

Bluefield Land Limited

**Former Pontardawe Foundry, Old Foundry
Road, Pontardawe, SA8 4EZ**

Summary Earthworks Specification

12360/GNS/24/SES

CLIENT: Bluefield Land Limited

PROJECT: Former Pontardawe Foundry, Old Foundry Road, Pontardaw

TITLE: Summary Earthworks Specification

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EXECUTIVE SUMMARY

Bluefield Land Limited are proposing to redevelop the former Pontardawe Foundry off Old Foundry Road, Pontardawe for light commercial end use.

The site was previously investigated by Integral Geotechnique (Wales) Limited in 2007 initially and 2019, and reference should be made to the following report:

- Preliminary Site Investigation Report Ref. 9903/RB/07 dated May 2007,
- Site Investigation Report Ref. 12360/RAH/19/SI/RevB dated August 2023.

The site is located to the south of Arthur Terrace, in Pontardawe, at a National Grid Reference of SN 726 041, see Figure 1. Access was gained off Old Foundry Road, along the south-eastern boundary of the site.

The site is roughly rectangular in shape and occupies an area of approximately 0.75 hectares.

The former foundry buildings and neighbouring church that occupied the site have been demolished and a large stockpile of materials was located in the north-east of the site, comprising demolition materials, covering a maximum of 55m by 36m and up to four metres high.

We understand below ground structures including foundations, services etc remain in-situ. The existing site plan is provided in Figure 2, whilst the outline development proposals are provided in Figure 3.

The following works will be required prior to the site being developed.

1. Site Clearance

- a) Following site strip, all exposed formations should be visually inspected and handpicked of any identified ACM. Additionally, any excavated made ground materials, any processed stockpiled soils, any encountered buried foundations, service runs/ducts, pipework etc should also be visually inspected and handpicked of any identified ACM.;
- b) Identify locations of Japanese Knotweed and/or other invasive plant species; and treat appropriately;
- c) Identification of buried services/sewers, protection/easement to live services or diversion as necessary;
- d) Felling of saplings/trees and site scrape of vegetation;
- e) Planing out of tarmac hardstandings, to be set aside for re-use at a later date.
- f) Breaking out of existing concrete hardstanding and slabs, and processing to 6F2 grade

EXECUTIVE SUMMARY (CONTINUED)

- g) Processing and sorting of existing stockpile materials identified on site
- h) Removal of all fly tipped materials and disposal off site

2. Engineering Earthworks

- a) Stop off redundant services at site boundaries, if not already completed by the demolition contractor previously
- b) Excavate the areas previously occupied by buildings, hardstandings and/or covered with imported fill/made ground materials, to a minimum depth of 2m below existing ground level or until original undisturbed ground is encountered (if this is less than 2.0m), as directed by the Engineer, including emptying any below ground tanks and containers left behind. The finished plateau level must be free from obstructions to at least 2.0m beneath the existing ground level. All obstructions to remain in-situ below 2.0m will require surveying and there locations recorded to be provided to applicable contractors;
- c) Extra-over for breaking up any residual slabs, concrete sub-structures/foundations;
- d) Crush concrete/obstructions and process to Class 6F2 grade;
- e) Remediate contaminated soils as necessary. Remove off site structurally unsuitable materials (hazardous, hazardous non-reactive and/or inert waste) and replace with imported suitable fill material; or if feasible, treat and re-use
- f) Prior to filling proof roll reduced formation any soft spots to be replaced with suitable structural fill;
- g) Backfill and raise the reclaimed ground as necessary with site arising suitable structural fill, processed materials and imported materials and re-grade the site to the required profile;
- h) The prepared engineered ground must be capable of supporting the proposed piling plant, construction plant and all infrastructure including drainage and other services, hardstandings and roads
- i) Surface water management during and after the works and their discharge;
- j) Collection and treatment of any contaminated groundwater;
- k) Validation sampling/testing of the remediated plateau;
- l) Field geotechnical testing of the remediated plateau;
- m) Liaisons with Regulatory Authorities.

Notes

- 1. Earthworks will be seasonal. It is anticipated that work between October and March will not be undertaken without the Engineers approval.
- 2. Earthworks to be suspended during inclement weather from March to October.
- 3. Any material placed in stockpile prior to re-use or removal off site shall be adequately shaped and sealed to prevent ingress of water and deterioration. Stockpiles shall be located away from site boundaries with surface water run-off controlled away from stockpiles.

EXECUTIVE SUMMARY (CONTINUED)

4. Plant movement shall be on designated haul roads adequately prepared to prevent damage to the sub-grade.
5. Final slab levels and foundation options must take account of arisings from groundworks.
6. It is recommended that a stability assessment or similar is completed on the retaining wall and embankment in the north of the site prior to redevelopment. Additionally, when engineering levels are understood, an assessment of the temporary works and permanent works required to ensure the short, medium and long-term stability of the bank and canal is maintained should be completed. This review should also consider the impact and implications of the settlement generated by both the increase in site levels and the applied weight of the proposed apartment block in this area.

1.0 SITE DESCRIPTION AND RECENT HISTORY

- 1.1 The site is located to the south of Arthur Terrace, in Pontardawe, at a National Grid Reference of SN 726 041, see Figure 1. Access to the site was gained off Old Foundry Road, along the south-eastern boundary of the site.
- 1.2 The site is roughly rectangular in shape and occupies an area of approximately 0.75 hectares. The boundaries of the site are defined by an industrial estate access road to the south-east, the residential properties of Holly Street to the south-west, an approximately 2.0m high embankment to the former Swansea Canal with Arthur Terrace beyond and an approximate 1.5m high retaining wall to Holly Street to the north-west, and vacant land to the north-east, see Figure 2.
- 1.3 The former foundry buildings and neighbouring church that occupied the site have been demolished and a large stockpile of materials was located in the north-east of the site, comprising demolition materials, covering a maximum of 55m by 36m and up to four metres high. Smaller bunds of material were located in the three access ways and the site was partially surrounded by Heras fencing at the time of the previous site investigations.
- 1.4 The main part of the site is situated on largely flat ground, sloping very slightly from north-west to south-east sitting between 33m and 31m AOD. There is a more significant change in level in the north of the site, with an embankment from the path level alongside the canal (approximately 36/37m AOD), dropping steeply to the site level at approximately 32mAOD immediately south.
- 1.5 Intégral Géotechnique were previously informed that all services within the site were terminated as part of the demolition works. Utility plans indicate the overhead power cables entering the north-west corner of the site. A disused, above ground steel pipe runs from north-east to south-west in the north-eastern corner of the site, along the northern boundary. The pipe terminates before entering the ground in the approximate centre of the northern boundary.
- 1.6 Some invasive plant species may be encountered including Japanese Knotweed. A vegetation survey of the site is recommended.

1.0 SITE DESCRIPTION AND RECENT HISTORY (CONTINUED)

- 1.7 The 1878 edition of the map showed the site to be occupied by an Iron Foundry. The foundry buildings were shown to be present in the central part of the site. The parts of the site to the north-east and south-west of the foundry were shown to be undeveloped. An Old Limekiln was indicated to the north-west of the site. A canal was present on an embankment running along the north-west boundary of the site. The land to the north and north-west of the site was mostly developed for residential use. A gas works was present to the west of the site, approximately 110m west-north-west. The land to the south and east was undeveloped. Pontardawe town was shown to the south-west of the site.
- 1.8 The 1918 edition of the map showed no change to the foundry part of the site. No additional buildings or features were present. A Methodist Chapel was now present in the south-western part of the site. Further residential development had taken place to the north and south-west of the site and a printing works was indicated approximately 50m to the south-west. The land to the south and east remained undeveloped.
- 1.9 Between 1918 and 1941/1942 there was no significant change to the site. The surrounding areas had been further developed for residential use and the gas works was no longer present.
- 1.10 The 1941/1942 editions of the map showed the development of additional foundry buildings to the north of the existing buildings. A circular feature was shown immediately to the north of the northern site boundary. A large Sheet Mill had been developed some 100m to the south of the site, together with associated railway tracks, tanks and chimneys. The land between the site and the Sheet Mill remained as undeveloped.
- 1.11 The 1964/1965 edition of the map showed the site to now be occupied by 'Works'. No significant change to the buildings had taken place, with the exception of the additional new building in the north-east corner of the site. The circular feature previously identified just outside the northern boundary was now shown as a pond. The southern part of the site was occupied by an English Methodist Church.
- 1.12 The 1974 edition of the map showed very little change to the site. A chimney was now shown as part of the 'Works' located in the approximate centre of the site. The land to the south and east of the site was now shown to be an industrial estate with several buildings and uses shown, including a factory, a bakery, a council yard and a bus depot. The pond formerly present immediately to the north of the site was no longer shown. There have been no significant changes to the land to the north and west of the site.

1.0 SITE DESCRIPTION AND RECENT HISTORY (CONTINUED)

- 1.13 There have been no significant changes to the site between 1974 and present day. The foundry and the church closed and became disused, the dates of this are unknown. These were demolished in 2006 and a layer of crushed stone placed across the site.

2.0 GENERAL REQUIREMENTS

- 2.1 At present the site is unused with all former above ground structures including the foundry buildings and church having been demolished.
- 2.2 The proposed redevelopment will comprise fifteen light commercial properties with infrastructure and limited soft landscaping- and two drainage basins. The proposed site layout is provided in Figure 3.
- 2.3 Reclamation works will be carried out as part of a site remediation operation to render the site suitable for such commercial development.
- 2.4 An acceptable site is to be achieved by site clearance, demolition/removal of existing sub-structures/obstructions, treatment and/or removal of obviously contaminated soils, treatment and/or removal of groundwater contamination, and the placing of suitable reprocessed materials in a controlled engineering manner (well compacted layers) to form a site suitable for development.
- 2.5 The existing levels will be reduced by up to 2.0m to sub-formation level. Locally, excavations may be extended as deemed necessary, either to deal with soft spots, made ground, contamination, large obstructions, pits and basements and buried tanks etc. Any grossly contaminated underlying made ground and/or original ground will be removed and treated/processed to provide suitable material for re-use as filling.
- 2.6 Following site clearance and reclamation earthworks (including importation of suitable structural fill if necessary) the site will need to be finished to final development levels with hard cover of roads and buildings or in soft landscaped areas with acceptable landscape sub-soil and topsoil materials.

2.0 GENERAL REQUIREMENTS (CONTINUED)

- 2.7 Based on the contamination test data available at the time of writing a single elevated concentration of cyanide which exceeds commercial screening values was identified in the made ground deposits. In addition asbestos was identified in eight samples of made ground. Appropriate risk assessment and subsequent mitigation measures are required. These materials will require capping with hard cover of roads and buildings or if any of the impacted soil is to be retained at the ground surface in any areas of soft landscaping, a cover system comprising a minimum 600mm thick cap of clean/inert subsoil/topsoil with an underlying hi-visibility, anti-mixing/anti-dig geotextile separation/warning membrane would be adequate to prevent site end users coming into contact with the contaminated made ground deposits.
- 2.8 Following site strip, all exposed formations should be visually inspected and handpicked of any identified ACM. Additionally, any excavated made ground materials, any processed stockpiled soils, any encountered buried foundations, service runs/ducts, pipework etc should also be visually inspected and handpicked of any identified ACM.
- 2.9 These works should be carried out by a suitably licenced contractor in accordance with an appropriate risk assessment and managed in accordance with the requirements of the Control of Asbestos Regulations (2012).
- 2.10 Any handpicked ACM should be disposed off-site at a suitable licensed facility as hazardous waste. Daily records and waste transfer notes should be kept in order to document the identification and subsequent removal of any ACM. These records and waste transfer notes should be made available for review as they will be required for potential remediation verification.
- 2.11 Following the completion of the asbestos remedial works outlined above, all proposed areas of soft landscaping that are underlain by made ground should be capped with a minimum thickness of 600mm of clean imported subsoil and topsoil with an underlying hi-visibility, anti-mixing/anti-dig geotextile separation/warning membrane. This would break all the above listed relevant pollutant linkages and removing the potential risk to future end users.

3.0 BACKGROUND INFORMATION

3.1.1 The following reports have been made available:

- Preliminary Site Investigation Report Ref. 9903/RB/07 dated May 2007,
- Site Investigation Report Ref. 12360/RAH/19/SI/RevB dated August 2023.

3.2 Reference shall be made to the above documents for more detail and when preparing Method Statements for various sections of the works.

3.3 This report does not supercede the findings or recommendations of the revision B site investigation report.

4.0 SPECIFIC REQUIREMENTS

4.1 GENERAL

- 4.1.1 The purpose of the Works is to enable the proposed re-development and prepare the site for light commercial end use with limited areas of soft landscaping. This will involve the excavation, processing and re-laying of existing fill/made ground material; demolition of surface and buried structures and recycling of materials arising for re-use; dealing with any contamination issues; importation of structural fill materials and grading the site to the agreed finished ground levels. The works will also potentially include processing the large stockpile of materials which is currently present on site.
- 4.1.2 It is recommended that a stability assessment or similar is completed on the retaining wall and embankment in the north of the site prior to redevelopment. Additionally, when engineering levels are understood, an assessment of the temporary works and permanent works required to ensure the short, medium and long-term stability of the bank and canal is maintained should be completed. This review should also consider the impact and implications of the settlement generated by both the increase in site levels and the applied weight of the proposed apartment block in this area.
- 4.1.3 The specification for the required earthworks shall be in accordance with the DTp Specification for Highway Works.
- 4.1.4 Remediation of contamination shall comply with the current guidelines set out in DEFRA/EA, agreed Soil Screening Values (SSVs) or risk assessments and site specific target levels (SSTL's) for those contaminants of concern (COC). The Suitable 4 Use Level (S4ULs) published by LQM have been adopted as critical concentrations against which soil contaminants concentrations can be compared. In the absence of additional published S4ULs, the Category 4 Screening Levels (C4SLs) derived by DEFRA and Soil Screening Values (SSVs) derived by Atkins ATRISK^{soil} for a commercial end use have been adopted, where considered appropriate.
- 4.1.5 Imported structural fill must be clean naturally occurring, devoid of anthropogenic contamination and comply with Appendix B - Contamination Testing of Imported Soils
- 4.1.6 The operational and performance requirements for the Works are set out below.

4.2 SITE CLEARANCE

- 4.2.1 All scrap, refuse, fly tipped materials and any tanks should be removed from site. Large stockpile of soils present on site to be processed and suitability for re-use on site to be assessed.
- 4.2.2 A full survey of the site should be carried out to determine if invasive plant species such as Japanese Knotweed are present. Any identified areas will then need to be treated in line with accepted industry practices based upon NRW guidelines. The treatment shall be in the form of an appropriate and effective herbicide spray over the required period for at least 95% eradication coupled with bulk removal of rhizome materials.
- 4.2.3 Prior to remediation/reclamation works commencing on site, if not already done so all existing services should be located and either diverted, protected or terminated, as appropriate, at site boundaries. Appropriate easements should be adopted if services are to remain in-situ.
- 4.2.4 Site scrape of surface vegetation/topsoil, felling and chipping of trees, removal of tree stumps and roots and chipping of, all to be set aside for landscaping or disposal
- 4.2.5 Planing of tarmac surfaces to be set aside for re-use.
- 4.2.6 Surface concrete floor slabs/hard standings to be broken out and processed to 6F5 grade and stockpiled for potential re-use on site or off site disposal.

4.3 DEMOLITION

- 4.3.1 Foundations, basement walls, pits, drainage runs, disused services, manholes etc. associated with historic buildings shall be removed such that land for development is free from obstructions to a depth of at least 2m below existing levels (i.e. allowing for excavation and processing of made ground materials prior to commencement of fill works). Any buried structures beneath this level e.g. deep culverts/pipelines will be treated in accordance with the requirements of IGWL and the Employer's Civil and Structural Engineer.
- 4.3.2 All concrete, masonry and any other hard materials/obstructions shall be demolished and/or excavated and shall be passed through a crusher to provide well-graded material of maximum gauge 125mm. Any unsuitable material arising from this operation e.g. steel reinforcement, girders, metal, cloth, timber, plastic etc. shall be removed and taken off-site. The crushed material shall be set aside for re-use.

4.3 DEMOLITION (CONTINUED)

4.3.3 All material shall be screened and tested for its chemical and physical stability and suitability for the works. This shall include screening and testing for asbestos fibres, and organic compounds and heavy metal content. Appendices A and B detail the required criteria for suitability.

4.3.4 Bitumen bound Tarmac containing materials to be crushed and stockpiled separately for reuse within the reclamation works. Bound materials found to contain tar will be classified as hazardous waste for disposal to a suitably licenced landfill facility.

4.4 EXCAVATION AND FILLING

4.4.1 The made ground shall be excavated down to a depth of at least 2.0m below the existing ground level, or until competent original undisturbed ground is encountered if this is less than 2.0m, over the previously developed development area. The material shall also be processed to ensure the removal of any unsuitable materials e.g. asbestos, timber, metal, plastics etc. and any large particles greater than 125mm. Locally excavations will be deepened where necessary.

4.4.2 The Works shall be phased to suit the Employer's Development programme and the Contractor's Method of Working.

4.4.3 Prior to filling, the reduced formation shall be proof rolled and all soft and unsuitable materials exposed at the reduced formation level must be removed and replaced with suitable compacted material.

4.4.4 The moisture content of the fill shall be controlled so that it does not exceed the Proctor Compaction Test (as defined in BS 1377 (1990) Part 4.CL.2.4) Optimum Moisture Content + 1.5%. Compaction shall be considered satisfactory when the compacted material has a dry density equal to or greater than 95% of its maximum dry density and not greater than 10% air voids. The compaction requirements are provided in Appendix C – Table 6/4 Compaction Requirements.

4.4.5 Unsuitable Material shall be classified as follows:

- peat, materials from swamps, marshes and bogs
- logs, stumps, sawdust and perishable materials
- materials in a frozen condition
- materials susceptible to spontaneous combustion (except unburnt colliery spoil);
- clay of liquid limit exceeding 90% and/or plasticity index exceeding 65%,
- domestic refuse
- concentrated mineral oils

4.4 EXCAVATION AND FILLING (CONTINUED)

- tyres
- plastic
- liquid wastes
- biodegradable or putrescible wastes
- other similar materials as directed by the Engineer
- asbestos
- expansive materials

4.4.6 Suitable Material

General Earthworks Materials Class 1 and 2

- (i) Cohesive materials include clays and marls with up to 20 per cent of gravel or rock and having a moisture content not less than the value of the plastic limit (determined in accordance with clause 5 of BS 1377:1990 Part 2) minus 4. Maximum particle size 125mm.
- (ii) 'Well-graded granular and dry cohesive soils' includes clays, shales and marls containing more than 20 per cent of gravel and/or having a moisture content less than the value of the plastic limit (determined in accordance with clause 5 of BS 1377:1990 Part 2) minus 4; well graded sands and gravels with a uniformity coefficient exceeding 10. Maximum particle size 125mm.
- (iii) 'Uniformly-graded material' includes sand and gravels with a uniformity coefficient of 10 or less, and all silts and pulverised fuel ashes. Any soil containing 80 per cent or more of material in the particle size range 0.06 and 0.002mm will be regarded as silt for this purpose.

4.4.7 Marginal material generated on site can be treated by aeration depending on weather conditions such as wind, humidity and temperature. Alternatively, the material can be modified by the addition of lime, or an alternative product to make the material acceptable. The Contractor shall provide the Engineer with all necessary method statements and health and safety assessments for these activities (Note that during winter months or during inclement weather periods of conditioning by weather alone are likely to be slow or negative leading to programme extensions).

4.4.8 Where material >125mm is encountered, including concrete slab, foundations and demolition brick/concrete materials, the oversize material shall be removed by an approved method and removed off-site or if appropriate may be processed (i.e. crushed and screened) to a DTP Class 6F5 specification and stockpiled for later re-use at a location agreed with the Client.

4.4 EXCAVATION AND FILLING (CONTINUED)

- 4.4.9 The Contractor shall, with reference to any available site investigation information and any desk study archives, plus any further testing they deem necessary, above and beyond that required by Intégral Géotechnique (Wales) Limited classify any site arising materials or materials imported from off-site in accordance with Appendix A - Table 6/1A Acceptability Criteria: Physical Properties and Appendix B Contamination Testing for Imported Soil. Any further testing the Contractor considers necessary in order to assist them in the classification of materials shall be agreed with Intégral Géotechnique (Wales) Limited.
- 4.4.10 The Contractor shall allow in their programme and method of working for the site classification of materials and the time taken for testing, sampling and interpretation of results. The Contractor's attention is drawn to the need in their programme to allow time for sampling, carrying out the required laboratory testing, reporting and assessment of the results
- 4.4.11 Any unsuitable materials from the works which cannot be treated are to be relocated off site to a suitable licensed tip. Any bulk asbestos contaminated materials identified on site will be made safe, prior to depositing in a suitably licensed tip by a licensed Contractor.
- 4.4.12 Hardcore and granular fill, either imported or site processed as above, shall be good clean hard brick, concrete, hardstone, coarse gravel, sound slab or other approved material free from dust and foreign matter, complying with DTp Class 6F5 specification. Screenings will be required to fill surface voids. (Reference should be made to BRE Digest 522 parts 1 and 2).
- 4.4.13 Where mature trees/hedges are within influencing distance of the proposed buildings, allowances should be made for the removal of any associated roots that may become exposed in any proposed nearby earthworks and foundations excavations. Any such works should be conducted in accordance with appropriate industry guidance such as the code of practice recommended by the National House Building Council (NHBC).
- 4.4.14 Exposed formations should be protected from site traffic and inclement weather in order to preserve their integrity. Any soft spots/areas should be removed and replaced with well compacted site won or imported granular fill material.
- 4.4.15 Should ground levels be proposed to be raised by more than 0.6m, then a review of the settlement characteristics should be undertaken. The outcome of such a review may conclude that settlement mitigation measures, such as surcharge of the ground prior to ground raising activities, may be required to ensure that residual settlement characteristics are within tolerable criteria.

4.4 EXCAVATION AND FILLING (CONTINUED)

- 4.4.16 Landscaping sub-soil and topsoil materials shall have acceptable soil forming properties, be free of pathogens, potentially toxic elements, have appropriate growth properties, have no weeds or invasive plant matter, have no stones or sharps or extraneous/anthropogenic materials.

5.0 WORKMANSHIP

- 5.1 The Contractor shall arrange for the rapid disposal of any water shed on to all earthworks during construction or which enters the earthworks from any source.
- 5.2 Prior to placing fill material the existing ground shall be proof rolled to the satisfaction of the Engineer. Soft or unsound spots in the formation or under areas to be filled shall be excavated as instructed by the Engineer. The resultant excavation shall be backfilled with approved material deposited and compacted as specified for the forming of filled areas. For backfilling of excavations below standing water the Contractor shall use only free draining material. Such material may be deposited below water without the associated use of compaction plant.
- 5.3 All filling materials other than rock shall be deposited in layers not exceeding 250mm loose depth or such depth to ensure compatibility with the material type and compaction plant unless as a result of compaction trials the Engineer approves a greater depth. The compaction requirements are provided in Appendix C.
- 5.4 Areas to be filled shall be clear of rubbish, scrap material, topsoil and standing water when fill material is placed.
- 5.5 Where filling is to be placed on sloping ground (steeper than 1 vertical to 30 horizontal) the surface of the ground shall be benched in steps to enable blending of the fill with the existing slope, and may include, as necessary, under-draining for dealing with water.
- 5.6 Fill material in areas of benching shall be carefully placed and compacted to ensure that no voids occur at the vertical steps of the benching.
- 5.7 Placing and compacting of fill material on a lower bench shall continue to a level one compacted layer thickness above an adjacent higher bench before material is placed upon the latter bench.
- 5.8 Four additional passes of the approved compaction plant shall be made over a width of 2m each side of each vertical face immediately following the compaction of the first layer of material on each bench.

5.0 WORKMANSHIP (CONTINUED)

- 5.9 All filling material used in earthworks shall be compacted in accordance with Table 6/4 and the Contractor shall submit to the Engineer for approval their proposals for the compaction of each main type of material to be used in the filled areas, the types of plant to be used, the number of passes and the loose depth of layer. Compaction shall be considered satisfactory when the compacted material has a dry density equal to or greater than 95% of its maximum dry density and not greater than 10% air voids.
- 5.10 Fill shall be placed in layers which shall extend over the full width of the works and each layer shall be thoroughly compacted with a roller of approved capacity to a thickness not greater than that agreed before the next layer is placed.
- 5.11 Where for any reason the moisture content of acceptable material changes to a value unacceptable for compaction, the Contractor shall raise or lower the moisture content until satisfactory compaction can be achieved.
- 5.12 Control testing shall be carried out on each layer of fill material. Testing scope and frequency shall comprise:

Material characteristics -

chemical characteristics (prior to import)	three per source
chemical characteristics	1 per 500m ³
grading	1 per 500m ³
dry density relationship	1 per 500m ³
plasticity	1 per 500m ³
moisture content	1 per 100m ³

In situ placement performance

In-situ CBR (highways)	1 per 500m ²
In-situ density/air voids determination (optional)	3 per 1000m ³
In-situ plate test/dynamic probing	1 per 500m ²

- 5.13 In-situ plate load testing/dynamic probing should be undertaken during the works at approximately 1m intervals and following completion of the filling works. A minimum of 3 No. tests per area, or testing on alternate commercial units is recommended dependent on proposed site layout.
- 5.14 A suitably qualified Engineer from Intégral Géotechnique (Wales) Limited will regularly attend on site from the commencement of work on site up to the completion of the site filling works.

5.0 WORKMANSHIP (CONTINUED)

- 5.15 Intégral Géotechnique (Wales) Limited will submit to the Contractor, a programme of chemical testing of soils during the site filling that will be undertaken based on the requirements of Appendix B.
- 5.16 The purpose of the chemical testing shall be to confirm the suitability of the materials and enable appropriate certification to be made.
- 5.17 Intégral Géotechnique (Wales) Limited will arrange for all chemical testing to be undertaken at an approved laboratory. The laboratory shall hold UKAS/MCERTS accreditation for the specified determinants. The minimum frequency of testing for the purpose of classifying material is given in 5.12 above.
- 5.18 Intégral Géotechnique (Wales) Limited will arrange for the provision of all the necessary equipment, sample containers and transport of samples to a laboratory. The Contractor will be informed within 24 hours of receipt of test results. The Contractor shall be immediately informed of any results exceeding the values specified.
- 5.19 All laboratory contaminant test results are to be reported within ten working days from the time of sampling.
- 5.20 It may be necessary to specify additional testing after the results of the original tests are available.
- 5.21 Testing and reporting shall be carried out in accordance with BS 7755 unless otherwise specified.
- 5.22 Samples shall be examined for characteristics such as colour, odour, and any non-soil materials, and the findings recorded.
- 5.23 The percentage volume of the following categories of matter in the sample shall be estimated and each category described:
- i. 'Inert' material, less than 2mm (e.g. clay, sand)
 - ii. 'Inert' material, greater than 2mm, (e.g. stones, glass, pottery etc)
 - iii. Organic material - non-putrescible
 - iv. Organic material - putrescible
- 5.24 Test results for the contamination ground investigation shall be accompanied by an unambiguous description of sample preparation, extraction and analysis method used

6.0 CONTAMINATION

- 6.1 The site shall be investigated and remediated in accordance with the current national guidelines and to the satisfaction of Swansea Council and Natural Resources Wales (NRW).
- 6.2 Air quality shall be monitored by the contractor, to include both nuisance dust and respiratory dust, to the satisfaction of the Local Environmental Health Officer and NRW.
- 6.3 Materials within at least 1m of the surface of the reclaimed plateau shall be uncontaminated to the extent that the risk posed to end users, which will include residents with private gardens, is acceptably low. Materials deeper than 1m below the surface of the reclaimed land shall be uncontaminated to the extent that the risk posed to construction/maintenance workers and end-users or infrastructure works is acceptably low.
- 6.4 Materials deeper than 1m below the surface of the reclaimed plateau shall be uncontaminated to the extent that the risk posed to the aquatic environment is sufficiently low to be acceptable to Natural Resources Wales.
- 6.5 On completion of the reclaimed plateau a series of trial pits on 50m x 50m grid with sampling and testing shall be undertaken. For the materials to be included in the permanent works, the tests undertaken shall satisfy the agreed SSV's/SSTL's with respect to the recommended contaminant concentrations for the proposed end-use.
- 6.6 If the tested materials do not satisfy these criteria then depending on the measured concentrations of various contaminants and their volume, they should either be removed off site or, if possible, treated by techniques such as bio-remediation. After such treatment and provided that a) the required clean-up standards have been achieved and b) the materials are acceptable geotechnically, then these could be re-used in the works.
- 6.7 The reprocessed acceptable materials shall be sampled and tested for chemical elements/compounds and the results shall satisfy the appropriate SSV's or SSTL's for the intended end-use which will include commercial properties with limited soft landscaping. The materials for re-use shall be non-shrinkable, non-expansive and non-frost susceptible. The frequency of sampling and testing shall be 4 N° tests per 1000m³ of reprocessed materials.

6.0 CONTAMINATION (CONTINUED)

- 6.8 Samples of reprocessed materials shall also be tested for leachability characteristics to ensure that any leachate from site does not adversely affect the aquatic environment.
- 6.9 Any imported materials shall be free of contamination. The imported materials shall be free of any asbestos, hydrocarbons and oil based contaminants. In addition, they should satisfy SSV's for the proposed commercial development.
- 6.10 Sufficient sampling and testing of the imported fill materials shall be carried out to ensure that the above contamination requirements are achieved. The frequency of sampling and testing, as a minimum, shall be 4 N° tests per 1000m³ of imported fill, and at least 1 N° test from each source if the quantity of fill from that source is less than 250m³.
- 6.11 The sampling and testing shall also be in accordance with the requirements of Natural Resource Wales and the Local Authority's Environmental Health Officers.
- 6.12 The reprocessed and imported fill shall be such that it does not generate gases such as methane, carbon dioxide or radon.
- 6.13 The imported materials shall be such that any future excavations will not require any precautionary measures with respect to ground contamination other than normal good health and safety/hygiene practices.
- 6.14 Areas of proposed soft landscaping will require an alert membrane beneath a capping layer (minimum thickness of 600mm) of clean sub-soil and topsoil (by others) with an underlying hi-visibility, anti-mixing, anti-dig geotextile separation/warning membrane.

7.0 FOUNDATIONS AND GROUND FLOOR SLABS

- 7.1 The prepared ground shall be suitable as a working platform for the proposed foundation construction works and for the use of piling equipment. A working platform for tracked plant will have to be constructed, tested and validated prior to any piling works commencing.
- 7.2 Ground floor slabs will be a suspended construction.

8.0 ACCESS ROADS, CAR PARKING AREAS AND SERVICE RUNS

- 8.1 The earthworks including the compaction works, will be carried out such that the whole of the reclaimed plateau meets with the following criteria:
- 8.2 California Bearing Ratio (CBR) value of at least 4% within 750mm of the ground surface of the reclaimed plateau. Once the controlled earthworks have commenced, in-situ CBR tests will be undertaken to confirm the CBR values are achieved.
- 8.3 The preparation of the reclaimed plateau shall be such that twelve years after completion of the reclaimed plateau and housing, the total settlement at any point on the reclaimed plateau (other than beneath the houses) shall not exceed 25mm as a result of change in volume of the fill materials or consolidation of underlying in-situ materials. During this period, the differential movement between the structures and the adjacent finished ground levels shall not be more than 20mm. Along the new access roads, car parking areas and service runs, the differential settlements shall not exceed 1 in 400 as a result of change in volume of the fill materials or consolidation of the underlying in-situ materials.
- 8.4 There are likely to be loose materials within the backfilled trenches of the existing, either live or disused services and in the locations in which buried obstructions have been removed. Any loose materials, if not removed during the earthworks operation, will be removed and recompacted to achieve the above settlement criteria.
- 8.5 Disused services shall either be removed and replaced with well compacted materials or grouted up with an appropriate cementitious grout mix.

9.0 FINISHED PLATEAU LEVELS

- 9.1 Reclaimed plateau levels will depend on the original state of compaction of the fill, the extent of obstructions to be removed, the extent of any voids to be filled and the amount of unsuitable material within the fill.
- 9.2 Finished development levels are unconfirmed at the time of writing. The surface of the reclaimed plateau shall be a minimum of 600-800mm below the intended finished level of the soft landscaped areas i.e. approximately 750-950mm below the proposed floor slab levels.
- 9.3 The surface of the reclaimed plateau will be graded to temporary ditches including settlement ponds to prevent run-off, as required.

10.0 CERTIFICATION

- 10.1 All investigation works and remediation works, physical and chemical, must be designed, monitored and certified by Intégral Géotechnique with the reports and certification assignable to the Client. All these works shall be to the agreement and approval of the relevant regulators, including the Local Authority's Environmental Health Department and NRW.
- 10.2 If the reclamation works are to be undertaken in phases, testing and certification of each phase of works will be required prior to works being commenced on following phases. This is to ensure that the development areas comply with the Specification prior to phased handover to the Client.

APPENDIX A

TABLE 6/1A ACCEPTABILITY CRITERIA: PHYSICAL PROPERTIES

APPENDIX 6/1 :

ACCEPTABLE CRITERIA FOR FILL MATERIALS (CLASS 1 & 2)

TABLE 6/1A PHYSICAL PROPERTIES (BS 1377)	
PARAMETER	LIMITS
MOISTURE CONTENT	OPTIMUM MOISTURE CONTENT + 1.5% - 2.0%
ATTERBERG LIMITS	1.2 x P.L.
COMPACTION TEST	OPTIMUM MOISTURE CONTENT/MAXIMUM DRY DENSITY BY 2.5KG METHOD
GRADING	TABLE 6/2 CLASS 1 & 2, (EXCLUDING CLASS 1C, 2D & 2E)
IN SITU DENSITY TEST	95% OF MAXIMUM DRY DENSITY

APPENDIX B

CONTAMINATION TESTING FOR IMPORTED SOIL

Appendix 6/1: Contamination Testing of Imported Materials

All imported materials (excluding garden sub-soil and topsoil) to be placed on site shall be tested as given below in Table 6/1B and shall be:-

- free from asbestos, hydrocarbons, mineral oils, volatile/semi-volatile organic compounds, timber, metal, plastic etc; and;
- not exceed the Threshold Concentration (see Table below) and
- have acceptable physical properties.

	Determinand	Commercial
		Soil Screening Value (SSV) (mg/kg)
Metals Group	Beryllium	12
	Boron	240,000
	Cadmium	190
	Chromium (III)	N/A
	Chromium (VI)	33
	Copper	68,000
	Lead	200
	Mercury	-
	Mercury (Elemental)	58
	Mercury (Inorganic)	1,100
	Mercury (Methyl)	320
	Nickel	980
	Vanadium	9000
	Zinc	730,000
Semi-Metals & Non-Metals	Arsenic	640
	Cyanide	34
	Free Cyanide	-
	Selenium	13,000

PAH	Acenaphthene	84,000
	Acenaphthylene	83,000
	Anthracene	520,000
	Benzo(a)anthracene	170
	Benzo(a)pyrene	35
	Benzo(b)fluoranthene	44
	Benzo(ghi)perylene	3,900
	Benzo(k)fluoranthene	1,200
	Chrysene	350
	Dibenzo(ah)anthracene	3.5
	Fluoranthene	23,000
	Fluorene	63,000
	Indeno(123cd)pyrene	500
	Naphthalene	190
	Phenanthrene	22,000
	Pyrene	54,000
VPH/EPH (TPH)	Aliphatic C5-C6	3,200
	Aliphatic C6-C8	7,800
	Aliphatic C8-C10	2,000
	Aliphatic C10-C12 EPH	9,700
	Aliphatic C12-C16 EPH	59,000
	Aliphatic C16-C35 EPH	1,600,000
	Aliphatic C35-C44 EPH	1,600,000
	Aromatic C5-C7	26,000
	Aromatic C7-C8	56,000
	Aromatic C8-C10	3,500
	Aromatic C10-C12 EPH	16,000
	Aromatic C12-C16 EPH	36,000
	Aromatic C16-C21 EPH	28,000
	Aromatic C21-C35 EPH	28,000
	Aromatic C35-C40 EPH	28,000
BTEX	Benzene	27
	Toluene	56,000
	Ethylbenzene	5,700
	O-Xylene	6,600
	M-Xylene	6,200
	P-Xylene	5,900
Others	Phenol	760
	Asbestos	ND

APPENDIX C

TABLE 6/4 COMPACTION REQUIREMENTS

TABLE 6/4: Method Compaction for Earthworks Materials: Plant and Method (Method 1 to Method 6). (This Table is to be read in conjunction with sub-Clause 612.10)

Type of Compaction Plant	Ref	Category	Method 1		Method 2		Method 3		Method 4		Method 5		Method 6		
			D	N#	D	N#	D	N#	D	N	D	N	N for D = 110mm	N for D = 150mm	N for D = 250mm
Smooth wheeled roller (or vibratory roller operating without vibration)	1	Mass per metre width of roll over 2100 kg up to 2700 kg	125	8	125	10	125	10*	175	4	unsuitable		unsuitable	unsuitable	unsuitable
	2	over 2700 kg up to 5400 kg	125	6	125	8	125	8*	200	4	unsuitable		16	unsuitable	unsuitable
	3	over 5400 kg	150	4	125	8	unsuitable		300	4	unsuitable		8	16	unsuitable
Grid roller	1	Mass per metre width of roll: over 2700 kg up to 5400 kg	150	10	unsuitable		150	10	250	4	unsuitable		unsuitable	unsuitable	unsuitable
	2	over 5400 kg up to 8000 kg	150	8	125	12	unsuitable		325	4	unsuitable		20	unsuitable	unsuitable
	3	over 8000 kg	150	4	150	12	unsuitable		400	4	unsuitable		12	20	unsuitable
Tamping roller	1	Mass per metre width of roll: over 4000 kg	225	4	150	12	250	4	350	4	unsuitable		12	20	unsuitable
Pneumatic-tyred roller	1	Mass per wheel: over 1000 kg up to 1500 kg	125	6	unsuitable		150	10*	240	4	unsuitable		unsuitable	unsuitable	unsuitable
	2	over 1500 kg up to 2000 kg	150	5	unsuitable		unsuitable		300	4	unsuitable		unsuitable	unsuitable	unsuitable
	3	over 2000 kg up to 2500 kg	175	4	125	12	unsuitable		350	4	unsuitable		unsuitable	unsuitable	unsuitable
	4	over 2500 kg up to 4000 kg	225	4	125	10	unsuitable		400	4	unsuitable		unsuitable	unsuitable	unsuitable
	5	over 4000 kg up to 6000 kg	300	4	125	10	unsuitable		unsuitable		unsuitable		12	unsuitable	unsuitable
	6	over 6000 kg up to 8000 kg	350	4	150	8	unsuitable		unsuitable		unsuitable		12	unsuitable	unsuitable
	7	over 8000 kg up to 12000 kg	400	4	150	8	unsuitable		unsuitable		unsuitable		10	16	unsuitable
	8	over 12000 kg	450	4	175	6	unsuitable		unsuitable		unsuitable		8	12	unsuitable

Table 6/4: Method Compaction for Earthworks Materials: Plant and Methods (Method 1 to Method 6) (continued)

(This Table is to be read in conjunction with sub-Clause 612.10)

Vibratory roller		Mass per metre width of a vibratory roll:									
	1	over 270 kg up to 1500 kg	unsuitable	75	16	150	16	unsuitable	unsuitable	unsuitable	unsuitable
	2	over 450 kg up to 700 kg	unsuitable	75	12	150	12	unsuitable	unsuitable	unsuitable	unsuitable
	3	over 700 kg up to 1300 kg	100 12	125	10	150	6	125 10	unsuitable	16	unsuitable
	4	over 1300 kg up to 1800 kg	125 8	150	8	200	10*	175 4	unsuitable	6	16
	5	over 1800 kg up to 2300 kg	150 4	150	4	225	12*	unsuitable	unsuitable	4	6
	6	over 2300 kg up to 2900 kg	175 4	175	4	250	10*	unsuitable	400 5	3	5
	7	over 2900 kg up to 3600 kg	200 4	200	4	275	8*	unsuitable	500 5	3	5
	8	over 3600 kg up to 4300 kg	225 4	225	4	300	8*	unsuitable	600 5	2	4
	9	over 4300 kg up to 5000 kg	250 4	250	4	300	6*	unsuitable	700 5	2	4
	10	over 5000 kg	275 4	275	4	300	4	unsuitable	800 5	2	3
Vibrating plate compactor		Mass per m ² of base plate:									
	1	over 800kg up to 1100 kg	unsuitable	unsuitable		75	6	unsuitable	unsuitable	unsuitable	unsuitable
	2	over 1100 kg up to 1200 kg	unsuitable	75	10	100	6	75 10	unsuitable	unsuitable	unsuitable
	3	over 1200 kg up to 1400 kg	unsuitable	75	6	150	4	150 8	unsuitable	unsuitable	unsuitable
	4	over 1400 kg up to 1800 kg	100 6	125	6	150	4	unsuitable	unsuitable	8	unsuitable
	5	over 1800 kg up to 2100 kg	150 6	150	5	200	4	unsuitable	unsuitable	5	8
	6	over 2100 kg	200 6	200	5	250	4	unsuitable	unsuitable	3	6

(This Table is to be read in conjunction with sub-Clause 612.10)

Vibro-tamper		Mass:											
	1	over 50 kg up to 60 kg	100	3	100	3	150	3	unsuitable	4	8	unsuitable	
	2	over 65 kg up to 75 kg	125	3	125	3	200	3	unsuitable	3	6	12	
	3	over 75 kg up to 100 kg	150	3	150	3	225	3	unsuitable	2	4	10	
	4	over 100 kg	225	3	200	3	225	3	250	3	unsuitable	2	4
Power rammer		Mass:											
	1	100 kg up to 500 kg	150	4	150	6	unsuitable	200	4	unsuitable	5	8	unsuitable
	2	over 500 kg	275	8	275	12	unsuitable	400	4	unsuitable	5	8	14
Dropping-weight compactor		Mass of rammer over 500 kg											
	1	height drop: over 1m up to 2m	600	4	600	8	450	8	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
	2	over 2m	600	2	600	8	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	

FIGURES

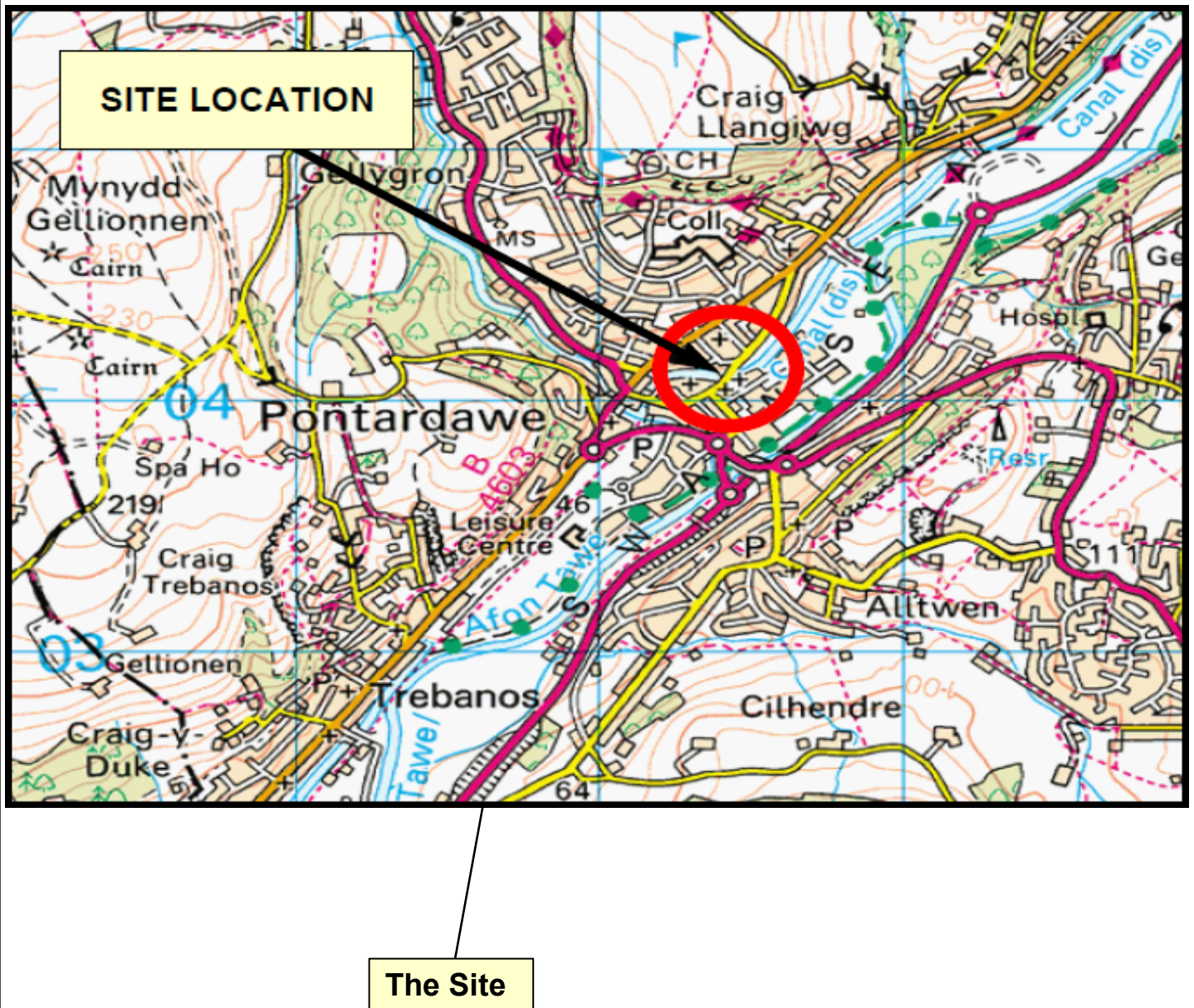


Figure 1: Site Location Plan

12360 - Pontardawe Foundry, Pontardawe

Intégral
Géotechnique

Intégral House
7 Beddau Way
Castlegate Business Park
Caerphilly
CF83 2AX
Tel: 029 2080 7991

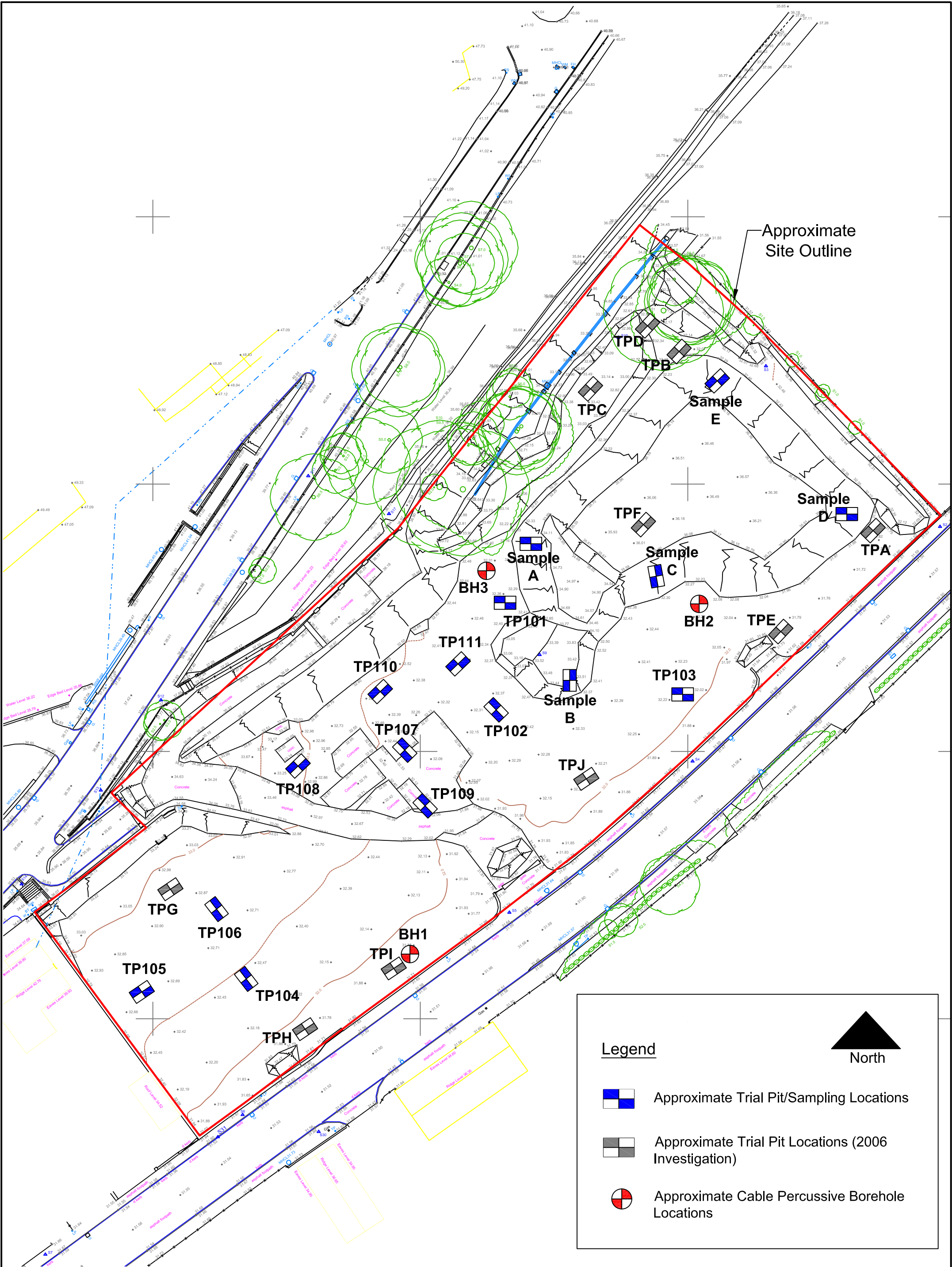


Figure 2: Exploratory Hole Location Plan (Existing Layout)

Project: Pontardawe Foundry	Job No.: 12360	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Bluefield Land	Scale: 1:500 at A3		



Figure 3: Site Plan (Proposed Layout)

12360 - Bluefield Land - Pontardawe Foundry Redevelopment

Intégral
Géotechnique

Intégral House
7 Beddau Way
Castlegate Business Park
Caerphilly
CF83 2AX
Tel: 029 2080 7991