

7 FIGURES

Figure 1 – Invasive Species Location Map



- Legend**
- Ecological Survey Area
 - Existing National Grid Underground Cable
 - Overhead Line to be Removed
 - Existing National Grid Overhead Line
 - Existing National Grid Pylon to be Removed
 - Invasive Plant Species Areas

Source:
Ecology: RSK, 2016.
Study Area: AECOM, 2015, edited Mott MacDonald March 2016.

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-	-	Snowdonia VIP

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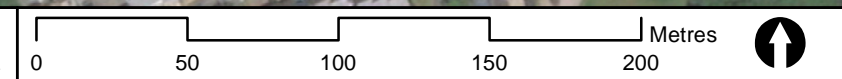
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**Figure 1:
Invasive Species Location Map**

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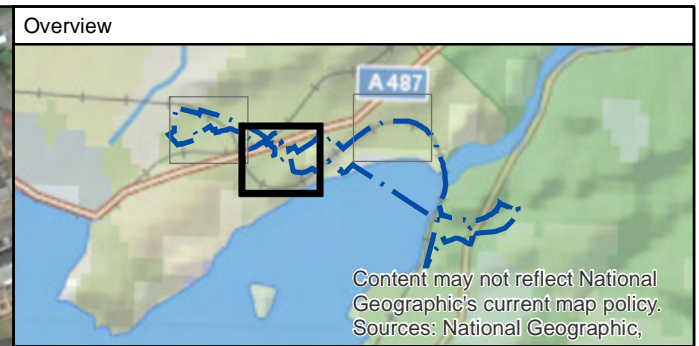
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Appendix 6:

Outline Peat Management Plan

VISUAL IMPACT PROVISION (VIP) PROJECT - SNOWDONIA

Peat Depth Survey

DECEMBER 2019



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VERSION CONTROL

Version	Date	Author	Checker	Approver	Changes
01	13 February 2019	Bruce Lascelles			
02	02 December 2019	Bruce Lascelles			Updated based on additional survey results

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1 Introduction

- 1.1 Following the results of a landscape and visual impact assessment in 2014, covering all of the overhead line (OHL) within the scope of the Visual Impact Provision (VIP) Project, those sections of OHL which had the greatest visual impact on the surrounding landscape were identified.
- 1.2 This includes a section in Snowdonia (OHL 4ZC) which runs from National Grid's existing Garth Sealing End Compound (SEC) near Minffordd (to the east of Porthmadog) across the Dwyryd Estuary where it enters the western edge of the Snowdonia National Park. It then continues past the small settlement of Cilfor. This section is approximately 3km in length.
- 1.3 At the eastern end the land is predominantly under agricultural use. To the west of the A496 the land is under improved pasture. To the east of the road the land is significantly wetter in the low-lying areas and is under rough grazing.
- 1.4 Initial site investigation work undertaken identified the presence of peat to the east of the A496 in BH124/125 and TP105/106/107 as shown in the map extract below. These will correspond approximately to the locations highlighted on the aerial photograph below.



- 1.5 In BH124 peat to a depth of 1.4m was recorded. In BH125 the peat depth recorded was 1.2m. In the trial pits the recorded depth was approximately 0.7m. The peat was described as soft dark brown and fibrous with frequent plant roots and plant fibres visible.
- 1.6 It is anticipated that the A496, which runs on a raised causeway, is likely to be affecting groundwater levels to the east of the road and may at least in part a causation factor in the accumulation of peat at this location.
- 1.7 A site walkover undertaken confirmed that the extent of the peat body will also be constrained on the southern, eastern and north-western sides by rising ground levels.
- 1.8 In order to assess the full extent and depth of peat and support the development of appropriate mitigation measures a peat depth survey was undertaken as detailed below.

2 Methodology

- 2.1 An initial peat depth survey was undertaken in January 2019. The information collected was used to inform aspects of the design, in particular the proposed access route. Following a site meeting with consultees on the 30th September 2019 further information on peat depth was requested for the proposed tunnel head house footprint and the proposed access track footprint. A further peat depth survey was undertaken in November 2019 focused on recording peat depth. The results of both surveys are presented together in this report.
- 2.2 The thickness of the peat was assessed using a graduated glass fibre peat probe which could be extended to up to 5m depth. The probe was pushed vertically into the ground and the depth of peat recorded.
- 2.3 The coordinates of each probe point were collected using a handheld Global Positioning System instrument (GPS).
- 2.4 The actual peat depth was determined through the feel of the probe as it is pushed through the ground. The base of the peat, and the nature of the underlying material, was recorded based on the following scenarios:
 - Solid and abrupt refusal – rock;
 - Solid but less abrupt refusal with grinding or crunching sound – sand or gravel;
 - Rapid and firm refusal – clay; and
 - Gradual refusal – dense peat or soft clay
- 2.5 Peat probing locations are shown on Figure 2 (each dot representing a probe location). There were a number of limitations to where probing could be undertaken as follows:
 - Limited probing was permitted underneath or within 10m of the OHL (note on Figure 2 the aerial is not from directly above and so points appear to be under the OHL);
 - There were areas of dense vegetation which restricted access;
 - In some locations the ground was too soft to safely continue; and
 - No crossing of the ditches was permitted and routes around had to be determined.
- 2.6 In addition, because of the presence of soft mineral sediment underlying the peat it was not always possible to feel the peat base accurately. As such, at each probe location the auger was also used to provide a visual check of the actual thickness of the peat layer. Where the auger did not reach the peat base and it was not possible to accurately determine peat depth through probing the thickness of the peat layer was recorded as >1m.
- 2.7 It is considered that sufficient coverage was achieved to provide an understanding of the ground conditions across the survey area.
- 2.8 The survey was undertaken by two surveyors so there was no lone working. A full Risk Assessment Method Statement was produced in advance of the works being undertaken.
- 2.9 The site and associated ditch network is shown on Figure 1. Figure 2 shows the peat depth readings and an interpolated plot of peat depths across the site. Figure 3 shows the total depths of soft sediment (i.e. peat and mineral sediments) present. The interpolations were undertaken using the topo to raster function within ArcMap.

3 Results

- 3.1 The survey area comprises flat, low lying land bounded to the west by the A496 and by rising ground to the east and south. This can be seen in Image 1 below.

3.2 The flat ground is likely to have been part of the wider estuary in the past and the Site Investigation work mapped the sediments as tidal flat deposits.

3.3 In these environments the sediment stratigraphy can be complex, relating to differing phases of sediment deposition. As flow paths through the estuary change some areas may become relatively stable (low energy), with sediment deposition occurring and vegetation establishment. If the area remains stable for long enough peat can then build up.

3.4 There is also the potential for remobilisation of materials and mixing of organic and mineral materials. As detailed below it is notable that some of the mineral sediments are dark in colour due to a higher organic matter content.

3.5 The nature of the catchment upstream (upland with likely highly variable flows and sediment erosion and transport) is likely to have resulted in significant quantities of mineral material being available for deposition in this estuary and will explain the recording from the Site Investigation of thick deposits of clay, silt and sand.



Image 1: view to the north-east across the site

3.6 The flat areas include a number of drainage ditches (shown on Figure 1), which were all flooded at the time of the survey. It is assumed these were dug in attempts to lower groundwater levels across the site. However, it is likely that the A496, which runs on a raised bund at its lowest point, is to some extent a restriction on drainage, with the main water flow to the west being via the main stream and the culvert under the road. As such, the current invert of the culvert will be an important controlling factor in relation to water levels across the wetland area.

3.7 Within the central area of the site (where there is tree and scrub growth) there was extensive surface water present at the time of the survey. Whilst the survey was undertaken in winter it was during a relatively dry period, suggesting that this area does not drain rapidly.

3.8 Figure 2 shows the mapped distribution of peat across the survey area. The greatest depths of peat were found along the southern, eastern and northern extents of the survey area, with peat becoming progressively shallower towards the stream running parallel to the road (to the north) and as the land rises to the south and south-east.

3.9 As expected, peat becomes shallower and disappears as the topography rises (see Image 1 above). The linear nature of the deeper deposits is potentially explained by this being an old flow path which, once water started to flow along a different path became a stable environment for the built up of peat. The inclusion of organic-rich mineral sediments below the surface peat potentially represents flood events resulting in the deposition of mineral material and mixing with the peat during the build up of sediments in these locations.

3.10 The most extensive area of peat is located in the northern part of the survey area where the valley narrows, with peat depths of >1m recorded more continuously with a few exceptions.

3.11 Using the peat depth data, the volumes of peat potentially lying under the footprint of the eastern tunnel head house have been calculated and are shown on Figure 2. This shows there is potentially

approximately 4,230m³ of peat present underneath the footprint. This is based on point data and interpolation; actual volumes will only be known once the peat has been excavated.

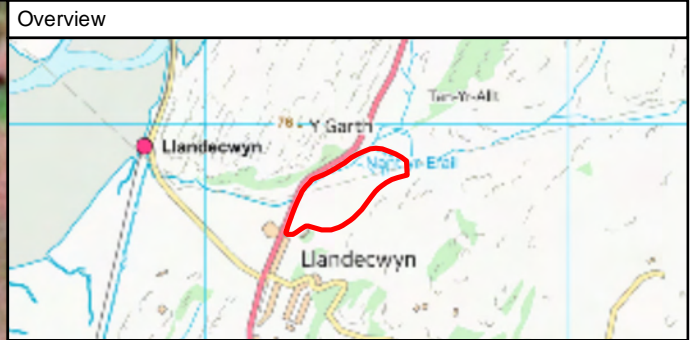
- 3.12 Figure 3 presents details of the total depth of soft sediment recorded. As discussed above there will have been an accumulation of mineral sediments across the estuary comprising sand, silt and clay. The augering confirmed the presence of organic-rich silts overlying clay. The probing indicated the likely presence of coarser sediments underlying some of the silts and clays as was expected from the Site Investigation results.

4 Summary

- 4.1 The peat and sediment depth survey undertaken has provided a greater understanding of the distribution and depth of the peat resource and of the underlying material.
- 4.2 The extent of peat is limited to a linear feature running parallel with the southern and eastern boundary of the survey area, potentially representing an old channel within which peat has built up. Elsewhere the peat is very shallow overlying mineral sediments (generally silt and clay overlying sands).
- 4.3 The fine nature of the sediments present, the flat topography and the restricted drainage towards the estuary result in an area of wetland that is likely to remain wet for large parts of the year. A significant control on water levels is likely to be the current invert level of the culvert under the A496.
- 4.4 Potential volumes of peat underlying proposed construction footprints have been calculated based on the survey data. It should be noted that the actual volumes may differ and will only be known once the peat has been excavated.

FIGURES

Figure 1: Ditch network plan



Legend

- Survey Area
- Overhead_Powerline
- Existing Ditches
- Stream
- Wetland Area

Source:
 ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,
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P01	FOR INFORMATION	RG	PC	EH	30/01/2019
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 Figure 1: Ditch network locations

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Development Eng: C. Carr	Document Type: -	Scale: 1:1,250	Format: A3	Sheet(s): 1 of 1	Rev: P01

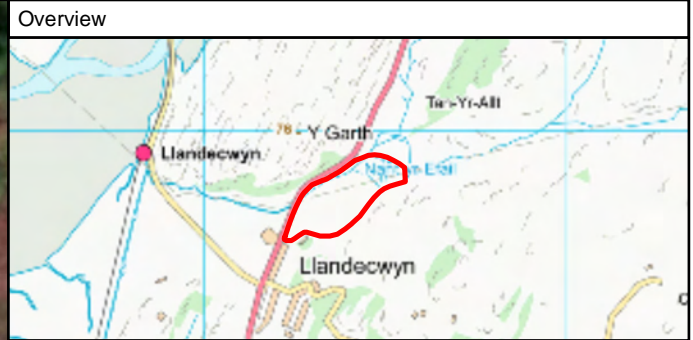
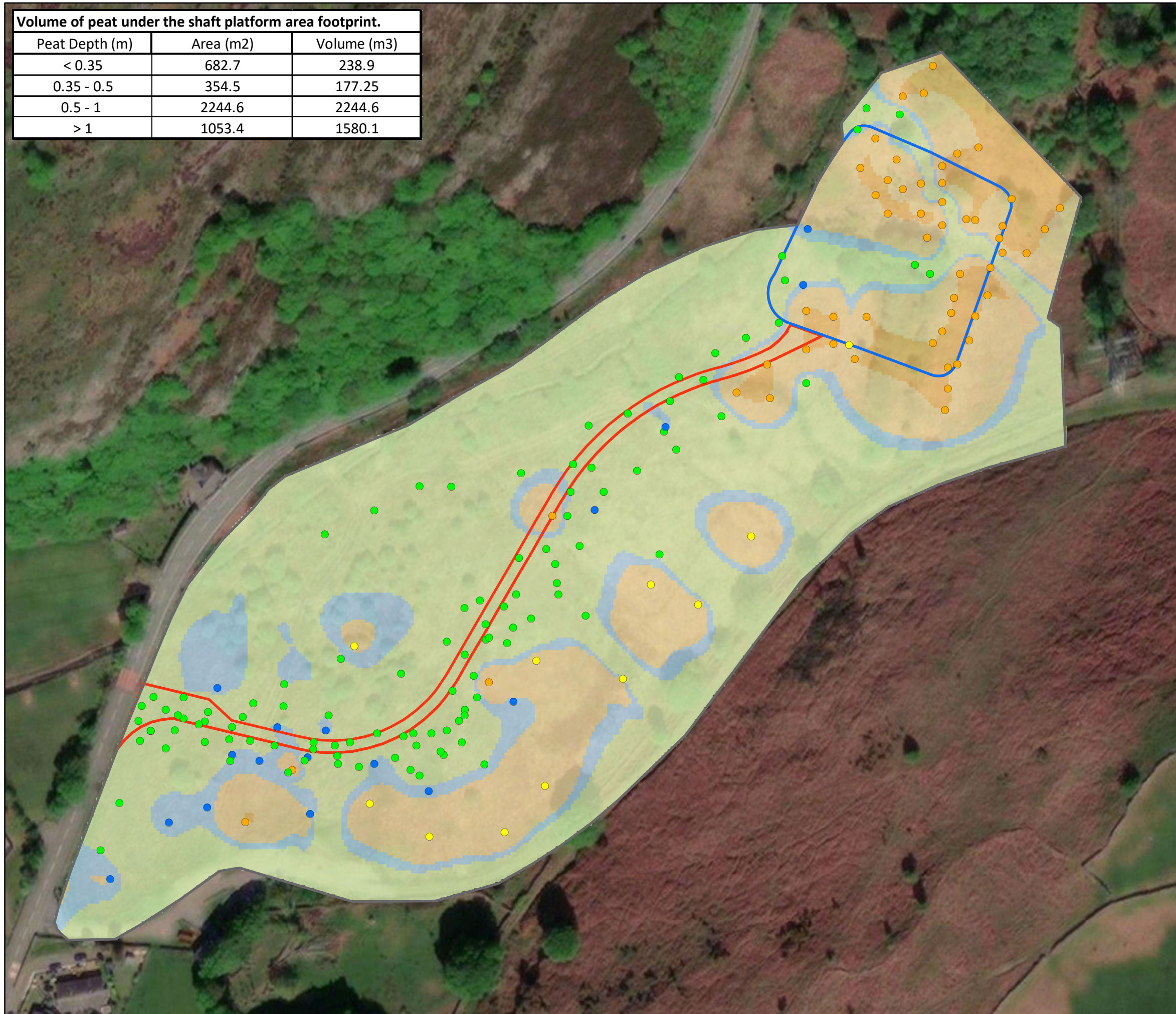
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Figure 2: Peat depth plan

Volume of peat under the shaft platform area footprint.		
Peat Depth (m)	Area (m2)	Volume (m3)
< 0.35	682.7	238.9
0.35 - 0.5	354.5	177.25
0.5 - 1	2244.6	2244.6
> 1	1053.4	1580.1



Legend

- Shaft Platform Area
- Access Track

Peat Depth

- 0 - 35cm
- 36 - 50cm
- 51 - 100cm
- > 100cm

Peat Depth (m)

- <0.35m
- 0.35 - 0.5m
- 0.5 - 1m
- >1m

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-	-	-

Scheme Name: 400kV Visual Impact Provision - Snowdonia

Document Title: Figure 2: Peat Depth Plan

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A.Hankinson	29/11/2019	E.Hargreave	29/11/2019	B.Lascelles	29/11/2019
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C. Carr	-	1:1,255	A3	1 of 1	P01

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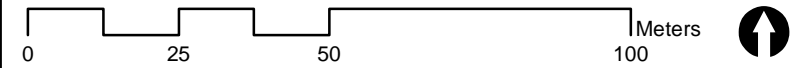
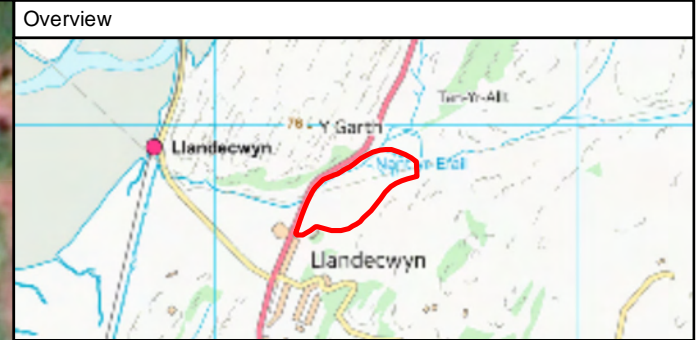


Figure 3: Total soft sediment depth plan



- Legend**
- Survey Area
- Depth Locations - Total Soft Sediment Depth**
- 0 - 35cm
 - 36 - 50cm
 - 51 - 100cm
 - 101 - 150cm
 - 151 - 300cm

Source:
 ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,
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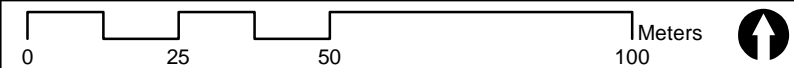
Scheme Name:
 400kV Visual Impact Provision - Snowdonia

Document Title:
 Figure 3: Total Soft Sediment Depth Plan

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APPENDIX A

Peat depth data

ID	GPS_ID	X	Y	Stop_depth	Clay_depth	Probing comments	Auger comments
103	GS0103	262235.6	337722.7	2.5	0.5	0 - 1.75m firm and smooth. 1.75-2.5m more resistance, gritty/silty	
104	GS0104	262255.1	337741.4	1.8	0.5	0-1.6m firm and smooth. 1.6-1.8m more resistance, gritty/silty	
105	GS0105	262275.4	337761.9	1.9	0.35	0-1.0m firm and smooth. 1.0-1.9m more resistance, gritty/silty	
106	GS0106	262271.1	337786.0	1.75	0.4	0-0.7m firm and smooth. 0.7-1.75m more resistance, gritty/silty	
107	GS0107	262316.5	337799.8	1.7	0.55	0-1.0m firm and smooth. 1.0-1.7m very resistance, gritty/silty	
108	GS0108	262352.9	337812.4	1.6	0.2	0-1.3m firm and smooth. 1.3-1.6m more resistance, gritty/silty	
109	GS0109	262383.5	337820.6	1.6	0.35	Firm silty stop	0-0.35m mostly organic matter with lots of fibrous materials. 0.35-1.0m grey - predominantly clay
110	GS0110	262417.5	337830.2	1.6	0.3	Firm silty stop	0-0.3m drier organic material (past the gully). 0.30-1.0m smooth grey predominantly clay with some fibrous material
111	GS0111	262447.8	337836.1	2.25	0.9	Firm silty stop	Core is much drier with a band of light brown soil between 0.15-0.3m. 0-0.9m predominantly organic material, then clay 0.9-1.0m. 0.75-0.9 transitional material between clay and brown organic matter
112	GS0112	262430.2	337813.5	1.7	0.7		0-0.25m dark brown, predominantly organic material. 0.25-0.7 core transitions into clay with a lighter brown material with more clay texture. 0.7-1.0m grey clay. Less vegetation and fibrous material present
127	GS0127	262379.5	337753.5	2	0.9		0-0.9m predominately organic matter, core was dark brown in colour with fibrous materials throughout and a band of reddish soil. 0.9-1.0m grey clay.
128	GS0128	262366.2	337738.2	2	0.9		0.0.9m dark brown material with lots of reeds, grass and fibrous materials. At 0.7m large chunks of wood. 0.9-1.0m clay
129	GS0129	262341.3	337736.8	1.9	0.9	Silty layer at 1.9	0-0.9 dark organic matter. 0.9-1.0m clay
130	GS0130	262321.6	337747.6	2	0.7		0-0.25m dark brown organic matter with roots.0.25-0.7m large band of mixed organic matter and clay - pale brown. 0.7-1.0m pale grey clay
131	GS0131	262301.8	337744.2	2.3	0.5	Land had been altered and flattened.	0-0.3m dark organic matter, 0-0.1m compact and dry. 0.3-0.5m transitional clay and organic matter mix. 0.5-1.0m predominately clay
132	GS0132	262280.4	337741.6	1.2	1	Vegetation changed - patches of dead bracken and the remains of 2 dead sheep. Lots of rocks near the surface. Next to attempted access track.	0-0.1 dark wet organic matter. 0.1-0.3 band of clay. 0.3-0.4 dark organic matter, not clay. 0.4-0.7 transitional material, mixture of organic matter and clay
141	GS0141	262267.7	337746.4	2.8	0.4		
142	GS0142	262294.6	337757.9	1.8	0.25	1.6m silt	Large transition between mostly organic matter to clay. 0.75m vey pale grey clay
143	GS0143	262310.8	337763.5	1.9	0.25		
144	GS0144	262332.7	337769.9	2.3	0.3	Very wet area	
145	GS0145	262351.1	337775.0	1.9	0.3		
146	GS0146	262369.1	337781.4	2	0.4	1.35m resistant band of silt	
147	GS0147	262376.7	337795.0	1.8	0.65	Silt at approx. 1.2m	
148	GS0148	262359.9	337807.0	1.9	0.2		
149	GS0149	262347.0	337801.3	1.8	0.28	1.0m resistant band	
150	GS0150	262332.0	337790.6	1.9	0.15	Surrounded by trees. 1.5m silt	
151	GS0151	262312.0	337795.5	1.9	0.3	Surrounded by trees in an open grassy area 1.5m silt	
152	GS0152	262293.2	337787.1	1.85	0.35	Edge of trees. 1.5m silt	Sharp boundary between mud and clay
153	GS0153	262279.5	337776.3	2.15	0.3	Open area. 1.5m silt	
154	GS0154	262306.7	337836.8	>3.0	0.05	Drier ground. 1.9m silt	All clay, not much vegetation or fibrous matter within core
155	GS0155	262323.1	337844.7	1.4	0.05	More vegetation present within the core. At 20cm the materials were foul smelling - suspected man made material (building aggregate?)	0-0.05m predominantley organic matter. 0.05-0.1 grey clay. 0.1-0.15 predominantly organic matter. 0.15-0.35 clay. Core couldn't be taken any deeper - ground too firm. Fibrous materials present throughout core
156	GS0156	262348.5	337852.6	2	0.1	Wetter ground with reeds and grass	0-0.1 clay. 0.1-1.0m organic soil with some fibrous materials and roots (vegetation not as dense as previous core)
157	GS0157	262338.0	337852.8	1.3	0.25	1.0 resistant layer. 0.25 foul smelling material - suspected building aggregate, possibly associated with pylon or road construction	0-0.25 predominately organic material. 0.25-0.50 clay (foul smelling). Core could not be taken past 0.5 - ground too firm
158	GS0158	262371.7	337857.1	1.9	0.25	Ground was dry with grass and some reeds. When peat probe was pulled out it had very watery clay residue on it	0-0.25 organic material. 0.25-0.5m foul smelling clay. Core could not be taken past 0.5 - ground too firm
159	GS0159	262388.9	337860.0	2	0.25	Dry ground	Sharp boundary between mud and clay
160	GS0160	262419.5	337872.3	2.55	0.4	Wet ground	Sharp boundary between mud and clay
165	GS0165	262238.7	337748.0	1.6	0.15		Large clay transition area
166	GS0166	262232.5	337732.2	1.6	0.35		
167	GS0167	262245.5	337768.5	1.9	0.2		
168	GS0168	262281.9	337768.5	1.65	0.3		
169	GS0169	262302.9	337765.7	1.9	0.2		
170	GS0170	262330.0	337762.8	2.7	0.3	Surface layer of moss and reeds floating on a vet/unstable layer below	
171	GS0171	262341.1	337751.8	3	0.4	In rectangular access track. Ground was wet and firm	
174	GS0174	262359.5	337760.7	1.85	0.35	Ponded area with leafy vegetation	
175	GS0175	262361.1	337802.7	1.5	0.2	Waterlogged ground with reeds and fresh shoots	
176	GS0176	262393.0	337809.9	2.2	0.25	Sphagnum moss, reeds and a small tree (within approx. 3m)	Large transition between mostly organic matter to clay

178	GS0178	262405.4	337788.9	3	0.55	Sphagnum moss in area surrounded by bushes. Sulphurous smell when probed and corad.	
179	GS0179	262414.6	337820.2	1.9	0.8	Drier ground - past the gully	
181	GS0181	262466.5	337937.9	1	0.5	Building aggregate at 1.0m	
182	GS0182	262465.1	337919.4	1	0.4	Building aggregate at 1.0m	
183	GS0183	262480.2	337899.5	2.7	0.7		
	GPS0003	262246	337780	2.3	0.2		
	GPS0004	262245	337775	1.3	0.15		
	GPS0005	262250	337783	0.6	0.15		
	GPS0006	262254	337766	1.75	0.1		
	GPS0007	262257	337772	0.7	0.22		
	GPS0008	262258	337777	1.75	0.19		
	GPS0009	262265	337774	1.5	0.08		
	GPS0010	262268	337778	1.8	0.13		
	GPS0011	262267	337768	1.65	0.08		
	GPS0012	262276	337773	1.8	0.11		
	GPS0013	262275	337769	1.65	0.1		
	GPS0014	262283	337781	2.2	0.11		
	GPS0015	262293	337780	1.7	0.1		
	GPS0016	262291	337773	1.65	0.4		
	GPS0017	262290	337767	1.7	0.3		
	GPS0018	262301	337763	2	0.45		
	GPS0019	262303	337768	1.6	0.12		
	GPS0020	262307	337772	1.8	0.4		
	GPS0021	262308	337777	1.8	0.32		
	GPS0022	262300	337762	2.3	0.1		
	GPS0023	262310	337767	2.85	0.15		
	GPS0024	262315	337768	1.9	0.05		
	GPS0025	262318	337760	1.6	0.14		
	GPS0026	262324	337771	1.6	0.15		
	GPS0027	262337	337767	1.9	0.08		
	GPS0028	262338	337757	1.5	0.21		
	GPS0029	262336	337771	1.9	0.2		
	GPS0030	262342	337771	1.95	0.27		
	GPS0031	262345	337765	1.85	0.12		
	GPS0032	262347	337772	1.7	0.15		
	GPS0033	262352	337768	1.8	0.07		
	GPS0034	262353	337777	2.1	0.09		
	GPS0035	262349	337785	1.7	0.1		
	GPS0036	262356	337790	1.5	0.2		
	GPS0037	262353	337797	1.4	0.06		
	GPS0038	262360	337802	1.5	0.08		
	GPS0039	262358	337815	1.9	0.18		
	GPS0040	262366	337813	2	0.11		
	GPS0041	262369	337806	1.5	0		
	GPS0042	262370	337817	1.6	0.19		
	GPS0043	262371	337829	2.1	0.03		
	GPS0044	262383	337827	1.55	0.21		
	GPS0045	262380	337832	2.2	0.05		
	GPS0046	262382	337843	1.8	>1		
	GPS0047	262388	337851	2	0.35		
	GPS0048	262396	337845	2	0.4		
	GPS0049	262395	337859	1	0		
	GPS0050	262394	337873	1.5	0.24		
	GPS0051	262407	337877	1.75	0.3		
	GPS0052	262419	337871	2.05	0.06		
	GPS0053	262421	337881	1	0.25		
	GPS0054	262432	337888	2	0.24		
	GPS0055	262424	337889	1.4	0.23		
	GPS0056	262436	337897	2.4	0.12		
	GPS0057	262446	337902	2	0.05		
	GPS0058	262457	337907	2	0.22		
	GPS0059	262475	337909	1.6	>1		
	GPS0060	262486	337909	1.55	>1		
	GPS0061	262482	337895	2.5	>1		
	GPS0062	262475	337900	1.6	>1		
	GPS0063	262466	337911	1.4	>1		
	GPS0064	262459	337921	2.45	0.15		
	GPS0065	262458	337929	1.2	0		
	GPS0066	262466	337887	2.9	0.21		
	GPS0067	262454	337882	0.07	>1		
	GPS0068	262438	337876	2	0.02		
	GPS0069	262423	337865	1.45	0		
	GPS0070	262410	337858	1.9	0.15		
	GPS0071	262399	337851	1.5	0.07		
	GPS0072	262387	337843	1.85	0.18		
	GPS0073	262391	337833	1.6	0.11		
	GPS0074	262384	337817	1.65	0		
	GPS0075	262375	337809	1.6	0		
	GPS0076	262367	337801	2.1	0		
	GPS0077	262361	337788	2.8	>1		
	GPS0078	262357	337783	1.75	0.3		
	GPS0079	262353	337779	1.9	0.3		
	GPS0080	262346	337764	1.85	0.21		
	GPS0081	262335	337759	1.6	0.19		
	GPS0082	262323	337761	1.75	0.4		
	GPS0083	262311	337761	2.05	0		
	GPS0084	262296	337759	1.8	>1		
	GPS0085	262285	337762	1.7	0.38		
	GPS0086	262276	337764	1.9	0.4		
	GPS0087	262267	337775	1.5	0.29		
	GPS0088	262260	337776	1.7	0.24		
	GPS0089	262254	337779	2.1	0.08		

GPS0090	262483	337971	1.4	0.3	
GPS0091	262486	337978	1.5	0.19	
GPS0092	262497	337976	1.9	0.1	
GPS0093	262498	337982	2.1	>1	
GPS0094	262505	337983	2.3	>1	
GPS0095	262508	337992	2.5	>1	
GPS0096	262489	337968	1.85	>1	
GPS0097	262496	337961	2.1	>1	
GPS0098	262504	337953	2.4	>1	
GPS0099	262511	337959	2.4	>1	
GPS0100	262516	337963	2.7	>1	
GPS0101	262523	337965	2.7	>1	
GPS0102	262511	337947	2.5	>1	
GPS0103	262522	337941	2.75	>1	
GPS0104	262530	337935	3.1	>1	
GPS0105	262539	337930	2.9	>1	
GPS0106	262545	337938	2.8	>1	
GPS0107	262550	337945	2.5	>1	
GPS0108	262534	337948	3	>1	
GPS0109	262531	337939	3.1	>1	
GPS0110	262531	337930	3.2	>1	
GPS0111	262527	337925	3.1	>1	
GPS0112	262526	337916	1.9	>1	
GPS0113	262522	337909	2.1	>1	
GPS0114	262520	337901	1	>1	
GPS0115	262516	337893	2	>1	
GPS0116	262513	337885	2.5	>1	
GPS0117	262512	337878	1	>1	
GPS0118	262513	337892	3.3	>1	
GPS0119	262508	337900	2	>1	
GPS0120	262511	337904	1.35	>1	
GPS0121	262514	337910	3	>1	
GPS0122	262515	337915	2.8	>1	
GPS0123	262517	337923	2.7	>1	
GPS0124	262507	337923	0.2	0.2	
GPS0125	262502	337926	0.25	0.25	
GPS0126	262506	337935	2.6	>1	
GPS0127	262511	337939	2.6	>1	
GPS0128	262504	337943	2	>1	
GPS0129	262493	337943	3	>1	
GPS0130	262489	337949	2.4	>1	
GPS0131	262484	337958	1.5	>1	
GPS0132	262493	337954	2.4	>1	
GPS0133	262498	337951	3	>1	
GPS0134	262511	337953	2.8	>1	
GPS0135	262519	337941	3.2	>1	
GPS0136	262466	337898	2.5	>1	
GPS0137	262453	337893	1.5	>1	
GPS0138	262443	337884	2.2	>1	
GPS0139	262249	337772	2.4	0.27	
GPS0140	262249	337772	1.5	0.12	
GPS0141	262260	337783	1.9	0.32	
GS0103	262235.6	337722.7	2.5	0.5	
GS0104	262255.1	337741.4	1.8	0.5	
GS0105	262275.4	337761.9	1.9	0.35	
GS0106	262271.1	337786	1.75	0.4	
GS0107	262316.5	337799.8	1.7	0.55	
GS0108	262352.9	337812.4	1.6	0.2	
GS0109	262383.5	337820.6	1.6	0.35	
GS0110	262417.5	337830.2	1.6	0.3	
GS0111	262447.8	337836.1	2.25	0.9	
GS0112	262430.2	337813.5	1.7	0.7	
GS0127	262379.5	337753.5	2	0.9	
GS0128	262366.2	337738.2	2	0.9	
GS0129	262341.3	337736.8	1.9	0.9	
GS0130	262321.6	337747.6	2	0.7	
GS0131	262301.8	337744.2	2.3	0.5	
GS0132	262280.4	337741.6	1.2	>1	
GS0141	262267.7	337746.4	2.8	0.4	
GS0142	262294.6	337757.9	1.8	0.25	
GS0143	262310.8	337763.5	1.9	0.25	
GS0144	262332.7	337769.9	2.3	0.3	
GS0145	262351.1	337775	1.9	0.3	
GS0146	262369.1	337781.4	2	0.4	
GS0147	262376.7	337795	1.8	0.65	
GS0148	262359.9	337807	1.9	0.2	
GS0149	262347	337801.3	1.8	0.28	
GS0150	262332	337790.6	1.9	0.15	
GS0151	262312	337795.5	1.9	0.3	
GS0152	262293.2	337787.1	1.85	0.35	
GS0153	262279.5	337776.3	2.15	0.3	
GS0154	262306.7	337836.8	>3.0	0.05	
GS0155	262323.1	337844.7	1.4	0.05	
GS0156	262348.5	337852.6	2	0.1	
GS0157	262338	337852.8	1.3	0.25	
GS0158	262371.7	337857.1	1.9	0.25	
GS0159	262388.9	337860	2	0.25	
GS0160	262419.5	337872.3	2.55	0.4	
GS0165	262238.7	337748	1.6	0.15	
GS0166	262232.5	337732.2	1.6	0.35	
GS0167	262245.5	337768.5	1.9	0.2	
GS0168	262281.9	337768.5	1.65	0.3	
GS0169	262302.9	337765.7	1.9	0.2	

GS0170	262330	337762.8	2.7	0.3		
GS0171	262341.1	337751.8	3	0.4		
GS0174	262359.5	337760.7	1.85	0.35		
GS0175	262361.1	337802.7	1.5	0.2		
GS0176	262393	337809.9	2.2	0.25		
GS0178	262405.4	337788.9	3	0.55		
GS0179	262414.6	337820.2	1.9	0.8		
GS0181	262466.5	337937.9	1	0.5		
GS0182	262465.1	337919.4	1	0.4		
GS0183	262480.2	337899.5	2.7	0.7		

APPENDIX B

Auger descriptions and images

PEAT STRATIGRAPHY RECORDING

ID	A1				
Vegetation present (height / type)	Reeds - approx. 80cm and patches of sphagnum moss.				
Depth below ground surface the layer starts (cm)	Plant remains visible (Y/N)	Description of what is visible (e.g. leaves, stems, fibrous material)	Colour description	Any other materials visible (e.g. beetle wing cases, wood fragments) - description	Comments
0	Y	Roots, grass, reeds	Light brown		
10	Y	Reeds, roots, grass	Reddish brown		
25	Y	Mostly fibres and roots.	Red-dark brown		
50	Y	Mostly fibres and roots.	Grey brown		
65	Y	Fibrous material.	Grey		Predominantly clay
95					

ID	A2				
GPS reading					
Vegetation present (height / type)	Predominantly grass with patches of Sphagnum moss and reeds.				
Depth below ground surface the layer starts (cm)	Plant remains visible (Y/N)	Description of what is visible (e.g. leaves, stems, fibrous material)	Colour description	Any other materials visible (e.g. beetle wing cases, wood fragments) - description	Comments
0	Y	Reeds, roots, grass	Dark brown		Unconsolidated. Moist - when squeezed brown water came out
10	Y	Reeds, roots, grass	Lighter brown	Fragment of slate	
30	Y	Mostly fibres and roots	Brown		
50	Y	Fibrous material	Grey -brown		A mixture of organic and mineral material - similar texture to clay

ID	A3				
Vegetation present (height / type)	Reeds - approx. 80cm with small areas of grass.				
Depth below ground surface the layer starts (cm)	Plant remains visible (Y/N)	Description of what is visible (e.g. leaves, stems, fibrous material)	Colour description	Any other materials visible (e.g. beetle wing cases, wood fragments) - description	Comments
0	Y	Dense amount of - reeds, roots, small amount of bark and grass.	Brown soil		More organic matter (fibers, reeds and roots) than other locations
25	Y	Reeds and roots.	Grey-brown		Denser - a transitional layer with a mixture of organic and mineral material
35	Y	Mostly fibres and roots.	Grey		Predominantly clay, dark streaks of mineral matter within the pale clay

ID	A4				
Vegetation present (height / type)	Reeds, grass and small patches of sphagnum moss. Leaf litter.				
Depth below ground surface the layer starts (cm)	Plant remains visible (Y/N)	Description of what is visible (e.g. leaves, stems, fibrous material)	Colour description	Any other materials visible (e.g. beetle wing cases, wood fragments) - description	Comments
0	Y	Very dense - reeds, roots and grass	Dark brown		Very moist
10	Y	Very dense - reeds and roots.	Brown		Predominately organic material with some mineral matter, considerably firmer than the first layer
40	Y	Less dense than the top 40cm, still containing reeds and roots.	Pale grey		Clay

ID	A5				
Vegetation present (height / type)	Reeds, grass and leaf litter.				
Depth below ground surface the layer starts (cm)	Plant remains visible (Y/N)	Description of what is visible (e.g. leaves, stems, fibrous material)	Colour description	Any other materials visible (e.g. beetle wing cases, wood fragments) - description	Comments
0	Y	Dense (progressively less in the lower layers) - reeds, roots and grass	Dark brown		
30	Y	Mostly fibres and roots.	Grey-brown		Transitional layer of a mixture of organic materials and clay
55	Y	Less dense - mostly fibrous material	Pale grey		Clay
80					Bottom 20cm of core was lost when extracting

ID	A6				
Vegetation present (height / type)					
Depth below ground surface the layer starts (cm)	Plant remains visible (Y/N)	Description of what is visible (e.g. leaves, stems, fibrous material)	Colour description	Any other materials visible (e.g. beetle wing cases, wood fragments) - description	Comments
0	Y	High density of roots, fibers and reeds	Dark brown		Moist, soft, unconsolidated.
5	Y	Mostly fibres and roots	Brown		Transitional material with a mixture of organic and mineral materials.
20	Y	Lower density - mostly fibres and roots	Pale brownish-grey		Predominantly mineral matter. Very wet at the bottom of the layer
55	Y	Fibres	Light brown		Very wet
65					Last 35cm were not recoverable

ID	A7				
Vegetation present (height / type)	Dry long grass (approx. 50cm) and some reeds				
Depth below ground surface the layer starts (cm)	Plant remains visible (Y/N)	Description of what is visible (e.g. leaves, stems, fibrous material)	Colour description	Any other materials visible (e.g. beetle wing cases, wood fragments) - description	Comments
0	Y	Lots of fibrous materials - reeds and roots	Dark brown		Damp, more condensed top layer than other cores
15	Y	Lots of fibrous materials	Brownish red		Drier
30	Y	Some fibrous materials			
70	Y	Lower density of fibrous materials	Dark brownish-grey		Texture of clay, however much darker and browner than other clay layers at similar depths

ID	A8				
Vegetation present (height / type)	Dry long grass/reeds (approx. 50cm) and some reeds.				
Depth below ground surface the layer starts (cm)	Plant remains visible (Y/N)	Description of what is visible (e.g. leaves, stems, fibrous material)	Colour description	Any other materials visible (e.g. beetle wing cases, wood fragments) - description	Comments
0	Y	Fibrous materials and roots	Dark brown		Drier, dense layer of organic material
30	Y	Fibrous material	Brown		Intermediate layer - brown in colour but with the texture of clay
70	Y	Lower density of fibrous material	Pale greyish-brown		

GPS reading	A9				
Vegetation present (height / type)	Sphagnum moss, grass and a mixture of live and dry reeds.				
Depth below ground surface the layer starts (cm)	Plant remains visible (Y/N)	Description of what is visible (e.g. leaves, stems, fibrous material)	Colour description	Any other materials visible (e.g. beetle wing cases, wood fragments) - description	Comments
0	Y	Lots of fibrous material and roots throughout the 90cm. At 70cm there was a high density of woody vegetation	Dark brown		Damp
90					Last 10cm could not be cored, suspected change in material from probing at approx 1m (clay)

ID	A10				
Vegetation present (height / type)	Predominantly grass, surrounded by reeds.				
Depth below ground surface the layer starts (cm)	Plant remains visible (Y/N)	Description of what is visible (e.g. leaves, stems, fibrous material)	Colour description	Any other materials visible (e.g. beetle wing cases, wood fragments) - description	Comments
0	Y	High density of fibrous materials and roots	Dark brown		
25	Y	Low density of fine roots	Pale brown		Band of dense clay
30	Y	Fibrous materials and roots	Brownish-grey		Transitional layer between organic material and clay/mineral material
70	Y	Lower density of fibrous materials and roots	Pale grey		Predominantly clay, with streaks of darker mineral matter

ID	A11				
Vegetation present (height / type)	Dried/dead bracken area with small patches of grass and sphagnum moss and dried reeds				
Depth below ground surface the layer starts (cm)	Plant remains visible (Y/N)	Description of what is visible (e.g. leaves, stems, fibrous material)	Colour description	Any other materials visible (e.g. beetle wing cases, wood fragments) - description	Comments
0	Y	High density of roots and fibrous materials	Dark brown		Compacted/dense and dry
10	Y	Roots and fibrous materials	Brown - mixed darker and lighter areas		Compact - organic materials
30	Y	Roots and fibrous materials	Light brown		Transitional layer with a mixture of organic and mineral materials
75	Y	Lower density - fibrous materials	Dark grey		Predominantly mineral/clay - darker grey than other mineral layers at similar depths

ID	A12				
Vegetation present (height / type)	Reeds				
Depth below ground surface the layer starts (cm)	Plant remains visible (Y/N)	Description of what is visible (e.g. leaves, stems, fibrous material)	Colour description	Any other materials visible (e.g. beetle wing cases, wood fragments) - description	Comments
5	Y	Fibrous materials, reeds and roots	Brown		Organic material
10	N		Pale grey		Mineral/clay material
15	Y	Roots and fibrous materials.	Brown		At 20cm foul smelling material - suspected building aggregate
35					Couldn't retrieve the rest of the core, ground too firm

A3



A7



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Appendix 7:

Dust Risk Assessment

VISUAL IMPACT PROVISION (VIP) SNOWDONIA PROJECT

Dust Risk Assessment

FEBRUARY 2020



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VERSION CONTROL

Version	Date	Author	Checker	Approver	Changes
V1	21/11/2019	E.Hassall	H.Dennett	Kate Tomos	

This report dated 11 October 2019 has been prepared for National Grid (the "Client") in accordance with the terms and conditions of appointment dated 08 February 2018(the "Appointment") between the Client and **Arcadis (UK) Limited** ("Arcadis") for the purposes specified in the Appointment. For avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

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1 Introduction

Arcadis was commissioned to undertake a dust risk assessment for the National Grid Visual Impact Provision (VIP) Snowdonia Project (hereon referred to as the “Proposed Project”) to determine site specific mitigation measures to mitigate potential dust effects associated with the construction of the Proposed Project.

National Grid is proposing to underground a section of the 4ZC overhead line (OHL) within a tunnel, aiming to mitigate the visual impact of existing electricity infrastructure within Snowdonia National Park, near Minffordd.

There are two above ground compounds from which shaft and tunnel construction will take place. Access to the western construction compound is from a B road from the A497 to the west of Minffordd; access to the eastern end is via the A496.

A full project description is provided in Chapter 2 of the Environmental Appraisal prepared for the Proposed Project in support of an application for planning permission.

The Proposed Project is not located in an Air Quality Management Area (AQMA) and there are no AQMAs within the surrounding area of Gwynedd.

2 Legislation

When of sufficient scale and frequency, dust may become a statutory nuisance. The relevant legislation dealing with statutory nuisance is given in Part III of the Environmental Protection Act 1990 (Ref 1). A statutory nuisance in relation to dust and deposits is defined under Section 79 of the act as follows:

“...any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance” or “any accumulation or deposit, which is prejudicial to health or a nuisance...”

Enforcement of the Act, in regard to nuisance, is currently under the jurisdiction of the local Environmental Health Department, whose officers are deemed to provide an independent evaluation of nuisance. If the Local Authority is satisfied that a statutory nuisance exists, or is likely to occur or happen again, it must serve an Abatement Notice under Part III of the Environmental Protection Act (1990). Enforcement can insist that there be no dust beyond the boundary of the works. The only defence is to show that the process to which the nuisance has been attributed and its operation are being controlled according to best practice measures.

3 Methodology

There is the potential for fugitive dust emissions to occur as a result of construction phase activities associated with the Proposed Project. These have been assessed in accordance with the methodology outlined within the Institute of Air Quality Management’s (IAQM) ‘Guidance on the Assessment of Dust from Demolition and Construction’ (Ref 2).

Activities associated with the construction phase of the Proposed Project have been divided into four types to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and,
- Trackout.

The potential for dust emissions have been assessed for each activity that is likely to take place and considered three separate dust effects:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and,
- The risk of health effects due to a significant increase in exposure to particulate matter less than 10 microns in diameter (PM₁₀).

The assessment steps are detailed below.

Step 1- screens the requirement for a more detailed assessment. Should human receptors be identified within 350m of the Site Boundary or 50m from the construction vehicle route (up to 500m from the Site entrance for large sites, 200m from medium sites and 50m from small sites), then the assessment proceeds to Step 2. Additionally, should ecological receptors be identified within 50m of the Site Boundary or 50m from the construction vehicle route (up to 500m from the Site entrance for large sites, 200m from medium sites and 50m from small sites), then the assessment also proceeds to Step 2.

Should sensitive receptors not be present within the relevant distances then negligible impacts would be expected and further assessment is not necessary.

Step 2- assesses the risk of potential dust impacts. A Proposed Project is allocated a risk category based on two factors:

- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and,
- The sensitivity of the area to dust impacts, which can be defined as low, medium or high sensitivity (Step 2B).

The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied.

Step 3- requires the identification of site-specific mitigation measures within the guidance to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with negligible risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

Step 4- Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be not significant. This has been described as negligible within this report to provide continuity between assessment terminologies.

4 Dust Risk Assessment

Step 1

The undertaking of activities such as demolition, excavation, ground works, cutting, construction and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from highway surfaces. Due to the nature of the Proposed Project, dust generating activities would generally be limited to the compounds either side of the tunnel; the Western Compound and the Eastern Compound. As such, these two Compounds have been the focus of the assessment.

The potential for impacts at sensitive locations depends significantly on local meteorology during the undertaking of dust generating activities, with the most significant effects likely to occur during dry and windy conditions.

A desk-study identified a number of sensitive receptors within 350m of the Site Boundary of the two Compounds. A detailed assessment of potential dust impacts was therefore required.

There are five ecological statutory designated sites potentially sensitive to dust within 50m of the Site Boundary or trackout boundary. The trackout boundary is defined as the local road network used by construction vehicles up to 500m from the site entrances/exits. The ecological sites considered within the assessment are:

- Ysbyty Bron y Garth - Site of Special Scientific Interest (Wales)

- Glaslyn - Site of Special Scientific Interest (Wales)
- Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites - Special Area of Conservation (Wales)
- Morfa Harlech - Site of Special Scientific Interest (Wales)
- Pen Llyn a'r Sarnau / Lleyrn Peninsula and the Sarnau - Special Area of Conservation (Wales)

As such, ecological impacts have been assessed further.

Step 2A

Demolition

There are no demolition activities associated with the Proposed Project other than the deconstruction of 10 pylons which are not anticipated to be a dust generating activity. Therefore, the potential dust emissions from demolition has not been considered further in the assessment.

Earthworks

Earthworks associated with the Proposed Project will primarily involve the excavation of material during shaft and tunnel construction and will mostly be limited to the two Compounds. The total area of these Compounds is estimated to be greater than 10,000 m² and there is expected to be more than 100,000 tonnes of potentially dusty soil type moved. As such, the magnitude of potential dust emissions from earthworks is classified as large.

Construction

There is likely to be temporary construction of above ground storage units during the construction period, for the storage of materials and equipment, as well as the construction of tunnel head houses. The total building volume is expected to be within the IAQM construction category of below 25,000 m³ (Ref 2). As such, the magnitude of potential dust emissions from construction is classified as small.

Trackout

The peak construction activity in terms of traffic generation is expected to relate to the excavation of rock and soil during tunnelling. Current forecasts indicate that tunnelling will generate in the order of 30 loads per day, (60 two-way HGV movements) undertaken by vehicles with a load carrying capacity of 15m³. During this period, worst-case forecasts indicate that tunnelling activities could generate 160 two-way Light Goods Vehicles (LGV) movements spread across three shifts. Tunnelling works are expected to take place for approximately 17 months. There is the potential for moderately dusty surface material, therefore the magnitude of potential dust emissions from trackout is classified as medium.

The dust emission magnitude for each dust generating activity for the Proposed Project is summarised in Table 1.

Table 1 - Dust Emission Magnitude Summary

Activity	Dust emission magnitude
Demolition	n/a
Earthworks	Large
Construction	Small
Trackout	Medium

Step 2B

Receptors sensitive to potential dust impacts during earthworks and construction were approximated from a desktop study. A Study Area up to 350m from the Site Boundary was used for human receptors and up to 50m was used for ecological receptors. The number of sensitive human and ecological receptors potentially affected by the Proposed Project are summarised in Table 2.

Table 2 - Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Less than 20	1 – 10	1
Less than 50	10 – 100	3
Less than 100	10 – 100	-
Less than 200	10 – 100	-
Less than 350	10 – 100	-

The number of receptors sensitive to potential dust impacts during trackout were approximated from a desktop study. A trackout study area consisting of a 50m buffer from the road network used by construction vehicles. As the magnitude of potential dust released was classified as medium, the trackout study area included roads up to 500m of the entrances/exits to the Compounds. The approximate number of receptors identified within the trackout study area are summarised in Table 3.

Table 3 - Trackout Dust Sensitive Receptors

Distance from Trackout Roads (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Less than 20	10 - 100	3
Less than 50	10 - 100	3

The background PM¹⁰ concentration is used to assign what category is selected to determine sensitivity. In order to determine the sensitivity of the receiving environment, the average PM₁₀ background concentration for the two Compound areas (UK Grid Squares XY: 259500,338500 and 262500,337500) was obtained from the DEFRA website (Ref 3) and identified as being 7.05µg/m³ for 2019. Therefore, in accordance with IAQM guidance (Ref 2), health impacts should be determined based on the criteria within the less than 24µg/m³ category.

In accordance with the IAQM guidance (Ref 2), the highest level of sensitivity should be recorded from the criteria outlined in guidance. As the human receptors include residential properties and ecological receptors listed on the citations of statutory designated sites, the sensitivity of the receiving environment to potential dust impacts is considered to be high for both human and ecological receptors.

The sensitivity of the receiving environment to specific dust impacts, based on high sensitivity receptors within the less than 24µg/m³ category, in accordance with the IAQM guidance (Ref 2) is summarised in Table 4.

Table 4 - Summary of the Sensitivity of the Area

Potential Impact	Sensitivity of the surrounding area			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	n/a	Medium	Medium	High
Human health	n/a	Low	Low	Low
Ecological	n/a	High	High	High

Step 2C

The risk of effects in the absence of environmental mitigation measures was then defined based upon the interaction between the magnitude of emission and the highest level of area sensitivity (determined in Steps 2A and 2B, respectively) for each dust generating activity. The risk of dust effects was determined, as presented in Table 5.

Table 5 - Summary of the Risk of Dust Effects

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	n/a	Medium Risk	Low Risk	Medium Risk
Human health	n/a	Low Risk	Negligible	Low Risk
Ecological	n/a	High Risk	Low Risk	Medium Risk

Table 5 presents that the assessment has indicated the maximum risk of dust effects as high, as a worst case.

It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was predicted based on a worst-case scenario of works being undertaken at the Site Boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase.

Step 3

The IAQM guidance (Ref 2) on the assessment of dust from demolition and construction provides potential mitigation measures to reduce impacts as a result of fugitive dust emissions during the construction phase. These have been adapted for the Proposed Project based on the risk of dust effects (Table 5) and are summarised in Table 6. The mitigation measures identified have been incorporated into the CEMP.

Table 6 - Proposed Dust Mitigation Measures based on IAQM Guidance (Ref 2)

Mitigation measure	H = Highly Recommended D = Desirable
Mitigation for all sites: Communications	
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	H
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H
Display the head or regional office contact information.	H

Mitigation measure	H = Highly Recommended D = Desirable
Site Management	
Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	H
Make the complaints log available to the local authority when asked.	H
Record any exceptional incidents that cause dust and/or air emissions, either on-site or off-site, and the action taken to resolve the situation in the logbook.	H
Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, if applicable, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.	H
Monitoring	
Undertake daily on-site and off-site visual inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of Site Boundary, with cleaning to be provided if necessary. Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	H
Agree dust deposition, dust flux, or real-time PM ₁₀ continuous monitoring and PM _{2.5} monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences. It is suggested to propose dust deposition or dust flux monitoring using Frisbee Gauges or Fablon monitoring techniques rather than continuous automatic monitoring, subject to agreement with Local Authority. Baseline monitoring is suggested particularly at the west compound site due the presence of a quarry in close proximity to the site, to determine the presence of dust from existing sources. Further guidance is provided by IAQM on monitoring in the vicinity of demolition and construction sites (Ref 4).	H
Preparing and maintaining the site	
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	H
Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.	H
Avoid site runoff of water or mud.	H
Keep site fencing, barriers and scaffolding clean using wet methods.	H
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	H
Cover, seed or fence stockpiles to prevent wind whipping.	H
Operating vehicle/machinery and sustainable travel	
Ensure all vehicles switch off engines when stationary - no idling vehicles.	H
Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	H
Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).	H
Produce a Construction Traffic Management Plan to manage the sustainable delivery of goods and materials and implement a travel plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	H
Operations	
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.	H
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	H
Use enclosed chutes and conveyors and covered skips.	H
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	H
Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	H

Mitigation measure	H = Highly Recommended D = Desirable
Waste management	
Avoid bonfires and burning of waste materials.	H
Measures specific to earthworks:	
Where the ecological objectives allow, re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	H
Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.	H
Only remove the cover in small areas during work and not all at once.	H
Measures specific to construction:	
Avoid scabbling (roughening of concrete surfaces) if possible.	D
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	D
Measures specific to trackout:	
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.	H
Avoid dry sweeping of large areas.	H
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	H
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	H
Record all inspections of haul routes and any subsequent action in a site log book.	H
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	H
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	H
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	H
Access gates to be located at least 10 m from receptors where possible.	H

Step 4

Assuming the relevant mitigation measures outlined in Table 6 are implemented, the residual effect from all dust generating activities is predicted to be negligible.

5 References

Ref 1 - Environmental Protection Act (1990) Part III, Section 79 Statutory Nuisances and Clean Air

Ref 2 - Institute of Air Quality Management (2014) Guidance on the Assessment of Dust from Demolition and Construction Version 1.1

Ref 3 - Defra UK Air website. 2017-based background maps. Available online at: <https://uk-air.defra.gov.uk/data/laqm-background-home> [Accessed: 17/09/2019]

Ref 4 - Institute of Air Quality Management (2018) Guidance on Monitoring in the Vicinity of Demolition and Construction Sites Version 1.1

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Appendix 8:

Reptile Method Statement



National Grid

Visual Impact Provision (VIP) Snowdonia Project

Reptile Method Statement

Rev01

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RSK

RSK GENERAL NOTES

Project No.: 660952



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Date:	<u>16 September 2019</u>	Date:	<u>18 September 2019</u>

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Environment.

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1 INTRODUCTION

1.1 Purpose of this Method Statement

The Visual Impact Provision (VIP) Snowdonia Project, located within Snowdonia National Park aims to reduce the visual impact of National Grid's 4ZC overhead line (OHL) across the Dwyryd Estuary near Penrhyndeudraeth, Gwynedd by relocating a section of the OHL below ground in a cable tunnel. The project will make use of a £500 m allocation by Ofgem to carry out work to help reduce the impact of existing transmission lines in English and Welsh Areas of Outstanding Natural Beauty (AONBs) and National Parks.

Surveys of the proposed construction area and access routes undertaken by RSK Environment Ltd in 2016 and 2018 (RSK, 2018) recorded the presence of Common Lizard, Slow-worm, Adder and Grass Snake. The location of the areas in which the reptiles were recorded are shown on *Figure 1*. This method statement relates to construction of the access routes, works compounds, tunnel head houses and sealing end compounds as well as removal of overhead lines (OHL) that are close to any areas where reptiles are known to occur.

The construction of the tunnel head house and sealing end compound at Cilfor (the eastern end of the cable tunnel), as well as the removal of the existing pylon at this location, will be subject to a programme of fencing, trapping and translocation. This is discussed in *Section 5* and shown on *Figure 2*.

This method statement is a working document that should be reviewed and maintained throughout the construction period as a record of activities. It details measures to prevent killing or injuring reptiles as a result of the construction works being undertaken.

2 REPTILE LOCATIONS

The confirmed locations of reptiles are shown on *Figure 1*. Details of the surveys that have been carried out and the reptiles recorded in each area are given in the animal survey report (RSK, 2019). A summary (including both 2016 and 2018 survey results) of the species present at each location is provided below:

Survey Location (Figure 1)	Easting	Northing	Proposed Works	Reptile Species Present	Population Size
1	259542	338795	Area to be crossed by direct cable burial route	Common Lizard	Low
				Slow worm*	Low*
2	260205	338651	No works currently proposed. Possible compound area.	Slow-worm	Good
3	260327	338508	Crossed by OHL	Grass Snake	Exceptional
				Slow-worm	Exceptional
4	261089	338429	Crossed by OHL	Common Lizard	Good
5	262411	337830	Tunnel head house and sealing end compound location. Area to be fenced and trapped out. Any works outside of fenced area to be carried out under this method statement.	Common Lizard	Low
				Adder*	Low*
				Grass Snake	Low
				Slow-worm	Low

***Survey results from 2016. Presence of these species not recorded in 2018, however they are assumed still to be present in low numbers.**

The information regarding the presence of reptiles, contained within this method statement, was recorded in spring and summer of 2016 and 2018. It is possible that populations may have grown, shrunk or moved to new areas since the most recent survey was completed. It should also be assumed, given the widespread presence of reptiles at the site, that reptiles are also present in areas of adjacent suitable habitat outside of the survey area.

3 IDENTIFICATION AND LEGISLATION

3.1 Identification

The plates below are to be used to aid the identification of reptiles found during the proposed works.

Common reptiles (Clockwise from Top Right: Common Lizard; Slow-worm; Adder; Grass Snake)



3.2 Legislation

Zootoca vivipara (Common Lizard), *Natrix* (Grass Snake), *Anguis fragilis* (Slow-worm), and *Vipera berus* (Adder) are listed under *Schedule 5 of the Wildlife and Countryside Act 1981 (as amended)*, in respect of Section 9(5) and part of Section 9(1). This protection was extended by the CRoW Act. Under this legislation it is an offence to:

- intentionally or deliberately kill or injure any individual of such a species; or
- sell or attempt to sell any part of the species alive or dead.

4 METHOD STATEMENT – TEMPORARY WORKS

4.1 Overview

The methods outlined below will be the most effective for preventing the killing or injuring of reptiles, given the type of works that are proposed. This method statement applies to areas of temporary work which require only a small scale of habitat loss or disturbance (*Figure 1* – survey locations 1 – 4). This also applies to those areas at survey location 5, where small scale habitat loss (permanent or temporary) are required – such as for the erection of a new terminal pylon.

For the areas of the site that are suitable for reptiles, where large scale or permanent habitat loss is taking place (i.e. survey location 5 – *Figure 1*), a programme of fencing, trapping and translocation of reptiles will be required. This is discussed in *Section 5* below. The methods described in this section (*Section 4*) will apply to all areas of temporary or small-scale habitat loss outside of this fenced area.

The proposed works covered by this method statement will include temporary excavations, access roads, direct burial of cables and removal of OHL and pylons. Some of this work will take place in habitat that is suitable for reptiles and where populations of reptiles have been recorded.

This method statement therefore considers methods for site access and works within habitats suitable for reptiles. As the works are temporary and/or affect only a small proportion of the suitable habitat at any one location, reasonable avoidance measures are proposed. These methods are required for any works within habitat suitable for reptiles where reptiles have been recorded during surveys in 2016 or 2018. All other works at the site can take place without being required to follow this method statement.

4.2 Responsibilities and timescales

Responsibilities and liabilities for the precautionary methods of works and site set up are to be agreed by the client and principal contractor prior to works commencing. All parties are to be made aware of the risks and control procedures for dealing with reptile species on the site.

4.3 General construction works and pylon removal

Prior to and during any construction traffic entering the site, the following methods will be employed to prevent the killing or injuring of reptiles.

All site preparation works in suitable reptile areas (as identified in *Section 2*) can only be carried out during the reptile active period (April to September inclusive). No works should take place outside of this time.

- A clerk of works responsible for overseeing the method statement will be identified and will brief all site staff. The briefing will include information on the identification of the reptile species present and what to do if a reptile is found at the site. As Adders have been recorded in some areas, the briefing will include precautions which are to be followed in these areas.
- Vegetation which will be crossed by the Proposed Project will be cut to 15 cm under the supervision of the ecological clerk of works. This will be carried out a minimum of one week prior to the works commencing. The arisings will be removed from the site.
- Any suitable refuges (debris, piles of logs or brash) will be avoided where possible. If this is not possible, a destructive search of the refuges will be carried out. This will be supervised by the ecological clerk of works.
- Vehicles leaving the area should be confined to haulage routes which have previously been cleared of vegetation.
- Any materials or excavated spoil stored on the site should be stored on hard standing. If this is not possible, they should be stored on pallets to raise them off the ground. Alternatively topsoil or subsoil could be stored in compacted mounds and covered to prevent access by reptiles. Any waste material should be stored in a designated skip prior to removal from the site.
- Any excavations left open overnight should be covered with boards, flush to the ground and overlapping the sides of the excavation by a minimum of 0.5 m. The excavations should be checked for reptiles before work starts each morning.
- Areas with long-term temporary works (such as for the direct burial of cable) should have reptile fencing installed around the perimeter of the works to prevent reptiles accessing these areas. Installation of the fencing should be supervised by the ecological clerk of works and can only be carried out when the ecological clerk of works has confirmed that the area is free of reptiles.
- If any reptiles are found during the site works, all works must stop and a suitably qualified ecologist should be contacted.

4.4 Overhead line removal

The removal of OHL represents a temporary impact on any habitats suitable for reptiles. The work is likely to require the lowering of lines to ground level before being winched from the site onto an appropriate cable drum.

The following methods should be adhered to in order to reduce the likelihood of affecting any reptiles present.

- An ecological clerk of works responsible for overseeing the method statement will be identified and will brief all site staff. The briefing will include information on the

identification of the reptile species present and what to do if a reptile is found at the site. As Adders have been recorded in some areas, the briefing will include precautions which are to be followed in these areas.

- Vegetation which will be crossed by the overhead lines will be cut to 15 cm under the supervision of the ecological clerk of works. This will be carried out a minimum of one week prior to the works commencing. The arisings will be removed from the site.
- Any suitable refuges (debris, piles of logs or brash) will be avoided where possible. If this is not possible, a destructive search of the refuges will be carried out. This will be supervised by the ecological clerk of works.
- Vehicles leaving the area should either be confined to haulage routes which have previously been cleared of vegetation.
- If any reptiles are found during the site works, all works must stop and a suitably qualified ecologist should be contacted.

5 METHOD STATEMENT – REPTILE TRANSLOCATION

The construction of the tunnel head house, sealing end compound, construction compounds and access routes at the eastern end of the construction area, will result in the permanent loss of some habitats that contain reptiles (*survey location 5 – Figure 1*).

Surveys in this area have recorded low populations of Common Lizard, Slow-worm and Grass Snake in 2018 and a low population of Adder in 2016. As construction works will result in permanent development, it is proposed that a translocation of reptiles in this area is required. The translocations will follow the methods outlined below:

- Fence installation and translocation will only take place between late March and mid-October (subject to weather conditions), when reptiles are out of hibernation.
- A reptile proof fence will be installed around the perimeter of the construction area (*Figure 2*). To aid in the capture of reptiles, the site will also be separated into compartments with drift fencing.
- Prior to fence installation, vegetation along the route of the fence will be checked by an ecological clerk of works before being cut to 15 cm. This will be carried out a minimum of one week prior to the works commencing. The arisings will be removed from the site.
- Artificial refugia (typically 0.5m x 0.5 m bitumen roofing felt) will be placed in suitable areas of habitat within the fenced area. As snakes are known to be present, half of the refugia will be 1 m x 0.5 m corrugated roofing sheets. Refugia will be set at a density of 100 per hectare.
- Artificial refugia will be left in place for a minimum of two weeks before translocation takes place to allow them to bed in and reptiles to begin to use them.
- The refugia will be checked each day during suitable weather conditions. Any reptiles found will be placed in a cloth sack before being removed from the site and placed in the receptor habitat outside of the fenced area. As Adders are present, the surveyors will wear Adder proof gauntlet gloves. Each Adder caught will be placed in a separate bag.
- The site will be checked each morning and evening for a total of 30 suitable days. A period of 5 capture free days will be required at the end of this period for the site to be classed as reptile free.
- Any piles of debris that are suitable as refuges for reptiles will be dismantled and checked by hand, under the supervision of the ecological clerk of works, prior to removal from the site.
- Construction will only be allowed to start in each compartment once it has been declared as free of reptiles.

Following the completion of construction activities, the fence will be removed, under supervision of an ecological clerk of works. Reptiles that have been moved to areas of suitable habitat outside of the fenced area will then be able to return to the habitats within the construction area which have not been subject to permanent habitat loss.

Given the low population of all reptile species found at this area, and the relative size of the construction zone and proposed receptor habitats, it is not anticipated that an off-site receptor site is required. Indeed, it is considered that the translocation of reptiles from this area to an off-site receptor area would be detrimental to the survival of those reptiles and that the low numbers of animals expected to be caught would be more likely to survive if moved to unaffected habitat adjacent to the works area. It is proposed that habitat enhancements (such as log piles and hibernacula) are provided in the receptor areas to improve habitat quality and compensate for the loss of habitats.

6 METHOD STATEMENT SIGN OFF

Declaration – by signing this document, I confirm that I have read and understood this document, and that I will comply with all measures detailed above.

NAME (PRINT)	ORGANISATION	SIGNATURE	DATE

7 REFERENCES

RSK Environment Ltd (2016). *National Grid – Snowdonia Animal Report REV01*

RSK Environment Ltd (2019). *National Grid – Snowdonia Animal Report REV01*

8 FIGURES

Figure 1 – Reptile Location Map and construction layout

Figure 2 – Reptile Translocation Area

259000

259500

260000

260500

339000

338500



Overview



Legend

- Site Boundary
- Ecological Survey Area
- Existing National Grid Pylon to be Removed
- Existing National Grid Underground Cable
- Overhead Line to be Removed
- Existing National Grid Overhead Line
- Common Lizard
- Grass Snake & Slow Worm
- Slow Worm

Source: Study Area: P6 (with western extension) NG & RSK Existing Infrastructure - National Grid, Marine Environment - NRW, Species Records - Cofnod

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Rev	Description	Cre'd	Chk'd	App'd	Date
02	Site boundary updated	AJ	WH	SR	12/02/2020
01	Site Boundary	NH	WH	WH	04/12/2019
00	First draft	NH	WH	WH	25/09/2019



Master Scheme No:	Sub-Scheme No:	Site:
-	-	-

Scheme Name:
Visual Impact Provision (VIP) Snowdonia Project

Document Title:
**Figure 1:
Reptile Location Map
Map 1 of 4**

Created by: N.Hogben	Date: 12/02/2020	Checked by: W.Holden	Date: 12/02/2020	Approved by: W.Holden	Date: 12/02/2020
Development Eng:	Document Type:	Scale: 1:5,000	Format: A3	Sheet(s): 1 of 4	Rev: 02

National Grid Document Number:
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260500

261000

261500

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Overview



Legend

- Site Boundary
- Ecological Survey Area
- Foundation of Former Pylon 4ZC030 to be Removed
- Existing National Grid Pylon to be Removed
- Overhead Line to be Removed
- Existing National Grid Overhead Line
- Common Lizard
- Grass Snake

Source: Study Area: P6 (with western extension) NG & RSK Existing Infrastructure - National Grid, Marine Environment - NRW, Species Records - Cofnod

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00	First draft	NH	WH	WH	25/09/2019



Master Scheme No:	Sub-Scheme No:	Site:
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Scheme Name: Visual Impact Provision (VIP) Snowdonia Project

Document Title:

**Figure 1:
Reptile Location Map
Map 2 of 4**

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261500

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Legend

- Site Boundary
- Ecological Survey Area
- Foundation of Former Pylon 4ZC030 to be Removed
- Existing National Grid Pylon to be Removed
- Existing National Grid Pylon to be Retained
- Overhead Line to be Removed
- Existing National Grid Overhead Line
- Common Lizard, Slow Worm, Grass Snake

Source: Study Area: P6 (with western extension) NG & RSK Existing Infrastructure - National Grid, Marine Environment - NRW, Species Records - Cofnod

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00	First draft	NH	WH	WH	25/09/2019



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Document Title:
**Figure 1:
Reptile Location Map
Map 3 of 4**

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263000

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Legend

- Site Boundary
- Ecological Survey Area
- Existing National Grid Pylon to be Removed
- Existing National Grid Pylon to be Retained
- Existing National Grid Overhead Line
- Common Lizard, Slow Worm, Grass Snake

Source: Study Area: P6 (with western extension) NG & RSK Existing Infrastructure - National Grid, Marine Environment - NRW, Species Records - Cofnod

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00	First draft	NH	WH	WH	25/09/2019



Master Scheme No:	Sub-Scheme No:	Site:
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Scheme Name:
Visual Impact Provision (VIP) Snowdonia Project

Document Title:
**Figure 1:
Reptile Location Map
Map 4 of 4**

Created by:	Date:	Checked by:	Date:	Approved by:	Date:
N.Hogben	12/02/2020	W.Holden	12/02/2020	W.Holden	12/02/2020
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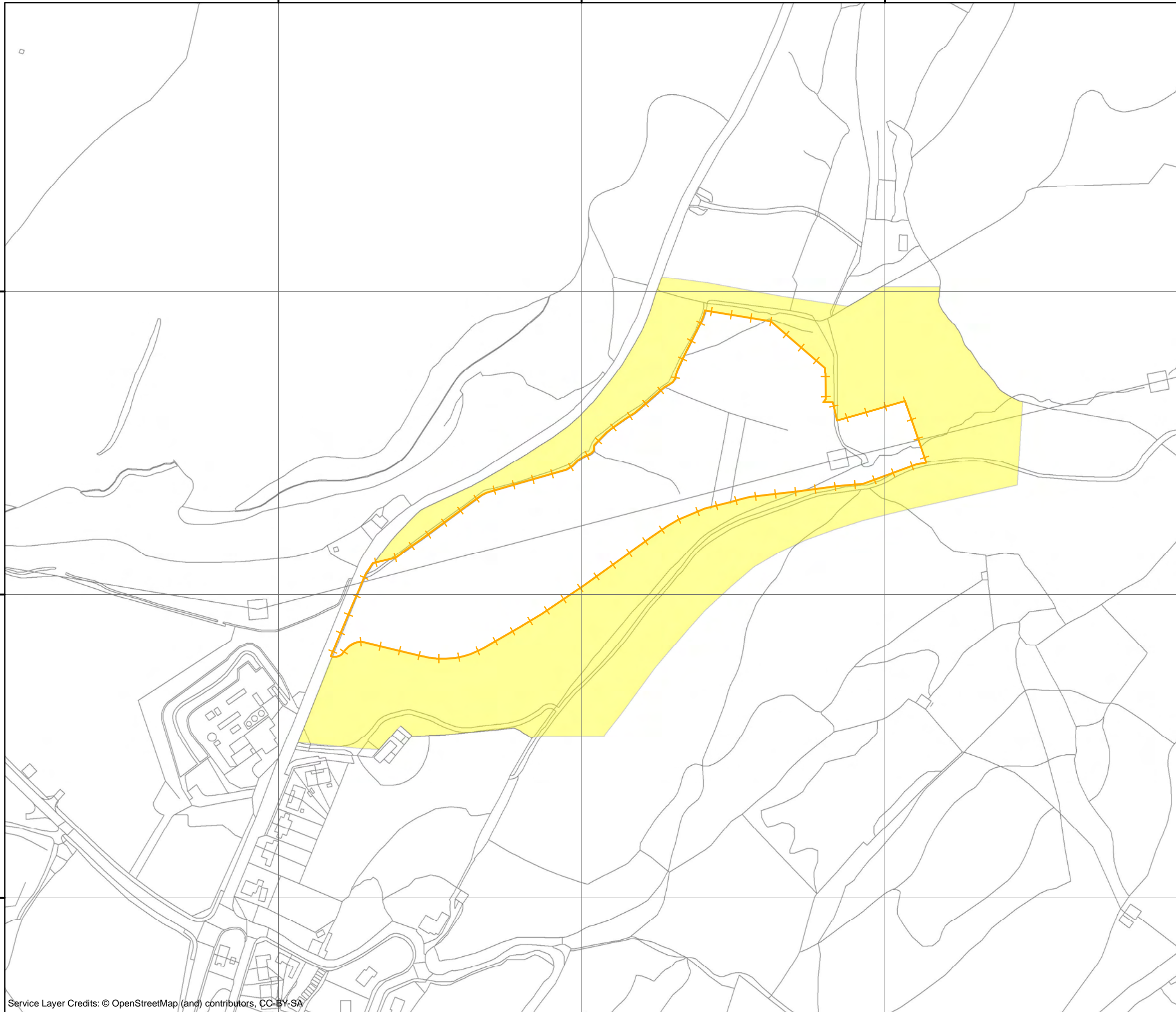
262400

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Overview



Legend

-  Reptile_Fencing
-  Reptile Receptor Area

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04	Fencing updated	AJ	WH	SR	12/02/2020
03	Fig Number	NH	SR	SR	03/12/2019
02	Reptile Fence Change - S & NE	NH	SR	SR	26/11/2019
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-	-	-

Scheme Name:
Visual Impact Provision (VIP) Snowdonia Project

Document Title:
Figure 2: Reptile Translocation Plan

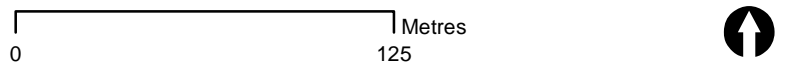
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N.Hogben	12/02/2020	W.Holden	12/02/2020	S.Rotherham	12/02/2020
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Appendix 9:

Outline Habitat Management Plan



National Grid

Visual Impact Provision (VIP), Snowdonia Project

Outline Habitat Mitigation Plan

660952

FEBRUARY 2020

RSK



RSK GENERAL NOTES

Project No.: 660952

Title: Visual Impact Provision (VIP), Snowdonia Project
Outline Habitat Mitigation Plan

Client: National Grid

Date: February 2020

Office: Helsby

Status: Rev 03

Author	<u>Will Holden</u>	Technical and quality reviewer	<u>Stephanie Wray</u>
Signature		Signature	
Date:	<u>25 February 2020</u>	Date:	<u>25 February 2020</u>
Project Manager	<u>Sally Rotherham</u>		
Signature			
Date:	<u>25 February 2020</u>		

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Environment Ltd.

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1 INTRODUCTION

1.1 Project Description

The Visual Impact Provision (VIP) Snowdonia Project will make use of a provision of £500 million for electricity transmission owners to mitigate the visual impact of existing electricity infrastructure in nationally protected landscapes in Great Britain. For National Grid, which is the transmission owner in England and Wales, this means mitigating the effects of existing infrastructure on the visual amenity and landscapes of National Parks and Areas of Outstanding Natural Beauty (AONBs). The Proposed Project seeks to underground an existing stretch of overhead line (OHL) within a cable tunnel beneath the Dwyryd Estuary. At both ends of the cable tunnel a tunnel head house will be required. On the eastern side of the Dwyryd Estuary the tunnel head house will be located at Cilfor within Snowdonia National Park and on the west near National Grids existing SEC at Garth.

At Cilfor (eastern end of the tunnel), the Proposed Project will include a temporary construction compound. The permanent works will include a floating access road, construction of a tunnel head house and sealing end compound (SEC), and a replacement terminal pylon. As detailed in the reptile method statement (RSK, 2019b), a reptile fence will be installed around the boundary of construction compound, encompassing all areas of permanent and temporary work. This fence will provide a barrier to movement of vehicles outside of this area, ensuring protection of the habitats outside of the fence.

At Garth (western end of the tunnel), the Proposed Project will include a temporary construction compound. The permanent works will include a new access, a tunnel head house and below ground cables connecting the proposed tunnel head house to the existing Garth SEC. A full description of the Proposed Project is provided in Chapter 2 of the Environmental Appraisal (RSK 2019c).

The areas of temporary land take are provided on *Figure 2.1* and the areas of permanent land take, including the latest landscape masterplan for the Proposed Project are shown on *Figure 2.2* of the Environmental Appraisal (RSK 2019c).

1.2 Purpose of the Report

Planning Policy Wales (PPW) 10 sets out that ‘planning authorities must seek to maintain and enhance biodiversity in the exercise of their functions. This means that development should not cause any significant loss of habitats or populations of species, locally or nationally and must provide a net benefit for biodiversity’.

In direct relation to this policy, this document has been prepared by RSK to provide guidance for biodiversity mitigation, the creation of new habitats and long-term protection and management of retained habitats. This mitigation plan initially focuses on land surrounding the proposed Cilfor (eastern) tunnel head house and SEC (OS grid reference: SH 624 378) and the existing Gath SEC to identify habitat that will be temporarily and permanently lost to the Proposed Project and the mitigation and compensation measures that are proposed. This Outline Habitat Mitigation Plan will be

updated throughout the planning, landowner negotiation and detailed design process to include measures for the Proposed Project as a whole and include those areas of land agreed with the Local Planning Authority which will be improved to achieve a biodiversity net benefit. The Outline Habitat Mitigation Plan will be updated as more detailed information becomes available, a contractor is appointed, and methods can be prepared on how the Outline Habitat Mitigation Plan will be implemented and managed.

1.2.1 Achieving a Net Benefit

National Grid is committed to ensuring that the Proposed Project delivers a net benefit to biodiversity rather than only ensuring there is no net loss. National Grid have sought to work closely with Snowdonia National Park Authority, Gwynedd Council and Natural Resources Wales to explore and identify opportunities to compensate for habitat and species adversely impacted by the Proposed Project. National Grid appreciate the knowledgeable input and assistance of stakeholders received to date and commit to continuing to work collaboratively with all relevant stakeholders to deliver a net benefit.

Delivering a net benefit to biodiversity in accordance with national and local planning policy is a priority. Over and above that, National Grid will also seek opportunities to enhance existing habitat within the project boundary, or further afield. 'On site' options do include the restoration of habitats and mitigation but with limited opportunities to offset the net loss of habitats.

It is preferable for biodiversity net benefit opportunities to be as close as possible to the Proposed Project. Potential sites are therefore being carefully considered to make further improvements to biodiversity. These include the area owned by National Grid around the current Garth SEC. Other areas are privately owned so are subject to landowner agreement and ongoing land management practices. However, these areas offer opportunities to improve habitat distinctiveness and condition and therefore to contribute towards a benefit for biodiversity.

A net benefit calculation, based upon the published DEFRA Biodiversity Metric 2.0 approach, is being prepared to help quantify biodiversity impacts and inform the enhancement strategy. If suitable sites cannot be secured within the immediate proximity of the Proposed Project or within the wider area, for land rights, third party access or other reasons, National Grid is committed to supporting suitable alternative ecological improvement works in agreement with Snowdonia National Park Authority.

The benefits of the Proposed Project in landscape, visual and environmental terms cannot be underestimated. The removal of 3.5km of existing high voltage OHL including 9 pylons will bring about other environmental gains. These benefits will be felt by the wider National Park, residents and visitors alike. National Grid is committed to delivering improvements in the most environmentally sensitive way and will work with stakeholders to ensure a net benefit for biodiversity at the same time.

1.3 Site Description and Ecological Context

The location of the Cilfor site including the proposed permanent footprint and Phase 1 Habitat Survey information is shown in Figure 1.

At Cilfor, the proposed site is c.3.4 ha in size, containing valley mire habitat and areas of *Rubus fruticosus* agg. (Bramble) scrub, dense *Salix caprea* (Goat Willow) and *Pteridium aquilinum* (Bracken). There are several drainage ditches across the site. The areas of valley mire habitat extend further south and north from the site boundary, within the same land ownership. These areas also include dense scrub, bracken, tall ruderal vegetation and semi-improved grassland.

At Garth, the works are predominantly within agricultural fields. These are bordered by a mixture of stone walls and stock proof fencing. There is one hedgerow present and a single dry ditch. The below ground cables connecting the proposed tunnel head house to the existing SEC includes a bank of rough grassland and scrub with some stands of *Crocsmia xcrocosmiiflora* (Montbretia) and *Fallopia japonica* close by. The field which contain the existing SEC is semi-improved grassland with stands of scrub and woodland along the adjacent railway embankment to the north-east.

2 BASELINE CONDITIONS

An ecological baseline has been recorded for the site, published in a preliminary ecological appraisal (PEA) report produced by AECOM, surveys were repeated in 2019 and 2016 by RSK Environment.

Botanical surveys of the site were completed by RSK Environment Ltd between 2016 and 2019 and are reported as an appendix of the Environmental Appraisal (RSK 2019c); however, results are summarised in this document below. The management of reptiles and invasive species are detailed in separate method statements (RSK 2019b and 2019d). This Outline Habitat Mitigation Plan is based on the results of these surveys.

2.1 Habitats and Plants

The existing Garth SEC site is formed predominantly of agricultural grassland. The east of the survey area, at Cilfor is predominantly valley mire and dense scrub. The PEA (RSK, 2019a) conducted at the site describes the following phase 1 habitats present:

- poor semi-improved grassland;
- hedgerow;
- valley mire and swamp;
- dense and scattered scrub;
- bracken; and,
- ditches.

In addition, immediately adjacent to the site boundary, are the following habitat types:

- valley mire and swamp;
- dense and scattered scrub;
- bracken;
- tall ruderal vegetation; and,
- semi-improved grassland.

The parts of the Proposed Project near the existing Garth SEC is within a series of poor-semi-improved and improved grassland fields between the proposed tunnel head house and the SEC. The swards are typically dense, between 5cm and 10cm high, and regularly grazed. At certain times of the year, the fields are left ungrazed to be harvested as hay. The sward in these fields therefore grows to be c.30cm high.

The fields are typically dominated by *Lolium perenne* (Perennial Rye-grass), although *Agrostis capillaris* (Common Bent), *Dactylis glomerata* (Cock's-foot), *Holcus lanatus* (Yorkshire-fog) were also frequently recorded. Some of the fields are waterlogged in places, and in these areas grasses such as *Alopecurus geniculatus* (Marsh Foxtail) and *Glyceria fluitans* (Floating Sweet-grass) are found.

These grasslands are species-poor, with infrequent forbs restricted to common and widespread species. Typical herb species include *Bellis perennis* (Daisy), *Cerastium fontanum* (Common Mouse-ear), *Ranunculus flammula* (Lesser Spearwort), *Ranunculus repens* (Creeping Buttercup) and *Trifolium repens* (White Clover), with other species such as *Cirsium palustre* (Marsh Thistle), *Galium palustre* (Common Marsh-bedstraw) and *Silene flos-cuculi* (Ragged-Robin) infrequently in marshier areas. The only hedgerow, to the east of the proposed tunnel head house at Garth, is species-poor and formed of *Corylus avellana* (Hazel), *Crataegus monogyna* (Hawthorn), *Prunus spinosa* (Blackthorn), *Rosa arvensis* (Field-rose) and *Salix* spp (Willows).

The majority of the site at Cilfor is a continuous but heterogeneous area of mire in a valley bottom. The substrate is consistently peaty with *Molinia caerulea* (Purple Moor-grass) forming dense tussocks alongside other graminoids such as *Agrostis canina* (Velvet Bent), *Agrostis capillaris* (Common Bent), *Carex echinata* (Star Sedge), *Carex nigra* (Common Sedge), *Eriophorum angustifolium* (Common Cottongrass). This area contains some standing water at the far east and here is dominated by *Phragmites australis* (Common Reed) swamp. The western end is more heavily dominated by rushes, including *Juncus acutiflorus* (Sharp-flowered Rush), *Juncus articulatus* (Jointed Rush) and *Juncus effusus* (Soft-rush). Diverse wetland broad-leaved herbs throughout include *Cirsium palustre* (Marsh Thistle), *Epilobium palustre* (Marsh Willowherb), *Galium palustre* (Common Marsh-bedstraw), *Hydrocotyle vulgaris* (Marsh Pennywort), *Lythrum salicaria* (Purple-loosestrife), *Ranunculus flammula* (Lesser Spearwort) and *Viola palustris* (Marsh Violet). At the edges are areas of bracken and bramble scrub as well as some dense areas of scrub dominated by *Salix* sp (Willows).

The mire habitat is included in the upland flushes, fens and swamps UK priority habitat and is also included on the Snowdonia local BAP under blanket mire and purple moor grass and rush pastures. The botanical appraisal of the site concluded the habitat is in moderate condition with the presence of artificial drainage (ditches) being a factor contribution to the habitat not meeting good condition.

2.2 Non-native Invasive Species

There are many stands of invasive species around the north- western area of the Proposed Project. The location of invasive species stands is shown within the Botanical report (RSK, 2019a). Species present close to the proposed works area at Garth include *Fallopia japonica* (Japanese Knotweed) and *Crocsmia crocosmiiflora* (Montbretia).

There are no non-native invasive plant species at Cilfor.

2.3 Protected Species

Baseline animal surveys have recorded the use of the site by foraging and commuting bat species. No roosting locations for bats were found at the site.

The surveys also recorded low populations of Common Lizard, Slow-worm, Grass Snake and Adder at the site. A separate reptile method statement has been prepared (RSK 2019b) for reptile species.

3 MITIGATION HIERARCHY

Construction of the tunnel head house, SEC and floating access road at Cilfor has followed the mitigation hierarchy in order to reduce, as much as possible, the impacts on the sensitive and important habitats recorded during the baseline ecological surveys.

Avoidance: The position of the tunnel head houses and SEC has been designed to predominantly affect lower quality habitats such as poor semi-improved grassland, dense scrub and bracken and avoid the more sensitive and valuable mire habitat. Following peat surveys, the permanent access track has been sited to avoid the areas of deepest peat.

Minimisation: The initial construction compound footprint has been significantly reduced so that it now affects a much smaller proportion of the mire habitat than in previous design iterations. Areas of mire habitat to the north and south of the compound will be retained and will be safeguarded from construction activities by reptile fencing which will provide a barrier to construction activities. A floating road has been proposed for the permanent access to retain as much peat in situ as possible. Where possible, areas of land temporarily used for construction activities will have a trackway surface to retain seedbank and peat in situ.

Rehabilitation/restoration: This document outlines measures to restore those habitats that would be temporarily lost to the Proposed Project.

Offset: This document outlines measures to enhance those habitats that would be temporarily lost and subsequently restored to the Proposed Project and enhance those habitats outside of the site boundary that are being retained. Further habitat enhancements will be undertaken to achieve a net benefit to biodiversity as discussed in Section 1.2.1 above.

Compensation: As discussed in Section 1.2.1 above, if suitable sites cannot be secured to achieve a biodiversity benefit within the immediate proximity of the Proposed Project or within the wider area (for land rights, third party access or other reasons), National Grid is committed to supporting suitable alternative ecological improvement works in agreement with Snowdonia National Park Authority.

4 HABITAT MANAGEMENT, RESTORATION AND ENHANCEMENT

4.1 Habitat Restoration

All habitats that are to be temporarily lost to construction compounds will be restored to the original condition or an improved condition, where possible.

The valley mire habitat present at the Cilfor site has been assessed as being of moderate condition. The presence of drainage ditches across this habitat is a major factor reducing the quality of this habitat.

In line with the Outline Peat Management Plan (Arcadis, 2019, Appendix 2A of the Environmental Appraisal), restoration of this habitat will include the reuse of peat in drainage ditches, this will help to retain water in the mire habitat. As well as reusing peat within drainage ditches (by the construction of small weirs), the ditches will be filled with peat overlaid with turves of valley mire that have been excavated for the tunnel head house and SEC construction.

The aim is not only to improve the condition of the restored valley mire to good condition, but also to increase the coverage of valley mire habitat overall, through infilling of ditches.

Where possible, at the construction compound (outside of the tunnel head house construction area and shown on Figure 2.1) it is proposed to use aluminium trackway and bog mats to store construction materials, rather than through the use of imported stone, with the turf layer being left intact. It is anticipated that following removal of the trackway and matting, recovery of the peat substrate (from compression) and the recovery of the plants will take place within 10 years.

4.2 On Site Enhancement

A landscaping plan has been produced that includes screening planting around the new tunnel head houses and SEC. The planting will primarily take place on areas of low quality habitat, including existing areas of poor semi-improved grassland, dense scrub and *Pteridium aquilinum* (Bracken).

The screening planting will include a range of native species that are suitable for the ground conditions and local area. They will improve the diversity and quality of the habitats present by replacing low quality habitats with more valuable woodland habitat.

Following stakeholder correspondence, the areas around the Garth THH and SEC are proposed to include planting with a mixture of scrub (c. 12%) and species rich grassland (c. 88%).

4.3 Off Site Mitigation and Enhancement

The areas of valley mire that are present in the same land ownership, but which are outside of the construction footprint, will be subject to improved management and enhancement.

The reuse of peat within drainage ditches to improve water retention will go towards improvement of this habitat from moderate to good condition. The improvement is expected to take between 10 to 15 years.

In addition, the boundaries of these areas include lower quality habitats, such as dense scrub, *Pteridium aquilinum* (bracken) and semi-improved grassland. These habitats will be cut back and the surface excavated to remove roots and seed-bank. The excavation will aim to reach the ground water level where possible (as areas of bracken are likely to be on drier ground and more mineral soils the hydrological regime will need to be taken into account and the ground may need to be lowered).

The excavated areas will then be filled with peat overlaid with turves of valley mire that have been excavated for the tunnel head house and SEC construction. The aim is to improve the quality and increase the coverage of valley mire habitat immediately adjacent to the construction areas. Establishment of new valley mire habitat is anticipated to take 5 – 10 years.

Management of ecological features and mitigation areas, together with habitat enhancement at the site, will help lead to an improvement in the quality of retained habitats at the site.

4.4 Other Enhancement Features

Aims and Objectives: To improve the general suitability of the site for birds, bats and reptiles.

Bat and bird boxes, positioned at suitable heights and aspects, will be provided to increase the roosting and nesting provision for local bat and bird populations. The location of the boxes, on new buildings or mature trees, will be agreed with landowners and consultees.

As part of the reptile mitigation works, log piles will be constructed to improve the availability of refuges and hibernation sites for these species.

4.4.1 Bat Box Installation

Bat box placement will consider a range of aspects and conditions from south-west to south-east and must be 3m to 5m from the ground to prevent predation and human interference. All models of bat box and tubes should be in keeping with the specifications in *Appendix 1*. It is recommended that the following are installed:

- four boxes (Schwegler 2F) suitable for smaller crevice dwellers such as Common Pipistrelle (*Pipistrellus pipistrellus*) and Soprano Pipistrelle (*Pipistrellus pygmaeus*), on retained trees; and
- two bat boxes (Ibstock Enclosed Bat Box C) or bat bricks.

Bat boxes should be inspected annually for signs of significant damage or missing boxes. Bat boxes are generally low maintenance and do not require regular cleaning, they should not be opened unless done so by a suitably licenced ecologist.

4.4.2 Bird Box Installation

A variety of bird boxes will be installed to provide additional nesting habitat for breeding birds. Bird boxes should consider placement on the north to east aspect of structures so as to avoid direct sunlight and overheating of boxes. Open-fronted boxes will be erected at 2m height, and hole-fronted boxes will be installed at 3m height. They should be installed during the autumn to give birds the opportunity to find them prior to the breeding season commencing. All models of bird box and tubes should be in keeping with the specifications in Appendix 1.

It is recommended that the following bird boxes are installed:

- Two House Sparrow (*Passer domesticus*) terrace nest boxes (Schwegler 1SP);
- Four 26mm hole-fronted bird boxes (Schwegler 1B) on retained trees, not obscured by vegetation, for use by Blue Tit (*Cyanistes caeruleus*) and Great Tit (*Parus major*).
- Two Swift nest boxes (Schwegler 17A) at 6m to 7m high should a suitable building be identified.

Bird boxes should be monitored for signs of significant damage or missing boxes. Bird boxes are generally low maintenance but will require cleaning-out outside of the breeding bird season (March and August inclusive) in order to reduce incidences of persistent diseases and parasites.

4.5 Management

Management of the enhanced and reinstated habitats will be required to ensure that the target habitat type is achieved and maintained. This will be required to prevent natural succession.

Management options are subject to agreement with the relevant tenant farmers. In addition, the type and timing of management will be dependent on the target habitat types and the results of soil nutrient testing which is currently being carried out on parts of the Proposed Project.

Short- and long-term management will be confirmed in the detailed Habitat Mitigation Plan and may include the following measures:

- Initial period where grazing is prohibited to allow successful reinstatement and establishment of target habitat types;
- Weed control to remove the initial flush of species such as Nettles and Docks;
- Prescriptive grazing timings and densities following successful establishment of habitats;
- A regime of cutting of grasslands in addition to or instead of livestock grazing;
- Scrub management through cutting or application of herbicide to prevent succession;

- For areas where scrub is proposed, planting areas should be kept clear of weeds by a combination of herbicides and mechanical control methods;
- Rolling, flailing or cutting of invading Bracken.

5 MONITORING

All habitats will be monitored for a period of time which will be agreed with consultees to check that habitats are establishing themselves effectively.

The Outline Habitat Mitigation Plan recommendations are for general guidance and are subject to ongoing discussions with consultees.

6 TIMESCALES

Current proposals are for site clearance works and pre-construction mitigation to commence following the grant of planning, expected November 2020. Construction is due to commence in March 2021.

Habitat creation works, including the erection of bat and bird boxes on the trees, should be carried out before the relevant habitats for which they are mitigating, are lost.

Mitigation measures will be agreed with the council prior to construction commencement and timescales for mitigation will be agreed at this point.

Timescales for mitigation and remediation, as well as habitat creation, will be subject to change and this should be seen as a working document to be updated as the project progresses.

7 FIGURES

Figure 1 – Site Location Plan and Phase 1 Habitat Map

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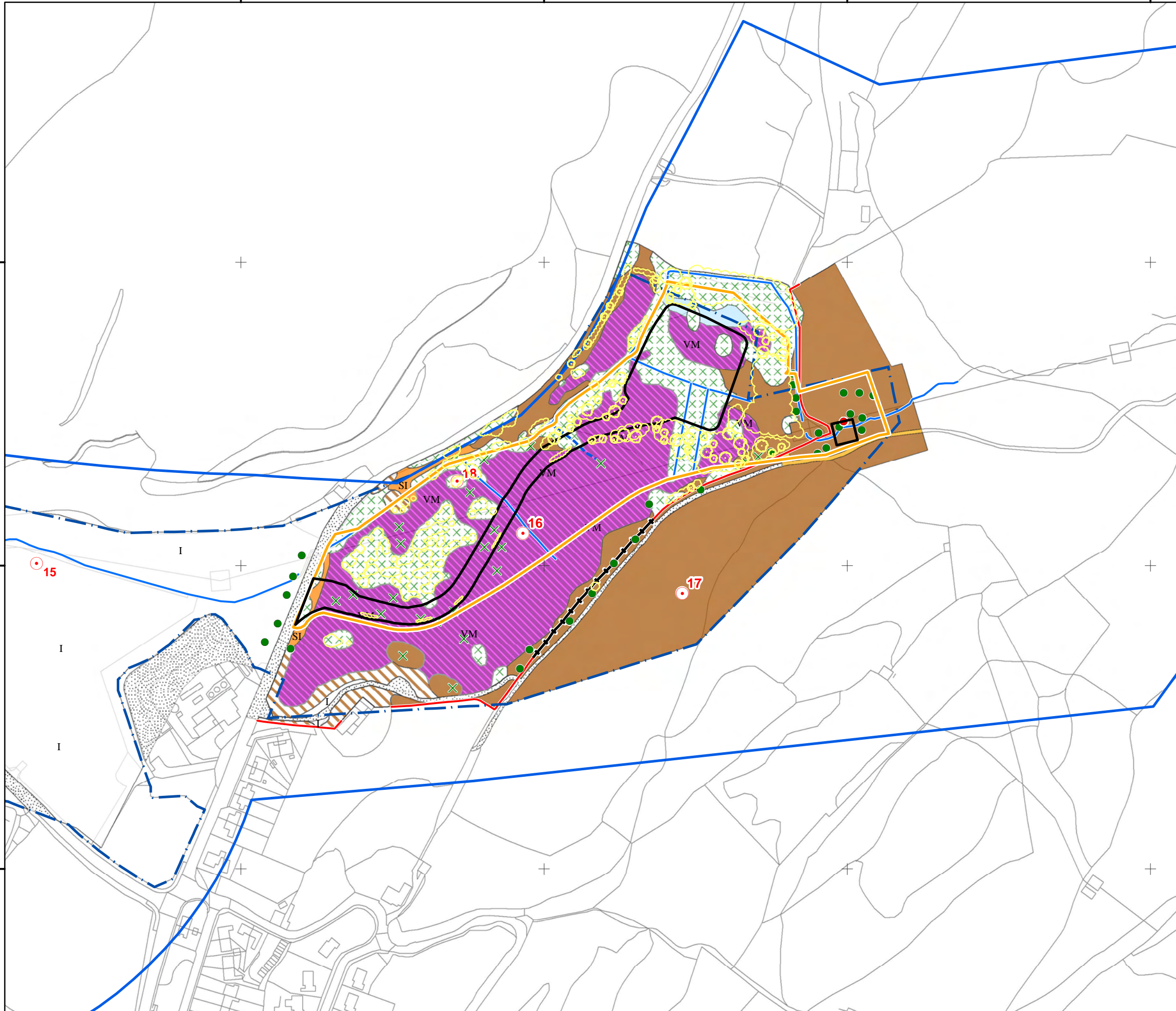
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Legend

- Permanent Development Footprint
- Permanent Development – Landscape Planting
- Temporary Development Area
- Area of Search for Permanent and Temporary Works
- Ecological Area of Search
- New National Grid Pylon

Phase 1 Habitat Survey

- Scattered Scrub
- Scattered-Broad-leaved Tree
- Target Note
- Dry Ditch
- Fence
- Running Water
- Wall
- Bracken
- Dense / Continuous Scrub
- Hardstanding/Bare Ground
- Improved Grassland
- SI Rough Grassland
- SI Semi-improved Grassland
- Semi-improved Neutral Grassland
- Swamp
- Tall Ruderal
- Valley Mire

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01	Boundary updates	AJ	WH	WH	12/02/2020
00	First draft	NH	WH	WH	16/01/2020
Rev	Description	Cre'd	Chk'd	App'd	Date



Master Scheme No:	Sub-Scheme No:	Site:
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Scheme Name:
Visual Impact Provision (VIP) Snowdonia Project

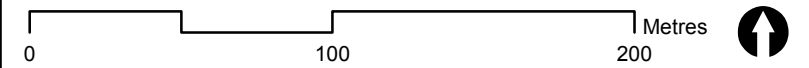
Document Title:
**Figure 1:
Habitat Management Plan**

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8 REFERENCES

Arcadis (2019). Snowdonia VIP – Outline Peat Management Plan. Arcadis, 2019 (Construction Environmental Management Plan Appendix 6)




RSK (2019a). Snowdonia VIP - Ecological Baseline Report (Botanical). RSK, 2019 (Environmental Appraisal Report Appendix 7A)




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RSK (2019d). Snowdonia VIP – Biodiversity Risk Assessment. RSK, 2019 (Construction Environmental Management Plan)

APPENDIX 1: BAT & BIRD BOX SPECIFICATIONS

Model	Suitability	Specification
 <p>Schwegler 2F</p>	<p>Smaller British bats</p>	<p>Height: 33 cm Diameter: 16 cm Weight: 4 kg Material: Schwegler Woodcrete Colour: Black with grey front panel.</p> <p>The 2F is manufactured from long-lasting Woodcrete, which is a blend of wood, concrete and clay which will not rot, leak, crack or warp, and will last for at least 20 - 25 years, making it suitable for long-term mitigation projects. Woodcrete is breathable and maintains a stable temperature inside the box and the 2F is painted black to absorb warmth. It also provides a rough surface for bats to cling to and climb up.</p>
 <p>Schwegler 1FF</p>	<p>Pipistrelles and Noctule</p>	<p>Dimensions: 43 x 27 x 14 cm Entrance hole dimensions: 12 cm x 24 cm Weight: 9.5 kg Material: Schwegler Woodcrete Colour: Black with stable hard-wearing wooden insert</p> <p>The 1FF is manufactured from long-lasting Woodcrete, which is a blend of wood, concrete and clay which will not rot, leak, crack or warp, and will last for at least 20 - 25 years, making it suitable for long-term mitigation projects. Woodcrete is breathable and maintains a stable temperature inside the box and the 1FF is painted black to absorb warmth. It also provides a good rough surface for bats to cling on to and climb. To compensate for fluctuations in temperature in spring and autumn, the 1FF is provided with a roughened rear panel made of hard-wearing wood.</p>
 <p>Ibstock Enclosed Bat Box 'C'</p>	<p>All bats which roost in buildings</p>	<p>Height: 21.5 cm Width: 21.5 cm Depth: 10.5 cm Weight: 9.2 kg</p> <p>The Enclosed Bat Box 'C' from Ibstock is designed for the pipistrelle bat. It is ideal for new builds as it can be integrated directly into the brickwork to produce a discrete but attractive home for bats.</p> <p>The inside of the box is designed to create several roosting zones which are ideal for crevice dwelling bats such as the pipistrelle. The bottom entrance means that no maintenance is required as droppings will simply fall out the bottom.</p>

Model	Suitability	Specification
<p>Schwegler 1SP Sparrow</p>  <p>Terrace</p>	Sparrows	<p>Brood chamber dimensions: Height: 16 cm Width: 10.5 cm Depth: 15 cm</p> <p>External dimensions: Height: 24.5 cm Width: 43 cm Depth: 20 cm</p> <p>Weight: 15 kg Material: Woodcrete</p>
<p>Schwegler 17A Swift Box</p> 	Swift	<p>Height: 15 cm Width: 90 cm Depth: 15 cm</p> <p>Material: Woodcrete</p>
<p>Schwegler 2H Robin Box</p> 	Robin and other small species	<p>Height: 20 cm Width: 15 cm Depth: 20 cm Interior diameter: 12 cm Weight: 2.5 kg Material: Woodcrete</p>

Model	Suitability	Specification
<p>Schwegler 1B Nest Box</p> 	<p>Various</p>	<p>Height: 23 cm Diameter: 16 cm Weight: 3.6 kg Material: Woodcrete Entrance hole sizes: 26 mm or 32 mm</p>