



CELTIC ENERGY LIMITED

NANT HELEN COMPLEMENTARY RESTORATION EARTHWORKS

ENVIRONMENTAL STATEMENT
APPENDICES
MAY 2020

ARUP



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Appendix 3A

Construction programme

Outline Programme of Earthworks for Nant Helen - GCRE / Complimentary Restoration (Assumes a July 2020 Start)

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Appendix 3B

Outline CEMP

Celtic Energy Ltd

**Nant Helen Complementary Restoration
Earthworks**

Outline Construction Environmental
Management Plan

Issue | 29 April 2020

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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1 Introduction

1.1 Purpose of the Outline CEMP and CEMP

- 1.1.1 This document is the outline Construction Environmental Management Plan (CEMP) to accompany the planning application Nant Helen Complementary Restoration Earthworks.
- 1.1.2 The CEMP contains control measures, and the standards to be implemented throughout the construction of the works in order to avoid and reduce impacts during construction.
- 1.1.3 The Contractor will be responsible for producing the final CEMP in accordance with the requirements set out in this document. The CEMP will therefore evolve and is subject to refinement, amendment and expansion as necessary.

1.2 Guidance and other documents

- 1.2.1 The CEMP is intended to satisfy the principles of the International Environmental Management System (EMS) Standard ISO 14001. The appointed Contractor(s) will ensure that the CEMP for the Proposed Development complies with the Contractor(s)'s own EMS.
- 1.2.2 The CEMP will be developed in accordance with relevant best construction practice guidance including:
 - Guidance for Pollution Prevention (GPP) 1 – 29. In particular:
 - GPP 2 Above Ground oil storage tanks;
 - GPP 5 Works and maintenance in or near water;
 - GPP 6 Working at construction and demolitions sites;
 - GPP 21 Pollution incident response planning;
 - GPP 22 Dealing with Spills;
 - GPP 26 Safe storage – drums and intermediate bulk containers
 - CIRIA Environmental handbook for building and civil engineering projects.

1.3 Assumptions of the Outline CEMP

- 1.3.1 This Outline CEMP is based on the information available at the time of writing. It is assumed that the Outline CEMP will be developed into the CEMP by the appointed Contractor(s).
- 1.3.2 Any planning conditions and commitments made following submission of the planning application (if required) will be incorporated into the CEMP by the appointed Contractor(s).
- 1.3.3 It is assumed that the CEMP will be updated regularly by the Contractor(s) during construction.

- 1.3.4 It is assumed that a number of Contractors (including specialist contractors and sub-contractors) may be appointed during construction. All site construction staff, including sub-contractors, will be required to comply with the CEMP throughout the entire construction stage of the Proposed Development.
- 1.3.5 It is assumed that any failings in environmental management will be corrected through regular site monitoring and site audits, undertaken by the Contractor's Environmental Manager.

Document and Records

- 1.3.6 There shall be two electronic copies of the CEMP, one to be held on site by the Environmental Manager and the other off site by GIL. Both copies are to be kept up to date by the Contractor's Environmental Manager.

1.4 Incident Response Planning

- 1.4.1 The Contractor(s) will develop a Pollution Incident Response Plan which identifies the procedures for the event of a pollution incident during construction. The procedures will be in accordance with the guidance set out in GPP 21 Incident Response Planning.
- 1.4.2 All environmental incidents and accidents will be recorded and reported to the Contractor(s)'s Site Foreman and the Project Manager. Following a review of the incident, the Contractor's Environmental Manager will instigate an appropriate change in procedures where necessary.
- 1.4.3 The appropriate equipment required to implement these procedures shall be made available by the Contractor(s) and stored within the Contractor(s)' compound.

2 Roles and responsibilities

- 2.1.1 This section of the Outline CEMP identifies the roles and responsibilities of those involved in environmental management during construction.

2.2 Employer

- 2.2.1 Celtic Energy Ltd are the employer and will appoint project managers on their behalf to oversee the Earthworks.
- 2.2.2 Celtic Energy Ltd will appoint a board level Director to oversee the project and appointment of staff and contractors.
- 2.2.3 Celtic Energy Ltd is accredited to ISO 14001 (2015).

2.3 Project Manager

- 2.3.1 The Project Manager will act on behalf of the Employer, with responsibility for managing the Earthworks of the Proposed Development within the agreed environmental constraints in conjunction with all other necessary management processes.

2.4 Contractor

- 2.4.1 It is assumed that a number of Contractor(s) (including specialist contractors and sub-contractors) will be appointed during construction of the Proposed Development. There may be separate contractors for the Enabling Works and the Main Construction Contract.

2.5 Environmental Manager

- 2.5.1 An Environmental Manager and the Project Manager will oversee the implementation of CEMP including environmental control measures, mitigation and procedures. The Environmental Manager will be appointed by the Contractor prior to the enabling works and will implement the control measures during the Enabling works and main construction.
- 2.5.2 The Environmental Manager shall monitor, measure and review the environmental performance of the construction activities.
- 2.5.3 The Environmental Manager will host regular internal and external meetings, and undertake audits to review the operation and effectiveness of the CEMP. The results shall be reported by the Environmental Manager at monthly construction progress meetings and used to update the CEMP.
- 2.5.4 The Environmental Manager will be responsible for the implementation of other environmental management plans.

2.6 Community Liaison

- 2.6.1 The Employer and the Contractor will prepare a procedure for local community liaison with regards to construction activities. Regular community forum meetings will be held to keep the community informed of project progress including anticipated issues which may be of interest.
- 2.6.2 The Employer will provide to the community general enquiry and emergency contacts for them to use, such that any issues may be raised directly with them, in the event that feel it appropriate to do so.
- 2.6.3 The contractor will provide a site based Community Liaison Officer (CLO) and will ensure all site generated enquiries and/or complaints are effectively logged, communicated and actioned in agreement with The Employer. The CLO will align with and assist the delivery of the overarching Communication and Engagement plan.
- 2.6.4 The CLO will represent the contractor at any required internal and external partnership/stakeholder meetings. These meetings will relate specifically to community initiatives or communications tasks for the Proposed Development.
- 2.6.5 The CLO will be the primary point of contact for the Community Development Manager relating to matters on the ground. Themes the CLO will regularly communicate are; progress of construction, barriers to progress, reported issues, resolution of those issues and report impact on overall objectives.
- The CLO will build and maintain positive relationships with stakeholders facilitating a dynamic and effective communication procedure with established communications team and generating an acceptance of a common vision with all partners/stakeholders;
 - Ensuring positive awareness of the project brand to all internal and external stakeholders;
 - Work closely with the communications team and particularly the Community Development Manager to plan and deliver community liaison tasks to ensure the delivery of the KPI's of the communication and engagement plan;
 - Deliver, monitor and communicate on the 'Buy Social' clauses and subsequent targets of the project;
 - To be the primary point of contact for the service provider of the 'Buy Social' initiative; and
 - Communicate and administer all enquiries and/or complaints in an effective and timely manner, reporting up when required.
- 2.6.6 The contractor and the site will be registered with the Considerate Construction Scheme (CCS) and will be monitored and measured against the code of Considerate Practice.

3 Control of Construction Processes

3.1 Training, awareness and competence

- 3.1.1 The Contractor(s) will set out a programme of training to enable all site personnel to be aware of the potential risk to the environment during the construction progress.
- 3.1.2 The Environmental Manager will set out a series of induction courses for all site personnel including sub-contractors. The induction courses shall ensure all site personnel (including any new personnel) are aware of the environmental risks which have the potential to happen during construction. The inductions will inform the construction team on how to identify relevant environmental risks on site, record actions taken to protect the environmental and implement best practice to minimise pollution.
- 3.1.3 Environmental Awareness Toolbox Talks will be delivered by the Environmental Manager on a regular basis. These will provide an update to the site team on any relevant environmental issues as the construction progresses.
- 3.1.4 Selected members of the site management team including the Construction Site Foreman and Environmental Manager will be given practical training in the use of the spill kits, appropriate PPE, clean-up procedures and the appropriate disposal and recycling plans.

3.2 Environmental inspection, monitoring and reporting

- 3.2.1 The Environmental Manager will prepare a monthly environmental report to be tabled at the monthly site progress meetings. This report will monitor the implementation of the CEMP and review the ongoing site monitoring and inspections.
- 3.2.2 The monthly reports will be circulated to the Employer and the Contractor(s) for consultation and review.

3.3 Internal communications

- 3.3.1 All staff and Contractor(s) will be informed of the content and location of the CEMP and associated management plans and method statements. Method Statements will be used to communicate specific environmental requirements as appropriate.
- 3.3.2 The Environmental Manager will have responsibility for communicating any changes and updates in policy, procedure, best practice guidance and legislation.
- 3.3.3 The Contractor(s) will have responsibility for maintaining internal communication, including changes to material on display.

3.4 Communications with the statutory bodies and the public

- 3.4.1 The Contractor(s) will organise and facilitate regular meetings with statutory environmental bodies to provide an update on risk mitigation, progress against targets and a review of site monitoring and inspections. This will provide a mechanism for updating and adapting the CEMP as the project progresses.
- 3.4.2 The contractor(s) will maintain a record of all meetings held with statutory bodies during construction stage.
- 3.4.3 A notice board shall be identified on site where environmental information on the Project shall be displayed.

4 Environmental Control Measures

- 4.1.1 Control measures have been designed as part of the EIA and are integral to the Proposed Development.
- 4.1.2 This section of the Outline CEMP identifies the control (i.e. mitigation) measures as per each environmental topic assessed within the ES.

4.2 General Measures

- 4.2.1 Excavation plant machinery will be fitted with fuel spill kits.
- 4.2.2 Lighting will only be used as necessary.
- 4.2.3 Welfare facilities will be provided on site and maintained by Celtic Energy.
- 4.2.4 Vehicle/equipment washing facilities will be positioned away from watercourses and constructed with a drainage system which will capture run-off and effluent which will then be contained for proper treatment as per the Surface Water Management Plan.
- 4.2.5 To minimise noise, vibrational and air quality impacts from vehicles and plant/equipment, the Contractor(s) will instigate behavioural policies for all site staff. This will include:
- Minimising traffic to site by 'sharing' vehicles or by the use of a site bus (this will be detailed in the Construction Traffic Management Plan (CTMP));
 - Avoidance of part load deliveries (this will be detailed in the CTMP);
 - Utilisation of a pre-booked delivery policy to minimise holding vehicles prior to loading or unloading (this will be outlined in the CTMP); and
 - Ensuring that all construction plant, vehicles and equipment are turned off rather than left idling while awaiting usage (this will be detailed in the CTMP). Where feasible use of hybrid generators which help reduce noise and fuel consumption.
- 4.2.6 Areas will be clearly marked and managed to prevent them becoming overfilled and ensure that the areas are suitable for the materials stored.
- 4.2.7 Hazardous materials such as fuel will be stored within secure compound areas to prevent spillage, theft or malicious damage. A single Control of Substances Hazardous to Health (COSHH) area will be established to ensure the correct level of protection against fire spills and other chemical hazards. This will prevent sub-contractors and others creating individual stores, which are then not recorded or controlled.

4.3 Biodiversity

- 4.3.1 Appropriate measures will be adopted to protect the ecology of the site with special attention to specified ecological resources, as identified within the Ecology Chapter of the ES.
- 4.3.2 The Employer will require its contractors to manage impacts from construction (including site clearance) including to the following ecological receptors:
- Statutory designated sites including the Nant Llech SSSI; in hydrological connectivity to the Site.
 - Non Statutory sites including ancient woodland (ancient woodland and Planted Ancient Woodland (PAWS)); within and adjacent to the Site.
 - Other notable habitats including mire/fen, flushes, wet heathland, marshy grassland, acid grassland/dry heathland, ditches, ponds and streams; within and adjacent to the Site.
 - Notable species (e.g. including vascular plants, fungi, invertebrates amphibians, reptiles, breeding birds, wintering birds, otters, roosting/foraging bats, mammals and badgers); within and adjacent to the Site.
 - Invasive Non-Native Species; within and adjacent to the Site.

General Provisions

- 4.3.3 A SQE will provide a tool box talk to all contractors prior to any works commencing, and be available for advice for the duration of the construction programme.
- 4.3.4 The INNS Management Plan will be implemented during construction.
- 4.3.5 Any retained habitats (such as waterbodies, trees and woodland) will be securely fenced off with appropriate temporary fencing (e.g. chestnut paling on scaffold supports or 'Heras' fencing) at the start of construction work to prevent access and incidental damage by site vehicles, equipment and personnel.
- 4.3.6 All retained trees should be treated in accordance with British Standard BS5837 (2012) Guidance for the Treatment of Trees in Relation to Construction. Damage to mature trees, as well as tree and scrub understorey and ground flora within mature woodland, should be avoided.
- 4.3.7 Where possible vegetation clearance takes place outside of the bird breeding season (generally March to August inclusive); if this is not possible, pre-construction checks for nesting birds will be undertaken by an ecologist to ensure active nests are not disturbed.
- 4.3.8 Where protected/notable species are found during pre-construction checks in habitats within, and or adjacent to, the Site, and cannot be disturbed for example nesting birds, resting/breeding otter, badger setts, an appropriate buffer (based on best practice guidance for relevant species where available) will be demarcated

and no construction works will take place within this area, until the SQE has confirmed otherwise.

- 4.3.9 Pollution control measures will be implemented in accordance with industry standards and the Pollution Prevention Guidelines published by the Environment Agency¹.
- 4.3.10 In particular, measures to control and contain sediment and material arising from excavations and or piling operations at areas in proximity to waterbodies, will be included within the working method statements that will be developed as part of the agreed CEMP.
- 4.3.11 Any task lighting or security lighting, which may be required on site during the winter months, is to be designed in consultation with an ecologist to ensure that there is no disturbance to habitats within the site, which are likely to support crepuscular or nocturnal species such as otter or bat. Where practicable, daytime working hours will be adopted for any construction works to commence no sooner than one hour after sunrise and finish no later than one hour before dusk.
- 4.3.12 All tools, food, litter and construction materials and packaging that may constitute a hazard to otters and other Section 7 mammals, as well as roosting birds and reptiles, will be removed daily from the site.
- 4.3.13 Any traffic plans produced will ensure that vehicle traffic is restricted to agreed low limits.
- 4.3.14 Excavations are to be covered at night-time or a means of escape provided (such as a plank of wood) for otter, badger or other animals.

Specific requirements during construction

- 4.3.15 A detailed Ecological Protection Plan (EPP) and Ecological Management Plan (EMP) drawn up prior to any clearance or construction activities commencing on Site, and be submitted for approval by the LPA and NRW, and will include the following.
- 4.3.16 The EPP will include detail the results of the current survey and additional pre-construction surveys required. It will include species-specific mitigation measures such as reptile translocation, and the treatment of notable habitats during construction, particularly those which are to be translocated (species-rich grassland, fungi-rich habitats and shallow peat habitats). Where notable plants are present these will also need to be translocated into suitable habitat. In addition, details of mitigation measures, which are required during construction to ensure the protection of adjacent notable habitats (including ancient woodland, more and wet heathland/flushes) and species, will need to be included such protection measures/buffer zones for adjacent habitats and species.

¹ It is noted that these Guidelines have been withdrawn by the Environment Agency, however they are considered to still be relevant and applicable until such time as new guidance is available.

4.3.17 An EMP will include the following:

- Details of the ecological baseline, including: existing and additional ecological survey results. It will also detail information of existing landownership and management, as well as geology/ground conditions, hydrology and topography – which will be essential to inform habitat establishment proposals.
- Details of the newly established habitats including existing habitat translocations, where possible, and the creation of new habitats. It will include details of how these habitats, will provide suitable habitat for notable species i.e. suitable species as food plants within species-rich grassland for butterflies, a network of ponds of different sizes/shapes suitable for damselflies and amphibians, open areas with shallow pools and rushes for ground nesting birds such as curlew and lapwing. Opportunities will be sought to enhance areas of marshy grassland for marsh fritillary, since they are known to occur in the wider area.
- Details of compensatory measures will be required to enhance the condition of adjacent ancient woodland. Where this habitat is lost, which is anticipated for PAW, proportionate areas of adjacent PAW will need to be enhanced, through the removal of conifer species, and replanting of appropriate native broadleaved species.
- Details of habitat enhancements, which will be provided in addition to the ‘like for like’ replacement of lost habitats within the Site.
- Details of total areas of habitat lost (during construction), along with new habitat to be gained (post construction/operation). This will also include details of net gains. It will need to be clear where habitat replacement/enhancement is for the existing ecological baseline and the future baseline (i.e. the restored site).
- The locations of newly established habitats. Where off-site habitat is established, agreements will need to be in place with the relevant landowners.
- Suitable prescriptions, for the management of newly established habitats, which enhances their value for biodiversity post development. This will include specific management measures for notable habitats and species within the site including notable plants/fungi, invertebrates, amphibians, reptiles, breeding birds, wintering birds, roosting and foraging/commuting bats, otter and notable mammals.
- A programme detailing the duration of each survey/habitat creation/management activity, what time of year it will need to be undertaken, and how frequently.
- The EMP period will be agreed with the LPAs/NRW but is anticipated to be for a minimum of five years. A programme detailing all management prescriptions for the first 5 years post-construction, which will be subject to review and extension. Responsibilities for each task will need to be detailed.

- Full details for the monitoring of the site post development, to provide information on changes in habitat condition and additional mitigation/management measures that may be required.
- 4.3.18 The INNS Management Plan will be drawn up prior to site clearance, and approved by the LPAs prior to being implemented on Site during construction.
- 4.3.19 Details of habitat (and species) translocations will be included within the EPP and EMP, for their appropriate treatment prior to, during and post construction including any aftercare/maintenance and monitoring. This will include information on methods/equipment/timing etc.
- 4.3.20 The Contractor will need to provide information on construction methods and temporary works prior to Site clearance, and for inclusion within the EPP and EMP.

Enhancements

- 4.3.21 Full details of enhancements will be provided in a EMP, however in general will be targeted at the existing notable habitats and species within the Site, as well as notable species present in the wider area. For example, marsh fritillary are present in a Wildlife Trust 1.5 km west of the Site, which could utilise marshy grassland within the Site or in connecting habitats to the west, if they were enhanced through sympathetic grazing regimes.

Monitoring

- 4.3.22 Monitoring (in addition to the supervision of the works outlined above and the auditing of mitigation measures) will be undertaken during the construction period and post-construction (period to be defined by the local planning authorities and Natural Resources Wales (NRW)), in accordance with the EMP. The monitoring will include:
- Monitoring of newly established habitats (using NVC survey methods) on an annual basis; and
 - Monitoring of notable species. Including vascular plants, fungi, invertebrates, breeding birds, bat activity and notable mammal species (with surveys following relevant best practice, and based on previous surveys undertaken to establish the baseline). It is proposed that these monitoring surveys will be in year 1, 3 and 5 post construction.
- 4.3.23 Monitoring results will be evaluated through a Steering Group, led by the Site owner in partnership with Neath Port Talbot County Borough Council (NPTCBC) and Powys County Council (PCC), NRW, any Site users/managers, advisory consultants (such as Arup), and potentially other local groups/independent experts. The group should identify where additional remedial measures are required to ensure the objectives of the EMP are implemented, and also to extend the EMP, for an appropriate period with new/amended management prescriptions as required.

4.4 Landscape and Visual Impact

General Provisions

- 4.4.1 The following measures will be implemented to help mitigate the impact of the development on the landscape and visual resource:
- Where possible retain existing trees across the site. Protecting trees within or in the vicinity of the site, in accordance with BS 5837: 'Trees in relation to design, demolition and construction' (2012);
 - replace/plant tree with suitably sized tree to the approval of the Local Authority Tree Officer, and in accordance with the approved programme for undertaking planting works at the first available planting season;
 - use of well-maintained fencing and hoardings to prevent unwanted access to the earthworks site, to provide screening, and site security where required;
 - use of different types of fencing and hoarding to minimise visual intrusion;
 - painting the side of hoardings facing away from the site, and to keep them free of graffiti or posters;
 - temporary lighting needs to avoid unnecessary intrusion onto the a wider landscape to prevent unwanted impacts on night-time lighting;
 - Maintain a clean and tidy site, using road sweepers and other appropriate methods.

Protection of Vegetation

- 4.4.2 Vegetation clearance would be undertaken, during the appropriate season/time of year, with great care to remove the minimum necessary and to protect and retain adjacent vegetation.
- 4.4.3 To prevent the spread of non-native invasive plant species, the appointed contractor must follow the latest guidance as set out by Natural Resources Wales.
- 4.4.4 Sourcing of plants and seed will be in accordance with current Defra/Natural Resources Wales and industry guidance to prevent the spread of pests and diseases and non-native invasive species. The Contractor is to refer to UK Plant Health Information Portal and NRW's latest publications on this topic.

Measures to Reduce Potential Impacts on Landscape and Visual Resource

- 4.4.5 Planting and other landscape measures will be implemented during the earliest planting season and when it is reasonably practicable. If 'off-site' planting is proposed this should be planted in advance of construction works, if reasonably practicable.

- 4.4.6 A record of how the implementation of the works meets control measures, relevant to protection of the landscape and key landscape features, will be maintained and regularly reviewed.
- 4.4.7 The Employer, the Local Planning Authorities, NRW and other bodies (where they have an interest), and adjacent landowners will be consulted, as appropriate, regarding the landscape and planting proposals.

Monitoring

- 4.4.8 Appropriate inspection, monitoring and maintenance of seeding works provided as part of the Project, will be undertaken by the Contractors throughout the earthworks.
- 4.4.9 The Employer will supply its Contractors with information prior to the earthworks to verify the landscape planting and seeding design as set out in the ES, on drawings and in the specification. This will allow the contractors to fully understand the required mitigation measures.
- 4.4.10 The Employer will require its contractors to undertake appropriate maintenance of seeding works and implementation of management measures, through the construction period as landscape works are completed. The contractors will monitor the progress of new landscape works through the construction period. Any failures of planting and seeding will be replaced in accordance with the approved specification and works requirements. This will ensure reseeded works are undertaken (as required) to achieve successful establishment of the landscape mitigation proposals at completion of the construction works. The Employer will require its contractor to maintain seeding throughout the defects liability period.

4.5 Historic Environment

Cultural Heritage Management - general provisions

- 4.5.1 The Employer and its principal contractors will manage the impact of earthworks on the cultural heritage assets present in proximity to the site, including:
- The Scheduled Monument within the site;
 - Undesignated assets as identified in Chapter 8 of the Environmental Statement and previously unrecorded archaeological remains potentially present in areas not subjected to open cast mining.
- 4.5.2 Any works to the Scheduled Monument will require Scheduled Monument Consent, obtained from Cadw. Carrying out works without gaining consent is an illegal act.
- 4.5.3 All works will be managed in accordance with relevant Standards and Guidance of the Chartered Institute for Archaeologists and guidance from Glamorgan Gwent Archaeological Trust (GGAT) and Clwyd Powys Archaeological Trust (CPAT) taking account of the relevant sections of the Written Scheme of Investigation, developed by The Employer and its contractors and approved by CPAT and GGAT.
- 4.5.4 General cultural heritage management measures will include:
- An archaeological contractor will be appointed by The Employer. They will be a CIfA Registered Organisation.
 - Provision to the contractors of locations and descriptions of all known cultural heritage assets within and adjacent to, construction works, including restrictions to construction methods to protect cultural heritage assets, where these have been identified in the ES;
 - A programme detailing the implementation of cultural heritage survey works prior to and during construction, addressing the measures set out in the ES;
 - The Employer will ensure that the cultural heritage mitigation works measures (as set out in the ES) are properly programmed by its contractors;
- 4.5.5 The Employer will require its contractors to monitor compliance using appropriately qualified environmental management staff with specific responsibility for supervising works with the potential to affect cultural heritage interests;
- 4.5.6 During all stages, The Employer will require its contractors to facilitate archaeological specialists undertaking the works as specified as an appropriate mitigation measure (including purposive investigation and/or watching brief works);
- 4.5.7 All archaeological intervention, recording, analysis, dissemination and archiving will be undertaken by a suitably qualified and demonstrably experienced organisation; and

- 4.5.8 Cadw and GGAT/CPAT (Development Control) will be consulted as appropriate through all stages of the implementation of the programme of cultural heritage works.

Human Remains

- 4.5.9 Should human remains be located during earthworks The Employer and its contractors will comply with all relevant legislative and project specific requirements.

Written Scheme of Investigation

- 4.5.10 A Written Scheme of Investigation will be prepared by a suitably qualified archaeological contractor and agreed with CPAT/GGAT (Development Control) prior to the start of work.

Measures in the Event of Unexpected Discoveries of Significance

- 4.5.11 Should cultural heritage assets of potential national significance be unexpectedly revealed during construction the procedure, as previously agreed with The Employer, and where appropriate CPAT/GGAT, will be implemented in the event of any such discoveries being made. Mitigation may include the following, as appropriate:
- Investigation and assessment of discoveries to determine their significance if this cannot be determined from the asset as found;
 - Assessment of potential project impacts to inform design of appropriate mitigation measures;
 - Preparation of a written scheme of investigation for any stage of archaeological work required;
 - Excavation, recording and reporting on any discoveries; and
 - Recording and implementing measures to preserve any discoveries in situ, if required or if appropriate.
 - Appropriate fencing and hoarding will be provided as necessary to protect sites of archaeological or cultural heritage interest within or adjacent to the construction site, including unknown sites discovered during construction.

Monitoring

- 4.5.12 Arrangements will be made to allow CPAT/GGAT Development Control and Cadw to monitor the works at their discretion.

4.6 Water Environment

General Site Activities

- 4.6.1 Site compounds will be located away from all surface water features and watercourses and outside of the flood plain.
- 4.6.2 Wherever practicable, grey water systems will be used at site compounds to reduce run-off from site, improve water efficiency and reduce the potential for polluting discharges to surface watercourses.
- 4.6.3 A site drainage plan will be prepared in advance of construction works, identifying the location of all watercourses and drains/drainage paths and showing mitigation measures to protect the receiving water environment from pollutants from the scheme's construction.
- 4.6.4 All drainage on site will be identified and mapped, with colour coding used to distinguish between surface water, foul sewer and combined drainage. This will ensure that all those working on site are aware of the type of drain in the event of a pollution incident. Pollution control measures such as the use of oil interceptors, the placement of bunds or sediment traps will be used to prevent sediment run-off entering drains.
- 4.6.5 All personnel will attend a site induction before commencing work on site. The briefing will emphasise the sensitivity of the watercourses, surrounding habitat and methods and working practices employed to protect the water environment.

Surface Water Management

- 4.6.6 Temporary surface water management systems will be installed early in the construction sequencing and carefully managed to prevent localized flooding or pollution of surface and groundwater from sediment and other contaminants.
- 4.6.7 Silt fencing, cut-off ditches and soil bunds will be constructed downslope of excavations, to retain and convey water to adequately sized treatment areas to prevent the ingress of sediment contaminated water.
- 4.6.8 Areas of exposed sediment deemed at risk of erosion during heavy rainfall or flood inundation should be protected using either temporary measures (e.g. sheeting) or semi-permanent measures (for example coir matting) until vegetation is able to establish on these surfaces.
- 4.6.9 Temporary surface water drainage measures should be planned and designed appropriately prior to installation and recorded on drawings. This should include details on:
 - Soil/sediment settlement rate;
 - Drainage system capacity;
 - Details of systems installed to intercept and treat contaminated water run-off; and

- Details of steps to prevent bypassing of the drainage system.
- 4.6.10 Use of cut-off drains or ditches to convey water around the site and/or prevent sediment laden water entering excavations and watercourses.
- 4.6.11 Sediment laden water will be treated to allow suspended solids to settle out before disposal.
- 4.6.12 Settlement ponds should be constructed to promote the removal of sediment from site runoff. Ponds should be large enough to ensure sufficient residence time for particulates to settle out, prior to discharge of the water.

Severe Weather and Flooding

- 4.6.13 The contractor should consider the potential impacts of extreme weather events during construction. To ensure resilience of the scheme to such extreme weather events, the contractor should use a short to medium-range weather forecasting service from the Met Office or other approved weather forecast provider to manage climate-related risks and inform programme management and impact mitigation measures.
- 4.6.14 The contractor's Environmental Management System (EMS) should consider all measures deemed necessary and appropriate to manage extreme weather events and should specifically cover training of personnel and prevention and monitoring arrangements.

Vehicle and Plant Movements

- 4.6.15 Haul routes will be regularly inspected and maintained to minimise sediment laden run-off.
- 4.6.16 During the earthworks mass haul operation, damping down of the haul roads to minimise dust being generated by plant movements would be required. This would minimise dust pollution causing nuisance to neighbouring properties and businesses along the route of the scheme.
- 4.6.17 All vehicles, plant and equipment will be regularly inspected and maintained in accordance with manufacturers' recommendations. Records of inspections will be maintained on site.
- 4.6.18 Areas of hard standing will be provided at site access and egress points, where practicable. The areas will be regularly inspected and cleaned.
- 4.6.19 Site wheel washing facilities will be established at access and egress points and located away from watercourses and the floodplain. Cleaning will be carried out in a bunded area and wastewater will either be recycled or discharged to foul sewer (with consent from the sewerage undertaker). If unable to be discharged, waste will be removed from site by a licensed waste carrier for disposal to an appropriately licensed facility.
- 4.6.20 Guidance from GPP13 will be used to put in place good practice for vehicle washing and cleaning.

In-channel working

- 4.6.21 Any instream works or works close to watercourses will follow GPP5.
- 4.6.22 Any temporary works to divert watercourses during construction, either by gravity flumes or over pumping will include suitable provisions to pass high flows.
- 4.6.23 The use of construction materials on site will be free from contaminated material so as to avoid potential contamination of the watercourse.

Storage of Fuels, Oils and Other Chemicals

- 4.6.24 Spill kits to be available near all points of work and personnel trained in their use.
- 4.6.25 COSHH store to be bunded and locked when not in use.
- 4.6.26 In areas of limited footprint, settlement tanks and oil separators will be used to treat contaminated water from the work areas.
- 4.6.27 Physical barriers to stop material overspill.
- 4.6.28 No fuels, oils or other chemicals will be stored in high- risk locations such as:
 - Within 50 metres of a spring, well or borehole;
 - Within 10 metres of a watercourse;
 - Places where spills could enter open drains or soak into groundwater; or
 - On a floodplain.
- 4.6.29 Storage tanks for oils, fuels or chemicals will be sited on an impermeable base, surrounded by an impermeable bund, and inspected regularly for leaks. Any valve, filter, sight gauge, vent pipe or ether ancillary equipment must be kept within the bund when not in use. The drainage system of bunded areas shall be sealed with no outlet to any watercourse, pond or underground strata.
- 4.6.30 Bunded areas will be located on stable and on level ground and located away from watercourses, ditches and drains.
- 4.6.31 Associated pipework should be situated above ground and protected from accidental damage.
- 4.6.32 All bulk fuels storage must be contained within a double skinned bowser/container or have a bund. Double skinned tanks or bowzers must also be bunded unless the outer skin would provide secondary containment. The bund must have sufficient volume to contain 110% of the contents of the largest fuel/pipe container or 25% of the total storage capacity of all the containers, whichever is the greater.
- 4.6.33 All fuel containers, including those containing waste fuels, must be stored on a drip tray/bunded area away from vehicle traffic within a designated storage area, where possible, to avoid damage.

- 4.6.34 Plant will be regularly inspected, serviced and maintained to minimise the risk of leaks/spills. At the end of each working day, driveable plant will be moved away from watercourses.
- 4.6.35 Refuelling will be carried out in accordance with PPG7.

Topsoil Stripping and Storage

- 4.6.36 Wherever possible, topsoil will be left in place to minimise the amount of unprotected ground exposed to runoff. Where topsoil removal is required it would take place as late as possible prior to other works in the area. Topsoil will be stored outside of the floodplain on level areas.
- 4.6.37 In advance of vegetation clearance and soil stripping operations commencing within 10m of a watercourse, appropriate control measures would be implemented to prevent contamination.
- 4.6.38 Topsoil stockpiles would be created and managed in accordance with best practice guidance. The sides of stockpiles would be graded to prevent ponding and to help shed rainwater. Exposed stockpiles that are to remain for long periods would be seeded with a standard Rye Grass seed mix immediately upon completion and in suitable weather conditions. This would minimise soil erosion during the soil storage period and to help reduce colonisation of nuisance weeds.
- 4.6.39 Silt fencing would be installed around the margins of topsoil mounds to minimise the risk of sediment-laden runoff reaching watercourses.
- 4.6.40 Cleared land would be reseeded as soon as practicable, to minimise exposed soil and subsequent sediment runoff.

Consents

- 4.6.41 Depending on the nature of the earthworks, an abstraction licence may be required for de-watering operations. The consenting authority would be Natural Resources Wales. A separate licence may be required for each location or activity.
- 4.6.42 An Ordinary Watercourse Consent is required for all works carried out over, under or near an ordinary watercourse. Ordinary watercourses include non-main rivers and all ditches, drains, cuts, culverts, dikes, sewers (other than public sewers) and passages through which water flows.

4.7 Soils, Geology and Hydrogeology

General Provisions

- 4.7.1 It is envisaged that many of the risks identified in relation to the earthworks will be covered by the use of the following measures:
- Dust control measures during the works, wheel washers for any offsite movements, construction of appropriate temporary transport networks within the construction area, covering of loads during on site transport;

- Health and safety training, guidance notes and signs and suitable welfare facilities. Promotion of good hygiene practices implemented for the duration of the works with no smoking, eating, or drinking in the locale of excavations in potentially contaminated areas;
- The use of protective clothing and equipment; appropriate Personal Protective Equipment (PPE) provided to all construction workers. The assessment of risks to construction workers and the provision of appropriate PPE would be the responsibility of the contractor involved in the works;
- Health and safety risk assessments will consider available chemical testing results for soils, groundwater and surface water and will inform identification of adequate mitigation measures;
- An Action Plan for safely dealing with unexpected contamination should be developed. This will include provisions to appoint a suitably qualified and experienced contaminated land practitioner to provide a watching brief and supervisory role should unexpected contamination be encountered. This role shall include assessment of the risks to the construction works and workers. In addition, the Action Plan shall set out procedures for dealing with unexpected contamination to allow for assessment of identified contamination, review of health and safety provisions, review of remediation/disposal options, identification of measures limiting environmental impact of these materials. This should include sampling and testing of the encountered materials insitu or upon excavation, assessment of risk to the environment, storing contaminated materials in a designated and suitably controlled location i.e. lined and bunded, and appropriate waste disposal procedures;
- Environmental monitoring to ensure environmentally sound working practises are being adopted and adhered to, and allowing for early warning system preventing detrimental impact on the water environment surrounding the scheme. A monitoring plan shall be prepared by the Contractor and agreed with regulators. It should include baseline monitoring, monitoring during and post construction of controlled water receptors identified by a suitable risk assessment. Should mineworking treatment be required, a detailed mitigation strategy will be developed.

Site specific measures

4.7.2 Site specific measures will be proposed as the design develops

4.8 PRow

- 4.8.1 A Public Rights of Way Management Plan is to be prepared by PCC and NPTCBC in collaboration with Celtic Energy. This is to include details of how PRow are to be affected, i.e. diversions or closures and whether these would be temporary or permanent. Reasons for any changes to the existing PRow network are to be provided. Further details to be included are:
- Details of any signage that will be used to identify temporary diversions or closures. This is to include where these signs will be located.
 - Safety measures such as fencing will be identified to keep users of PRow safe during the earthworks.
 - Details of how PRow will be reinstated following earthworks
 - Details of how PRow will be inspected during the earthworks.

4.9 Common land

- 4.9.1 Common land covers the site and commoners rights will be restored across the site following construction. Therefore for the purpose of Nant Helen Complementary Earthworks, no management is required during construction itself as Commoners Rights will not be returned until construction is complete.

4.10 Noise and Vibration

- 4.10.1 The purpose of this Noise and Vibration section is to set out measures for the Contractor to control and manage noise and vibration from machinery and construction works.
- 4.10.2 The effects of noise and vibration from the construction site will be controlled by introducing management and monitoring processes to ensure that best practicable means (BPM) are planned and employed during construction.
- 4.10.3 As part of the contractors' detailed CEMP, a noise and vibration management plan will be prepared and will set out these processes. The plan will include management and monitoring processes to ensure, as a minimum:
- a) Integration of noise control into the preparation of method statements;
 - b) Ensuring proactive links between noise management activities and community relations activities;
 - c) Preparing details of site hoardings, screens or bunds that will be put in place to provide acoustic screening during construction, together with an inspection and maintenance schedule for such features;

- d) Developing procedures for the installation of noise insulation or provision of temporary re-housing and to ensure such measures are, where required, in place as early as reasonably practicable;
- e) Preparing risk assessments to inform structural surveys of buildings and structures which may be affected by vibration from construction;
- f) Developing a noise and vibration monitoring protocol including a schedule of noise and vibration monitoring locations and stages during construction of the scheme when monitoring will be undertaken;
- g) Preparing and submitting Section 61 consent applications;
- h) Undertaking and publishing all monitoring required to ensure compliance with all acoustic commitments and consents; and
- i) Implementing management processes to ensure ongoing compliance, improvement and rapid corrective actions to avoid any potential non-compliance.

Measures to reduce potential noise and vibration impacts - Best Practicable Means (BPM)

- 4.10.4 The Control of Pollution Act 1974 and the Noise and Statutory Nuisance Act 1993 contain powers to control noise emission and to require the employment of the best practicable means for preventing or counteracting the effect of noise.
- 4.10.5 Well defined noise control procedures will be implemented for all construction plant equipment and all site activities. The contractor will comply with BS 5228: Noise control on construction sites and open sites. Noise control measures will include:
- a) Noisy equipment will be located at furthest practicable distance from properties with provision of temporary screening where possible to reduce construction noise impacts at properties. The contractor will identify optimum positions for noisy equipment and screening to minimize disruption.
 - b) In order to reduce construction vibration impacts at properties, vibratory rollers will not be used within 90m of properties during operation (125m for start-up/run down) unless further risk assessment and monitoring can demonstrate no likely adverse effect due to vibration. The contractor will undertake further risk assessment prior to works and/or vibration monitoring at the start of works within the stipulated distances to confirm no adverse effects due to vibration.
 - c) All plant and machinery will have effective silencers fitted and kept in good condition.
 - d) Areas of traffic movement will be designed to minimise reversing alarm use principally by the use of one-way systems.
 - e) Natural features and buildings will be used to minimise noise from operations where practical.
 - f) Noise levels can be predicted from knowledge of the type and number of plant to be used for various activities.
 - g) Noise from standard construction plant is of short duration therefore impact is minimised.

- h) Where there is expectation of considerably more noise than the baseline, consideration for applying to the Council for a Section 61 Consent will be given, whereby the Council approves working methods and noise mitigation measures (Note Section 61 Consent only applies to nuisance and doesn't consider disturbance to ecology). Further details on section 61 Consent are given below.
- i) Construction activity will typically be confined to 08.00-18.00 hours, Monday to Friday and 08.00-13.00 hours on Saturdays.
- j) As the requirement for Sunday working and/or night working cannot be ruled out, discussions will take place with the local Environmental Health Officer before such operation begins.
- k) All activities which have the potential to cause vibration issues will be identified and receptors (particularly local residents) will be informed of activities.
- l) During the construction phase, haul roads will be maintained and kept as smooth as possible and maintain them to reduce vibration impacts caused by heavy plant movement.

4.10.6 If situations arise where despite the implementation of BPM, the noise exposure levels exceed the criteria defined in the contractors' detailed Noise and Vibration Management Plan (NVMP), the contractor may offer:

- a) Noise insulation; or ultimately
- b) Temporary re-housing.

Section 61 consents

- 4.10.7 The contractor will seek to obtain consents from the relevant local authority under Section 61 of the Control of Pollution Act 1974 for the proposed construction works, excluding non-intrusive surveys. Applications will be made to the relevant local authority for a Section 61 consent at least 28 days before the relevant work is due to start or earlier if reasonably practicable.
- 4.10.8 Details of construction activities, prediction methods, location of sensitive receivers and noise and vibration levels will be discussed with the relevant local authority, or authorities, both prior to construction work and throughout the construction period. Prediction, evaluation and assessment of noise and vibration as well as discussion between the employer's representative and its contractor and the relevant local authority will continue throughout the construction period.
- 4.10.9 Unless otherwise agreed with the relevant local authority, noise levels will be predicted in accordance with the methods set out in BS 5228 – 1.
- 4.10.10 All construction noise levels will be predicted or measured at a distance of 1m from any affected eligible facade, which must have windows to bedrooms or living rooms.
- 4.10.11 Annex A of BS 5228-1 provides a flow diagram demonstrating the process of a Section 61 application.

- 4.10.12** The contractor will seek to agree with local authorities a common format and model consent conditions for Section 61 applications or any dispensations and variations to an existing consent.
- 4.10.13** The contractor will use BPM to minimise the extent to which noise insulation work or temporary re-housing of occupiers of dwellings adjacent to the works needs to be considered.
- 4.10.14** Notwithstanding the measures set out here and any Section 61 consents, noise insulation or temporary re-housing will be offered to qualifying parties when:
- noise levels are predicted or measured by the contractor to exceed the relevant trigger level defined in Table 1 below at that property for at least ten days out of any period of fifteen consecutive days or alternatively 40 days in any six-month period;
 - the property complies with all other requirements of the Noise Insulation (Amendment) Regulations 1988;
 - the property is lawfully occupied as a permanent dwelling; and
 - in respect of insulation, noise insulation does not already exist that is of an equivalent standard to that which would be allowed for under the Noise Insulation (Amendment) Regulations 1988.

Table 1 Noise thresholds for noise insulation/temporary re-housing

Day	Time (hrs)	Average period, T	Noise insulation trigger level $L_{pAeq, T}$ (dB) */**	Temporary re-housing trigger level $L_{pAeq, T}$ (dB) */**
Monday-Friday	07:00-08:00	1 hr	70	80
	08:00-18:00	10 hrs	75	85
	18:00-19:00	1 hr	70	80
	19:00-22:00	1 hr	65	75
Saturday	07:00-08:00	1 hr	70	80
	08:00-13:00	5 hrs	75	85
	13:00-14:00	1 hr	70	80
	14:00-22:00	1 hr	65	75
Sunday and public holidays	07:00-22:00	1 hr	65	75

Any day	22:00-07:00	1 hr	55	65
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*Proposed Scheme construction sound only. Trigger levels are defined as 1m in front of the closest façade of a habitable room.

**Where the current ambient noise level is greater than the noise insulation trigger level:

- a) the ambient noise level shall be used as the noise insulation trigger level, and
- b) the ambient noise level +10 dB shall be used as the temporary rehousing trigger level.

4.10.15 The contractor will develop and seek to agree with local authorities a noise insulation and temporary rehousing policy that will set out all roles, responsibilities and actions required in respect of these measures.

4.10.16 The contractor will consider at its discretion applications supported by evidence for noise insulation or temporary rehousing from occupiers who may have special circumstances. Special circumstances could include night workers, those working in home occupations, local businesses or buildings that provide community facilities requiring a particularly quiet environment and those with a medical condition which will be seriously aggravated by construction noise, and provide noise insulation or temporary rehousing where it is demonstrated that this is necessary.

Appendix 4A

PRoW suspension order/map
programme

POWYS COUNTY COUNCIL

APPEAL

by

CELTIC ENERGY LTD

and

APPLICATION

**for confirmation of the Nant Helen Extension
(Suspension of Public Rights of Way) Order 1997**

Inspector:

Dates of Inquiry:

**J J Parkinson MSc CEng MICE MIHT MRTPI
25, 26, 27, 28, November 1997; 3, 4, 5, 9, 10, 11,
December 1997. Evening Session on 3 December 1997.
Accompanied Site Inspections on 12, 16 and 17 December
1997.**

File Nos:

**APP T6850L/A/96/510161 and
APP T6850/W/97/511220**

OPENCAST COAL ACT 1958
NANT HELEN EXTENSION
(SUSPENSION OF PUBLIC RIGHTS OF WAY) ORDER 1997

E A S

Celtic Energy Limited has applied to the Coal Authority for an Order under Section 15 of the Opencast Coal Act 1958 suspending public rights of way not being rights enjoyed by vehicular traffic on the Nant Helen Extension Site.

The Coal Authority is satisfied that Celtic Energy Limited :-

- i. is the person who will have the benefit of the opencast planning permission;
- ii. is a licensed operator within the meaning of the Coal Industry Act 1994;
- iii. has complied with the prescribed notification and publicity requirements before applying for the Order; and
- iv. will make available suitable alternative rights of way for use by the public during the period for which this Order is in force.

HEREFORE

Authority, in exercise of its powers under Section 15 and 15A(9) of the Opencast Coal Act 1958 hereby makes the following

This Order may be cited as :- **THE NANT HELEN EXTENSION (SUSPENSION OF PUBLIC RIGHTS OF WAY) ORDER 1997**

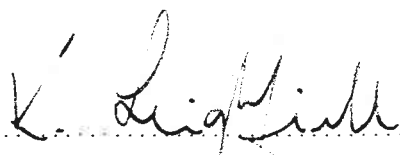
In this Order "the map" means the map annexed hereto.

This Order shall not take effect unless confirmed by the Secretary of State. If the Secretary of State decides to confirm the Order :-

- i. the public rights of way over the ways specified in Schedule 1 to this Order shall, to the extent specified in Schedule 1, be suspended from a date to be determined by the Secretary of State and specified in the Order as confirmed; and
- ii. alternative rights of way, specified in Schedule 2 to this Order, shall be created

The provisions of Schedule 3 to this Order shall have effect for securing the reconstruction of the ways specified in Schedule 1 on the restoration of the land over which the ways subsisted immediately before the confirmation of this Order, unless the ways are diverted, whilst suspended, under Section 119 of the Highways Act 1980.

Insofar as the carrying out of operations, or any change in the use of land involved in making the alternate ways specified in Schedule 2 to this Order available, within the meaning of the Town and Country Planning Act 1990, permission shall be deemed to be granted subject to the conditions specified in relation to those ways in that Schedule.


K. Lightfoot

Date :

8th Sept 1997

YR SWYDDFA CYMREIG
WELSH OFFICE

THE OPENCAST COAL ACT 1958

THE NANT HELEN EXTENSION
(SUSPENSION OF PUBLIC RIGHTS OF WAY)
ORDER 1997

WHEREAS

(1) the Coal Authority, on 8 September 1997, made the attached Order, and has since submitted it to the Secretary of State for confirmation; and

(2) the Secretary of State is satisfied that the notice required by section 15A(1A) has been published, and the requirements of section 15A(5) complied with;

NOW THEREFORE the Secretary of State for Wales, in exercise of his powers under section 15 of the Opencast Act 1958 (as amended), and of all other powers enabling him in that behalf, hereby confirms the attached Order to take effect from 4 August or, if later, on the last date of publication of the requisite notice by Celtic Energy Limited in accordance with section 15A(10).



Dated: 21 July 1998

M H HARPER
Head of Planning 1 Branch
Welsh Office

SCHEDULE 1

EXISTING RIGHTS OF WAY TO BE SUSPENDED

That part of Footpath No.11 in the Community of Ystradgynlais, in the County of Powys, which extends to a length of 215 metres from a point 230 metres south-east of Gwern Gyrlais Farmstead near Penrhos (marked B on the map) to a point 445 metres south-east of the said Farmstead (marked A on the map).

That part of Footpath No.40 in the Community of Ystradgynlais, in the County of Powys, which extends to a length of 1760 metres south-eastward from a point 500 metres south-east of Little London (marked C1 on the map) to a point 200 metres east of Bryn Llechwen on Mynydd y Drum (marked D on the map).

Alternative Right of Way No.1 (1986) (as Authorised by the Secretary of State for Wales in 1986) in the Community of Ystradgynlais, in the County of Powys, which extends to a length of 1825 metres from a point 340 metres south-south-east of Gwern-y-Gilfach Farmstead (marked E1 on the map) to a point 420 metres east-north-east of Bryn Llechwen on Mynydd y Drum (marked F on the map).

SCHEDULE 2

ALTERNATIVE RIGHTS OF WAY TO BE CREATED

Alternative Right of Way No.1 (1997) which commences on the formation of the disused railway line at a point 350 metres south-south east of Little London (marked C on the map), extends south-west for a distance of 560 metres, then along a track parallel to the former railway line for a further 480 metres and then turning eastward for a distance of 200 metres to join Footpath No.11 at a point approximately 300 metres east of Hendre-ladis (marked A on the map). This Alternative Way together with the remaining length of Footpath No.11 on Mynydd y Drum would replace those parts of Footpaths No.11 and No.40 which would be lost.

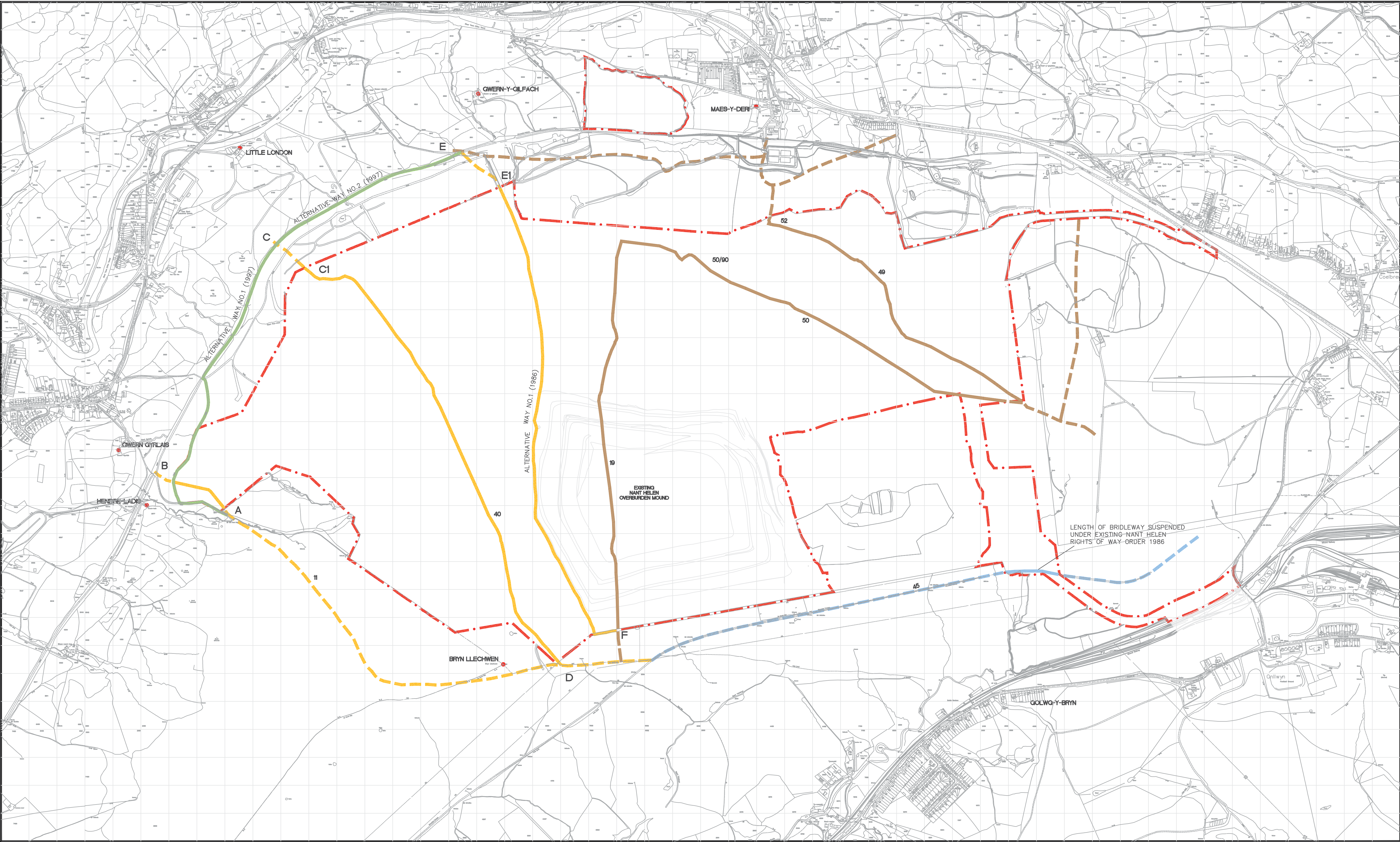
Alternative Right of Way No.2 (1997) which commences on the formation of the disused railway line at a point approximately 234 metres south-south-west of Gwern-y-Gilfach Farmstead (marked E on the map), extends south-west along the said formation for a distance of approximately 720 metres to make an end-on connection with Alternative Way No.1 at a point approximately 350 metres south-south-east of Little London (marked C on the map). This Alternative Way, together with that described in Alternative Way No.1 above, together with the remaining length of Footpath No.11 on Mynydd y Drum would replace Alternative Way No.1 (1986) which would be lost.

Following conditions shall apply to the Alternative Rights of Way to be created :-

- they shall not be less than 1.5 metres in width;
- they shall be serviceable at all times;
- they shall be adequately fenced on both sides to prevent access to the site or adjoining land;
- they shall have suitable all-weather surfaces and be provided with adequate drainage;
- any gate or stile shall be constructed to the satisfaction of the Local Planning Authority.

SCHEDULE 3

RECONSTRUCTION



Legend

- . - . - . SITE BOUNDARY (inside edge of symbol to be taken as boundary of site)
- - - - - FOOTPATH (To be suspended where shown solid)
Footpath marked 'ALTERNATIVE WAY NO.1 1986'
confirmed under existing Nant Helen R.O.W.
Order 1986.
- - - - - FOOTPATH TEMPORARILY CLOSED UNDER EXISTING
NANT HELEN RIGHTS OF WAY ORDER 1986.
- - - - - BRIDLEWAY
- - - - - PROPOSED ALTERNATIVE WAY

CELTIC ENERGY LIMITED
Heol Ty Aberaman, Aberaman, Aberdare, Mid Glam, CF44 6LX

SITE NAME
NANT HELEN EXTENSION

TITLE
**Rights of Way Application 1997
(Revised)**

COUNTY
POWYS/WEST GLAM

DISTRICT
NEATH/BRECKNOCK

CIVIL PARISH

LOCATION
2km N.E. of YSTRADGYNLAIS

O.S. SHEETS USED

7912	8012	8112	8212	8312	8412
7911	8011	8111	8211	8311	8411
7910	8010	8110	8210	8310	8410
7909	8009	8109	8209	8309	8409

Prefix
SN

Based upon Ordnance Survey maps
with the sanction of the controller
of H.M. Stationery Office.
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Drawn by SW Date 18.06.97
Checked by MKG Date 18.06.97
Scale 1 : 5000 Sheet 1 of 1
Drawing No. 07A01427A Contract Drawing No.

Appendix 5A

WFD Screening Assessment

WFD Screening Assessment

WFD/01

Final | 8 January 2020

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

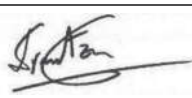
Job number

Ove Arup & Partners Ltd
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ARUP

Document Verification

ARUP

Job title				Job number	
Document title		WFD Screening Assessment		File reference	
Document ref		WFD/01			
Revision	Date	Filename			
Final	04 Dec 2018	Description			
			Prepared by	Checked by	Approved by
		Name	Irantzu Lexartza-Artza	Irantzu Lexartza-Artza	
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
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		Name			
		Signature			
Issue Document Verification with Document ☒					

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1 Introduction

Ove Arup & Partners have been commissioned by Celtic Energy Ltd to undertake a preliminary Water Framework Directive (WFD) assessment to assess the environmental impacts of the proposed Nant Helen Complementary Restoration Earthworks. This preliminary assessment is to support the full planning application submitted to Powys County Council (PCC) and Neath Port Talbot County Borough Council (NPTCBC) for those works.

The proposed Restoration Earthworks are to include the following:

- Earthworks to include cutting and embankment; and
- Drainage works associated with the revised landform.

1.1 WFD Background

The WFD has been in force since 2000 and is currently the largest and most influential piece of European Union (EU) legislation relating to the water environment. All new (and current on-going) activities in the water environment need to be guided by the requirements of the WFD. In Wales, Natural Resources Wales (NRW) is the Competent Authority for implementing WFD.

This WFD assessment aims to determine the effects of the proposed scheme on ecological quality and potential. The assessment will identify any potential impacts that could cause deterioration in the status of a water body or that could prevent the water body from meeting its WFD objectives.

The Directive requires that Environmental Objectives be set for all surface and ground waters in England and Wales to enable them to achieve Good Status (or Good Ecological Potential for Heavily Modified and Artificial Water Bodies) by a defined date. These Environmental Objectives are listed below:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters;
- Aim to achieve at least good status for all water bodies by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027;
- Meet the requirements of Water Framework Directive Protected Areas;
- Promote sustainable use of water as a natural resource;
- Conserve habitats and species that depend directly on water;
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and

- Contribute to mitigating the effects of floods and droughts.

The Directive was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. The framework for delivering this Directive is through the River Basin Management Plans (RBMPs). There are three River Basin Districts (RBD) that cover Wales: Dee, Severn and Western Wales. NRW is responsible for drawing up the RBMPs for Dee and Western Wales river basin districts. The responsibility for the RBMP for Severn is shared between NRW and Environment Agency. Each RBD has been characterised into smaller management units known as Water Bodies. These include all river, lake, groundwater, coastal, and transitional waters located within that RBD.

The Ecological Status or Potential of each water body in the RBD is established on the basis of specific criteria and boundaries defined against biological, physicochemical, and hydromorphological Quality Elements, and is ultimately determined by whichever of these elements is poorer.

The scheme is located in the Western Wales RBD. The RBMP details the Environmental Objectives, alongside the specific actions which are necessary to enable each water body in the RBD to meet these objectives.

1.2 Project Background

The project site is within the Dulais Valley located within Powys and Neath Port Talbot, with the Brecon Beacons National Park Authority boundary immediately to the north. Nearby settlements include Onllwyn, Seven Sisters, Ystradgynlais, Caehopkin, Abercrave or Coelbren. The site is predominantly brownfield land that has been heavily worked by open cast mining. Much of the site has been revegetated.

The proposed site is currently being mined by Celtic Energy, who will cease extraction operations in 2021, at which point Celtic Energy will be required to restore the land in accordance with regulatory requirements and agreements with PCC. Celtic Energy has submitted a revised restoration strategy for approval (under Section 73 application under the Town and Country Planning Act 1990) which would change the existing approved restoration scheme (for planning application ref 18/1070/REM). The purpose of the variation is to allow for a *'flexible and adaptable landform for a variety of uses on restoration including agriculture, nature conservation, leisure, tourism and some industrial uses'*¹.

The revised restoration proposal looks to provide a flexible landform that can be used or adapted for a diverse set of future uses, including: traditional agriculture, woodland and nature conservation uses, to amenity, leisure and tourism. Other uses of the site could also include industrial after uses such as the Welsh Government's (WG) proposal to develop a rail testing and storage facility, known as the Global Centre of Rail Excellence (GCRE) at this site together with the

¹ Celtic Energy s73 application for variation of condition 45 of planning application 18/1070/REM – further addendum to original environmental statement and supporting information submitted under planning reference 18/1070/REM including revised LVIA.

adjacent Onllwyn Washery. It is anticipated that a planning application for the GCRE will be submitted early next year subject to confirmation of its feasibility.

2 Project Details

The proposed project includes earthworks to modify the existing landform at the site. Figure 1: Restoration plan, overlain with earthworks

Table 1 outlines the main details of the proposed works, which include as their key elements:

- Earthworks to include cutting and embankment; and
- Drainage works associated with the revised landform.

Table 1: Details of the proposed project.

Project Details	
Applicant name	Celtic Energy
Application reference number (where applicable)	n/a
Description of activities	Earthworks to include cutting and embankment; and related drainage works
Location of activity (central point XY coordinates or national grid reference)	SN825113
Footprint of activity (ha)	350
Timings of activity (including start and finish dates)	Approximately 73 weeks including site preparation and landscaping. Start and finish tbc
Relevant supporting documents	Drainage Strategy

The restoration earthworks include a combination of cutting and embankments to create a loop form. The extent of these works is shown in Figure 1. The materials for the earthworks would all originate from within the existing Celtic Energy Nant Helen open cast mining site boundary and represents a volume of approximately 1,850,000m³. The cut excavation will likely be carried out using a combination of machinery, each achieving approximately half of the cut excavation (i.e. 1,425,000m³).

The geotechnical design of the Nant Helen Enabling Works will ensure slope stability of the cuttings and embankments. The design will also consider ground hazards associated with historical mine workings and subsidence due to potential change in groundwater conditions. The final finish of the embankment and cut surfaces will be undertaken in accordance with landscaping proposals provided as part of the wider restoration plans. These will include grass seeding to vegetate the restored areas.

A stormwater drainage strategy has been prepared for the Earthworks which will identify how water falling on the site during rainfall events will be managed and mitigated to attenuate flows.

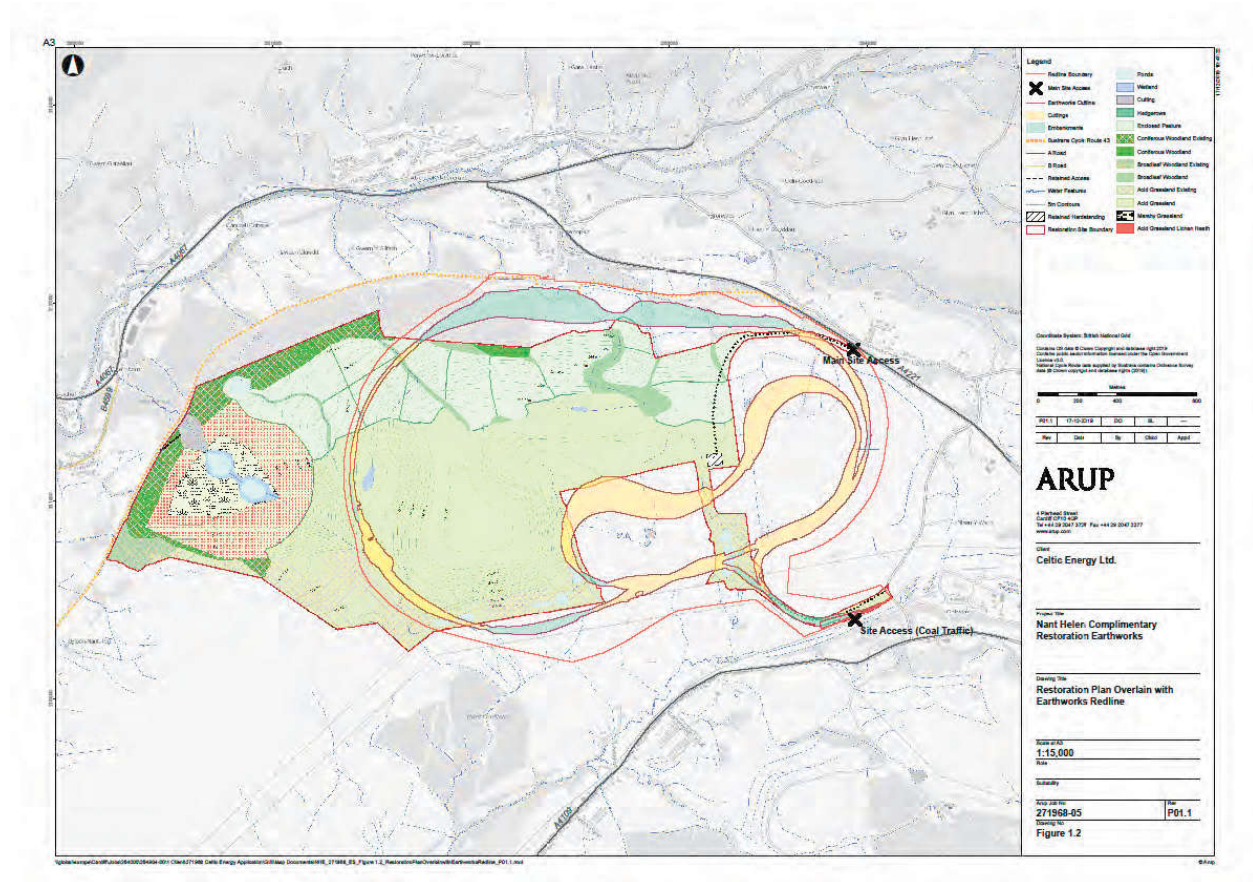


Figure 1: Restoration plan, overlain with earthworks

3 Baseline Information

3.1 Zone of influence

The Water Framework Directive Cycle 2 (2018) information² shows that the site is located between three WFD river water body catchments. These include:

- Tawe - Confluence with Nant Llech to Confluence with Giedd (ID GB110059032170)
- Nant Llech - Headwaters to confluence with Tawe (ID GB110059032240)
- Dulais - Headwaters to confluence with River Neath (ID GB110058032430).

All three WFD river water bodies are classified as being at **Good** status, and as such Good Status Objectives are not relevant.

² Water Watch Wales, Cycle 2 (2018), Available at:
<https://nrw.maps.arcgis.com/apps/webappviewer/index.html?id=4ef6ea25c5984c939636714dbfce25f3>

The site falls within one groundwater body, Tawe - Swansea Carboniferous Coal Measures (GB41002G201000), which has an overall status of **poor**.

The location of the project site and associated surface water features is shown in Figure 2.

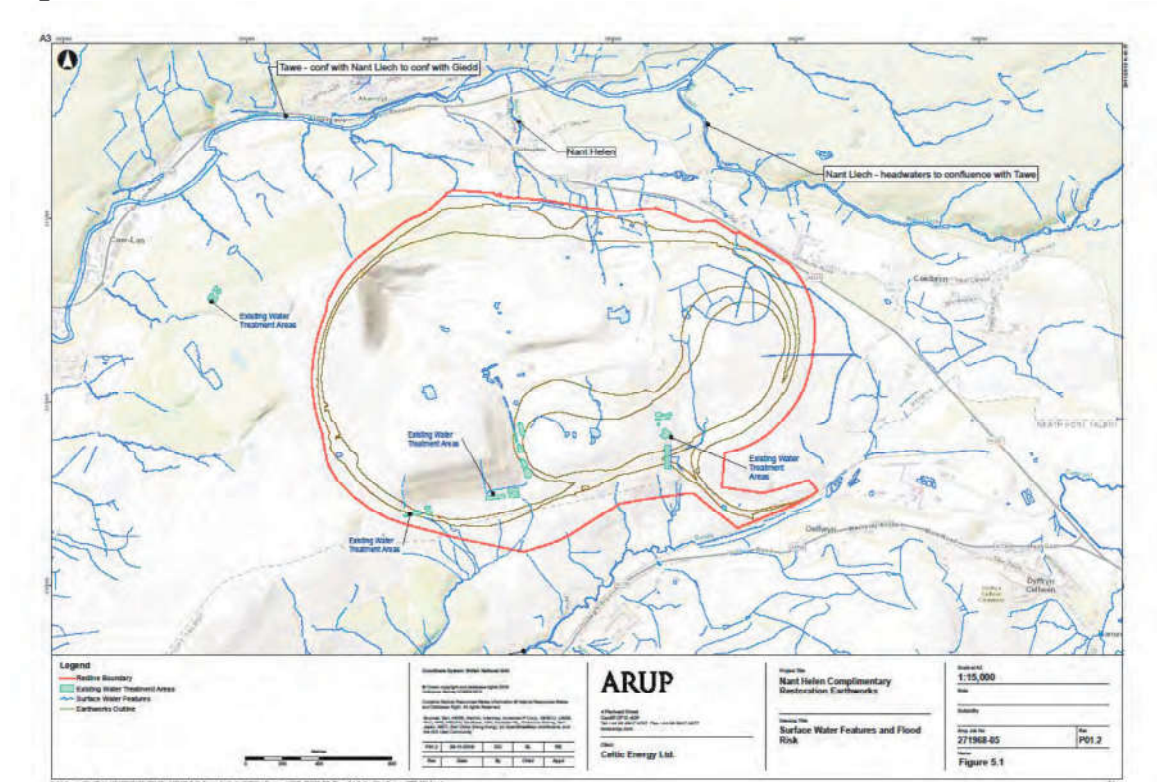


Figure 2 Site location and associated WFD water bodies

A general site walkover was conducted on 28th November 2018 to support this work. Most of the watercourses on the site itself are artificial ditches part of the water drainage system for the mine site. The whole area has been mined at some point during the last 50 years.

3.2 Surface Water

3.2.1 Tawe – Confluence with Nant Llech to Confluence with Giedd

The Tawe - Confluence with Nant Llech to Confluence with Giedd water body (ID GB110059032170) is achieving overall **Good** status (Table 2), with both ecological status and chemical status classified as **Good**. Biological quality elements such as invertebrates are at **Good** status, whereas fish, macrophytes and diatoms are **High**. Supporting physico-chemical elements are achieving High status, other than ammonia which has a status of **Good**. As a result, physico-chemical status is **Good**.

Table 2 Summary of WFD status for Tawe – Confluence with Nant Llech to Confluence with Giedd

Macrophytes and phytobenthos combined	
Diatoms	
Hydromorphological Supporting Elements	
Hydrological regime	
Morphology	

3.2.2 Nant Llech -Headwaters to confluence with Tawe

The Nant Llech - Headwaters to confluence with Tawe water body (ID GB110059032240) is achieving overall **Good** status (Table 3), with both ecological and chemical status also **Good**. Biological status is **Good**, with elements such as fish and macrophytes at **Good** status, whereas invertebrates and diatoms are **High**. Physico-chemical status is classified as **High**.

Table 3 Summary of WFD status for Nant Llech – Headwater to confluence with Tawe.

Invertebrates	
Fish	
Macrophytes and phytobenthos combined	
Diatoms	
Physico-chemical elements	
Ammonia	High
Dissolved oxygen	High
pH	High
Phosphate	High
Temperature	High
Hydromorphological Supporting Elements	
Hydrological regime	High
Morphology	
	Not assessed

3.2.3 Dulais - Headwaters to confluence with River Neath

The Dulais - water body (ID GB110058032430) is achieving overall **Good** status (Table 4). Biological status is **Good**, with macrophytes at **High** status, whereas fish, macrophytes and diatoms are **High**. Physico-chemical status is classified as **High**.

Table 4 Summary of WFD status for Dulais – Headwaters to confluence with River Neath

OVERALL STATUS	Good
ECOLOGICAL STATUS	Good
Biological Quality Elements	Good
Invertebrates	High
Fish	Good
Macrophytes and phytobenthos combined	Good
Diatoms	Good
Physico-chemical elements	High
Ammonia	High
Dissolved oxygen	High
pH	High
Phosphate	High
Temperature	High
Hydromorphological Supporting Elements	Not High
Hydrological regime	Not High
Morphology	Good
Specific Pollutants	Not assessed
CHEMICAL STATUS	Good

3.3 Groundwater

The scheme is located within the Swansea Carboniferous Coal Measures groundwater body (ID GB41002G201000). The overall status for the groundwater body is **Poor**, driven by a **Poor** chemical status, likely associated with a legacy of coal mining activities in the region (Table 5). Natural Resources Wales has designated that it is technically infeasible to reach 'good' status at this waterbody by 2021 due to coal minewater³.

The site is topographically located on high ground, which suggests that the water table may be relatively low in relation to the ground surface. The ground condition assessment desk study has identified level of 70 to 120 metres below ground level in the area based on online available data.

Table 5 Summary of WFD groundwater body status

Quality Element	Status
OVERALL STATUS	Poor
Quantitative	Good
Chemical	Poor

3.4 Protected Sites

There aren't any Natura 2000 Sites located within the WFD river water body catchments. There is a Special Area of Conservation (SAC) located approximately 5 miles east of the site, which falls within the extent of the Swansea Carboniferous Coal Measures groundwater body. However, the features in this protected area are all related to supporting surface habitats and are separated by a topographic water divide, so it is considered to be not relevant for this assessment.

³ Natural Resources Wales (2015) Consultation on updating the River Basin Management Plan: River Basin Management Planning Overall Annex.

4 Screening

4.1 Proposed activities

Activities that may result in an impact on WFD quality elements may take place during construction and/or operation of the proposed development. Details the expected activities, whether they have been screened in/out of further assessment, along with an explanation for the screening decision, are provided in Table 6.

The design and construction information are currently at an outline stage and is subject to change. This assessment should be revisited during the detailed design and construction of the scheme to ensure these activities remain compliant with the objectives of the WFD.

Key activities will include temporary dewatering to allow construction of below ground elements and excavation works. A desk study ground condition assessment has been completed, and a site investigation will be undertaken. The ground condition assessment has identified that as the site has been impacted by both sub-surface and surface coal mining activities, potential ground contamination resulting from such activities is likely. Potential contaminants associated with coal mining activities typically include various metals, metalloids, sulphates, PAHs, TPHs and asbestos. The site investigation will confirm the presence and nature of any contamination. Dewatering activities and excavation works in a contaminated ground setting pose a risk to both groundwater and surface water. Although the risk may be limited to a certain extent by the potentially low water level in relation to the high ground setting of the site, appropriate method statements and mitigation will be required once site investigations have been undertaken and the nature of the risk is better understood.

Additional risks related to the construction activities could include risks arising from works in or near watercourses, which could be increased by sediment mobilisation from and discharge of site runoff, and accidental spillage of pollutants. These risks should be managed by ensuring that there is an appropriate Construction Environmental Management Plan in place to ensure that there are no negative impacts to WFD quality elements.

It is expected that the material on the revised landform will be capped following the earthworks and a Drainage Strategy is implemented. Provided these measures are put in place, due to the nature of the scheme and location of the site in relation to the WFD water bodies, it is not expected that the operation phase of the scheme will have an impact of the status of WFD quality elements.

Table 6 Screening of proposed activities against WFD objectives

Proposed Activity	Potential impacts and mitigation measures	Screen In/Out of further assessment
<i>Construction (Temporary) Activities</i>		
Temporary dewatering to allow construction of below-ground elements	Temporary dewatering poses a risk to surface and groundwater due to risks of soil contamination. Site investigations will be undertaken to ensure this risk is better understood and to inform appropriate method statements and mitigation.	In
Works in or near to watercourses (e.g. open cut installation of new pipe beneath watercourse)	Potential impacts from activities affecting watercourses that are part of the tributary network of the river WFD water bodies. This risk would be mitigated provided there is an appropriate CEMP in place to ensure there are no negative impacts of WFD quality elements.	Out
Sediment mobilisation from site runoff	Potential impacts from excess sediment affecting watercourses that are part of the tributary network of the river WFD water bodies. This risk would be mitigated provided there is an appropriate CEMP in place to ensure there are no negative impacts of WFD quality elements.	Out
Discharge of site runoff	Potential impacts from discharge affecting watercourses that are part of the tributary network of the river WFD water bodies. This risk would be mitigated provided there is an appropriate CEMP in place to ensure there are no negative impacts of WFD quality elements.	Out
Accidental spillage of pollutants (e.g. fuel leakage from storage or plant)	Potential impacts from pollutants affecting watercourses that are part of the tributary network of the river WFD water bodies. This risk would be mitigated provided there is an appropriate CEMP in place to ensure there are no negative impacts of WFD quality elements.	Out
Excavation works (e.g. the digging of trial or borrow pits)	Excavation poses a risk to surface and groundwater due to risks of soil contamination. Site investigations will be undertaken to ensure this risk is better understood and to inform appropriate method statements and mitigation.	In
<i>Operational (Permanent) Activities</i>		
Operation of new section of wastewater pipeline	No risk from operation to Water Framework Directive water quality elements.	Out

5 Summary

The proposed project includes earthworks to modify the existing landform at the site to facilitate its restoration, with earthworks to include cutting and embankment; and the development of drainage works associated with the revised landform.

The site is located on high ground between three WFD river water body catchments, Tawe – Conf with Nant Llech to Conf with Giedd, Nant Llech – Headwaters to confluence with Tawe and Dulais - Headwaters to confluence with River Neath. All three water bodies are classified as being of **Good** status.

The site is located within the Tawe - Swansea Carboniferous Coal Measures WFD groundwater body, which has an overall status of **Poor**, driven by a **Poor** chemical status, likely associated with a legacy of coal mining activities in the region.

Proposed key activities include temporary dewatering to allow construction of below ground elements and excavation works. There is potential for ground contamination at the site resulting from historical coal mining activities, which could result in a risk of negative impacts to both groundwater and surface water from proposed activities. Although the risk may be limited by the potentially low water level in relation to the high ground setting of the site, appropriate method statements and mitigation will be required once site investigations have been undertaken and the nature of the risk is better understood.

Other potential impacts from construction activities would be mitigated provided there is an appropriate CEMP in place to ensure there are no negative impacts of WFD quality elements.

The design and construction information are currently at an outline stage and is subject to change. This assessment should be revisited during the detailed design and construction of the scheme to ensure these activities remain compliant with the objectives of the WFD.

Appendix 6A

Global Centre of Railway
Excellence Desk Study

Welsh Government

**Land at Nant Helen and Onllwyn
Coal Washery**

**Geotechnical and Geoenvironmental
Desk Study**

Issue | 18 December 2019

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 264904-00

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Appendix A

Site Walkover Photographs

Appendix B

Groundsure Historical Maps

Appendix C

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Appendix D

BGS Borehole Records

Appendix E

Groundsure EnviroInsight and GeoInsight Reports

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Appendix G

Opencast Completion Plans - Celtic Energy

Appendix H

2011 Nant Helen Extension Environmental Statement extracts - Celtic Energy

1 Introduction

The Welsh Government is considering the development of a rail testing facility in South Wales. The aspiration is for the development of a nationally significant rolling stock and infrastructure testing facility (Hereafter referred to as the ‘proposed development’).

Celtic Energy’s Nant Helen site and Onllwyn Washery, immediately to the north of Onllwyn village, has been identified as a potential site for the proposed development. The site is currently an operational opencast coal mine and coal washery. The proposed development would allow the site to be re-purposed once the opencast mining activities have ceased and the site has been restored.

Arup have been commissioned by the Welsh Government to undertake a desk study assessment for the proposed site near Onllwyn in Powys. This desk study includes a summary of the site’s history and ground conditions, including topography, geology, hydrogeology, hydrology and the coal mining legacy at the site. A preliminary conceptual site model and preliminary engineering assessment is then presented, together with a summary of the identified geotechnical and geoenvironmental risks and opportunities and recommendations for further work.

It is envisaged that 7km of cuttings and embankments will be constructed in two loops. Based on the complex topography of the site, the cuttings and embankments will likely require significant cut (~30m) and fill (~40m) earthworks to form the embankment level.

In addition to the track loops, it is envisaged that a platform environment, facilities for rail storage, train decommissioning areas and educational activities will also be included as part of the developed works. These are likely to be located both within the Nant Helen site and within the portion of the site currently occupied by the Onllwyn Washery.

2 Sources of Information

The following sources of information have been reviewed in the preparation of this report:

- British Geological Survey (BGS) published geological and hydrogeological mapping
- British Geological Survey (BGS) online GeoIndex viewer
- Published environmental information (Lle)
- Information contained within the 2011 Nant Helen Extension Environmental Statement
- Historical aerial photographs (Welsh Government)
- Historical and present-day mapping sets (Groundsure)
- Opencast completion plans and select underground working abandonment plans (provided by Celtic Energy)
- Groundsure EnviroInsight and GeoInsight reports
- Coal Authority online viewer
- Coflein, National Monuments Record of Wales

3 Site Location and Description

The Celtic Energy Nant Helen site is located approximately 20km north-west of Swansea, immediately south of the Brecon Beacons National Park (refer to Figure 1). The plan area of the site covers approximately 500 hectares and is located between the A4109 to the south, and the A4221 to the north-east. To the north the site is bounded by an area of forestry and by forestry access tracks from the Brecon Road to the north-west. The majority of the site is located within the Powys county boundary however the southern boundary of the site lies along the Powys/Neath-Port Talbot county border and a small portion of the site lies within the county of Neath-Port Talbot.

The site boundary is shown on Figure 2. For ease of identification, throughout the report the site (as a whole) has been split into the main and the “washery” portions. The main portion refers to the central body of the site which contains the proposed rail test track whereas, the “washery” portion refers to the extension of the site to the southeast incorporating the Onllwyn Washery.

The topography of the site is shown on Figure 2. The northern site boundary starts at ~250m AOD in the north-western corner before dropping in an easterly direction to ~195m AOD. The land then climbs back up to the eastern arc of the site boundary which approximately follows the 250m AOD contour line. The southern site boundary also approximately follows the 250m AOD contour line and locally drops to ~235m AOD. The western arc of the site boundary rises up from 250m AOD in the south to 270m AOD in the south-western corner.

The topography of the site generally rises inwards from the site boundary. The central portion of the site sits at around 280m AOD with localised peaks reaching approximately 295m AOD. The “washery” portion of the site sits lower than the main portion of the site at roughly 230mAOD.

The Celtic Energy Nant Helen site is currently being used as an active open cast coal mine. The extreme west of the site contains the Nant Helen Extension opencast working which is typically 150m lower than the surrounding ground surface at its deepest point (refer to Figure 2). A series of access tracks are present across the site. These access tracks connect the current open cast workings in the west with the Onllwyn Washery located in the east of the site. The washery site accessed from the A4221 via a separate entrance, and is comprised several buildings, conveyer belts and material sorting facilities.

The central portion of the main site is dominated by a large ‘Overburden Storage Area’. The overburden storage areas are understood to be spoil heaps placed above the natural ground level. The maximum height of the spoil material is understood to be approximately 80m above the natural ground surface.

3.1 Site Walkover

A site walkover was undertaken by an Arup geotechnical engineer on 28th November 2018 with a representative from Celtic Energy. Pertinent site walkover photographs are presented in Appendix A which should be referred to throughout

this section. Refer to Figure 3 for the approximate locations of the site walkover photographs.

The images presented in Appendix A include Photograph 1 showing the large overburden storage area. Photograph 3 shows the current Nant Helen Extension opencast site. Photographs 3, 4, 5 and 6 show examples of the material excavated during the opencast mining activities.

Photograph 1 was taken facing approximately NNW and shows the southern face of the large overburden storage area centrally located within the site. Photograph 1 also shows the electricity pylons that cross the southern portion of the site; the route of which is indicated on Figure 3.

Photograph 2 was taken facing approximately eastwards and shows a small pond type feature which is located on the current proposed track route. The western slope of the large overburden storage area is shown behind the pond feature.

Photograph 3 was taken facing northwest and looks down into the current Nant Helen Extension opencast mine extent. The depth of the excavation is evident (~150m) and a large lake feature is present at the base of the excavation. Assuming backfilling activity has been undertaken as shown by the batter slopes shown on the right-hand side of the photograph.

Photographs 3, 4, 5 and 6 show examples of the material excavated during the opencast mining activities. The material shown is predominantly gravel sized with larger cobble and boulder sized inclusions. Evidence of fracturing is present on many of the larger inclusions. The material is anticipated to be mudstone/siltstone and is dark in colour. This material is anticipated to be the non-coal bearing arisings excavated during the opencast mining activity and is likely to be indicative of the material used to backfill the opencast sites post completion.

Photograph 5 is facing roughly eastwards and shows the coal haul route running eastwards towards the centrally located site compound and offices. The land rising to the south (right-hand side of the photo) is the northernmost extent of the overburden storage area. The current proposed track route is anticipated to run eastwards from this point running through the southern edge of the forestry shown on the left-hand side of the photograph.

Photograph 6 is facing approximately ESE and is located along the coal haul route. The photograph shows the various stockpiles either side of the roadway. From review of the site context figure provided by Celtic Energy (Appendix H), this area is the coal stocking area. The coal stocking area is located atop the backfilled extent of the original Nant Helen opencast site. The site compound and offices are located over the horizon shown on photograph 6.

Photograph 7 shows four cylindrical tanks located to the northwest of the site compound and offices. These tanks display flammable warning signs and are anticipated to be fuel tanks used for the various motorised plant vehicles. A large motorised plant vehicle is shown to be parked behind the tanks.

Photograph 8 was taken facing NW and looks out over the eastern half of the main portion of the site. The land is shown to rise gently towards the northwest

with the forestry that borders the northern half of the site shown to be present lining the horizon on the left-hand side of the photograph.

Photograph 9 is facing approximately eastwards and looks back towards the Onllwyn washery site. The washery infrastructure is shown in the background with a large pond shown in the foreground beyond the road.

Photograph 10 is facing NW and looks in towards the centre of the site. The photograph shows the eastern extent of the electricity pylons and the left-hand portion of the horizon marks the anticipated southern extent of the second Onllwyn opencast site (refer to Section 9).

4 Site History

Historical features and constraints have been identified through a review of historical mapping sets (1876 - 2019) and historical aerial photography (1945 – 2019). The mapping sets have been purchased from Groundsure and are referenced accordingly; the mapping sets cover a range of scales from 1:1,250 to 1:10,560. The aerial photographs have been acquired from Welsh Government and provide a higher level of detail for portions of the site covered. Current online aerial imagery has also been reviewed to supplement the historical sources. The mapping source material reviewed is presented within Appendix B.

In general, the site has been subject to extensive surface and sub-surface coal mining activities over the past century. The majority of relevant features and potential constraints identified are related to the site's coal mining legacy. A detailed review of mining activity is discussed in further detail within Section 9 of this report.

Table 1 below provides a summary of each individual historical source reviewed. Refer to Figure 4, Figure 8 and Figure 9 throughout.

Table 1 – Summary of historical features and constraints

Source	Notable features and alterations
1876 / 1877 Historical Maps	The Gwaunclawdd and Abercrave Collieries are shown to the north of the site with the latter shown to be located within the site boundary. To the south of the Abercrave Colliery, numerous 'Old Quarry' and 'Old Coal Level' features are shown to be located within an area which appears to have been heavily worked. The Neath and Brecon Railway (Junction Line) is shown to run along the northern boundary of the site following a rough east to west alignment. The "Junction Line" forms a network with the Neath and Brecon Railway main line (see paragraph below) and links the Collieries located to the north of Mynydd Drum (Abercrave & Gwaunclawdd) to the Onllwyn Colliery and washery site to the south of Mynydd Drum. To the south of the southern main site boundary, the Neath and Brecon Railway runs from southwest to northeast before crossing into the "washery" portion of the site. The majority of the southern portion of the main site is shown to be undeveloped moorland with localised marshy areas; the marshy areas feed several streams which flow in a southerly direction to converge with the River Dulais. A selection of cuttings and embankments, labelled as an "Old Tramway", is shown to cross the southern boundary of the site running along a rough east to west alignment. Based on review of

Source	Notable features and alterations
	the Transport Trust and Forest Fawr online sources, the Old Tramway believed to have originally formed part of the “Brecon Forest Tramroad”. The portion of the tramroad that passes through the site was called the ‘Claypon extension’ and was constructed circa 1827. The extension linked the existing Brecon Forest Tramroad network, constructed circa 1819, to the “Drum Coal Levels” (located ~500m to the southeast of the site) and to the Swansea Canal. In 1859 the majority of the Brecon Forest Tramroad was incorporated into the Neath and Brecon Railway; however, the Claypon extension, which crossed Mynydd Drum, was abandoned. An ‘Old Coal Level (Entrance)’ is shown to be located close to the southern boundary of the site. Numerous ‘Old Quarries’ are located towards the centre of the site, although these are all minimal in size. The washery portion of the site is shown as predominantly undeveloped moorland. A tramway links the Onllwyn Colliery to the Neath and Brecon Railway main line which passes through the washery portion of the site. The tramway initially follows the same alignment (SW to NE) of the Neath and Brecon Railway before spurring off in an easterly direction once past the Onllwyn Station. The tramway then runs along the northern boundary of the washery site before turning to the south east and running along the north-eastern boundary of the washery site towards the Maes-y-marchog Colliery. The land to the north of the washery portion of the site is a marshy area marked as Gors Llwyn.
1901/ 1903 Historical Maps	The Abercrave Colliery has increased in size and an additional colliery, the International Colliery, is shown to be located approximately 100m to the west of the Abercrave Colliery. The area to the south of the Abercrave Colliery is still shown to be heavily worked. Approximately 500m to the east of the Abercrave Colliery an ‘Old Tramway’ is shown. The tramway links a selection of ‘Old Levels’ and a singular ‘Air Shaft’ to the Neath and Brecon Railway (Junction Line). These workings are not named and are not shown on the mapping from 1876/77. The Gwaunclawdd Colliery is now shown in a new location approximately 500m to the east of the original location. The original site now contains an ‘Old Shaft’ and an ‘Old Quarry’. The southern portion of the main site has remained relatively unchanged. However, a tramway is now shown to links a singular coal level to the Dulais Colliery (marked as “Drym Colliery”); an air shaft, believed to be associated with the coal level, is shown to the north of the level (see Figure 8). The Onllwyn Colliery has expanded and moved location to be situated within the site boundary. The Dulais Colliery (marked as “Drym Colliery”) is shown within the site boundary to the north of the Neath and Brecon Railway main line which still runs through the washery portion of the site. The tramway identified within the washery portion of the site on the 1877 mapping is still present. A selection of ‘Old Coal Levels’, ‘Old Quarries’ and an ‘Old Coal Pit’ (all not shown on the 1877 mapping) are now present.
1914 Historical Maps	The Abercrave Colliery is shown to have expanded eastwards with a new tramway linking to new drift mine located approximately 400m to the east of the main colliery site. The ‘Old Tramway’ linking to the ‘Old Levels’ and ‘Air Shaft’ identified on the 1901/03 mapping is no longer present. The ‘Glynllech Colliery’ is now shown immediately to the east of the ‘Old Levels’ with an associated tramway spurring from

Source	Notable features and alterations
	the colliery in a north-eastern direction linking to the Neath and Brecon Railway (Junction Line). The tramway identified in the southern portion of the main site is no longer present. The remainder of the southern half of the site has remained unchanged. The ‘Drym Colliery’ is now marked as the ‘Dulais Colliery’ and has grown considerably with multiple structures located to the north of the Neath and Brecon Railway. The majority of the washery portion of the site has remained unchanged.
1945 Aerial Photographs	Extensive earthworks and stockpiles are shown to be surrounding the collieries along the northern boundary of the site (Abercrave, International, Gwaunclawdd and Glynllech). Two distinct areas containing a number of depressions in the ground surface are shown on the aerial photograph in the southern portion of the site. These areas are in the same location as the coal levels and air shafts identified on the 1876/77 historical mapping sets. The frequency of the depressions is indicative of ‘bell pitting’ extraction methods refer to Figure 12 Extract from 1945 aerial photography showing potential ‘bell pitting’ 2 within Section 9.3. The washery portion of the site is shown to have been developed with numerous rail tracks spurring from the Onllwyn Station in an easterly direction. The tramway identified on earlier historical sources is still present. A number of large stockpiles/spoil heaps are shown to be present within the washery portion of the site and to the west of the Onllwyn Colliery.
1948 Historical Maps	The Glynllech Colliery is still shown however the tramway linking the colliery to the Neath and Brecon Railway (Junction Line) is no longer present; this suggests that the colliery is no longer operational. The Abercrave and International Colliery footprints have reduced in size and much of the interlinking rail tracks and tramways are no longer shown. The Gwaunclawdd Colliery is no longer shown. No changes noted within the southern portion of the main site. The Dulais Colliery is now labelled as disused and all the coal mining related infrastructure associated with the colliery that was previously shown is no longer present. The Onllwyn Colliery is still present. A ‘Brickworks’ is shown to be present within the washery portion of the site. The brickworks is located to the south of the existing rail tracks and assumed ‘Washery’ infrastructure. An ‘aerial ropeway’ is shown within the site and is believed to be associated with the spoil heaps shown to be present within the washery portion of the site.
1951 Aerial Photographs	The Abercrave and International Collieries are shown to be present and the area of land previously occupied by the Gwaunclawdd Colliery has been completely cleared of coal mining infrastructure; the only evidence of the colliery that remains are the earthworks located immediately to the south. The Glynllech Colliery is no longer shown.

Source	Notable features and alterations
	The first evidence of opencast coal mining activity is shown to be present within the southern half of the main portion of the site. These workings appear to have been recently filled are anticipated to be the original Onllwyn opencast site. The workings are shown to intersect the “Old Tramway” identified on the 1876/77 historical mapping; two sections of cuttings along the tramway alignment appear to have been filled with spoil which anticipated to have arisen from two of the opencast sites shown. The Onllwyn opencast sites shown appear to coincide with the locations of the “dimpling” noted from the 1945 photography; as a result, the “dimpling” (possible bell pitting extraction) is no longer shown on the 1951 photography.
1965 Historical Maps	The Abercrave Colliery is still shown on the map, however many of the levels and drifts are labelled as ‘disused’ and the majority of rail and tramway infrastructure is no longer present. The infrastructure within the washery portion of the site has increased in size and the plan extent of the stockpiles/spoil heaps in the east has grown.
1975 Aerial Photographs	The land previously occupied by the numerous collieries located along the northern boundary of the site appears to have been completely reprofiled with no evidence of the collieries, or the worked land immediately to the south of the collieries, present. This is believed to be the result of the Abercrave/Gwaunton opencast coal mine (refer to Section 9.5). Evidence of earthworks associated with the construction of the A4221 are shown to be located along the north-eastern boundary of the main portion of the site.
1977 Aerial Photographs	A large opencast coal mine is shown to be present in the eastern half of the main portion of the site. This opencast site is anticipated to be the second Onllwyn opencast site and covers a much greater plan area than the original workings. The land to the southwest of the opencast site is covered with numerous stockpiles/spoil heaps. The A4221 is shown to have completed construction and borders the north-eastern boundary of the site. The Onllwyn Colliery is no longer shown to be present. A large stockpile is now shown to occupy the original colliery site. The Neath and Brecon Railway line is still present and links to an extensive network of sidings which spur eastwards into the washery portion of the site. The washery has increased in size and the numerous pond features, shown on the most recent aerial imagery, are now present. The area of land to the east of the washery appears to be in the process of being filled with numerous stockpiles/spoil heaps present.
1985 Aerial Photographs (Colour)	A distinct area of darker land is shown along the northern boundary of the site. This is anticipated to be associated with the backfilling of the Abercrave/Gwaunton opencast site; extensive forestry planting operations appear to have taken place within the areas which have been backfilled. The larger Onllwyn opencast site is shown to have been backfilled with numerous man-made drainage features shown to be present across the surface.
1987 / 1988 Historical Maps	The northern half of the main portion of the site is shown to be covered with forestry. A collection of disused levels and drifts are shown to be present. These are likely to

Source	Notable features and alterations
	have been associated with the Glynllech Colliery. The Onllwyn opencast site is labelled as disused workings. No other major observable changes are shown with regards to the south of the main portion of the site or within the washery portion of the site.
1989 Aerial Photographs	The main site compound is shown to be present centrally located within the main portion of the site. The first evidence of the Nant Helen opencast workings are shown to be present immediately to the west of the site compound. To the west of the opencast workings the “layer cake” overburden storage area is being formed; it is likely that the layer cake was formed with arisings from the original Nant Helen opencast workings. Numerous pond features are present along the southern face of the overburden storage area and along the eastern and western edges of the Nant Helen opencast excavation. From review of the Site Context figure provided by Celtic Energy, see Appendix H, these pond features are labelled as water treatment areas.
1995 Aerial Photographs (Colour)	The Nant Helen opencast excavation has progressed northwards with the existing void having been backfilled. The large overburden storage area, now located to the southwest of the opencast workings, is shown to have been completed to its present extent.
2006 Aerial Photograph (Colour)	The Nant Helen Extension opencast coal mine is shown to extend westwards from the Nant Helen opencast coal mine identified in the 1989 and 1995 aerial photographs. The original Nant Helen opencast void appears to have been filled and the surface is now covered with numerous stockpiles. An access track runs westward through the stockpiles from the site compound to the Nant Helen Extension workings in the west. The site of the original Nant Helen opencast appears to have been restored with a collection of small pond features and areas of vegetation present
2009 Aerial Photograph (Colour)	The Nant Helen Extension opencast coal mine has grown westwards and the original extent has now been partially backfilled with what appears to be site-won material. No other major changes are noted between the 2006 and 2009 aerial photographs.
2019 Online Aerial Imagery	The Nant Helen Extension opencast is shown to have reached its maximum extent. The extent of excavation shown on the 2006 aerial photograph has been backfilled and the majority of the 2009 extent has been partially filled with batter slopes falling westward into the open excavation. The ‘washery’ portion of the site is shown to contain a varied array of coal processing infrastructure with a limited network of rail lines running along an east to west alignment towards the north of the site. The land to the north and east appears to be artificially raised industrial scrubland with minimal vegetation cover. The land to the south of the washery has a higher degree of vegetation.

4.1 Summary

Although certain areas, particularly the area close to southern boundary of site, have been left relatively undeveloped, the majority of the site is shown to have been impacted by extensive coal mining activity. These activities include both

surface and sub-surface workings and have been identified from the earliest historical mapping to the present day.

Several historical collieries have been identified along the northern and southern boundaries of the site. The majority of the collieries were located on the lower slopes of Mynydd Drum and workings were accessed via both drifts and vertical shafts. The Abercrave and Gwaunclawdd Collieries were present on the earliest historical mapping from 1876/77 and the last evidence of the collieries disappeared following the absence of the Onllwyn Colliery on the 1977 aerial photography (refer to Section 9.4 for greater detail regarding underground mining).

The first evidence of opencast workings was identified on the 1951 aerial photography which showed workings believed to be associated with the first Onllwyn opencast site. The subsequent aerial photographs show evidence of the second Onllwyn, the Abercrave/Gwaunton, the Nant Helen and the Nant Helen Extension opencast sites. The depth and extent of the opencast sites appears to have increased from the shallow workings associated with the first Onllwyn opencast site to the deepest workings associated with the Nant Helen Extension works which are shown on the present day online aerial imagery.

Various rail tracks and tramways are shown to have crossed through and run along the boundaries of the site. The earliest of which was marked as an ‘Old Tramway’ on the historical mapping from 1876/77; from a review of information presented on the Transport Trust [19] and Forest Ffawr online sources [20], this tramway is believed to have formed part of the “Brecon Forest Tramroad”. The section that passes through the site was known as “Claypon’s extension” and was constructed circa 1827. The tramroad is a historically significant site and is a scheduled ancient monument alternatively known as “Tramroad at Ystradgynlais”.

A selection of other short tramways are shown to have been present within the site linking collieries like the Glynllech Colliery to the Neath and Brecon Railway (Junction Line).

The washery portion of the site has contained rail tracks/sidings and tramways since the earliest historical mapping and as the opencast coal mining activity increased towards the end of the 20th century the extent of coal mining washery infrastructure and stockpile/spoil heaps also increased.

5 Published Geology

The geology beneath the site has been interpreted through a review of published geological sources. These sources include the BGS 1:10,560 geological mapping (sheet SN 81 SW) [1], the BGS 1:50,000 geological mapping (Sheet 231) [2] and the BGS GeoIndex online viewer [3]. Refer to Figure 5 and Figure 6 throughout.

5.1 Made Ground

A region of artificial ground is shown to be present in the north of the site; based on review of documents provided by Celtic Energy, this is anticipated to be made ground associated with the backfilling of the Abercrave/Gwaunton opencast coal mine (refer to Section 9.5 for greater detail).

Although not shown on published geological sources, based on the known extent of opencast coal mining across the site, backfill made ground is anticipated to be encountered beneath much of the proposed track route. Based on observations made during the site walkover the material excavated during mining are generally granular (see Photographs 3, 4, 5 and 6).

5.2 Drift (Superficial Deposits)

Geological mapping of superficial deposits at 1:50,000 scale shows that the site is predominantly void of superficial material with only localised areas to the west and south of Devensian Till and an area of peat located centrally within the site. Deposits of Devensian Till and peat are also shown to be present beneath a small section of the washery portion of the site. The Devensian Till is noted to be of glacial origins and is labelled as boulder clay on the 1:10,560 geological map. Glacial till typically comprises a heterogenous mixture of clay, sand and gravel with large cobble and boulder inclusions of various size and shape (diamicton). The 1904 geological memoir for sheet 231 describes the glacial till deposits within the Dulais valley “... *Old Red* (sandstone) *in a stiff bluish matrix* (clay)” [4]. Peat typically comprises a partially decomposed mass of vegetation that has grown under anaerobic conditions, usually found in bogs or swamps.

It should be noted that the area of glacial till identified to the west of the site coincides with the known extent of the Nant Helen Extension opencast site (refer to Section 9.5). It is therefore likely that these deposits are no longer present and will have been incorporated within the extensive ‘overburden storage areas’ formed from the surplus material excavated during opencast mining activity.

The area of peat shown in the centre of the site is also unlikely to be present due to the fact that the plan extent of the peat coincides with the Nant Helen opencast site. It is not known whether these peat materials were stockpiled on site or disposed of offsite.

Given the location shown, the area of glacial till shown to the south is unlikely to have been impacted by the earthworks associated with opencast activities and is therefore likely to remain present.

The geological map shows glacial till deposits to be present in the eastern end of the washery portion of the site. Peat deposits are shown to encroach into the north of the washery site, but it is considered likely that these materials would have been removed from beneath developed areas.

5.3 Solid (Bedrock)

The majority of the site is underlain by solid geology of the South Wales Middle Coal Measures Formation. The remainder of the site is shown to be underlain by South Wales Lower Coal Measures Formation. The South Wales Coal Measures generally comprise rhythmic sequences of mudstones (commonly containing pyrite), siltstones, sandstones, grits, fireclays, seatearths and coals; the coals found in these measures tend to be amongst the thickest and most economically significant in South Wales. According to the geological memoir (Sheet Memoir 231) from 1988, nodular masses of pyrite, up to 0.15m thick, are often present within the Middle and Lower Coal Measures formations [5].

The Middle and Lower Coal Measures reach their maximum thickness of around 900m in the Swansea district and decrease in thickness towards the northeast and east with a thickness of around 425m near Merthyr Tydfil [5]. Based on the location of the site, and assuming a linear reduction in thickness, the thickness of the Middle and Lower Coal Measures Formations beneath the site is anticipated to be to the order of 700m.

Based on review of dip angles presented on the 1:10,560 geological mapping, the solid geology is anticipated to have a regional dip in a west south-westerly direction at angles ranging from between 5° and 15° [1]. The sequence is folded with a syncline and anticline indicated to be present beneath the site and as a result of which the bedding dip angles will vary in these locations. Within the South Wales Coal Measures, there is the potential for instability within rock cuttings as a result of planar failure along bedding planes of weaker beds such as seatearths.

5.4 Linear Features

Five faults, three of which are named, have been identified to cross the site from review of published geological mapping. All of the faults are roughly aligned along a NNW to SSE alignment.

Refer to Figure 6 and Figure 11 throughout.

The easternmost fault, the Glyncorrwg Fault, is shown to pass through the washery portion of the site. The cross-mark on the 1:10,560 geological mapping indicates that the fault downthrows to the west [1]; the geological memoir for sheet 231 from 1904 suggests that the Glyncorrwg Fault has a downthrow of “*forty yards*” (~36.6m) [4]. Moving westwards, there is an unnamed fault (potentially associated with the Glyncorrwg Fault) which crosses into the eastern half of the main portion of the site that is also indicated to be downthrown to the west. The Chapel Fault is shown to cross through the eastern half of the site and is indicated to be downthrown to the east; the geological memoir for sheet 231 from 1904 suggests that the Chapel Fault is downthrown “*sixteen yards*” (~14.6m) eastwards [4].

To the west of the Chapel Fault is the Pwllau Bach Fault. The alignment of the Pwllau Bach Fault splits the main portion of the site roughly down the middle and

downthrows to the west. The downthrow is stated to be as much as “*eighty yards*” (~73.2m) within the 1904 geological memoir [4].

The Glyncorrwg, Chapel and Pwllau Bach Faults form part of a horst and graben formation which is shown to be located beneath the eastern half of the site. The final fault shown to cross into the site is also unnamed. The fault crosses into the north-western most corner of the main portion of the site and downthrows to the east.

Numerous coal seams are shown to outcrop within the boundary of the site. A review of the coal resource shown to be present beneath the site and the associated mining activities, both surface and sub-surface, is provided in Section 9 which focuses on mining.

6 Ground Conditions

The anticipated ground conditions beneath the site have been interpreted through review of borehole and trial pit logs from previously undertaken ground investigations. The logs have been sourced from information provided by Celtic Energy and BGS borehole scans accessed from the BGS online GeoIndex. The logs reviewed are provided within Appendix C and Appendix D.

The stratigraphy noted on each log is presented in Table 2 below before a summary of the anticipated ground conditions is provided. For the approximate locations of the borehole logs reviewed refer to Figure 5.

Table 2 – Borehole Logs from previous Ground Investigations

Reference	Stratigraphy (m bgl)	Groundwater
Completion plan vertical sections		
Onllwyn ¹ (1949)	GL @ 261.2m AOD Base of Nine Feet Seam @ 258.0m AOD – Coal Seam (3.2m bgl) Base of Brass Seam @ 249.3m AOD – Coal Seam (11.9m bgl)	No groundwater remarks noted
Onllwyn ¹ (1982)	GL @ 247.4m AOD Base of Upper Peacock @ 242.3m AOD – Coal Seam (5.1m bgl) Base of Peacock @ 232.5m AOD – Coal Seam (14.9m bgl) Base of Bluers @ 198.4m AOD – Coal Seam (49m bgl)	No groundwater remarks noted
Nant Helen Geotechnical Boreholes ^{2,3}		
BH 2002 (1986)	GL @ 278.2m AOD GL – 0.5: Peat 0.5 – 2: Clay 2 – 3.1: Till 3.1 – 3.4: Mudstone 3.4 – 3.5: Coal 3.5 – 5: Mudstone	No groundwater remarks noted
BH 2005 (1986)	GL @ 280.6m AOD GL – 0.5: Peat 0.5 – 3.6: Till 3.6 – 4.5: Sandstone 4.5 – 4.75: Siltstone 4.75 – 6.8: Mudstone	No groundwater remarks noted
BH 2008 (1986)	GL @ 279.3m AOD GL – 0.5: Peat	No groundwater remarks noted

Reference	Stratigraphy (m bgl)	Groundwater
	0.5 – 1.0: Clay 1.0 – 3.6: Till 3.6 – 5.4: Mudstone	
BH 2009 (1986)	GL @ 282.5m AOD GL – 0.45: Peat 0.45 – 1.45: Clay 1.45 – 3.7: Till 3.7 – 5.7: Mudstone	No groundwater remarks noted
BH 2010 (1986)	GL @ 277.2m AOD GL – 0.2: Peat 0.2 – 1.05: Clay 1.05 – 2.4: Till 2.4 – 4.2: Mudstone 4.2 – 7: Siltstone 7 – 7.5: Sandstone	No groundwater remarks noted
BH 2011 (1986)	GL @ 271.7m AOD GL – 0.2: Peat 0.2 – 1.8: Clay 1.8 – 3: Mudstone 3 – 3.4: Siltstone 3.4 – 6.4: Mudstone	No groundwater remarks noted
BH 2013 (1986)	GL @ 263.4m AOD GL – 0.5: Peat 0.5 – 1.5: Clay 1.5 – 3.5: Till 3.5 – 4.1: Mudstone 4.1 – 4.5: Unknown strata 4.5 – 5.9: Mudstone	No groundwater remarks noted
BH 2018 (1986)	GL @ 253.0m AOD GL – 1.6: Peat 1.6 – 2.6: Clay 2.6 – 3.6: Till 3.6 – 5.7: Mudstone	No groundwater remarks noted
BGS Borehole Scans		
SN81SW30 (1989)	GL @ 236.48m AOD GL – 6: MADE GROUND: Loose to medium dense black sand and gravel mudstone with coal in a black silty clay matrix (colliery waste) 6 – 7: MADE GROUND: Soft grey brown mottled orange and black silty clay with much gravel of weathered sandstone and mudstone 7 – 8.05: Grey highlight to completely weathered silty MUDSTONE very weak laminated and micaceous 8.05 – 8.65: Dark grey IRONSTONE with some SILTSTONE 8.65 – 8.9: Light grey slightly to moderately weathered fine SANDSTONE, strong massive to occasionally cross laminated 8.9 – 9.6: Grey and light grey interlaminated moderately weathered silty MUDSTONE and sandy SILTSTONE, moderately weak occasional grey sandstone bands 9.6 – 11: Grey moderately weathered silty to very silty MUDSTONE, moderately weak 11 – 11.95: Dark grey slightly weathered silty SANDSTONE, weak. Thin sub horizontal laminations 11.95 – 14.2: Dark grey slightly weathered very slightly silty MUDSTONE moderately weak to weak laminated. Becoming very carbonaceous with depth. 14.2 – 15.03: Vitreous COAL 15.03 – 16.08: Dark grey to grey slightly weathered silty MUDSTONE, moderately weak many carbonaceous plant remains	Groundwater level ranging between 3.45m and 7.2m bgl during drilling

Reference	Stratigraphy (m bgl)	Groundwater
	16.08 – 19.7: Light grey slightly weathered clayey SILTSTONE moderately weak with occasional bands of thinly laminated silty mudstone. 19.7 – 21.65: Light to dark grey slightly weathered fine and medium SANDSTONE, strong massive with occasional cross bedding 21.65 – 22.3: Grey slightly weathered silty fine SANDSTONE moderately weak thin sub horizontal laminations very occasional plant remains and occasional sub vertical joints 22.3 – 25: Dark grey/black slightly weathered slightly silty MUDSTONE moderately to very weak. Often highly fragmented, often highly carbonaceous with occasional plant traces and occasional slickenside on joint surfaces 25 – 30: Open hole; Dark grey MUDSTONE	
SN81SW36 (1989)	GL @ 237.2m AOD GL – 3.2: MADE GROUND: Medium dense black sands and gravel of carbonaceous silty mudstone and coal with occasional black silty clay matrix 3.2 – 3.4: Firm brown organic CLAY with many rootlets and some peat 3.4 – 5.8: Firm to stiff grey brown mottled orange and black silty sandy CLAY with much gravel and occasional cobble of sandstone and mudstone and occasional coal fragments 5.8 – 6.7: Firm grey brown silty clay with mudstone fragments 6.7 – 7.2: Grey brown highly weathered silty micaceous MUDSTONE weak laminated and fragmented some iron staining 7.2 – 9: Grey moderately to slightly weathered SILTSTONE moderately weak laminated sub horizontal to massive iron staining on 45° joint planes 9 – 11.59: Grey moderately weathered slightly silty MUDSTONE weak often highly fractured 11.59 – 12.4: COAL with 45-60° slickensided joint surfaces 12.4 – 13: Grey slightly weathered silty MUDSTONE moderately weak massive many carbonaceous plant remains 13 – 18: Grey slightly weathered SANDSTONE and MUDSTONE 18 – 23: Dark grey slightly weathered SILTSTONE	Seepage of groundwater noted at 3.2m bgl at the base of the made ground Groundwater level ranging between 3.5m and 6.4m bgl during drilling
SN81SE4 (1977)	GL not provided GL – 0.6: MADE GROUND: Stiff grey/brown stony clay with sandstone cobbles 0.6 – 3.9: MADE GROUND: Firm dark grey silty clay with coal fragments 3.9 – 5: Stiff brown and grey mottled sandy CLAY with mudstone fragments	Groundwater struck at 1.5m bgl which rose to 1.3m bgl after 10 minutes
SN81SE5 (1977)	GL not provided GL – 0.2: Topsoil 0.2 – 0.5: MADE GROUND: Clay with coal wood and stones 0.5 – 1.5: MADE GROUND: Firm brown and grey mottled silty clay with sandstone and coal fragments 1.5 – 2.6: MADE GROUND: Stiff brown mottled silty clay with sandstone and coal fragments 2.6 – 3: MADE GROUND: Stiff dark grey shaly clay with coal fragments 3 – 4: Very stiff brown grey shaly CLAY with large angular sandstone fragments	Borehole dry
SN81SE6 (1977)	GL not provided GL – 0.1: Topsoil 0.1 – 0.7: MADE GROUND: Coal and clay 0.7 – 2.5: MADE GROUND: Firm grey/brown sandy stony clay with mudstone fragments and disseminated coal particles 2.5 – 4: Stiff grey/brown sandy stony CLAY with mudstone and large sandstone fragments	Groundwater struck at 3.0m bgl. Standing water level was measured at 1.6m bgl.
SN81SW37 (1991)	GL not provided GL – 0.8: Firm orange silty sandy CLAY with some fine and medium angular mudstone gravel and occasional coarse gravel and cobbles of sandstone	Slight groundwater seepage at 1.0m bgl within mudstone

Reference	Stratigraphy (m bgl)	Groundwater
	0.8 – 1.9: Highly weathered grey and orange laminated MUDSTONE, very weak. Generally recovered as angular gravel size fragments in a clay matrix	
SN81SW38 (1991)	<i>GL not provided</i> GL – 0.6: MADE GROUND: Grey shale and coal fragments with occasional brick and clinker 0.6 – 1.1: Firm grey and orange silty sandy CLAY with occasional fine gravel 1.1 – 1.8: Dark grey completely weathered MUDSTONE, recovered as clay with very occasional very weak mudstone lithorelicts 1.8 – 2: Highly weathered grey and orange laminated MUDSTONE, very weak. Generally recovered as angular gravel size fragments in a clay matrix.	Trial pit was dry throughout
SN81SW39 (1991)	<i>GL not provided</i> GL – 0.25: MADE GROUND: Grey shale fragments with occasional gravel 0.25 – 0.45: Stiff orange and grey silty sandy CLAY with occasional fine sandstone gravel and occasional boulder 0.45 – 1.5: Grey and orange highly weathered laminated MUDSTONE, very weak. Recovered as gravel size fragments	Trial pit was dry throughout

Notes

1. Detailed stratigraphy is not provided on the vertical sections shown on the opencast completion plans. Vertical sections have been reviewed to reveal the depth to coal seams.
2. The level of detail regarding ‘Nant Helen Geotechnical Boreholes’ is as presented on logs, refer to Appendix C. Logs reviewed to ascertain anticipated thicknesses of strata and depth to bedrock rather than for a detailed description of the materials encountered.
3. The boreholes appear to have been progressed in the same location as the large overburden storage area. Given the ground levels provided on the logs reviewed, it has been interpreted that these boreholes were progressed through the land currently underlying the large overburden storage area.

6.1 Interpretation

Made ground deposits are anticipated to be encountered beneath the majority of the proposed track route and within the washery portion of the site. The made ground backfill material anticipated to be present within the areas where opencast mining has been undertaken is likely to comprise gravel and cobble sized fragments of mudstone, siltstone and occasional sandstone.

Based on the descriptions provided in the logs reviewed, the made ground material anticipated to be encountered beneath the washery site is likely to comprise a mixture of varied granular backfill material within a cohesive clay matrix. The various gravel inclusions within the made ground were noted to be mudstone, sandstone, coal, clinker and wood. The thickness of this material is anticipated to range between 0.25m and 7m, although locally thicker deposits could be encountered in the locations of any stockpiles/spoil heaps within the washery site.

Natural superficial deposits of peat and glacial till are anticipated to be encountered beneath the southern portion of the site that has avoided opencast

activities and locally beneath the made ground materials anticipated to be encountered beneath the washery portion of the site.

In areas of the site that have not been subject to historical opencasting, peat deposits with thicknesses of circa 1-2m may be encountered. This material is anticipated to be soft/highly compressible and would need to be excavated and replaced with suitable earthworks fill or be subjected to ground improvement/treatment if it is encountered in the locations of proposed track alignment or the associated earthworks.

Glacial till deposits are also anticipated to be encountered in the locations that have not been subject to opencast mining activities within the main body of the site. The thickness of the glacial till material materials is likely to be limited (~3m) and discontinuous. No detailed descriptions of the glacial till material encountered were provided on the logs reviewed. Based on review of the published geological sources, glacial till typically comprises sand, gravel and cobble inclusions within a clay matrix.

Firm to stiff grey/brown clay with various mudstone, siltstone and sandstone gravel inclusions was encountered beneath the made ground deposits within the washery portion of the site. Based on the description and the published geological mapping, these materials are anticipated to be glacial till. Where encountered, the glacial till material beneath the washery portion of the site ranged between 0.2m and 2.4m thick. In some locations within the washery portion of the site, no natural superficial materials were encountered; in these locations the made ground material (described above) was encountered directly overlying the weathered bedrock.

As a result of the historical opencast workings within the site area, the depth to rockhead will vary greatly depending on location. Within the areas of the main site that have not been subject to opencast mining, the depth to rockhead is anticipated to be relatively shallow, with recorded depths ranging between 1.8m and 3.6m. However, in the locations that have been subject to opencast activity and have since been backfilled, the depth to rockhead could vary significantly over short distances (as detailed above). The bedrock material is anticipated to comprise interbedded mudstones and siltstones with occasional sandstone bands. The detailed descriptions from boreholes progressed within the washery portion of the site suggest that the mudstones and siltstones are slightly to moderately weathered and are moderately weak to strong. The materials are generally grey to dark grey in colour and occasionally micaceous. Where encountered close to surface, bedrock was recovered as highly weathered fragments of mudstone and sandstone within a clay matrix. Given this description, it is likely to be difficult to distinguish between the weathered head of bedrock and the overlying Glacial Till material.

From review of the vertical sections presented on the opencast completion plans for the Onllwyn site (1949), the base of the Nine Feet and Brass seams were encountered at 3.2m and 11.9m bgl ground level respectively. In addition, reference to the base of the Upper Peacock and Peacock seams were shown to have been encountered at 5.1m and 11.9m bgl respectively on the vertical section presented on the opencast completion plan for the Onllwyn site (1982). For

further detail regarding coal mining activity and the risk of shallow workings being present, reference should be made to Section 9 of this report.

Groundwater remarks were only provided on the logs reviewed within the washery portion of the site. The logs for the two deep boreholes reviewed within the washery portion of the site provided no indication of distinct groundwater strikes; however, the measured standing water level ranged between 3.45m and 7.2m bgl. Slight seepages and groundwater strikes were presented on the other logs within the washery portion of the site with some as shallow as 1.0m bgl. A detailed review of the groundwater beneath the site is provided in Section 8.3.

7 Hydrology

The hydrological features that pass through and surround the site have been identified through review of aerial online imagery and through review of the Groundsure EnviroInsight report (refer to Appendix E for the Groundsure report). The flow direction of the watercourses has been determined through interpretation of contours presented on the OS mapping covering the site area.

Figure 7 shows the location of identified hydrological features.

7.1 Watercourses

The site overlaps with three principal river catchments. The northern half of the main portion of the site sits within the Tawe catchment and contains several small unnamed streams which drain in a northerly direction towards the River Tawe. The River Tawe is the largest watercourse within the vicinity of the site and flows roughly from east to west approximately 500m to the north of the site boundary.

The Nant Llech, a tributary of the River Tawe, flows from east to northwest where it feeds into the Tawe and passes within 300m of the north-eastern site boundary. The Nant Llech is also an SSSI (refer to Section 10). A collection of small unnamed stream features to the northeast of the main portion of the site are shown to drain in a north-easterly direction towards the Nant Llech.

The southern half of the site sits within the Dulais catchment. The River Dulais flows roughly from east-northeast to west-southwest and runs through the washery portion of the site and along a portion of the south-eastern boundary of the main site.

The Nant Ystalwyn, a tributary of the Dulais, is shown to be fed by a selection of ponds which are located at the base of the large overburden storage area which is centrally located within the body of the main site. These ponds have been identified as water treatment areas and are fed by the drainage features present on the southern face of the large overburden storage area.

A collection of other tributary streams which originate within the central portion of the site flow in a southerly direction to their respective convergences with the River Dulais.

A small portion of the eastern half of the main portion of the site is shown to sit within the Pyrddin catchment. However, from review of OS mapping contours and the Groundsure EnviroInsight report, the drainage features within this portion of the site are anticipated to contribute to flows within the Dulais and not the Pyrddin (located ~1km to the east of the eastern site boundary). The drainage features identified appear to be man-made and initially flow in an easterly direction. Once they pass beneath Onllwyn Road the direction of flow turns south-westwards and runs parallel to the Onllwyn Road before feeding into a collection of ponds within the washery portion of the site. These ponds are located at the apparent source of the River Dulais and based on contours in the area are likely to feed into the flows within the Dulais.

One unnamed stream is shown to be located to the south of the washery portion of the site. From review of information presented within the Groundsure EnviroInsight report, this stream flows in an easterly direction before being culverted beneath the A4109 that borders the washery site to the south. The stream is then shown to re-emerge within the washery site before passing through another culvert beneath a section of the washery site. The stream eventually converges with the Camnant which in turn is a tributary of the Pyrddin.

As shown on the 'Site Context' figure provided by Celtic Energy (refer to Appendix H), several small pond features are shown to be located within the boundary of the site. Most of these appear to be 'water treatment areas', refer to Figure 7.

Through consultation with Celtic Energy it is understood that the easternmost water treatment area comprises ponds which are lined with a plastic liner. The water treatment areas that lie at the southern base of the large overburden storage area were constructed in 'virgin ground' and are possibly clay lined/sealed; if unlined, it is likely that water is retained within these features due to the cohesive nature of the glacial till likely to be present in the area.

In addition to the water treatment areas, a collection of pond features are shown to be present in the area of 'restored land' above a portion of the Nant Helen opencast workings. It is understood that these ponds are an attempt to re-naturalise and create an ecological habitat post backfilling and are possibly lined with low permeability/cohesive materials.

8 Hydrogeology

This section of the report provides details on the anticipated hydrogeological regime beneath the site. Published hydrogeological sources have been reviewed alongside the Groundsure Report purchased for the site and data provided by Celtic Energy regarding groundwater levels beneath the site.

8.1 Hydrogeological Mapping

The information presented below has been based on review of the BGS 1:125,000 Hydrogeological Map of South Wales [6].