
Subject	Method Statement for Additional Ground Investigation at Central Rhyl
Date	11-03-2022
Notes	Additional Ground Investigation

Objective

Tidal Flat Deposits near promenade beach access ramp

- To identify and confirm presence of any Tidal Flat Deposits between 1m OD and -1.5m OD beneath the proposed promenade beach access ramp. Tidal Flat Deposits are typically described as very loose laminated bluish grey slightly gravelly sandy SILT with pockets of pseudo fibrous peat and very soft becoming firm slightly gravelly sandy CLAY with pockets of sandy gravelly silt.
- To identify and confirm depth and elevation of the underlying Glacial Till Cohesive (firm to stiff dark brown slightly sandy gravelly CLAY) or Glacial Till Granular (medium dense dark brown sandy GRAVEL).

Existing buried structures in beach

- To validate the location of the existing buried coastal defences (namely the revetment) and attempt to locate any buried remnants of the historic pier (at the nearshore).

Archaeological investigation

- To understand the potential for surviving evidence of palaeoenvironments, and understand the nature and depth of any surviving archaeological remains, which may consist of past land surfaces, peat deposits and prehistoric forest remains

Trial Pitting (TP)

- Trial Pits are required for additional archaeological investigation to provide a visual inspection of the existing concrete revetment and confirm the presence of organic peat beneath the site
- The locations of the trial pits are shown on drawings CR-MMD-00-XX-SK-C-9001 to 9005, and Figure 2 from the Written Scheme of Investigation (York Archaeology 2022).
- Grid coordinates, existing ground (beach) elevation and base of trial pit at each test location to be recorded with reference to Ordnance Datum.
- Depth of each trial pit to be agreed with the Investigation Supervisor on a location specific basis but shall typically extend up to 3.0m below existing beach level.
- Typically, the trial pitting shall be undertaken with a 13t, 360° tracked excavator using a toothless bucket. The excavator operator shall be instructed by the Investigation Supervisor to dig in thin layers, as requested.
- Bulk samples to be taken from the arisings as and when instructed by the Investigation Supervisor.
- Measurements of any groundwater strikes to be recorded.
- Daily reports and logs shall be undertaken by an experienced geotechnical engineer / engineering geologist and provided to the Investigation Supervisor within two working days of the trial pit being completed.
- Logs to be written in accordance with BS5930:2015.
- Trial pitting will be overseen by an experienced archaeologist who will record the lithologies encountered in accordance with the Written Scheme of Investigation (York Archaeology 2022).
- All arisings shall be stockpiled then reinstated in the reverse order of excavation.

- Temporary shoring is not envisaged at this stage however, trench boxes or similar may be required at specific locations of interest, as agreed by the archaeologist and Investigation Supervisor.
- Large excavations greater than 1.0m in depth are to be safely benched accordingly to mitigate potential collapse, particularly in the marine environment.
- Entry into the trial pits is not envisaged at this stage.
- Refer to Table 1 below for proposed Trial Pit Schedule.

Cone Penetration Testing (CPT)

- Locations of CPT to be +1/-1m of proposed locations shown on drawings CR-MMD-00-XX-SK-C-9001 and 9002 unless site constraints dictate otherwise. Any changes to be CPT locations to be agreed with the Investigation Supervisor.
- Grid coordinates, existing ground (beach) elevation of test location to be recorded with reference to Ordnance Datum.
- CPTs to be undertaken using a truck / crawler CPT unit, capable of tracking on soft beach deposits as agreed with the GI Contractor. Temporary vehicular matting for access on the beach may be required, as determined by the GI Contractor.
- Each CPT with pore pressure measurement (CPTu) to be undertaken to a minimum elevation of **-6m OD** at each location (approximately 8m depth from beach elevation ~2.0m OD) measuring cone resistance, local friction, and pore water pressure. Magnetometer (Magcone) is to be attached to CPT equipment at these locations to investigate for possible UXO whilst also proving ground conditions. Refer to Table 2 for CPT schedule.
- Additional Magnetometer Probing (CPT-M) is required to undertake to identify possible buried obstructions associated with the existing pier foundations which intersect the proposed ramp alignment. These CPT-M shall be undertaken to a depth of **-3m OD** (i.e., maximum toe level of ramp sheet piles). Refer to Table 3 for CPT-M schedule.
- If any inspection pits are dug, the arisings shall be stockpiled then reinstated in the reverse order of excavation.
- CPTu testing to be undertaken in accordance with BS ISO 22476-1:2012.
- Evidence of calibrations and copies of calibration charts shall be supplied to the Investigation Supervisor prior to commencing the work or when otherwise requested.
- Field checks to be undertaken before each test, include the seals between different elements of a tip shall be cleaned and inspected to check their integrity. The zero-load error shall be checked by observing the zero-load deflection before and after each test, it shall not exceed 2% of the rated load. Prior to checking the zero-load error, all grooves shall be checked and cleaned. The minimum voltage that can be accurately read by the equipment used shall be clearly stated. As requested by the Investigation Supervisor, the zero-load error shall be checked when the cone is placed in buckets of water at different temperatures. The zero-load error shall be checked after an equalisation period of five minutes.
- For piezocone tests, following completion of a test the data shall be immediately reviewed, if there is evidence that the porous element de-saturated whilst the test was being carried out, the test shall be repeated. The cost of repeat tests shall be borne by the Contractor, unless the Contractor can demonstrate that the type of ground penetrated would inevitably lead to de-saturation of the porous element.
- The Contractor shall prepare for each static probe test a daily journal that shall be of a form to be approved by the Investigation Supervisor. The Journals for each static probe test shall be submitted in duplicate to the Investigation Supervisor at the beginning of the next working day following the day to which they refer and contain the following information in addition to that required by BS EN ISO 22476-1.

- Contract title.
- Contractor's name.
- Test location reference number.
- Date(s) of test.
- Name of Responsible Expert.
- Name of Qualified Operator.
- Details of services or drains located, if any.
- Details of time spent other than in performing test.
- Type of equipment in use, including type of cone.
- Diameter of cone.
- Depth to which 55mm outside diameter flush casing was used, if any.
- Details of Calibrations.
- Results of Field checks.
- Details of unusual events or abnormal interruptions to the test and the depths corresponding to when they occurred.

The following information plotted graphically against depth:-

- Cone resistance.
 - Local friction.
 - Friction ratio, defined as ratio of local friction to cone resistance (measured at the same depth) measured as a percentage.
- CPT records together with interpreted identification of the soils tested and estimated soil shear strength to be presented in a report prepared by the GI Contractor. In addition, an interpretation of the soil types penetrated by the cone test shall be provided. This interpretation shall include an assessment of undrained shear strength for clay soils and an assessment of relative density for granular soils. In particular, a detailed interpretation of the changes in soil type with depth will be required. References shall be given to the methods of interpretation used.
 - In addition, the CPT data shall be provided in a format agreed with the Investigation Supervisor following completion of the ground investigation for use in CPeT-IT software.

Ground Investigation Schedule

Table 1 Proposed Trial Pit (TP) Locations (approximate centre point)

TP	E*	N*	Estimated Depth below beach level	Purpose
500	300218.1	381329.7	3m	To confirm alignment and structure geometry at termination of West Rhyl scheme.
514	300391.5	381541.2	3m	To locate toe and confirm geometry of existing coastal defence structure.
525	300663.3	381743.1	3m	To locate toe and confirm geometry of existing coastal defence structure.
555*	300702.9	381782.0	3m	To locate alignment of SeaQuarium Intake and Outfall Pipes.
556	300726.2	381809.8	3m	To confirm the terminal point of the visible existing stepped revetment.
557	300781.2	381871.8	3m	To locate toe and confirm geometry of existing coastal defence structure.
558	300864.7	381939.6	3m	To locate toe and confirm geometry of existing coastal defence structure.
559	300983.6	382006.5	3m	To locate toe and confirm geometry of existing coastal defence structure.
560	301063.7	382045.0	3m	To locate toe and confirm geometry of existing coastal defence structure at the existing point of access.
561	301156.9	382091.1	3m	To locate toe and confirm geometry of existing coastal defence structure. If the transition in existing revetment profile is found TP 562 could be omitted.
562	301169.3	382096.7	3m	To locate toe and confirm geometry of existing coastal defence structure.
563	301375.4	382207.1	3m	To locate toe and confirm geometry of existing coastal defence structure. If the transition in existing revetment profile is found TP 564 could be omitted.
564	301403.5	382218.7	3m	To locate toe and confirm geometry of existing coastal defence structure.
565	301775.2	382358.5	3m	To locate toe and confirm geometry of existing coastal defence structure.
566	301856.8	382386.1	3m	To locate toe and confirm geometry of existing coastal defence structure.
567	301995.2	382436.0	3m	To locate the toe and confirm the profile of the existing rock armour revetment.

*Location of Trial Pits are to be confirmed on-site and adjusted accordingly to suit purpose.

Table 2 - Proposed CPT Locations (to local grid) to confirm ground conditions and absence of existing structure.

CPT	E	N	Depth to (m OD)
501	300220.4	381334.1	-6m OD
503	300237.8	381366.0	-6m OD
504	300267.3	381396.4	-6m OD
505	300296.7	381426.8	-6m OD
506	300326.1	381457.2	-6m OD
507	300355.5	381487.7	-6m OD
511	300368.3	381505.4	-6m OD
512	300377.5	381522.7	-6m OD
515	300391.9	381545.6	-6m OD
517	300423.1	381568.9	-6m OD
518	300449.2	381586.6	-6m OD
519	300497.1	381620.6	-6m OD
520	300545.1	381654.6	-6m OD
521	300574.3	381677.0	-6m OD
522	300603.4	381699.4	-6m OD
523	300630.3	381724.2	-6m OD
524	300657.2	381749.1	-6m OD
526	300660.8	381746.4	-6m OD
527	300669.8	381758.5	-6m OD
528	300664.1	381762.2	-6m OD
529	300678.4	381770.7	-6m OD
530	300672.3	381774.7	-6m OD
531	300688.6	381782.0	-6m OD
532	300680.5	381787.3	-6m OD
533	300693.6	381789.3	-6m OD
534	300687.1	381794.8	-6m OD
535	300704.5	381799.7	-6m OD
536	300697.0	381806.1	-6m OD
537	300709.7	381807.8	-6m OD
538	300703.2	381813.4	-6m OD

Table 3 - Proposed Magnetometer Cone (CPT-M) Locations (to local grid) to prove absence of pier foundations/existing structures

CPT-M	E	N	Depth to (m OD)
502	300229.1	381350.1	-3m OD
508	300358.3	381491.4	-3m OD
509	300361.0	381495.1	-3m OD
510	300364.6	381500.3	-3m OD
513*	300386.7	381540.0	-3m OD
516	300397.1	381551.3	-3m OD
539	300687.9	381788.1	-3m OD
540	300689.5	381790.5	-3m OD
541	300692.8	381795.6	-3m OD
542	300694.5	381798.2	-3m OD
543	300696.1	381800.7	-3m OD
544	300697.8	381803.2	-3m OD
545	300699.4	381805.7	-3m OD
546	300701.1	381808.2	-3m OD
547	300682.2	381791.1	-3m OD
548	300684.1	381793.3	-3m OD
549	300688.2	381797.9	-3m OD
550	300690.2	381800.2	-3m OD
551	300692.1	381802.4	-3m OD
552	300694.1	381804.7	-3m OD
553	300696.1	381806.9	-3m OD
554	300698.1	381809.2	-3m OD

*location of CPT-M to be determined once alignment of Sea Aquarium outfall has been determined.