St Peters Close, Rhosrobin

Proposed Housing

Geotechnical Report

SG Estates



GroundSolve Ltd
Consulting Geotechnical, Engineering Geology and Environmental Engineers

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1.0 INTRODUCTION

SG Estates (SGE) are proposing to purchase and develop a site next to St Peters Close in Rhosrobin, Wrexham. The proposals include some ninety-two residential dwellings, including semi-detached and detached housing, along with apartments.

Consequently, SGE have appointed GroundSolve Ltd (GSL) to carry out a Phase II site investigation at the site. A Phase I desk study has not been commissioned. Initially the investigation was limited to the southern field, but was then extended to incorporate additional information for a drainage strategy for the eastern field.

This report presents the findings of the site investigation, and gives firm geotechnical recommendations for the development. In addition, environmental comments are presented.

2.0 THE SITE

2.1 Site Location and Description

The site is located off Plas Acton and Llay New Roads, in Rhosrobin, Wrexham at National Grid Reference SJ 330, 529, see Figure 1.

It is currently open fields, bounded to the north and west by Plas Acton Road and Cemetery, with the western boundary defined by Llay New Road. The Wrexham Railway Line in cutting runs along the southeastern boundary of the site. Several small residential estates are present around the site, see Figure 2.

The site comprises three separate open fields, north, south and one to the east of the southern field, divided by hedgerows. A public footpath cuts between the northern and southern/eastern fields. Two overhead power lines cross the site, with one trending west to east, and another southwest-northeast, see Figure 2.

A topographic survey has been provided, which confirms the site to have a gentle fall in elevation in a west to east direction, from around 69mAOD in the west to 65mAOD in the eastern field. A recent aerial photograph is presented below.



Recent aerial photograph

Photographs of the site are presented in Appendix A.

2.2 Geology and Hydrogeology

The geology of the site has been studied on the following sources:

- 1:50,000 scale geology plan, Sheet 121,
- Associated geological memoirs, Reference 1,
- Wrexham applied mapping project at a scale of 1:25,000, Reference 2.

These confirmed the south and western parts of the site to be underlain by glacial till (Boulder Clay), with glaciofluvial deposits (Sand and gravel) recorded in the north and eastern sections of the site.

Reference 2 describes the glacial till as mainly silty, sandy clays, with gravel, cobble and occasional boulder. It contains beds of sand and gravel, which may be water bearing. The clays are generally of low to intermediate compressibility, with small consolidation settlements.

The glacial sand and gravel are described as water bearing, medium dense to dense, well sorted, sand and gravel, with occasional cobbles, and interbedded with medium dense, clean sands, and silty, clayey sands.

Reference 2 records the drift thickness at around 15m.

Made ground is recorded along the railway line on the southern site boundary.

The underlying bedrock is Carboniferous in age, the strata differing in age across the site. Underlying the majority of the site is the Coed Yr Allt Formation, with the overlying Bettisfield Formation outcropping on the eastern section of the site. The dip of the strata is gentle in an easterly direction, Reference 1.

The Coed Yr Allt Formation, comprises a grey to green, micaceous sandstone, and grey to green mudstone, with thin coals and limestone beds known as the 'Spirobis' limestone, with local intraformational conglomerate. Whilst the Bettisfield formation is largely mudstone with minor sandstones.

These strata lie above the Ruabon Formation and the underlying Coal Measures, consequently, any coal seams and associated workings would be anticipated to be at significant depth beneath the site. No mine shafts are record in the vicinity of the site, although Reference 2 confirms past deep mining beneath the site.

The major Wrexham fault is shown to the west of the site trending approximately north to south.

Groundwater would be anticipated to be at significant depth beneath the site, although a perched water table on the surface of the low permeability glacial till should be anticipated.

2.3 History

A full desk study has not commissioned for this project, however, a review of Old Maps in GSL archives confirms the site to be open fields from 1872 until the present day. The railway on the southern site boundary was constructed before 1872, with the site occupied by 'Pandy Farm' by 1900, with the introduction of the public footpath. A small pond was recorded just within the south western site boundary. Plas Acton Cemetery was opened in 2009.

3.0 PROPOSED DEVELOPMENT

SGE are proposing to develop the site with ninety-two residential properties on the southern field. The plans include a series of affordable dwellings comprising apartments and two-bedroom housing, as well as private dwellings comprising 3-4 bedroom detached and semidetached houses. A new road is also proposed for access to the site. The current proposed development layout is presented in Figure 3.

Current plans involve directing the surface drainage from the southern field to a soakaway and attenuation pond on the eastern field, such plans are included in Figure 3.

Building loads and levels have not been provided, however, foundation loads are anticipated to be between 50 to 75kN/m run, with floor slab loadings not exceeding 5kN/m².

Due to the flattish nature of the site, development levels are anticipated to be at/close to grade.

The recommendations given in this report are based on the above assumptions, therefore, they should be reviewed and if necessary revised during the detailed design.

4.0 SITE INVESTIGATIONS

4.1 Previous Investigation

GSL carried out a full Phase II investigation on a site immediately east of this site on the other side of the railway line.

The ground conditions at this site comprised glacial till (clay) and fluvioglacial deposits (sand and gravel).

The glacial till was generally described as firm to stiff, brown, slightly sandy slightly gravelly clay. It generally had a weathered upper layer, which was orange, brown in colour, and slightly weaker, being firm. Physical testing recorded the clay to be of low plasticity.

The fluvioglacial deposits generally comprised loose becoming medium dense, brown, slightly clayey, gravelly, fine to coarse sand, with a low cobble content. PSD testing confirmed that silt/ clay contents were below 10%.

No contamination was encountered on the site, and chemical attack of buried concrete was not an issue. Permeabilities within the sand and gravel were generally between $1x10^{-4}$ and $7x10^{-6}$ m/sec.

4.2 This Investigation

4.2.1 Fieldwork

The site investigation was divided into two phases.

Phase I was the site investigation for the southern field, which was undertaken on the 4th August 2021, and comprised:

- Eleven machine excavated trial pits, excavated to a maximum depth of 2.90m,
- Hand Shear Vein (HSV) testing within the glacial till to determine the shear strength of the cohesive soils,
- Sixteen CBR tests undertaken using a TRL probe to depths up to 1.00m.

The Phase II site investigation for the eastern field was undertaken to determine the ground conditions for drainage design, and was carried out between 9th and 10th September, and the 17th to 22nd of September.

It comprised:

- Eleven machine excavated trial pits, excavated to a maximum depth of 3.0m,
- Two trenches to determine the extent of the shallow sand and gravel,
- Four boreholes, to a maximum depth of 10m,
- Installations in two boreholes for groundwater monitoring,
- Soakaway testing carried out in two trial pits (three cycles in each pit),
- Falling Head Tests carried out at approx. 1.0m intervals within sand and gravel in the boreholes.

The trial pits, boreholes and CBR testing was supervised and logged by a GSL Engineer in general accordance with BS 5930, Reference 3. The Soakaway testing was carried out by filling the trial pits quickly with water from a 1,600-gallon water tanker and monitoring the water level in accordance with BRE Digest 365, Reference 4. The falling head tests were carried out in general accordance with BS EN ISO 22282-1, Reference 5.

The locations of the trial pits boreholes and CBR tests from both phases of investigation are presented in Figures 2 and 2a, with the trial pit logs, borehole logs, soakaway tests and CBR results presented in the following Appendices.

- Trial pit logs – Appendix B,
- Borehole Logs- Appendix C,
- Soakaway Tests – Appendix D,
- Falling Head Tests- Appendix E,
- CBR test results – Appendix F.

4.2.2 Laboratory Work

Samples were taken from the trial pits and boreholes for the following chemical and physical analysis:

Physical Testing

- Natural moisture content,
- Atterberg limits,
- pH & water-soluble sulphate (2:1 extract).

The testing was carried out in accordance with BS1377, Reference 6. The results are discussed in Section 6.0, and presented in full in Appendix G.

Chemical Testing

Samples for chemical testing were taken from the topsoil, placed in appropriate containers and a cool box, and taken immediately to the laboratories of Derwentside Environmental Testing Services (DETS) in County Durham for the following testing:

Metals & Non-metals - Arsenic (As), Boron (B), Cadmium (Cd), Chromium (Trivalent), Chromium (Hexavalent), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Phenol, Selenium (Se), and Zinc (Zn).

Petroleum Hydrocarbons - Benzene, Toluene, Ethylbenzene, o-xylene, m-xylene, p-xylene, Aliphatics >C5 – C44, Aromatics >EC5 – EC44.

Polyaromatic Hydrocarbons (PAH) – Acenaphthene, Acenaphthylene, Anthracene, Benz (a) anthracene, Benzo (a) pyrene, Benzo (b) fluoranthene, Benzo (g, h, i) perylene, Benzo (k) fluoranthene, Chrysene, Dibenzo (a, h) anthracene, Fluorene, Fluoranthene, Indeno (1,2,3-cd) pyrene, Naphthalene, Phenanthrene, Pyrene.

Other Contaminants – Sulphide (easily liberated), Water soluble Sulphate (2:1 extract), Cyanide, pH, Soil Organic Matter (SOM).

In addition, asbestos screening was carried out on all samples.

The results are summarised in Section 7.0, and the results presented in full in Appendix H.

5.0 GROUND CONDITIONS

5.1 General Stratigraphy

The general stratigraphy encountered in the Phase I and II site investigations is summarised below in Table 5.1:

Table 5.1 Summary of Ground Conditions

BH/TP No.	Topsoil (m)	Glacial Till (m)	Fluvioglacial Deposits(m)
TP01	0.00-0.35	0.35-2.10	2.10-2.70
TP02	0.00-0.40	0.40-2.90	
TP03	0.00-0.40	0.40-2.10	2.10-2.60
TP04	0.00-0.45	0.45-2.40	2.40-2.75
TP05	0.00-0.20	0.20-1.60 2.00-2.70	1.60-2.00
TP06	0.00-0.45	0.45-2.70	
TP07	0.00-0.30	0.30-2.70	
TP08	0.00-0.30	0.30-2.30 2.50-2.90	2.30-2.50
TP09	0.00-0.35	0.35-2.60	
TP10	0.00-0.35	0.35-2.70	
TP11	0.00-0.40	0.40-2.75	
TP201	0.00-0.20		0.20-2.00
TP202	0.00-0.25	0.25-2.00	
TP203	0.00-0.20		0.20-1.30
TP204	0.00-0.20	0.20-1.80	
TP205	0.00-0.15	0.15-1.50	
TP206	0.00-0.25	0.25-1.50	
TP207	0.00-0.25	0.25-2.00	
TP208	0.00-0.25	0.25-2.50	
TP209	0.00-0.25	0.25-0.40	0.40-3.40
TP210	0.00-0.30	0.60-1.80 3.10-3.20	0.30-0.60 1.80-3.10
TP211	0.00-0.30	0.30-3.00	
BH01	0.00-0.40		0.40-10.00
BH02	0.00-0.40	2.30-5.00	0.40 – 2.30
BH2A	0.00-0.50	0.50-4.80	4.80-7.50
BH03	0.00-0.60	0.40-4.40	4.40-10.00

Cross sections through the eastern section of the site are presented in Figure 4.

5.2 Topsoil

Topsoil was encountered in all of the exploratory holes to a maximum depth of 0.60m, where it was generally described as grass over loose, brown, gravelly, slightly clayey sand.

pH values between 5.7-8.6 were recorded, with sulphate values, when measured as 2:1 water extract between 12 and 95 mg/l (0.012 to 0.095g/l).

5.3 Glacial Till

Glacial Till was encountered in all exploratory holes, apart from BH01, TP201 and TP203. It was proved to a maximum depth of 4.80m, and generally comprised firm to stiff, brown, mottled blue, sandy, gravelly clay.

Hand Shear Vein Testing (HSV) recorded shear strengths ranging between 40kPa (Soft) and 100KPa (Stiff).

Atterberg limit testing recorded liquid limits between 27 and 34%, plastic limits between 13 and 14%, and plasticity indices between 14 and 17%, indicating a clay of low plasticity. Natural moisture contents were between 13 and 14%.

pH values were between 6.7 and 7.7, with sulphate values, when recorded as 2:1 water extract between <10 and 62 mg/l (<0.01 and 0.062g/l).

5.4 Fluvioglacial Deposits

Fluvioglacial deposits were identified at depth on site, apart from several trial pits and boreholes on the eastern section of the site, where these deposits were encountered at surface, see Figure 2a. It was generally described as loose to medium dense, brown, slightly clayey, gravelly, fine to coarse sand, with a low cobble content.

5.5 Groundwater

No groundwater strikes were recorded in any of the boreholes or trial pits.

Groundwater monitoring was then undertaken in BH01 and BH03, where they were monitored every week for three weeks. During this time groundwater was not recorded in either borehole.

5.6 DCP Testing

Dynamic Cone Penetrometer (DCP) testing was carried out across the southern field, to determine CBR values for pavement design. The results are summarised in Table 5.2 below.

Table 5.2: DCP Results

Test No	Depth (m)	CBR %
DCP1	0-280	7.7
	280-400	13.4
	400-800	18.6
DCP2	0-280	5.3
	280-800	8.3
DCP3	0-280	5.8
	280-400	10.1
	400-800	14.2
DCP4	0-280	3.5
	280-400	8.3
DCP5	0-280	5.7
	280-400	10.1
	400-800	6.0
DCP6	0-280	7.5
	280-400	8.3
	400-800	6.3
DCP7	0-280	5.5
	280-400	12.7
	400-800	14.2
DCP8	0-280	4.5
	280-400	14.2
	400-800	8.3
DCP9	0-280	6.1
	280-400	8.3
	400-800	7.5
DCP10	0-350	5.8
	350-700	8.0
	700-900	20.1
DCP11	0-300	12.7
	300-650	16.1
	650-850	38.6
DCP12	0-280	5.5
	280-400	12.7
	400-800	8.0
DCP13	0-400	15.1
	400-800	9.3
	800-900	45.4
DCP14	0-300	6.5
	300-550	23.9
	550-800	14.2
DCP15	0-800	8.9
DCP16	0-250	8.0
	250-400	23.9
	400-900	16.1

5.7 Permeability Testing

Permeability testing was concentrated in the eastern field in the sand and gravel deposits at surface, where the proposed drainage for the housing development is to be directed.

The results are summarised in Table 5.3 below:

Table 5.3 Soakaway Test Results

TP No.	Depth (m)	Test No.	Infiltration Rate (m/s)
201	2.00	1	2.6×10^{-5}
		2	1.6×10^{-5}
		3	2.0×10^{-5}
203	1.10	1	3.7×10^{-5}
	1.10	2	2.5×10^{-5}
	1.10	3	2.6×10^{-5}

As only a very limited area of sand and gravel at surface was identified, Falling Head Testing was undertaken at approximately 1.0m intervals in the boreholes.

The results are summarised in Table 5.4 below:

Table 5.4 Falling Head Permeability Test Results

BH No.	Depth (m)	Infiltration Rate (m/s)
BH01	3.00-4.00	7.79×10^{-4}
	4.50-5.50	1.37×10^{-4}
	5.50-6.50	9.4×10^{-4}
	7.00-8.00	3.35×10^{-3}
BH2a	5.00-6.00	1.00×10^{-3}
BH3	5.00-6.00	1.50×10^{-4}
	6.00-7.00	4.9×10^{-3}
	8.00-9.00	2.25×10^{-3}

5.8 Services

Two overhead power lines cross the site, with one trending west to east, and another southwest-northeast, both crossing the south and west fields. A sewage line also crosses the site from the south west, and then following the public footpath to the east, see Figure 2.

A medium pressure gas main also crosses the site.

6.0 RESULTS OF CHEMICAL TESTING

Samples were taken from the topsoil for chemical testing, with the sample depths presented in Table 6.1 below.

Table 6.1 Sample Depths

TP No	Depth (m)
TP01	0.20
TP04	0.20
TP06	0.20
TP09	0.20
TP11	0.20

The results of the soil analyses are presented below, where they have been compared to suitable generic assessment criteria (GACs), in order to allow a generic quantitative risk assessment (GQRA) to be carried out for the site and the proposed development.

The Category 4 Screening Levels (C4SLs) published by DEFRA (2014) have been adopted in the first instance, which have been published for six substances to date. Where a C4SL is unavailable, the "Suitable 4 Use Levels" (S4ULs) published by LQM/CIEH (2015) have been adopted.

These criteria have been derived using the CLEA model for a range of standard end-use scenarios and a range of soil organic matter (SOM) contents. It should be noted that the C4SL values are derived on the basis of a "low level of toxicological concern", while the S4UL values are based on a "tolerable" or "minimal" level of risk. As such, the S4ULs describe a lower level of risk than the C4SLs, and are equivalent to the former Soil Guideline Values (SGVs, published by the Environment Agency) and the previous editions of the LQM/CIEH GAC values.

A "residential with gardens" end-use has been adopted for this analysis, based on the a SOM content of 1.0%.

Note: the S4UL values presented below are Copyright Land Quality Management Limited, reproduced with permission; Publication Number S4UL3668. All rights reserved.

Metals & Non-Metals	TP01 0.20	TP04 0.20	TP06 0.20	TP09 0.20	TP11 0.20	Adopted Guideline (mg/kg)	Source	Exceedances
Arsenic	13	8.10	9.20	10	11	37	C4SL	0
Boron, Water Soluble	0.2	0.30	0.50	0.4	0.4	290	S4UL	0
Cadmium	0.2	0.30	0.40	0.4	0.2	22	C4SL	0
Chromium III	16	15	21	18	19	910	S4UL	0
Chromium, Hexavalent	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	21	C4SL	0
Copper	26	17	29	25	25	2400	S4UL	0
Lead	81	53	87	54	56	200	C4SL	0
Mercury	0.09	0.06	0.11	0.07	0.07	1.2	S4UL	0
Nickel	14	12	13	17	18	130	S4UL	0
Phenol - Monohydric	0.3	< 0.3	0.50	0.4	0.4	120	S4UL	0
Selenium	2.4	1.90	1.60	1.9	1.1	250	S4UL	0
Zinc	220	170	66	72	57	3700	S4UL	0

None of the above values exceed the relevant guidance values for residential land use with gardens.

Petroleum Hydrocarbons	TP01 0.20	TP04 0.20	TP06 0.20	TP09 0.20	TP11 0.20	Adopted Guideline (mg/kg)	Source	Exceedances
Aliphatic C5-C6	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	42	S4UL	0
Aliphatic C6-C8	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	100	S4UL	0
Aliphatic C8-C10	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	27	S4UL	0
Aliphatic C10-C12	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	130	S4UL	0
Aliphatic C12-C16	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	1100	S4UL	0
Aliphatic C16-C21	< 1.5	< 1.5	< 1.5	<1.5	< 1.5	65000	S4UL	0
Aliphatic C21-C35	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	65000	S4UL	0
Aliphatic C35-C40	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	70	S4UL	0
Aromatic C5-C7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	130	S4UL	0
Aromatic C7-C8	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	34	S4UL	0
Aromatic C8-C10	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	74	S4UL	0
Aromatic C10-C12	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	140	S4UL	0
Aromatic C12-C16	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	260	S4UL	0
Aromatic C16-C21	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	1100	S4UL	0
Aromatic C21-C35	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	1100	S4UL	0

None of the above values exceed the relevant guidance values for residential land use with gardens.

Polyaromatic Hydrocarbons (PAH)	TP01 0.20	TP04 0.20	TP06 0.20	TP09 0.20	TP11 0.20	Adopted Guideline (mg/kg)	Source	Exceedances
Acenaphthene	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	210	S4UL	0
Acenaphthylene	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	170	S4UL	0
Anthracene	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	2400	S4UL	0
Benzo(a)anthracene	0.1	0.03	< 0.03	0.11	0.03	7.2	S4UL	0
Benzo(a)pyrene	0.08	< 0.03	< 0.03	0.1	< 0.03	5	C4SL	0
Benzo(b)fluoranthene	0.19	0.10	0.10	0.22	0.11	2.6	S4UL	0
Benzo(g,h,i)perylene	0.03	< 0.03	< 0.03	0.05	< 0.03	320	S4UL	0
Benzo(k)fluoranthene	0.04	< 0.03	< 0.03	0.05	< 0.03	77	S4UL	0
Chrysene	0.1	< 0.03	< 0.03	0.12	0.04	15	S4UL	0
Dibenzo(a,h)anthracene	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.24	S4UL	0
Fluoranthene	0.21	0.05	0.07	0.21	0.06	280	S4UL	0
Fluorene	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	170	S4UL	0
Indeno(1,2,3-c,d)pyrene	0.03	< 0.03	< 0.03	0.05	< 0.03	27	S4UL	0
Naphthalene	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	2.3	S4UL	0
Phenanthrene	0.05	< 0.03	< 0.03	0.07	< 0.03	95	S4UL	0
Pyrene	0.19	0.04	0.06	0.18	0.05	620	S4UL	0

None of the above values exceed the relevant guidance values for residential land use with gardens.

Other Contaminants / Testing	TP01 0.20	TP04 0.20	TP06 0.20	TP09 0.20	TP11 0.20	Adopted Guideline (mg/kg)	Source	Exceedances
Organic matter	4	4.20	4.60	4.4	4.3	-	-	-
pH	6.5	-	5.70	8.6	5.7	-	-	-
Sulphide	24	< 10	20.00	< 10	< 10	-	-	-
Cyanide, Total	0.5	0.50	0.70	0.6	0.6	-	-	-
Sulphur (free)	1.3	< 0.75	2.10	1.2	< 0.75	-	-	-
Sulphate Aqueous Extract as SO4	95	16.00	19.00	12	15	-	-	-

None of the above values cause any concern.

In addition, no asbestos was detected in any of the samples.

7.0 GEOTECHNICAL RECOMMENDATIONS

7.1 Ground Model

To understand the foundation and drainage recommendations it is useful to understand the depositional history of the soils on site.

Firstly, the glacial till is deposited beneath advancing ice sheets during the last glaciation, with Reference 1 recording an ice thickness in this area of around 400m.

Secondly, as the ice sheets retreat the glacial meltwaters deposit sand and gravel, usually in a fining upwards sequence, as the flow from the meltwaters subsides. Consequently, permeabilities would be anticipated to generally increase with depth.

In addition, the water flow would erode the surface of the glacial till, forming an uneven surface, with some channels cut into the surface of the till. The uneven surface also explaining why the sand and gravel is unevenly spread across the site.

7.2 Excavations and Site Preparation

Firstly, it will be necessary to strip the topsoil, which should be stockpiled on site for later re use. However, there is likely to be a surplus, which could be sold on, or alternatively, it could be used for landscaping bunds in the eastern section of the site.

It will also be necessary to remove the mature hedgerows on the southern field, with the roots grubbed out. Excavations where they are not in building areas can be backfilled with suitable site won material, such as the sand and gravel. Whilst in building areas excavations should be backfilled with suitable imported granular material compacted in accordance with an approved earthworks specification, Reference 7.

Excavations are likely to be unstable in the short term, especially in the sand and gravel horizons. Consequently, excavations deeper than 1.20m will need to be battered back for safety reasons. For any attenuation ponds the side slopes should be cut at a gradient of 1 on 2 (26.5º).

Groundwater seepages are not anticipated, if encountered, they should be slight and easily catered for by pumping from sumps cut within the excavation.

7.3 Foundations and Floor Slabs

The proposed development area is underlain by firm to stiff glacial till, although occasional soft spots were recorded.

Consequently, conventional spread foundations are recommended for the development founded in clay of at least firm consistency, designed assuming an allowable bearing capacity of 100kN/m², which based on the anticipated loadings a 600mm wide excavation bucket width should suffice.

However, there is a slight possibility that the ground conditions may vary across a plot, from sand and gravel to glacial till, especially in the eastern section of the development. Whilst it would be normal practice to locally deepen foundations to ensure a uniform bearing strata, if the sand and gravel proves to be say thicker than 2m, the foundations should be lightly reinforced.

Foundations should be a minimum of 0.90m below final external ground level, and if any trees are within influencing distance of the plots the foundation depths will need to be assessed in accordance with Reference 8, with a low volume change potential assumed.

However, whilst a desk study has not been undertaken, examination of historical plans in GSL archives has identified a backfilled pond to the rear of Plot 7. This is most likely to have been a "Marling Pit" used by local farmers, experience of which shows they are generally around 2m deep. Consequently, it may be necessary to locally deepen foundations in this area.

It would also be prudent to undertake further trial pitting in this area to determine the nature of the backfill to the pond, following which it may need to be removed from site.

Floor slabs can be designed to be ground bearing, designed assuming a "Poor" formation in the clay, as described in Reference 9.

7.4 Drainage

A drainage strategy for the site was undertaken by Waterco in August 2021 for SGE. This report concluded that soakaways were not feasible in the development area, which is underlain by low permeability glacial till. However, two trial pits in the eastern field confirmed the presence of sand and gravel with permeabilities between 1.137 x 10^{-5} and 1.45 x 10^{-5} m/sec.

It also concluded that a 20m standoff from the railway cutting is required between the cutting and any infiltration basin.

Soakaway testing in trial pits at shallow depth during this investigation recorded permeabilities between 1.6 and 3.7 x 10^{-5} m/sec, which is similar to those recorded above. However, deeper testing at depths greater than 3m in the boreholes recorded higher permeabilities between 2.25 x 10^{-3} and 9.4 x 10^{-4} m/sec as anticipated from the ground model.

7.5 Reuse of Materials

As discussed above the topsoil on site can be re used.

As the site is fairly flat, it is not envisaged that any cut/fill will be required. However, both the glacial till and sand and gravel will be suitable for re-use as a general structural fill. The sand and gravel has a low fines content, consequently, it will conform to several of the earthwork's classifications given in Reference 7, as will the glacial till. It will also be a more reliable fill material than the glacial till, as it is not susceptible to the effects of wet weather.

It would therefore be prudent to phase the works so that sand and gravel is excavated from soakaways first and then stockpiled for re-use elsewhere.

Based on the Atterberg limit testing the glacial till will also be a suitable fill material. However, it should be recorded that it would be susceptible to deterioration during wet weather and trafficking. Consequently, if required, it should be excavated and recompacted immediately without stockpiling.

It would also be suitable to form an impermeable liner for any attenuation ponds.

7.6 Roads and Hard Standings

CBR testing using a TRL probe has been carried out across the development area.

The results are summarised in Table 5.2, and at the top of the glacial till CBR values between 6 and 14% were recorded. Therefore, in accordance with the above results and GSL experience of such materials, a CBR value of 6% should be assumed for the design.

As mentioned above it should also be noted that formations in the glacial till will be subject to rapid deterioration on exposure to wet weather and trafficking. Therefore, in these areas it would be prudent to leave the formation slightly high until construction is imminent.

It will also be necessary for the formation to be proof rolled and any soft spots identified, excavated typically an additional 300m and replaced with suitable well compacted granular material.

7.7 Protection of Buried Concrete

The laboratory test results have indicated that chemical attack of buried concrete will not be an issue. Buried concrete can therefore be designed in accordance with the following classes, Reference 10.

- AC – 1,
- DS – 1.

7.8 Landfill and Radon Gas

As a desk study has not been commissioned, it is not possible to assess the potential for nearby landfills. However, a desk study on the site immediately to the east failed to record any nearby landfills.

Whilst a small backfilled pond has been identified on site, it is sufficiently small that should it contain degradable material it could all be excavated and removed from site.

The desk study on the adjacent site confirmed it to be in an area where full radon protection measures are required, which should be constructed in accordance with Reference 11. As a minimum this would comprise a suitable membrane beneath internal and external walls. It should also include proprietary "Top Hats" where services enter the building below the slab.

It is therefore recommended that a detailed radon report be obtained for this site.

7.9 Environmental Comments

The historical plans have confirmed that there have been no previous land uses, with the exception of open fields for farming.

In addition, the numerous trial pits and boreholes failed to detect any visual or olfactory evidence of contamination, which was confirmed by the chemical testing. The site can therefore be concluded to be uncontaminated and fit for its intended end use.

Whilst a backfill pond has been identified on site this can easily be treated during, the works.

Finally, in accordance with current good practice, a watching brief should be kept on all excavations. Should any contaminated material be encountered, it should be excavated, stored safely on site, tested and then disposed of at a suitably licensed landfill facility.

REFERENCES

1. The Geology of the Country around Wrexham (Part II), British Geological Survey, 1928.
2. Applied geological mapping in the Wrexham area: geology and land use planning, Technical Report WA/91/4, British Geological Survey, 1991.
3. BS 5930:2015, Code of Practice for Site Investigation.
4. BRE Digest 365, Soakaway Design, 2003.
5. BS EN ISO 22282-2:2012, Variable Head Method.
6. BS 1377:1991, British Standard Methods of Tests for Soils for Civil engineering Purposes.
7. Manual of Contract Documents for Highway Works, Volume 1, Specification for Highway Works - Series 600, Department of Transport, 2016.
8. NHBC Standards, Part 4 Foundations, 2007.
9. Cement & Concrete Association, Concrete Ground floors: their design, construction and finish, Deacon, R, Publication 48.034, 1986.
10. BRE Special Digest 1, 2005, Concrete in Aggressive Ground.
11. Radon: Guidance on protective measures for New Buildings, BRE 211, 2007.

FIGURES



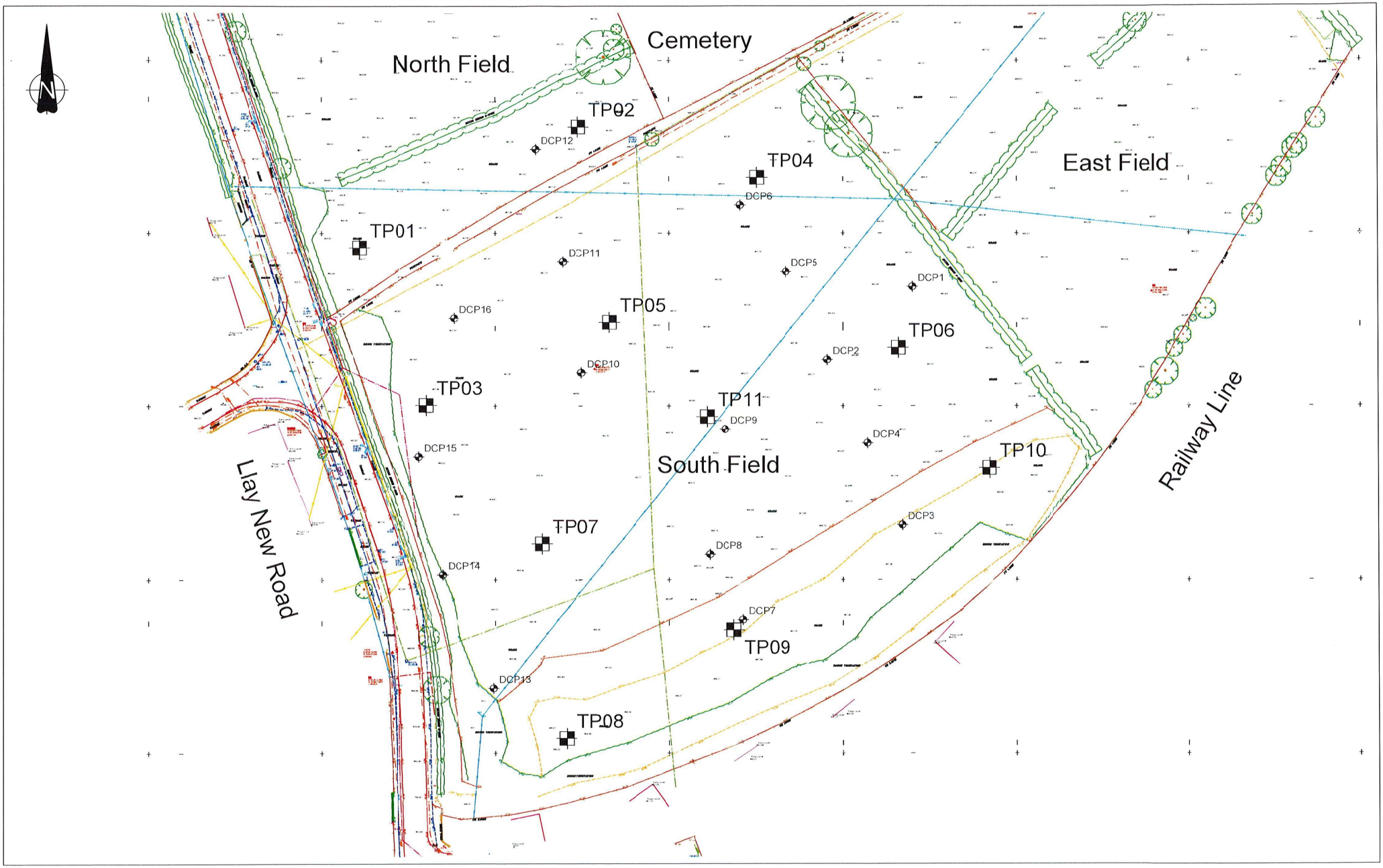
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SCALE 1:50,000 @ A4

Figure Title

SITE LOCATION

FIGURE 1

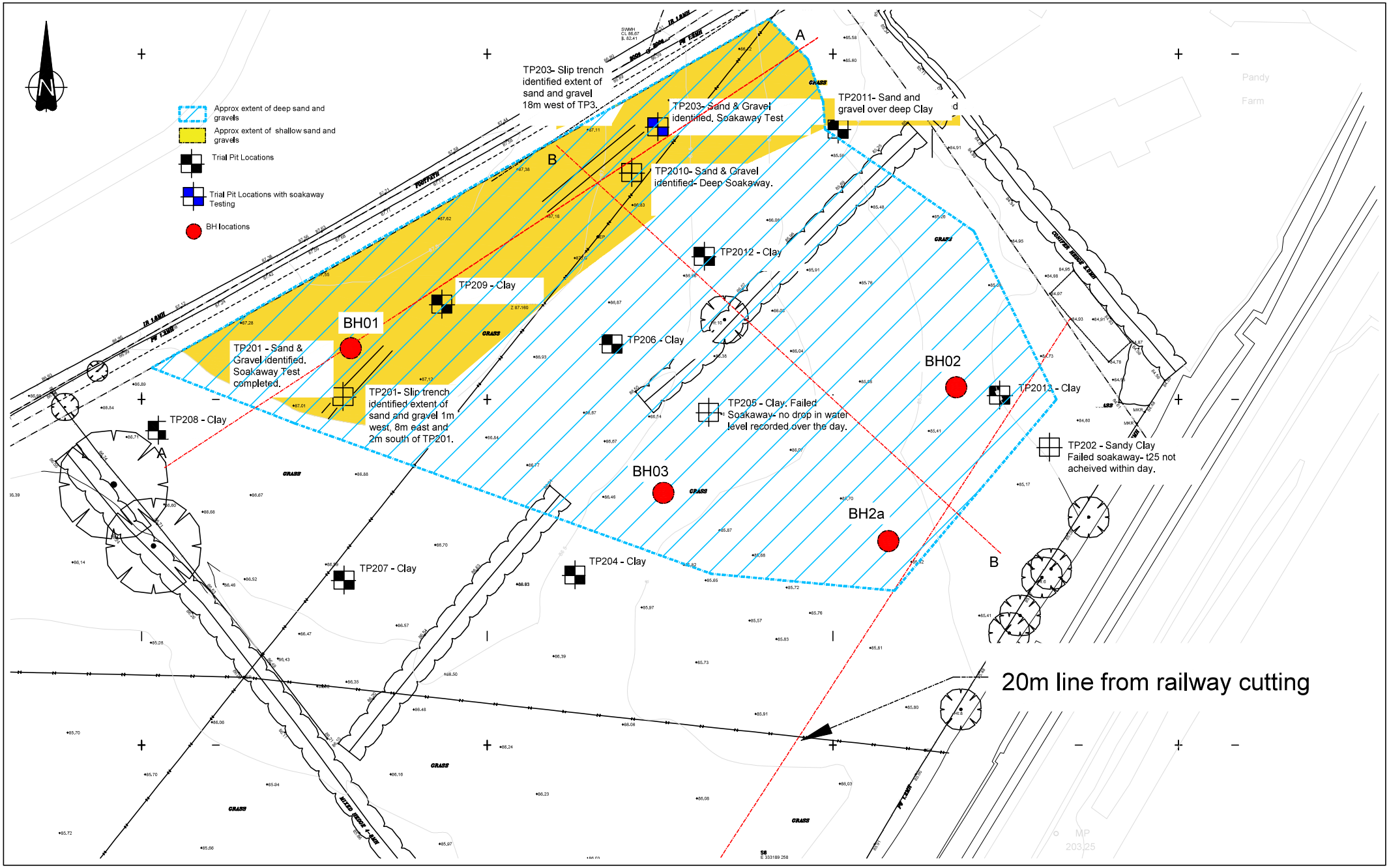


SCALE 1: 1000 @ A3

Figure Title

Site Layout &
Exploratory Hole
Location Plan

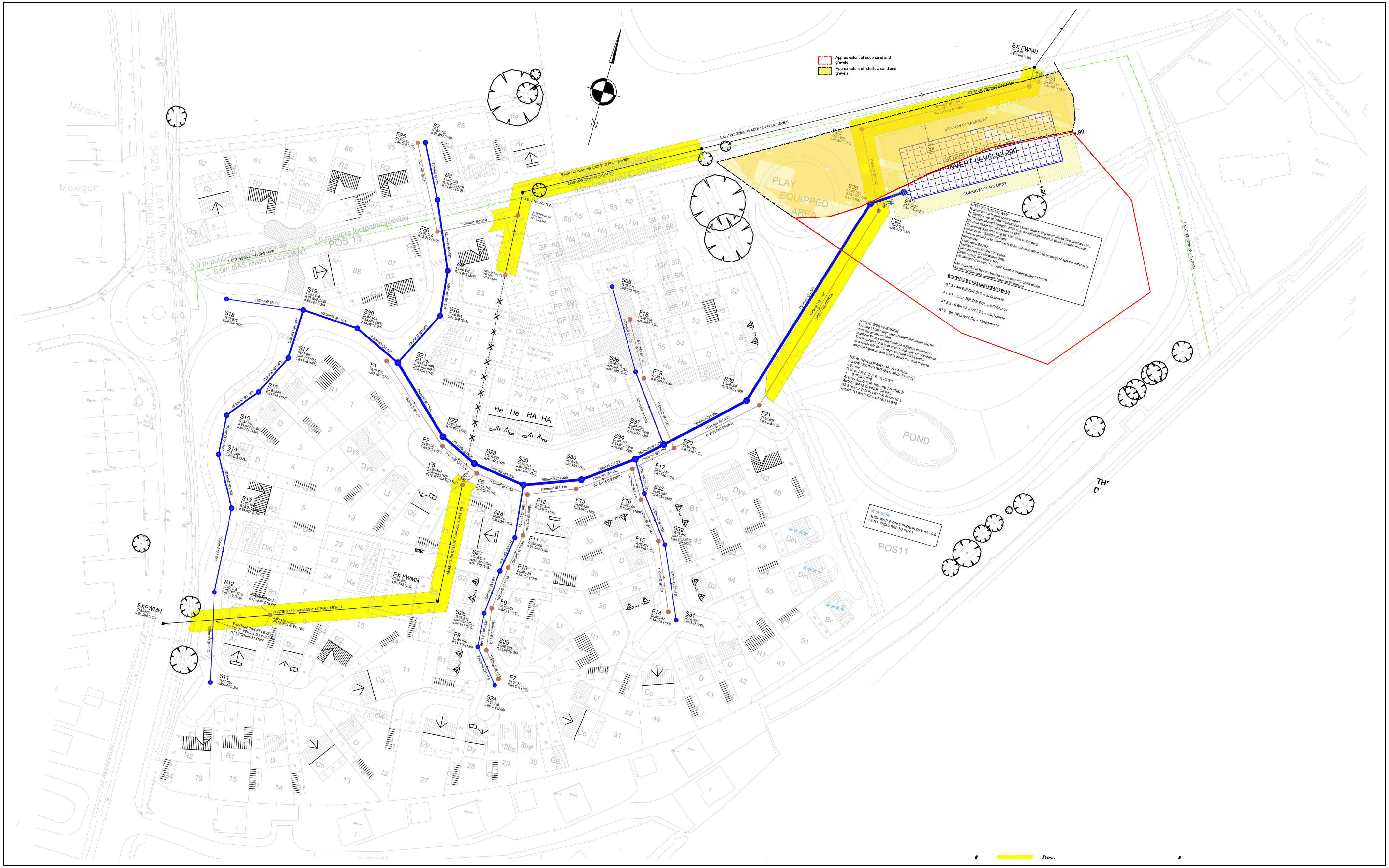
FIGURE 2



SCALE 1:500 @ A3

Figure Title

FIGURE 2A

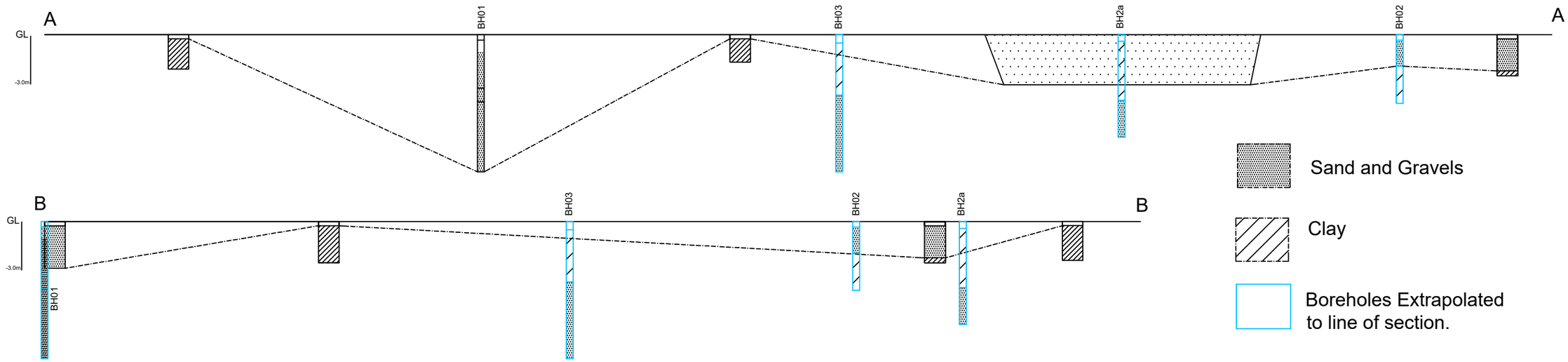


SCALE 1: 1000 @ A3

Figure Title

Proposed Development

FIGURE 3



SCALE NTS

Figure Title

CROSS SECTIONS

FIGURE 4

APPENDIX A

General Site Photographs



Photograph 1 Site entrance



Photograph 2 General view from east



Photograph 3 Overhead power lines



Photograph 4 As above



Photograph 5 general view of open fields



Photograph 6 as above



Photographs 7 & 8 General views





Photographs 9 & 10 Footpaths across site





Photographs 11 & 12 Vegetation (Reeds) proving impeded drainage



APPENDIX B

Trial Pit Logs

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close	Client: SG Estates	Date: 04/08/2021
Location:	Contractor: Harvey Plant Hire	
Project No. : 2585	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP01	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.35			Medium dense brown slightly clayey SAND. (TOPSOIL)
		1.00	D					Firm brown very sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse of sandstone and coal. (GLACIAL TILL)
		1.00		HVP=85.0				
		2.10		HVP=40.0	2.10			Loose brown slightly gravelly SAND. Gravel is subrounded to subangular fine to coarse of sandstone and coal. (FLUVIOGLACIAL DEPOSITS)
		2.20	D					
					2.70			End of Borehole at 2.700m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.80	0.60	Pit unstable at base.					

Remarks

Slow groundwater infiltration at base.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close	Client: SG Estates	Date: 04/08/2021
Location:	Contractor: Harvey Plant Hire	
Project No. : 2585	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP02	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Soft brown very sandy CLAY. (TOPSOIL)
					0.40			Firm to stiff brownish blue very sandy gravelly CLAY. Gravel is subrounded to subangular fine to coarse of sandstone and coal. (GLACIAL TILL)
		1.20		HVP=80.0				
		2.00		HVP=85.0				
					2.90			End of Borehole at 2.900m

1
2
3
4
5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.90	0.60	Pit Stable					

Remarks

No groundwater encountered.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close	Client: SG Estates	Date: 04/08/2021
Location:	Contractor: Harvey Plant Hire	
Project No. : 2585	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP03	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Medium dense brown slightly clayey SAND. (TOPSOIL)
					0.40			Firm brown very sandy gravelly CLAY. Gravel is subrounded to subangular fine to coarse of coal and mudstone. (GLACIAL TILL)
		1.00		HVP=65.0				
		1.50		HVP=85.0				
					2.10			Loose brown slightly gravelly SAND. (FLUVIOGLACIAL DEPOSITS)
					2.60			End of Borehole at 2.600m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.90	0.60	Pit stable.					

Remarks

No groundwater encountered.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close	Client: SG Estates	Date: 04/08/2021
Location:	Contractor: Harvey Plant Hire	
Project No. : 2585	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP05	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			Loose to medium dense brown clayey SAND. (TOPSOIL)
								Firm brown mottled orange very sandy gravelly CLAY with low cobble content. Gravel is subrounded to subangular fine to coarse of mudstone with occasional coal traces. Cobbles are rounded of mudstone. (GLACIAL TILL)
					1.60			Loose brown slightly gravelly SAND Gravel is subrounded to subangular fine to coarse of mudstone with occasional coal traces. (FLUVIOGLACIAL DEPOSITS)
					2.00			Stiff brown mottled orange gravelly slightly sandy CLAY. Gravel is subrounded to subangular fine to coarse of mudstone with occasional coal. (GLACIAL TILL)
		2.40		HVP=90.0				
					2.70			End of Borehole at 2.700m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.90	0.60	Pit stable.					

Remarks

No groundwater encountered.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close	Client: SG Estates	Date: 04/08/2021
Location:	Contractor: Harvey Plant Hire	
Project No. : 2585	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP04	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES					Loose to medium dense brown slightly clayey SAND. (TOPSOIL)
					0.45			Firm brown mottled orange very sandy gravelly CLAY. (GLACIAL TILL)
		1.20	D					
		1.50		HVP=90.0				
		2.00		HVP=85.0				
					2.40			Loose brown slightly gravelly SAND. Gravel is subrounded to rounded fine to coarse of sandstone with occasional coal. (FLUVIOGLACIAL DEPOSITS)
					2.75			End of Borehole at 2.750m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.80	0.60	Pit stable.					

Remarks

No groundwater encountered.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close	Client: SG Estates	Date: 04/08/2021
Location:	Contractor: Harvey Plant Hire	
Project No. : 2585	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP06	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES					Loose dark brown very gravelly SAND. (FLUVIOGLACIAL DEPOSITS)
					0.45			Firm to stiff brown mottled blue sandy gravelly CLAY. (GLACIAL TILL)
		1.00	D					
		2.00		HVP=100.0				
					2.70			End of Borehole at 2.700m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
2.00	0.60	Pit stable.					

Remarks

Becoming wet at 2.50m.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close	Client: SG Estates	Date: 04/08/2021
Location:	Contractor: Harvey Plant Hire	
Project No. : 2585	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP07	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.30			Soft dark brown sandy gravelly CLAY. Gravel is subrounded to subangular fine to coarse of mixed lithologies. (TOPSOIL)
		1.00	D					Firm to stiff brown mottled blue sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mudstone with occasional coal. (GLACIAL TILL)
		2.00		HVP=94.0				
					2.70			End of Borehole at 2.700m

1
2
3
4
5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.90	0.60	Pit stable.					

Remarks

No groundwater encountered.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close	Client: SG Estates	Date: 04/08/2021
Location:	Contractor: Harvey Plant Hire	
Project No. : 2585	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP08	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Sift brown sandy gravelly CLAY. Gravel is subrounded to subangular fine to coarse of mixed lithologies. (TOPSOIL)
					0.30			Soft to firm brown mottled grey sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mudstone with occasional coal. (GLACIAL TILL)
		2.00		HVP=65.0				
					2.30			Loose brown gravelly clayey SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (FLUVIOGLACIAL DEPOSITS)
					2.50			Firm to stiff brown mottled grey sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (GLACIAL TILL)
		2.70		HVP=80.0				
					2.90			End of Borehole at 2.900m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
2.00	0.60	Pit stable.					

Remarks

No groundwater encountered.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close	Client: SG Estates	Date: 04/08/2021
Location:	Contractor: Harvey Plant Hire	
Project No. : 2585	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP09	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.35			Loose dark brown very gravelly slightly clayey SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (TOPSOIL)
		1.00	D					Firm to stiff brown mottled blue sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mudstone and occasional coal. (GLACIAL TILL)
		1.50		HVP=80.0				*Thin band of sand between 2.30 and 2.40m.*
					2.60			End of Borehole at 2.600m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.80	0.60	Pit stable.					

Remarks

No groundwater encountered.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close	Client: SG Estates	Date: 04/08/2021
Location:	Contractor: Harvey Plant Hire	
Project No. : 2585	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP10	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.00	D		0.35			Loose dark brown very gravelly SAND. Gravel is subangular to angular fine to coarse of mixed lithologies. (TOPSOIL)
					2.70			Firm to stiff brown mottled blue very sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mudstone with occasional coal. (GLACIAL TILL)
								End of Borehole at 2.750m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
2.00	0.60	Pit stable.					

Remarks

No groundwater encountered.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close	Client: SG Estates	Date: 04/08/2021
Location:	Contractor: Harvey Plant Hire	
Project No. : 2585	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP11	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.40			Loose dark brown very gravelly SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (TOPSOIL)
		1.00	D					Soft to firm brown very sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (GLACIAL TILL)
		1.50			1.70			
		1.80	D					Firm to stiff brown mottled blue sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mudstone with occasional coal. (GLACIAL TILL)
		2.50			2.75			End of Borehole at 2.700m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.90	0.60	Pit stable.					

Remarks

No groundwater encountered.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close additional SI	Client: SG Estates	Date: 09/09/2021
Location: Rhosrobin	Contractor: Harvey Plant Hire	
Project No. : 2609	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP201	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.20			Grass over loose brown gravelly SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies (TOPSOIL)
								Loose gravelly SAND. (FLUVIOGLACIAL DEPOSITS)
					2.00			End of Borehole at 2.000m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.40	0.60	Pit Stable					

Remarks

No groundwater encountered. Soakaway test carried out.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close additional SI	Client: SG Estates	Date: 09/09/2021
Location: Rhosrobin	Contractor: Harvey Plant Hire	
Project No. : 2609	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP202	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.25			Grass over brown gravelly SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (TOPSOIL)
								Soft brown gravelly sandy CLAY. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (GLACIAL TILL)
								Sand content increasing with depth from 1.10m.
					2.00			End of Borehole at 2.000m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.40	0.60	Pit Stable					

Remarks

No groundwater encountered.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close additional SI	Client: SG Estates	Date: 09/09/2021
Location: Rhosrobin	Contractor: Harvey Plant Hire	
Project No. : 2609	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP203	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Grass over very gravelly SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies. (TOPSOIL)
					0.20			Loose brown gravelly SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (FLUVIOGLACIAL DEPOSITS)
					1.30			End of Borehole at 1.300m

1
2
3
4
5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.40	0.60	Pit Stable					

Remarks

No groundwater encountered. Soakaway testing carried out.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close additional SI	Client: SG Estates	Date: 09/09/2021
Location: Rhosrobin	Contractor: Harvey Plant Hire	
Project No. : 2609	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP204	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Grass over loose brown very clayey gravelly SAND. Gravel is subangular to angular fine to coarse of mixed lithologies. (TOPSOIL)
					0.20			Stiff brown mottled blue gravelly slightly gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (GLACIAL TILL)
					1.80			End of Borehole at 1.800m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.50	1.80	Pit stable					

Remarks

No groundwater encountered.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close additional SI	Client: SG Estates	Date: 09/09/2021
Location: Rhosrobin	Contractor: Harvey Plant Hire	
Project No. : 2609	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP205	TP			1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.15			Grass over loose brown gravelly SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (TOPSOIL)
								Firm brown sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (GLACIAL TILL)
					1.50			End of Borehole at 1.500m

1
2
3
4
5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.50	0.60	Pit Stable					

Remarks

Soakaway carried out. No drop in level recorded over day.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close additional SI	Client: SG Estates	Date: 09/09/2021
Location: Rhosrobin	Contractor: Harvey Plant Hire	
Project No. : 2609	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP206	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Grass over loose brown very gravelly SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (TOPSOIL)
					0.25			Soft to firm very sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (GLACIAL TILL)
					1.50			End of Borehole at 1.500m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.40	0.60	Pit stable.					

Remarks

No groundwater ecnountered.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close additional SI	Client: SG Estates	Date: 09/09/2021
Location: Rhosrobin	Contractor: Harvey Plant Hire	
Project No. : 2609	Crew Name:	Equipment:

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP207	TP			1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				

1
2
3
4
5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks

No groundwater encountered.

AGS

GroundSolve Ltd

Trial Pit Log

Project Name: St Peters Close additional SI	Client: SG Estates	Date: 09/09/2021
Location: Rhosrobin	Contractor: Harvey Plant Hire	
Project No. : 2609	Crew Name:	Equipment: JCB 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP208	TP		ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Grass over loose brown slightly gravelly SAND Gravel is subrounded to rounded fine to coarse of mixed lithologies. (TOPSOIL)
					0.25			Stiff brown gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (GLACIAL TILL)
					1.40			End of Borehole at 1.400m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.50	0.60	Pit Stable					

Remarks

No groundwater encountered.

AGS

APPENDIX C

Borehole Logs

Keynetix — Percussion Drilling Log

Project Name: St Peters Close additional SI	Client: SG Estates	Date: 14/09/2021
Location: Rhosrobin	Contractor: Harvey Plant Hire	
Project No. : 2609	Crew Name: Cheshire Drilling	Drilling Equipment: Dando 2000

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH01	CP		ES	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.40			Grass over brown gravelly SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (TOPSOIL)
								Loose gravelly SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (FLUVIOGLACIAL DEPOSITS)
		2.50 - 3.50	B					
					3.50			Medium dense brown clayey gravelly SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (FLUVIOGLACIAL DEPOSITS)
		4.50 - 5.50	B		4.50			Medium dense sandy subrounded to subangular fine to coarse GRAVEL of mixed lithologies with high cobble content. Cobbles are rounded of sandstone and limestone. (FLUVIOGLACIAL DEPOSITS)
		5.50 - 6.50	B					
		7.00 - 8.00	B					
		9.00 - 10.00	B					
					10.00			End of Borehole at 10.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
10.00	200	10.00	200								

Remarks

No groundwater encountered. Falling head depths carried out at various depths.

AGS

Keynetix — Percussion Drilling Log

Project Name: St Peters Close additional SI	Client: SG Estates	Date: 15/09/2021
Location: Rhosrobin	Contractor: Harvey Plant Hire	
Project No. : 2609	Crew Name: Cheshire Drilling	Drilling Equipment: Dando 2000

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH02	CP		ES	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.40			Grass over brown gravelly SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (TOPSOIL)
								Loose to medium dense clayey gravelly SAND. GRavel is subrounded to rounded fine to coarse of mixed lithologies. (FLUVIOGLACIAL DEPOSITS)
		2.30	B		2.30			Firm brown very sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (GLACIAL TILL)
					5.00			*Cobbles or angular limestone recorded @ 4.85m.* End of Borehole at 5.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
				4.85		01:00					

Remarks

No groundwater encountered.

AGS

Percussion Drilling Log

Project Name: St Peters Close additional SI	Client: SG Estates	Date: 14/09/2021
Location: Rhosrobin	Contractor: Harvey Plant Hire	
Project No. : 2609	Crew Name: Cheshire Drilling	Drilling Equipment: Dando 2000

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH2A	CP		ES	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.50			Grass over brown gravelly SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (TOPSOIL)
								Soft to firm brown mottled blue sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (GLACIAL TILL)
					4.80			Medium dense brown very gravelly SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (FLUVIOGLACIAL DEPOSITS)
		5.00	B					
		6.00	B					
		7.00	B					
					7.50			End of Borehole at 7.500m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
7.50	200	7.50	200								

Remarks

No groundwater encountered. Falling head tests carried out at various depths.

Percussion Drilling Log

Project Name: St Peters Close additional SI	Client: SG Estates	Date: 15/09/2021
Location: Rhosrobin	Contractor: Harvey Plant Hire	
Project No. : 2609	Crew Name: Cheshire Drilling	Drilling Equipment: Dando 2000

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH03	CP		ES	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Grass over brown gravelly SAND. Gravel is subrounded to rounded fine to coarse of mixed lithologies.
					0.60			(TOPSOIL)
								Firm brown very gravelly sandy CLAY. Gravel is subrounded to rounded fine to coarse of mixed lithologies. (GLACIAL TILL)
					4.40			Medium dense brown very gravelly slightly clayey SAND with medium cobble content. Gravel is subrounded to rounded fine to coarse of mixed lithologies. Cobbles are rounded of sandstone and limestone. (FLUVIOGLACIAL DEPOSITS)
		5.00	B					
								Cobble content increasing with depth from 7.0m.
					10.00			End of Borehole at 10.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
0.00	200	0.00	200								

Remarks

No groundwater encountered. Falling head tests carried out at various depths.

APPENDIX D

Soakaway Test Results

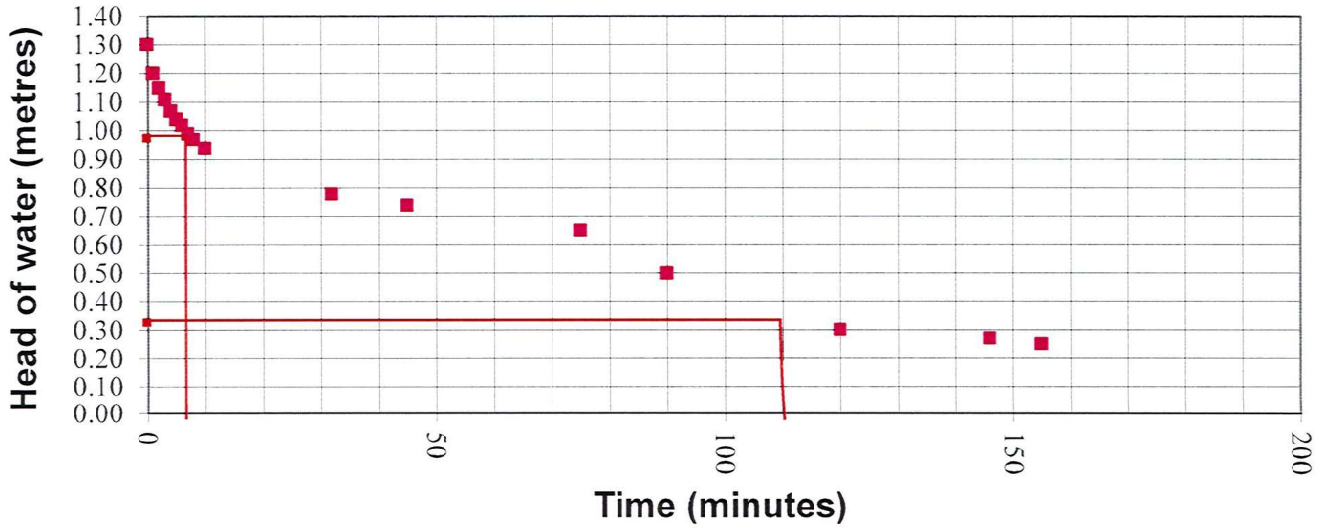
Time (Mins)	Depth of Water	Head of Water
0	0.70	1.30
1	0.80	1.20
2	0.85	1.15
3	0.89	1.11
4	0.93	1.07
5	0.96	1.04
6	0.98	1.02
7	1.01	0.99
8	1.03	0.97
10	1.06	0.94
32	1.22	0.78
45	1.26	0.74
75	1.35	0.65
90	1.50	0.50
120	1.70	0.30
146	1.73	0.27
155	1.75	0.25

GroundSolve Ltd

2609. St Peters Close Additional Works

TP1- Test 1

09/09/2021



Depth	Length	Width	Head at 75% Vol	Head at 25% Vol	Water depth(t=0)	Effective Area	Vp75-Vp25	Adjustment Factor *	t75	t25	Infiltration
(m)	(m)	(m)	(m)	(m)	(m)	Ap50 m2	Volume of water m3		(mins)	(mins)	rate m/s
2.00	1.40	0.60	0.975	0.33	1.30	3.440	0.546	1.00	9	110	2.619E-05

* with gravel filter adjustment factor = 0.30, with no filter = 1.0

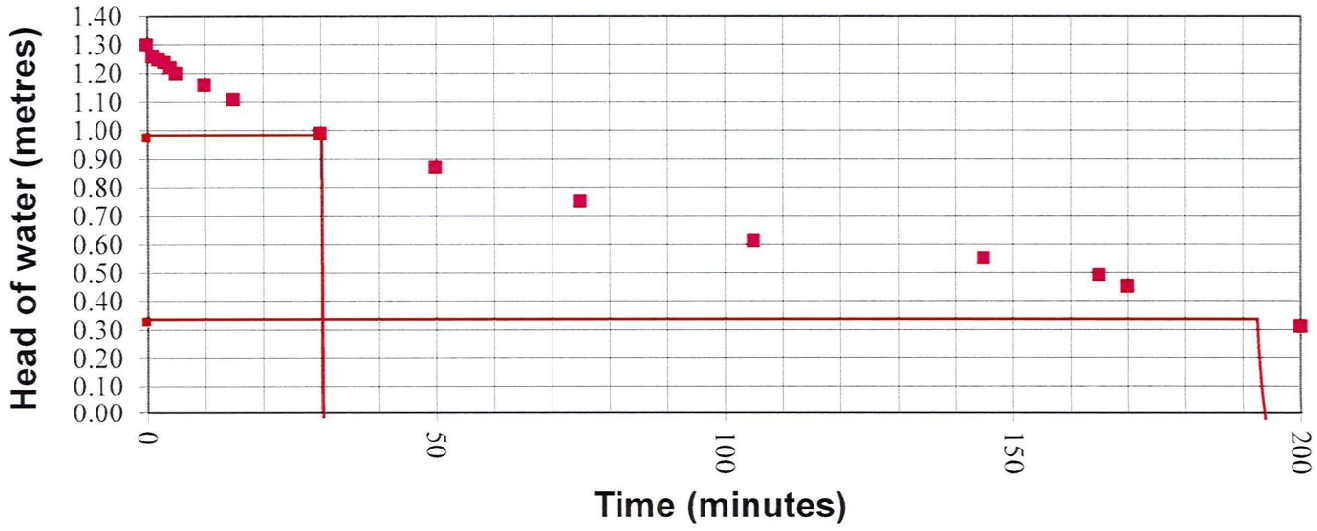
Time (Mins)	Depth of Water	Head of Water
0	0.70	1.30
1	0.74	1.26
2	0.75	1.25
3	0.76	1.24
4	0.78	1.22
5	0.80	1.20
10	0.84	1.16
15	0.89	1.11
30	1.01	0.99
50	1.13	0.87
75	1.25	0.75
105	1.39	0.61
145	1.45	0.55
165	1.51	0.49
170	1.55	0.45
200	1.69	0.31

GroundSolve Ltd

2609. St Peters Close Additional Works

TP1- Test 2

09/09/2021



Depth	Length	Width	Head at 75% Vol	Head at 25% Vol	Water depth(t=0)	Effective Area	Vp75-Vp25	Adjustment Factor *	t75	t25	Infiltration
(m)	(m)	(m)	(m)	(m)	(m)	Ap50 m2	Volume of water m3		(mins)	(mins)	rate m/s
2.00	1.40	0.60	0.975	0.33	1.30	3.440	0.546	1.00	30	192	1.633E-05

* with gravel filter adjustment factor = 0.30, with no filter = 1.0

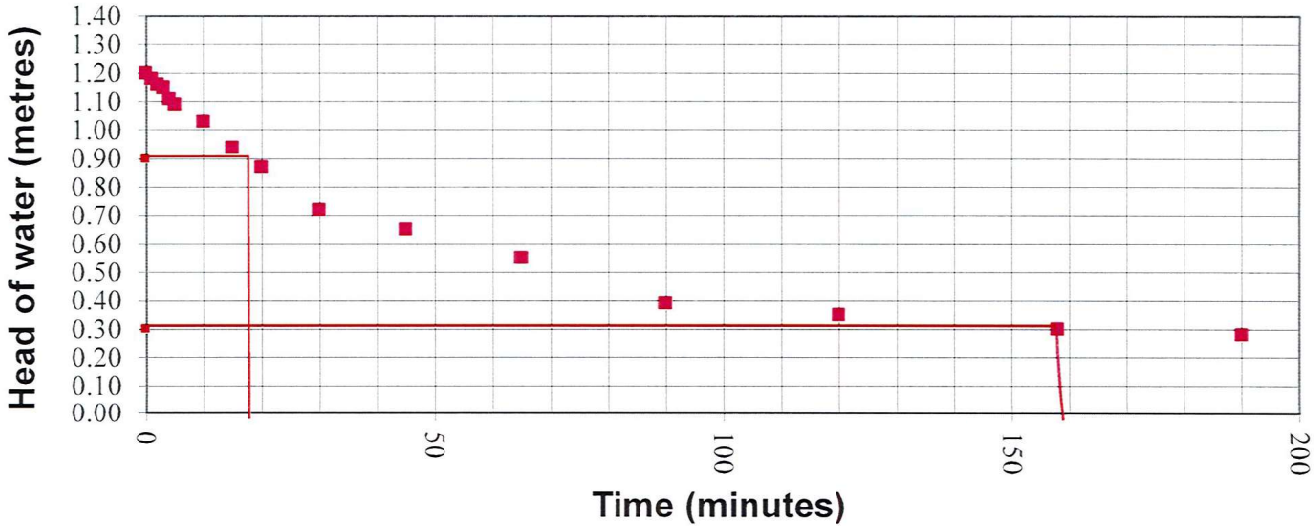
Time (Mins)	Depth of Water	Head of Water
0	0.60	1.20
1	0.62	1.18
2	0.64	1.16
3	0.65	1.15
4	0.69	1.11
5	0.71	1.09
10	0.77	1.03
15	0.86	0.94
20	0.93	0.87
30	1.08	0.72
45	1.15	0.65
65	1.25	0.55
90	1.41	0.39
120	1.45	0.35
158	1.50	0.30
190	1.52	0.28

GroundSolve Ltd

2609. St Peters Close Additional Works

TP1- Test 3

10/09/2021



Depth	Length	Width	Head at 75% Vol	Head at 25% Vol	Water depth(t=0)	Effective Area	Vp75-Vp25	Adjustment Factor *	t75	t25	Infiltration
(m)	(m)	(m)	(m)	(m)	(m)	Ap50 m2	Volume of water m3		(mins)	(mins)	rate m/s
1.80	1.40	0.60	0.900	0.30	1.20	3.240	0.504	1.00	30	159	2.010E-05

* with gravel filter adjustment factor = 0.30, with no filter = 1.0

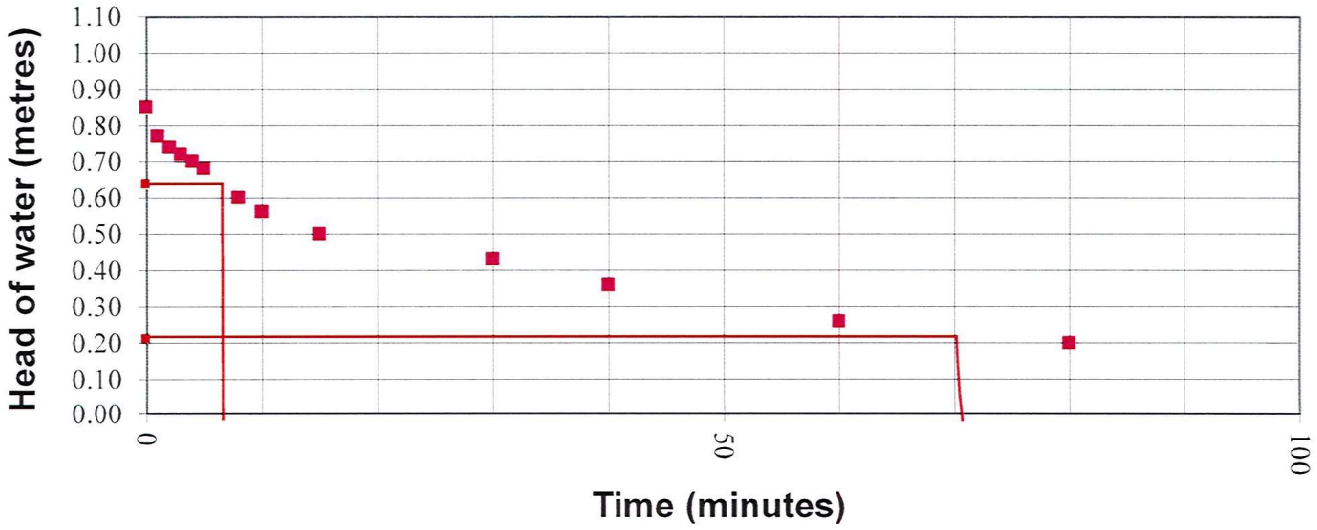
Time (Mins)	Depth of Water	Head of Water
0	0.45	0.85
1	0.53	0.77
2	0.56	0.74
3	0.58	0.72
4	0.60	0.70
5	0.62	0.68
8	0.70	0.60
10	0.74	0.56
15	0.80	0.50
30	0.87	0.43
40	0.94	0.36
60	1.04	0.26
80	1.10	0.20

GroundSolve Ltd

2609. St Peters Close Additional Works

TP3- Test 1

09/09/2021



Depth (m)	Length (m)	Width (m)	Head at 75% Vol (m)	Head at 25% Vol (m)	Water depth(t=0) (m)	Effective Area Ap50 m2	Vp75-Vp25 Volume of water m3	Adjustment Factor *	t75 (mins)	t25 (mins)	Infiltration rate m/s
1.30	1.30	0.60	0.638	0.21	0.85	2.395	0.332	1.00	8	70	3.721E-05

* with gravel filter adjustment factor = 0.30, with no filter = 1.0

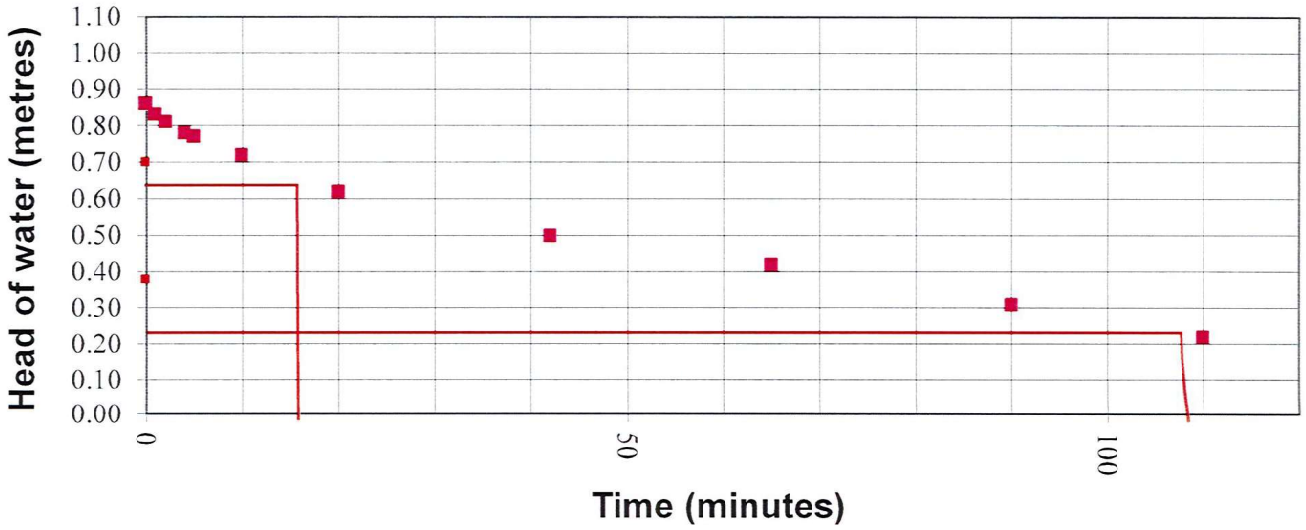
Time (Mins)	Depth of Water	Head of Water
0	0.44	0.86
1	0.47	0.83
2	0.49	0.81
4	0.52	0.78
5	0.53	0.77
10	0.58	0.72
20	0.68	0.62
42	0.80	0.50
65	0.88	0.42
90	0.99	0.31
110	1.08	0.22

GroundSolve Ltd

2609. St Peters Close Additional Works

TP3- Test 2

09/09/2021



Depth (m)	Length (m)	Width (m)	Head at 75% Vol (m)	Head at 25% Vol (m)	Water depth(t=0) (m)	Effective Area Ap50 m2	Vp75-Vp25 Volume of water m3	Adjustment Factor *	t75 (mins)	t25 (mins)	Infiltration rate m/s
1.30	1.30	0.60	0.645	0.22	0.86	2.414	0.335	1.00	15	108	2.490E-05

* with gravel filter adjustment factor = 0.30, with no filter = 1.0

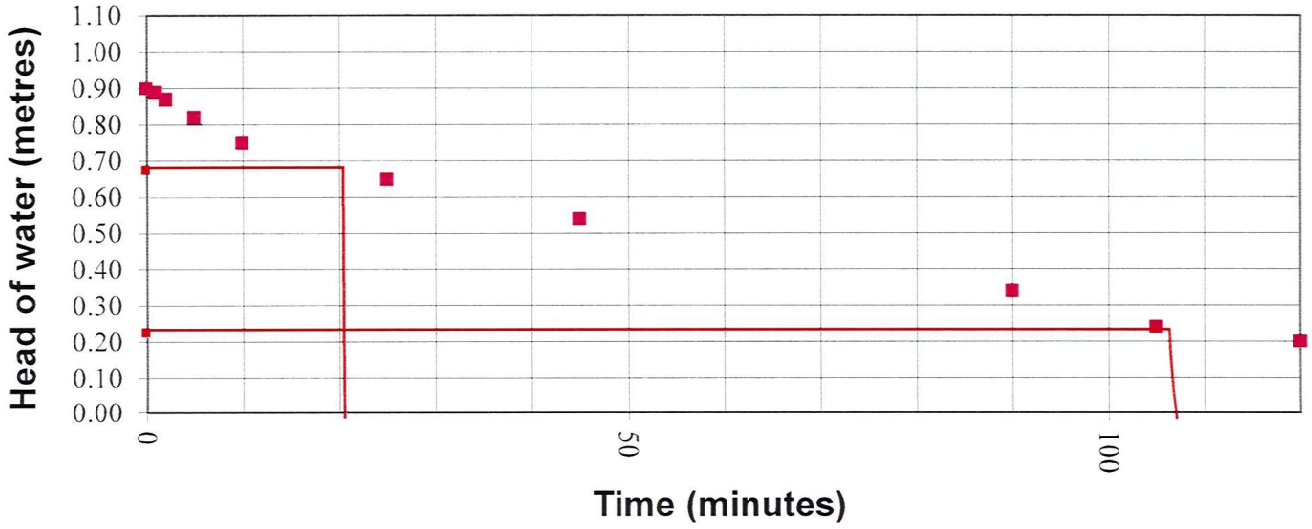
Time (Mins)	Depth of Water	Head of Water
0	0.40	0.90
1	0.41	0.89
2	0.43	0.87
5	0.48	0.82
10	0.55	0.75
25	0.65	0.65
45	0.76	0.54
90	0.96	0.34
105	1.06	0.24
120	1.10	0.20

GroundSolve Ltd

2609. St Peters Close Additional Works

TP3- Test 3

09/09/2021



Depth (m)	Length (m)	Width (m)	Head at 75% Vol (m)	Head at 25% Vol (m)	Water depth(t=0) (m)	Effective Area Ap50 m2	Vp75-Vp25 Volume of water m3	Adjustment Factor *	t75 (mins)	t25 (mins)	Infiltration rate m/s
1.30	1.30	0.60	0.675	0.23	0.90	2.490	0.351	1.00	20	108	2.670E-05

* with gravel filter adjustment factor = 0.30, with no filter = 1.0

APPENDIX E

Falling Head Permeability Test Results

GroundSolve Ltd
Unit 1 Well House Barns
Chester Road
Bretton
Flintshire CH4 0DH

FALLING HEAD TEST PERMEABILITY CALCULATION

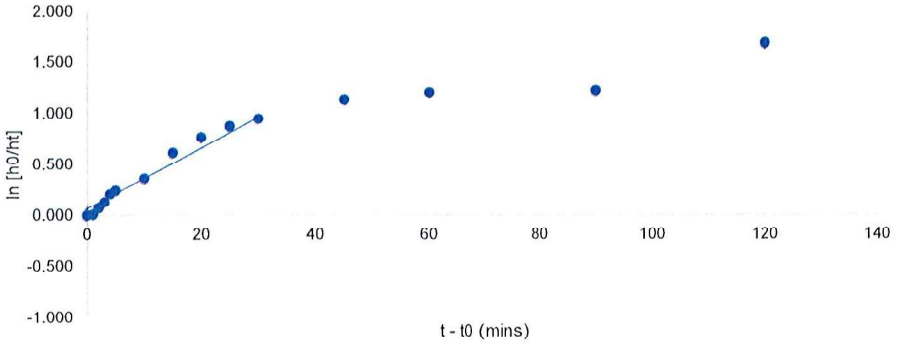
Variable Head Test Method, BS EN ISO 22282-2:2012

Project No.	2609
Project Name	St Peters Close
Borehole	BH1
Date	

BH Depth (m)	4.00
Casing Depth (m)	3.00
Casing Dia (m)	0.15
Casing Height (m)	0.00

L/D Ratio	3.85
Shape Factor	2.4205

Time (mins)	Depth to Water	ln (h0/ht)
0	1.63	0.000
1	1.65	0.008
2	1.80	0.074
3	1.92	0.131
4	2.08	0.211
5	2.15	0.248
10	2.35	0.362
15	2.72	0.616
20	2.90	0.768
25	3.01	0.873
30	3.08	0.946
45	3.24	1.137
60	3.29	1.205
90	3.30	1.220
120	3.56	1.684
		-0.523
		-0.523
		-0.523
		-0.523
		-0.523



α (gradient)	0.03399
Area of BH (m^2)	0.05552

Infiltration Rate, k	**7.796E-04**	m/s

Notes	Test carried out between 3&4m, within slightly clayey sand and gravels.

GroundSolve Ltd
Unit 1 Well House Barns
Chester Road
Bretton
Flintshire CH4 0DH

FALLING HEAD TEST PERMEABILITY CALCULATION

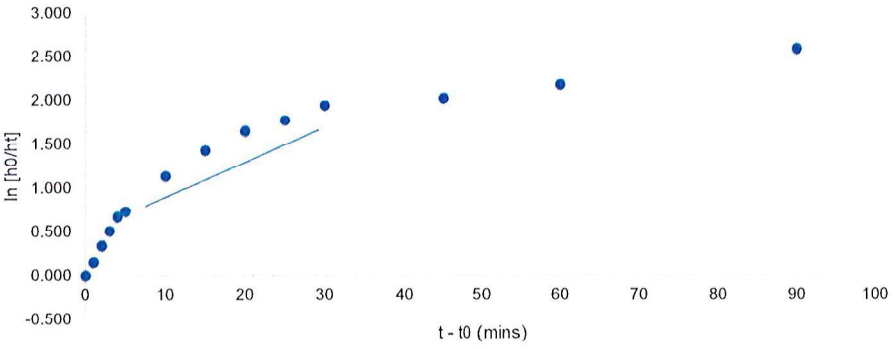
Variable Head Test Method, BS EN ISO 22282-2:2012

Project No.	2609
Project Name	St Peters Close
Borehole	BH1
Date	

BH Depth (m)	5.50
Casing Depth (m)	4.50
Casing Dia (m)	0.15
Casing Height (m)	0.00

L/D Ratio	3.85
Shape Factor	2.4205

Time (mins)	Depth to Water	ln (h0/ht)
0	0.20	0.000
1	0.94	0.150
2	1.75	0.346
3	2.32	0.511
4	2.79	0.671
5	2.95	0.732
10	3.80	1.137
15	4.23	1.429
20	4.48	1.648
25	4.60	1.773
30	4.74	1.942
45	4.80	2.024
60	4.90	2.179
90	5.10	2.584
		-0.037
		-0.037
		-0.037
		-0.037
		-0.037
		-0.037



α (gradient)	0.05784
Area of BH (m^2)	0.05552

Infiltration Rate, k	1.37E10-4	m/s

Notes	Test carried out between 4.5+5.5m, within sand and gravels.

GroundSolve Ltd
Unit 1 Well House Barns
Chester Road
Bretton
Flintshire CH4 0DH

FALLING HEAD TEST PERMEABILITY CALCULATION

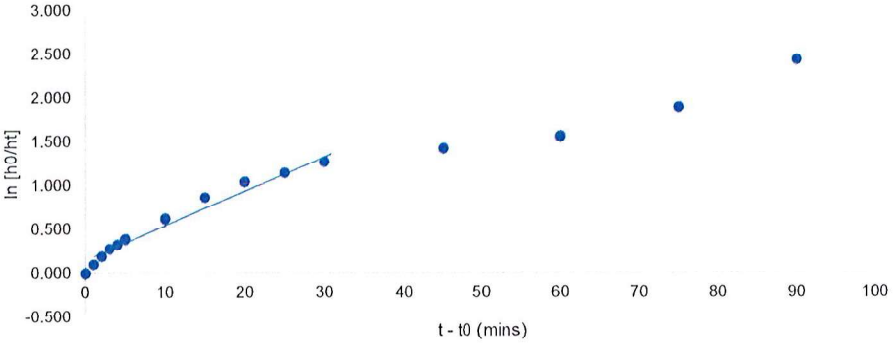
Variable Head Test Method, BS EN ISO 22282-2:2012

Project No.	2609
Project Name	St Peters Close
Borehole	BH1
Date	

BH Depth (m)	6.50
Casing Depth (m)	5.50
Casing Dia (m)	0.15
Casing Height (m)	0.00

L/D Ratio	3.85
Shape Factor	2.4205

Time (mins)	Depth to Water	ln (h0/ht)
0	0.80	0.000
1	1.35	0.101
2	1.80	0.193
3	2.20	0.282
4	2.40	0.329
5	2.65	0.392
10	3.44	0.622
15	4.10	0.865
20	4.50	1.047
25	4.70	1.153
30	4.91	1.277
45	5.13	1.426
60	5.30	1.558
75	5.64	1.891
90	6.00	2.434
		-0.131
		-0.131
		-0.131
		-0.131
		-0.131



α (gradient)	0.04127
Area of BH (m^2)	0.05552

Infiltration Rate, k	9.466E-04	m/s

Notes	Test carried out between 5.5+6.5m, within sand and gravels.

GroundSolve Ltd
Unit 1 Well House Barns
Chester Road
Bretton
Flintshire CH4 0DH

FALLING HEAD TEST PERMEABILITY CALCULATION

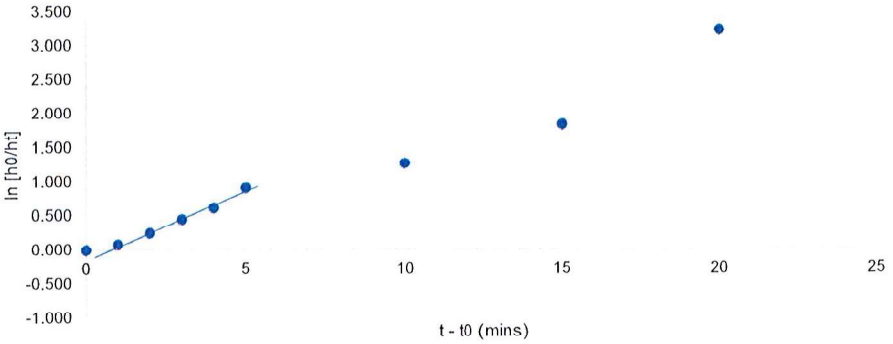
Variable Head Test Method, BS EN ISO 22282-2:2012

Project No.	2609
Project Name	St Peters Close
Borehole	BH1
Date	

BH Depth (m)	8.00
Casing Depth (m)	7.00
Casing Dia (m)	0.15
Casing Height (m)	0.00

L/D Ratio	3.85
Shape Factor	2.4205

Time (mins)	Depth to Water	ln (h0/ht)
0	3.00	0.000
1	3.40	0.083
2	4.10	0.248
3	4.80	0.446
4	5.30	0.616
5	6.00	0.916
10	6.60	1.273
15	7.20	1.833
20	7.80	3.219
		-0.470
		-0.470
		-0.470
		-0.470
		-0.470



α (gradient)	0.14604
Area of BH (m^2)	0.05552

Infiltration Rate, k	**3.350E-03** m/s

Notes	Test carried out between 7+8m, slightly sand and gravels.

GroundSolve Ltd
Unit 1 Well House Barns
Chester Road
Bretton
Flintshire CH4 0DH

FALLING HEAD TEST PERMEABILITY CALCULATION

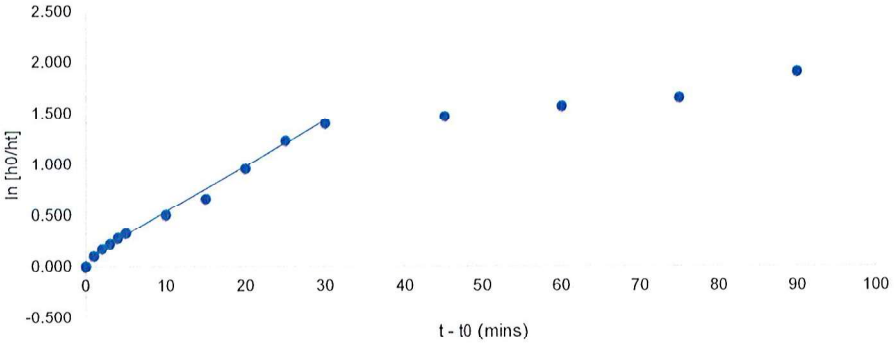
Variable Head Test Method, BS EN ISO 22282-2:2012

Project No.	2609
Project Name	St Peters Close
Borehole	BH2a
Date	

BH Depth (m)	6.00
Casing Depth (m)	5.00
Casing Dia (m)	0.15
Casing Height (m)	0.00

L/D Ratio	3.85
Shape Factor	2.4205

Time (mins)	Depth to Water	ln (h0/ht)
0	1.78	0.000
1	2.20	0.105
2	2.46	0.176
3	2.63	0.225
4	2.82	0.283
5	2.96	0.328
10	3.45	0.504
15	3.83	0.665
20	4.38	0.957
25	4.77	1.233
30	4.96	1.401
45	5.03	1.470
60	5.12	1.568
75	5.19	1.651
90	5.37	1.902
		-0.352
		-0.352
		-0.352
		-0.352
		-0.352



α (gradient)	0.04389
Area of BH (m^2)	0.05552

Infiltration Rate, k	**1.007E-03**	m/s

Notes	Test carried out between 5+6m, within sand and gravels.

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FALLING HEAD TEST PERMEABILITY CALCULATION

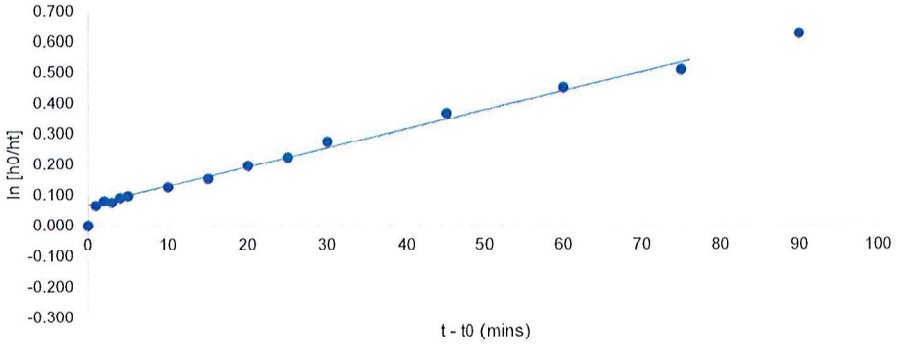
Variable Head Test Method, BS EN ISO 22282-2:2012

Project No.	2609
Project Name	St Peters Close
Borehole	BH3
Date	

BH Depth (m)	6.00
Casing Depth (m)	5.00
Casing Dia (m)	0.15
Casing Height (m)	0.00

L/D Ratio	3.85
Shape Factor	2.4205

Time (mins)	Depth to Water	ln (h0/ht)
0	0.95	0.000
1	1.27	0.065
2	1.34	0.080
3	1.32	0.076
4	1.39	0.091
5	1.42	0.098
10	1.55	0.126
15	1.67	0.154
20	1.85	0.196
25	1.96	0.223
30	2.16	0.274
45	2.50	0.367
60	2.78	0.450
75	2.96	0.508
90	3.30	0.626
		-0.172
		-0.172
		-0.172
		-0.172
		-0.172



α (gradient)	0.00650
Area of BH (m^2)	0.05552

Infiltration Rate, k	1.491E-04	m/s

Notes	Test carried out between 5+6m, within sand and gravels.

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FALLING HEAD TEST PERMEABILITY CALCULATION

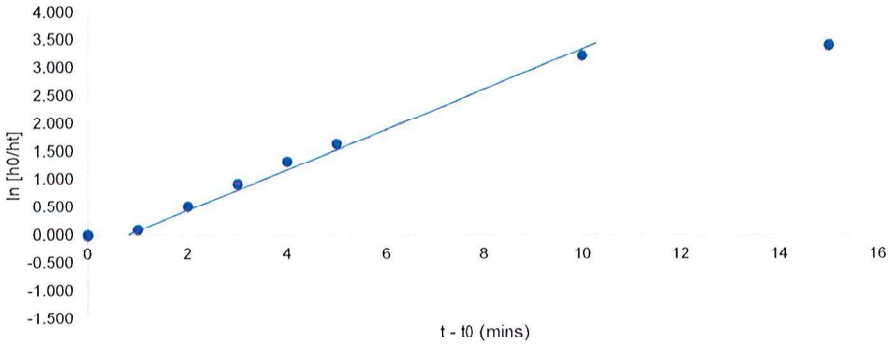
Variable Head Test Method, BS EN ISO 22282-2:2012

Project No.	2609
Project Name	St Peters Close
Borehole	BH3
Date	

BH Depth (m)	7.00
Casing Depth (m)	6.00
Casing Dia (m)	0.15
Casing Height (m)	0.00

L/D Ratio	3.85
Shape Factor	2.4205

Time (mins)	Depth to Water	ln (h0/ht)
0	4.00	0.000
1	4.29	0.102
2	5.20	0.511
3	5.80	0.916
4	6.20	1.322
5	6.42	1.643
10	6.88	3.219
15	6.90	3.401
		-0.847
		-0.847
		-0.847
		-0.847
		-0.847



α (gradient)	0.21491
Area of BH (m^2)	0.05552

Infiltration Rate, k	4.929E-03	m/s

Notes	Test carried out between 6+7m, within sand and gravels.

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Flintshire CH4 0DH

FALLING HEAD TEST PERMEABILITY CALCULATION

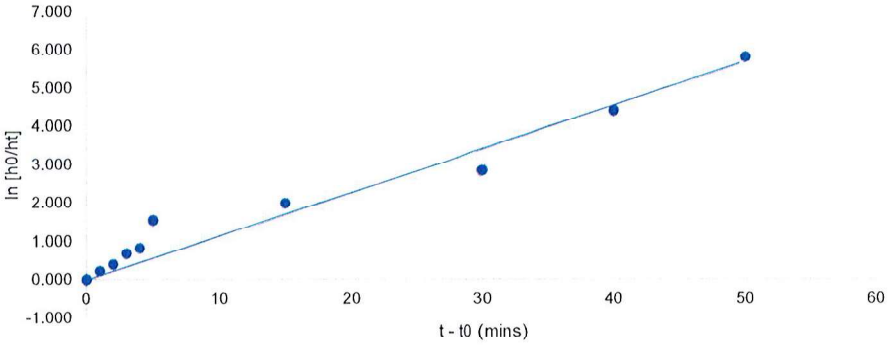
Variable Head Test Method, BS EN ISO 22282-2:2012

Project No.	2609
Project Name	St Peters Close
Borehole	BH3
Date	

BH Depth (m)	9.00
Casing Depth (m)	8.00
Casing Dia (m)	0.15
Casing Height (m)	0.00

L/D Ratio	3.85
Shape Factor	2.4205

Time (mins)	Depth to Water	ln (h0/ht)
0	2.40	0.000
1	3.72	0.223
2	4.60	0.405
3	5.68	0.687
4	6.10	0.822
5	7.60	1.551
15	8.10	1.992
30	8.62	2.855
40	8.92	4.413
50	8.98	5.799
		-0.310
		-0.310
		-0.310
		-0.310
		-0.310



α (gradient)	0.09808
Area of BH (m^2)	0.05552

Infiltration Rate, k	**2.250E-03**	m/s

Notes	Test carried out between 8+9m, within sand and gravels.

APPENDIX F

CBR Test Results

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

Well House Barns • Bretton • CH4 0DH

Project: 2585

Project name: St Peters Close

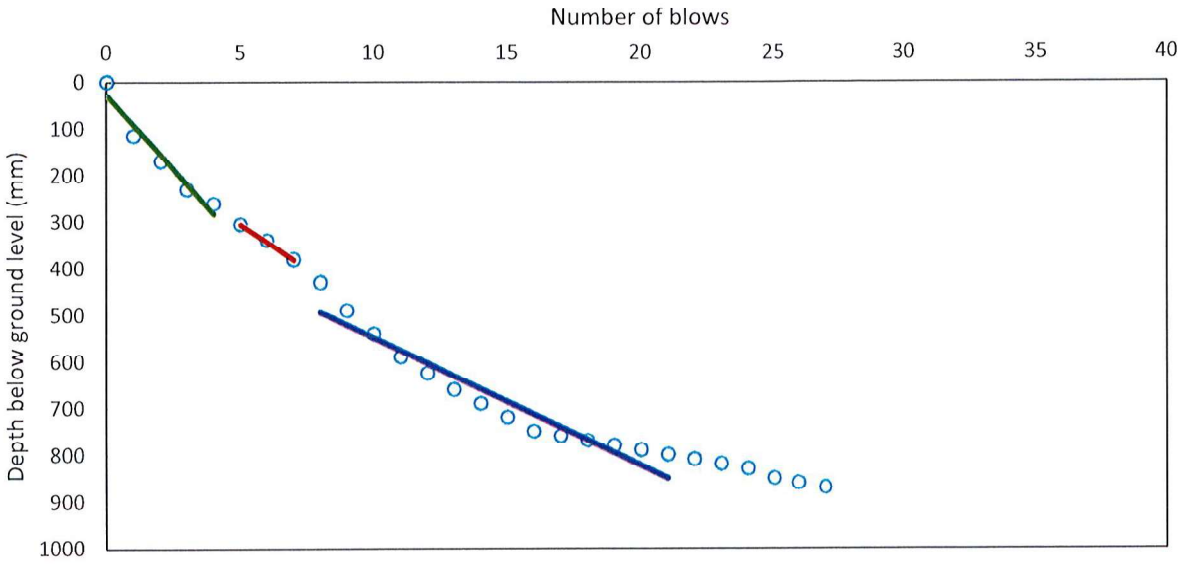
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP1



Layer 0-280mm bgl

50th Percentile penetration rate	32	mm/blow	
Estimated CBR	7.7	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	65.2	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	101.9	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 280-400mm bgl

50th Percentile penetration rate	19	mm/blow	
Estimated CBR	13.4	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	92.7	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	146.8	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 400-800mm bgl

50th Percentile penetration rate	14	mm/blow	
Estimated CBR	18.6	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	114.0	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	181.9	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

Well House Barns • Bretton • CH4 0DH

Project: 2585

Project name: St Peters Close

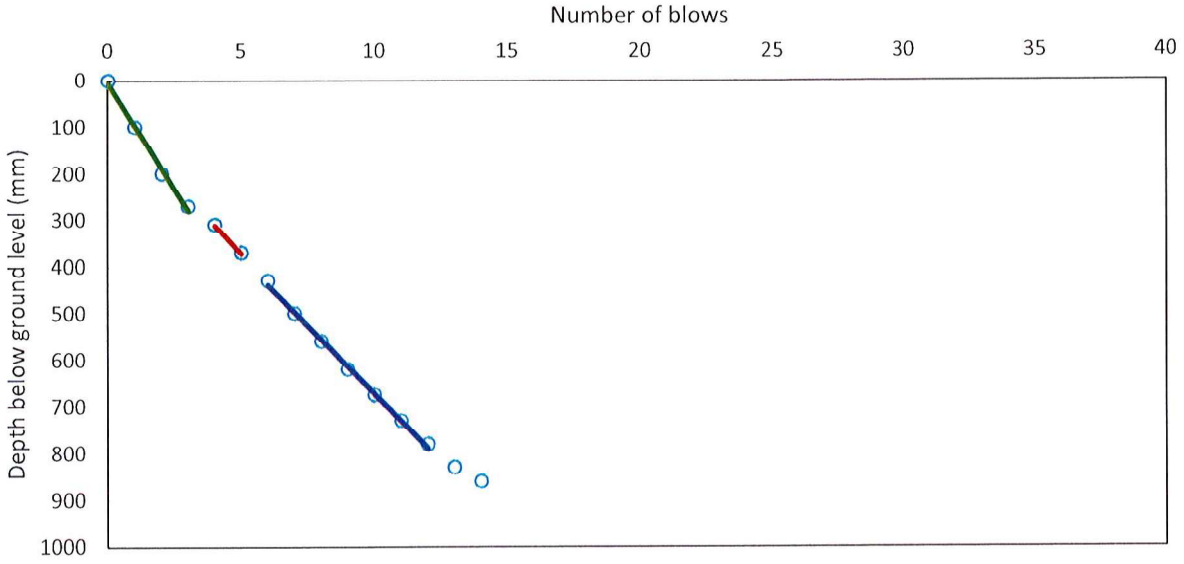
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP2



Layer 0-280mm bgl

50th Percentile penetration rate	46	mm/blow	
Estimated CBR	5.3	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	51.0	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	79.0	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 280-400mm bgl

50th Percentile penetration rate	30	mm/blow	
Estimated CBR	8.3	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	68.1	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	106.6	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 400-800mm bgl

50th Percentile penetration rate	30	mm/blow	
Estimated CBR	8.3	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	68.1	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	106.6	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

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Project: 2585

Project name: St Peters Close

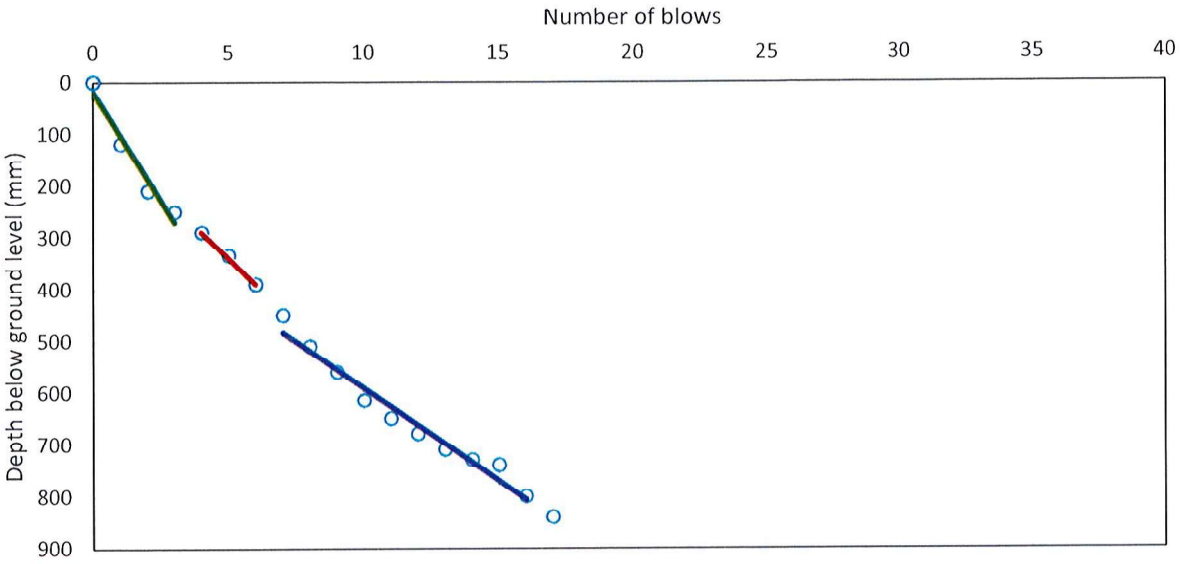
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP3



Layer 0-280mm bgl

50th Percentile penetration rate	42	mm/blow	
Estimated CBR	5.8	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	54.2	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	84.2	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 280-400mm bgl

50th Percentile penetration rate	25	mm/blow	
Estimated CBR	10.1	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	77.0	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	121.1	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 400-800mm bgl

50th Percentile penetration rate	18	mm/blow	
Estimated CBR	14.2	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	96.2	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	152.5	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

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Project: 2585

Project name: St Peters Close

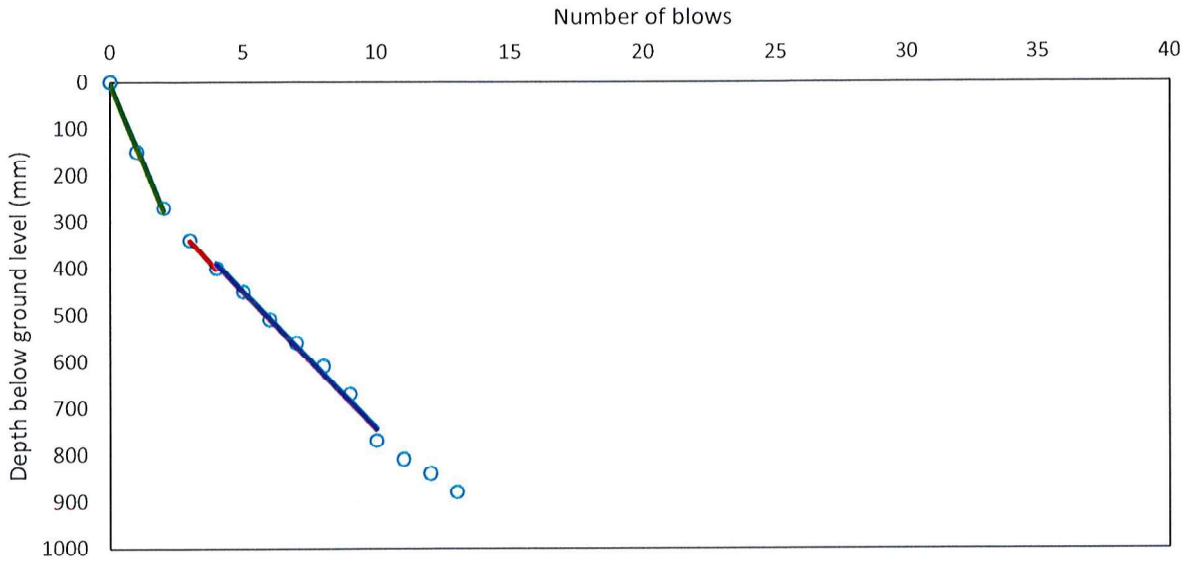
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP4



Layer 0-280mm bgl

50th Percentile penetration rate	68	mm/blow	
Estimated CBR	3.5	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	39.1	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	60.0	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 280-400mm bgl

50th Percentile penetration rate	30	mm/blow	
Estimated CBR	8.3	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	68.1	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	106.6	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 400-800mm bgl

50th Percentile penetration rate	30	mm/blow	
Estimated CBR	8.3	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	68.1	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	106.6	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

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Project: 2585

Project name: St Peters Close

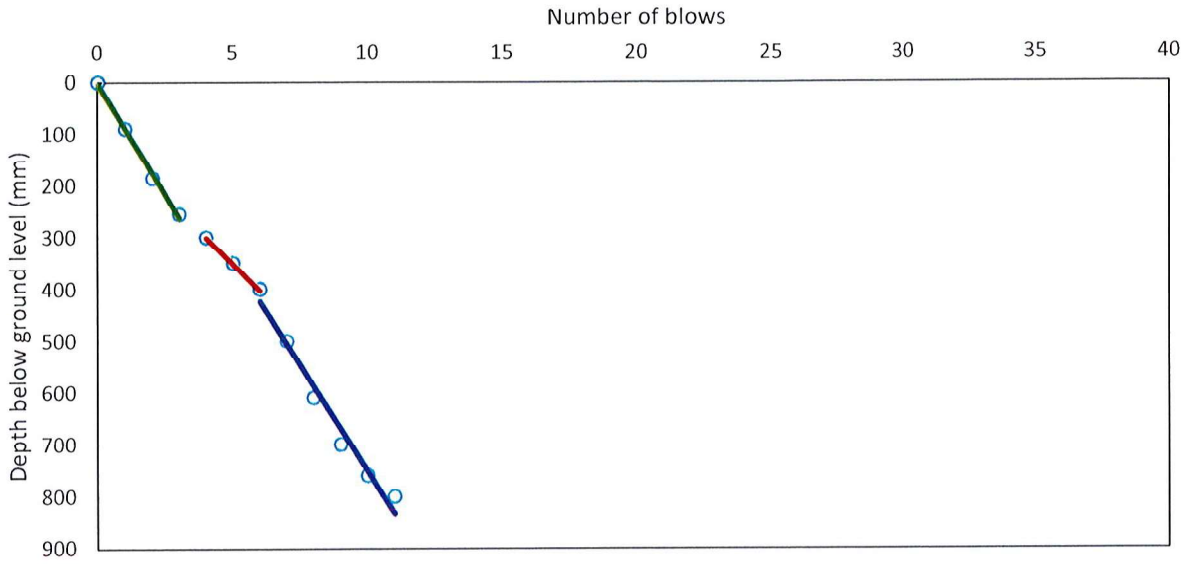
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP5



Layer 0-280mm bgl

50th Percentile penetration rate	43	mm/blow	
Estimated CBR	5.7	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	53.4	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	82.8	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 280-400mm bgl

50th Percentile penetration rate	25	mm/blow	
Estimated CBR	10.1	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	77.0	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	121.1	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 400-800mm bgl

50th Percentile penetration rate	41	mm/blow	
Estimated CBR	6.0	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	55.1	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	85.6	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

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Project: 2585

Project name: St Peters Close

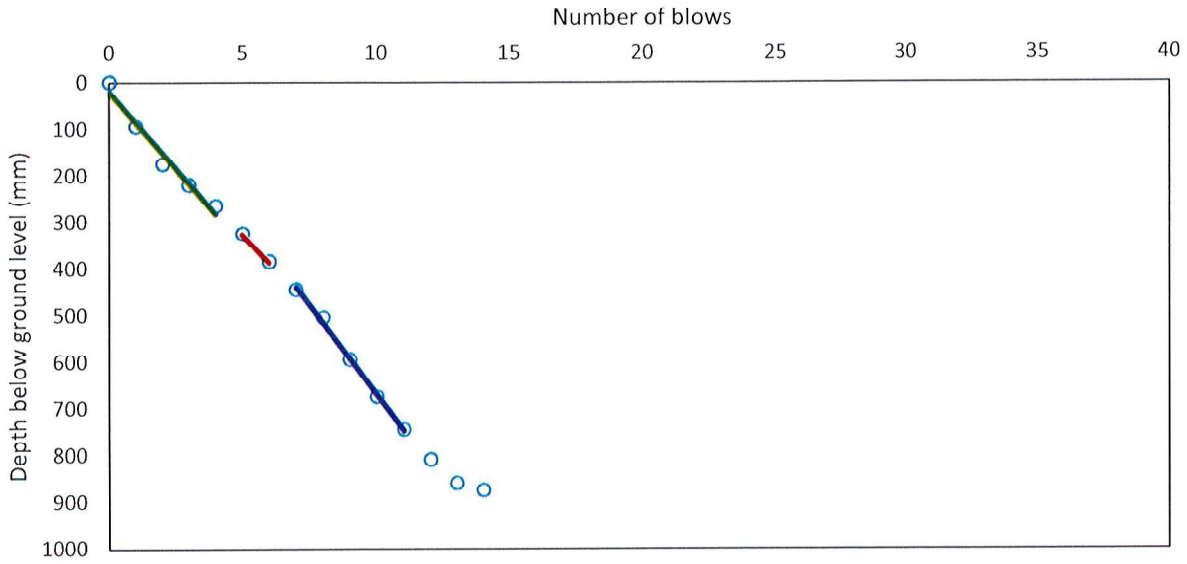
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP6



Layer 0-280mm bgl

50th Percentile penetration rate	33	mm/blow	
Estimated CBR	7.5	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	63.8	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	99.7	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 280-400mm bgl

50th Percentile penetration rate	30	mm/blow	
Estimated CBR	8.3	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	68.1	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	106.6	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 400-800mm bgl

50th Percentile penetration rate	39	mm/blow	
Estimated CBR	6.3	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	57.0	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	88.6	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

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Project: 2585

Project name: St Peters Close

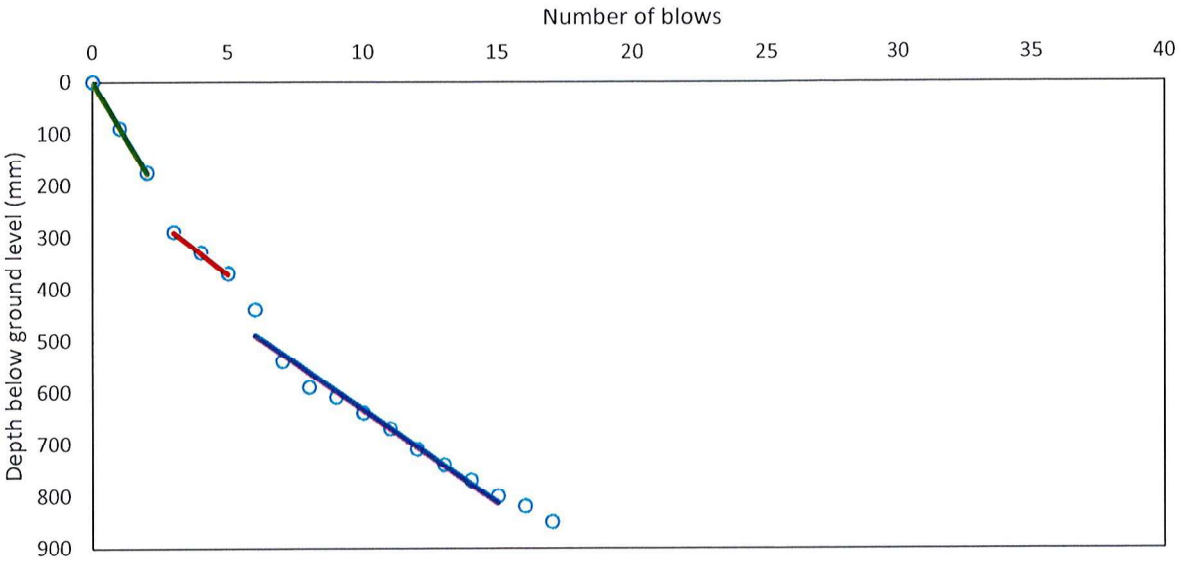
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP7



Layer 0-280mm bgl

50th Percentile penetration rate	44	mm/blow	
Estimated CBR	5.5	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	52.5	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	81.5	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 280-400mm bgl

50th Percentile penetration rate	20	mm/blow	
Estimated CBR	12.7	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	89.6	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	141.7	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 400-800mm bgl

50th Percentile penetration rate	18	mm/blow	
Estimated CBR	14.2	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	96.2	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	152.5	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

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Project: 2585

Project name: St Peters Close

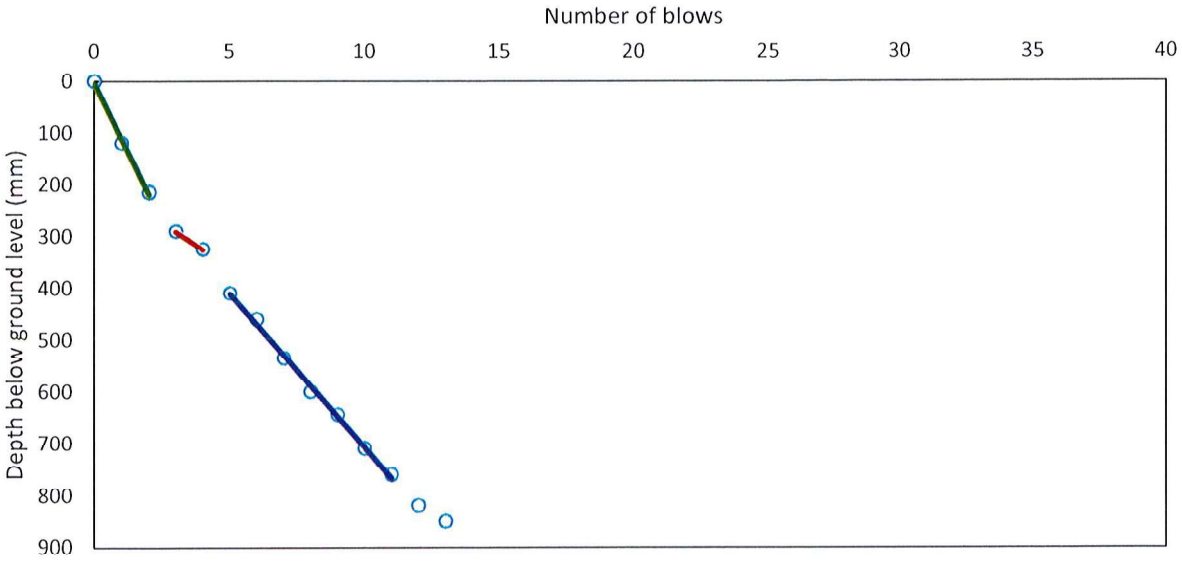
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP8



Layer 0-280mm bgl

50th Percentile penetration rate	54	mm/blow	
Estimated CBR	4.5	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	45.7	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	70.5	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 280-400mm bgl

50th Percentile penetration rate	18	mm/blow	
Estimated CBR	14.2	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	96.2	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	152.5	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 400-800mm bgl

50th Percentile penetration rate	30	mm/blow	
Estimated CBR	8.3	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	68.1	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	106.6	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

Well House Barns • Bretton • CH4 0DH

Project: 2585

Project name: St Peters Close

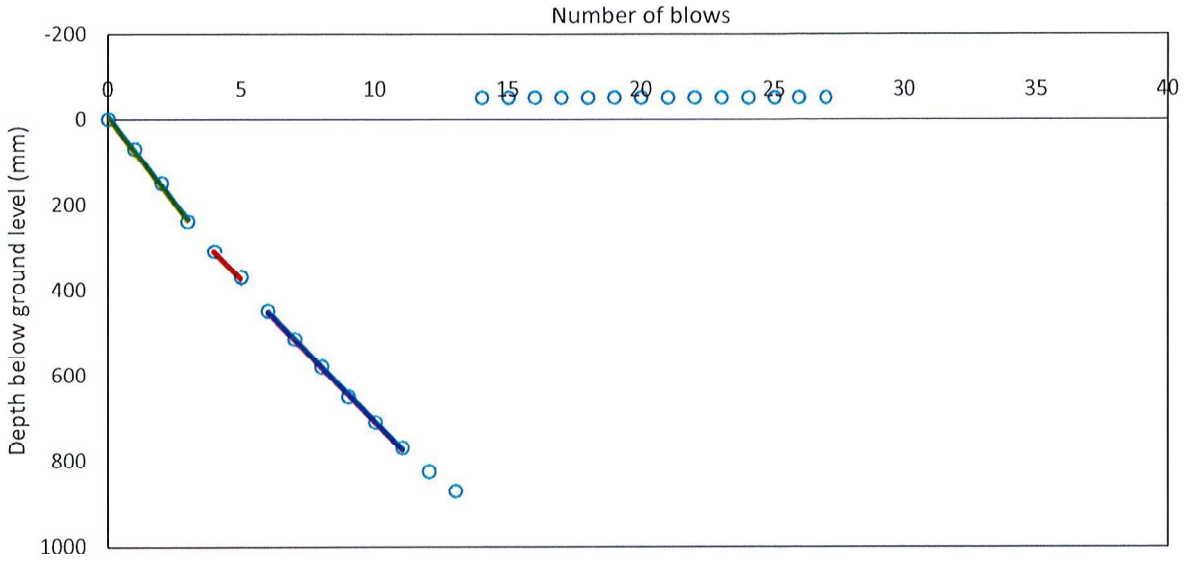
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP9



Layer 0-280mm bgl

50th Percentile penetration rate	40	mm/blow	
Estimated CBR	6.1	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	56.0	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	87.1	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 280-400mm bgl

50th Percentile penetration rate	30	mm/blow	
Estimated CBR	8.3	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	68.1	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	106.6	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 400-800mm bgl

50th Percentile penetration rate	33	mm/blow	
Estimated CBR	7.5	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	63.8	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	99.7	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

Well House Barns • Bretton • CH4 0DH

Project: 2585

Project name: St Peters Close

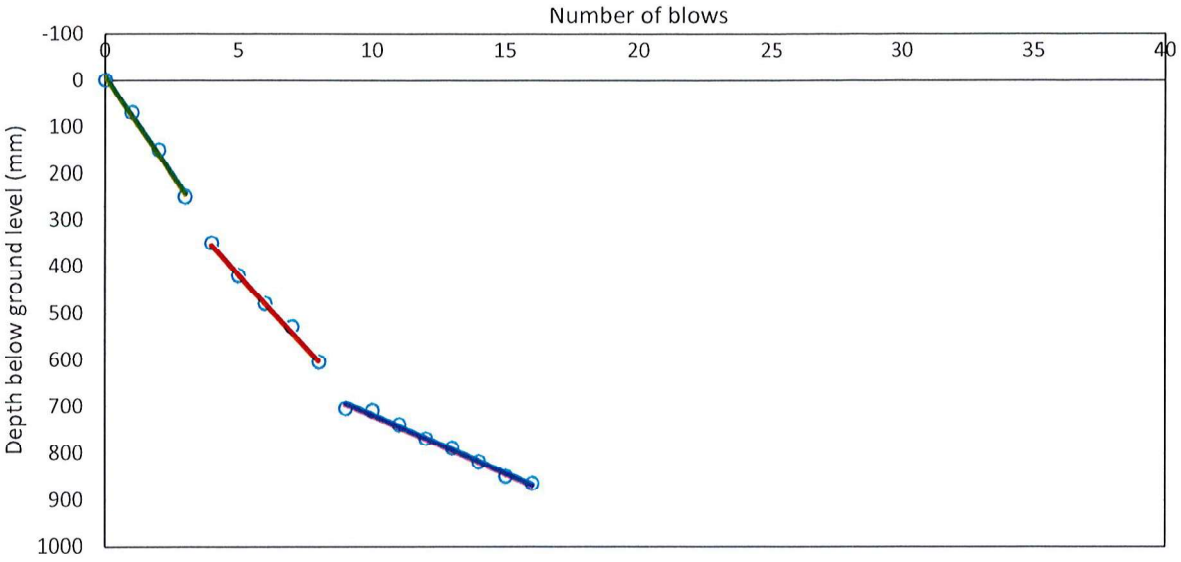
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP10



Layer 0-280mm bgl

50th Percentile penetration rate	42	mm/blow	
Estimated CBR	5.8	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	54.2	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	84.2	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 350-700mm bgl

50th Percentile penetration rate	31	mm/blow	
Estimated CBR	8.0	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	66.6	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	104.1	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 700-900mm bgl

50th Percentile penetration rate	13	mm/blow	
Estimated CBR	20.1	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	119.9	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	191.7	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

Well House Barns • Bretton • CH4 0DH

Project: 2585

Project name: St Peters Close

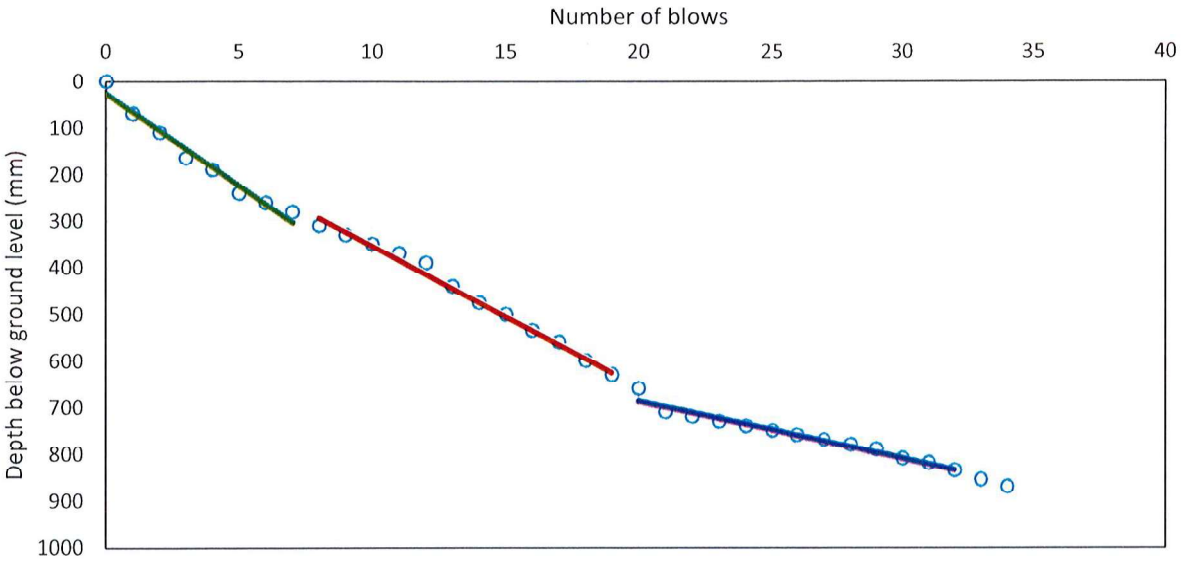
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP11



Layer 0-300mm bgl

50th Percentile penetration rate	20	mm/blow	
Estimated CBR	12.7	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	89.6	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	141.7	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 300-650mm bgl

50th Percentile penetration rate	16	mm/blow	
Estimated CBR	16.1	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	104.1	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	165.7	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 650-850mm bgl

50th Percentile penetration rate	7	mm/blow	
Estimated CBR	38.6	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	182.2	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	296.0	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

Well House Barns • Bretton • CH4 0DH

Project: 2585

Project name: St Peters Close

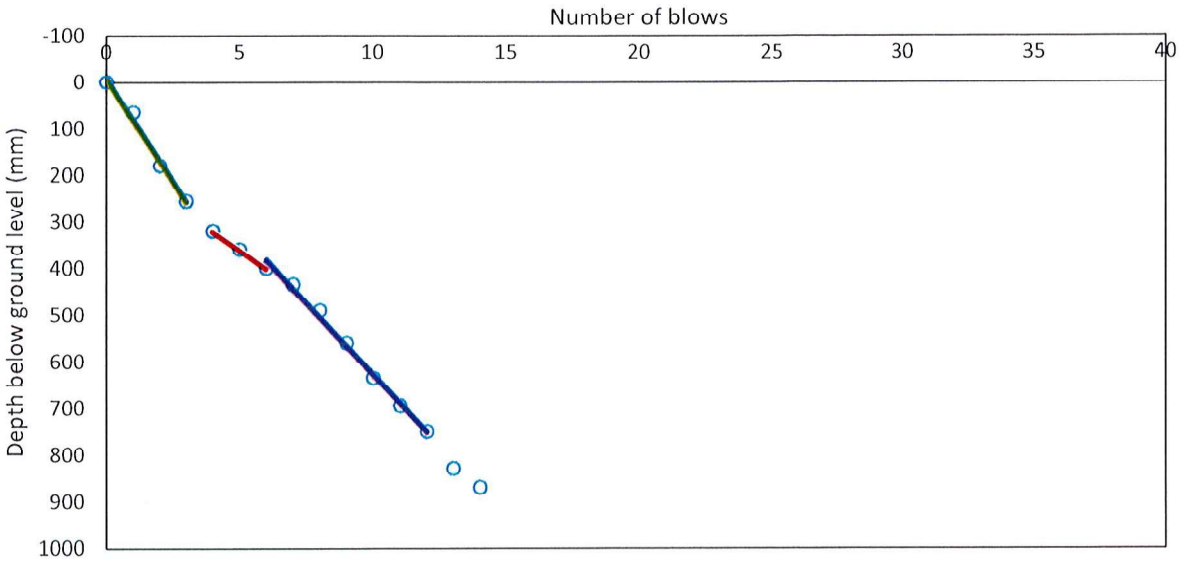
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP12



Layer 0-280mm bgl

50th Percentile penetration rate	44	mm/blow	
Estimated CBR	5.5	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	52.5	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	81.5	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 280-400mm bgl

50th Percentile penetration rate	20	mm/blow	
Estimated CBR	12.7	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	89.6	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	141.7	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 400-800mm bgl

50th Percentile penetration rate	31	mm/blow	
Estimated CBR	8.0	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	66.6	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	104.1	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

Well House Barns • Bretton • CH4 0DH

Project: 2585

Project name: St Peters Close

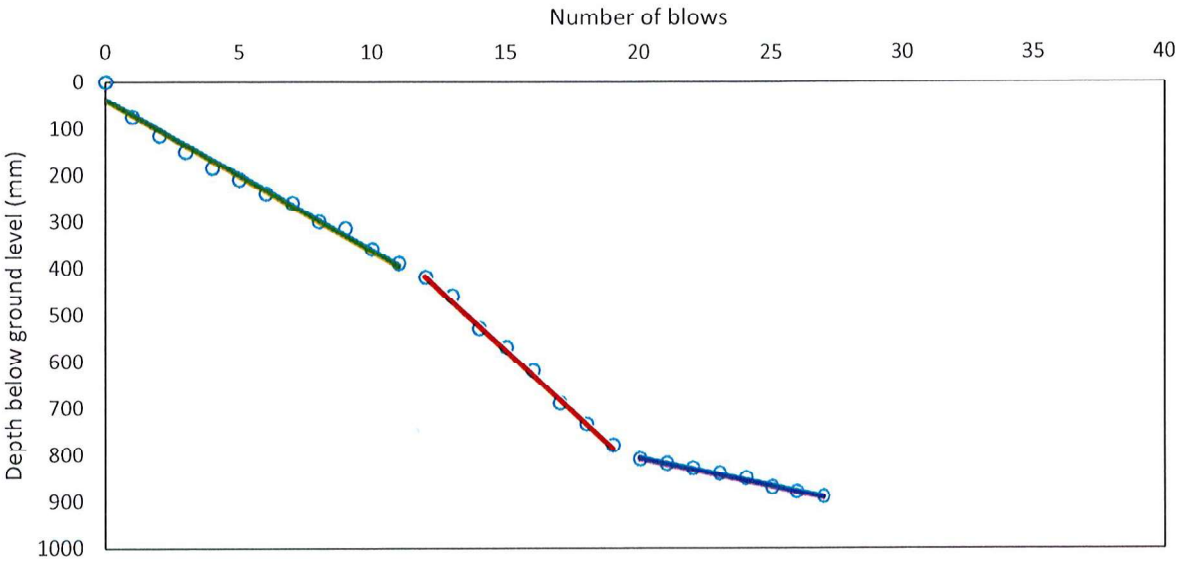
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP13



Layer 0-400mm bgl

50th Percentile penetration rate	17	mm/blow	
Estimated CBR	15.1	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	100.0	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	158.8	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 400-800mm bgl

50th Percentile penetration rate	27	mm/blow	
Estimated CBR	9.3	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	73.1	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	114.8	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 800-900mm bgl

50th Percentile penetration rate	6	mm/blow	
Estimated CBR	45.4	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	202.2	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	329.8	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

Well House Barns • Bretton • CH4 0DH

Project: 2585

Project name: St Peters Close

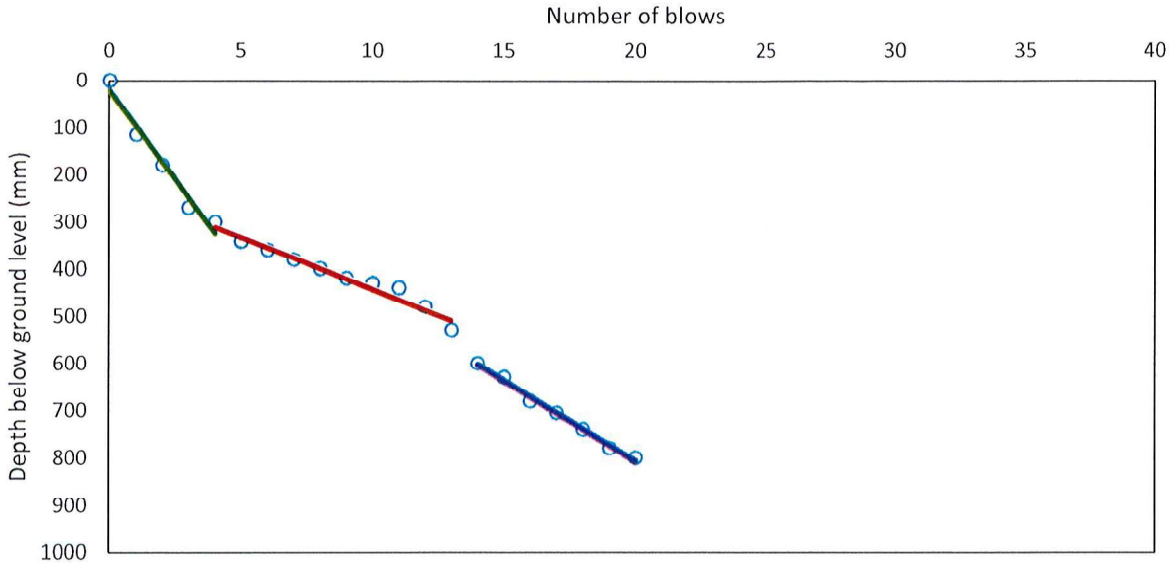
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP14



Layer 0-300mm bgl

50th Percentile penetration rate	38	mm/blow	
Estimated CBR	6.5	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	58.0	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	90.3	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 300-550mm bgl

50th Percentile penetration rate	11	mm/blow	
Estimated CBR	23.9	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	134.2	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	215.5	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 550-800mm bgl

50th Percentile penetration rate	18	mm/blow	
Estimated CBR	14.2	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	96.2	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	152.5	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

Well House Barns • Bretton • CH4 0DH

Project: 2585

Project name: St Peters Close

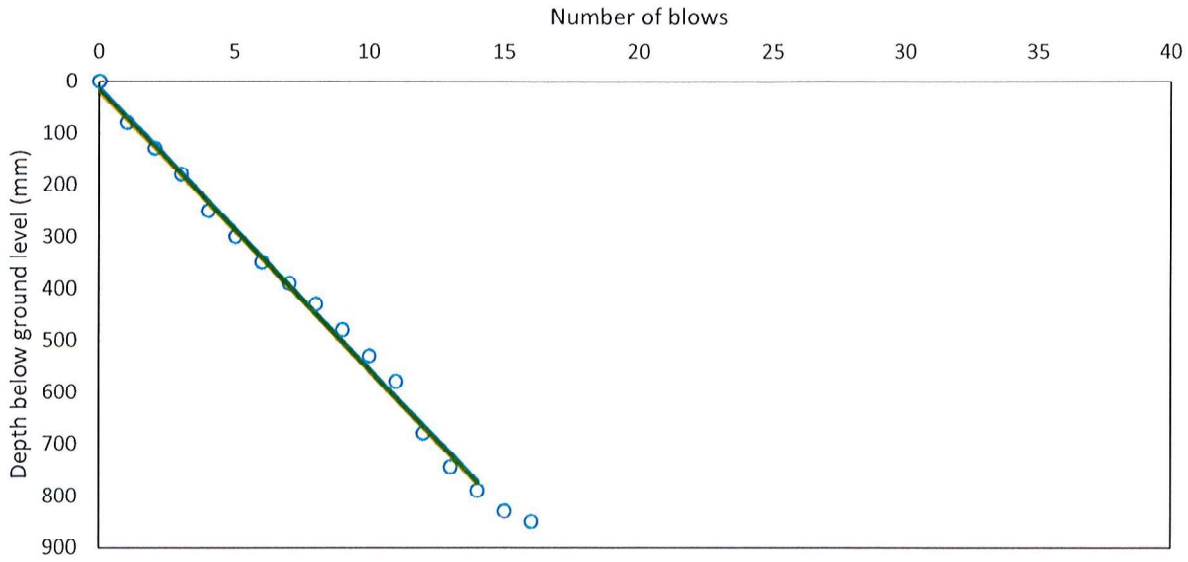
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP15



Layer 0-800mm bgl

50th Percentile penetration rate	28	mm/blow	
Estimated CBR	8.9	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	71.3	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	111.9	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

DYNAMIC CONE PENETROMETER TEST REPORT

GroundSolve Ltd

Well House Barns • Bretton • CH4 0DH

Project: 2585

Project name: St Peters Close

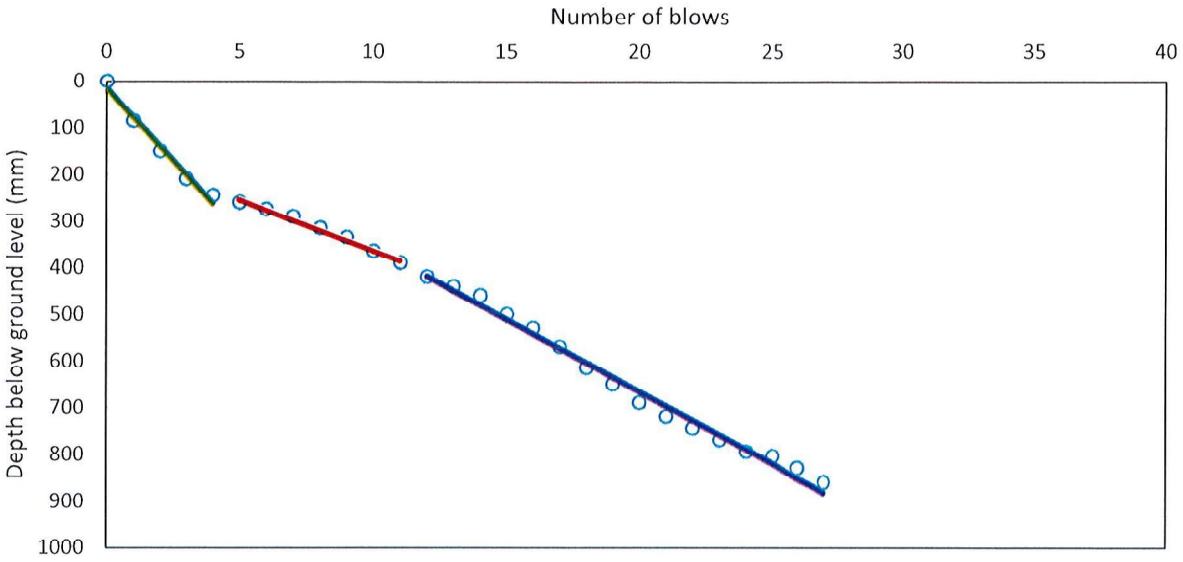
Report date: 05/08/2021

Operator: CK

Notes:

Test date: 05/08/2021

Test location: DCP16



Layer 0-250mm bgl

50th Percentile penetration rate	31	mm/blow	
Estimated CBR	8.0	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	66.6	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	104.1	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 250-400mm bgl

50th Percentile penetration rate	11	mm/blow	
Estimated CBR	23.9	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	134.2	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	215.5	kPa	[PCA - Design of Concrete Pavement. 1955]

Layer 400-900mm bgl

50th Percentile penetration rate	16	mm/blow	
Estimated CBR	16.1	%	[IAN 73/06 Rev1 (2009) - Clause 893]
Subgrade surface modulus	104.1	MPa	[TRRL LR 1132 - Appendix C Equation C1]
Estimated bearing capacity	165.7	kPa	[PCA - Design of Concrete Pavement. 1955]

Produced by	Dated	Checked by	Dated
TG	05/08/21		

APPENDIX G

Physical Test Results

LABORATORY REPORT

4043

Contract Number: PSL21/6865

Report Date: 02 September 2021

Client's Reference:

Client Name: Dets
Park Rd Industrial Estate
South Consett
Co Durham
DH8 5PY

For the attention of: Adam Fenwick

Contract Title: 21-17044

Date Received: 25/8/2021
Date Commenced: 25/8/2021
Date Completed: 2/9/2021

Notes: **Opinions and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins (Director)

R Berriman (Quality Manager)

S Royle (Laboratory Manager)

L Knight (Assistant Laboratory Manager)

S Eyre (Senior Technician)

T Watkins (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP01	1889375		1.00		Brown slightly gravelly very sandy CLAY
TP04	1889376		1.00		Brown slightly gravelly very sandy CLAY
TP07	1889379		1.00		Brown gravelly very sandy CLAY
TP09	1889381		1.00		Brown slightly gravelly very sandy CLAY
TP11	1889383		1.00		Brown mottled grey slightly gravelly very sandy CLAY

UKAS TESTING 4043

PSL Professional Soils Laboratory

21-17044

Contract No:
PSL21/6865
Client Ref:

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
TP01	1889375		1.00		13			31	15	16	94	Low Plasticity CL
TP04	1889376		1.00		14			27	13	14	96	Low Plasticity CL
TP07	1889379		1.00		13			29	14	15	87	Low Plasticity CL
TP09	1889381		1.00		14			34	17	17	96	Low Plasticity CL
TP11	1889383		1.00		15			32	17	15	95	Low Plasticity CL

SYMBOLS : NP : Non Plastic * : Liquid Limit and Plastic Limit Wet Sieved.

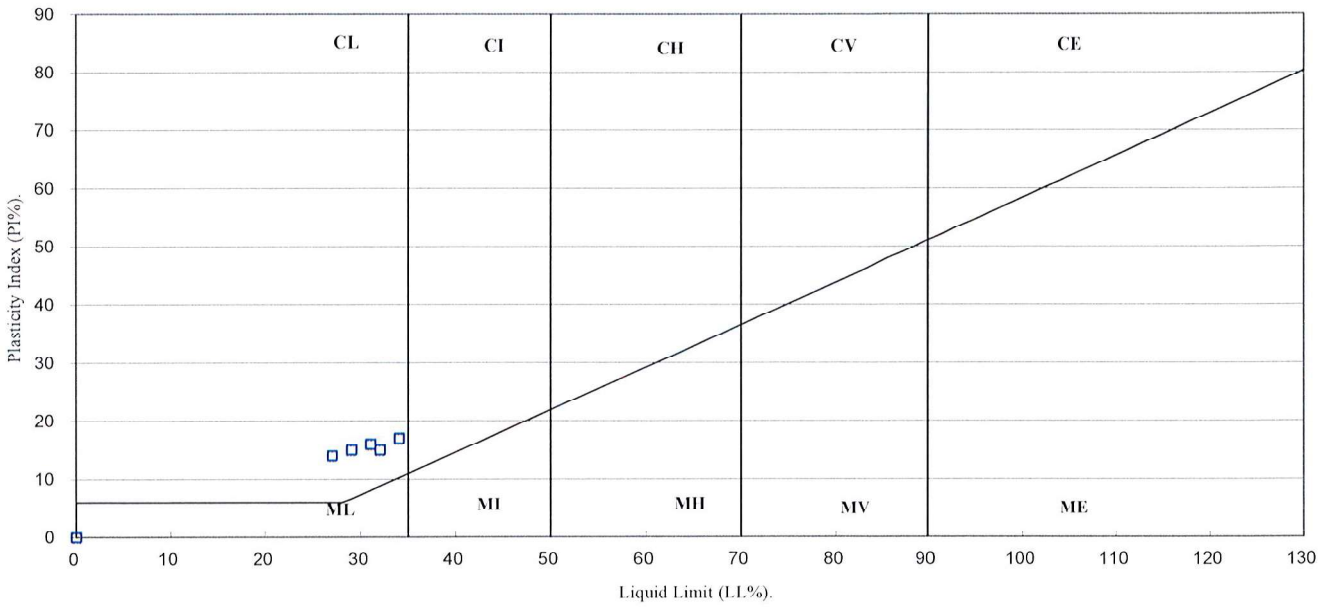
UKAS TESTING 4043

PSL Professional Soils Laboratory

21-17044

Contract No:
PSL21/6865
Client Ref:

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	21-17044	Contract No: PSL21/6865 Client Ref:

APPENDIX H

Chemical Test Results

Certificate of Analysis

Certificate Number	21-17044	*Issued:*	02-Sep-21

Client GroundSolve Limited
Unit 1
Well House Barns
Bretton
Flintshire
FAO Adam Fenwick
CH4 0DH

Our Reference	21-17044
Client Reference	2585
Order No	(not supplied)
Contract Title	St Peters Close
Description	10 Soil samples.
Date Received	13-Aug-21
Date Started	13-Aug-21
Date Completed	02-Sep-21
Test Procedures	Identified by prefix DETSn (details on request).
Notes	Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 21-17044
Client Ref 2585
Contract Title St Peters Close

	Lab No	1889374	1889375	1889376	1889377	1889378	1889379
	.Sample ID	TP01	TP01	TP04	TP04	TP06	TP07
	Depth	0.20	1.00	1.00	0.20	0.20	1.00
	Other ID						
	Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampling Date	04/08/2021	04/08/2021	04/08/2021	04/08/2021	04/08/2021	04/08/2021
	Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
Moisture Content	DETSC 1004	0.1	%		11	12			11
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	13			8.1	9.2	
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.2			0.3	0.5	
Cadmium	DETSC 2301#	0.1	mg/kg	0.2			0.3	0.4	
Chromium	DETSC 2301#	0.15	mg/kg	16			15	21	
Chromium III	DETSC 2301*	0.15	mg/kg	16			15	21	
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0			< 1.0	< 1.0	
Copper	DETSC 2301#	0.2	mg/kg	26			17	29	
Lead	DETSC 2301#	0.3	mg/kg	81			53	87	
Mercury	DETSC 2325#	0.05	mg/kg	0.09			0.06	0.11	
Nickel	DETSC 2301#	1	mg/kg	14			12	13	
Selenium	DETSC 2301#	0.5	mg/kg	2.4			1.9	1.6	
Zinc	DETSC 2301#	1	mg/kg	220			170	66	
Inorganics									
pH	DETSC 2008#		pH	6.5	7.2	7.7		5.7	
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.5			0.5	0.7	
Organic matter	DETSC 2002#	0.1	%	4.0			4.2	4.6	
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	95	62	33	16	19	
Sulphide	DETSC 2024*	10	mg/kg	24			< 10	20	
Sulphur (free)	DETSC 3049#	0.75	mg/kg	1.3			< 0.75	2.1	
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01			< 0.01	< 0.01	
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01			< 0.01	< 0.01	
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01			< 0.01	< 0.01	
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5			< 1.5	< 1.5	
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2			< 1.2	< 1.2	
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5			< 1.5	< 1.5	
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4			< 3.4	< 3.4	
Aliphatic C35-C40	DETSC 3072*	3.4	mg/kg	< 3.4			< 3.4	< 3.4	
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10			< 10	< 10	
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01			< 0.01	< 0.01	
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01			< 0.01	< 0.01	
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01			< 0.01	< 0.01	
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9			< 0.9	< 0.9	
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5			< 0.5	< 0.5	
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6			< 0.6	< 0.6	
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4			< 1.4	< 1.4	
Aromatic C35-C40	DETSC 3072*	1.4	mg/kg	< 1.4			< 1.4	< 1.4	
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10			< 10	< 10	
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10			< 10	< 10	
PAHs									

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 21-17044
Client Ref 2585
Contract Title St Peters Close

	Lab No	1889374	1889375	1889376	1889377	1889378	1889379
	.Sample ID	TP01	TP01	TP04	TP04	TP06	TP07
	Depth	0.20	1.00	1.00	0.20	0.20	1.00
	Other ID						
	Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampling Date	04/08/2021	04/08/2021	04/08/2021	04/08/2021	04/08/2021	04/08/2021
	Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03			< 0.03	< 0.03	
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03			< 0.03	< 0.03	
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03			< 0.03	< 0.03	
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03			< 0.03	< 0.03	
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.05			< 0.03	< 0.03	
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03			< 0.03	< 0.03	
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.21			0.05	0.07	
Pyrene	DETSC 3303#	0.03	mg/kg	0.19			0.04	0.06	
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.10			0.03	< 0.03	
Chrysene	DETSC 3303	0.03	mg/kg	0.10			< 0.03	< 0.03	
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.19			0.10	0.10	
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.04			< 0.03	< 0.03	
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.08			< 0.03	< 0.03	
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.03			< 0.03	< 0.03	
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03			< 0.03	< 0.03	
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.03			< 0.03	< 0.03	
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	0.97			0.19	0.23	
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.3			< 0.3	0.5	

Key: * -not accredited. # MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 21-17044
Client Ref 2585
Contract Title St Peters Close

			Lab No	1889380	1889381	1889382	1889383
			.Sample ID	TP09	TP09	TP11	TP11
			Depth	0.20	1.00	0.20	1.00
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	04/08/2021	04/08/2021	04/08/2021	04/08/2021
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
Moisture Content	DETSC 1004	0.1	%		12		14
Metals							
Arsenic	DETSC 2301#	0.2	mg/kg	10		11	
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.4		0.4	
Cadmium	DETSC 2301#	0.1	mg/kg	0.4		0.2	
Chromium	DETSC 2301#	0.15	mg/kg	18		19	
Chromium III	DETSC 2301*	0.15	mg/kg	18		19	
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0		< 1.0	
Copper	DETSC 2301#	0.2	mg/kg	25		25	
Lead	DETSC 2301#	0.3	mg/kg	54		56	
Mercury	DETSC 2325#	0.05	mg/kg	0.07		0.07	
Nickel	DETSC 2301#	1	mg/kg	17		18	
Selenium	DETSC 2301#	0.5	mg/kg	1.9		1.1	
Zinc	DETSC 2301#	1	mg/kg	72		57	
Inorganics							
pH	DETSC 2008#		pH	8.6	6.7	5.7	7.6
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.6		0.6	
Organic matter	DETSC 2002#	0.1	%	4.4		4.3	
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	12	< 10	15	< 10
Sulphide	DETSC 2024*	10	mg/kg	< 10		< 10	
Sulphur (free)	DETSC 3049#	0.75	mg/kg	1.2		< 0.75	
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5		< 1.5	
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2		< 1.2	
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5		< 1.5	
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4		< 3.4	
Aliphatic C35-C40	DETSC 3072*	3.4	mg/kg	< 3.4		< 3.4	
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10		< 10	
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9		< 0.9	
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5		< 0.5	
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6		< 0.6	
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4		< 1.4	
Aromatic C35-C40	DETSC 3072*	1.4	mg/kg	< 1.4		< 1.4	
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10		< 10	
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10		< 10	
PAHs							

Key: * not accredited. # MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 21-17044
Client Ref 2585
Contract Title St Peters Close

			Lab No	1889380	1889381	1889382	1889383
			.Sample ID	TP09	TP09	TP11	TP11
			Depth	0.20	1.00	0.20	1.00
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	04/08/2021	04/08/2021	04/08/2021	04/08/2021
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03		< 0.03	
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03		< 0.03	
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03		< 0.03	
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03		< 0.03	
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.07		< 0.03	
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03		< 0.03	
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.21		0.06	
Pyrene	DETSC 3303#	0.03	mg/kg	0.18		0.05	
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.11		0.03	
Chrysene	DETSC 3303	0.03	mg/kg	0.12		0.04	
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.22		0.11	
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.05		< 0.03	
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.10		< 0.03	
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.05		< 0.03	
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03		< 0.03	
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.05		< 0.03	
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	1.2		0.25	
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.4		0.4	

Summary of Asbestos Analysis
Soil Samples

Our Ref 21-17044
Client Ref 2585
Contract Title St Peters Close

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1889374	TP01 0.20	SOIL	NAD	none	Colin Patrick
1889377	TP04 0.20	SOIL	NAD	none	Colin Patrick
1889378	TP06 0.20	SOIL	NAD	none	Colin Patrick
1889380	TP09 0.20	SOIL	NAD	none	Colin Patrick
1889382	TP11 0.20	SOIL	NAD	none	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 21-17044
Client Ref 2585
Contract St Peters Close

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1889374	TP01 0.20 SOIL	04/08/21	GJ 250ml, GJ 60ml x2	Sulphur (free) (7 days), pH + Conductivity (7 days)	
1889375	TP01 1.00 SOIL	04/08/21	PT 1L	pH + Conductivity (7 days)	
1889376	TP04 1.00 SOIL	04/08/21	PT 1L	pH + Conductivity (7 days)	
1889377	TP04 0.20 SOIL	04/08/21	GJ 250ml, GJ 60ml x2	Sulphur (free) (7 days), pH + Conductivity (7 days)	
1889378	TP06 0.20 SOIL	04/08/21	GJ 250ml, GJ 60ml x2	Sulphur (free) (7 days), pH + Conductivity (7 days)	
1889379	TP07 1.00 SOIL	04/08/21	PT 1L		
1889380	TP09 0.20 SOIL	04/08/21	GJ 250ml, GJ 60ml x2	Sulphur (free) (7 days), pH + Conductivity (7 days)	
1889381	TP09 1.00 SOIL	04/08/21	PT 1L	pH + Conductivity (7 days)	
1889382	TP11 0.20 SOIL	04/08/21	GJ 250ml, GJ 60ml	Sulphur (free) (7 days), pH + Conductivity (7 days)	
1889383	TP11 1.00 SOIL	04/08/21	PT 1L	pH + Conductivity (7 days)	

Key: G-Glass J-Jar P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report