Station Road, Hebburn

Phase II Geo-Environmental Assessment

For

Aldi Stores Ltd

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Executive Summary

Site Investigation	The investigation has involved: • Inspection of a previous phase I geo-environmental assessment. • 5 mini percussive boreholes (WS01 to WS05) and three rotary open-hole boreholes (RBH01 to RBH03). • Installation of ground gas monitoring wells. • Geotechnical and contamination related testing. • Preliminary ground gas and groundwater monitoring.
Ground Conditions	Made ground was encountered within the all of the exploratory holes to depths of between 0.25m and 1.50m. These materials generally comprised grass and tarmac gravel surfacing, overlying sandy gravel, brick rubble and disturbed clay, with. brick, concrete, coal and occasional ash and slag. Drift deposits comprising firm to stiff sandy gravelly clay were identified to between 8.30m to 9.40m. Sandstone bedrock deposits were initially encountered below the site to depths of between 16.10m and 19.30m, overlying grey mudstone with occasional sandstone and dark grey mudstone inter-beds, up to in excess of 35.00m. A thin coal and mudstone band was also noted at depths of between 17.50m and 20.20m.
Groundwater	A shallow continuous groundwater surface (water table) was noted to be absent below the site, with all of the exploratory positions remaining dry during the intrusive works. During the preliminary monitoring variable standing water levels of between 1.31m and 4.83m were recorded, which are considered to be attributable to perched water.
Gas Monitoring	The results of the ground gas monitoring indicate that gas protection measures are required for this site (CIRIA C665 Characteristic Situation 2). Gas monitoring is ongoing.
Contamination	No visual or olfactory evidence of contamination was identified on site, with the results of the chemical analysis no significant risk to human health and controlled waters associated with the made ground below this site, based upon a commercial end use. In addition, although a slightly increased level of PAH contamination was identified at the location of WS02, at this stage no risk is anticipated to human health (i.e. future site users) with these materials encapsulated wholly below an area of future hard-standing. However, should alterations be made to the site layout a re-assessment may be required in this respect. The levels of contaminants in the samples screened are not considered to be sufficiently mobile to represent a risk to any off site sources or controlled waters.

Appraisal	Remediation – At this stage, no further remedial requirements and/or risk assessment are deemed necessary for this site with regards potential future risk to human health or controlled waters. Mining – From the findings of the rotary intrusive works, this site is not considered to be at significant risk from shallow coal mining activities. Foundations and Floor Slabs – Conventional pad and strip foundations will be suitable for the proposed development. Foundations should be extended through any made ground and be based wholly within the natural firm and stiff clay deposits, with these designed on a maximum allowable bearing capacity of 100kN/m^2 and a minimum depth of 0.9m. Ground bearing floor slabs are anticipated to be suitable. Sulphate attack on buried concrete – Buried concrete should be designed to BRE Special Digest 1:2005 Design Sulphate Class DS-2 with an ACEC site classification AC-2.

1 INTRODUCTION

1.1 3e Consulting Engineers Ltd (3e) were commissioned by Aldi Stores Ltd to carry out a phase II geo-environmental assessment of land located adjacent to Station Road, Hebburn. The proposed development includes an Aldi store with associated car parking, details of which are provided in **Appendix A**.

1.2 The objectives of this assessment were:

- 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 (if required).
- To assess the risk posed by hazardous ground gas.
- To provide advice relating to geotechnical issues associated with the site, including the potential for shallow mine workings.
- To provide foundation recommendations.

1.3 Fieldwork was undertaken between the 7th and 8th July 2015 and comprised five mini percussive boreholes (WS01 to WS05) with associated sampling and testing, and three rotary open-hole boreholes (RBH01 to RBH03).

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 commercial 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.

1.6 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.

1.7 This report has been prepared for the sole use of Aldi Stores 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 430810 564480, is located off Glen Street in the town of Hebburn approximately 5.8km east of Newcastle city centre.

2.2 The site occupies an area of 0.49Ha and is currently occupied by grassed open space with occasional mature trees, encompassed by timber knee rail fencing. The grassed areas are separated by public pavements. The north easterly portion of the site is currently occupied by raised flower beds.

2.3 Land uses in the vicinity of the site are summarised below:

- North east: Station Road, Fountain Square, grass field and residential properties.
- South east: Commercial properties with associated car parking.
- South west: Grass fields and residential properties.
- North west: Glen Street and commercial properties

2.4 The location of the site is provided on **Figure 1**.

3 PHASE I GEO-ENVIRONMENTAL ASSESSMENT

3.1 A phase I geo-environmental assessment of the site was completed by 3e Consulting Engineers in August 2013 (ref: 13675). 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 sections:

Site History

3.2 From 1859 the site is recorded as undeveloped grassland. By 1896, a small school is recorded across the north-western site area, with the remainder of the site occupied by several rows of terraced housing. By 1970 the terraced residential houses have been demolished and replaced by new residential properties. The site remained unchanged until 2013 when all buildings previously occupying the site were demolished.

3.3 Extensive industrial development has historically taken place in the surrounding areas.

Geology and Mining

3.4 The site is recorded as being underlain by Upper or Pelaw Clay drift (superficial) deposits over Carboniferous Middle Coal Measures bedrock deposits. Nearby historical BGS borehole records indicate approximately 10m of superficial deposits overlying bedrock.

3.5 Published geological plans record an unnamed coal seam sub-cropping on or close to the south-eastern site boundary whilst an additional unnamed coal seam sub-crops to the north-west and dips below the site. Following a review of available data, it was considered possible that the identified coal seams could potentially underlie the site at shallow depth. Coal Authority data online also records the site as lying within a development 'high risk' area from 'probable shallow coal workings'.

Watercourses and Groundwater

3.6 There are no watercourses recorded within 250m, with the nearest surface water feature being the River Tyne located 730m west. There are no surface or groundwater abstractions recorded within plausible migration distance (i.e. 1km). The site does not lie within a fluvial flood plain and as such is not considered to be at significant risk from flooding.

3.7 The bedrock deposits are classified as a Secondary A Aquifer whilst the drift deposits are recorded as Unproductive Strata.

Landfill Sites, Pollution Controls and Industrial Land Use

3.8 There are no existing or historic landfill sites recorded within 250m of the site boundary, however, there is evidence of historical quarrying 160m north-west associated with a former Bauxite Works.

3.9 The nearest pollution, prevention and control is recorded 120m north-east, associated with a bitumen and tar processing works. There are no petrol filling stations within 250m.

Conceptual Site Model

3.10 Based on the information available, it was concluded that the main source of contamination on the site was made ground associated with historic site usage, including demolition of former residential housing and a school. A series of off-site sources of potential contamination were also identified for this site, including a nearby railway line, bauxite works and bituminous product works.

3.11 The assessment indicates that the risk to human health from potential contamination (if present) can be largely mitigated by use of appropriate PPE during the construction period and by the use of hard cover as part of the proposed development.

3.12 In addition, the assessment also indicates that the presence of low permeable clay beneath the site will reduce the risk of vertical migration of contamination to the underlying Secondary A Aquifer deposits, as well as reducing the risk of contamination migrating onto the site from adjacent sites which may have been contaminated by former industrial use.

3.13 Overall the assessment indicates a low to moderate environmental risk until proven otherwise.

Ground Gas Risk Assessment

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

3.15 The assessment indicates a low to moderate risk of ground gas, with the primary source identified being made ground below the site as a whole and infilling of a nearby quarry 160m north-west. In addition, the site was also considered to be at potential risk from mine gases should shallow coal workings be identified below the site.

4 METHOD OF INVESTIGATION

Fieldwork

4.1 The intrusive works comprised five mini percussive boreholes (WS01 to WS05), with associated sampling and testing, and three rotary open-hole boreholes (RBH01 to RBH03). The site works were carried out between the 7th and 8th July 2015. The exploratory holes were located across the site to provide general coverage making allowance for buried utilities and areas of steep ground. A copy of the exploratory hole records are included as **Appendix B** and the locations are shown on **Figure 2** (Exploratory Hole Location Plan).

4.2 The mini percussive boreholes were sunk in order to determine the shallow soil profile, whilst also allowing for ground gas and groundwater monitoring wells to be installed. Disturbed samples were recovered for soil descriptions and laboratory testing. Insitu hand shear vanes (HSV) and standard penetration tests (SPT's) were carried out to provide an assessment of the insitu strength and density of the made ground and natural deposits below the site. The rotary boreholes were targeted across the site to assess the potential risk to the proposed development from shallow coal mining activities.

4.3 Gas/groundwater monitoring wells, comprising slotted 50mm diameter HDPE pipe within a granular filter were installed in three of the boreholes (WS01 to WS03) 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 two occasions between 15th and 28th July 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**.

4.4 Fieldwork and soil descriptions were carried out in general accordance with BS5930+A2:2010 The Code of Practice for Site Investigations and BS10175:2011+A1:2013 The Code of Practice for the Investigation of Potentially Contaminated Sites.

Laboratory Chemical Testing

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

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

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

4.7 During the intrusive works, there was no visual and/or olfactory evidence of potential hydrocarbon contamination noted within the soils across the site, and as such screening for Total Petroleum Hydrocarbons (TPH's) was not deemed necessary or appropriate.

Laboratory Geotechnical Testing

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

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

4.9 The results of the above geotechnical testing are included as **Appendix E**.

4.10 In addition to the above, nine samples of made ground and two samples of natural soil were scheduled for water soluble sulphate and pH determinations to assess the potential for sulphate attack on buried concrete, the results of which are included in **Appendix D**.

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 borehole record sheets included as **Appendix B**. A summary of the ground conditions encountered is presented below. However, there is likely to be some local variation across the site and reference should also be made to individual exploratory hole records.

Ground Surface

5.2 Existing site surfacing comprises a mixture of grass, tarmac gravel and paving, associated with the existing soft landscaping, public seating area, pathways and temporary car parking areas. To facilitate the ground investigation works, the majority of the exploratory holes were positioned within areas of soft landscaping, with the exception of WS01 which was sunk within an area of tarmac gravel currently utilised as a temporary parking area.

Relict Foundations

5.3 There was no evidence of relict foundations and/or infilled former basement features identified within any of the exploratory positions.

Made Ground

5.4 Made ground was encountered within the all of the exploratory holes to depths of between 0.25m and 1.50m. These materials generally comprised grass and tarmac gravel surfacing, overlying sandy gravel, brick rubble and disturbed clay, with anthropogenic debris (i.e. brick, concrete, coal and occasional ash and slag).

Natural Drift Deposits

5.5 Drift deposits comprising firm to stiff (medium to high strength) slightly sandy gravelly clay were identified within the mini percussive boreholes (WS01 to WS05) up to in excess of 5.45m depth. At the rotary hole locations (RBH01 to RBH03) slightly sandy gravelly clay deposits were also identified to depths of between 8.30m to 9.40m below ground level.

Bedrock

5.6 Sandstone bedrock deposits were initially encountered at the rotary borehole locations to depths of between 8.3m and 9.4m, overlying grey mudstone with occasional thin sandstone and dark grey mudstone inter-beds, to a maximum recorded depth of 35.00m.

5.7 A thin coal and mudstone band was also encountered within the rotary holes (0.20m to 0.30m thick) at depths of between 17.50m and 20.20m.

Mining Assessment

5.8 From published geological plans, an unnamed coal seam is recorded as sub-cropping on or close to the south-eastern site boundary whilst an additional unnamed coal seam sub-crops to the north-west and dips below the site at potentially shallow depth. From BGS data both of these seams as indicated to be locally thin below the general site area. However, Coal Authority data records the site as being located within a development 'high risk' area associated with 'probable shallow coal workings'.

5.9 Therefore, in order to determine the level of potential risk to this site from shallow coal workings three rotary open hole boreholes were sunk across the site (RBH01 to RBH03), with the boreholes positioned to assess the risk associated with both identified coal seams. Copies of the rotary borehole record sheets are included in **Appendix B**.

5.10 From the findings of the rotary boreholes, although an intact thin and banded coal seam was encountered at depths of between 17.50m and 20.20m below ground level, there was no evidence of shallow coal workings beneath the site, with broken ground, voiding, etc., being absent within the rotary boreholes undertaken, up to 35.00m below ground level.

5.11 Therefore, this site is not considered to be at risk from shallow coal mining activities. In addition, whilst worked seams may be present at greater depth below this site (i.e. beyond 35.00m below ground level), they are not considered to represent a significant risk, as the thickness of overlying competent rock cover is sufficient as to prevent any possible crown hole migration resulting from potential mine working collapses.

Groundwater

5.12 A shallow continuous groundwater surface (water table) was noted to be absent below the site, with all of the exploratory positions remaining dry during the intrusive works.

5.13 During the intrusive works, combined gas and groundwater monitoring wells were installed at the locations of WS01, WS02 and WS03, with the results of the monitoring (completed to date) recording variable standing water levels of between 1.31m and 4.83m, which are considered to be attributable to perched water.

5.14 The results of the groundwater monitoring carried out to date are presented in **Appendix C**. It should also be noted that groundwater levels vary seasonally and that a higher water table than recorded could occur.

Physical Evidence of Contamination

5.15 No visual and/or olfactory evidence of potential hydrocarbon contamination was recorded within the made ground and/or natural superficial deposits below the site. However, occasional ash and slag fragments were noted within the made ground at the locations of WS02 and WS03, respectively.

Gas Monitoring

5.16 The results of the ground gas monitoring carried out to date (15th and 28th July 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	0.0-0.2	2.4-3.9	13.1-16.7	-9.8	998 & 1014	0.38	0.02
WS02	0.0	0.0	11.0-13.9	-0.1			
WS03	0.0	1.6-2.3	17.5-17.9	<0.1			

* CIRIA 665 Gas Screening Value based on the maximum flow (including negative) and concentration

5.17 During the gas monitoring completed to date, methane was recorded up to a maximum concentration of 0.2% whilst carbon dioxide was recorded up to a maximum concentration of 3.9%v/v. Depleted oxygen levels were also noted throughout the monitoring

period, with a minimum concentration of 11.0% recorded at the location of WS02. No positive flow was detected during the monitoring period (to date). In accordance with BS8485 (2015) and taking account of negative flow, preliminary CIRIA Gas Screening Value (GSV) of 0.38l/hr and 0.02l/hr are calculated for carbon dioxide and methane respectively.

5.18 The result of the preliminary assessment indicates this site could potentially fall within Characteristic Situation CS2, which would result in gas protective measures being required. A further four gas monitoring visits are planned and any conclusions may be subject to change until completion of the monitoring programme. The results of the ground gas monitoring carried out to date are presented in **Appendix C**.

Contamination Related Testing

Soils Analysis - Human Health

5.19 The results of the contamination related testing undertaken on the six representative samples of made ground are included in **Appendix D**.

5.20 Generally, the results have been assessed using the recently published LQM/CIEH Suitable for Use Levels (S4ULs) for Human Health Risk Assessment (Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3170; All rights reserved), with these values having been derived utilising the most up to date developments in UK human health risk assessment guidance.

5.21 These values replace and update the previous LQM/CIEH GAC's which have been subsequently withdrawn, with the use of these values considered to represent the more conservative approach for assessing the level of potential risk to Human Health.

5.22 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).

5.23 With respect to the assessment of the site, as the site is proposed to be redeveloped with an Aldi food store, the most appropriate values are considered to be the GACs for a

commercial end use. Based on the laboratory results, a conservative SOM of 2.5% has been used in the assessment.

5.24 A summary of the contamination related testing is presented in the table below.

Determinand	Minimum conc. mg/kg	Maximum conc. mg/kg	No of Samples Tested	Generic Assessment Criteria (GAC) mg/kg	No of Samples Exceeding GAC
Arsenic	8.5	37	6	640(1)	0
Boron	<0.5	2.9	6	240000(2)	0
Cadmium	0.2	1.2	6	190(1)	0
Chromium	76	230	6	8600(2)	0
Copper	23	87	6	68000(2)	0
Lead	40	289	6	750(3)	0
Mercury	<0.5	<0.5	6	1100(1)	0
Nickel	17	31	6	980(1)	0
Selenium	1.1	2.9	6	12000(1)	0
Zinc	71	286	6	730000(2)	0
PAH Compounds					
Naphthalene	<0.01	5.64	6	460(2)	0
Acenaphthylene	<0.01	0.07	6	97000(2)	0
Acenaphthene	0.01	6.17	6	97000(2)	0
Fluorene	0.02	4.21	6	68000(2)	0
Phenanthrene	0.21	33.88	6	22000(2)	0
Anthracene	0.07	6.61	6	540000(2)	0
Fluoranthene	0.33	64.92	6	23000(2)	0
Pyrene	0.27	55.30	6	54000(2)	0
Benzo(a)anthracene	0.16	22.44	6	170(2)	0
Chrysene	0.20	22.56	6	350(2)	0
Benzo(b)fluoranthene	0.24	23.67	6	44(2)	0
Benzo(k)fluoranthene	0.11	10.15	6	1200(2)	0
Benzo(a)pyrene	0.16	20.22	6	35(2)	0
Indeno(123cd)pyrene	0.13	13.28	6	510(2)	0
Dibenz(ah)anthracene	<0.02	**4.26**	6	3.6(2)	**1 (WS02)**
Benzo(ghi)perylene	0.09	12.38	6	4000(2)	0

Notes

(1) CLEA soil guideline value for a commercial end use.
(2) LQM/CIEH C4SUL for a commercial end use.
(3) CLEA soil guideline value for a commercial end use (version 1.0 beta).

5.25 The results of the laboratory chemical screening have identified generally low levels of contamination within the soil samples screened from across the site, with the majority falling below current assessment criteria based upon a commercial end use.

5.26 In addition, although a slightly increased level of Dibenz(ah)anthracene was recorded for the made ground screened from WS02, from the proposed site layout plan these materials are located wholly below an area of proposed hard-standing (i.e. car parking area), which would remove any pathways currently available, and thereby negate any potential risk. Therefore, at this stage no significant risk is anticipated to future end users (i.e. human

health) associated with the made ground identified below the site. However, should alterations be made to the proposed site layout a re-assessment as to the level of potential risk may be required.

Asbestos

5.27 Six samples of made ground were screened for asbestos fibres. The result of this screening indicates that no asbestos fibres were detected during testing.

Phytotoxic Contaminants

5.28 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	Minimum conc. (mg/kg)	Maximum conc. (mg/kg)	Maximum Permissible Concentration of PTE(1) in Soil (dependent upon soil pH range) (mg/kg)(2)		
				pH<6.0	pH 6.0-7.0	pH>7.0
Zinc	7.4-8.5	71	286	<200	<200	<300
Copper		23	87	<100	<135	<200
Nickel		17	31	<60	<75	<110

Notes
(1) PTE – Phytotoxic Element
(2) BS3882:2007 & DoE Code of Practice for Agricultural use of Sewage Sludge, 1996

5.29 From the above results and considering the pH was greater than 7.0 in all samples, it can be seen that no elevated concentrations of Copper, Zinc and Nickel have been detected within the soil samples screened from across the site which have the potential to impact future plant growth.

Modified Site Conceptual Model

Sources of Contamination

5.30 From the information gathered during the desk study, it was concluded that the main source of contamination for this site was made ground associated with historical site usage, which included demolition of former residential housing and a school. In addition, a series of off-site sources of potential contamination were also identified for this site, including a nearby railway line, bauxite works and bituminous product works.

5.31 During the intrusive works, no visual and/or olfactory evidence of contamination was recorded within the made ground or natural soils. However, occasional ash and slag fragments were noted within the made ground at WS02 and WS03, respectively.

5.32 The results of the laboratory chemical analysis identified no significantly elevated levels of contamination for the made ground screened from across the majority of the site, based on a commercial end use. However, an isolated slightly elevated level of PAH contamination (Dibenz(ah)anthracene) was identified at the location of WS02, which is likely associated with the presence of ash within the made ground at this location.

5.33 The preliminary gas monitoring results indicate that ground gas and depleted oxygen is present and protection measures are required (CIRIA C665 Characteristic Situation 2).

Pathways and Receptors

5.34 The following pathways and receptors are identified:

- Dust inhalation, direct contact and soil ingestion – Human health.
- Leaching of contamination to the underlying aquifer – Controlled Waters.
- Leaching of contamination to the River Tyne – Controlled Waters.
- Leaching of contamination onto site from off site sources – Human health.
- Vertical and lateral migration of ground gas into confined spaces – Human health.

Pollutant Linkage Assessment

5.35 A qualitative risk assessment has been made of the likelihood of any pollutant linkage operating and its potential significance, based on the findings of the investigation. The results are summarised in the table below:

Contamination Source	Pathway	Hazard	Potential Receptors	Linkage Complete
Made ground - slightly increased levels of PAH contamination at WS02	Dust inhalation, direct contact and soil ingestion	Human health risk	Site construction workers	Yes, however risk can be mitigated by the use of appropriate PPE and suitable handling of affected materials.
			Site end users	Yes, although pathways will not be available within areas of future hard-standing.
	Vertical and lateral migration	Pollution of controlled waters	Secondary A aquifer and River Tyne	No. Site is underlain by glacial clay and contamination levels are very low.
Off site sources of contamination from former industrial use.	Leaching onto site	Human health risk	Site end users	Unlikely given the presence of glacial clay beneath the site which will restrict lateral movement of contamination. Post-construction, direct contact pathways with soils will be eliminated.
Ground gas	Vertical and lateral migration into confined spaces	Human health risk	Site end users	Yes.

Geotechnical Related Testing

5.36 The results of the geotechnical testing are presented in **Appendix E**.

Classification Tests

5.37 Six Atterberg limit determinations were made on the natural cohesive deposits at depths of between 0.90m and 2.00m. The results indicate plasticity indices of between 18% and 23%, which are indicative of clays of intermediate plasticity. The modified plasticity indices vary between 15.84% and 21.60%, which are indicative of clays with a low to medium volume change potential.

Sulphate and pH Determinations

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

5.39 Within the made ground, water soluble sulphate concentrations varied between 39mg/l and 1014mg/l with pH values between 7.4 and 8.5. Within the natural soils water soluble sulphate concentrations of 63mg/l and 135mg/l were recorded with pH values 7.7 and 8.0. These indicate a worst case BRE Special Digest 1:2005 Design Sulphate Class DS-2 with an ACEC site classification AC-2 for concrete in contact with made ground.

6 DISCUSSION

6.1 Development proposals include an Aldi store with associated car parking. 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 A slightly increased level of PAH contamination was identified at the location of WS02, although at this stage no risk is anticipated to human health (i.e. future site users) with these materials encapsulated wholly below an area of future hard-standing. However, should alterations be made to the site layout a re-assessment may be required in this respect.

6.3 The levels of contaminants in the samples screened are not considered to be at levels which would present a risk to any off site sources or controlled waters. In addition, low permeability clay was identified below the site which will further inhibit groundwater movement on site and limit the potential for contaminant migration both on and off site.

6.4 Based on the findings of the investigation and conceptual site model, no remediation is considered necessary.

Disposal of Materials

6.5 It is considered likely that made ground materials for off-site disposal will be classified as stable non-reactive hazardous waste.

Mining Assessment

6.6 There was no evidence of shallow coal workings beneath the site, with broken ground, voiding, etc., being absent within the rotary boreholes to 35.0m below ground level.

6.7 Therefore, this site is not considered to be at risk from shallow coal mining activities. In addition, whilst worked seams may be present at greater depth below this site (i.e. beyond 35.0m below ground level), they are not considered to represent a significant risk, as the

thickness of overlying competent rock cover is sufficient as to prevent any possible crown hole migration resulting from potential mine working collapses.

Foundations and Floor Slabs

6.8 At this stage, it is understood that the proposed development is to include the construction of an Aldi store with associated car parking and limited areas of soft landscaping.

6.9 Based upon the findings of the intrusive works, it is envisaged that conventional pad and strip foundations will be suitable for the proposed development. Foundations should be extended through any made ground and be based wholly within the natural firm and stiff clay deposits, with these designed on a maximum allowable bearing capacity of 100kN/m^2. This limit takes account of the occasional areas of the site where lower SPT 'N' values and shear strengths are recorded within the otherwise generally stiff clay.

6.10 Minimum foundation depths for pad strip or trench foundations should be 0.90m below finished ground levels, deepened as required to take account any existing or proposed trees or locally deep made ground.

6.11 Ground bearing floor slabs are anticipated to be feasible, subject to re-engineering the made ground to a minimum of 500mm below the slab sub-base and removal of unsuitable or soft ground.

Gas Protection Measures

6.12 The results of the ground gas monitoring indicate that gas protection measures are required for this site (CIRIA C665 Characteristic Situation 2).

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

Excavations and Dewatering

6.14 If man entry is proposed into excavations the use of support to excavation sides is recommended, in line with health and safety guidelines. Precautions should also be taken to protect personnel from potential hydrocarbon vapours which can build-up in sumps and excavations.

6.15 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.

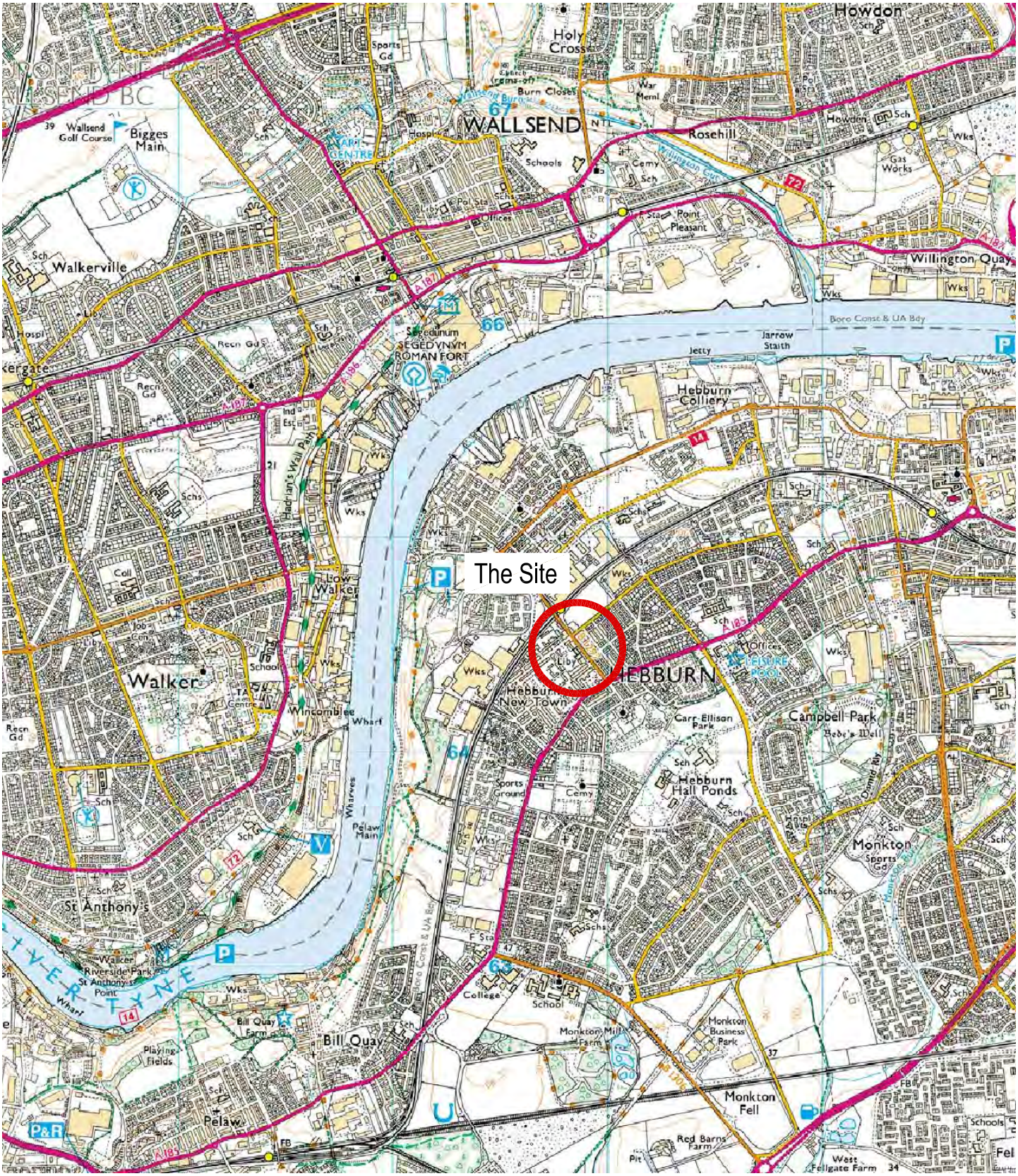
Soakaway Drainage

6.16 The presence of firm to stiff low permeability clay will likely preclude the use of soakaway drainage.

Sulphate Attack on Buried Concrete

6.17 The results of the chemical analyses indicate a BRE Special Digest 1:2005 Design Sulphate Class DS-2 with an ACEC classification AC-2 for made ground; buried concrete should be designed accordingly.

Figures



Date	Revision	Checked	Rev.

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consulting engineers

Project	Station Road, Hebburn Aldi Stores Ltd		
Title	Site Location Plan		
Scale 1:25,000 at A4	Drawn CB	Checked AC	Date Aug '15
Job No. 13675	Drawing No. Figure 1		Rev 0

Key:

- WS — Mini Percussive Borehole Location
- RBH — Rotary Borehole Location
- Site Boundary
- Proposed Building (approx)

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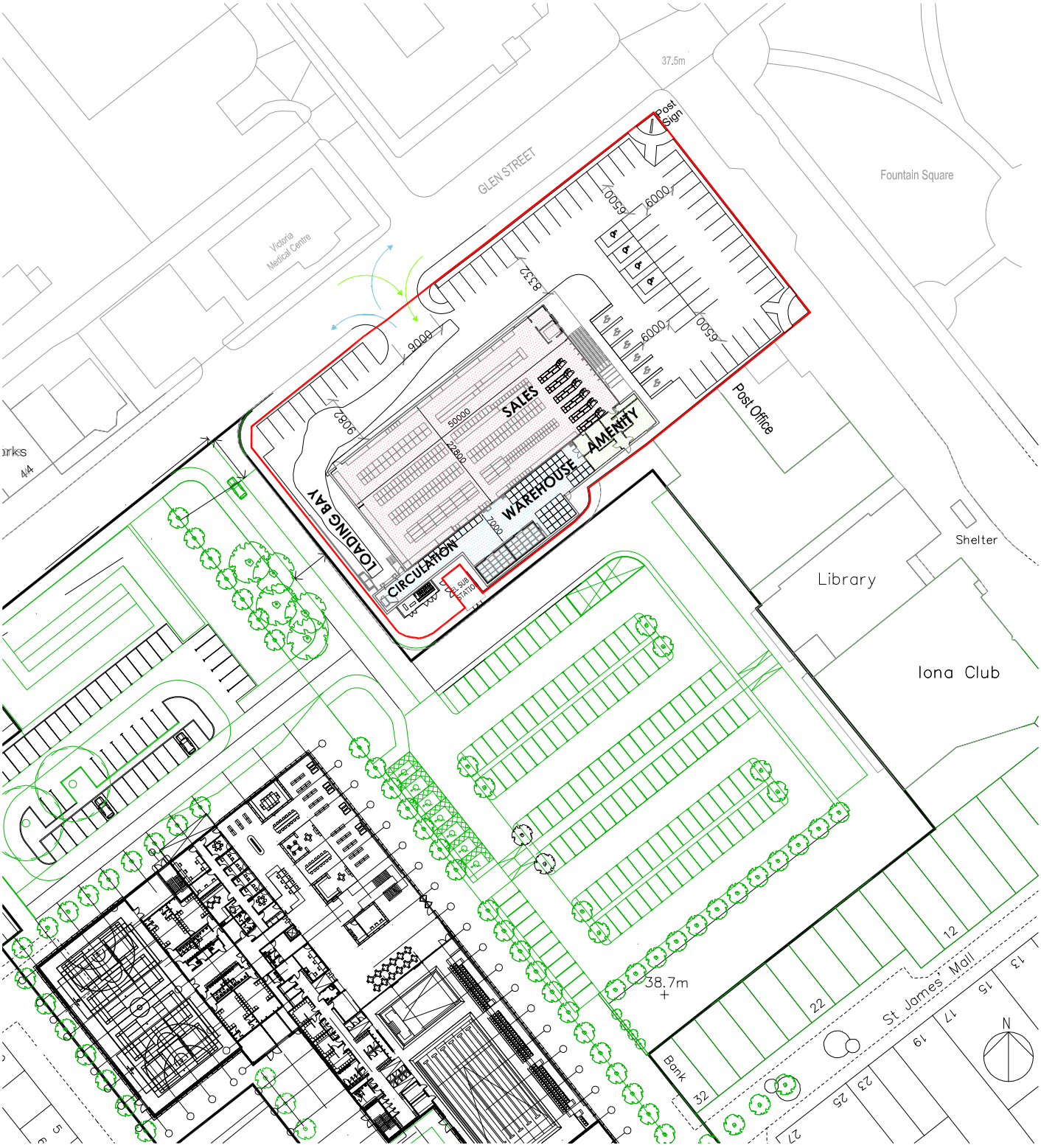
Project: Station Road, Hebburn Aldi Stores Ltd			
Title: Exploratory Hole Location Plan			
Scale: 1:500 at A3	Drawn: NW	Checked: AC	Date: Aug '15
Job No.: 13675	Drawing No.: Figure 2		Rev: 0

Appendix A

Proposed Development Plan



Sales Area - 1125m2 / 12109 ft2

Storage - 350 m2 / 3767 ft2

Amenity - 100 m2 / 1076 ft2

62 No. 1.2m2 Pallet Spaces

Aldi Land Take - 4696 m2 / 1.16 acres

Vehicular site access

Vehicular site egress

1140 Concept II
- Reduced Canopy
- Trolley park at shop front
- Bespoke Warehouse to avoid sub-station
- Projecting Amenity Block

Car Parking:
- Standard Bays (2.5 x 5.0m) - 61
- Accessible Bays (6.2 x 3.7m) - 4
- Parent and Child Bays (3.0 x 5.0m) - 6
- Total - 71

Client
Aldi Stores Ltd

Project Address
Station Road, Hebburn

Drawn JC

Checked by .

Date 29.07.13

Scale 1:1000 @ A4

Project
Aldi - Hebburn

Drawing Title
Proposed Site Feasibility
Stage B1

Drawing Number
0268 - SK09

Revision
.

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Appendix B

Exploratory Hole Records

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Mini-Percussive Log

WS01

Site Name: Station Road, Hebburn, South Tyneside
Client: Aldi Stores Ltd
Project No: 13675

Ground Level:
Easting:
Northing:

Contractor: SWWS Ltd

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: 07/07/2015
Logged By: NW

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			0.12						
0.20-0.60	ES			MADE GROUND - Dark grey tarmac GRAVEL surfacing.					
			(0.56)	MADE GROUND - Dark grey and brown sandy very clayey brick rubble, with occasional concrete.					
			0.68						
0.70-0.90	D		(0.22)	MADE GROUND - Firm dark grey and brown slightly silty slightly gravelly CLAY, with a slight organic 'peaty' odour. Gravel is angular to subrounded sandstone, mudstone and brick.					
			0.90						
1.00	S	N10 (1/1/2/2/2/4)			1.0				
1.20	D			Stiff high strength brown with grey mottling slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse sandstone, mudstone and coal.					
1.30	HSV	85							
1.60	HSV	112							
2.00	D				2.0				
2.00	HSV	>140							
2.00	S	N19 (1/2/4/4/5/6)							
2.50	HSV	>140							
3.00	D				3.0				
3.00	HSV	>140							
3.00	S	N23 (2/2/5/5/5/8)	(4.55)						
3.50	HSV	>140		from 3.50m..occasional sandstone cobbles.					
4.00	D				4.0				
4.00	HSV	>140		from 4.00m..occasional very thin sand lenses.					
4.00	S	N19 (2/2/4/5/4/6)							
4.50	HSV	102							
5.00	D				5.0				
5.00	HSV	108							
5.00	S	N16 (1/2/2/4/5/5)							
			5.45						
				End of Exploratory Hole at 5.45m					

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

WS02

Site Name: Station Road, Hebburn, South Tyneside
Client: Aldi Stores Ltd
Project No: 13675

Ground Level:
Easting:
Northing:

Contractor: SWWS Ltd

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: 07/07/2015
Logged By: NW

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
0.20-0.40	ES		(0.40) 0.40	MADE GROUND - Grass over dark brown sandy very clayey GRAVEL, with sandstone, dolomite, concrete and brick.					
0.40-0.60	D								
0.70-0.90	ES		(0.25) 0.65	MADE GROUND - Stiff brown sandy very gravelly CLAY, with sandstone, brick, mudstone and coal.					
1.00	S	N11 (7/5/3/4/2/2)	(0.55) 1.20	MADE GROUND - Red and brown slightly clayey sandy brick rubble, with concrete and occasional ash.	1.0				
1.40	D		(0.30) 1.50	MADE GROUND - Stiff brown slightly sandy gravelly CLAY, with occasional brick.					
1.40	HSV	92							
1.60	HSV	85		Stiff high strength brown with grey mottling slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse sandstone, mudstone and coal.					
1.80	D								
1.90	HSV	75							
2.00	S	N15 (1/2/2/4/4/5)			2.0				
2.50	HSV	>140							
3.00	D				3.0				
3.00	HSV	>140							
3.00	S	N24 (2/3/4/5/7/8)							
3.50	HSV	>140	(3.95)						
				from 3.70m..occasional very thin sand lenses.					
4.00	D				4.0				
4.00	HSV	>140							
4.00	S	N17 (2/2/3/4/4/6)							
4.50	HSV	88							
				from 4.50m..becomes slightly silty.					
5.00	D				5.0				
5.00	HSV	90							
5.00	S	N14 (1/2/3/3/4/4)							
			5.45						
				End of Exploratory Hole at 5.45m					

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

WS03

Site Name: Station Road, Hebburn, South Tyneside
Client: Aldi Stores Ltd
Project No: 13675

Ground Level:
Easting:
Northing:

Contractor: SWWS Ltd

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: 07/07/2015
Logged By: NW

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
0.20-0.40	ES		(0.50)	MADE GROUND - Grass over dark brown sandy very clayey GRAVEL, with sandstone, brick and concrete.					
0.50-0.70	D		0.50						
0.70-0.85	D		(0.20) 0.70	MADE GROUND - Brown clayey sandy GRAVEL, with brick, concrete and slag.					
0.90	HSV	68	(0.15) 0.85	MADE GROUND - Dark brown and orangish brown slightly sandy gravelly CLAY, with occasional brick, concrete, sandstone and coal.	1.0				
1.00	D								
1.00	S	N9 (1/1/2/2/2/3)							
1.20	HSV	95		Firm becoming stiff medium to high strength brown with grey mottling slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse sandstone, mudstone and coal.					
1.50	D								
1.50	HSV	112							
2.00	D				2.0				
2.00	HSV	>140							
2.00	S	N16 (1/2/3/3/4/6)							
2.50	HSV	>140							
3.00	D				3.0				
3.00	HSV	>140	(4.60)						
3.00	S	N21 (2/2/3/5/6/7)							
3.50	HSV	>140							
4.00	D				4.0				
4.00	HSV	>140							
4.00	S	N21 (2/3/4/5/5/7)							
4.50	HSV	>140							
5.00	D				5.0				
5.00	HSV	>140							
5.00	S	N22 (2/2/4/5/6/7)							
			5.45						
				End of Exploratory Hole at 5.45m					

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: Station Road, Hebburn, South Tyneside
Client: Aldi Stores Ltd
Project No: 13675

Ground Level:
Easting:
Northing:

Contractor: SWWS Ltd

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: 07/07/2015
Logged By: NW

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
0.10-0.30	ES		(0.30) 0.30	MADE GROUND - Grass over brown sandy gravelly CLAY, with dolomite, brick, concrete and sandstone.					
0.50-0.70	D		(0.45) 0.75	MADE GROUND - Dark brown sandy very gravelly CLAY, with concrete, breeze block and brick.					
0.75-0.90	D		(0.15) 0.90	MADE GROUND - Firm orangish brown slightly sandy gravelly CLAY, with sandstone, coal, mudstone and brick.	1.0				
0.95	HSV	56							
1.00	D		(0.30) 1.20						
1.00	S	N9 (1/1/1/3/2/3)		Firm to stiff medium to high strength orangish brown with grey mottling slightly silty slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium sandstone, mudstone and coal.					
1.15	HSV	80							
1.50	D								
1.50	HSV	118							
2.00	D			Stiff high strength brown with grey mottling slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse sandstone, mudstone and coal.	2.0				
2.00	HSV	110							
2.00	S	N16 (1/2/3/3/5/5)							
2.50	HSV	100							
3.00	D				3.0				
3.00	HSV	>140							
3.00	S	N19 (2/2/3/5/5/6)	(4.25)						
3.50	HSV	>140							
4.00	D				4.0				
4.00	HSV	>140							
4.00	S	N21 (2/3/3/5/6/7)							
4.50	HSV	>140							
5.00	D				5.0				
5.00	HSV	>140							
5.00	S	N24 (2/3/5/5/6/8)							
			5.45	*End of Exploratory Hole at 5.45m*					

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: Station Road, Hebburn, South Tyneside
Client: Aldi Stores Ltd
Project No: 13675

Ground Level:
Easting:
Northing:

Contractor: SWWS Ltd

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: 07/07/2015
Logged By: NW

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
0.10-0.30	ES		(0.45)	MADE GROUND - Grass over dark brown and greyish brown slightly clayey in places very gravelly SAND, with mudstone, sandstone, brick, concrete and dolomite.					
0.45-0.55	D		0.45 / 0.55	MADE GROUND - Brown and orangish brown slightly gravelly CLAY, with mudstone, coal, sandstone and occasional brick.					
0.70	HSV	80							
0.90	D			Stiff high strength brown with grey mottling slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse sandstone, mudstone and coal.					
0.90	HSV	78			1.0				
1.30	HSV	92							
1.40	S	N6 (1/1/1/1/2/2)							
1.50	D								
2.00	D				2.0				
2.20	HSV	>140							
2.40	S	N10 (2/1/2/2/3/3)							
			(4.45)						
3.00	D				3.0				
3.00	HSV	>140							
3.00	S	N15 (1/2/3/3/4/5)							
3.50	HSV	>140							
4.00	D				4.0				
4.00	HSV	>140							
4.00	S	N9 (1/1/2/2/2/3)							
4.80	HSV	>140							
5.00-5.45	D		5.00		5.0				
5.00	S	N12 (1/2/2/3/3/4)	(0.45)	Stiff thinly laminated greyish brown slightly silty CLAY, with sand and silt dustings on laminae surfaces.					
			5.45	*End of Exploratory Hole at 5.45m*					

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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Rotary Borehole Log

RBH01

Site Name: Station Road, Hebburn, South Tyneside
Client: Aldi Stores Ltd
Project No: 13675

Ground Level:
Easting:
Northing:

Contractor: JB Site Investigations

Key:
= Water Strike Depth & No.
TCR = Total Core Recovery
SCR = Solid Core Recovery
RQD = Rock Quality Designation
FI = Fracture Index

Plant: Rotary Drilling Rig
Dates: 07/07/2015
Logged By: NW

Method: Rotary Open Hole
Flush: Water

Core Data			Fractures		Strata Details					Well	
Core Run (m)	TCR (%)	SCR (%)	RQD (%)	F.I.	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
					(0.60) 0.60	MADE GROUND - Grass over brown slightly clayey sandy GRAVEL, with brick, concrete and occasional whole brick.					
					(8.80)	Brown slightly sandy gravelly CLAY. Gravel consists of sandstone, mudstone and coal.					
					9.40						
					(9.90)	Yellowish brown SANDSTONE.					
					19.30						
					(0.90)	Grey MUDSTONE.					
						Continued next page...					

Groundwater Observations				Flush Returns			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From	To	Returns (%)	
			No Groundwater Encountered	0.0	35.0	100	

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Rotary Borehole Log

RBH01

Site Name: Station Road, Hebburn, South Tyneside
Client: Aldi Stores Ltd
Project No: 13675

Ground Level:
Easting:
Northing:

Contractor: JB Site Investigations

Key:
= Water Strike Depth & No.
TCR = Total Core Recovery
SCR = Solid Core Recovery
RQD = Rock Quality Designation
FI = Fracture Index

Plant: Rotary Drilling Rig
Dates: 07/07/2015
Logged By: NW

Method: Rotary Open Hole
Flush: Water

Core Data			Fractures		Strata Details					Well	
Core Run (m)	TCR (%)	SCR (%)	RQD (%)	F.I.	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
					20.20						
					(0.30)						
					20.50	Black COAL / Dark grey MUDSTONE.					
						Grey MUDSTONE, with occasional thin sandstone and dark grey mudstone bands.	21.0				
							22.0				
							23.0				
							24.0				
							25.0				
							26.0				
							27.0				
					(14.50)		28.0				
							29.0				
							30.0				
							31.0				
							32.0				
							33.0				
							34.0				
					35.00		35.0				
						End of Exploratory Hole at 35m					

Groundwater Observations				Flush Returns			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From	To	Returns (%)	
			No Groundwater Encountered				

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Rotary Borehole Log

RBH02

Site Name: Station Road, Hebburn, South Tyneside
Client: Aldi Stores Ltd
Project No: 13675

Ground Level:
Easting:
Northing:

Contractor: JB Site Investigations

Key:
= Water Strike Depth & No.
TCR = Total Core Recovery
SCR = Solid Core Recovery
RQD = Rock Quality Designation
FI = Fracture Index

Plant: Rotary Drilling Rig
Dates: 07/07/2015
Logged By: NW

Method: Rotary Open Hole
Flush: Water

Core Data			Fractures		Strata Details					Well	
Core Run (m)	TCR (%)	SCR (%)	RQD (%)	F.I.	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
					(0.80) 0.80	MADE GROUND - Grass over brown slightly clayey sandy GRAVEL, with brick and concrete.	1.0				
					(7.70) 8.50	Brown slightly sandy gravelly CLAY. Gravel consists of sandstone, mudstone and coal.	2.0 3.0 4.0 5.0 6.0 7.0 8.0				
					(8.00) 16.50	Yellowish brown SANDSTONE.	9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0				
					(0.80) 17.30	Grey MUDSTONE.	17.0				
					17.50	Black COAL / Dark grey MUDSTONE.	18.0				
						Grey MUDSTONE, with occasional thin sandstone and dark grey mudstone bands.	19.0				
						Continued next page...	20.0				

Groundwater Observations				Flush Returns			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From	To	Returns (%)	
			No Groundwater Encountered	0.0	35.0	100	

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Rotary Borehole Log

RBH02

Site Name: Station Road, Hebburn, South Tyneside
Client: Aldi Stores Ltd
Project No: 13675

Ground Level:
Easting:
Northing:

Contractor: JB Site Investigations

Key:
= Water Strike Depth & No.
TCR = Total Core Recovery
SCR = Solid Core Recovery
RQD = Rock Quality Designation
FI = Fracture Index

Plant: Rotary Drilling Rig
Dates: 07/07/2015
Logged By: NW

Method: Rotary Open Hole
Flush: Water

Core Data			Fractures		Strata Details					Well	
Core Run (m)	TCR (%)	SCR (%)	RQD (%)	F.I.	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
						Grey MUDSTONE, with occasional thin sandstone and dark grey mudstone bands. *(continued)*	21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0 31.0 32.0 33.0 34.0				
					(17.50)						
					35.00	*End of Exploratory Hole at 35m*	35.0				

Groundwater Observations				Flush Returns			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From	To	Returns (%)	
			No Groundwater Encountered				

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Rotary Borehole Log

RBH03

Site Name: Station Road, Hebburn, South Tyneside
Client: Aldi Stores Ltd
Project No: 13675

Ground Level:
Easting:
Northing:

Contractor: JB Site Investigations

Key:
= Water Strike Depth & No.
TCR = Total Core Recovery
SCR = Solid Core Recovery
RQD = Rock Quality Designation
FI = Fracture Index

Plant: Rotary Drilling Rig
Dates: 08/07/2015
Logged By: NW

Method: Rotary Open Hole
Flush: Water

Core Data			Fractures		Strata Details					Well	
Core Run (m)	TCR (%)	SCR (%)	RQD (%)	F.I.	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
					0.25	MADE GROUND - Grass over dark brown slightly gravelly CLAY, with occasional brick and concrete.					
					(8.05)	Brown slightly sandy gravelly CLAY. Gravel consists of sandstone, mudstone and coal.	1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0				
					8.30	Yellowish brown SANDSTONE.	9.0 10.0 11.0				
					(7.80)		12.0 13.0 14.0 15.0				
					16.10	Grey MUDSTONE.	16.0				
					(2.10)		17.0				
					18.20		18.0				
					18.40	Black COAL / Dark grey MUDSTONE.					
						Grey MUDSTONE, with occasional thin sandstone and dark grey mudstone bands.	19.0 20.0				

Continued next page...

Groundwater Observations				Flush Returns			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From	To	Returns (%)	
			No Groundwater Encountered	0.0	35.0	100	

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Holland Park
Holland Drive
Newcastle Upon Tyne
NE2 4LD

Tel. 0191 2302993

Rotary Borehole Log

RBH03

Site Name: Station Road, Hebburn, South Tyneside
Client: Aldi Stores Ltd
Project No: 13675

Ground Level:
Easting:
Northing:

Contractor: JB Site Investigations

Key:
= Water Strike Depth & No.
TCR = Total Core Recovery
SCR = Solid Core Recovery
RQD = Rock Quality Designation
FI = Fracture Index

Plant: Rotary Drilling Rig
Dates: 08/07/2015
Logged By: NW

Method: Rotary Open Hole
Flush: Water

Core Data			Fractures		Strata Details					Well	
Core Run (m)	TCR (%)	SCR (%)	RQD (%)	F.I.	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
					(16.60)	Grey MUDSTONE, with occasional thin sandstone and dark grey mudstone bands. *(continued)*	21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0 31.0 32.0 33.0 34.0				
					35.00	*End of Exploratory Hole at 35m*	35.0				

Groundwater Observations				Flush Returns			General Remarks
No.	Struck (m)	20min Level (m)	Remarks	From	To	Returns (%)	
			No Groundwater Encountered				

Appendix C

Gas & 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: 13675
Site: Station Road, Hebburn
Date: 15/07/20115
Weather: Sunny spells
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	0.2	2.4	16.7	1014	<0.1	2.83	
WS02	0.0	0.0	11.0	1014	<0.1	4.83	
WS03	0.0	1.6	17.5	1014	<0.1	4.12	

Date: 28-Jul-15
Weather: Raining
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	3.9	13.1	998	-9.8	1.31	
WS02	0.0	0.0	13.9	998	-0.1	4.23	
WS03	0.0	2.3	17.9	998	<0.1	3.70	

Appendix D

Laboratory Chemical Test Results

2531

ANALYTICAL TEST REPORT

Contract no: 56035

Contract name: Station Road, Hebburn

Client reference: 13675

Clients name: 3E Consulting Engineers

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

Samples received: 09 July 2015

Analysis started: 09 July 2015

Analysis completed: 15 July 2015

Report issued: 16 July 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
NAD No Asbestos Detected

Approved by: K Campbell

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
56035-1	WS 01	0.20-0.60	Sandy Clay with Gravel	-	-	22.6
56035-2	WS 01	0.70-0.90	Clay	-	-	24.3
56035-3	WS 01	1.20	Clay	-	-	22.9
56035-4	WS 02	0.20-0.40	Loam with Gravel	-	-	12.6
56035-5	WS 02	0.70-0.90	Sand with Brick & Slag	-	-	13.3
56035-6	WS 02	1.40	Clay & Sand	-	-	17.1
56035-7	WS 03	0.20-0.40	Loam with Gravel	-	-	11.7
56035-8	WS 03	1.00	Clay	-	-	18.0
56035-9	WS 04	0.10-0.30	Loam	-	-	13.1
56035-10	WS 05	0.10-0.30	Loamy Sand with Gravel	-	-	8.6
56035-11	WS 05	0.45-0.55	Loamy Sandy Clay	-	-	19.8

Chemtech Environmental Limited

SOILS

Lab number			56035-1	56035-2	56035-3	56035-4	56035-5	56035-6
Sample id			WS 01	WS 01	WS 01	WS 02	WS 02	WS 02
Depth (m)			0.20-0.60	0.70-0.90	1.20	0.20-0.40	0.70-0.90	1.40
Date sampled			07/07/2015	07/07/2015	07/07/2015	07/07/2015	07/07/2015	07/07/2015
Test	**Method**	**Units**						
Arsenic (total)	CE127 M	mg/kg As	36	-	-	9.4	37	-
Boron (water soluble)	CE063 M	mg/kg B	2.9	-	-	0.8	1.8	-
Cadmium (total)	CE127 M	mg/kg Cd	0.4	-	-	0.3	0.3	-
Chromium (total)	CE127 M	mg/kg Cr	110	-	-	110	230	-
Copper (total)	CE127 M	mg/kg Cu	50	-	-	23	32	-
Lead (total)	CE127 M	mg/kg Pb	289	-	-	55	106	-
Mercury (total)	CE127 M	mg/kg Hg	<0.5	-	-	<0.5	<0.5	-
Nickel (total)	CE127 M	mg/kg Ni	31	-	-	26	17	-
Selenium (total)	CE127 M	mg/kg Se	1.7	-	-	1.3	2.9	-
Zinc (total)	CE127 M	mg/kg Zn	222	-	-	89	160	-
pH	CE004 M	units	8.1	7.4	7.7	7.8	8.5	8.4
Sulphate (2:1 water soluble)	CE061 M	mg/l SO_4	1014	232	63	84	787	334
Total Organic Carbon (TOC)	CE072 M	% w/w C	3.50	-	-	2.81	1.56	-
Estimate of OMC (calculated from TOC)	CE072	% w/w	6.03	-	-	4.84	2.69	-
PAH								
Naphthalene	CE087 M	mg/kg	0.11	-	-	0.03	5.64	-
Acenaphthylene	CE087 M	mg/kg	0.06	-	-	0.05	0.07	-
Acenaphthene	CE087 M	mg/kg	0.54	-	-	0.04	6.17	-
Fluorene	CE087 U	mg/kg	1.02	-	-	0.09	4.21	-
Phenanthrene	CE087 M	mg/kg	4.79	-	-	0.67	33.88	-
Anthracene	CE087 U	mg/kg	1.39	-	-	0.22	6.61	-
Fluoranthene	CE087 M	mg/kg	4.55	-	-	1.68	64.92	-
Pyrene	CE087 M	mg/kg	3.32	-	-	1.34	55.30	-
Benzo(a)anthracene	CE087 U	mg/kg	1.91	-	-	0.76	22.44	-
Chrysene	CE087 M	mg/kg	1.94	-	-	0.88	22.56	-
Benzo(b)fluoranthene	CE087 M	mg/kg	1.91	-	-	1.02	23.67	-
Benzo(k)fluoranthene	CE087 M	mg/kg	0.81	-	-	0.43	10.15	-
Benzo(a)pyrene	CE087 U	mg/kg	1.34	-	-	0.72	20.22	-
Indeno(123cd)pyrene	CE087 M	mg/kg	0.85	-	-	0.56	13.28	-
Dibenz(ah)anthracene	CE087 M	mg/kg	0.28	-	-	0.15	4.26	-
Benzo(ghi)perylene	CE087 M	mg/kg	0.75	-	-	0.51	12.38	-
PAH (total of USEPA 16)	CE087	mg/kg	25.6	-	-	9.14	306	-
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	-	-	NAD	NAD	-

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SOILS

Lab number			56035-7	56035-8	56035-9	56035-10	56035-11
Sample id			WS 03	WS 03	WS 04	WS 05	WS 05
Depth (m)			0.20-0.40	1.00	0.10-0.30	0.10-0.30	0.45-0.55
Date sampled			07/07/2015	07/07/2015	07/07/2015	07/07/2015	07/07/2015
Test	**Method**	**Units**					
Arsenic (total)	CE127 M	mg/kg As	8.5	-	11	10	-
Boron (water soluble)	CE063 M	mg/kg B	<0.5	-	0.9	0.6	-
Cadmium (total)	CE127 M	mg/kg Cd	0.2	-	0.2	1.2	-
Chromium (total)	CE127 M	mg/kg Cr	76	-	137	128	-
Copper (total)	CE127 M	mg/kg Cu	24	-	30	87	-
Lead (total)	CE127 M	mg/kg Pb	40	-	70	188	-
Mercury (total)	CE127 M	mg/kg Hg	<0.5	-	<0.5	<0.5	-
Nickel (total)	CE127 M	mg/kg Ni	24	-	26	31	-
Selenium (total)	CE127 M	mg/kg Se	1.2	-	1.2	1.1	-
Zinc (total)	CE127 M	mg/kg Zn	71	-	76	286	-
pH	CE004 M	units	7.8	8.0	7.8	8.2	8.1
Sulphate (2:1 water soluble)	CE061 M	mg/l SO_4	58	135	170	87	39
Total Organic Carbon (TOC)	CE072 M	% w/w C	2.96	-	2.12	3.41	-
Estimate of OMC (calculated from TOC)	CE072	% w/w	5.10	-	3.65	5.87	-
PAH							
Naphthalene	CE087 M	mg/kg	<0.01	-	<0.01	0.07	-
Acenaphthylene	CE087 M	mg/kg	<0.01	-	<0.01	<0.01	-
Acenaphthene	CE087 M	mg/kg	0.02	-	0.01	0.03	-
Fluorene	CE087 U	mg/kg	0.02	-	0.02	0.04	-
Phenanthrene	CE087 M	mg/kg	0.21	-	0.23	0.51	-
Anthracene	CE087 U	mg/kg	0.04	-	0.07	0.09	-
Fluoranthene	CE087 M	mg/kg	0.33	-	0.45	1.03	-
Pyrene	CE087 M	mg/kg	0.27	-	0.35	0.86	-
Benzo(a)anthracene	CE087 U	mg/kg	0.16	-	0.19	0.49	-
Chrysene	CE087 M	mg/kg	0.20	-	0.22	0.65	-
Benzo(b)fluoranthene	CE087 M	mg/kg	0.24	-	0.24	0.79	-
Benzo(k)fluoranthene	CE087 M	mg/kg	0.09	-	0.11	0.31	-
Benzo(a)pyrene	CE087 U	mg/kg	0.16	-	0.17	0.51	-
Indeno(123cd)pyrene	CE087 M	mg/kg	0.13	-	0.12	0.41	-
Dibenz(ah)anthracene	CE087 M	mg/kg	<0.02	-	0.03	0.10	-
Benzo(ghi)perylene	CE087 M	mg/kg	0.12	-	0.09	0.38	-
PAH (total of USEPA 16)	CE087	mg/kg	1.98	-	2.28	6.27	-
Subcontracted analysis							
Asbestos (qualitative)	$	-	NAD	-	NAD	NAD	-

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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	Naphthalene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	Wet	U	0.01	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	Wet		0.27	mg/kg
$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

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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.

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)
56035-1	WS 01	0.20-0.60	N	
56035-2	WS 01	0.70-0.90	N	
56035-3	WS 01	1.20	N	
56035-4	WS 02	0.20-0.40	N	
56035-5	WS 02	0.70-0.90	N	
56035-6	WS 02	1.40	N	
56035-7	WS 03	0.20-0.40	N	
56035-8	WS 03	1.00	N	
56035-9	WS 04	0.10-0.30	N	
56035-10	WS 05	0.10-0.30	N	
56035-11	WS 05	0.45-0.55	N	

Appendix E

Laboratory Geotechnical Test Results

UKAS accredited testing laboratory No. 0744

Report/Sample ID No: **S2179/01-CLS**

NORTHUMBERLAND

Northumberland County Council

Highways Laboratory
Bassington Drive • Cramlington • Northumberland • NE23 8AJ
Tel (01670) 737575 • Fax (01670) 732044 • Email highwayslaboratory@northumberland.gov.uk

CLASSIFICATION OF SOILS

Tests according to B.S. 1377 : 1990

Client: **3E Consulting Engineers Ltd**
Engineer: **Nicola Watson**
Project: **Station Road, Hebburn**
Location: **WS 01 at 2.00m**
Material Type: **Brown, grey sandy CLAY with occasional gravel**

Source: **Site**
Date Sampled: **07/07/2015** Date Received: **09/07/2015** Sampled By: **Clients Staff**

	Test Results	Specification
Natural Moisture Content (%):	**17.5**	Part 2 Clause 3.2

The liquid and Plastic Limits are prepared in accordance with BS1377: Part 2: Clause 4.2.4 due to the nature of most materials in the surrounding area (Sandy CLAY with gravel cobbles and boulders)

Liquid Limit (%):	**42**	Part 2 Clause 4.4 (One Point Method)
Plastic Limit (%):	**22**	Part 2 Clause 5.3
Plasticity Index (%):	**20**	Part 2 Clause 5.4
Passing 425mic (%):	**86**	
Soil Classification:	**Cl**	
Mean Particle Density	**N/A**	Part 2 Clause 8.2 (Gas Jar Method)

The following tests are NOT accredited.

Moisture Condition Value*	**N/A**	Part 4 Clause 5.4
MCV Test Moisture Content (%):	**N/A**	
Permeability (m/s) *	**N/A**	

(Method as given in Head's "Manual Of Soil Laboratory Testing" Volume 3 Section 20.4.2

Remarks: **None**

Certificate of sampling received: ☐

Signed: Brian Newell

[ ] M. Newton, Senior Technician
[✓] B. Newell, Laboratory Manager

Start of Test Date: **14/07/2015** End of Test Date: **15/07/2015** Report Date: **16/07/2015**

UKAS accredited testing laboratory No. 0744 Report/Sample ID No: **S2179/02-CLS**

NORTHUMBERLAND
Northumberland County Council

Highways Laboratory
Bassington Drive • Cramlington • Northumberland • NE23 8AJ
Tel (01670) 737575 • Fax (01670) 732044 • Email highwayslaboratory@northumberland.gov.uk

CLASSIFICATION OF SOILS

Tests according to B.S. 1377 : 1990

Client: **3E Consulting Engineers Ltd**
Engineer: **Nicola Watson**
Project: **Station Road, Hebburn**
Location: **WS 02 at 1.80m**
Material Type: **Brown, orange, grey, mottled, sandy CLAY with occasional gravel**

Source: **Site**
Date Sampled: **07/07/2015** Date Received: **09/07/2015** Sampled By: **Clients Staff**

	Test Results	Specification
Natural Moisture Content (%):	**23.9**	Part 2 Clause 3.2

The liquid and Plastic Limits are prepared in accordance with BS1377: Part 2: Clause 4.2.4 due to the nature of most materials in the surrounding area (Sandy CLAY with gravel cobbles and boulders)

Liquid Limit (%):	**41**	Part 2 Clause 4.4 (One Point Method)
Plastic Limit (%):	**20**	Part 2 Clause 5.3
Plasticity Index (%):	**21**	Part 2 Clause 5.4
Passing 425mic (%):	**89**	
Soil Classification:	**CI**	
Mean Particle Density	**N/A**	Part 2 Clause 8.2 (Gas Jar Method)

The following tests are NOT accredited.

Moisture Condition Value*	**N/A**	Part 4 Clause 5.4
MCV Test Moisture Content (%):	**N/A**	
Permeability (m/s) *	**N/A**	

(Method as given in Head's "Manual Of Soil Laboratory Testing" Volume 3 Section 20.4.2

Remarks: **None**

Certificate of sampling received: ☐

Signed: Brian Newell

[ ] M. Newton, Senior Technician
[✓] B. Newell, Laboratory Manager

Start of Test Date: **14/07/2015** End of Test Date: **15/07/2015** Report Date: **16/07/2015**

UKAS accredited testing laboratory No. 0744 Report/Sample ID No: **S2179/03-CLS**

NORTHUMBERLAND

Northumberland County Council

Highways Laboratory
Bassington Drive • Cramlington • Northumberland • NE23 8AJ
Tel (01670) 737575 • Fax (01670) 732044 • Email highwayslaboratory@northumberland.gov.uk

CLASSIFICATION OF SOILS

Tests according to B.S. 1377 : 1990

Client: **3E Consulting Engineers Ltd**
Engineer: **Nicola Watson**
Project: **Station Road, Hebburn**
Location: **WS 03 at 1.50m**
Material Type: **Brown, orange, grey, mottled, sandy CLAY with occasional gravel**

Source: **Site**
Date Sampled: **07/07/2015** Date Received: **09/07/2015** Sampled By: **Clients Staff**

	Test Results	Specification
Natural Moisture Content (%):	**19.1**	Part 2 Clause 3.2

The liquid and Plastic Limits are prepared in accordance with BS1377: Part 2: Clause 4.2.4 due to the nature of most materials in the surrounding area (Sandy CLAY with gravel cobbles and boulders)

Liquid Limit (%):	**37**	Part 2 Clause 4.4 (One Point Method)
Plastic Limit (%):	**19**	Part 2 Clause 5.3
Plasticity Index (%):	**18**	Part 2 Clause 5.4
Passing 425mic (%):	**88**	
Soil Classification:	**Cl**	
Mean Particle Density	**N/A**	Part 2 Clause 8.2 (Gas Jar Method)

The following tests are NOT accredited.

Moisture Condition Value*	**N/A**	Part 4 Clause 5.4
MCV Test Moisture Content (%):	**N/A**	
Permeability (m/s) *	**N/A**	

(Method as given in Head's "Manual Of Soil Laboratory Testing" Volume 3 Section 20.4.2

Remarks: **None**

Certificate of sampling received: ☐

Signed: Brian Newell [ ] M. Newton, Senior Technician
[✓] B. Newell, Laboratory Manager

Start of Test Date: **14/07/2015** End of Test Date: **15/07/2015** Report Date: **16/07/2015**

UKAS accredited testing laboratory No. 0744 Report/Sample ID No: **S2179/04-CLS**

NORTHUMBERLAND

Northumberland County Council

Highways Laboratory
Bassington Drive • Cramlington • Northumberland • NE23 8AJ
Tel (01670) 737575 • Fax (01670) 732044 • Email highwayslaboratory@northumberland.gov.uk

CLASSIFICATION OF SOILS

Tests according to B.S. 1377 : 1990

Client: **3E Consulting Engineers Ltd**
Engineer: **Nicola Watson**
Project: **Station Road, Hebburn**
Location: **WS 04 at 1.50m**
Material Type: **Brown, grey, orange, mottled, sandy CLAY with occasional gravel**

Source: **Site**
Date Sampled: **07/07/2015** Date Received: **09/07/2015** Sampled By: **Clients Staff**

	Test Results	Specification
Natural Moisture Content (%):	**20.4**	Part 2 Clause 3.2

The liquid and Plastic Limits are prepared in accordance with BS1377: Part 2: Clause 4.2.4 due to the nature of most materials in the surrounding area (Sandy CLAY with gravel cobbles and boulders)

Liquid Limit (%):	**41**	Part 2 Clause 4.4 (One Point Method)
Plastic Limit (%):	**21**	Part 2 Clause 5.3
Plasticity Index (%):	**20**	Part 2 Clause 5.4
Passing 425mic (%):	**90**	
Soil Classification:	**Cl**	
Mean Particle Density	**N/A**	Part 2 Clause 8.2 (Gas Jar Method)

The following tests are NOT accredited.

Moisture Condition Value*	**N/A**	Part 4 Clause 5.4
MCV Test Moisture Content (%):	**N/A**	
Permeability (m/s) *	**N/A**	

(Method as given in Head's "Manual Of Soil Laboratory Testing" Volume 3 Section 20.4.2

Remarks: **None**

Certificate of sampling received: ☐

Signed: Brian Newell [ ] M. Newton, Senior Technician
[✓] B. Newell, Laboratory Manager

Start of Test Date: **14/07/2015** End of Test Date: **15/07/2015** Report Date: **16/07/2015**

UKAS accredited testing laboratory No. 0744

Report/Sample ID No: **S2179/05-CLS**

NORTHUMBERLAND

Northumberland County Council

Highways Laboratory
Bassington Drive • Cramlington • Northumberland • NE23 8AJ
Tel (01670) 737575 • Fax (01670) 732044 • Email highwayslaboratory@northumberland.gov.uk

CLASSIFICATION OF SOILS

Tests according to B.S. 1377 : 1990

Client: **3E Consulting Engineers Ltd**
Engineer: **Nicola Watson**
Project: **Station Road, Hebburn**
Location: **WS 04 at 2.00m**
Material Type: **Brown, grey, orange, mottled, sandy CLAY with occasional gravel**

Source: **Site**
Date Sampled: **07/07/2015** Date Received: **09/07/2015** Sampled By: **Clients Staff**

	Test Results	Specification
Natural Moisture Content (%):	**21.4**	Part 2 Clause 3.2

The liquid and Plastic Limits are prepared in accordance with BS1377: Part 2: Clause 4.2.4 due to the nature of most materials in the surrounding area (Sandy CLAY with gravel cobbles and boulders)

Liquid Limit (%):	**44**	Part 2 Clause 4.4 (One Point Method)
Plastic Limit (%):	**21**	Part 2 Clause 5.3
Plasticity Index (%):	**23**	Part 2 Clause 5.4
Passing 425mic (%):	**91**	
Soil Classification:	**CI**	
Mean Particle Density	**N/A**	Part 2 Clause 8.2 (Gas Jar Method)

The following tests are NOT accredited.

Moisture Condition Value*	**N/A**	Part 4 Clause 5.4
MCV Test Moisture Content (%):	**N/A**	
Permeability (m/s) *	**N/A**	

(Method as given in Head's "Manual Of Soil Laboratory Testing" Volume 3 Section 20.4.2

Remarks: **None**

Certificate of sampling received: ☐

Signed: Brian Newell

[ ] M. Newton, Senior Technician
[✓] B. Newell, Laboratory Manager

Start of Test Date: **14/07/2015** End of Test Date: **15/07/2015** Report Date: **16/07/2015**

UKAS accredited testing laboratory No. 0744 Report/Sample ID No: **S2179/06-CLS**

NORTHUMBERLAND

Northumberland County Council

Highways Laboratory
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Tel (01670) 737575 • Fax (01670) 732044 • Email highwayslaboratory@northumberland.gov.uk

CLASSIFICATION OF SOILS

Tests according to B.S. 1377 : 1990

Client: **3E Consulting Engineers Ltd**
Engineer: **Nicola Watson**
Project: **Station Road, Hebburn**
Location: **WS 04 at 0.90m**
Material Type: **Brown, orange, grey, mottled, sandy CLAY with occasional gravel**

Source: **Site**
Date Sampled: **07/07/2015** Date Received: **09/07/2015** Sampled By: **Clients Staff**

	Test Results	Specification
Natural Moisture Content (%):	**39.8**	Part 2 Clause 3.2

The liquid and Plastic Limits are prepared in accordance with BS1377: Part 2: Clause 4.2.4 due to the nature of most materials in the surrounding area (Sandy CLAY with gravel cobbles and boulders)

Liquid Limit (%):	**45**	Part 2 Clause 4.4 (One Point Method)
Plastic Limit (%):	**21**	Part 2 Clause 5.3
Plasticity Index (%):	**24**	Part 2 Clause 5.4
Passing 425mic (%):	**90**	
Soil Classification:	**Cl**	
Mean Particle Density	**N/A**	Part 2 Clause 8.2 (Gas Jar Method)

The following tests are NOT accredited.

Moisture Condition Value*	**N/A**	Part 4 Clause 5.4
MCV Test Moisture Content (%):	**N/A**	
Permeability (m/s) *	**N/A**	

(Method as given in Head's "Manual Of Soil Laboratory Testing" Volume 3 Section 20.4.2

Remarks: **None**

Certificate of sampling received: ☐

Signed: Brian Newell [ ] M. Newton, Senior Technician
[✓] B. Newell, Laboratory Manager

Start of Test Date: **14/07/2015** End of Test Date: **15/07/2015** Report Date: **16/07/2015**