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# Red John Pumped Storage Hydro Scheme

## Environmental Impact Assessment Report Volume 1: Non-Technical Summary

ILI (Highlands PSH) Ltd.

November 2018

## Quality information

| Prepared by | Checked by | Verified by | Approved by |
|---|---|---|---|
| Sarah Young<br>Graduate Environmental Consultant | Victoria Deacon<br>Principal Consultant | Catherine Anderson<br>Associate Director | Catherine Anderson<br>Associate Director |

## Revision History

| Revision | Revision date | Details | Authorized | Name | Position |
|---|---|---|---|---|---|
| 1 | November 2018 | Submission | CA | Catherine Anderson | Associate Director |
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# Abbreviations and Glossary

| Acronym | Description |
|---|---|
| AWI | Ancient Woodland Inventory |
| B&B | Bed and Breakfast |
| CAR | Controlled Activities Regulations |
| CBC | Common Bird Census |
| CCP | Climate Change Plan |
| CEMP | Construction Environmental Management Plan |
| CTMP | Construction Traffic Management Plan |
| ECU | Energy Consents Unit |
| EIA | Environmental Impact Assessment |
| EIA Report | Environmental Impact Assessment Report (formerly Environmental Statement) |
| EU | European Union |
| GWDTE | Groundwater Dependent Terrestrial Ecosystem |
| GWh | Giga Watt hours |
| HV | High Voltage |
| HwLDP | The Highland-Wide Local Development Plan |
| ILI | ILI (Highlands PSH) Ltd (also referred to as the Applicant) |
| IMFLDP | Inner Moray Firth Local Development Plan |
| INNS | Invasive Non-Native Species |
| LDP | Local Development Plan |
| LEMP | Landscape and Ecology Management Plan |
| IMFLDP | Inner Moray Firth Local Development Plan |
| MMA | Materials Management Appraisal |
| MW | Mega Watt |
| MWhrs | Mega Watt hours |
| NPF 3 | National Planning Framework 3 |
| NTS | Non-Technical Summary |
| PANs | Planning Advice Notes |
| PMP | Peat Management Plan |
| PSH | Pumped Storage Hydro |
| PWS | Private Water Supply |
| SAC | Special Area of Conservation |
| SEPA | Scottish Environment Protection Agency |
| SES | Scottish Energy Strategy |
| SINC | Site of Importance for Nature Conservation |
| SLA | Special Landscape Area |
| SPA | Special Protected Area |
| SPP | Scottish Planning Policy |
| SSSI | Site of Special Scientific Interest |

| Acronym | Description |
|---|---|
| SuDS | Sustainable Drainage System |
| SWMP | Surface Water Management Plan |
| THC | The Highland Council |
| ZTV | Zone of Theoretical Visibility |

# Definitions

| Term | Description |
|---|---|
| The Applicant | ILI (Highlands PSH) Ltd, the company responsible for the application for consent for the Development |
| Amenity | The preferable features of a location which contribute to its overall character and the enjoyment of residents or visitors. |
| Baseline | Environmental conditions at specific periods of time, present on, or near a site, against which future changes may be measured or predicted. |
| British Standard | The display of a British Standard number shows that the manufacturer claims to have made the product in accordance with British Standard. A standard is a published document that contains a technical specification or other precise criteria designed to be used consistently as a rule or definition. Standards are designed for voluntary use and do not impose any regulations. However, laws and regulations may refer to certain standards and make compliance with them compulsory. Sometimes BS will be accompanied by the letters EN and/or ISO. These mean that the standard was developed as a European (EN) or International (ISO) standard and then adopted by the UK as a British Standard. |
| Conservation Areas | Conservation Areas are described by the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 "as areas of special architectural or historic interest, the character of which it is desirable to preserve or enhance". Local planning authorities are required to determine which parts of their area should be safeguarded due to their architectural or historic interest, to ensure that any new development pays respect to or enhances their character. |
| Construction Environmental Management Plan | Strategic document setting out best practice methods to minimise environmental impacts during construction. An outline CEMP has been produced for the Development (Appendix 3.1, Volume 5) |
| Construction Traffic Management Plan | Strategic document that outlines the management of vehicle movements and interactions with the surrounding road network during the various stages of the construction process. A framework CTMP has been produced for the Development (Appendix 15.1, Volume 5) |
| Cumulative Effects | The summation of effects caused by both for intra-project (where a single receptor is affected by multiple aspects of a project, worsening the effect) and inter-project effects (where effects are exacerbated due to other reasonably foreseeable projects either in construction, consented or yet to be built). |
| Desk Based Assessment | Research based primarily on database and internet data gathering methods, and other third party data. |
| Effect | The consequence of an impact on the environment, multiplied by the sensitivity of the receptor. |
| Section 36 of the Electricity Act 1989 | The planning application will be made in accordance with the requirements of Section 36 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, and will be submitted to the Energy Consents Unit (ECU) of the Scottish Government. |
| EIA Regulations | For the Development the relevant EIA regulations are Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017. By virtue of its size, nature and location, the Development constitutes an 'EIA development' under Schedule 2 of the above regulations. |
| Environmental Impact Assessment | The assessment of the likely significant environmental effects of the Development. Undertaken in accordance with the EIA Regulations. |
| Environmental Impact Assessment Non-Technical Summary | (This document). A report presenting a non-technical summary of the information provided in the EIA Report. |
| Environmental Impact Assessment Report | A report that includes such of the information referred to in Schedule 4 of the 2017 EIA Regulations as is reasonably required to assess the environmental effects of the Development. |
| Gardens and Designed | The Historic Environment (Amendment) Scotland Act (2011) made it a statutory duty for HES to compile and maintain an Inventory of Gardens and Designed |

| Term | Description |
|---|---|
| Landscapes | Landscapes in Scotland. |
| Groundwater | Water occurring in the ground which can be reasonably attributed to relatively geologically recent recharge and which can be reasonably considered to be wholesome (potable) unless it has been contaminated (altered) by anthropogenic activity. |
| Habitat | The environment in which populations or individual species live or grow. |
| Heavy Good Vehicle | A commercial road vehicle that is of a construction primarily suited for the carriage of goods or burden of any kind and designed or adapted to have a maximum weight exceeding 3,500 kilograms when in normal use and travelling on a road laden. |
| Hectare | A unit of area (10,000 $m^2$ / 2.471 acres). |
| Historic Environment | All aspects of the environment resulting from the interaction between people and places through time including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped, planted or managed flora. Those elements of the historic environment that hold significance are called heritage assets. |
| Impact | A physical or measurable change to the environment. |
| Kilometre | Measurement of distance (1000 metres). |
| Landscape and Visual Impact Assessment | A tool used to identify and assess the likely significant effects of change resulting from development both on the landscape as an environmental resource in its own right and on people's views and visual amenity. |
| Landscape Character | The distinct and recognisable pattern of elements that occur consistently in a particular type of landscape, and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement. |
| Laydown Area | A temporary construction compound for the storage of materials, plant and equipment as well as containing site accommodation and welfare facilities, temporary car parking and temporary fencing. |
| Listed Building | A list of buildings of special architectural or historic interest compiled by the Secretary of State for the guidance of local planning authorities in the exercise of their planning functions under the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997. Buildings are graded as follows: Grade I – Buildings of exceptional interest; Grade II* - Particularly important buildings of more than special interest; and Grade II – Buildings of special interest. |
| Magnitude | A combination of the scale, extent and duration of an impact. |
| Mitigation | Action proposed to avoid, prevent, reduce and where possible offset adverse effects arising from the whole or specific elements of a development. |
| Outline Surface Water Management Plan | A document outlining the approach to onsite surface water and foul water drainage. An Outline Surface Water Management Plan for the Development is included as Appendix 10.5 (Volume 5) |
| Ramsar | A wetland site designated of international importance under the Ramsar Convention. |
| Receptor | A component of the natural, created, or built environment such as a human being, water, air, a building, or a plant that has the potential to be affected by the Development. |
| Residual Effect | Those effects of a development that remain following the implementation of mitigation measures. |
| Scheduled Monument | Scheduled monuments are of national or international importance and are protected under the Ancient Monuments and Archaeological Areas Act 1979 and the Historic Environment (Amendment) (Scotland) Act 2011. |
| Sensitivity | A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value related to that receptor. |
| Site of Special | A site statutorily notified under the Wildlife and Countryside Act 1981 (as |

| Term | Description |
|---|---|
| Scientific Interest | amended) as being of special nature conservation or geological interest. SSSIs include wildlife habitats, geological features and landforms. |
| Special Area of Conservation | Areas of protected habitats and species as defined in the European Union's Habitats Directive (92/43/EEC). |
| Special Protection Area | Classified for rare and vulnerable birds, and for regularly occurring migratory species, as defined in the EC Birds Directive (2009/147/EC). |
| Species | A group of organisms that seldom or never interbreed with individuals in other such groups, under natural conditions; most species are made up of subspecies or populations. |
| Topography | The natural or artificial features, level and surface form of the ground surface. |
| Visual amenity | The value of a particular area or view in terms of what is seen. |
| Visual effect | Change in the appearance of the landscape from available viewpoints as a result of development. |
| Visual receptors | Individuals and/or defined groups of people who have the potential to be affected by the visual appearance of a development. |
| Zone of Theoretical Visibility | Areas from which a specified element of a development may be visible. Hence, the development would not be visible beyond the ZTV. |

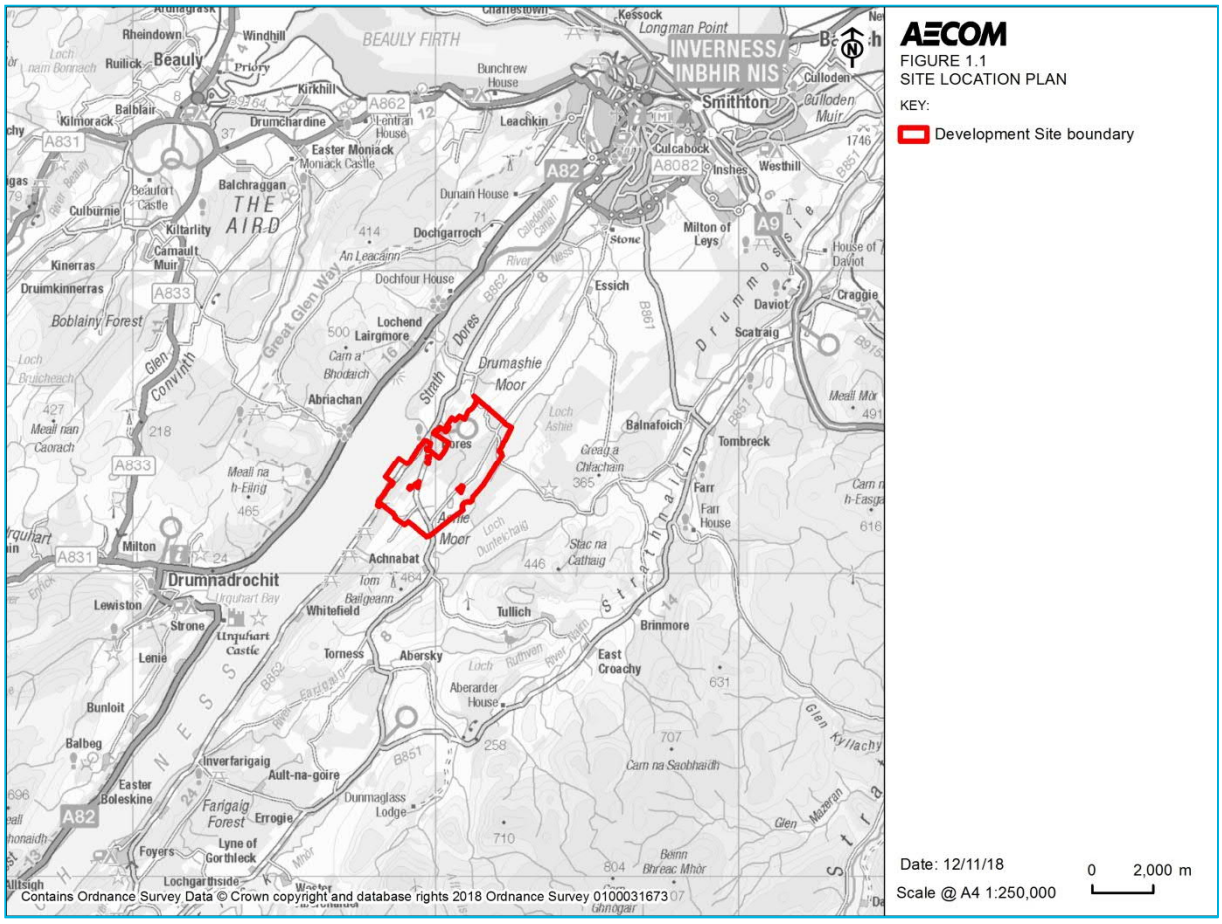
# 1. Introduction

## 1.1 Overview

1.1.1 ILI (Highlands PSH) Ltd (ILI), are proposing to build a pumped storage hydro scheme (PSH) near Dores, Highlands, that will aid electricity production when there is a surge in demand for electricity, also known as “peak demand”. The proposed Red John PSH scheme (hereafter referred to as ‘the Development’) will be located approximately 14 kilometres (km) south-west of Inverness within the Dores and Essich Community Council area and borders the Strathnairn Community Council and the Stratherrick and Foyers Community Council areas.

1.1.2 As the Development comprises an electricity generating station with a capacity of more than 50MW, it is required to be determined by the Scottish Government in accordance with the provisions of Section 36 of the Electricity Act 1989[1], as amended. 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[2].

1.1.3 It should be noted that the name of the Development is a working title, and will be renamed prior to the determination of the Section 36.



## 1.2 Purpose of this Document

1.2.1 This document is the Non-Technical Summary (NTS) of the Environmental Impact Assessment Report (EIA Report) for the Development. It has been prepared by AECOM on behalf of ILI, the Applicant.

1.2.2 The EIA Report presents a summary of the findings of the Environmental Impact Assessment (EIA). An EIA provides an assessment of the Development's likely significant environmental effects. The purpose of this document is to provide a summary of the EIA Report in non-technical language. The main volumes comprising the EIA Report are available separately as follows:

- Volume 1: NTS;
- Volume 2: EIA Report Main Text - contains the introductory and detailed topic specific environmental assessment Chapters, which are summarised in this NTS;
- Volume 3: Figures - containing all the figures relating to the EIA Report Chapters;
- Volume 4: Visualisations – containing photomontages to both The Highland Council (THC) and Scottish Natural Heritage (SNH) standards, projecting how the Development will sit within the surrounding landscape;
- Volume 5: Appendices - contains supporting Appendices to the EIA Report. The Appendices include detailed technical information such as raw data, survey reports and plans that are cross referenced where relevant within Volume 2 of the EIA Report;
- Volume 6: Confidential Appendices - contains supporting Appendices which are only provided to certain competent bodies due to the nature of the information which is contained within them.

1.2.3 The NTS focuses on discussion of residual effects. These are defined as a summary of the environmental impacts likely to occur to a receptor due to the Development once mitigation measures have been applied. They have been described during construction, operation and decommissioning of the Development. Where likely significant effects have not been identified, it can be concluded that residual effects have not been identified, and therefore no additional mitigation is required.

1.2.4 The NTS is structured as follows:

- Section 2: Site and Project Description
- Section 3: Alternatives
- Section 4: Approach to EIA
- Section 5: Assessment Findings
- Section 6: Cumulative Effects
- Section 7: Conclusions;

## 1.3 The Applicant

1.3.1 The Applicant is ILI (Highlands PSH) Ltd (ILI). The Applicant has been developing renewable energy projects for nearly 15 years, ranging from wind farms down to the single medium sized wind turbines that benefit from the UK's Feed-in Tariff. The Applicant has now diversified into PSH as they seek to play their part in meeting Scotland's future energy needs.

1.3.2 Further details on ILI are provided at http://www.ili-energy.com/.

## 1.4 The Application

1.4.1 This NTS and other documentation prepared to support the Section 36 application are available for download from the Highland Council Planning Portal website: http://wam.highland.gov.uk/wam/ and the ECU website: http://www.energyconsents.scot/.

1.4.2 The EIA Report will be available for viewing at the following locations:

- Scottish Government Library, Victoria Quay, Edinburgh, EH6 6QQ.
- The Highland Council Planning Office, Glenurquhart Road, Inverness.
- The Dores Post Office, Dores, Inverness IV2 6TT.
- Farr Community Hall, Farr, Inverness IV2 6XA.

**How to Make Representations**

1.4.3 Any representations regarding the application should be made by completing the online representation form on the Scottish Government, Energy Consents website at:

http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-Consents/Support-object

1.4.4 Or by email to The Scottish Government, Energy Consents Unit mailbox at: econsentsadmin@scotland.gsi.gov.uk

1.4.5 Or by post to:

Energy Consents Unit, Energy Division, Directorate for Energy and Climate Change, Scottish Government, 4th Floor, 5 Atlantic Quay, 150 Broomielaw, Glasgow, G2 8LU

1.4.6 Representations should be dated and should clearly state the name (in block capitals) and full return email or postal address of those making representation. All representations to the Scottish Government will be copied in full to the planning authority, and made available to the public on request, unless individuals request otherwise.

**How to Get a Copy of the Application Documents**

*Through the Development Website*

1.4.7 Copies of the publicly application documents can also be found on the Development website: http://www.redjohnpsh.co.uk/ and requests for copies of the EIA Report may be submitted through the queries form.

*Further Electronic or Hard Copies*

1.4.8 Hard copies of the publicly available application can be made available at a fee of £250 per application copy. Electronic copies of the publicly available application can be made available at a fee of £10 per DVD or pen drive. Cheques should be made payable to AECOM Ltd, with your name and address on the back.

1.4.9 A paper copy of the Non-Technical Summary is available free of charge.

1.4.10 To request copies of the publicly available application documents please contact the Red John PSH Project Team at the following details:

Red John PSH Project Team, AECOM, 1 Tanfield, Edinburgh EH3 5DA

E-mail: pumpedstorage@aecom.com

## 1.5 Background to the Development

1.5.1 Hydropower is an established generation technology in Scotland. Today, hydropower is a commercial technology in Scotland that accounts for around 10% of Scotland's total energy generation. As set out within the Energy Strategy: The Future of Energy further development

of hydropower in Scotland and PSH in particular is supported by the Scottish Government in the pursuit of a flexible and resilient future energy network and power supply.

1.5.2 A Scottish-wide review of the untapped hydropower potential to identify locations suitable for PSH development was conducted by the Applicant. Through this review the potential for a PSH scheme utilising Loch Ness was identified.

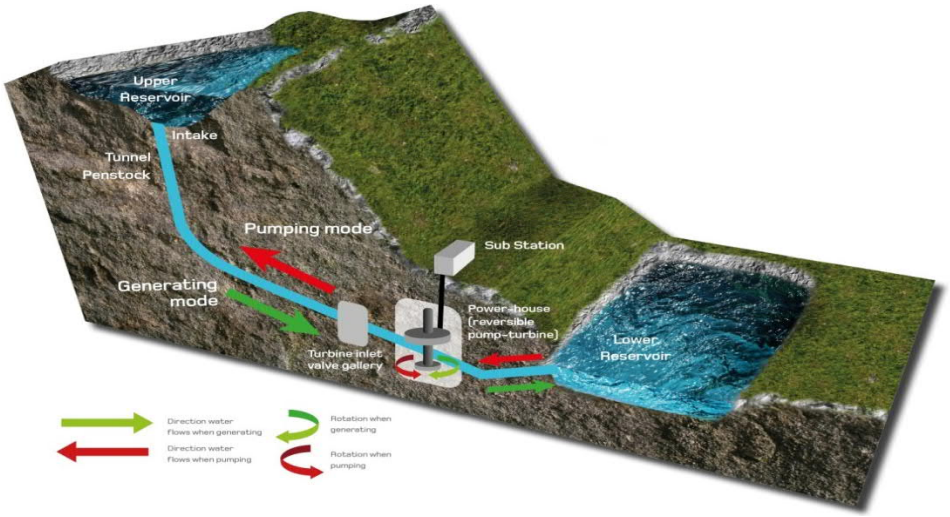
1.5.3 There are a number of hydro-electric schemes that currently utilise Loch Ness and surrounding water bodies. This includes Foyers PSH (305 MW), which has been operating since 1974 and the 100 MW Glendoe conventional hydro-electric scheme that began generation in June 2009. In addition there are also several smaller conventional hydropower schemes in operation or under construction in the Loch Ness area. The prevalence of hydropower in the Loch Ness area is facilitated by the local topography and geology being suited to hydro development.

## 1.6 Concept of Pumped Storage

1.6.1 The main principle of pumped storage is to release water from an upper reservoir to a lower reservoir when there is a demand to generate electricity and to pump water from a lower to an upper reservoir when there is either a low demand or excess supply of electricity. As the water transfers between the upper and lower reservoir, the water passes through the pumped turbine either generating or storing electricity depending on what mode the scheme is in.

1.6.2 Pumped storage is currently the most efficient technology for storing large amounts of energy and is capable of generating and pumping, in a relatively short period of time, when there is a demand or a surplus of electricity. Pumped storage is complementary to variable intermittent energy sources such as wind and solar and is able to reduce the curtailment of excess generation by providing load and energy storage for the grid. Therefore, can enable greater deployment of renewable energy into the grid and at the same time providing flexibility to generation plants to meet the demands from the grid.

1.6.3 The schematic below provides an indicative view of how a pumped storage system works. Note that this does not accurately represent the specific arrangement for the Development.




**Insert 1.1 Schematic of a Typical Pumped Storage Hydro Scheme**

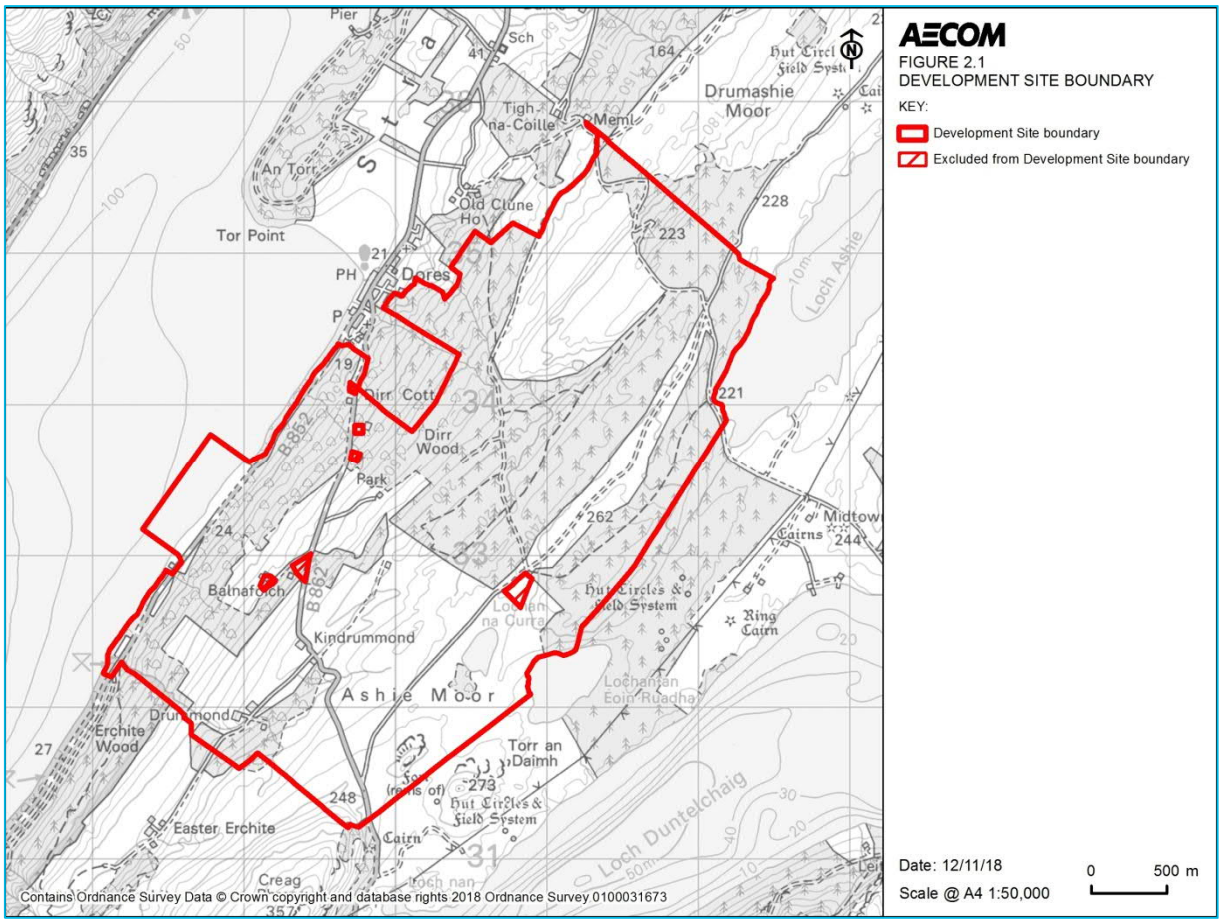
## 1.7 Planning Policy Context

1.7.1 The EIA Report and this NTS have been prepared with reference to all relevant European, national, regional, and local policy. Details of these are discussed in each technical chapter of the EIA Report Main Text (Volume 2) but in greater detail within the Planning Statement.

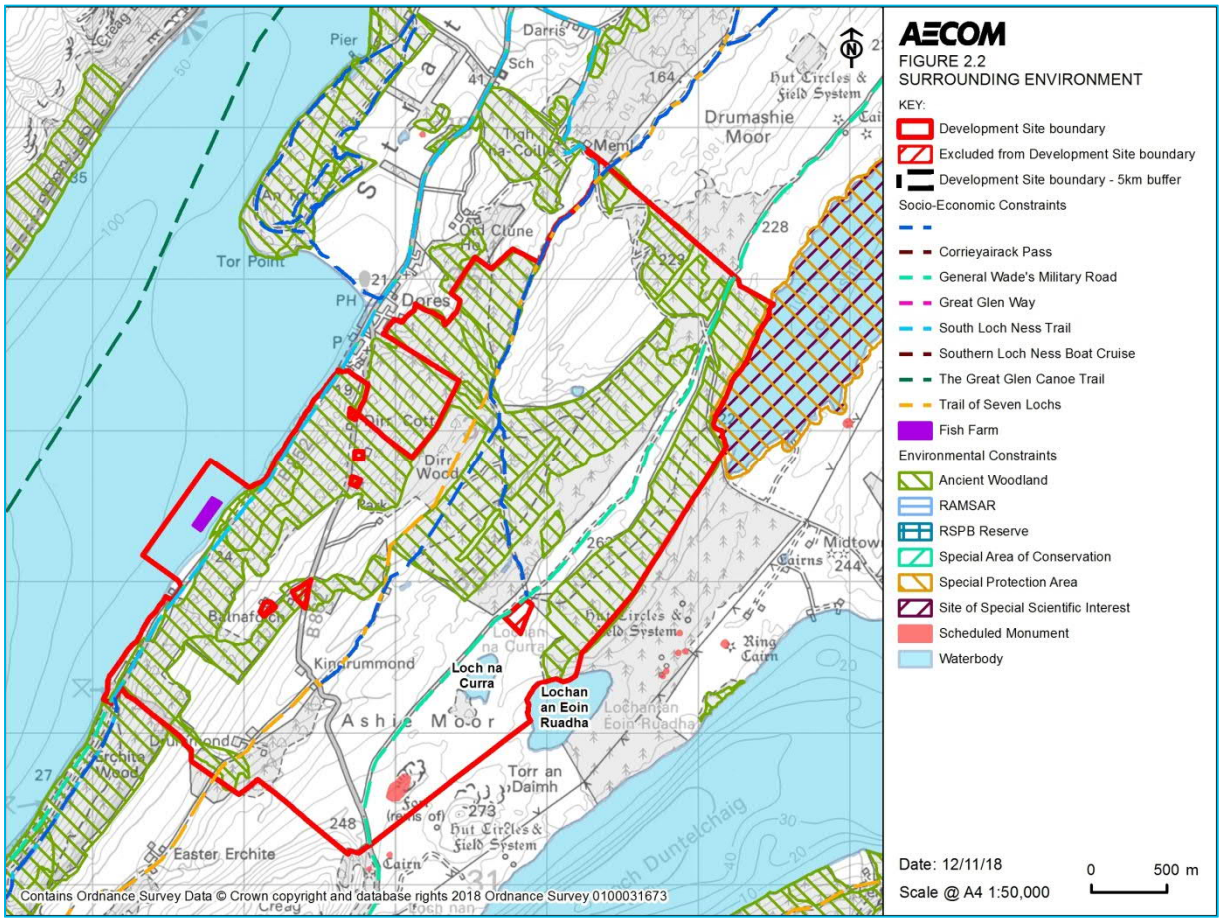
# 2. Site and Project Description

## 2.1 Site and Surroundings

2.1.1 The Development is located in the Highland region of Scotland, approximately 14 kilometres (km) south-west of Inverness, and is centred on national grid reference (NGR) NH 60479 32531. The Development Site lies within the Dores and Essich Community Council area and borders the Strathnairn Community Council and the Stratherrick and Foyers Community Council areas. The extent of the Development Site is shown on Figure 2.1: The Development Site.




2.1.2 The environmental and social features within the Development Site boundary and surrounding the Development are shown on Figure 2.2: The Surrounding Environment.




2.1.3 The Development Site comprises an area of approximately 950 hectares (ha) and straddles the watershed between the River Ness and River Nairn water catchments. Just under half of the Development Site comprises a mix of commercial coniferous plantation, semi-natural broad-leaved and mixed woodland, much of which is designated Ancient Woodland Inventory (AWI), the remaining areas are predominantly shrub heathland with some agricultural and grazing land.

2.1.4 The shore of Loch Ness is the lowest point of the Development Site at approximately 15 metres (m) Above Ordnance Datum (AOD). The terrain climbs steeply from the banks of Loch Ness and then gradually plateaus on Ashie Moor, with a high point of 262 m AOD on the minor road as marked on the OS Map. There is a small peak at the south-eastern side of the Development Site which is 266 m AOD. From Ashie Moor the land dips down towards the shore of Loch Duntelchaig, towards the end of the Development Site boundary.

2.1.5 The entirety of the Development Site is within the Loch Ness and Duntelchaig Special Landscape Area (SLA) and there is one scheduled monument within the south-eastern corner - the remains of fort Caisteal an Dunriachaidh, with additional archaeological features within the Development Site:

- The Loch Ashie field system, which is in the north of the Development Site and is not scheduled;
- The Merchants Stone off the C1064, is undesignated;
- The West Town hut circles and ring cairn, which are scheduled, but outside of the Development Site to the east; and
- The two Achnabat hut circles and the Achnabat Cairn, which are also scheduled, but outside of the Development Site to the south-east.

2.1.6 There are no statutory ecological designations within the Development Site. There are two designations present within 5 km of the Development Site boundary, these are:

- Loch Ashie Site of Special Scientific Interest (SSSI) and Special Protected Area (SPA) which is designated for its importance as a passage habitat for the Slovenian Grebe (*Podiceps auritus*), borders the Development Site to the north-east.
- Loch Ruthven, which is approximately 3.2 km south of the closest point on the red line boundary, is designated as a SSSI, SPA, Special Area of Conservation (SAC) and under the RAMSAR convention for its breeding Slavonian grebe population, SAC freshwater habitat and otter population.

2.1.7 There are a number of watercourses within the Development Site. These include the Allt a' Mhinisteir, the Allt Dailinn, the Allt a' Chnuic Chonaisg and the Allt a' Chruineachd. The Allt a' Mhinisteir flows from Loch na Curra down into Loch Ness at Dores and the Allt Dailinn from the centre of the Development Site to Loch Ness. The Allt a' Chnuic Chonaisg and the Allt a' Chruineachd are both located in the west of the Development Site flowing from around the properties of Park and Balnafoich respectively down to Loch Ness.

2.1.8 The closest trunk roads to the Development Site are the A82 and the A9. The A82 connects Inverness to Fort Augustus along the northern shore of Loch Ness. The section of the A9 between Inverness and Carrbridge passes approximately 10.5 km to the north-east of the Development Site, at its closest point. There are a number of formal and forestry tracks within the Development Site boundary, including the C1064, which will be realigned as part of the Development, the B852 and B862.

2.1.9 The B852 and the C1064 follow part of the General Wade Military Road network. Other routes of interest that pass through the Development Site include the Trail of the Seven Lochs and the South Loch Ness Trail and two Highland Council core paths (IN12.05 and IN12.04).

## 2.2 The Development

2.2.1 The following sections introduce the terminology and component parts of the Development. The complete arrangement of the Development can be seen on Figure 2.3.

## 2.3 Above Ground Infrastructure

**Headpond**

2.3.1 This is the upper reservoir and includes the following components, as shown on Figure 2.4: Above Ground Infrastructure:

*Headpond (Waterbody)*

2.3.2 This is the waterbody, which is designed to contain approximately 5 million metres cubed ($Mm^3$) of water with approximately 4.9 $Mm^3$ being used as the working volume during operation. During operation, the working bottom water level (BWL) will be 249 mAOD and the working top water level (TWL) will be 269 mAOD.

*Embankment*

2.3.3 The Embankment is the structure retaining the waterbody, and will be approximately 1,900 m long (from embankment toe to toe), up to 600 m wide and up to 39 m high (at its maximum height). It will have a footprint of approximately 93 ha. The majority of the Embankment will be a built-up earth and rockfilled structure with the exception of the southern edge, which due to the topography will be an area of cut into the existing ground level.

2.3.4 The Embankment will have a maximum top of bank level of 273 m AOD, providing a minimum of 4 m freeboard from the TWL of 269 m AOD (excluding the wave wall).

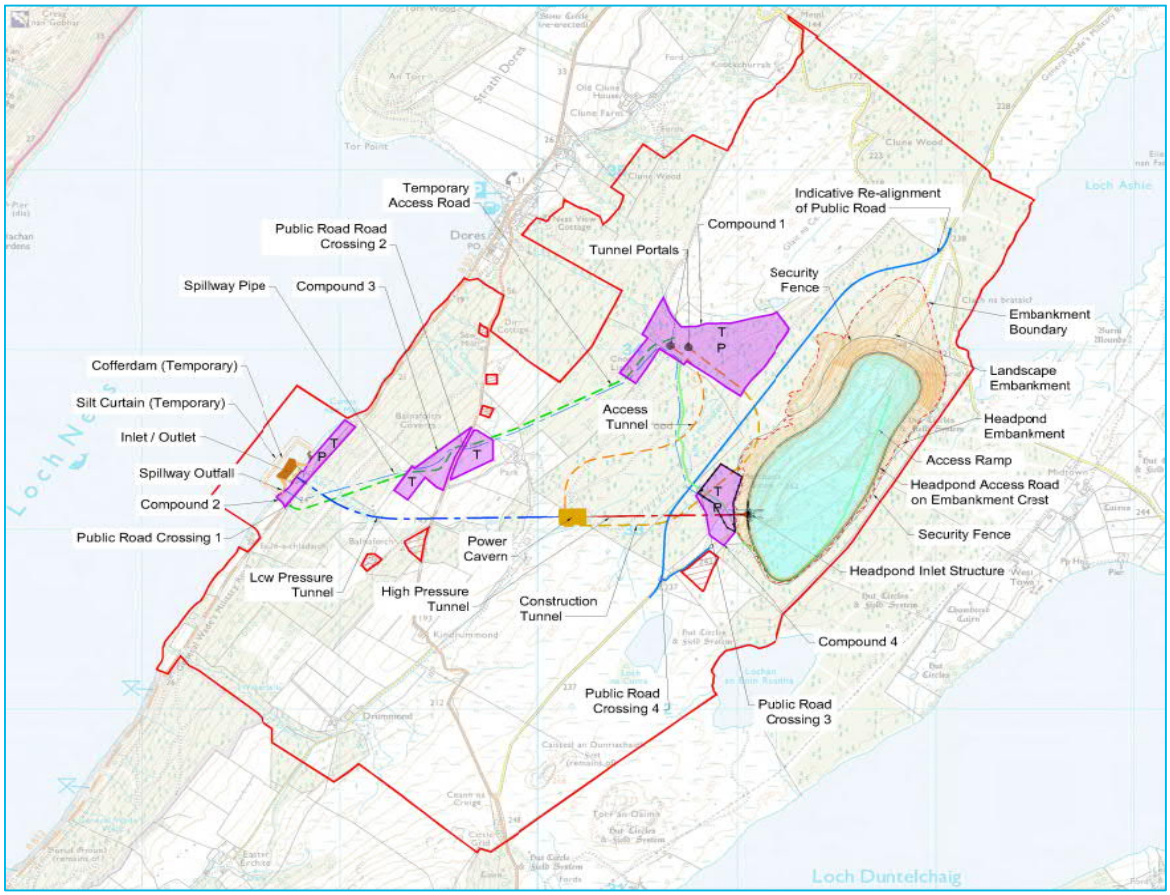



**Figure 2.3 Development Layout**

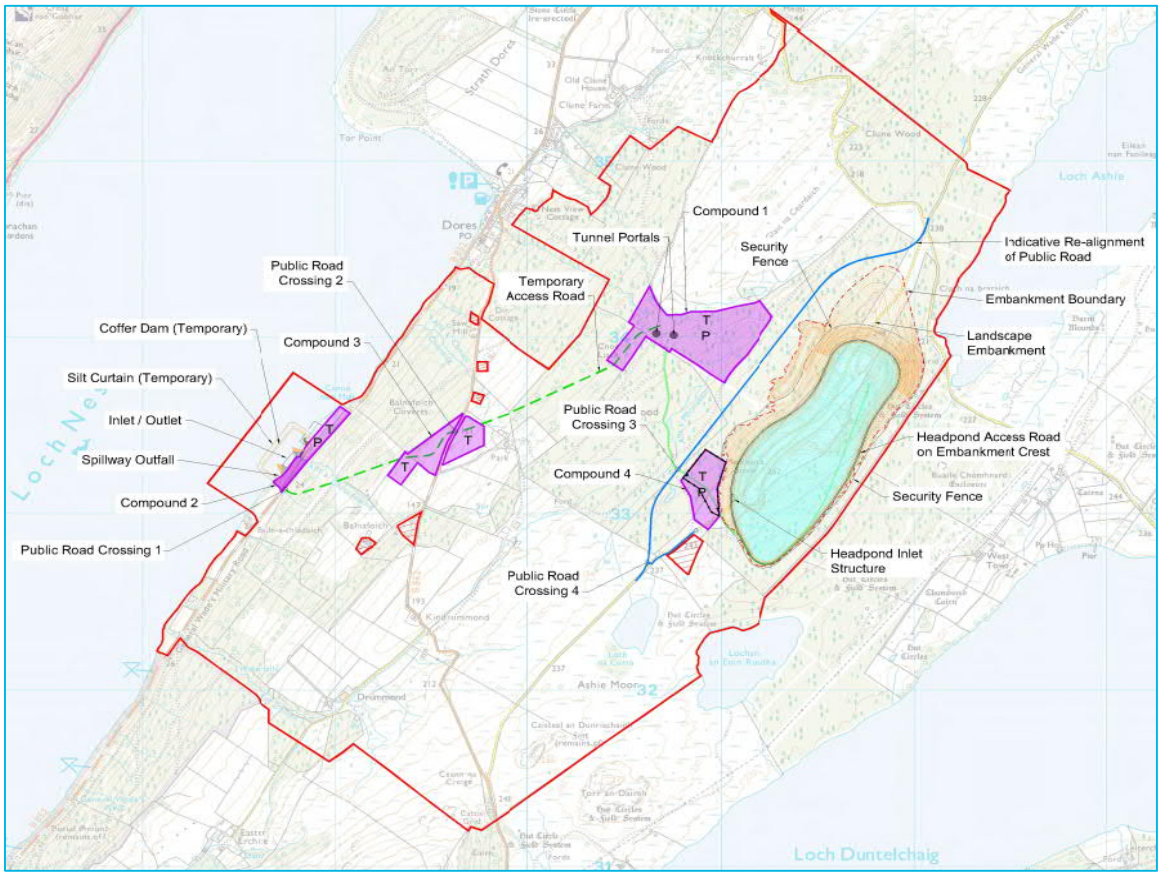



**Figure 2.4 Above Ground Infrastructure**

2.3.5 The crest of the Embankment will typically be a maximum of 10 m wide and will include a 5 m wide access track with low kerb on the external side. Around the inner side of the crest there will be a 1 m high vertical wave wall.

2.3.6 The inner slope of the Embankment will be approximately 1 in 2.5 and the external slope will be 1 in 3. The inner slopes and base of the Embankment will be lined so that the Headpond is fully watertight preventing groundwater ingress. The lining will be a waterproof system that would be either an asphalt or concrete lining. This is shown on Figure 2.5: Indicative Embankment Section

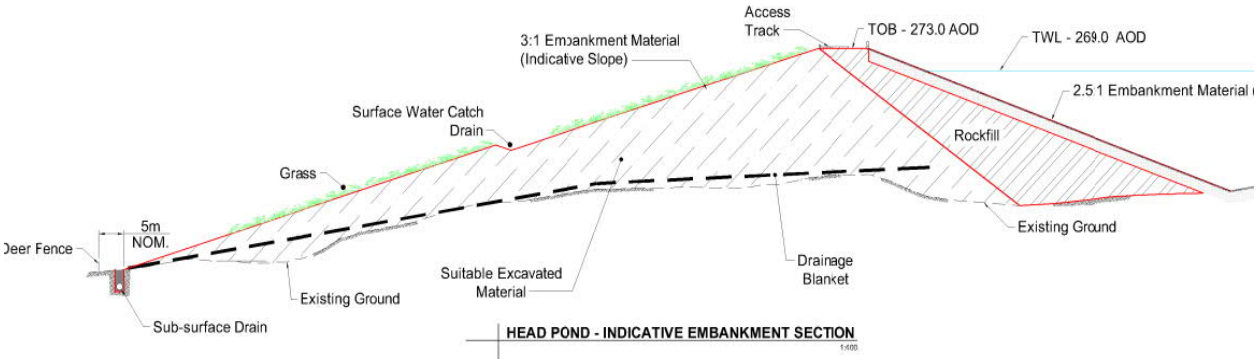



**Figure 2.5 Indicative Embankment Section**

*Landscape Embankment*

2.3.7 The Landscape Embankment is an extension to the Embankment that covers an area of approximately 25 ha. It is an embedded design feature which naturalises the Headpond by reducing the slope angle and facilitating planting of tall vegetation.

2.3.8 It will be constructed from unsuitable and / or excess excavated materials which cannot be utilised within the construction of the Embankment, with the aim of minimising the visual impact of the new Headpond from various views in the surrounding topography.

2.3.9 The slopes will be graded to between 1:9 and 1:15 to ensure that the Development blends into the surrounding topography, as shown on Figure 2.6: Embankment Cross Section.

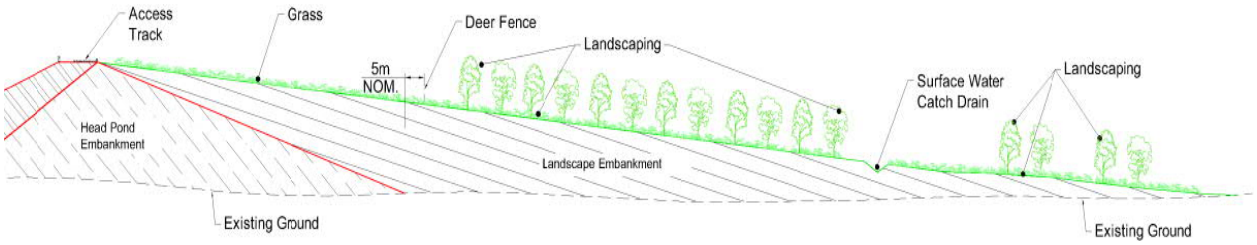



**Figure 2.6 Indicative Embankment Section (looking west)**

*Headpond Inlet / Outlet Structure*

2.3.10 This structure is where the Waterways exit the Headpond and into the High-Pressure Tunnel (see below). This structure predominantly sits out of sight within the Embankment with an above ground mechanical equipment housed within a natural stone (or other suitable material agreed with THC) approximately 8 m high above the height of the Embankment. The structure is situated within the trench at the bottom of the Headpond and comprises a course screen and gates before narrowing into the High-Pressure Tunnel.

2.3.11 The Spillway and Scour Pipes are incorporated into the structure on the inside of the Headpond.

2.3.12 The Spillway Inlet will be situated above the top water level of the Headpond with a 0.5 m freeboard, and conveys excess water to a vertical pipe that will connect to the Scour Pipe that runs from the trench at the toe of the Headpond Inlet / Outlet Structure.

2.3.13 This is shown on Figure 2.7: Indicative Arrangement of Inlet / Outlet Structure.

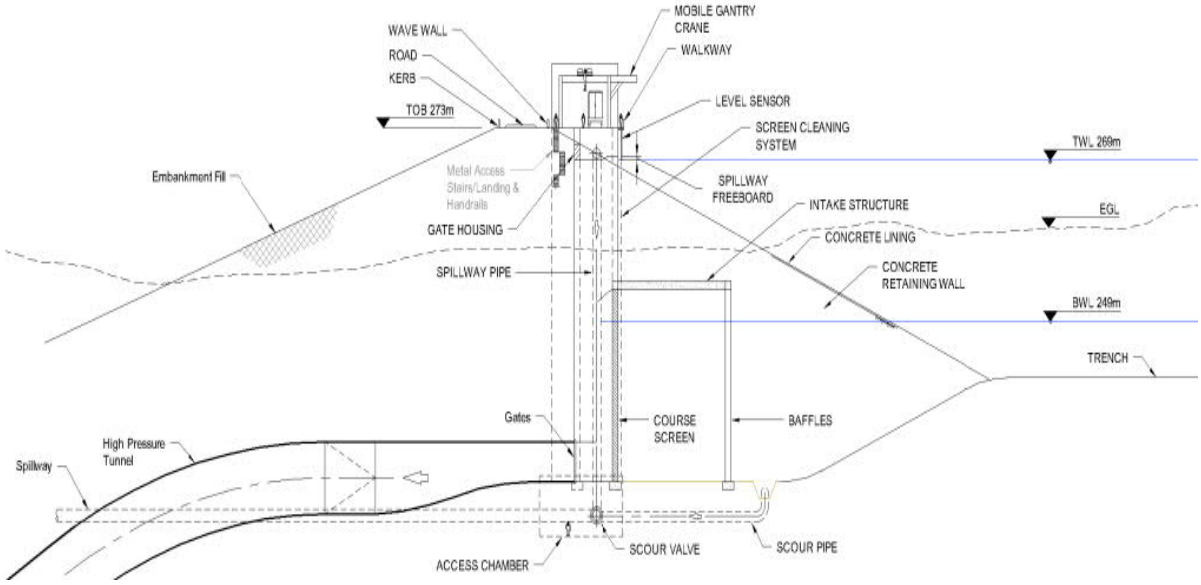



**Figure 2.7 Indicative Arrangement of Headpond Inlet / Outlet Structure**

**Tailpond**

2.3.14 This is the lower reservoir, and in the case of this Development, will utilise a small area of the existing body of Loch Ness. It includes the following components

*Tailpond Inlet/Outlet Structure*

2.3.15 This is a permanent structure and is where the Waterways enters the Tailpond. This Structure comprised of a partially submerged structure which will be a maximum of 15 m deep (within the bank of Loch Ness) and extends approximately 45 m in to Loch Ness from the stilling chamber (and not the existing bank) as shown on Figure 2.8: Tailpond Inlet / Oulet Cross Section. The majority of the structure is either sub-surface within the bank of Loch Ness or beneath the water level of the Loch.

2.3.16 The Inlet / Outlet Structure consists of an inclined screen, which is approximately 90 m wide, and screen cleaning mechanism, wave walls, roof and a stilling chamber, in addition to the Spillway outfall. To avoid fish and debris entrainment, the screen will have 2 mm apertures and is designed to have a through water velocity of less than 0.15 m/s. The screen also acts as an energy dissipation measure to reduce the velocity of the water discharging from the Development.

2.3.17 The Spillway outfall is incorporated into the Tailpond Inlet / Outlet Structure as a submerged outlet in the southern wave wall. The Spillway will also contain energy dissipation components to reduce the velocity of the water entering Loch Ness and is designed to only operate in one direction – to discharge into Loch Ness.

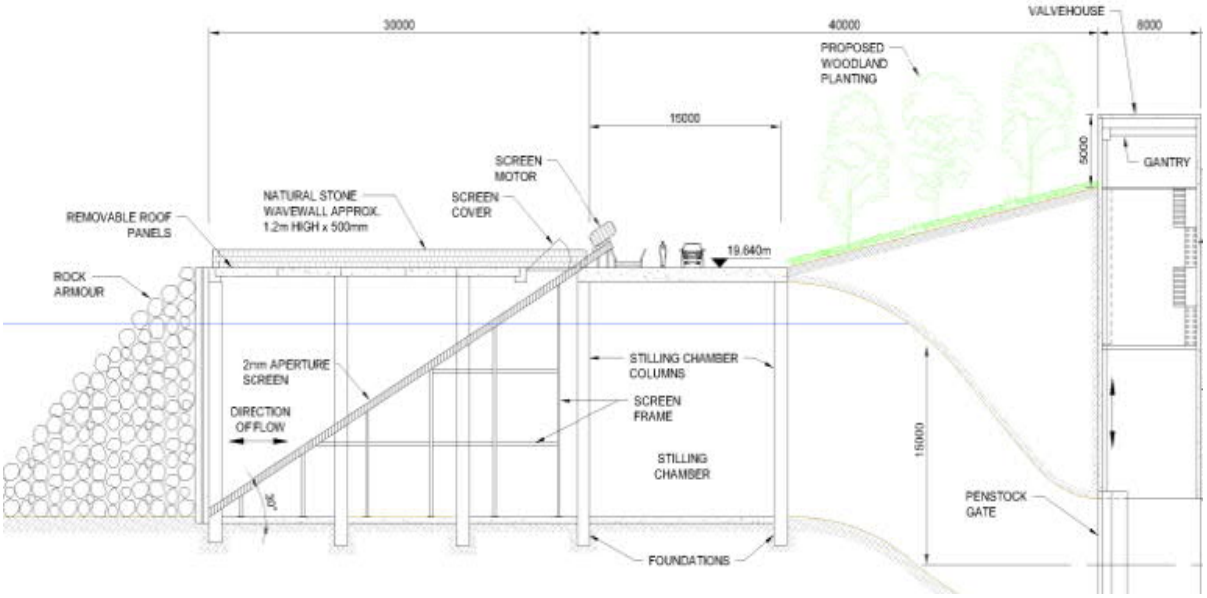



**Figure 2.8 Tailpond Inlet / Outlet Cross Section**

*Jetty*

2.3.18 There is a permanent and temporary element to the Jetty. The Jetty will be constructed into Loch Ness and located adjacent to the north of the Tailpond Inlet / Outlet Structure. This is shown on Figure 2.9 Tailpond Inlet / Outlet Structure (Operational Phase).

2.3.19 The temporary jetty will be approximately 45 m long by 140 m wide and will be constructed out into Loch Ness. The permanent structure will measure approximately 35 m from the shoreline and approximately 20 m in length. This structure will be used for accessing the Inlet/Outlet Structure during operation for maintenance.

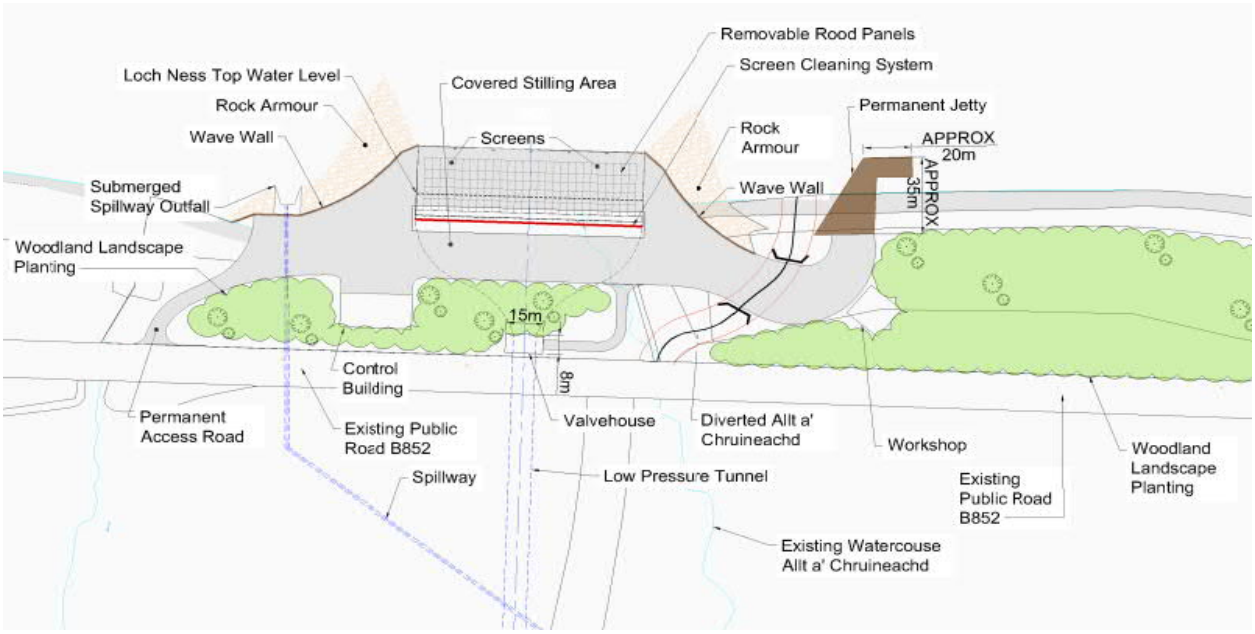



**Figure 2.9 Tailpond Inlet / Outlet Structure (Operational Phase)**

*Cofferdam*

2.3.20 The Cofferdam is a temporary water-tight structure measuring approximately 130 m from the shoreline into Loch Ness and approximately 300 m wide. It will encircle the required working area for the Tailpond Inlet / Outlet structure. The area within the Cofferdam will be pumped dry to facilitate the construction of the Tailpond Inlet / Outlet Structure.

2.3.21 This is shown on Figure 2.10: Indicative Arrangement of Tailpond Works

*Operational Buildings*

2.3.22 Once construction is finished, there will be a Valve House containing the mechanical equipment for operating the gate within the Low-Pressure Tunnel. The Valve House will be 5 m in height (above ground level), 15 m wide and 8 m long and will be clad in natural stone (or a suitable finish to be agreed with THC). There may be other operational buildings which may include control room facilities and workshops. These are shown on Figure 2.9.

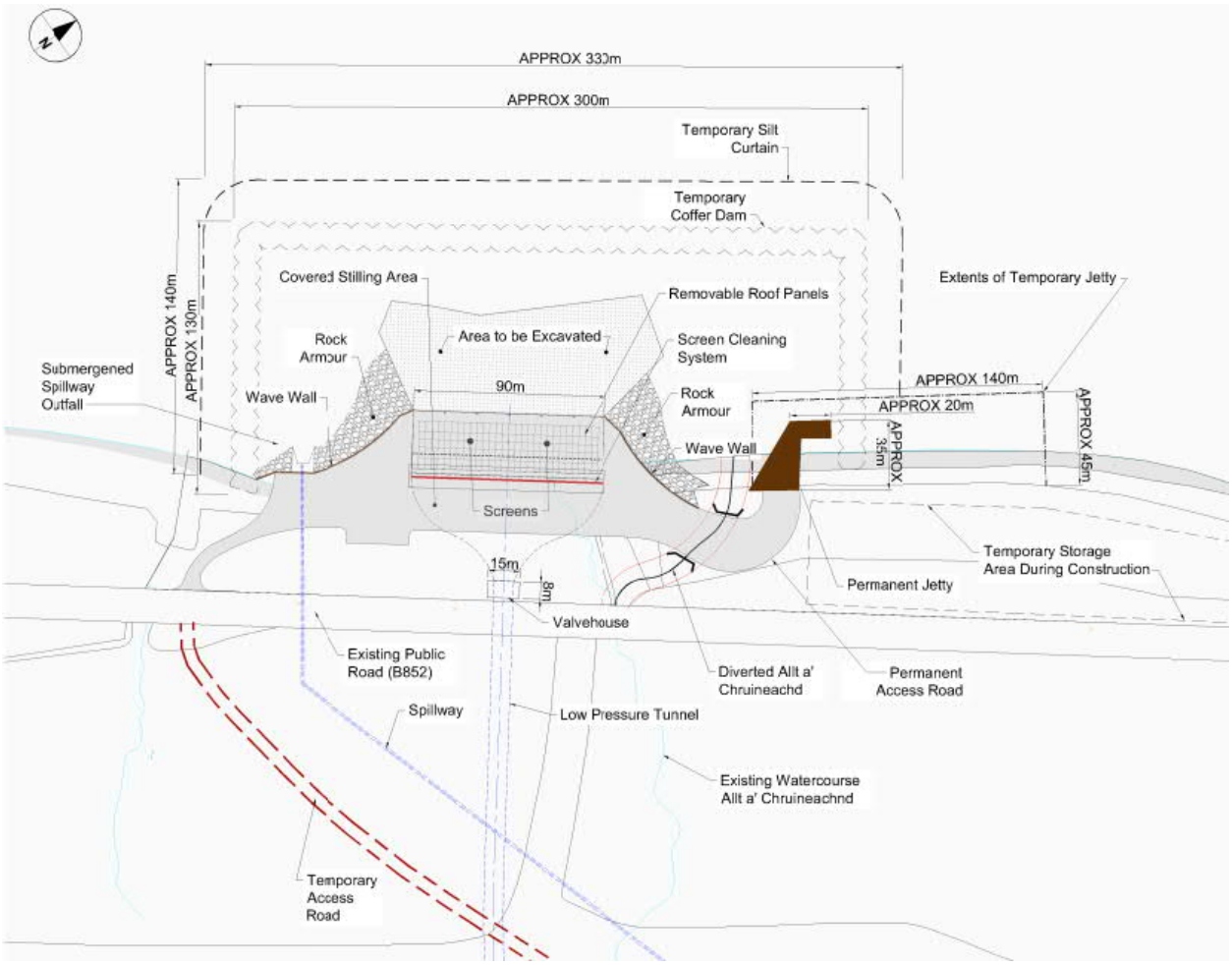



**Figure 2.10 Indicative Arrangement of Tailpond Works**

**Construction Compounds**

2.3.23 There will be four areas for equipment and material storage, access to the Waterways and Tunnels, site office and welfare facilities across the site, as shown on Figure 2.4. Once the construction phase is over, these compounds will be reduced in size, with Compound 2 removed completely. The Compounds are shown on Figure 2.4 and as follows in Table 2.1

**Table 2.1 Proposed Construction Compound Location and Size**

| Compound No. | Usage | Approximate Location | Approximate Maximum Size of Working Area ($m^2$) for Construction |
|---|---|---|---|
| 1 | Construction Contractor's main compound, temporary office accommodation, welfare, construction access, screening area and temporary material storage. | NH 60784 34019 | 210,000 |
| 2 | Tailpond Inlet / Outlet, Tunnel access, laydown areas, work yards, temporary tunnelling works, offices and temporary material storage. | NH 58781 33239 | 35,000 |
| 3 | Temporary construction compound and temporary material storage. | NH 59568 33460 | 80,000 |
| 4 | Temporary and permanent compound for construction and operation of the Headpond. Potential access shaft and temporary material storage. | NH 60903 32965 | 60,000 |

*Note: The size is in relation to the boundary of each compound and not a relation to the size of any hardstanding areas.*

2.3.24 Ancillary components for the operation of the Development, such as parking, operational buildings, battery houses and the substation will also be located within the permanent footprint of the Compounds.

**Access and Roads**

*Development Site Access*

2.3.25 The Development Site access will be access via the A9, the B851, and then northwards on the B862, accessing the Development Site from the C1064. There is also the potential for the Cofferdam and the Jetty to act as Development Site access for certain deliveries via water from Loch Ness and the Caledonian Canal.

*Access Tracks within Development Site Boundary*

2.3.26 There are Permanent and Temporary Access Tracks within the Development Site Boundary, as shown on Figure 2.4.

2.3.27 The Permanent Access Track will be constructed between Compound 1 and the Headpond / Compound 4. It starts at the centre of Compound 1 and then follows an existing forest road (the southern section of the IN12.05 Core Path) to the realigned C1064. The Permanent Access Track will then cross the realigned C1064 at Crossing 3 before ending at the southern tip of the Headpond / Compound 4.

2.3.28 The Permanent Access Track will require a working width of up to 50 m to incorporate two-way vehicular access, drainage, a conveyer, material storage and the working width for the installation of the Spillway. Dust screens will be installed on the outer edges of the Permanent Access Track. This is

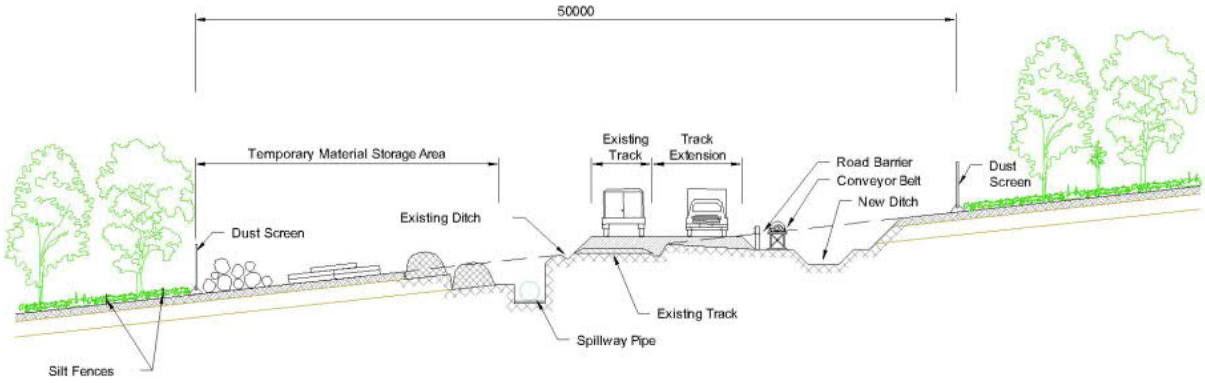



**Figure 2.11 Permanent Access Track Indicative Arrangement**

shown on Figure 2.11: Permanent Access Track Indicative Arrangement. It should be noted that this is a maximum width and there are elements of the working areas that could be reduced.

2.3.29 Once the construction phase has been completed, the Permanent Access Track will be utilised by the operational workforce to access the underground Power Cavern via the Access Tunnel. Therefore the Permanent Access Track will be reduced for two-way vehicular access only and the road resurfaced with the appropriate drainage also installed. The remaining working width will then be reseeded and reinstated, in addition to the reinstated route of the IN12.05 Core Path.

2.3.30 A Temporary Access Track will be constructed between the Tailpond and Compound 1. The Temporary Access Track will start at the south of Compound 2, crossing the B852 at Crossing 1. The Track will pass through the AWI-listed broadleaved woodland above Loch Ness to cross the B862 at Crossing 2 and then pass through the north-west of Dirr Wood to enter the south-western corner of Compound 1.

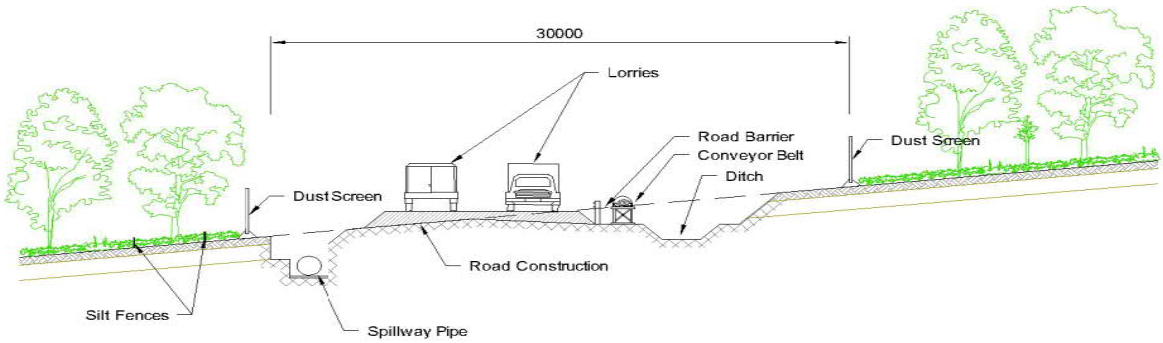



**Figure 2.12 Temporary Access Track Indicative Arrangement**

2.3.31 The construction corridor required for the Temporary Access Track will be a maximum of 30 m to allow for two-way vehicular traffic, drainage, a conveyer and the working width for the installation of the

Spillway. It has been possible to minimise the working width by removing the need to store materials within the corridor.

2.3.32 The Temporary Access Track will typically be unsealed in nature and will be removed following the completion of the construction phase.

*Realignment of C1064*

2.3.33 The existing location of the C1064 public road currently routes through the Headpond location, and so will be realigned, as shown on Figure 2.4. The realigned road will be built to the specifications of the existing road on a like for like basis: single-track with passing places and in agreement with THC Highways. There is the potential to include a dedicated cycle / walking path on one side, further to stakeholder responses and feedback from the local community.

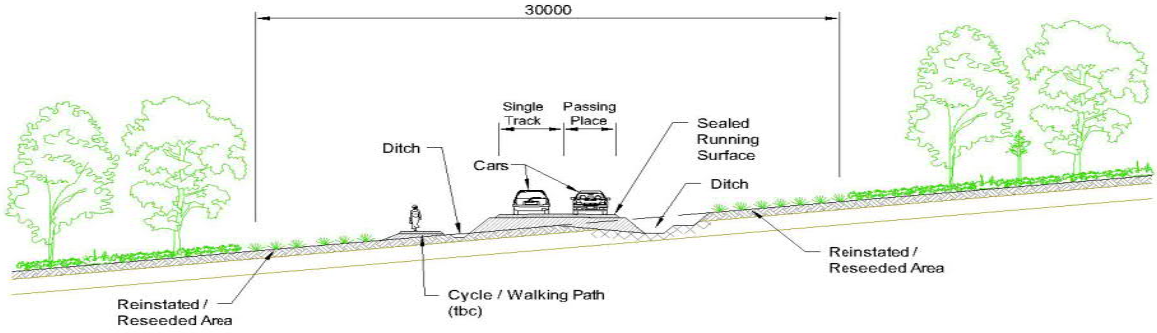



**Figure 2.13 Indicative Arrangement of Realigned C1064**

2.3.34 It is proposed to retain a section of the C1064 as access to the Ach-na-Sidhe B&B near the southern end of the Headpond. This will be upgraded and a new junction with the realigned C1064 provided to ensure visibility and safe access.

2.3.35 The remainder of the previous C1064 located within the footprint of the Headpond will be used as a haul route during construction works.

2.3.36 This road will be realigned prior to the main construction phase commencing.

*Ancillary Access Tracks*

2.3.37 In addition to the Permanent and Temporary Access Tracks, there will also be Ancillary Temporary Tracks that will be implemented for the construction of specific Development Components or for certain stages of the construction phase. Once the relevant component or stage is completed, these Ancillary Temporary Tracks will be reinstated.

2.3.38 Where possible, existing paths will be used to minimise the construction footprint and removal of vegetation and forestry. However new, additional tracks will be required for specific purposes, such as accessing work areas within the Headpond.

*Public Road Crossings*

2.3.39 During construction, three of the public roads within the Development Site will be crossed by the Permanent and Temporary Access Tracks. The locations and description of the components at these crossing points is set out in Table 2.2 below.

**Table 2.2 Public Road Crossings**

| Name | Public Road | Approximate Location (NGR) | Description |
|---|---|---|---|
| Crossing 1 | B852 | NH 58750 33159 | Temporary access track, conveyor belt, telemetry cable, and Spillway. |
| Crossing 2 | B862 | NH 59621 33482 | Temporary access track, conveyor belt, telemetry cable, and Spillway. |
| Crossing 3 | Realigned C1064 | NH 60833 33083 | Temporary/permanent access track, telemetry cable, conveyor belt, and Spillway. |
| Crossing 4 | Realigned C1064 | NH 60610 32690 | Realignment of C1064. |

2.3.40 During the construction phase, it is intended that the Crossings will consist of semi-permanent traffic two-way signalling system given the duration of construction. The Crossing will be a conventional crossroads that will cross the public roads where grade and visibility is optimal to reduce the impact on the public roads as far a practical. To accommodate the traffic lights, the public road will be widened on the approach to the crossings. The crossroads will also have new signage and line markings warning drivers of new road layout ahead. Priority will be given to the public road users.

2.3.41 These Crossings will be removed following the end of the construction phase.

**Conveyors**

2.3.42 A temporary Conveyor Belt has been included within the Development design as it is an efficient method for moving large volumes of material over long distances, therefore reducing vehicle movements within the Development Site. The temporary Conveyor Belt would be used to transport material generated from the underground excavation of the Waterways and other tunnelling works up to the Headpond area to be used as Embankment fill. However, the material transport within the Development Site will be determined by the Construction Contractor on appointment.

2.3.43 The indicative route for the Conveyor Belt is within the working width of the Temporary and Permanent Access Tracks from the Tailpond up to the Headpond via Compound 1.

2.3.44 The Conveyor Belt would either cross the public roads via a temporary overhead gantry or through an underground underpass (box culvert or equivalent). The choice of crossing method would be confirmed by the Construction Contractor post-consent. If the Conveyor Belt crossing is anticipated to be via a gantry, it will have a minimum clearance height of 5.1 m above the public road and will be covered to prevent any material from leaving the belt and hitting vehicles.

## 2.4 Below Ground Infrastructure

2.4.1 This is the upper reservoir and includes the following components, as shown on Figure 2.5: Below Ground Infrastructure with a cross section shown in Figure 2.14: Below Ground Infrastructure Cross Section and an Indicative Arrangement shown on Figure 2.15: Below Ground Indicative Arrangement.

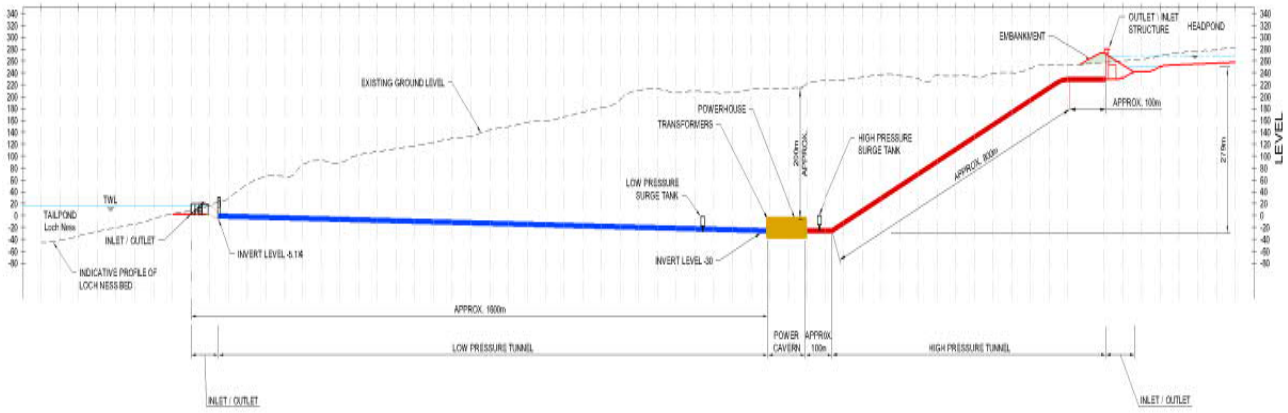



**Figure 2.14 Below Ground Infrastructure Cross Section**

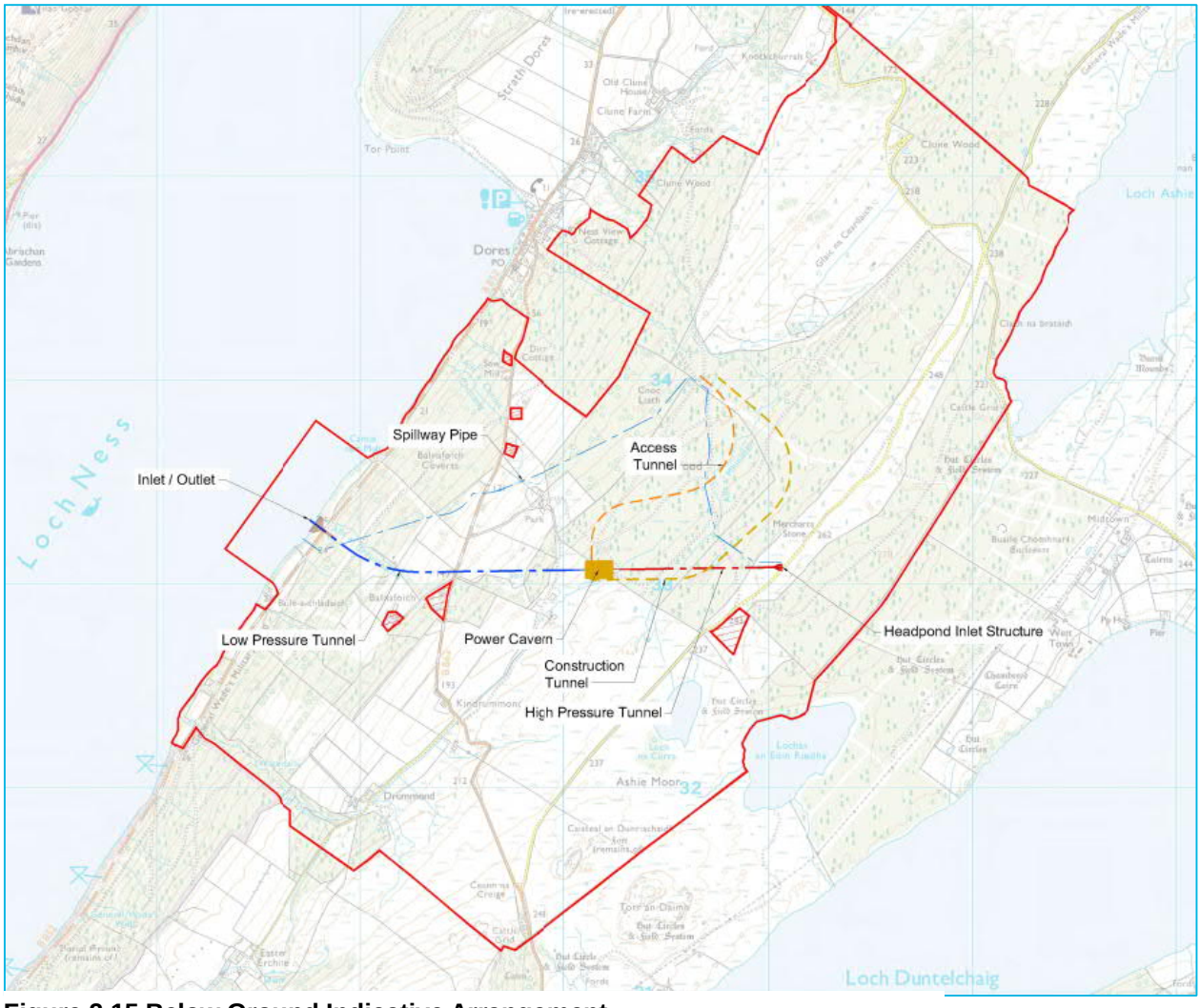



**Figure 2.15 Below Ground Indicative Arrangement**

## Waterways

2.4.2 The Waterways transfer water between the Headpond and Tailpond within a closed loop system. The waterways consist of:

*High-Pressure Tunnel*

2.4.3 The High Pressure Tunnel connects the Headpond to the Powerhouse, and has an approximate diameter of 9 m and a length of approximately 900 m. It will be lined with either precast concrete, steel segments or reinforced shotcrete.

*Low Pressure Tunnel*

2.4.4 The Low Pressure Tunnel connects the Tailpond Outlet / Inlet Structure to the Powerhouse, and has an approximate diameter of 9 m and a length of approximately 1,700 m long. It will be lined in a similar manner to the High-Pressure Tunnel. At the Transformer Gallery, the Low-Pressure Tunnel is located at a lower depth than its connection to the Tailpond Inlet / Outlet, and so the Low-Pressure Tunnel travels at a slight incline uphill towards the Tailpond.

*Spillway Pipe*

2.4.5 This is buried pipe with an inlet above the top water level of the Headpond used to drain any excess water from the Headpond. The Spillway Pipe only operates in one direction – from Headpond to the Tailpond.

*The Scour Pipe*

2.4.6 The Scour pipe within trench at the bottom of the Headpond that joins Spillway pipe within a chamber below the Headpond. Along with the Spillway, the Scour is used for the scouring and draining down of the Headpond in an emergency situation.

**Surge Tanks**

2.4.7 Surge Tanks will be located upstream of the Powerhouse and downstream of the Transformer Gallery, and are a safety feature of the Development. They are intended to neutralise sudden changes of pressure in the flow by filling when the pressure increases and emptying when it drops.

**Power Cavern**

2.4.8 The Power Cavern contains the mechanical and electrical equipment for generating electricity. The reversible pump turbines will be housed within the Powerhouse and the transformers within the Transformer Gallery. The Waterways will connect into Powerhouse and Transformer Gallery through the Power Cavern Pipes.

2.4.9 The Power Cavern is 200m beneath the existing ground level at its closet point. The Powerhouse could be approximately 120 m long, up to 25 m wide and up to 50 m high. The Transformer Gallery will be approximately 50 m from the Powerhouse and will be approximately 120 m long, up to 20 m wide and up to 30 m high.

**Tunnels**

2.4.10 The entrance to the Tunnels will be from Compound 1 (as shown as portals on Figure 2.4). Tunnels for access and construction / emergency access during operational phase to the Power Cavern are as shown as Figure 2.15.

*Access Tunnels*

2.4.11 The Access Tunnel will be approximately 1,700 m long, 6 m wide and 5 m high as shown on Figure 2.5. It will be used for both the Construction and Operation phases and therefore is a permanent feature of the Development. During operation, the Access Tunnel will be utilised for operational workers travelling to the Power Cavern.

2.4.12 It is likely that a gradient of 12.5 % can be used so that vehicles can safely travel from the surface to the Power Cavern, but this is also subject to detailed design.

2.4.13 Subject to confirmation during further ground investigation, the Tunnels may be lined, paved, lit and ventilated.

*Construction Tunnel*

2.4.14 The Construction Tunnel will be approximately 1,800 m long, 8 m wide and 6 m high, and could potentially have a 10 % gradient. Similar to the Access Tunnel, the Construction Contractor may wish to alter the gradient as part of the detailed design.

2.4.15 Whilst labelled as a Construction Tunnel, this tunnel will also be utilised for the operational phase for maintenance, plant/equipment movements and an emergency exit.

## 2.5 Construction Programme

2.5.1 The lifespan of the Development has been broken into four distinct phases as summarised, set out Table 2.3 below:

- Pre-Construction – initial works that enable the construction of the Development;
- Construction – the building and commissioning of the Development;
- Operation – the period when the Development is active and has the potential to generate electricity; and
- Decommissioning – the end of operational use and the removal and/or making safe of the Development.

2.5.2 A detailed construction methodology will be produced by the Construction Contractor for the Development post-consent. Construction is expected to last up to 6 years including the pre-construction works. The construction work is anticipated to peak within the third year of construction as the tunnelling construction and the Headpond construction are the two biggest operations and they are likely to be sequenced in parallel. It is expected that the tunnelling work will be a 24-hour operation.

**Table 2.3 Construction Programme**

| Phase | Activity | | Year 1 | | | | Year 2 | | | | Year 3 | | | | Year 4 | | | | Year 5 | | | | Year 6 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Pre-Construction | Site Clearance | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Utility Diversion | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Compound Set-up | | | | | | | | | | | | | | | | | | | | | | | | | |
| | C1064 Realignment | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Access Track Construction | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Public Road Crossing | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Path Diversions | | | | | | | | | | | | | | | | | | | | | | | | | |
| Construction | Headpond | Headpond excavation | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Embankment construction | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Embankment lining | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Landscape Embankment construction | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Headpond Inlet / Outlet works | | | | | | | | | | | | | | | | | | | | | | | | |
| | Tailpond | Temporary Works (in Loch Ness) | | | | | | | | | | | | | | | | | | | | | | | | |
| | | TBM Delivery and Construction | | | | | | | | | | | | | | | | | | | | | | | | |
| | | TBM Launch Preparation | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Tailpond Inlet / Outlet works | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Removal of Temporary works | | | | | | | | | | | | | | | | | | | | | | | | |
| | Waterways | Spillway | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Low-Pressure Tunnel | | | | | | | | | | | | | | | | | | | | | | | | |
| | | High-Pressure Tunnel | | | | | | | | | | | | | | | | | | | | | | | | |
| | Tunnels | Access Tunnel | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Construction Tunnel | | | | | | | | | | | | | | | | | | | | | | | | |
| | Power Cavern | Powerhouse | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Surge Tanks | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Powerhouse & Transformer Gallery | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Mechanical and electrical equipment | | | | | | | | | | | | | | | | | | | | | | | | |
| Commissioning | | | | | | | | | | | | | | | | | | | | | | | | | | |

## 2.6 Pre-construction

**Site Clearance**

2.6.1 Prior to the commencement of works, vegetation will be cleared including tree felling where necessary. Trees will be retained wherever possible. To facilitate this, the Development component areas will be surveyed to determine the extent of forestry removal.

2.6.2 Tree felling will be conducted in accordance with a Development Felling Plan with the timber removed from the Development Site. Some temporary timber storage will be required and this will be located within the Compounds. The tree stumps will then be removed and shredded on-site along with any remaining brash wood. This processed material will also be removed from the Development Site.

2.6.3 Once trees and other vegetation are removed, soil will be excavated in a sequential manner. Turves, topsoil and subsoil will be excavated as required and stored individually. Stockpiles of soil will be compacted and sealed as far as practicably possible.

**Utility Diversions**

2.6.4 The existing low voltage overhead power line that is located within the area of the Headpond will be permanently diverted as part of the pre-construction works.

2.6.5 The water main that routes along the C1064 and coincides with the Headpond will be diverted as part of the C1064 realignment pre-construction works.

**Borrow Pits**

2.6.6 The existing on-site borrow pits will be used as far as practically possible to minimise the requirement to import material at the start of construction.

Material from the on-site borrow pits is anticipated to be used for the construction of the Compounds and the Access Tracks.

2.6.7 Access to Borrow Pit 1 is already available within the Headpond area ahead of construction of the Headpond and Embankment commencing. Until the Temporary Access Track is built with an ancillary spur to the borrow pit, Borrow Pit 2 will be accessed along the private road at Park (NH 59862 33406).

**Compounds Set Up**

2.6.8 The location of the Compounds will be confirmed so that the required area can be cleared, felled and levelled as required. The vegetation and topsoil that has been excavated will be temporarily stored nearby so that is can be reused to dress off the Compound areas post-construction. The Compounds will be constructed with material from the existing on-site borrow pits, due to the requirement for material occurring prior to the establishment of the Headpond.

2.6.9 The Allt a' Chruineachd watercourse at Compound 2, will be diverted as part of the Compound set-up works during the pre-construction phase.

**Permanent and Temporary Access**

2.6.10 The construction method to be used for the Permanent and Temporary Access Tracks and the C1064 realignment will be similar. Once the required areas are cleared, the routes of the Permanent and Temporary Access Tracks, and the realignment of the C1064 will be marked out and the ground prepared. Drainage will be installed along the full length of the Access Tracks before stone is placed and covered with a base and wearing course. The Access Tracks will be left unsealed during Construction while the C1064 will be surfaced as per its current condition.

2.6.11 The majority of the material for the Access Tracks is anticipated to be generated within the Development Site. This will be from existing on-site borrow pits in the first instance. There may be a need for materials to be sourced or imported from a nearby quarry depending on the finalised construction programme determined by the Construction Contractor – this is considered unlikely but local quarries have been identified to aid the Construction Contractor.

2.6.12 Should Ancillary Temporary Tracks be required, those not already established or those requiring upgrading will be made up of bog mats or trackway systems. These alternate road construction materials will be employed where the ground may be saturated.

**Public Road Crossings**

2.6.13 Temporary road closures may be required at each crossing point to construct both the Spillway and Conveyor Belt. This may require a short road closure or a single lane closure over a widened section of road to allow the pipe to be constructed under the road.

**Sustainable Drainage Systems (SuDS)**

2.6.14 During the pre-construction phase, much of the on-site SuDS will be implemented in a variety of ways such as settlement ponds, silt busters and drainage ditches. In particular, a series of settlement lagoons will be created in the north-west of the Headpond area, where the Landscape Embankment works are proposed. SuDS ponds will also be created at Compound 2. There will be SuDS along all of the Access Tracks including downslope silt fences and temporary ditches.

**Public Paths**

2.6.15 During the Pre-construction works:

- The permanent diversions for the IN12.04 and the IN12.05 core paths will be built; and
- The temporary diversion for the South Loch Ness Trail will be implemented.

2.6.16 The path diversions will be constructed using material sourced from on-site borrow pits.

## 2.7 Construction Phase

**Construction Vehicles, Plant and Equipment**

2.7.1 The construction of the Development will require task-specific vehicles, plant and equipment in addition to general construction equipment. Equipment potentially required on-site includes, but is not limited to:

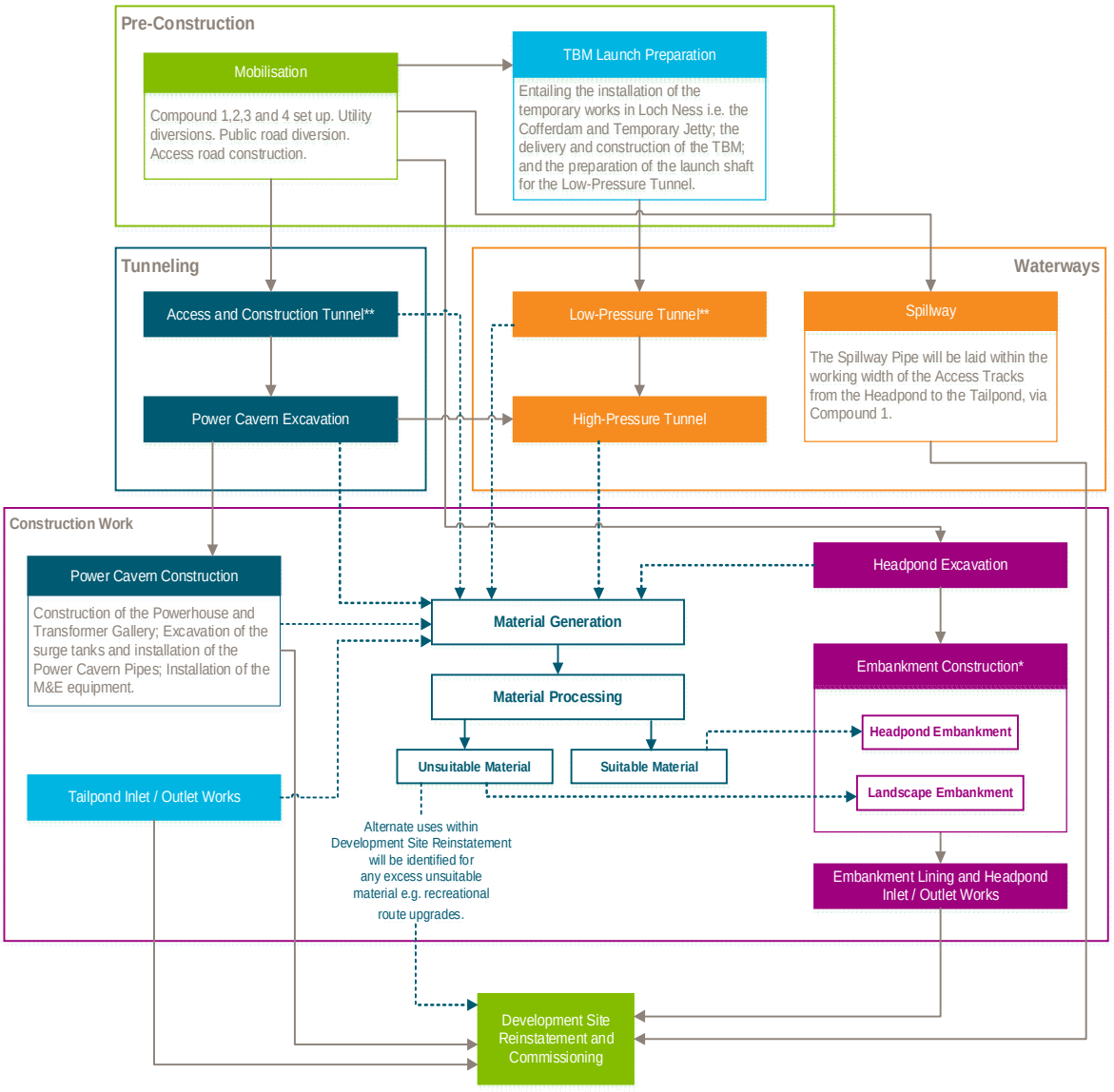
- Concrete – batching plant, concrete mixers, concrete pavers, concrete pumps, concrete wagons, planers;
- Cranes – crawler cranes, dock cranes, gantry cranes, large cranes and winches;
- Crushers and screeners;
- Dozers, grader, pavers, road brush, rollers and sheep foot roller;
- Drill and blast equipment and hydraulic breakers;
- Excavators, long reach excavators and tracked excavators;
- Rigs – loading rig, piling rig, sequential / impact drill rig;
- Silt fence, pumps, bog mats, low ground pressure (LGP) equipment, wheel wash and dust suppression;
- Site set up equipment such as traffic lights, portable buildings, generators, toilets and temporary utilities (lighting, ventilation, power);

- TBM and associated equipment;
- Transporting equipment – articulated dump trucks, flatbeds, HGVs, hiabs, load haul dumpers, tracked dump trucks, tractors, trailers, tipper wagons, unimogs and conveyors;
- Tree felling and site clearance equipment such as harvesters, mulchers and logging wagons; and
- Vessels for loch transport such as jack-up rig, barges and tugs.

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

**Materials Management**

2.7.3 The tunnelling and excavation works for the Development will generate a significant volume of material, as shown on Insert 2-2 below.

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**Insert 2.2 Illustrative Flowchart of Material Generation**

2.7.4 One of the key design principles for the Development has been to minimise any surplus material by balancing the material that is generated from the cutting, drilling and excavation activities with the construction activities.

2.7.5 It is anticipated that the Conveyor Belt will be used to transport tunnelled material from the Waterways and the Tunnels to the Headpond area where it will be stored and processed with the excavated material from the Headpond works. There will be temporary material storage at the Headpond, the Compounds and within the working width of the Permanent Access Track. The material will be processed and sorted for re-use within the Headpond area. Suitable material will be used within the Embankment and Landscape Embankment. If material cannot be re-used within the embankments then other uses will be sought so that only residual material will remain for appropriate disposal, if any remains. This temporary storage area will also be used as the conveyors will not be used at night, but excavation may occur on a 24 hour basis once the works are sufficiently underground.

2.7.6 A Materials Management Appraisal (MMA) has been undertaken and demonstrates that the material that is generated from construction operations is reused as far as practically possible. The MMA results are used to 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; and
- Classification of the excavated rock to determine the use in the Development;

2.7.7 The likely volumes excavated and reused in the Development as summarised below.

**Table 2.4 Estimated Material Volumes**

| Component | Estimated Maximum Volume ($m^3$) |
|---|---|
| Headpond Excavation | 4,740,000 (bulked) |
| Below Ground Infrastructure Excavation | 1,250,000 (bulked) |
| Tailpond Inlet / Outlet Excavation | 156,000 (bulked) |
| Vegetation Strip | 651,000 (bulked) |
| Embankment (Reuse) | 4,820,000 (bulked) |
| Landscape Embankment (Reuse) | 1,392,000 (unbulked) |

2.7.8 The post-consent site investigation will more accurately inform the volume and quality of material generated from the construction of each of the Development Components.

**Power**

2.7.9 Electrical power will be required on the Development for various aspects of construction. It may be possible for a temporary connection to be made to the local distribution network. Grid connection would reduce fuel consumption on the Development site and reduce noise from on-site generators. However, it is anticipated that this will not be available across the whole Development Site and for the full duration of the construction phase. Therefore it has been assumed that construction power will also be supplied by portable generators fuelled by natural gas or diesel. It is assumed that most of the smaller works, not requiring the use of construction plant or machines, will use handheld petrol generators and equipment.

**Construction Workforce**

2.7.10 The number of construction staff on the Development Site will vary according to the construction activities being undertaken, and will be confirmed by the Construction Contractor upon appointment. These will range from admin and transportation of staff to construction and machine operators. It is expected that up to 390 personnel will be employed on site during the construction phase at its peak. The average number of personnel working on the Development Site over the construction period will be up to 205. As this will be subject to the requirements of the Construction Contractor this estimate could change.

2.7.11 It is proposed that a proportion of the construction workforce will be available from Inverness and the surrounding communities. However it is also likely that some specific construction activities will require specialist skills, which may be brought in from other parts of UK, Europe or worldwide.

2.7.12 The welfare and other facilities required for the personnel will be located within Compound 1. For some critical path activities where 24 hour working is required, it is anticipated that on-site accommodation facilities will be required for a small proportion of the workforce. It is anticipated that this accommodation could be located within the boundary of Compound 1.

**Headpond Construction**

2.7.13 The cut and fill design of the Headpond means that the excavation of the Headpond and the construction of the Embankment can be sequenced together. Where possible, material excavated from the Headpond will be used to construct the Embankment. The excavated material will be supplemented by the material generated from the tunnelling activities, which will be transported to the Headpond area via the Conveyor Belt. Due to the size of the excavation and the material anticipated to be handled, the Headpond works will be constructed under the Quarries Regulations 1999 and Explosives Regulations 2014 (as amended).

2.7.14 The following is an indicative methodology for the construction of the Headpond and Embankment. After the pre-construction works, the Headpond area will be split into sections. The southern end of the Headpond has some of the deepest areas of cut, and it is anticipated that this area could be excavated first to generate material for the start of the Embankment. Once the first section is complete, the next section will be started so that the construction sequence is rolling until the Embankment is completed.

2.7.15 Some areas of hard rock are anticipated to be encountered during the excavation of the Headpond. For example, the bottom of the trench and the deeper sections at the southern end of the Headpond. If conventional rippers and hydraulic breakers are not effective, blasting may be implemented. The amount and rate of blasting will be informed by detailed site investigation.

2.7.16 At the base of the Embankment, a drainage blanket of geosynthetic or geocomposite material will be laid. Embankment fill will be placed atop the drainage blanket and rolled in accordance with the Embankment design. The Embankment fill will be made up of compacted rock and soil generated through excavation and tunnelling activities. Temporary stockpiles of excavated and tunnelled material will be processed in order to separate the different types of material.

2.7.17 As the construction of the Embankment progresses, the outside of the Embankment will be dressed off with topsoil that was generated during excavation. This material will have a higher organic content than the makeup of the Embankment so is anticipated to regenerate faster.

2.7.18 Material that is unable to be used in the Headpond Embankment construction will be transported to the north of the Headpond area to be used as fill for the Landscape Embankment.

2.7.19 The Headpond Inlet / Outlet will be constructed prior to the Embankment being completed. The Headpond Inlet / Outlet will require substantial foundations and reinforcement to hold the sides of the Embankment.

2.7.20 The Headpond will be lined appropriately and any water collected from precipitation will need to be pumped out of the Headpond to appropriately sized settlement lagoons adjacent to the Landscape Embankment.

**Tailpond Construction**

*Temporary Works*

2.7.21 Works at the Tailpond will be initiated with the installation of the temporary infrastructure. This includes a silt curtain, the temporary Cofferdam and Jetty. The temporary Jetty is likely to be constructed on piles and will stretch across the Cofferdam. The silt curtain will be installed prior to works commencing on the Cofferdam.

2.7.22 A piling rig will be required for installing sheet piles which is likely to take the form of a jack-up barge, manoeuvred into place by a tugboat. The Cofferdam may require bracing or infilling, and these may involve further activity of vessels, such as tugs and barges on the loch as well as activity on the shoreline to transfer materials from Compound 2 to the Cofferdam.

2.7.23 The area within the completed Cofferdam will be dewatered to facilitate TBM access for the construction of the Low-Pressure Tunnel. Any water collected from precipitation will be pumped out of the area while the Cofferdam is in place.

*TBM Delivery, Construction and Launch*

2.7.24 The TBM will be delivered in component parts to the Development Site by barge via the Caledonian Canal. The component parts will be received at the temporary Jetty for on-site assembly.

2.7.25 Following completion of the Cofferdam and the associated initial dewatering works, preparations will be made to launch the TBM for the Low-Pressure Tunnel. This will require a 30 m deep launch pit / shaft to be excavated, and in the worst case is assumed to be piled. Cranes will be required for lifting in, out and around the launch pit / shaft. A large temporary gantry crane may also be required for the TBM installation and will be removed once the TBM has been launched.

2.7.26 Once the TBM works are complete there may be a period of time that the Tunnel shaft is left open, as other tunnelling activities are ongoing elsewhere on the Development Site and the Low-Pressure Tunnel could be used as an access point.

*Construction of the Tailpond Inlet / Outlet Structure*

2.7.27 The Tailpond Inlet / Outlet Structure will commence once the TBM has reached the Headpond. This is to enable excavated material to continue to be delivered to the Inlet / Outlet Structure and transported to the Headpond via the conveyer. The Inlet / Outlet are likely to be a piled structure, supporting a structure steel frame, within which the screen is installed. Wave walls will be placed either side of the frame with rock armour placed around the wave wall, as shown on Figure 2.8. The shoreline around the Tailpond Inlet / Outlet Structure will be landscaped and the loch bed on the approach will be re-profiled. Once there is no access requirement for the Low-Pressure Tunnel portal, the roof of the Tailpond Inlet / Outlet Structure will be installed.

*Removal of the Temporary Works*

2.7.28 Once the works at the Tailpond are complete, the Cofferdam will be removed. This will involve the removal of the sheet piling. The same plant and equipment that was used during the Cofferdam

installation will be used during the removal works. Some localised dredging and further demobilisation work may be required following removal of the Cofferdam to remove any material that has built up around the piles.

**Waterways Construction**

*Use of a TBM*

2.7.29 The TBM is a long piece of plant that consists of a cutter head, Tunnel shield, liner installer, conveyor system, and trailing gear. The full length of the TBM could be over 100 m.

2.7.30 The TBM excavates by rotating a cutter head at the front of the machine. The cutter head is made up with a combination of teeth, and pre-cut bits that break the rock head in front of the TBM. The material is then brought through the cutter head and is crushed in the process. The excavated material is then removed by a conveyor belt that takes the material through the TBM and out of the Tunnel portal at the Tailpond Inlet / Outlet Structure.

2.7.31 Power is anticipated to come from a temporary grid connection and / or generators located within the trailing gear of the TBM or at Compound 2 outside the Low-Pressure Tunnel. Ventilation will come from large ducts running along the bottom of the Low-Pressure Tunnel to an outside ventilated area. Temporary pumps will also be required if water is encountered and / or generated from the tunnelling works.

2.7.32 As the TBM progresses, the Tunnel will be lined with either precast segments or reinforced shotcrete. The selection of the lining will depend on the rock type anticipated to be encountered and the design of the Tunnel. The material for the lining works will be fed to the TBM via either a conveyor or a temporary rail line on the base of the Tunnel.

*Low-Pressure Tunnel*

2.7.33 It is anticipated that the Low-Pressure Tunnel will be excavated using a TBM suitable for hard rock excavation of up to 9 m in diameter.

2.7.34 The Low-Pressure Tunnel ends at the Transformer Gallery and it is anticipated that the construction will be sequenced so that construction at the Power Cavern will have commenced prior to the arrival of the TBM. The Power Cavern will then act as a temporary receiving pit where the TBM will be reoriented ready to construct the High-Pressure Tunnel.

*High-Pressure Tunnel*

2.7.35 The tunnelling process continues from the Power Cavern towards the Headpond as described above. However, as operational water pressures will be higher than the Low-Pressure Tunnel, the High-Pressure Tunnel may include a steel liner for lining.

2.7.36 The TBM is anticipated to enter the Headpond from under the Embankment around the Headpond Trench. The Trench would be able to be used as a receiving pit to dismantle the TBM as it arrives. This would require similar large lifting equipment and temporary works as during launching. Once the TBM has been dismantled it will be removed from the Development Site either via road and or by barge after being transferred along the Permanent and Temporary Access Track from the Headpond to the Tailpond.

2.7.37 Should a vertical access shaft to the High-Pressure Tunnel from Compound 4 be required, it would be constructed using conventional drill and blast method.

*Surge Tanks*

2.7.38 The construction method is expected to be drill and blast and will follow the TBM excavation once this has cleared the area.

*Spillway Pipe*

2.7.39 The Spillway Pipe will be constructed using a conventional cut and cover method, and install either a flexible (polyethylene) or sectional pipe (glass reinforced plastic (GRP) or ductile iron). The Spillway will be excavated, laid, backfilled and reinstated in a sequential manner as the works progress along a similar alignment to the Permanent and Temporary Access Tracks. Works will be conducted within the working widths of the Access Tracks.

**Tunnel Construction**

2.7.40 The Tunnels will be one of the first underground components to start being constructed. The starting point for the Construction and Access Tunnels will be from Compound 1. The construction method for the Tunnels is anticipated to be by a conventional drill and blast method. Excavating using the drill and blast method is sequential in nature and a more flexible tunnelling method than that of a TBM. Prior to the drill and blast works, the Tunnel portal areas will be excavated and prepared for the drilling equipment. This operation will involve localised breaking, excavating and rock stabilisation.

2.7.41 It is anticipated that the underground tunnelling could be a 24-hour operation. The anticipated blast cycle could be up to two blasts per 24 hours.

**Power Cavern Construction**

2.7.42 The Power Cavern will be reached from Compound 1 via the Access and Construction Tunnels and will be excavated using a conventional drill and blast methods. A number of additional access adits will also be required that will connect the Access and Construction Tunnels to various parts of the Power Cavern. Once in the area of the Cavern, blasting will be carried out in a controlled sequence with the rate of blasting being dependent on the rock type, space, and orientation of excavation. However, it has been assumed that around four underground blasts could occur per day.

2.7.43 If required, following blasting there may be some localised scaling carried out by hydraulic breaking equipment which will ensure the size shape and position of the excavation is correct. Once it is safe to do so, the rubble that is produced from the blasting will be removed. Excavated material will be transported to the Tunnel portals via conveyor belt or vehicle.

2.7.44 Once lined, mechanical lifting (overhead cranes) and operating equipment will be installed in the Power Cavern. These will be used for the installation of the turbines and associated mechanical equipment. The turbines will be delivered through the Construction Tunnel to the Power Cavern where they will be lifted and installed in sections.

2.7.45 The generators will be fitted on top of the turbines and connected to the turbine shaft. The transformers and associated electrical wiring will be installed between and in the transformer gallery. Following the wiring of the generators, the HV cable can then be installed out of either the construction and or Access Tunnel out towards Compound 1.

**Public Paths - Construction**

2.7.46 During the Construction phase:

- The IN12.04 and IN12.05 core path diversion will be implemented with the sections coinciding with Compound 1 being permanently closed to the public;

- The South Loch Ness Trail diversion will be implemented and the bypassed section will be temporarily closed to the public;
- Local paths affected by construction will be closed for the duration of the construction period or for a pre-advertised time-period based on the requirements of use for the construction of the Development.

2.7.47 Path closures will be advertised locally as well as being announced by signage at route ends. The Temporary and Permanent Access Tracks will be fenced along their lengths to promote safety. Crossings will be provided at designated points and will be managed to ensure public safety.

**Battery Housing**

2.7.48 The battery house will be erected within the permanent footprint of Compound 1 ahead of the commissioning works.

**Commissioning**

2.7.49 The Development will be commissioned in stages commencing with a period of "dry commissioning". During this period the Development Components such as embankment leakage control, valves, motors, pumps, screens, stop-logs, gates, and electrical control systems will be tested for functionality with no water in the Headpond.

2.7.50 The Spillway Pipe will have a stringent hydrostatic test carried out to determine that the Pipe is not leaking. The water from the test would be sourced from the Headpond via natural precipitation or from a temporary mains connection and will fill the Spillway from the Scour Valve chamber at the Headpond Inlet / Outlet Structure. The Spillway will be tested in two sections:

- Headpond to Spillway junction at Compound 1;
- Spillway junction at Compound 1 to Tailpond.

2.7.51 Water from Loch Ness will not be used to test the Spillway Pipe due to the risk of transfer of INNS if the Spillway was to fail during the testing. During the testing, a small reservoir of water will be created at the Headpond using a small temporary cofferdam.

2.7.52 To minimise the impact of supply to other water customers, it is anticipated that the draw from the mains would be low over an extended period of time should the mains water supply be the source used for testing.

2.7.53 Once commissioning has been completed, the Headpond will be filled with water from the Tailpond by slowly opening the gates at the Tailpond Inlet / Outlet and letting the water flow into the Low-Pressure Tunnel towards the turbines which will fill with water from the Tailpond. Once filled, one of the turbines that will have already been pre-commissioned will be used to slowly pump water into the High-Pressure Tunnel and then the Headpond. Once the High-Pressure Tunnel is filled, the other pumps could assist with the pumping.

2.7.54 Once the Headpond is full, the "wet commissioning" of the mechanical and electrical equipment can take place. This, together with the commissioning of the grid connection will allow the Development to operate, initially in a reduced capacity, if market conditions allow until full functionality testing can occur at full operating capacity for the pumping and generating.

## 2.8 Operational Phase

**Operational lifetime**

2.8.1 The expected lifetime of a PSH scheme is reported in academic literature to be around 80 years. This is considered is to be a conservative estimation as Ffestiniog Power Station and Cruachan Power Station were commissioned in 1963 and 1965 respectively, and are still in good operational condition having had some relatively minor refurbishment works. It is expected that the civil works (Tunnels and Embankment) will have an operational life of up to 100 years, however, throughout this period it is expected that the electrical plant will require refurbishment or major overhaul every 25 years.

**Maintenance requirements**

2.8.2 Once commissioned, PSH schemes typically require very little maintenance however there will be regular inspections to ensure the safety of the Headpond. Under the Reservoir (Scotland) Act 2011, the operator of a reservoir must appoint a Supervising Engineer from a 'panel' of engineers pre-approved by the Scottish Government. The Supervising Engineer will monitor the Headpond, supervise operations and conduct visual inspections. Inspection must also be conducted with a minimum frequency of every two years by an Inspecting Engineer who is an independent, panel engineer.

**Operational Workforce**

2.8.3 After the initial construction of the Development it is expected that there will be approximately 5 - 10 on-site jobs created as a result of the operation of the Development plus external contractors from time to time.

**Operational Environmental Management**

2.8.4 The Development will be subject to an Environmental Policy / Environmental Management System (EMS) that will require regular monitoring and auditing.

**Operational Lighting requirements**

2.8.5 There will be internal lighting within the Access Tunnels and the Power Cavern. Further to this, external lighting is expected to be required at the tunnel portals and along the perimeter fence of Compound 1, focused around the entry gate.

2.8.6 At the Headpond and Tailpond, external lighting will be required for access. The lighting will only be used when needed rather than dusk to dawn. There will also be navigational lights fitted to the Jetty.

**Operational Discharges and Abstractions**

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

2.8.8 It is anticipated that the normal drawdown level of the Headpond will be between 249 and 269 mAOD. The outflow during generation at the Tailpond Inlet / Outlet will be up to 250 meters cubed per second ($m^3/s$) with a velocity of approximately 0.15 metres per second (m/s). The inflow during pumping will be up to 170 $m^3/s$ with a velocity of less than 0.15 m/s. 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 there will be many days when the Development will complete a full pump / generate cycle in a single day due to fluctuation in energy demand.

2.8.9 An application for a Controlled Activities Regulation (CAR) license will be made shortly after the submission of the Section 36 application. The Applicant has been in consultation with SEPA over the requirement and extent of the CAR license.

**Access Tracks - Operation**

2.8.10 The Permanent Access Road will be sealed and maintained as an asphalt road after the completion of the Construction phase. The variable working widths containing the material storage area and the conveyor belt within the working width of the Permanent Access Road will be reinstated. During the Operational phase, the Permanent Access Track will comprise the 10 m wide road plus drainage ditches as shown on Figure 2.16.

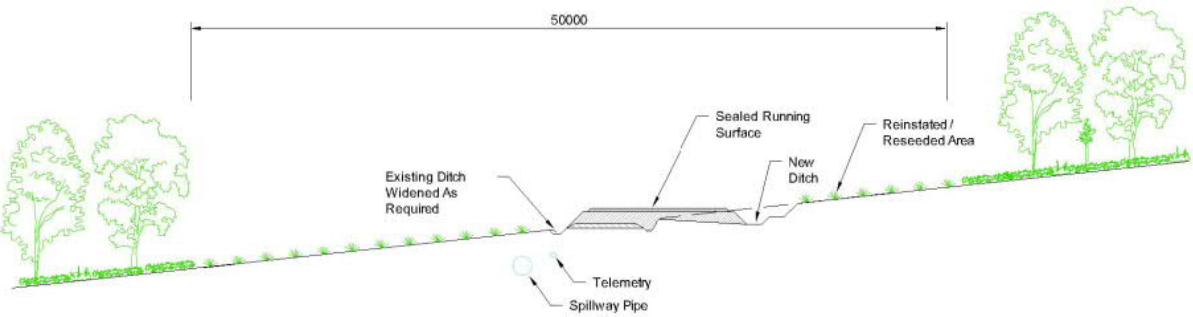



**Figure 2.16 Permanent Access Track Indicative Arrangement**

2.8.11 The Temporary Access Track will be reinstated after the completion of the Construction phase, as shown on Figure 2.17.

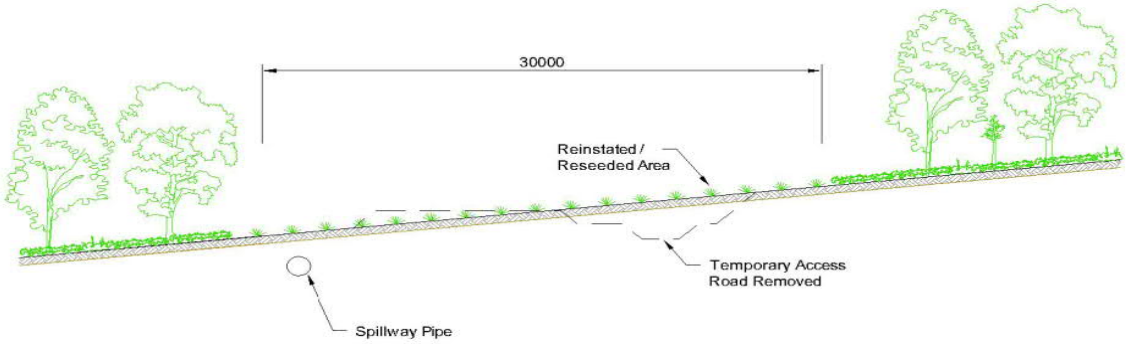



**Figure 2.17 Temporary Access Track Indicative Arrangement**

**Public Road Crossings - Operation**

2.8.12 Post construction it is intended that Crossings 1 and 2 will have the temporary signalling, line markings, signage, and gantry (if applicable) removed and the road would resume normal operation. Permanent access will be required to Compound 2. The temporary gantry, along with the Conveyor Belt, will be removed.

2.8.13 Crossing 3 will have all the temporary works removed like Crossings 1 and 2. However, the junction will be left in place without the signalling for operation as traffic flows are anticipated to be small and intermittent.

**Public Paths - Operation**

2.8.14 During the Operational Phase:

- Access to the temporarily closed section of the South Loch Ness Trail will be reinstated;
- The local paths closed for the construction phase will be upgraded and reopened;
- The temporarily closed sections of the IN12.04 and IN12.05 will be reopened;
- Short diversions will be implemented around the permanent Compound 1 to reinstate connectivity along the current core path routes; and
- A new path around the eastern side of the Headpond will be opened.

2.8.15 New paths and upgrades will utilise excavated material from the construction of the Development where appropriate and will be constructed in line with British Horse Society guidance on multi-use paths, surfaces and dimensions.

## 2.9 Decommissioning

2.9.1 Hydropower assets are very durable and, consequently, it is very rare for large-scale hydro projects to be decommissioned. Rather, they may be refurbished or adapted. However, if decommissioning became necessary, then it could be envisaged that at the end of its operational life, the Development can be decommissioned as follows:

- Water could be drained from the Headpond and released at an agreed rate and timescale through the appropriate licensing regime into Loch Ness;
- The pump turbines and associated mechanical and electrical plant would be removed;
- The Power House and Transformer Gallery will be stripped of equipment and the entrances to the Power Cavern blocked off;
- The Waterways and Tunnel portal entrances will be blocked off with local spoil;
- The Tailpond Inlet / Outlet Structure will be removed;
- The Control Building, Substation and Battery Housing will be removed;
- To prevent any incident with the Headpond filling up, the scour valves will remain open and the Spillway Pipe and the Headpond Inlet / Outlet Structure will be left in place.

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

# 3. Alternatives

## 3.1 Introduction

3.1.1 This chapter sets out the alternatives considered by the Applicant and the evolution of the design that has led to the Development as it is described in Chapter 2: Project and Site Description.

3.1.2 Under schedule 4, part 2 and 3 of the EIA Regulations, developers are 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.*"

## 3.2 Consideration of Alternatives

3.2.1 The following alternatives to the Development being constructed and operated are as follows:

**Alternative Location**

3.2.2 The Development Site was identified as part of a Scotland–wide review of pumped storage hydro (PSH) potential conducted by the Applicant. The review showed that sites possessing suitable characteristics are rare, and that the Development Site favoured comparably with other potential sites by directly avoiding certain sensitive features such as National Parks and European designated sites. There is a precedent for PSH in the Highland region and in the Loch Ness area in particular as the topography of Loch Ness provides suitable conditions for such as development. Section 3.4 provides further detail about the spatial evolution of the Development, and its final orientation with respect to Loch Ness.

**Alternative Technology**

3.2.3 PSH schemes provide benefits by balancing the electricity supply and demand. Night-time recharge 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 the Highlands where an increasing percentage of electricity is coming from wind power, the delivery of which is intermittent. Pumped storage can also provide ancillary services to the grid.

3.2.4 There are few, if any, energy storage technologies which can provide the grid scale services of pumped storage hydro, with proven life cycle costs and impacts. Alternative storage technologies are either too small (hydrogen, batteries), largely unproven (compressed air) or more carbon intense in the case of ancillary services such as fast response (for example, open cycle gas).

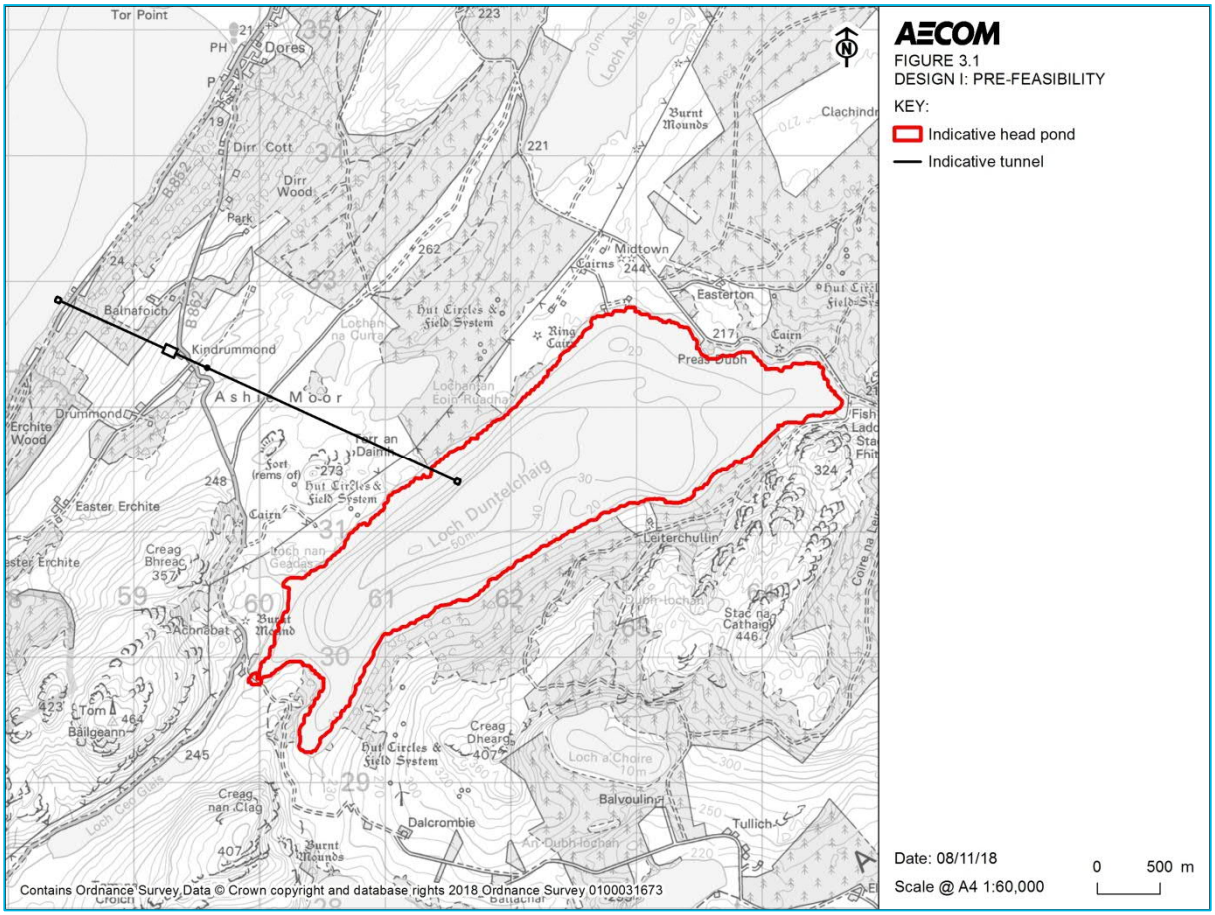
## 3.3 Evolution of Design

3.3.1 The Development has evolved through an iterative design process where the design has been progressed in parallel with the EIA process through consideration of engineering feasibility, environmental constraints and consultation responses. Where possible, mitigation has been integrated into the design to reduce any potential significant effects from the Development on identified receptors.

3.3.2 The evolution of the design of the Development was developed through seven key stages:

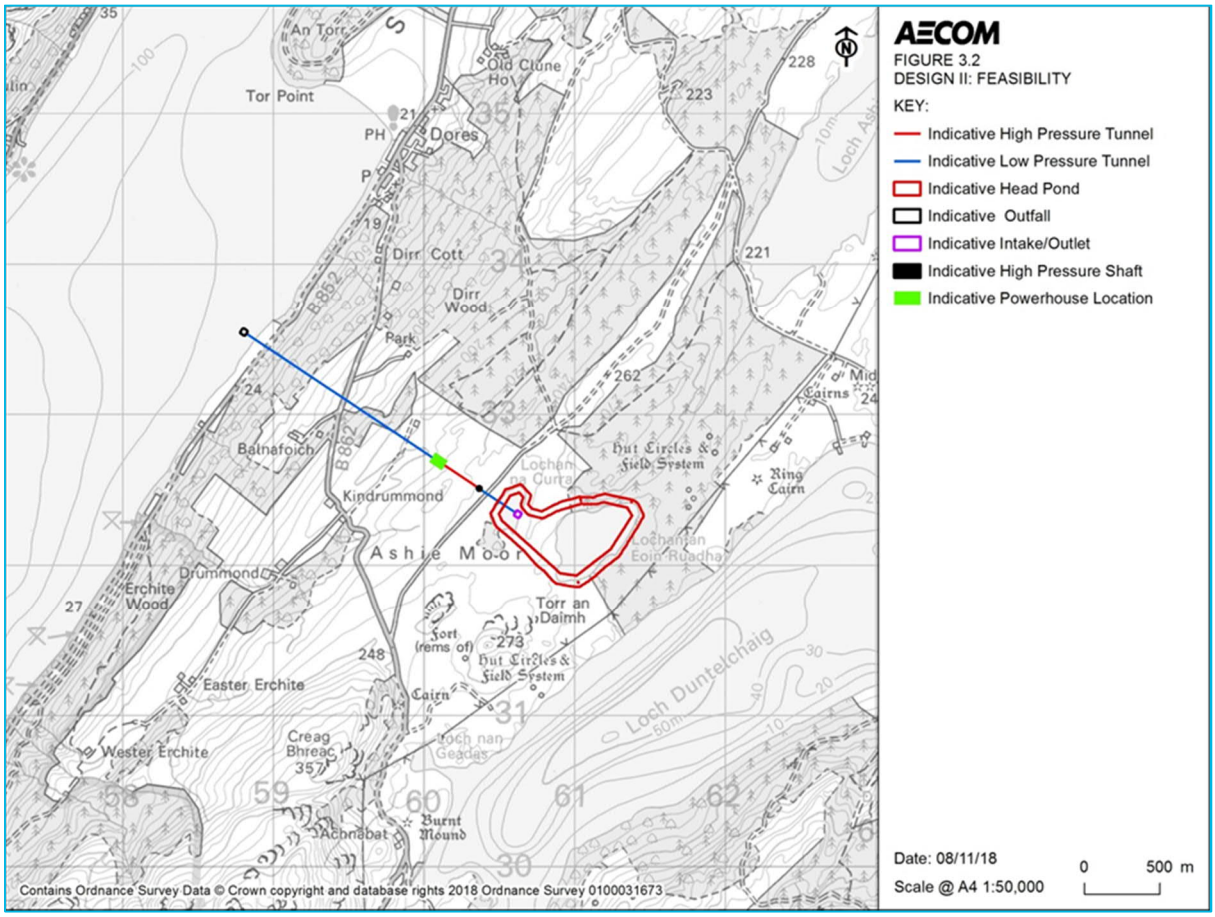
**Design I: Pre-Feasibility**

3.3.3 The Applicant reviewed potential PSH scheme locations within Scotland and the potential to develop a PSH scheme utilising Loch Ness with Loch Duntelchaig was identified. The proposed location had been previously considered for the development of a hydro scheme, initially by the former North of Scotland Hydro Electric Board in the 1940's and latterly by Scottish Water. The Applicant developed a preliminary layout that utilised Loch Duntelchaig as the Headpond and Loch Ness as the Tailpond




**Design II: Feasibility**

3.3.4 Following initial consultation with the Scottish Environment Protection Agency (SEPA) and Scottish Water, the presence of invasive non-native species (INNS) in Loch Ness and the risk of transfer between the two separate water catchments, one supplying Inverness' drinking water, was identified. Therefore it was determined that Loch Duntelchaig was not appropriate as a Headpond for the Development. Lochan an Eoin Ruadha and Loch na Curra were then identified as a potential suitable alternative Headpond to Loch Duntelchaig. A preliminary layout was developed incorporating the two small lochs into a Headpond.

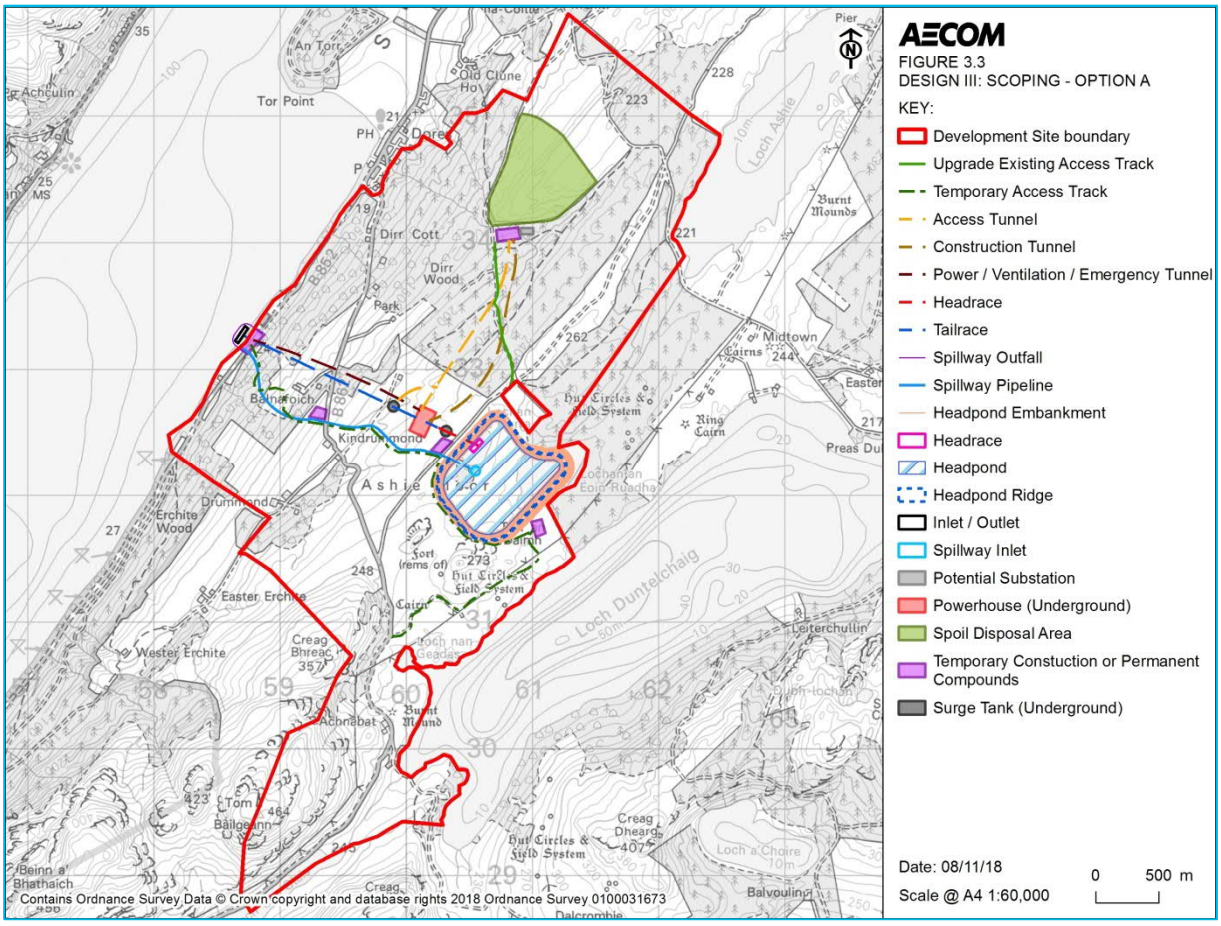



**Design III: Scoping**

3.3.5 A high level environmental assessment was undertaken which identified the importance of permissive routes such as the Trail of the Seven Lochs and the South Loch Ness Trail, recreational activities and a scheduled ancient monument, amongst other receptors that could be affected by the Development. In addition, the Phase 1 survey identified the presence of breeding red throated diver on Lochan an Eoin Ruadha and Loch na Curra. With respect to these findings, the design was amended to change the headpond design, introduce a close loop waterway via Loch Ness only, utilise existing forest tracks, consider incorporation of a visitor centre, and identify an appropriate soil disposal area.

3.3.6 Two options were submitted within the Scoping Report:

- An updated Headpond design utilising the two lochs (known as Option A) while directly avoiding the C1064 and Caisteal an Dunriachaidh;
- An alternative Headpond location (known as Option B) located away from the two lochs and further from Caisteal an Dunriachaidh, but located on the C1064, further undesignated archaeological features and partially within Ancient Woodland Inventory (AWI) listed woodland;


AECOM
FIGURE 3.3
DESIGN III: SCOPING - OPTION A
KEY:
Development Site boundary
Upgrade Existing Access Track
Temporary Access Track
Access Tunnel
Construction Tunnel
Power / Ventilation / Emergency Tunnel
Headrace
Tailrace
Spillway Outfall
Spillway Pipeline
Headpond Embankment
Headrace
Headpond
Headpond Ridge
Inlet / Outlet
Spillway Inlet
Potential Substation
Powerhouse (Underground)
Spoil Disposal Area
Temporary Constuction or Permanent Compounds
Surge Tank (Underground)
Date: 08/11/18
Scale @ A4 1:60,000
0
500 m
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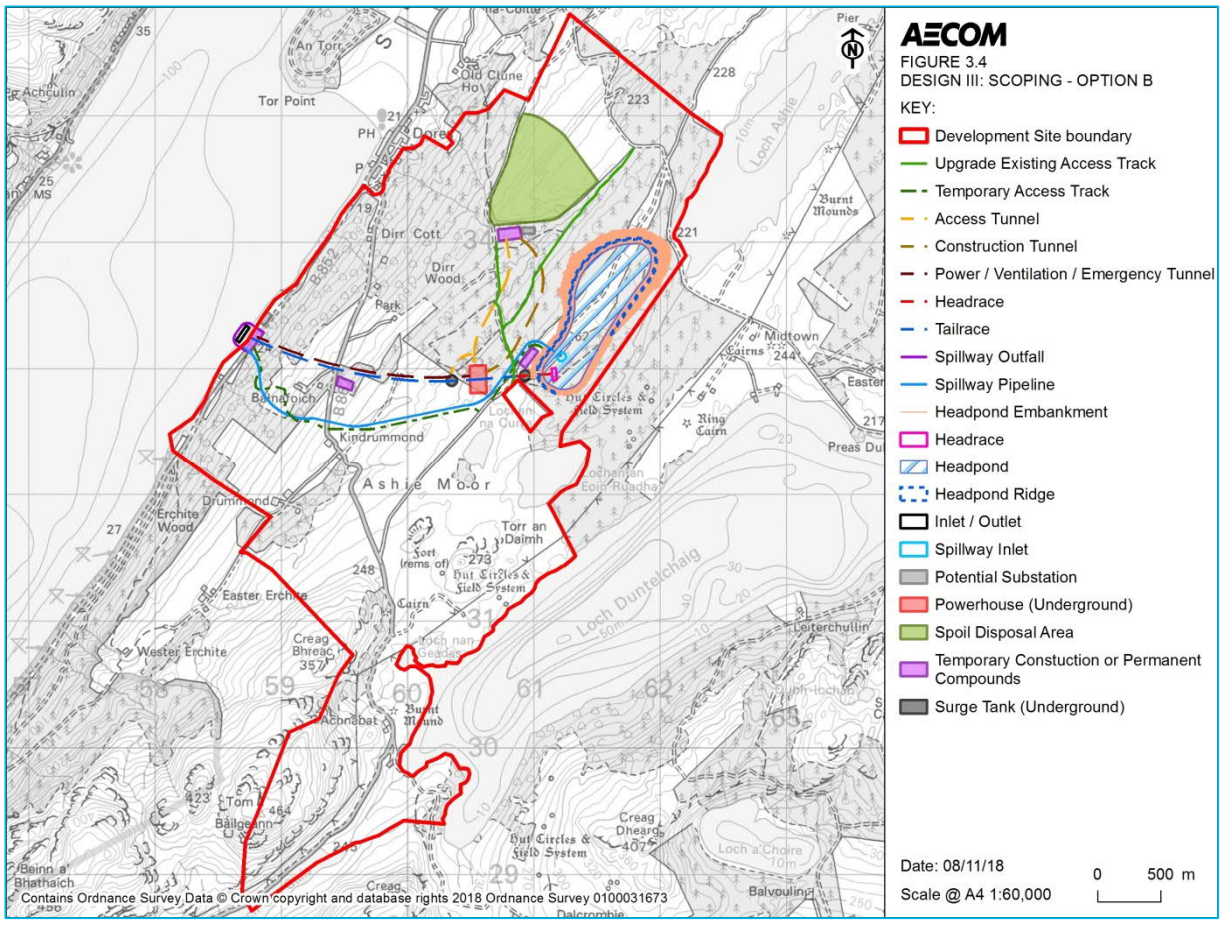
AECOM
FIGURE 3.4
DESIGN III: SCOPING - OPTION B
KEY:
Development Site boundary
Upgrade Existing Access Track
Temporary Access Track
Access Tunnel
Construction Tunnel
Power / Ventilation / Emergency Tunnel
Headrace
Tailrace
Spillway Outfall
Spillway Pipeline
Headpond Embankment
Headrace
Headpond
Headpond Ridge
Inlet / Outlet
Spillway Inlet
Potential Substation
Powerhouse (Underground)
Spoil Disposal Area
Temporary Constuction or Permanent Compounds
Surge Tank (Underground)
Date: 08/11/18
Scale @ A4 1:60,000
0
500 m
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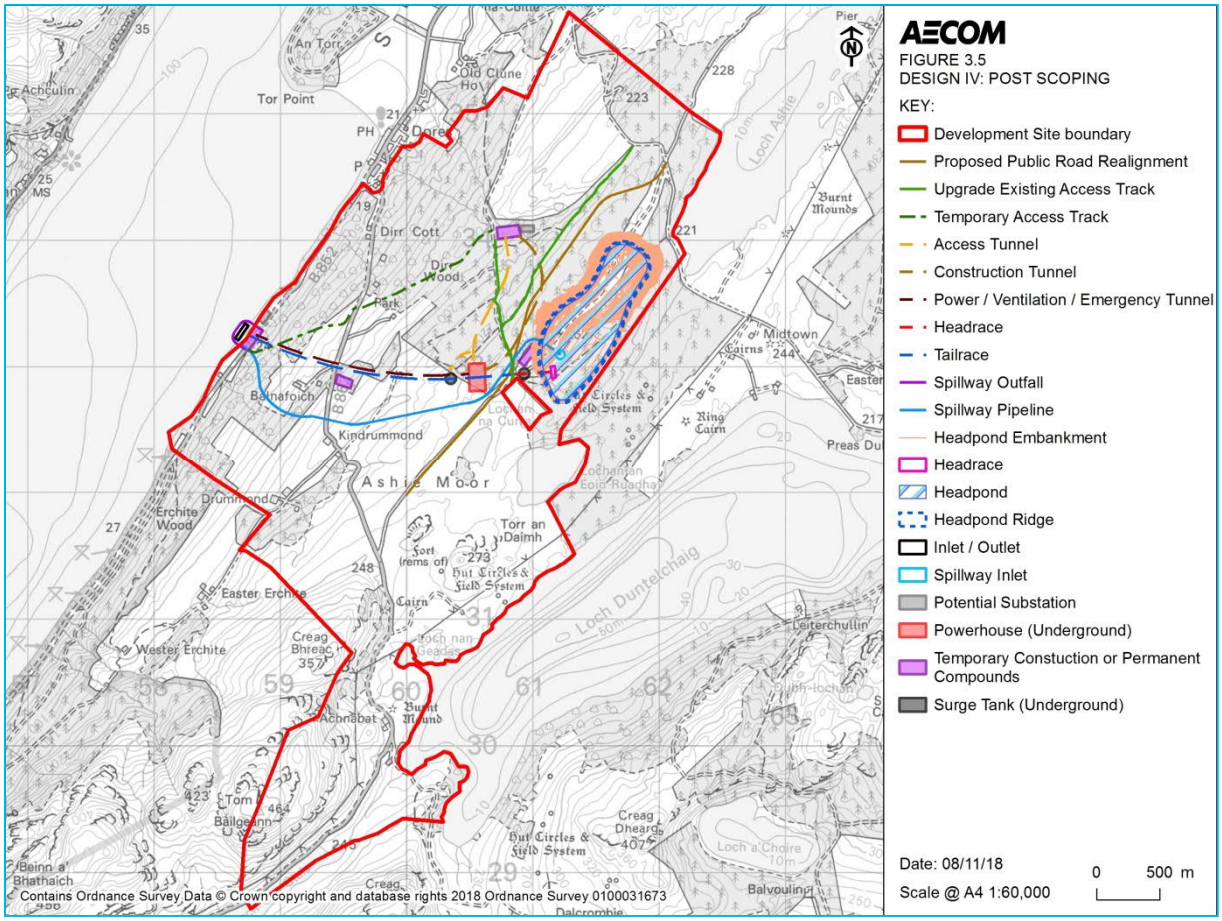
**Design IV: Post Scoping**

3.3.7 On receipt of the Scoping Opinion it was determined that the Option B Headpond was the favourable of the two options considering ecology, archaeology and, water quality and resources. After selection of the favoured Headpond, the design was further progressed by means of reducing the size of the Headpond Embankment and orientation, soften the Embankment slope, removal of the material storage in favour of re-use of materials on site in the Landscape Embankment, siting of construction compounds to minimise forest removal and visual effect, routing of Access Toads to minimise loss of agricultural land, reroute the Spillway and amends to the realignment of the C1064.

3.3.8 The Applicant engaged further with SEPA, THC and SNH in order to clarify responses made within the Scoping Opinion. Further detailed consultation with SEPA (meeting on the 27 April 2018) and SNH confirmed that screening for INNS would not be required following confirmation that the Development was a closed loop system, thereby potential for cross-catchment transfer was negligible. Therefore, a 2 millimetre (mm) aperture screen was selected for the Tailpond Inlet / Outlet to prohibit fish egress. In addition, an INNS risk assessment would be required to be submitted to confirm this agreement.

3.3.9 The updated Option B Headpond scheme was presented for feedback at the public consultation event held at the Dores Community Hall on the 27 and 28 June 2018.

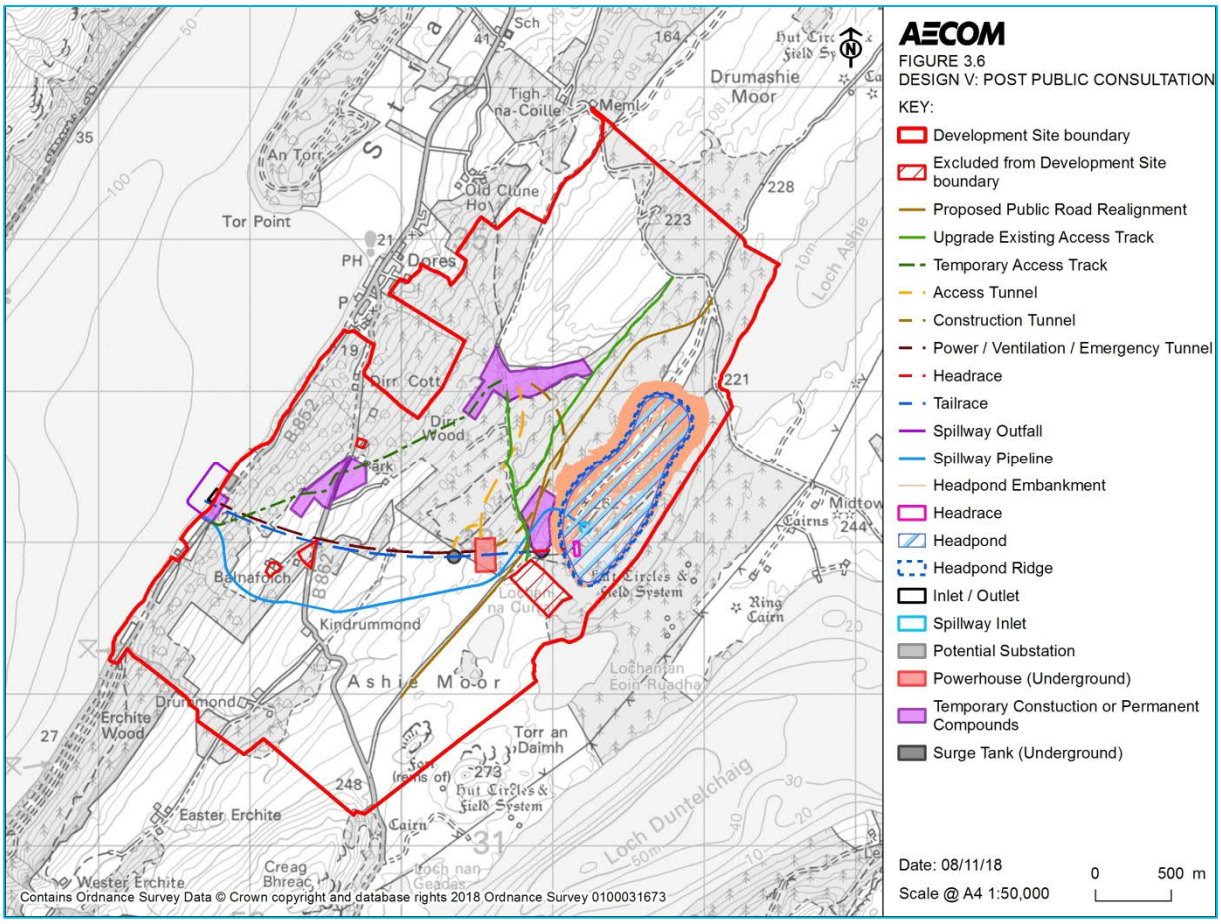


**Design V: Post Public Consultation**

3.3.10 Following public consultation, Design V was prepared based on the comments and feedback received from the local community and the landowner.

3.3.11 A number of changes were made to the design including updating the red line boundary to reflect the reduced area requirements of the progressed design and properties to be excluded from the Boundary Site Boundary.

3.3.12 Some realignment of the below ground works in line with these exclusion areas was also undertaken including realigned routes for core and local paths, Tailpond Inlet / Outlet structure moved northward to allow the landowner to retain access to and use of the field to the north and secondary uses of construction compounds for visitor centres or to facilitate recreation were decided against in favour of reinstating as much of the temporary area in order to retain the tranquillity of the area.




**Design VI: Design Refinement**

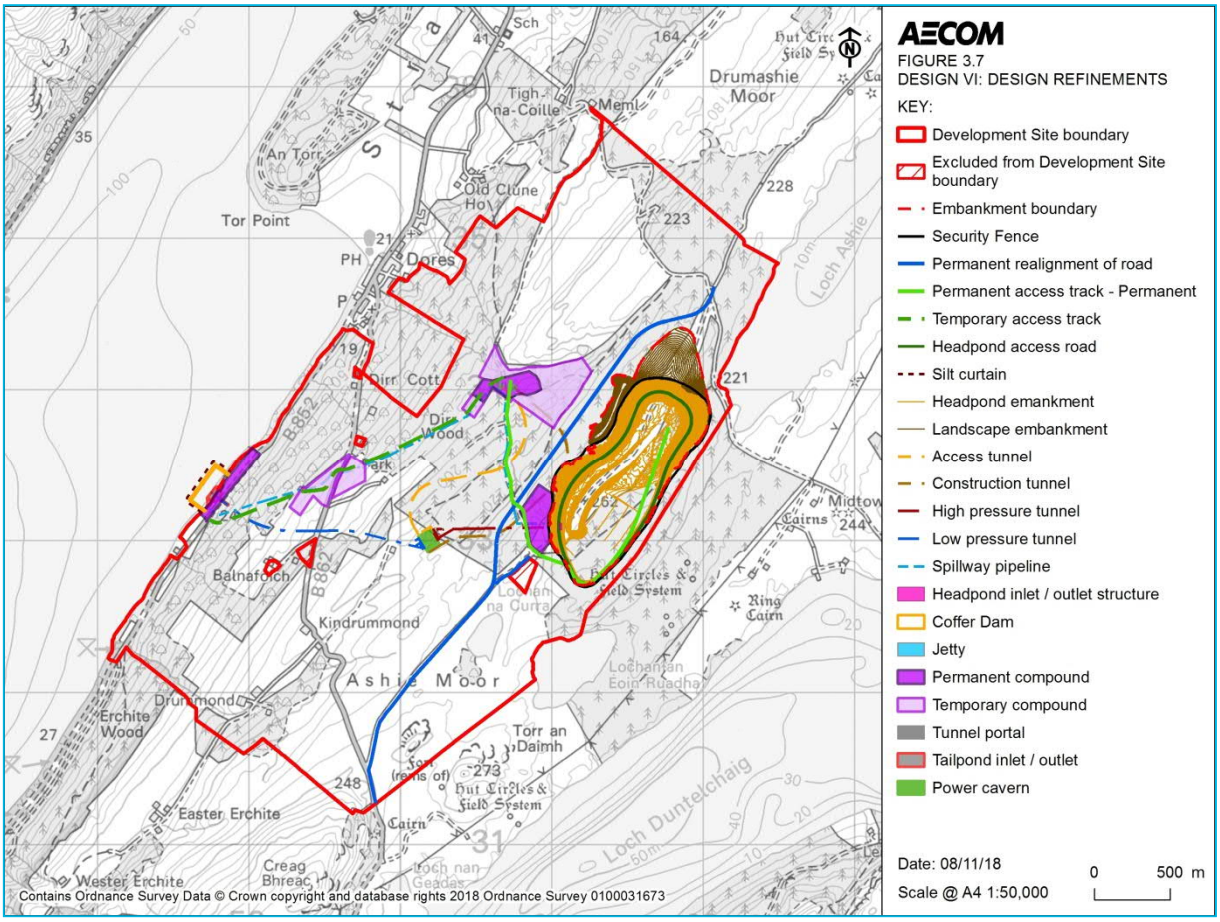
3.3.13 Following on from the public consultation event, a design day was held that brought together the environmental technical specialist relevant to the Development for a holistic review of the Development components. The following sets out the updates to the Post Public Consultation Design V as a result of refined engineering requirements and environmental constraints:

- The Landscape Embankment was reshaped, reducing the tail to the north and also extending to the west. The reshaping will provide a larger buffer between the edge of the Embankment and the realignment of the C1064 at the north of the Headpond as well as providing screening to the realigned road along the western side of the Headpond. The screening will be dual function,

softening the angle of the incline of the Embankment and allowing trees to be reinstated between the realigned road and the Headpond. The Landscape Embankment will also soften the appearance of the north-western Headpond Embankment profile in wider views and assist with incorporating the Headpond into the existing landscape.

- The Spillway Inlet was incorporated within the design of the Headpond Inlet / Outlet structure, removing the need a separate Spillway Tower of up to 20 metres in height.
- Compounds were refined and reshaped taking into account topography.
- The maximum dimensions of the Tailpond Inlet / Outlet structure were identified along with the cofferdam required for the construction of the structure. A silt curtain or similar to mitigate impacts from the construction of the Tailpond Inlet / Outlet structure on water quality has been incorporated into the design of the cofferdam.

3.3.14 This design was submitted with the Gate Check Report, as shown on Figure 3.7




## 3.4 Design Optimisation

3.4.1 The engineering design process resulting in the Section 36 Submission Design has been undertaken in accordance with set design principles and engineering standards, therefore safety is inherent within the design of the Development. For instance, the design, construction and operation of the Embankment will be in accordance with the requirements of the Reservoirs (Scotland) Act 2011.

3.4.2 The design process has also been undertaken and refined where possible based on the environmental information gained to date. An overview of how environmental information is incorporated into the design is available in Chapter 4: Approach to the EIA.

3.4.3 There will be elements of the Development that will be subject to detailed design informed by further site investigation works, confirmed operational requirements and the working practices of the Construction Contractor. At this stage the construction materials and methods will be finalised.

3.4.4 During detailed design there is also the potential for engineering improvements and optimisation, such as a smaller Power Cavern or reducing the capacity of the Headpond itself.

3.4.5 The Development has the potential to generate more or even less unsuitable / excess material than is anticipated. Post consent, once further site investigation works have been undertaken, the detailed design will be undertaken which will look to balance the materials in the same way the preliminary design has done. The design of the Headpond can be optimised and manipulated as required as a result of insufficient or excess material potentially being generated, and this would be the primary method of managing the potential for excess material.

## 3.5 Mitigation

3.5.1 Mitigation which is implicit in the design of the Development, such as the measures described in Section 3.3 and Section 3.4 of this chapter, and mitigation implemented through design, standard control measures routinely used, such as working within good practice guidance during construction (management measures), are known as embedded mitigation.

3.5.2 The following mitigation is embedded into the Development (note this list is not exhaustive and is in greater detail within the EIA Report (Volume 2):

- Construction Environment Management Plan (CEMP) which sets out the environmental management framework to be adopted during construction and measures to be implemented to minimise construction environmental impacts, including the avoidance of key seasons. The CEMP also outlines other management plans which will developed and finalised by the Construction Contractor including the Biosecurity Management Plan, Materials Management Plan and Pollution Prevention Plan.
- Framework Construction Traffic Management Plan (CTMP) which sets out measures to be implemented to minimise adverse effects from construction traffic.
- Topic specific management plans covering the following topics:
  - Outline Landscape and Ecology Management Plan (LEMP) – which outlines the holistic landscape and ecological reinstatement measures including enhancement, planting, management;
  - Outline Peat Management Plan (PMP) – which details the management of peat following the Phase 1 peat probing survey;
  - Outline Surface Water Management Plan (SWMP) – which outlines how water quality will be maintained, watercourse protection and the protection of private water supplies;
  - Outline Access Management Plan – which outlines the diversions, closures and management of recreational and formal access routes and paths within the Development Site and connections to them outside the boundary.
  - Materials Management Appraisal (MMA) – which provides an engineering justification for the management of materials that will be excavated to create the infrastructure associated with the Development.
- Decommissioning Plan which sets out the framework for how the Development will be decommissioned, if and how structures will be removed, compounds, traffic and overall measures for environmental protection.

- The architectural design of the buildings and structures within the Development Site will seek to assimilate them into the surrounding landscape as much as possible by using simple, clean forms and a palette of materials and colour which lessens the contrast with the surrounding landscape.
- Due to the proximity of known archaeological assets to the construction work areas, it is envisaged that an Archaeological Watching Brief (AWB) will be conducted. The AWB will be conducted by a suitably qualified Archaeological Clerk of Works (ACoW) during site clearance. The AWB will be implemented when stripping in the vicinity of known assets and virgin ground.
- Tree protection measures such as dust screens and fencing to separate trees from working areas will be implemented along the Temporary Access Track within the area of Ancient Woodland on the slopes up from the bank of Loch Ness. Good practice tree protection measures expected to be implemented on-site are detailed within the outline CEMP
- The best available construction methods shall be employed at all times, having regards to the principles of Best Practicable Means (BPM) to minimise noise and vibration impacts during the construction of the Development. Measures to achieve BPM will be adopted through the CEMP.
- Post-construction local paths affected by the Development will be realigned and made good using appropriate materials for path use. Longer diversions on the core paths will be left insitu.
- Implementation of the Woodland Restructuring
- The design of the Development has minimised the requirement for additional structures, which has kept the Headpond and the Tailpond shoreline as uncluttered as possible
- Temporary Access Road will be removed and the ground reinstated to minimise the operational visual impacts of the Development.
- Operational Controlled Activities Regulations (CAR) Licence and operational arrangements around flood and drought conditions.

# 4. Approach to Environmental Impact Assessment

## 4.1 Assessment of Receptors

4.1.1 For each specialist topic area, sensitive 'receptors' are identified which may be affected by the Development. This includes living organisms, habitats, natural resources, receptors in the historic environment in or around the Development Site, which could be adversely affected during construction of the Development, during the operation of the Development, or during decommissioning of the Development.

4.1.2 The assessment methodology used for the EIA Report was broadly the same for all topic areas. For each topic, the assessment of significance is informed by the sensitivity of the existing or baseline environmental conditions or character, and the magnitude of the change to the existing conditions or baseline character which is expected to occur as a result of the Development.

4.1.3 The value or sensitivity of the receptors is assessed according to the relative importance of existing environmental features on or near to the site, or by the sensitivity of receptors, i.e. whether they are likely to be robust enough to be unaffected by the Development or alternatively are highly susceptible to the type of effects likely to occur.

4.1.4 Table 3.1 provides general definitions of the sensitivity criteria used within the assessment.

**Table 4.1 Generic Guidelines for the Assessment of Value / 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. |

## 4.2 Measurement of Magnitude of Environmental Impacts

4.2.1 The magnitude of potential effects on environmental baseline conditions is identified through consideration of the Development. Where the design is not yet fixed, we have considered the parameters and assessed the "worst case" scenario to ensure that the assessment is robust and describes the fullest extent of likely effects. The setting of parameters for assessment in this way is sometimes referred to as the "Rochdale Envelope" approach. The assessment of magnitude of changes takes into account the scale or degree of change from the existing situation as a result of the effect being considered; and the duration and reversibility of the effect, as well as consideration of relevant legislative or policy standards or guidelines.

4.2.2 To this end, where flexibility in parameters for the Development (such as the height of the embankment) has been provided, the Applicant has assessed the realistic worst case and it is made clear in each 'topic' assessment what this constitutes.

4.2.3 Table 3.2 provides general definitions of effect magnitude criteria. In each specialist chapter of the EIA Report, effect magnitude criteria will be explained with reference to that particular discipline.

**Table 4.2 Generic Guidelines for the Assessment of Magnitude**

| Magnitude | Definition |
|---|---|
| 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. |

## 4.3 Measurement of Significance of Environmental Effects

4.3.1 A combination of the magnitude of the effect and the sensitivity of the receptor determines the significance of effect (Table 3.3). For instance, when a receptor that is deemed very sensitive to change is exposed to an environmental impact of high magnitude, the resultant effect on the receptor will be classed as Major. It should be noted that this general approach is a framework and should not be treated as a matrix.

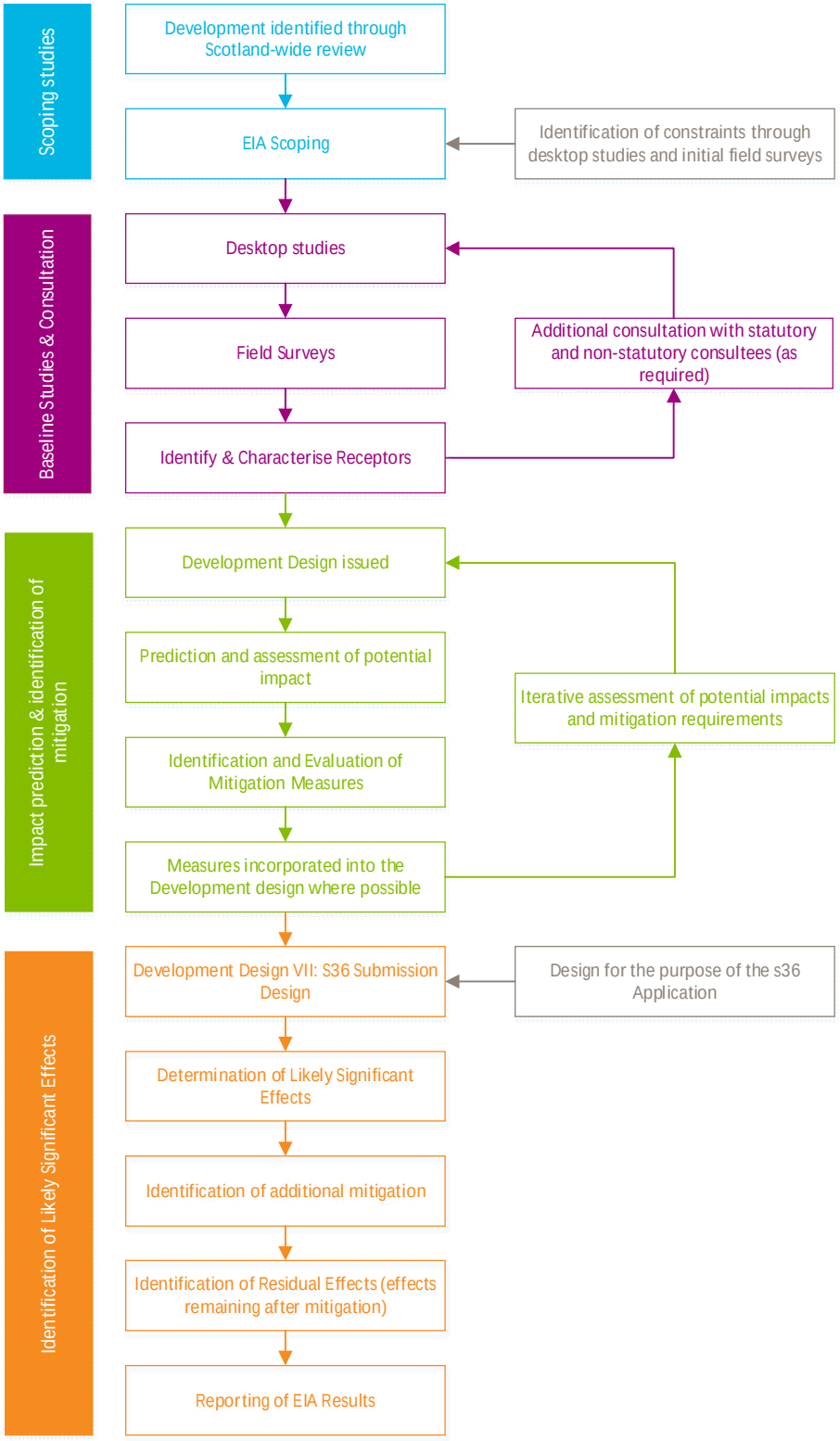
4.3.2 The issue may have a positive or negative impact on the receptor. Therefore, the significance of effects is reported using a seven-point scale, from: Major Adverse; Moderate Adverse; Minor Adverse; Negligible; Minor Beneficial; Moderate Beneficial; to Major Beneficial. For some assessments, professional judgement has been applied. Where this is the case, it is indicated in the topic chapter and the variation will be explained clearly and fully.

4.3.3 Generally, effects which are Major or Moderate are considered to be significant. Minor and Negligible effects are considered to be not significant.

**Table 4.3 Classification of Effects**

| | Sensitivity | | | | |
|---|---|---|---|---|---|
| **Magnitude** | **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 |

4.3.4 The EIA process can be summarised within the flow chart below:




**Insert 4.1 EIA Process**

## 4.4 Consultation

4.4.1 The Applicant has engaged with multiple stakeholders as part of the pre-application process. Meetings have been undertaken with the following stakeholders including two public consultation events on the 27 and 28 June 2018, held in Dores. Over 100 people attended the public consultation events. Further details can be found in the Pre-Application Consultation Report, which has been submitted with this application

**Table 4.4 Overview of Consultation**

| Date | Consultees in Attendance | Discussion |
|---|---|---|
| May 2017 | SEPA & Scottish Water | Discussion around using Loch Duntelchaig and awareness of invasive species. |
| 17 August 2017 | SEPA & SNH | Informal meeting to introduce the Development and project team. |
| 17 August 2017 | THC | Informal meeting to introduce the Development and project team. |
| 24 August 2017 | ECU | Introductory meeting to the Applicant and Development. |
| 25 September 2017 | Historic Environment Scotland (HES) | Introductory meeting to the Development and to discuss the Scoping Report chapter. Minutes contained in Appendix A.1 of the Gate Check Report (Appendix 4.5 Volume 5). |
| 27 September 2017 | Multiple | THC Pre-application meeting – advice pack from the meeting provided in Appendix 4.1 (Volume 5). |
| 5 April 2018 | ECU | Meeting to discuss Scoping Opinion and progress on Section 36 application. |
| 27 April 2018 | SEPA | Meeting to discuss Scoping Opinion, requirement for invasive species management and screening, and Phase 1 peat probing – minutes provided in Appendix A.3 of the Gate Check Report (Appendix 4.5 Volume 5). |
| 22 June 2018 | ECU | Progress meeting on Section 36 Application. |
| 27 June 2018 | THC | Private viewing of the public exhibition (SEPA and SNH also invited but could not make it). |
| 28 June 2018 | Community Councils | Private viewing of the public exhibition where Dores & Essich, Glenurquhart, Strathnairn, Inverness West and Stratherrick and Foyers Community Councils attended. |
| 5 September 2018 | Forestry Commission Scotland | To discuss the forestry plan and felling proposals. |
| 1 October 2018 | Gate Check Meeting and Site Visit | Attendance by ECU, SEPA, SNH and THC. |

# 5. Assessment Findings

## 5.1 Introduction

5.1.1 The EIA Report identifies the key environmental topics that have been assessed. For each assessment topic, the EIA Report describes the methodological approach to assessment, provides existing information on the local environment (the environmental 'baseline'), and describes the potential effects on that environment during construction, operation and decommissioning.

5.1.2 The environmental topic areas reported on in the EIA Report are summarised below.

## 5.2 Geology and Ground Conditions

5.2.1 A desk study and site walkover was undertaken in combination with intrusive site investigation works (borehole and trial pits) and peat probing over the Development Site Boundary to ascertain the geology and ground conditions. In summary, one sensitive receptor was identified: peat located within the Development. This was assigned a sensitivity value of medium as these areas of peat are not mapped by Soils Scotland as 'peat soil' and therefore not considered nationally important. The peat affected has also been modified due to commercial forestry.

5.2.2 Other than peat, no other features associated with geology or ground conditions (including contaminated land, fault lines and seismic activity) have been identified as a sensitive receptor therefore impacts have been scoped out.

5.2.3 Although the impacts on geology have largely been scoped out, during the construction phase substantial excavation, tunnelling and earthworks will be undertaken. One of the main design principals embedded within this Development was to minimise any unsuitable / excess material by balancing the material that is generated from the excavation works with the works associated with construction of the Headpond Embankment. The results of the desk top study and the SI have shown that the material at or near the surface will likely be suitable for the proposed design of the Headpond Embankment. However, there will be a percentage of this material that is not suitable for use during construction. Therefore to demonstrate the balance of the excavated material with the construction of the Headpond embankment a Materials Management Appraisals Assessment (MMA) has been produced.

5.2.4 Potential effects have been assessed prior to mitigation, with the residual effects after implantation of the mitigation measures resulting in peat being the only sensitive receptor, which could be potentially affected by excavation for the Development infrastructure, resulting in loss of peat. This permanent, adverse effect can be mitigated through the layout design being developed to minimise infrastructure in areas of peat. Appropriate peat guidance will also be adhered to and an outline Peat Management Plan to be implemented. As such, there are no significant residual effects anticipated to remain after the implementation of mitigation.

## 5.3 Terrestrial Ecology

5.3.1 This assessment identifies ecological designated sites, habitats, species or ecosystems which may be affected by the Development and assessed the likelihood of significant effects. This chapter also considers potential effects from air quality, noise, water, landscape, and lighting on ecological receptors.

5.3.2 A desk based study has been undertaken for a 2 km radius for nationally and locally non-statutory designated sites (SSSI, SINC) and 10 km for internationally designated sites (Ramsar, SAC, SPA). A search for records of protected and/or notable species within 2 km of the Development was also carried out.

5.3.3 The following ecological surveys have been undertaken to establish the ecological baseline:

- Phase 1 Habitat
- NVC
- Bat
- Badger
- Red Squirrel
- Otter
- Pine marten
- Wildcat
- Water vole
- Great crested newt
- Reptile
- Butterfly, dragonfly & damselfly

**Residual Effects**

5.3.4 Further to the embedded mitigation described in Chapter 3, additional mitigation will also be implemented including pre-construction surveys including micro-siting of access roads and any infrastructure that could impact GWDTEs. In addition, adverse effects on ancient woodland have been mitigated through careful siting of the Development and proposed fencing to exclude deer. Therefore the assessment concludes the following residual effects:

*Construction of the Development*

5.3.5 Permanent **Moderate adverse** habitat loss to semi-natural ancient broadleaved woodland.

5.3.6 Permanent **Moderate beneficial** effects to:

- Vegetation containing frequent juniper from the landscaping planting plan incorporating a large area of juniper woodland.
- Foraging and commuting bats from habitat creation including native broadleaved and mixed native woodland and **Negligible** effects from construction lighting pollution.
- Sika deer displacement through installation of deer fencing.

5.3.7 Permanent **Minor adverse** habitat loss to blanket bog, basic flush, flushed wet heath and groundwater dependent terrestrial ecosystems (GWDTE).

5.3.8 Permanent **Minor adverse** effects on red squirrels from loss of dreys during site clearance and from loss of supporting woodland habitat loss and **Negligible** effects from temporary construction access tracks and associated increase in vehicular traffic.

5.3.9 Temporary **Minor adverse** effects on foraging badgers from loss of optimal foraging habitat and **Negligible** effects from loss of sub-optimal woodland foraging habitat.

5.3.10 Temporary **Minor adverse** effects on roosting bats from noise and vibration during construction activities and permanent **Minor beneficial** effects from artificial roosting habitat creation.

5.3.11 Temporary **Minor adverse** effects on:

- Habitat loss to long-established woodland of plantation origin with Scots pine
- Foraging and commuting pine marten from loss of woodland habitat

5.3.12 Temporary **Minor adverse** effects on small pearl-bordered fritillary from habitat loss, and **Negligible** effects from dust.

5.3.13 **Negligible** effects on:

- Notified lichen species within Creag nan Clag SSSI from dust generated during construction.
- Other semi-natural broadleaved woodland from construction activities.
- Dry heath, typical wet heath, oligotrophic waterbodies, acid/neutral flush, swamp, watercourses, flushed purple moor grass and unimproved neutral grassland.
- Badger sett habitat from construction activities, badger sett habitat and badger mortality from temporary construction access tracks and associated increase in vehicular traffic.
- Direct mortality of otters and commuting or foraging otters through disturbance and/or barrier to movement from new watercourse crossings or construction of inlet/outlet structure.
- Pine marten sheltering habitat from site clearance activities; on foraging and commuting pine marten from disturbance during construction activities; and on pine marten mortality from temporary construction access tracks and associated increase in vehicular traffic.
- Great crested newts and common lizard from disturbance, on their habitats or direct mortality from increased vehicular traffic.
- Butterflies, dragonflies and damselflies from disturbance, habitat loss or dust.
- Rhododendron spread.

*Operation of the Development*

5.3.14 **Negligible** effects on:

- Bats from security lighting during operation.
- Otters from barrier to movement, security lighting and mortality.
- Great crested newts and common lizard from habitat loss and creation.
- Butterflies, dragonflies, damselflies and small pearl-bordered fritillary from habitat loss and creation.

*Decommissioning of the Development*

5.3.15 **Negligible** effects on:

- Red squirrels from mortality from increased vehicular traffic on public roads.
- Common lizard, butterflies, dragonflies, damselflies and small pearl-bordered fritillary from loss of aquatic habitat from Headpond drainage.
- Invasive non-native species from spread.

**Conclusions**

5.3.16 One significant (Moderate) residual adverse effect and two significant (Moderate) residual beneficial effects were assessed during construction. No significant effects are predicted during operation and decommissioning. The implementation of embedded mitigation inherent within the design and the additional mitigation measures such as replacement habitats where possible via the LEMP and pre-construction surveys have minimised the impacts.

## 5.4 Aquatic Ecology

5.4.1 This assessment identifies the ecological impacts and effects of the Development on aquatic habitats, namely Loch Ness, smaller lochs and watercourses throughout the Development Site and assessed the likelihood of significant effects.

5.4.2 A desk study was carried out to identify international nature conservation designations within 10km of the Development site boundary, and other national statutory and local non-statutory nature

conservations designations and notable habitats within 2 km of the Development Site boundary, including invasive non-native species (INNS).

5.4.3 The following field surveys were undertaken to establish the aquatic baseline:

- Invasive non-native species
- Macrophyte survey;
- Macroinvertebrate survey and analysis; and
- Fish habitat assessment.

**Residual Effects**

5.4.4 Further to the embedded mitigation described in Chapter 3, additional mitigation will also be implemented by means of the Controlled Activities Regulations (CAR) Licence and further surveys and pre-commencement checks. In addition, piling activities will avoid key migratory seasons for Atlantic Salmon and lamprey. Therefore the assessment concludes the following residual effects:

*Construction of the Development*

5.4.5 Eventhough the Development will avoid piling activities during the migratory seasons of Atlantic Salmon, a precautionary temporary **Moderate adverse** effects on Atlantic salmon and lamprey, and other fish species, within Loch Ness through direct mortality or injury from construction activities including piling and de-watering has been predicted as a very worst case, and **Negligible** effects from material transport and INNS spread.

5.4.6 Temporary **Minor adverse** effects on flowing watercourses from new watercourse crossings including culverts from sedimentation and alterations to flow.

5.4.7 **Negligible** effects on:

- Loch Ashie SPA and SSSI water quality, sedimentation and introduction of INNS.
- Habitats within Loch Ness from temporary disturbance to the shoreline and margins of Loch Ness; disruption and removal of substrate, including dredging after removal of the Cofferdam, and de-watering.
- Loch Ness from spread of INNS by barge transport and construction activities; and impacts due to substrate and sediment removal and mobilisation, together with run-off from stockpiled material on the loch shore.
- Loch Duntelchaig, Lochan an Eoin Ruadha and Loch na Curra from run-off impacting water quality, sedimentation and INNS.
- Water quality and potential for INNS spread of the Allt a' Mhinisteir and other receiving watercourses and aquatic habitats, including ponds, from construction of the Headpond and Embankment and material transport.
- Aquatic macrophyte and aquatic macroinvertebrate community from construction activities including watercourse crossing, access tracks, Headpond construction, transportation of material and potential for INNS spread.
- Resident brown trout and other fish species within flowing watercourses within the Development site from watercourse crossings, temporary access tracks, construction of the Headpond, transportation of material, sedimentation, reduction in water quality and INNS spread.

*Operation of the Development*

5.4.8 **Minor adverse** effects on flowing watercourses and aquatic macrophyte and aquatic macroinvertebrate community and **Negligible** effects on resident brown trout from operation of new watercourse crossings and culverts impacting upon fish passage and permanent compounds including land take.

5.4.9 **Negligible** effects on:

- Loch Ashie SPA and SSSI, Loch Ness, Loch na Curra, Lochan an Eoin Ruadha, Loch Duntelchaig, flowing watercourses, ponds, aquatic macrophyte and aquatic macroinvertebrate community and Atlantic salmon, lamprey, other fish species (Loch Ness) and resident brown trout (flowing watercourses) from the introduction of INNS during operation.
- Loch Ness habitats, Atlantic salmon, lamprey and other fish species (Loch Ness), and aquatic macrophyte and aquatic macroinvertebrate community from operation of the inlet/outlet structure, including Screen.
- Atlantic salmon and lamprey species (Loch Ness) from rheotactic (the tendency of fish to face into an oncoming current) distraction by attracting migratory fish such as salmon from their migration path.

*Decommissioning of the Development*

**5.4.10** **Minor adverse** effects on flowing watercourses from surface water run-off and associated siltation and pollution.

5.4.11 **Negligible** effects on:

- Loch Ashie SPA and SSSI, Loch Duntelchaig, Lochan an Eoin Ruadha, Loch na Curra, ponds, aquatic macrophyte and aquatic macroinvertebrate community, brown trout within flowing watercourses and fish species within Loch Ness from surface water run-off and associated siltation, sedimentation and pollution.
- Loch Ness habitats and substrate disturbance and sediment mobilisation from removal of inlet/outlet structure and screen.
- Atlantic salmons, lamprey and other fish species within Loch Ness from direct mortality and injury of fish in the precise locality of the works.

**Conclusions**

5.4.12 One temporary Moderate adverse effect has been identified during the Construction phase. No significant effects are predicted during Operation and Decommissioning. The implementation of embedded mitigation inherent within the design and the additional mitigation measures such as set out within the CEMP, SWMP and Biosecurity Management Plan have removed, reduced or offset impacts as far as practically possible including the avoidance of key migratory seasons of aquatic species to avoid any likely significant effects.

## 5.5 Ornithology

5.5.1 This assessment identifies the ornithological impacts and effects of the Development and assessed the likelihood of significant effects.

5.5.2 A desk study was carried out to identify nature conservation designations, and protected and notable species potentially relevant to the Development. A stratified approach was taken when defining the desk study area, based on the likely zone of influence of the 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 boundary and other national statutory and local non-statutory nature conservations designations and notable species within 2 km of the Development Site boundary.

5.5.3 The following field surveys were undertaken to establish the ornithology baseline:

- Common Bird Census (CBC)
- Moorland breeding bird survey
- Breeding diver and grebe survey
- Black grouse lek survey
- Breeding raptor survey

**Residual Effects**

5.5.4 Further to the embedded mitigation described in Chapter 3, the following additional mitigation will also be implemented: reinstatement and enhancement measures for ornithological features via the Outline LEMP, and general mitigation measures within the CEMP. In addition, piling and blasting activities will be undertaken outside of key breeding seasons of the Slavonian Grebe and Red Throated Diver, and an alternative entrance is proposed should these species be confirmed breeding on Loch na Curra.

*Construction of the Development*

5.5.5 Permanent **Moderate beneficial** effects on black-throated diver from habitat improvements as part of the landscape design.

5.5.6 Permanent **Minor beneficial** effects on:

- Black grouse from felling of woodland habitat which is unsuitable for this species, and the incorporation of productive native and mixed native woodland within the landscaping proposals.
- Osprey from loss of potential nesting habitat due to the enhancement measures proposed including an artificial osprey nest.
- Notable red-listed passerines and red-throated diver from loss of territories/habitat due to improvements in the landscaping proposals.

5.5.7 Temporary **Minor adverse** effects

- Qualifying species Slavonian grebe at Loch Ashie SPA and SSSI from noise generated during construction activities.
- Qualifying species Slavonian grebe at Loch Ashie SPA and SSSI from run-off of sediment and pollutants from construction activities in Headpond area and tree felling within the Loch Ashie catchment which has the potential to increase run-off to the waterbody.
- General breeding birds from the potential accidental destruction of active nests as a result of tree felling and other vegetation clearance where this work is undertaken during the bird breeding season.
- Black grouse during tree felling activities which could disturb foraging, and Negligible during tree felling for this species due to accidental destruction of nests sites containing chicks.

5.5.8 **Negligible** effects on:

- Qualifying species Slavonian grebe at Loch Ashie SPA and SSSI from blasting activities.
- Crested tit, Crossbill and wader species from tree felling and loss of or shift in territory boundary.

- Red-throated diver, black-throated diver, Slavonian grebe and black grouse from increased noise, traffic and general construction disturbance.
- Barn owl from loss of non-breeding roost within a tree and loss of habitat and disturbance.
- Breeding and foraging hen harriers, red kite, peregrine and osprey due to lack of existing suitable habitat and the latter three species tolerance to human activities.

*Operation of the Development*

5.5.9 **Negligible** effects on:

- Loch Ashie SPA and SSSI from changes to water levels due to installation of the Headpond altering surface water flows and from the spread of INNS between the Headpond and Loch Ashie during operation.
- Wader species from proposed planting plans, which will not encroach on wader breeding habitat.
- Red-throated diver, black-throated diver, Slavonian grebe or osprey from introduction of a new water habitat as a foraging or breeding ground. The installation of a screen will also prevent bird mortality at the inlet/outlet.

*Decommissioning of the Development*

5.5.10 **Negligible** effects on:

- Loch Ashie SPA and SSSI from loss of aquatic habitat on drainage of the Headpond given its limited value for displaying or loafing Slavonian grebe.
- Red-throated diver, black-throated diver or hen harrier from disturbance and increase in vehicular traffic.
- Hen harrier from restoration of the Headpond Embankment seeded with heather creating a suitable nesting habitat for this species.

**Conclusions**

5.5.11 One permanent significant (Moderate) beneficial effect has been identified during the construction phase. No significant adverse effects are predicted at any stage of the development. The implementation of embedded mitigation inherent within the design such as measures set out within the CEMP and LEMP have minimised and offset the impacts where possible.

## 5.6 Flood Risk and Water Resources

5.6.1 This assessment identifies the potential effect on flood risk and water resources from the Development and assessed the likelihood of significant effects. Details of water quality, hydromorpholgy and hydrogeology are covered in Water Environment section 5.7.

5.6.2 A desk study was carried out to establish flood data and identify the hydrological features associated with the Development. The significant water features included in this assessment were assessed to be Loch Ness, Loch Dochfour, Caledonian Canal, Loch Ashie, Loch Duntelchaig and the River Ness.

5.6.3 A Flood Risk Assessment was also undertaken to evaluate the impact of the Development on flood risk from the construction and operation of the Development. A Water Resource Assessment was also undertaken which reviews the current water resource usage and working parameters for the key receptors. It assesses the potential impact on water resources as a result of the Development and addresses appropriate mitigation measures to reduce the impact of the Development including outlining the operational rules.

**Residual Effects**

5.6.4 The assessment of residual effects below assumes that the embedded mitigation is implemented. Additional mitigation includes that within the CEMP, which outlines the outline contents of the Emergency Response and Flood Risk Management Plan. This contains measures to be implemented to avoid any significant adverse effects to the identified receptors during the construction phase. The Outline Surface Water Management Plan will also ensure suitable design of surface water drainage for the Development.

*Construction of the Development*

5.6.5 **Negligible** effects on offsite properties, onsite users and the Development from flooding due to temporary increases in impermeable area and compacted ground; temporary water storage and increased flow due to dewatering activities.

*Operation of the Development*

5.6.6 **Negligible** effects on:

- Loch Ness, River Ness and Caledonian Canal Water Level from discharging to Loch Ness under normal operation.
- Offsite properties, onsite users and Development infrastructure from risk of flooding from the Headpond during operation.
- Offsite properties, onsite users and development infrastructure from an embankment breach.
- Loch Ness, River Ness and Caledonian Canal Water Level from reduction in water levels in Loch Ness during low flows.

*Decommissioning of the Development*

5.6.7 **Negligible** effects on flood risk downstream due to the Headpond being a non-impounding reservoir and loss of storage will not have an impact on flood risk downstream.

**Conclusions**

5.6.8 There are no predicted significant flood risk effects on any identified receptors during construction, operation or decommissioning. The implementation of embedded mitigation such as the CEMP, Outline Surface Water Management Plan, maintenance plans, and CAR licence have minimised residual effects as far as reasonably practicable.

5.6.9 In addition the Development will be required to comply with the Reservoirs Act, and have a Panel Engineer approve the finalised design of the Embankment and Headpond. The Development will be subject to stringent regular inspections throughout its operational life.

## 5.7 Water Environment

5.7.1 This assessment identifies and assesses the potential effects of the Development on surface water quality, groundwater quality and hydromorphology. There is interaction between topics with flood risk and water resources addressed within Section 4.6 above, which considers the potential effects on hydrology, flood risk and water resources. A Water Framework Directive assessment on designated water bodies was also undertaken.

5.7.2 A desk study was carried out to determine the baseline upon which effects have been assessed and included a Study Area of 1km buffer from the Development Site boundary. A field survey was also undertaken to identify and characterise surface water receptors, to consider the flow pathways between water bodies and across the Study Area, and to make general observations about the

character of the landscape and other relevant features that could influence the sensitivity of water bodies and the prediction of potential effects from the Development.

5.7.3 The Development is surrounded by three main lochs, Loch Ashie, Loch Ness and Loch Duntelchaig and several small lochs and watercourses associated to them.

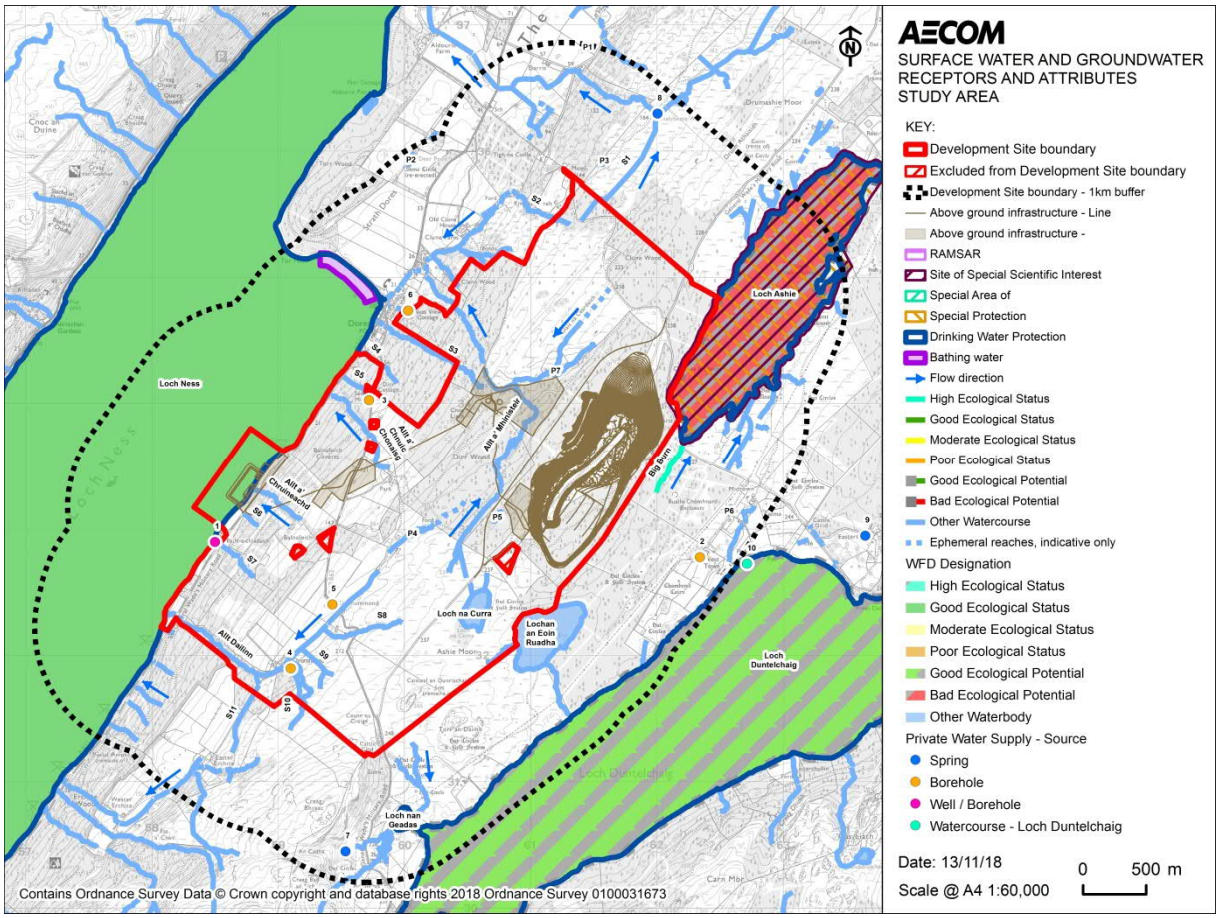



**Figure 5.1 Surface Water and Groundwater Receptors**

**Residual Effects**

5.7.4 The assessment of residual effects below assumes that the embedded mitigation is implemented. Additional mitigation including the CEMP, outline SWMP, Outline Surface Water Management Plan and pre-construction and construction phase surface water monitoring will also be implemented to reduce or offset significant adverse effects to the identified receptors as far as practicably possible.

*Construction of the Development*

5.7.5 Temporary **Moderate adverse** effects on Loch Ness from construction site runoff resulting in sedimentation and pollution from chemical spillages.

5.7.6 Temporary **Minor adverse** effects on:

- Big Burn from construction site runoff – Changes in morphology due to temporary increases in peak flows and fine sediment deposition.
- Allt'a Chnuic Chonaisg, Allt a' Chruineachd, short drains S3 and S6 and Allt a' Mhinisteir from construction site runoff resulting in sedimentation and chemical spillages.

5.7.7 **Negligible** effects on:

- Borehole drinking private water supplies (PWS) at Balachladaich and Kindrummond and Dirr Cottage and Ness View Cottage from construction activities.
- GWDTE to the north east of tunnel portals from availability of groundwater to support the GWDTEs.
- Groundwater quality on Inverness groundwater body from construction of the Headpond.
- Bathing waters at Dores (Loch Ness) from Water qualNGRity (foul waste water).
- Allt a' Mhinisteir from hydromorphological changes from new or upgraded watercourse crossings and diversion– disruption of sediment transport processes and construction site runoff – Changes in morphology due to temporary increases in peak flows and fine sediment deposition.
- Pond 7 from Construction site runoff – suspended fine sediments, construction site runoff or chemical spillages.
- Allt a' Chruineachd and Allt a' Chnuic Chonaisg from Hydromorphological effects from new temporary crossing.

*Operation of the Development*

5.7.8 Permanent **Moderate adverse** effects on Loch Ness from Loss of loch bed due to construction of new structures in the littoral zone.

5.7.9 Temporaryand very short term **Moderate adverse** effects on Loch Ness from concrete residues from Headpond construction. (impact is uncertain and precautionary and would be very short term and temporary)

5.7.10 Permanent **Minor adverse** effects on (although :

- Three private water supplies and Inverness Groundwater body from operation of Waterways, Tunnels and Power Cavern due to ingress of groundwater (although unlikely due to depth, to be confirmed at detailed design stage).
- Loch Ness from destabilisation of summer thermal stratification and temperature changes from water discharges at the Outlet.
- Inverness groundwater body during operation of the Headpond due to the potential for impact on water resources and water quality.
- Allt a' Mhinisteir and Big Burn from hydromorphological changes – loss of catchment area.
- Allt a' Chruineachd from diversion of approximately the final 50 m before it flows into Loch Ness including a section to be culverted.

5.7.11 Permanent, episodic **Minor adverse** effects on Loch Ness from algal blooms from thermal stratification disruption, organic sediments discharge from the Headpond.

5.7.12 **Negligible** effects on:

- Loch Ness from sediments discharge from the Headpond and spillage risk.
- Bathing waters at Dores (Loch Ness) from Water quality (foul waste water).
- Allt a' Mhinisteir from spillage risk and potential water quality impacts from surface water runoff.
- Loch Ashie from surface water runoff.

5.7.13 **No impact** on Loch Ness from changes in water levels resulting in changes in water quality.

*Decommissioning of the Development*

5.7.14 It is assumed that the decommissioning of the Development will require similar activities to construction, potentially with additional crushing of construction materials and removal of drainage

pipework containing residual water and sediment, although it would be expected that the Headpond would remain in situ and would not need to be infilled. These works could result in run-off containing excessive amount of fine sediment of chemicals such as fuel oil entering the surrounding locks, watercourses and other drainage ditches present on the Development Site. A short-term and temporary **Moderate adverse** impact is predicted from run-off containing excessive fine sediment and from spillage risk on these waterbodies.

**Conclusions**

5.7.15 One temporary significant (Moderate) adverse effect has been identified during the construction phase. One temporary significant (Moderate) adverse operational effect and one permanent significant (Moderate) adverse operational effect have been assessed during the operational phase, with one temporary significant (Moderate) adverse effect at decommissioning.

5.7.16 The implementation of embedded mitigation such as the CEMP, outline SWMP, Outline Surface Water Management Plan and pre-construction and construction phase monitoring will minimise adverse effects as far as reasonably practicable.

## 5.8 Landscape and Visual Assessment

5.8.1 The Landscape and Visual assessment sets out the potential effects on landscape character and visual amenity arising from construction, operation and decommissioning of the Development.

5.8.2 A desk based study, consultation exercise and field survey were undertaken to inform the assessment. The Study Area was determined by a combination of Zone of Theoretical Visibility (ZTV) analysis and professional judgement which identified that it is highly unlikely that significant long term residual effects will be possible from further than 5 km from the Development Site boundary. The visual assessment considers a representative viewpoint beyond 5 km, however it is not considered proportionate to extend the Study Area. Viewpoints were selected to represent the experience of different types of visual receptor (viewer) including settlements and residential properties, transport and recreational routes and other outdoor locations.

**Residual Effects**

5.8.3 The assessment of residual effects below assumes that the embedded mitigation (described in Section 2.4) is implemented. All mitigation measures for the landscape and visual assessment are embedded. Whilst residual significant effects remain for some of the landscape and visual receptors, no additional mitigation it available that would be effective in further reducing effects. Photomontages are provided in Figures 5.3 and 5.4 for Viewpoints 2 and 5 respectively. The full set of visualisations is contained with Volume 4: Visualisations of the EIA Report.

*Construction of the Development*

5.8.4 **Major adverse** effect on visual amenity of:

- Viewpoint 1: Minor road adjacent to Ach-Na-Sidhe B & B,
- Viewpoint 2: Abriachan,
- Viewpoint 4: Minor road to the north-east of Loch Duntelchaig (Trail of the Seven Lochs),
- Viewpoint 5: Trail of the Seven Lochs between Loch Duntelchaig and Loch a' Choire,
- Viewpoint 10: Layby on A82; and
- Viewpoint 11: Local road near Caisteal an Dunriachaid.

5.8.5 **Moderate adverse** effects on the landscape character of Broad Steep-Sided Glen and Flat Moorland Plateau with Woodland

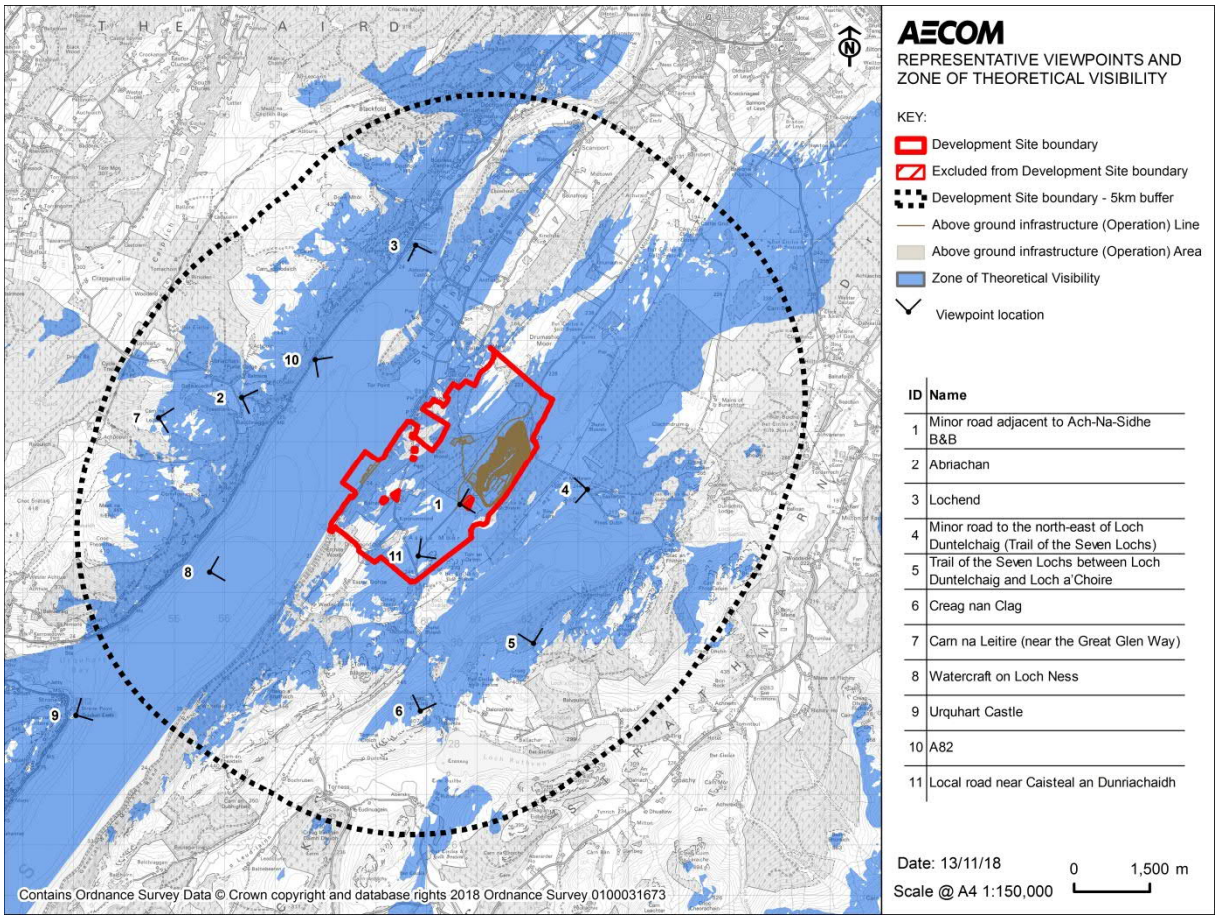



**Figure 5.2 Representative Viewpoints**

5.8.6 **Moderate adverse** effect on visual amenity of:

- Viewpoint 3: Lochend,
- Viewpoint 6: Creag nan Clag,
- Viewpoint 7: Carn na Leitire (near The Great Glen Way),
- Viewpoint 8: Watercraft on Loch Ness; and
- Viewpoint 9: Urquhart Castle.

5.8.7 **Minor adverse** effects on the landscape character of Farmed and Wooded Foothills, Rocky Moorland Plateau and Rocky Moorland Plateau with Woodland.

*Operation of the Development (Year 1)*

5.8.8 **Major adverse** effect on visual amenity of

- Viewpoint 1: Minor road adjacent to Ach-Na-Sidhe B & B,
- Viewpoint 2: Abriachan and
- Viewpoint 11: Local road near Caisteal an Dunriachaidh.

5.8.9 **Moderate adverse** effect on landscape character of Broad Steep-Sided Glen and Flat Moorland Plateau with Woodland.

5.8.10 **Moderate adverse** effect on visual amenity of:

- Viewpoint 4: Minor road to the north-east of Loch Duntelchaig (Trail of the Seven Lochs),
- Viewpoint 5: Trail of the Seven Lochs between Loch Duntelchaig and Loch a' Choire; and

- Viewpoint 10: Layby on A82.

5.8.11 **Minor adverse** effect on landscape character of Farmed and Wooded Foothills.

5.8.12 **Minor adverse** effect on visual amenity of:

- Viewpoint 3: Lochend,
- Viewpoint 6: Creag nan Clag,
- Viewpoint 7: Carn na Leitire (near The Great Glen Way),
- Viewpoint 8: Watercraft on Loch Ness; and
- Viewpoint 9: Urquhart Castle.

5.8.13 **Negligible** effect on landscape character of Rocky Moorland Plateau and Rocky Moorland Plateau with Woodland.

*Operation of the Development (Year 15)*

5.8.14 **Moderate adverse** effect on visual amenity of:

- Viewpoint 1: Minor road adjacent to Ach-Na-Sidhe B & B and
- Viewpoint 11: Local road near Caisteal an Dunriachaidh.

5.8.15 **Minor adverse** effect on landscape character of Broad Steep-Sided Glen, Flat Moorland Plateau with Woodland.

5.8.16 **Minor adverse** effect on visual amenity of:

- Viewpoint 2: Abriachan,
- Viewpoint 3: Lochend,
- Viewpoint 4: Minor road to the north-east of Loch Duntelchaig (Trail of the Seven Lochs),
- Viewpoint 5: Trail of the Seven Lochs between Loch Duntelchaig and Loch a' Choire,
- Viewpoint 6: Creag nan Clag,
- Viewpoint 7: Cairn na Leitire (near The Great Glen Way),
- Viewpoint 8: Watercraft on Loch Ness,
- Viewpoint 9: Urquhart Castle and
- Viewpoint 10: Lay-by on A82.

5.8.17 **Negligible** effect on landscape character of Farmed and Wooded Foothills, Rocky Moorland Plateau and Rocky Moorland Plateau with Woodland.

*Decommissioning of the Development*

5.8.18 Decommissioning of PSH schemes is extremely rare and in the unlikely event that the Development was to be decommissioned, the Headpond would remain in situ. As a result, potential effects on the landscape and visual resource during decommissioning would be no worse than those assessed during the construction and operational phases of works.

**Conclusions**

5.8.19 Thirteen significant adverse effects were identified during construction phase (6 Major and 7 Moderate), eight significant adverse effect during operational year 1 (3 Major and 5 Moderate) and two significant adverse effects during operational year 15 (both Moderate). The implementation of embedded mitigation inherent within the design such as measures set out within the CEMP and LEMP have minimised and offset the impacts where possible.

**Figure 5.3 Viewpoint 2 Abriachan (Year 1)**

**Figure 5.4 Viewpoint 2 Abriachan (Year 15)**

**Figure 5.5 Viewpoint 5 Trail of the Seven Lochs between Loch Duntelchaig and Loch a' Choire (Year 1)**

**Figure 5.6 Viewpoint 5 Trail of the Seven Lochs between Loch Duntelchaig and Loch a' Choire (Year 15)**

## 5.9 Forestry

5.9.1 In the UK there is a strong presumption against permanent deforestation unless it addresses other environmental concerns. In Scotland such deforestation is dealt with under the Scottish Government's "Control of Woodland Removal Policy". The purpose of the policy is to provide direction for decisions on woodland removal in Scotland. The Development lies within existing commercial forestry plantations, which is privately owned and managed. Areas of forestry would require to be cleared for the construction and operation of the Development. The forestry proposals have been developed to identify areas of forest to be removed, including habitat management works; identify those areas which may or may not be planted as part of the Proposed Development; and describe management practices for the forestry works.

5.9.2 The Forestry Study Area extends to approximately 948.9 hectares (ha) and contains a wide variety of woodland types and age classes. The main area of productive, commercial forestry lies to the south east of the Forestry study Area and is comprised principally of Scots pine with some areas of Sitka spruce and other conifers. There has been recent felling and restocking within the study area with a few areas of ground currently felled awaiting restock.

5.9.3 The Development felling programme would largely be driven by technical constraints. Within forests habitats, areas of crop require to be felled to accommodate the construction and operation of a Development. Typically, buffers are placed around each item of infrastructure, in addition to the area required for the main engineering works; and a 25 m - 30 m wayleave for access roads, though this is project and site dependent. In certain cases, further felling may be required for landscape, ecology and forest management purposes in addition to the felling required for the infrastructure. In this case considering technical and environmental constraints a 50 m corridor will be felled for road lines. There will be additional felling to facilitate a variety of objectives concerning landscape and visual impact, ecology and forest landscape design.

5.9.4 The Development restocking plan shows which woodlands would be restocked and with which species. No replanting would be carried out on the areas to be felled for the Development's permanent infrastructure or for habitat management, forest management or forest design purposes. As a result, there would be a net loss of woodland area of 12.1 ha. In order to comply with the criteria of the Scottish Government's Control of Woodland Removal Policy, off-site compensation planting would be required.

## 5.10 Archaeology and Cultural Heritage

5.10.1 This assessment identifies the potential effect on heritage assets (archaeological remains, historic buildings and historic landscapes) that are likely to arise from construction, operation, and decommissioning of the Development.

5.10.2 A desk study with consultation exercise and site walkover was undertaken to identify the location, type and significance of heritage assets and their setting. A study area of 1 km around the Development Site boundary was considered in order to understand the nature of the cultural heritage landscape surrounding the Development, with a wider 3 km search of designated assets reviewed where the Development might have an impact on setting.

**Residual Effects**

5.10.3 The assessment of residual effects below assumes that the embedded mitigation is implemented. Additional mitigation including micro-siting of Access Tracks, or reducing the working width of Access Tracks within the Limits of Deviation, to avoid heritage assets will also be undertaken to minimise adverse effects.

*Construction of the Development*

5.10.4 **Moderate adverse** effects on:

- Caisteal an Dunriachaidh fort due to the impact on the setting of the asset.
- Ten features including enclosures and clearance cairns in Dirr Wood resulting in possible total loss due to construction of Temporary Access and Ancillary Tracks, Compounds and Spillway.
- Wester Drumashie Farm due to total loss from construction of the new public access.
- Loch Ashie Cairnfield and Loch Ashie field system from partial loss of any surviving assets due to Headpond construction.

5.10.5 **Minor adverse** effects on:

- Two sections of the Military Road from partial loss due to construction of the Headpond and partial loss due to works on infrastructure.
- Ashiemoor Cairnfield and eight possible road stone quarries from total loss due to construction of the Headpond.

5.10.6 **No impact** on a possible road marker with bench mark and Merchants stone from total loss due to construction of the Headpond.

*Operation and Decommissioning of the Development*

5.10.7 The archaeological assets will have been removed during the construction phase therefore there will be no effects on archaeological assets during the operational or decommissioning phases. No further effects on the setting of heritage assets will take place during the operation or decommissioning of the Development

**Conclusions**

5.10.8 Five significant (Moderate) residual adverse effects are predicted as a result of construction of the Development. No significant impacts are predicted during the operation or decommissioning phases. The implementation of embedded mitigation in combination with additional mitigation such as micro-siting of Access Tracks, or reducing the working width of Access Tracks within the Limits of Deviation, to avoid heritage assets will also minimise adverse effects.

## 5.11 Socio-Economics and Tourism

5.11.1 This assessment identifies the potential environmental effects to socio-economics and tourism as a result of the Development.

5.11.2 A desk study and consultation exercise was undertaken for a 5km Study Area from the red line boundary in order to ensure consideration of receptors in the wider area around the Development Site. Data was collated on the environmental conditions, resources and receptors that currently exist within the Development Site and in the surrounding area covering the following key topics: existing land use, socio-economics, tourism, tourism industry and tourism receptors.

**Residual Effects**

5.11.3 The assessment of residual effects below assumes that the embedded mitigation is implemented. Additional mitigation will also be implemented including a “meet the developer day” with local businesses, further consultation with the fish farm owners regarding relocation, production of a finalised CTMP, authorising use of the Jetty for recreation, erection of educational signage, community consultation over the types of recreational route reinstatement materials and requirement for upgrades in addition to communication on the Access Management Plan.

*Pre-Construction of the Development*

5.11.4 **Minor beneficial** effects on:

- The local economy due to the potential for increase in local expenditure during the pre-construction phase. Workers may stay in locally available accommodation.
- The local job market from the potential for the creation of local jobs.

5.11.5 **Minor adverse** effects on:

- Access to land due to access being restricted in certain parts of the Development Site during pre-construction.
- Ach-Na-Sidhe B&B as pre-construction activities could produce a disturbance and impact amenity of B&B which may deter visitors.

5.11.6 **Minor adverse/negligible** effects on tourism and recreation routes as there may be some loss of amenity on recreation routes which are nearer to pre-construction works.

*Construction of the Development*

5.11.7 **Moderate beneficial** effects on the local economy from the potential for increase in local expenditure during the construction phase. Workers may stay in locally available accommodation.

5.11.8 **Moderate adverse** effects on:

- Access as access will not be permitted in certain parts of the Development Site during construction.
- Tourist services from the increase of personnel working in the area which could reduce the accommodation available to tourists.

5.11.9 **Minor beneficial** effects on the local job market from the potential of creation of local jobs.

5.11.10 **Minor adverse** effects on:

- Ach-Na-Sidhe B&B from construction activities which could produce a disturbance and impact amenity of B&B which may deter visitors.
- Loch Ness fish farm as in water works at the Tailpond may disturb fish at the fish farm which could impact the business itself.
- Local community as no direct impacts to communities are predicted. Views of construction will not change day to day activities.
- Accommodation due to on-site accommodation having the potential to impact on the local community.
- Visitor attractions as views of construction from visitor attractions could impact amenity and deter visitors.
- Lochs due to a small portion of Loch Ness will be unavailable for recreational activities during construction.
- Kindrummond to Dirr Wood Highland Council Core Path (IN12.04), The Drumashie Moor Highland Council Core Path (IN12.05), The South Loch Ness Trail, The Trail of the Seven Lochs, National Cycle Route 78, due to partial closures and diversions.
- Local path network - Some local paths will be retained and will be open to users during construction. Other will be closed for duration of the construction period and some will be closed temporarily during construction. The local paths which are in the location of the head pond will be closed permanently.

5.11.11 **Minor adverse/Negligible** effects on races and other outdoor events which use local recreation routes as they could be impacted by construction activities.

5.11.12 **Negligible** effects on:

- The C1064 from permanent realignment prior to construction. This realignment will include the provision of a path which can be used for recreation. It will be available to recreation users throughout the construction period.
- B862 due to increased traffic during construction.
- An Torr Highland Council Core Path (IN12.01) and Fair Headed Lad's Pass Core Path (17.01) due to surrounding diversions.
- Great Glen Way and Great Glen Canoe Trail as there are no predicted direct impact as a result of construction activities.

*Operation of the Development*

5.11.13 **Minor beneficial** effects on:

- The local job market due to the potential for the creation of local jobs.
- The local economy from a community benefit payment to be provided by the Applicant.
- Diversions 1 & 2 as they will be retained during the operation phase providing two additional local paths to the existing network.

5.11.14 **Minor adverse** effects on:

- Access as it will not be permitted in certain parts of the Development Site during operation.
- Recreational routes Kindrummond to Dirr Wood Highland Council Core Path (IN12.04) and The Drumashie Moor Highland Council Core Path (IN12.05) due to partial closures and diversions.
- National Cycle Route 78 due to the installation of a new traffic light system on the road.

5.11.15 **Negligible** effects on The South Loch Ness Trail, The Trail of the Seven Lochs, C1064, B862, Local Path Network, An Torr Highland Council Core Path (IN12.01), Fair Headed Lad's Pass Core Path (17.01), Great Glen Way and Great Glen Canoe Trail as they will be accessible to users as usual or a new path installed that will be accessible during operation.

*Decommissioning of the Development*

5.11.16 **Minor beneficial** effects on:

- The local economy due to the potential for an increase in local expenditure during decommissioning works. Workers may stay in locally available accommodation.
- The local job market due to the potential for the creation of local jobs.

5.11.17 **Minor adverse** effects on:

- Access as it will not be permitted in certain parts of the Development Site during decommissioning.
- Ach-Na-Sidhe B&B from decommissioning activities which could produce a disturbance and impact amenity of B&B which may deter visitors.

5.11.18 **Minor adverse / Negligible** effect on tourism and recreation routes as there may be some loss of amenity on recreation routes which are nearer to decommissioning works.

**Conclusions**

5.11.19 Two significant adverse effects (Moderate) and one significant beneficial effect (Moderate) are predicted as a result of construction of the Development. No significant impacts are predicted during the operation or decommissioning phases. The implementation of embedded mitigation in combination with additional mitigation will minimise adverse effects.

## 5.12 Traffic & Transport

5.12.1 A desk study was undertaken to collate existing traffic data which was supplemented with additional traffic surveys to count vehicle flows. Two-way traffic counts were undertaken where traffic data was not available for those roads. The network of secondary and tertiary roads to be assessed were also identified which form the base of the traffic impact assessment.

**Residual Effects**

5.12.2 The assessment of residual effects below assumes that the embedded mitigation is implemented. Additional mitigation were also considered, this includes measures to reduce single occupant trips to site by worker such as car sharing or minibus services; use of on-site concrete batching facilities; shipping certain elements via the Caledonian Canal; restricted working hours; restrictions on traffic movements in sensitive areas and timing of vehicle movements; increased signage; temporary site entrance relocation (in line with potential effects on ornithological features); and monitoring and enforcement of the Developments CTMP.

*Construction of the Development*

5.12.3 **Minor adverse** effects on:

- Increased journey time for non-construction traffic from traffic management associated with abnormal load deliveries which may involve local road closures and local diversion of traffic.
- Dust and dirt volumes from construction traffic travelling to, from and throughout the Development which is likely to disturb the surface of the access tracks which will produce dust and dirt. Should a large quantity of dirt be spread over a public road, vehicles could lose traction could lead to road traffic accidents and an overall reduction in road user safety.
- Traffic increase due to site workers as site workers travelling to the Development Site by personal vehicle will increase the volume of traffic on the local road network which may cause delay to other road users
- Pedestrian intimidation and pedestrian loss of amenity from an increase the volume of traffic on the local road network which may cause delay to other road users.

5.12.4 **Negligible** effects on:

- Severance from increases in the amount of traffic on the roads used by construction vehicles resulting in perception that a road is less safe to cross or that parts of a settlement or property become isolated.
- Increased journey time for non-construction traffic from an increase in slow moving HGV traffic which results in a convoy of vehicles being unable to overtake the HGV. This in turn leads to increased journey times, driver frustration and drivers taking unnecessary risks.
- Pedestrian delay from site workers travelling to the Development Site by personal vehicle as it will increase the volume of traffic on the local road network which may cause delay to other road users.
- Road accidents and safety from: an increase in slow moving HGV traffic which results in a convoy of vehicles being unable to overtake the HGV. This in turn leading to increased journey times, driver frustration and drivers taking unnecessary risks; abnormal loads may need to overrun footways to negotiate some junctions along the delivery route to site; and adverse weather could result in poor road conditions which could lead to road traffic accidents occurring.
- Air pollution from an increase in traffic which has the potential to cause environmental and ecological damage due a reduction in air quality.

*Operation of the Development*

5.12.5 The operational phase of the Development requires minimal vehicle trips to the Development Site, which are primarily attributed to the workforce. The number of vehicles visiting the Development Site to undertake maintenance activities will likely be negligible as it is anticipated that there will be a small workforce during operation. The number of HGV and AIL movements will be low and would likely only result in minor disruption to local residents and road users. It can be concluded that the significance of the operational effects of the Development is **Minor Adverse** and therefore Not Significant.

*Decommissioning of the Development*

5.12.6 The volume of materials, construction plant vehicles and workers that would be required during the decommissioning of the Development would be substantially less than those required during the construction phase. The anticipated volume of vehicles which would be required during the decommissioning of the Development is low and the sensitivity of the local road network to such an increase in traffic is also low. The decommissioning effects of the Development are considered to be **Negligible** and therefore Not Significant.

**Conclusions**

5.12.7 No significant effects are predicted at any stage of the development. The implementation of embedded mitigation inherent within the design and the additional mitigation measures seek to minimise adverse effects where practically possible.

## 5.13 Noise and Vibration

5.13.1 This assessment identifies the potential noise and vibration effects during the construction, operational and decommissioning phases of the Development.

5.13.2 A desk based study was undertaken to establish the locations of underground services, as although these are not sensitive to noise they are sensitive to vibration due to the potential for damage to occur during construction of the Development.

5.13.3 Long-term baseline sound monitoring was carried out at three locations which were considered representative of the closest identified sensitive receptors. In addition to these, short-term measurements have been carried out at two locations in the vicinity of four other receptors.

**Residual Effects**

5.13.4 The assessment of residual effects below assumes that the embedded mitigation (described in Section 2.4) is implemented. Additional mitigation including the use of acoustic barriers at some locations, the proposed earth bund with also reduce noise levels, and the Contractor will consider all possible piling methods and types of plant to determine the most appropriate, will also be undertaken to minimise adverse effects. The detailed design of the Development, including the underground Power Cavern, will also determine the requirement for any further mitigation to mitigate adverse effects.

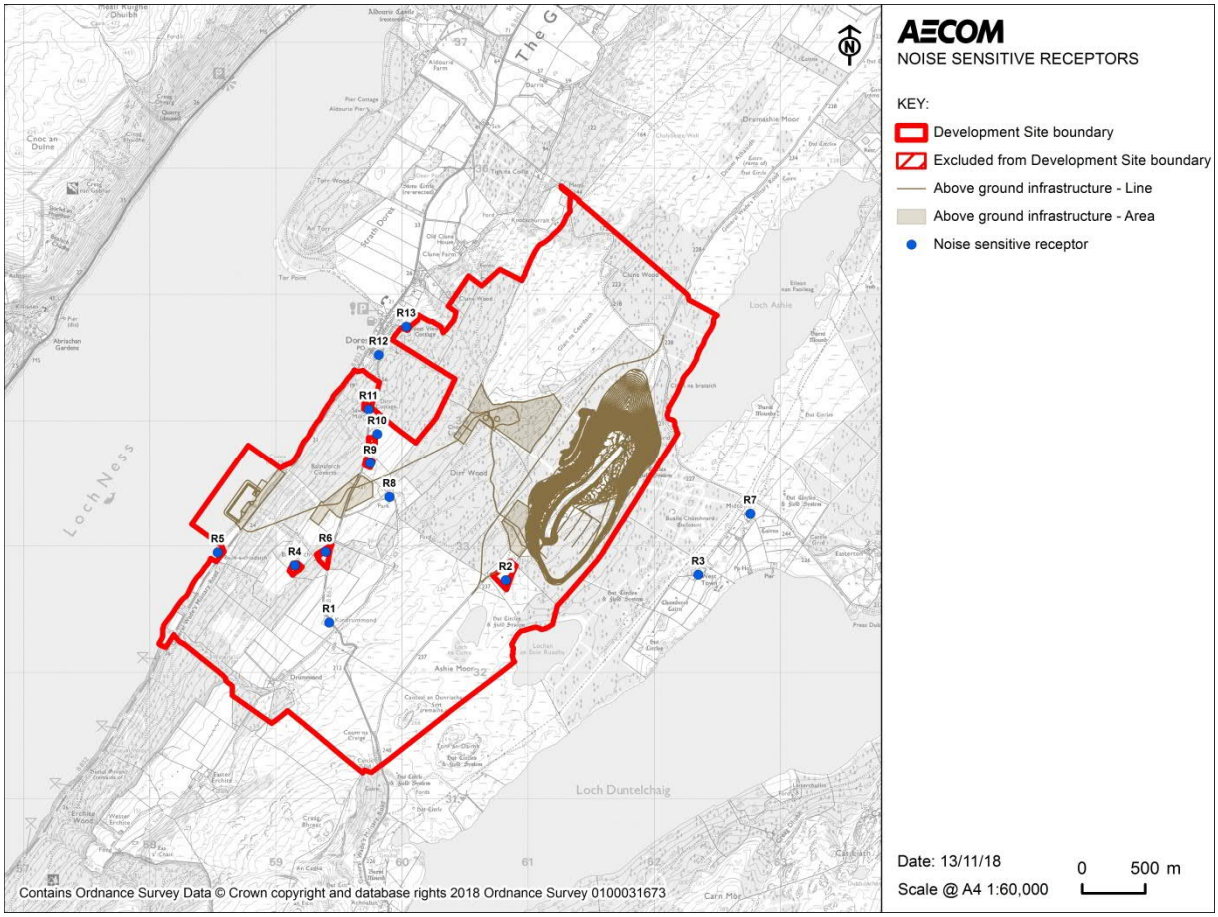



**Figure 5.7 Noise Sensitive Receptors**

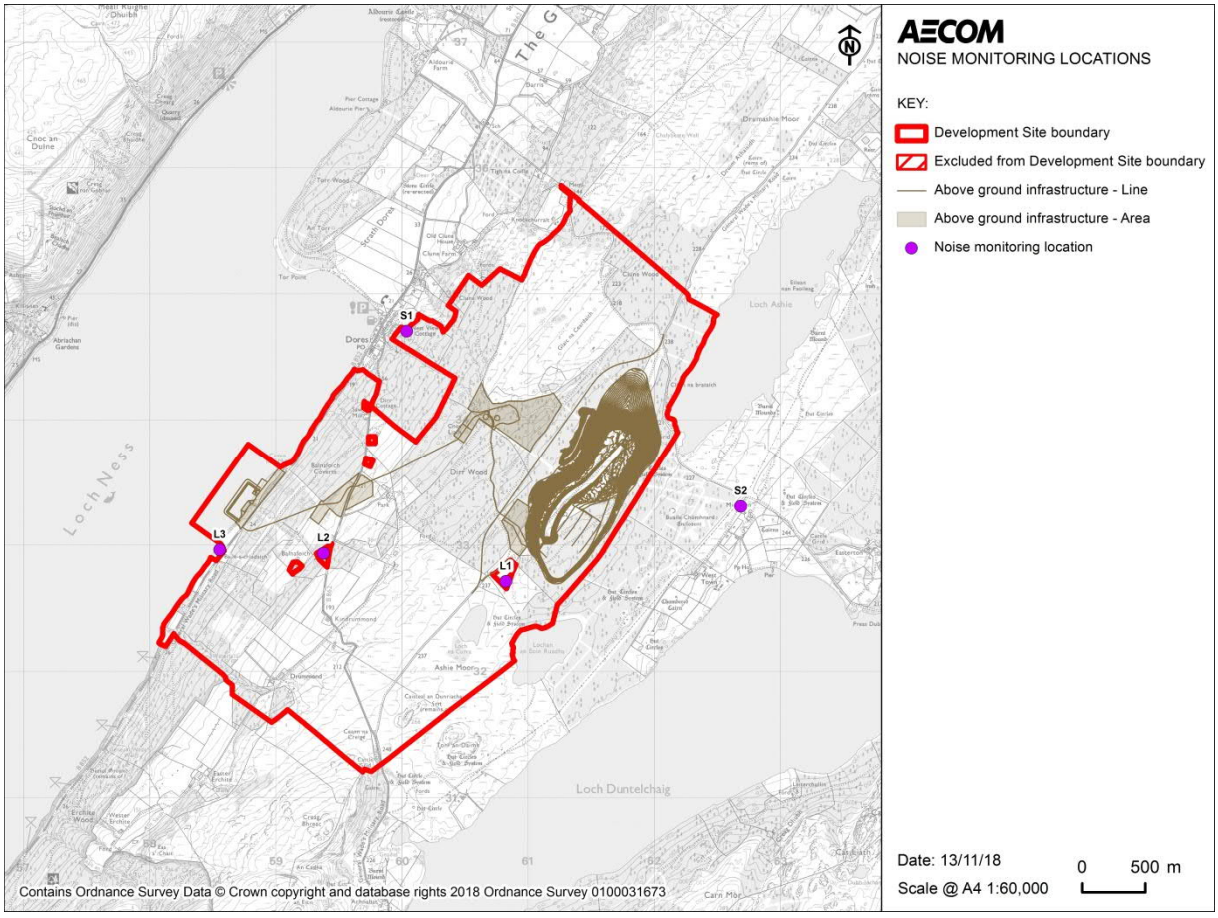



**Figure 5.8 Noise Monitoring Locations**

*Construction of the Development*

5.13.5 **Minor adverse** effect on:

- Occupants of residual dwellings from disturbance / annoyance due to temporary elevated noise levels from surface plant associated with all proposed construction works, including Headpond construction.
- Occupants of residual dwellings from disturbance / annoyance due to temporary vibration from piling works, temporary groundborne noise and vibration from tunnelling and temporary air overpressure and vibration from blasting.

5.13.6 **Negligible** effects on occupants of residual dwellings from disturbance / annoyance due to temporary vibration from surface plant except piling.

5.13.7 **No significant** effects on underground services from damage due to vibration from piling, tunnelling or blasting.

*Operation of the Development*

5.13.8 **Minor adverse** effects on:

- Occupants of residential dwellings from disturbance/annoyance due to airborne noise from underground and/or above ground equipment.
- Occupants of residential dwellings from disturbance/annoyance due to groundborne noise and vibration from underground equipment.

*Decommissioning of the Development*

5.13.9 Decommissioning, if required, 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. No blasting, tunnelling or crushing will be required and it is considered that the effects will be **negligible**.

**Conclusions**

5.13.10 No significant effects are predicted at any stage of the development. The implementation of embedded mitigation inherent within the design and the additional mitigation measures will also be undertaken to minimise adverse effects.

# 6. Cumulative Effects

## 6.1 Overview

6.1.1 In accordance with the EIA Regulations, the EIA has given consideration to 'cumulative effects'.

6.1.2 Two types of effect have been considered:

- Intra-project effects: These occur where a single receptor is affected by more than one source of effect arising from different aspects of the Development. This is also known as "in-combination effects". An example of an intra-project effect would be where a local resident is affected by dust, noise and traffic disruption during the construction of a scheme, with the result being a greater nuisance than each individual effect alone; and
- Inter-project effects: These effects occur as a result of a number of past (projects which have been granted planning permission), present (projects currently in the planning process but not yet granted permission) or reasonably foreseeable proposed developments, which individually might not be significant, but when considered together could create a significant cumulative effect on a shared receptor, and could include developments separate from or related to the Development. Generally, it is not anticipated that any future development in the area would change the significance of the predicted residual effects associated with the Development.

## 6.2 Intra-Project Effects on Shared Receptors

6.2.1 Shared receptors from individual elements of the Development (e.g excavation of the Headpond in addition to the tunnelling and excavation of the Tailpond) are likely to be limited to nearby residential dwellings, small businesses and local communities.

6.2.2 Due to the application of embedded mitigation and additional mitigation measures (such as the avoidance of habitats, design of the Development, the CEMP and topic specific management plans) which ensure that potential significant effects on shared receptors are unlikely; or the absence of any in-combination effects on shared receptors, the following topics are scoped out from the intra-project cumulative assessment:

- Geology & Ground Conditions - There are not expected to be any intra-relationship effects on geology or ground conditions.
- Terrestrial Ecology - Intra-relationship effects arising through the Development are not considered as the approach to this chapter has been to consider all possible effects on individual ecological features.
- Ornithology - Intra-relationship effects arising through the Development are not considered as the approach to this chapter has been to consider all possible effects on individual ecological features.
- Forestry
- Archaeology - A review of the assets within the study area, as well as the wider landscape, has revealed that no intra-cumulative effects resulting from the Development are predicted.
- Socio-economics and Tourism
- Traffic and Transport

6.2.3 Intra-project effects have however been assessed on the following:

- Ecology –There will be a requirement for lighting during construction, and operation at several locations throughout the Development Site. It is envisaged that embedded mitigation, including directional cowling and restrictions to the hours of operation, will ensure that the potential impacts of this operational lighting will be a **Negligible** effect on ecology receptors.
- Flood Risk and Water Resources - There is the potential for intra-relationship effects between the assessment of water levels through the flood risk, water resource and the water environment assessments. The impact of changes in water level as a result of the Development are **Negligible** both during construction and operation of the Development. The residual effect the Development has on the water environment and shared receptors as a result of these changes is considered to be **Negligible**. No protected species or important and sensitive ecological receptors have been identified in water bodies across the Site and so these effects are considered to be **Negligible**.
- Water Environment - There is the potential for intra-relationship effects between the assessment of effects of water quality, morphology and ecology. Firstly, it is important that the biological value of water bodies is carefully taken into account and that any physical modifications or river enhancements also consider the effects on ecological receptors. Generally, it is assumed that by improving water quality, hydraulic conditions and morphological diversity there would be associated biological benefits. Alternatively, on rare occasions, modified river morphology may support a sensitive ecological receptor or have heritage value, and these themselves may be important features that then restrict the type of hydromorphological improvements that can be made. No protected species or important and sensitive ecological receptors have been identified in water bodies across the Site and so these effects are considered **Negligible** (Not Significant).
- Landscape & Visual - The topics where there is the potential for intra-relationship effects include the following:
  - Forestry: There would be combined effects on the Loch Duntelchaig and Loch Ness SLA, Broad Steep-Sided Glen LCT, Flat Plateau with Woodland LCT and the existing forestry within the Development Site. Combined effects would result from the scale and extent of felling. Reinstatement planting would also have a combined effect that would lessen the overall impression of the Development within the landscape and would reduce the overall loss of stocked woodland.
  - Archaeology and Cultural Heritage: There would be combined effects on the visual amenity experienced at Urquhart Castle and on the setting of the asset.
  - Socio Economics and Tourism: Combined effects would be experienced by recreational users of the designated trails and core paths within the study area, where there would be intervisibility of the Development and where there are also diversions proposed.
  - Traffic and Transport: Combined effects would be experienced by users of the road network during the construction phase where the sense of activity would increase.

  The intra-relationship effects identified above would not be worse than those temporary and permanent effects assessed within the Landscape and Visual Assessment.
- Noise and Vibration - Vibration levels have been predicted at receptors separately for different activities. It is anticipated that some of these activities will overlap, however this is highly unlikely to occur whilst these activities are in close proximity to the same receptors. Hence intra-cumulative vibration effects will not be significant.

## 6.3 Inter Project Cumulative Effects

6.3.1 The effects of the Development are assessed in combination with other projects that are either under construction or currently going through planning. Other projects have been identified through a search of the Highland Council Planning Portal and confirmed with THC Planning Officers. The final planning portal check was conducted on the 14 August 2018, even though it had been agreed with THC that the cumulative sites review would end on the 28 June 2018 (the day of the final public consultation event). 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 Development as well as the effects from other projects (inter-project effects).

6.3.2 The following projects were been identified:

**Table 6.1 Cumulative Projects**

| Development | Description | Location* | Status | Likely Shared Receptors |
|---|---|---|---|---|
| EE Telecommunications Tower<br>17/03199/FUL | 15 metre (m) high lattice telecommunications tower with ancillary equipment in a fenced compound at Farr. | 7.4 km E | Application permitted<br>Decided 20 Oct 2017 | Amenity |
| Underground Water Main<br>16/05768/SCRE | New underground water main from Dores to Inverness treatment works. | 1.2 km NNW | Screening Request - EIA not required 19 Jan 2017. No application submitted yet | Land<br>Temporal – duration of construction phase |
| Tulloch Homes<br>17/02007/FUL | 446 new homes on the south side of Inverness of the B862. | 11.4 km NNE | Application permitted<br>Decided 03 Aug 2018 | Roads |
| Ness Castle (phase 2)<br>17/01189/MSC | 137 new homes off the B862. | 9.3 km NNE | Application permitted<br>Decided 02 Jun 2017 | Roads |
| Scainport<br>17/02446/PIP | 5 new homes off the B862. | 7.1 km NNE | Awaiting Decision<br>Application Validated 29 May 2017 | Roads |
| B851 Junction with the A9<br>18/03539/FUL | Change of use of existing buildings to office, use for maintenance of vehicles & fleet vehicles used for temporary and permanent road engineering. | 12.45 km NE | Under Consideration<br>Application Validated 30 July 2018 | Roads |
| Coire Glas<br>18/01564/S36 | Revised application for 1500 MW PSH scheme | 53 km SW | Under Consideration<br>Application Validated 03 April 2018 | Traffic<br>Socio-economics |

6.3.3 From the table above the following applications will be included within the assessment of inter-cumulative effects:

- Scottish Water Main – due to close proximity;
- Coire Glas extension – due to similar construction timescales; and
- Tulloch Homes - due to similar construction timescales.

6.3.4 All other developments are not on a like-for-like comparison basis or are scoped out due to there being limited or no shared receptors with the Development.

6.3.5 It is also acknowledged that a grid connection will be required for the Development. As the grid connection is expected to be underground and within the highway verge, limited effects are anticipated.

6.3.6 Inter-cumulative effects are when multiple types of effects act on a shared receptor. For an inter-cumulative effect to be present, cumulative effects must be identified across two or more topic chapters for a shared receptor(s) when assessing the Development cumulatively with another development. The assessment of these effects is presented in Table 5.1.

6.3.7 Due to the application of embedded mitigation and additional mitigation measures which ensure that potential significant effects on shared receptors are unlikely; or the absence of any inter-cumulative effects on shared receptors, the following topics are scoped out from the inter-project cumulative assessment:

- Geology & Ground Conditions - The substantial volume of material being excavated has the potential to result in inter-relationship effects if it were to be transported off site. However, as demonstrated in the MMA, all excavated material can and will be reused with the development site removing any potential inter-relationship effects.
- Flood Risk & Water Resources - Inter-relationship cumulative effects have been assessed qualitatively where committed development is proposed that could have cumulative effects with water bodies that may be affected by the Development, either during construction or operation phases. However, it is anticipated that providing the same robust and rigorous approach to mitigation is applied to other schemes as this proposal, the potential for significant adverse cumulative effects is low.
- Noise & Vibration - The minimum distance between developments which may result in cumulative effects is 1.2 km. At this distance no receptors are anticipated to experience inter-project cumulative noise effects. Noise is an amenity issue and other impacts, such as air quality and landscape and visual, can also affect residential amenity. As the Development will inevitably result in impacts in a variety of areas which can influence residential amenity inter-relationship effects may occur.

**Table 6.2 Inter Cumulative Effects on Shared Receptors**

| Development | Cumulative Assessment on Shared Receptor |
|---|---|
| Scottish Water Underground Water Main<br><br>It is currently understood that the programme for this development is for the pipeline to have been installed prior to the commencement of construction of this Development. | <u>Aquatic Ecology</u><br>The proposed intake for the pipeline development is in close proximity to the proposed Tailpond Inlet / Outlet for the Development. Therefore there is the potential for cumulative effects on habitats and fish species present within Loch Ness. The ecology report for the proposed pipeline and associated infrastructure recommended screening at the intake comparable with screening proposed for the Development. Therefore, given the very small and localised scale of the two Inlet structures in the context of Loch Ness as a whole, it is considered that the cumulative effect will be Negligible. The proposed discharge from the pipeline development is downstream of Loch Ashie, and therefore it is considered that there will be no cumulative effects on Loch Ashie.<br><u>Archaeology</u><br>An archaeological desk-based assessment and walkover survey was undertaken to support to the pipeline Request for Screening Opinion. This work identified boundaries and an enclosure in the area adjacent to the Temporary Access Track and Spillway in Dirr Wood. These features were tentatively dated to the prehistoric period, but are the same as post-medieval features identified elsewhere in the area such as Dores Wood. The Development would pass near to these assets, although they do not appear to impact on them. As a result, no inter-cumulative effects are predicted.<br><u>Traffic & Transport</u><br>Unlikely to cause any significant impact in conjunction with the traffic impact associated with the Development. The development is small in scale and the respective transport impact would likely be low due to the low volume of traffic associated with construction. |
| Tulloch Homes | <u>Traffic & Transport</u><br>Construction traffic related to the Tulloch Homes residential development would likely be routed through Inverness or via the B8082 from the A9. Given that the Development's construction traffic – excluding AILs – will be routed via the B851, the cumulative impact would likely be negligible. This is due to the anticipated use of night time AIL deliveries, where possible, to mitigate the traffic impact on the local road network. |
| Coire Glas Pumped Storage Hydro Scheme | <u>Socio-Economics & Tourism</u><br>Should the Coire Glas development be approved the timescales of the construction period are likely to overlap. Should this occur, it is possible that the construction of two PSH projects in the same general vicinity could cumulatively impact the local job market. The construction of two PSH schemes will create jobs which has the potential to have beneficial effect on the local market. This is approximately 0.65% of the total number of jobs in the Highland Council region. As the number of local jobs available during construction is unknown and the duration will be temporary the magnitude of change of job creation is considered to be Low. The significance of effect on the local job market is therefore likely to be Minor Beneficial.<br>Given the distance of the Coire Glas development cumulative effects to tourism and recreation routes are not predicted.<br><u>Traffic & Transport</u><br>The Coire Glas EIA Report details the development's anticipated construction traffic distribution on the local road network. It is anticipated that traffic associated with this development will only use the A82, A86, A87 and Kilfinnan Road and therefore any cumulative impact will be negligible. |

# 7. Overall Conclusions

7.1.1 This Non-Technical Summary outlines the findings of the EIA Report for the Red John Pumped Storage Hydro scheme. The construction, operation and decommissioning of the Development have the potential to have effects on the natural environment and nearby human receptors.

7.1.2 The EIA Report concludes that the Development is likely to have mainly **Minor adverse** to **Negligible** effects on the environment. **Moderate adverse** effects are likely to occur to terrestrial and aquatic ecology, water environment, archaeology and socio economics and tourism during construction.

7.1.3 **Moderate** to **Major** adverse effects are limited to landscape and visual during the construction phase, and operational phase Year 1.

7.1.4 **Moderate adverse** effects are also predicted to occur to the water environment and landscape and visual during operation with **Moderate adverse** effects also predicted to occur to the water environment during decommissioning.

7.1.5 **Moderate Beneficial** impacts are predicted during construction on terrestrial ecology, ornithology and socio-economics and tourism.

7.1.6 The results of the EIA also ensure that decision makers, such as ECU, THC, SEPA and SNH amongst other statutory consultees as well as other interested parties including local communities, are aware of a proposed development's potential environmental impacts and whether these may be significant or not so that they may be considered in the determination of an application for consent.

7.1.7 A significant adverse effect is not necessarily one that would make the Development unacceptable, nor is a significant beneficial effect necessarily one that would make the Development acceptable. The purpose of identifying the significant effects (adverse and beneficial) is to ensure that all parties, in particular decision makers, are aware of the environmental impacts (in particular those which are likely to be significant) of the Development and consider these alongside other material considerations in determining this application. .

**Next Steps**

7.1.8 The results of the EIA will be considered as part of the decision to grant or refuse planning permission for the Development. As described within this NTS one of the key aims of the EIA is to ensure that the environmental effects of the Development are known and understood so that these may be considered before deciding whether or not to proceed with the development.

7.1.9 In considering the application, ECU will consult with a range of organisations such as THC, SEPA, SNH and HES as well as invite comments from the local community. The responses to the Section 36 application from all parties, including comments made in relation to results of the EIA, will be considered in determining the application for consent.

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