary
[Dashed circle] 10km Study Area
[Orange shading] Glen Etive and Glen Fyne SPA

Project Management Initials: MB Designer: ER Checked: NS Approved: VD



Contains Ordnance Survey Data © Crown copyright and database rights 2020 Ordnance Survey 0100031673
Contains SNH information licensed under the Open Government Licence v3.0.

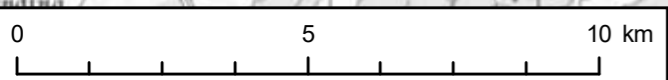
TITLE
Figure 9.1
Statutory Designated Sites

REFERENCE
BM_211026_SC_9.1_v2

SHEET NUMBER
1 of 1

DATE
26/10/21

Scale @ A3 1:130,000



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

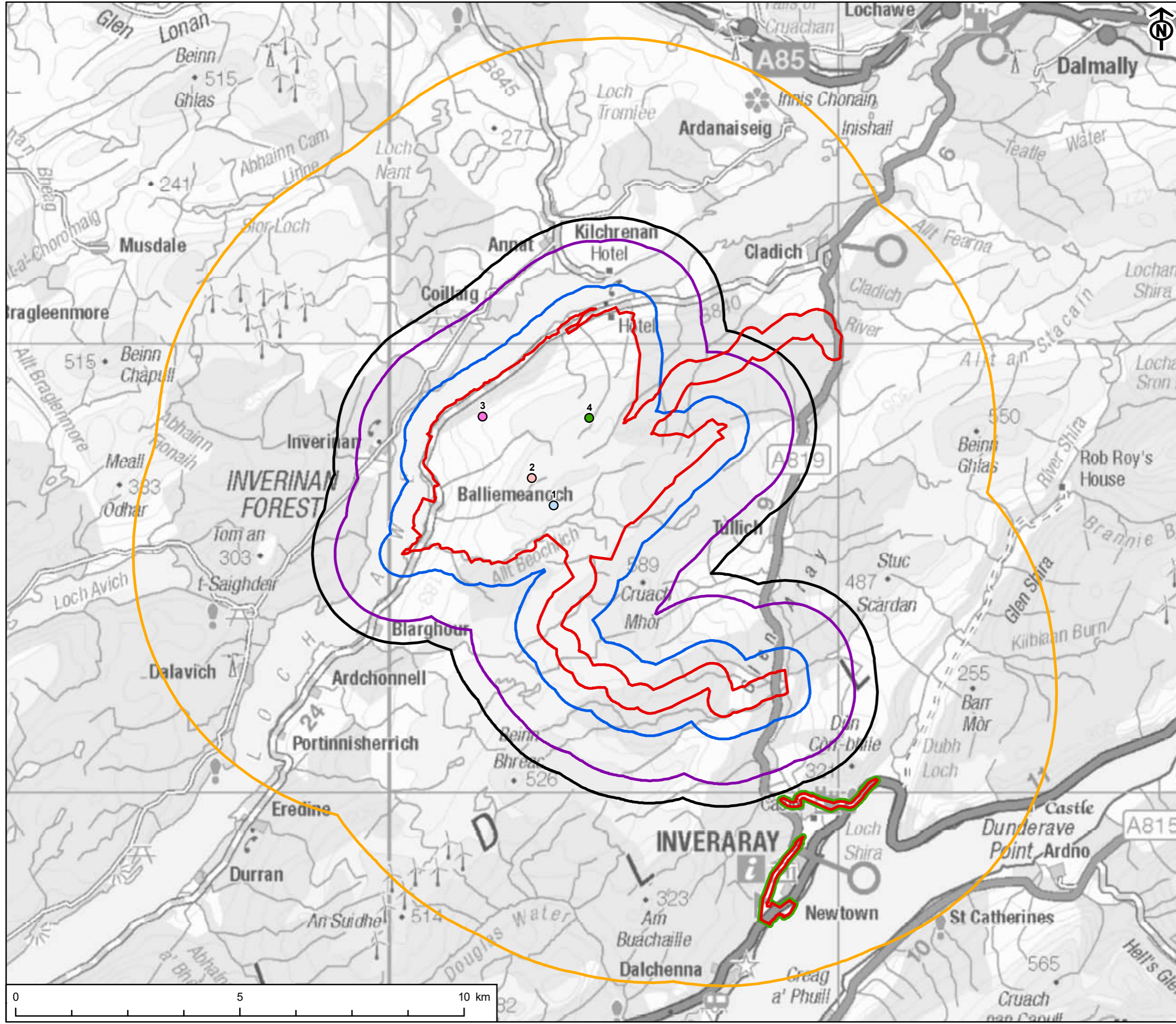
- KEY
- Proposed Development Boundary
 - Black Grouse 1.5km Study Area
 - Breeding Eagle 6km Study Area
 - Breeding Raptor 2km Study Area
 - Common Bird 50m Study Area
 - Moorland Breeding Bird 500m Study Area

Vantage Point

- 1
- 2
- 3
- 4

Project Management Initials: MB Designer: ER Checked: NS Approved: VD

Scale @ A3 1:80,000



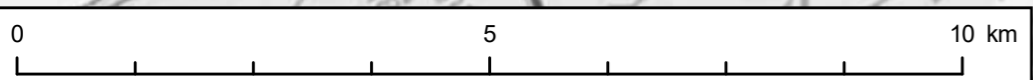
Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673

TITLE
Figure 9.2
Ornithology Survey Areas






REFERENCE
BM_211026_SC_9.2_v2

SHEET NUMBER
1 of 1

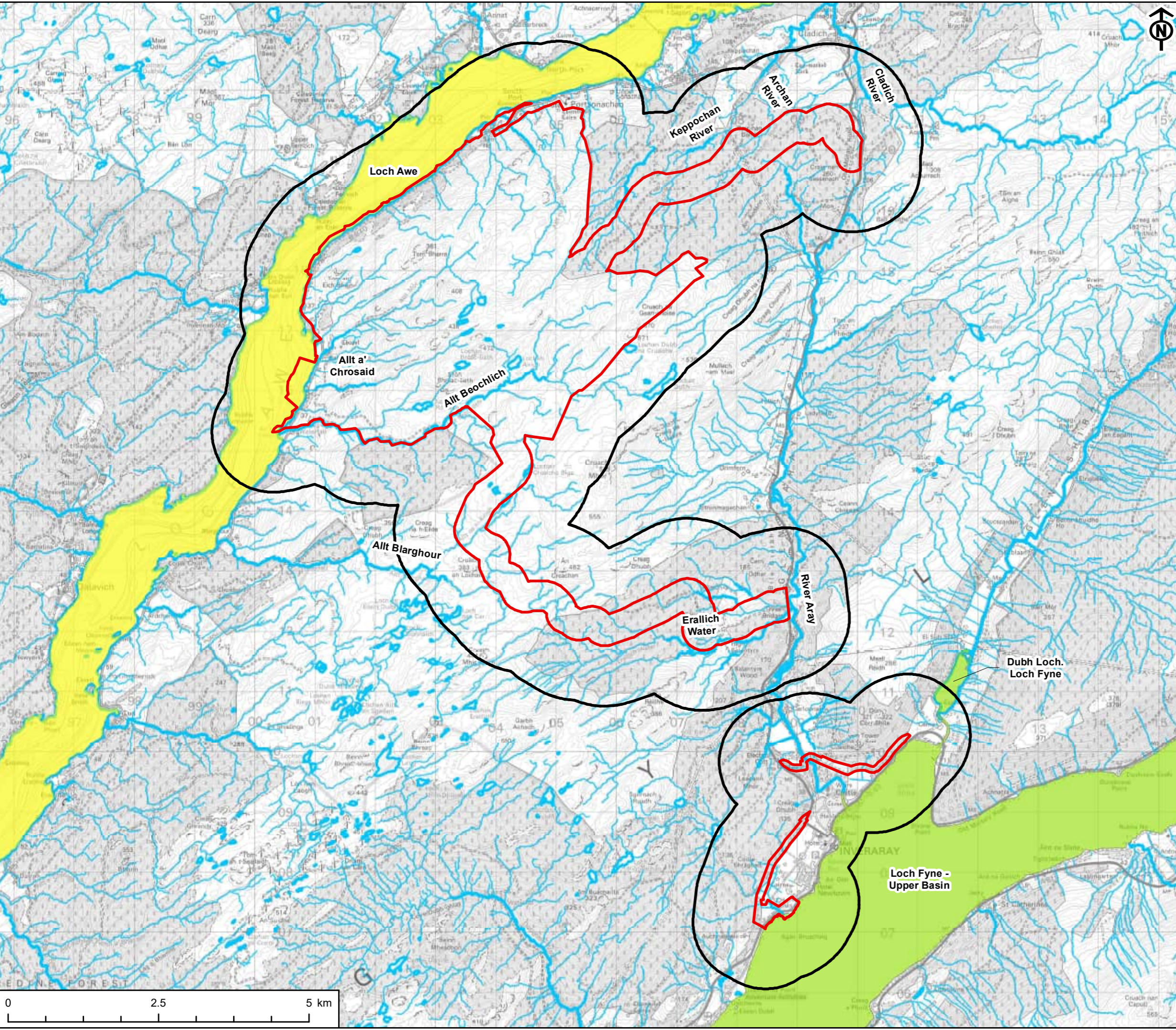
DATE
26/10/21



KEY

	Proposed Development Boundary
	1km Study Area
	Watercourse / Waterbody
Waterbody Classification	
	Good status / potential
	Moderate status / potential

Project Management Initials: MB Designer: ER Checked: LC Approved: VD



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673
Contains public sector information licensed under the Open Government Licence v3.0.

TITLE
Figure 11.1
Waterbody Classifications

REFERENCE
BM_211026_SC_11.1_v2

SHEET NUMBER
1 of 1

DATE
26/10/21

Scale @ A3 1:60,000

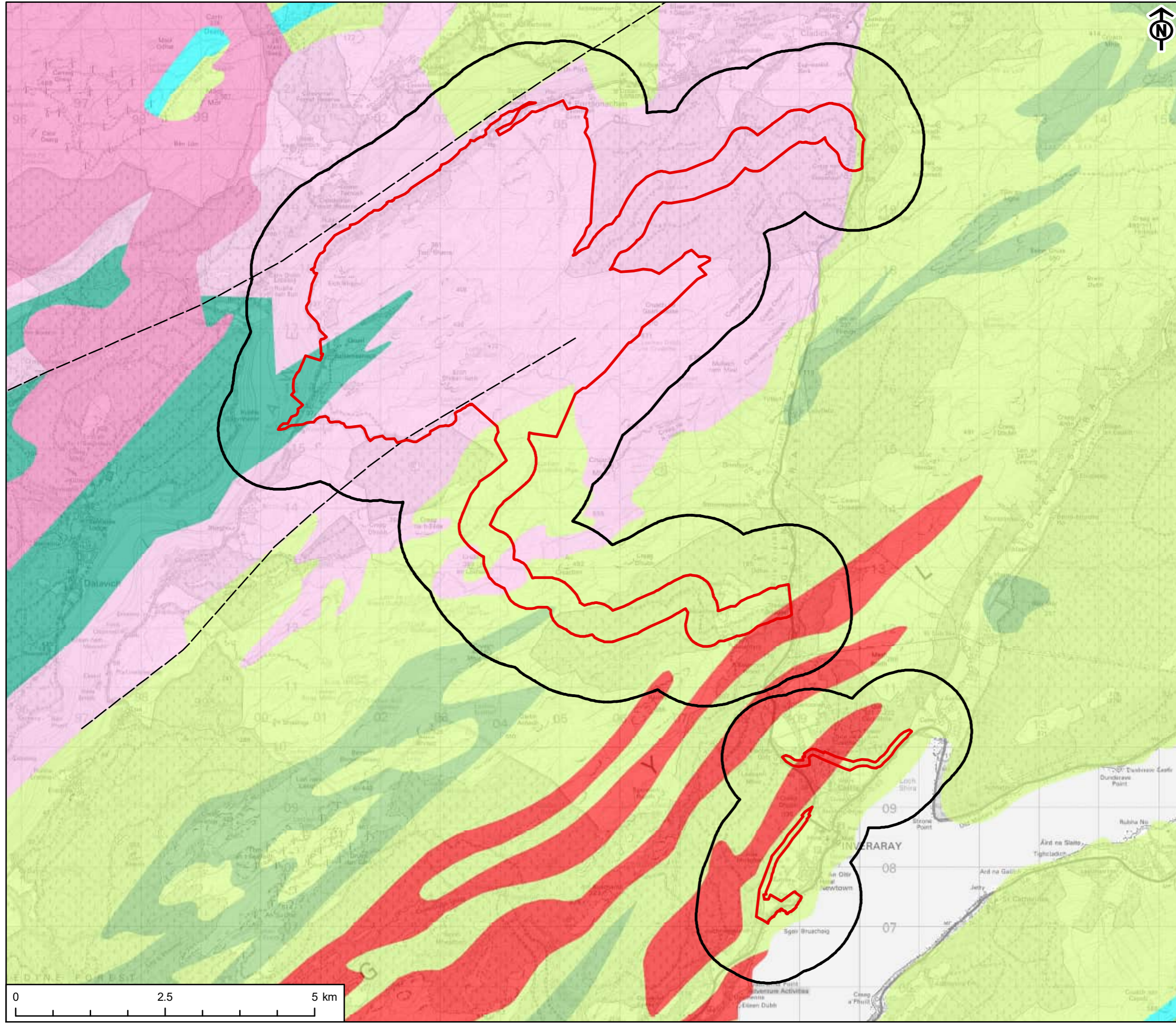
PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

- KEY
- Proposed Development Boundary
 - 1km Study Area
 - Fault Line
 - Fault at rockhead
 - Bedrock Geology
 - Unnamed Igneous Intrusion, Late Silurian to Early Devonian - Felsic-Rock
 - Unnamed Extrusive Rocks, Silurian to Devonian - Mafic Lava and Mafic Tuff
 - Argyll Group - Metalimestone
 - Argyll Group - Metalimestone
 - Southern Highland Group - Lava, Tuff, Volcaniclastic Rock and Sedimentary Rock
 - Southern Highland Group - Psammite and Pelite
 - Unnamed Extrusive Rocks, Neoproterozoic - Mafic Lava and Mafic Tuff
 - Unnamed Igneous Intrusion, Neoproterozoic - Mafic Igneous-Rock

Project Management Initials: MB Designer: ER Checked: LC Approved: VD

Scale @ A3 1:60,000



Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673

© UKRI 2021

TITLE
Figure 11.2
Bedrock Geology

REFERENCE
BM_211026_SC_11.2_v2

SHEET NUMBER
1 of 1

DATE
26/10/21

PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

- KEY
- Proposed Development Boundary
 - 1km Study Area
 - Fault Line
 - Fault at rockhead
 - Dyke
 - Unnamed Igneous Intrusion, Palaeogene - Mafic Igneous-Rock
 - Unnamed Igneous Intrusion, Carboniferous to Permian - Dolerite and Tholeiitic Basalt
 - Unnamed Igneous Intrusion, Late Silurian to Early Devonian - Felsic-Rock
 - Unnamed Igneous Intrusion, Late Silurian to Early Devonian - Mafic Igneous-Rock
 - Superficial Geology
 - Alluvium - Clay, Silt and Sand
 - Glacial Sand and Gravel
 - Raised Marine Deposits - Sand and Gravel
 - Till - Diamicton
 - Unknown

Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673

Contains public sector information licensed under the Open Government Licence v3.0.

© UKRI 2021

TITLE
Figure 11.3
Superficial Geology

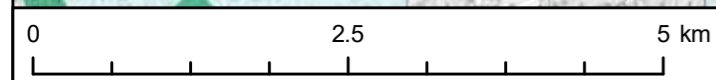
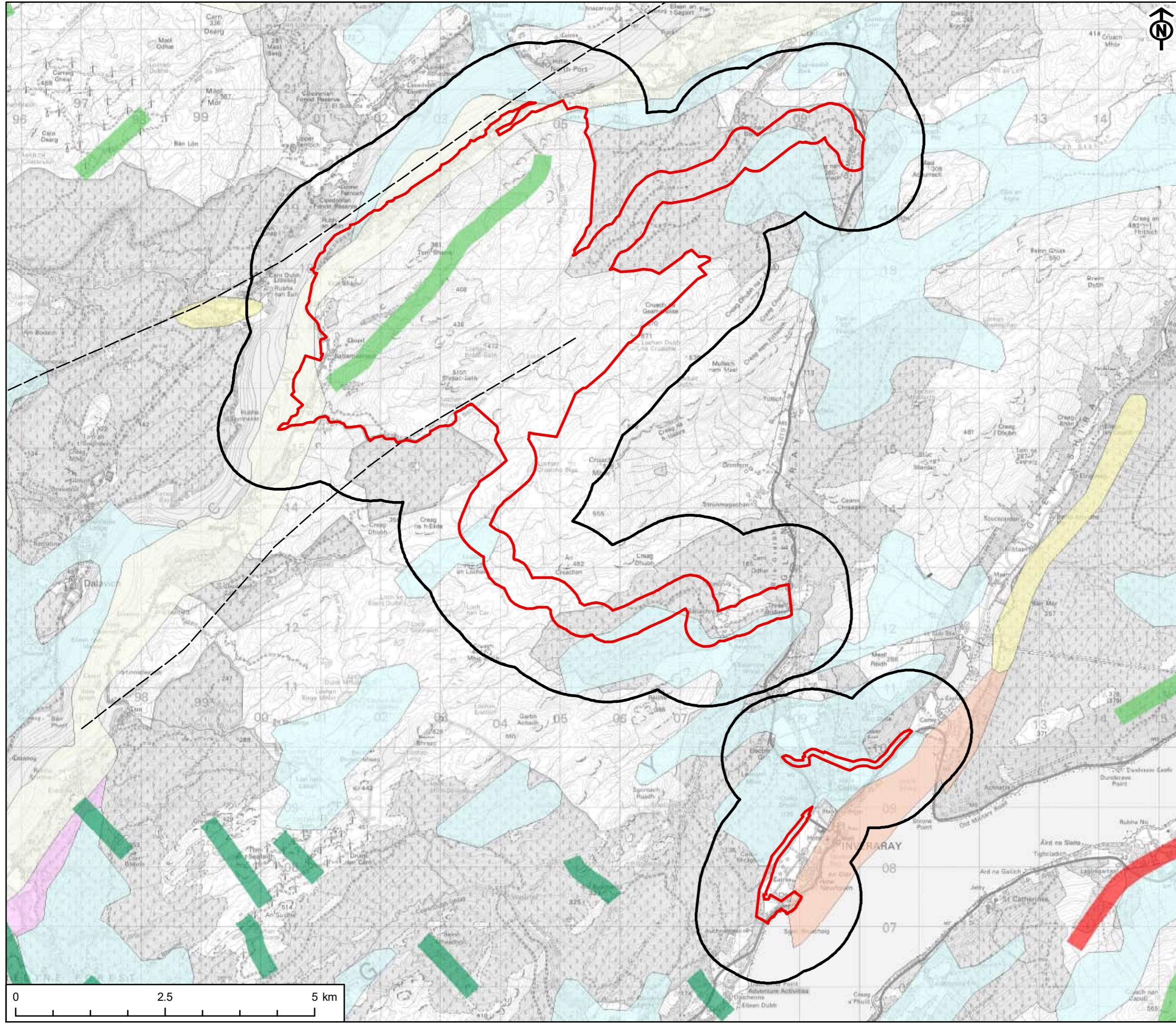
REFERENCE
BM_211026_SC_11.3_v2

SHEET NUMBER
1 of 1

DATE
26/10/21

Project Management Initials: MB Designer: ER Checked: LC Approved: VD

Scale @ A3 1:60,000



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

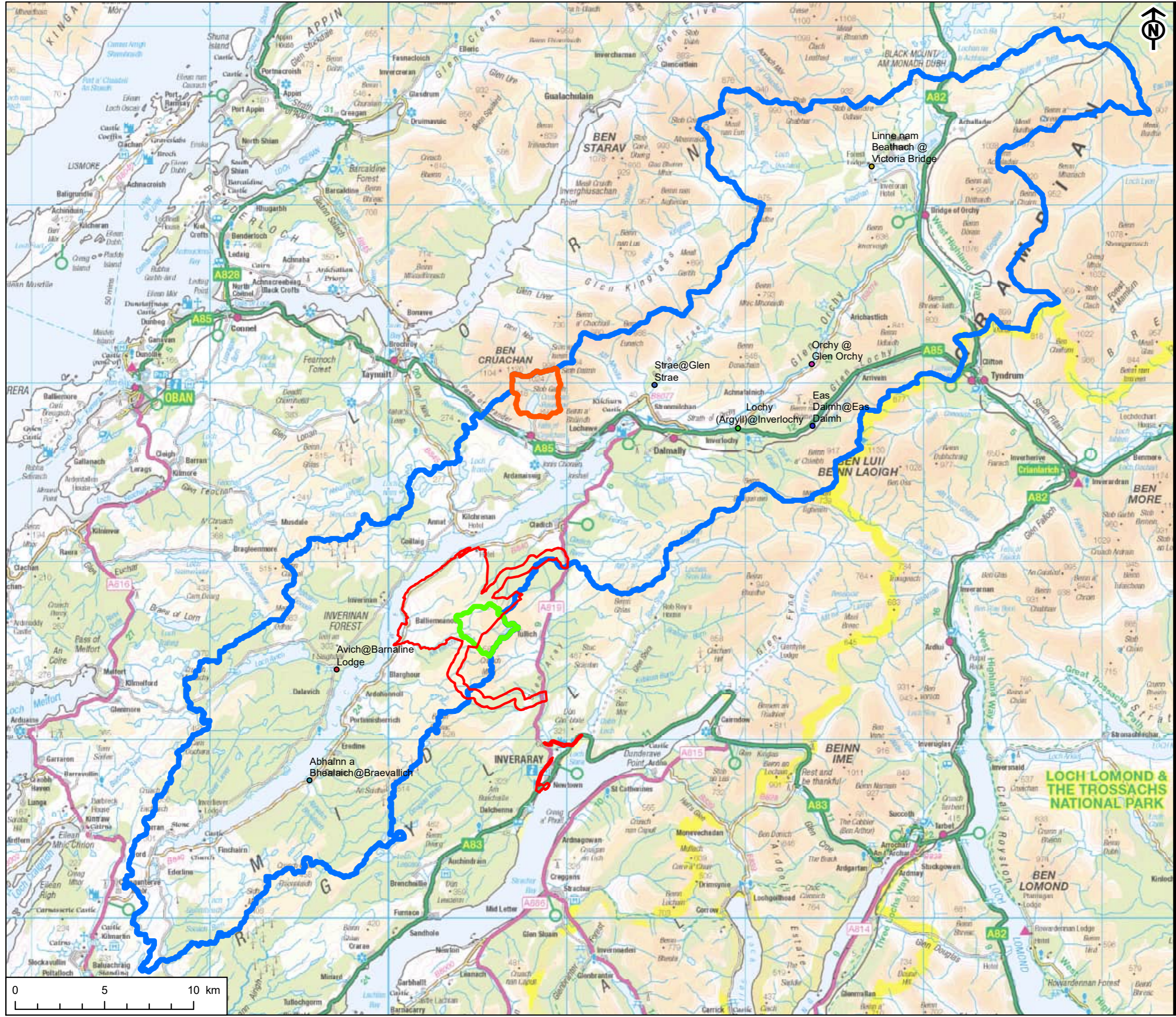
PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Highlands PSH) Ltd.

KEY

- SEPA Gauging Stations**
- Abhainn a Bhealach@Braevallich
 - Avich@Barnaline Lodge
 - Eas Daimh@Eas Daimh
 - Linne nam Beathach @ Victoria Bridge
 - Lochy (Argyll)@Inverlochy
 - Orchy @ Glen Orchy
 - Strae@Glen Strae
- ▭ Development_Boundary
 - ▭ Proposed Headpond Reservoir Catchment
 - ▭ Cruachan Reservoir Catchment
 - ▭ Loch Awe catchment area - SEPA

Project Management Initials: CA Designer: LC Checked: LL Approved: CA



TITLE
FIGURE 12.1
LOCH AWE CATCHMENT AREA

REFERENCE
BM_211115_SC_12.1

SHEET NUMBER
1 of 1

DATE
15/11/21

Scale @ A3 1:200,000

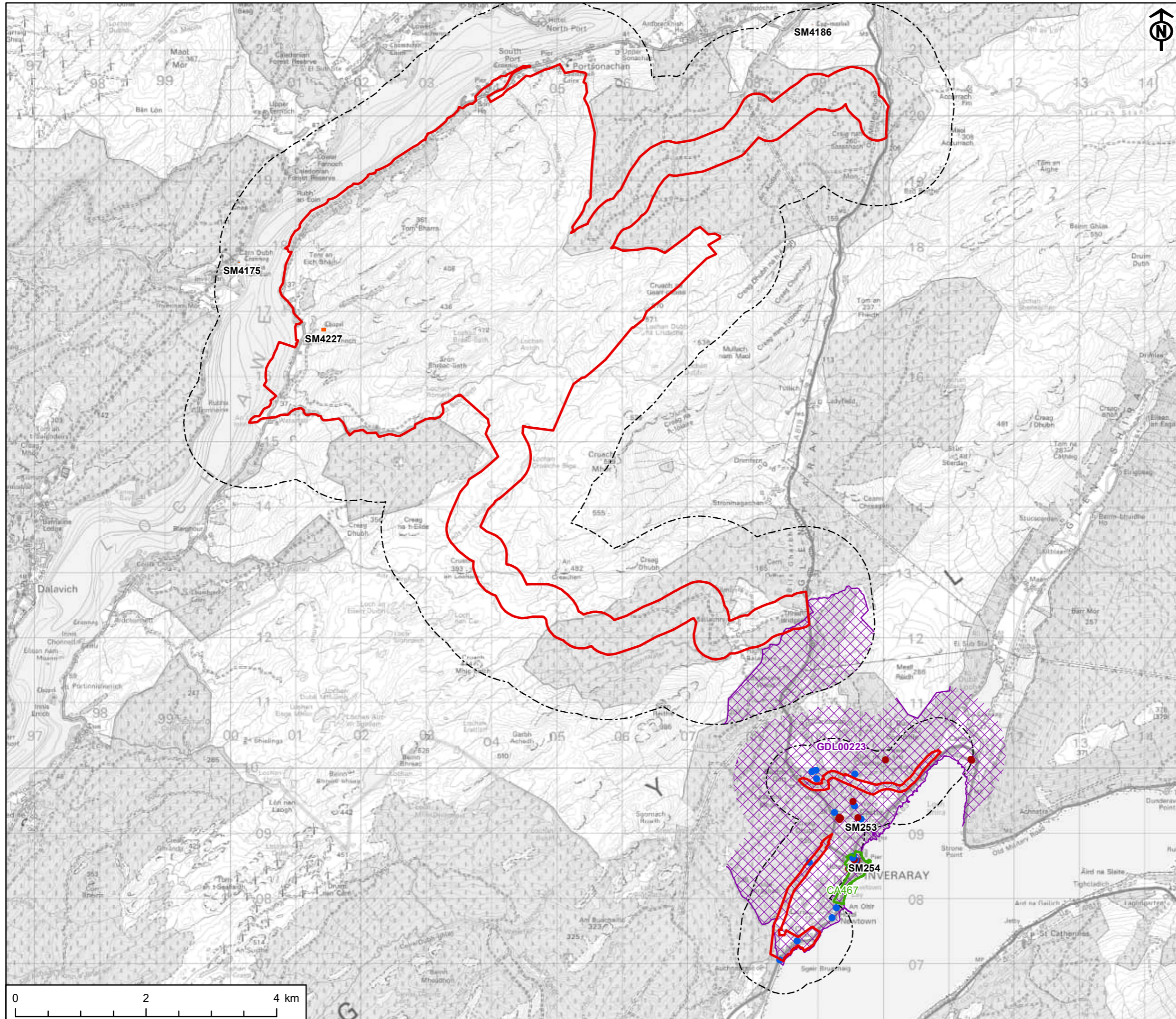
This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

- KEY
- Proposed Development Boundary
 - Archaeology Study
 - Scheduled Monument
 - Conservation
 - Gardens and Designed Landscapes

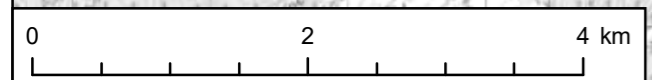
Listed Buildings by Category

- A
- B

Project Management Initials: VD Designer: NS Checked: LC Approved: VD



Scale @ A3 1:55,000



Contains Ordnance Survey Data © Crown copyright and database rights 2020 Ordnance Survey 0100031673
Contains Historic Environment Scotland and Ordnance Survey data © Historic Environment Scotland - Scottish Charity No. SC045925 © Crown copyright and database right 2020

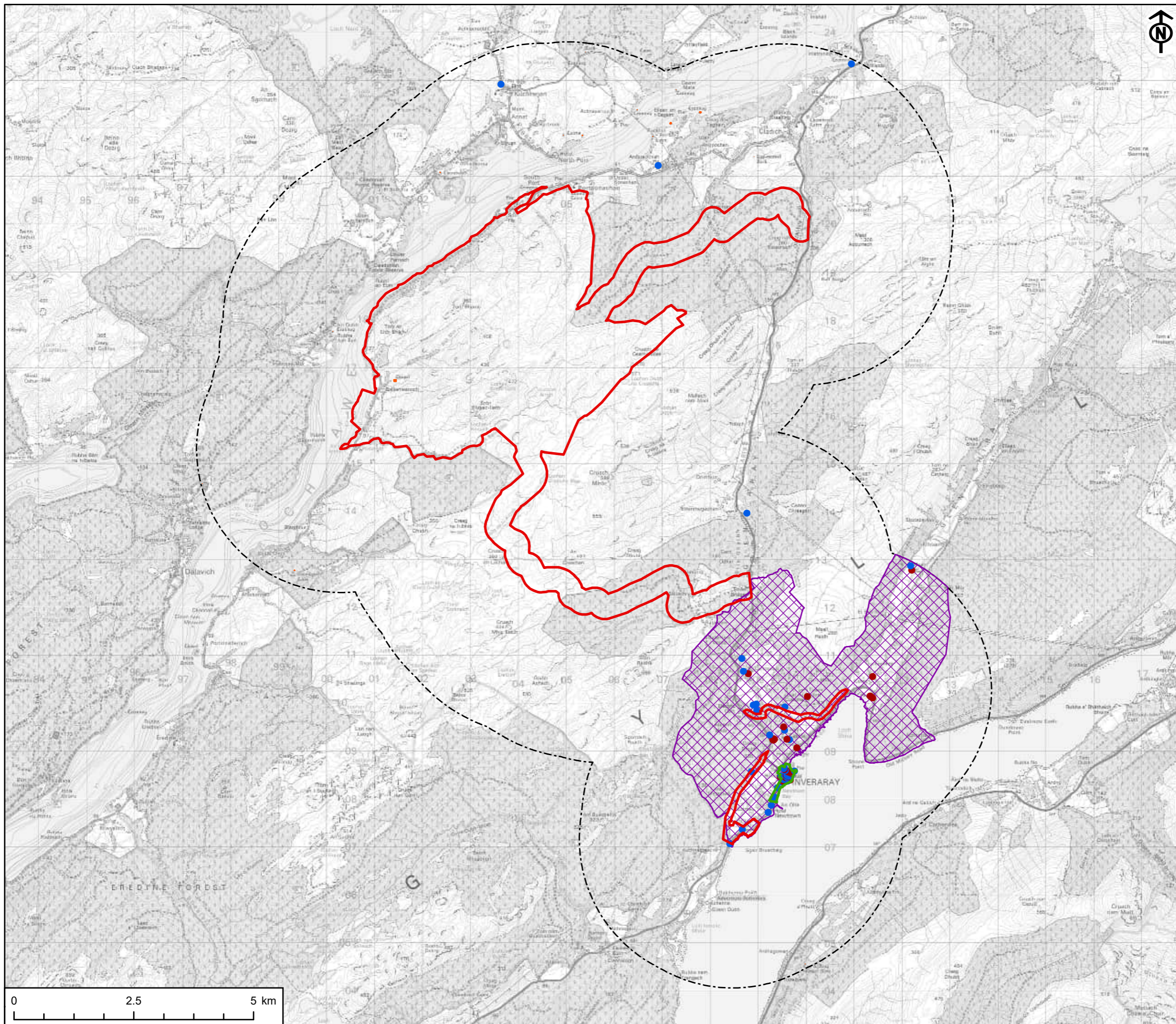
TITLE
Figure 13.1
Heritage Designations Within
1km Study Area

REFERENCE
BM_211117_SC_13.1_v3

SHEET NUMBER
1 of 1

DATE
17/11/21

This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

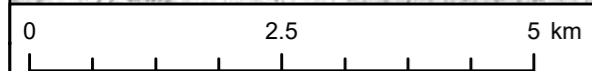


Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673
Contains Historic Environment Scotland and Ordnance Survey data © Historic Environment Scotland - Scottish Charity No. SC045925 © Crown copyright and database right 2020

TITLE
Figure 13.2
Heritage Designations within 3km Study Area

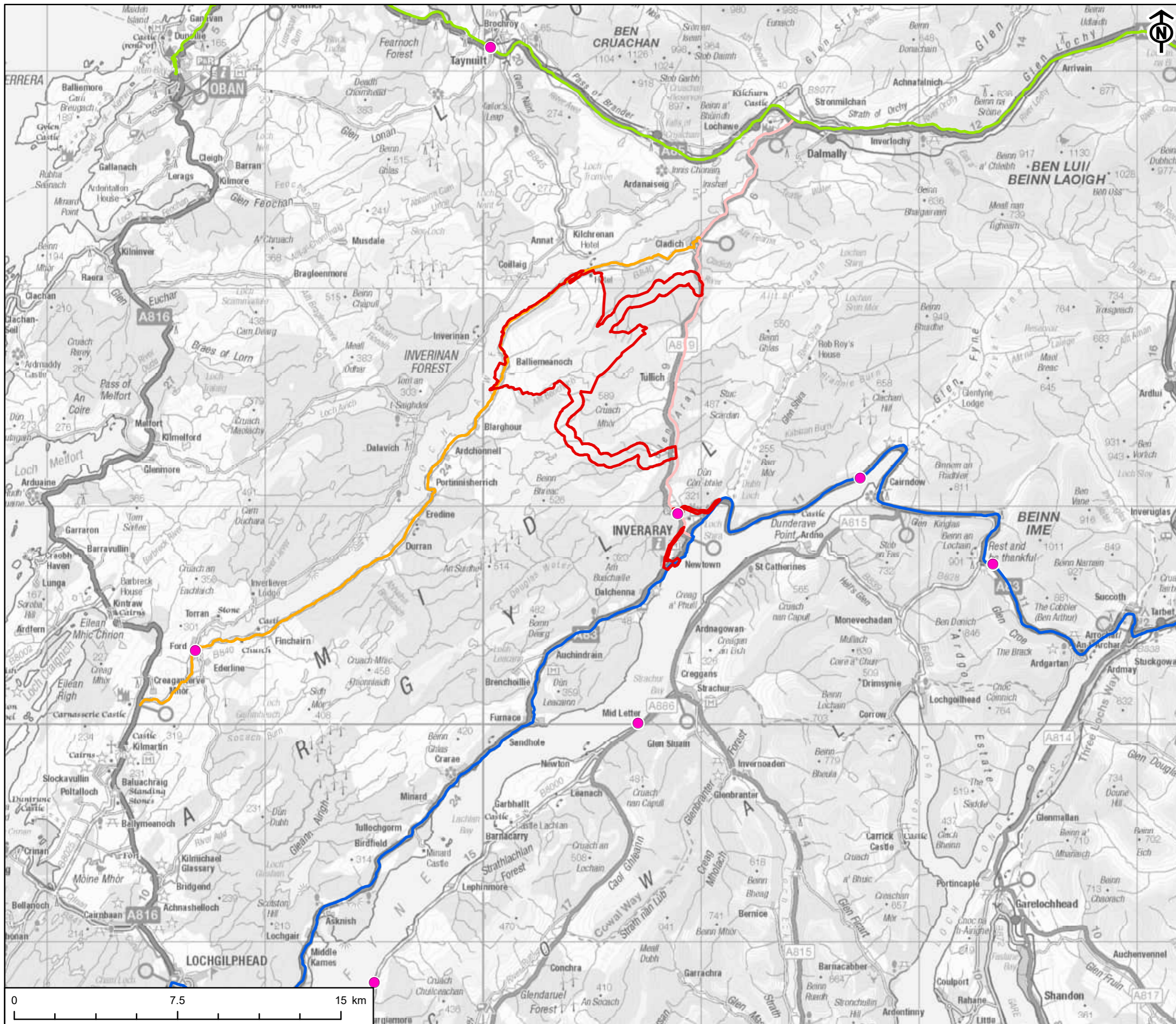
REFERENCE
BM_211116_SC_13.2_v3

SHEET NUMBER 1 of 1 DATE 16/11/21



PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO
CLIENT
ILI (Borders PSH) Ltd.

- KEY
- Proposed Development Boundary
 - Road Name
 - A819
 - A83
 - A85
 - B840
 - ATC Location



Contains Ordnance Survey Data © Crown copyright and database rights 2021 Ordnance Survey 0100031673

TITLE
Figure 14.1
Proposed ATC Locations and Local Highway Network

REFERENCE
BM_211026_SC_14.1_v2

SHEET NUMBER
1 of 1
DATE
26/10/21

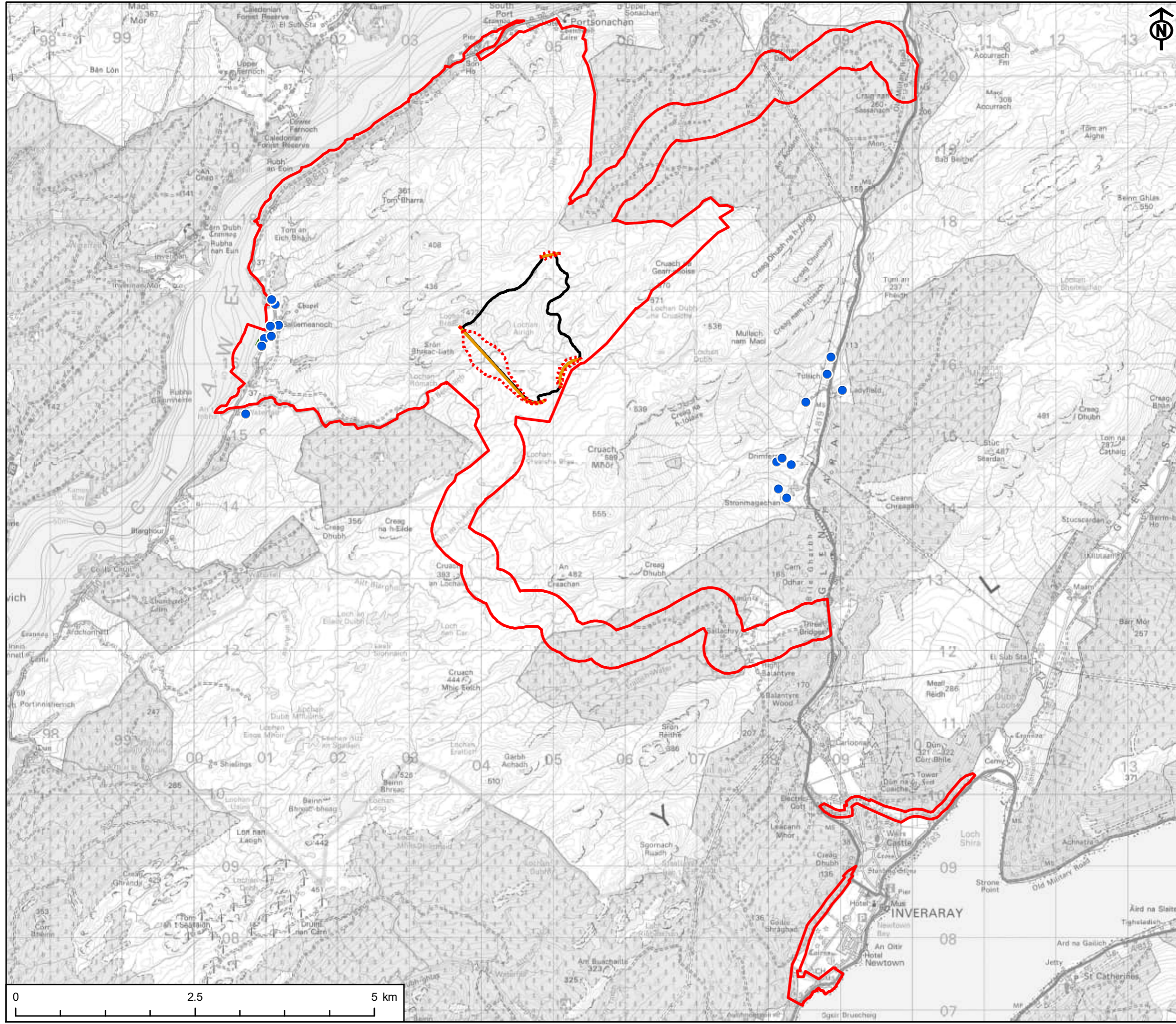
This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

Project Management Initials: VD Designer: ER Checked: DS Approved: VD

Scale @ A3 1:165,000

- KEY
- Proposed Development Boundary
 - Indicative Headpond Area
 - Indicative Tailpond Inlet / Outlet
 - Indicative Embankment
 - Indicative Headpond Wall
 - Noise Sensitive Receptor

Project Management Initials: VD Designer: ER Checked: LC Approved: VD



This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

Contains Ordnance Survey Data © Crown
Copyright and database rights 2021 Ordnance
Survey 0100031673

TITLE
Figure 15.1
Noise Sensitive Receptors

REFERENCE
BM_211026_SC_15.1_v2

SHEET NUMBER
1 of 1

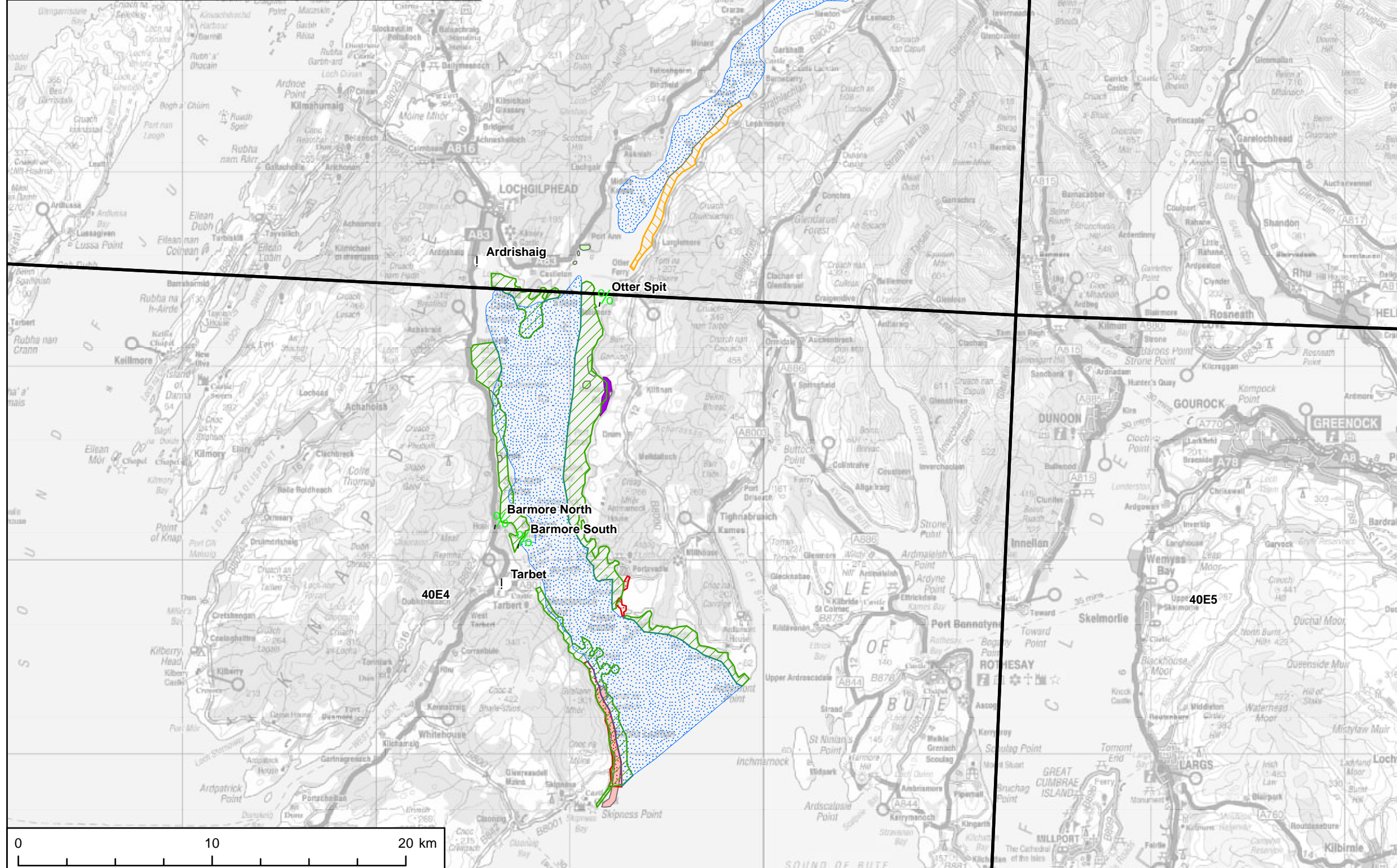
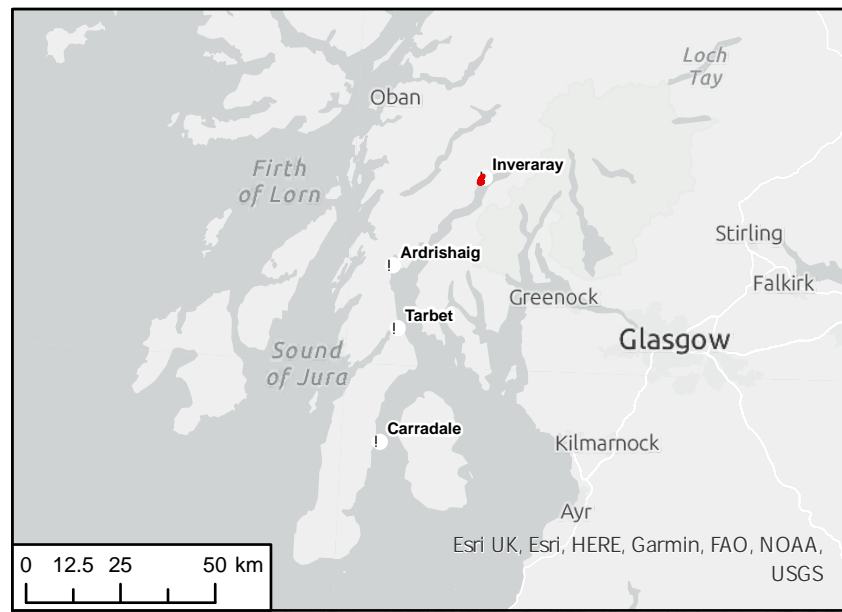
DATE
26/10/21

Scale @ A3 1:50,000

PROJECT
BALLIEMEANOCH PUMPED STORAGE HYDRO

CLIENT
ILI (Borders PSH) Ltd.

- KEY**
- Proposed Development Boundary (Marine Facility)
 - ICES Statistical Rectangles
 - % Shellfish Sites
 - ! Ports
 - Commercial Fisheries**
 - Nephrops Creeling
 - Nephrops Trawling/Creeling
 - Previous Queen Scallop Fishery
 - Razorshell Diving
 - Scallop Diving
 - Scallop Dredging
 - Scallop/Razor Diving



Contains Ordnance Survey Data © Crown
Copyright and database rights 2022 Ordnance Survey 0100031673

Contains ICES Rectangles- ICES Spatial Facility, ICES, Copenhagen.(2022)

Fisheries Information taken from "Integrated Coastal Zone Management Plan, Loch Fyne" Produced by Argyll and Bute Council (2009)

TITLE
Figure 21.1
Commercial Fisheries

REFERENCE
BM_220615_SC_21.1_v2

SHEET NUMBER 1 of 1 **DATE** 15/06/22

Project Management Initials: MLS Designer: ER Checked: LC Approved: VD

Scale @ A3 1:220,000

This drawing has been produced for the use of AECOM's client. It may not be used, modified or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies upon this drawing without AECOM's express written consent. All dimensions are indicative and in metres unless otherwise noted. Do not scale this document.

