

# REVISED COIRE GLAS PUMPED STORAGE SCHEME

**Borrow Pit Screening Assessment**  
Prepared for: Ash Design & Assessment Ltd

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## 1.0 Introduction

SLR Consulting Ltd (SLR) was commissioned by ASH Design & Assessment Ltd, on behalf of SSE Renewables to undertake a Borrow Pit Screening Assessment for the Revised Coire Glas Pumped Storage Scheme (The Proposed Development). The Proposed Development is situated on Forestry Commission (Scotland) land to the south west of Laggan Locks, approximately 19km to the south west of Fort Augustus.

Access tracks would be required to facilitate access to the above ground components of The Proposed Development, as shown on Figure 1. It is proposed that existing public roads and forestry tracks would be utilised where possible. However, there would be a requirement for some of these tracks to be upgraded, as well as the construction of new tracks. Borrow pits are required to provide aggregate to supply sufficient rock to construct suitable access tracks.

The use of excavated rock from the underground works in dam construction has been explored through the EIA process. With the creation of a potential new temporary track to connect the lower reservoir works with the upper reservoir works (see Figure 1), there would be an opportunity for quarried rock from the upper reservoir to be supplemented by suitable tunnel spoil from rock excavated from the underground works and transported from the lower reservoir to the upper reservoir. However, due to the complexity of the construction programme for the project, the availability of excavated rock from the underground works for use in the upgrade of existing and construction of new access tracks would not be suitable, or economically viable for the project. Even if it were, the removal of rock by dump truck via Kilfinnan Road, onto the public roads (A82 / A87) before accessing the main haul road at White Bridge would need to cover some distance (and ascent) with potential for effects on the local community (disruption, amenity, traffic, air quality and noise). Given these programming, economic, environmental and practical constraints, there is a clear requirement for borrow pits as part of this project to facilitate the construction of access tracks.

### 1.1 Scope of this Report

This report provides an initial screening assessment of the potential borrow pits, which would be necessary to provide the aggregate required to construct the access tracks to The Proposed Development.

The work undertaken to date has involved review of geological plans, including historic geological plans, aerial photography, OS mapping, topographic and slope plans. The study has also been informed by a detailed peat probing programme and site visits by experienced engineering geologists and hydrogeologists between September and November 2017.

As a consequence of intrusive site investigations and additional work that would be undertaken at the detailed design stage actual borrow pit locations and extents presented in this report may be revised.

### 1.2 Sources of Information

The following sources of information have been reviewed and assessed:

- British Geological Survey (BGS) online map viewer and Geoindex<sup>1</sup>;

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<sup>1</sup> British Geological Survey (BGS) Online Viewer/Geoindex website

- Scotland's Environment website<sup>2</sup>;
- The Macaulay Institute for Soil Research Soil Survey of Scotland Sheet 3 – Northern Scotland, Land Capability for Agriculture Map. 1:250,000 scale, 1982;
- Aerial Photography;
- Historical OS Mapping;
- Phase 1, National Vegetation Classification and Groundwater Dependent Terrestrial Ecosystems surveys undertaken as part of the EIA Report for The Proposed Development; and
- Peat depth probing and review of rock exposures on site.

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<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>; <http://www.bgs.ac.uk/geoindex/> Last accessed November 2017

<sup>2</sup> Scotland's Environment Website [www.environment.scotland.gov.uk](http://www.environment.scotland.gov.uk) (last accessed November 2017)

## 2.0 Geological Setting

### 2.1 Superficial Geology

The published superficial geological map is reproduced as Figure 2 which shows the superficial deposits comprise hummocky glacial deposits and peat. Superficial deposits are shown to be absent on the hilltops and on steeper hillsides (see Figure 5). The published mapping was confirmed by site surveys.

The peat deposits have been mapped in detail during a peat probing exercise, with a peat depth isopach plan shown as Figure 4. The probing completed provides good coverage of the site and of the proposed infrastructure locations.

### 2.2 Bedrock Geology

The bedrock geology on the site predominately comprises Neoproterozoic age metasediments with minor intrusions. A summary of the bedrock geology on site is shown in Table 2-1 and an extract of British Geological Survey mapping is shown as Figure 3.

The published mapping was confirmed by site surveys.

The psammite and semipelite bedrock that is mapped across the site is expected to be suitable for use as engineering material; detailed geotechnical investigation will however be required to confirm its suitability prior to development of the borrow pits. Where semipelite is interbedded, the material may be more susceptible to weathering, however may still be of use.

**Table 2-1**  
**Solid Geology Summary**

Age	Supergroup	Group	Formation	Description
Permo-Carboniferous (272-331 Ma)	n/a	Scottish Highlands Late Carboniferous to Permian Alkali Dyke Suite	Eil-Arkaig Dyke Swarm	Lamprophyre.
Siluro-Devonian (359-444 Ma)	Caledonian Supersuite	Argyll and Northern Highlands Granitic Suite	n/a	Granitic Rock.
Siluro-Ordovician (419-485 Ma)	n/a	n/a	n/a	Unnamed Metamorphosed Igneous Rocks – Caledonian Schist Hornblende.
Neoproterozoic (542-1000 Ma)	Moine Supergroup	Loch Eil Group	Upper Garry Psammite Formation	Psammite and semipelite.
Mesozoic – Neoproterozoic (66 – 1000 Ma)	n/a	n/a	n/a	Great Glen Fault Zone Rocks – Fault gouge (cataclasite, metamorphic)

## 2.3 Structural Geology

There are a number of small faults cross cutting the site on a roughly east northeast – west southwest trend and are predominately defined by breaks in slope or watercourses. The locations of the faults are shown on Figures 2 and 3.

One fault cuts through the Coire Glas valley with the line of the fault coinciding with the location of the Allt a'Choire Ghlais watercourse. Smaller faults are mapped along the base of the eastern slope of Ben Tee, towards Glengarry Forest; between Sron A' Choire Ghairbh and Meall Dubh and along the line of the River Garry across Allt Ruighe Bhlair watercourse.

The Great Glen Fault, a large cross-country strike-slip fault is mapped within the eastern edge of the site boundary, following the line of Loch Lochy. During the faulting process, the bedrock within influencing distance, described as cataclasite, has been heavily fractured. This bedrock unit is detailed in Table 2.1 above (Great Glen Fault Zone Rocks) and its mapped extent is shown within Figure 3.



## 3.0 Potential Borrow Pits

### 3.1 Introduction

There has been no active mining or quarrying activities within the site boundary (see Figures 1 and 3), though there has been borrow pit extraction within the forestry site (Photograph 3-1, See Figures 1 - 6). Large volumes of rock appear to have been extracted from this borrow pit which provides a guide to the extraction potential of Borrow Pit 2 (BP2).

**Photograph 3-1**  
**Forestry Borrow Pit (E 226814 N 800307)**



### 3.2 Assessment Approach

Following a high level review of environmental constraints and consideration of proximity to the required site infrastructure, suitable search areas were selected from which a borrow pit could be developed. The original search areas were not definitive, but covered a general area, within which SLR has selected appropriate sites, taking into consideration; environmental constraints, presence of rock, slope morphology, hydrology and potential size.

A total of 5 potential borrow pit areas have been identified, selected from a number of initial search areas. Each area has been assessed in the sections below.

The assessment has been completed through a desk based review of geological maps, aerial photography and topographical data and is supported by evidence gathered during a peat probing survey initially completed in September 2017. The siting of the potential borrow pit areas has also taken into consideration potential environmental constraints, including:

- The water environment;
- Flood risk;

- Sensitive habitats;
- Protected species (including birds);
- Ground Water Dependent Terrestrial Ecosystems;
- Landscape and Visual;
- Land Use and Recreation; and
- Cultural Heritage.

Commentary on potential environmental constraints in relation to each borrow pit area is included in Appendix A. Appendix B presents the site constraints plan.

The potential borrow pit locations have been predominantly selected due to their geological setting. Other factors included potential environmental impacts, morphology, accessibility from the site or existing roads, orientation and the expected proximity of rock to the surface. The potential borrow pit locations are in areas where the superficial coverage is minimal and where bedrock is known to be near to surface (see Figure 6). This has been confirmed by peat probing and visual inspection.

No account has been taken in the calculations for the fortuitous 'winning' of rock during the construction phase for example during infrastructure excavations. The calculations provided in this report assume a worst case scenario where no other rock or materials would be found on site during construction. In the event that such rock was available the amount extracted from the borrow pits would be reduced.

Calculations of volumes of aggregate are estimates only and will require more detailed quantification at a later stage. Once potential borrow pits have been selected, detailed ground investigation and geotechnical testing would be required to confirm the assumptions made during this assessment and to assess the suitability and volume of potential aggregate reserves.

The intention of this assessment is to identify larger extraction volumes than is necessary for The Proposed Development. This is to confirm that sufficient volumes of suitable aggregate can be sourced on site, allowing for the fact that detailed ground investigation may identify unsuitable aggregate in some of the potential borrow pits.

The approximate aggregate volumes were calculated by taking the dimensions of the potential borrow pit area and multiplying by the probable height of the excavation (based on the elevation difference between the highest and lowest points of the potential borrow pit). This number was then multiplied by 0.4, taking into account approximately 10% for overburden materials. For example, for BP1 the dimensions (100m x 150m) have been multiplied by the height of the excavation (20m). This gives 300,000 m<sup>3</sup>, which is then multiplied by 0.4, equalling an estimated volume of 120,000 m<sup>3</sup>.

At this stage a detailed design and modelling exercise has not been undertaken and would be required to provide a more accurate estimate as well as to assess the suitability of rock and detail aspects such as bulking factor (75-80% bulking would be a typical increase for psammite/pelite bedrock).

## 3.3 Selection of Potential Borrow Pits

### 3.3.1 Borrow Pit BP1

Borrow pit BP1 is located within the forested area at the north of the proposed access track at approximately NH 26611 00714 shown on Figure No. 7a. The borrow pit would be located a short distance from the existing access track and indicative site compound.

The underlying geology in this area is the Neoproterozoic age Upper Garry Psammite Formation, comprising psammite and semipelite.

It is anticipated that the borrow pit would comprise a layer of weathered granular material, broken rock and rock close to surface, which would offer a significant volume of material. Peat probing identified no peat and in some areas found bedrock outcropping at surface.

**Table 3-1**  
**Borrow Pit - BP1**

Characteristics	
Site Dimensions (plan area)	Approximately 150 x 100 m
Excavation Area*	Approximately 16,500 m <sup>2</sup>
Height of Excavation	Approximately 20 m
Gradient and elevation	Slope increases to the northwest from an elevation of approximately 200m AOD to a maximum elevation of approximately 220m AOD.
Details of Extraction	Combination of ripping and blasting
Overburden Type and Approximate Depth to Rock	Soil/weathered rock (no peat). <1m
Extent of Aggregate Extraction	Approximately 120,000 m <sup>3</sup>
Aggregate Composition	Psammite and semipelite bedrock of the Upper Garry Psammite Formation.

\*Assumes 10% additional land take for access tracks and any site preparation areas.

It is noted that the borrow pit is located within 250m of two areas of potential GWDTE:

- An area of potential high GWDTE to the south-west of the borrow pit which bounds Allt Coire Bo Chailein, a tributary of Allt na Cailliche. Given the low permeability of the bedrock, it is considered unlikely that this area of GWDTE is sustained by groundwater but rather is sustained by surface water runoff in response to incident rainfall. With appropriate best practice controls to safeguard water quality and water discharge from the borrow pit, including maintenance of existing surface water flow paths, development of the borrow pit is unlikely to have any effect on the GWDTE.
- An area of potential moderate GWDTE to the south-east of the borrow pit. As above, given the low permeability of the bedrock, it is considered unlikely that this area of GWDTE is sustained by groundwater but rather is sustained by surface water runoff in response to incident rainfall. The area of moderate GWDTE is not in the same local surface water catchment as the borrow pit and thus will not be effected by development of the borrow pit.

**Photograph 3-2**  
**Borrow Pit BP1 (Direction of View – northeast)**



**Photograph 3-3**  
**Bedrock outcropping at Borrow Pit BP1**



### **3.3.2 Borrow Pit BP2**

Borrow pit BP2 is located within the forested area at the north of the proposed access track at approximately NH 26995 00344 shown on Figure No.7b. The potential borrow pit is located adjacent to a former forestry borrow pit, and adjacent to the existing track that is to be upgraded as part of The Proposed Development.

The underlying geology in this area is the Neoproterozoic age Upper Garry Psammite Formation, comprising psammite and semipelite.

It is anticipated that the borrow pit would comprise a layer of weathered granular material, broken rock and rock close to the surface, which would offer a significant volume of material.

**Table 3-2**  
**Borrow Pit – BP2**

Characteristics	
Site Dimensions (plan area)	Approximately 120 x 100 m
Excavation Area*	Approximately 13,200 m <sup>2</sup>
Height of Excavation	Approximately 35 m
Gradient and elevation	Slope increases to the northwest from an elevation of approximately 150m AOD to a maximum elevation of approximately 185m AOD.
Details of Extraction	Combination of ripping and blasting
Overburden Type and Approximate Depth to Rock	Soil/weathered rock (no peat) <1m
Extent of Aggregate Extraction	Approximately 168,000 m <sup>3</sup>
Aggregate Composition	Psammite and semipelite bedrock of the Upper Garry Psammite Formation.

\*Assumes 10% additional land take for access tracks and any site preparation areas.

It is noted that the borrow pit is located within 250m of one area of potential GWDTE:

- An area of potential moderate GWDTE is located to the north-west of the borrow pit. Given the low permeability of the bedrock, it is considered unlikely that this area of GWDTE is sustained by groundwater but rather is sustained by surface water runoff in response to incident rainfall. The area of moderate GWDTE is at a higher elevation than the proposed borrow pit (e.g. it is above the borrow pit) and thus will not be effected by development of the borrow pit.



**Photograph 3-4**  
**Borrow Pit BP2 (Direction of View – northeast)**



**Photograph 3-5**  
**Bedrock outcropping at Borrow Pit BP2**



### **3.3.3 Borrow Pit BP3**

Borrow pit BP3 is located within the forested area at the north of the proposed access track at approximately NH 26449 00126 shown on Figure No.7c. The proposed borrow pit is located to the south of an existing forestry track that is to be upgraded as part of The Proposed Development.

The underlying geology in this area is the Neoproterozoic age Upper Garry Psammite Formation, comprising psammite and semipelite.

It is anticipated that the borrow pit would comprise a layer of weathered granular material, broken rock and rock close to surface, which would offer significant volume of material for much of the site. Peat probing identified no peat.

**Table 3-3**  
**Borrow Pit – BP3**

Characteristics	
Site Dimensions (plan area)	Approximately 120 x 100 m
Excavation Area*	Approximately 13,200 m <sup>2</sup>
Height of Excavation	Approximately 20 m
Gradient and elevation	Slope increases to the southwest from an elevation of approximately 205m AOD to a maximum elevation of approximately 225m AOD.
Details of Extraction	Combination of ripping and blasting
Overburden Type and Approximate Depth to Rock	Soil/weathered rock (no peat) <1m
Extent of Aggregate Extraction	Approximately 96,000 m <sup>3</sup>
Aggregate Composition	Psammite and semipelite bedrock of the Upper Garry Psammite Formation.

\*Assumes 10% additional land take for access tracks and any site preparation areas.

**Photograph 3-6**  
**Borrow Pit BP3 (Direction of View – southwest)**



**Photograph 3-7**  
**View towards Borrow Pit BP3 (Direction of View – south)**



### 3.3.4 Borrow Pit BP4

Borrow pit BP4 is located towards the start of the proposed new access track, south of the forested area, at approximately NN 25952 97867 shown on Figure No.7d. The proposed borrow pit is located on the eastern edge of a steep slope, immediately to the west of the proposed access track. Due to the anticipated high volumes of bedrock close to surface, it would be possible to extend this borrow pit in width and gain large volumes of aggregate.



The underlying geology in this area is the Neoproterozoic age Upper Garry Psammite Formation, comprising psammite and semipelite.

It is anticipated that the borrow pit would comprise a layer of weathered granular material, broken rock and rock close to surface, which would offer a significant volume of material. Peat probing identified little peat and found bedrock outcropping at the surface over much of the search area.

**Table 3-4**  
**Borrow Pit – BP4**

Characteristics	
Site Dimensions	Approximately 100 x 150 m
Excavation Area*	Approximately 16,500 m <sup>2</sup>
Height of Excavation	Approximately 30 m
Gradient and elevation	Slope increases to the southwest from an elevation of approximately 365m AOD to a maximum elevation of approximately 395m AOD.
Details of Extraction	Combination of ripping and blasting
Overburden Type and Approximate Depth to Rock	Very limited, average soils depth <0.5m
Extent of Aggregate Extraction	Approximately 180,000 m <sup>3</sup>
Aggregate Composition	Psammite and semipelite bedrock of the Upper Garry Psammite Formation.

\*Assumes 10% additional land take for access tracks and any site preparation areas.

It is noted that the borrow pit is located within 250m of one area of potential GWDTE:

- An area of potential moderate GWDTE to the east of the borrow pit. Given the low permeability of the bedrock, it is considered unlikely that this area of GWDTE is sustained by groundwater but rather is sustained by surface water runoff in response to incident rainfall.

With appropriate best practice controls to safeguard water quality and discharge of water from the borrow pit, including maintenance of existing surface water flow paths, development of the borrow pit is unlikely to have any effect on the GWDTE. Notwithstanding this, it is recommended a 50 m buffer between the borrow pit and the area of potential GWDTE is included in the final site design. This buffer should also be applied to the headwater of the tributary of the Allt na Cailliche which is located to the north-east of the borrow pit.

**Photograph 3-8**  
**Borrow Pit BP4 (Direction of View – West)**



**Photograph 3-9**  
**Bedrock outcropping at Borrow Pit BP4**



### **3.3.5 Borrow Pit BP5**

Borrow pit BP5 is located on the southern slope of Ben Tee immediately to the north of the proposed access track at approximately NN 24691 96633 shown on Figure No.7e. Due to the anticipated high volumes of bedrock close to surface, it would be possible to extend this borrow pit in width and gain large volumes of aggregate.

The underlying geology in this area is the Neoproterozoic age Upper Garry Psammite Formation, comprising psammite and semipelite.

It is anticipated that the borrow pit would comprise a layer of weathered granular material, broken rock and rock close to surface, which would offer a significant volume of material. Peat probing identified little peat.

**Table 3-5**  
**Borrow Pit – BP5**

Characteristics	
Site Dimensions	Approximately 150 x 100 m
Excavation Area*	Approximately 16,500 m <sup>2</sup>
Height of Excavation	Approximately 25 m
Gradient and elevation	Slope increases to the northwest from an elevation of approximately 485m AOD to a maximum elevation of approximately 510m AOD.
Details of Extraction	Combination of ripping and blasting
Overburden Type and Approximate Depth to Bedrock.	Very limited, average soils depth <0.5m
Extent of Aggregate Extraction	Approximately 150,000 m <sup>3</sup>
Aggregate Composition	Psammite and semipelite bedrock of the Upper Garry Psammite Formation.

\*Assumes 10% additional land take for access tracks and any site preparation areas.

It is noted that the borrow pit is located within 250m of three areas of potential GWDTE:

- A discrete area of potential moderate and high GWDTE to the north of the borrow pit. Given the low permeability of the bedrock, it is considered unlikely that either are sustained by groundwater but rather they are sustained by surface water runoff in response to incident rainfall. Both the moderate and high GWDTE are at a higher elevation than proposed borrow pit (e.g. they are located above the borrow pit) and thus will not be effected by development of the borrow pit.
- Two areas of potential moderate GWDTE are located to the south-west and east of the borrow pit. As above, given the low permeability of the bedrock, it is considered unlikely that these areas of GWDTE are sustained by groundwater but rather are sustained by surface water runoff in response to incident rainfall.

With appropriate best practice controls to safeguard water quality and the discharge from the borrow pit, including maintenance of existing surface water flow paths, development of the borrow pit is unlikely to have any effect on the GWDTE.

**Photograph 3-10**  
**Borrow Pit BP5 (Direction of View – Northeast)**



## 4.0 Principals for Borrow Pit Design and Restoration

### 4.1 Excavations within Rock

Following ground investigation, the borrow pits would be designed fully with appropriate access, drainage, laydown and process areas. In advance of the works all borrow pit locations would be surveyed and pegged out and the Ecological Clerk of Works (ECoW) would be consulted on in relation to species, habitats and drainage provisions.

Excavation, handling and storage of materials would strictly conform to the standards outlined in the project Construction Environmental Management Plan (CEMP) and the Peat Management Plan (PMP), as required. Suitable areas for the storage of material would be determined in consultation with the ECoW.

Once overburden and weathered rock horizons have been stripped, and stored, the nature of the underlying solid rock strata would be assessed by a suitably qualified geotechnical engineer/blasting engineer. The engineer would provide advice on suitable extraction techniques including; extraction method, bench and cut face design parameters, and blasting design (if required).

If blasting is required, blasting would be undertaken in accordance with the Quarries Regulations 1999 and Annex D PAN 50.

The blasted/excavated rock materials would be processed using a mobile crushing and screening plant, which would be sited within the base of the working borrow pit.

### 4.2 Stockpiling of Materials

The initial overburden strip would be stored within temporary screening mounds around the perimeter of the borrow pit. The screening mounds would be a maximum of 2m in height. All vegetated turves, if present, would be kept and stored separately from underlying mineral soil, to enable successful reinstatement at a later stage. Turves would be stored top side up and on stripped ground. The methodology to be used would be detailed in full in the site CEMP.

The remaining unsuitable materials (glacial material/weathered rock horizons) would be stockpiled within the base of the working borrow pit, until they are reused for reinstatement. The stockpiles would have a maximum height of 5m, with maximum side-slope gradients of 1(V) in 2.5(H) and be in full compliance with the Quarries Regulations 1999 and QNJAC Guidelines.

### 4.3 Access Tracks and Haulage Routes

The proposed access to the borrow pits would involve constructing a temporary access track from the main access track. The access track would include suitable roadside drainage ditches, with soakaways located where appropriate. Each potential borrow pit has been located close the proposed access track, to minimise the length of additional track required to access each potential borrow pit.

The tracks (haulage routes) within the borrow pit would have a gradient of no steeper than 1(V) in 10(H).

### 4.4 Water Management/Drainage

Each borrow pit would feature a perimeter drain, which would aim to prevent water in-flow into the borrow pit. The greenfield water collected within the perimeter drain would be discharged into the surrounding vegetation. Further details are included within the CEMP.

Further drainage within the borrow pit may be required to carry silt loaded water and where necessary settlement lagoons would be constructed within the borrow pit, to treat the drainage water. The lagoons would be contained within a bunded area at the base of the borrow pit, and subject to all necessary treatments such as silt fences for further filtration, prior to any releases.

## 4.5 Restoration

Upon completion of extraction at the borrow pit it would be restored.

Site derived general fill material would be sourced from the stockpiles located within the borrow pit void. These comprise of generally unsuitable construction materials which might consist of glacial material, weathered rock and weak rock horizons, but are suitable for reuse in restoration. This material would be utilised to provide the basis of the restoration profile.

The fill materials would be used as general fill to soften the benched profile of the excavations and provide a gentler sloping gradient than near vertical working face slope designs. The fill materials would also be used to provide a suitable gradient on the borrow pit floor to prevent ponding.

The stripped soils and subsoil horizons (which would be stored separately) within perimeter screening mounds, would be utilised as the surface dressing layer and be placed in the sequence they were taken, with turves used to seal and restore in the first instance, or peat found along the proposed access route could be used as a final dressing to a depth of 500mm, to provide a suitable medium for seeding and planting as appropriate. No mineral soil will be used as final dressings.

The restoration of the borrow pit site would not involve importing any material onto site.

The base of the borrow pit could re-use unsuitable material and peat materials generated from the site excavations. To create a peat habitat on the surface of the borrow pit, peat will be used to a maximum of 2 metres thick, where slopes allow and where appropriate, prior to being capped with vegetated turves or reseeded with a suitable seed mix agreed by the Site ECoW.

Prior to restoration a Borrow Pit Restoration Plan would be provided by the contractor to the developer for approval.

Photograph 4-1 and Diagram 4-1 (overleaf) show examples of borrow pit restoration.

## 4.6 Best Practice Guidance Documents

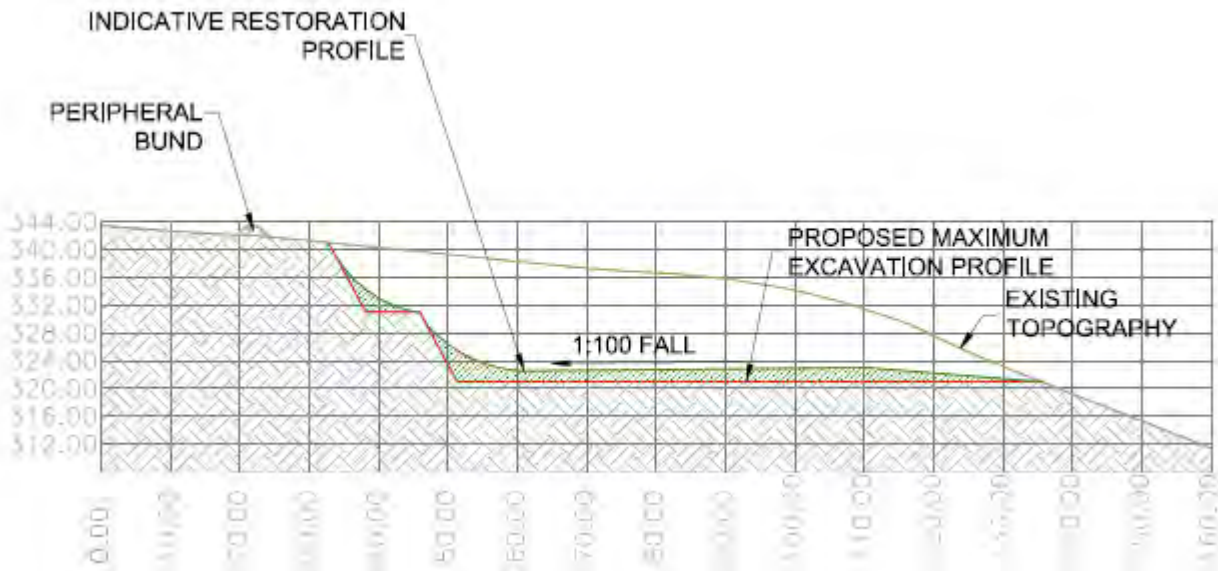
A number of general pollution prevention measures would be employed to minimise the risks to ground and surface waters during the development. Extraction operations would be carried out in compliance with the CEMP and all environmental legislative requirements in force during the works, along with relevant Guidance for Pollution Prevention (GPP) and other codes of industry best practice, to ensure that both ground and surface waters are not impaired as a consequence of development and restoration of the borrow pits. Peat management and re-use would be specified in a site specific Peat Management Plan.



**Photograph 4-1**  
**Borrow Pit Restoration Example**



**Diagram 4-1**  
**Restoration Profile Example**



## 5.0 Conclusions

In summary, 5 potential borrow pit areas have been identified and evaluated for their potential to provide aggregate for the site access tracks for The Proposed Development. It is concluded that it would be possible to source sufficient aggregate from the borrow pits on site.

The potential borrow pit areas have been selected from a desk based assessment but have been informed by peat probing, site inspections and an assessment of potential effects on GWDTE. Actual borrow pit locations and extents of extraction areas are indicative only, and are subject to confirmation following intrusive site investigation that would be undertaken prior to development of the borrow pits.

Calculations of volumes of aggregate are estimates only and will require more detailed design at a later stage. Once potential borrow pits have been defined, detailed ground investigation and geotechnical testing will be required to confirm the assumptions made during this assessment and to assess the suitability of potential aggregate reserves.

The intention of this assessment is to identify larger extraction volumes than is necessary for The Proposed Development. This is to confirm that sufficient volumes of suitable aggregate can be sourced on site, allowing for the fact that detailed ground investigation may identify unsuitable aggregate in some of the potential borrow pits.

There may be opportunity to win rock from infrastructure extractions, thereby reducing the volumes taken from onsite borrow pits.

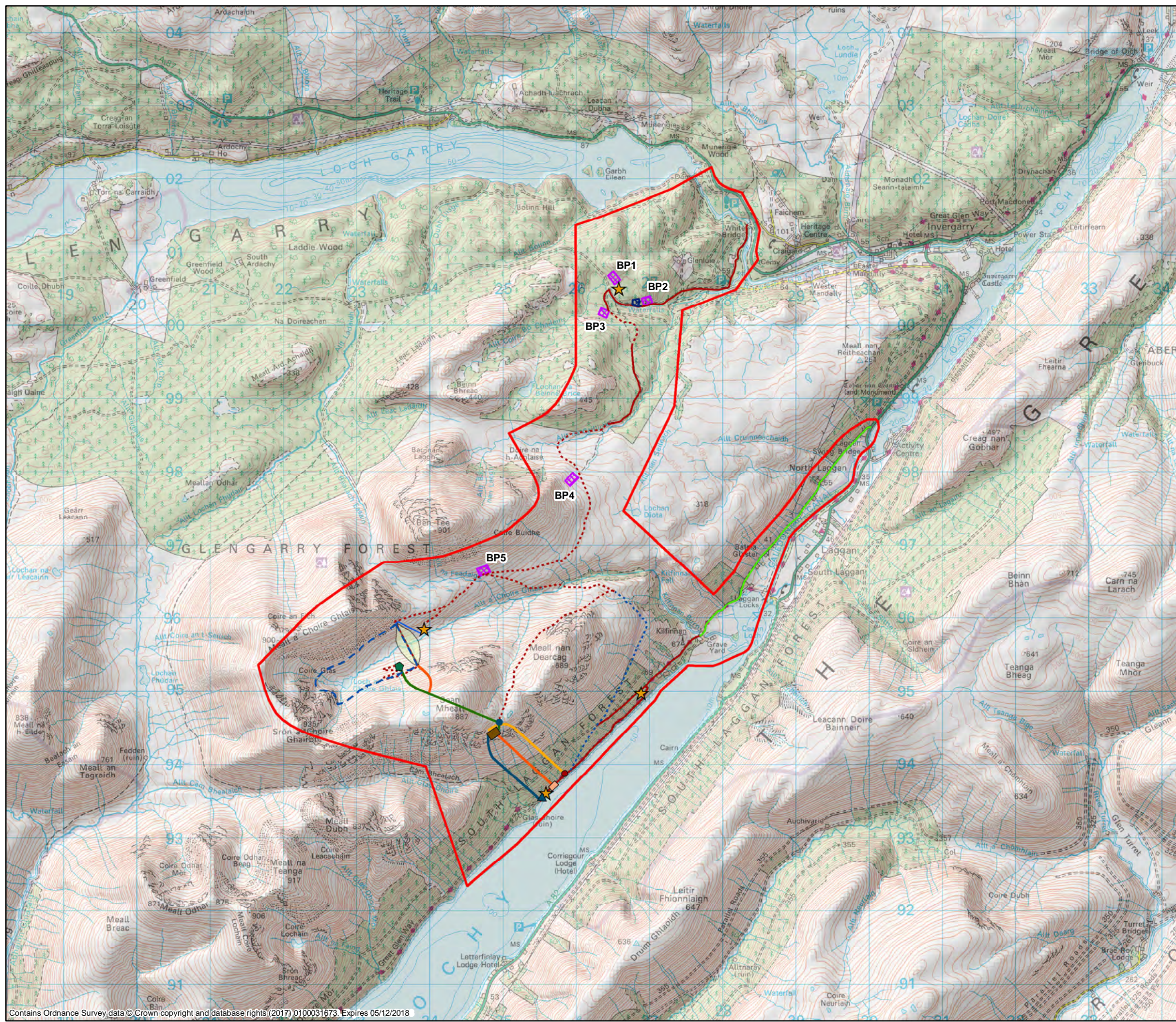
The borrow pit locations and dimensions have been selected at this stage to maximise aggregate potential. Post consent, and in accordance with relevant Conditions of Consent, a detailed assessment and modelling exercise would be undertaken to further assess the suitability of each borrow pit area.

All borrow pits will be restored in line with the CEMP, Peat Management Plan and industry best practice and with the advice of the Ecological Clerk of Works, in relation to reseeded and the use of turves, where present.



## FIGURES





**Key:**

- Site Boundary
- Upper Reservoir
- Dam
- Spillway Channel
- Intake Tower
- Headrace Tunnel (underground)
- Tailrace Tunnel (underground)
- Access Tunnel (underground)
- Emergency Access Tunnel (underground)
- Cavern Power Station (underground)
- Surge and Ventilation Shafts
- Emergency Access Tunnel Portal
- Lower Control Works
- Jetty and Administration Building
- Potential Borrow Pit
- Former Forestry Borrow Pit
- Indicative Site Establishment Area
- Existing Road to be upgraded
- Temporary New Access Track
- Existing Track to be upgraded
- Permanent New Access Track

Scale 1:50,000 @ A3



**Figure 1**  
**SITE LAYOUT**

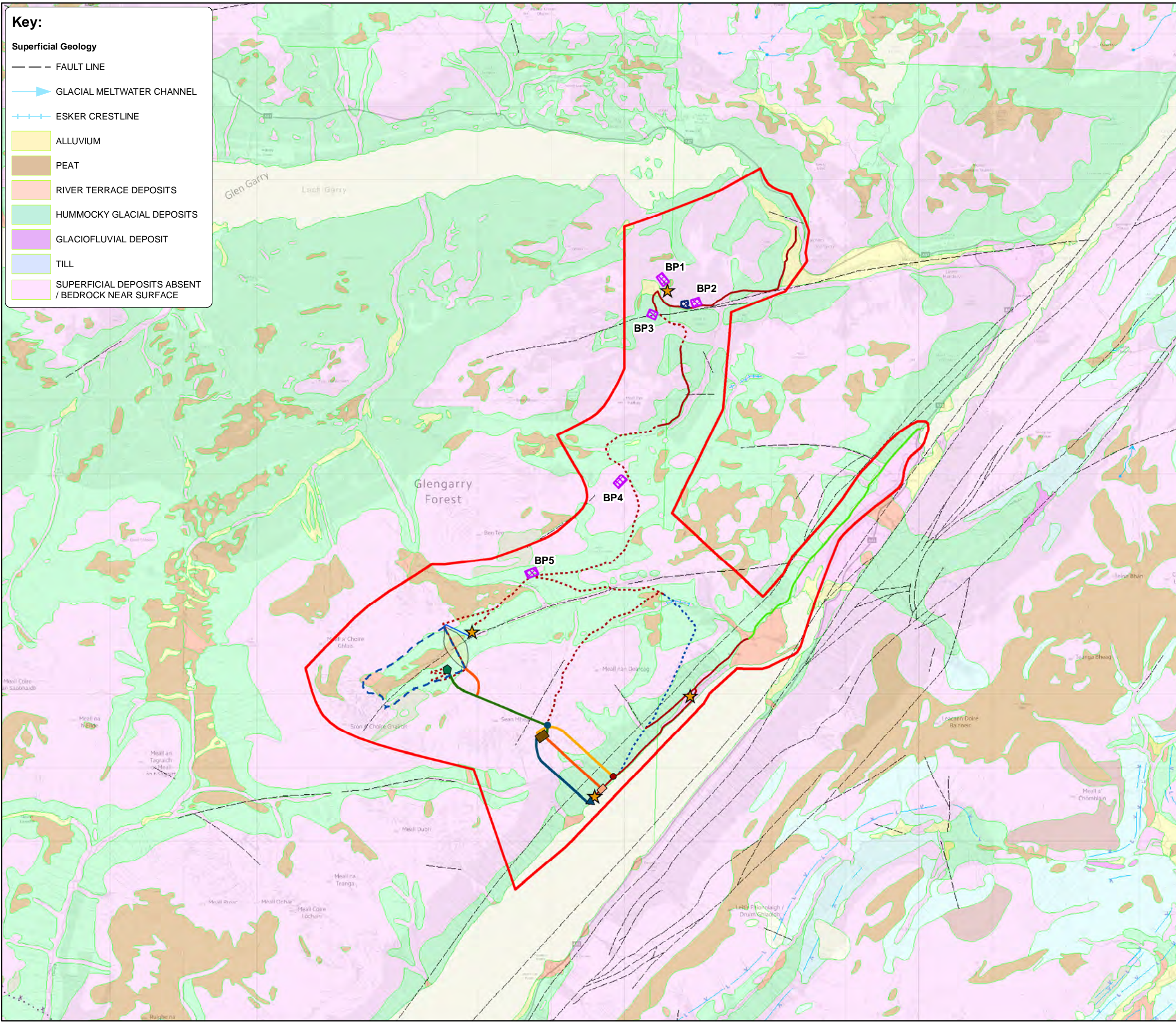
**Revised Coire Glas Pumped Storage Scheme**  
**Borrow Pit Screening Assessment**



**Key:**

**Superficial Geology**

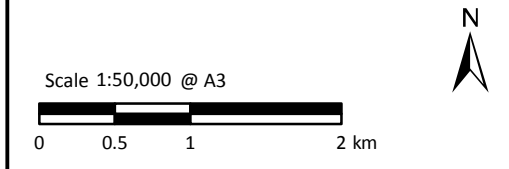
- FAULT LINE
- GLACIAL MELTWATER CHANNEL
- +++ ESKER CRESTLINE
- ALLUVIUM
- PEAT
- RIVER TERRACE DEPOSITS
- HUMMOCKY GLACIAL DEPOSITS
- GLACIOFLUVIAL DEPOSIT
- TILL
- SUPERFICIAL DEPOSITS ABSENT / BEDROCK NEAR SURFACE



**Key:**

- Site Boundary
- Upper Reservoir
- Dam
- Spillway Channel
- Intake Tower
- Headrace Tunnel (underground)
- Tailrace Tunnel (underground)
- Access Tunnel (underground)
- Emergency Access Tunnel (underground)
- Cavern Power Station (underground)
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- Emergency Access Tunnel Portal
- Lower Control Works
- Jetty and Administration Building
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- Former Forestry Borrow Pit
- Indicative Site Establishment Area
- Existing Road to be upgraded
- Existing Track to be upgraded
- Permanent New Access Track
- Temporary New Access Track

Superficial geology data obtained via BGS wms. British Geological Survey ©NERC. All rights Reserved.

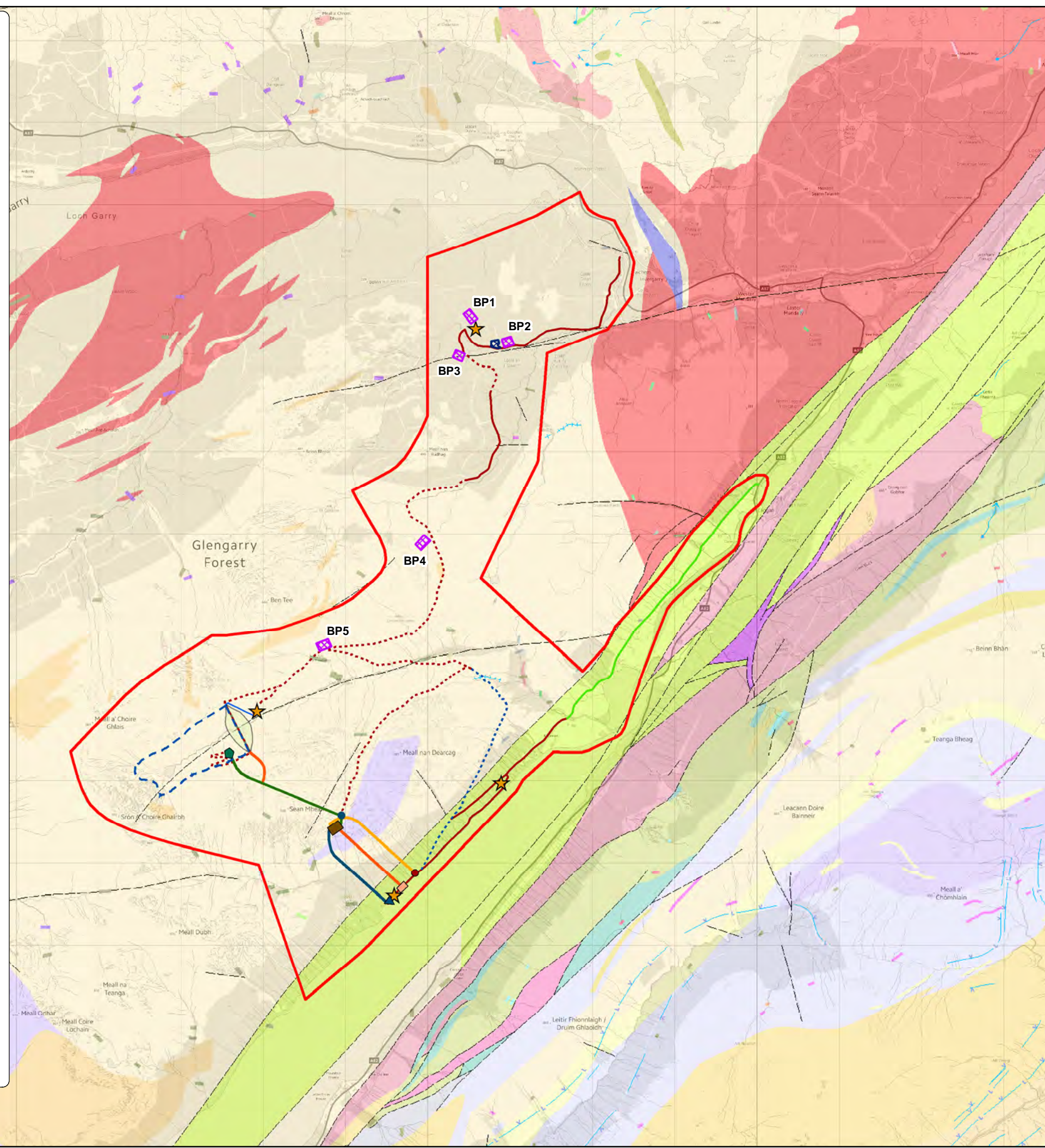


**Figure 2**  
**SUPERFICIAL GEOLOGY**  
 Revised Coire Glas Pumped Storage Scheme  
 Borrow Pit Screening Assessment



**Key:**

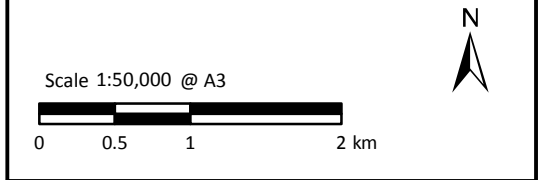
- Bedrock Geology**
- FAULT LINE
  - ▶ GLACIAL MELTWATER CHANNEL
  - ESKER CRESTLINE
  - OLD RED SANDSTONE SUPERGROUP - FAULT-GOUGE
  - OLD RED SANDSTONE SUPERGROUP - SANDSTONE, BRECCIA AND CONGLOMERATE
  - UPPER GARRY PSAMMITE FORMATION - PSAMMITE
  - UPPER GARRY PSAMMITE FORMATION - PSAMMITE AND SEMIPELITE
  - TARVIE PSAMMITE FORMATION - PSAMMITE
  - GLEN FINTAIG SEMIPELITE FORMATION - SEMIPELITE
  - GLEN BUCK PEBBLY PSAMMITE FORMATION - LIMESTONE, DOLOMITIC
  - GLEN BUCK PEBBLY PSAMMITE FORMATION - METABASALT
  - GLEN BUCK PEBBLY PSAMMITE FORMATION - PELITE, GRAPHITIC
  - GLEN BUCK PEBBLY PSAMMITE FORMATION - PSAMMITE, MICACEOUS-PEBBLY
  - GLEN BUCK PEBBLY PSAMMITE FORMATION - QUARTZITE
  - ALLT GOIBHRE SEMIPELITE FORMATION - QUARTZITE
  - ALLT GOIBHRE SEMIPELITE FORMATION - SEMIPELITE
  - AUCHVARIE PSAMMITE FORMATION - PSAMMITE
  - GLEN GLOY QUARTZITE FORMATION - QUARTZITE, FELDSPATHIC
  - GREAT GLEN FAULT ZONE - CATACLASITE
  - GREAT GLEN FAULT ZONE - FAULT-GOUGE
  - Intrusive Rocks**
  - EIL-ARKAIG DYKE SWARM - LAMPROPHYRE
  - SCOTTISH HIGHLANDS LATE CARBONIFEROUS TO PERMIAN ALKALI DYKE SUITE - LAMPROPHYRE
  - ARGYLL AND NORTHERN HIGHLANDS GRANITIC SUITE - GRANITIC-ROCK
  - ARGYLL AND NORTHERN HIGHLANDS GRANITIC SUITE - MICRODIORITE
  - ARGYLL AND NORTHERN HIGHLANDS GRANITIC SUITE - MICRODIORITE, FOLIATED
  - ARGYLL AND NORTHERN HIGHLANDS GRANITIC SUITE - MELADIORITE, HORNBLende
  - APPINITE SUITE - APPINITIC FELSIC ROCKS AND APPINITIC ULTRAMAFIC ROCKS
  - BEN NEVIS DYKE SWARM - MICRODIORITE
  - GLEN GARRY VEIN COMPLEX - GRANODIORITE, DIORITE AND LEUCOGRANITE
  - SCOTTISH HIGHLAND SILURO-DEVONIAN CALC-ALKALINE MINOR INTRUSION SUITE (OTHER THAN DYKES) - OLIVINE-PYROXENITE
  - CALEDONIAN SUPERSUITE - DIORITE
  - CALEDONIAN SUPERSUITE - FELSITE AND QUARTZ-FELDSPAR PORPHYRY
  - CALEDONIAN SUPERSUITE - MICRODIORITE
  - UNNAMED METAMORPHOSED IGNEOUS ROCKS, CALEDONIAN - SCHIST, HORNBLende
  - UNNAMED METAMORPHIC ROCKS, NEOPROTEROZOIC - AMPHIBOLITE AND HORNBLende SCHIST
  - WEST HIGHLAND GRANITE GNEISS INTRUSION - GRANITE, GNEISSOSE



**Key:**

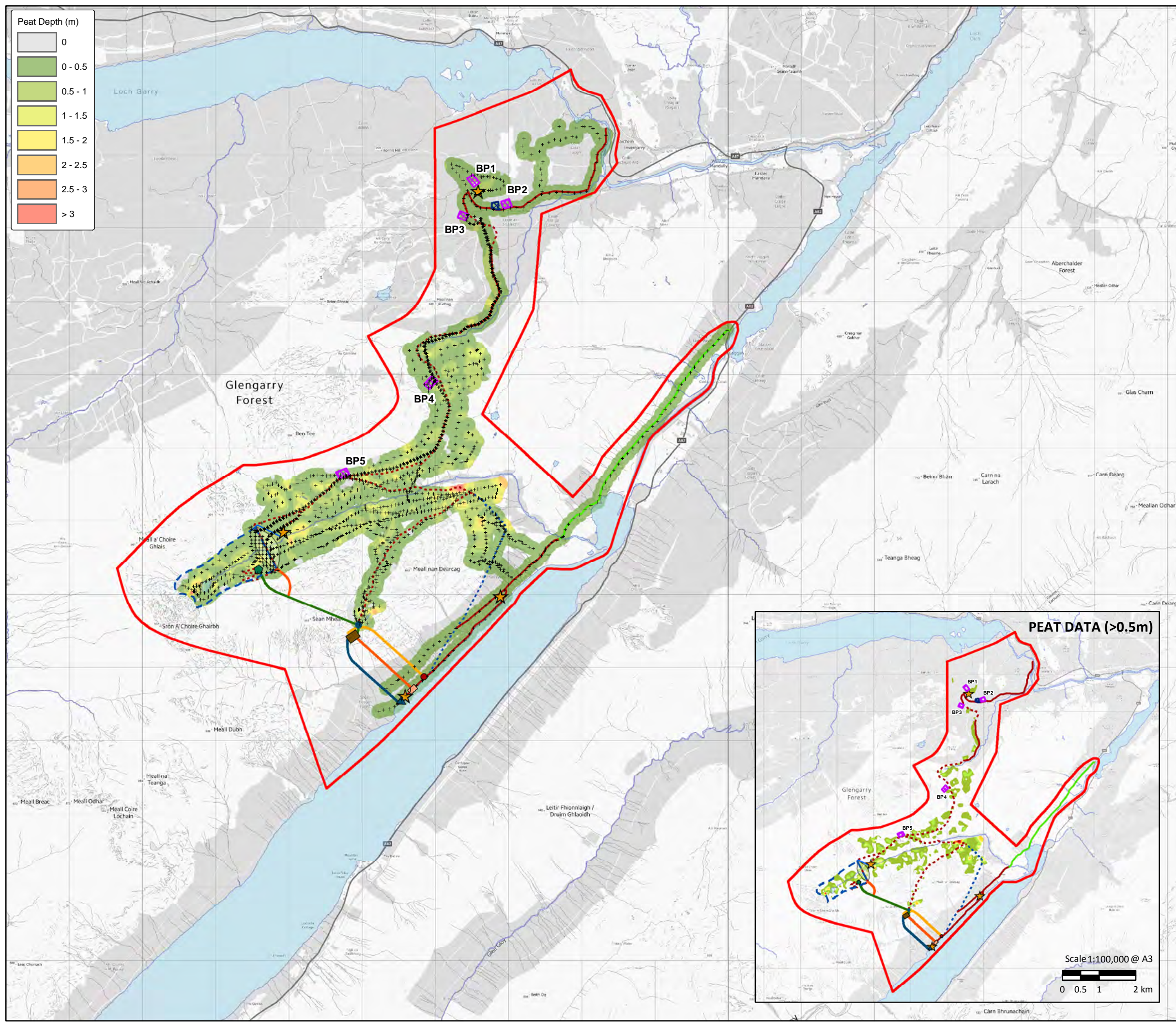
- Site Boundary
- Upper Reservoir
- Dam
- Spillway Channel
- Intake Tower
- Headrace Tunnel (underground)
- Tailrace Tunnel (underground)
- Access Tunnel (underground)
- Emergency Access Tunnel (underground)
- Cavern Power Station (underground)
- Surge and Ventilation Shafts
- Emergency Access Tunnel Portal
- Lower Control Works
- Jetty and Administration Building
- Potential Borrow Pit
- Former Forestry Borrow Pit
- Indicative Site Establishment Area
- Existing Road to be upgraded
- Temporary New Access Track
- Existing Track to be upgraded
- Permanent New Access Track

Bedrock geology data obtained via BGS wms. British Geological Survey ©NERC. All rights Reserved.

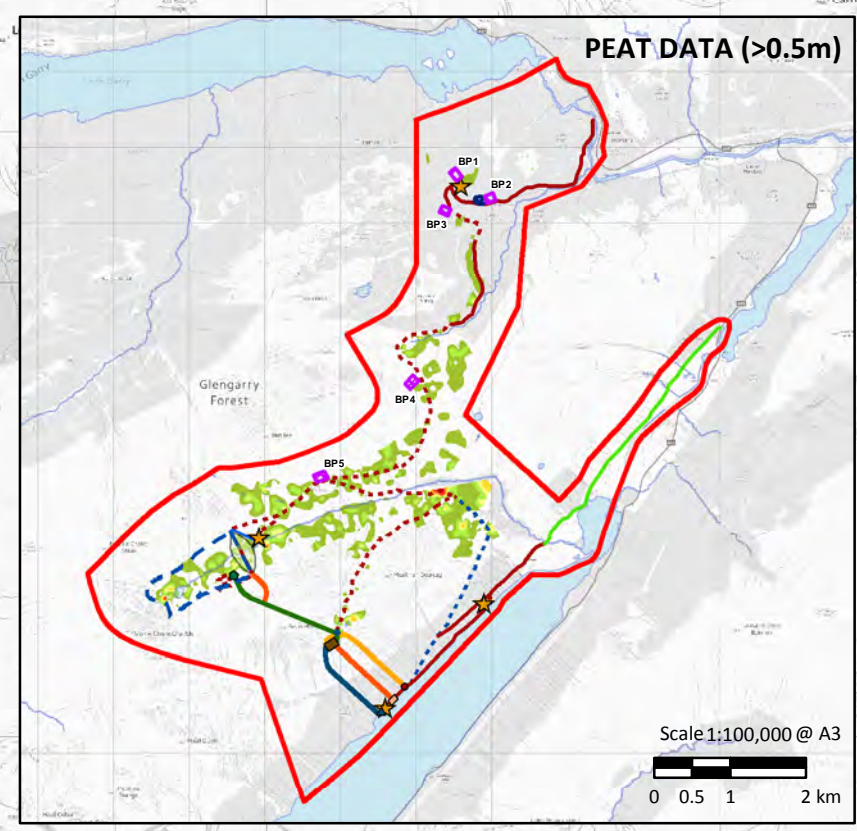


**Figure 3**  
**BEDROCK GEOLOGY**  
**Revised Coire Glas Pumped Storage Scheme**  
**Borrow Pit Screening Assessment**





- Key:**
- Site Boundary
  - Upper Reservoir
  - Dam
  - Spillway Channel
  - Intake Tower
  - Headrace Tunnel (underground)
  - Tailrace Tunnel (underground)
  - Access Tunnel (underground)
  - Emergency Access Tunnel (underground)
  - Cavern Power Station (underground)
  - Surge and Ventilation Shafts
  - Emergency Access Tunnel Portal
  - ▲ Lower Control Works
  - Jetty and Administration Building
  - Potential Borrow Pit
  - Former Forestry Borrow Pit
  - ★ Indicative Site Establishment Area
  - Existing Road to be upgraded
  - Existing Track to be upgraded
  - Permanent New Access Track
  - Temporary New Access Track
  - + Peat Probe Location

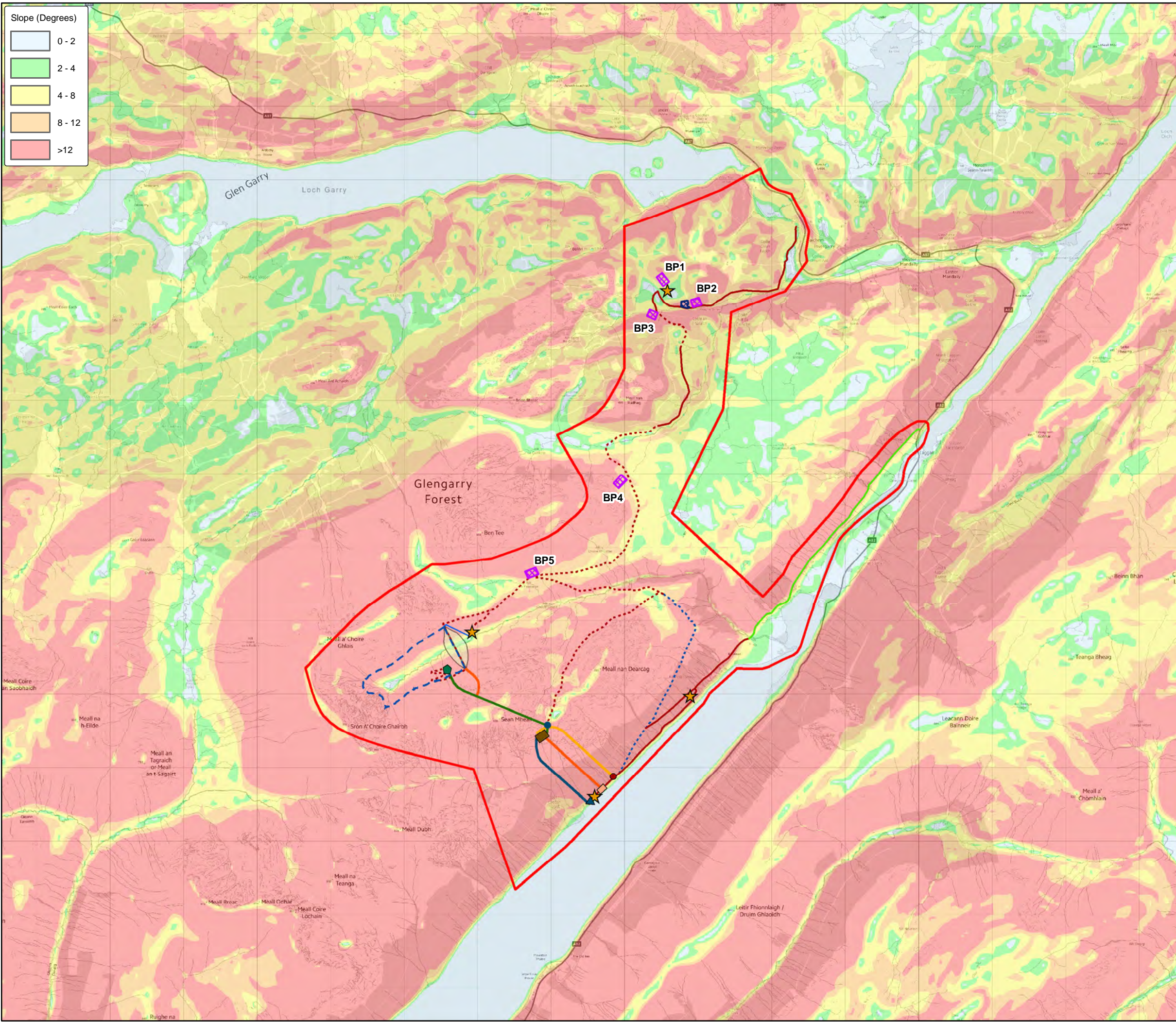
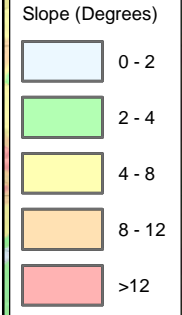


Scale 1:50,000 @ A3

**Figure 4**  
**PEAT DATA**

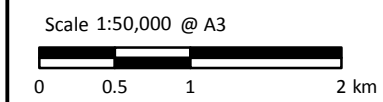
**Revised Coire Glas Pumped Storage Scheme**  
**Borrow Pit Screening Assessment**





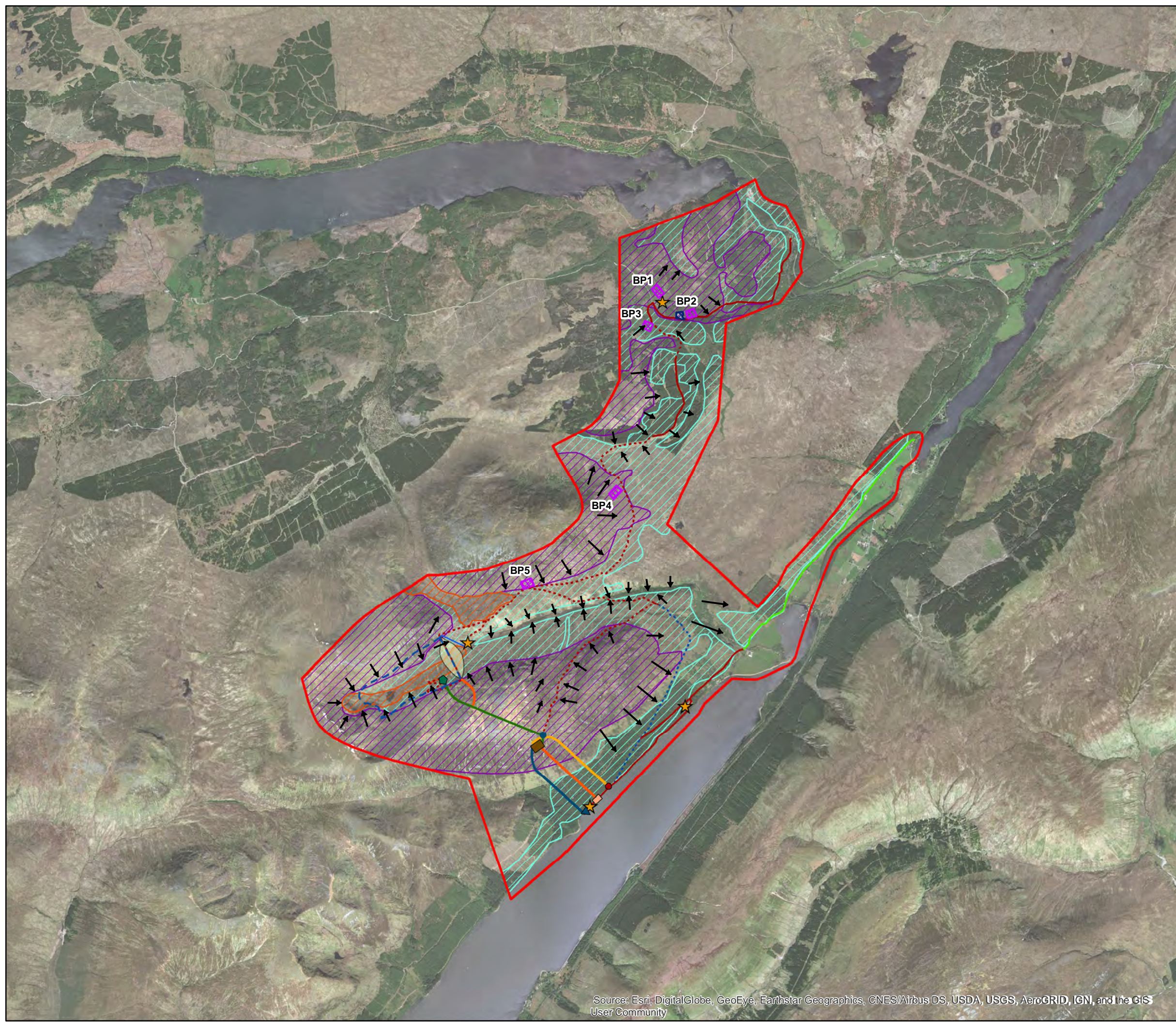
- Key:**
- Site Boundary
  - Upper Reservoir
  - Dam
  - Spillway Channel
  - Intake Tower
  - Headrace Tunnel (underground)
  - Tailrace Tunnel (underground)
  - Access Tunnel (underground)
  - Emergency Access Tunnel (underground)
  - Cavern Power Station (underground)
  - Surge and Ventilation Shafts
  - Emergency Access Tunnel Portal
  - Lower Control Works
  - Jetty and Administration Building
  - Potential Borrow Pit
  - Former Forestry Borrow Pit
  - Indicative Site Establishment Area
  - Existing Road to be upgraded
  - Existing Track to be upgraded
  - Permanent New Access Track
  - Temporary New Access Track

Slope Data OS Terrain 50 © Crown copyright and database right 2017



**Figure 5**  
**SLOPE PLAN**  
**Revised Coire Glas Pumped Storage Scheme**  
**Borrow Pit Screening Assessment**

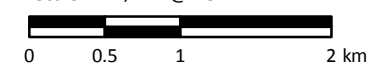




**Key:**

- Site Boundary
- Upper Reservoir
- Dam
- Spillway Channel
- █ Intake Tower
- Headrace Tunnel (underground)
- Tailrace Tunnel (underground)
- Access Tunnel (underground)
- Emergency Access Tunnel (underground)
- Cavern Power Station (underground)
- Surge and Ventilation Shafts
- Emergency Access Tunnel Portal
- ▲ Lower Control Works
- Jetty and Administration Building
- Potential Borrow Pit
- Former Forestry Borrow Pit
- ★ Indicative Site Establishment Area
- Existing Road to be upgraded
- Existing Track to be upgraded
- Permanent New Access Track
- Temporary New Access Track
- Direction of Slope
- Bedrock at or Close to Surface
- Haggy Peat
- Hummocky Glacial Deposits

Scale 1:50,000 @ A3











**Figure 6**  
**GEOMORPHOLOGY**

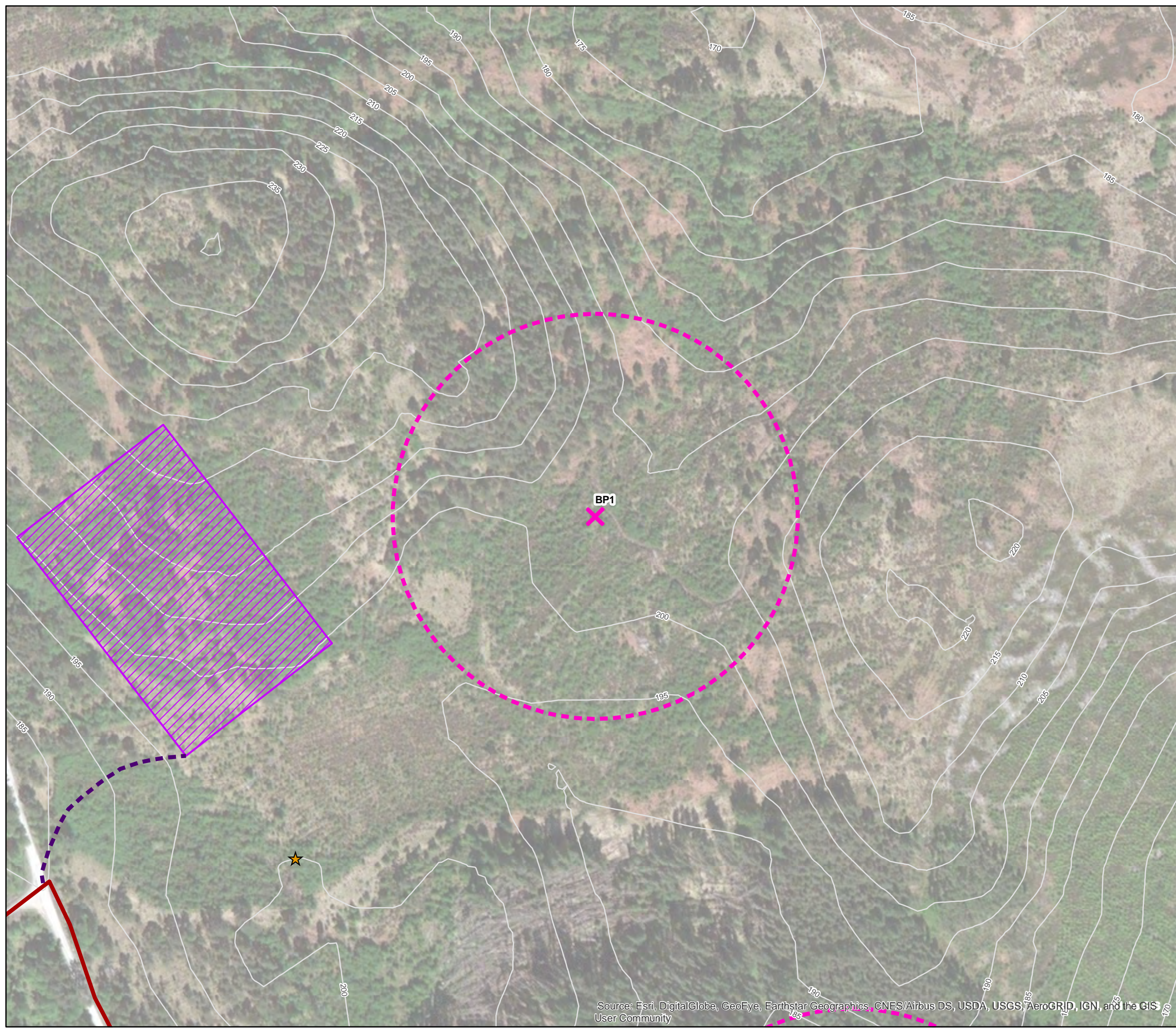
**Revised Coire Glas Pumped Storage Scheme**  
**Borrow Pit Screening Assessment**

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Key:

-  Potential Borrow Pit
-  Initial Borrow Pit Search Area
-  Initial Borrow Pit Centre Point
-  Site Establishment Area
-  Indicative Track
-  Existing Track to be upgraded
-  Permanent New Access Track
-  5m Contours



Contours derived from OS Terrain 5

Scale 1:2,000 @ A3

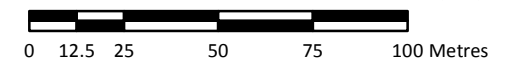











Figure 7.a

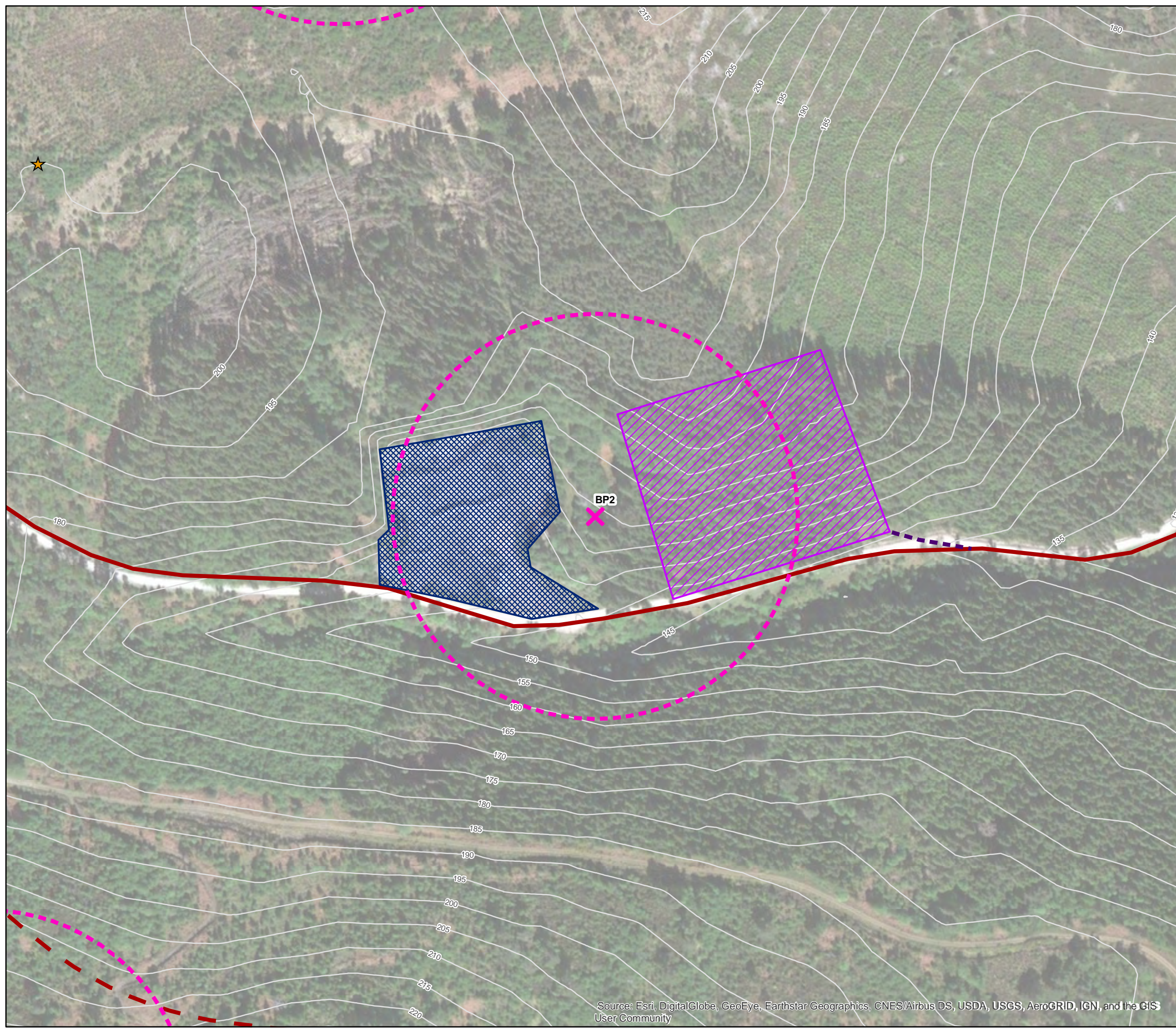
**PROPOSED BORROW PIT  
LOCATION (BP1)**

**Revised Coire Glas Pumped  
Storage Scheme  
Borrow Pit Screening Assessment**



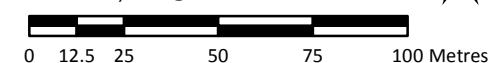
Key:

-  Potential Borrow Pit
-  Initial Borrow Pit Search Area
-  Initial Borrow Pit Centre Point
-  Site Establishment Area
-  Indicative Track
-  Existing Track to be upgraded
-  Permanent New Access Track
-  5m Contours
-  Former Forestry Borrow Pit



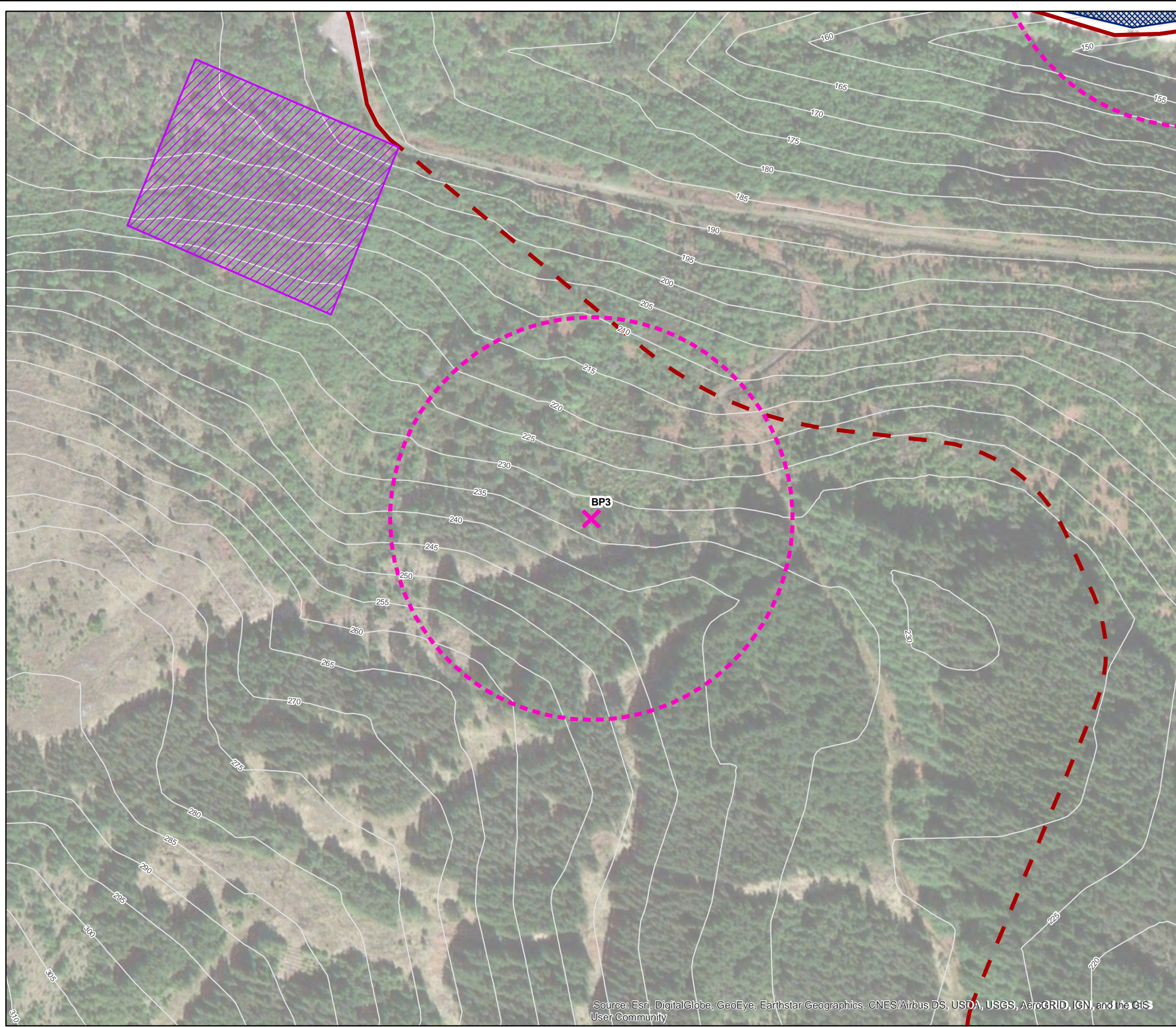
Contours derived from OS Terrain 5

Scale 1:2,000 @ A3












**Figure 7.b**  
**PROPOSED BORROW PIT**  
**LOCATION (BP2)**  
**Revised Coire Glas Pumped**  
**Storage Scheme**  
**Borrow Pit Screening Assessment**



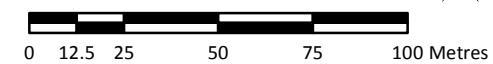


**Key:**

-  Potential Borrow Pit
-  Initial Borrow Pit Search Area
-  Initial Borrow Pit Centre Point
-  Site Establishment Area
-  Indicative Track
-  Existing Track to be upgraded
-  Permanent New Access Track
-  5m Contours
-  Former Forestry Borrow Pit

Contours derived from OS Terrain 5

Scale 1:2,000 @ A3



**Figure 7.c**

**PROPOSED BORROW PIT  
LOCATION (BP3)**

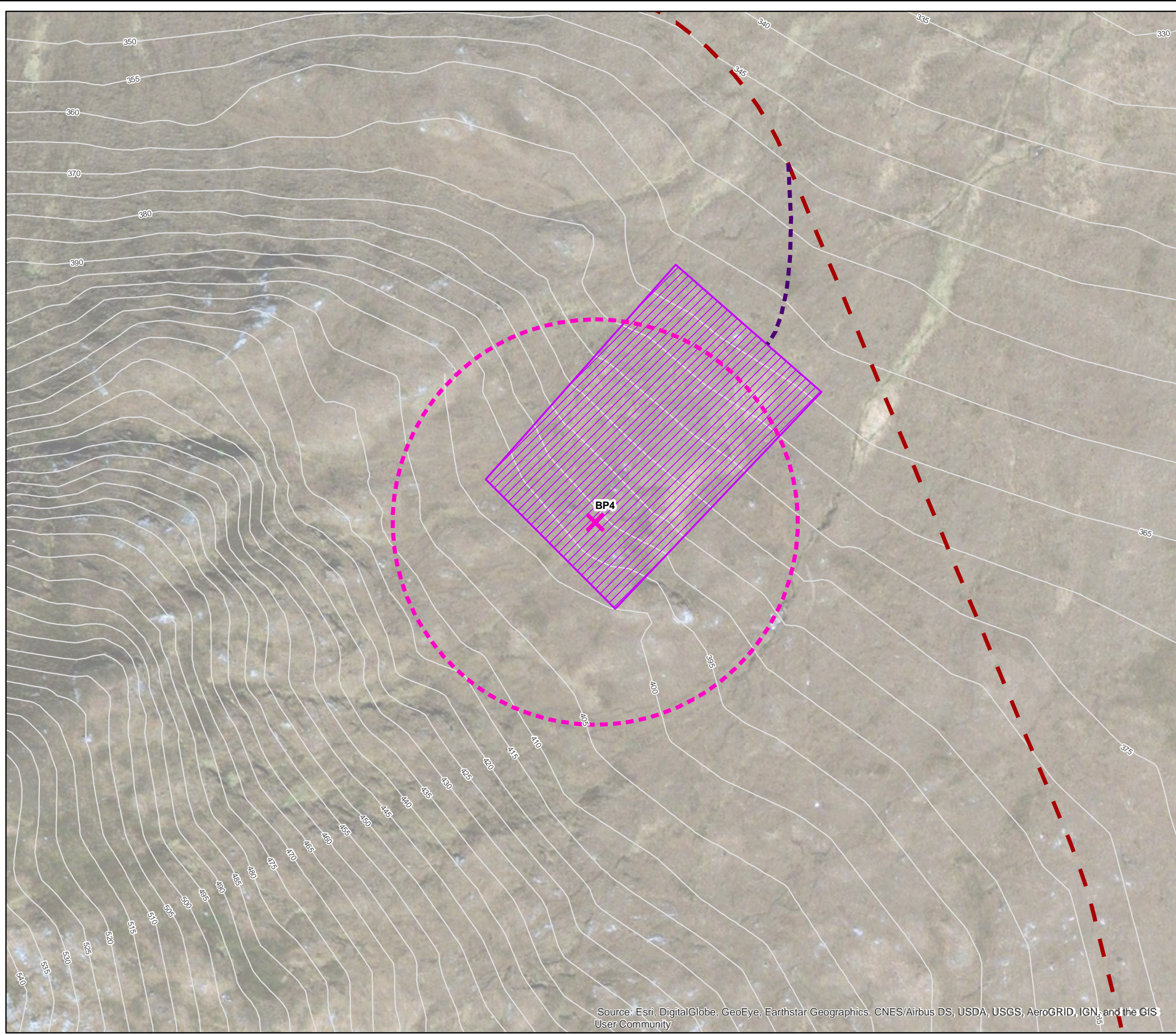
**Revised Coire Glas Pumped  
Storage Scheme  
Borrow Pit Screening Assessment**

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



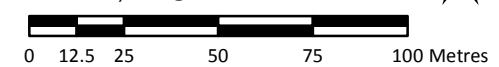
Key:

- Potential Borrow Pit
- Initial Borrow Pit Search Area
- Initial Borrow Pit Centre Point
- Site Establishment Area
- Indicative Track
- Existing Track to be upgraded
- Permanent New Access Track
- 5m Contours



Contours derived from OS Terrain 5

Scale 1:2,000 @ A3



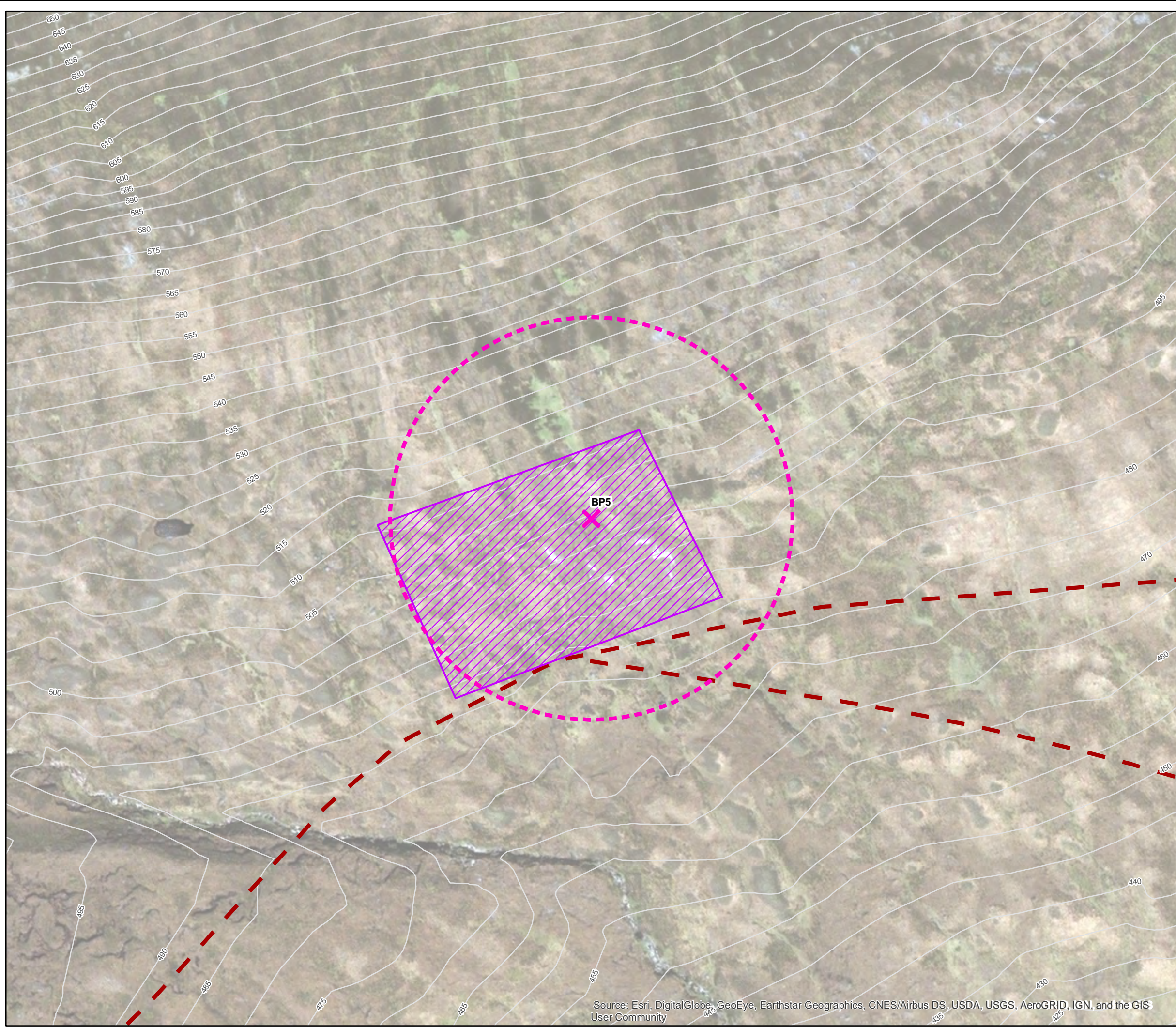
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community









Figure 7.d

**PROPOSED BORROW PIT LOCATION (BP4)**

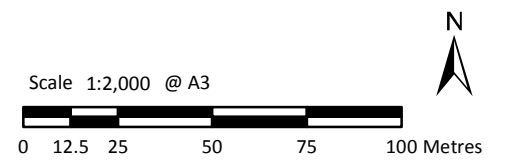
**Revised Coire Glas Pumped Storage Scheme  
Borrow Pit Screening Assessment**





- Key:**
-  Potential Borrow Pit
  -  Initial Borrow Pit Search Area
  -  Initial Borrow Pit Centre Point
  -  Site Establishment Area
  -  Indicative Track
  -  Existing Track to be upgraded
  -  Permanent New Access Track
  -  5m Contours

Contours derived from OS Terrain 5



**Figure 7.e**  
**PROPOSED BORROW PIT**  
**LOCATION (BP5)**

**Revised Coire Glas Pumped**  
**Storage Scheme**  
**Borrow Pit Screening Assessment**



## APPENDIX A

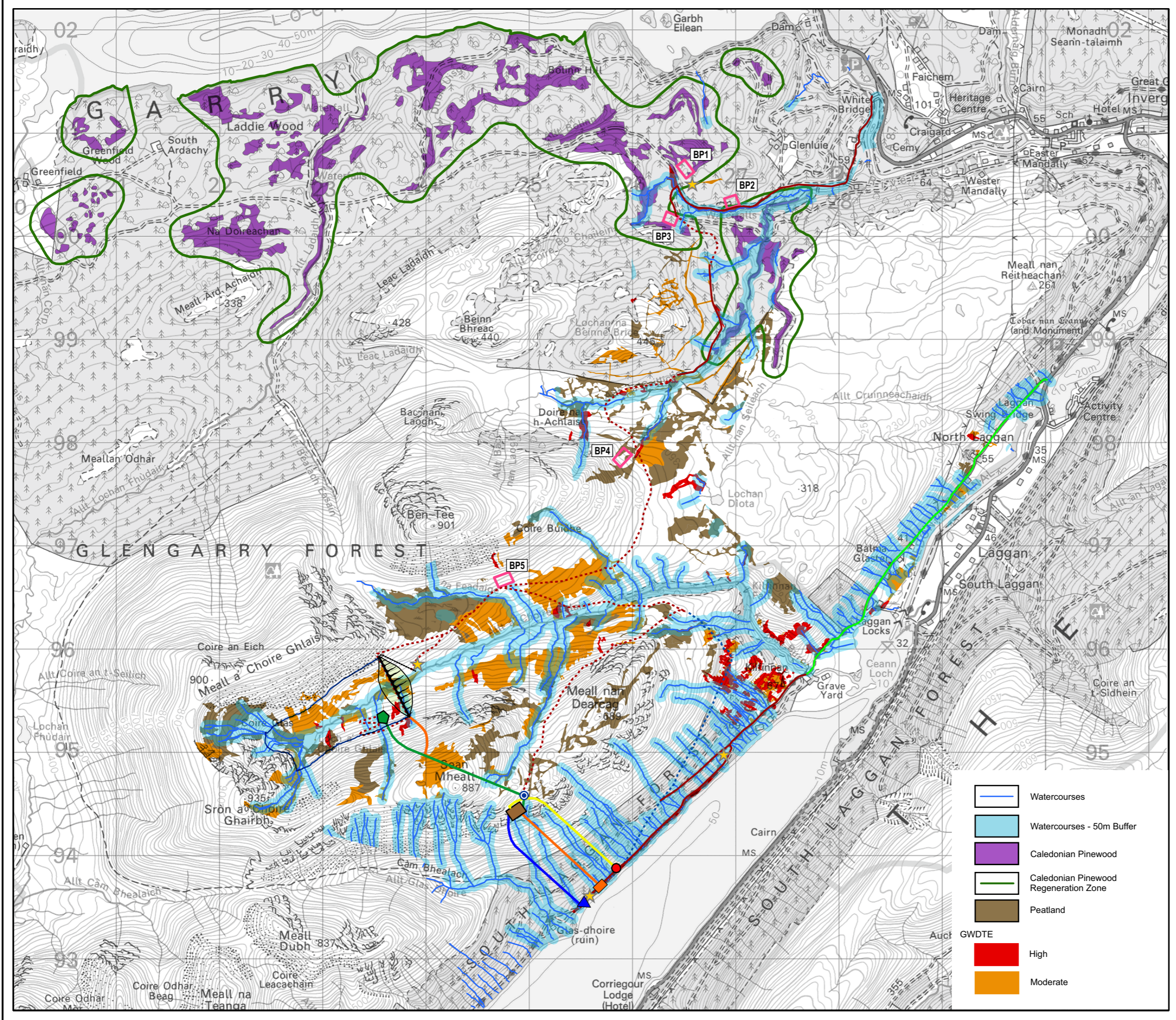
### Borrow Pit Summary

Location	PEAT		GEOLOGY		CURRENT SETTING	SLOPE		DIMENSIONS (m / mAOD)					POTENTIAL		COMMENT		
	Peat Present	Max Depth of Peat (m)	Drift	Solid	Current Setting	Approximate Slope (degrees)	Predominant Slope Direction	Width	Length	Height (min)	Height (max)	Height Differential	Potential Excavation Area (m2)	Proximity to Development	Engineered Borrow Pit Potential (m <sup>3</sup> )	Potential for Peat Restoration	Environmental Considerations
<b>BP1</b>	No	<0.5	None Mapped	Upper Garry Psammite Formation - Psammite. Metamorphic Bedrock	Forestry	8-12	NW	150	100	200	220	20	16,500	Close to proposed site establishment area & site access track	<b>120,000</b>	<b>Possible</b>	BP is located within coniferous forestry, offering good screening potential for wider area. Located within an area identified for Caledonian Pinewood regeneration. The avoidance of felling mature Caledonian Pine trees would be given due consideration in detailed design if this borrow pit were selected. The BP avoids areas of GWDTE, and no peat was identified following peat probing exercise. Pre-construction checks for protected species would be required.
<b>BP2</b>	No	<0.5	None Mapped	Upper Garry Psammite Formation - Psammite. Metamorphic Bedrock	Forestry	>12	NW	120	100	150	185	35	13,200	Close to proposed site establishment area & site access track	<b>168,000</b>	<b>Possible</b>	BP is located within forestry, offering good screening potential for wider area. The BP avoids areas of GWDTE, and no peat was identified following peat probing exercise. Pre-construction checks for protected species would be required.
<b>BP3</b>	No	<0.5	None Mapped	Upper Garry Psammite Formation - Psammite. Metamorphic Bedrock	Forestry	8-12	SW	120	100	205	225	20	13,200	Close to proposed site establishment area & site access track	<b>96,000</b>	<b>Possible</b>	BP is located within forestry, offering good screening potential for wider area. Located within an area identified for Caledonian Pinewood regeneration. The avoidance of felling mature Caledonian Pine trees would be given due consideration in detailed design if this borrow pit were selected. The BP avoids areas of GWDTE, and no peat was identified following peat probing exercise. Pre-construction checks for protected species would be required.
<b>BP4</b>	Little (700m3)	<1	None Mapped	Upper Garry Psammite Formation - Psammite. Metamorphic Bedrock	Open hillside	>12	SW	100	150	365	395	30	16,500	Close to access track to dam site	<b>180,000</b>	<b>Possible</b>	Potential effects on landscape character and visual receptors (principally walking routes) during construction. Close (but >50m) from watercourse. The BP avoids areas of GWDTE. Excavated peat can be readily used in restoration of borrow pit.
<b>BP5</b>	Little (200m3)	<1	Hummocky Glacial Deposits	Upper Garry Psammite Formation - Psammite. Metamorphic Bedrock	Open hillside	>12	NW	150	100	485	510	25	16,500	Close to access track to dam site	<b>150,000</b>	<b>Possible</b>	Potential effects on landscape character and visual receptors (principally walking routes) during construction. Close (but >50m) from watercourse. The BP avoids areas of GWDTE. Excavated peat can be readily used in restoration of borrow pit.

## APPENDIX B

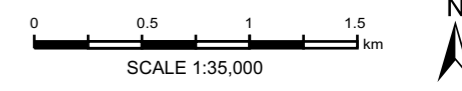
### Environmental Constraints Plan





- Key:**
- Upper Reservoir
  - Dam and Embankment
  - Spillway Channel
  - Intake Tower
  - Headrace Tunnel (underground)
  - Tailrace Tunnel (underground)
  - Access Tunnel (underground)
  - Emergency Access Tunnel (underground)
  - Cavern Power Station (underground)
  - Surge / Ventilation Shafts
  - Emergency Access Tunnel Portal
  - Lower Control Works
  - Jetty & Administration Building
  - Existing Road to be Upgraded
  - Existing Track to be Upgraded
  - Permanent New Access Track
  - Temporary New Access Track
  - Indicative Site Establishment Area
  - Proposed Borrow Pits

- Watercourses
  - Watercourses - 50m Buffer
  - Caledonian Pinewood
  - Caledonian Pinewood Regeneration Zone
  - Peatland
- GWDTE**
- High
  - Moderate



**Appendix B**  
**Figure 1**  
**Environmental Constraints**  
 Revised Coire Glas Pumped Storage Scheme  
 EIA Report



## EUROPEAN OFFICES

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#### CAMBRIDGE

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#### CARDIFF

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#### CHELMSFORD

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#### EDINBURGH

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#### EXETER

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