HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

6.4.57 ES Volume D - WNDA Development App D9-24 - SSSI Compensation Strategy - Volume II

PINS Reference Number: EN010007

Application Reference Number: 6.4.57

June 2018

Revision 1.0

Regulation Number: 5(2)(a)

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Horizon Internal DCRM Number: WN0902-JAC-PAC-APP-00158

[This page is intentionally blank]

HORIZON NUCLEAR POWER

ENERGY WORKING FOR BRITAIN

TRE'R GOF SSSI COMPENSATION PROPOSAL VOLUME II

Outline habitat creation, enhancement and management proposal - Cae Canol-dydd

DCRM Ref Number: WN0902-JAC-PAC-REP-00059

Revision: 1.0

Additional Requirements or Controls			
LISTED READERS ONLY		LEGALLY PRIVILEGED	

Comments:

About this document

The Tre'r Gof SSSI Compensation Proposal – Volume II presents outline habitat creation and management proposals for the three sites identified within the Tre'r Gof SSSI Compensation Proposal – Volume I document (Appendix D9-23. Application Reference Number: 6.4.57), which form the final compensation proposal:

- Cae Canol-dydd;
- Cors Gwawr; and,
- Ty du.

This volume is an anthology of four separate reports which outline the creation, enhancement and long-term management of the habitats proposed at each of the three compensation sites, together with a proposal for hydrological monitoring associated with the habitat creation and enhancement proposals at Cae Canol-dydd and Cors Gwawr. Each of the four reports has been structured to form a stand-alone document which can be used as a reference for the relevant site.

The structure of this volume is as follows:

- Habitat creation and management proposals – Cae Canol-dydd
- Habitat creation and management proposals – Cors Gwawr
- Habitat creation and management proposals – Ty du
- Hydrological monitoring scope – Cors Gwawr and Cae Canol-dydd

Contents

1 Introduction

1.1 Background

Horizon Nuclear Power Wylfa Ltd. (Horizon) is planning to develop a new nuclear power station on the north coat of Anglesey. Land adjacent to the Existing Power Station at Wylfa Head, west of Cemaes on the north coast of Anglesey, is identified by the UK Government in the *Overarching National Policy Statement for Energy (EN-1)* (NPS EN-1) [RD1] and *National Policy Statement for Nuclear Power Generation (EN-6)* (NPS EN-6) [RD2] as potentially suitable for the construction of a new nuclear power station. Horizon proposes to construct and operate a new nuclear power station, known as Wylfa Newydd, on this land and adjacent land. As part of the Wylfa Newydd Project, Horizon has committed to delivering a compensation proposal, in order to offset a potential adverse effect on Tre'r Gof Site of Special Scientific Interest (SSSI), which will create new areas of rich-fen habitat and enhance areas of existing rich-fen habitat at three sites on Anglesey.

The Tre'r Gof SSSI compensation proposal has been developed by Horizon through discussion at a Technical Advisory Group (TAG) comprising representatives from Horizon, the Isle of Anglesey County Council and Natural Resources Wales (NRW). This proposal has been developed in line with the principles set out in the Landscape and Habitat Management Strategy for the Wylfa Newydd Project (Application Reference Number 8.16), and will be secured by the provisions of this document. Further background to the development of the Tre'r Gof SSSI compensation proposal and justification for the selection of the sites is provided in Volume I of this document (Appendix D9-23. SSSI Compensation Strategy - Volume I. Application Reference Number: 6.4.56).

1.2 Purpose of this report

The purpose of this report is to outline the creation, enhancement, and long-term management of habitat proposed at Cae Canol-dydd, to the north west of Talwrn, Anglesey (figure 1-1), as part of the Tre'r Gof SSSI compensation proposal.

This outline proposal for Cae Canol-dydd complements that for Cors Gwawr and Ty du proposed as part of the Tre'r Gof SSSI compensation proposal. Also accompanying this proposal are soil and hydrological investigations at the proposed compensation sites, including Cae Canol-dydd, which would inform the final detailed design of the Tre'r Gof SSSI compensation proposal. Detailed design information will be prepared in accordance with the habitat and landscape principles relating to the Ecological Compensation Sites in the Landscape and Habitat Management Strategy (Application Reference Number: 8.16) and submitted to the IACC for approval. Development of the Ecological Compensation Sites will be undertaken in accordance with the approved design details. These measures will be secured through the DCO. The proposals set out in the Tre'r Gof SSSI Compensation Strategy Volume II have been assessed within the Ecological Compensation Sites: Assessment of Environmental Effects in Appendix D1-2 (Application Reference Number: 6.4.18).

There is a National Grid proposal to construct a new pylon in the north of Cae Canol-dydd in addition to the existing pylon. It is unlikely to significantly affect the compensation proposal presented in this report, and further detailed information on how it relates to the compensation proposal at Cae Canol-dydd will be provided during detailed design. The proposed pylon is not considered further in this report.

1.3 Overview of compensation proposal at Cae Canol-dydd

The compensation proposal at Cae Canol-dydd in terms of areas of rich-fen habitat creation and enhancement is summarised in table 1-1.

Table 1-1: Cae Canol-dydd compensation proposal summary

PROPOSAL ELEMENT	INDICATIVE AREA (HA)
Potential area of rich-fen proposed to be created	7.7
Potential area of rich-fen proposed to be enhanced	4.8
Total potential area of rich-fen within proposal	12.5
Total site area	20.8

Benefits of the compensation proposal at Cae Canol-dydd in addition to habitat creation and enhancement would also include:

- significant extension of Caeau Talwrn SSSI, an Anglesey Fens Special Area of Conservation (SAC) site, joining isolated units of the site and expanding the site to form an integrated natural headwater valley, improving ecological resilience and landscape connectivity;
- potential for conservation of threatened flora and fauna of rich-fens through species introductions or recovery projects; and
- public access and interpretation enhancements.

1.4 Consultation on additional land

In February 2018, Horizon undertook a consultation on additional land that had not been consulted on previously, which included Cae Canol-dydd. Details of this consultation are provided in chapter B9 Introduction to the topics (Application Reference Number: 6.2.9).

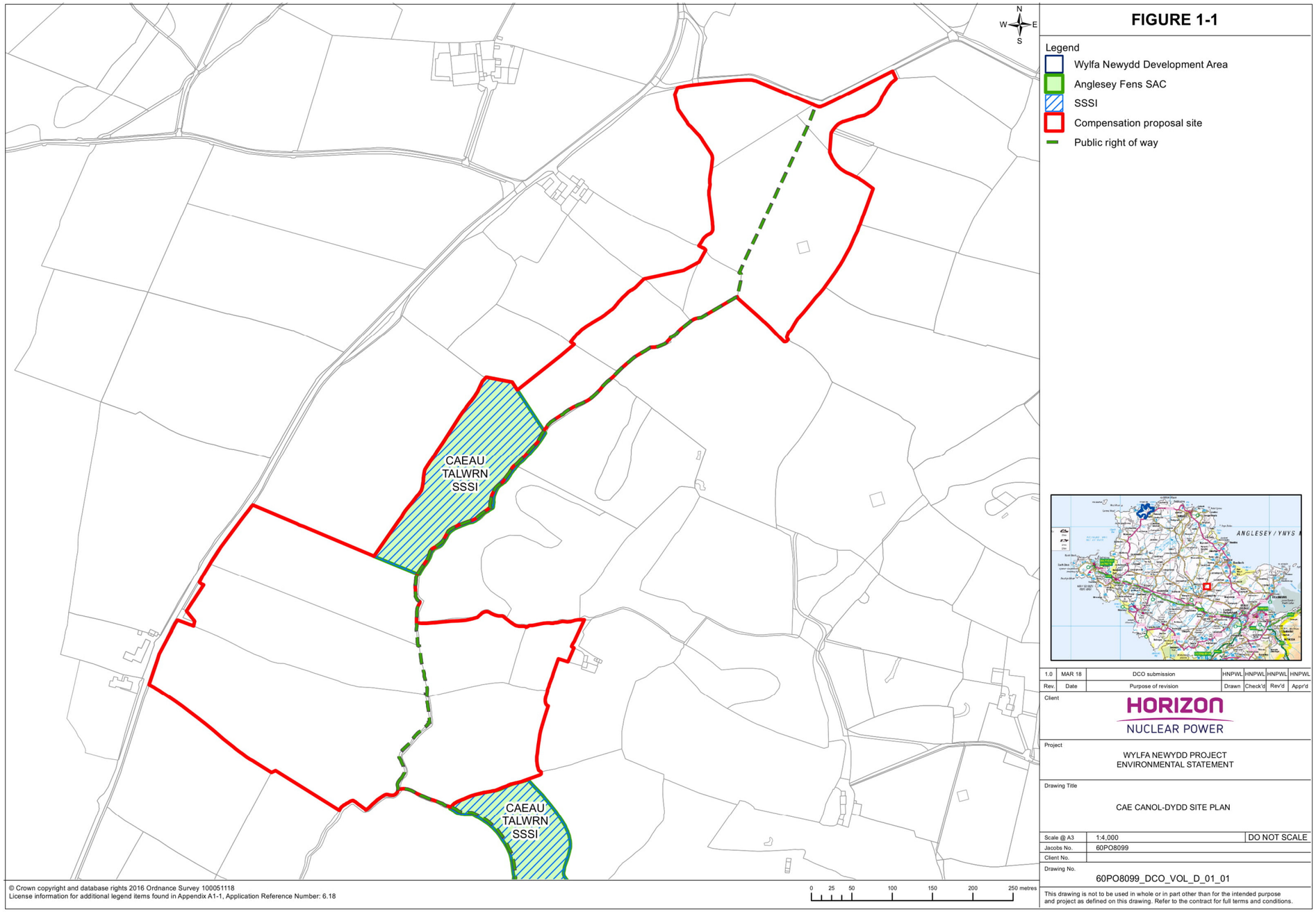
1.5 Report outline

This report is structured as follows:

- section 2 provides baseline information on the topography, geology and soils, hydrology and hydrogeology and ecology of Cae Canol-dydd;
- section 3 outlines the compensation proposal for Cae Canol-dydd;
- section 4 outlines the works that would be required to deliver the proposal at Cae Canol-dydd;

- section 5 outlines the management that would be required in order to secure the long-term favourable development and condition of Cae Canol-dydd; and
- section 6 outlines the process of monitoring, assessment and review required to guide decisions on the development of Cae Canol-dydd.

Figure 1-1: Cae Canol-dydd site plan



2 Summary of baseline conditions

2.1 Site description

Cae Canol-dydd is situated to the north west of the village of Talwrn along the B5110 in south-eastern Anglesey (SH 4741 7775; figure 1-1). The site has an area of approximately 20.8ha. Cae Canol-dydd includes a unit of the Caeau Talwrn SSSI and connects it to another unit of this SSSI to the south east. Caeau Talwrn SSSI supports internationally important fen habitat, and the units within and adjacent to Cae Canol-dydd form part of the Anglesey Fens SAC.

A public right of way (PRoW) crosses Cae Canol-dydd, running along the length of the site, beginning in the north and leaving site in the south-east. An electricity pylon is present in the north of Cae Canol-dydd.

A summary of the baseline conditions at Cae Canol-dydd is provided below and a hydroecological conceptual model of the site is provided as a synthesis of current information. Further details are provided in Volume I of this document, (Appendix D9-23. Application Reference Number: 6.4.56).

2.2 Topography

Cae Canol-dydd comprises a valley aligned approximately northeast-southwest, with the head of the valley in the north occupying a wide basin open to the south. At the southern boundary of the site, the valley converges with a second valley from the southeast.

The baseline topography of Cae Canol-dydd is shown in figure 2-1, based on the light distancing and ranging (LiDAR) data freely available from Welsh government.

2.3 Geology and soils

British Geological Survey (BGS) 1:50,000 bedrock mapping shows the majority of Cae Canol-dydd to be underlain by the Lligwy Sandstone Formation. The eastern portion of the site is underlain by the Clwyd Limestone Group, (i.e. limestone interbedded with sandstone). BGS 1:50,000 mapping shows a layer of glacial till covering the bedrock across the whole of the site, with alluvium in places overlying the till in the valley bottom along the route of the watercourse.

Ground investigations to date have found that the site is underlain by mineral soils. Across most of the site a horizon of white sandy soil and limestone gravel clasts was found at depths between 0.2m and 1.2m below clay. In the far south of the site, silty clay soil was encountered. An extensive deposit of tufa is present in the north-west, exposed by ditch works within agriculturally improved pasture.

2.4 Hydrology and hydrogeology

Inflows into Cae Canol-dydd are interpreted to be from surface water runoff from the surrounding catchment, from groundwater, and from direct rainfall. Hydrological features of the site are shown in figure 2-2.

The main hydrological feature of Cae Canol-dydd is the Afon Canol-dydd, which does not have Main River status, which rises at the head of the valley and flows southwest along its bottom, receiving a tributary from the valley to the south-east at the southern boundary of site. The course of the Afon Canol-dydd has been straightened around the electricity pylon to the north, and it is fed by numerous drainage ditches draining the valley slopes along its course. A landowner reported that there is an extensive network of sub-surface field drainage within the agriculturally improved areas in the southern part of site, presumed also to drain into the Afon Canol-dydd. Downstream of site, the Afon Canol-dydd gains Main River status.

An unnamed watercourse, without Main River status, also drains the high ground to the east and northeast of site, entering the site via its eastern border, and running down the valley and discharges into the Afon Canol-dydd. The pH of this stream was neutral to slightly alkaline and calcium concentrations were high, as were surface water and soil samples across the site. Concentrations of other major ions and nutrients in the surface water samples were generally low to moderate.

Seepages were evident around the valley head area of site and along the valley slopes, including some more discrete areas recognisable as springs. There was also a drained spring in the pasture on the valley slope to the east, opposite Caeau Talwrn SSSI. This area is out with the boundary of Cae Canol-dydd but was visited as part of site investigations (Appendix D9-23. Application Reference Number: 6.4.56).

No source protection zones (SPZ) are present on Anglesey.

2.5 Ecology

During site investigations, rich-fen was found to occupy Caeau Talwrn SSSI and almost the whole of the valley head in the northern part of Cae Canol-dydd, where areas were found to be under or unmanaged. The remainder of the valley was found to have been drained and converted to improved pasture.

A plan of the baseline vegetation of Cae Canol-dydd is shown in figure 2-3 and a complete list of plant communities recorded is provided in table 2-1. The existing rich-fen habitat within the valley head of Cae Canol-dydd supports the following characteristic rich-fen plant communities [RD3]:

- M9 *Carex rostrata-Calliergon cuspidatum/giganteum* mire
- M10 *Carex dioica-Pinguicula vulgaris* mire
- M13 *Schoenus nigricans-Juncus subnodulosus* mire;
- M22 *Juncus subnodulosus-Cirsium palustre* fen meadow; and
- M24 *Molinia caerulea-Cirsium dissectum* fen meadow.

Cae Canol-dydd supports a suite of characteristic rich-fen vascular plant species, including dioecious sedge (*Carex dioica*); fen pondweed (*Potamogeton coloratus*); grass-of-Parnassus (*Parnassia palustris*); long-stalked yellow sedge (*Carex lepidocarpa*); and parsley water-dropwort (*Oenanthe lachenalii*). The rich-fen moss *Philonotis calcarea* is also present in the valley head.

Table 2-1: Plant communities recorded from Cae Canol-dydd

PLANT COMMUNITY
Dense scrub
Juncus inflexus-dominated vegetation
M10b *Carex dioica-Pinguicula vulgaris* mire, *Briza media-Primula farinosa* sub-community
M13a *Schoenus nigricans-Juncus subnodulosus* mire, *Festuca rubra-Juncus acutiflorus* sub-community
M13b *Schoenus nigricans-Juncus subnodulosus* mire, *Briza media-Pinguicula vulgaris* sub-community
M13c *Schoenus nigricans-Juncus subnodulosus* mire, *Caltha palustris-Galium uliginosum* sub-community
M22 swampy variant
M22a *Juncus subnodulosus-Cirsium palustre* fen meadow, typical sub-community
M22b *Juncus subnodulosus-Cirsium palustre* fen meadow, *Briza media-Trifolium* spp. sub-community
M23b *Juncus acutiflorus/effusus-Galium palustre* rush pasture, *Juncus effusus* sub-community
M24b *Molinia caerulea-Cirsium dissectum* fen meadow, typical sub-community
M27 *Filipendula ulmaria-Angelica sylvestris* mire
M9 *Carex rostrata-Calliergon cuspidatum/giganteum* mire
MG10 *Holcus lanatus-Juncus effusus* rush pasture
MG10a *Holcus lanatus-Juncus-effusus* rush pasture, typical sub-community
MG10b *Holcus lanatus-Juncus-effusus* rush pasture, *Juncus inflexus* sub-community
MG5a *Cynosurus cristatus-Centaurea nigra* grassland, *Lathyrus pratensis* sub-community
MG7 *Lolium perenne* leys and related grasslands
OV24 *Urtica dioica-Galium aparine* community
S10 *Equisetum fluviatile* swamp
S14 *Sparganium erectum* swamp
S22 *Glyceria fluitans* water-margin vegetation
S22a *Glyceria fluitans* water-margin vegetation, *Glyceria fluitans* sub-community
S23 Other water-margin vegetation
W23 *Ulex europaeus-Rubus fruticosus* scrub
W24 *Rubus fruticosus-Holcus lanatus* underscrub
Willow scrub

2.6 Current conceptual understanding

The current conceptual understanding of the hydroecology of Cae Canol-dydd is based on the limited hydrological and hydrogeological information collected to date and summarised above.

The surface water and soil chemistry of Cae Canol-dydd appears to be neutral to alkaline and calcium carbonate-rich across the site. This is indicated by the vegetation, water quality and soil samples (albeit limited in number and frequency of sampling), presence of calcite along the faces of some ditches, and the deposits of tufa in some areas.

Within Cae Canol-dydd, the vegetation of Caeau Talwrn SSSI and the northern valley head indicate that calcareous groundwater plays a key role in the hydrological supply, with vegetation consistent with seepage of calcareous groundwater within the valley head and along the western valley slope within Cae Talwrn SSSI. Some discrete areas of pronounced seepage are also recognisable as springs. Vegetation indicative of seepage within agriculturally improved pasture is also present along the eastern valley slope, where there is also a spring, and to the west. There is also vegetation indicative of calcareous groundwater seepage within the area of Caeau Talwrn SSSI to the south-east of the Cae Canol-dydd site boundary. Groundwater influence in these improved areas is thought to be limited by drainage, including an extensive sub-surface field drainage system.

Within the valley head, vegetation indicative of seepage is apparent below approximately 56.6m AOD in the west and 55.5m AOD in the east. Vegetation showing the strongest groundwater influence is found on the eastern side. This area is situated below a low escarpment, presumed to be of the Clwyd Limestone Group shown by BGS 1:50,000 mapping as underlying that part of the site, and the Clwyd Limestone Group meets the Lligwy Sandstone Formation through this area. Seepage in the valley head may thus be interpreted as arising from where groundwater within bedrock meets the ground surface, with potentially local upwelling along the boundary of the limestone and sandstone. However, the valley head is also shown by BGS 1:50,000 mapping as being covered in a layer of till, the depth and permeability of which is unknown, so that the hydraulic connectivity between groundwater in the bedrock and superficial deposits, and thus the extent to which the till limits groundwater emergence or recharge, is unknown.

South of the valley head, and south from Caeau Talwrn SSSI, the valley opens out at approximately 44m AOD. On both sides of the valley this elevation marks the limit of vegetation indicative of groundwater seepage, and is therefore interpreted as the approximate elevation at which groundwater in the bedrock meets the ground level. However, again the role of till covering the valley is unknown.

Finally, the BGS 1:50,000 mapping shows alluvium comprising silts, sands and gravels in much of the valley bottom. Soil investigations to date have also found deeper, less permeable soils in this area. The presence of such soils is likely to limit groundwater influence and recharge, leading to a more surface water driven system in the valley bottom. Within Caeau Tawlrn SSSI this can be seen between the northern and southern halves of the SSSI: in the north, alkaline fen vegetation requiring strong groundwater influence was found to lie over a shallow topsoil overlying

marl; in the south, more topogenous fen meadow vegetation was found to lie over a clay layer of around 0.5m depth.

The conceptual model outlined above is preliminary, based on the limited hydrological data collected, and will be refined once further monitoring data have been collected.

Figure 2-1: Cae Canol-dydd baseline topography plan

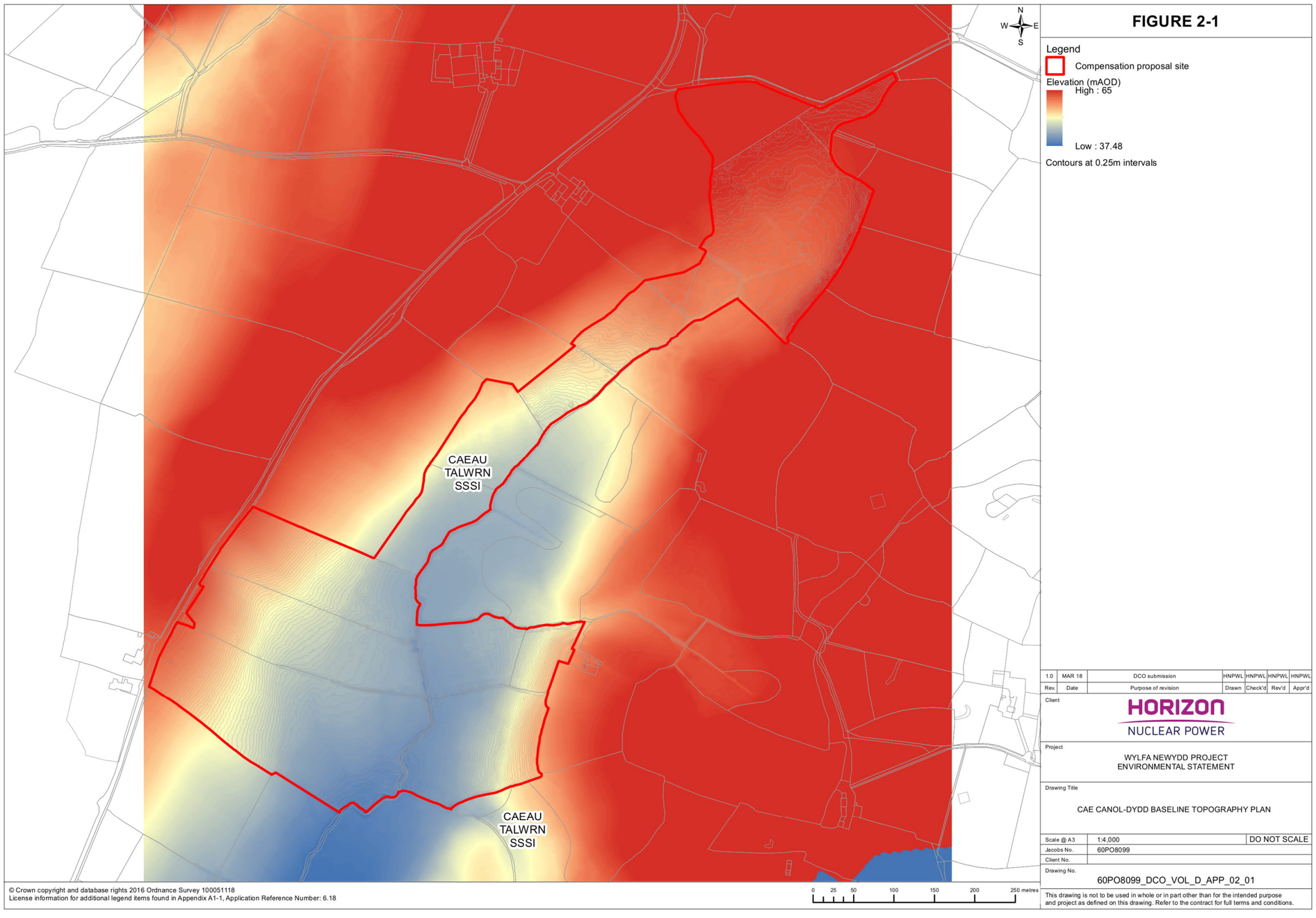


Figure 2-2: Cae Canol-dydd baseline hydrological features plan

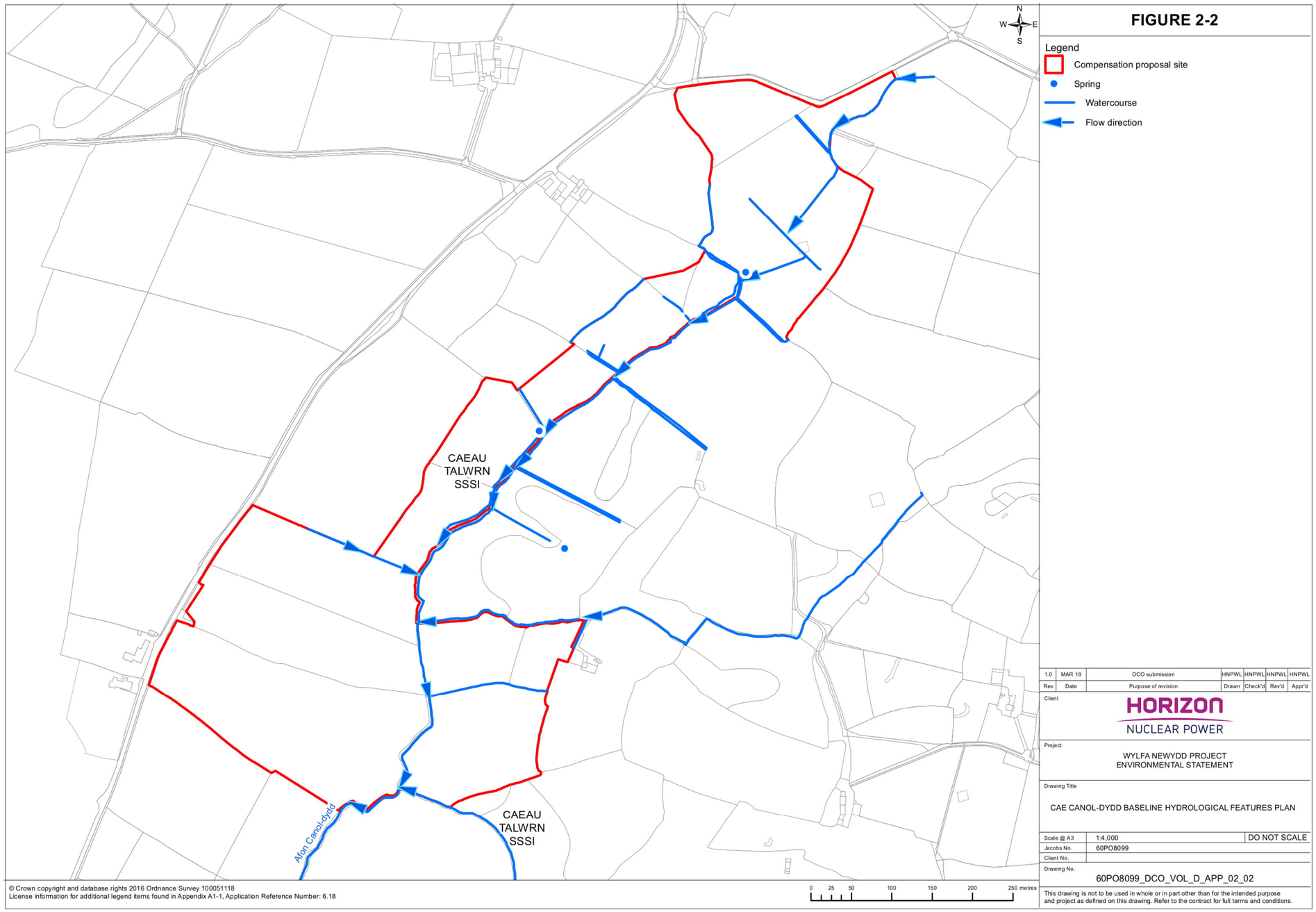
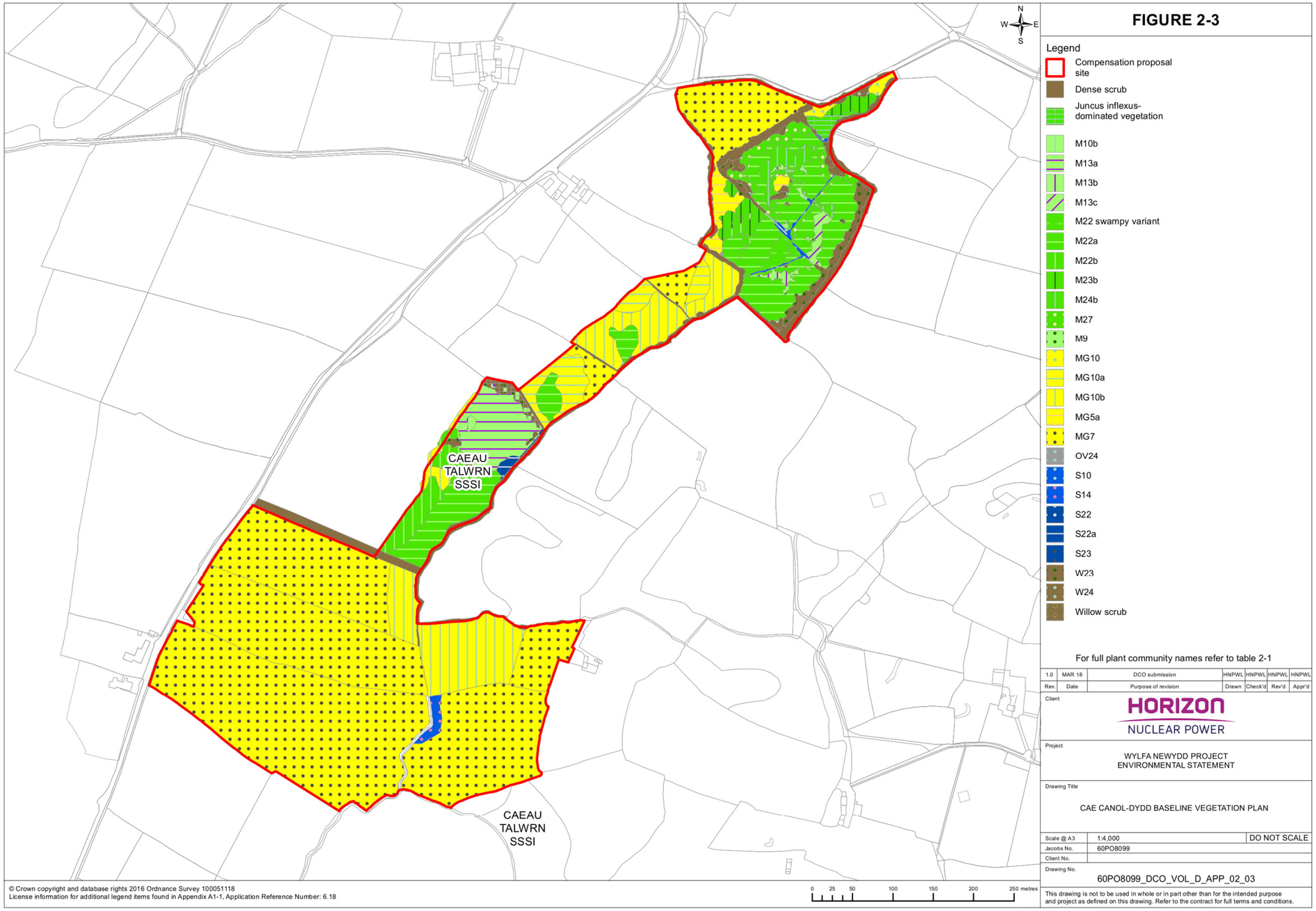


Figure 2-3: Cae Canol-dydd baseline vegetation plan



3 Compensation proposal for Cae Canol-dydd

3.1 Introduction

This section outlines the proposal for Cae Canol-dydd as part of the Tre'r Gof SSSI compensation proposal, and describes:

- the project management structure for the proposal (section 3.2);
- the habitat creation and enhancement proposal (section 3.3);
- other potential nature conservation enhancements as part of the Cae Canol-dydd compensation proposal (section 3.4); and
- potential public access enhancements as part of the Cae Canol-dydd compensation proposal (section 3.5).

Detailed design of the Cae Canol-dydd compensation proposal, including habitat creation and enhancement, will be informed following the collection of baseline data, further discussion within the TAG, and consultation with stakeholders.

The indicative works required in order to realise the habitat creation and enhancement proposals are outlined in section 4. Section 5 outlines the management principles that would be required in order to secure the long-term favourable development and condition of the compensation proposal at Cae Canol-dydd, and section 6 outlines the process of monitoring, assessment and review required to guide decisions on the development of the Cae Canol-dydd compensation proposal.

3.2 Project officer and steering group

As part of the Tre'r Gof SSSI compensation proposal, Horizon would be responsible for the long-term management of Cae Canol-dydd and would appoint a project officer, to be employed directly by Horizon or through a third party. A steering group would be established to make collective decisions about compensation works and management at Cae Canol-dydd and other sites as part of the Tre'r Gof SSSI compensation proposal. The steering group would comprise experts and stakeholders from Horizon, NRW and other interested parties, such as Talwrn Community Council. This project management structure would be defined as part of detailed design.

The project officer would have the following responsibilities:

- management of preparatory works and supervision of habitat creation and enhancement works at Cae Canol-dydd (section 4);
- oversight of site management at Cae Canol-dydd (see section 5);
- coordination of monitoring, assessment and review of progress (see section 6); and
- reporting to the steering group.

The above responsibilities would extend to all sites included in the Tre'r Gof SSSI compensation proposal.

3.3 Habitat creation and enhancement proposal

An overview of the habitat creation and enhancement proposals at Cae Canol-dydd is outlined in sections 3.3.1 and 3.3.2 and shown in figure 3-1. The approximate areas of habitat creation and enhancement proposed are summarised in table 3-1.

Table 3-1: Summary of areas of rich-fen habitat as part of the compensation proposal at Cae Canol-dydd

PROPOSAL	INDICATIVE AREA (HA)
Rich-fen proposed to be created	7.7
Rich-fen proposed to be enhanced	4.8
Total area of rich-fen within proposal	12.5

Throughout the proposed areas of habitat creation and enhancement, it is proposed to modify ground conditions so as to mimic or restore the hydroecology of natural fen systems, i.e. soligenous or (rheo-)topogenous wetland habitat supplied by calcareous groundwater overlying a nutrient-poor calcareous substrate. It is considered that these key hydrological and hydrogeological processes are present or can be created at Cae Canol-dydd and, with suitable vegetation establishment, rich-fen habitat can be created and enhanced. To support this, there is on-going work to address uncertainty and refine the conceptual understanding of the site.

The vegetation to be established within areas of habitat creation and enhancement would follow the pattern of rich-fen plant communities present within Caeau Talwrn SSSI and more intact rich-fen vegetation at Cae Canol-dydd, i.e.:

- alkaline fen around springs and other areas most influenced by groundwater;
- other rich-fen communities in drier or less strongly groundwater-influenced areas;
- topogenous rich-fen communities toward the bottom of the valley; and
- neutral grassland in the higher and driest areas.

The broad locations of plant communities proposed are indicated in the annotations to figure 3-1. Neutral grassland habitat creation is not included in the total areas provided for the compensation proposal, which focuses solely on fen habitat. Further detail on the planned location and extent of rich-fen plant communities would be provided as part of detailed design. Proposed methods of vegetation establishment are outlined in section 4.12.

3.3.1 Habitat creation

Rich-fen habitat creation is proposed for three locations within Cae Canol-dydd (figure 3-1):

- agriculturally improved pasture in the south west, to the west of the Afon Canol-dydd;
- agriculturally improved pasture in fields in the south east, to the east of the Afon Canol-dydd; and
- agriculturally improved pasture in the north-west.

The conceptual habitat creation proposals for each of these areas is outlined in table 3-2, and further investigations proposed to enable a more detailed design are also described.

3.3.2 Habitat enhancement

The enhancement of existing rich-fen habitat is proposed at two locations within Cae Canol-dydd (figure 3-1):

- rich-fen in fields in the valley head to the north; and
- rich-fen within Caeau Talwrn SSSI.

The proposed habitat enhancements largely aim to improve vegetation condition by active management. Based on the current understanding of Cae Canol-dydd (section 2), the proposed habitat enhancements are summarised in table 3-3, and further investigations to enable a more detailed design are also described.

3.4 Other nature conservation enhancements

As a large rich-fen site that would be managed for nature conservation, Cae Canol-dydd offers the potential for nature conservation measures in addition to habitat creation and enhancement:

- The situation of Cae Canol-dydd connecting isolated units of Caeau Talwrn SSSI, part of the Anglesey Fens SAC, provides an enhancement for this internationally important site, as the proposed habitat creation and enhancements would connect these units and extend fen habitat across much of the valley, improving ecological resilience and landscape connectivity.
- It is also proposed that the unit of Caeau Talwrn SSSI within Cae Canol-dydd be integrated with the management regime for Cae Canol-dydd (section 5). This would enhance the condition of the SSSI and facilitate the dispersal of species between areas.
- Further enhancement measures could include the introduction of threatened flora and fauna of rich-fens by Horizon or through collaboration with species recovery programmes run by third parties. Such work would be addressed during detailed design.

3.5 Public access enhancements

There is a public right of way (PRoW) across Cae Canol-dydd (figure 2-1), but access is currently difficult due to overgrown hedges between fields, deep ditches obstructing access across areas of pasture and wet conditions in existing fen habitat. As part of the compensation proposals,

public access to Cae Canol-dydd would be improved by the clearance of obstructions along the PRoW. Other potential benefits may be included, such as the construction of boardwalks and the installation of signage and interpretation boards to enable the public to understand the works being undertaken, and to appreciate the importance of fens for nature conservation and ecosystem service provision.

Table 3-2: Summary of habitat creation proposals at Cae Canol-dydd

LOCATION	BASELINE CONDITION	CONCEPTUAL HABITAT CREATION PROPOSAL	INVESTIGATIONS TO BE UNDERTAKEN	AREA OF RICH-FEN CREATION (HA)
South west	• Agriculturally improved and drained pasture on western valley slope. Adjacent to area of Caeau Talwrn SSSI, to the north within Cae Canol-dydd boundary. • Seepage zone along eastern valley slope at approximately 44m AOD	• Remove agricultural topsoil to expose nutrient-poor, calcareous subsoil. • Upper limit of rich-fen habitat creation 44m AOD, defined by seepage zone along valley slope. • Fen meadow to be created on valley slopes with topogenous communities to be created in valley bottom.	• Stratigraphy and calcium carbonate/nutrient-soil depth relationship incompletely understood. A soil investigation is being undertaken to understand these, and will inform detailed design, including topsoil removal, storage and re-landscaping design. • Hydrological regime not quantitatively understood, including groundwater levels and gradients, ditch volumes and flows, seasonal flooding levels, groundwater-surface water interactions etc. Hydrological monitoring is being undertaken to understand these, and will inform detailed design, including location of alkaline fen communities.	3.3

South east	• Agriculturally improved and drained pasture on eastern slope of valley. Adjacent to area of Caeau Talwrn SSSI, to the south of Cae Canol-dydd boundary. • Seepage zone along eastern valley slope at approximately 44m AOD	• Remove agricultural topsoil to expose nutrient-poor, calcareous subsoil. • Upper limit of rich-fen habitat creation 44m AOD, defined by seepage zone along valley slope. • Divert calcareous water from the eastern stream onto pasture, creating an artificial spring source. This may require a constructed wetland in case of nutrient contamination of the stream. • Alkaline fen to be created in areas flushed with water from stream, within mosaic of fen meadow. Topogenous communities to be created in valley bottom.	• Stratigraphy and calcium carbonate/nutrient-soil depth relationship incompletely understood. A soil investigation is being undertaken to understand these, and will inform detailed design, including topsoil removal, storage and landscaping design. • Hydrological regime not quantitatively understood, including groundwater levels and gradients, ditch volumes and flows, seasonal flooding levels, groundwater-surface water interactions etc. Hydrological monitoring is being undertaken to understand these, and would inform detailed design, including location of alkaline fen communities. • Further water quality sampling to understand nutrient levels in eastern stream. The size of the constructed wetland, if required, would need to be calculated and further data would need to be gathered to inform this.	2.4

North west	• Agriculturally improved pasture on valley slope to the north of Caeau Talwrn SSSI, with rush pasture and small areas of species-poor fen meadow in the south of the area. • Pasture drained by deep drains. • Marl known to be present in northern part of area, with extensive tufa deposits exposed in ditch cuttings.	• Remove agricultural topsoil to expose nutrient-poor, calcareous subsoil. • Modify drainage by use of small dams or plank weirs, and lower ground level to raise relative groundwater levels. Modification of drainage also to restore shallow groundwater flows from valley head to north, presently intercepted by ditches. • Establish alkaline fen on areas of strong groundwater influence, with fen-meadow in remaining area.	• Stratigraphy and calcium carbonate/nutrient-soil depth relationship incompletely understood. A soil investigation is being undertaken to understand these, and will inform detailed design, including topsoil removal, storage and landscaping design. • Hydrological regime not quantitatively understood, including groundwater levels and gradients, ditch volumes and flows, seasonal flooding levels, groundwater-surface water interactions etc. Hydrological monitoring is proposed to determine these, and would inform detailed design, including location of alkaline fen communities.	2.0

Table 3-3: Summary of habitat enhancement proposals at Cae Canol-dydd

LOCATION	BASELINE CONDITION	CONCEPTUAL HABITAT ENHANCEMENT PROPOSAL	INVESTIGATIONS TO BE UNDERTAKEN	AREA OF RICH-FEN ENHANCEMENT (HA)
Valley head	• Rich-fen, including alkaline fen, unmanaged or only occasionally grazed, with areas of alkaline	• Cutting and seeding of areas around existing alkaline fen	• Hydrological monitoring will gather data on water levels within the valley head but this	2.8

	fen reduced in extent due to lack of management.	vegetation to encourage its spread. • Restoration of grazing and integration with management of wider site to improve ecological resilience.	would not be immediately relevant to the proposed enhancements.	
Caeau Talwrn SSSI	• Rich-fen, including alkaline fen, with the latter unmanaged, dominated by large tussocks of black bog-rush.	• Cutting of tussocks to open up vegetation and restoration of grazing by cattle or other suitable livestock. • Integration with management of wider site to improve ecological resilience.	• No further investigations are being undertaken in this area.	2.0

Figure 3-1: Cae Canol-dydd compensation proposal plan

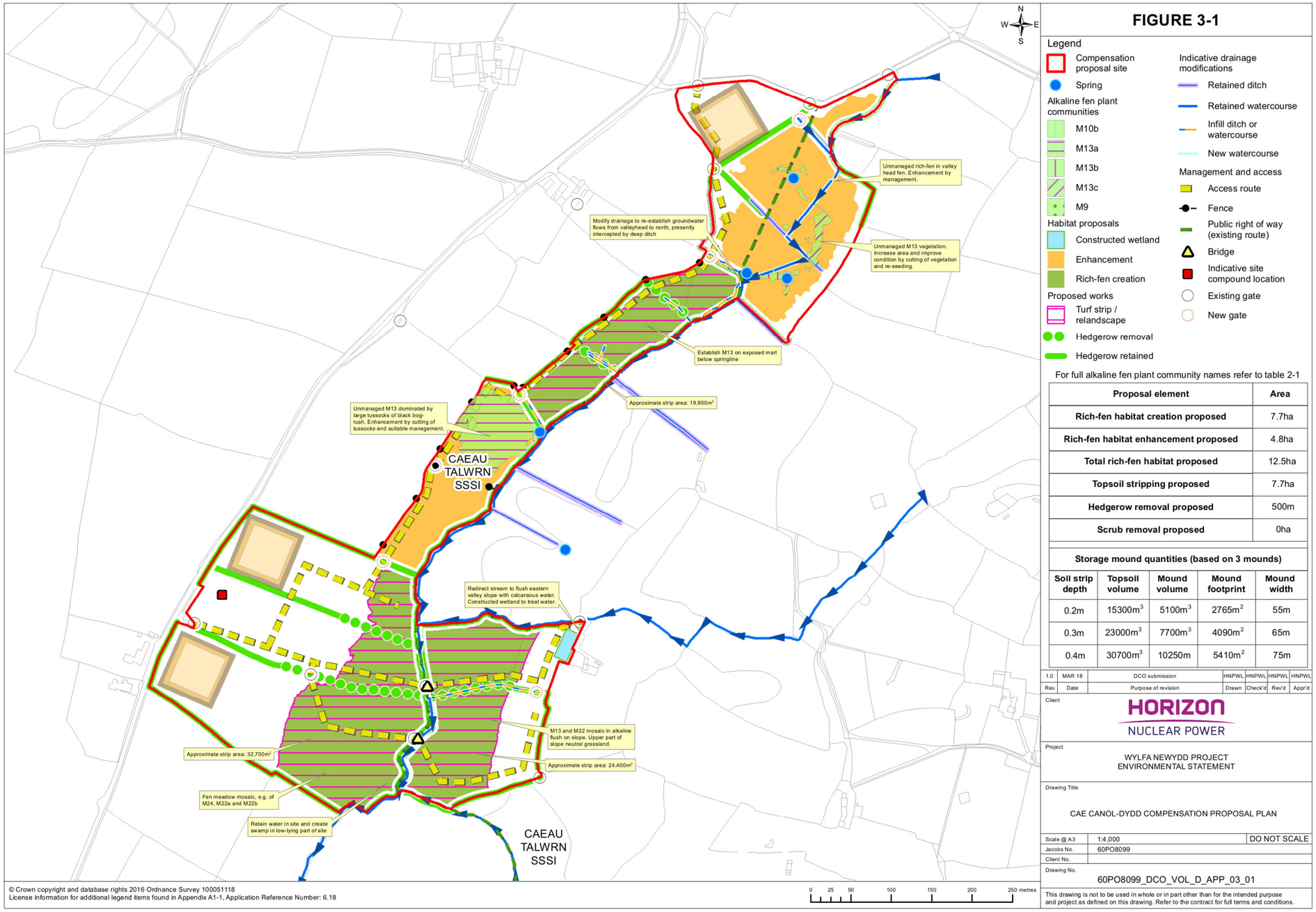


FIGURE 3-1

Legend

- Compensation proposal site
- Spring

Alkaline fen plant communities
- M10b
- M13a
- M13b
- M13c
- M9

Habitat proposals
- Constructed wetland
- Enhancement
- Rich-fen creation

Proposed works
- Turf strip / relandscape
- Hedgerow removal
- Hedgerow retained

Indicative drainage modifications
- Retained ditch
- Retained watercourse
- Infill ditch or watercourse
- New watercourse

Management and access
- Access route
- Fence
- Public right of way (existing route)
- Bridge
- Indicative site compound location
- Existing gate
- New gate

For full alkaline fen plant community names refer to table 2-1

Proposal element	Area
Rich-fen habitat creation proposed	7.7ha
Rich-fen habitat enhancement proposed	4.8ha
Total rich-fen habitat proposed	12.5ha
Topsoil stripping proposed	7.7ha
Hedgerow removal proposed	500m
Scrub removal proposed	0ha

Storage mound quantities (based on 3 mounds)

Soil strip depth	Topsoil volume	Mound volume	Mound footprint	Mound width
0.2m	15300m^3	5100m^3	2765m^2	55m
0.3m	23000m^3	7700m^3	4090m^2	65m
0.4m	30700m^3	10250m	5410m^2	75m

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
1.0	MAR 18	DCO submission	HNPWL	HNPWL	HNPWL	HNPWL

Client: HORIZON NUCLEAR POWER

Project: WYLFA NEWYDD PROJECT
ENVIRONMENTAL STATEMENT

Drawing Title: CAE CANOL-DYDD COMPENSATION PROPOSAL PLAN

Scale @ A3	1:4,000 DO NOT SCALE
Jacobs No.	60PO8099
Client No.	
Drawing No.	60PO8099_DCO_VOL_D_APP_03_01

This drawing is not to be used in whole or in part other than for the intended purpose and project as defined on this drawing. Refer to the contract for full terms and conditions.

4 Habitat creation and enhancement works

4.1 Introduction

This section outlines the works that would be required to realise the habitat creation and enhancement proposals at Cae Canol-dydd, outlined in section 3, including construction works. Quantities relating to these works are summarised in table 4-1.

In order to manage environmental risks during construction, works would adopt an 'adaptive management' approach, including e.g. the phasing of works with subsequent monitoring, allowing for any issues to be identified and resolved as and when they arose. This will follow the collection of detailed baseline information to inform design, and further consultation with stakeholders.

Table 4-1: Summary of works quantities as part of the compensation proposal at Cae Canol-dydd. Estimated spoil volume based on a uniform soil stripping depth of 0.3m.

WORKS ELEMENT	INDICATIVE QUANTITY
Topsoil stripping	7.7ha
Approximate topsoil volume	23,000m^3
Number of storage mounds	3
Volume of single storage mound	7,700m^3
Footprint of single storage mound based on maximum height of 2m	0.4ha
Hedgerow removal	500m

4.2 Preparation

The preparatory elements to the proposed habitat creation and enhancement works for Cae Canol-dydd are outlined in table 4-2, and would be undertaken in advance of the commencement of any works. The preparatory elements included in the compensation proposal for Cae Canol-dydd include soil investigations and hydrological monitoring. Details of these investigations are given separately as part of this document.

Table 4-2: Summary of key preparatory elements for work at Cae Canol-dydd

TASK	MAIN ELEMENTS
Consenting	• Proposed habitat creation and associated works to be consented under DCO for the Wylfa Newydd Project • NRW assent obtained for working within Caeau Talwrn SSSI

TASK	MAIN ELEMENTS
	• Flood Risk Activity Permits (FRP) and permits for working within or adjacent to drainage ditches will be secured prior to works commencing
Project structure	• Appoint a project officer • Establish a steering group • Establish arrangements with any third party delivery partner(s) • Define the management structure for the compensation proposal
Establish detailed baseline	• Ground investigations to provide detail of soils and geology • Hydrological monitoring, comprising installation of boreholes, piezometers, surface water monitoring and any other relevant installations • Hydrological data to be collected over at least one full hydrological cycle (one year)
Public access	• Identify temporary PRoW diversion for period of works • Identify new permanent route for PRoW across site • Identify public access enhancements as part of the proposal, e.g. board walks, interpretation boards
Detailed site design	• Detailed site design to be provided in accordance with the principles set out in the Landscape and Habitat Management Strategy (Application Reference Number: 8.16) • Detailed design to include route of temporary PRoW diversion • Detailed design to include new permanent PRoW route across site and public access enhancements • Detailed design to include adaptive management methods for construction • Detailed design to include drainage • Detailed design to include design of topsoil storage mounds • Detailed design to include site management scheme (section 5) • Define period during which work should take place, and produce detailed works plan and timeline • Detailed design to include assessment of health and safety, security, and environment risks, with risks designed out as far as possible, and controls identified for residual risks.
Identification of access measures	• Identification of safe access points for vehicles across site • Identification of construction no-go areas

TASK	MAIN ELEMENTS
	• Identification of construction compound location within site • Identification of locations for new access gates between fields • Structural assessment of bridges between western and eastern sides of site
Topsoil storage	• Identify areas on-site for storage of topsoil to be stripped during works, and prepare designs for topsoil storage mounds.
Identification of source for plant propagules	• Identification of source of green hay or similar for use in habitat creation scheme (e.g. adjacent SSSI, or another site) • Identification of nursery with capacity to propagate and provide key plant species for planting as part of habitat creation scheme
Procure groundworks contractor	• Appoint suitably experienced contractors for elements of works • Contractor scope to include identification of suitable plant and other equipment for undertaking works
Undertake preparatory site access	• Installation of health and safety, security and environment controls • Demarcate no-go areas for construction • Construct site compound in selected location • Works to bridges for vehicle access between west and east of site • Install infrastructure to support temporary footpath diversion

4.3 Construction methods

Construction of the compensation proposal at Cae Canol-dydd could have a number of adverse environmental effects which are assessed in Appendix D1-2 (Application Reference Number: 6.4.18) including the following:

- impacts to Caeau Talwrn SSSI, an Anglesey Fens SAC site;
- impacts to protected and notable species;
- spread of invasive non-native species;
- sediment impacts on and off-site during construction;
- increased off-site flood risk;
- nutrient mobilisation due to topsoil stripping;
- noise and air quality effects from construction traffic; and

- landscape impacts.

The provisions of the Main Power Station Site sub-Code of Construction Practice (CoCP) (Application Reference Number: 8.7), details controls for the above and any other risks identified, e.g. construction of settlement ponds for sediment control. An Environmental Clerk of Works would ensure the compliance with the provisions of the Main Power Station Site sub-CoCP.

As part of the Main Power Station Site sub-CoCP (Application Reference Number: 8.7), an adaptive management approach would be adopted, including but not limited to:

- phasing of works, with incremental changes to topsoil stripping, drainage and other works, over two seasons;
- monitoring on and off-site before, during and following works;
- adaptive management of water flows; and
- enhanced revegetation, for example by planting or using nursery crops.

The above approach would allow for any issues to be identified and resolved as and when they arise. In addition to mitigating potential impacts, an adaptive approach would enable a responsive approach to habitat creation and enhancement, ensuring greater success of the compensation proposal. The adaptive management design, including triggers for instigating measures and assessing their performance, would be provided as part of detailed design.

4.4 Access and management infrastructure

In order to facilitate the proposed works and subsequent management of the site, it is proposed that access and management infrastructure would be installed (figures 3-2 to 3-3). This is likely to include the following:

- fencing and gates, to be installed prior to any vegetation clearance works in order to exclude stock from works areas;
- a site compound, proposed to be sited on raised within the southern part of the site;
- replacement of or repairs to existing bridges over the Afon Canol-dydd in order to accommodate vehicles and livestock;
- temporary public right of way diversion, with supporting signage and infrastructure to ensure public safety during construction works; and
- any further fencing and gates, and infrastructure for corralling and watering livestock, proposed to be sited on higher ground to the west and north-west, within the site.

4.5 Hedgerow removal

Five lengths of hedgerow would need to be removed in order to facilitate the habitat creation works, with a total length of approximately 500m. Hedgerows proposed to be removed are shown on figures 3-2 and 3-3. Woody material resulting from hedgerow removal could be disposed of

by removal from site by contractor, or retained on site as habitat piles providing a wildlife enhancement. Proposals for the disposal of material would be provided as part of detailed design.

4.6 Topsoil stripping

As part of habitat creation works the removal of approximately 7.7ha of agriculturally modified topsoil is proposed in order to expose a nutrient-poor, calcium-rich mineral substrate for vegetation establishment, and to raise groundwater levels relative to the ground surface [RD4]. Areas for topsoil stripping are shown in figure 3-1. Indicative volumes of topsoil for removal based on indicative stripping depths are shown in table 4-3, although it is unlikely that stripping would be to a uniform depth. Additional landscaping may also be required as part of habitat creation, which would be provided as part of detailed design. All unused excavated topsoil removed would be retained on site in storage mounds (section 4.7). Excavated topsoil would be stored on site for up to three years and suitable uses for it identified.

Table 4-3: Summary of indicative estimated topsoil volumes for stripping at Cae Canol-dydd based on uniform stripping depths.

TOPSOIL STRIPPING DEPTH (M)	APPROXIMATE VOLUME (M^3)
0.2	15,300
0.3	23,000
0.4	30,700

4.7 Storage mounds

All topsoil stripped during the habitat creation construction works would be retained at Cae Canoldydd and reformed as storage mounds. Excavated topsoil would be stored on site for up to three years and suitable uses for it identified.

The mounds would be square-based, 2m high and have edges planed at 45°, and would be revegetated with a suitable grassland seed mix. Indicative locations and footprints of the storage mounds are shown in figure 3-1. Based on the topsoil stripping depths shown in table 4-3 and dividing the volume into three mounds then the indicative volumes, footprints and dimensions of the storage mounds required to accommodate the full volume of material are shown in table 4-4.

Table 4-4: Summary of individual storage mound quantities for stripping based on uniform stripping depths and storage in three mounds

TOPSOIL STRIPPING DEPTH (M)	APPROX. VOLUME OF SINGLE MOUND (M^3)	APPROX. FOOTPRINT OF SINGLE MOUND (M^2)	APPROX. WIDTH OF SINGLE MOUND (M)
0.2	5,100	2,750	55
0.3	7,700	4,100	65

TOPSOIL STRIPPING DEPTH (M)	APPROX. VOLUME OF SINGLE MOUND (M^3)	APPROX. FOOTPRINT OF SINGLE MOUND (M^2)	APPROX. WIDTH OF SINGLE MOUND (M)
0.4	10,250	5,400	75

These storage details are indicative and would subject to further assessment and mitigation as part of detailed design. This would take into consideration the existing hydroecological sensitivities of Cae Canol-dydd and implement mitigation in order to eliminate or reduce potential impacts from the mounds, such as sedimentation or nutrient enrichment.

4.8 Suspended sediment management

Throughout periods of topsoil stripping and until stripped areas become sufficiently revegetated, there would be management of suspended sediment washed from the site. Management would include the construction of temporary sediment settlement ponds. All options for controlling suspended sediment, including chemical dosing, would be assessed and are outlined within the Main Power Station Site sub-CoCP (Application Reference Number: 8.7), as part of the adaptive management approach. Any material arising from these treatments would be retained on site with the excavated topsoil, stored on site for up to three years and suitable uses for it identified.

4.9 Drainage modifications

As part of the proposed habitat creation and enhancement, existing drainage features at Cae Canol-dydd would be modified in order to create the hydrology necessary for proposed habitat to become established. Indicative drainage modifications are shown on figures 3-2 to 3-3.

Drainage modifications could include the obstruction of ditches by infilling or installation of plank weirs, with the purpose of increasing water retention and restoring shallow groundwater flows. Other drainage modifications may be required at the site boundary in order to eliminate impacts from altered hydrology to surrounding farm land. Modifications may include the installation of sheet piling to act as a cut-off wall to prevent flooding or the construction of bunds to prevent surface water flooding. Drainage modifications would incorporate structures enabling the management of water within site, such as removable plank weirs or right angled-bend pipes to enable to the manipulation of water levels, as part of the adaptive management approach.

A detailed design of drainage modifications would be based on the results of the hydrological monitoring. Features potentially of use for habitat creation such as bunds to retain water could detract small areas from the total areas provided as part of this compensation proposal (table 3-1); this would be provided as part of detailed design.

4.10 Constructed wetlands

Where drainage is proposed to be modified to provide a source of water to supply habitat creation areas, constructed wetlands may be required to treat water where excessive nutrient loads could

compromise habitat development. Indicative constructed wetlands are shown on figure 3-1, sited upstream of habitat creation areas. The need for constructed wetlands and their design would be based on water quality data collected as part of the hydrological monitoring at Cae Canol-dydd. The design and construction methods of constructed wetlands would be provided as part of detailed design.

4.11 Vegetation cutting

The north-eastern area of Caeau Talwrn SSSI within Cae Canol-dydd currently supports rank alkaline fen vegetation dominated by tussocks of black bog-rush and purple moor-grass (*Molinia caerulea*), with an area of approximately 0.7ha. The vegetation would be cut in order to facilitate management and regeneration.

Tussocks would be cut by a contractor using power tools (e.g. brush cutter or chainsaw), and material removed from the area, disposed of by removal from site or used to infill ditches. Complete clearance is not proposed, some tussocks supporting other vegetation (such as heather (*Calluna vulgaris*)) would be left *in situ*. This vegetation cutting work would be carried out under supervision of the project officer, in order to achieve the desired vegetation structure.

4.12 Vegetation establishment

As described in section 3.3, the vegetation to be established within the habitat creation and enhancement areas at Cae Canol-dydd would follow the pattern of rich-fen plant communities present within Caeau Talwrn SSSI. It is unlikely that valuable habitat would establish in the short-term through natural regeneration of vegetation, such as through a buried seed bank (in areas not stripped of topsoil) or natural dispersal [RD4]. It is therefore proposed to introduce plant propagules. This method would be used within all areas of habitat creation, and would also be undertaken in proposed enhancement areas to enrich existing rich-fen habitat. Indicative areas for introduction of propagules are shown in annotations to figures 3-2 and 3-3.

The introduction of propagules would be mainly through the spreading of seed via hay/litter collected from existing rich-fen vegetation, but may also be supplemented by planting of adult plants of ecologically important species, e.g. black bog-rush and great fen-sedge. A detailed plan for the inoculation of habitat creation and enhancement areas will be provided in detailed design, and would give consideration to multiple factors, including:

- the identification of suitable donor sites for hay/litter and other sources of propagules (e.g. Anglesey Fen SAC sites);
- the timing of the cutting of hay/litter, which according to species phenology would affect its seed composition;
- supplementary seed collection of ecologically important species, or species unlikely to be transferrable by hay;
- any requirement for drying/storage of material, depending on the works programme and availability of material;

- any requirement for *ex situ* propagation and cultivation of species, with estimates of quantities and an identification of suitable nurseries to undertake the work; and
- control of biosecurity risks in transporting material, e.g. presence of invasive non-native species in donor sites.

All areas where seed would be introduced would be monitored by fixed plots to determine the efficacy of the treatments applied, with comparable control plots (section 6).

4.13 Works timing

The timing, including date of commencement, of the works would be provided in detailed design, and would seek to minimise wider environmental effects to air quality, ecology, landscape, and noise receptors. The current proposed timing of works at Cae Canol-dydd is outlined below.

Construction works would likely be phased over a 12 to 24 month period encompassing two drier periods for earthworks. This phased approach would reduce the increase in sediment and nutrient loads which will mobilise as a result of the earthworks. Vegetation clearance, such as of hedgerows and scrub, would be undertaken in the intervening winter in order to avoid the breeding bird season and any protected species constraints. Undertaking earthworks during spring-summer times would coincide with the active periods of protected animal species (e.g. reptiles, water vole (*Arvicola amphibius*)) that might be present on site, allowing species to actively move from the site or, if required, be translocated from the working area.

4.14 Public access

Works would be undertaken to enhance public access to Cae Canol-dydd, including creating gaps in boundaries to permit access by the public along the existing PRoW. Public access infrastructure would also be installed following the completion of works, e.g. signage and boardwalks. The design of public access infrastructure would be provided in detailed design.

5 Habitat management proposals

5.1 Introduction

This section outlines the management proposed in order to secure the long-term favourable development and condition of Cae Canol-dydd following the completion of all habitat works described in section 4.

5.2 Management scheme

Ongoing management of Cae Canol-dydd would be carried out in accordance with management schemes to be submitted to and approved by the IACC. The management schemes will be prepared in accordance with the management principles in section 7 of the Landscape and Habitat Management Strategy (Application Reference Number: 8.16). These measures will be secured through the DCO.

The management scheme would set out the objectives for adaptive management, site management, management methods, management programme and any other relevant information. The overall objective would be to deliver the establishment/enhancement and maintenance of rich-fen habitat to offset potential adverse effects at Tre'r Gof SSSI. The management scheme would include a programme of on-going monitoring, assessment and review (section 6), and would be periodically reviewed and updated where necessary, initially on an annual cycle but this would be extended as habitats become established.

Adaptive management and initial management of habitat creation and enhancement areas are outlined below. These management activities would operate until the first review of the management scheme. Indicative management methods are outlined below.

5.2.1 Adaptive management

During construction, a process of adaptive management would be employed to ensure the success of habitat creation and enhancement proposal at Cae Canol-dydd and avoid adverse effects to Caeau Talwrn SSSI or neighbouring farmland. The management scheme would include adaptive management measures to control any adverse effects that could arise following completion of the works. This would be informed by ongoing hydrological monitoring (section 6.2) allowing any issues identified by Horizon or its contractors to be dealt with as and when they arise. Adaptive management would be addressed as part of the Main Power Station Site sub-CoCP (Application Reference Number: 8.7), and the Landscape and Habitat Management Strategy (Application Reference Number: 8.16).

5.2.2 Initial management of habitat creation areas

The management scheme would provide detailed proposals for the rich-fen habitat creation areas. Habitat creation areas would be managed differently from the rest of site during habitat establishment, with stock excluded for at least the first five years to prevent grazing. Management infrastructure to support this would be installed as part of construction works (section 4.4). Any

management that may be required during this period would be identified by the project officer and undertaken on an *ad hoc* basis, (e.g. control of weeds or other species by cutting). The point at which habitat creation areas would be incorporated with the wider site grazing management would be determined by the monitoring, assessment and review process (section 6).

5.2.3 Initial management of habitat enhancement areas

A number of rich-fen habitat enhancement proposals outlined in section 3.3.2 would be undertaken as part of the works outlined in section 4, including cutting of rank vegetation within Caeau Talwrn SSSI. Further work would be undertaken to enhance existing rich-fen habitat as part of management, and that would be detailed in the site management scheme, including:

- manual cutting and raking of vegetation to improve condition of coarser vegetation;
- introduction of hay or other plant propagules to areas in order to diversify existing vegetation; and
- instigation of grazing management.

Indicative areas for such works are shown in the annotations to figure 3-1.

5.3 Management methods

5.3.1 Grazing and cropping

The main long-term management method at Cae Canol-dydd would be low-intensity grazing by suitable livestock, such as ponies or cattle. Options for stocking and other grazing management would be detailed in the site management scheme. The following are indicative stocking densities (1 livestock unit (LU) = 1 cow; 0.15 = 1 sheep) [RD6]:

- fen and swamp 0.02LU/ha/year;
- purple moor-grass grassland 0.25LU/ha/year;
- rush pasture 0.4LU/ha/year; and
- semi-natural grassland 0.3-0.5LU/ha/year.

Options for grazing would give consideration to numerous factors, including the type of stock and their experience of grazing similar habitats. Management infrastructure to support grazing would be installed as part of construction works (section 4.4).

Other vegetation cropping methods could include the mechanical cutting of vegetation and removal of litter. This and other cropping methods would be set out in the site management scheme.

5.3.2 Water management

The site management scheme would set out a water management scheme for Cae Canol-dydd, to include targets for water levels and flows across site and their management in order to support key vegetation types, and a programme of maintenance of water infrastructure. The water

management scheme would also detail controls for ensuring there would be no hydrological effects to Caeau Talwrn SSSI, neighbouring farmland or other receptors resulting from the works (see Appendix D1-2. Application Reference Number: 6.4.18).

5.3.3 Scrub and hedgerow management

Scrub would be managed as part of routine site management and removed where it encroaches on important herbaceous communities. Hedgerows would be laid or cut back on a periodic basis.

5.3.4 Routine monitoring

As part of the management of Cae Canol-dydd, management issues would be identified as and when they arose, (e.g. over- or under-grazing, weed infestation), and appropriate corrective measures would be instigated. This would form a separate management activity from the monitoring outlined in section 6.

5.3.5 Public access

The management scheme would also make provision for the maintenance of any public access infrastructure at Cae Canol-dydd (section 4.14), such as repairs to signage or paths.

6 Monitoring, assessment and review

6.1 Introduction

Monitoring would be required to determine the success of the habitat creation and enhancement proposal and of subsequent management at Cae Canol-dydd, and to inform future management decisions. The hydrological and habitat monitoring, assessment, and review process to be delivered as part of the compensation proposal is outlined below; the programme for this process would be detailed in the site management scheme (section 5.2). Horizon and its contractors would be responsible for all monitoring, assessment and review undertaken as part of the Tre'r Gof SSSI compensation proposal.

6.2 Hydrological monitoring and assessment

The hydrological monitoring proposed as part of the Cae Canol-dydd compensation proposal has been designed in order that monitoring can continue following the completion of all works. This continuity is key to assessing the success of habitat creation and enhancement works in creating or restoring the target hydrological conditions at Cae Canol-dydd. Ongoing hydrological monitoring would also be required to inform any adaptive management that might be required.

As part of detailed design, hydrological assessment criteria to measure the success of the works would be provided. This may include hydrological indicators covering key parameters, such as water levels and water quality parameters, including pH, calcium and nutrient levels. Monitored quantities would be assessed against reference data (e.g. [RD5], [RD6]).

6.3 Habitat monitoring and assessment

As part of the Cae Canol-dydd compensation proposal, the development of vegetation in both habitat creation and enhancement areas would be monitored in order to assess the success of habitat creation and enhancement works in creating or restoring the target plant communities at Cae Canol-dydd.

As part of detailed design, a habitat monitoring and assessment plan would be provided. Habitat monitoring would be by means of fixed vegetation plots recorded before and after any works on an annual basis, and designed to enable the assessment of the success of all vegetation treatments, including control treatments, and to enable correlation with results obtained by hydrological monitoring. High resolution aerial imagery and LiDAR would also be collected to provide additional data. The assessment criteria would include positive and negative indicators covering key parameters, such as presence and cover of ecologically important (e.g. black bog-rush, brown mosses) or undesirable plants (e.g. those indicative of higher nutrient status).

6.4 Review

Data collected as part of monitoring and the results of assessments would be periodically reviewed by the project officer and reported to the steering group. Based on these results decisions would be taken on the on-going management needs at Cae Canol-dydd.

7 References

REF. NO.	REFERENCE
[RD1]	Department for Energy and Climate Change (2011). *National Policy Statement for Nuclear Power Generation (EN-6)*.
[RD2]	Department for Energy and Climate Change (2011). *National Policy Statement for Nuclear Power Generation (EN-6).*
[RD3]	Rodwell, J. S. (Ed.), 1991-2000. British Plant Communities. Cambridge: CUP.
[RD4]	McBride, A., Diack, I., Droy, N., Hamill, B. Jones, P., Schutten, P., Skinner, A. & Street, M. (Eds.) (2011). *The Fen Management Handbook*. Scottish Natural Heritage: Perth.
[RD5]	Wheeler, B.D., Gowing, D.J.G., Shaw, S.C., Mountford, J.O., Money, R.P. (2004). *Ecohydrological Guidelines for Lowland Wetland Plant Communities* (Eds. A.W. Brooks, P.V. Jose, and M.I. Whiteman,). Environment Agency (Anglian Region)
[RD6]	UKTAG, 2012. Technical report on groundwater dependent terrestrial ecosystem (GWDTE) threshold values., s.l.: s.n.

HORIZON NUCLEAR POWER

ENERGY WORKING FOR BRITAIN

TRE'R GOF SSSI COMPENSATION PROPOSAL VOLUME II

Outline habitat creation, enhancement and management proposal – Cors Gwawr

DCRM Ref Number: WN0902-JAC-PAC-REP-00058

Revision: 1.0

Additional Requirements or Controls			
LISTED READERS ONLY		LEGALLY PRIVILEGED	

Comments:

Contents

1. Introduction

1.1 Background

Horizon Nuclear Power Wylfa Ltd. (Horizon) is planning to develop a new nuclear power station on the north coat of Anglesey. Land adjacent to the Existing Power Station at Wylfa Head, west of Cemaes on the north coast of Anglesey, is identified by the UK Government in the *Overarching National Policy Statement for Energy (EN-1)* (NPS EN-1) [RD1] and *National Policy Statement for Nuclear Power Generation (EN-6)* (NPS EN-6) [RD2] as potentially suitable for the construction of a new nuclear power station. Horizon proposes to construct and operate a new nuclear power station, known as Wylfa Newydd, on this land and adjacent land. As part of the Wylfa Newydd Project, Horizon has committed to delivering a compensation proposal, in order to offset a potential adverse effect on Tre'r Gof Site of Special Scientific Interest (SSSI), which will create new areas of rich-fen habitat and enhance areas of existing rich-fen habitat at three sites on Anglesey.

The Tre'r Gof SSSI compensation proposal has been developed by Horizon through discussion at a Technical Advisory Group (TAG) comprising representatives from Horizon, the Isle of Anglesey County Council and Natural Resources Wales (NRW). This proposal has been developed in line with the principles set out in the Landscape and Habitat Management Strategy for the Wylfa Newydd Project (Application Reference Number 8.16). Further background to the development of the Tre'r Gof SSSI compensation proposal and justification for the selection of the sites is provided in Volume I of this document (Appendix D9-23. SSSI Compensation Strategy - Volume I. Application Reference Number: 6.4.56).

1.2 Purpose of this report

The purpose of this report is to outline the creation, enhancement, and long-term management of habitat proposed at Cors Gwawr, Talwrn, Anglesey (figure 1-1), as part of the Tre'r Gof SSSI compensation proposal.

This outline proposal for Cors Gwawr complements that for Cae Canol-dydd and Ty du proposed as part of the Tre'r Gof SSSI compensation proposal. Also accompanying this proposal are soil and hydrological investigations at the proposed compensation sites, including Cors Gwawr, which would inform the final detailed design of the Tre'r Gof SSSI compensation proposal. Detailed design information will be prepared in accordance with the habitat and landscape principles relating to the Ecological Compensation Sites in the Landscape and Habitat Management Strategy (Application Reference Number: 8.16) and submitted to the IACC for approval. Development of the Ecological Compensation Sites will be undertaken in accordance with the approved design details. These measures will be secured through the DCO. The proposals set out in the Tre'r Gof SSSI Compensation Strategy Volume II have been assessed within the Ecological Compensation Sites: Assessment of Environmental Effects in Appendix D1-2 (Application Reference Number: 6.4.18).

1.3 Overview of compensation proposal at Cors Gwawr

The compensation proposal at Cors Gwawr in terms of areas of rich-fen habitat creation and enhancement is summarised in table 1-1.

Table 1-1: Cors Gwawr compensation proposal summary

PROPOSAL ELEMENT	INDICATIVE AREA (HA)
Potential area of rich-fen proposed to be created	6.1
Potential area of rich-fen proposed to be enhanced	8.2
Total potential area of rich-fen within proposal	14.3
Total site area	20.5

Benefits of the compensation proposal at Cors Gwawr in addition to habitat creation and enhancement would also include:

- significant extension of Cors Bodeilio SSSI, an Anglesey Fens Special Area of Conservation (SAC) site, expanding the site into its natural headwater valley, improving ecological resilience and landscape connectivity;
- potential for conservation of threatened flora and fauna of rich-fens through species introductions or recovery projects; and
- public access and interpretation enhancements.

1.4 Consultation on additional land

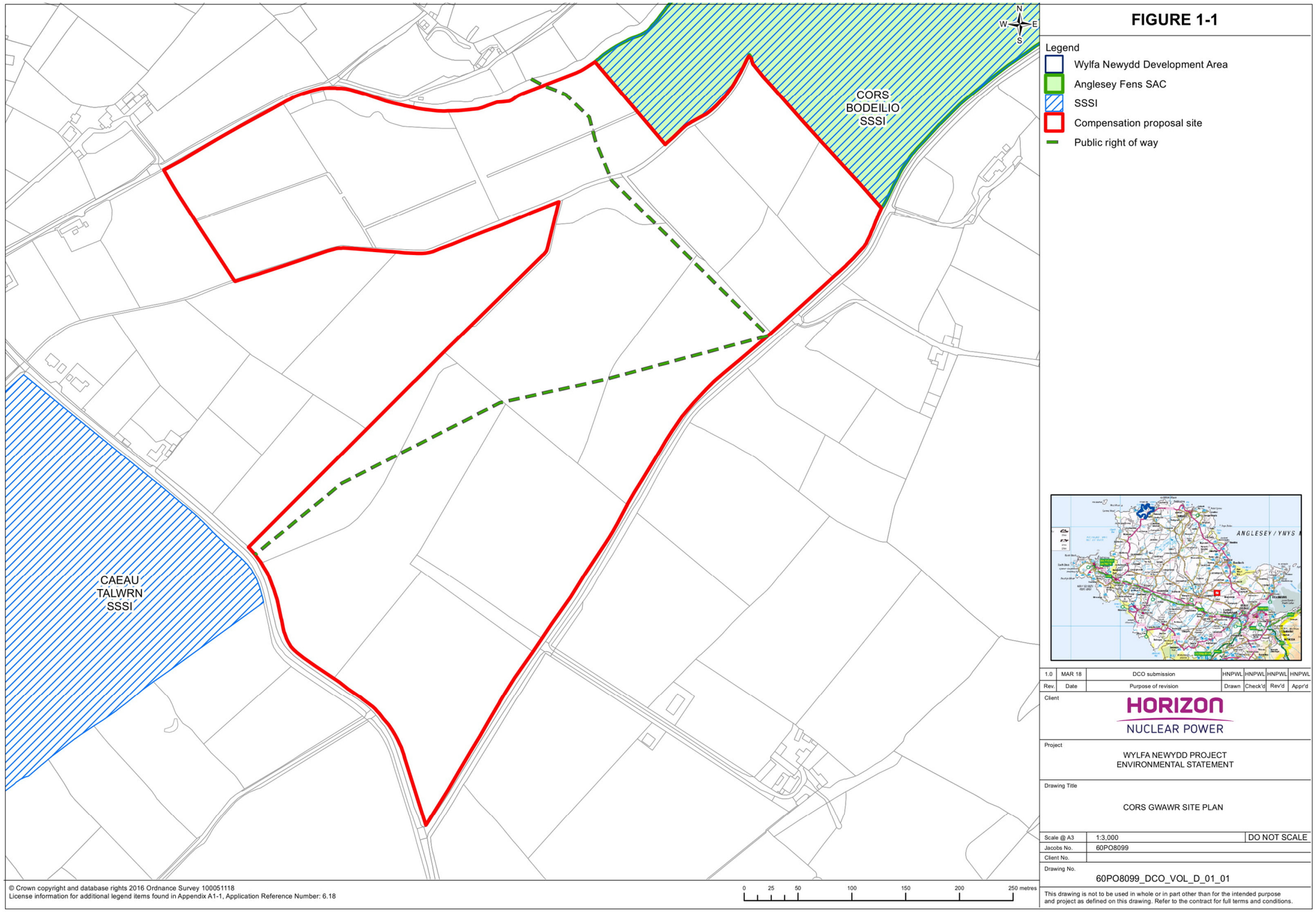
In February 2018, Horizon undertook a consultation on additional land that had not been consulted on previously, which included Cors Gwawr. Details of this consultation are provided in chapter B9 Introduction to the topics (Application Reference Number: 6.2.9).

1.5 Report outline

This report is structured as follows:

- section 2 provides baseline information on the topography, geology and soils, hydrology and hydrogeology and ecology of Cors Gwawr;
- section 3 outlines the compensation proposal for Cors Gwawr;
- section 4 outlines the works that would be required to deliver the proposal at Cors Gwawr;
- section 5 outlines the management that would be required in order to secure the long-term favourable development and condition of Cors Gwawr; and
- section 6 outlines the process of monitoring, assessment and review required to guide decisions on the development of Cors Gwawr.

Figure 1-1: Cors Gwawr site plan



2. Summary of baseline conditions

2.1 Site description

Cors Gwawr is situated to the south-east of the village of Talwrn in south-eastern Anglesey (SH 4943 7671; figure 1-1), and has an area of 20.5ha.

Cors Gwawr borders Cors Bodeilio SSSI to the north-east, with the northern area of site contiguous with Bodeilio Common, an area of open access land included in Cors Bodeilio SSSI. Cors Bodeilio SSSI supports internationally important fen habitat, and is part of the Corsydd Môn / Anglesey Fens SAC. Part of Cors Bodeilio SSSI is also a National Nature Reserve (NNR). Caeau Talwrn SSSI lies approximately 30m to the west of Cors Gwawr, separated by the Talwrn to Ceint road. Two public rights of way cross Cors Gwawr (figure 1-1).

A summary of the baseline conditions at Cors Gwawr is provided below and a hydroecological conceptual model of the site is provided as a synthesis of current information. Further details are provided in Volume I of this document, (Appendix D9-23. Application Reference Number: 6.4.56).

2.2 Topography

Cors Gwawr lies at the head of a shallow valley, open to the north-east and enclosed by higher ground to the north, east, south and south-west, with the valley sloping gently downwards towards the north-east. The high ground along the west is projected north-east into the valley as two low elongated hills, creating three sub-valleys which extend towards the centre of site. A steep escarpment runs along the northern boundary of the site.

The baseline topography of Cors Gwawr is shown in figure 2-1, the result of a light distancing and ranging (LiDAR) survey of Cors Gwawr undertaken in 2016.

2.3 Geology and soils

British Geological Survey (BGS) 1:50,000 bedrock mapping shows the majority of Cors Gwawr to be underlain by the Clwyd Limestone Group, i.e. limestone with interbedded sandstone. The escarpment along the northern boundary of site is believed to be of limestone belonging to this group. The entire eastern portion of the site is underlain by schist, quartzite and pillow lavas belonging to the Gwna Group. The surface expression of the unconformity between these two bedrock groups runs south-west to north-east, along the south-western valley and the eastern area of site.

BGS 1:50,000 mapping shows a layer of glacial till covering the bedrock across the whole of Cors Gwawr, with alluvium overlying the bottom of the valley in the north, extending across part of the central area of site, across the lower part of the north-east area of site and up the south-western valley. While soil investigations have been limited at Cors Gwawr, results of soil coring and observations of ditch sections along the slopes of the valley in the north and east, and the valley head in the south-west, are consistent with the presence of glacial till across these areas,

contrasting with heavier soils toward the bottom of the valley. The thickness of the till across the site is not known.

Ground investigations to date have found that Cors Gwawr is predominantly underlain by mineral soils, comprising loams and clays lying over a coarse-grained sand layer at a depth of approximately 0.4m which appeared to comprise calcite. A shallow peat deposit is present in the northeast of Cors Gwawr, adjacent to Cors Bodeilio SSSI, to a depth of approximately 0.2m. This peat deposit appeared to be underlain by similar soils to those seen elsewhere on site.

2.4 Hydrology and hydrogeology

Inflows into Cors Gwawr are interpreted to be from surface water runoff from the surrounding catchment, from groundwater, and from direct rainfall. Hydrological features of the site are shown in figure 2-2.

All or most drainage ditches receive drainage from within the site boundary as opposed to flowing into it. The main watercourse originates along the site's western border, flows northeast through the centre of the valley, and exits the site via its north-eastern corner. A complex network of drainage ditches discharges into this watercourse from north and south, which also flow in a north-easterly direction. There is a ditch in the south-west of Cors Gwawr that begins at the site boundary, with a culvert or a similar structure which may allow drainage from the road immediately to the west; this contribution from outside of site is unknown.

There is a spring at the head of a drainage ditch within the northern area of Cors Gwawr which discharges into this drainage ditch. A spring is also present within pasture at the head of the valley in the south-west of site, including an area of approximately 1m^2 comprising a tufa-forming springhead. There are drains immediately to the south, north and north-west of this spring, the former draining the up-gradient area of pasture via a pipe. There appear to be areas of seepage on the opposite slope of the valley, and the scrub to the north of this may conceal a further spring. There are also seepage areas around the periphery of site to the north and south.

Surface water and soil sampling conducted to date have found that neutral to alkaline conditions prevail across most of the site (maximum pH of 8.3) with high concentrations of calcium and bicarbonate, and high electrical conductivity in water samples. The only acidic soil samples collected were from the peat in the north-east of site.

No source protection zones (SPZ) are present on Anglesey.

2.5 Ecology

During site investigations the northern part of Cors Gwawr was found to have been drained and converted to improved pasture. In contrast, much of the southern part retained semi-natural rich-fen vegetation. However, its quality had reduced in places due to lack of management, drainage and other agricultural operations.

A plan of the baseline vegetation of Cors Gwawr is shown in figure 2-3 and a complete list of plant communities recorded is provided in table 2-1. The existing rich-fen habitat supports the following characteristic rich-fen plant communities [RD3]:

- M13 *Schoenus nigricans-Juncus subnodulosus* mire;
- M22 *Juncus subnodulosus-Cirsium palustre* fen meadow; and
- M24 *Molinia caerulea-Cirsium dissectum* fen meadow.

Cors Gwawr supports a suite of characteristic rich-fen vascular plant species, including black bog-rush (*Schoenus nigricans*); dioecious sedge (*Carex dioica*); fen fragrant orchid (*Gymnadenia densiflora*); fen pondweed (*Potamogeton coloratus*); few-flowered spike-rush (*Eleocharis quinqueflora*); grass-of-Parnassus (*Parnassia palustris*); great fen-sedge (*Cladium mariscus*); greater spearwort (*Ranunculus lingua*); lesser water-plantain (*Baldellia ranunculoides*); long-stalked yellow sedge (*Carex lepidocarpa*); marsh helleborine (*Epipactis palustris*); and parsley water-dropwort (*Oenanthe lachenalii*). A full species list and results of quadrat sampling at Cors Gwawr are provided in Volume I (Appendix D9-23. Application Reference Number: 6.4.56).

Table 2-1: Plant communities recorded from Cors Gwawr

PLANT COMMUNITY
A9 *Potamogeton natans* community
Carex disticha vegetation
Damp semi-improved grassland
Dense scrub
Improved grassland
Juncus articulatus vegetation
Juncus inflexus-dominated vegetation
M9 *Carex rostrata-Calliergon cuspidatum/giganteum* mire
M10b *Carex dioica-Pinguicula vulgaris* mire, *Briza media-Primula farinosa* sub-community
M13a *Schoenus nigricans-Juncus subnodulosus* mire, *Festuca rubra-Juncus acutiflorus* sub-community
M13b *Schoenus nigricans-Juncus subnodulosus* mire, *Briza media-Pinguicula vulgaris* sub-community
M13c *Schoenus nigricans-Juncus subnodulosus* mire, *Caltha palustris-Galium uliginosum* sub-community
M22 swampy variant
M22a *Juncus subnodulosus-Cirsium palustre* fen meadow, typical sub-community
M22b *Juncus subnodulosus-Cirsium palustre* fen meadow, *Briza media-Trifolium* spp. sub-community
M23a *Juncus acutiflorus/effusus-Galium palustre* rush pasture, *Juncus acutiflorus* sub-community
M23b *Juncus acutiflorus/effusus-Galium palustre* rush pasture, *Juncus effusus* sub-community
M24 *Molinia caerulea-Cirsium dissectum* fen meadow

PLANT COMMUNITY
M24b *Molinia caerulea-Cirsium dissectum* fen meadow, typical sub-community
M27 *Filipendula ulmaria-Angelica sylvestris* mire
M27a *Filipendula ulmaria-Angelica sylvestris* mire, *Rumex acetosa-Valeriana officinalis* sub-community
M27c *Filipendula ulmaria-Angelica sylvestris* mire, *Juncus effusus-Holcus lanatus* sub-community
MG5a *Cynosurus cristatus-Centaurea nigra* grassland, *Lathyrus pratensis* sub-community
MG5c *Cynosurus cristatus-Centaurea nigra* grassland, *Danthonia decumbens* sub-community
MG6 *Cynosurus cristatus-Lolium perenne* grassland
MG6a *Cynosurus cristatus-Lolium perenne* grassland, typical sub-community
MG6b *Cynosurus cristatus-Lolium perenne* grassland, *Anthoxanthum odoratum* sub-community
MG7 *Lolium perenne* leys and related grasslands
MG8 *Cynosurus cristatus-Caltha palustris* grassland
MG10 *Holcus lanatus-Juncus effusus* rush pasture
MG10a *Holcus lanatus-Juncus-effusus* rush pasture, typical sub-community
MG10b *Holcus lanatus-Juncus-effusus* rush pasture, *Juncus inflexus* sub-community
MG11 *Festuca rubra-Agrostis stolonifera-Potentilla anserina* grassland
MG13 *Agrostis stolonifera-Alopecurus geniculatus* grassland
OV24 *Urtica dioica-Galium aparine* community
OV25 *Urtica dioica-Cirsium arvense* community
OV28b *Agrostis stolonifera-Ranunculus repens* community, *Poa annua-Polygonum aviculare* sub-community
S2a *Cladium mariscus* swamp and sedge-beds, *Cladium mariscus* sub-community
S4a *Phragmites australis* swamp and reed-beds, *Phragmites australis* sub-community
S10 *Equisetum fluviatile* swamp
S10a *Equisetum fluviatile* swamp, *Equisetum fluviatile* sub-community
S10b *Equisetum fluviatile* swamp, *Carex rostrata*-sub-community
S12 *Typha latifolia* swamp
S14a *Sparganium erectum* swamp, *Sparganium erectum* sub-community
S14b *Sparganium erectum* swamp, *Mentha aquatica* sub-community
S19 *Eleocharis palustris* swamp
S22 *Glyceria fluitans* water-margin vegetation
S22a *Glyceria fluitans* water-margin vegetation, *Glyceria fluitans* sub-community
S23 Other water-margin vegetation
Species-poor *Juncus acutiflorus*

PLANT COMMUNITY
W1 *Salix cinerea-Galium palustre* woodland
W23 *Ulex europaeus-Rubus fruticosus* scrub
W24 *Rubus fruticosus-Holcus lanatus* underscrub
Willow scrub
Woodland

2.6 Current conceptual understanding

The current conceptual understanding of the hydroecology of Cors Gwawr is based on the limited hydrological and hydrogeological information collected to date and summarised above.

The surface water and soil chemistry of Cors Gwawr appears to be neutral to alkaline and calcium carbonate-rich across the site. This is indicated by the vegetation, water quality and soil samples (albeit limited in number and frequency of sampling), presence of calcite along the faces of almost all the ditches across site and the tufa-forming springhead in the valley to the south-west. Only in the north-east of the site do soil conditions become more acidic where there is a shallow peat deposit.

The vegetation of much of Cors Gwawr appears to indicate that groundwater plays a key role in its hydrological supply, and that this supply is constant and calcareous, with seepage zones along the slopes of the valleys and springs emerging at the heads of the northern and south-western valleys. In the north, the foot of the limestone escarpment along the northern boundary appears to mark a seepage zone at approximately 32.25m AOD, where there is a transition to rush (*Juncus*)-dominated vegetation, extending west beyond the site boundary up to the valley head. This elevation coincides with the upper limit of soligenous rich-fen vegetation within Cors Bodeilio SSSI to the north-east and approximately with the elevation of the spring in the south-western valley, and extends south-west to north-east across the eastern valley slope, below which is also vegetation indicative of groundwater influence. Given this consistency, this elevation may therefore indicate the limit of groundwater inflow across the site.

The elevations of the two springs within Cors Gwawr coincide with the upper limit of alluvium shown by the BGS 1:50,000 mapping, and they could therefore be interpreted as representing contact zones between bedrock or till and the less permeable alluvial soils in the valley bottoms, or where the groundwater level meets the ground surface. However, the south-western valley is also crossed by the unconformity between the Clwyd Limestone Group and the Gwna Group, and this spring could instead represent a local groundwater upwelling along this boundary, perhaps where the till is thinner. Across the site it is uncertain whether there is hydraulic connectivity between the till and bedrock, i.e. whether the site is supplied by an essentially superficial system or could be dependent on deeper groundwater.

The hydrology of the valley bottom in the north and north-east appears to be more surface water-driven, with water at or above the surface throughout the year and with deep winter flooding. Evidence of flooding is anecdotal, based on infrequent site visits, although the site is identified by

NRW as being at high risk of surface water flooding, with a risk of deep ponding throughout the site, particularly in the northeast. This conclusion is consistent with the presence of impermeable alluvial or clay soils across this area, increasing surface water retention and limiting groundwater influence/recharge. Peat has formed across part of this area, and extends north-eastwards across alluvium underlying Cors Bodeilio.

The above outline is consistent with the functioning of other sites within the Anglesey Fens SAC described as rheo-topogenous, including Cors Bodeilio SSSI [RD4]. These fens are found in shallow valleys characterised by calcareous groundwater emerging along seepage zones and at springs around the periphery, supporting soligenous rich-fen vegetation. At such sites groundwater emerging at the periphery is retained in the valley bottom by an aquitard (e.g. marl), supporting topogenous, peat-forming vegetation.

The conceptual model outlined above is preliminary, based on the limited hydrological data collected, and will be refined once further monitoring data have been collected.

Figure 2-1: Cors Gwawr baseline topography plan

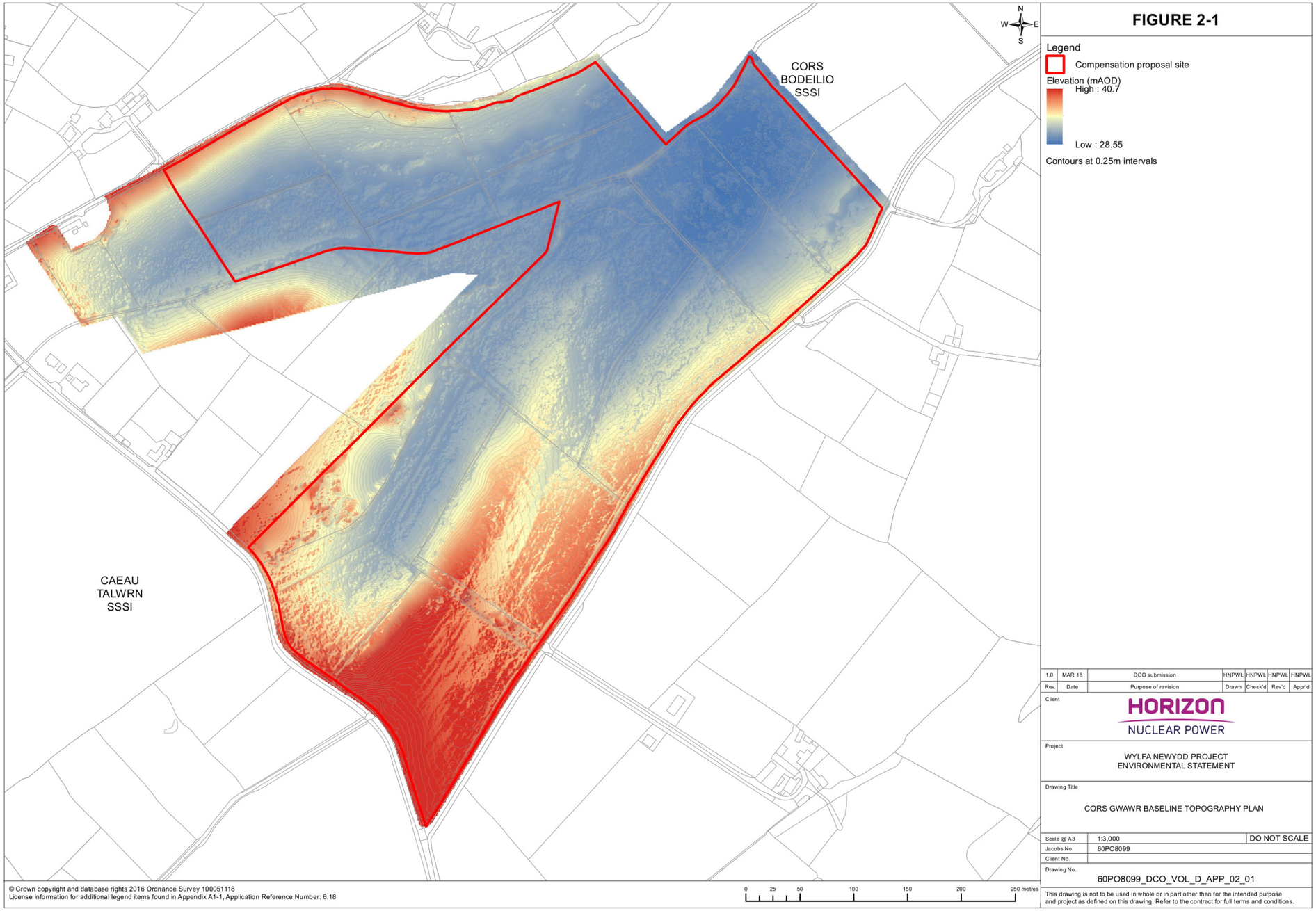


Figure 2-2: Cors Gwawr baseline hydrological and hydrogeological features plan

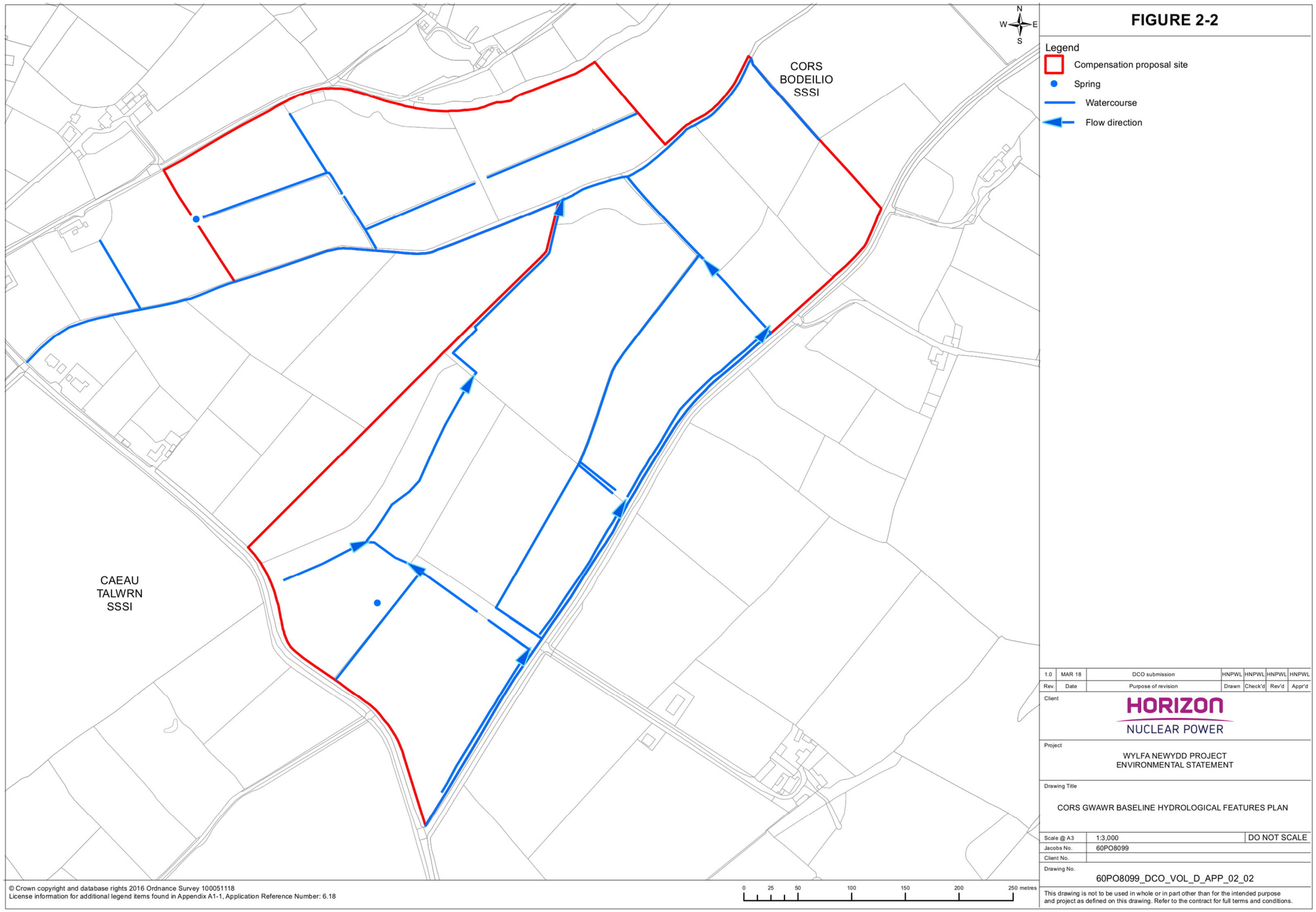
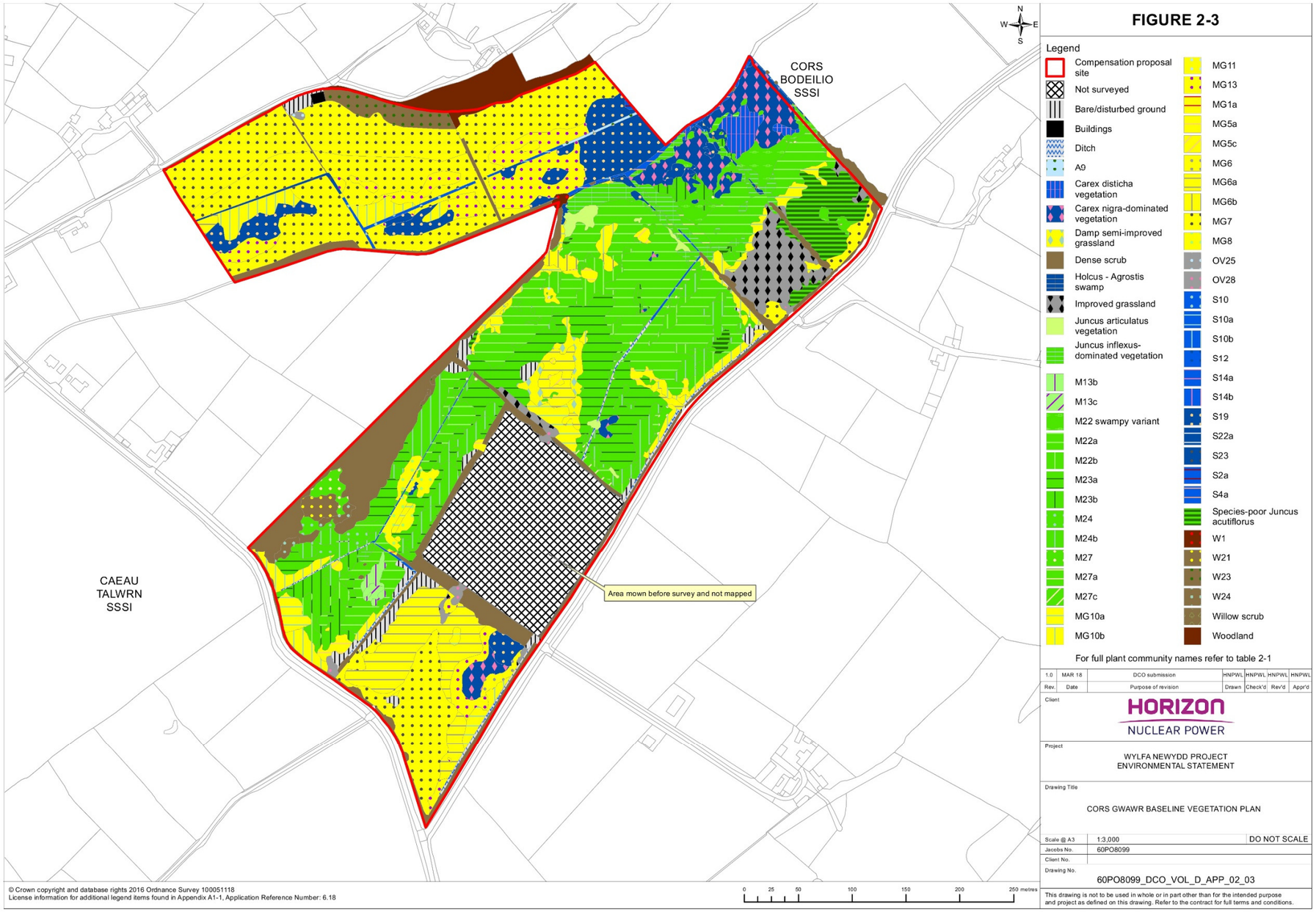


Figure 2-3: Cors Gwawr baseline vegetation plan



3. Compensation proposal

3.1 Introduction

This section outlines the proposal for Cors Gwawr as part of the Tre'r Gof SSSI compensation proposal, and describes:

- the project management structure for the proposal (section 3.2);
- the habitat creation and enhancement proposal (section 3.3);
- other potential nature conservation enhancements as part of the compensation proposal (section 3.4); and
- potential public access and site interpretation enhancements as part of the compensation proposal (section 3.5).

Detailed design of the Cors Gwawr compensation proposal, including habitat creation and enhancement, will be informed following the collection of baseline data, further discussion within the TAG, and consultation with stakeholders.

The indicative works required in order to realise the habitat creation and enhancement proposals are outlined in section 4. Section 5 outlines the management principles that would be required in order to secure the long-term favourable development and condition of the compensation proposal at Cors Gwawr, and section 6 outlines the process of monitoring, assessment and review required to guide decisions on the development of the compensation proposal.

3.2 Project officer and steering group

As part of the compensation proposal, Horizon would be responsible for the long-term management of Cors Gwawr and would appoint a project officer, to be employed directly by Horizon or through a third party. A steering group would be established to make collective decisions about compensation works and management at Cors Gwawr and other sites as part of the compensation proposal. The steering group would comprise experts and stakeholders from Horizon, NRW and other interested parties, such as Talwrn Community Council. This project management structure would be defined as part of detailed design.

The project officer would have the following responsibilities:

- management of preparatory works and supervision of habitat creation and enhancement works at Cors Gwawr (section 4);
- oversight of site management at Cors Gwawr (see section 5);
- coordination of monitoring, assessment and review (see section 6); and
- reporting to the steering group.

The above responsibilities would extend to all sites included in the Tre'r Gof SSSI compensation proposal.

3.3 Habitat creation and enhancement proposal

An overview of the habitat creation and enhancement proposals at Cors Gwawr is outlined in sections 3.3.1 and 3.3.2 and shown in in figure 3-1. The approximate areas of habitat creation and enhancement proposed are summarised in table 3-1.

Table 3-1: Summary of areas of rich-fen habitat as part of the compensation proposal at Cors Gwawr

PROPOSAL	INDICATIVE AREA (HA)
Rich-fen proposed to be created	6.1
Rich-fen proposed to be enhanced	8.2
Total area of rich-fen within proposal	14.3

Within the areas of habitat creation and enhancement, it is proposed to modify ground conditions so as to mimic or restore the hydroecology of natural fen systems, i.e. soligenous or (rheo-) topogenous wetland habitat supplied by calcareous groundwater overlying a nutrient-poor calcareous substrate. It is considered that these key hydrological and hydrogeological processes are present or can be created at Cors Gwawr and, with suitable vegetation establishment, rich-fen habitat can be created and enhanced. To support this, there is on-going work to address uncertainty and refine the conceptual understanding of the site.

The vegetation to be established within areas of habitat creation and enhancement would follow the pattern of rich-fen plant communities present within Cors Bodeilio SSSI and more intact rich-fen vegetation at Cors Gwawr, i.e.:

- alkaline fen around springs and other areas most influenced by groundwater;
- other rich-fen communities in drier or less strongly groundwater-influenced areas;
- topogenous rich-fen communities toward the bottom of the valley; and
- neutral grassland in the higher and driest areas.

The broad locations of plant communities proposed are indicated in the annotations to figure 3-1. Neutral grassland habitat creation is not included in the total areas provided for the compensation proposal, which focuses solely on fen habitat. Further detail on the planned location and extent of rich-fen plant communities would be provided as part of detailed design. Proposed methods of vegetation establishment are outlined in section 4.12.

3.3.1 Habitat creation

Rich-fen habitat creation is proposed for three locations within Cors Gwawr (figure 3-1):

- agriculturally improved pasture within the valley in the north;
- agriculturally improved pasture in fields in the north-east; and
- a scrub-covered area in the valley to the south-west.

The conceptual habitat creation proposal for each of these areas are outlined in table 3-2, and further investigations proposed to enable a more detailed design are also described.

Table 3-2: Summary of habitat creation proposals at Cors Gwawr

LOCATION	BASELINE CONDITION	CONCEPTUAL HABITAT CREATION PROPOSAL	INVESTIGATIONS TO BE UNDERTAKEN	AREA OF RICH-FEN CREATION (HA)
North	• Agriculturally improved grassland with deep ditches and buried field drains. • Foot of escarpment at approx. 32.25m AOD marks a seepage face, coincident with the upper limit of soligenous rich-fen within Cors Bodeilio. Elevation of the spring at approx. 30.3m AOD marks lower edge of a low topographic 'shelf', with a transition to a wetter and, toward the north-east, seasonally flooded area. This feature continues into Cors Bodeilio, marking transition to topogenous rich-fen. • Water quality samples at spring and within the ditch draining it confirmed that groundwater is calcareous. Substantial calcite precipitation along the ditch face. Elevated phosphorus and nitrate concentrations found locally. • Soil calcareous, with marl found at approx. 0.4m below ground level.	• Remove agricultural topsoil to expose nutrient-poor, calcareous subsoil. • Modify drainage by use of small dams or plank weirs, topography and lower ground level to raise relative groundwater levels, and introduce calcareous groundwater from the spring and seepage line. • Upper limit of rich-fen habitat creation defined by foot of escarpment at approximately 32.25m AOD. • Establishment of areas of alkaline fen along the springline at 30.3m AOD, with topogenous rich-fen in the lower part of the valley. • Scrapes and pools within valley bottom to maintain aquatic plants already present.	• Stratigraphy and calcium carbonate/nutrient-soil depth relationship incompletely understood. A soil investigation is being undertaken to understand these, and will inform detailed design, including topsoil removal, storage and re-landscaping design. • Hydrological regime not quantitatively understood, including groundwater levels and gradients, ditch volumes and flows, seasonal flooding levels, groundwater-surface water interactions etc. Hydrological monitoring is being undertaken to understand these, and will inform detailed design, including location of alkaline fen communities. • Further water quality sampling to be undertaken to identify any nutrient contamination from outside the site, such as the pasture to the west, and develop solutions as part of detailed design.	4.3

North-east	• Agriculturally improved grassland and rush pasture in upper half of field, assumed nutrient-enriched but active drainage not apparent. Species-poor topogenous fen in lower half. • The lower half of this area is permanently wet, with water at above ground level and there is deep seasonal flooding. • The upper part of the field lies below 32.25m AOD, the potential seepage zone across the site. • A shallow peat horizon of approx. 0.2m depth was found to overlie clay and marl in the lower part.	• Remove agricultural topsoil to expose nutrient-poor, calcareous subsoil. • Modify drainage by use of small dams or plank weirs, and lower ground level to raise groundwater levels (relative to the ground surface) • The above may be sufficient to introduce calcareous groundwater into this area. A further proposed option is to divert the calcareous water from the ditch along the south-eastern boundary of site, and create an artificial spring source. This may require a constructed wetland to treat the water in case of nutrient contamination from this source.	• Stratigraphy and nutrient-soil depth relationship within habitat creation area is not known. A soil investigation is being undertaken to understand these, and will inform detailed design, including topsoil removal, storage and re-landscaping design. • Hydrological regime unknown, including groundwater levels and gradients, ditch levels and flows, seasonal flooding levels, groundwater-surface water interaction etc. Hydrological monitoring is being undertaken to understand these, and would inform detailed design. • Further water quality sampling to be undertaken to identify any possible nutrient contamination of the ditch along the south-eastern boundary. • The size of the constructed wetland, if required, would need to be calculated and further data would need to be gathered to inform this.	1.2
South-West	• Scrub covered area of valley slope. • Ground conditions beneath scrub unknown but thought to be similar to fen-meadow/pasture to south.	• Clear scrub and establish fen-meadow/pasture. • No ground modifications are anticipated to be required. • Habitat creation would complement habitat enhancement in remainder of valley head.	• Scrub may conceal a spring and this would be further investigated as part of the hydrological monitoring proposal. Habitat design would be modified accordingly.	0.6

		• Areas of higher ground within the scrub unlikely to be suitable for rich-fen creation and is not included in the total area figure. Establishment of neutral grassland more appropriate.		

3.3.2 Habitat enhancement

The enhancement of existing rich-fen habitat is proposed at three locations within Cors Gwawr (figure 3-1):

- rich-fen in fields in the north-east;
- rich-fen in the south and east; and
- rich-fen in the valley in the south-west.

The proposed habitat enhancements largely aim to improve vegetation condition by active management. In some areas, drainage modifications are also proposed. Based on the current understanding of Cors Gwawr (section 2) the proposed habitat enhancements are summarised in table 3-3, and further investigations to enable a more detailed design are also described.

3.4 Other nature conservation enhancements

As a large rich-fen site that would be managed for nature conservation, Cors Gwawr offers the potential for nature conservation measures in addition to habitat creation and enhancement:

- The situation of Cors Gwawr adjacent to Cors Bodeilio SSSI, an Anglesey Fens SAC site, provides an enhancement for this internationally important site, as proposed habitat creation and enhancement at Cors Gwawr would significantly extend Cors Bodeilio SSSI into its natural headwater valley, improving ecological resilience and landscape connectivity.
- It is also proposed that Cors Gwawr and Cors Bodeilio integrate management regimes (section 5). This would be mutually beneficial, allowing for more effective and efficient management of both sites and the dispersal of species between sites.
- Further enhancement measures could include the introduction of threatened flora and fauna of rich-fens by Horizon or through collaboration with species recovery programmes run by third parties. Any such work would be addressed during detailed design.

3.5 Public access enhancements

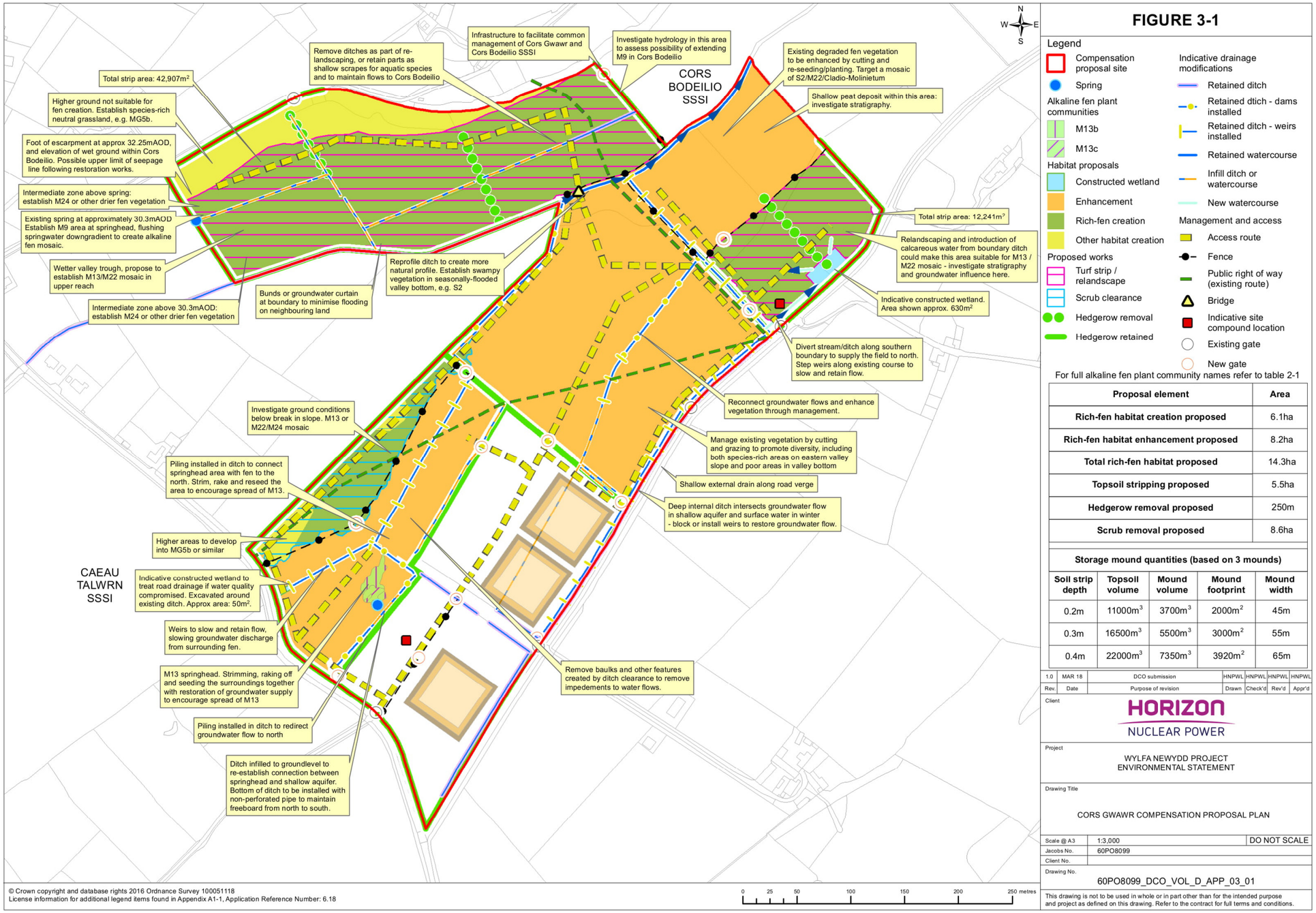
There are two public rights of way (PRoW) across Cors Gwawr (figure 2-1), but access is currently difficult by either route. The south-western to north-eastern PRoW is impassable in the south as this area is covered in dense scrub, while the route from the east to the north is impassable in winter or following heavy rain due to flooding. There is an existing boardwalk along part of the latter route but it is not adequate to cross the site during deep floods.

As part of the compensation proposal, public access to Cors Gwawr would be improved. Scrub is proposed to be cleared from the first route described, and an alternative route would be provided for the second during flooding, which may include the construction of a new boardwalk or other infrastructure. There may also be the opportunity to establish a new PRoW between Cors Gwawr, Bodeilio Common (public access) and Cors Bodeilio NNR. Signage and interpretation boards would be installed to enable the public to understand the works being undertaken, and to appreciate the importance of fens for nature conservation and ecosystem service provision.

Table 3-3: Summary of habitat enhancement proposals at Cors Gwawr

LOCATION	BASELINE CONDITION	CONCEPTUAL HABITAT ENHANCEMENT PROPOSAL	INVESTIGATIONS TO BE UNDERTAKEN	AREA OF RICH-FEN ENHANCEMENT (HA)
North-east	• Existing area of species-poor fen vegetation overlying shallow peat substrate. Permanently wet and seasonally flooded	• Management to restore vegetation condition, including cutting and raking off, introduction of propagules of species adapted to flooding and grazing	• Flooding regime unknown and relation to Cors Bodeilio SSSI unknown, proposed to be investigated during hydrological monitoring	1.6
South and east	• Existing area of fen-meadow / pasture, damaged in places due to agricultural improvement, including drainage, and disturbance. • Undermanaged and seasonally flooded areas toward north-east support species-poor vegetation	• Management to restore vegetation condition, including cutting and raking off, and grazing. • Restore a more natural hydrology by modifying drainage features. • Planting of seasonally flooded areas with e.g. great fen-sedge	• N/A	4.4
South-west	• Existing area of rich-fen centred around a tufa-forming springhead, with a small area of alkaline fen, surrounding fen-meadow/pasture and semi-improved pasture. • Rich-fen has been damaged by agricultural activities, and drains have been dug around the springhead and through the pasture.	• Restore a more natural hydrology by modifying drainage features. • Encourage the spread of alkaline fen through management.	• Hydrological investigations are being undertaken to understand groundwater supply mechanism to springhead, and to monitor levels and flows in ditches. This would inform detailed restoration options.	2.2

Figure 3-1: Cors Gwawr compensation proposal



4. Habitat creation and enhancement proposal works

4.1 Introduction

This section outlines the works that would be required to realise the habitat creation and enhancement proposals at Cors Gwawr, outlined in section 3, including construction works. Quantities relating to these works are summarised in table 4-1.

In order to manage environmental risks during construction, works would follow an adaptive management approach, including for example the phasing of works with subsequent monitoring, allowing for any issues to be identified and resolved as and when they arose. This will follow the collection of detailed baseline information to inform design, further discussion within the TAG, and consultation with stakeholders.

Table 4-1: Summary of works quantities as part of the compensation proposal at Cors Gwawr. Estimated spoil volume based on a uniform soil stripping depth of 0.3m.

WORKS ELEMENT	INDICATIVE QUANTITY
Topsoil stripping	5.5ha
Approximate topsoil volume	16,500m^3
Number of storage mounds	3
Volume of single storage mound	5,500m^3
Footprint of single storage mound based on maximum height of 2m	0.3ha
Hedgerow removal	250m
Scrub clearance	0.9ha

4.2 Preparation

The preparatory elements to the proposed habitat creation and enhancement works are outlined in table 4-2, and would be undertaken in advance of the commencement of any works. The preparatory elements include soil investigations and hydrological monitoring. Details of the hydrological monitoring is detailed as part of this document.

Table 4-2: Summary of key preparatory elements at Cors Gwawr

TASK	MAIN ELEMENTS
Consenting	• Proposed habitat creation and associated works to be consented under DCO for the Wylfa Newydd Project • NRW assent for working on SSSI/SAC boundary

TASK	MAIN ELEMENTS
	• Flood Risk Activity Permits (FRP) and permits for working within or adjacent to drainage ditches will be secured prior to works commencing
Project structure	• Appoint a project officer • Establish a steering group • Establish arrangements with any third party delivery partner(s) • Define the management structure for the compensation proposal
Establish detailed baseline	• Ground investigations to provide detail of soils and geology • Hydrological monitoring, comprising installation of boreholes, piezometers, surface water monitoring and any other relevant installations • Hydrological data to be collected over at least one full hydrological cycle (one year)
Detailed site design	• Detailed site design to be provided in accordance with the principles set out in the Landscape and Habitat Management Strategy (Application Reference Number: 8.16)Detailed design to include route of temporary PRoW diversion • Detailed design to include new permanent PRoW route across site and public access enhancements • Detailed design to include adaptive management methods for construction • Detailed design to include drainage • Detailed design to include design of topsoil storage mounds • Detailed design to include site management scheme (section 5) • Define period during which work should take place, and produce detailed works plan and timeline • Detailed design to include assessment of health and safety, security, and environment risks, with risks designed out as far as possible, and controls identified for residual risks.
Public access	• Identify temporary PRoW diversion for period of works • Identify new permanent route for PRoW across site • Identify public access enhancements as part of the proposal, e.g. board walks, interpretation boards
Public right of way diversion	• Identify alternative route for public right of way across site during works • Identify public access enhancements as part of the proposal, e.g. board walks, interpretation boards

TASK	MAIN ELEMENTS
Identification of access measures	• Identification of safe access points for vehicles across site • Identification of construction no-go areas • Identification of construction compound location within site • Design of bridge for livestock and vehicle access between north and south of site
Topsoil storage	• Identify areas on-site for storage of topsoil to be stripped during works, and prepare designs for topsoil storage mounds.
Identification of source for plant propagules	• Identification of a source of green hay or similar for use in habitat creation scheme (e.g. adjacent SSSI, or another site) • Identification of nursery with capacity to propagate and provide key plant species for planting as part of habitat creation scheme
Procure groundworks contractor	• Appoint suitably experienced contractors for elements of works • Contractor scope to include identification of suitable plant and other equipment for undertaking works
Undertake preparatory site access	• Installation of health and safety, security and environment controls • Demarcate no-go areas for construction • Construct site compound in selected location • Construction of bridge for vehicle access between north and south of site • Install infrastructure to support temporary footpath diversion

4.3 Construction methods

Construction of the compensation proposal at Cors Gwawr could have a number of adverse environmental effects, including the following:

- impacts to Cors Bodeilio SSSI, an Anglesey Fens SAC site;
- impacts to protected and notable species;
- spread of invasive non-native species;
- sediment impacts on and off-site during construction;
- increased off-site flood risk;
- nutrient mobilisation due to topsoil stripping;
- noise and air quality effects from construction traffic; and

- landscape impacts.

The provisions of the Main Power Station Site sub-Code of Construction Practice (CoCP) (Application Reference Number: 8.7), details controls for the above and any other risks identified, e.g. construction of settlement ponds for sediment control. An Environmental Clerk of Works would ensure the compliance with the provisions of the Main Power Station Site sub-CoCP.

As part of the Main Power Station Site sub-CoCP (Application Reference Number: 8.7), an adaptive management approach would be adopted, including but not limited to:

- phasing of works, with incremental changes to topsoil stripping, drainage and other works, over two seasons;
- monitoring on and off-site before, during and following works;
- adaptive management of water flows; and
- enhanced revegetation, for example by planting or using nursery crops.

The above approach would allow for any issues to be identified and resolved as and when they arise. In addition to mitigating potential impacts, an adaptive approach would enable a responsive approach to habitat creation and enhancement, ensuring greater success of the compensation proposal. The adaptive management design, including triggers for instigating measures and assessing their performance, would be provided as part of detailed design.

4.4 Access and management infrastructure

In order to facilitate the proposed works and subsequent management of the site, it is proposed that access and management infrastructure would be installed (figure 3-1). This is likely to include the following:

- fencing and gates, to be installed prior to any vegetation clearance works in order to exclude stock from works areas;
- a site compound, proposed to be sited on raised ground at the southern part of the site;
- replacement of or repairs to the existing footbridge along the public right of way crossing the main drain in order to accommodate vehicles and livestock;
- temporary public right of way diversion, with supporting signage and infrastructure to ensure public safety during construction works; and
- any further fencing and gates, and infrastructure for corralling and watering livestock, proposed to be sited on raised ground to the south of the site.

4.5 Hedgerow removal

Three lengths of hedgerow within Cors Gwawr would need to be removed in order to facilitate the habitat creation works, with a total length of approximately 250m. Hedgerows proposed to be removed are shown on figure 3-1. Woody material resulting from hedgerow removal could be disposed of by removal from site by contractor, or retained on site as habitat piles providing a

wildlife enhancement. Proposals for the disposal of material would be provided as part of detailed design.

4.6 Topsoil stripping and landscaping

As part of habitat creation works, the removal of approximately 5.5ha of agriculturally modified topsoil is proposed in order to expose a nutrient-poor, calcium-rich mineral substrate for vegetation establishment, and to raise groundwater levels relative to the ground surface [RD5]. Areas for topsoil stripping are shown in figure 3-1. Indicative volumes of topsoil for removal based on indicative stripping depths are shown in table 4-3, although it is unlikely that stripping would be to a uniform depth. Additional landscaping may also be required as part of habitat creation, which would be provided as part of detailed design. All unused excavated topsoil removed would be retained on site in storage mounds (section 4.7). Excavated topsoil would be stored on site for up to three years and suitable uses for it identified.

Table 4-3: Summary of estimated topsoil volumes for stripping at Cors Gwawr based on uniform stripping depths.

TOPSOIL STRIPPING DEPTH (M)	APPROXIMATE VOLUME (M^3)
0.2	11,000
0.3	16,500
0.4	22,000

4.7 Storage mounds

All topsoil stripped during the habitat creation construction works would be retained at Cors Gwawr and reformed as storage mounds. Excavated topsoil would be stored on site for up to three years and suitable uses for it identified.

The mounds would be square-based, 2m high and have edges planed at 45°, and would be revegetated with a suitable grassland seed mix. Indicative locations and footprints of the storage mounds are shown in figure 3-1. Based on the topsoil stripping depths shown in table 4-3 and dividing the volume into three mounds then the indicative volumes, footprints and dimensions of the storage mounds required to accommodate the full volume of material are shown in table 4-4.

Table 4-4: Summary of individual storage mound quantities for stripping based on uniform stripping depths and storage in three mounds

TOPSOIL STRIPPING DEPTH (M)	APPROX. VOLUME OF SINGLE MOUND (M^3)	APPROX. FOOTPRINT OF SINGLE MOUND (M^2)	APPROX. WIDTH OF SINGLE MOUND (M)
0.2	3,700	2,000	45
0.3	5,500	3,000	55

TOPSOIL STRIPPING DEPTH (M)	APPROX. VOLUME OF SINGLE MOUND (M^3)	APPROX. FOOTPRINT OF SINGLE MOUND (M^2)	APPROX. WIDTH OF SINGLE MOUND (M)
0.4	7,350	3,920	65

These storage details are indicative and would subject to further assessment and mitigation as part of detailed design. This would take into consideration the existing hydroecological sensitivities of Cors Gwawr and implement mitigation in order to eliminate or reduce potential impacts from the mounds, such as sedimentation or nutrient enrichment.

4.8 Suspended sediment management

Throughout periods of topsoil stripping and until stripped areas become sufficiently revegetated, there would be management of suspended sediment washed from the site. Management would include the construction of temporary sediment settlement ponds. All options for controlling suspended sediment, including chemical dosing, would be assessed and are outlined within the Main Power Station Site sub-CoCP (Application Reference Number: 8.7part of the adaptive management approach. Any material arising from these treatments would be retained on site with the excavated topsoil, stored on site for up to three years and suitable uses for it identified.

4.9 Drainage modifications

As part of the proposed habitat creation and enhancement, existing drainage features at Cors Gwawr would be modified in order to create the hydrology necessary for proposed habitats to become established and to restore hydrological function to enhancement areas. Indicative drainage modifications are shown on figure 3-1.

Drainage modifications could include the obstruction of ditches by infilling, or installation of plank weirs, with the purpose of increasing water retention and restoring near surface groundwater flows. Other drainage modifications may be required at the site boundary in order to eliminate impacts from altered hydrology to surrounding farm land and to Cors Bodeilio SSSI. Modifications may include the installation of sheet piling to act as a cut-off wall to prevent flooding or the construction of bunds to prevent surface water flooding. Drainage modifications would incorporate structures enabling the management of water within site, such as removable plank weirs or right angled-bend pipes to enable to the manipulation of water levels, as part of the adaptive management approach.

A detailed design of drainage modifications would be provided based on the results of the hydrological monitoring. Features potentially of use for habitat creation such as bunds to retain water could detract small areas from the total areas provided as part of this Cors Gwawr compensation proposal (table 3-1); this would be provided as part of detailed design.

4.10 Constructed wetlands

Where drainage is proposed to be modified to provide a source of water to supply habitat creation or enhancement areas, constructed wetlands may be required to treat water where excessive nutrient loads could compromise habitat development. Indicative constructed wetlands are shown on figure 3-1, sited upstream of target habitat areas. The need for constructed wetlands and their design would be based on water quality data collected as part of the hydrological monitoring at Cors Gwawr. The design and construction methods of constructed wetlands would be provided as part of detailed design.

4.11 Scrub clearance

Scrub occupies approximately 0.9ha of land suitable for fen creation (figure 4-1), and this is proposed to be cleared in order to establish 0.6ha of rich-fen habitat. Scrub would be removed by the contractor, any stumps likely to persist would be removed or chemically treated and arisings would be disposed of by inclusion in ditch in-fill, incorporation into other structures as part of the works or burning.

4.12 Vegetation establishment

As described in section 3.3, the vegetation to be established within the habitat creation and enhancement areas would follow the pattern of rich-fen plant communities present within Cors Bodeilio SSSI and Cors Gwawr. It is unlikely that valuable habitat would establish in the short-term through natural regeneration of vegetation, such as through a buried seed bank (in areas not stripped of topsoil) or natural dispersal [RD5], and it is therefore proposed to introduce plant propagules. This method would be used within all areas of habitat creation, and would also be undertaken in proposed enhancement areas to enrich existing rich-fen. Indicative areas for introduction of propagules are shown in annotations to figure 3-1.

The introduction of propagules would be mainly through the spreading of seed via hay/litter collected from existing rich-fen vegetation, but may also be supplemented by planting of adult plants of ecologically important species, e.g. black bog-rush and great fen-sedge. A detailed plan for the inoculation of habitat creation and enhancement areas will be provided in detailed design, and would give consideration to multiple factors, including:

- the identification of suitable donor sites for hay/litter and other sources of propagules (e.g. Anglesey Fen SAC sites);
- the timing of the cutting of hay/litter, which according to species phenology would affect its seed composition;
- supplementary seed collection of ecologically important species, or species unlikely to be transferrable by hay;
- any requirement for drying/storage of material, depending on the works programme and availability of material;

- any requirement for *ex situ* propagation and cultivation of species, with estimates of quantities and an identification of suitable nurseries to undertake the work; and
- control of biosecurity risks in transporting material, e.g. presence of invasive non-native species in donor sites.

All areas where seed would be introduced would be monitored by fixed plots to determine the efficacy of the treatments applied, with comparable control plots (section 6).

4.13 Works timing

The timing, including date of commencement, of the works would be provided in detailed design, and would seek to minimise wider environmental effects to air quality, ecology, landscape, and noise receptors. The current proposed timing of works is outlined below.

Construction works would likely be phased over a 12 to 24-month period encompassing two drier periods for earthworks. During the summer of year one an initial area for habitat creation would be topsoil stripped, with a second and final area stripped the following summer. This phased approach would reduce the increase in sediment and nutrient loads which will mobilise as a result of the earthworks. Vegetation clearance, such as of hedgerows and scrub, would be undertaken in the intervening winter in order to avoid the breeding bird season and any protected species constraints. By undertaking earthworks during spring-summer times, this work would coincide with the active periods of protected animal species (e.g. reptiles, water vole (*Arvicola amphibius*)) that might be present on site, allowing species to be either passively or actively removed from the working area.

4.14 Public access

Works would be undertaken to enhance public access to Cors Gwawr, including creating gaps in boundaries to permit access by the public along the existing PRoW. Public access infrastructure would also be installed following the completion of works, e.g. signage and boardwalks. The design of public access infrastructure would be provided in detailed design.

5. Habitat management proposals

5.1 Introduction

This section outlines the management proposed in order to secure the long-term favourable development and condition of Cors Gwawr following the completion of all habitat works described in section 4.5

5.2 Management scheme

Ongoing management of Cors Gwawr would be carried out in accordance with management schemes to be submitted to and approved by the IACC. The management schemes will be prepared in accordance with the management principles in section 7 of the Landscape and Habitat Management Strategy (Application Reference Number: 8.16). These measures will be secured through the DCO.

The management scheme would set out the objectives for adaptive management, site management, management methods, management programme and any other relevant information. The overall objective would be to deliver the establishment/enhancement and maintenance of rich-fen habitat to offset potential adverse effects at Tre'r Gof SSSI. The management scheme would include a programme of on-going monitoring, assessment and review (section 6). The management scheme would be periodically reviewed an updated, initially on an annual cycle but this would be extended as habitats become established.

Adaptive management and initial management of habitat creation and enhancement areas are outlined below. These management activities would operate until the first review of the management scheme. Indicative management methods are outlined below.

5.2.1 Adaptive management

During construction, a process of adaptive management would be employed to ensure the success of habitat creation and enhancement proposal and avoid adverse effects to Cors Bodeilio SSSI or neighbouring farmland. The management scheme would include adaptive management measures to control any adverse effects that could arise following completion of the works. This would be informed by ongoing hydrological monitoring (section 6.2), allowing any issues identified by Horizon or its contractors to be dealt with as and when they arise. Adaptive management would be addressed as part of the Main Power Station Site sub-CoCP (Application Reference Number: 8.7), and the Landscape and Habitat Management Strategy (Application Reference Number: 8.16).

5.2.2 Initial management of habitat creation areas

A management scheme would provide detailed proposals for the rich-fen habitat creation areas. Habitat creation areas would be managed differently from the rest of site during habitat establishment, with stock excluded for at least the first five years to prevent grazing. Management infrastructure to support this would be installed as part of construction works (section 4.4). Any

management that may be required during this period would be identified by the project officer and undertaken on an *ad hoc* basis, (e.g. control of weeds or other species by cutting). The point at which habitat creation areas would be incorporated with the wider site grazing management would be determined by the monitoring, assessment and review process (section 6).

5.2.3 Initial management of habitat enhancement areas

A number of rich-fen habitat enhancement proposals outlined in section 3.3.2 would be undertaken as part of the works outlined in section 4, including drainage modifications. Further work will be undertaken to enhance existing rich-fen habitat as part of management, and that would be detailed in the site management scheme, including:

- manual cutting and raking of vegetation to improve condition of rank vegetation;
- introduction of hay or other plant propagules to areas in order to diversify existing vegetation; and
- instigation of grazing management.

Indicative areas for such works are shown in the annotations to figure 3-1.

5.3 Management methods

5.3.1 Grazing and cropping

The main long-term management method at Cors Gwawr would be low-intensity grazing by suitable livestock, such as ponies or cattle. Options for stocking and other grazing management would be detailed in the site management scheme. The following are indicative stocking densities (1 livestock unit (LU) = 1 cow; 0.15 = 1 sheep) [RD5]:

- fen and swamp 0.02LU/ha/year;
- purple moor-grass (*Molinia caerulea*) grassland 0.25LU/ha/year;
- rush pasture 0.4LU/ha/year; and
- semi-natural grassland 0.3-0.5LU/ha/year.

Options for grazing would give consideration to numerous factors, including the type of stock and their experience of grazing similar habitats. Management infrastructure to support grazing would be installed as part of construction works (section 4.4).

Other vegetation cropping methods could include the mechanical cutting of vegetation and removal of litter. Suitable tools for manual methods would be purchased, e.g. brushcutters, mowers, scythes. This and other cropping methods would be set out in the site management scheme.

5.3.2 Water management

The site management scheme would set out a water management scheme for Cors Gwawr, to include targets for water levels and flows across site and their management in order to support

key vegetation types, and a programme of maintenance of water infrastructure. The water management scheme would also detail controls for ensuring there would be no hydrological effects to Cors Bodeilio SSSI, neighbouring farmland or other receptors resulting from the works.

5.3.3 Scrub and hedgerow management

Scrub would be managed as part of routine site management and removed where it encroaches on important herbaceous communities. Hedgerows would be laid or cut back on a periodic basis.

5.3.4 Routine monitoring

As part of the management of Cors Gwawr, management issues would be identified as and when they arose, (e.g. over- or under-grazing, weed infestation), and appropriate corrective measures would be instigated. This would form a separate management activity from the monitoring outlined in section 6.

6. Monitoring, assessment and review proposals

6.1 Introduction

Monitoring would be required to determine the success of the habitat creation and enhancement proposal and of subsequent management at Cors Gwawr, and to inform future management decisions. The hydrological and habitat monitoring, assessment, and review process would be delivered as part of the Tre'r Gof SSSI compensation proposal is outlined below; the programme for this process would be detailed in the site management scheme (section 5.2). Horizon and its contractors would be responsible for all monitoring, assessment and review undertaken as part of the Tre'r Gof SSSI compensation proposal.

6.2 Hydrological monitoring and assessment

The hydrological monitoring proposed as part of the compensation proposal has been designed in order that monitoring can continue following the completion of all works. This continuity is key to assessing the success of habitat creation and enhancement works in creating or restoring the target hydrological conditions at Cors Gwawr. Ongoing hydrological monitoring would also be required to inform any adaptive management that might be required.

As part of detailed design, hydrological assessment criteria to measure the success of the works would be provided. This may include hydrological indicators covering key parameters, such as water levels and water quality parameters, including pH, calcium and nutrient levels. Monitored quantities would be assessed against reference data (e.g. [RD6], [RD7]).

6.3 Habitat monitoring and assessment

As part of the compensation proposal, the development of vegetation in both habitat creation and enhancement areas would be monitored in order to assess the success of habitat creation and enhancement works in creating or restoring the target plant communities at Cors Gwawr.

As part of detailed design, a habitat monitoring and assessment plan would be provided. Habitat monitoring would be by means of fixed vegetation plots recorded before and after any works on an annual basis, and designed to enable the assessment of the success of all vegetation treatments, including control treatments, and to enable correlation with results obtained by hydrological monitoring. High resolution aerial imagery and LiDAR would also be collected to provide additional data. The assessment criteria would include positive and negative indicators covering key parameters, such as presence and cover of ecologically important (e.g. black bog-rush, brown mosses) or undesirable plants (e.g. those indicative of higher nutrient status).

6.4 Review

Data collected as part of monitoring and the results of assessments would be periodically reviewed by the project officer and reported to the steering group. Based on these results decisions would be taken on the on-going management needs at Cors Gwawr.

7. References

Table 7-1: References

REF. NO.	REFERENCE
[RD1]	Department for Energy and Climate Change (2011). *National Policy Statement for Nuclear Power Generation (EN-6)*.
[RD2]	Department for Energy and Climate Change (2011). *National Policy Statement for Nuclear Power Generation (EN-6).*
[RD3]	Rodwell, J. S. (Ed.), 1991-2000. British Plant Communities. Cambridge: CUP.
[RD4]	Jones, P.S., Hanson, J., Farr, G. (2013). *Proceedings of the Anglesey & Llyn Fens Technical Workshop: The rich-fens of Anglesey and Llŷn.* NRW
[RD5]	McBride, A., Diack, I., Droy, N., Hamill, B. Jones, P., Schutten, P., Skinner, A. & Street, M. (Eds.) (2011). *The Fen Management Handbook*. Scottish Natural Heritage: Perth.
[RD6]	Wheeler, B.D., Gowing, D.J.G., Shaw, S.C., Mountford, J.O., Money, R.P. (2004). *Ecohydrological Guidelines for Lowland Wetland Plant Communities* (Eds. A.W. Brooks, P.V. Jose, and M.I. Whiteman,). Environment Agency (Anglian Region)
[RD7]	UKTAG, 2012. Technical report on groundwater dependent terrestrial ecosystem (GWDTE) threshold values., s.l.: s.n.

HORIZON NUCLEAR POWER

ENERGY WORKING FOR BRITAIN

TRE'R GOF SSSI COMPENSATION PROPOSAL VOLUME II

Outline habitat enhancement and management proposal - Ty du

DCRM Ref Number: WN0902-JAC-PAC-REP-00061

Revision: 1.0

Additional Requirements or Controls			
LISTED READERS ONLY		LEGALLY PRIVILEGED	

Comments:

Contents

1. Introduction

1.1 Background

Horizon Nuclear Power Wylfa Ltd. (Horizon) is planning to develop a new nuclear power station on the north coat of Anglesey. Land adjacent to the Existing Power Station at Wylfa Head, west of Cemaes on the north coast of Anglesey, is identified by the UK Government in the *Overarching National Policy Statement for Energy (EN-1)* (NPS EN-1) [RD1] and *National Policy Statement for Nuclear Power Generation (EN-6)* (NPS EN-6) [RD2] as potentially suitable for the construction of a new nuclear power station. Horizon proposes to construct and operate a new nuclear power station, known as Wylfa Newydd, on this land and adjacent land. As part of the Wylfa Newydd Project, Horizon has committed to delivering a compensation proposal, in order to offset a potential adverse effect on Tre'r Gof SSSI, which will create new areas of rich-fen habitat and enhance areas of existing rich-fen habitat at three sites on Anglesey. The compensation proposal has been developed by Horizon through discussion at a Technical Advisory Group (TAG) comprising representatives from Horizon, the Isle of Anglesey County Council and Natural Resources Wales (NRW). This proposal has been developed in line with the principles set out in the Landscape and Habitat Management Strategy for the Wylfa Newydd Project (Application Reference Number 8.16), and will be secured by the provisions of this document. Further background to the development of the compensation proposal and justification for the selection of the sites is provided in Volume I of this document (Appendix D9-23. SSSI Compensation Strategy - Volume I. Application Reference Number: 6.4.56).

1.2 Purpose of this report

The purpose of this report is to outline proposal for the enhancement and long-term management of habitat at Ty du, Cemaes, Anglesey (figure 1-1), as part of the Tre'r Gof Site of Special Scientific Interest (SSSI) compensation proposal.

This outline proposal for Ty du complements that for Cae Canol-dydd and Cors Gwawr proposed as part of the Tre'r Gof SSSI compensation proposal. Detailed design information will be prepared in accordance with the habitat and landscape principles relating to the Ecological Compensation Sites in the Landscape and Habitat Management Strategy (Application Reference Number: 8.16) and submitted to the IACC for approval. Development of the Ecological Compensation Sites will be undertaken in accordance with the approved design details. These measures will be secured through the DCO. The proposals set out in the Tre'r Gof SSSI Compensation Strategy Volume II have been assessed within the Ecological Compensation Sites: Assessment of Environmental Effects in Appendix D1-2 (Application Reference Number: 6.4.18).

1.3 Overview of compensation proposal at Ty du

The compensation proposal at Ty du in terms of areas of mire enhancement is summarised in table 1-1.

Table 1-1: Ty du compensation proposal summary

PROPOSAL ELEMENT	INDICATIVE AREA (HA)
Potential area of rich-fen proposed to be enhanced	7.0
Total site area	8.1

Benefits of the compensation proposal at Ty du in addition to habitat enhancement would also include:

- potential for conservation of threatened flora and fauna of rich-fens through species introductions or recovery projects; and
- public access and interpretation enhancements.

1.4 Consultation on additional land

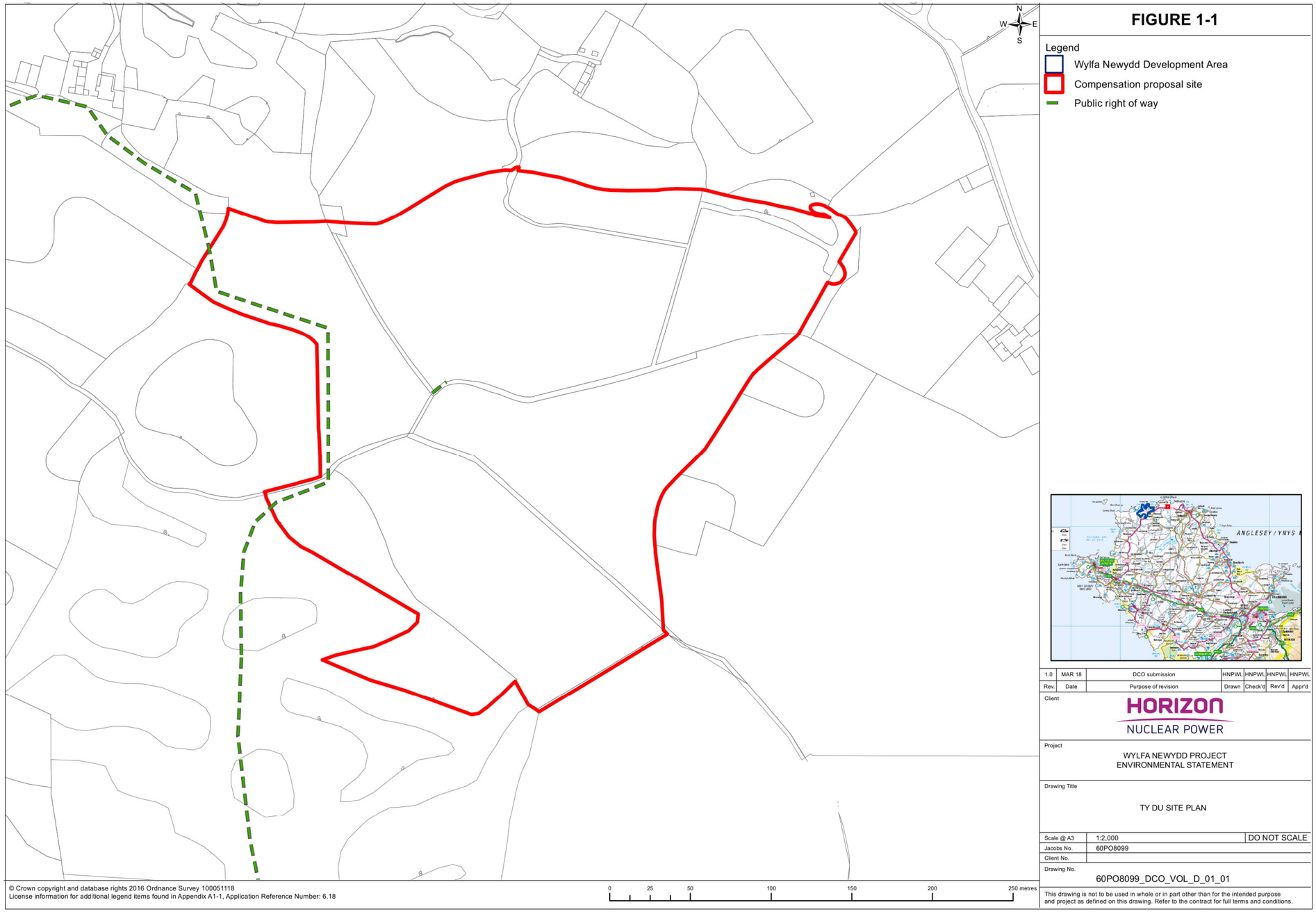
In February 2018, Horizon undertook a consultation on additional land that had not been consulted on previously, which included Ty du. Details of this consultation are provided in chapter B9 Introduction to the topics (Application Reference Number: 6.2.9).

1.5 Report outline

This report is structured as follows:

- section 2 provides baseline information on the topography, geology and soils, hydrology and hydrogeology and ecology of Ty du;
- section 3 outlines the compensation proposal for Ty du;
- section 4 outlines the works that would be required to deliver the proposal at Ty du;
- section 5 outlines the management that would be required in order to secure the long-term favourable development and condition of Ty du; and
- section 6 outlines the process of monitoring, assessment and review required to guide decisions on the development of Ty du.

Figure 1-1: Ty du site plan



2. Summary of baseline conditions

2.1 Site description

Ty du is situated on the Llanbadrig headland to the east of Cemaes, north of the A5025, north Anglesey, (SH 3958 9405; figure 1-1). The site has an area of 8.1ha. Ty du is included in the non-statutory Wildlife Site Tir Lleidiog Ty du, a site of local nature conservation importance that also includes a small mire to the north west.

A summary of the baseline conditions at Ty du is provided below. Further details are provided in Volume I of this document (Appendix D9-23. Application Reference Number: 6.4.56).

2.2 Topography

Ty du sits within a topographic basin formed of hills to the north, east and southwest (figure 2-1). The elevation of the site ranges from 53m AOD in the west to 50m AOD in the east. The surrounding land rises steeply to the north, east and southwest of the site, with maximum elevations of 75m AOD in the north, 63m AOD in the east and 70m AOD in the southwest.

2.3 Geology and soils

British Geological Survey (BGS) 1:50,000 bedrock mapping shows the majority of Ty du to be underlain by the Church Bay Tuffs and Skerries Grits (tuff and sandstone). The southernmost part of the site is underlain by the New Harbour Group, comprising schist, phyllite and pillow lava. Overlying the bedrock throughout most of Ty du is a layer of alluvium (mixed clays, sands and gravels) which may be underlain in places by glacial till.

Ground investigations to date have shown that most of Ty du comprises a peat basin, which in the north found peat to over 2.25m. The depth of peat at one location was confirmed as 1.75m. The periphery of the basin comprises mineral soil.

2.4 Hydrology and hydrogeology

Data gathered to date indicate that inflows into Ty du are interpreted to be from surface water runoff from the surrounding catchment, from groundwater, and from direct rainfall. Hydrological features of the site are shown in figure 2-2.

A large, incised drainage ditch enters the site at the south east corner, flows west through the centre of the site and exits at the southwestern border. A network of smaller drains that originate within the site feed into this main channel from both the north and south. A septic tank is located at the site's northeastern corner, although it is not known whether this is currently in use.

The total upstream surface water catchment area for Ty du is estimated to be around 48ha. The Welsh Government development advice map indicates that the area has been subject to flooding in the pastpast. If glacial till is present across the site this will limit rainwater infiltration to groundwater and will result in wet conditions being maintained across the site. The potential for

groundwater flows into the site arises from a variety of sources, mostly where the topography flattens out on the periphery of the basin.

Water quality and soil samples to date have shown that the chemistry of Ty du is circum-neutral to slightly acid, with relatively low levels of alkalinity, and low levels of major ions (Appendix D9-23. Application Reference Number: 6.4.56). The sampling found slightly elevated levels of ammoniacal nitrogen and phosphorus in some locations, which could be an indication of nutrient pollution from the septic tank referred to above.

No source protection zones (SPZ) are present on Anglesey.

2.5 Ecology

During site investigations, Ty du was found to comprise largely unmodified mire habitats indicative of varying chemistry across the site, with slightly acid, circum-neutral and more base-rich conditions indicated, as well as drier areas. There is little management of the site, with areas accessible from the surrounding pasture grazed by sheep.

A vegetation plan is shown in figure 2-3, and a complete list of plant communities recorded is provided in table 2-1. In addition to a large area of grey willow (*Salix cinerea*) scrub, occupying approximately 40% of the site, the following mire plant communities were recorded [RD3], [RD4]:

- M5 *Carex rostrata-Sphagnum squarrosum* mire
- M6 *Carex echinata-Sphagnum recurvum/auriculatum* mire
- M16 *Erica tetralix-Sphagnum compactum* wet heath
- M22 *Juncus subnodulosus-Cirsium palustre* fen-meadow
- M23 *Juncus acutiflorus/effusus-Galium palustre* rush pasture
- M25 *Molinia caerulea-Potentilla erecta* mire
- M29 *Hypericum elodes-Potamogeton polygonifolius* soakway
- Species-rich *Sphagnum* mire

A large area in the southern part of Ty du was found to comprise species-poor M25 *Molinia caerulea-Potentilla erecta* mire dominated by purple moor-grass (*Molinia caerulea*). This area appeared not to be grazed or otherwise managed. The vegetation of some ditches and of the area around the septic tank to the northeast was indicative of long-term nutrient enrichment.

A diversity of vascular plants and bryophytes of mire habitats was recorded from Ty du, with the following notable species: bog pimpernel (*Anagallis tenella*); blunt-flowered rush (*Juncus subnodulosus*); many-stalked spike-rush (*Eleocharis multicaulis*); slender sedge (*Carex lasiocarpa*); and the uncommon mosses *Calliergon giganteum*, *Rhizomnium pseudopunctatum* and *Sphagnum contortum*.

Table 2-1: Plant communities recorded from Ty du

PLANT COMMUNITY
M5 *Carex echinata-Sphagnum recurvum/denticulatum* mire
M6c *Carex rostrata-Sphagnum squarrosum* mire, *Juncus effusus* sub-community
M16b *Erica tetralix-Sphagnum compactum* wet-heath, *Succisa pratensis-Carex panicea* sub-community
M22a *Juncus subnodulosus-Cirsium palustre* fen meadow, typical sub-community
M23a *Juncus acutiflorus/effusus-Galium palustre* rush pasture, *Juncus acutiflorus* sub-community
M23a swampy variant
M23b *Juncus acutiflorus/effusus-Galium palustre* rush pasture, *Juncus effusus* sub-community
M23b swampy variant
M25 *Molinia caerulea-Potentilla erecta* mire
M25a *Molinia caerulea-Potentilla erecta* mire, *Erica tetralix* sub-community
M25b *Molinia caerulea-Potentilla erecta* mire, *Anthoxanthum odoratum* sub-community
M25c *Molinia caerulea-Potentilla erecta* mire, *Angelica sylvestris* mire
M29 *Potamogeton polygonifolius-Hypericum elodes* soakway
MG6b *Cynosurus cristatus-Lolium perenne* grassland, *Anthoxanthum odoratum* sub-community
MG10 *Holcus lanatus-Juncus effusus* rush pasture
S6 *Carex riparia* swamp
S10 *Equisetum fluviatile* swamp
S10a *Equisetum fluviatile* swamp, *Equisetum fluviatile* sub-community
S10b *Equisetum fluviatile* swamp, *Carex rostrata*-sub-community
S12 *Typha latifolia* swamp
S14a *Sparganium erectum* swamp, *Sparganium erectum* sub-community
S14b *Sparganium erectum* swamp, *Mentha aquatica* sub-community
S22 *Glyceria fluitans* water-margin vegetation
S22a *Glyceria fluitans* water-margin vegetation, *Glyceria fluitans* sub-community
S23 Other water-margin vegetation
S27a *Carex rostrata-Potentilla palustris* tall-herb fen, *Carex rostrata-Equisetum fluviatile* sub-community
S28 *Phalaris arundinacea* tall-herb fen
Species-rich *Sphagnum* mire
U4b *Festuca ovina- Agrostis capillaris-Galium saxatile* grassland, *Holcus lanatus-Trifolium repens* sub-community
U20 *Pteridium aquilinum-Galium saxatile* community
U20a *Pteridium aquilinum-Galium saxatile* community, *Anthoxanthum odoratum* sub-community

PLANT COMMUNITY
W1 *Salix cinerea-Galium palustre* woodland
W21 *Crataegus monogyna-Hedera helix* scrub
W22 *Prunus spinosa-Rubus fruticosus* scrub
W23 *Ulex europaeus-Rubus fruticosus* scrub
W24 *Rubus fruticosus-Holcus lanatus* underscrub
Willow scrub

Figure 2-1: Ty du baseline topography

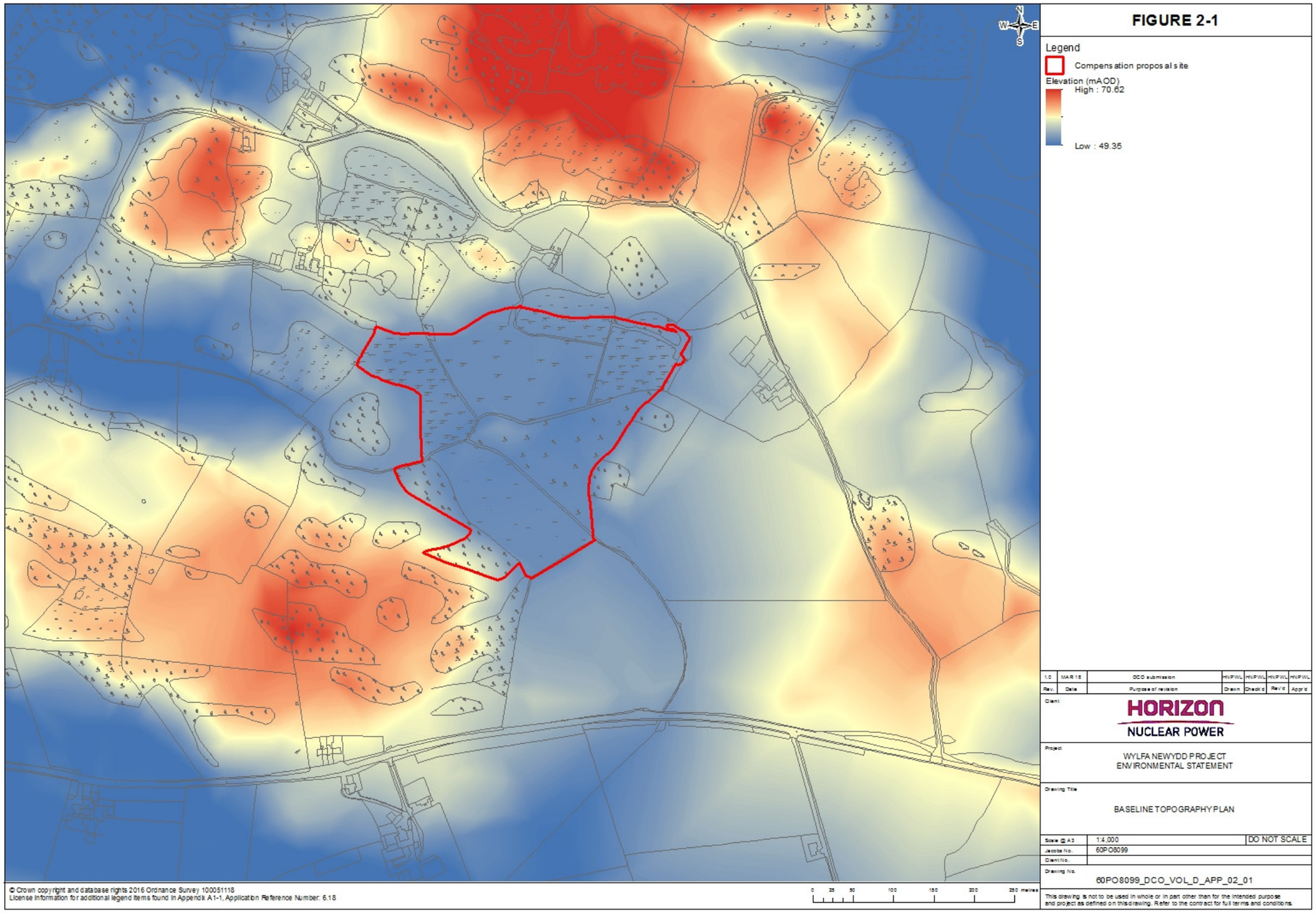


Figure 2-2: Ty du baseline hydrological features

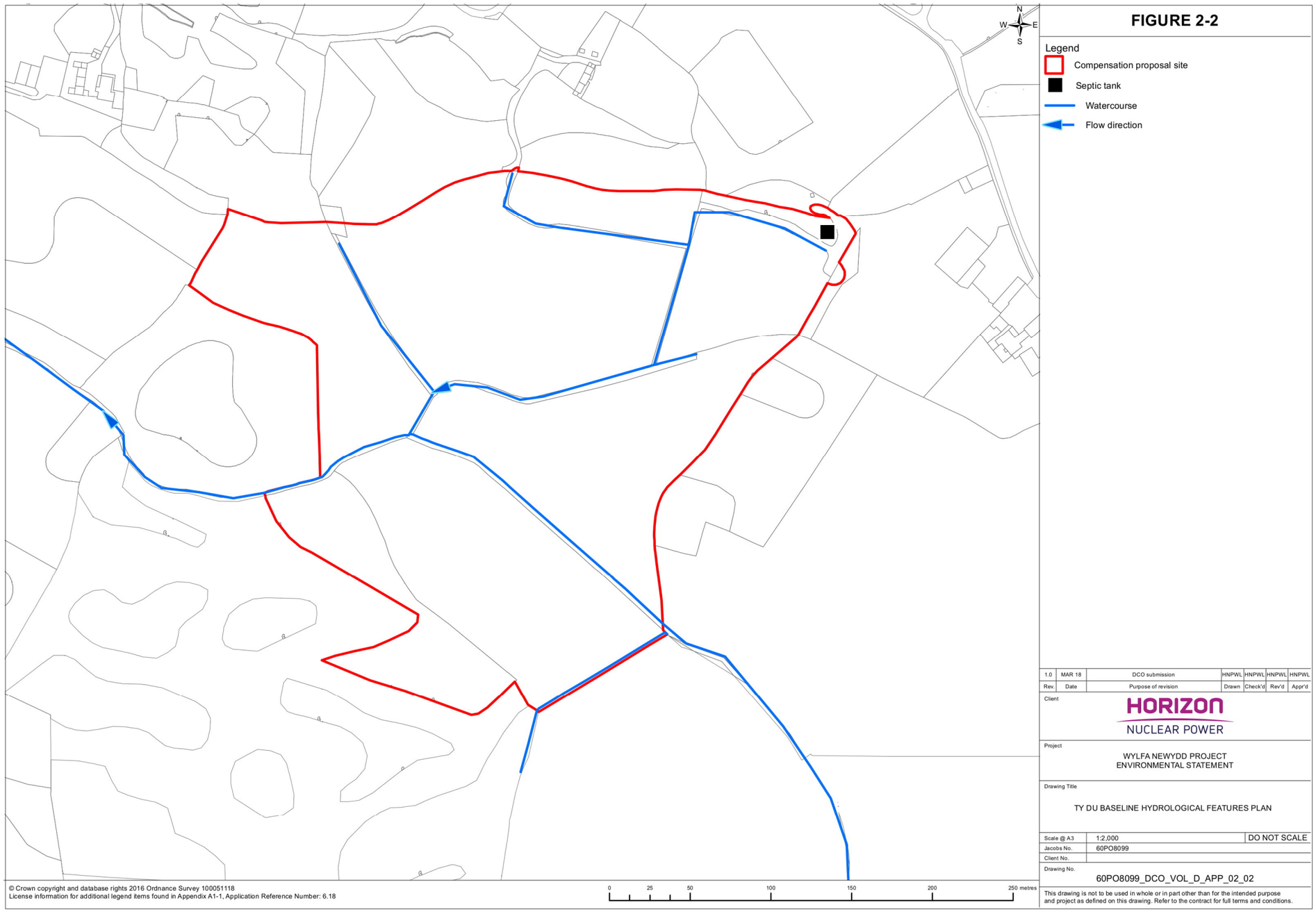
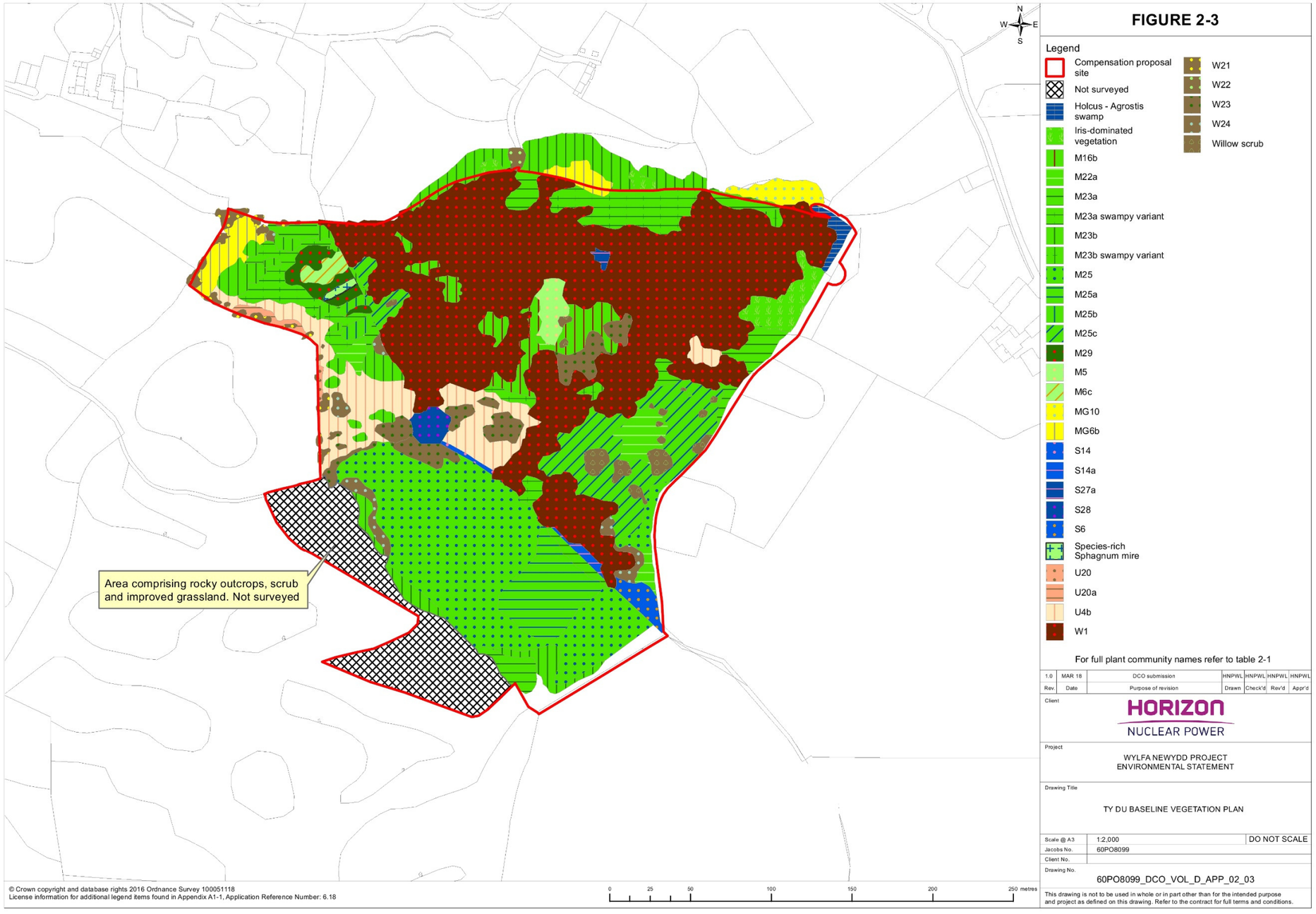


Figure 2-3: Ty du baseline vegetation



3. Compensation proposal

3.1 Introduction

This section outlines the proposal for Ty du as part of the Tre'r Gof SSSI compensation proposal, and describes:

- the project management structure for the proposal (section 3.2);
- the habitat enhancement proposal (section 3.3);
- other potential nature conservation enhancements as part of the compensation proposal (section 3.4); and
- potential public access enhancements as part of the compensation proposal (section 3.5).

The indicative works required in order to realise the habitat enhancement proposals are outlined in section 4. Section 5 outlines the management principles that would be required in order to secure the long-term favourable development and condition of the compensation proposal at Ty du, and section 6 outlines the process of monitoring, assessment and review required to guide decisions on the development of the compensation proposal.

3.2 Project officer and steering group

As part of the compensation proposal, Horizon would be responsible for the long-term management of Ty du and would appoint a project officer, to be employed directly by Horizon or through a third party. A steering group would be established to make collective decisions about compensation works and management at Ty du and other sites as part of the compensation proposal. The steering group would comprise experts and stakeholders from Horizon, NRW and other interested parties. This project management structure would be defined as part of detailed design.

The project officer would have the following responsibilities:

- management of preparatory works and supervision of habitat enhancement works (section 4);
- oversight of site management (see section 5);
- coordination of monitoring, assessment and review (see section 6); and
- reporting to the steering group.

The above responsibilities would extend to all sites included in the compensation proposal.

3.3 Habitat enhancement proposal

An overview of the habitat enhancement proposals at Ty du is provided below and shown in figure 3-1. The proposal for Ty du would aim to facilitate the regeneration and management of mire habitat, and would include the following:

- installation of management infrastructure;
- approximately 2.4ha of mire that would be enhanced directly through appropriate management (see Section 4);
- approximately 3.1ha of scrub-covered mire that would be enhanced through scrub clearance and vegetation regeneration;
- approximately 1.5ha of species-poor purple moor-grass dominated mire that would be enhanced through cutting and vegetation regeneration; and
- removal or repair of the septic tank in the northeast of site.

Areas cleared of vegetation would be inoculated with suitable plant propagules to establish desired plant communities. Proposed methods of inoculation are described in section 4.7. The target plant communities would be those already found at Ty du (section 2.5), such as M6 *Carex rostrata-Sphagnum squarrosum* mire and other communities of mires with a range of water chemistries.

3.4 Other nature conservation enhancements

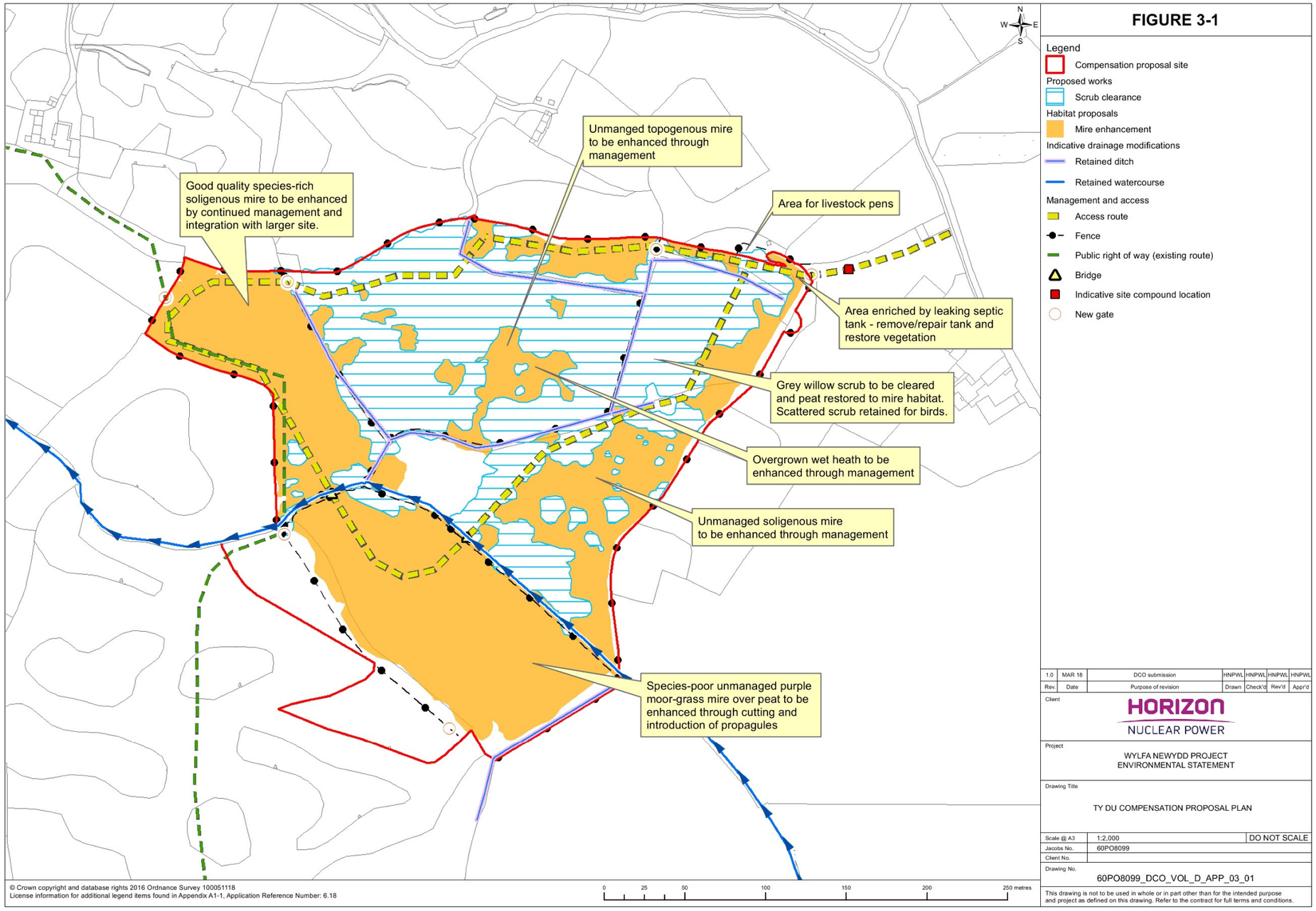
As it supports important mire habitat that would be managed for nature conservation, Ty du offers the potential for nature conservation measures in addition to habitat enhancement. This could include the introduction of threatened flora and fauna of mires by Horizon or through collaboration with species recovery programmes run by third parties.

3.5 Public access enhancements

There is a public right of way (PRoW) across the western part of Ty du (figure 1-1), but the route in the south west is partly overgrown and the bridge over the main drain through site is dilapidated and in need of repair/replacement.

As part of the compensation proposal, public access to Ty du would be improved. Scrub is proposed to be cleared from part of the route and a new bridge would be constructed. Signage and interpretation boards would be installed to enable the public to understand the works being undertaken, and to appreciate the importance of peatlands for nature conservation and ecosystem service provision.

Figure 3-1: Ty du compensation proposal plan



4. Habitat enhancement works

4.1 Introduction

This section outlines the works that would be required to realise the habitat enhancement proposals outlined in section 3.3. Quantities relating to these works are summarised in table 4-1.

Table 4-1: Summary of works quantities as part of the compensation proposal at Ty du

WORKS ELEMENT	INDICATIVE AREA (HA)
Scrub clearance	3.1
Purple moor-grass cutting	1.5

4.2 Preparation

The preparatory elements to the proposed habitat creation and enhancement works are outlined in table 4-2.

Table 4-2: Summary of key preparatory elements at Ty du

TASK	MAIN ELEMENTS
Consenting	• Proposed works unlikely to require consents, but proposal to be included in DCO for the Wylfa Newydd Project
Project structure	• Appoint a project officer • Establish a steering group • Establish arrangements with any third party delivery partner(s) • Define the management structure for the compensation
Public access	• Identify temporary PRoW diversion for period of works • Identify new permanent route for PRoW across site • Identify public access enhancements as part of the proposal, e.g. board walks, interpretation boards
Detailed site design	• Detailed site design to be provided in accordance with the principles set out in the Landscape and Habitat Management Strategy (Application Reference Number: 8.16) • Detailed design to include route of temporary PRoW diversion • Detailed design to include site management scheme (section 5) • Define period during which work should take place, and produce detailed works plan and timeline

TASK	MAIN ELEMENTS
	• Detailed design to include new permanent PRoW route across site and public access enhancements • Detailed design to include assessment of health and safety, security, and environment risks, with risks designed out as far as possible, and controls identified for residual risks.
Identification of access measures	• Identification of safe access points for vehicles across site • Identification of construction no-go areas • Design of bridges for livestock and vehicle access between north and south of site
Identification of source for plant propagules	• Identification of source of green hay or similar for use in enhancement • Identification of nursery with capacity to propagate and provide key plant species for planting as part of habitat re-establishment
Preparatory Health and Safety works	• Risks and hazards associated with works assessed and control measures identified
Procure groundworks contractor	• Appoint suitably experienced contractors for elements of works • Contractor scope to include identification of suitable plant and other equipment for undertaking works
Undertake preparatory site access	• Installation of health and safety, security and environment controls • Demarcate no-go areas for construction • Construct site compound in selected location • Replacement of existing derelict perimeter fencing and removal of internal fences • Construction of bridges for vehicle and livestock access between north and south of site

4.3 Access and management infrastructure

In order to facilitate vegetation clearance and management of the site, it is proposed that grazing and access infrastructure would be installed. This is likely to include the following:

- perimeter fencing and access points, installed prior to any vegetation clearance works in order to exclude stock;
- construction of replacement footbridge along the public right of way and a further bridge to the east, to be installed in advance of the works to enable access; and
- additional internal fencing and access points and an area for corralling and watering livestock.

An indicative plan of the above features is provided in figure 3-1.

4.4 Scrub clearance

Willow scrub occupies approximately 3.1ha of former mire habitat and would be cleared as part of the works (figure 3-1). Scrub would be removed by a contractor, with smaller stumps winched out of the peat and larger stumps treated with herbicide. Scrub removal arisings could be disposed of by removal from site or retention on site as habitat piles. Options for the removal of scrub arisings would be provided in detailed design.

Scrub clearance would not take place during bird nesting season (March to August inclusive), and some peripheral or scattered patches of scrub would be retained for breeding birds. The works would be supervised by the project officer in order to achieve the desired vegetation structure. Clearance works are anticipated to be completed within one season: vegetation would be cut down outside the bird nesting season (bird nesting season considered to be March – September), and stumps removed during the spring and summer months.

4.5 Purple moor-grass clearance

The unmanaged and over-grown purple moor-grass mire in the south of Ty du would be cut as part of the proposal in order to reinstate management and facilitate regeneration (figure 3-1). Tussocks of purple moor-grass would be removed using power tools (e.g. brush cutter or chainsaw) and removed from the area by contractor, with vegetation removed disposed of by filling the main drain, removal from site or burning on site in a suitable location. Complete clearance is not proposed, some tussocks supporting other vegetation (such as bog asphodel (*Narthecium ossifragum*)) which would be left *in situ*.

The area to be cut supports adder (*Vipera berus*) and works would be undertaken during the hibernation season (approximately October to March inclusive) to avoid any impacts to this and any other herpetile species. Vegetation clearance works would be carried out under the supervision of the project officer in order to ensure no impacts to protected species and to achieve the desired vegetation structure.

4.6 Septic tank removal

The septic tank in the north east corner of site (figure 2-2) would be removed or drained by specialist contractor and sealed as part of the proposal to prevent further contamination of mire habitat at Ty du.

4.7 Vegetation establishment

Following vegetation clearance, mire habitat of greater nature conservation value would be established. In cleared areas, hay would be introduced, spread by hand. The hay would have been collected the summer immediately prior to works, either from Ty du or from other suitable donor sites. If hay is collected from another site, then it would be from vegetation broadly similar to the types represented at Ty du. Consideration would be given to the control of biosecurity risks when transporting material, e.g. presence of invasive non-native species in donor sites.

Other methods of vegetation establishment may be undertaken. Bog moss (*Sphagnum* spp.) may be introduced on exposed peat surfaces and plugs of other ecologically important plants (e.g. bottle sedge (*Carex rostrata*), common cotton-grass (*Eriophorum angustifolium*)) could be planted, following methods used in the restoration of bogs in England and Wales [RD4]. Detailed options for vegetation establishment would be provided in detailed design.

Livestock would be excluded from regenerating areas. Subsequent management of these areas is described in section 5.

5. Habitat management proposals

5.1 Introduction

This section outlines the management proposed in order to secure the long-term favourable development and condition of Ty du following the completion of all habitat works described in section 4.

5.2 Management scheme

Ongoing management of Ty du would be carried out in accordance with management schemes to be submitted to and approved by the IACC. The management schemes will be prepared in accordance with the management principles in section 7 of the Landscape and Habitat Management Strategy (Application Reference Number: 8.16). These measures will be secured through the DCO.

The management scheme would set out the objectives for management, management methods, management programme and any other relevant information. The overall objective would be to deliver the enhancement and maintenance of mire habitat to offset potential adverse effects at Tre'r Gof SSSI. The management programme would include a programme of on-going monitoring, assessment and review (section 6). The management scheme would be periodically reviewed an updated where necessary, initially on an annual cycle but this would be extended as habitats become established. Indicative management methods are outlined below.

5.3 Management methods

5.3.1 Grazing and cropping

The long-term management of Ty du would principally be low-intensity grazing by suitable livestock, such as ponies or cattle. Options for stocking and other grazing management would be detailed in the site management scheme. The following are indicative stocking densities (1 livestock unit (LU) = 1 cow; 0.15 = 1 sheep) [RD4]:

- fen and swamp 0.02LU/ha/year;
- purple moor-grass (*Molinia caerulea*) grassland 0.25LU/ha/year;
- rush pasture 0.4LU/ha/year; and
- semi-natural grassland 0.3-0.5LU/ha/year.

Options for grazing would give consideration to numerous factors including the type of stock and their experience of grazing similar habitats. Other vegetation cropping methods could include the cutting of vegetation and removal of litter. This and other cropping methods would be set out in the site management scheme.

5.3.2 Scrub management

Scrub would be managed as part of routine site management and removed where it encroaches on important herbaceous communities.

5.3.3 Routine monitoring

As part of the management of Ty du, management issues would be identified as and when they arose (e.g. over- or under-grazing, weed infestation), and appropriate corrective measures would be instigated. This would form a separate management activity from the monitoring outlined in section 6.

5.3.4 Public access

The management scheme would also make provision for the maintenance of any public access infrastructure at Ty du, such as repairs to signage or paths.

6. Monitoring, assessment and review

6.1 Introduction

Monitoring would be required to determine the success of the habitat enhancement proposal and of subsequent management at Ty du, and to inform future management decisions. The habitat monitoring, assessment, and review process to be delivered as part of the compensation proposals is outlined below. The programme for this process would be detailed in the site management scheme (section **Error! Reference source not found.**). Horizon and its contractors would be responsible for all monitoring, assessment and review undertaken.

6.2 Habitat monitoring and assessment

As part of the compensation proposal, the development of vegetation would be monitored in order to assess the success of habitat enhancement works in restoring the target plant communities at Ty du. The target plant communities would be those already found at Ty du (section 2.5), such as M6 *Carex rostrata-Sphagnum squarrosum* mire and other communities of mires with a range of water chemistries.

As part of detailed design, a habitat monitoring and assessment plan would be provided. Habitat monitoring would be by means of fixed vegetation plots recorded before and after any works on an annual basis, and designed to enable the assessment of all vegetation treatments. High resolution aerial imagery and LiDAR would also be collected to provide additional data. The assessment criteria would include positive and negative indicators covering key parameters, such as presence and cover of ecologically important (e.g. bog mosses) or undesirable plants (e.g. those indicative of higher nutrient status).

6.3 Review

Data collected as part of monitoring and the results of assessments would be periodically reviewed by the project officer and reported to the steering group. Based on these results, decisions would be taken on the on-going management needs at Ty du.

7. References

Table 7-1: References

REF. NO.	REFERENCE
[RD1]	Department for Energy and Climate Change (2011). *National Policy Statement for Nuclear Power Generation (EN-6)*.
[RD2]	Department for Energy and Climate Change (2011). *National Policy Statement for Nuclear Power Generation (EN-6).*
[RD3]	Rodwell, J. S. (Ed.), 1991-2000. British Plant Communities. Cambridge: CUP.
[RD4]	BeadaMoss, 2017. [Online] Available at: http://www.beadamoss.co.uk/page8.html

HORIZON NUCLEAR POWER

ENERGY WORKING FOR BRITAIN

TRE'R GOF SSSI COMPENSATION PROPOSAL VOLUME II

Hydrological monitoring scope – Cors Gwawr and Cae Canol-dydd

DCRM Ref Number: 60PO8097/HYD/REP/001

Revision: 1.0

Additional Requirements or Controls			
LISTED READERS ONLY		LEGALLY PRIVILEGED	

Comments: FINAL REPORT

Distribution		
Required for Listed Readers Only and Legally Privileged but can be used with other markings		

Contents

1 Introduction

This report presents Horizon's hydrological monitoring scope for the two sites proposed for fen creation and enhancement; Cors Gwawr and Cae Canol-dydd. The monitoring network described in the sections below has been designed to develop the existing conceptual understanding of the two sites, with particular regard to their hydrological functioning, and the interactions between the surface water and groundwater environments.

Based on the current conceptual understanding of each site, a number of potential options for raising water levels, and creating or enhancing areas of alkaline fen, have been identified, which include:

- Low key dam installation (e.g. using plank weirs) across surface water drainage channels to retain water.
- Blocking surface water drainage channels.
- Removal, or diversion, of local surface water drainage channels.
- Removal of buried field drains or blocking their outflows.
- Localised changes to the topography to retain water.
- Diversions of calcareous spring flows across the site.

The hydrological monitoring outlined below has been designed to provide data which would allow the effectiveness of each option to be assessed and refined as part of a detailed optioneering assessment, and for identifying the preferred options to be taken forward for fen creation and enhancement.

It is recommended that the preferred options are designed based on 12 months' worth of monitoring data, but that monitoring is continued beyond this, to collect further baseline data, which can then be used to refine the option design and provide a more robust pre-construction dataset.

1.1 Sources of information

The sources of information used in the production of the hydrological monitoring scope are summarised in Table 1 below.

Table 1: Sources of information

TYPE OF INFORMATION	DATA SOURCE
Similar studies	Anglesey & Llyn Fens LIFE Project: Technical Report No. 2 [RD1] and Anglesey & Llyn Fens LIFE Project: Technical Report No. 4 [RD2].
Bedrock and superficial geology	British Geological Survey geological maps (1:50,000 scale) [RD3].

TYPE OF INFORMATION	DATA SOURCE
Soils	Preliminary soil survey from scoping phase of project. A total of 17 soil cores were taken across the two sites using a hand-held gouge auger in September 2016 and November 2016 [RD4].
Topography	LiDAR data (<0.1m resolution) [RD4].
Hydrology and hydrogeology	Site walkovers in September 2016, November 2016, March 2017 and July 2017 to identify locations of drainage ditches, surface water networks, buried field drains, inputs of spring water or seepage areas, groundwater upwelling, marginal groundwater inflows intercepted by peripheral drainage [RD4].
Vegetation	Vegetation mapping carried out by a Jacobs ecologist in July 2017 and National Vegetation Classification mapping provided by Natural Resources Wales (NRW) in 2016 [RD4].
Water quality	Surface water samples taken from multiple locations across the two sites in September 2016, November 2016, March 2017 and July 2017 [RD4].

1.2 Stakeholder Engagement

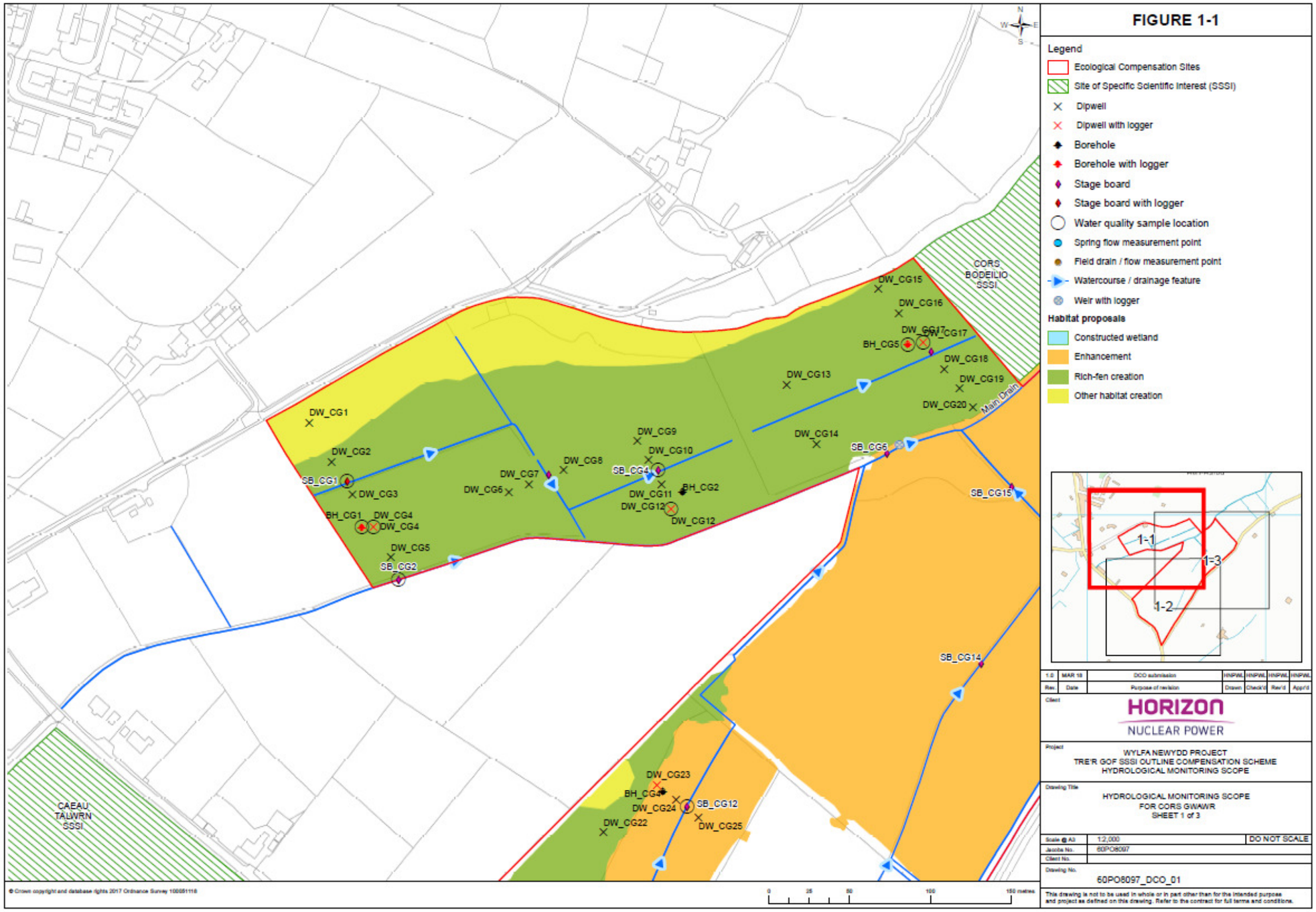
The hydrological monitoring scope has been developed by Horizon through discussion with a Technical Advisory Group (TAG), comprising representatives from Horizon, the Isle of Anglesey County Council and Natural Resources Wales (NRW). Further information regarding stakeholder liaison is provided in appendix D9-23 (SSSI Compensation Strategy - Volume I) (Application Reference Number: 6.4.56).

2 Hydrological monitoring scope

Outlines of hydrological monitoring plans are provided below for each site. Figures 1 and 2 show the locations of proposed dipwells, boreholes, stage boards (for surface water level measurements) and additional monitoring locations. Tables 2 and 3 provide justification for the type and location of each monitoring point proposed. All monitoring points would be surveyed to Ordnance Datum and National Grid upon completion.

2.1 Cors Gwawr

Figure 1: Proposed hydrological monitoring plan for Cors Gwawr



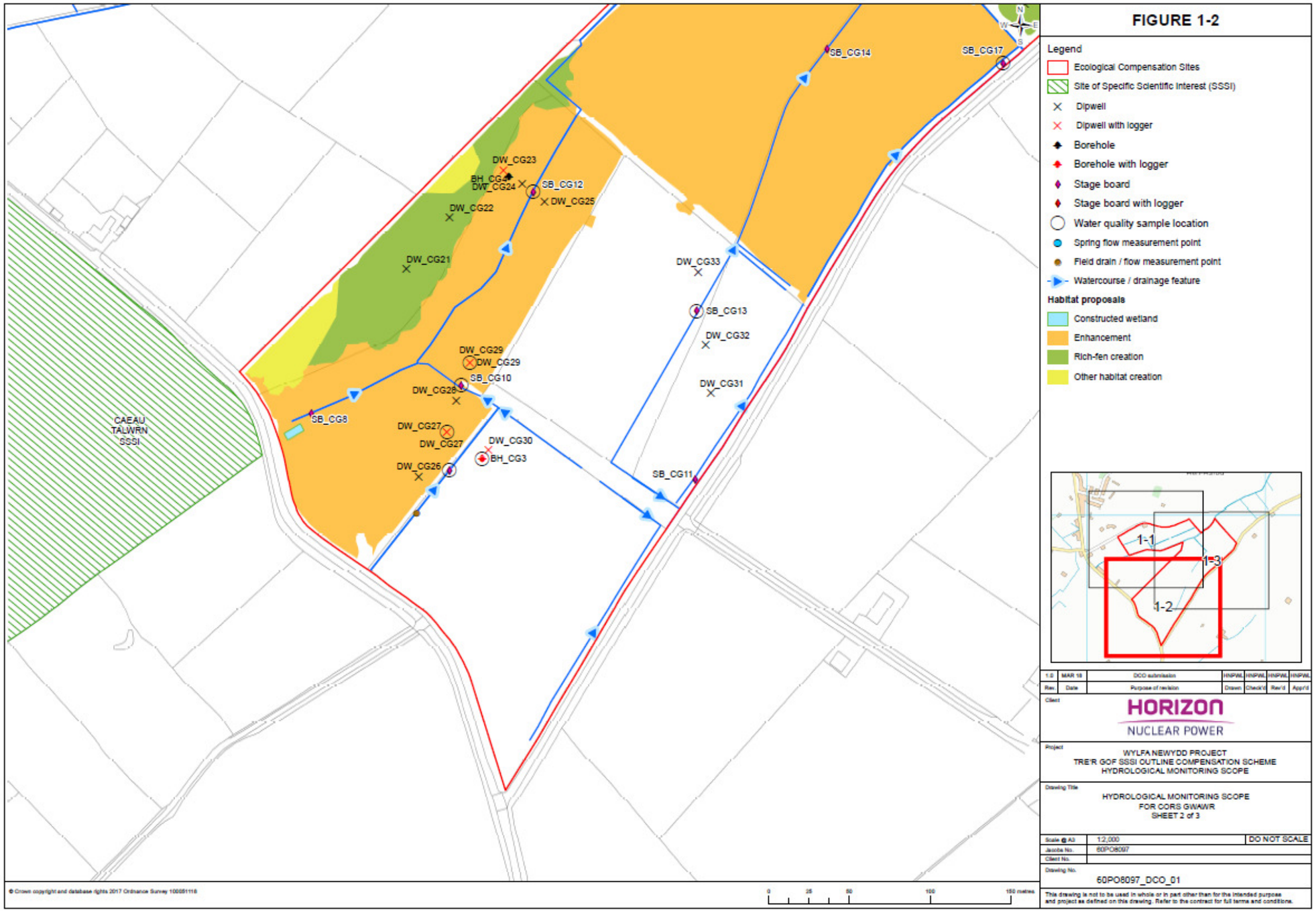


FIGURE 1-2

Legend

- Ecological Compensation Sites
- Site of Specific Scientific Interest (SSSI)
- Dipwell
- Dipwell with logger
- Borehole
- Borehole with logger
- Stage board
- Stage board with logger
- Water quality sample location
- Spring flow measurement point
- Field drain / flow measurement point
- Watercourse / drainage feature

Habitat proposals

- Constructed wetland
- Enhancement
- Rich-fen creation
- Other habitat creation

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	App'd
1.0	MAR 18	DCO submission	HNPWL	HNPWL	HNPWL	HNPWL

Client: HORIZON NUCLEAR POWER

Project: WYLFA NEWYDD PROJECT
TRE'R GOF SSSI OUTLINE COMPENSATION SCHEME
HYDROLOGICAL MONITORING SCOPE

Drawing Title: HYDROLOGICAL MONITORING SCOPE
FOR CORS GWAWR
SHEET 2 of 3

Scale @ A3	1:2,000 DO NOT SCALE
Jacobs No.	60PO8097
Client No.	

Drawing No.: 60PO8097_DCO_01

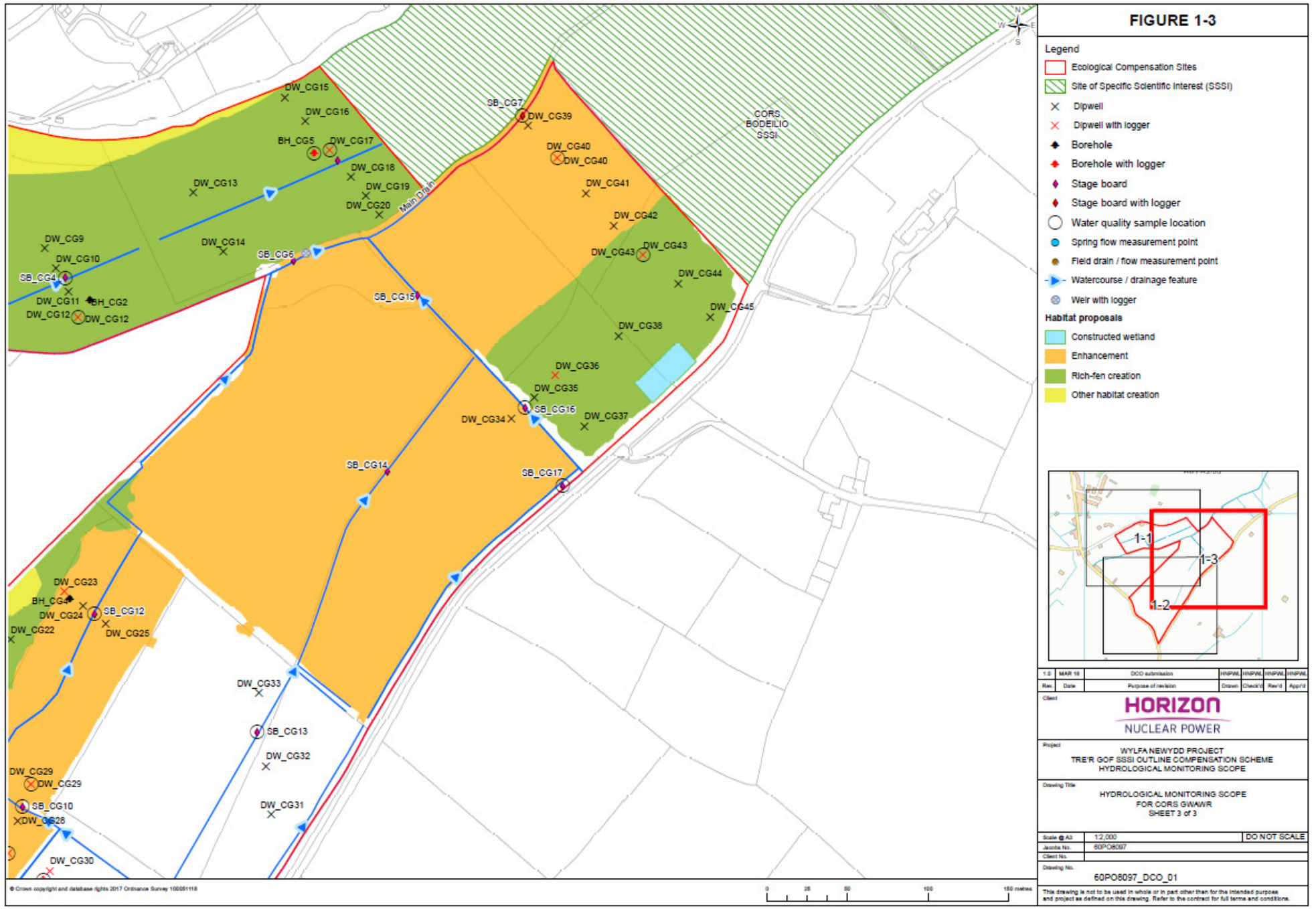

DW_CG15
DW_CG16
BH_CG5
DW_CG17
DW_CG18
DW_CG13
DW_CG19
DW_CG20
Main Drain
DW_CG9
DW_CG10
SB_CG4
DW_CG11
BH_CG2
DW_CG12
DW_CG12
DW_CG14
SB_CG5
SB_CG15
SB_CG7
DW_CG39
DW_CG40
DW_CG40
DW_CG41
DW_CG42
DW_CG43
DW_CG43
DW_CG44
DW_CG45
DW_CG38
DW_CG36
DW_CG35
SB_CG16
DW_CG34
DW_CG37
SB_CG14
SB_CG17
CORS BODEILIO SSSI
DW_CG23
BH_CG4
DW_CG24
SB_CG12
DW_CG22
DW_CG25
DW_CG33
SB_CG13
DW_CG32
DW_CG29
DW_CG29
SB_CG10
DW_CG28
DW_CG31
DW_CG30
© Crown copyright and database rights 2017 Ordnance Survey 100051116
0 25 50 100 150 metres
FIGURE 1-3
Legend
Ecological Compensation Sites
Site of Specific Scientific Interest (SSSI)
Dipwell
Dipwell with logger
Borehole
Borehole with logger
Stage board
Stage board with logger
Water quality sample location
Spring flow measurement point
Field drain / flow measurement point
Watercourse / drainage feature
Weir with logger
Habitat proposals
Constructed wetland
Enhancement
Rich-fen creation
Other habitat creation
1-1
1-2
1-3
1.0 MAR 18 DCO submission HNPWL HNPWL HNPWL HNPWL
Rev. Date Purpose of revision Drawn Check'd Rev'd App'd
Client
HORIZON NUCLEAR POWER
Project
WYLFA NEWYDD PROJECT
TRE'R GOF SSSI OUTLINE COMPENSATION SCHEME
HYDROLOGICAL MONITORING SCOPE
Drawing Title
HYDROLOGICAL MONITORING SCOPE
FOR CORS GWAWR
SHEET 3 of 3
Scale @ A3 1:2,000 DO NOT SCALE
Jacobs No. 60PO8097
Client No.
Drawing No.
60PO8097_DCO_01
This drawing is not to be used in whole or in part other than for the intended purpose and project as defined on this drawing. Refer to the contract for full terms and conditions.

Table 2: Justification for monitoring points proposed at Cors Gwawr

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
DIPWELLS				
DW_CG1 to DW_CG5	249198 to 249249	376879 to 376796	• Dipwells proposed in transects rather than single point locations to generate cross-sectional shallow groundwater level plots that can be mapped with soil profile information, bedrock and superficial geology profiles, and deeper bedrock groundwater levels • Dipwell transects proposed at all locations where modifications to existing drainage ditches or watercourses are proposed to raise shallow groundwater levels within the site boundary • Dipwells proposed at single points when paired with boreholes to identify vertical head gradients between superficial and bedrock aquifers (if present), or in basin areas that are intended to be irrigated with surface water	• The dipwell transect would measure the shallow groundwater level gradient across the valley to the north of the Main Drain, at the up-gradient end of an area of potential fen creation in the northwest of the site • DW_CG4 is also located adjacent to borehole BH_CG1, to establish the vertical hydraulic head gradient between the bedrock groundwater level and the shallow groundwater level in the superficial deposits / sub-soil in an area of perennial seepage, at a topographic break in slope, that gives rise to an area of existing fen vegetation (M13 and M22 communities)
DW_CG6 to DW_CG8	249322 to 249356	376836 to 376850		• The dipwell transect would monitor shallow groundwater levels either side of a drainage ditch that may be infilled, dammed or diverted as a potential option to raise shallow groundwater levels in an area of potential fen creation in the north of the site. The transect would monitor the before and after response to any changes
DW_CG9 to DW_CG12	249402 to 249422	376868 to 376826		• The dipwell transect would monitor shallow groundwater levels either side of a drainage ditch that may be infilled, dammed or diverted as a potential option to raise shallow groundwater levels in an area of potential fen creation in the north of the site. The transect would monitor the before and after response to any changes • DW_CG12 is also located adjacent to borehole BH_CG2, to establish the vertical hydraulic head gradient between the bedrock groundwater level and the shallow groundwater level in the superficial deposits / sub-soil in this part of the site

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
DW_CG13 & DW_CG14	249494 and 249513	376904 and 376866	or groundwater to raise shallow groundwater levels in the areas of proposed fen creation • Service plans would be collected and provided to the appointed contractor for review, prior to the installation of any structures • Water levels in all dipwells would be manually dipped on a monthly basis • Automatic water level loggers would be installed at dipwell locations shown on Figure 1, and downloaded on a monthly basis • In-situ water quality readings would be taken at dipwell locations shown on Figure 1, on a monthly basis • Water quality samples would be taken from borehole locations shown on Figure 1, on a quarterly basis. The proposed	• The dipwells would monitor shallow groundwater levels in areas that may be irrigated by surface water from two separate drainage ditches, which could be dammed or partially infilled along their reaches as potential options to raise shallow groundwater levels in an area of potential fen creation in the north of the site. The dipwells would monitor the before and after response to any changes
DW_CG15 to DW_CG20	249551 to 249610	376962 to 376889		• The dipwell transect would measure the shallow groundwater level gradient across the valley to the north of the Main Drain, at the down-gradient end of an area of potential fen creation in the north of the site, and would allow assessment of potential future adverse impacts on shallow groundwater levels entering Cors Bodeilio SSSI • DW_CG17 is also located adjacent to borehole BH_CG5, to establish the vertical hydraulic head gradient between the bedrock groundwater level and the shallow groundwater level in the superficial deposits / sub-soil in this part of the site
DW_CG21 to DW_CG23	249354 to 249414	376593 to 376656		• The dipwell transect would measure the shallow groundwater level gradient, in an area of potential fen creation, adjacent to an area of prohibited access to the north to allow assessment of potential future adverse impacts on groundwater levels in this area • The dipwell transect would also monitor shallow groundwater levels in an area that may be irrigated by surface water from a drainage ditch at SB_CG12, which could raise shallow groundwater levels in this area. The dipwell would monitor the before and after response to any changes
DW_CG23 to DW_CG25	249414 to 249439	376656 to 376635		• The dipwell transect would monitor shallow groundwater levels either side of a drainage ditch that may be infilled, dammed or diverted as a potential option to raise shallow

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
			locations of water quality sampling from dipwells include areas intended to be flushed with surface water or shallow groundwater to monitor baseline water quality and compare changes post-construction, and also adjacent to certain boreholes to directly compare bedrock and superficial / soil water quality to aid with source interpretation and develop the site Conceptual Site Model (CSM) • The locations and installation details of dipwells installed in Cors Bodeilio SSSI would also be reviewed, to determine baseline conditions in an offsite receptor, down-gradient of Cors Gwawr, as well as any water level data obtained through manual dips or divers, and water quality data obtained from in-situ tests or lab analysis	groundwater levels in the south of the site. The transect would monitor the before and after response to any changes • DW_CG23 is also located adjacent to borehole BH_CG4, to establish the vertical hydraulic head gradient between the bedrock groundwater level and the shallow groundwater level in the superficial deposits / sub-soil in this part of the site
DW_CG26 to DW_CG29	249362 to 249394	376465 to 376535		• The dipwell transect would monitor the shallow groundwater level gradient, in an area of existing fen habitat, where a spring head discharges calcareous groundwater towards a drainage ditch that may be infilled as a potential option to raise shallow groundwater levels, and restore the groundwater flow path in this part of the site. The transect would monitor the before and after response of this option as well as enabling the assessment of any potential future adverse impacts on the existing fen habitat
DW_CG30	249405	376482		• Adjacent to borehole BH_CG3, to establish the vertical hydraulic head gradient between the bedrock groundwater level and the shallow groundwater level in the superficial deposits / sub-soil adjacent to an area of existing fen habitat
DW_CG31 to DW_CG33	249542 to 249534	376516 to 376592		• The dipwell transect would measure the shallow groundwater level gradient, in an area that may be considered for future fen creation, and which may be irrigated by surface water from the drainage ditches at locations SB_CG11 and SBCG13 if required
DW_CG34 to DW_CG36	249692 to 249719	376762 to 376790		• The dipwell transect would monitor shallow groundwater levels either side of a drainage ditch that may be infilled, dammed or diverted as a potential option to raise shallow groundwater levels in an area of potential fen creation in the east of the site. The transect would monitor the before and after response to any changes

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
DW_CG37 and DW_CG38	249737 and 249759	376757 and 376815		• The dipwells would monitor shallow groundwater levels in areas that may be irrigated by surface water from two drainage ditches at SB_CG16 and SB_CG17, which could be dammed or partially infilled along their reaches as potential options to raise shallow groundwater levels in an area of potential fen creation in the east of the site. The dipwells would monitor the before and after response to any changes
DW_CG39 to DW_CG45	249704 to 249817	376945 to 376826		• The dipwell transect would measure the shallow groundwater level gradient across lower portion of the valley, to the south of the Main Drain and across areas of both existing fen habitat and potential fen creation, to provide a cross-sectional profile across the valley and to compare to the shallow groundwater level data obtained from dipwell transect DW_CG15 to DW_CG20 in the northern compartment of the valley bottom • The dipwell transect is positioned perpendicular to the shallow groundwater / surface water flow direction into Cors Bodeilio SSSI, to allow assessment of any future adverse impacts on shallow groundwater levels entering the SSSI
BOREHOLES				
BH_CG1	249232	376814	• All borehole locations proposed are considered feasible in terms of access and ground conditions for drilling rigs / vehicles • Service plans would be collected and provided to the appointed contractor for review, prior to the	• To provide groundwater level data in bedrock and superficial deposits (if saturated) and to identify groundwater flow directions, in an area of proposed fen creation in the north of the site • Current conceptual understanding shows that calcareous spring flow emerges from the shallow limestone bedrock (<0.2m deep) in the west of the site, near to the proposed location of borehole BH_CG1. Boards across the ditch to the north could be a potential option to raise water levels in this area. Borehole installation here would also allow comparison of groundwater quality from the limestone bedrock, with that

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
			installation of any structures • Possible dual installations required (to screen both the bedrock and superficial deposits) if water bearing strata are found within the till or alluvium • Based on the existing conceptual understanding of the site, no borehole would need to extend below 10m depth • Water levels in all boreholes would be manually dipped on a monthly basis • Automatic water level loggers would be installed at borehole locations shown on Figure 1, and downloaded on a monthly basis • In-situ water quality readings would be taken at borehole locations shown on Figure 1, on a monthly basis • Water quality samples would be taken from	from the spring, which discharges into the drainage ditch at this location, to confirm that the spring rises from the limestone bedrock
BH_CG2	249430	376836		• To provide groundwater level data in bedrock and superficial deposits (if saturated) and to identify groundwater flow directions, in an area of proposed fen creation in the north of the site, close to both a primary inflow into the north of the site and the Main Drain, which if dammed or infilled, could raise local groundwater levels in the valley bottom (depending on the depth and permeability of the superficial cover) • Close to the central portion of the site to monitor groundwater levels adjacent to an area where access is prohibited and to allow assessment of potential future adverse impacts on groundwater levels in this location
BH_CG3	249401	376475		• To provide groundwater level data in bedrock and superficial deposits (if saturated) and to identify groundwater flow directions, adjacent to an area of existing fen habitat in the southwest of the site, close to where groundwater is emerging at ground level via a spring head at SPRING_CG2, at the boundary of the limestone and metamorphic bedrock (Gwna Group) and at a topographic break in slope • Borehole installation here would also allow comparison of groundwater quality from the bedrock, with that from the spring, which discharges into the drainage ditch at SB_CG10
BH_CG4	249417	376650		• Provide groundwater level data in bedrock deposits and superficial deposits (if saturated), and to identify groundwater flow directions, adjacent to an area of proposed fen creation in the south of the site, close to a drainage ditch, which if dammed, could raise local groundwater levels in this area

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
			borehole locations shown on Figure 1), on a quarterly basis • The locations and installation details of boreholes in Cors Bodeilio SSSI would also be reviewed, to determine baseline conditions in an offsite receptor, down-gradient of Cors Gwawr, as well as any water level data obtained through manual dips or divers, and water quality data obtained from in-situ tests or lab analysis	(depending on the depth and permeability of the superficial cover) • Located close to the central region of the site to monitor groundwater levels adjacent to where access is prohibited, to assess risks to off-site receptors
BH_CG5	249569	376928		• To provide groundwater level data for the north-eastern part of the site, for bedrock and superficial deposits, and to identify groundwater flow directions, in an area of proposed fen creation, where monitoring would be targeted • Close to Cors Bodeilio SSSI to provide groundwater level data for the limestone bedrock and to assess of any adverse impacts on groundwater levels adjacent to the SSSI (sensitive receptor)
STAGE BOARDS				
SB_CG1	249222	376843	• Water levels at all stage board locations would be measured manually on a monthly basis • Automatic water level loggers would be installed at locations SB_CG1 and SB_CG7 to collect 15-minute water level readings at key times of the year. This data would be	• To monitor flows and water levels along one of the five main surface water inputs into the site • To monitor water levels and flows in a drainage ditch that could be dammed or infilled as a potential option to flush calcareous spring water east and raise shallow groundwater levels in an area of fen creation in the northwest of the site
SB_CG2	249253	376782		• To monitor flows and water levels along the Main Drain (one of the five main surface water inputs into the site) • To monitor water levels and flows in a drainage ditch that could be dammed as a potential option to raise shallow groundwater levels in an area of fen creation throughout the north of the site

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
			downloaded on a monthly basis • Monthly spot flow monitoring would be undertaken at stage board locations shown on Figure 1 to monitor pre and post option responses • In-situ water quality readings would be taken at stage board locations shown on Figure 1, on a monthly basis • Water quality samples would be taken from stage board locations shown on Figure 1, on a quarterly basis. The proposed locations of water quality samples from stage board locations include ditches or watercourses intended to be dammed, infilled or diverted, to irrigate adjacent land with surface water, to monitor baseline water quality and identify if pre-treatment is required before each potential option is considered	• To monitor water levels and flows along the boundary of an area of prohibited access to allow assessment of any adverse impacts occurring in this area
SB_CG3	249346	376847		• To monitor water levels in a drainage ditch that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of fen creation in the north of the site
SB_CG4	249414	376851		• To monitor water levels in a drainage ditch that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of fen creation in the north of the site
SB_CG5	249583	376924		• To monitor water levels and flows close to the outflow point of the site into Cors Bodeilio SSSI to allow assessment of any future adverse impacts occurring to the receptor, as well as providing additional water level information for transect DW_CG15 to DW_CG20
SB_CG6	249556	376860		• To monitor water levels along a section of the Main Drain that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of fen creation in the north of the site
SB_CG7	249699	376950		• To monitor water levels and flows along the Main Drain at its outflow point from the site (and the inflow point to Cors Bodeilio SSSI), and also to provide additional water level data for dipwell transect DW_CG39 to DW_CG45 • To allow assessment of any future adverse impacts occurring to water levels within the SSSI
SB_CG8	249295	376505		• To monitor water levels along one of the five main surface water inputs into the site

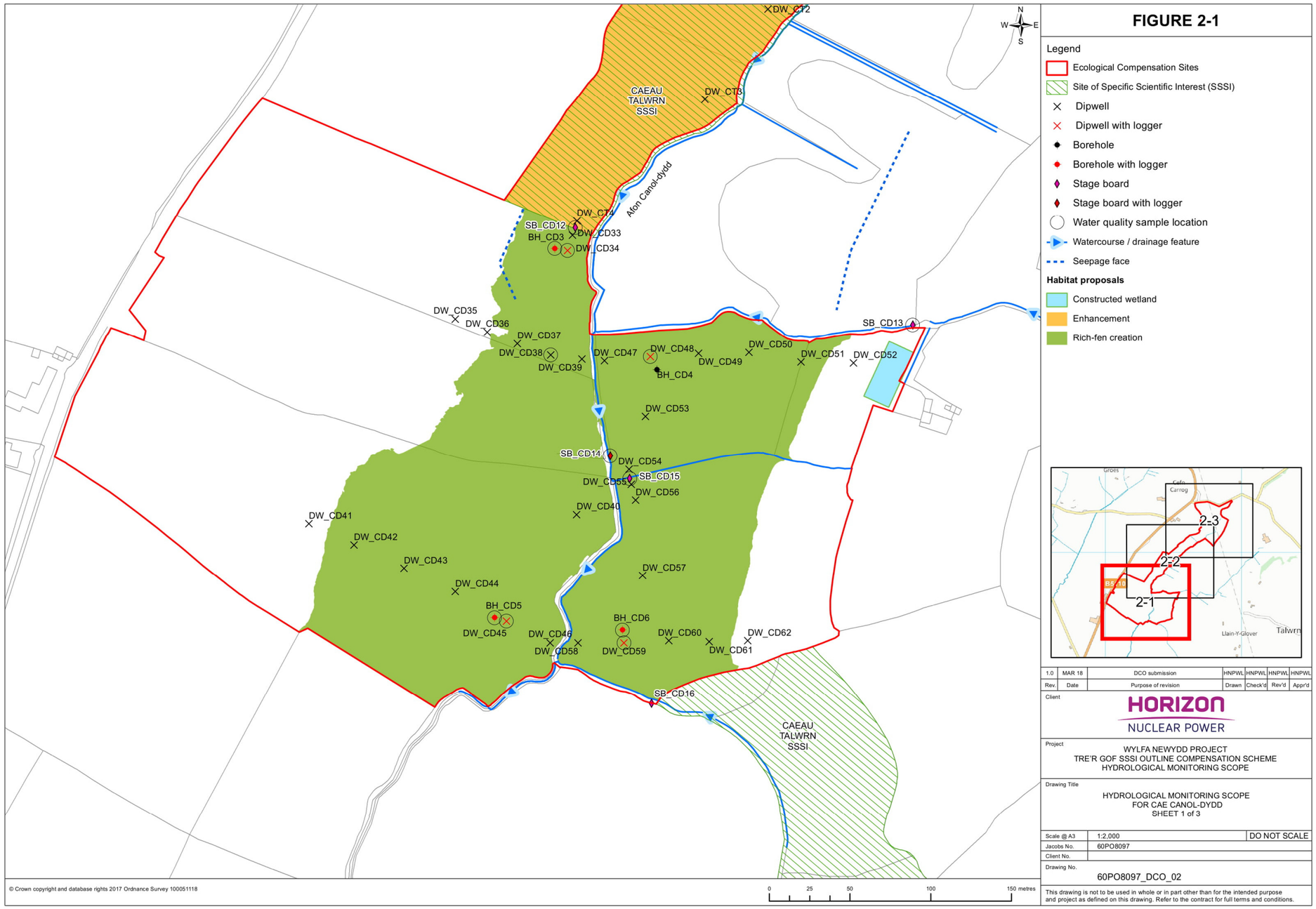
POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
SB_CG9	249380	376469	• The locations, flow data and water quality data held by NRW for Cors Bodeilio SSSI would also be reviewed, to determine baseline conditions in an offsite receptor, down-gradient of Cors Gwawr	• To monitor flows and water levels along one of the five main surface water inputs into the site • To monitor water levels and flows in a drainage ditch that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of existing fen vegetation in the southwest of the site and to restore an existing groundwater pathway and encourage the development of the existing M13 and M22 community in this part of the site
SB_CG10	249388	376522		• To monitor water levels in a drainage ditch that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of existing fen vegetation in the southwest of the site and to restore an existing groundwater pathway and encourage the development of the existing M13 and M22 community in this part of the site
SB_CG11	249533	376464		• To monitor water levels along one of the five main surface water inputs into the site
SB_CG12	249432	376642		• To monitor water levels in a drainage ditch that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of existing fen vegetation in the southwest of the site
SB_CG13	249533	376567		• To monitor water levels in a drainage ditch that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of the site that could later be considered as a potential for fen creation
SB_CG14	249615	376730		• To monitor water levels along one of the main drainage ditches in the south of the site
SB_CG15	249634	376839		• To monitor water levels along one of the main drainage ditches in the east of the site

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
SB_CG16	249701	376770		• To monitor water levels and flows in a drainage ditch that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of proposed fen creation in the east of the site
SB_CG17	249723	376721		• To monitor water levels and flows in a drainage ditch that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of proposed fen creation in the east of the site
FLOW MONITORING POINTS				
WEIR_CG1	249562	376865	• A weir would be installed at location WEIR_CG1, the design of which would take into account the nature of the channel cross section at the location shown on Figure 1. An automatic water level logger would be installed in a stilling well to collect 15-minute water level readings which would be used to calculate stream discharge volume • Monthly spot flow monitoring would be undertaken at WEIR_CG1 to validate flow data calculated from the water levels recorded by the automatic data logger • Flow data (for SPRING_CG1,	• To obtain detailed water flow information along the Main Drain close to its outflow point from the site (and the inflow point to Cors Bodeilio SSSI), and to allow assessment of any future adverse impacts occurring to water levels within the SSSI
SPRING_CG1	249201	376834		• To obtain flow data for a spring, which provides calcareous inflows into a drainage ditch in the northwest of the site, within an area of proposed fen creation, at a break in the slope from the north • To compare water quality data with that obtained from the bedrock at BH_CG1 to aid with source interpretation and develop the site CSM
SPRING_CG2	249368	376479		• To obtain flow data (when possible) for a spring head, which provides calcareous inflows to the southwest of the site, within an area of existing fen habitat • To compare water quality data with that obtained from the bedrock at BH_CG3 to aid with source interpretation and develop the site CSM
DRAIN_24A	249359	376442		• To obtain flow data from a field drain, which can be seen discharging into a drainage ditch at this location, to identify

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
			SPRING_CG2 and DRAIN_CG1) would be collected on a monthly basis using a 1L container and a stopwatch • In-situ water quality readings would be taken at all locations on a monthly basis • Water quality samples would be taken at all locations on a quarterly basis	the range in flows provided by the sub-surface drainage network. If topsoil stripping is taken forward as an option, there is a high probability that the majority of buried field drains would be removed, locally raising water levels through the site. The potential increase in water levels would need to be estimated through monitoring existing flows and volumes currently being conveyed by the field drainage network

2.2 Cae Canol-dydd

Figure 2: Proposed hydrological monitoring plan for Cae Canol-dydd



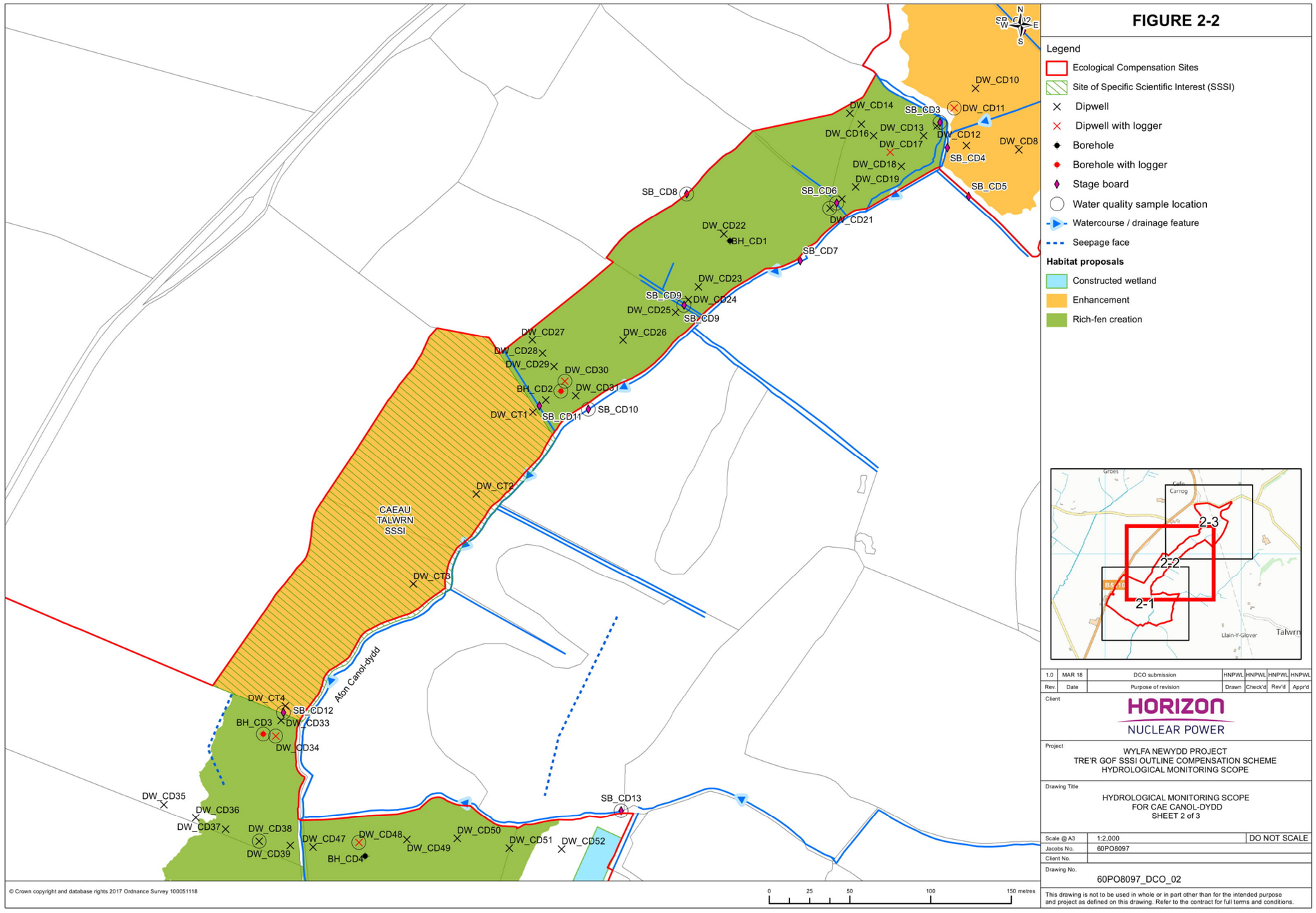


FIGURE 2-2

Legend

- Ecological Compensation Sites
- Site of Specific Scientific Interest (SSSI)
- Dipwell
- Dipwell with logger
- Borehole
- Borehole with logger
- Stage board
- Water quality sample location
- Watercourse / drainage feature
- Seepage face

Habitat proposals

- Constructed wetland
- Enhancement
- Rich-fen creation

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
1.0	MAR 18	DCO submission	HNPWL	HNPWL	HNPWL	HNPWL

Client: HORIZON NUCLEAR POWER

Project: WYLFA NEWYDD PROJECT
TRE'R GOF SSSI OUTLINE COMPENSATION SCHEME
HYDROLOGICAL MONITORING SCOPE

Drawing Title: HYDROLOGICAL MONITORING SCOPE
FOR CAE CANOL-DYDD
SHEET 2 of 3

Scale @ A3	1:2,000	DO NOT SCALE
Jacobs No.	60PO8097	
Client No.		

Drawing No.: 60PO8097_DCO_02

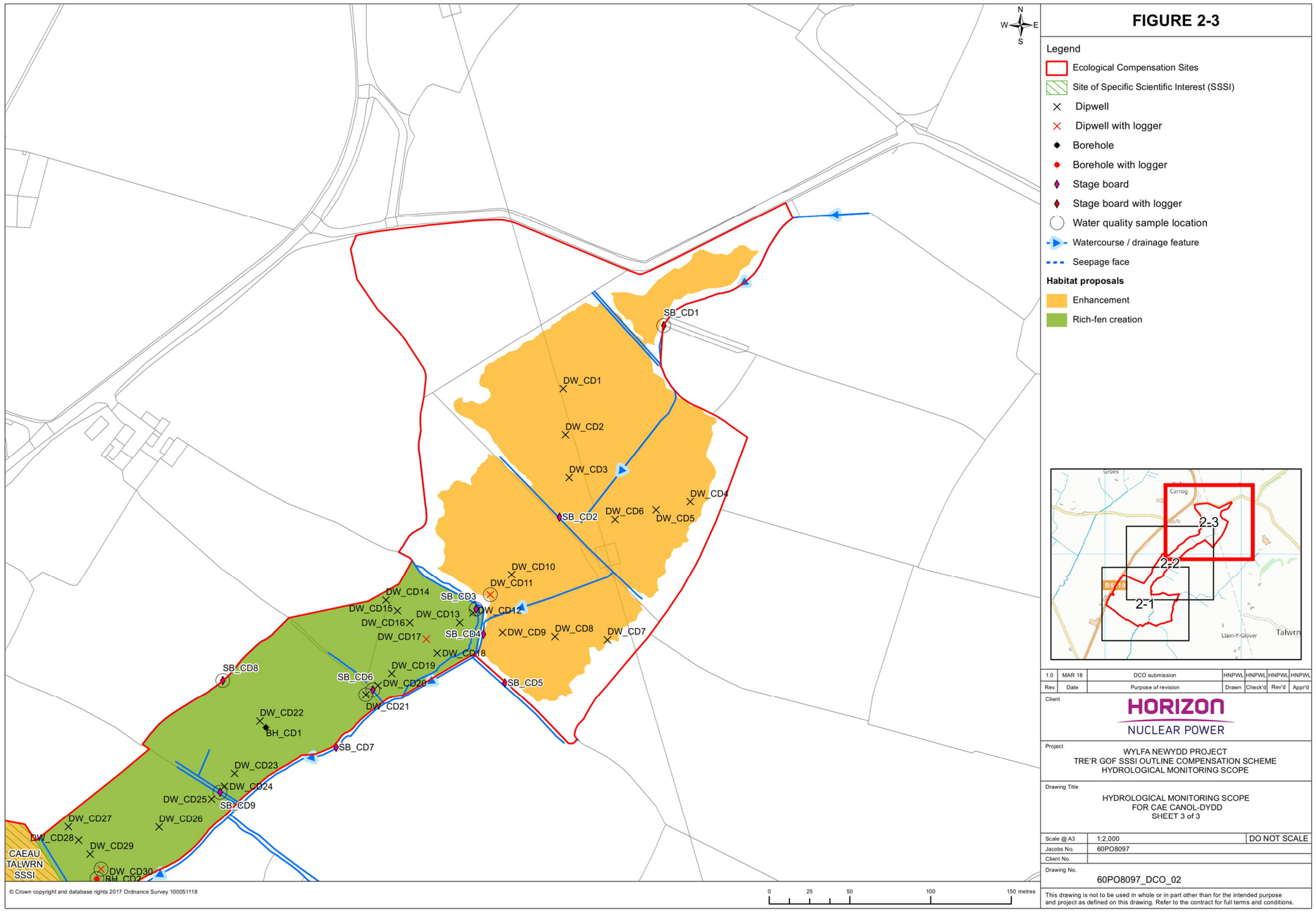


FIGURE 2-3

Legend

- Ecological Compensation Sites
- Site of Specific Scientific Interest (SSSI)
- Dipwell
- Dipwell with logger
- Borehole
- Borehole with logger
- Stage board
- Stage board with logger
- Water quality sample location
- Watercourse / drainage feature
- Seepage face

Habitat proposals

- Enhancement
- Rich-fen creation

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
1.0	MAR 18	DCO submission	HNPWL	HNPWL	HNPWL	HNPWL

Client: HORIZON NUCLEAR POWER

Project: WYLFA NEWYDD PROJECT
TRE'R GOF SSSI OUTLINE COMPENSATION SCHEME
HYDROLOGICAL MONITORING SCOPE

Drawing Title: HYDROLOGICAL MONITORING SCOPE
FOR CAE CANOL-DYDD
SHEET 3 of 3

Scale @ A3	1:2,000	DO NOT SCALE
Jacobs No.	60PO8097	
Client No.		

Drawing No.: 60PO8097_DCO_02

Table 3: Justification for monitoring points proposed at Cae Canol-dydd

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
DIPWELLS				
DW_CD1 to DW_CD3	247789 to 247792	378270 to 378214	• Dipwells proposed in transects rather than single point locations to generate cross-sectional shallow groundwater level plots that can be mapped with soil profile information, bedrock and superficial geology profiles, and deeper bedrock groundwater levels • Dipwell transects proposed at all locations where modifications to existing drainage ditches or watercourses are proposed to raise shallow groundwater levels within the site boundary • Dipwells proposed at single points when paired with boreholes to identify vertical head gradients between superficial and bedrock aquifers (if present), or in basin areas that are intended to be irrigated with surface water or groundwater to raise shallow groundwater levels in the areas of proposed fen creation	• Located in an area of perennial seepage, at a topographic break in slope, that gives rise to an area of existing fen vegetation (M13 and M22 communities) • The transect would measure the shallow groundwater level gradient (in the superficial deposits / sub-soil), in an existing fen basin in the northeast of the site
DW_CD4 to DW_CD6	247868 to 247821	378200 to 378188		• Located in a seasonally wet area, at a topographic break in slope, at the boundary of the Clwyd Limestone and Lligwy Sandstone bedrock formations, which provides potential soligenous inputs from the limestone escarpment in the east, and gives rise to an area of existing fen vegetation (M13 and M22 communities) • The transect would measure the shallow groundwater level gradient in an existing fen basin in the northeast of the site
DW_CD7 to DW_CD9	247816 to 247751	378114 to 378118		• Located in an area of perennial seepage, at a topographic break in slope, at the boundary of the Clwyd Limestone and Lligwy Sandstone, which provide potential soligenous inputs from the limestone escarpment in the east, and gives rise to an area of existing fen vegetation (M13 and M22 communities) • The transect would measure the shallow groundwater level gradient in an existing fen basin in the northeast of the site
DW_CD10 to DW_CD13	247757 to 247724	378153 to 378124		• The transect would measure the water level gradient in an existing fen basin in the northeast of the site, where a

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
			• Service plans would be collected and provided to the appointed contractor for review, prior to the installation of any structures • Water levels in all dipwells would be manually dipped on a monthly basis • Automatic water level loggers would be installed at dipwell locations shown on Figure 2, on a monthly basis • In-situ water quality readings would be taken at dipwell locations shown on Figure 2, on a monthly basis • Water quality samples would be taken from dipwell locations shown on Figure 2, on a quarterly basis. The proposed locations of water quality sampling from dipwells include areas intended to be flushed with surface water or shallow groundwater to monitor baseline water quality and compare changes post-construction, and also adjacent to certain boreholes to directly compare bedrock and superficial / soil water quality to aid with source	perennial spring has been identified during multiple site walkovers • The dipwell transect would monitor shallow groundwater levels either side of a drainage ditch that may be infilled, dammed or diverted as a potential option to raise shallow groundwater levels in an area of potential fen creation. The transect would monitor the before and after response to any changes
DW_CD14 to DW_CD18	247679 to 247710	378138 to 378105		• The transect would measure the shallow groundwater level gradient across the western side of the valley, to the west of the Afon Canol-dydd, in an area of potential fen creation located immediately down gradient of an existing fen basin
DW_CD19 to DW_CD21	247683 to 247667	378093 to 378079		• The dipwell transect would monitor shallow groundwater levels either side of a drainage ditch that may be infilled, dammed or diverted as a potential option to raise shallow groundwater levels in an area of potential fen creation. The transect would monitor the before and after response to any changes
DW_CD22	247601	378064		• Adjacent to borehole BH_CD1, to establish the vertical hydraulic head gradient between the bedrock groundwater level and the shallow groundwater level in the superficial deposits / sub-soil in an area of potential fen creation
DW_CD23 to DW_CD25	247585 to 247571	378030 to 378015		• The dipwell transect would monitor shallow groundwater levels either side of a drainage ditch that may be infilled, dammed or diverted as a potential option to raise shallow groundwater levels in an area of potential fen creation. The transect would monitor the before and after response to any changes
DW_CD26	247538	377997		• The dipwell would monitor shallow groundwater levels in an area that may be irrigated by surface water from the

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
			interpretation and develop the site CSM	Afon Canol-dydd, which could be dammed along its reach as a potential option to raise shallow groundwater levels in this area of potential fen creation. The dipwell would monitor the before and after response to any changes
DW_CD27 to DW_CD31	247482 to 247508	377997 to 377964		• The dipwell transect would measure the shallow groundwater level gradient across the western side of the valley, to the west of the Afon Canol-dydd, in an area of potential fen creation located immediately up-slope of Caeau Talwrn SSSI, to allow assessment of potential future adverse impacts on shallow groundwater levels to the receptor, and to compare to the water level gradient obtained at the head of the valley from dipwell transect DW_CD14 to DW_CD18 • DW_CD30 is also located adjacent to borehole BH_CD2, to establish the vertical hydraulic head gradient between the bedrock groundwater level and the shallow groundwater level in the superficial deposits / sub-soil in this part of the site
DW_CD30 to DW_CT1	247502 to 247482	377971 to 377953		• The dipwell transect would monitor shallow groundwater levels either side of a drainage ditch that separates an area of fen creation and Caeau Talwrn SSSI, to allow assessment of potential future adverse impacts on shallow groundwater levels to the SSSI
DW_CT2 and DW_CT3	247448 and 247408	377901 to 377846		• The dipwells would monitor shallow groundwater levels in the valley bottom of the Afon Canol-dydd, within Caeau Talwrn SSSI, to ensure that any potential modifications to the upstream stretch of watercourse do not adversely impact on shallow groundwater levels in an area of existing fen habitat. The dipwell would monitor the before and after response to any changes

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
DW_CT4 to DW_CD34	247330 to 247323	377770 to 377752		• The dipwell transect would monitor shallow groundwater levels either side of a drainage ditch that may be infilled, dammed or diverted as a potential option to raise shallow groundwater levels in an area of potential fen creation in the south of the site. The transect would monitor the before and after response to any changes • DW_CD34 is also located adjacent to borehole BH_CD3, to establish the vertical hydraulic head gradient between the bedrock groundwater level and the shallow groundwater level in the superficial deposits / sub-soil in an area immediately south of Caeau Talwrn SSSI
DW_CD35 to DW_CD39 and DW_CD47 to DW_CD52	247254 to 247332 and 247347 to 247500	377709 to 377684 and 377682 to 377681		• The two dipwell transects would measure the shallow groundwater level gradient across both sides of the Afon Canol-dydd valley, in an area of potential fen creation, at the up-gradient end of an area of fen creation in the south of the site • DW_CD48 is also located adjacent to borehole BH_CD4, to establish the vertical hydraulic head gradient between the bedrock groundwater level and the shallow groundwater level in the superficial deposits / sub-soil in an area of potential fen creation in the south of the site
DW_CD40, DWCD_53 and DW_CD57	247330, 247373 and 247370	377587, 377650 and 377550		• These dipwells would monitor shallow groundwater levels in areas that may be irrigated by surface water from the Afon Canol-dydd, or its tributaries from the east, which could be dammed or diverted as potential options to raise shallow groundwater levels in this area of potential fen creation. The dipwells would monitor the before and after response to any changes
DW_CD54 to DW_CD56	247362 to 247365	377615 to 377597		• The dipwell transect would monitor shallow groundwater levels either side of a drainage ditch that may be infilled, dammed or diverted as a potential option to raise shallow

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
				groundwater levels in an area of potential fen creation. The transect would monitor the before and after response to any changes
DW_CD41 to DW_CD46 and DW_CD58 to DW_CD62	247164 to 247312 and 247330 to 247435	377582 to 377507 and 377508 to 377509		• The two dipwell transects would measure the shallow groundwater level gradient across both sides of the Afon Canol-dydd valley, in an area of potential fen creation, at the down-gradient end of an area of fen creation in the south of the site • To allow comparison to the water level gradient obtained up-gradient from dipwell transect DW_CD35 to DW_CD39 and DW_CD47 to DW_CD52 • To allow assessment of potential future adverse impacts on shallow groundwater levels down-gradient of the site by monitoring shallow groundwater levels immediately up-gradient of the site's southern boundary • DW_CD45 and DW_CD59 are also located adjacent to boreholes BH_CD5 and BH_CD6, to establish the vertical hydraulic head gradient between the bedrock groundwater level and the shallow groundwater level in the superficial deposits / sub-soil in an area of potential fen creation in the south of the site
BOREHOLES				
BH_CD1	247604	378058	• The borehole locations proposed are considered feasible in terms of access and ground conditions for drilling rigs / vehicles • Service plans would be collected and provided to the appointed	• To provide groundwater level data in bedrock and superficial deposits (if saturated) and to identify groundwater flow directions, in an area of proposed fen creation, close to the Afon Canol-dydd, which if dammed, could raise local groundwater levels in the valley bottom (depending on the depth and permeability of the superficial cover)

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
BH_CD2	247501	377965	contractor for review, prior to the installation of any structures • Possible dual installations required (to screen both the bedrock and superficial deposits) if water bearing strata are found within the till or alluvium • Based on the existing conceptual understanding of the site, no borehole would need to extend below 10m depth • Water levels in all boreholes would be manually dipped on a monthly basis • Automatic water level loggers would be installed at borehole locations shown on Figure 2 and downloaded on a monthly basis • In-situ water quality readings would be taken at borehole locations shown on Figure 2, on a monthly basis • Water quality samples would be taken at borehole locations shown on Figure 2, on a quarterly basis	• To provide groundwater level data in bedrock and superficial deposits (if saturated) and to identify groundwater flow directions, in an area of proposed fen creation, close to the Afon Canol-dydd, which if dammed, could raise local groundwater levels in the valley bottom (depending on the depth and permeability of the superficial cover) • To monitor groundwater levels and quality up-gradient of Caeau Talwrn SSSI to allow assessment of any future adverse impacts to the receptor
BH_CD3	247316	377753		• Provide groundwater level data in bedrock and superficial deposits (if saturated) and to identify groundwater flow directions, in an area of proposed fen creation, close to the Afon Canol-dydd, which if dammed, could raise local groundwater levels in the valley bottom (depending on the depth and permeability of the superficial cover) • To monitor groundwater levels and quality down-gradient of Caeau Talwrn SSSI to compare to water level and quality data obtained from BH_CD2
BH_CD4	247377	377678		• Provide groundwater level data in bedrock and superficial deposits (if saturated) and to identify groundwater flow directions, in an area of proposed fen creation, close to the Afon Canol-dydd, which if dammed, could raise local groundwater levels in the valley bottom (depending on the depth and permeability of the superficial cover), and close to the tributary joining from the limestone escarpment in the east, which if dammed or diverted could also raise local groundwater levels in this area of fen creation
BH_CD5	247276	377523		• Provide groundwater level data in bedrock and superficial deposits (if saturated) and to identify groundwater flow directions, in an area of proposed fen creation, close to

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
				the Afon Canol-dydd, which if dammed, could raise local groundwater levels in the valley bottom (depending on the depth and permeability of the superficial cover) and to ensure that no adverse impacts on groundwater levels extend beyond the southern site boundary
BH_CD6	247356	377516		• Provide groundwater level data in bedrock and superficial deposits (if saturated) and to identify groundwater flow directions, in an area of proposed fen creation, close to the Afon Canol-dydd, which if dammed, could raise local groundwater levels in the valley bottom (depending on the depth and permeability of the superficial cover) and to ensure that no adverse impacts on groundwater levels extend beyond the southern site boundary
STAGE BOARDS				
SB_CD1	247851	378310	• Water levels at all stage board locations would be measured manually on a monthly basis • Automatic water level loggers would be installed at locations SB_CD1 and SB_CD13 to collect 15-minute water level readings at key times of the year. This data would be downloaded on a monthly basis • Monthly spot flow monitoring would be undertaken at stage board locations shown on Figure 2, to monitor pre and post option responses	• To monitor flows and water levels along the Afon Canol-dydd (main surface water input) as it enters the site
SB_CD2	247786	378189		• To establish baseline water level data along an axial drainage ditch in the northeast of the site, in the centre of an area of existing fen habitat
SB_CD3	247735	378132		• To monitor water levels and flows in a drainage ditch that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of fen creation in the northeast of the site
SB_CD4	247740	378117		• To monitor water levels and flows along the Afon Canol-dydd as it enters an area of proposed fen creation in the northeast of the site
SB_CD5	247754	378086		• To monitor water levels along a site boundary in the northeast of the site to allow assessment of any adverse impacts on water levels adjacent to an area of no access

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
SB_CD6	247670	378082	• In-situ water quality readings would be taken at stage board locations shown on Figure 2, on a monthly basis • Water quality samples would be taken from stage board locations shown on Figure 2, on a quarterly basis. The proposed locations of water quality samples from stage board locations include ditches or watercourses intended to be dammed, infilled or diverted, to irrigate adjacent land with surface water, to monitor baseline water quality and identify if pre-treatment is required before each potential option is considered	• To monitor water levels in a drainage ditch that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of fen creation in the northeast of the site
SB_CD7	247648	378047		• To monitor water levels and flows along the Afon Canol-dydd in the central compartment of an area of proposed fen creation in the northeast of the site • Required in addition to SB_CD4 to ensure that water levels in all areas of the site are monitored to more accurately design future potential options
SB_CD8	247577	378089		• To monitor water levels in a drainage ditch that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of fen creation in the northeast of the site
SB_CD9	247574	378019		• To monitor water levels in a drainage ditch that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of fen creation in the northeast of the site
SB_CD10	247517	377953		• To monitor water levels and flows along the Afon Canol-dydd, immediately upstream of Caeau Talwrn SSSI, and to allow assessment of any future adverse impacts on surface water levels within the SSSI
SB_CD11	247485	377956		• To monitor water levels in a drainage ditch that borders Caeau Talwrn SSSI, to allow assessment of any future adverse impacts on surface water levels within the SSSI
SB_CD12	247326	377766		• To monitor water levels and flows in a drainage ditch that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of fen creation in the south of the site

POINT ID	EASTING	NORTHING	MONITORING SPECIFICATIONS	MONITORING POINT JUSTIFICATION
SB_CD13	247540	377706		• To monitor water levels and flows along a key tributary of the Afon Canol-dydd • A defined channel cross-section needs to be identified to install a stage board and to safely carry out monthly flow monitoring
SB_CD14	247350	377624		• To monitor water levels and flows along the Afon Canol-dydd as it flows through an area of proposed fen creation in the south of the site • This location is the only existing safe access point to the watercourse
SB_CD15	247361	377609		• To monitor water levels in a drainage ditch that could be dammed, infilled or diverted, as a potential option to raise shallow groundwater levels in an area of fen creation in the south of the site
SB_CD16	247376	377470		• To monitor water levels and flows along a key tributary of the Afon Canol-dydd

3 Summary

The key components of the hydrological monitoring would include:

- A total of 11 boreholes, 25 dipwell transects, 9 isolated dipwells and 33 stage boards across the two sites, along with flow monitoring at a weir, and from two springs and an exposed field drain at Cors Gwawr.
- Manual water level measurements at all borehole, dipwell, stage board and weir locations on a monthly basis.
- Water levels recorded by automatic data loggers installed within dipwells and boreholes, at key stage board locations, and at the weir, all downloaded on a monthly basis.
- Spot flow monitoring at stage board locations (shown on Figures 1 and 2) on a monthly basis, along with flow monitoring at the weir, springs and field drain at Cors Gwawr.
- Monthly walkover observations, including flow conditions in all surface water features (drainage ditches, watercourses), weather conditions, variations in diffuse spring inputs, seepage areas and springs.
- In-situ water quality parameters from monitoring locations shown on Figures 1 and 2 collected on a monthly basis and water quality samples collected and sent to the laboratory for analysis on a quarterly basis.

Monitoring would extend over 12 months to inform option design, but with monitoring continuing beyond this, to collect further baseline data, which would then be used to refine the option design and provide a more robust pre-construction dataset.

The monitoring data would be regularly reviewed and if necessary the monitoring regime would be changed to ensure that sufficient data are collected. In some instances it may be appropriate to reduce the amount of monitoring being undertaken if it is not proving useful.

4 References

Table 4: References

REF. NO.	REFERENCE
[RD1]	Natural Resources Wales. 2014. *Restoration of a Key Groundwater Supply Pathway and Related Hydrological Restoration Work at Cors Bodeilio National Nature Reserve. (LIFE project actions A5, C10, C11, C13, E.4, E.4.03). Final Report of the Anglesey & Llyn Fens LIFE Project: Technical Report No. 2.*
[RD2]	Natural Resources Wales. 2016. *Large Scale Restoration of Alkaline Fen Communities at Cae Gwyn, Cors Erddreiniog (Anglesey Fens SAC). (LIFE project actions C13, C10, C11 & A5). Final Report of the Anglesey & Llyn Fens LIFE Project: Technical Report No. 4.*
[RD3]	British Geological Survey. 2016. Geological maps at 1:50,000 scale. [Online]. [Accessed: 26/10/2017]. Available from: www.bgs.ac.uk/products/digitalmaps/digmapgb_50.html.
[RD4]	Horizon Nuclear Power. 2018. *Tre'r Gof SSSI compensation proposal. Volume I – Rationale and site identification.* DRAFT Report.