River Drive, South Shields

Phase II Geo-Environmental Assessment

For

Galliford Try Partnership North Ltd

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Executive Summary

Site Investigation	The investigation has involved: • Inspection of a previous Phase I geo-environmental assessment. • 8 Trial pits to a maximum depth of 3.9m. • 3 Cable percussion boreholes to a maximum depth of 28.9m. • 5 mini-percussive boreholes to a depth of 5.0m. • Installation of ground gas monitoring wells. • Geotechnical and contamination related testing. • Preliminary ground gas and groundwater monitoring.
Ground Conditions	**Northern Portion** - Made ground was recorded to typically comprise of a thin layer of topsoil overlying black/dark brown very sandy gravel with sandstone, flint, concrete, ash, slag and brick fragment ranging in depth of between 0.8m and 1.6m. The made ground is underlain by firm brown and/or grey silty sandy clay and/or sandy slightly gravelly clay. **Southern Portion** - Made ground was recorded at much greater depths ranging between 3.7m and 18.5m. The made ground is underlain by firm brown and/or grey silty sandy clay overlying firm to stiff sandy gravelly clay. Bedrock was recorded as yellow or grey sandstone at depths ranging between 23.0m and 28.5m.
Groundwater	During the site works, groundwater strikes were encountered within boreholes WS01, WS02, BH01 and BH02 at depths ranging between 4.5m and 5.7m. To date, with the exception of borehole WS01, all boreholes were recorded as dry during the groundwater monitoring. Standing groundwater was recorded within borehole WS01 at depths of between 4.44m and 4.47m
Gas Monitoring	A preliminary assessment of the ground gas monitoring indicates that no gas protection measures are required (CIRIA C665 Characteristic Site Situation 1). A further 5 monitoring visits are still required and therefore any conclusions are subject to change until completion of the gas monitoring programme. At this stage it would be prudent to make an allowance for basic gas protection measures in accordance with CIRIA C665 Characteristic Site Situation 2.
Contamination	The made ground was generally recorded as ashy commonly comprising of clinker and slag deposits. No other visual and/or olfactory evidence of contamination was noted during the ground investigation (e.g. hydrocarbons, asbestos etc.). Laboratory chemical analysis indicates that the metals Arsenic and Lead, several PAHs and sporadic asbestos fibres (located within the topsoil) pose a potential risk to human health through direct contact and dust inhalation. In addition, elevated concentrations of Copper and Zinc were recorded within the made ground which have the potential to impact future plant growth. Elevated leachable Zinc was encountered in the made ground, however given the presence of low permeability glacial clay below the site and the relatively low concentrations recorded, the elevated Zinc is not considered to pose a risk to the wider environment.

Appraisal	Remediation – Given the results of the chemical analysis, the following remediation is recommended to mitigate against the risk to human health: • A minimum of 600mm of clean imported capping soil is required for areas of soft landscaping. • Imported topsoil will need to validated to ensure it is not pose a risk to the environment. • No remediation is required on made ground deposits located under the proposed building footprint or hardstanding as this is considered to be suitable to break the pollutant pathway between the end user and made ground deposit. With regards to asbestos contamination observed within the topsoil in trial pit TP05, good construction practice will be adequate to mitigate risks, in terms of dust suppression. Further quantitative testing may be required for off-site disposal. Water Supply Pipes – UK WIR analysis has not been undertaken as part of this assessment. It is recommended that the results of the assessment are provided to the water supply company to determine a suitable material type. Mining – The site is considered to be stable with respect to mining. Foundations and Floor Slabs – Due to the thickness of the made ground and its potential for unacceptable total and/or differential settlement, conventional shallow foundations are not considered suitable. It is considered that piled foundations will be required founding within the underlying bedrock recorded at depths ranging between 23.0m and 28.5m. Advice should be sought from a specialist piling contractor with respect to pile loadings, length of piles, choice of piles and method of installation. Due to the thickness of made ground, a suspended floor slab will be required for the development. Gas precautions – Preliminary monitoring suggests gas protection measures are not necessary, however a further 5 monitoring visits are still required and any conclusions are subject to change until completion of the ground gas monitoring. At this stage, it would be prudent to allow for basic gas protection measures (CIRIA C665 Site Characteristic Situation 2). Sulphate attack on buried concrete – Buried concrete should be designed to BRE Special Digest 1:2005 Design Sulphate Class DS-3 with an ACEC site classification AC-3.

1 INTRODUCTION

1.1 3e Consulting Engineers Ltd (3e) were commissioned by Galliford Try Partnership North Ltd to carry out a Phase II geo-environmental assessment of land located off River Drive in South Shields. The proposed development includes the construction of an over 55s residential apartment building with associated car parking and areas of soft landscaping, details of which are provided in **Appendix A**.

1.2 A Phase I geo-environmental assessment of the site was completed by 3e Consulting Engineers in October 2014 (ref: 14643). It is recommended that the Phase I report is read in conjunction with this assessment, the objectives of which were as follows:

- To investigate near surface soil and groundwater conditions.
- To determine the potential risks posed by any ground or groundwater contamination and provide recommendations on remedial measures to manage such risks.
- To assess the risk posed by hazardous ground gas.
- To provide advice relating to geotechnical issues associated with the site.
- To provide foundation recommendations.

1.3 Fieldwork was undertaken between the 8th and 22nd December 2014 and comprised five mini-percussive boreholes, three cable percussive boreholes and eight trial pits with associated sampling and testing.

1.4 This report presents the factual information available during this appraisal, interpretation of the data obtained and recommendations relevant to the scope of works outlined above. It has been assumed in the production of this report that the site is to be redeveloped for a residential end use.

1.5 The comments and opinions presented in this report are based on the findings of the intrusive investigation carried out by 3e and the results of laboratory analysis. Responsibility cannot be accepted for any conditions not revealed by this investigation and which have not been taken into account by this report. Any diagram or opinion relating to site geology, contamination or other spatially variable features between or beyond investigation positions is conjectural and provided for guidance only. Confirmation of ground conditions between exploratory holes should be undertaken if deemed necessary. Evaluation of ground gas and

groundwater is based on observations made at the time of the investigation and any monitoring visits, but it should be noted that levels may vary due to seasonal and other effects.

1.6 This report has been prepared for the sole use of Galliford Try Partnership North Ltd. No other third party may rely upon or reproduce the contents of this report without the written approval of 3e. If any unauthorised third party comes into possession of this report, they rely on it entirely at their own risk and 3e do not owe them any Duty of Care or Skill.

2 THE SITE

Location and Description

2.1 The site, centred on National Grid Reference 436070, 567700, is situated on the corner of River Drive and Palatine Street, South Shields, about 600m north-west of South Shields town centre. A site location plan is included as **Figure 1**.

2.2 The majority of the site is generally managed grassland, although a series of storage garages (lock-up) and associated hard-standing are present across the northern site area. Areas of increased vegetation (bushes and trees) are also present on site adjacent to the southern and eastern boundaries, and forming a line between the grassed area and adjacent garages. Variations in topography can be seen across the site, with a general decrease noted to the north and north-east. An increase in gradient can also be seen adjacent to the southern and western boundaries, adjacent to River Drive and Palatine Street.

2.3 The site is situated within a predominantly residential setting, with housing recorded to the east and south of the site, and a residential apartment block situated adjacent to the northern boundary. Grassed parkland is located to the west of the site, leading down to a boatyard and the River Tyne.

2.4 During the walkover, there was no visual evidence of potential contamination sources noted across the site as a whole. However, an isolated area of 'burning' was noted at the surface across the central eastern site area.

2.5 The adjacent land use is as follows:

- North: Residential Apartment Blocks.
- East: Lady's Walk and New Build Residential Housing.
- South: Palatine Street and Residential housing.
- West: River Drive leading to grassed Land, a Boat Yard and the River Tyne.

3 PHASE I GEO-ENVIRONMENTAL ASSESSMENT

3.1 A Phase I geo-environmental assessment of the site was completed by 3e Consulting Engineers in October 2014 (ref: 14643). It is recommended that the report is read in conjunction with this assessment. Relevant information from the Phase I geo-environmental assessment is summarised in the following section:

Site History

3.2 During the late 1800s, a clay pit extended across the southern and central portions of the site, associated with a brick works to the west. Prior to 1941 the clay pit was infilled, and following completion of these works, Allotment Gardens were noted across the southern site area, which are no longer recorded by 1956.

Geology and Mining

3.3 Geological information suggests the majority of the site is underlain by made ground, likely associated with backfill material used within the former clay pit. The made ground is recorded as being underlain by glacial clay overlying Carboniferous Middle Coal Measures.

3.4 Following a review of available data, this site is not considered to be at risk from shallow coal mining activities.

Watercourses and Groundwater

3.5 The nearest watercourse is the River Tyne located approximately 110m west. There are no recorded surface water abstractions within 1km and the nearest discharge consent is located approximately 120m west. Records indicate a significant pollution incident occurred approximately 162m to the north-west of the site boundary.

3.6 The underlying superficial deposits are classed as unproductive strata whereas the underlying bedrock is classed as a Secondary A aquifer. In addition, there are no groundwater abstraction wells within 1km of the site boundary.

3.7 The site does not lie within a fluvial flood plain considered to be at risk of flooding from rivers or the sea.

Landfill Sites, Pollution Controls and Industrial Land Use

3.8 There is on registered landfill site located approximately 128m south-west, associated with infilling of a former dry dock adjacent to the River Tyne. In addition, there is one historical landfill site located 80m west.

3.9 There are 5 recorded other waste management facilities within 250m, the nearest of which is located 151m north however none are currently active.

3.10 There are no pollution controls or recorded industrial land use within 250m of the site.

Conceptual Site Model

3.11 Based on the information available, it was concluded that the main sources of contamination on the site is likely to arise from the material used to backfill the former clay pit which covered the majority of the site. At this stage the materials used to infill the former clay pit is generally unknown.

3.12 The assessment indicates that the risk to human health from the contamination can be largely mitigated by use of appropriate PPE during construction; however, at this stage it is considered a moderate risk is posed to site end users given the infill material is largely unknown below the site.

3.13 With regards to controlled water, the assessment also indicates that the presence of low permeable glacial clay beneath the site will reduce the risk of vertical and lateral migration of contamination into surface water courses and the underlying Secondary A aquifer. The presence of glacial clay will also reduce the risk of contamination migrating onto the site from adjacent sites which may have been contaminated associated with immediately adjacent fill materials (i.e. from the former clay pit).

3.14 Overall the assessment indicates a moderate environmental risk until proved otherwise.

3.15 The assessment indicates a moderate risk of ground gas associated with on-site sources primarily from the infill material used within the former clay pit which poses a potential source of ground gas production. There is also anticipated to be a potential ground gas risk associated with the nearby infilling of a former dry dock and the nearby Ballast Hill.

3.16 Radon protection measures are not required in the construction of new dwellings.

4 METHOD OF INVESTIGATION

Fieldwork

4.1 The intrusive works comprised three cable percussive boreholes sunk to a maximum depth of 28.9m, 5 mini-percussive boreholes to a depth of 5m and 8 trial pits to a maximum depth of 3.9m. The site works were carried out between the 8th and 22nd December 2014. The exploratory holes were located across the site to provide general coverage making allowance for buried utilities and areas of steep ground. All depths were taken from below existing ground level at the time of the investigation.

4.2 A copy of the exploratory hole records are included as **Appendix B** and the locations are shown on **Figure 2** (Exploratory Hole Location Plan).

4.3 The trial pits were excavated to provide an assessment of the shallow soil profile and to allow samples to be recovered for geotechnical and contamination related analysis.

4.4 The boreholes were sunk in order to determine the deeper soil profile and to allow ground gas and groundwater monitoring wells to be installed. Disturbed samples and, where possible, undisturbed open drive tube samples were recovered as appropriate for soil descriptions and laboratory testing. Standard penetration tests (SPT) were carried out to provide an assessment of the insitu strength of the cohesive strata and the relative density of the granular made ground and natural deposits.

4.5 Gas/groundwater monitoring wells, comprising slotted 50mm diameter HDPE pipe within a granular filter were installed in two of the boreholes (WS01, WS02,WS03 and WS04) to a depth of approximately 5m below ground level (bgl). The wells were sealed using bentonite and a lockable cover was fitted at the surface. To date, the wells have been monitored on five occasions between 12th December 2014 and 8th January 2015 for Methane, Carbon Dioxide and Oxygen using a portable infra-red gas monitor. The rate of gas flow from the boreholes was also recorded using a portable flow meter and the groundwater levels were recorded using a portable dip meter. The results of the ground gas monitoring are presented in **Appendix C**.

4.6 Fieldwork and soil descriptions were carried out in general accordance with BS5930:1999, “Code of Practice for Site Investigations”.

Laboratory Chemical Testing

4.7 The results of the chemical analysis are included as **Appendix D**. The analyses were carried out at an MCERTS registered and UKAS accredited laboratory.

Soils

4.8 In order to provide a preliminary assessment of contamination, 10 samples of made ground were screened for the following determinands:

- Metals: Arsenic, Boron, Copper, Cadmium, Chromium, Lead, Mercury, Nickel, Selenium and Zinc.
- Hydrocarbons: Speciated Polyaromatic Hydrocarbons (PAH).
- Other: Total Organic Carbon (TOC), Asbestos.

4.9 In addition, ten samples of made ground and six of natural soil were scheduled for water soluble sulphate and pH determinations to assess the potential for sulphate attack on buried concrete.

Leachate

4.10 Three samples of the made ground were scheduled for leachate analysis. The following determinands were screened:

- Metals: Arsenic, Boron, Copper, Cadmium, Chromium, Lead, Mercury, Nickel, Selenium and Zinc.
- Hydrocarbons: Speciated Polyaromatic Hydrocarbons (PAH)
- Non-metals: Sulphate
- Other: pH

Laboratory Geotechnical Testing

4.11 Geotechnical related testing was carried out to determine the physical characteristics of the soils and comprised the following:

- Four Atterberg limits determinations to confirm field descriptions and classify cohesive soils.

The results of the geotechnical test results are included as **Appendix E**.

5 RESULTS OF THE INVESTIGATION

Soil Profile

5.1 Detailed descriptions of the materials encountered together with observations of groundwater behaviour, the results of insitu testing and sampling information are given on the exploratory hole records included as **Appendix B** and the locations of the holes are shown on **Figure 2**.

5.2 A generalised succession of the ground profile is presented below, however, there is some local variation across the site and reference should also be made to individual exploratory hole records. For the purpose of this report, the site will be divided into two areas, a northern area which is proposed to be developed into a car park and a southern area which development proposals include an over 55s residential apartment building and areas of soft landscaping.

Northern Area

Depth to Top (Thickness Range)	Description
Ground Level (0.8 – 1.6)	**Made Ground:** Surface typically comprises of a thin layer of topsoil over black/dark brown very sandy gravel comprising of mixed deposits of sandstone, flint, clinker, concrete, ash, slag and brick fragments.
0.8 – 1.6 (Base of deposit not identified within this area)	**Glacial Deposits**: The area generally comprises either firm brown and/or grey silty sandy clay and/or firm sandy slightly gravelly clay (becoming stiff with depth).

Southern Area

Depth to Top (Thickness Range)	Description
Ground Level (3.7 – 18.5)	**Made Ground (Southern Area):** The surface comprised of a thin layer of topsoil overlying black/dark brown very sandy gravel comprising of mixed deposits of sandstone, flint, clinker, concrete, ash, slag and brick fragments.
3.7 – 18.5 (6.7 – 18.1)	**Glacial Deposits (Southern Area)**: Firm brown and/or grey sandy silty clay overlying firm to stiff sandy gravelly clay.
23.0 – 28.5 (No applicable)	**Bedrock:** Yellow or grey sandstone was recovered at rockhead.

Relict Foundations

5.3 Evidence of relict foundations were not encountered during the ground investigation, however, given a row of lock-up garages currently occupy part of the northern portion of the site, foundations are possibly present within this area.

Groundwater

5.4 The trial pits were recorded as dry, however groundwater strikes were encountered within mini-percussive boreholes WS01 and WS02 at depths of 4.6m and 4.5m respectively.

5.5 Within the cable-percussive boreholes groundwater was struck within BH01 and BH02 at depths of 5.3m and 6.8m, rising to 5.1m and 5.7m after 20 minutes respectively.

5.6 During the preliminary monitoring of the wells installed in the boreholes WS01 and WS02, WS03 and WS04, all boreholes were recorded as dry with the exception of borehole WS01 which recorded standing groundwater at depths between 4.44m and 4.47m. The results of the groundwater monitoring are presented in **Appendix C**.

5.7 It should be noted that groundwater levels vary seasonally and that a higher water table than recorded could occur.

Physical Evidence of Contamination

Made Ground

5.8 The made ground is generally recorded as ashy commonly comprising gravel sized fragments of clinker and slag. Within the central eastern part of the site, an isolated area of 'burning' was also encountered across the surface.

Superficial Drift Deposits

5.9 No visual and/or olfactory evidence of contamination was noted within superficial deposits during the ground investigation.

Groundwater

5.10 No visual and/or olfactory evidence of contamination was noted within the groundwater.

Gas Monitoring

5.11 The results of the preliminary ground gas monitoring carried out on four occasions between the 12th December 2014 and 8th January 2015 are summarised in the following table:

Location	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Flow (l/hr)	Barometric Pressure (mb)	Maximum GSV*	
						CO_2	CH_4
WS01	0.0 – 0.1	0.4 – 1.6	18.7 – 20.4	<0.1	997 - 1026	<0.07	<0.07
WS02	0.0 – 0.1	0.0 – 0.4	20.0 – 21.0	<0.1			
WS03	0.0 – 0.1	0.0 – 4.0	16.3 - 20.8	<0.1			
WS04	0.0 – 0.1	0.0 – 0.9	19.5 – 20.8	<0.1			

* CIRIA 665 Gas Screening Value based on the maximum flow and concentration

5.12 The results of the preliminary gas monitoring indicate that Methane was detected at low levels (a maximum concentration of 0.1%v/v) and Carbon Dioxide was detected at a maximum concentration of 4.0%v/v. No flow has been detected, therefore a calculated CIRIA Gas Screening Value (GSV) of <0.07l/hr is calculated for both Carbon Dioxide and Methane. In view of the above results, at this stage it is considered that no gas protection measures are required (C665 site Characteristic Situation 1), although at this stage it may be prudent to assume Characteristic Situation 2 until the monitoring is completed.

5.13 A further five gas monitoring visits are still required and any conclusions are subject to change until completion of the gas monitoring programme.

Contamination Related Testing

5.14 The results of the contamination related testing undertaken on samples of made ground are included as **Appendix D**. Generally, the results have been assessed using the LQM/CIEH Suitable for Use Levels (S4ULs) for Human Health Risk Assessment (Copyright

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5.15 Where no S4UL is available, reference is made to published CLEA Soil Guidelines Values (SGVs) for standard land uses, or generic levels derived using the CLEA model (v1.06). For the purpose of this report, all S4ULs or SGVs will be referred to as Generic Assessment Criteria (GAC).

5.16 With respect to the assessment of the site, as the site is proposed to be redeveloped with an over 55s residential apartment block, the most appropriate values are considered to be the GACs for a residential end use with home grown produce. Based on the laboratory results, an SOM of 6.0% has been used in the assessment.

5.17 A summary of the contamination related testing is presented below.

Metals and Inorganics

Determinand	Maximum conc. mg/kg	Minimum conc. mg/kg	No of Samples Tested	Generic Assessment Criteria (GAC)[1] mg/kg	No of Samples Exceeding GAC
Arsenic	76	10	10	37	**2**
Boron	2.5	0.6	10	290	0
Cadmium	1.3	<0.2	10	11	0
Chromium (III)	113	54	10	910	0
Lead	2235	88	10	200[2]	**7**
Mercury	11	<0.5	10	40	0
Selenium	2.3	0.5	10	250	0
Copper	1212	15	10	2400	0
Nickel	71	16	10	180	0
Zinc	906	38	10	3700	0

Notes
(1) LQM/CIEH S4UL for residential end use with home grown produce unless otherwise stated
(2) DEFRA, SP1010: Category 4 Screening Levels

Hydrocarbons

Determinand	Maximum conc. mg/kg	Minimum conc. mg/kg	No of Samples Tested	Generic Assessment Criteria (GAC)[1] mg/kg	No of Samples Exceeding GAC
Speciated PAH					
Naphthalene	3.94	0.07	10	13	0
Acenaphthene	6.94	<0.01	10	920	0
Acenaphthylene	0.48	<0.01	10	1100	0
Fluorene	6.70	0.01	10	860	0
Phenanthrene	89.32	0.24	10	440	0
Anthracene	31.72	0.03	10	11000	0
Fluoranthene	240.43	0.33	10	890	0
Pyrene	221.00	0.26	10	2000	0
Benzo(a)anthracene	123.46	0.19	10	13	**1**
Chrysene	103.21	0.20	10	27	**1**
Benzo(b)fluoranthene	110.01	0.28	10	3.7	**1**
Benzo(k)fluoranthene	49.04	0.10	10	100	0
Benzo(a)pyrene	101.01	0.18	10	3.0	**1**
Indeno(1,2,3-cd)pyrene	61.85	0.16	10	41	**1**
Dibenz(a,h)anthracene	15.43	0.03	10	0.3	**3**
Benzo(g,h,i)perylene	55.84	0.16	10	350	0

Notes

(1) LQM/CIEH S4UL for commercial/industrial end use unless otherwise stated

5.18 The laboratory test results indicate elevated levels of Arsenic, Lead and several PAHs within some samples of made ground with regards to the specified assessment criteria levels.

Asbestos

5.19 Ten samples of made ground were screened for asbestos fibres. The results of the screening indicate the presence of Chrysotile asbestos fibres in one of the samples. The sample was taken within the existing topsoil layer, however it should be noted that there was no visual evidence of asbestos encountered during the investigation.

Phytotoxic Contaminants

5.20 To assess the potential risks to plants in areas of soft landscaping, the results of the soil screening have also been assessed with respect to plant phytotoxicity, as summarised in the table below:

Plant Phytotoxicity						
Determinand	Soil pH range	Maximum conc. (mg/kg)	Minimum conc. (mg/kg)	Assessment Value as outlined within BS3882:2007 (dependent upon soil pH range) (mg/kg)		
				pH<6.0	pH 6.0-7.0	pH>7.0
Copper	7.7 – 8.6	1212	15	<200	<200	<300
Nickel		71	16	<100	<135	<200
Zinc		906	38	<60	<75	<110

5.21 From the above results, it can be seen that elevated concentrations of Copper and Zinc have been detected within the made ground which have the potential to impact future plant growth. Therefore, it is recommended that further specialist advice be sought in relation to plant selection in any areas of soft landscaping due to the presence of phytotoxic contaminants within the made ground.

Leachate Analysis

5.22 In order to assess the risk to the wider environment including the underlying Secondary A aquifer and watercourse (River Tyne), three samples of made ground were scheduled for leachate analysis. Where appropriate, the results have been compared against environmental quality standards (EQS) for saltwater/coastal or inland surface waters. In the absence of freshwater EQS, UK drinking water standards have been adopted.

LEACHATE						
Determinand	Unit	Maximum conc. µg/l	Minimum conc. µg/l	No of Samples Tested	Generic Assessment Criteria (GAC)	No of Samples Exceeding GAC
Arsenic	µg/l	11.88	0.89	3	25(1)	0
Boron	µg/l	15	<6	3	7000(1)	0
Cadmium	µg/l	<0.07	<0.07	3	0.45(1)	0
Chromium	µg/l	0.6	<0.2	3	4.7(*)	0
Lead	µg/l	<0.2	<0.2	3	7.2(1)	0
Mercury	µg/l	<0.008	<0.008	3	0.07(1)	0
Selenium	µg/l	0.31	0.24	3	10(1)	0
Copper	µg/l	3.3	2.2	3	5(1)	0
Nickel	µg/l	5.3	<0.5	3	20(1)	0
Zinc	µg/l	1745	363	3	40(1)	**3**
Speciated PAH						
Naphthalene	µg/l	<0.1	<0.1	3	2.4(1)	0
Acenaphthene	µg/l	<0.1	<0.1	3	0.1(2)	0
Acenaphthylene	µg/l	<0.1	<0.1	3	0.1(2)	0
Fluorene	µg/l	<0.1	<0.1	3	0.1(2)	0
Phenanthrene	µg/l	<0.1	<0.1	3	0.1(2)	0
Anthracene	µg/l	<0.1	<0.1	3	0.4(1)	0
Fluoranthene	µg/l	<0.1	<0.1	3	1(1)	0
Pyrene	µg/l	<0.1	<0.1	3	0.1(2)	0
Benzo(a)anthracene	µg/l	<0.1	<0.1	3	0.1(2)	0
Chrysene	µg/l	<0.1	<0.1	3	0.1(2)	0
Benzo(b)fluoranthene	µg/l	<0.1	<0.1	3	0.1(2)	0
Benzo(k)fluoranthene	µg/l	<0.1	<0.1	3	0.1(2)	0
Benzo(a)pyrene	µg/l	<0.1	<0.1	3	0.1(1)	0
Indeno(1,2,3-cd)pyrene	µg/l	<0.1	<0.1	3	0.1(2)	0
Dibenz(a,h)anthracene	µg/l	<0.1	<0.1	3	0.1(2)	0
Benzo(g,h,i)perylene	µg/l	<0.1	<0.1	3	0.1(2)	0

Notes

(1) Environmental Quality Standards for saltwater/coastal waters
(2) UK Drinking Water Standards
(3) Environmental Quality Standards for Inland Surface Waters
(*) EQS value available for Chromium (III) is freshwater

5.23 The results of the leachate screening indicate elevated Zinc with respect to the EQS for Saltwater/Coastal waters. The elevated Zinc was encountered in all three samples tested from the site. All other determinands were below the respective assessment criteria.

Modified Site Conceptual Model

5.24 In view of the results from the chemical testing of the made ground material on site, the following sources, pathways and receptors for the site are considered below:

Sources of Contamination

- Laboratory test result indicate that Arsenic, Lead, several PAHs and Asbestos fibres potentially pose a human health risk within the ashy made ground deposits.
- In addition, the results of the leachate testing indicate that Zinc may pose a risk to controlled waters.
- At this stage, the results of the ground gas monitoring suggest that no gas protection measures are required, however a further 5 visits are still required and therefore any conclusions are subject to change until completion of the gas monitoring programme.

Potential Pollution Pathways

- Humans – direct contact, soil ingestion, dust inhalation and plant uptake.
- Secondary A Aquifer – leaching and vertical migration of contamination – not considered to be at significant risk due to the anticipated low permeability clay drift deposits likely inhibiting groundwater movement to this receptor.
- Lateral migration into nearby surface water features (watercourses) – not considered to be at significant risk due to the anticipated low permeability clay drift deposits likely inhibiting groundwater movement below the site.
- Vertical and lateral migration, ingress and accumulation of ground gases into buildings and service entries (manholes).
- Direct contact of aggressive soils with building foundations and floor slabs.

Receptors

- Human Health (site end users).
- Human Health (construction workers).
- Controlled Waters (Secondary A Aquifer and watercourses).
- Buildings, foundations and floor slabs.

Pollutant Linkage Assessment

5.25 On the basis of the above, an assessment of potential pollutant linkages at the site has been made as follows:

Contamination source	Pathway	Hazard	Potential Receptors	Linkage Complete
Contamination associated with material used to infill former clay pit. (Arsenic, Lead, several PAHs and Asbestos)	Direct contact, ingestion, dust inhalation and plant uptake	Human Health Risk	Construction workers	Yes, but exposure is transient and the risk can be mitigated by use of appropriate PPE.
			Site end users	Yes.
Leachable contamination on site (Zinc)	Vertical migration	Water Pollution	Groundwater	Unlikely. The presence of very stiff glacial clay beneath the site will inhibit the migration of significant levels of contamination.
	Lateral migration	Water pollution	Surface water	Unlikely. Given the distance of the nearest watercourse and the presence of low permeability glacial clay below the site which will mitigate against the migration of any significant levels of contamination.
		Contamination of adjacent land	Human health	Unlikely, given the levels of contamination identified and the presence of low permeability glacial clay below the site and within the surrounding area.

Geotechnical Related Testing

5.26 The results of the geotechnical testing are presented in **Appendix G**.

Classification Tests

5.27 Four Atterberg limit determinations were carried out (one within the made ground and two within the natural ground). The results of the testing carried out on the single made ground sample at a depth of 1.9m indicates a modified plasticity indices of 15.5% indicative of a clay with a low volume change potential.

5.28 The results carried out on natural 2.4m and 4.9m indicate modified plasticity indices of between 19% and 37%, indicative of a low to moderate volume change potential.

Sulphate and pH Determinations

5.29 Ten samples of made ground and six samples of natural soil were scheduled for water soluble sulphate and pH determinations to assess the potential for sulphate attack on buried concrete.

5.30 Within the made ground, water soluble sulphate concentrations varied between 34mg/l and 1766mg/l with pH values between 7.7 and 8.6. This indicates a BRE Special Digest 1:2005 Design Sulphate Class DS-3 with an ACEC site classification AC-3.

5.31 Within the natural soils water soluble sulphate concentrations ranged between 112mg/l and 1965mg/l with pH values between 8.1 and 8.4. These indicate a BRE Special Digest 1:2005 Design Sulphate Class DS-3 with an ACEC site classification AC-3.

6 DISCUSSION

6.1 Development proposals include an over 55s residential apartment building with associated car parking and areas of soft landscaping. This investigation was carried out to provide geotechnical information with respect to foundations for the proposed development and contamination related testing to outline potential constraints.

Contamination Assessment

6.2 Made ground encountered during the ground investigation was typically recorded to be ashy in nature with thicknesses ranging between 0.8m and 18.5m.

6.3 The results of the chemical analysis indicate that the analytes Arsenic, Lead and several PAHs potentially pose a risk to human health. In addition, a single sample tested positive for asbestos fibres, however no visual evidence of asbestos was observed during the ground investigation. With regards to plant phytotoxicity, the levels of Zinc and Copper were recorded at elevated levels and therefore have the potential to impact future plant growth.

6.4 Chemical test results indicate leachable Zinc and Arsenic within the made ground which slightly exceed the specified threshold levels. Given the site is underlain by low permeability glacial clay deposits, which will inhibit the migration of contamination; the potential for any significant levels of contamination polluting controlled waters is considered low.

Outline Remediation

6.5 Given the results of the chemical analysis, the following remediation is required to mitigate against the risk to human health:

- A minimum of 600mm of clean imported capping soil is required for areas of soft landscaping. It is recommended that further specialist advice be sought in relation to plant selection in any areas of soft landscaping due to the presence of phytotoxic contaminants within the made ground.
- Imported topsoil will need to be validated to ensure it does not pose a risk to the environment (i.e. contaminated). The acceptance criteria for validation should be agreed with the local authority as part of a remediation strategy for the site.

- An isolated area of 'burning' (former bonfire) was recorded across the surface of the central eastern site area. It is recommended that this material is stripped and disposed off site. Given the nature of the burnt ground, delineation by visual inspection is considered sufficient.
- No remediation is required on made ground deposits located under the proposed building footprint or hardstanding as this is considered to be suitable to break the pollutant pathway between the end user and made ground deposit.
- Any unforeseen contamination encountered during the enabling earthworks should be assessed by a suitably qualified geo-environmental engineer.

6.6 With regards to asbestos contamination observed within the topsoil in trial pit TP05, the following is recommended:

- In order to prevent the generation of dust, made ground should be dampened to allow suitable handling as precaution to prevent generation of dust and covered when stockpiled to prevent drying. In addition, if areas of made ground are trafficked by plant during construction then suitable precautions will be required to prevent dust generation. These recommendations are not exhaustive, but should form part of the asbestos management strategy for the site.
- Further testing in the form of quantitative analysis may be required for off site disposal.

Disposal of Materials

6.7 Waste classification testing has not been carried out, however, the results of the chemical analyses allow an initial assessment and suggest that generally, the made ground may be suitable for disposal as either stable non-reactive hazardous or hazardous waste.

6.8 It is recommended that the results of the investigation are made available to the waste carrier/receiver in order to determine the waste classification and costs for offsite disposal.

Water Supply Pipes

6.9 UKWIR analysis has not been undertaken as part of this assessment. It is recommended that the results of the assessment are provided to the water supply company so that the correct pipe material can be selected.

Mining Assessment

6.10 The Coal Authority record workings beneath the site in 2 seams of coal from 130m to 190m depth. Any ground movement from these coal workings should have ceased by now. Following a review of available data, this site is not considered to be at risk from shallow coal mining activities.

Foundations and Floor Slabs

6.11 The proposed development is likely to include a mixed 2, 3 and 4 storey over 55s residential apartment building with associated areas of soft landscaping and car parking facilities.

6.12 Within the southern portion of the site (the area of the proposed building), made ground was recorded at depths ranging between 3.7m and 18.5m. The shallowest made ground was recorded within the western end of the site, deepening to the east. The made ground is typically underlain by firm and/or stiff sandy silty clay deposits overlying firm to stiff sandy gravelly clay which in turn is underlain by sandstone bedrock recorded at depths ranging between 23.0m in the west and 28.5m in the south east.

6.13 Given the thickness of made ground deposits and its potential for unacceptable total and/or differential settlement, it is considered that conventional shallow foundations will not be suitable. Based on this, piled foundations will need to be adopted for the structure founding within the bedrock strata. Advice should be sought out from a specialist piling contractor with respect to the pile loadings, length of piles, choice of pile types and method of installation.

Floor Slab

6.14 Due to the thickness of made ground deposits across the footprint of the proposed building, it is considered the use of a suspended floor slab will be required for the development.

Gas Protection Measures

6.15 Radon protection measures are not required for the proposed development.

6.16 The preliminary results of the ground gas monitoring indicate that no gas protection measures are required (CIRIA C665 Characteristic Situation 1).

6.17 A further 5 monitoring visits are still required and therefore any conclusions are subject to change until completion of the gas monitoring programme. At this stage, for preliminary costing purposes it would be prudent to allow for basic gas protection measures in accordance with CIRIA C665 Characteristic Situation 2.

Excavations and Dewatering

6.18 If man entry is proposed into excavations the use of full support to excavation sides is anticipated in line with health and safety guidelines.

6.19 Significant groundwater ingress into excavations is not anticipated, any that does occur, or within deeper excavations, should be controlled adequately by localised pumping from sumps within excavations.

External Works

6.20 A CBR value of 2% should be adopted at this stage for design on the imported fill and made ground, subject to confirmation following site clearance.

6.21 It is recommended that in-situ plate load tests are carried out to verify the CBR at formation level.

Soakaways

6.22 Given the presence of deep made ground across much of the site, underlain by low permeability glacial clay deposits, the use of soakaways for surface water disposal is not considered suitable.

Sulphate Attack on Buried Concrete

6.23 The results of the chemical analyses indicate a BRE Special Digest 1:2005 Design Sulphate Class DS-3 with an ACEC classification AC-3; buried concrete should be designed accordingly.

Figures

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Date	Revision	Checked	Rev.

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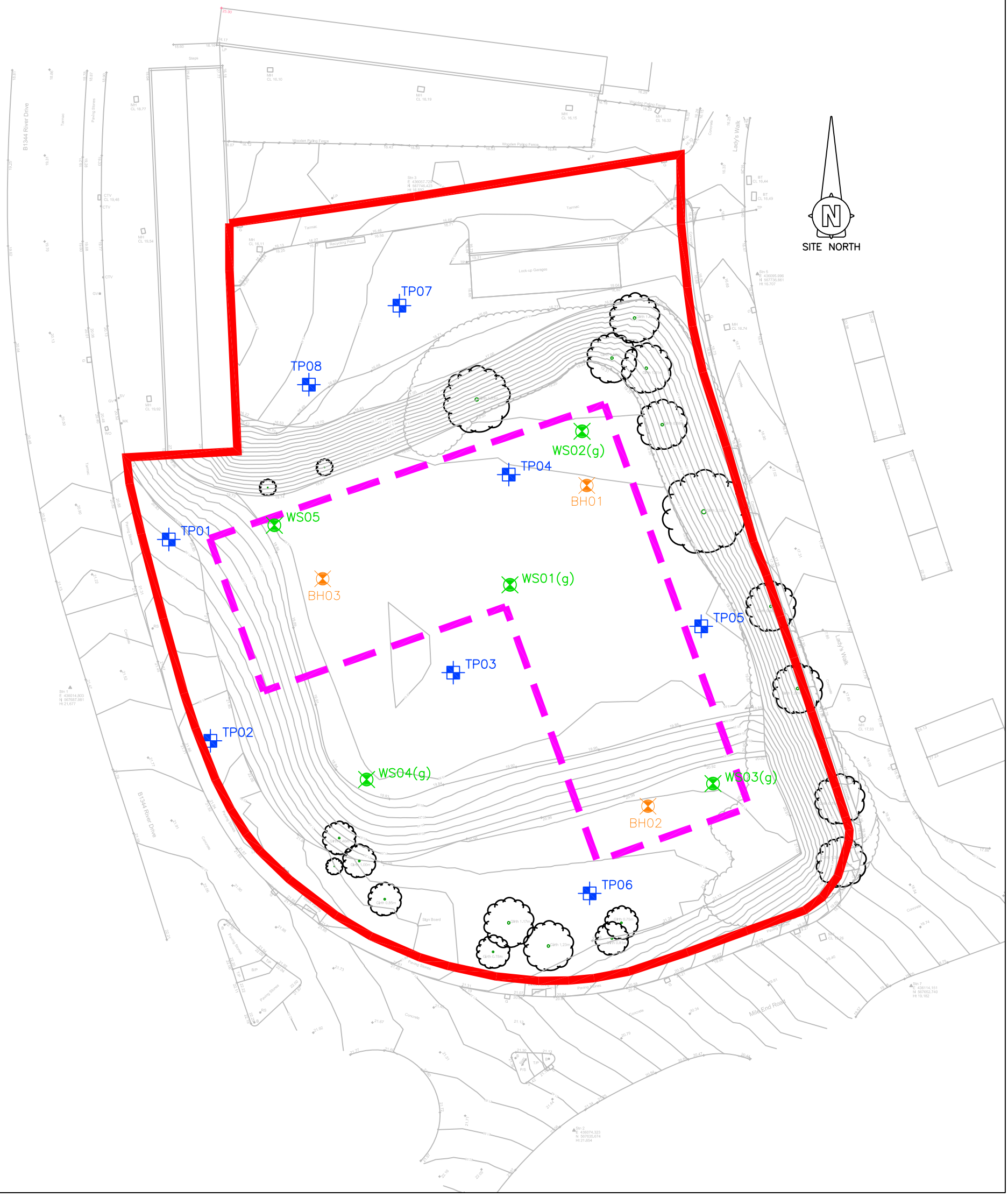
Project	River Drive, South Shields Galliford Try Partnerships North Ltd		
Title	Site Location Plan		
Scale 1:25,000 at A4	Drawn CB	Checked AH	Date Jan '15
Job No. 14643	Drawing No. Figure 1		Rev 0



BH	Cable-Percussive Borehole Location
WS	Mini-Percussive Borehole Location
(g)	Gas and Groundwater Monitoring Well
TP	Trial Pit Location
	Site Boundary
	Proposed Building Location

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Project	River Drive, South Shields Galliford Try Partnership North Ltd		
Title	Exploratory Hole Location Plan		
Scale 1:500	Drawn CB	Checked AC	Date Jan '15
Job No. 14643	Drawing No. Figure 2		Rev 0

Appendix A

Proposed Development Plan

NOTES
Do not scale from this drawing. Only figured dimensions are to be taken from this drawing.

Contractor must verify all dimenslons on slte before commencing any work or shop drawings.

Report any discrepancies before commencing work to the Architect. If this drawing exceeds the quantities taken in any way the Architects are to be informed before the work is initiated.

Work within the Construction (Design & Management) Regulations 2007 is not to start until a Health and Safety Plan has been produced by the Principal Contractor

This Drawing is Copyright and must not be reproduced without consent of BSBA Tees Ltd.

Drawing Status/Type Key:

F - Feasibility stage drawing
P - Planning stage drawing
T - Tender stage drawing
C - Construction stage
AB - As Built Status
TNT - Tenant drawing
SK - Sketch drawing
M - Marketing drawing
L - Landscape Drawing
S - Survey drawing
OS - Ordnance Survey drawing

Rev.	Description	Drawn	Date	Ch'ked	Date

Notes:

A
Grass.

B
Planting.

C
Tarmac Footpath; timber edging.

D
1800mm High Metal Interlaced Bowtop Railings.

E
Hedge

F
External Refuse Store
2000mm High Timer Fence.
Wired close Boarded one side, (Public), with Concrete posts.

G
Proposed Root Protection Areas.

H
Unit Concrete Paving

I
Macadam to adopted requirements

J
Block Paving with car parking demarcation.

K
Raised Beds

NB - Min clear width of gates to be 850mm

New tree
Fruit tree
Existing tree

Site Area
0.57 Hect
1.41 Acres

BS BA Architects

Unit 19, Evans Business Centre
Lingfield Way, Yarm Road
Business Park, Darlington.
DL1 4QZ.
Tel: 01325 746 566
e-mail: info@bsba-tees.com

PROJECT
River Drive
South Shields
Care Ready Apartments

DRAWING TITLE
Site Layout

Scale	Drawn By
1:200@A1	AM
	Date Drawn: 26.10.14
Checked By	Date Checked

Drawing No.: 13019 / F200
Revision: *

Appendix B

Exploratory Hole Records

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Mini-Percussive Log

WS01

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: GED

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
HSV = Hand Shear Vane (kPa)
S / C = Split Spoon / Cone
N = SPT N Value

Plant: Mini Percussive Rig
Date: 08/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			0.05						
0.20	ES		(0.20) 0.25	MADE GROUND: Grass over very soft dark brown silty sandy slightly gravelly organic CLAY (topsoil). Gravel is finr to coarse angulat to subrounded sandstone. Many rootlets.					
0.60	ES		(0.70)	MADE GROUND: Dark brown clayey silty slightly gravelly SAND. Gravel is fine to coarse angular to subrounded brick fragments, sandstone, coal and mudstone. Many rootlets.					
1.00	C	N4 (1/2/1/1/1/1)	0.95	MADE GROUND: Black very sandy fine to coarse angular GRAVEL of brick fragments, ash, flint, clinker, coal and sandstone.	1.0				
			(0.80)	MADE GROUND: Dark brown sandy fine to coarse angular to rounded GRAVEL of flint and brick fragments.					
			1.75						
1.90	D		(0.55)	MADE GROUND: Soft and firm brown sandy gravelly CLAY. Gravel is fine to coarse angular brick fragments, flint, clinker and ash.	2.0				
2.00	C	N4 (1/1/1/1/1/1)	2.30						
2.50	ES			MADE GROUND: Black very sandy fine to coarse angular GRAVEL of brick fragments, ash, flint, clinker, coal, concrete and sandstone.					
3.00	C	N5 (2/1/1/1/2/1)			3.0				
			(2.70)						
4.00	C	N4 (1/1/1/1/1/1)			4.0				
			5.00						
5.00	C	N10 (-/1/1/3/4/2)		*End of Exploratory Hole at 5m*	5.0				

Groundwater Observations			Window Sample Run				General Remarks
No.	Struck (m)	Remarks	From (m)	To (m)	Dia. (mm)	Recovery (%)	
1	4.6	Slight water seepage.					

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Mini-Percussive Log

WS02

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: GED

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
HSV = Hand Shear Vane (kPa)
S / C = Split Spoon / Cone
N = SPT N Value

Plant: Mini Percussive Rig
Date: 08/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			(0.20) 0.20	MADE GROUND: Grass over soft dark brown clayey sandy slightly gravelly organic SILT (topsoil). Gravel is fine to coarse angular to subrounded sandstone. Many rootlets.					
0.40	ES		(0.80)	MADE GROUND: Brown clayey gravelly SAND. Gravel is fine to coarse angular to subrounded flint, brick fragments, sandstone and coal.					
0.80	D		1.00						
1.00	C	N8 (2/2/2/2/2/2)		MADE GROUND: Black very sandy fine to coarse angular GRAVEL of brick fragments, ash, flint, clinker, coal and sandstone.	1.0				
2.00	C	N6 (1/3/2/2/1/1)			2.0				
2.50	ES								
3.00	C	N6 (1/3/2/2/1/1)	(4.00)		3.0				
3.40	ES								
4.00	C	N11 (2/1/1/-/2/8)			4.0			1	
5.00	C	N8 (1/3/2/2/2/2)	5.00	*End of Exploratory Hole at 5m*	5.0				

Groundwater Observations			Window Sample Run				General Remarks
No.	Struck (m)	Remarks	From (m)	To (m)	Dia. (mm)	Recovery (%)	
1	4.5	Slight water seepage.					

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Mini-Percussive Log

WS03

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: GED

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
HSV = Hand Shear Vane (kPa)
S / C = Split Spoon / Cone
N = SPT N Value

Plant: Mini Percussive Rig
Date: 08/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
0.15	ES		(0.25) 0.25	MADE GROUND: Grass over soft dark brown silty sandy slightly gravelly organic CLAY (topsoil). Gravel is fine to coarse angular to subrounded sandstone, coal, mudstone and quartz. Many rootlets.					
			(1.25)	MADE GROUND: Black/dark brown very sandy fine to coarse angular GRAVEL of brick fragments, ash, flint, clinker, coal and sandstone.					
1.00	C	N18 (3/3/2/4/4/8)	1.50		1.0				
1.90	ES			MADE GROUND: Brown sandy fine to coarse angular to rounded GRAVEL of brick fragments, ash, flint, clinker, coal and sandstone. Occasional pottery.					
2.00	C	N14 (2/1/1/3/5/5)			2.0				
3.00	C	N6 (3/1/2/1/1/2)			3.0				
3.20	D		(3.50)						
4.00	C	N12 (1/2/2/2/4/4)			4.0				
4.50	ES								
5.00	C	N5 (1/1/1/-/1/3)	5.00	*End of Exploratory Hole at 5m*	5.0				

Groundwater Observations			Window Sample Run				General Remarks
No.	Struck (m)	Remarks	From (m)	To (m)	Dia. (mm)	Recovery (%)	
		No Groundwater Encountered					

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Mini-Percussive Log

WS04

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: GED

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
HSV = Hand Shear Vane (kPa)
S / C = Split Spoon / Cone
N = SPT N Value

Plant: Mini Percussive Rig
Date: 08/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			(0.20) 0.20	MADE GROUND: Grass over soft dark brown silty sandy slightly gravelly organic CLAY (topsoil). Gravel is fine to coarse angular to subrounded brick fragments and coal. Many rootlets.					
0.30	ES + D		(0.20) 0.40	MADE GROUND: Soft to firm brown sandy gravelly CLAY. gravel is fine to coarse angular to subrounded brick fragments, coal and mudstone.					
1.00	C	N2 (1/1/1/-/1/-)		MADE GROUND: Black/dark brown sandy fine to coarse angular GRAVEL of brick fragments, ash, clinker, coal, mudstone and sandstone.	1.0				
1.30	ES		(1.80)						
2.00	C	N7 (-/1/2/2/2/1)	2.20		2.0				
				MADE GROUND: Brown silty very sandy fine to coarse angular GRAVEL of ash, coal, brick fragments, clinker and sandstone.					
			(1.00)						
3.00	C	N6 (1/1/2/1/2/1)	3.20		3.0				
				MADE GROUND: Black/dark brown sandy fine to coarse angular GRAVEL of brick fragments, ash, clinker, coal, mudstone and sandstone.					
			(1.20)						
4.00	C	N10 (1/2/2/2/3/3)	4.40		4.0				
				Firm brown and grey silty sandy slightly gravelly CLAY. Gravel is fine to coarse angular to subrounded coal.					
4.70	D		(0.60)						
4.90	D		5.00						
5.00	C	N12 (2/3/2/4/3/3)		*End of Exploratory Hole at 5m*	5.0				

Groundwater Observations			Window Sample Run				General Remarks
No.	Struck (m)	Remarks	From (m)	To (m)	Dia. (mm)	Recovery (%)	
		No Groundwater Encountered					

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Mini-Percussive Log

WS05

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: GED

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
HSV = Hand Shear Vane (kPa)
S / C = Split Spoon / Cone
N = SPT N Value

Plant: Mini Percussive Rig
Date: 08/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			(0.20) 0.20	MADE GROUND: Grass over soft dark brown silty sandy slightly gravelly organic CLAY (topsoil). Gravel is fine to coarse angular to subrounded brick fragments, flint, mudstone and coal. Many rootlets.					
0.60	ES		(0.70) 0.90	MADE GROUND: Black/dark brown sandy fine to coarse angular GRAVEL of brick fragments, ash, clinker, coal, mudstone and sandstone.					
1.00	C	N1 (1/-/-/-/1/-)	(1.10) 2.00	MADE GROUND: Brown slightly clayey sandy fine to coarse angular GRAVEL brick fragments, ash, sandstone and coal.	1.0				
2.00	C	N2 (1/-/1/-/1/-)		MADE GROUND: Very soft brown sandy gravelly CLAY. Gravel is fine to coarse angular brick gragments, sandstone, coal, clinker, ash and burnt shale.	2.0				
2.20	ES								
2.80	D		(1.70)						
3.00	C	N10 (-/-/3/3/2/2)			3.0				
			3.70						
3.80	HSV	60		Firm brown and grey silty sandy CLAY.					
4.00	C	N14 (2/3/3/3/4/4)	(0.90) 4.60		4.0				
4.70	HSV	100		Firm to stiff brown sandy laminated CLAY and SILT.					
4.80	D		(0.40) 5.00						
5.00	C	N17 (3/4/4/4/5/4)		*End of Exploratory Hole at 5m*	5.0				

Groundwater Observations			Window Sample Run				General Remarks
No.	Struck (m)	Remarks	From (m)	To (m)	Dia. (mm)	Recovery (%)	
		No Groundwater Encountered					

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Trial Pit Log

TP01

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 09/12/2014
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
0.10	ES				(0.20) 0.20	MADE GROUND: Grass over soft dark brown silty sandy slightly gravelly organic CLAY (topsoil). Gravel is fine to coarse angular to subrounded sandstone, flint and brick fragments. Many rootlets.			
0.70	ES				(2.80) 3.00	MADE GROUND: Black/dark brown very sandy fine to coarse angular GRAVEL of brick, ash, flint, clinker, coal and sandstone.	1.0 2.0 3.0		
3.10	ES				(0.40) 3.40	MADE GROUND: Dark brown sandy fine to coarse angular GRAVEL of ash, clinker, slag and coal.			
						End of Exploratory Hole at 3.4m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions

Stability: Side walls unstable.
Length:
Width:
Orientation:

General Remarks

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Trial Pit Log

TP02

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 09/12/2014
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
0.15	ES				(0.20) 0.20	MADE GROUND: Grass over soft dark brown silty sandy slightly gravelly organic CLAY (topsoil). Gravel is fine to coarse angular to subrounded sandstone, flint and brick fragments. Many rootlets.			
						MADE GROUND: Black/dark brown very sandy fine to coarse angular GRAVEL of ash, brick, pottery, flint, clinker, slag and concrete.	1.0		
					(3.00)		2.0		
2.60	ES								
					3.20		3.0		
						End of Exploratory Hole at 3.2m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Side walls unstable.
Length:
Width:
Orientation:

General Remarks

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Tel. 0191 2302993

Trial Pit Log

TP03

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 09/12/2014
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					(0.20) 0.20	MADE GROUND: Grass over soft dark brown silty sandy slightly gravelly organic CLAY (topsoil). Gravel is fine to coarse angular to subrounded sandstone, flint and brick fragments. Many rootlets.			
						MADE GROUND: Black/dark brown very sandy fine to coarse angular GRAVEL of ash, brick, flint, clinker, slag and concrete.	1.0		
1.80	ES				(3.70)		2.0		
3.70	ES				3.90		3.0		
						End of Exploratory Hole at 3.9m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions	General Remarks
Stability: Side walls unstable.	
Length:	
Width:	
Orientation:	

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Trial Pit Log

TP04

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 09/12/2014
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					(0.20) 0.20	MADE GROUND: Grass over soft dark brown silty sandy slightly gravelly organic CLAY (topsoil). Gravel is fine to coarse angular to subrounded sandstone, flint and brick fragments. Many rootlets.			
					(1.20) 1.40	MADE GROUND: Black/dark brown very sandy fine to coarse angular GRAVEL of brick, pottery, flint, clinker, slag and concrete.	1.0		
1.50	ES				(1.30) 2.70	MADE GROUND: Brown sandy fine to coarse angular to rounded GRAVEL of flint, clinker and ash.	2.0		
					(1.00) 3.70	MADE GROUND: Black/dark brown very sandy fine to coarse angular GRAVEL of brick, pottery, flint, clinker, slag and concrete.	3.0		
						End of Exploratory Hole at 3.7m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Side walls unstable.
Length:
Width:
Orientation:

General Remarks

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Trial Pit Log

TP05

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 09/12/2014
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
0.10	ES				(0.25) 0.25	MADE GROUND: Grass over soft dark brown silty sandy slightly gravelly organic CLAY (topsoil). Gravel is fine to coarse angular to subrounded sandstone, flint and brick fragments. Many rootlets.			
					(3.05)	MADE GROUND: Black/dark brown very sandy fine to coarse angular GRAVEL of ash, brick, flint, clinker and concrete.	1.0 2.0 3.0		
					3.30	*End of Exploratory Hole at 3.3m*			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions

Stability: Side walls unstable.
Length:
Width:
Orientation:

General Remarks

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Trial Pit Log

TP06

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 09/12/2014
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					(0.20) 0.20	MADE GROUND: Grass over soft dark brown silty sandy slightly gravelly organic CLAY (topsoil). Gravel is fine to coarse angular to subrounded sandstone, flint and brick fragments. Many rootlets.			
						MADE GROUND: Black/dark brown very sandy fine to coarse angular GRAVEL of ash, brick, flint, clinker, slag and concrete.			
1.10	ES						1.0		
					(3.20)				
							2.0		
2.40	D					2.30 - 2.50 Occassional pockets of firm brown sandy CLAY.			
							3.0		
					3.40				
						End of Exploratory Hole at 3.4m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Side walls unstable.
Length:
Width:
Orientation:

General Remarks

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Trial Pit Log

TP07

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 09/12/2014
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					(0.20) 0.20	MADE GROUND: Grass over soft dark brown silty sandy slightly gravelly organic CLAY (topsoil). Gravel is fine to coarse angular to subrounded sandstone, flint and brick fragments. Many rootlets.			
					(1.40) 1.60	MADE GROUND: Black/dark brown very sandy fine to coarse angular GRAVEL of ash, brick, flint, slate tiles, clinker and concrete.	1.0		
2.40	D				(1.40) 3.00	Firm brown and grey silty very sandy CLAY.	2.0		
						End of Exploratory Hole at 3m	3.0		

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions	General Remarks
Stability: Side walls unstable.	
Length:	
Width:	
Orientation:	

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Trial Pit Log

TP08

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 09/12/2014
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
0.05	ES				(0.20) 0.20	MADE GROUND: Grass over soft dark brown silty sandy slightly gravelly organic CLAY (topsoil). Gravel is fine to coarse angular to subrounded sandstone, flint and brick fragments. Many rootlets.			
					(0.60) 0.80	MADE GROUND: Black/dark brown very sandy fine to coarse angular GRAVEL of ash, brick, flint, clinker, slag and concrete.			
0.90	D				(0.20) 1.00	Brown very clayey silty SAND.	1.0		
					(0.50) 1.50	Firm brown sandy slightly gravelly CLAY. Gravel is fine to coarse angular to subrounded coal and sandstone			
					(1.90) 3.40	Stiff dark brown sandy slightly gravelly CLAY. Gravel is fine to coarse angular to subrounded coal and sandstone	2.0		
2.70	D						3.0		
						End of Exploratory Hole at 3.4m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions

Stability: Side walls stable.
Length:
Width:
Orientation:

General Remarks

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Cable Percussion Log

BH01

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: RD Drilling

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
U100 = Undisturbed U100 Sample
S/C = SPT (split spoon/cone)
N = SPT N Value

Plant: Cable Percussion Rig
Dates: 19/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			(0.40) 0.40	MADE GROUND: Grass over brown topsoil (drillers description).					
0.50	D			MADE GROUND: Dark brown medium dense clayey very sandy fine to coarse angular to rounded GRAVEL of brick fragments, sandstone, flint, ash and coal.	1.0				
1.50	C	N20 (4/4/5/5/5/5)							
2.00	D				2.0				
3.00	D								
3.00	C	N22 (4/8/6/6/5/5)			3.0				
			(6.60)						
4.00	D				4.0				
4.50	C	N14 (2/2/3/3/4/4)							
5.00	D				5.0			1	
								1	
6.00	C	N16 (3/3/4/4/4/4)			6.0				
7.00	D		7.00		7.0				
7.50	C	N20 (3/4/5/5/5/5)		MADE GROUND: Dark brown medium dense very clayey sandy fine to coarse angular to subrounded GRAVEL of brick fragments, clinker, quartz, wood and flint.					
					8.0				

Continued next page...

Groundwater Observations				Chiselling			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From (m)	To (m)	Hours	
1	5.3	5.1		28.5	28.9	1.50	

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Cable Percussion Log

BH01

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: RD Drilling

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
U100 = Undisturbed U100 Sample
S/C = SPT (split spoon/cone)
N = SPT N Value

Plant: Cable Percussion Rig
Dates: 19/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
8.00	D			MADE GROUND: Dark brown medium dense very clayey sandy fine to coarse angular to subrounded GRAVEL of brick fragments, clinker, quartz, wood and flint. *(continued)*					
9.00	D				9.0				
9.00	C	N20 (3/4/4/5/5/6)							
10.00	D				10.0				
10.50	C	N22 (3/4/5/5/6/6)	(7.50)						
11.00	D				11.0				
12.00-14.00	B								
12.00	D				12.0				
12.00	C	N50/115mm (7/11/15/35/-/-)							
13.50	C	N50/20mm (50/-/-/-/-/-)			13.0				
14.50	D		14.50		14.0				
15.00	S	N65 (9/11/15/20/15/15)	(1.50)	Firm to stiff brown sandy slightly gravelly CLAY. Gravel is fine to medium rounded quartz and sandstone.	15.0				
			16.00		16.0				

Continued next page...

Groundwater Observations				Chiselling			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From (m)	To (m)	Hours	
1	5.3	5.1		28.5	28.9	1.50	

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Cable Percussion Log

BH01

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: RD Drilling

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
U100 = Undisturbed U100 Sample
S/C = SPT (split spoon/cone)
N = SPT N Value

Plant: Cable Percussion Rig
Dates: 19/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
16.00	D			Firm to stiff brown sandy gravelly CLAY. Gravel is fine to coarse angular to rounded quartz, sandstone and coal.					
16.50	C	N30 (3/5/7/7/8/8)							
17.00	D				17.0				
18.00	D								
18.00	C	N25 (3/4/5/5/6/9)			18.0				
19.00	D				19.0				
19.50	C	N37 (3/7/8/8/9/12)							
20.00	D				20.0				
21.00	D								
21.00	C	N35 (3/5/8/8/9/10)			21.0				
22.00	D		(12.50)		22.0				
22.50	C	N32 (4/7/7/8/8/9)							
23.00	D				23.0				
					24.0				

Continued next page...

Groundwater Observations				Chiselling			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From (m)	To (m)	Hours	
1	5.3	5.1		28.5	28.9	1.50	

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Cable Percussion Log

BH01

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: RD Drilling

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
U100 = Undisturbed U100 Sample
S/C = SPT (split spoon/cone)
N = SPT N Value

Plant: Cable Percussion Rig
Dates: 19/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
24.00	D								
24.00	C	N35 (3/8/8/9/9/9)		Firm to stiff brown sandy gravelly CLAY. Gravel is fine to coarse angular to rounded quartz, sandstone and coal. *(continued)*					
25.00	D				25.0				
25.50	C	N41 (4/8/9/10/11/11)							
26.00	D				26.0				
27.00	C	N45 (4/8/9/11/12/13)			27.0				
27.50	D								
					28.0				
			28.50						
			(0.40) 28.90	Hard brown grey sandstone (drillers description).					
				End of Exploratory Hole at 28.9m					

Groundwater Observations				Chiselling			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From (m)	To (m)	Hours	
1	5.3	5.1		28.5	28.9	1.50	

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Cable Percussion Log

BH02

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: RD Drilling

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
U100 = Undisturbed U100 Sample
S/C = SPT (split spoon/cone)
N = SPT N Value

Plant: Cable Percussion Rig
Dates: 18/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			(0.40) 0.40	MADE GROUND: Grass over topsoil.					
0.50	D			MADE GROUND: Dark brown medium dense slightly clayey sandy fine to coarse angular to subrounded GRAVEL of sandstone, flint, coal and ash.					
1.00	S	N11 (2/2/3/3/3/2)			1.0				
2.00	D		(3.60)		2.0				
2.50	S	N18 (3/4/4/5/5/4)							
3.50	D				3.0				
4.00	S	N34 (7/8/9/7/9/9)	4.00		4.0				
4.50	D			MADE GROUND: Dark brown medium dense very clayey sandy fine to coarse angular to subrounded GRAVEL of dolomite, flint, coal, clinker, ash and brick fragments.					
5.50	C	N15 (3/4/3/4/4/4)			5.0			1	
6.00	D								
6.00	C	N50/0mm (50/-/-/-/-/-)			6.0				
7.00	D				7.0			1	
7.50	C	N17 (3/4/4/4/4/5)	(7.00)						
					8.0				

Continued next page...

Groundwater Observations				Chiselling			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From (m)	To (m)	Hours	
1	6.8	5.7		5.8 25.2	6.8 25.7	1.00 1.50	

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Cable Percussion Log

BH02

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: RD Drilling

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
U100 = Undisturbed U100 Sample
S/C = SPT (split spoon/cone)
N = SPT N Value

Plant: Cable Percussion Rig
Dates: 18/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
8.00	D			MADE GROUND: Dark brown medium dense very clayey sandy fine to coarse angular to subrounded GRAVEL of dolomite, flint, coal, clinker, ash and brick fragments. *(continued)*					
9.00	C	N17 (3/4/4/4/4/5)			9.0				
9.50	D								
					10.0				
10.50	D								
10.50	C	N14 (2/3/3/3/4/4)	11.00						
				MADE GROUND: Black medium dense sandy fine to coarse angular to subrounded GRAVEL of ash, clinker and brick fragments.	11.0				
11.50	D		(1.00)						
12.00	C	N18 (2/4/4/4/5/5)	12.00		12.0				
12.50	D			MADE GROUND: Dark brown medium dense very clayey sandy fine to coarse angular to subrounded GRAVEL of dolomite, flint, coal, clinker, ash and brick fragments.					
			(2.00)		13.0				
13.50	C	N21 (3/4/5/5/6/5)							
14.00	D		14.00		14.0				
				MADE GROUND: Black medium dense sandy fine to coarse angular to subrounded GRAVEL of ash, clinker and brick fragments.					
15.00	C	N23 (2/4/4/6/6/7)			15.0				
15.30	D								
					16.0				

Continued next page...

Groundwater Observations				Chiselling			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From (m)	To (m)	Hours	
1	6.8	5.7		5.8 25.2	6.8 25.7	1.00 1.50	

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Cable Percussion Log

BH02

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: RD Drilling

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
U100 = Undisturbed U100 Sample
S/C = SPT (split spoon/cone)
N = SPT N Value

Plant: Cable Percussion Rig
Dates: 18/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			(4.40)	MADE GROUND: Black medium dense sandy fine to coarse angular to subrounded GRAVEL of ash, clinker and brick fragments. *(continued)*					
16.50	D								
16.50	C	N23 (3/3/6/6/5/6)			17.0				
17.50	D								
18.00	C	N23 (3/4/5/5/6/7)			18.0				
			18.40						
18.50	D			Firm to stiff brown sandy gravelly CLAY. Gravel is fine to coarse angular to subrounded sandstone and quartz.					
					19.0				
19.50	S	N29 (3/4/6/7/8/8)							
					20.0				
20.50	D								
21.00	S	N31 (3/6/7/7/8/9)			21.0				
			(6.80)						
22.00	D				22.0				
22.50	S	N33 (4/7/8/8/8/9)							
					23.0				
23.50	D								
					24.0				

Continued next page...

Groundwater Observations				Chiselling			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From (m)	To (m)	Hours	
1	6.8	5.7		5.8 25.2	6.8 25.7	1.00 1.50	

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Cable Percussion Log

BH02

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: RD Drilling

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
U100 = Undisturbed U100 Sample
S/C = SPT (split spoon/cone)
N = SPT N Value

Plant: Cable Percussion Rig
Dates: 18/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
24.00	S	N50/145mm (7/9/11/17/22/-)		Firm to stiff brown sandy gravelly CLAY. Gravel is fine to coarse angular to subrounded sandstone and quartz. *(continued)*					
24.70	D								
					25.0				
25.20	S	N50/16mm (25/-/50/-/-/-)	25.20						
			(0.50)	Grey SANDSTONE. (Recovered as sandy fine to coarse angular gravel of sandstone).					
25.70	D		25.70						
25.70	C	N50/0mm (50/-/-/-/-/-)		*End of Exploratory Hole at 25.7m*					

Groundwater Observations				Chiselling			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From (m)	To (m)	Hours	
1	6.8	5.7		5.8 25.2	6.8 25.7	1.00 1.50	

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Cable Percussion Log

BH03

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: RD Drilling

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
U100 = Undisturbed U100 Sample
S/C = SPT (split spoon/cone)
N = SPT N Value

Plant: Cable Percussion Rig
Dates: 22/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			(0.30) 0.30	MADE GROUND: Grass over brown topsoil.					
0.50	D			MADE GROUND: Dark brown medium dense clayey sandy fine to coarse angular to subrounded GRAVEL of flint, slag, clinker, brick fragments and ash.	1.0				
1.50	D								
1.50	C	N16 (2/4/4/4/4/4)	(2.60)						
2.00	D				2.0				
			2.90						
3.00	D			MADE GROUND: Soft to firm dark brown gravelly CLAY. Gravel is fine to coarse angular to subrounded ash, clinker, slag, brick fragments, flint and sandstone.	3.0				
3.00	C	N14 (2/3/3/3/4/4)							
4.00	D		(2.00)		4.0				
4.50	C	N10 (2/3/2/2/3/3)							
			4.90						
5.00	D			Firm to stiff brown silty sandy slightly laminated CLAY.	5.0				
6.00	C	N18 (3/4/4/4/5/5)			6.0				
6.50	D								
					7.0				
7.50	D								
7.50	C	N23 (3/4/5/6/6/6)							
					8.0				

Continued next page...

Groundwater Observations				Chiselling			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From (m)	To (m)	Hours	
			No Groundwater Encountered	23.0	23.5	1.50	

consulting engineers
First Floor, Block C
Holland Park
Holland Drive
Newcastle Upon Tyne
NE2 4LD

Tel. 0191 2302993

Cable Percussion Log

BH03

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: RD Drilling

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
U100 = Undisturbed U100 Sample
S/C = SPT (split spoon/cone)
N = SPT N Value

Plant: Cable Percussion Rig
Dates: 22/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
				Firm to stiff brown silty sandy slightly laminated CLAY. *(continued)*					
8.50	D								
9.00	C	N23 (3/5/5/5/6/7)			9.0				
			(9.10)						
					10.0				
11.00	D				11.0				
12.00	D								
12.00	C	N24 (3/4/5/6/6/7)			12.0				
13.00	D				13.0				
13.50	C	N23 (3/4/5/6/6/6)							
14.00	D		14.00		14.0				
				Firm to stiff brown sandy gravelly CLAY. Gravel is fine to coarse angular to rounded sandstone, coal and mudstone.					
15.00	D				15.0				
15.00	C	N25 (3/4/5/6/7/7)							
					16.0				

Continued next page...

Groundwater Observations				Chiselling			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From (m)	To (m)	Hours	
			No Groundwater Encountered	23.0	23.5	1.50	

consulting engineers
First Floor, Block C
Holland Park
Holland Drive
Newcastle Upon Tyne
NE2 4LD

Tel. 0191 2302993

Cable Percussion Log

BH03

Site Name: River Drive, South Shields
Client: Galliford Try Partnership North Ltd
Project No: 14643

Ground Level:
Easting:
Northing:

Contractor: RD Drilling

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
U100 = Undisturbed U100 Sample
S/C = SPT (split spoon/cone)
N = SPT N Value

Plant: Cable Percussion Rig
Dates: 22/12/2014
Logged By: CB

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
16.00	D			Firm to stiff brown sandy gravelly CLAY. Gravel is fine to coarse angular to rounded sandstone, coal and mudstone. *(continued)*					
16.50	C	N31 (3/6/7/7/8/9)							
17.00	D				17.0				
18.00	D								
18.00	C	N31 (4/6/7/8/8/8)			18.0				
			(9.00)						
19.00	D				19.0				
19.50	C	N32 (4/5/7/8/8/9)							
					20.0				
21.00	D								
21.00	C	N42 (4/8/10/10/11/11)			21.0				
					22.0				
22.50	D								
22.50	C	N50/3mm (25/-/50/-/-/-)							
			23.00		23.0				
			(0.50)	Yellow SANDSTONE. (Recovered as a sandy fine to coarse angular gravel of sandstone).					
23.50	D		23.50						
23.50	C	N50/0mm (50/-/-/-/-/-)		*End of Exploratory Hole at 23.5m*					

Groundwater Observations				Chiselling			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From (m)	To (m)	Hours	
			No Groundwater Encountered	23.0	23.5	1.50	

Appendix C

Gas and Groundwater Monitoring Results

Gas monitoring record

3e Consulting Engineers Ltd
1st Floor, Block C
Holland Drive
Holland Park
Newcastle Upon Tyne
NE2 4LD

Job no: 14643
Site: River Drive, South Shields
Date: 12-Dec-14
Weather: Windy and dry
Pressure Trend: Rising

BH No	Methane (%v/v)	Carbon dioxide (%v/v)	Oxygen (%v/v)	Barometric Pressure (mb)	Flow (l/hr)	Water level (m bgl)	Remarks
WS01	0.0	0.4	20.2	998	0.0	4.47	
WS02	0.1	0.4	20.3	998	0.0	Dry	Base at 4.0m
WS03	0.0	2.2	18.8	998	0.0	Dry	Base at 4.0m
WS04	0.1	0.3	20.3	998	0.0	Dry	Base at 4.0m

Date: 18-Dec-14
Weather: Overcast with sunny spells
Pressure Trend: Falling

BH No	Methane (%v/v)	Carbon dioxide (%v/v)	Oxygen (%v/v)	Barometric Pressure (mb)	Flow (l/hr)	Water level (m bgl)	Remarks
WS01	0.1	0.4	19.5	997	<0.1	4.37	
WS02	0.1	0.0	20.0	997	<0.1	Dry	
WS03	0.1	0.0	20.4	997	<0.1	Dry	
WS04	0.1	0.2	19.7	997	<0.1	Dry	

Date: 05-Jan-15
Weather: Overcast and dry
Pressure Trend: Falling

BH No	Methane (%v/v)	Carbon dioxide (%v/v)	Oxygen (%v/v)	Barometric Pressure (mb)	Flow (l/hr)	Water level (m bgl)	Remarks
WS01	0.0	1.6	18.7	1026	<0.1	Dry	
WS02	~	~	~	~	~	~	Damaged.
WS03	0.0	4.0	16.3	1026	<0.1	Dry	
WS04	0.0	0.9	19.5	10260	<0.1	Dry	

Date: 08-Jan-15
Weather: Sunny
Pressure Trend: Rising

BH No	Methane (%v/v)	Carbon dioxide (%v/v)	Oxygen (%v/v)	Barometric Pressure (mb)	Flow (l/hr)	Water level (m bgl)	Remarks
WS01	0.0	0.6	20.4	1013	<0.1	4.44	
WS02	0.0	0.1	21.0	1013	<0.1	Dry	
WS03	0.0	0.1	20.8	1013	<0.1	~	Unable to remove bung
WS04	0.0	0.0	20.8	1013	<0.1	Dry	

Appendix D

Laboratory Chemical Test Results

2531

ANALYTICAL TEST REPORT

Contract no: 53796

Contract name: River Drive, South Shields

Client reference: 14643

Clients name: 3E Consulting Engineers

Clients address: 1st Floor, Block C
Holland Park, Holland Drive
Newcastle Upon Tyne
NE2 4LD

Samples received: 10 December 2014

Analysis started: 10 December 2014

Analysis completed 17 December 2014

Report issued: 17 December 2014

Notes:
Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, withour prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key:
U UKAS accredited test
M MCERTS & UKAS accredited test
$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Approved by:

Karan Campbell Director	John Campbell Director	Dave Bowerbank Customer Services Co-ordinator

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
53796-1	TP 01	0.70	Sandy Clay with Gravel	-	-	16.2
53796-2	TP 03	1.80	Sand with Gravel	-	-	17.1
53796-3	TP 05	0.10	Loam	-	-	31.1
53796-4	TP 06	1.10	Sand with Gravel & Brick	-	-	13.2
53796-5	TP 08	0.05	Loam	-	-	32.0
53796-6	TP 08	2.70	Clay	-	-	12.5
53796-7	WS 01	0.15	Loam	-	-	22.6
53796-8	WS 02	2.50	Sand with Gravel	-	-	7.6
53796-9	WS 03	1.90	Sand with Gravel & Brick	-	-	12.6
53796-10	WS 04	1.30	Sand with Gravel & Slag	-	-	11.6
53796-11	WS 04	4.70	Clay	-	-	17.1
53796-12	WS 05	0.60	Sand with Slag	-	-	20.3

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SOILS

Lab number			53796-1	53796-2	53796-3	53796-4	53796-5	53796-6
Sample id			TP 01	TP 03	TP 05	TP 06	TP 08	TP 08
Depth (m)			0.70	1.80	0.10	1.10	0.05	2.70
Date sampled			08/12/2014	08/12/2014	08/12/2014	08/12/2014	08/12/2014	08/12/2014
Test	**Method**	**Units**						
Arsenic (total)	CE127 M	mg/kg As	21	76	26	22	16	-
Boron (water soluble)	CE063 M	mg/kg B	1.1	2.5	1.4	1.2	1.3	-
Cadmium (total)	CE127 M	mg/kg Cd	0.3	1.3	0.4	0.4	0.4	-
Chromium (total)	CE127 M	mg/kg Cr	83	64	54	75	55	-
Copper (total)	CE127 M	mg/kg Cu	84	1212	59	65	70	-
Lead (total)	CE127 M	mg/kg Pb	1235	2234	240	300	222	-
Mercury (total)	CE127 M	mg/kg Hg	0.5	11	1.2	1.2	0.8	-
Nickel (total)	CE127 M	mg/kg Ni	37	71	23	38	26	-
Selenium (total)	CE127 M	mg/kg Se	1.2	2.3	1.1	1.0	1.2	-
Zinc (total)	CE127 M	mg/kg Zn	181	906	157	259	177	-
pH	CE004 M	units	8.1	8.1	8.0	7.9	7.7	8.2
Sulphate (2:1 water soluble)	CE061 M	mg/l SO_4	64	110	43	899	63	136
Total Organic Carbon (TOC)	CE072 M	% w/w C	5.22	27.62	8.81	7.49	7.98	-
Estimate of OMC (calculated from TOC)	CE072	% w/w	9.00	47.62	15.19	12.91	13.76	-
PAH								
Naphthalene	CE087	mg/kg	0.07	3.94	0.15	0.15	0.12	-
Acenaphthylene	CE087	mg/kg	0.01	0.48	0.04	0.15	<0.01	-
Acenaphthene	CE087	mg/kg	<0.01	6.94	0.04	0.05	0.04	-
Fluorene	CE087	mg/kg	0.01	6.70	0.05	0.09	0.04	-
Phenanthrene	CE087	mg/kg	0.36	89.32	0.93	1.45	0.76	-
Anthracene	CE087	mg/kg	0.05	31.72	0.25	0.35	0.16	-
Fluoranthene	CE087	mg/kg	0.56	240.43	1.92	4.00	1.22	-
Pyrene	CE087	mg/kg	0.49	221.00	1.75	3.50	1.03	-
Benzo(a)anthracene	CE087	mg/kg	0.28	123.46	1.11	1.99	0.61	-
Chrysene	CE087	mg/kg	0.34	103.21	1.01	2.06	0.59	-
Benzo(b)fluoranthene	CE087	mg/kg	0.37	110.01	1.45	2.85	0.80	-
Benzo(k)fluoranthene	CE087	mg/kg	0.15	49.04	0.59	1.17	0.32	-
Benzo(a)pyrene	CE087	mg/kg	0.25	101.01	1.13	2.36	0.56	-
Indeno(123cd)pyrene	CE087	mg/kg	0.21	61.85	0.96	1.96	0.44	-
Dibenz(ah)anthracene	CE087	mg/kg	0.05	15.46	0.21	0.46	0.10	-
Benzo(ghi)perylene	CE087	mg/kg	0.22	55.84	0.89	1.87	0.43	-
PAH (total of USEPA 16)	CE087	mg/kg	3.45	1220	12.5	24.5	7.23	-
Subcontracted analysis								
Asbestos	$	-	NAD	NAD	Chrysotile	NAD	NAD	-

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SOILS

Lab number			53796-7	53796-8	53796-9	53796-10	53796-11	53796-12
Sample id			WS 01	WS 02	WS 03	WS 04	WS 04	WS 05
Depth (m)			0.15	2.50	1.90	1.30	4.70	0.60
Date sampled			08/12/2014	08/12/2014	08/12/2014	08/12/2014	08/12/2014	08/12/2014
Test	**Method**	**Units**						
Arsenic (total)	CE127 M	mg/kg As	21	10	15	26	-	39
Boron (water soluble)	CE063 M	mg/kg B	1.6	0.6	1.6	1.6	-	1.4
Cadmium (total)	CE127 M	mg/kg Cd	0.4	<0.2	0.2	0.2	-	0.7
Chromium (total)	CE127 M	mg/kg Cr	88	132	69	113	-	80
Copper (total)	CE127 M	mg/kg Cu	62	7.2	15	57	-	191
Lead (total)	CE127 M	mg/kg Pb	188	88	106	293	-	1770
Mercury (total)	CE127 M	mg/kg Hg	0.6	<0.5	<0.5	0.5	-	4.7
Nickel (total)	CE127 M	mg/kg Ni	35	16	25	56	-	56
Selenium (total)	CE127 M	mg/kg Se	1.6	0.5	0.7	1.1	-	1.7
Zinc (total)	CE127 M	mg/kg Zn	168	38	68	88	-	489
pH	CE004 M	units	8.1	8.3	7.9	8.3	8.1	8.6
Sulphate (2:1 water soluble)	CE061 M	mg/l SO_4	34	49	1673	1766	1965	296
Total Organic Carbon (TOC)	CE072 M	% w/w C	7.45	2.00	3.60	7.82	-	11.68
Estimate of OMC (calculated from TOC)	CE072	% w/w	12.84	3.45	6.21	13.48	-	20.14
PAH								
Naphthalene	CE087	mg/kg	0.07	0.07	0.08	0.27	-	0.42
Acenaphthylene	CE087	mg/kg	<0.01	<0.01	0.03	<0.01	-	0.05
Acenaphthene	CE087	mg/kg	<0.01	<0.01	0.01	<0.01	-	0.05
Fluorene	CE087	mg/kg	0.01	0.02	0.02	0.03	-	0.07
Phenanthrene	CE087	mg/kg	0.24	0.35	0.48	0.80	-	1.66
Anthracene	CE087	mg/kg	0.03	0.03	0.09	0.05	-	0.34
Fluoranthene	CE087	mg/kg	0.33	0.54	0.77	0.33	-	2.64
Pyrene	CE087	mg/kg	0.29	0.48	0.68	0.32	-	2.33
Benzo(a)anthracene	CE087	mg/kg	0.19	0.18	0.36	0.23	-	1.44
Chrysene	CE087	mg/kg	0.20	0.31	0.37	0.27	-	1.52
Benzo(b)fluoranthene	CE087	mg/kg	0.28	0.43	0.52	0.33	-	2.10
Benzo(k)fluoranthene	CE087	mg/kg	0.10	0.17	0.22	0.12	-	0.90
Benzo(a)pyrene	CE087	mg/kg	0.18	0.26	0.38	0.21	-	1.59
Indeno(123cd)pyrene	CE087	mg/kg	0.16	0.26	0.33	0.18	-	1.39
Dibenz(ah)anthracene	CE087	mg/kg	0.03	0.05	0.07	0.05	-	0.32
Benzo(ghi)perylene	CE087	mg/kg	0.16	0.26	0.33	0.22	-	1.42
PAH (total of USEPA 16)	CE087	mg/kg	2.28	3.41	4.74	3.39	-	18.2
Subcontracted analysis								
Asbestos	$	-	NAD	NAD	NAD	NAD	-	NAD

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LEACHATES

Lab number			53796-1L	53796-8L	53796-10L
Sample id			TP 01	WS 02	WS 04
Depth (m)			0.70	2.50	1.30
Test	**Method**	**Units**			
Arsenic (dissolved)	CE128 U	µg/l As	0.89	5.52	11.88
Boron (dissolved)	CE128 U	µg/l B	15	<6	8
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	<0.07	<0.07
Chromium (dissolved)	CE128 U	µg/l Cr	0.6	<0.2	0.2
Copper (dissolved)	CE128 U	µg/l Cu	3.3	2.8	2.2
Lead (dissolved)	CE128 U	µg/l Pb	<0.2	<0.2	<0.2
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	<0.008	<0.008
Nickel (dissolved)	CE128 U	µg/l Ni	5.3	0.5	<0.5
Selenium (dissolved)	CE128 U	µg/l Se	0.31	0.25	0.24
Zinc (dissolved)	CE128 U	µg/l Zn	1745	154	64
pH	CE004 U	units	8.3	8.6	8.5
Sulphate	CE049 U	mg/l SO_4	374	363	588
PAH					
Naphthalene	CE087	µg/l	<0.1	<0.1	<0.1
Acenaphthylene	CE087	µg/l	<0.1	<0.1	<0.1
Acenaphthene	CE087	µg/l	<0.1	<0.1	<0.1
Fluorene	CE087	µg/l	<0.1	<0.1	<0.1
Phenanthrene	CE087	µg/l	<0.1	<0.1	<0.1
Anthracene	CE087	µg/l	<0.1	<0.1	<0.1
Fluoranthene	CE087	µg/l	<0.1	<0.1	<0.1
Pyrene	CE087	µg/l	<0.1	<0.1	<0.1
Benzo(a)anthracene	CE087	µg/l	<0.1	<0.1	<0.1
Chrysene	CE087	µg/l	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	CE087	µg/l	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE087	µg/l	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE087	µg/l	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE087	µg/l	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE087	µg/l	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE087	µg/l	<0.1	<0.1	<0.1
PAH (total of USEPA 16)	CE087	µg/l	<1.6	<1.6	<1.6

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE063	Boron (water soluble)	Hot water extract, ICP-OES	Dry	M	0.5	mg/kg B
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO_4
CE072	Total Organic Carbon (TOC)	Removal of IC by acidification, Carbon Analyser	Dry	M	0.1	% w/w C
CE072	Estimate of OMC (calculated from TOC)	Calculation from Total Organic Carbon	Dry		0.1	% w/w
CE087	PAH (speciated)	Solvent extraction, GC-MS	Wet		0.01	mg/kg
$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

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METHOD DETAILS

METHOD	LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE128	Arsenic (dissolved)	ICP-MS	U	0.06	µg/l As
CE128	Boron (dissolved)	ICP-MS	U	6	µg/l B
CE128	Cadmium (dissolved)	ICP-MS	U	0.07	µg/l Cd
CE128	Chromium (dissolved)	ICP-MS	U	0.2	µg/l Cr
CE128	Copper (dissolved)	ICP-MS	U	0.4	µg/l Cu
CE128	Lead (dissolved)	ICP-MS	U	0.2	µg/l Pb
CE128	Mercury (dissolved)	ICP-MS	U	0.008	µg/l Hg
CE128	Nickel (dissolved)	ICP-MS	U	0.5	µg/l Ni
CE128	Selenium (dissolved)	ICP-MS	U	0.07	µg/l Se
CE128	Zinc (dissolved)	ICP-MS	U	1	µg/l Zn
CE004	pH	Based on BS 1377, pH Meter	U	-	units
CE049	Sulphate	Ion Chromatography	U	10	mg/l SO_4
CE087	PAH (speciated)	Solvent extraction, GC-MS		0.1	µg/l

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments
Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.
For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.
Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
A	Sampling date not provided
B	Sampling time not provided (waters only)
C	Sample exceeded holding time(s)
D	Sample not received in appropriate containers
E	Headspace present in sample container
F	Sample not chemically fixed (where appropriate)
G	Sample not cooled
H	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
53796-1	TP 01	0.70	N	
53796-2	TP 03	1.80	N	
53796-3	TP 05	0.10	N	
53796-4	TP 06	1.10	N	
53796-5	TP 08	0.05	N	
53796-6	TP 08	2.70	N	
53796-7	WS 01	0.15	N	
53796-8	WS 02	2.50	N	
53796-9	WS 03	1.90	N	
53796-10	WS 04	1.30	N	
53796-11	WS 04	4.70	N	
53796-12	WS 05	0.60	N	

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ANALYTICAL TEST REPORT

Contract no: 53983

Contract name: River Drive, South Shields

Client reference: 14643

Clients name: 3E Consulting Engineers

Clients address: 1st Floor, Block C
Holland Park, Holland Drive
Newcastle Upon Tyne
NE2 4LD

Samples received: 08 January 2015

Analysis started: 08 January 2015

Analysis completed 13 January 2015

Report issued: 14 January 2015

Notes:
Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, withour prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key:
U UKAS accredited test
M MCERTS & UKAS accredited test
$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing

Approved by:

Karan Campbell Director	John Campbell Director	Dave Bowerbank Customer Services Co-ordinator

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
53983-1	BH 01	7.00	Clayey Sand with Gravel	-	-	11.6
53983-2	BH 02	18.50	Clay	-	-	13.2
53983-3	BH 02	23.50	Clay	-	-	9.8
53983-4	BH 03	14.00	Clay	-	-	13.5

Chemtech Environmental Limited

SOILS

Lab number			53983-1	53983-2	53983-3	53983-4
Sample id			BH 01	BH 02	BH 02	BH 03
Depth (m)			7.00	18.50	23.50	14.00
Date sampled			08/01/2015	08/01/2015	08/01/2015	08/01/2015
Test	**Method**	**Units**				
pH	CE004 M	units	10.5	8.1	8.4	8.3
Sulphate (2:1 water soluble)	CE061 M	mg/l SO_4	345	199	112	303

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO_4

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DEVIATING SAMPLE INFORMATION

Comments
Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.
For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.
Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

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E	Headspace present in sample container
F	Sample not chemically fixed (where appropriate)
G	Sample not cooled
H	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
53983-1	BH 01	7.00	N	
53983-2	BH 02	18.50	N	
53983-3	BH 02	23.50	N	
53983-4	BH 03	14.00	N	

Appendix E

Laboratory Geotechnical Test Results

PSL
Professional Soils Laboratory

LABORATORY REPORT

UKAS TESTING
4043

Contract Number: PSL14/6574

Client's Reference: Report Date: 22 December 2014

Client Name: 3E Consulting Engineers Ltd
1st Floor, Block C
Holland Park
Holland Drive
Newcastle Upon Tyne
NE2 4LD

For the attention of: Christopher Brewster

Contract Title: River Drive, South Shields

Date Received: 12/12/2014
Date Commenced: 12/12/2014
Date Completed: 22/12/2014

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 in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson (Director)
A Watkins (Director)
M Beastall (Laboratory Manager)

D Lambe (Senior Technician)
S Royle (Senior Technician)

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Doncaster DN4 0AR
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fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
WS01		D	1.90	Brown mottled grey slightly gravelly very sandy CLAY.
WS04		D	4.90	Brown sandy CLAY.
WS05		D	4.80	Brown mottled grey slightly sandy silty CLAY.
RTP07		D	2.40	Brown mottled grey slightly sandy CLAY.

PSL
Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	22/12/14		22/12/14		22/12/14

RIVER DRIVE, SOUTH SHIELDS.

Contract No: PSL14/6574

Client Ref: 14643

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % Clause 3.2	Bulk Density Mg/m^3 Clause 7.2	Dry Density Mg/m^3 Clause 7.2	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4.4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	% Passing .425mm	Remarks
WS01		D	1.90	18				33	17	16	97	Low plasticity CL.
WS04		D	4.90	20				37	18	19	100	Intermediate plasticity CI.
WS05		D	4.80	30				68	28	40	100	High plasticity CH.
RTP07		D	2.40	27				64	27	37	100	High plasticity CH.

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

PSL
Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	22/12/14		22/12/14		22/12/14

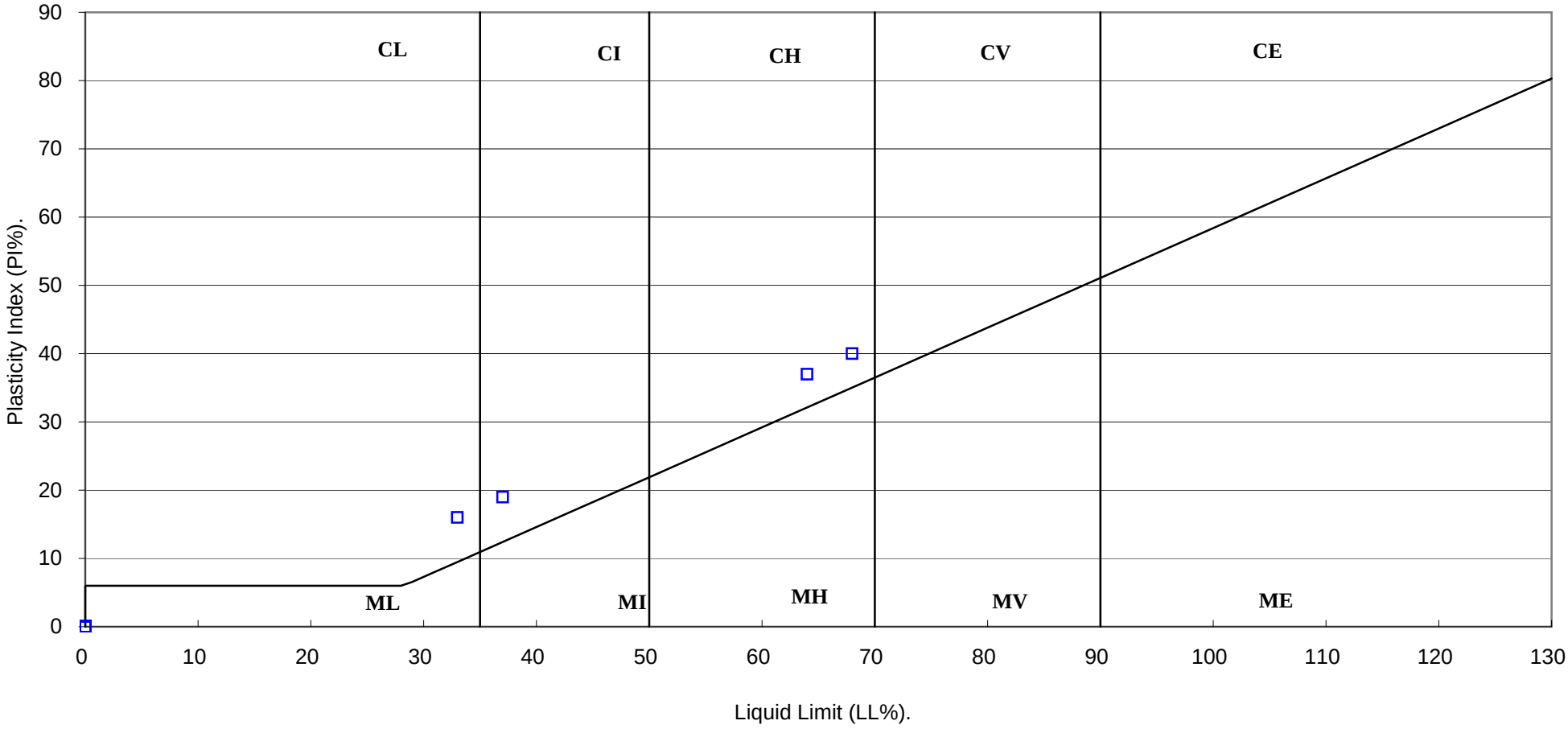
RIVER DRIVE, SOUTH SHIELDS.

Contract No: **PSL14/6574**

Client Ref: **14643**

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



PSL Professional Soils Laboratory	Compiled by	Date	Checked by	Date	Approved by	Date
		22/12/14		22/12/14		22/12/14
	RIVER DRIVE, SOUTH SHIELDS.				Contract No:	PSL14/6574
					Client Ref:	14643