



SPECIFICATION DOCUMENT

Project: 21529B – CERD Development – Sudbrook Sea Defence

Location: OS Grid Reference ST507873

Mileage and ELR: BSW 13m 1100yds 50chs

Client: Amco Giffen

Scope of this Document: Topographical Survey & Ground Investigation Requirements

CW Document Reference No: 21529B-SPE-006

Address:

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

Design Brief:

Works for this scheme include remediation works to the rock armour where low or deficient and repair of the wall were required as part of the CERD development.

Topographic Survey Requirements:

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 their 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.
- Closest running rail.
- Any vegetation and services such as manholes.
- Bases and other infrastructure in place.
- Any significant or irregular undulations to be surveyed where possible.
- Extent of walkway and capping stones at the base of the wall
- Extents of rock faces / wall / cuttings, including rock armour levels
- 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 180m length. The survey required shall cover this area.



Ground Investigation Requirements:

Name of Contract

CERD Development – Sudbrook Sea Defences

Name of Investigation Supervisor

To be confirmed by AMCO GIFFEN.

Introduction

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

Sudbrook Sea Wall is a coastal defence situated on the western bank of the River Severn, protecting the Sudbrook Pumping Station which is a railway critical asset. Sudbrook Wall is approximately 180m in length and 2.7m in height and is considered a single structure, however, it consists of different construction types such as a lower masonry wall section, a concrete wall section and a setback masonry capping wall. The asset is fronted by a coarse cobble beach.

The sea wall is in poor condition, especially the lower masonry wall section. There are large open voids at the base of the masonry structure due to scouring which is undermining the wall and showing signs of failure. Defects include:

- Several collapses of the lower wall section.
- Hollows / voids in places.
- Spalling and fracturing in the concrete wall section.
- Significant scouring to the base of both concrete and masonry sections.
- Corroded outfall pipe.
- Extensively corroded fence along the top of the wall.

Figure 2 shows the location of the Sea Defense.



Figure 2 – Sudbrook Sea Defence. Location Plan.

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-00007.

For this site the preferred option is (Option 2) to enhance the existing sea wall and rock revetment to provide a 200-year design life and provide coastal protection for a 1 in 200-year storm event.

To enable the design of the above works, it is required that ground investigations are carried out to determine the existing ground conditions at the locations of repair.

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

Site Description

The site is located at Ordnance Survey National Grid Reference (350777E, 187363N), on the right bank of the River Severn, immediately east of the Sudbrook Pumping Station. The nearest postcode is NP26 5SY. The site is located approximately 3 km east-south-east of Caldicot town centre and 7 km south-south-west of Chepstow in Monmouthshire.



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 defence structures.

Scope of the Investigation

The scope of the ground investigation is as follows:

- 3no Rotary Core Boreholes to a minimum of 12m. SPT testing to be carried out at 1.0m intervals from 1.2m depth to 5m depth and at 1.5m intervals thereafter. Each Borehole location is to be commenced with a hand dug inspection pit to a depth of no less than 1.2m.
- 1no Windowless Sample to a minimum of 6m depth or refusal on the beach. Windowless sample position is to be commenced with a hand dug inspection pit to a depth of no less than 1.2m.
- 1no. Dynamic Probes (DPSH), adjacent to Windowless sample location This shall be carried out to a depth of 6m or refusal;
- 5no cores through existing sea wall, spaced at 25m centres along the wall. Cores are to be done at mid height of wall and horizontally.
- Geotechnical and Geo-environmental 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

The underlying geology of the site has been determined from the British Geological Survey (BGS) online viewer, which shows the following:

- **Superficial Geology:** Published information from the BGS indicates that superficial deposits underlie the site and comprise of Tidal Flat Deposits and River Terrace Deposits. Tidal Flat Deposits underlie most of the site and are described by the BGS as “unconsolidated sediment, mainly mud and/or sand”. Tidal Flat Deposits are also be described as “normally a consolidated soft silty clay, with layers of sand, gravel and peat” where they form the top surface of a deltaic deposit. The River Terrace Deposits are described by the BGS as “sand and gravel, locally with lenses of silt, clay or peat”.
- **Bedrock Geology:** The site is underlain by sandstone and mudstone of the Mercia Mudstone Group. The boundary between the Mudstone and the Sandstone unit appears to be the top of what is mapped as the intertidal zone. The Mercia Mudstone Group is described by the BGS as “dominantly red, less commonly green-grey, mudstones and subordinate siltstones with thick halite bearing units in some basinal areas. Thin beds or gypsum/anhydrite widespread; sandstones are also present”. The regional dip of the strata in this area is 10° to the east. Five faults are marked nearby, with the largest being a thrust fault located approximately 1.78km north-west of the site, orientated in a north-west to south-east direction. A fault orientated north-west to south-east is located approximately 915m north of the site, with two smaller faults located immediately to the east of this in a west to east direction. The final fault is located approximately 1.5km east of the site, in the River Severn orientated in a north to south direction.



Mining and Mineral Extraction

The site is located outside of the South Wales Coal Field and is not underlain by coal-bearing strata in accordance with the BGS and the National Library of Scotland.

Hydrogeology

The BGS indicates that the superficial River Terrace Deposits are classified as a Secondary A aquifer; the Tidal Flat Deposits are classified as a Secondary undifferentiated aquifer. The sandstone from the Mercia Mudstone Group is classified as a Secondary A aquifer; the mudstone from the Mercia Mudstone Group is classified as a Secondary B aquifer. The site is not located on or within 1km of a groundwater source protection zone.

Hydrology

The River Severn is located immediately east of the site. Natural Resources Wales indicates that the site is at a “high risk” of flooding from the River Severn and the sea. The groundwater vulnerability of both the superficial deposits and bedrock are classified as highly vulnerable from contamination by human activities.

Unexploded bomb risk

Freely available online Unexploded Ordnance (UXO) Risk mapping, produced by Zetica, provides an estimate of the potential risk associated with unexploded WW2 air dropped ordnance. The site is identified to be situated in an area assessed as having a “low risk” from UXO with an estimated bombing density of 15 bombs per 1000 acre or less. It should be noted that this assessment does not consider other sources of enemy or allied air dropped or ground UXO.

Results of a pre desk study assessment provided by Zetica, highlighted that although the site is at a low risk, the records of UXOs washing up on this part of the coastline warrants a detailed UXO desk study assessment in the future.

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.

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.



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.

Sentinel requirements or Network Rail safe systems of work may be necessary, it is for the Contractor to ascertain these requirements and provide appropriately qualified staff members to carry out the works.

Suitable safe systems of work are to be agreed with Amco-Giffin 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 exploratory hole 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.

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 resulting from 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. The Contractor should take all necessary actions to avoid damaging any existing services. The Contractor is responsible for acquiring up to date service plans.

All exploratory hole locations shall be scanned with CAT and genny in accordance with HSG47. Hand dug pits are needed before any starting any exploratory position.

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

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 resulting from 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.

Rotary Drilling

CAT-scan and Genny to be conducted to check no services are present at the BH location.

Hand-dug inspection pit shall be carried out to at least 1.2mBGL to be carried out to confirm no services are present at the BH location.

Rotary core drilling boreholes to be carried out to a minimum depth of 12.0mBGL.

The Contractor is free to determine the starting diameter for each borehole such that boring, sampling and testing can be carried out to the scheduled depth with a minimum final diameter of 100mm. Minimum core recovery needs to be 95%.

Coal Authority permit needed to drill into coal/workings and use of air flush is not permitted. Drilling shall be carried out in accordance with Guidance on managing the risk of hazardous gases when drilling or piling near coal April 2019.

For drilling through hard rock, water may be employed exclusively as a lubricant. Any water used must be contained within re-circulation tanks to prevent contamination of adjacent land. Re-circulation tanks are to be emptied by pumping to a bowser with water disposed off site to a waste treatment area. There is no facility on site to dispose of the water flush utilised during the works.

Rotary core drilling to be carried out with diamond or tungsten carbide tipped bits. All bits, core barrels and casing shall conform to current standards. The requirements of BS EN 1997-2:2007 (Section 3.5 Rock sampling) and EN ISO 22475-1 shall be followed.

All rotary drill equipment is to be cleaned between boreholes to prevent cross contamination of boreholes. Similarly, water tanks are to be emptied by pumping to a bowser and water disposed off-site. There is no facility on-site to dispose of the water flush utilised during the works.

Engineering logs to be produced by qualified engineering geologist according to BS 5930:2015 (Section 6: Description of soils and Rock)

Backfilling of the completed borehole shall be using bentonite pellets and grout over the top 2.0mBGL. No monitoring installations are required in borehole positions.

Other aspects to comply with clause 5.2 and 5.4 of the UK Specification for Ground Investigation, Second Edition, as published by ICE in 2012.

Percussion Boring/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. Suitable measures should be taken to minimise the risk of creating pollutant pathways in vulnerable areas of the site such the estuary.

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.

Cores are to be taken along the extents of the wall. They are to be at mid height of the wall and taken horizontally. Reinstatement of cored locations shall be carried out with non-shrink cementitious grout of C40/50 grade or better.

In-Situ Testing Particular Restrictions/Relaxations

Standard Penetration Testing (SPT) shall be carried out in all windowless 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;
- Particle Size Distribution tests.

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

A Factual Report is required.

Draft engineers/drillers log to be provided to the designer within 3 working 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 the draft report and return comments. Following receipt of comments, the Contractor shall issue the final Factual Report within 5 working days.

1 No. digital (pdf) copy of the final factual 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 Engineers/Drillers Logs	3 working days of completion of site works
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
BH01-BH03	Rotary core borehole	To 12m min	
WS01	Windowless sample	To refusal (min 6m)	
DCP01	Dynamic Probing (DPSH – Super Heavy)	To refusal (min 6m)	

The below figure presents an indicative exploratory hole location plan.



Figure 3 –Sudbrook Sea Defence. Proposed GI works location plan (Subject to change).