



SPECIFICATION DOCUMENT

Project: 21529B – CERD Development – Afon Wen

Location: Afon Wen OS Grid Reference 244860, 337210.

Mileage and ELR: DJP 127m 41ch- 128m 11ch.

Client: Amco Giffen

Scope of this Document: Topographical Survey & Ground Investigation Requirements

CW Document Reference No: 21529B-SPE-004

Address:

Crouch Waterfall, The Barn, Elms Farm, Hobb Lane, Warrington, WA4 5LS

Design Brief:

Works for this scheme include remediation works to the sea wall at Afon Wen, as part of the CERD development.

Methodology:

- *The survey shall be carried out to an accuracy of Band 3 +/- 25mm as per Network Rail standard NR/L2/TRK/3100 issue 5, using a Drone UAV survey.*
- *National Grid Coordinates supplied for those points as well as the local grid xyz values.*
- *Surveyed heights (levels) shall be orthometric and quoted in metres above the national height datum published by the national mapping agency.*
- *The surveyor shall provide permanent survey control markers not more than 50m apart – all control points shall be inter visible by two other control points and part of the continuous survey control to demonstrate accuracy and residual redundancy.*
- *The surveyor shall locate permanent markers for survey control as required for the survey at the surveyor's discretion.*
- *The surveyor shall use his/her discretion to select the most appropriate marker type for all survey control points.*

Provisions:

- *3D Topographic Survey Drawing in AutoCAD .dwg or Microstation.dgn format.*
- *3D Point cloud data in .pod format suitable for use in Microstation or .rcs format suitable for use in AutoCAD/Revit and WebPointCloud (online point cloud viewer).*
- *Site wide 2D Orthophotos as jpeg images and .jgw files suitable for viewing as raster images backgrounds in AutoCAD and Microstation.*
- *ProjectWise integration is assumed to be required.*
- *It is assumed there is no requirement for snakegrid conversions.*

General Information / Topographical survey Requirements:

- Boundary wall routes, plus boundary fencing as required.
- Bases and other infrastructure in place.
- Any significant or irregular undulations to be surveyed where possible.
- Extents of rock faces / wall / cuttings, including rock armour levels
- Details of any channels /ditches / weep holes.
- Average water levels (Where possible)

Survey Extents:



Figure 1 – Survey Extents

Figure 1 shows the chainage extents provided from the CRT documents, covering an approximate 1.3km length chainage. The survey required shall cover this area. The adjacent rail track does not require capturing, however top of embankment levels and distance to track is required. Confirmation of easements for undertaking drone surveys to be confirmed around the track, possible possessions required.

GROUND INVESTIGATION REQUIREMENTS:

INTRODUCTION

The following document provides a ground investigation specification for works to be carried out at Afon Wen Sea Wall in the context of the renovation requirements set out by NR and detailed within CRT document reference NR-IP-EN-2155-A01.

The existing sea defence at Afon Wen has been identified by Network Rail for renewal, as it was assessed in 2014 and significant sections found to be in a Poor condition due to a number of defects directly attributable to: the wave action, environmental weather conditions and coastal processes.



The existing sea defence structure is located between Afon Wen & Llanystumdwy, ELR: DJP 127m 41ch & 128m 11ch, protecting the Network Rail infrastructure and saltmarsh environments from flooding and coastal erosion.

The structure comprises two main sections; Afon Wen Sea Wall A, comprising the eastern side of the defence, and Afon Wen Wall B, comprising the western side of the defence. This corresponds to major changes in the existing condition and style of defence in place, as follows:

- Afon Wen Sea Wall A, an armourstone embankment over a shingle beach (127m 41ch – 127m 61ch) (400m);
- Afon Wen Sea Wall B, a stone mortared wall with concrete apron and sheet pile toe (127m 61ch – 128m 11ch) (600m).

An option selection report (5191937-ATK-REP-CIV-RP-C-00002) has been undertaken which evaluates a number of possible solutions. The main focus of the options report was the sea defence asset; however, it considered the adjacent earthwork as well. The option selection report recommends Option 2 which is outside the scope of planned works. Therefore, it has been agreed by RAM and the Project Team to develop a modified Option 1. The key outputs for the chosen option are:

- Replenish rock armour where low or deficient;
- Repair defects to the existing sea wall including:
 - o Drilling and grouting of voids;
 - o Repointing masonry and replacing missing blockwork;
 - o Filling sections of undermined wall;
 - o Investigation of failed sheet piling to understand failure mechanisms / route cause and repair of sheet piling where damaged;
 - o Local concrete repairs.
- Address any outstanding defects scored 12 or above in the Coastal Asset Condition Report or the latest Detailed Examination referenced in Annex 1 of CRT documentation.

Further details on the defects present at this structure can be found in the most recent examinations reports, the Coastal Asset Condition Survey Report (JBA 2014), or the GRIP 3 Option Selection Report 5191937-ATK-REP-CIV-RP-C-00002.

To enable the design of the above works, it is required that investigations are carried out to ascertain the makeup of the existing sea wall and founding strata and design the appropriate renovation measures to the structure.

The Specification shall be the UK Specification for Ground Investigation, Second Edition, as published by ICE Publishing in 2012.

NAME OF CONTRACT

CERD Development

NAME OF INVESTIGATION SUPERVISOR

To be confirmed by AMCO GIFFEN.



Site Description

The existing sea defence structure is located between Afon Wen & Llanystumdwy, ELR: DJP 127m 41ch & 128m 11ch, protecting the Network Rail infrastructure and saltmarsh environments from flooding and coastal erosion.

OS grid reference for the site is SH 44860 37210, with the nearest postcode being LL53 6TX.

Main Works Proposed and Purpose of Contract

The purpose of the Contract and investigation is to gather geotechnical information which shall be used to inform the design of renovation measures for the existing sea wall structure and associated rock armour.

Scope of the Investigation

The scope of the ground investigation is as follows:

- 5no Windowless Samples to a minimum of 6 m in depth, at 200m centres along the length of the sea wall. All Windowless sample positions are to be commenced with a hand dug inspection pit for service clearance to a depth of no less than 1.2m.
 - Undisturbed samples are to be taken at the top of every change in strata;
 - SPT testing at every 1.0m and change in strata;
- 11no. Dynamic Probes to 10m or refusal, at 100m centres along the length of the sea defences, adjacent to the boreholes where relevant;
- 30no cores through the existing wall, spaced at 40 m centres along the length of the wall. Cores are to be carried out in pairs, one at base of wall (horizontal core) and another through the concrete apron at the base of the wall with a 45 deg inclination.
- Laboratory testing of selected samples;
- Logging and reporting to BS EN 1997-1 and BS5930-2015.
- Only a factual report is required.

Working hours and access arrangements are to be confirmed by AMCO GIFFEN.

Geology and Ground Conditions

Geological mapping available from the BGS Geology Viewer has been used to determine the expected bedrock geology at the site as follows:

- Cwm Eigiau Formation – Sandstone with siltstone and silty mudstone, tuffs and tuffites

The BGS Geology Viewer has also been used to determine the superficial geology at the site:

- Glacial Deposits – Diamicton, Sands and Gravels
- Marine Beach Deposits – Sand and Gravel

There is no historical ground investigation information currently available to review.

Mining and Mineral Extraction

The Coal Authority interactive online map viewer does not show any records of historical coal mining near the site.



Hydrogeology

The site and surrounding area is designated as a Secondary B aquifer, which consists of predominately lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

Hydrology

Afon Wen is situated at the mouth of the Afon Wen, a river which enters the Irish Sea through Tremadog Bay in the principal area of Gwynedd, North Wales. The apparent source of the Afon Wen is located approximately 9 km north of the site near the north-eastern corner of the Llŷn peninsula.

Underground Drainage and Seepage

It has been observed from the site walkover survey that seepage occurs below Afon Wen Sea Wall, contributing to the deterioration of the defence.

Flooding

The site has a history of storm surges resulting in flooding along the coast, despite the presence of existing sea defences. In January 2014 northern Wales was hit by a storm surge, leaving Afon Wen and other surrounding villages seriously affected by the coastal flooding.

The National Resources Wales online long-term flood maps show the areas to the north of the existing sea defences and railway line to be at risk from significant and frequent tidal and fluvial flooding [15].

The site exhibits low to high risk areas of flooding from both rivers and the sea as well as low to high risk areas of surface water flooding. The flooding encompasses the majority of the saltmarsh, significantly around the central pond, located approximately halfway along the defence.

Significant flooding risk is also identified along the route of the Afon Wen river, specifically at the mouth, to the west of the defence.

Unexploded bomb risk

An unexploded bomb (UXO) risk map indicates that the area is of low UXO risk, having 15 bombs per 1000 acres of less.

General Requirements

CDM (2015) regulations apply to the Contract.

The Contractor shall carry out all work to ISO 9001 or a similarly approved quality management system.

The level of staffing provided by the Contractor shall be commensurate with the works being carried out. An experienced ground engineer shall be present on site full-time for the duration of the site-works; this engineer will be responsible for the supervision of all site activities, logging of exploratory holes, taking samples and photographs and the provision of daily records and preliminary logs.

Although it is not expected that Sentinel requirements or Network Rail safe systems of work are necessary, it is for the Contractor to ascertain these requirements and provide appropriately qualified staff members to carry out the works.



Dates for mobilisation to site and commencement of the site-works are to be confirmed with AMCO GIFFEN.

Working hours are to be confirmed with AMCO GIFFEN. The challenges of working in a tidal environment should be considered.

Access arrangements and permits to work to be confirmed by AMCO GIFFEN.

Suitable safe systems of work are to be agreed with the Client to allow safe access to the work site and adjacent to open water. Investigations are to be coordinated with tide times, taking especial consideration to access and egress to and from GI locations.

The Contractor is responsible for the security of site during the works, and their work sites will need to be fenced off. No exploratory holes are to be left open overnight. Any plant left on site overnight shall be appropriately secured to deny access to the public.

Appropriate hygiene and welfare facilities shall be provided on site by the Contractor; the Contractor shall not use available public facilities. The Contractor shall detail any assumptions or requirements (e.g. availability of on-site power, space required for facilities) in their return.

Contamination is not known to be present on site. However, as the site is located adjacent to an active railway, the possibility of contamination being present cannot be discounted. The Contractor shall take appropriate measures to safeguard their plant and employees, surrounding personnel and the environment from the spread of any contamination as a result of drilling activities. The Contractor shall decontaminate all drilling equipment on completion of each exploratory hole and on completion of the site works.

No services information has been provided to the Designer. All exploratory hole positions shall be scanned using appropriate detection equipment prior to the commencement of drilling and at 300mm intervals while excavating.

All unavoidable damage shall be reinstated by the Contractor. The Contractor is responsible for reinstating the site to its previous condition following the completion of site-works.

The Contractor is responsible for the disposal of all waste (including contaminated arisings and groundwater) generated as a result of the works, including the sampling and testing of all waste materials.

All exploratory hole positions are to be surveyed in by the Contractor to a vertical and horizontal accuracy of 0.05m. Position and levelling information are to be provided to National Grid and Ordnance Datum respectively.

Sufficient photos to show the condition of the whole of the site prior to the start of the site-works and an analogous set on completion of the investigation are to be provided.

Dynamic Sampling

Dynamic sampling shall be undertaken using a windowless sampling rig. The Contractor is free to determine the drilling methodology and the starting diameter for the borehole such that drilling,



sampling and testing can be carried out to the scheduled depth while suitable sampling and testing is undertaken.

The maximum period for chiselling / slow boring / excavation through hard strata shall be 30 minutes, following which the Investigation Supervisor shall be contacted for instruction.

Water shall not be added during drilling except where required to facilitate drilling in granular strata. The maximum period of chiselling shall be 30 minutes. Following this period, instruction from the Investigation Supervisor shall be sought.

Concrete Coring

Concrete cores are to be 100mm in diameter, to a maximum length of 2.0m. Cores shall be taken in pairs at 40m centres along the length of the wall; each pair of cores shall consist of one core at the base of wall driven horizontally, and one core in the apron inclined 45° downwards.

The concrete cores shall be logged on site and stored for the duration of the project should the need for testing arise. Fill materials behind the wall should be included in the log and sampled where suitable. Any voids identified should likewise be included in the log.

Reinstatement of cored locations shall be carried out with non-shrink cementitious grout of C40/50 grade.

Sampling and Monitoring during Intrusive Investigation

In Windowless sample holes, 1no bulk and 1no disturbed samples shall be taken at 1m intervals or at any change in strata.

In hand dug inspection pits, 1no bulk and 1no disturbed sample shall be taken at 0.5m intervals or at any change in strata, whichever is smaller.

Groundwater strikes should be recorded and monitored during drilling for 20mins. Groundwater level shall be measured again at the end of the borehole / end of shift. Groundwater shall be sampled once encountered in all positions.

In-Situ Testing Particular Restrictions/Relaxations

SPT testing shall be carried out in all window sample boreholes in accordance with BS EN ISO 22476-3. The first SPT shall be undertaken at the base of the hand-dug pit and at 1.0m intervals to completion.

Dynamic Probing (Super Heavy Dynamic Probing – DPSH) is to be carried out in accordance with BS EN ISO 22476-2.

Hand Shear Vane testing is to be carried out in suitable cohesive material to BS EN ISO 22476-9 or BS EN 1997-2 and NS to BS EN 1997-2.



Instrumentation Particular Restrictions/Relaxations

Not required.

Instrumentation Monitoring and Sampling Particular Restrictions/Relaxations

Not required.

Daily Records Particular Restrictions/Relaxations

Raw data comprising drillers logs shall be provided to the Investigation Supervisor within 24 hours of the completion of each shift.

Draft engineering logs shall be provided to the Investigation Supervisor within 3 working days of completion of each position, along with a laboratory testing schedule detailing samples taken and the depth at which they were taken.

Logging and reporting will be in accordance with BS 5930:2015. Descriptions are to include, where relevant:

- Soil name and constituents;
- Colour;
- Structure;
- Strength, consistency and / or relative density;
- Moisture content;
- Soil plasticity, sensitivity and dilatancy;
- Note of any minor constituents / contamination;

Geotechnical Laboratory Testing Particular Restrictions/Relaxations

A geotechnical laboratory testing schedule shall be provided to the Investigation Supervisor alongside the draft engineering log.

Geotechnical testing is likely to comprise, but is not limited to the following tests:

- Natural moisture content;
- Atterberg limit tests;
- BRE Digest 1: 2005 Concrete Aggressivity Suite – Suite B;
- Quick Undrained Triaxial Compression.

All laboratories used shall be UKAS accredited.

Geoenvironmental Laboratory Testing Particular Restrictions/Relaxations

No geoenvironmental testing of soil or rock samples apart from that already noted is required. However, the Contractor should be aware for the potential for contaminated material to be present. If visual, olfactory or other evidence suggests the presence of contamination, suitable environmental samples are to be taken.



Reporting Particular Restrictions/Relaxations

Only a Ground Investigation Report (Factual Report) is required. A Geotechnical Design Report (GDR) is not required.

Draft engineers/drillers log to be provided to the designer within 3 days of completion of the site-works. (handwritten is fine)

A draft version of the report is to be produced within 10 working days of the completion of site-works. The Contractor shall allow 5 working days for the Investigation Supervisor to review this draft and return comments. Following receipt of comments, the Contractor shall issue the final Ground Investigation Report within 5 working days.

1 No. digital (pdf) copy of the final ground investigation report is to be provided.

The final report is to be accompanied with a complete AGS file (AGS 4.0) containing all exploratory hole, in-situ and laboratory test data.

Key programme dates are as follows:

Activity	Timeframe
Mobilisation period	To be confirmed with AMCO GIFFEN
Site-works period	To be confirmed with AMCO GIFFEN
Submission of Draft Report	2 calendar weeks following completion of site works
Return of comments	1 calendar week following draft submission
Submission of Final Report	1 calendar week following receipt of comments

Schedule of works

Hole No.	Type	Scheduled Depth (m)	Remarks
WS001-WS005	Windowless sample	To refusal (min 5m)	Evenly spaced approximately every 200m along the length of sea defence structures.
DCP001-DCP011	Dynamic Probing (DPSH – Super Heavy)	To refusal (min 10m)	Evenly spaced approximately every 100m along the length of the sea defence structures, located adjacent to that of corresponding WS where applicable.
CC001-CC020	100mm diameter horizontal concrete cores	Maximum 2.0m length	Evenly spaced approximately every 40m along the length of the concrete sea wall (Section B). 20no. pairs of cores, upper core labelled A, lower core labelled B.

Commented [MH1]: Was 11no., now reduced to 5no. to complete in one week.

Commented [MH2]: Adjacent to WS boreholes with additional probes in between to provide coverage

The below figure presents an indicative location plan for the proposed GI works.



Figure 1 – Afon Wen Sea Defence. Proposed GI works location plan.