Technical Appendix 10.3: Borrow Pit Appraisal

Windburn Wind Farm

Windburn Wind Farm Limited

Prepared by:

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SLR Project No.: 428.V12959.00001

2 June 2025

Revision: 1

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1	2 June 2025	R. Watson	A. Huntridge	A. Huntridge

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1.0 Introduction

SLR Consulting Ltd (SLR) was commissioned by Windburn Wind Farm Limited (the 'Applicant'), to undertake a Borrow Pit Appraisal (BPA) for the proposed Windburn Wind Farm (the proposed development).

The proposed development would comprise of 13 wind turbines with associated infrastructure including access tracks, crane hardstandings, borrow pits, substation compound and temporary construction compounds. **Figure 10.3.1** shows the location of the proposed development and **Figure 10.3.2a-e** shows the layout of the site infrastructure. Full details proposed development are provided in **Chapter 3: Description of Development** of the EIA Report.

There have been several surveys undertaken to date at the proposed development site to inform the proposed borrow pits, including site reconnaissance visits and several phases of peat probing which are detailed within EIA Report **Technical Appendix 10.1: Peat Landslide and Hazard Risk Assessment (PLHRA)** and **Technical Appendix 10.2: Peat Management Plan (PMP).**

The principal objective of this report is to provide an initial assessment of the aggregate requirements for the proposed development and identify the potential borrow pit locations suitable for providing this aggregate.

The proposed borrow pit search areas reviewed within this report were selected because of morphology, accessibility from proposed tracks, orientation and the expected proximity to suitable rock close to the surface with consideration of other site constraints including sensitive receptors.

The proposed development is located within an area of peatland and the proposed borrow pit search areas have been selected based on areas where peat coverage is limited, but may be in close proximity to areas of peat and where bedrock may outcrop and potential aggregate reserves are expected to occur near the surface.

The work has been undertaken by a team of Geotechnical Engineers and Geologists, some of whom have over 17 years' consultancy experience in undertaking borrow pit and geological assessments. The team was led by a Chartered Hydrogeologist with 30 years' consultancy experience and specialising in the assessment of soils, geology and water for renewable power projects in Scotland.

2.0 Desk Based Review

This assessment has been completed through a largely desk-based review of soil and geological maps and Ordnance Survey (OS) contour data with site reconnaissance undertaken by a geologist and geotechnical engineer, to cross-check the geological desk-based review.

2.1 Site Description

The proposed development is located within the Ochil Hills, approximately 2.9km north of the settlement of Alva. The nearest proposed turbine is 3.2km from Alva, 5.3km from the village of Blackford and 5.7km from Greenloaning. The proposed development would be located across the administrative boundaries of both Clackmannanshire, and Perth and Kinross Councils, centred on National Grid Reference (NGR) NN 87737 02889.

The proposed development is located on predominantly upland moorland that is managed as farmland grazing. There are areas of young forestry plantations in the north. The location and layout of the proposed development are detailed on **Figure 10.3.1** and **Figure 10.3.2a-e**.

2.2 Topography

From review of Ordnance Survey (OS) mapping, the topography across the proposed development consists largely of undulating hills with moderate to steep slopes.

The ground elevation within the proposed development is at approximately 142m AOD near Blackford where the proposed development is accessed from the A9 near Longfauld and then increases in elevation as the access track climbs up to 268m AOD at the junction of the access to Carim Lodge. The access track then climbs steeply, rising to 520m AOD at Little Corum and into the main turbine areas located on the hill tops and plateau, with the highest point within the application boundary located at the south eastern edge of the site at a height of 677m AOD at Ben Buck.

2.3 Geology

2.3.1 Artificial Ground

Based on the information available from the BGS Geoindex[1], no made ground deposits are present across the proposed development.

2.3.2 Superficial Geology

A review of the BGS Geoindex[1] indicates that peat is the most common superficial deposit mapped across the proposed development. There are localised areas of glacial till (Devensian) primarily situated on slopes and in valleys.

In addition, there are areas of the proposed development that are shown to be absent of any superficial deposits, particularly areas with steep slopes where bedrock may be exposed and also in the north of the site, along the Sheriffmuir Road.

Figure 10.3.3 contained within this report details the superficial geology BGS mapping across the proposed development.

[1] BGS Online Viewer, available at [https://mapapps2.bgs.ac.uk/geoindex/home.html?_ga=2.133433804.376188765.1646739904-1030004651.1646739904]

2.3.3 Bedrock Geology

A review of the BGS Geoindex[1] indicates that the proposed development is predominantly underlain by the Ochil Volcanic Formation which consists of lava flows and volcaniclastic rocks. This unit is predominantly comprised of andesites and basalts, with localised areas of volcanic conglomerates and trachyandesites. The northern area of the proposed development is underlain by the Sheriffmuir Sandstone Member. This formation is comprised of early Devonian sandstones with minor mudstone units. Several dykes are noted primarily within the east of the proposed development, described as North Britain Siluro-Devonian Calc-Alkaline Dyke Suite.

Figure 10.3.4 contained within this report details the bedrock geology BGS mapping overlaid across the proposed development.

2.3.4 Structural Geology

A review of the BGS Geoindex[1] highlighted four faults located within the east of the proposed development, all trending north to south.

2.4 Aerial Photography

The OS mapping and aerial photography do not indicate frequent bedrock exposures across the proposed development. Site visits noted occasional bedrock outcrops, predominantly in the east and north of the proposed development.

3.0 Borrow Pit Assessment

This section of the report provides an assessment of the two potential borrow pit search area locations with an evaluation of their potential to meet the proposed development's aggregate requirements.

The assessment has been completed through a desk-based review of geological maps and memoirs and is supported by several site visits from SLR geologists and a geotechnical engineer. Potential borrow pit locations were inspected visually with a view to assessing ground conditions and to help determine the borrow pit's suitability for use during construction of the proposed development.

In exploring the two potential borrow pit search area locations, as defined in **Figures 10.3.5a** and **10.3.5b,** consideration has been given to the practical aspects of each borrow pit. The main aspects to consider are as follows:

- ease of access;
- rock type;
- overburden thickness;
- topography;
- current and historical uses;
- proximity to construction activities;
- visual impact; and
- impact on environmentally sensitive areas.

Steeper topography is preferable for quarrying, where peat and soils coverage will be limited. Careful consideration was given to landscape and visual impacts, and other environmental aspects including proximity to watercourses and other constraints. The proposed borrow pits are in areas where the peat cover is typically thinner or vacant and aggregate reserves are expected to occur near the surface.

3.1 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 (SHW)[2].

The indicative volumes of aggregate required for site infrastructure are summarised in **Table 3-1** based on the materials calculator provided in **Annex A**.

The aggregate requirements below have been calculated based on an estimate of aggregate volumes required.

2 Highways Agency, Manual of Contract Documents for Highway Works Volume 1 Specification for Highway Works, Series 600 Earthworks, Published February 2017.

Table 3-1: Aggregate Requirement Summary

Infrastructure Element	Volume of Aggregate Required (m^3)
New Excavated Track	44,826
Existing Upgraded Track	5,673
Proposed Turning Head T05	252
Proposed Turning Head T09	459
Proposed Turning Head T10	415
Proposed Turning Head T11	415
Proposed Turning Head T13	469
Turbine Bases - formation only	4,592
Fill above Turbine Bases	13,650
WTG Concrete Foundation Aggregate	6,825
Permanent Hardstandings	21,138
Temporary Hardstandings	22,334
Proposed Substation Compound	7,500
Proposed TCC 1	5,475
Proposed TCC 2	6,712
Proposed TCC 3	5,636
Total	**146,373**

It has been estimated that approximately 146,373m^3 of suitable quality rock would be required to construct the proposed development. This includes SHW[4] classes 6F2, 6N/6P and concrete aggregate. If rock quality is not suitable for each of these engineered materials, then there may be a requirement for imported materials.

No account has been taken in the calculations for the fortuitous 'winning' of rock during the construction phase for example during infrastructure excavations. If such rock was available, the amount extracted from the borrow pits could be reduced.

3.2 Borrow Pit Assessment

This section of the report provides an assessment of the two borrow pit search areas together with an evaluation of their potential to meet the proposed development's aggregate requirements. The indicative Borrow Pit design within each search area is detailed within **Figure 10.5.3a** (BP1) and **Figure 10.3.5b** (BP2).

All borrow pits could be extended or reduced in size depending on review of aggregate requirements and/or ground investigation data which would be obtained from a detailed geotechnical survey which would be undertaken prior to construction if the proposed development was consented.

The geology encountered within the proposed development is supported by BGS geological maps. The dimensions of the borrow pits, volume of superficial material to be removed and volumes of site won rock for each borrow pit have been estimated based on cross-sections developed through a digital terrain model. These are required to be confirmed by future intrusive ground investigation works.

3.2.1 Borrow Pit 1

Borrow Pit 1 is located in the northern area of the proposed development close to turbine T2 at the approximate National Grid Reference (NGR) NN 87682, 01510.

Photo 1: BP01 facing west

Table 3-2: Borrow Pit 1

Borrow Pit 1	
Superficial Geology	Peat overlying Glacial Till
Bedrock Geology	Ochil Volcanic Formation (Andesite & Basalt)
Inferred Design Parameters	Overall slope 70° Maximum face height 15m
Gradient	Slope increasing towards the west
Details of Extraction	Combination of digging, drilling and blasting
Estimated Excavation Area	5,091m^2
Estimated Excavation Volume	41,492m^3

3.2.2 Borrow Pit 2

Borrow Pit 2 is located in the centre of the proposed development to the south of turbine T13 at the approximate NGR NN 87930, 03306.

Photo 2: BP02 facing north-west

Table 3-3: Borrow Pit 2

Borrow Pit 2	
Superficial Geology	Peat overlying Glacial Till
Bedrock Geology	Ochil Volcanic Formation (Andesite & Basalt)
Inferred Design Parameters	Overall slope 70° Maximum face height 15m
Gradient	Slope increasing towards the north-west
Details of Extraction	Combination of digging, drilling and blasting
Estimated Excavation Area	3,737m^2
Estimated Excavation Volume	33,644m^3

3.3 Aggregate Volume Assessment

As shown in Section 3.1, an estimated 146,373m^3 of suitable quality rock would be required to construct the proposed development. However, the proposed borrow pits are likely to be only capable of producing 75,136m^3 of aggregate. This will likely result in non-site won imported rock being required to construct the proposed development.

4.0 Indicative Borrow Pit Design

The indicative borrow pit volumes are presented in **Table 3-2** and **Table 3-3**. The design of the borrow pits anticipates extracting a net stone volume suitable for the requirements of the proposed development, excluding imported top surface dressing which would require importing. This target capacity has been determined based on the estimated requirements for construction materials together with additional allowances for overburden material. It is envisaged that overburden/soils together with processed materials would be carefully stored adjacent to the excavation void for eventual use in the restoration process.

4.1 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 combination of crawler tractor dozers and backtrackers with the material loaded by loading shovels. The overburden (including surface vegetation turves) would be carefully stripped and stored as a series of separate turves, topsoil, subsoil and weathered rock storage mounds to be used for reinstatement purposes.

4.2 Excavations within Rock

Once overburden and weathered rock horizons have been stripped, and stored, a suitably qualified geotechnical engineer/blasting engineer would assess the nature of the underlying solid rock strata. 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[3] and Annex D PAN 50[4].

A combination of digging, ripping and blasting would be utilised to excavate rock (subject to the nature of the material encountered, depth of weathering and level of fracturing) which would be processed using a mobile crushing and screening plant, which would be sited within the base of the working borrow pit.

4.3 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 1.5m 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 5m, with maximum side-slope gradients of 1(Vertical (V)) in 2.5(Horizontal (H)) and be in full compliance with the Quarries Regulations 1999 and Quarries National Joint Advisory Committee (QNJAC) Guidelines[5]. This material would be used as part of the restoration profiling on the cut faces.

3 Health and Safety Executive (2014), Health and Safety at Quarries, Quarries Regulations 1999, Approved Code of Practice and Guidance (Second Edition).

4 Scottish Government (2000), PAN 50 Annex D: Controlling the Environmental Effects of Surface Mineral Works.

5 Quarries National Joint Advisory Committee (2020), Available at: http://qnjac.co.uk/what-is-qnjac/. Last accessed April 2020.

4.4 Access Tracks/Haulage Routes

The proposed access to the borrow pit(s) would involve constructing access tracks from the main wind farm access track. 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).

4.5 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.

4.6 Restoration

When considering the borrow pit excavations the principles of the relevant guidance[6,7] of the re-use of excavated peat and the minimisation of waste have been consulted. This guidance states that across the borrow pit areas, peaty soils may be used at depths of up to 0.5m as part of the borrow pits' reinstatement works. The final configuration of the borrow pits shall allow retention of rainfall and promote the infiltration of this to the peat and peaty soils used to restore the borrow pits which will prevent peat drying out. Surface vegetation and acrotelmic peat layers, safeguarded from parts of the site where peaty soils and peat are excavated will be used to restore the surface of the borrow pits and prevent erosion.

The formulation of a detailed construction method statement undertaken pre-construction shall incorporate construction design and sequencing for the proposed restoration of borrow pit areas. These plans shall draw on detailed site investigation information gathered as part of the preconstruction phase of works. The final design of borrow pit floor levels and restoration profiles shall depend on the depth of superficial deposits and the quality of rock recorded across the proposed borrow pit locations.

For BP1 and BP2 as noted, the surface superficial are largely peaty soils. By following the borrow pit restoration proposals, the aim is to enhance the potential for habitat restoration. Our aim is to improve the potential for habitats within all borrow pits. Where possible, the existing surrounding peatland should be hydrologically linked to the reinstated borrow pit to allow hydrological systems to develop. Additional details could be provided on condition once detailed ground investigation has been undertaken to provide clarity on the underlying ground conditions at the site.

Peaty soils will be placed to a maximum depth of 0.5m (at BP1 and BP2), and will be covered with turves as detailed in the PMP. The restoration design process will take into account the surrounding topography and geology to ensure the profiling of the restored borrow pits blend into the surrounding landscape and encourage establishment of habitats.

[6] NatureScot (July 2024), Good Practice During Wind Farm Construction. https://www.nature.scot/doc/good-practice-during-wind-farm-construction

[7] Scottish Renewables, Scottish Environment Protection Agency. 2012. Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste

Profiling of the edges of borrow pit should be kept to <30 degrees to ensure hydrological connectivity with adjacent habitat.

The geometry of the borrow pit shall be such that retention of shallow groundwater once restored will prevent the peaty soils drying out. This could be achieved by the excavation and/or formation of impervious bunds or by combining the two approaches. Bunds should be constructed with stone as peat can't stick to mineral to retain basal peat. Bunds should be approximately 30m cells or smaller to increase residence times of water within the borrow pit. A further key requirement will be to maintain a source of water to the restoration area to allow for suitable hydrological conditions to develop. We consider that the existing peatland within the area is largely fed by ombrotrophic (rain-fed) from rainfall rather than ground-water sources and this should be sufficient to keep the reinstated peat wet. However, should monitoring data (as proposed in the response) suggest the peat is drying, mitigation measures would be agreed with SEPA and NatureScot.

4.7 Monitoring

An assessment of the water level/depth to saturated peat in the borrow pit will be recorded quarterly and reported annually for a period of five years, following placement of peat. This could be recorded by inserting a peat probe at a number of locations across the restoration surface or by establishing a small network of hand driven dip wells where it is safe to do so. In addition, annually for a period of five years, following placement of peat:

- the edge of the peat would be inspected to assess for potential loss of water; and
- evidence of drying (e.g. surface cracking and /or erosion) would be assessed and reported.

Should the monitoring data suggest the peat is drying, mitigation measures would be agreed with SEPA and NatureScot.

5.0 Conclusion

In summary, two borrow pit search areas have been assessed and are included in the proposed development. These two borrow pits are considered as not being capable of supplying all the aggregate required for the proposed development. An estimated 146,373m^3 of suitable quality rock would be required to construct the proposed development. However, the proposed borrow pits are likely to be only capable of producing 75,136m^3 of aggregate. This will likely result in non-site won imported rock being required to construct the proposed development.

Several alternative borrow pit locations were assessed as part of the EIA and site design work, however, these were discounted due to constraints such as peat depths, proximity to watercourses, and proximity to potential ground water dependent terrestrial ecosystems. An attempt was made to locate a site for a borrow pit along the Sheriffmuir Road, however no suitable location was identified.

The locations and methods of working would be managed to cause minimal impact to the ground conditions and water environment. The borrow pit design and recommended methods of operation are in line with the Quarries Regulations, Approved Code of Practice, 1999[8] (as amended) to provide a safe working environment and minimise risk of instability.

An approximate volume of excavated materials has been calculated for each of the proposed borrow pit locations within the borrow pit search areas, these volumes are based on initial calculations based on assumptions for the proposed development. These calculations would be verified by detailed intrusive investigation at the proposed locations, post-consent. Calculations do not take into consideration the 'winning' of materials along the route. Each of the proposed borrow pits selected could be increased or decreased in size, depending on the aggregate requirements or following an assessment of the suitability of aggregate materials following detailed ground investigation.

The quality of rock anticipated on-site is inferred from a visual assessment of rock outcrops and published information. An intrusive ground investigation, sampling and material laboratory testing will be required to confirm ground condition and suitability.

Prior to the construction of the proposed development, design and best practices, any required mitigation measures, would be set out in full within a Construction Environmental Management Plan (CEMP) and would be secured by an appropriately worded pre-development condition of consent.

8 Health and Safety Executive (2014), Health and Safety at Quarries, Quarries Regulations 1999, Approved Code of Practice and Guidance (Second Edition).

Figures

Technical Appendix 10.3: Borrow Pit Appraisal

Windburn Wind Farm

Windburn Wind Farm Limited

SLR Project No.: 428.V12959.00001

LEGEND

Application Boundary

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BORROW PIT ASSESSMENT

SITE LOCATION

FIGURE 10.3.1

Scale 1:150,000 @ A3

Date APRIL 2025

12959.00001.0264.0 Site Location

284000 286000 288000 290000 292000

708000 706000 704000 702000

Figure 10.3.2b

Figure 10.3.2c

Figure 10.3.2e

Figure 10.3.2d

TCC1 TCC2 TCC3

T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13

BP1 BP2

LEGEND

- Application Boundary
- Proposed Turbine Location
- Proposed Crane Pad
- Proposed Substation Compound
- Proposed Temporary Construction Compound (TCC)
- Proposed Borrow Pit
- Proposed Access Track
- Proposed Turning Head
- Existing Road (To Be Upgraded)

N

0 1 2 Kilometres

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BORROW PIT ASSESSMENT

SITE LAYOUT

FIGURE 10.3.2a

Scale 1:35,000 @ A3

Date MAY 2025

12959.00001.0256.0 Site Layout

286000

288000

708000

N

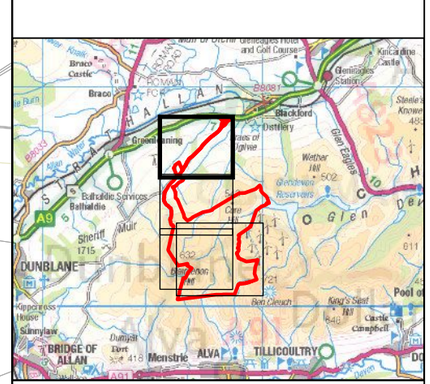
TCC1

0 250 500

Metres

LEGEND

- Application Boundary
- Proposed Substation Compound
- Proposed Temporary Construction Compound (TCC)
- Proposed Access Track
- Existing Road (To Be Upgraded)



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BORROW PIT ASSESSMENT

SITE LAYOUT

FIGURE 10.3.2b

Scale	Date
1:10,000 @ A3	MAY 2025

12959.00001.0256.0 Site Layout

286000

288000

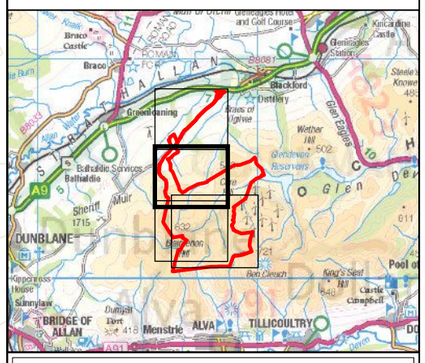
706000

704000

N

LEGEND

- Application Boundary
- Proposed Turbine Location
- Proposed Crane Pad
- Proposed Borrow Pit
- Proposed Access Track
- Proposed Turning Head
- Existing Road (To Be Upgraded)



T13

BP2

0 250 500

Metres

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BORROW PIT ASSESSMENT

SITE LAYOUT

FIGURE 10.3.2c

Scale 1:10,000 @ A3

Date MAY 2025

12959.00001.0256.0 Site Layout

286000

288000

702000

T13

BP2

T12

T10

T9

T8

T7

T6

TCC2

TCC3

T4

BP1

T3

T2

T1

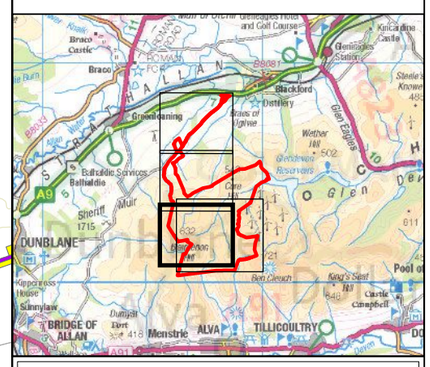
N

0 250 500

Metres

LEGEND

- Application Boundary
- Proposed Turbine Location
- Proposed Crane Pad
- Proposed Temporary Construction Compound (TCC)
- Proposed Borrow Pit
- Proposed Access Track
- Proposed Turning Head



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BORROW PIT ASSESSMENT

SITE LAYOUT

FIGURE 10.3.2d

Scale 1:10,000 @ A3

Date MAY 2025

12959.00001.0256.0 Site Layout

288000

290000

702000

T13

BP2

T12

T11

T10

T9

T8

T7

T6

TCC2

TCC3

T5

T4

BP1

T3

T2

T1

N

0 250 500

Metres

LEGEND

Application Boundary

Proposed Turbine Location

Proposed Crane Pad

Proposed Temporary Construction Compound (TCC)

Proposed Borrow Pit

Proposed Access Track

Proposed Turning Head

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BORROW PIT ASSESSMENT

SITE LAYOUT

FIGURE 10.3.2e

Scale	Date
1:12,000 @ A3	MAY 2025

12959.00001.0256.0 Site Layout

283000 284000 285000 286000 287000 288000 289000 290000 291000 292000 293000

708000 707000 706000 705000 704000 703000 702000

12959.00001.0257.0 Superficial Geology

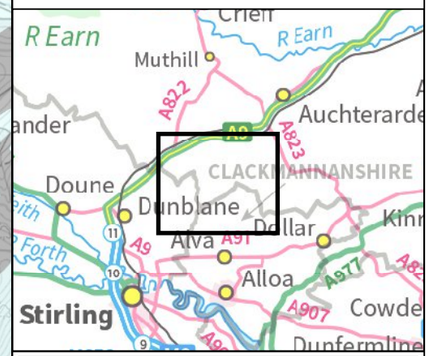
N

LEGEND

- Application Boundary
- Proposed Turbine Location
- Proposed Crane Pad
- Proposed Substation Compound
- Proposed Temporary Construction Compound (TCC)
- Proposed Borrow Pit
- Proposed Access Track
- Proposed Turning Head
- Existing Road (To Be Upgraded)

Superficial Geology

- Alluvial Fan Deposits - Gravel, Sand, Silt And Clay
- Alluvium - Clay, Silt, Sand And Gravel
- Glaciofluvial Ice Contact Deposits - Gravel, Sand And Silt
- Glaciofluvial Sheet Deposits - Gravel, Sand And Silt
- Peat - Peat
- River Terrace Deposits - Gravel, Sand, Silt And Clay
- Till, Devensian - Diamicton
- Bedrock at or Near Surface



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BORROW PIT ASSESSMENT

SUPERFICIAL GEOLOGY

FIGURE 10.3.3

Scale 1:35,000 @ A3

Date APRIL 2025

0 1 2 Kilometres

283000 284000 285000 286000 287000 288000 289000 290000 291000 292000 293000

708000 707000 706000 705000 704000 703000 702000

Bedrock Geology

DEVONIAN
- Buttergask Flagstone Member - Sandstone And Mudstone
- Cromlix Mudstone Formation - Mudstone And Siltstone
- Dunblane Sandstone Member - Sandstone
- Ochil Volcanic Formation - Conglomerate
- Sheriffmuir Sandstone Member - Sandstone

Igneous Rock

CARBONIFEROUS
- Central Scotland Late Carboniferous Tholeiitic Dyke Swarm - Basalt
- Central Scotland Late Carboniferous Tholeiitic Dyke Swarm - Quartz-microgabbro

DEVONIAN
- Ochil Volcanic Formation - Andesite
- Ochil Volcanic Formation - Andesite, Pyroxene
- Ochil Volcanic Formation - Basalt
- Ochil Volcanic Formation - Basaltic-andesite (tas)
- Ochil Volcanic Formation - Felsite
- Ochil Volcanic Formation - Olivine-basalt
- Ochil Volcanic Formation - Trachyandesite

SILURIAN / DEVONIAN
- Midland Valley Siluro-devonian Felsic Intrusion Suite - Microgranodiorite, Porphyritic
- Midland Valley Siluro-devonian Mafic Intrusion Suite - Diorite
- Midland Valley Siluro-devonian Mafic Intrusion Suite - Microdioritic-rock
- North Britain Siluro-devonian Calc-alkaline Dyke Suite - Basalt And Microgabbro
- North Britain Siluro-devonian Calc-alkaline Dyke Suite - Microdiorite, Porphyritic
- North Britain Siluro-devonian Calc-alkaline Dyke Suite - Microdioritic-rock
- North Britain Siluro-devonian Calc-alkaline Dyke Suite - Microgranodiorite, Porphyritic
- North Britain Siluro-devonian Plug And Vent Suite - Agglomerate

Linear Geology
- Fault, Inferred, Displacement Unknown
- Glacial Meltwater Channel Centre Line, Undifferentiated
- Margin of Contact Metamorphic Aureole, Symbol Towards Intrusion
- Mineral Vein, Observed

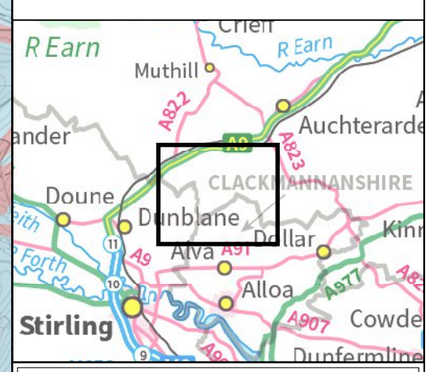
TCC1 TCC2 TCC3 BP1 BP2 T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13

Netherton Longfauld Factory Buttergask Topfauld Distillery Drumhead West Mains Bardrill Blueton Drumcairn Braes of Ogilvie Tarneybackle Banheath Williamfield Burnside Knowehead Whaick East Biggs Wester Biggs (ruin) Kinpauch Hill 426 Glen of Kinpauch Wether Hill 503 Craigentaggert 493 Hill Tambeth Berry Hill Upper Glendevon Reservoir Lower Glendevon Reservoir Core Hill 542 Shielings Little Corum Sauchanwood Hill Bald Hill 500 Burnfoot Hill Mickle Corum Glentye Hill 481 Middle Hill Grodwell Hill Glen Tye Big Hunt Hill Blairdenon Hill Ben Buck Skythorn Hill Maddy Moss Park Cott Glentye Cott Cauldhame Ashentrool Loss Hill Bengengie Hill Craighorn Ben Cleuch Andrew Gannel Hill 669 Ben Ever Colsnaur Hill

0 1 2 Kilometres

N

LEGEND
- Application Boundary
- Proposed Turbine Location
- Proposed Crane Pad
- Proposed Substation Compound
- Proposed Temporary Construction Compound (TCC)
- Proposed Borrow Pit
- Proposed Access Track
- Proposed Turning Head
- Existing Road (To Be Upgraded)



WINDBURN WIND FARM LTD

SLR

WINDBURN WIND FARM

BORROW PIT ASSESSMENT

BEDROCK GEOLOGY

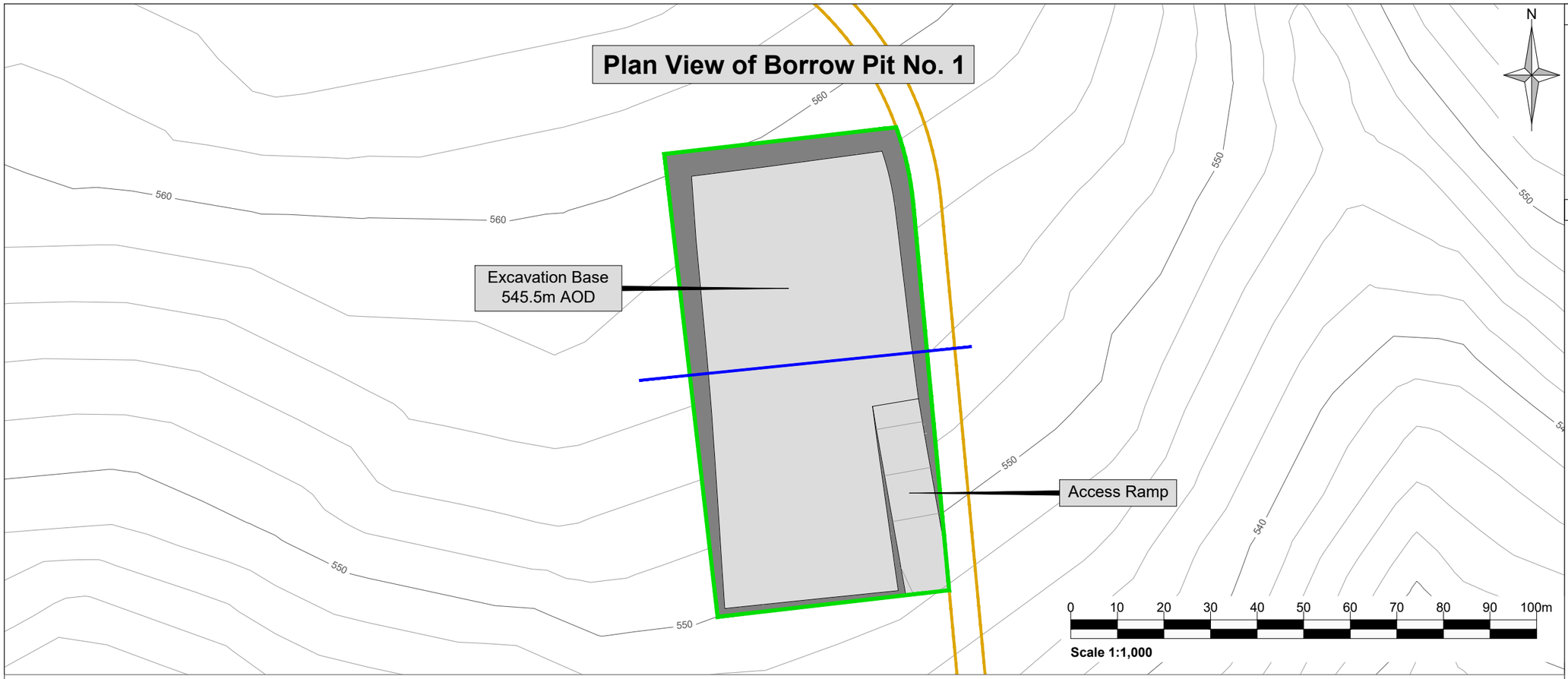
FIGURE 10.3.4

Scale 1:35,000 @ A3

Date APRIL 2025

12959.00001.0259.0 Bedrock Geology

Plan View of Borrow Pit No. 1



Notes:

Design parameters are indicative and should be refined based upon findings of ground investigations and or initial excavations, taking into account ground conditions and hydrological issues.

Legend:

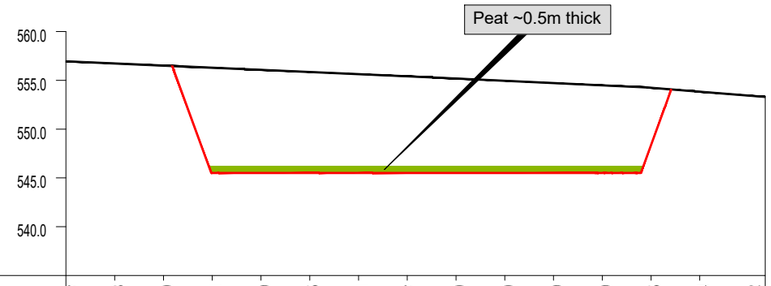
Plans

- Base of Excavation
- Excavation Face
- Borrow Pit Search Area
- Track Extents
- Site Location

Sections

- Section Line
- Excavation Profile
- Existing Topography
- Peat Restoration Profile

Cross-Section of Borrow Pit No. 1



Datum 535.0														
Topographic Levels	556.957	556.738	556.520	556.301	556.079	555.855	555.631	555.407	555.180	554.950	554.719	554.489	554.245	553.844	553.302
Borrow Pit Levels			556.480	545.500	545.500	545.500	545.500	545.500	545.500	545.500	545.500	545.500	545.500	545.500	554.078
Regular offsets	0.000	5.000	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000	55.000	60.000	65.000	70.000

Borrow Pit	No. 1
Total Excavation Area	5,091 m²
Total Excavation Volume	41,492 m³
Inferred Design Parameters	Slope angle 70°. Maximum face height of 15m.
Excavation Required	Digging, Drilling and Blasting
Rock Type	Ochil Volcanic Formation (Andesite & Basalt)
Coordinates for Centre of Borrow Pit	NN 87681 01514

Rev	Amendments	Date	By	Chk	Auth

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Project: Windburn Wind Farm

Figure Title: Borrow Pit Design - No. 1

Scale	SLR Project No.
1:1,000 @ A3	428.V12959.00001

Designed	Drawn	Checked	Authorised
SS	SS	RW	AH

Date	Date	Date	Date
APR 2025	APR 2025	APR 2025	APR 2025

Figure Number: **Figure 10.3.5a** Rev.

23/04/2025

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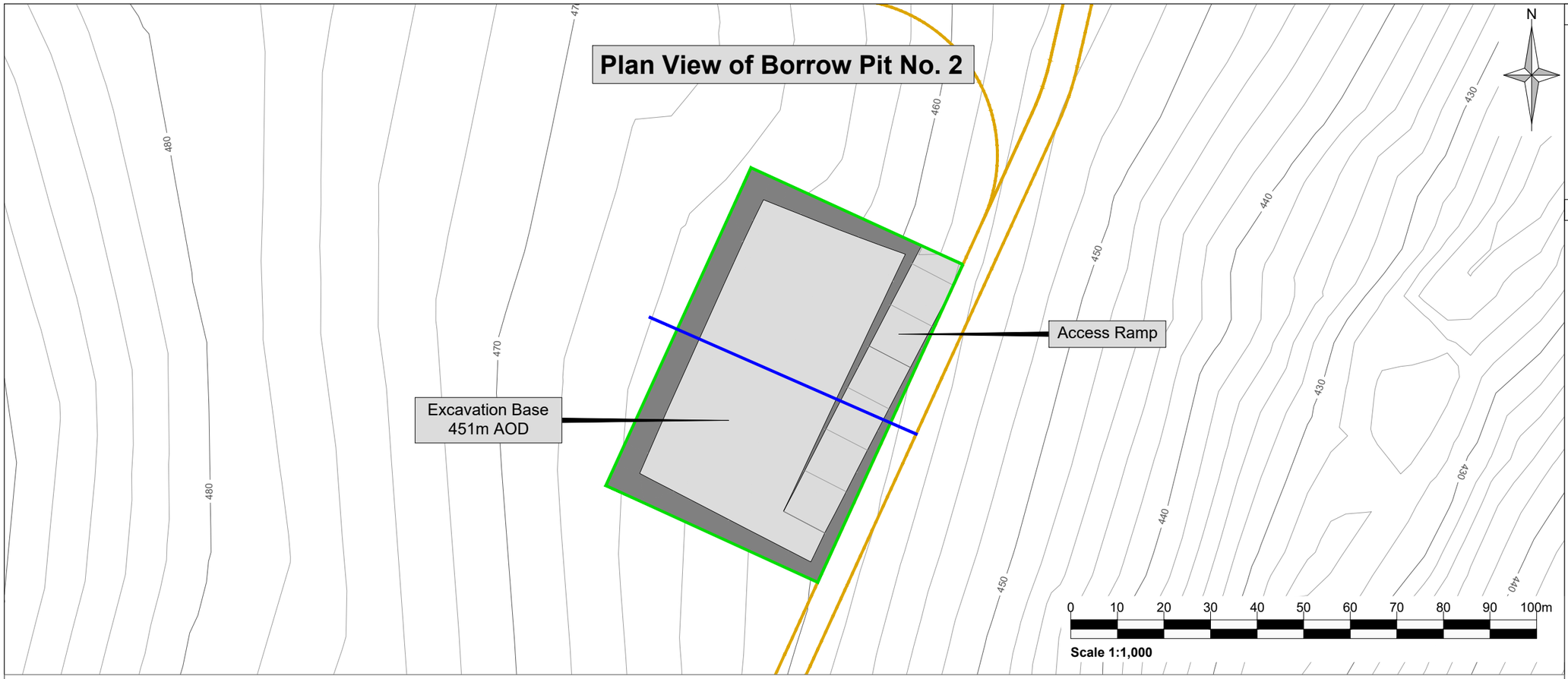
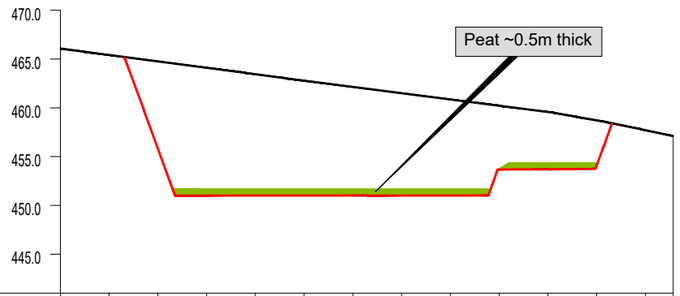
Plan View of Borrow Pit No. 2



Cross-Section of Borrow Pit No. 2



Datum 441.0

Topographic Levels	466.085	465.419	464.761	464.102	463.442	462.784	462.143	461.502	460.861	460.220	459.574	458.721	457.703
Borrow Pit Levels		465.210	455.830	451.000	451.000	451.000	451.000	451.000	451.000	451.000	453.673	453.705	453.738	458.411
Regular offsets	0.000	5.000	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000	55.000	60.000	

Borrow Pit	No. 2
Total Excavation Area	3,737 m²
Total Excavation Volume	33,644 m³
Inferred Design Parameters	Slope angle 70°. Maximum face height of 15m.
Excavation Required	Digging, Drilling and Blasting
Rock Type	Ochil Volcanic Formation (Andesite & Basalt)
Coordinates for Centre of Borrow Pit	NN 87927 03307

Notes:

Design parameters are indicative and should be refined based upon findings of ground investigations and or initial excavations, taking into account ground conditions and hydrological issues.

Legend:

Plans

- Base of Excavation
- Excavation Face
- Borrow Pit Search Area
- Track Extents
- Site Location

Sections

- Section Line
- Excavation Profile
- Existing Topography
- Peat Restoration Profile

Source: Esri, Maxar, Earthstar, Geographics, and the GIS User Community

Rev	Amendments	Date	By	Chk	Auth

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Client: Windburn Wind Farm Ltd

Project: Windburn Wind Farm

Figure Title: Borrow Pit Design - No. 2

Scale	SLR Project No.
1:1,000 @ A3	428.V12959.00001

Designed	Drawn	Checked	Authorised
SS	SS	RW	AH
Date: APR 2025	Date: APR 2025	Date: APR 2025	Date: APR 2025

Figure Number: **Figure 10.3.5b** Rev.

23/04/2025

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Annex A Aggregate Assessment

Technical Appendix 10.3: Borrow Pit Appraisal

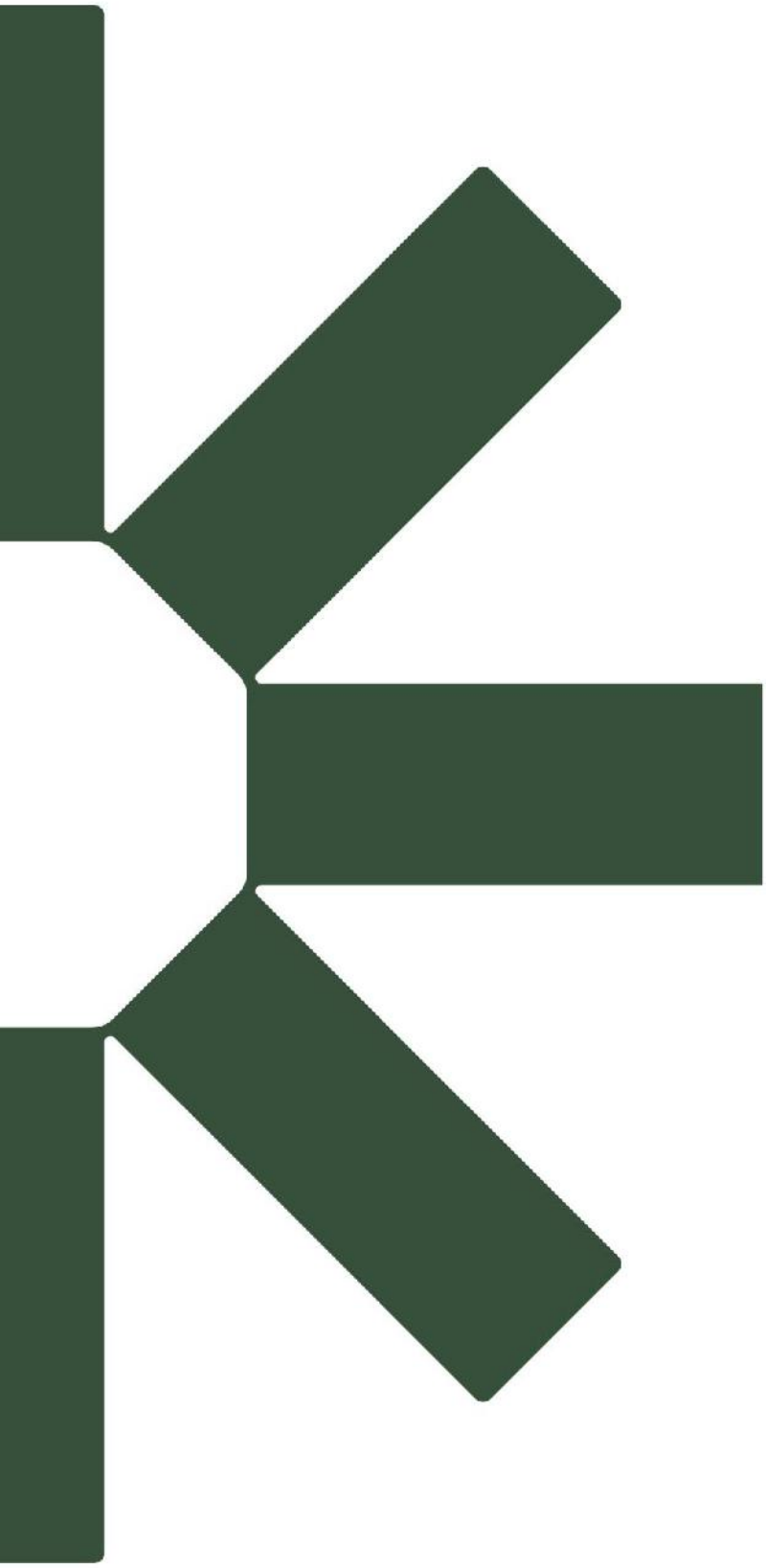
Windburn Wind Farm

Windburn Wind Farm Limited

SLR Project No.: 428.V12959.00001

Infrastructure	Length (m)	Width (m)	Area (m2)	Aggregate Thickness (m)	Number	Aggregate Volume (m^3)	Notes:
New Excavated Track	14942	6	89652	0.5	1	44826	Assumes 6m wide track
Existing Upgraded Track	3782	3	11346	0.5	1	5673	Assumes 3m wide upgrade
Proposed Turning Head T05			504	0.5	1	252	
Proposed Turning Head T09			918	0.5	1	459	
Proposed Turning Head T10			830	0.5	1	415	
Proposed Turning Head T11			831	0.5	1	415	
Proposed Turning Head T13			937	0.5	1	469	
Turbine Bases - formation only			707	0.5	13	4592	Assumes 30m diameter
Fill above Turbine Bases			1050	2	13	13650	Volume of 1no. foundation = 1050m^3
WTG Concrete Foundation Aggregate			525	1	13	6825	Assumes proportion of aggregate is 0.5 of 1m^3. Volume of 1no. foundation = 1050m^3
Permanent Hardstandings			1626	1	13	21138	
Temporary Hardstandings			1718	1	13	22334	
Proposed Substation Compound			7500	1	1	7500	
Proposed TCC 1			5475	1	1	5475	
Proposed TCC 2			6712	1	1	6712	
Proposed TCC 3			5636	1	1	5636	
Total Requirement						**146373**	All volumes measurements in m^3, based on turbine requirements and information provided by Client

Potential Volume of Rock to be sourced on site	
BP1	33644
BP2	41492
Total Volume from Site (m^3)	75136
Shortfall Volume (m^3)	-71237
Incl. 15% contingency (m^3)	-81922



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