

Onshore Grid Connection Electrical Infrastructure
Environmental Statement

Gwynt y Môr Offshore Wind Farm Volume 1: Non-Technical Summary



Preface

This Environmental Statement has been prepared by Gwynt y Môr Offshore Wind Farm Limited (GYMOWFL) in support of the application for statutory consent for a proposed onshore sub-station and ancillary works. These works form part of the Gwynt y Môr Offshore Wind Farm (GYMOWF) development and connect the electricity generated by the offshore wind turbines to the UK transmission system. The works are to be located between Belgrano, near Pensarn in Conwy and St. Asaph in Denbighshire.

The Environmental Statement has been prepared for the following applications:

Application Consenting Authority

Section 57 of the Town and Country Planning Act 1990 Conwy County Borough Council
Section 57 of the Town and Country Planning Act 1990 Denbighshire County Council

Additional copies of this ES on CDROM are available upon request, ES hard copies are priced at £250. Requests can be made to:

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Additional copies of the Non Technical Summary are available upon request. Alternatively, a downloadable version is available free of charge from the Gwynt y Môr Offshore Wind Farm website above.

The Environmental Statement can be viewed during the statutory consultation period at the GYMOWL offices (as above) and at the following locations:

Npower Renewables Limited
Dolgarrog Power Station
Conwy
LL32 8QE

Denbighshire County Council
Caledfryn
Smithfield Road
Denbigh
LL16 3RU

Abergele Library
Market St
Abergele
Clwyd
LL22 7BP

Conwy County Borough Council
Civic Offices
Colwyn Bay
Conwy
LL229 8AR

St Asaph Library
The Roe
St. Asaph
Clwyd
LL17 0LU

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Introduction

Gwynt y Môr Offshore Wind Farm Limited (GYMOWFL), a subsidiary of npower renewables, is proposing to construct, operate (and ultimately decommission) an onshore electrical sub-station and associated ancillary works and underground electrical cabling between Belgrano and St. Asaph in the administrative districts of Conwy and Denbighshire. These works form the 'onshore' component of the proposed Gwynt y Môr Offshore Wind Farm (GYMOWF) and are necessary to connect the electricity generated by up to 208 offshore wind turbines to the National Grid.

GYMOWFL has previously made an application to build an offshore wind farm with a generating capacity of 750 megawatts (MW). The wind farm would be approximately 13 to 15 km off the coast of North Wales. GYMOWF would provide a significant source of clean, renewable electricity, and would make a major contribution towards meeting the UK Government's targets for generating electricity from renewable sources. It is anticipated that GYMOWF could offset a substantial amount of carbon dioxide emissions per year when compared with electricity that might otherwise be generated from a coal-fired power station (www.bwea.com).

GYMOWF needs a connection to the high voltage electricity transmission system operated by National Grid. Due to the size of the wind farm, it cannot connect to lower voltage systems such as those operated by SP Manweb or other distribution operators.

Purpose of this document

This document is the non-technical summary (NTS) of the Environmental Statement (ES) for the onshore connection works. An Environmental Impact Assessment (EIA) has been undertaken in line with current regulations in order to identify and assess all significant environmental effects of the proposed connection and associated works.

This non-technical summary provides a summary of the ES for the non-specialist reader, and forms part of the ES. The full ES is available for public viewing at a number of locations and is also available to members of the public in both electronic and hard-copy form, both as set out at the start of this NTS.

The ES provides detailed information on the onshore elements of the project. This includes a description of the project proposals and a comprehensive description of the environment of the project area. The document covers the entire life of the project, including design, construction, operation and decommissioning. The potential positive and adverse environmental impacts are assessed in relation to the existing physical, biological and human environments and, where appropriate, mitigation measures and monitoring requirements have been set out.

The information presented in this NTS and in the main ES is intended to assist the decision-making process, and to allow statutory bodies, non statutory bodies and the general public to make comments prior to determination of the application for consent.

Background to the proposal

When considering the need for the onshore works, it is essential to consider this in the context of the need for the project overall. The UK Government and the Welsh Assembly Government have set challenging targets to increase the contribution of renewable energy in meeting the UK's future energy needs. These targets are driven by two fundamental concerns: climate change and the need to secure energy supplies for the future. The programme of offshore wind farm development around the UK coast, including Wales, is designed to help the deliver these targets and so tackle these underlying concerns. To deliver this programme, the development of supporting onshore infrastructure will be necessary.

Regulatory

The GYMOWF is one of fifteen projects awarded under 'Round Two', the name for the second phase of site awards for offshore wind farms which took place during 2003. The then Department for Trade and Industry (now BERR) is responsible for energy policy in England and Wales and conducted a Strategic Environmental Assessment on three strategic areas around the UK coast. As owner of the seabed, The Crown Estate conducted a competitive tender for sites and GYMOWFL was one of the successful candidates within the 'Liverpool Bay' Strategic Area.

The offshore components of the project require consent from both the Department for Business Enterprise and Regulatory Reform (BERR) and from the Department for Environment Food and Rural Affairs (DEFRA) under separate consenting regimes. Applications for offshore consents for the GYMOWF were made in November 2005 and Supplementary Environmental Information was supplied in 2007 and these await determination. The onshore connection works are required so that the renewable energy generated can connect to the electricity transmission system and can be used in the electricity supply network.

In order to construct the elements of the GYMOWF that are above Mean Low Water, permission is needed under Section 57 of the Town and Country Planning Act 1990 (TCPA). These permissions for the onshore cable, sub-station and ancillary works are granted by Conwy County Borough Council and Denbighshire County Council.

These permissions exclude the works related to the overhead lines which 'tee in' the new sub-station to overhead power lines. Such works require separate consent by BERR under Section 37 of the Electricity Act 1989. The ES considers the impacts from proposed works related to both the TCPA and s37 applications. This is because the EIA has considered both the applicants' proposed works and other associated works including those proposed separately by National Grid.

Although the offshore works do not form part of either the TCPA or the Section 37 consent application, these works are an integral part of the GYMOWF.

Alternatives Considered

The assessment of alternative connection options for GYMOWF considered a range of variables including:

- Suitable landfall locations for the subsea export cables from the offshore wind farm;
- Connection points to the existing 400 kV transmission system;
- Suitable candidate substation locations;
- Potential cable route corridors.

Six options for the cable landfalls near parts of the 400 kV transmission system were considered in the ES for the offshore wind farm. Three landfall location options were considered between Rhos Point and Point of Ayr (for possible connection to the 400 kV Deeside-Pentir overhead line):

- Pensarn Beach;
- Kinmel Bay;
- Gronant Dunes East of Prestatyn.

Two landfall areas were considered in the Dee Estuary (for possible connection to the 400 kV Deeside substation) and one area on Anglesey (for possible connection to the Wylfa 400 kV substation):

- Between Hoylake and Connah's Quay;
- Between Point of Ayr and Connah's Quay;
- Near Wylfa Power Station.

The option of routing the offshore cables along the Dee Estuary was ruled out on both environmental and engineering grounds. The landfall option near Wylfa power station on Anglesey would need a significantly increased length of offshore cable and it would be difficult to bring the cables onshore at this rocky location. Other options were discounted on the grounds of ecological designations or increasing distance from the Deeside-Pentir overhead line.

The preferred landfall option at Pensarn Beach was chosen because it presents the least combined environmental and engineering challenges. The Deeside-Pentir overhead line, in combination with a cables landfall site at Pensarn, was selected as the preferred option because the option had:

- Sufficient spare capacity in the electricity network;
- Shortest route to shore;
- Few biological onshore designations; and,
- Closest proximity to the existing electrical infrastructure.

Onshore Cable Route and Substation Siting

The double circuit overhead line between Deeside and Pentir is the main supply route into and out of North Wales. The line has two 400 kV circuits and is referred to as the 4ZB line.

A new substation is needed for the connection into the Deeside-Pentir 4ZB overhead line. GYMOWF will export power at a voltage of 132 kV where as the overhead line operates at 400 kV. There is a requirement to 'step up' the voltage from 132 kV to 400 kV using 400/132 kV transformers to allow the connection.

National Grid and its advisers were involved in the consideration of a suitable substation location, considering potential planning, environmental and engineering constraints. Five potential substation locations were identified as follows:

- St Asaph Business Park North, on undeveloped land adjacent to an existing SP Manweb 132 kV substation;
- St Asaph Business Park South, in agricultural land;
- Tir Llwyd, to the south of Tir Llwyd Industrial Estate in an area of flat undeveloped land;
- Pensarn Gap, an area of undeveloped land between Abergele and Belgrano; and,
- Adjacent tower 145 south of Abergele, in a relatively isolated area where space available was constrained but where a viable substation might be constructed.

These sites were assessed with the aim of minimising the anticipated environmental effects associated with the proposed works. In particular, the assessments considered how to minimise the use of overhead lines to reduce potential visual impact.

Siting the substation in the closest appropriate location to the existing overhead line minimises the length of new overhead transmission line required.

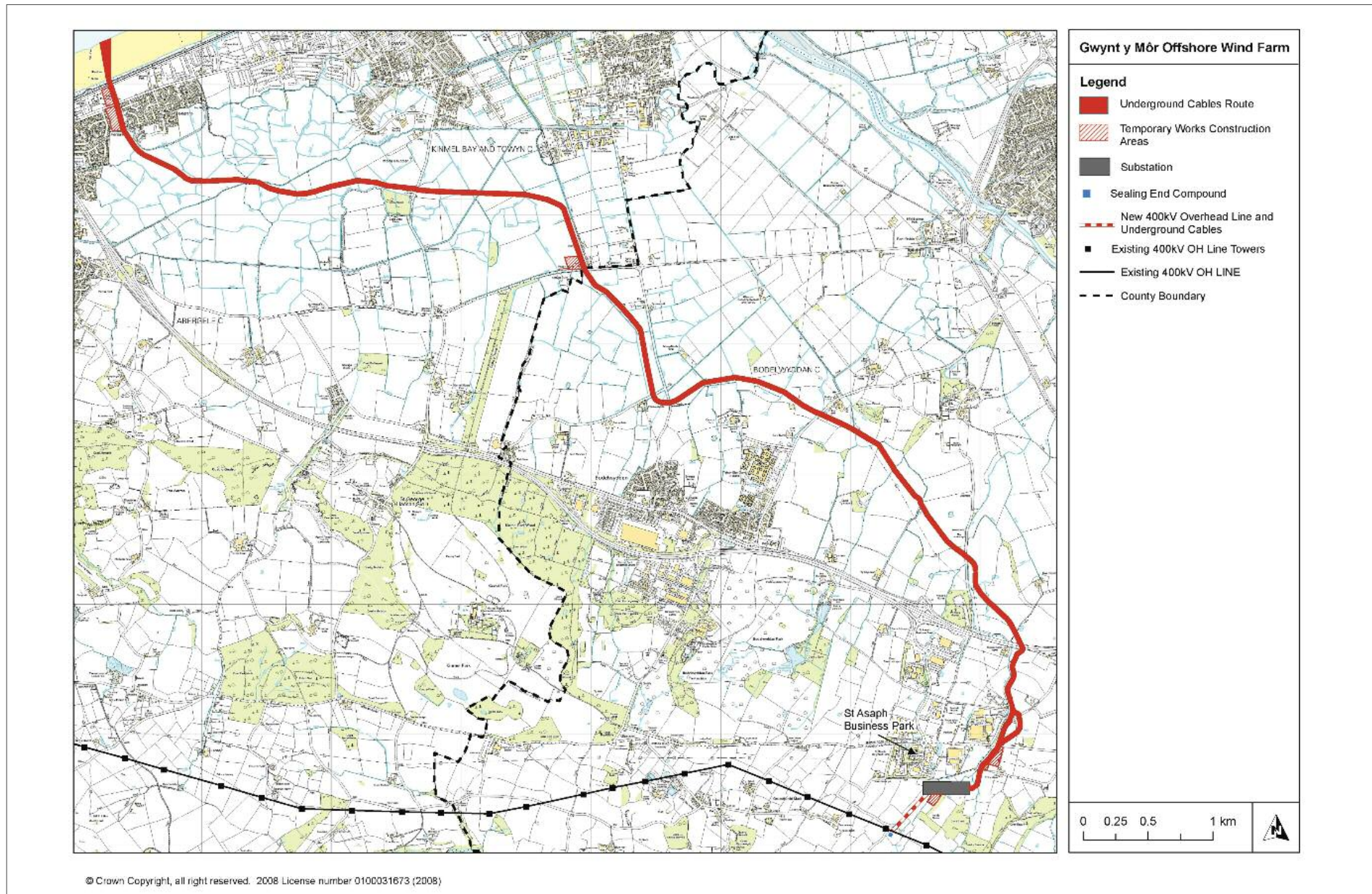


Figure 1: Onshore works overview

Overall, despite the fact that an underground cables route to St Asaph Business Park would be longer and therefore more expensive than alternatives, it was concluded that the St Asaph sites represented preferred options as the surrounding area has already undergone development and a substation could be proposed which would not be at odds with the scale of the other built development.

The area to the south of St Asaph Business Park was selected as the preferred location for substation development due to planning conflicts associated with the northern business park location.

132 kV Underground Onshore Cable Route

Two 132 kV cable routes between Pensarn Beach and the substation site were identified for investigation in detail.

The northern 132 kV cable route was preferred for connecting the St Asaph South Site to the landfall site at Pensarn due to its shorter length, fewer utility service crossings and better soil conditions.

Substation Design and Layout

The substation needs to incorporate the following components:

- 132 kV building;
- 400/132 kV transformers;
- Static Var Compensation (SVC);
- 400 kV building;
- Ancillary buildings;

National Grid has also sought to ensure that the substation can accommodate a bulk grid supply point. This would involve future installation of two further 132/400 kV transformers to allow robust supply to the local network in the light of increasing electricity demand in the area.

The substation design includes modern gas insulated type switchgear (GIS) as an alternative to air insulated switchgear (AIS). GIS technology can be more expensive than AIS but is much more compact, the equivalent AIS design would be have a footprint area approximately 4 times greater than the GIS solution. Using GIS switchgear results in a much smaller building footprint thus reducing the area required for the substation and, in this location in particular, greatly reducing effects on existing trees and woodland.

A range of alternative substation layouts were considered. The alternatives needed to consider how existing water pipes would be avoided and how an existing gas pipeline could be diverted. There was an emphasis on minimising losses to trees on the site and minimising the effect of the substation on landscape and views. The alternative layouts are described further in the main ES.

The preferred option achieves an efficient layout which relates well to the built development to the north. It requires some tree losses but avoids risks posed by additional cable and access road crossings of the gas pipeline.

Project Description

The onshore works are all works above the Mean Low Water mark to connect the electricity generated by the offshore wind turbines to the main electricity transmission system.

The key elements of the proposed GYMOWF onshore works are as follows:

- Landfall works at Pensarn beach including installation of 6 electricity cables underneath the railway and promenade;
- Installation of approximately 11.1km of buried electricity cables beneath agricultural land between the cable landfall at Pensarn and the substation at St Asaph Business Park; and,
- A new 132/400kV electricity substation south of St Asaph Business Park.

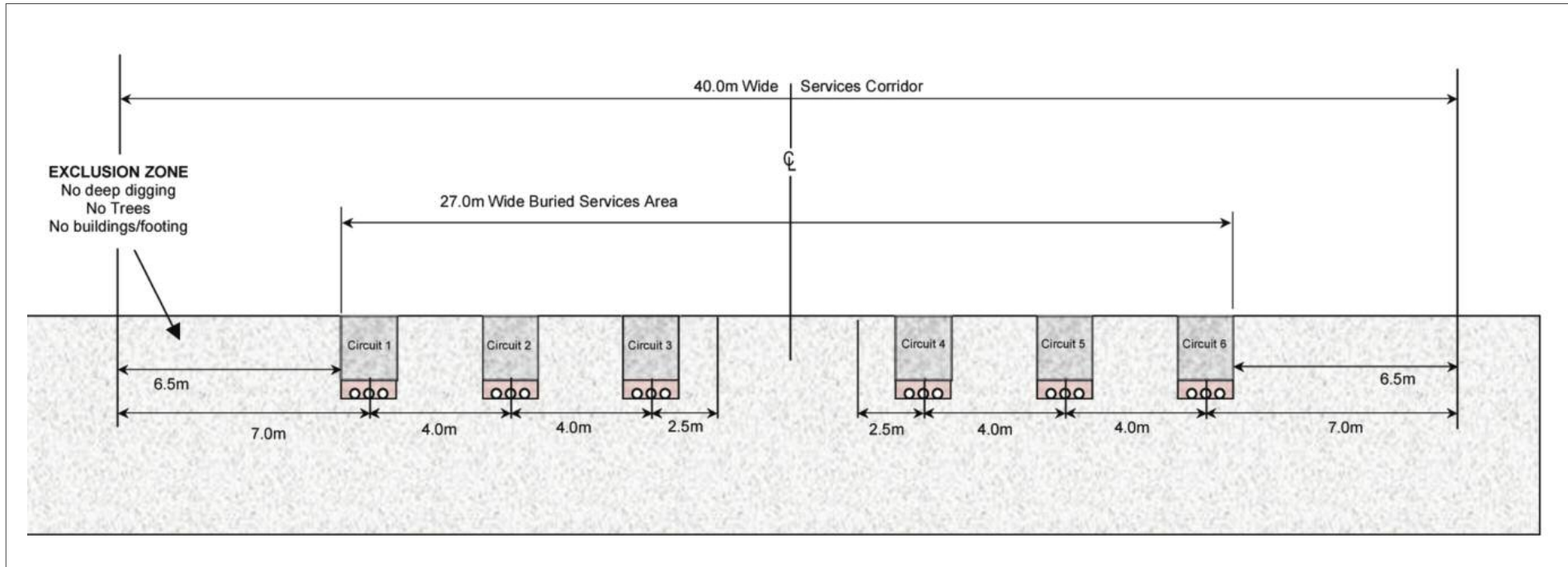


Figure 2: Example cable corridor cross section

To complete the connection, National Grid are proposing a 500 m section of overhead line and a new sealing end compound to connect to the transmission network.

Landfall Works

The proposed works at the landfall site will involve the connection of the 6 offshore electricity cables from the Mean Low Water mark to the onshore cables at the landfall site at Pensarn. The indicative route of the offshore cables at the landfall location is shown at Figure 1.

The offshore cables will be brought to shore by barge during high tide. The cables will be pulled through the cable ducts by winches and anchored in joint transition bays.

The offshore cables will be installed in the intertidal zone by a combination of cable plough and open trenching at a suitable depth to be agreed with Conwy County Borough Council. The offshore cables will be jointed to the onshore cables at the landfall site which will be located either on the landward side of the railway or at the beach, dependant upon the chosen methods employed by the successful construction contractor.

The cable ducts will be installed under the coastal defence and railway using a trenchless technique to ensure that there is no physical disturbance to these structures. This is likely to involve Horizontal Directional Drilling (HDD) although other trenchless techniques, such as thrust boring may be used. A 'super-silenced' generator will be used to minimise noise disruption during these works. The drill itself would not create any perceptible noise or vibration.

The directional drilling and duct installation works is expected to last for approximately 16 weeks and it is expected that this work can be undertaken outside of the peak tourist season, i.e. between September and May. However, the landing of the offshore cables will be done by barge and will need to occur during the summer months as the stability of the barge is dependent upon good sea conditions. The export cables may be brought ashore in different stages as the offshore development progresses in phases. The landfall works will typically be undertaken during daytime working hours; however, there may be circumstances where 24 hour working is required during directional drilling works.

A temporary access will be created off the A548 Towyn Road required for all deliveries associated with the landfall works. Should the jointing works be carried out at the beach side of the railway, plant and material deliveries will be made to the beach via the car park off Sea Road at Pensarn.

On completion of installation, the excavation will be reinstated to original ground levels with excess material removed from site. No above ground structure will be required.

Underground Cables

The length of the onshore cables route is approximately 11.1 km. The width of the cables installation corridor is 40 m. The route from the landfall to the new substation is shown in Figure 1.

The topography of the cable corridor route is generally flat, low-lying coastal land. The great majority of the route runs through farmland mainly used for grazing cattle and sheep although some fields near Bodelwyddan are used for crops where the land rises slightly.

The route will require the crossing of a number of watercourses including the River Gele, the Bodoryn Cut and the Ffynnon y Ddol and a number of highways, the most prominent being the A55(T). The cables corridor encounters a number of underground utilities, including gas and water pipelines, electricity and telephone cables.

The onshore cables will be installed into six trenches in 'flat formation', that is a group of three single-core cables installed immediately adjacent in a single trench. A schematic drawing of the cables layout is shown in Figure 2.

Three temporary compound areas will be established along the cables route for the location of offices, mess rooms, toilets, stores and a lay-down area. Such locations would be at each end of the cable route and also at a point close to mid way along the route. The locations of these marshalling/laydown areas are shown in Figure 1.

A temporary stone haul road will be constructed along the cables route and used to access the works. This haul road will be removed at the end of the installation process.

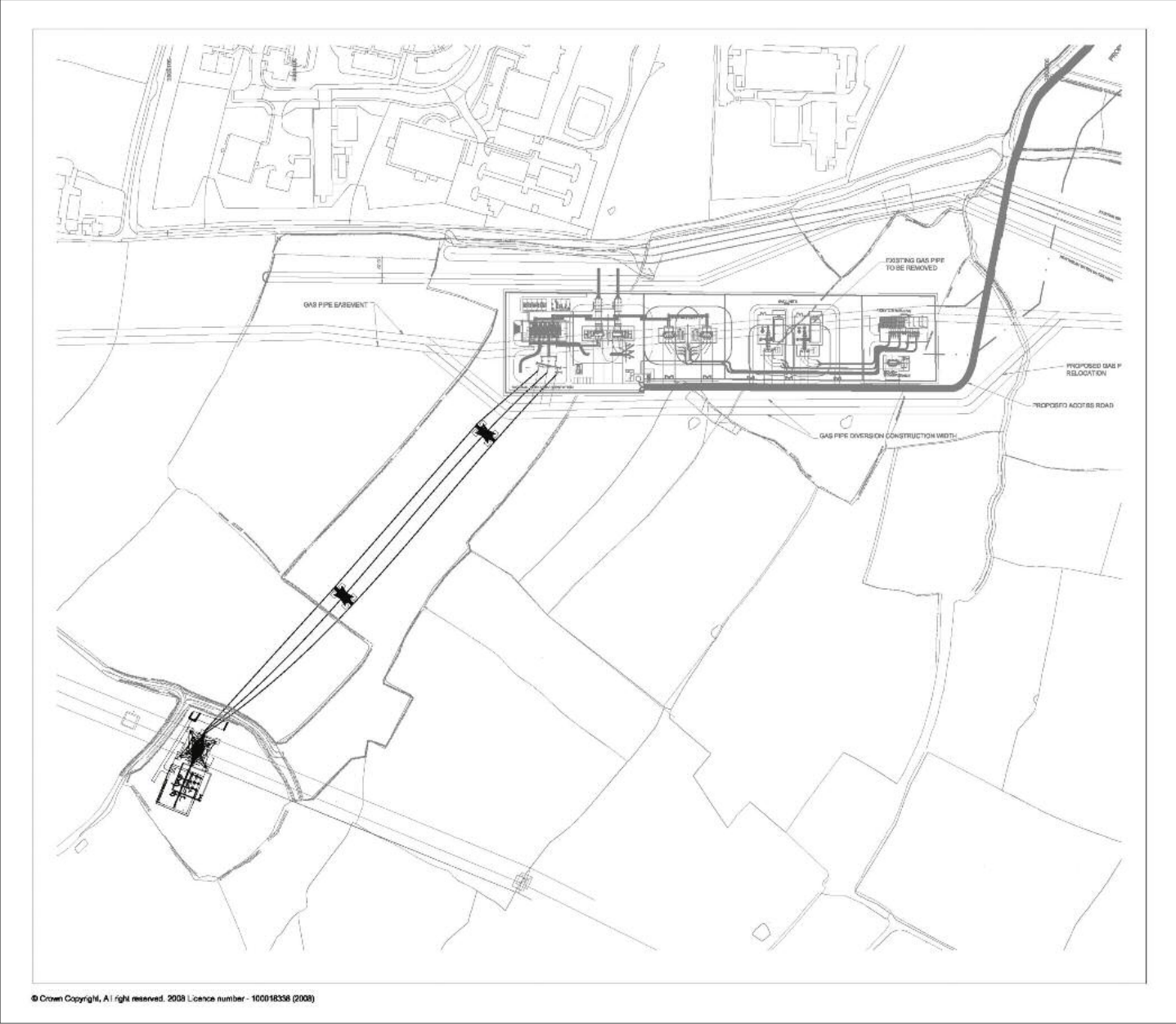


Figure 3: Substation and grid connection plan

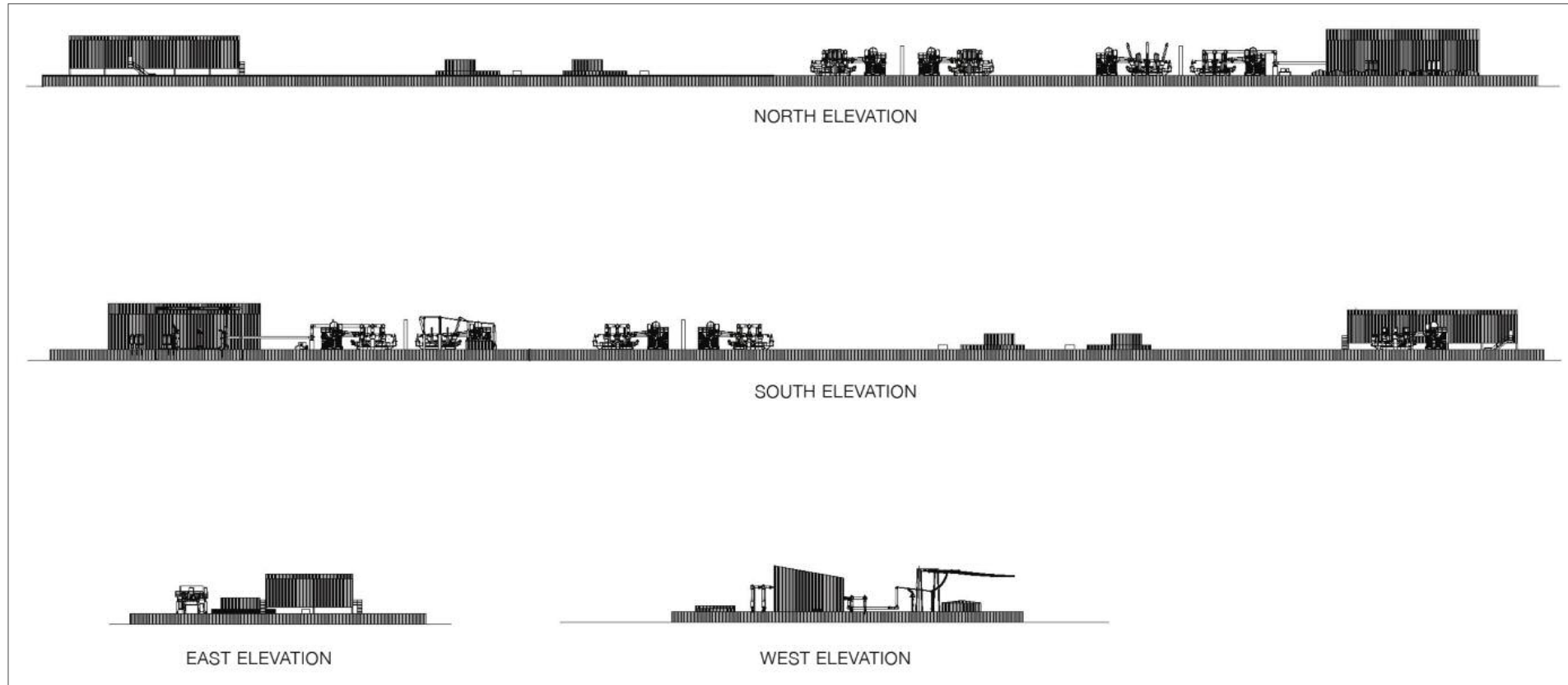


Figure 4: Substation elevations

The delivery of materials for the installation of the cables route will occur by road. The combined construction area incorporating the cable trenches and associated haul road, will be within the 40 m corridor and will be fenced on all sides. The construction phase for the underground cables is expected to last approximately 18 months. A variety of cable installation methods will be used depending upon the nature of specific crossings. Consent shall be sought from the relevant authorities prior to commencement of the works for ditch and road crossings.

Proposed Substation

The new 132/400 kV substation would be constructed to the south of St Asaph Business Park, on agricultural land. A plan of the proposed substation is shown in Figure 3 with elevations in Figure 4.

The total footprint of the proposed substation site would be approximately 2.8 hectares. The buildings would be clad around steel frames and recessive finishes would be used to minimise its visual impact on the surrounding area.

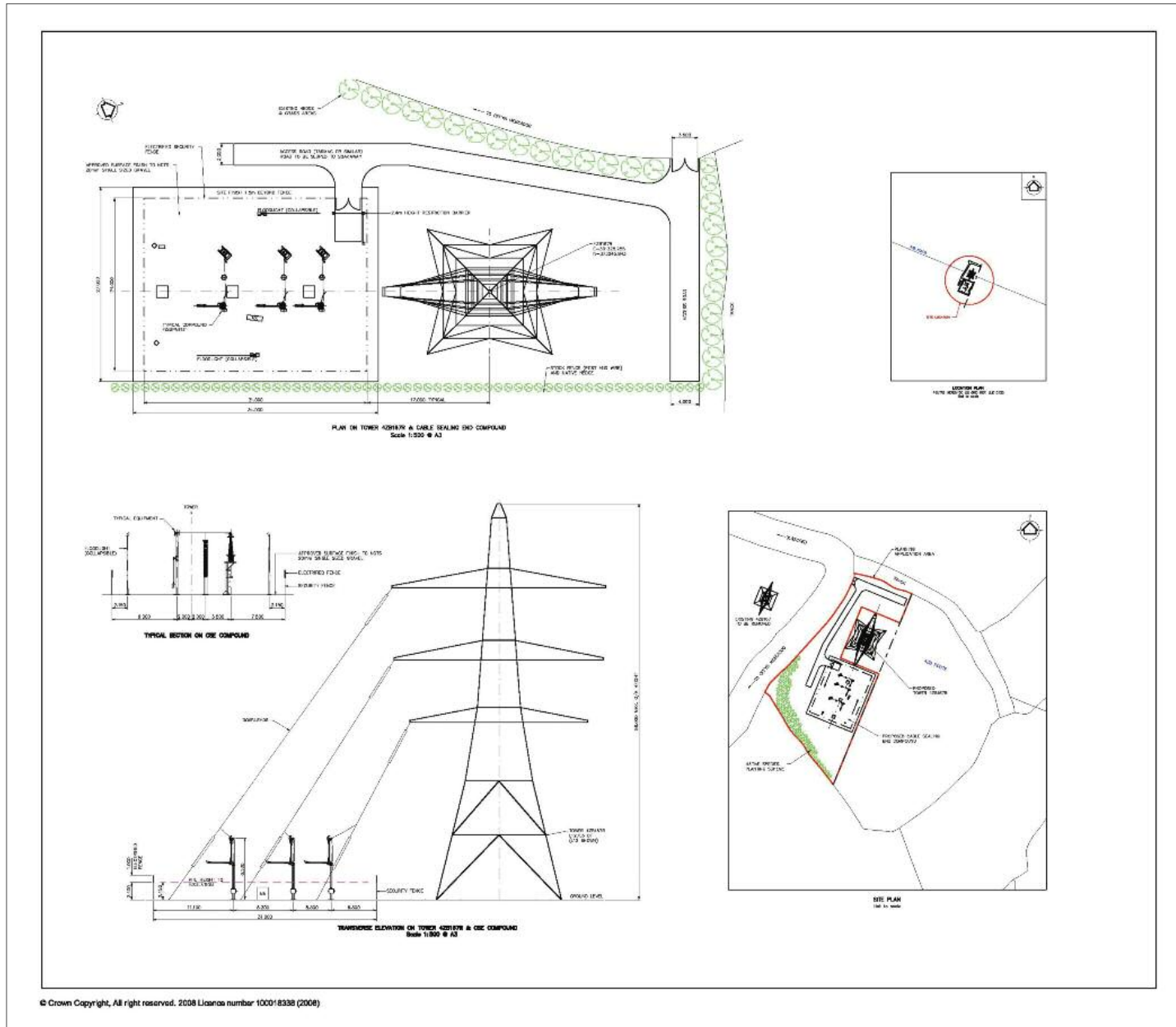


Figure 6: Sealing end compound

Prior to the commencement of any construction works, topographical, geotechnical, drainage and contaminated land surveys will be undertaken to confirm the nature of the ground conditions, and drainage discharge routes. The site history of the proposed site indicates that it has not previously been built upon or subject to land uses other than its current agricultural land use and installation of the existing gas pipeline.

The total construction time for the main elements of the proposed GYMOWF onshore works is approximately 24 months. Substation construction traffic will be travelling to and from the B5381 compound area (See Figure 5). The construction phase will involve the delivery of transformers, classified as Abnormal Indivisible Loads (AILs). Three deliveries are anticipated during the construction period with prior arrangements required in collaboration with the highway authorities and the police.

Other Works

Gas Pipeline Diversion

A gas pipeline is currently located directly below the site to be developed for the substation. Wales and West Utilities are to divert the existing gas pipeline prior to the commencement of the substation construction so that it runs to the south of its present position for a length of approximately 600 m. The position of the diverted gas pipeline is shown at Figure 3.

The effects of the gas pipeline diversion works together with those of the 132 kV underground cables and substation development have been included in the EIA.

Connection to 400 kV 4ZB Deeside - Pentir Overhead Line

The GYMOWF works requires a connection to be made from the substation to each of the two circuits on the existing Deeside-Pentir 4ZB 400 kV overhead line. This will allow the electricity to be transmitted on the National Grid.

The connection between the northern circuit of the 400 kV line and the substation will be by a new overhead line from a replacement tower on the 4ZB overhead line. The new overhead line will comprise two overhead line tower supports at heights of approximately 28m. This work will be sought by National Grid via a consent application to BERR. A plan of the overhead line is shown in Figure 3. A temporary mast and overhead line diversion will be constructed to carry the transmission lines whilst the old tower is demolished and the new replacement tower is constructed.

The connection between the southern circuit and the substation will be made via underground cables approximately 500 in length. A cable sealing end compound (SEC) will be installed to allow the connection from the southern circuit on the replacement tower to the underground cables. The SEC is required to enable the transition from overhead to underground cables on one circuit thus ensuring the new connection can be operated and maintained safely at all times. The SEC and associated works will occupy an area of approximately 0.8 hectares. A plan and elevation of the sealing end compound is shown at Figure 6.

Environmental Impact Assessment of the GYMOWF Connection

The EIA for GYMOWF has included investigations into the potential physical, biological and human effects during the construction, operation and decommissioning stages of the proposed development. In all cases, a reasonable 'worst-case scenario' has been assumed to ensure that the actual impact of the proposed development will be no greater than is set out in the EIA and in practice, may actually be notably less.

Potential Effects of the GYMOWF Connection on the Physical Environment

The assessment of potential impacts on the physical environment has specifically addressed the following environmental topics:

- Soils and contaminated land; and,
- Hydrology.

Soils and Contaminated Land

An assessment of the potential contaminated land risk has been completed as the proposed onshore works area contains a number of historical land uses with the potential to have caused contamination. A variety of map-based information (including historical, geological and groundwater vulnerability) as well as a site walkover identified a number of sites with the potential to cause contamination. These include a glass works; former landfill sites; former railway lines; made ground/fill from the backfill of a clay pit at the former brickworks and also from the removal of buildings such as Green Gate Farm and Morfa Farm. Further away from the cable route, a number of former shafts associated with lead mining and small quarries were identified outwith the study area.

The majority of the existing land in the area comprises agricultural land although other current land uses adjacent to the cable route include a timber works, electrical substations, optical glass works and a sewage works. The cables route crosses a number of existing highways with the A55 (T) being the largest. The route also crosses a number of water courses and drainage ditches. Potential sources of contamination include fill material/made ground including demolished buildings, above ground storage tanks and underground storage tanks and associated pipe work, electrical substations, timber works, glass works, agricultural land (arable and livestock), the former railway line, former mineral workings and landfill sites.

Potential adverse impacts were identified including potential impacts on surface and groundwater through exposure to re-mobilised contaminants during construction. However, a number of mitigation measures have been proposed including avoidance of potentially contaminated areas where possible, appropriate use of contaminant pathway control techniques and the implementation of an Environmental Management Plan to ensure that there will be no residual risks relating to contaminated land.

The potentially adverse risks and impacts associated with contaminated land can therefore be reduced appropriately through the implementation of suggested mitigation measures. A site investigation will be required prior to the construction works commencing to inform the mitigation work.

Hydrology

An assessment was completed on the potential impact of the proposed development on water resources. The assessment considered watercourses, surface water bodies and groundwater along the route as well as the potential impact on drainage from the different scheme components.

The onshore works are located within both the 'Western Wales River Basin District' and the 'Dee River Basin District'. There are approximately 35 watercourses crossed or affected by the proposed onshore works with 3 watercourses that will need to be diverted to accommodate the substation (see Figure 9). The majority of the GYMOWF onshore works area relates to underground 132 kV cables.

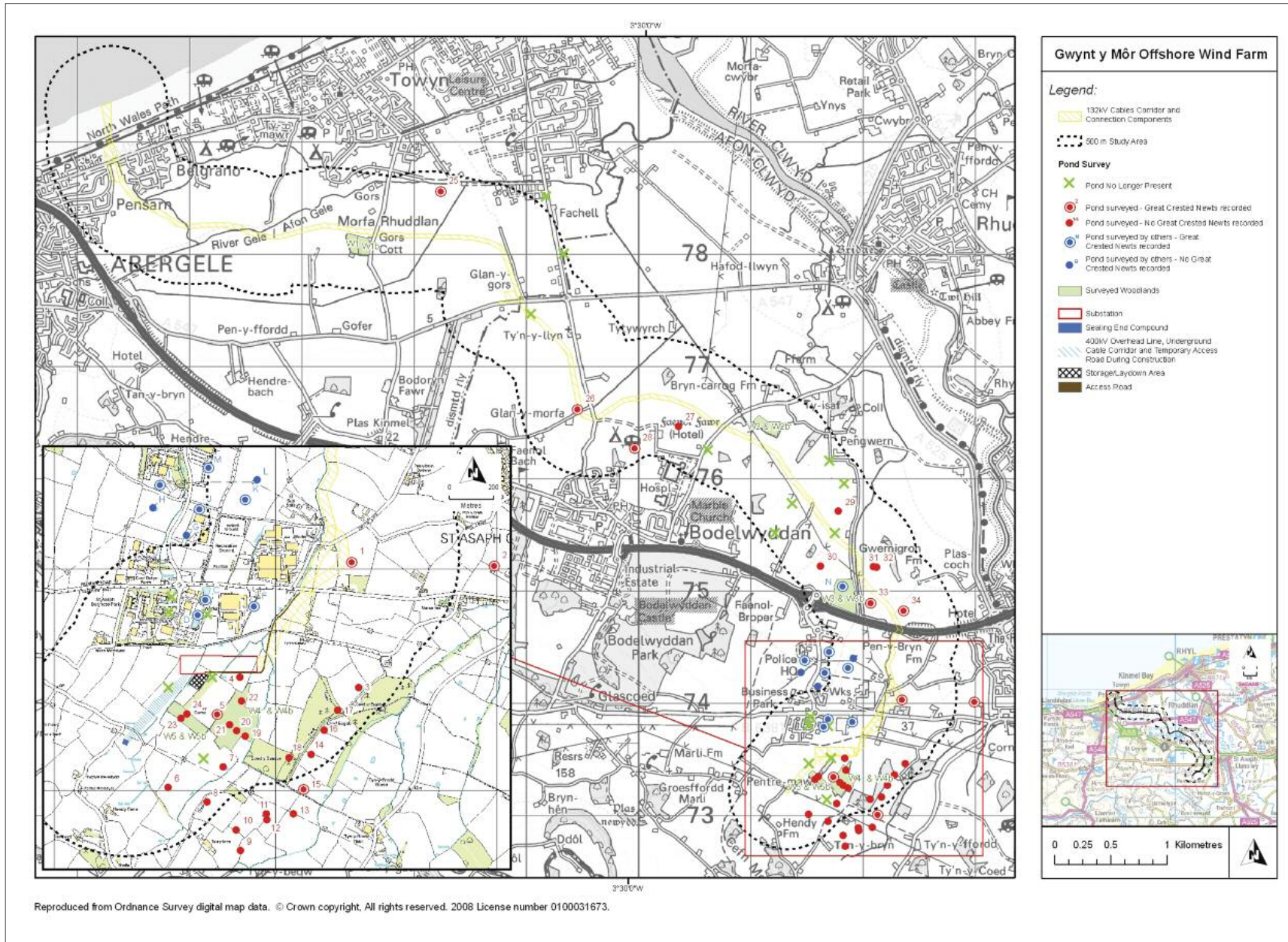


Figure 7: Ponds and study area

The northern part of the cable route is underlain by Carboniferous rock that forms part of the Barren Red Lithology (BRL). Towards the south, the route is underlain by younger Permian and Triassic Sandstone from the Bunter and Keuper formation. The southern end of the route is again underlain by the Barren Red Lithology. The drift deposits overlying the bedrock have a low permeability. These are clay rich and likely to be glacial till. The route also crosses areas where river terrace deposits and marine and estuarine alluvium are likely to be present.

Part of the cable route is situated in an area of high flood risk. The nature of the works means that they do not materially affect the flood capacity of this area. The substation site is not in an area of flood risk. Environment Agency Wales (EA Wales) has advised that a Flood Consequence Assessment is not required.

Ditches will be crossed by the cable trenches. To facilitate this, the cable will be installed at least 600 mm below the bed level of the ditch (or 1 m below bed level in the case of streams). Dams will be constructed either side of the crossing points and the water removed to allow excavation and cable installation. There may be a temporary increase in sediment load and transportation within watercourses in some cases during the construction phase which could have an adverse affect upon water quality. This may then cause low level indirect effects on flora and fauna through a reduction in water quality. These impacts can be mitigated through sympathetic construction techniques and methods of working (including excavation dewatering methods) to be agreed with EA Wales. Soil disturbance during the construction phase can also occur from the use of heavy machinery. This can result in the compacting of soils and cause a reduction in permeability which would in turn cause an increase in surface water runoff which may flow into nearby water features. This would create a further increase in the movement of sediment

loads. Control on vehicle movements and controls on soil compaction will be implemented through construction of temporary haul roads.

Other potential impacts identified include accidental chemical spillages, changes to water flows as a result of crossings to water features and an increase in impermeable areas at the proposed substation site further increasing the likelihood of flooding issues in the locality.

A number of 'management' and 'physical' mitigation techniques were identified which can significantly reduce adverse effects. An Environmental Management Plan will incorporate sound environmental best practice and manage pollution avoidance and control measures to be implemented during the construction and operation phase of the proposed development. Physical techniques include the use of bunded fuel and transformer tanks and spill control kits to guard against spillages and the subsequent contamination of water, designated refuelling areas and the use of sediment traps to reduce sediment flows and oil separators in refuelling areas.

Other mitigation measures include the construction of an attenuation pond south of the substation to hold any surface water run-off as a result of the loss of permeable surfaces, the diversion of existing watercourses at the proposed substation site and the use of Sustainable Drainage Systems to reduce flooding impacts at the proposed substation site.

No significant effects on hydrology are anticipated as a result of the proposed development provided mitigation measures are implemented.

Potential Effects of the GYMOWF Connection on the Biological Environment

The assessment of potential impacts on the biological environment has specifically addressed the likely impacts of the proposed development on ecology.

Ecology

An assessment of the potential ecological impact of the proposed development was undertaken. A range of ecological surveys have been undertaken to provide a baseline for assessment of potential impacts. Baseline conditions were determined following an analysis of these surveys and records of protected and notable species and habitats.

One Special Area of Conservation (SAC) and eight Sites of Special Scientific Interest (SSSIs) are located within 5 km of the proposed development area. Such sites are afforded international and national protection. A total of nine non-statutory designated sites are present within, or up to 500 m of the development area, including two Local Nature Reserves, one Wildlife Site and six candidate Wildlife Sites. The desktop and walkover surveys identified a number of important species in and around the proposed study area including otter, bats, water voles, badgers, great crested newts, grey partridge, skylark, song thrush, linnet, reed bunting and bullfinch. As part of the survey work, detailed protected species surveys have been undertaken in 2008 including extensive pond surveys have been carried out to establish great crested newt populations (Figure 7).

The installation of the underground cables and the proposed substation has the potential to create a number of adverse ecological impacts such as the permanent loss, disturbance or fragmentation of habitat due to construction. The installation of the cables route will involve the loss of some hedgerow and trees along the 11.1 km route and the permanent loss of land at the substation site also has the potential for disturbance to and loss of species and habitat.

A number of mitigation measures have been identified to ensure that there are no significant adverse impacts on ecology. Such measures include ecological awareness training for all construction workers. The removal of habitat will take place outside the main period of the breeding bird season to avoid effects on ground and tree nesting birds. Where this is not possible, all potential nesting habitat that will be disturbed will be checked before removal to ensure that no nesting birds will be affected. At appropriate timings in the year preceding construction, all potential bat trees will be surveyed for the presence or signs of use of by bats. If any trees that need to be felled are identified as roosts, felling will be timed to avoid maternity, hibernation and breeding periods. Mitigation measures will include erection of bat boxes in advance of felling. Potential impacts to water vole will be mitigated by minimising ditch disturbance, strimming of bank vegetation and use of an ecological watching brief. In addition, access to safe working areas at night will be ensured to allow nocturnal wildlife such as badgers and otters to access their natural habitat.

Every care has been taken to minimise tree and hedgerow losses. All hedgerows lost to the cable route will be fully reinstated upon completion of the works. Tree losses will be compensated for through substantial replanting at Coed Cord as detailed on the Landscape Master plan (see Figure 9.) and the loss of mature trees will be compensated at a ratio of 3:1. Newt compensation ponds will also be provided whilst secure fencing will be used during the construction phase to ensure that newts are not able to enter the construction areas.

The construction and operation of the substation, cable route, overhead line and realignment of the gas pipeline, along with all associated construction activities will not result in any significant residual ecological impacts.

Potential Effects of the GYMOWF Connection on the Human Environment

The assessment of potential impacts on the human environment has specifically addressed the following environmental topics:

- Landscape and views;
- Archaeology and cultural heritage;
- Land use;
- Noise;
- Transport;
- Tourism; and,
- EMF/EMC.

Landscape and Views

The proposed development has the potential to create adverse impacts on landscape and views and an assessment was undertaken to establish the significance of any potential impacts.

The landscape character assessment considered the condition, value and sensitivity of the landscape whilst the visual impact assessment considered the impact on the visual receptors namely the residents and visitors using a number of different accessible viewpoints in the immediate and surrounding area.

The immediate context of the location for the proposed onshore works is rural and influenced heavily by the North Wales coastline. The study area lies within the base of the river valley landscape of the Vale of Clwyd and is dominated by pasture and arable fields. Small blocks of woodland are scattered throughout the surrounding farmland together with the hedgerows and trees. The proposed substation site slopes up gently from the north between 38 m and 45 m above sea level.

The potential sources of impacts on landscape and views arise from the permanent above ground installations such as the proposed substation, 400kV overhead line and sealing end compound. Permanent changes were also considered such as the loss of trees and hedges that are unable to be replaced. Temporary effects considered include the temporary loss of features which are subsequently replaced and the presence of plant and machinery during the construction phase.

The exact location of the substation has been considered carefully and was subject to a number of alternative locations. The location of the substation is considered to be the best position to minimise visual and ecological impact through a combination of minimal tree loss and available screening from mature woodland. Similarly the 400kV overhead line and towers have been located to allow for the retention of the most valuable landscape features where possible.

The overall effect of the underground cables, substation, sealing end compound, tower and line modifications and gas pipeline diversion on landscape character during construction would be Minor adverse. The overall effect on visual receptors during construction is considered to be Minor adverse with the exception of underground cables which would be Minor to Moderate adverse.

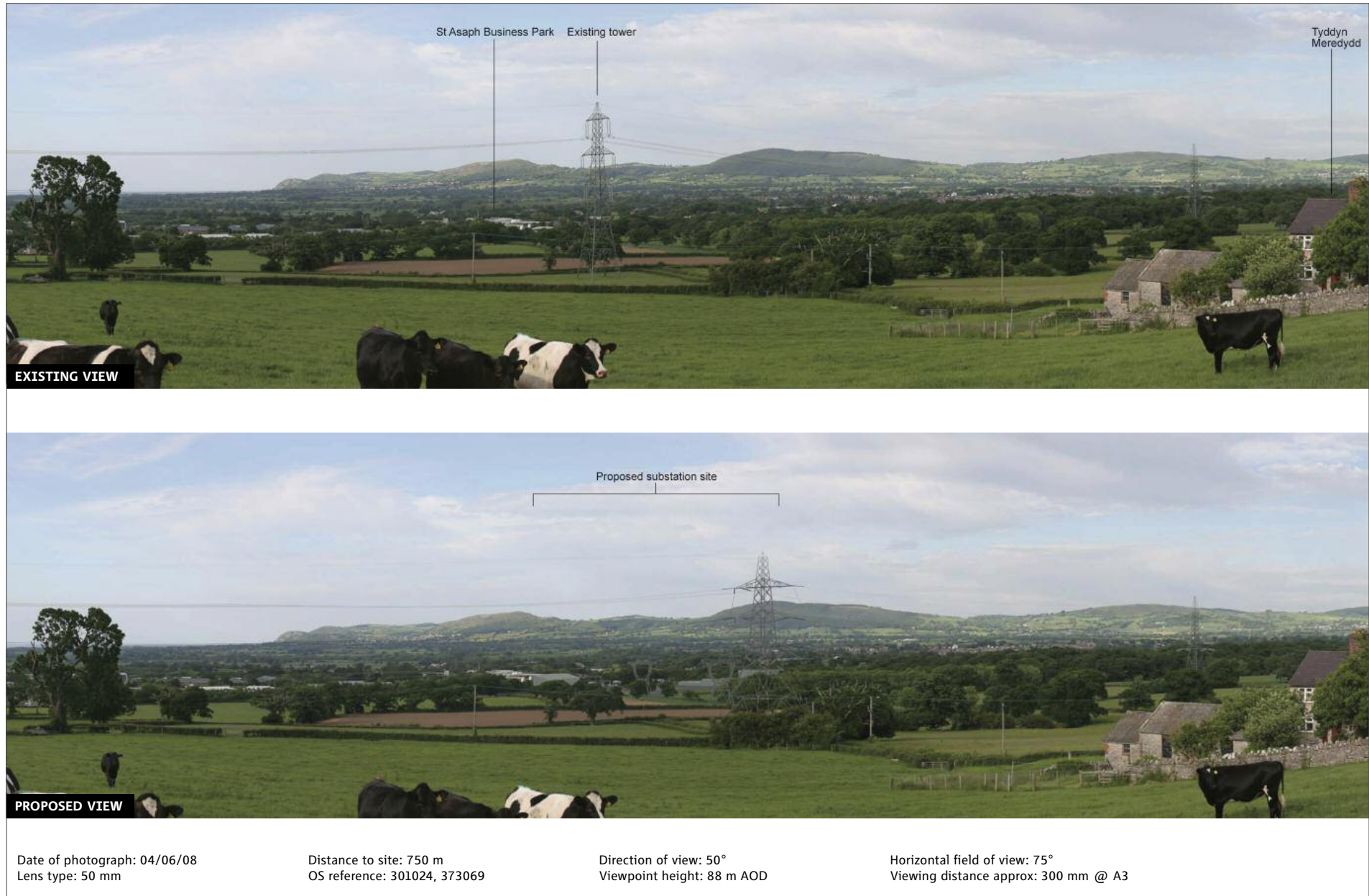


Figure 8: VIEWPOINT 3. Footpath between Pentre-mawr and Tyddyn Meredydd looking northeast



Figure 9: Landscape mitigation plan

The overall effect of the substation, sealing end compound, tower and line modifications and gas pipeline diversion on landscape character during the operational phase would be Moderate adverse, reducing to Minor adverse as mitigation planting matures. The overall significance of effect on visual receptors would be Minor adverse. Figure 8 shows an example photomontage showing the impacts of the substation against the existing view.

There is a Minor significance of effect of the underground cables on the landscape character areas during the operation phase, reducing to Neutral as the planting matures. The significance of visual effects would be Minor, reducing to Neutral.

Residual landscape effects are Minor adverse as the scale of habitat loss is minor and the replacement of farmland with diverse native habitats provides landscape and visual benefits in the long-term. The landscaping master plan is shown in Figure 9.

Residual visual effects are Minor adverse as the quality of the views will improve as the proposed mitigation planting matures.

Archaeology and Cultural Heritage

An assessment of the likely impacts of the proposed development on archaeological and cultural heritage features has been undertaken. The proposals may cause impacts not only to sites of known cultural heritage importance, but also to other cultural heritage sites which may exist but have not yet been identified.

A desk-based assessment using a number of different resources such as historical records, aerial photography, geological maps and trial pit and borehole data as well as a site walkover were undertaken to establish the existing baseline environment. Archaeology from all periods of history is represented in the study area. A total of 71 separate individual artefact find locations, archaeological or historic sites/areas and 20 historic buildings, some of which are Listed Buildings were identified from the desktop and walkover studies.

Potential impacts that can arise during construction are considered to be direct permanent effects upon heritage receptors, such as the disturbance of buried archaeological remains, or effects upon a standing building or a monument. Temporary construction effects may arise from construction activities that may cause indirect effects to the settings of monuments or buildings.

The installation of the 132kV underground cables requires shallow excavations of approximately 1.2 m, which are unlikely to impact upon early, deeper deposits beneath the surface. Potential effects may also arise from constructing access roads, construction compounds and the substation and overhead tower foundations.

A Written Scheme of Investigation (WSI) will be prepared for mitigation works proposed for any cultural heritage receptor that is likely to be impacted upon by the proposed works. Watching briefs will also be undertaken during the construction phase and effort will be also made to identify and fence the boundary marker at Sun Farm to prevent inadvertent disturbance or destruction by construction works.

A total of 18 of the 91 receptors would be subjected to negative effects of Low Significance. The majority of these receptors are of minor or local significance and mitigation measures have been recommended which would result in residual impacts of no significance.

Visual impacts upon many more sites of cultural heritage significance, including the Registered Parks and Gardens at Kinmel Park and Bodelwyddan Castle, the Landscapes of Outstanding Historic Interest of Creuddyn and Conwy and the Great Orme and Little Orme and a number of Listed Buildings have been restricted to indirect temporary impacts of Low significance due to the underground cables being installed beneath ground level.

Land Use

The proposed development has the potential to impact upon existing and future land uses in the study area.

Impacts include the loss of existing agricultural land (arable and grazing), the temporary disruption of access to established residential, commercial or industrial properties and communal facilities during construction and disruption to existing services, drainage regimes. The proposed development also has the potential to compromise future development land that is allocated in any Unitary Development Plan or Local Development Plan.

Temporary construction impacts have been identified relating to the loss of access to the beach and agricultural land during the landfall works and the installation of the underground cable route respectively. However, once the works are completed, all land will be fully reinstated and previous land uses can resume. There are no permanent effects on land use, including public rights of way. An Environmental Management Plan will be produced detailing the restoration strategy. The overall impact will not be significant and is of a temporary nature.

The installation of the 132 kV underground cables at the Local Plan designated local employment site will constrain the type and layout of any future employment development on the site. However, employment uses such as storage or yard-based uses would still be able to take place, provided that no buildings are erected directly above the cables. In addition, a report has been produced by Capita Symonds (2007) in liaison with CCBC Highways Department which confirms that the cables would not compromise the future development of the proposed link road designated in the Conwy UDP.

There is an area of land east of St Asaph Business Park identified as a potential strategic development site in the Denbighshire LDP Pre-Deposit Document. This site has not yet been confirmed as a future development site; however if this site was to come forward, any site development brief would need to take account of the presence of the GYMOWF 132 kV underground cables and sterilisation width.

The substation development will involve the permanent loss of approximately 2.8 ha of farmland excluding habitat mitigation areas. Consultation with landowners has confirmed that this will not result in overall adverse effect on viability of a farm unit.

The 132 kV underground cables route is located in open countryside and future development is unlikely to occur in these areas. The proposed development will not compromise the future development of land allocated in existing or pending development plan documents and the overall impact on future land use is assessed as Negligible.

Noise

An assessment of the potential impact of noise was undertaken because the operation of the proposed substation will generate noise emissions that have the potential to have an adverse effect on the surrounding environment. The assessment of noise generated during the construction phase of the proposed development was scoped out of the ES and agreed by Conwy County Borough Council and Denbighshire County Council due to the relatively low levels of noise envisaged and the temporary and transient nature of the construction works.

The assessment was based on the inclusion of the two possible future Super Grid Transformers (SGTs) to ensure a reasonable worst-case scenario is projected. All equipment was assumed to be operating at full capacity with full enclosures installed around the Thyristor Controlled Reactors units.

Noise generated by the proposed substation was assessed as not likely to create any adverse impacts on the nearest residential receptors likely to give rise to complaints. Noise levels at the nearest commercial premises at St Asaph Business Park would be expected to be in the region of 45dB(A) resulting in internal noise levels in the region of 35dB(A) with partially open windows. This falls within the category described as 'good conditions'.

The nearest dwellings, located approximately 350 m away to the east and west are not likely to be subjected to a noise nuisance provided that the Static Variable Compensation units (SVC) compound components are enclosed and achieve a sound reduction of 35 dB(A) or a noise level of around 60 dB(A) at the SVC compound fence. No further mitigation measures are anticipated to be required.

Transport

The significance of the potential transport impacts was assessed as the construction phase of the proposed development will generate an increase in traffic on the local highway network. Operation impacts were disregarded as the proposed development will not require any permanent operation personnel whilst maintenance and repairs will be required infrequently.

Vehicle movements will be generated towards the temporary works areas located off the A548, the A547 and the B5381. The temporary works areas will comprise offices, mess rooms, toilets, stores and lay-down areas during the construction period.

Abnormal load movements will involve the delivery of very large loads such as the substation transformers from the A55(T) onto the B5381 Glascoed Road and into the substation construction site. This will require routing and timing measures to be arranged in advance with the highway authorities and the police. Three such abnormal loads are envisaged.

Mitigation measures have been suggested to reduce potential adverse impacts to Low or Negligible. Such measures include directional drilling of underground cables beneath highways to minimise traffic disturbance where required, a beach access strategy at Pensarn, a Construction Management Plan to reduce traffic generation to and from working sites and agreement with the highway authorities regarding the crossing of narrow roads. Advice to construction workers, delivery companies, local employers and schools will also be provided to raise awareness of highway safety.

Specific mitigation measures will also be put in place to reduce the impact at Glan Clwyd Hospital and the schools and college in Abergele. Such measures include ensuring that traffic flow is maintained in Sarn Lane and Ty Fry Lane during the crossing of underground cables beneath highways and restricting vehicle access to Sarn Lane past Glan Clwyd Hospital to those directly associated with the cable installation works at that locality.

The roundabout junction of the A525 and A547 has been identified as an accident blackspot. The number of additional vehicles travelling through this location is likely to be very low. However, the access to the cable route from the A547 is located 600 m west of the junction and clear visibility splays will be maintained. The need for additional care at this junction will be highlighted at the worker briefing stage.

The overall impact is expected to be 'Negligible' for the majority of the construction period, with a 'Negligible/Low' impact potentially, but likely to occur only over a short period of time.

Tourism

The potential impact of the proposed development on tourism was assessed after consultation with CCBC during the EIA scoping exercise. This consultation revealed concerns regarding perceived adverse impacts on the local economy.

The area of North Wales in which the GYMOWF connection works are proposed is known for its tourism which is important to the local economy. The main tourist facilities and accommodation in the area affected by the connection works are located in the coastal area. The substation and associated works are in an area characterised by existing commercial development in St Asaph Business Park and agriculture beyond.

The proposed development has the potential to cause adverse impacts through the temporary restriction of access to local tourist facilities and delays to the local road network including a general loss of amenity. All identified impacts have the potential to cause the local area to suffer a reduction in its attractiveness to visitors. This has been mooted to potentially result in a temporary reduction in visitor numbers to the area resulting in an adverse impact on the vitality of the local economy.

A very small section of Pensarn beach and private land to the south of the railway line will be subject to temporary works during the landfall site construction phase. Access will be maintained at all times other than to a very small proportion of the beach.

The temporary works of cables installation and construction are anticipated to give rise to overall 'Minor to Moderate' adverse effects on landscape character and views. Potential temporary impacts are anticipated to be of a Moderate adverse nature at the coastal footpath by the sea defence wall located immediately above the drilling associated with the landfall works. Minor temporary effects are anticipated on the setting and views of Bodelwyddan Castle, Bodelwyddan Church and the Faenol Fawr hotel during the installation of the 132kV cables. There are no permanent effects on landscape and views associated with the landfall works and underground cables as all works will be constructed below ground level.

Users of public footpaths will have views of the permanent substation works which are assessed in Chapter 12.0 as being of no greater than 'Moderate' adverse effects. The substation and 400 kV overhead line will not be seen from the two closest tourist facilities identified comprising the trout fishery and Eryl Hall caravan park and all other tourist facilities are located too far away from the proposed substation and associated works to be adversely impacted upon.

No other adverse effects on tourism have been identified. Similar activities to those proposed for the GYMOWF connection works have been undertaken for both the North Hoyle and Rhyl Flats offshore wind farms without reported adverse effects on tourism.

Electro-magnetic Fields and Compatibility

All developments that produce electricity will generate electric and magnetic fields (EMF). The potential impact of the fields produced and the likely impact of electro-magnetic compatibility was assessed by National Grid in relation to national exposure guidelines.

Electric fields depend on the operating voltage of the equipment producing them and are measured in volts per metre (V/m). Electric Fields are shielded by most normal construction materials and trees and reduce rapidly with distance from the source. Magnetic fields depend on the electrical currents flowing and are measured in the unit microtesla (μT). They are not significantly shielded by most common building materials or trees but do reduce rapidly with distance from the source.

The proposed substation is located in a predominantly industrial area with the nearest residential properties located in excess of 350 m away. Electric and magnetic fields from the proposed substation and underground cables will not exceed UK Government guideline levels at nearest residences, and therefore, no significant EMF Effects are envisaged from the proposed development.

The closest distance of buried 132kV cable to nearest houses is approximately 20 m where the cables route runs through the Pensarn Gap adjacent to Belgrano and also at Cwttir Cottage near St Asaph. The cables will be buried to a depth of approximately 1.2 m. Magnetic fields have been calculated to dissipate rapidly to very low levels within 10 m of the cables assuming full output of the wind farm. There will be no external electric field produced and the overall impact will be small.

There will be no significant cumulative effect from electric and magnetic fields generated by the substation and little likelihood of significant adverse effects due to electromagnetic incompatibility.

Concluding Statement

The reality of global climate change is becoming increasingly apparent and is now a recognised issue requiring an unprecedented response by the international community. Efforts have begun around the world to respond to this threat. The UK is leading the way in its response through its efforts to harness the power of offshore renewables to produce clean and sustainable energy. The GYMOWF project represents an important step in realising those efforts. The electricity produced by the proposed development could be sufficient to supply over 40% of the households in Wales and could prevent the release of around 2 million tonnes of polluting CO² per year.

GYMOWF would provide a significant source of clean, renewable electricity, and would make a major contribution towards meeting the UK Government's targets for generating 10% of UK electricity demand from renewable sources by 2010, and 15% by 2015. The project has been assessed through a comprehensive EIA process in accordance with statutory requirements. This has been informed by an extensive and ongoing process of consultation with statutory and non-statutory stakeholders and the public. The EIA process has considered a reasonable worst-case approach to ensure that a precautionary assessment has been provided. This will ensure that the anticipated environmental impact of the GYMOWF scheme will be no greater than that described in the EIA and may in fact be considerably less than that presented.

The potential physical, biological and human impacts of the proposed development have generally been assessed to be not significant.

The implementation of suggested mitigation measures should ensure that residual effects are not significant and can be managed to acceptable levels. The ES has identified ecological benefits through the provision of better quality terrestrial and breeding habitat for great crested newts in compensation for habitat to be lost by the substation and sealing end compound.

Other potential positive impacts include the connection work's role in facilitating the general contribution of the GYMOWF scheme to a reduction in greenhouse gas emissions through the use of cleaner, more sustainable energy resources and contributing to a more diverse and secure energy supply.