

EUCHANHEAD RENEWABLE ENERGY DEVELOPMENT

Technical Appendix 10.6: Borrow Pit Assessment

Prepared for: **ScottishPower Renewables Ltd**

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1.0 Introduction

SLR Consulting Ltd (SLR) was commissioned by Scottish Power Renewables (SPR) (UK) Ltd to undertake a Borrow Pit Assessment at the proposed Euchanhead Renewable Energy Development (proposed development), located approximately 9.8 km south west of Sanquhar, in Dumfries and Galloway, as measured to the nearest proposed turbine location (**Figure 10.6.1**).

It is anticipated that the proposed Development would comprise up to 21 wind turbines and an energy storage facility, with associated infrastructure including external transformers, crane hardstandings, access tracks, cabling, borrow pits and a single substation including control building. It is proposed that the blade tip height of the turbines would be up to 230 m and blade lengths of up to 75 m.

1.1 Methodology

This report provides details of the proposed borrow pits, which would be necessary to provide the aggregates required to construct the proposed Development.

There are seven proposed borrow pit locations that have been selected because of their morphology, accessibility from proposed tracks, orientation and the expected proximity of suitable rock close to surface. The borrow pits are in areas where the peat coverage is minimal and where bedrock outcrops and potential aggregate reserves are known to occur near the surface.

This report is based on a desk based assessment of seven potential borrow pits, supported by a site visit by an experienced engineering geologist. The desk based assessment has involved review of all geological plans, including historic geological plans, topographic and slope plans and review of available memoirs. The site visit was used to confirm peat coverage and identify bedrock outcrops. Prior to construction, site investigations would be carried out to determine the suitability of the geology and rock at the proposed borrow pits locations.

1.1.1 Sources of Information

The following sources of information have been reviewed and assessed:

- British Geological Survey (BGS) online map viewer and Geoindex¹;
- Scotland's Environment website²; and
- Information gathered during site visits.

1.2 Site Location and Description

The proposed Euchanhead Site is located approximately 9.8 km south west of Sanquhar, in Dumfries and Galloway, as measured to the nearest turbine location. The proposed Site is currently accessed via an existing access track, south of the A76, plus smaller access points from the east and the south.

The Site is comprised of two blocks of commercial plantation forestry with extensive existing forestry tracks present across the Site. Two areas of open upland moorland are present above the tree line onsite, one in the northwest corner of the southern block in the area around Meikledodd Hill and Lorg Hill, and the other along the southern boundary of the southern block, from the Striding Arch to Lamgarroch.

The Site is characterised by numerous steep sided valleys with topography ranging from 643 m AOD at Meikledodd Hill in the west to 285 m AOD in the south-west of the Site. however, the turbines are generally

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

<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>; <http://www.bgs.ac.uk/geoindex/> Last accessed April 2019

² Scotland's Environment Website www.environment.scotland.gov.uk (last accessed April 2019)

located on flat lying ground, either on the valley floors or on the flatter hill tops. Approximate elevations for the proposed wind turbine locations range from 430 m AOD to 610 m AOD.

There are no lochs or large bodies of water on the Site. The Site is surrounded by numerous large hills, all generally higher than 505 m AOD. These include Well Hill (549 m AOD), Magheuchan Rig (559 m AOD), Blacklorg Hill (681 m AOD), Meikledodd Hill (643 m AOD) and Colt Hill (598 m AOD).

To the north west of the Site is the SPR operated Hare Hill Windfarm and extension, comprising fifty-five turbines currently operating at a capacity of 42.95 megawatts.

A detailed description of the Site can be found in **Chapter 3: Description of the proposed Development**. The Site layout is shown in **Figure 10.6.2**.

2.0 Geological Setting

This assessment has been completed through a largely desk based review of soil and geological maps and OS contour data. Minimally intrusive investigation has been undertaken on site in the form of peat survey, see **Technical Appendix 10.1: Peat Landslide Hazard Risk Assessment**.

2.1 Soils

The principal soil type underlying the Site is peaty gleys, with peaty podzols, mineral podzols and mineral gleys also all present. The peaty gley's parent materials are the Lower Paleozoic greywackes and shales found locally.

2.2 Superficial Geology

The superficial geology on Site comprises of peat present across the flatter hill tops, glacial till present on the valley sides and alluvial deposits alongside rivers. In some of the wider, flatter valleys there are hummocky glacial deposits present.

The superficial geology of the Site is detailed in **Figure 10.6.3**.

2.3 Bedrock Geology

The Site is predominantly underlain by metasedimentary lithologies with localised igneous intrusions. The metasedimentary lithologies are of Ordovician age and are trending in a south-west to north-east direction. The majority of the Site is underlain by the Kirkcolm Formation, a wacke unit made of sandstone and siltstone turbidite sequences. There is one localised outcrop of the Galdenoch Formation, also a wacke unit, within the Kirkcolm Formation. This sequence rests on the Moffat Shale Group, a mudstone unit present to the south of the Kirkcolm Formation. There are numerous faults present on the Site, one of these is present between the Moffat Shale Group and the Portpatrick Formation. The Portpatrick Formation is present to the south of the Moffat Shale group and consists of wacke and siltstone turbidite succession.

Across the Site there are localised outcrops of igneous lithologies ranging from the Silurian to Devonian in age. In the north of the Site there are outcrops of the Portallan Member, a volcanoclastic-breccia formed during the Ordovician. The North Britain Calc-Alkaline Suite is also present across the Site with outcrops of microdiorite and microgranodiorite both present. Granodioritic rocks of the Devonian age Harehill Pluton outcrop at Harehill Windfarm.

The bedrock geology is depicted in **Figure 10.6.4**.

Table 2-1
Bedrock Geology Summary

Age	Stratigraphic Group	Unit	Subunit	Description
Devonian (419 – 393 Ma)	Caledonian Supersuite	South of Scotland Granitic Suite	Harehill Pluton	Granodiorite
Ordovician (458 – 449 Ma)	Barrhill Group	Kirkcolm Formation	-	Sandstone/siltstone turbidite sequence
			Poltallan Member	Breccia of amygdaloidal lava clasts in a clastic or tuffaceous matrix with intercalations of dark silty mudstone
		Galdenoch Formation	-	Massive wacke and siltstone turbidite sequence

Age	Stratigraphic Group	Unit	Subunit	Description
	Scaur Group	Portpatrick Formation	-	Wacke and siltstone turbidite succession
Ordovician – Silurian (458 – 433 Ma)	-	Moffat Shale Group	-	Black shale, grey shale, bentonite and tuff
Silurian – Devonian (443 – 358 Ma)	Caledonian Supersuite	North Britain Siluro-Devonian Calc-Alkaline Dyke Suite	-	Microgranodiorite and microdiorite

2.4 Mining and Quarrying

Following review of publicly available records, there is evidence of historic mining onsite noted as a disused pit marked on the OS map in the south of the Site. However, review of historical maps presents no evidence of active mining. There are four large historic borrow pits present on the site which will have been utilised for building forestry commission access tracks. All four are marked as quarries on the OS maps.

2.5 Hydrogeology

The solid geology underlying the Site is classified as a Low Productivity Aquifer, where flow is virtually all through fractures and other discontinuities.

2.6 Local Hydrology

The Site is drained by three main surface water catchments; the Euchar Water, Polskeoch Burn, and the Shinnel Water. The Euchar Water drains the north of the Site, the Polskeoch Burn drains the centre of the Site and the Shinnel Water drains the south of the Site.

3.0 Aggregate Requirements

The proposed turbine locations and their subsequent maintenance would require the construction of a purpose built network of access tracks. These tracks would be single track with occasional passing places, un-metalled and would be constructed to the turbine suppliers' specifications conforming to the Specification for Highway Works.

The total length of permanent new access track is estimated to be approximately 32.71 km. The typical cross sectional area of track with respect to imported construction materials has been estimated to be 3.5 m² per linear metre, which is based upon an estimated carriage width of 5-7 m and an average thickness of 0.5 - 1.0 m.

The indicative volumes of rock required for Site infrastructure are summarised in **Table 3-1** and based on a materials calculator (**Appendix A**).

Table 3-1
Aggregate Requirements

Proposed Infrastructure	Volume of Aggregate Required
Access Track A (new)	47,320 m ³
Access Track A (upgraded)	4,378 m ³
Main Site Access Tracks (new)	135,412 m ³
Existing Access Tracks for Upgrade	9,452 m ³
Access Track to Met Mast	1,216 m ³
Access Track to Borrow Pit (temporary)	336 m ³
Passing Places	13,440 m ³
Turbine Bases – formation only	4,939 m ³
Fill Above Turbine Bases	52,143 m ³
Crane Pads	63,000 m ³
Crane Pad Boom Support	6,048 m ³
Blade laydown and ancillaries	1,680 m ³
Turning Heads	2,730 m ³
Substation	7,500 m ³

Proposed Infrastructure	Volume of Aggregate Required
Met Mast Working Area	600 m ³
Laydown Area	5,000 m ³
Security Compound	2,500 m ³
Main Construction Compound	5,000 m ³
Construction Compound Secondary	3,750 m ³
Construction Compound Secondary	1,250 m ³
Total	367,694 m³

4.0 Aggregate Quality

The primary use of aggregate arising from working of the selected borrow pits would be for the construction of the tracks using unbound aggregate to the turbine suppliers' specifications and conforming to the Specification for Highway Works.

A site investigation would be required to establish that aggregate within the proposed borrow pits would comprise suitable aggregate material; it is at this stage still subject to geotechnical testing.

5.0 Borrow Pits

5.1 Introduction

It is anticipated that the proposed turbine bases would be sited on glacial soils or shallow bedrock, composed of metasedimentary lithologies with localised igneous intrusions. The metasedimentary lithologies are of Ordovician age and are trending in a south-west to north-east direction. The majority of the Site is underlain by the Kirkcolm and Prortpatrick Formation, a wacke unit made of sandstone and siltstone turbidite sequences.

Following review of publicly available records, there is no evidence of mining or quarrying within the Site boundary or immediate surrounds, apart from localised use by the Forestry and Land Scotland (FLS).

The assessment has been completed through a desk-based review of geological maps and memoirs and is supported by several walkovers completed between February and July 2020.

This section of the report provides an assessment of the potential borrow pits with an evaluation of its potential to meet the proposed Development aggregate requirements.

The proposed borrow pit locations have been predominantly selected due to their geological setting. Other factors included environmental impacts, morphology, accessibility from the Site or proposed roads, orientation and the expected proximity of rock to the surface. The proposed locations are in areas where the superficial coverage is limited and where bedrock is anticipated to have aggregate reserves near to surface.

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 onsite during construction. In the event that such rock was available the amount extracted from the borrow pits would be reduced.

5.2 Borrow Pit Selection

A total of seven potential search areas have been selected as possible borrow pit locations. Each location will be reviewed in the sections below. Photographs of each location are detailed within **Appendix B**.

5.3 Borrow Pit BP1

Borrow pit BP1 is located to the north of the proposed access track at approximately NGR NR 269202, 606666 shown on **Figure 10.6.5.1** with further details in **Table 5-1**. The proposed location would form a new borrow pit, and is located in the valley between Well Hill and Wham Rig.

The underlying geology in this area comprises of Ordovician age wackes and grey wacke sandstones.

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 the Site. This borrow pit would not provide sufficient rock for the proposed Development on its own but could have the capacity to increase significantly if it was deemed appropriate for the development.

Table 5-1
 Borrow Pit BP1

Borrow Pit 1	
Site Dimensions	Approximately 150 x 50 m
Excavation Area	Approximately 7,431 m ²
Maximum Height of Excavation	Approximately 25 m
Gradient	Slope increasing steeply towards the north west
Details of Extraction	Combination of drilling and blasting
Overburden Type and Depth	Soil/weathered rock
Extent of Aggregate Extraction	Approximately 75,000 m ³
Aggregate Composition	Metasedimentary rock wackes and wacke sandstones

5.4 Borrow Pit BP2

Borrow pit BP2 is located on the north eastern edge of the access track at approximately NGR NR 269185, 602114 shown on **Figure 10.6.5.2** with further details in **Table 5-2**. The borrow pit would create a new working into the lower reaches of Wether Hill.

The underlying geology in this area comprises of Ordovician metasedimentary rocks.

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 moderate volume of material for the Site. This borrow pit would not provide sufficient rock for the proposed Development on its own.

Table 5-2
Borrow Pit BP2

Borrow Pit 2	
Site Dimensions	Approximately 120 x 50 m
Excavation Area	Approximately 6,000 m ²
Maximum Height of Excavation	Approximately 10 m
Gradient	Slope increasing steeply towards the south east
Details of Extraction	Combination of drilling and blasting
Overburden Type and Depth	Soil/weathered rock
Extent of Aggregate Extraction	Approximately 24,000 m ³
Aggregate Composition	Metasedimentary rocks

5.5 Borrow Pit BP3

Borrow pit BP3 is located to the east of the proposed access track at approximately NGR NR 268953, 601507 shown on **Figure 10.6.5.3** with further details in **Table 5-3**. The proposed location would form an extension to an existing borrow pit, currently used by FLS.

The underlying geology in this area comprises Ordovician metasedimentary rocks.

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 the Site.

Table 5-3
 Borrow Pit BP3

Borrow Pit 3	
Site Dimensions	Approximately 120 x 60 m
Excavation Area	Approximately 7200 m ²
Maximum Height of Excavation	Approximately 20 m
Gradient	Slope increasing steeply towards the north east
Details of Extraction	Combination of drilling and blasting
Overburden Type and Depth	Soil/weathered rock
Extent of Aggregate Extraction	Approximately 57,600 m ³
Aggregate Composition	Metasedimentary rocks

5.6 Borrow Pit BP4

Borrow pit BP4 is located to the south of a proposed new access track at approximately NGR NR 270047, 599778 shown on **Figure 10.6.5.4** with further details in **Table 5-4**. The proposed location would create a new borrow pit into the side of the lower reaches of Colt Hill.

The underlying geology in this area comprises Ordovician metasedimentary rocks.

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.

Table 5-4
 Borrow Pit BP4

Borrow Pit 4	
Site Dimensions	Approximately 170 x 100 m
Excavation Area	Approximately 14,258 m ²
Maximum Height of Excavation	Approximately 30 m
Gradient	Slope increasing steeply towards the south
Details of Extraction	Combination of drilling and blasting
Overburden Type and Depth	Soil/weathered rock
Extent of Aggregate Extraction	Approximately 204,000 m ³
Aggregate Composition	Metasedimentary rocks

5.7 Borrow Pit BP5

Borrow pit BP5 is located to the east of the site on the eastern edge of a proposed new access track at approximately NGR NR 270642, 599978 shown on Figure 10.6.5.5 with further details in Table 5-5. The proposed borrow pit would create a new working on the lower reaches of Troston Hill.

The underlying geology in this area comprises Ordovician metasedimentary rocks.

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 the Site.

Table 5-5
Borrow Pit BP5

Borrow Pit 5	
Site Dimensions	Approximately 100 x 70 m
Excavation Area	Approximately 7,000 m ²
Maximum Height of Excavation	Approximately 15 m
Gradient	Slope increasing steeply towards the south
Details of Extraction	Combination of drilling and blasting
Overburden Type and Depth	Soil/weathered rock
Extent of Aggregate Extraction	Approximately 42,000 m ³
Aggregate Composition	Metasedimentary rock

5.8 Borrow Pit BP6

Borrow pit BP6 is located in the north of the site on the western edge of a proposed new Access Track A at approximately NGR NR 265228, 606012 shown on Figure 10.6.5.6 with further details in Table 5-6. The proposed borrow pit would create a new working located on the lower reaches of Blackcraig Hill.

The underlying geology in this area comprises Ordovician metasedimentary rocks.

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 proposed new Access Track A to Site.

Table 5-6
Borrow Pit BP6

Borrow Pit 5	
Site Dimensions	Approximately 100 x 60 m
Excavation Area	Approximately 6000 m ²
Maximum Height of Excavation	Approximately 20 m
Gradient	Slope increasing steeply towards the north west
Details of Extraction	Combination of drilling and blasting
Overburden Type and Depth	Soil/weathered rock
Extent of Aggregate Extraction	Approximately 48,000 m ³
Aggregate Composition	Metasedimentary rock

5.9 Borrow Pit BP7

Borrow pit BP7 is located to the north of the site on the western edge of a proposed new Access Track A at approximately NGR NR 265401, 607204 shown on **Figure 10.6.5.7** with further details in **Table 5-7**. The proposed borrow pit would create a new working located on the lower reaches of Blackcraig Hill.

The underlying geology in this area comprises Ordovician psammite and pelite.

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 moderate volume of material for much of the proposed new Access Route A to the Site.

Table 5-7
Borrow Pit BP7

Borrow Pit 5	
Site Dimensions	Approximately 100 x 50 m
Excavation Area	Approximately 5,000 m ²
Maximum Height of Excavation	Approximately 15 m
Gradient	Slope increasing steeply towards the north west
Details of Extraction	Combination of drilling and blasting
Overburden Type and Depth	Soil/weathered rock
Extent of Aggregate Extraction	Approximately 30,000 m ³
Aggregate Composition	Metasedimentary rock

6.0 Proposed Borrow Pit Design

The indicative borrow pit volumes are indicated in **Tables 5-1 to 5-7**. The design of the borrow pits anticipates extracting a net stone volume suitable for the requirements onsite, excluding imported top surface dressing which will require importing. This target capacity has been determined on the basis of the estimated requirements for construction materials together with additional allowances for overburden and processing waste. It is envisaged that overburden/soils together with processing waste would be carefully stored adjacent to the excavation void for eventual use in the restoration process.

6.1 Marking Out and Overburden Stripping

The permitted extents of the borrow pit would be marked out with pegs, and overburden, including topsoil, subsoil and weathered rock horizons, would be stripped from within this delineated area.

The overburden and weathered rock horizons would be stripped using a backhoe excavator and loading shovels. The overburden would be carefully stripped and stored as a series of separate topsoil, subsoil and weathered rock storage mounds.

6.2 Excavations within Rock

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.

6.3 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 at least 1.5 m in height.

The remaining unsuitable materials (weathered/unsuitable rock horizons) would be stockpiled within the base of the working borrow pit. The Stockpiles would have a maximum height of 5 m, 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. This material would be used as part of the restoration profiling on the cut faces.

6.4 Access tracks/haulage routes

The proposed access to the borrow pit(s) would involve constructing access tracks from the main Site access tracks. The access tracks would include suitable roadside drainage ditches, with soakaways located where appropriate.

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

6.5 Water Management/Drainage

The borrow pit(s) would feature a perimeter surface drain, which would aim to prevent water in-flow into the borrow pit. The water collected within the surface drains would be discharged either into the surrounding vegetation, or into suitably located settlement lagoons.

Where necessary surface settlement lagoons would be constructed within the borrow pit. These would be constructed with the aim of containing any surface water collection within the excavation voids, and from collection of water from the perimeter surface drains. The lagoons would be contained within a bunded area at the base of the borrow pit, with suitable pumping systems installed allowing water to be pumped to soakaways as required.

6.6 Restoration

Upon completion of extraction at the borrow pit(s), the sites would be restored as far as possible back to their 'natural state'.

General fill material would be sourced from the stockpiles located within the borrow pit void. These comprise of unsuitable materials which consist of weathered rock and unsuitable/ poor quality rock horizons, and unsuitable materials arising from the crusher/blasting operations. 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 within perimeter screening mounds would be utilised as the surface dressing layer in which to provide a suitable medium for seeding and planting as appropriate.

The restoration of the borrow pit sites would not involve importing any material onto site. Only materials arising from the excavations would be utilised as part of the restoration scheme. The base of the borrow pit would re-use existing stockpiled materials/soils generated from the site excavations to create a habitat on the floor of the borrow pit, this would be to a maximum of 2 m thick across the floor area, if suitable some of these soils may be used to 'dress' shallower side slopes but not on the steeper faces.

An Ecological Clerk of Works (ECoW) would be in place, in order to monitor the restoration and aftercare of the borrow pits.

6.7 Best Practice Guidance Documents

A number of general pollution prevention measures would be employed to minimise the risks to ground and surface waters during creation and use of the borrow pits. Extraction operations would be carried out in accordance with relevant Pollution Prevention Guidelines and other codes of best practice, to ensure that both ground and surface waters are not contaminated. These would include relevant codes of best practice relevant to the site include:

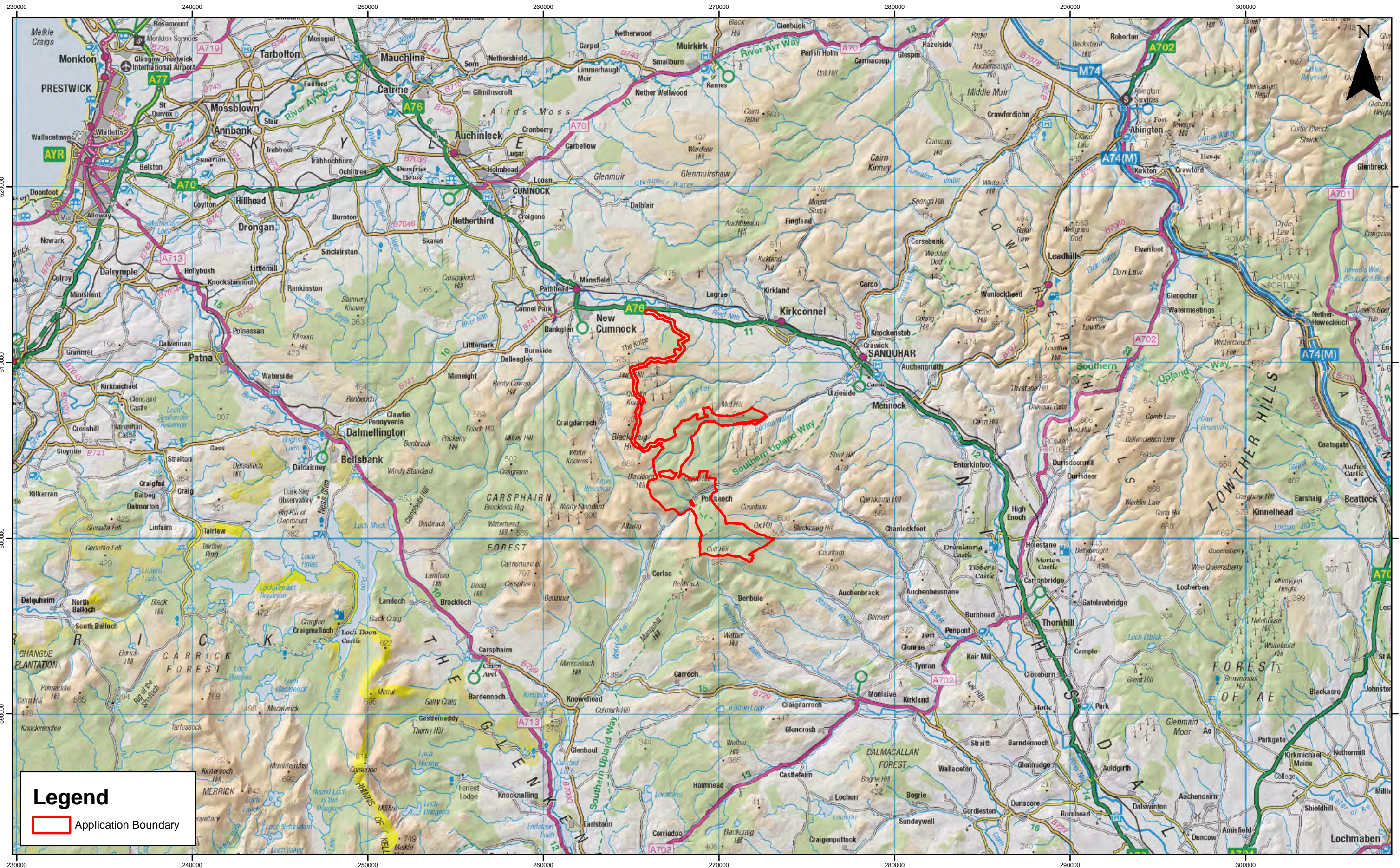
- Scottish Planning Policy (SPP), Scottish Executive, June 2014;
- EC Water Framework Directive (2000/60/EC);
- Planning Advice Note (PAN) 50, Controlling the Environmental Effects of Surface Mineral Workings, Scottish Executive, 1996;
- Good Practice on Controlling the Effects of Surface Mineral Working on the Water Environment, Department of the Communities and Local Government and Mineral Industry Research Organisation, 2008;
- Pollution Prevention Guidance (various dates and references), SEPA; and
- Environmental Good Practice on Site C692, CIRIA, 2010.

7.0 Conclusion

In summary, the borrow pits for the proposed Development, including 21 No. turbines, site access routes, energy storage facility, site construction compound, and substation compound, have been assessed as being capable of supplying all of the aggregate required for the proposed Development. The locations and methods of working will cause minimal impact to the ground conditions and water environment. Additional aggregate for the turbine bases and the initial track to access the borrow pits would be sourced off-site.

An approximate volume of excavated materials has been calculated for each of the proposed borrow pit locations, these volumes are based on initial calculations and would be verified by detailed intrusive investigation at the proposed locations. Each of the seven proposed borrow pits has the potential to be extended beyond its proposed dimensions to achieve a greater volume of material. Calculations do not take into consideration the 'winning' of material along the route.

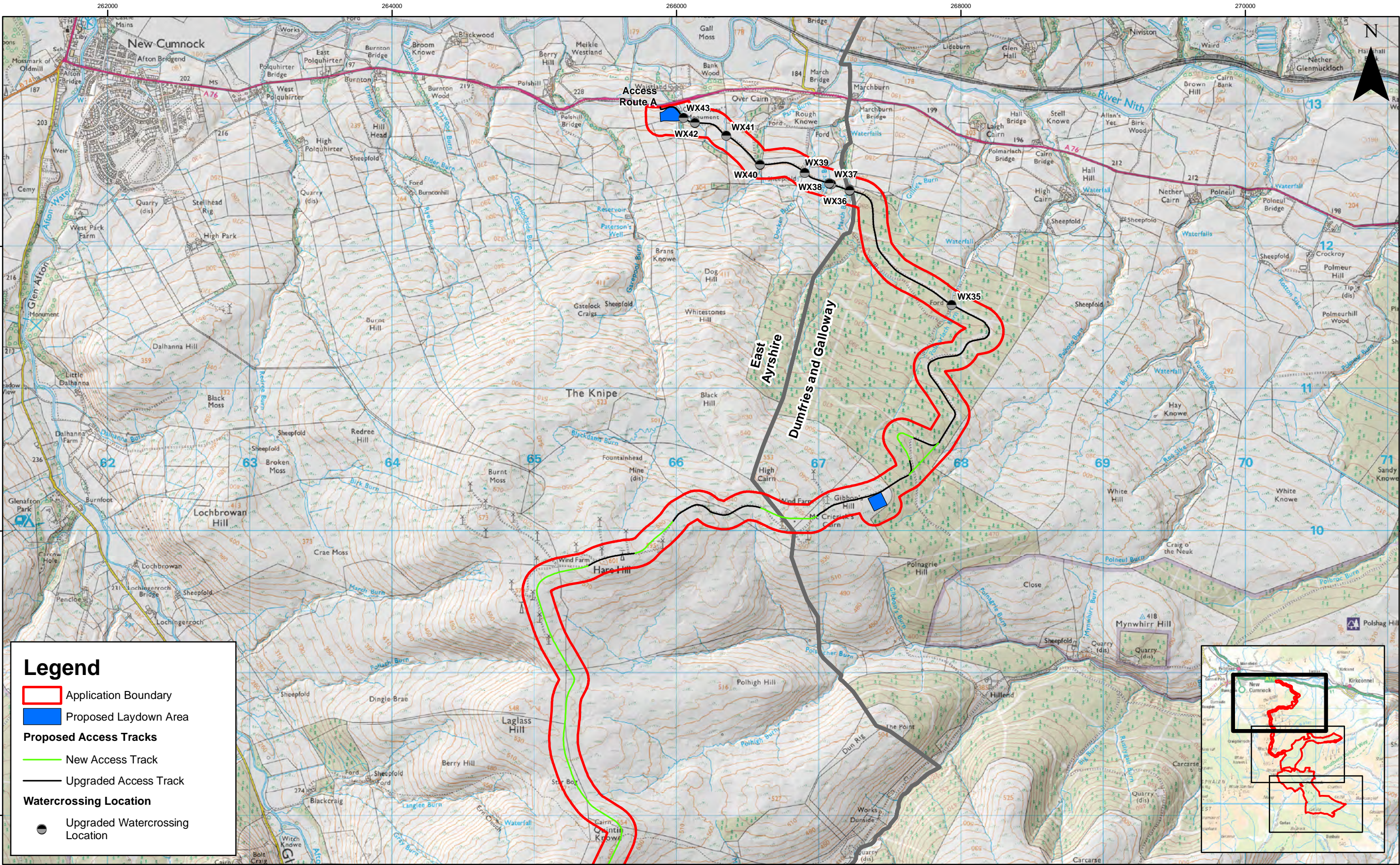
FIGURES & APPENDICES

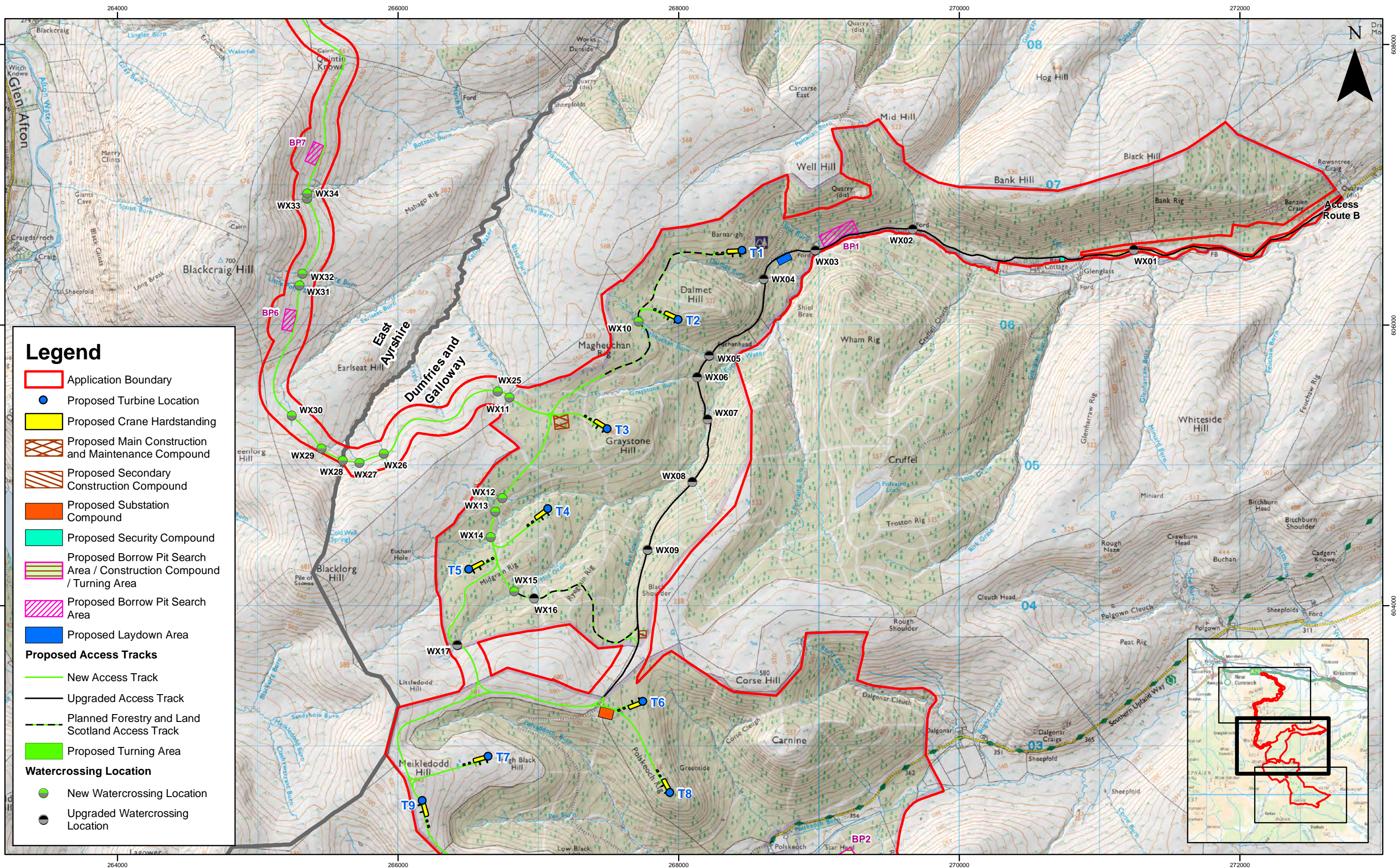


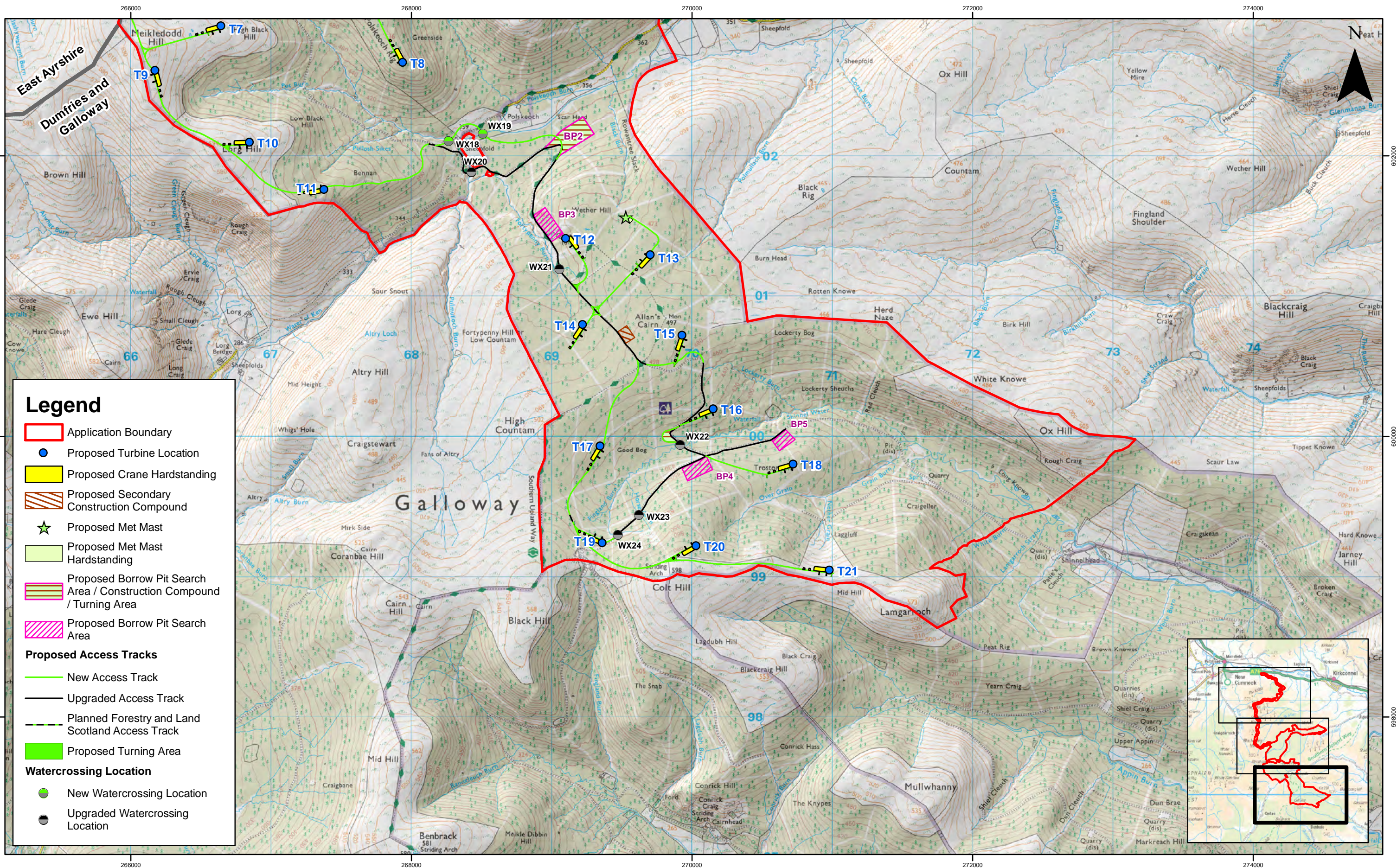
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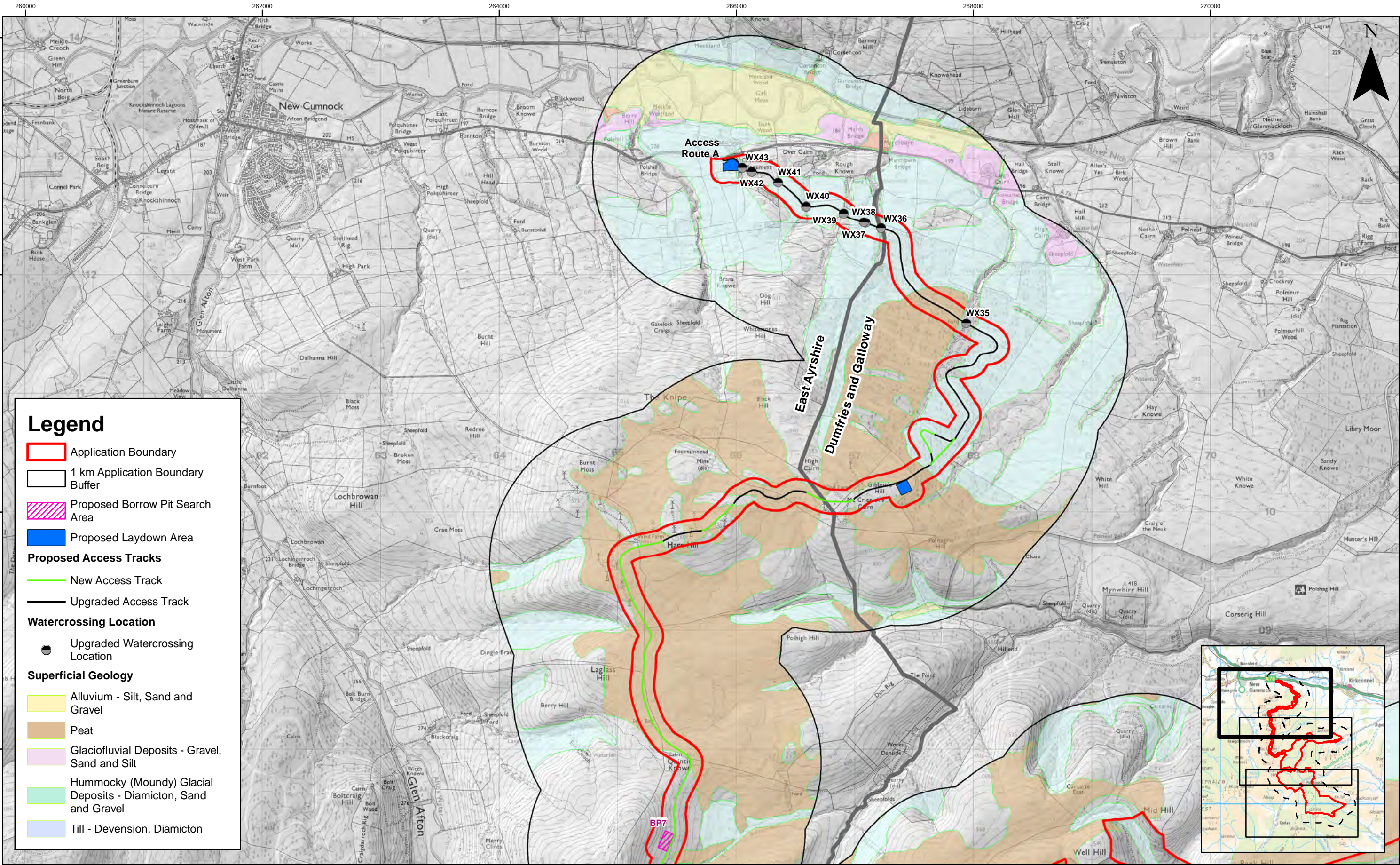
Application Boundary

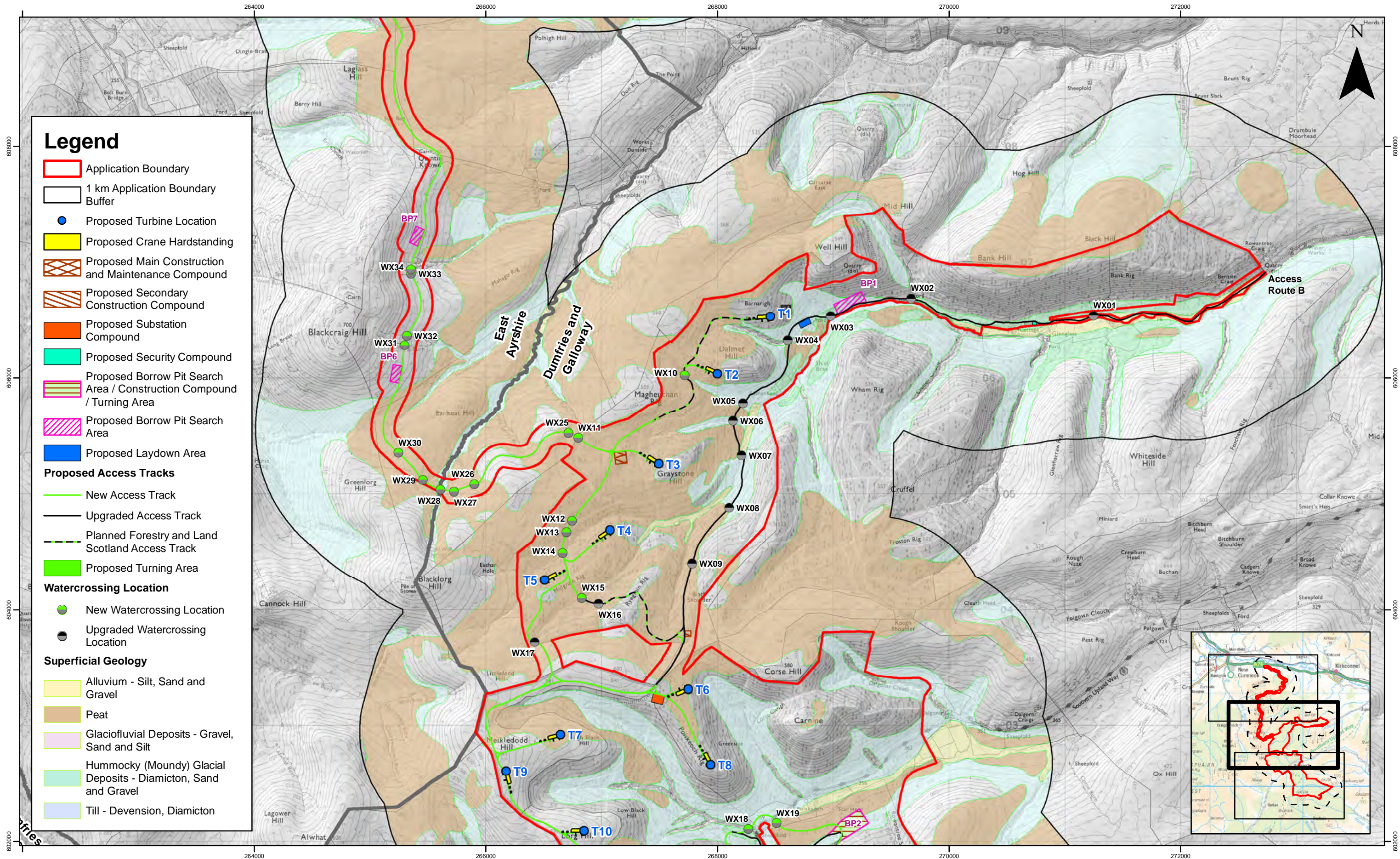
<div><div></div><div>SCOTTISHPOWER RENEWABLES</div></div>					1:200,000 Scale @ A3	<div><div><div></div><div>0</div><div>2.5</div><div>5</div><div>7.5</div><div>10</div></div><div>Kilometres</div></div>	Eucharhead Renewable Energy Development EIAR Borrow Pit Assessment Site Location		Drg No 00481.00052.0306.0	
	A	13/10/20	AA	Initial Issue					Rev A	Datum: OSGB36
	Rev	Date	By	Comment					Date 13/10/20	Projection: TM
									Figure 10.6.1	





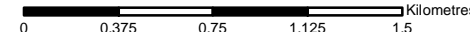






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Rev	Date	By	Comment

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Scale @ A3

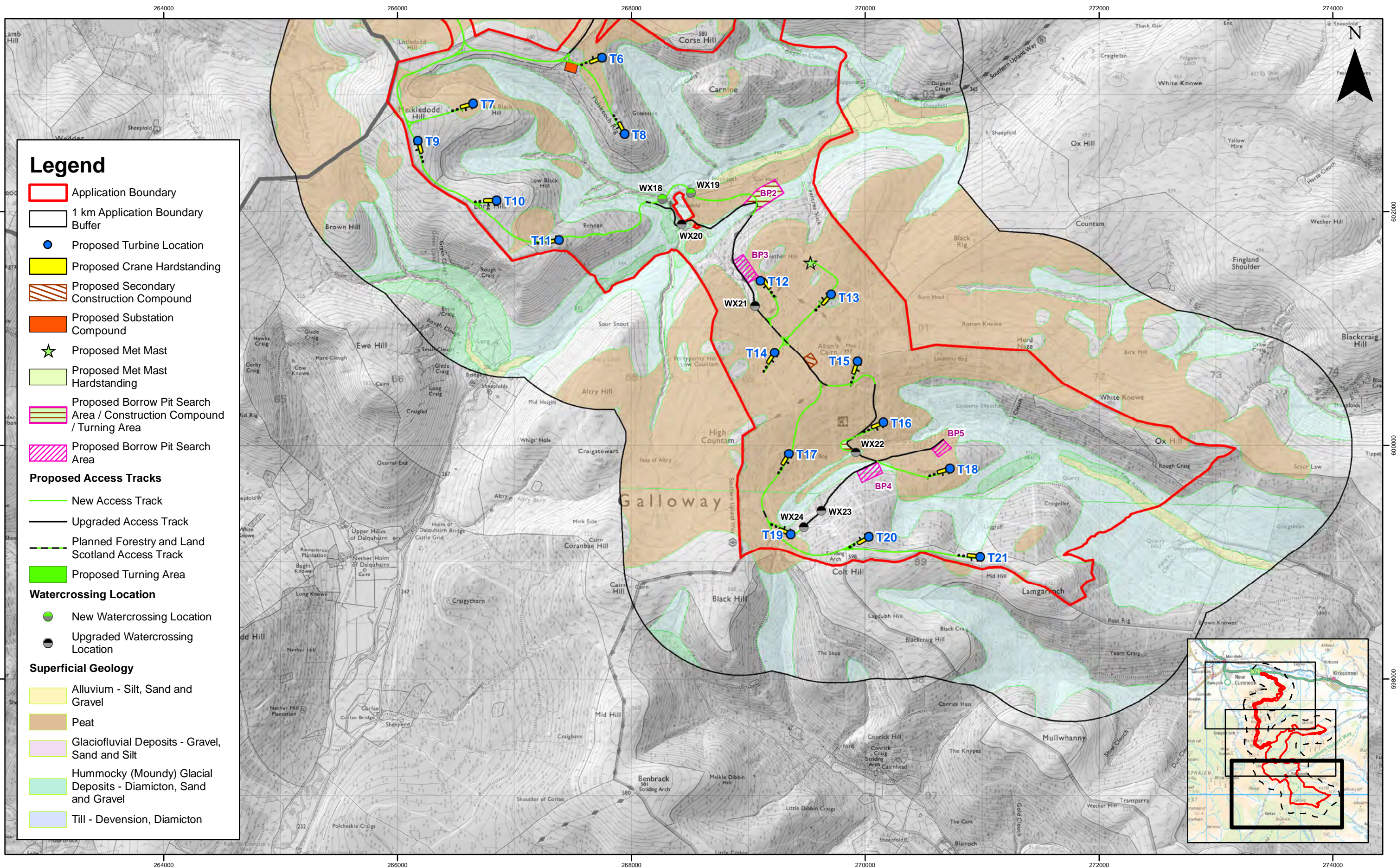


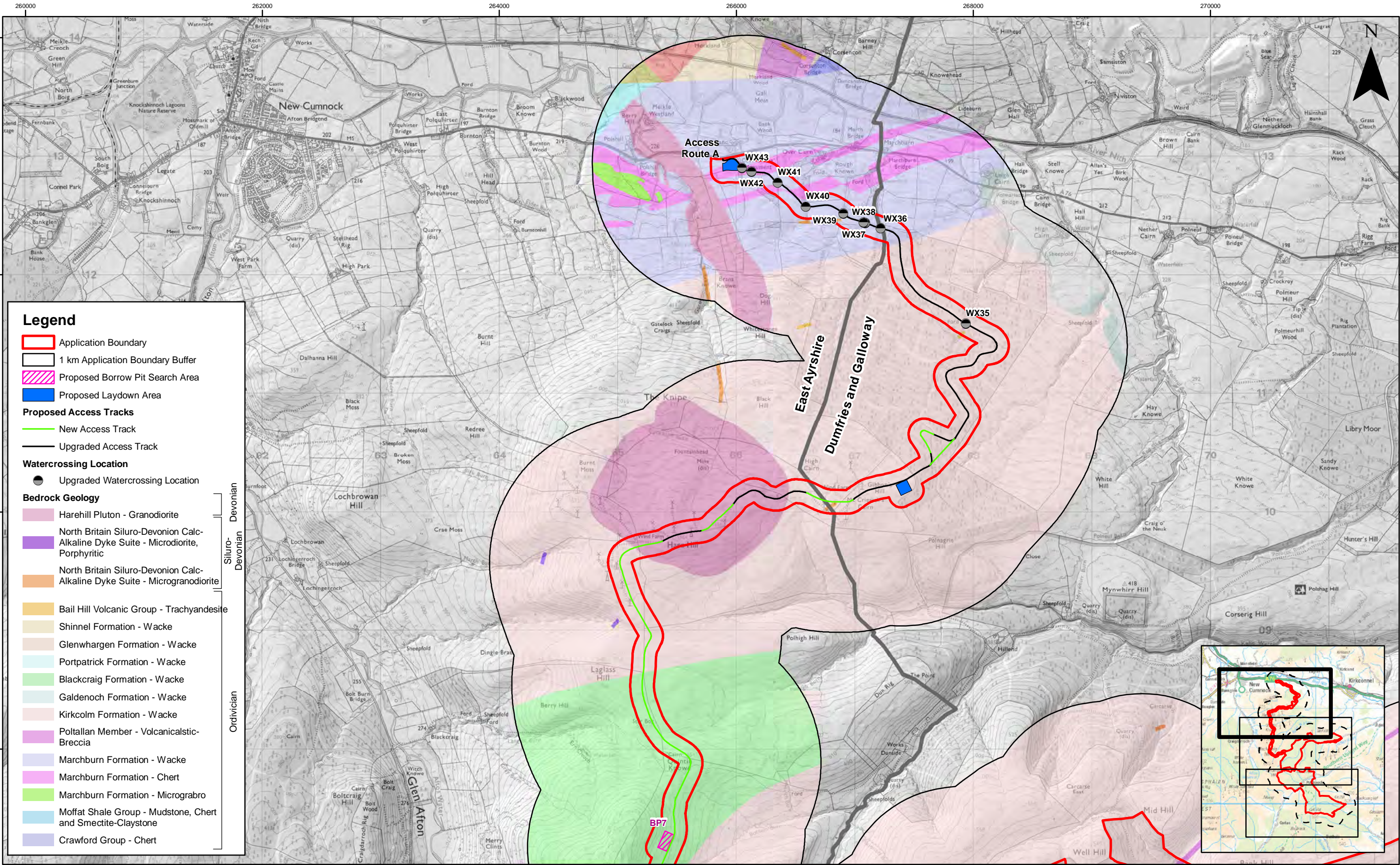
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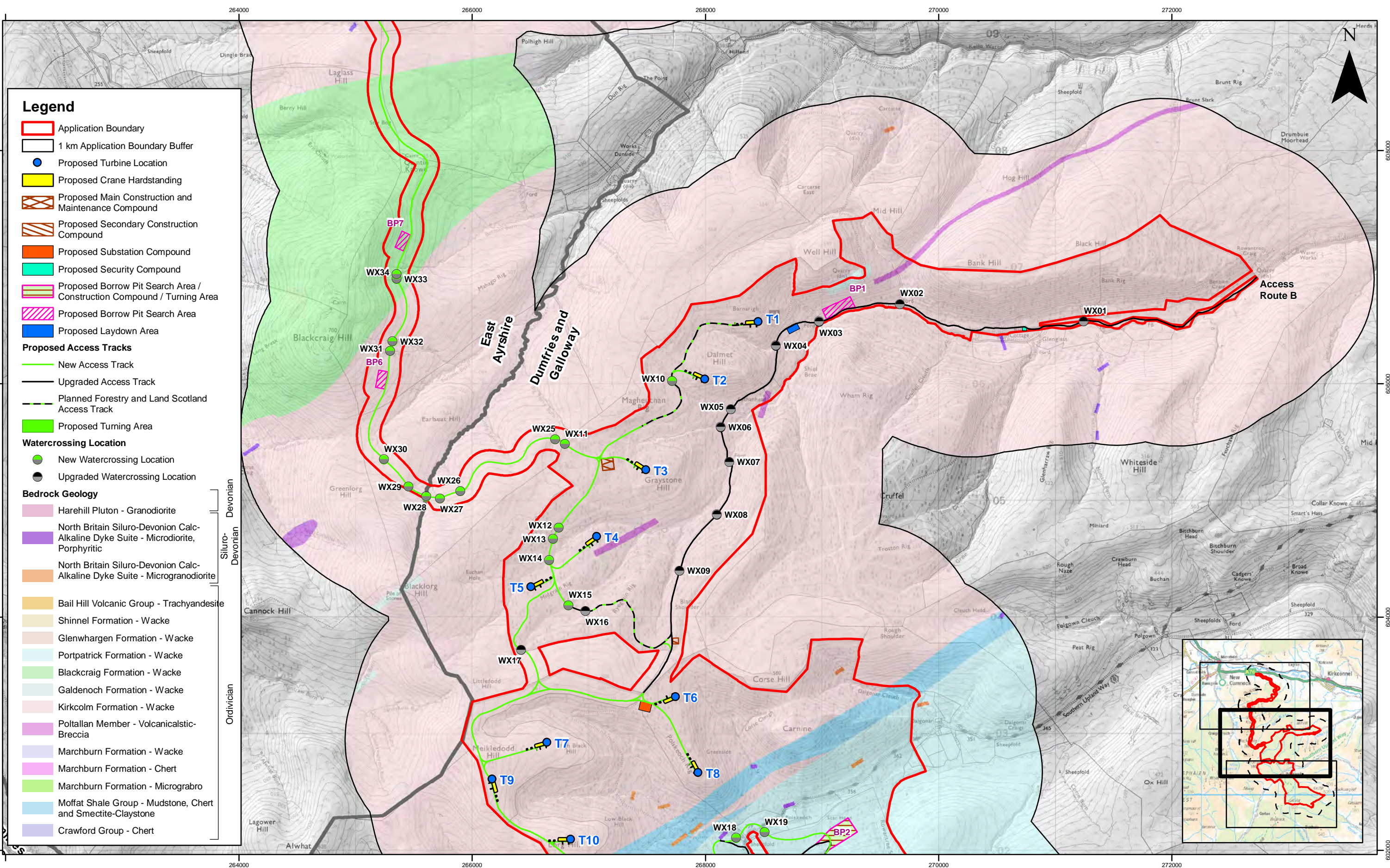
Eucharhead Renewable Energy Development EIAR
Borrow Pit Assessment
Superficial Geology

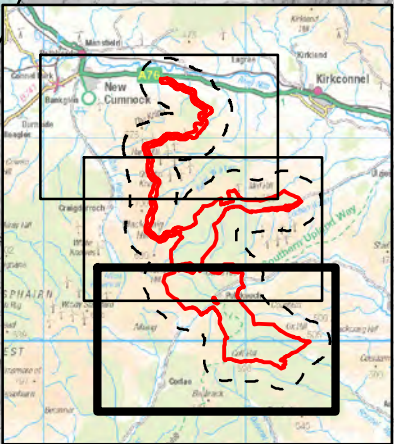
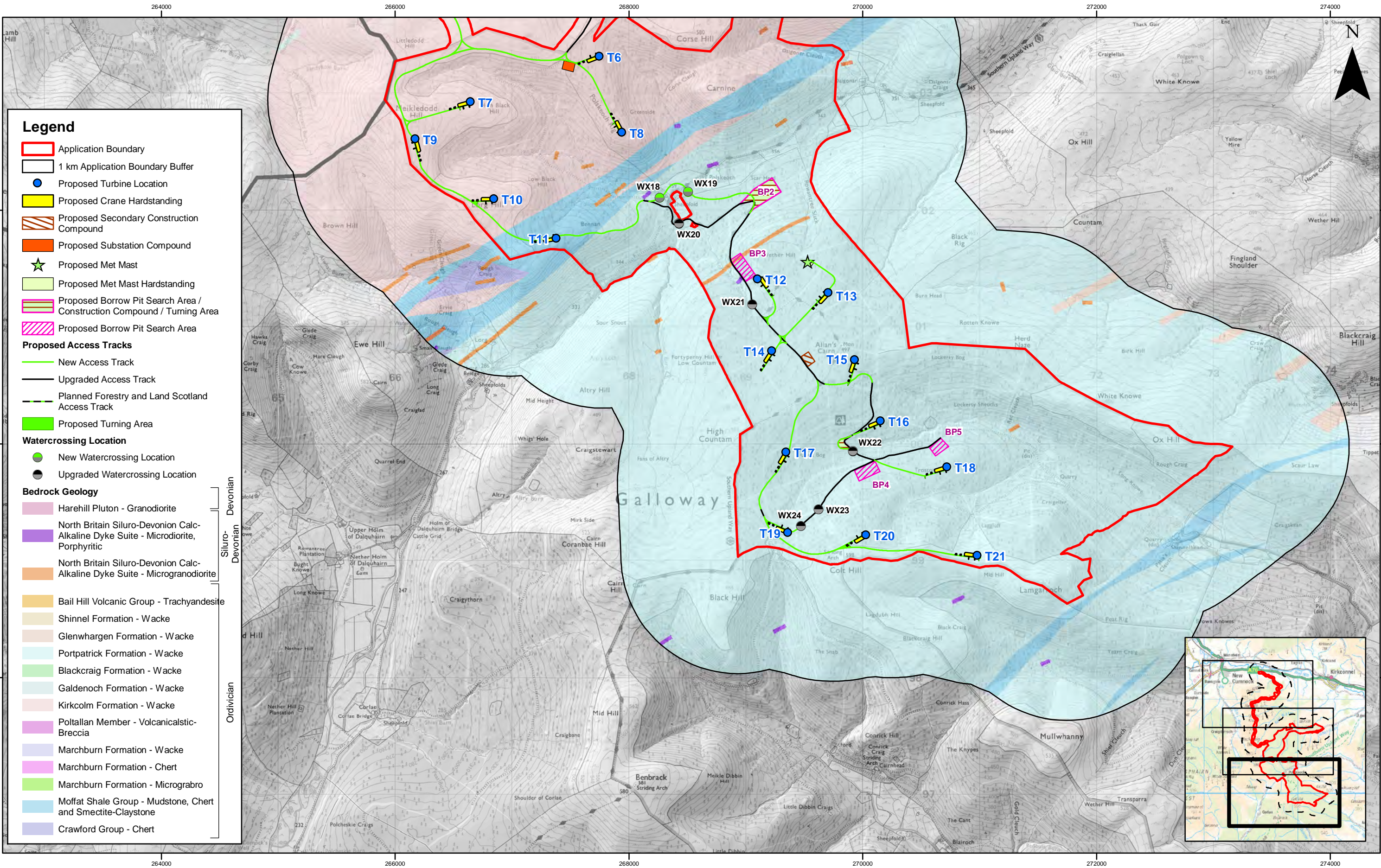
Page 2 of 3

Drg No	00481.00052.0309.0		
Rev	A	Datum: OSGB36	
Date	13/10/20	Projection: TM	
Figure	10.6.3.2		











Legend

Application Boundary

Proposed Borrow Pit

Proposed Borrow Pit Search Area

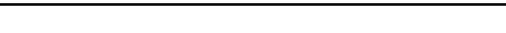

Proposed Access Track

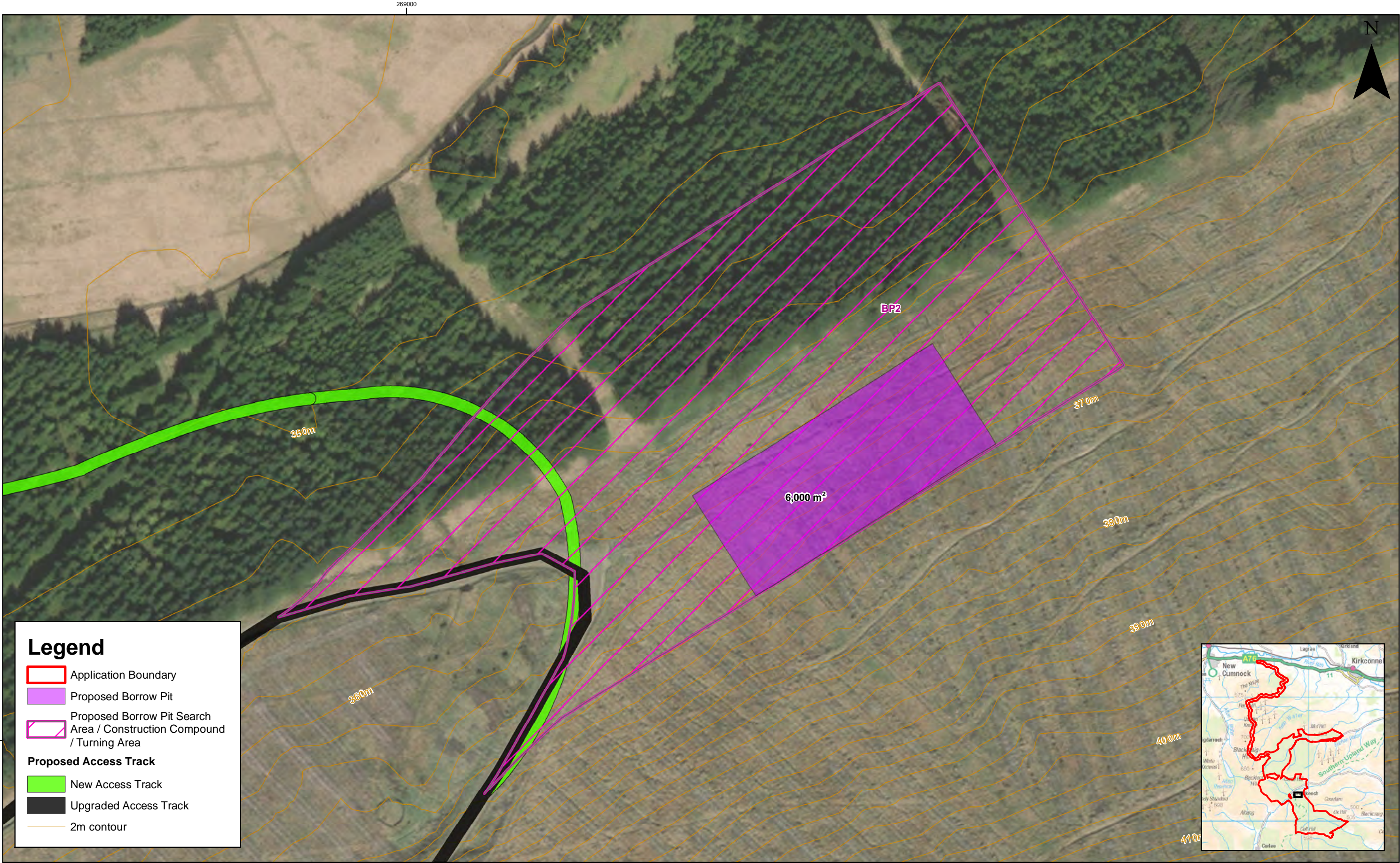
Upgraded Access Track

Watercrossing Location

Upgraded Watercrossing Location

2m contour

					1:1,500		Euchanhead Renewable Energy Development EIAR Borrow Pit Assessment Proposed Borrow Pit Locations - BP1	Drg No	00481.00052.0248.0	
					Scale @ A3			Rev	A	Datum: OSGB36 Projection: TM
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	Rev	Date	By	Comment				Figure	10.6.5.1	



Legend

Application Boundary

Proposed Borrow Pit



Proposed Borrow Pit Search Area / Construction Compound / Turning Area

Proposed Access Track

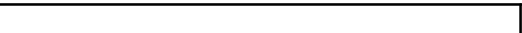

New Access Track

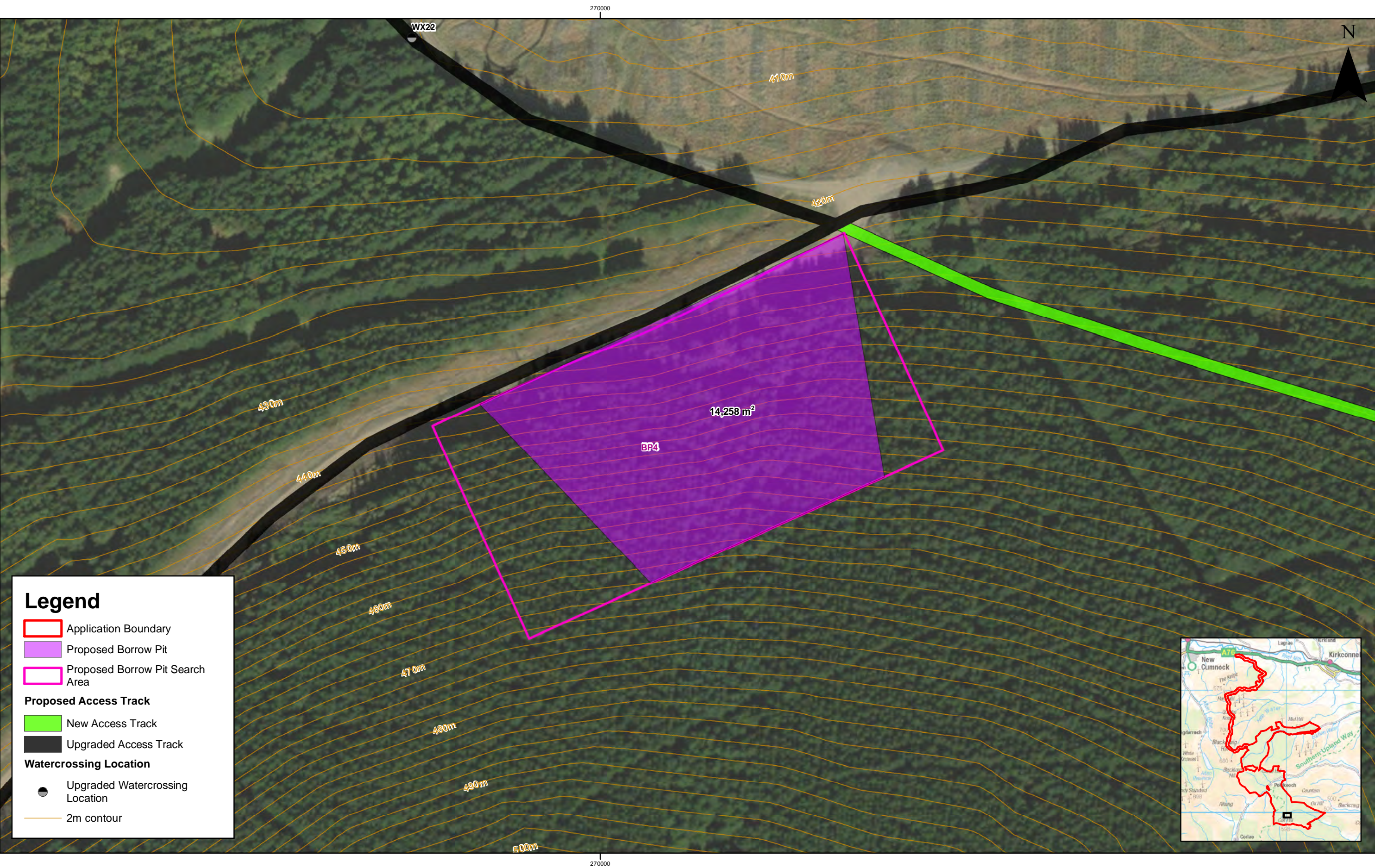
Upgraded Access Track


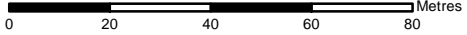
2m contour

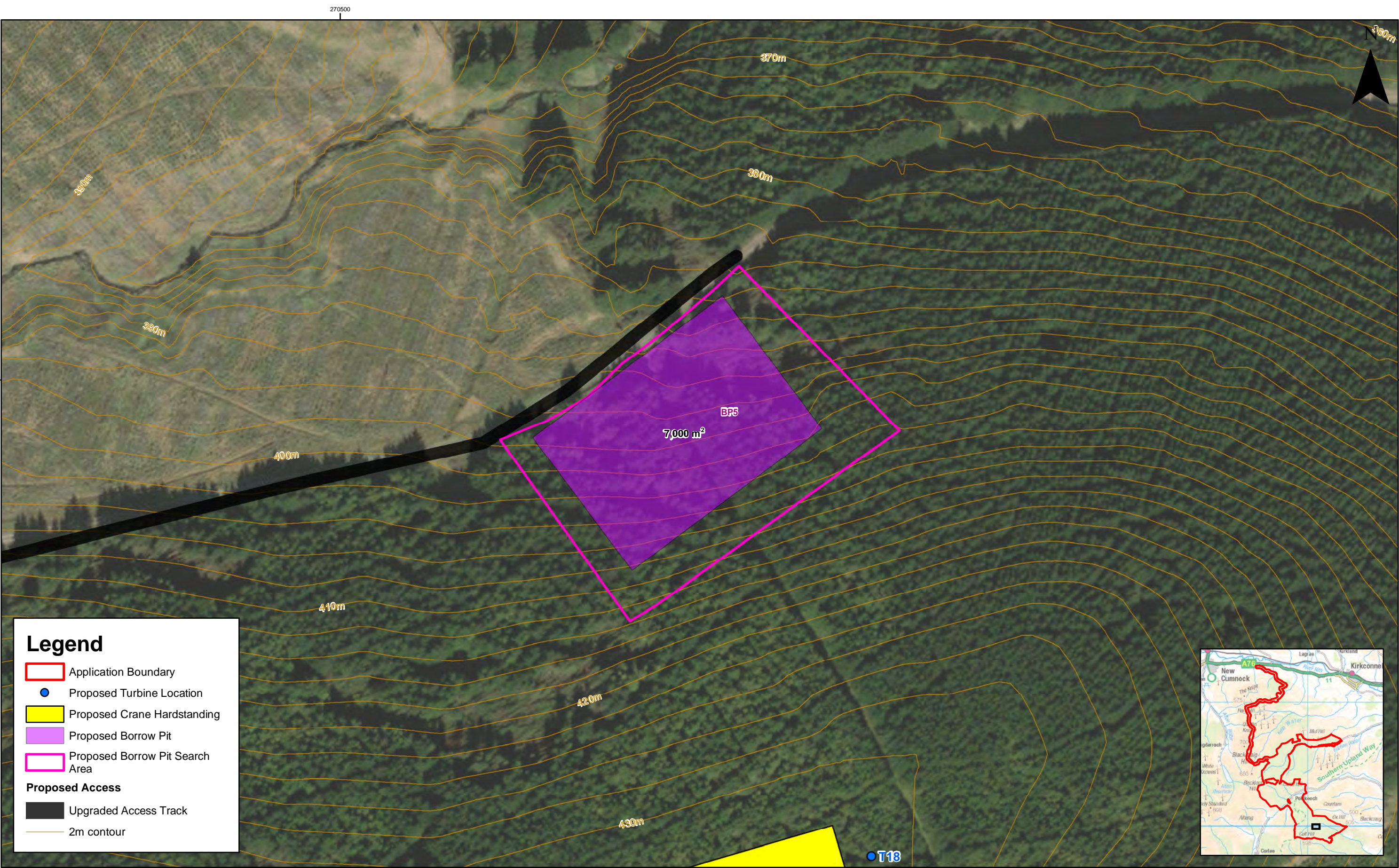
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	Rev	Date	By	Comment				Figure	10.6.5.2	





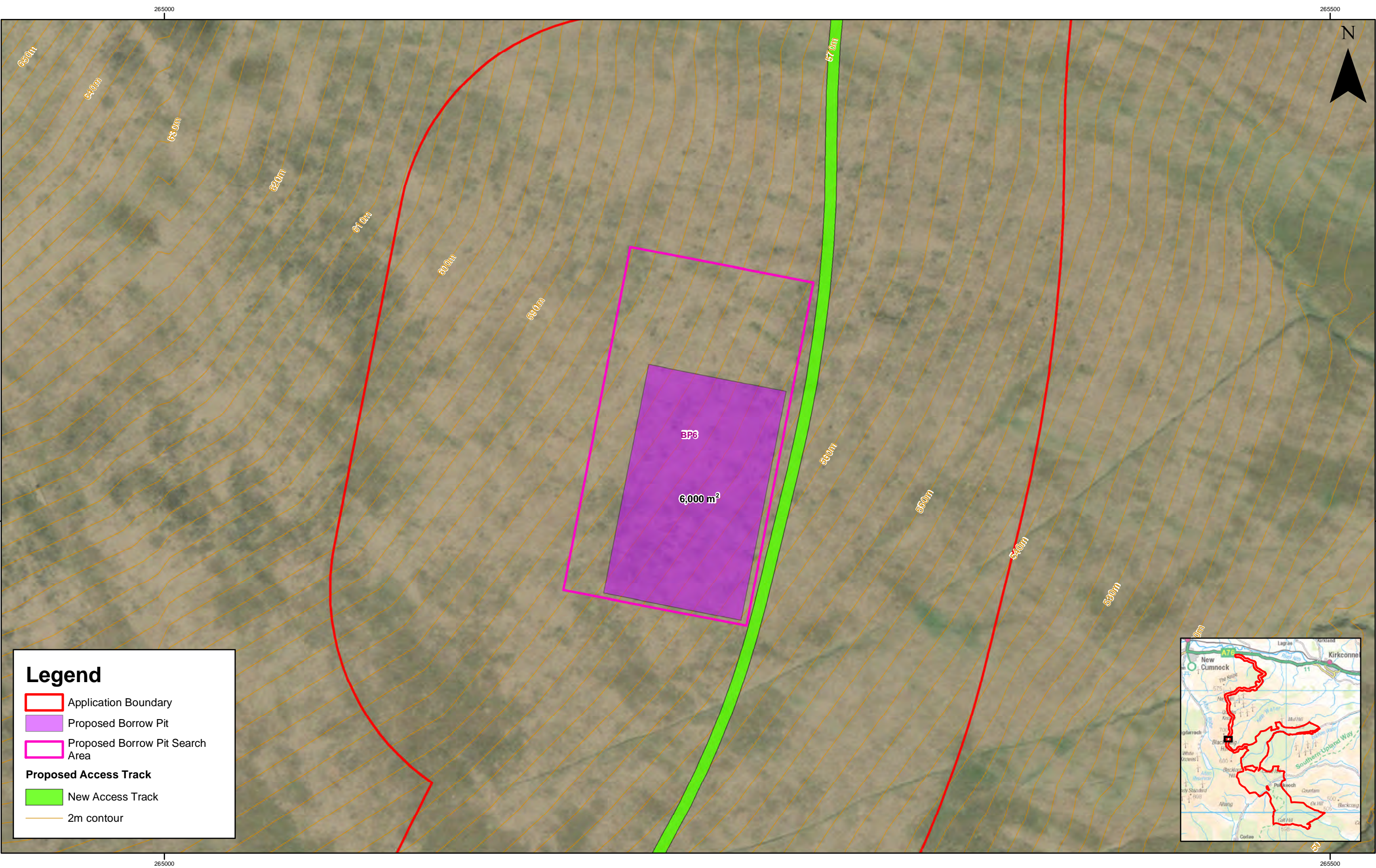
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	Rev	Date	By	Comment				Figure	10.6.5.3	


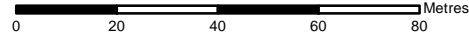


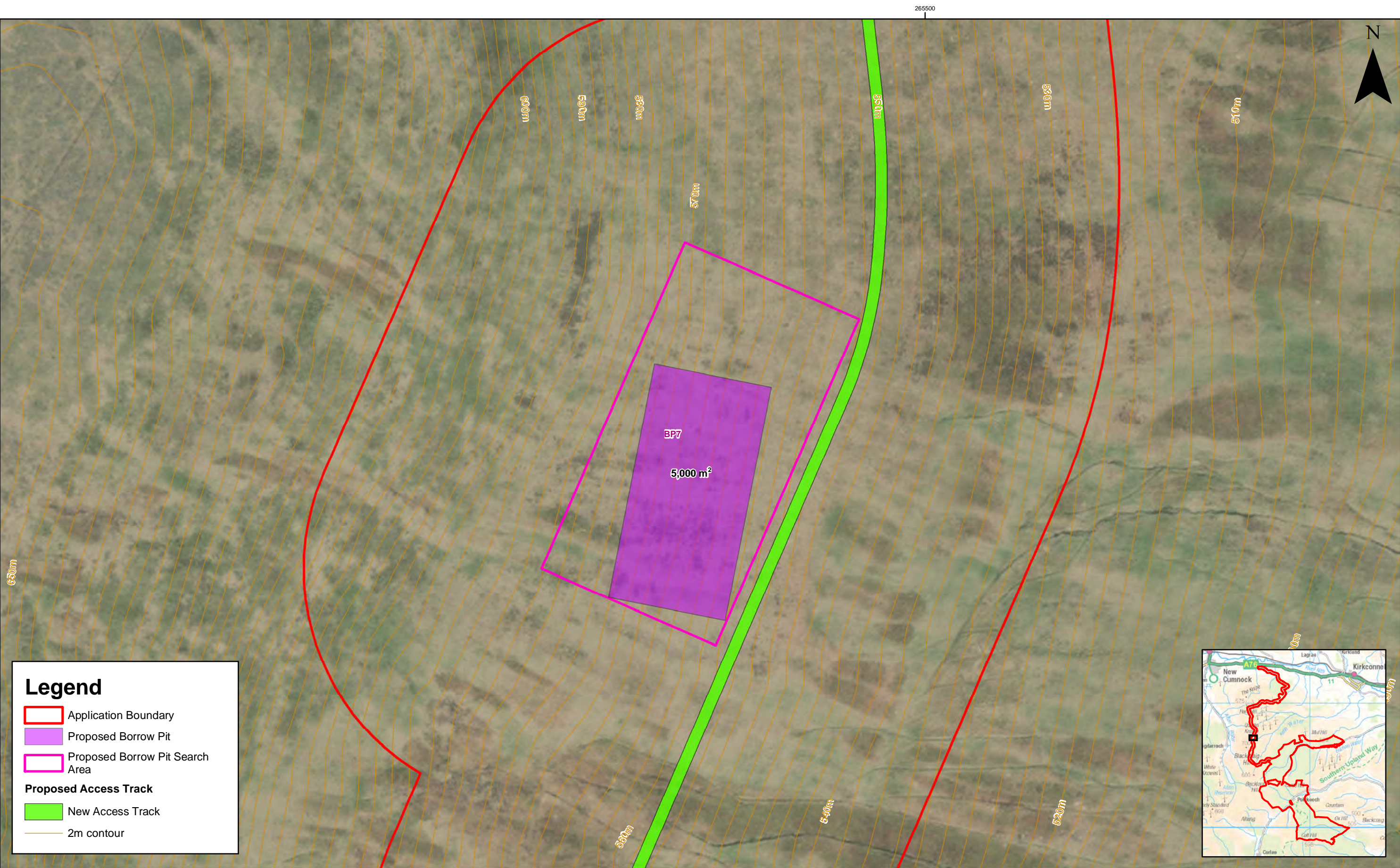
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	Rev	Date	By	Comment						Figure	10.6.5.4	Projection: TM

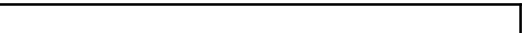



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	Rev	Date	By	Comment				Figure	10.6.5.5	



					1:1,500		Euchanhead Renewable Energy Development EIAR	Drg No	00481.00052.0248.0	
					Scale @ A3			Rev	A	Datum:
	A	13/10/20	AA	Initial Issue	© Crown Copyright 2019. All rights reserved. Ordnance Survey Licence 0100031673, Provided by Client Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community			Date	13/10/20	OSGB36
	Rev	Date	By	Comment				Figure	10.6.5.6	Projection: TM



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	Rev	Date	By	Comment				Figure	10.6.5.7	Projection:	
									TM		

APPENDIX A – MATERIALS CALCULATOR

Volume of Rock Required on Euchanhead Renewable Energy Development

Infrastructure	Length m	As built surface width m	Construction width m	As built area m2	Depth m	Number	Volume m3	Final Volume m3	Notes:
New Access Tracks (Access Route A only)	8450	5	7	59150	0.8	1	47320	47320	Assumes 5 m width on surface with 7 m average at base
Upgraded Access Tracks (Access Route A Only)	6254.6	5	7	43782.2	0.1	1	4378.22	4378.22	Assume average of 0.1 m over site to upgrade track
New track on site (wind farm track)	21097.17	5	7	147680.19	0.8	1	118144.15	118144.152	Assumes 5 m width on surface with 7 m average at base
New track on site (forestry tracks)	3083.53	5	7	21584.71	0.8	1	17267.768	17267.768	Assumes 5 m width on surface with 7 m average at base
Existing track on site to be upgraded	13502.6	5	7	94518.2	0.1	1	9451.82	9451.82	Assume average of 0.1 m over site to upgrade track
Access Track to Met Mast	380	4	4	1520	0.8	1	1216	1216	Assumes 4 m width
Access Track to Borrow Pit (Temporary)	10	5	6	60	0.8	7	336	336	Assumes 5m width on surface with 6 m average at base
Passing Places	70	4	4	280	0.8	60	13440	13440	60 along new turbine tracks overall length 70 m
Turbine Bases - formation only	28	28		784	0.3	21	4939	4939	Worst case is Assume all concrete imported, but its likely to be batched onsite.
Fill above Turbine Bases	38	38		1444	3	21	90972	52143	Less volume of bases (21*784 m3 =16464 m3), less volume of triangular batters (22365 m3)
Crane Pads	100	30		3000	1	21	63000	63000	
Crane Pad boom support	12	12		144	1	42	6048	6048	2 per crane hardstanding
Blade laydown and ancillaries	20	4		80	0.5	42	1680	1680	
Turning Heads	30	5		150	0.8	16	2730	2730	
Substation inc energy storage and control building	100	75		7500	1	1	7500	7500	
Met Mast Working area	30	20		600	1	1	600	600	
Laydown Area	100	50		5000	1	1	5000	5000	
Security Compound	100	50		5000	0.5	1	2500	2500	
Main Construction Compound	100	100		10000	0.5	1	5000	5000	
Construction Compound Secondary	100	75		7500	0.5	1	3750	3750	
Construction Compound Secondary	50	50		2500	0.5	1	1250	1250	
				0					
TOTAL REQUIREMENT							406523	367694	All volumes measurements in m3, based on Vestas Requirements
Borrow pit material won (estimate)	Search Area Dimensions (m)			Length (m)	Width (m)	Height (m)			
BP 1	260	80		150	50	25		75,000	Indicative bp dimensions x 0.4 to account for overburden and wastage
BP 2	230	140		120	50	10		24,000	Indicative bp dimensions x 0.4 to account for overburden and wastage
BP 3	220	100		120	60	20		57,600	Indicative bp dimensions x 0.4 to account for overburden and wastage
BP 4	190	100		170	100	30		204,000	Indicative bp dimensions x 0.4 to account for overburden and wastage
BP 5	230	95		100	70	15		42,000	Indicative bp dimensions x 0.4 to account for overburden and wastage
BP 6	145	80		100	60	20		48,000	Indicative bp dimensions x 0.4 to account for overburden and wastage
BP 7	145	80		100	50	15		30,000	Indicative bp dimensions x 0.4 to account for overburden and wastage
Total Volume from Site								480,600	
Import Requirement (shortfall)								112906	positive number is surplus
Total import								112906	

Assume 20000 m3 batched concrete for bases plus bases for substation, met mast (150 m3)

APPENDIX B - BORROW PIT PHOTOGRAPHS



Photograph 1: View west across proposed borrow pit BP1



Photograph 2: View southeast across proposed borrow pit BP2



Photograph 3: View northeast across proposed borrow pit BP3



Photograph 4: View east across proposed borrow pit BP4



Photograph 5: View south across proposed borrow pit BP5 (photography limited due to dense forestry cover).



Photograph 6: View south southwest across proposed borrow pit BP6



Photograph 7: View north northeast across proposed borrow pit BP7

END OF PHOTOGRAPHS

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