

TECHNICAL NOTE



THE ENVIRONMENT PARTNERSHIP

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Snowdonia VIP: Consideration of Air Quality Impacts on Ecological Receptors.

1. Introduction and Background

The Environment Partnership (TEP) was commissioned by Bureau Veritas (BV) in November 2024 to assess the impacts to ecological receptors following an air quality (AQ) assessment¹ to support an environmental permit (EP) application for planned construction works that will be part of the Snowdonia Visual Impact Project (VIP), Garth, Snowdonia.

The permit has been prompted due to the planned installation of six generators at the site for the operation of a tunnel boring machine (TBM), which will be in operation for up to 14 months (Fig 1).

Genset	Months														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
2	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
3	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
4	Yellow	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
5					Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
6					Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Capacity Stage 5 option	3540 kWh 7.83 MWth input				5,900 kWh 13.05 MWth input										

Notes

Blue	Generator in use	Additional capacity required after month 5 to power increasing number of booster pumps in the tunnel.
Yellow	Generator on standby	Spare genset available for breakdown and maintenance
Medium Combustion Plant (MCP) combustion plant with a rated thermal input equal to or greater than 1 MW but less than 50 MW.		

Figure 1: Operational duration of the TBM and associated generators.

¹ AIR20761597 - Snowdonia VIP – Air Quality Assessment HOCHTIEF (UK) Construction Ltd October 2024

The six generators will be installed, with three expected to operate from January 2025 and an additional two operational by April 2025. The sixth generator is a backup and will not operate unless any of the generators require replacing.

The emissions from individual generators will be combined and released to the air through two 20m concrete silos on 0.75 m concrete bases.

- Silo 1 – Combined emissions stack for generators 1, 2 and 3;
- Silo 2 - Combined emissions stack for generators 4 and 5.

1.1. Site Description

The Site is located along ffordd Tan-y-Glannau in the village of Minffordd within the Welsh county of Gwynedd. The surrounding land use is predominantly residential to the south-east of the Site, with agricultural land to the north-east. To the north-west of the Site lies open countryside, some of which is protected (figure 1).

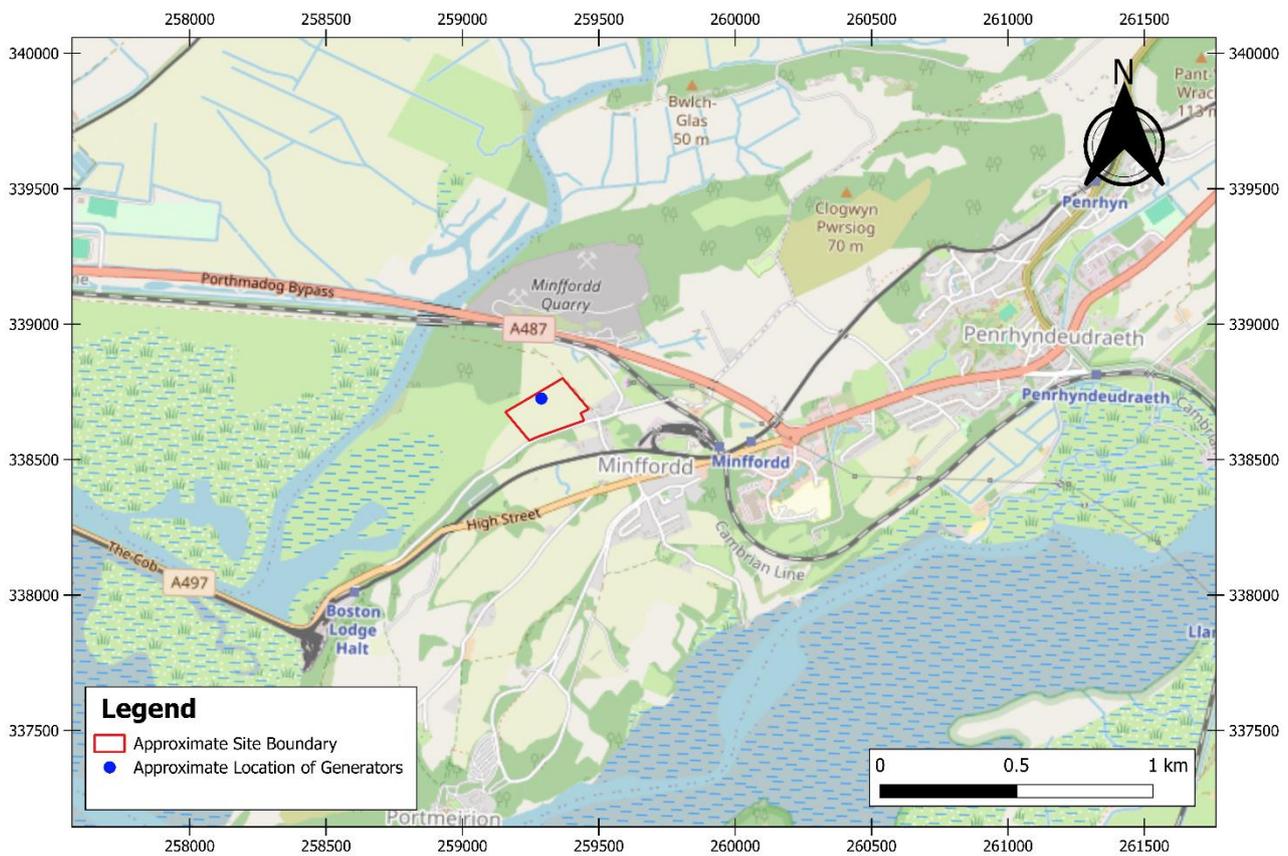


Figure 2: Site Location in Relation to Wider Area

2. Ecological Receptors

2.1. Discrete Ecological Receptors

The predominant route by which emissions will affect land in the vicinity of the construction activities is by deposition of atmospheric emissions. Potential ecological receptors can be sensitive to the deposition of pollutants, particularly nitrogen and sulphur compounds, which can affect the character of the habitat through eutrophication and acidification.

To complete the permit application, the results of the air quality modelling needed to be assessed for their potential impact on the ecology receptors identified within the vicinity of the Site² which includes:

- International and European³ designated sites within a 10km radius of Site; and
- Nationally designated SSSI and local nature sites (including ancient woods, local wildlife sites and national and local nature reserves) within a 2km radius of Site.

2.2. Ecological Receptors Scoped In

The closest ecological receptors are Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites, an SAC designated as bog woodland, and Glaslyn, a Site of Special Scientific Interest (SSSI) designated as semi-natural woodland. These ecological receptors overlap and cover an area of land bordering the north-west corner of the Site, approximately 77m away from the emissions points. Due to their proximity, additional ecological receptors were modelled within this area.

² Air risk assessment for your environmental permit (2016), Environment Agency. <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit> [accessed 22/06/2023]

³ SACs and Special Protection Areas (SPAs) in the UK no longer form part of the EU's Natura 2000 ecological network. The 2019 Regulations have created a national site network on land and at sea, including both the inshore and offshore marine areas in the UK.

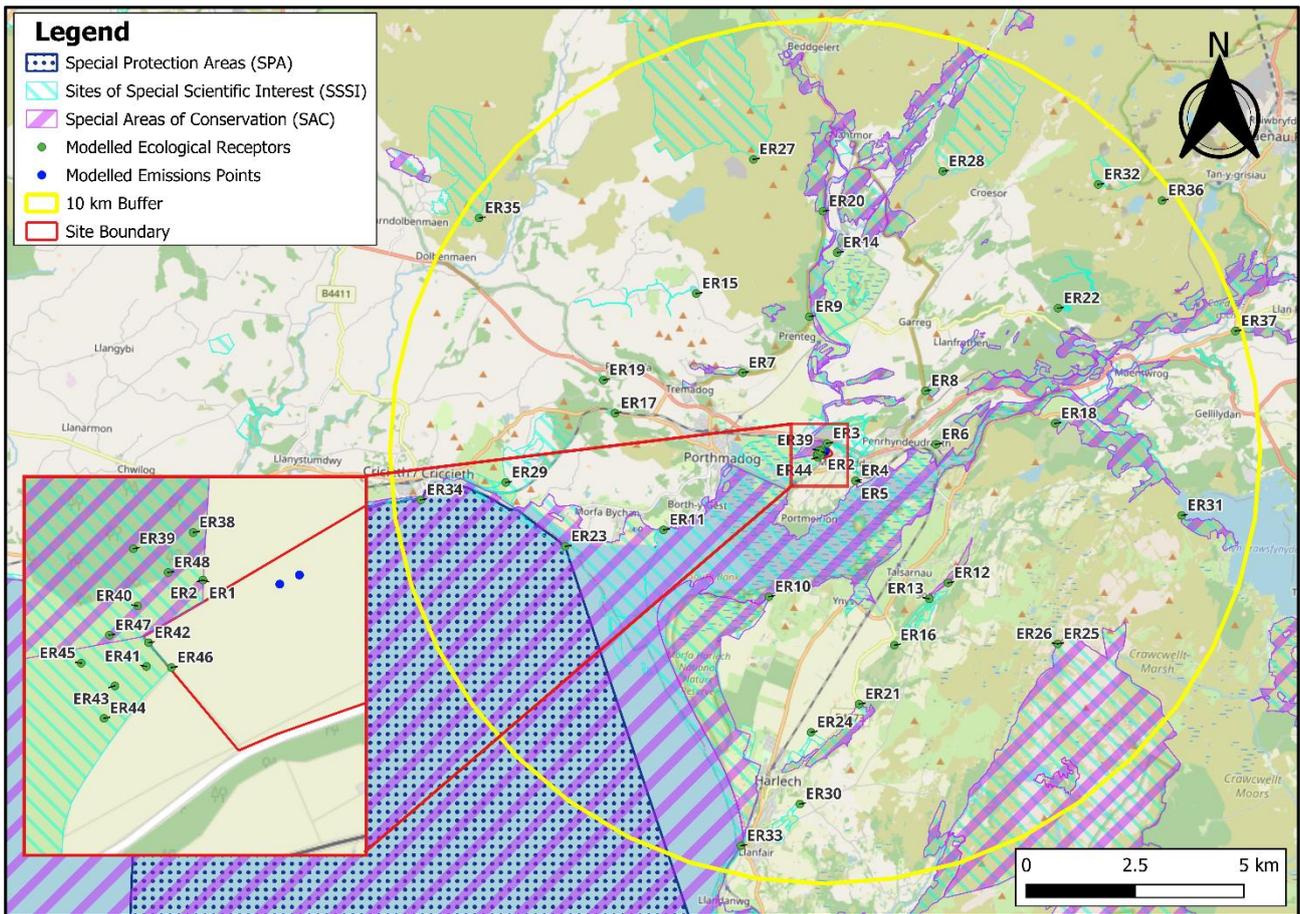


Figure 3: Designated Ecological Receptors within 10km (image taken from BV document AIR20761597 – Nov 2024)

These designated sites were used as the basis for the discrete modelled ecological receptors for the AQ assessment. See Figure 3.

The discrete ecological receptors are based on the shapefiles from Defra’s MAGIC Map for the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC and Glaslyn SSSI.

2.3. Ecological Receptors Scoped Out

Apart from those sites scoped in, Bureau Veritas concluded that there were no modelled exceedances of the critical levels or critical loads at any other protected site within 10km and therefore no other protected sites are considered further in this technical note.

3. Purpose of this Technical Note

This technical note (TN) explores the results of the Bureau Veritas air quality modelling using available study data to predict physical impacts on the habitats within the ecological receptors scoped into the assessment. This assessment focusses on the effects of nitrogen and acid deposition and oxides of nitrogen (NOx).

The results for nitrogen deposition show exceedances of the CL at 34 modelled ecological receptors. However, this was due to the background deposition rate at all receptors exceeding the minimum

critical load (CL). When taking the PC into account, this makes up less than 1% of the overall result at the majority (25) of ecological receptors, so the contribution from the plant at these locations were considered not significant.

Nine receptors situated within Glaslyn SSSI (ER39-ER45 and ER47) had a modelled PC greater than 1% of the CL, with the greatest exceedance being 2.4% at ER39. These receptors were therefore identified as requiring further assessment. The exceedances identified within Glaslyn SSSI are a result of the low CL, which is attributed to the presence of the floating water-plantain *Luronium natans* (CL=2 kg N ha⁻¹ yr⁻¹). As Glaslyn SSSI covers a large area of mixed vegetation types, further assessment was required to confirm the specific locations of *Luronium natans* within the area, as well as a current appreciation of the condition of the site.

Results for acid deposition showed exceedances of the CL at 21 modelled receptors; when taking account of the PC the contribution from the plant can be considered insignificant at 11 of these. Of the 9 (ER38, ER39, ER41-ER48) receptors that still showed exceedances, five are located within Glaslyn SSSI, while the remaining receptors are located in the region covered by Glaslyn SSSI and Coedydd Derw a Safleoedd Ystumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC. The exceedances in these areas are due to the woodland habitats at these sites. Further impact assessment of these areas was requested by an ecologist.

4. Methods Applied

4.1. Designated Sites and Qualifying Features

The qualifying features of the designated sites or their supporting habitats were reviewed, to assess where they are located within the modelling study area. The following information sources were consulted to ascertain which qualifying features are present and their locations:

- Multi Agency Geographic Information for the Countryside (MAGIC)⁴, and
- Natural Resources Wales (NRW) - Find Protected areas of land and sea⁵

The potential impacts of NO_x and nitrogen and acid deposition, in terms of the physical effects and implications are reported for each qualifying feature. The Air Pollution Information System (APIS) pollution impact records for habitats, ecosystems and species were also consulted⁶. APIS only records effects and implications on habitats where it has been possible to gather evidence through research-based studies.

⁴ Website: <https://magic.defra.gov.uk/MagicMap.aspx> (accessed 04/12/24)

⁵ Website: <https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/protected-areas-of-land-and-seas/find-protected-areas-of-land-and-sea/?lang=en> (accessed 04/12/2024)

⁶ <http://www.apis.ac.uk/> (accessed 04/12/24)

4.2. Standard methods used in Air Quality Assessment

Critical Levels and Critical Loads Relevant to the Assessment of Ecological Receptors

A summary of the relevant Air Quality Standards (AQS) and Environmental Assessment Levels (EAL) that apply NO_x and SO₂ emissions from the plant and their impact on ecological receptors are given in Table 1.

Table 1: Critical Levels of NO_x and SO₂ for Ecological Receptors

Pollutant:	AQS/EAL	Average Period:	Value (ug/m.3)
Oxides of Nitrogen (NO _x)	Target	24-hour mean	75
Oxides of Nitrogen (NO _x)	AQS	Annual Mean	30
Sulphur Dioxide (SO ₂)	AQS	Annual Mean	20

Critical Loads (CL) – Nitrogen Deposition (Eutrophication) and Acidification

The APIS website provides specific information on the potential effects of nitrogen deposition and acid deposition on various habitats and species. The information collected from APIS and used in the assessment is presented in Table 2. A review of the impacted areas above exceedance ((ER39-ER45 and ER47) was reviewed specifically for habitats and species affected within this area.

SAC/SPAs are underpinned by condition and management through relevant SSSI designation. In this instance Glaslyn SSSI and Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC processing relates to the worst-case critical load data (*Luronium natans*) for the ecological sites.

Table 2: Critical Loads for Nitrogen and Acid Deposition.

Designated Site:	Min N-CL	Max N-CL	Acid dep. of N equiv.	Acid dep. of S equiv.	CLminS	CLminN	CLmaxN
	(kg/N/ha/yr)		(keq/ha/yr)				
Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC	2	10	N/A				
Glaslyn SSSI	2	10	N/A				

The CLs relate to the most nitrogen (N) sensitive habitat listed for each of the designated sites. The nitrogen CL used is for floating water plantain (*Luronium natans*). There are no acidity deposition critical loads given within the APIS data.

5. Summary of Bureau Veritas Air Quality Modelling Findings

5.1. Impacts on Ecological Receptors

The short-term results for ecological receptors were below the 24-hour NO_x Air Quality Assessment Level (AQAL).

The results for nitrogen deposition showed exceedances at designated sites. The maximum total predicted environmental deposition rate (PEDR) is 869.4% of the Critical Level (CL). This is due to the background deposition rate at these receptors being relatively high when compared to the minimum CL. When taking the Process Contribution (PC), the impacts at eight of the modelled receptors can still be deemed significant, with the maximum %PC of CL being 2.4%. This is due to the relatively low CL in these areas.

Results for acid deposition showed exceedances of the CL at 21 modelled receptors; when taking account of the PC contribution, the impacts were still significant at nine receptors.

6. Evaluation of Impacts

6.1. Nitrogen Oxides (NO_x)

The assessed protected sites cover large areas and several different habitats and protected species. A review of the Core Management Plan for Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC⁷ identified the impacted area to be within SAC/SSSI Management unit 6790. The potential ecological impact area is highlighted (Fig 4).

Management Unit 6790 includes the following habitats only

- SAC Feature – Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*
- SSSI Feature – Semi-natural woodlands

With regards to the SSSI designation this relates to the following feature

- Semi natural broadleaved woodland (comprising Acidic oak woodland and wet woodland on river floodplain)

At the time of accessing (06/12/24) no known actions are needed with regards to this unit. Therefore, it can be assumed that any exceedances should be assessed on the critical loading for *Alnus glutinosus* woodland habitat (semi-natural woodlands).

On this basis the relevant exceedances of NO_x at receptors (ER39-ER45 and ER47) should be revised to model on the CL of Woodland Habitat within the protected sites.

⁷ CORE MANAGEMENT PLAN Including CONSERVATION OBJECTIVES FOR Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC – NRW 2022

For completeness a review of the BSBI⁸ plant records give no records of *Luronium natans* within the 20km² tetrad of the site in the last 20 years.

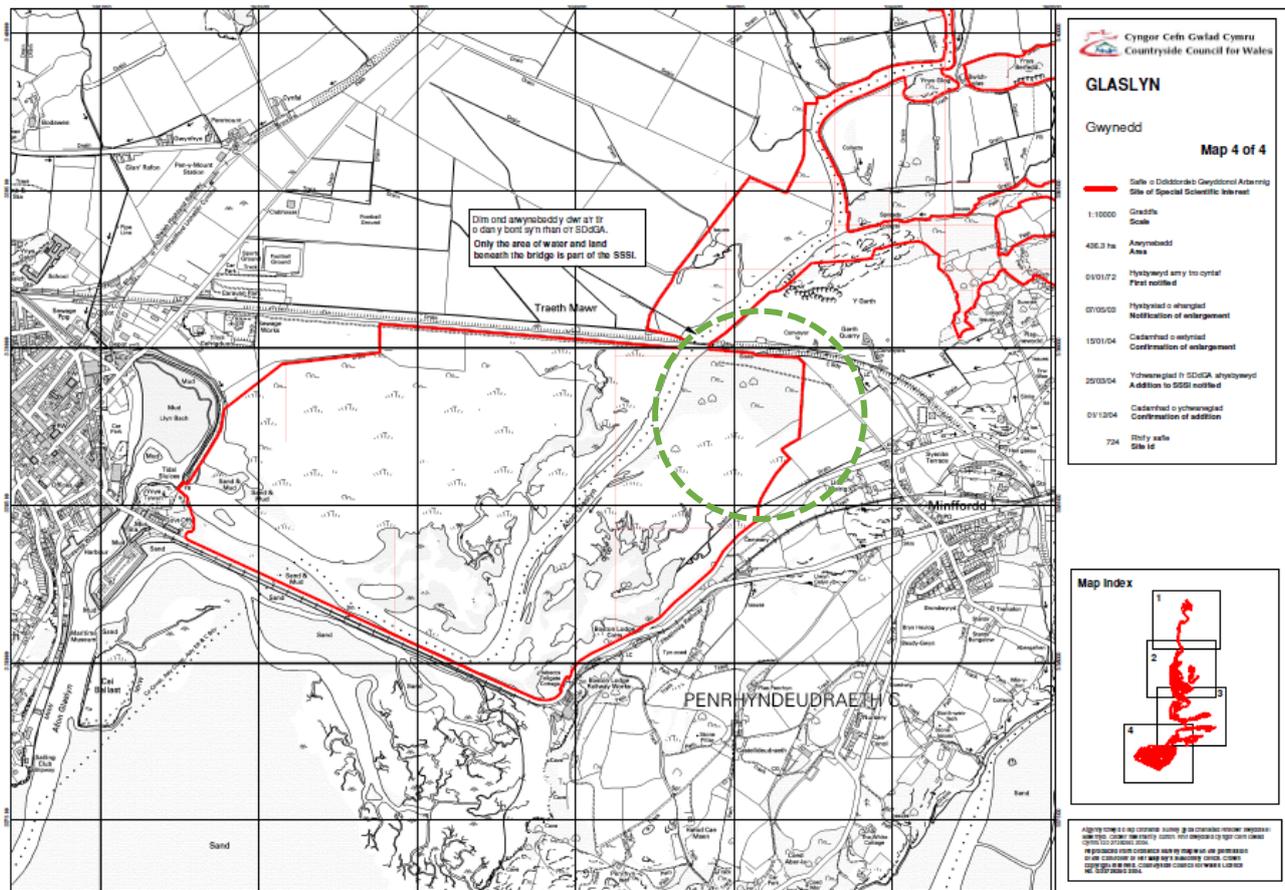


Figure 4: SAC/SSSI Management Unit 6790 in context with position of ecological receptors

Table 3: Re-evaluation of critical loadings

Habitat:	Critical Load (kg N ha ⁻¹ yr ⁻¹)	Impacts:
Temperate and boreal forests	10-20	Increased nitrogen deposition in mixed forests increases susceptibility to secondary stresses such as drought and frost, can cause reduced crown growth.
Oak Woodland	10-15	Increased nitrogen deposition in Oak forests increases susceptibility to secondary stresses such as drought and frost, can cause reduced crown growth

On this basis a re-evaluation of the critical loading at ER39-ER45 and ER47 would not be significant (<1% of PC of CL_{min} (%)) based on the specific habitat within the modelled area.

⁸ BSBI Plant Records <https://bsbi.org/maps?taxonid=2cd4p9h.fff> (accessed 06/12/2024)

6.2. Acid Deposition Rates

Assessment of the nine receptors which showed exceedance should be re-evaluated based on the above impacted habitat critical loading and revised acid CL (Table 4).

Table 4: Acid Deposition Re-assessment Rates

Acid Critical Loading Class	MaxCLminN (keqN/ha/yr)	MaxCLmaxN (keqN/ha/yr)	MaxCLmaxS (keqN/ha/yr)	MinCLminN (keqN/ha/yr)	MinCLmaxN (keqN/ha/yr)	MinCLmaxS (keqN/ha/yr)
Unmanaged broadleaved/coniferous woodland	0.357	3.336	2.979	0.285	1.205	0.92

6.3. Assessment of Qualifying Features Vulnerability to Acid Deposition

Results for acid deposition showed exceedances of the CL at 21 modelled receptors; when taking account of the PC contribution, the impacts were still significant at nine receptors. This is discussed further in Section 7 below.

7. Testing the integrity of the designated site

The assessment should test whether an adverse effect on the integrity of the designated site (in this case Coedydd Derw a Safleoedd Ystumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC/Glaslyn SSSI) from the proposal can be ruled out or not⁹.

The integrity of the site will be adversely affected if a proposal could, for example:

- destroy, damage or significantly change all or part of a designated habitat
- significantly disturb the population of a designated species
- harm the site's ecological connectivity with the wider landscape, for example, harm a woodland that helps to support the designated species from a nearby European site
- harm the site's ecological function, or its ability to survive damage, and reduce its ability to support a designated species
- change the site's physical environment, for example, by changing the chemical makeup of its soil, increasing the risk of pollution or changing the site's hydrology
- restrict access to resources outside the site that are important to a designated species, for example, food sources or breeding grounds
- prevent or disrupt restoration work, or the potential for future restoration, if it undermines the site's conservation objectives

It is necessary to be able to rule out all reasonable scientific doubt that the proposal would not have an adverse effect on the integrity of the site before the proposal may be allowed to proceed.

⁹ [Habitats regulations assessments: protecting a European site - GOV.UK](#)

7.1. How to assess effects on site integrity

To carry out the assessment and apply the integrity test, the following should be considered:

- the ecological requirements, conservation objectives and the current conservation status (if known) of the site's designated features that might be affected by the proposal
- each potential effect on the European site, including the risk of combined effects with other proposals, and how they might impact on the site's conservation objectives
- the scale, extent, timing, duration, reversibility and likelihood of the potential effects
- the likelihood of the effects occurring
- mitigation measures that have been proposed or conditions that can be attached to avoid or limit the effects
- The confidence that mitigation measures will be effective over the whole lifetime of the proposal - for example, the effects of construction, operation and decommissioning

Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC

The Meirionnydd Oakwoods and Bat Sites SAC is made up of a series of woodlands, stretching from Dolgellau in the south to Eryri in the north.

Most of the SAC is classified as the woodland type known as "Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles", which covers approximately 84% of the SAC and is the dominant woodland type at most of the sites. A key feature of European importance is the rich Atlantic bryophyte communities that are often well developed within this Annex I habitat. These include numerous rare species, such as *Campylopus setifolius*, *Sematophyllum demissum*, *Adelanthus decipiens*, *Leptoscyphus cuneifolius* and *Plagiochila atlantica*.

The following are the key SAC features associated with the designation:

Annex I (habitats)

- Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*
- *Tilio-Acerion* forests of slopes, screes and ravines*
- Bog woodland*
- European dry heath
- Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- Northern Atlantic wet heaths with *Erica tetralix*

Annex II (species)

- Lesser horseshoe bat *Rhinolophus hipposideros*

7.2. Evaluation of Impacts on Conservation Features from Acid Deposition

To fully evaluate the impacts on the integrity of the conservation features of the SAC and its associated SSSI component (Glaslyn SSSI), the following impacted feature of the SAC is assessed.

Annex 1 Habitat Feature (Woodlands)

Old sessile oakwoods with Ilex and Blechnum (NVC W17, W11, W10); Bog woodland (NVC W4c); Tilio-Acerion forests of slopes, screes and ravines (NVC W8 and W9); Alluvial forests with Alnus glutinosa and Fraxinus excelsior (NVC W5, W6 and W7) which covers most of the SAC.

The total extent of the woodland area, including woodland canopy and scrub, woodland glades and associated dry heath, bracken and grassland amounts to 1,826ha in total.

Exceedances were calculated at nine ecological receptors within the woodland to the immediate west of the proposed generators. This calculated to an area of approximately 1.0ha which equates to 0.055% (<1%) of Annex 1 habitat feature (woodlands).

It must be noted that the ecological receptors are located on the edge of the woodland habitats and as such would also be prone to secondary agricultural influences of eutrophication. The wind rose also indicates that the prevailing wind influence is from the southwest, therefore most of any deposition will fall to the north/northeast of the site outside of the designated sites.

Also, the exceedances will only apply during the temporary short-term operation of the TBM (up to 14 months). Given the above, it can be assessed that there will be no significant impact on the long-term integrity of the qualifying feature (woodlands) associated with Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites, and Glaslyn SSSI given that the impacted area is less than 1% of the qualifying feature and that the works associated with the exceedances will be short term.

8. Conclusions

The evaluation identified that any increases in nitrogen deposition would not have an impact on qualifying habitats associated with Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites, and Glaslyn SSSI.

This has been based on a re-evaluation of the habitats at ecological receptor critical loading from the conservative low-level CL for the most sensitive feature (*Lunorium natans*) within the designated sites to woodland CL, which would give a revised CL of <1%.

However, results for acid deposition showed exceedances of the CL at 21 modelled receptors. When taking account of the PC contribution, the impacts were still significant at nine receptors.

Consideration was given to re-assessment of the nine receptors which showed exceedance should be re-evaluated based on the revised habitat critical loading and acid CL noted in section 6.

Exceedances were calculated at nine ecological receptors within the woodland to the immediate west of the proposed generators, within an area of approximately 1.0ha, which equates to 0.055% (<1%) of the relevant Annex 1 habitat feature (woodlands). Also, the exceedances will only apply during the temporary short-term operation of the TBM (up to 14 months).

Therefore, it can be concluded that there will be no significant impact on the long-term integrity and ecological function of the qualifying feature (woodlands) associated with Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites, and Glaslyn SSSI given that the impacted

area is less than 1% of the qualifying Annex I feature (woodlands) and that the works associated with the exceedances will be short term.