

Structural
Civil
Geo-Environmental



Preston Street, Whitehaven

**Geo-environmental Appraisal
& Coal Mining Risk Assessment**

for

Aldi Stores Limited



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Executive Summary

Site Investigation	The investigation involved: • 3 mini-percussive boreholes (WS01 to WS03). • 6 no. rotary open-hole boreholes (R01 to R05, including R02A). • Contamination related testing. This investigation was undertaken to aid in assessing the level of potential risk to the site from shallow coal mining related activities, and to also provide a preliminary geo-environmental appraisal of ground conditions and potential environmental constraints, to aid in the future development works and foundation design.
Ground Conditions	<u>Made Ground</u> During the investigation works made ground encountered within WS01 to WS03, sunk to target the location of the proposed Aldi store, was identified to depths of between 1.90m and 2.70m. These materials were noted to generally comprise dark brown and black sand and clay with occasional brick, concrete, ash and sand bands. At the rotary borehole locations made ground was also noted to vary in depth to between 0.90m and 2.10m within the general location of the proposed Aldi store. <u>Superficial (Drift) Deposits</u> Generally variable natural superficial (drift) deposits comprising very soft to soft sandy silt with fibrous peat, loose to medium dense sand and gravel, were initially recorded at the locations of WS01 to WS03 to depths of between 2.90m up to in excess of 4.45m. Within WS02 and WS03 stiff clay deposits were also identified from depths of between 2.90m and 3.60m up to a maximum recorded depth of 4.45m, with grey clay deposits also noted at depth within the rotary boreholes from depths of between 3.70m and 6.30m. An exception was noted within R03 where sand and gravel superficial deposits were recorded to a depth of 12.80m. <u>Bedrock Deposits</u> Sandstone bedrock was initially recorded at the rotary borehole locations to depths of between 18.50m and 25.90m. These deposits were in turn underlain by an intact and banded coal seam to depths of between 20.50m and 28.00m, which was noted to range in thickness between 2.00m and 3.20m. Mudstone deposits were also typically recorded immediately underlying the banded coal seam up to in excess of 31.50m. An exception was noted within R04 where coal deposits were noted as absent with interbedded sandstone and mudstone recorded underlying the initial sandstone deposits from a depth of 22.90m.
Groundwater	Groundwater was encountered within the mini percussive boreholes at depths of between 1.30m and 3.00m which is considered to be attributable to water contained within the upper superficial deposits below the site. It should be noted that groundwater levels vary seasonally and that a higher water table than recorded could occur.

Mining	From the findings of the rotary investigation works an intact and banded coal seam has been identified below the site from depths of between 18.50m and 25.90m (4.00m to 14.8m below rock-head level), ranging in thickness between 2.00m to 3.20m, which is considered to be attributable to the Bannock Band coal seam. No evidence of voids, broken ground or loss of flush was recorded at any of the rotary borehole locations, completed during these investigation works and the previous works completed by DTS Raeburn in 2016, indicating a possible absence of workings within the Bannock Band seam below the site. However, as shown on the mine abandonment plan extract shown on Drawing G003 workings within the Bannock Band seam are recorded to extend below the whole of the site at shallow depth, and as such the potential for intact coal identified at the rotary borehole locations to be representative of unmined 'pillars' of mineral left to support the roof between worked areas, cannot be wholly dismissed at this stage. Therefore, as a precautionary measure it is recommended that an allowance be included for localised probing and grouting (if required) across to building footprint on a typical minimum 6m centre grid to more accurately assess the level of risk in this regard. Should workings be encountered an allowance should then be included for remedial works in the form of grouting to mitigate the risk to the development.
Contamination	From the results of the chemical analysis no levels of contaminants have been identified which exceed current assessment criteria based upon a future commercial end use. In addition, no significant risk is considered to controlled waters. These results support the findings of the previous contamination assessment completed by DTS Raeburn.
Appraisal	Offsite Disposal – Following a review of the soil screening results increased levels of Total Organic Carbon (TOC) have been identified for samples of made ground tested, which exceed acceptance criteria for disposal at an Inert Landfill (3%), indicating that these materials will likely be characterised as Non-Hazardous for disposal. Foundations – Due to the variability of the upper made ground and superficial deposits identified during the investigation works, the use of traditional shallow foundations is not considered to represent a viable solution for this site. In addition, due to the occasional presence of peat and very soft nature of the upper superficial deposits the use of ground improvement via stone columns is also unlikely to represent a viable solution for this site, due to the potential for the columns to bulge. However, ground improvement through the use of Controlled Modulus Columns (CMC) is considered to represent a viable solution, subject the removal of all remnant surface hard-standing and sub-surface obstructions. Alternatively, a piled foundation solution could also represent a viable solution for this site, subject to removal of all sub-surface obstructions. Floor Slab - If ground improvement (CMC's) were to be utilised for this site it is recommended that these works be designed to also facilitate the use of a ground bearing floor slab. Alternatively, if a piled foundation solution was to be considered it is likely that a suspended floor slab would be required. Concrete Design Classification - The results of the chemical analyses indicate a BRE Special Digest 1:2005 Design Sulphate Class DS-1 with an ACEC classification AC-1; buried concrete should be designed accordingly. External Works - Due to the nature of the shallow made ground it is recommended that a conservative CBR value of 2% be initially adopted at this stage for these materials, subject to the completion of in-situ plate bearing tests at formation level during the development works.

1 INTRODUCTION

1.1 3e Consulting Engineers Ltd (3e) were commissioned by Aldi Stores Ltd to carry out a Geo-environmental Appraisal and Coal Mining Risk Assessment for a proposed Aldi store located off Preston Street, Whitehaven. The proposed development includes the construction of a new Aldi retail store, with associated parking and soft landscaping, as shown on the indicative proposed site plan included in **Appendix A**.

1.2 This investigation was undertaken to aid in assessing the level of potential risk to the site from shallow coal mining related activities, and to also provide a preliminary geo-environmental appraisal of ground conditions and potential environmental constraints, to aid in the future development works and foundation design.

1.3 Fieldwork was undertaken between the 29th November 2021 and 6th January 2022, and comprised 3 no. mini percussive boreholes (referenced as WS01 to WS03) and 6 no. rotary open-hole boreholes (referenced as RO1 to RO5, including RO2A).

1.4 To aid in this assessment and appraisal, a review has also been made of the following reports which were completed for this site in 2016 and 2018, with a summary included in Section 3.

- 3e Consulting Engineers Limited; Phase I Geo-environmental Assessment for Land off Preston Street, Whitehaven, Report Ref: P18-351/P1, dated September 2018.
- DTS Raeburn Limited; Preliminary Risk Assessment and Ground Investigation Report for a site at Preston Street, Whitehaven, Cumbria, Contract No: E12964/1B, dated November 2016.

1.5 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.

1.6 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.

1.7 References to possible asbestos containing material made within this report do not constitute an asbestos survey. 3e are not asbestos specialists and it is recommended that the Client appoints an asbestos consultant to advise on any matters relating to asbestos.

1.8 This report has been prepared for the sole use of Aldi Stores Limited. 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

2.2 The site, centred on National Grid Reference 297290, 517540, is located to the immediate east of Preston Street, Whitehaven, Cumbria. A site location plan is included as **Drawing G001**.

2.3 The site is currently unoccupied following the removal of the majority of former above ground structures, although remnant building walls are still visible, with scrub vegetation present across the southern portions of the site. A site walkover survey was completed as part of the investigation works, with the majority of the site noted to comprise predominantly disused land with numerous areas of dense overgrown vegetation. An exception was noted across northern section of the site which was being currently used as a public car park and as a result prohibited the completion of investigation works across this area.

2.4 An area of residual hard-standing was also noted within the south-western corner, bounded by a low level wall. Within this area remnant hard-standing was noted to comprise concrete floor slabs within the areas of former buildings and tarmac. A rectangular building was also noted contained within this area adjacent to the south—western boundary. From the topographical survey a 'pit filled with rubble' was also noted within this area, however targeted investigation of this feature was prohibited due to the presence of walls preventing access into this area.

2.5 From provided information a sewer is also recorded crossing below the eastern site area, with surrounding easement, the location of which is shown on **Drawing G002** (Exploratory Hole Location Plan). In addition, from a provided survey area drawing localised areas of Japanese Knotweed were also indicated to be located on site, and as such the investigation works were designed to avoid these areas to minimise disturbance.

2.6 The immediate land uses are as follows:

- North: Public footpath, commercial units and car parking areas.
- South: Light industrial units and residential properties.
- East: Undeveloped land, cycle path and commercial properties.
- West: Preston Street, residential and commercial properties.

3 SUMMARY OF PREVIOUS REPORTS

3.1 The following section provides a brief summary of the Phase I Geo-environmental Assessment report produced for this site by 3e in 2018, as referenced in Section 1. In addition, where applicable reference has also been made to the findings of previous investigation works completed for the northern site area by DTS Raeburn Limited in 2016.

Site History

3.2 From earliest historical OS plans (dated 1867) reviewed as part of the Phase I Assessment the site is shown as being partially developed with several uses including a stone yard, pottery and colliery school noted. By 1956, several phases of redevelopment have occurred, adapting the site to other commercial uses such as an Auction Market and Mortuary, Mission Hall and public house, with many of the buildings demolished by 2018.

3.3 A stream (Pow Beck) is recorded running adjacent to the eastern site boundary on earliest OS plans, with this feature no longer evident at the surface by 1899. From available utility information a sewer is shown to bisect this area of the site, with the stream anticipated to have been incorporated into this feature, which is supported by current OS data which shows Pow Beck at the surface to the immediate north-east and south-east of the site, before existing / entering the sewer.

3.4 Recent aerial imagery also suggests the northern portion of the site as a car park, whilst the southern site area is shown as undeveloped land with areas of dense overgrown vegetation. Following completion of the Phase I report produced by 3e the boundary of the site has altered slightly and now incorporates an additional area of land to the south-west. Following a review of historical OS plans this area is initially recorded as undeveloped, with a series of buildings occupying the site by the 1960's, named as a 'Builders Yard'.

Geology

3.5 From BGS plans significant thicknesses of made ground are not recorded beneath the site, however as noted within the Phase I report it was considered that an initial thickness of made ground/fill should be anticipated, associated with previous site usage. In addition, it was also considered likely that an increased thickness of made ground was present below the eastern site area associated with the route of the existing sewer.

3.6 BGS data records the majority of the site as being underlain by Alluvium superficial deposits, whilst Glacial Till deposits are shown to extend below the western site area. Bedrock deposits of the Pennine Middle Coal Measure are also recorded below the site.

3.7 From BGS data reviewed as part of the Phase I report, the Bannock coal seam is noted as sub-cropping beneath the site, locally dipping to the south west. In addition, the Main coal seam is also noted as outcropping to the north west, dipping to the south-west below the development area.

3.8 However, to further aid in determining ground conditions below the site, as part of this assessment a review has been made of BGS plan NX91NE, which also indicates the presence a fault within the bedrock deposits as potentially bisecting the central site area, trending generally east-west and down-throwing to the north. As a result of the localised faulting the Bannock Band is indicated to sub-crop at rock-head level below the southern site area, dipping to the west away from the site. For the northern site area the Bannock Band seam is shown to sub-crop around 100m west and potentially dips below the site at shallow depth. An extract of BGS Plan NX91NE is included below:



Extract of BGS Plan NX91NE with the general site area outlined in Yellow.

Mining

3.9 From the Coal Authority (CA) Consultants Mining Report obtained as part of the Phase I report workings within two seams of coal are recorded below the site. Workings are recorded within the Brick (Bannock Band) and Main coal seams, at depths of 17m and 65m respectively, with recorded extraction thicknesses of 1.82m and 1.80m. The Bannock coal seam is indicated to have been last worked below the site in 1967 with the Main seam last worked in 1900. From the CA Interactive Viewer, the majority of the site is also recorded as a development high risk area and area of known shallow coal workings, with underground workings within the Bannock Band coal seam indicated to extend below the site as a whole.

3.10 To aid in assessing the level of potential risk to the site from workings within the Bannock Band coal seam, mine abandonment plan NW1395 (Plan of the workings in the Bannock band seam of coal) was obtained from the CA as part of the Phase I assessment. Following a review of this plan workings within the Bannock Band coal seam are shown to extend below the site as a whole with no faulting evident as indicated on BGS plan NX91NE. Taking this into account workings within the Bannock seam were considered to pose a potential risk to the site with further investigation works recommended (i.e. rotary boreholes) to aid in assessing the level of risk.

3.11 As part of the previous investigation works undertaken across the northern site area by DTS Raeburn in 2016, to aid in determining the level of risk in relation to potential shallow mine workings 3 no. rotary boreholes were completed to a depth of 35m, referenced as BH1 to BH3. From the findings of these works the presence of intact coal, containing thin bands of mudstone, was encountered at depths of between 24.80m to 29.10m, ranging in thickness of between 1.90m to 2.20m. No loss of flush was noted by Raeburn during drilling of the rotary boreholes, indicating the absence of any coal mining related voids and a low risk to the site.

3.12 However, following a review of the mine abandonment plan as previously noted workings within the Bannock Band coal seam are indicated to extend below the whole of the site, with the potential for large intact pillars to also be present. Taking this into account, it was considered possible that coal recorded by DTS Raeburn may reflect coal pillars rather than evidence to support an absence of coal mining activities. In addition, the CA report also refers of mine gas remedial works at number of properties to the south of the site and as a result the site was also considered to be at potential risk from ground gases relating to mining.

3.13 From the CA mining report and interactive viewer there are no mine entries recorded on or within influencing distance of the site.

Environmental Setting

- A watercourse is recorded beneath the eastern portion of the site, flowing south to north, noted as Pow Beck.
- The site is located within Zone 1 area considered to be at 'Low Risk' from fluvial flooding (i.e. is not within a flood plain). However, the site is located within an area considered to be at potential risk of groundwater flooding of property situated below ground level and at surface.
- No landfills are indicated to be located within 250m.
- The underlying bedrock deposits are classed as a Secondary A Aquifer whilst the superficial soils are classified as a Secondary A Aquifer and Secondary Aquifer (Undifferentiated).
- There are no enforcement or prohibition notices, pollution controls, pollution incidents, source protection zones, flood water storage areas or flood defences recorded within 1km of the site at the time of reporting.
- The site is not located within a radon risk area.

Summary of Ground Investigation Works (DTS Raeburn 2016)

3.14 The following provides a summary of the previous ground investigation works completed for the northern site area only by DTS Raeburn in 2016, as referenced in Section 1. The locations of exploratory holes completed by Raeburn are included on **Drawing G002** (Exploratory Hole Location Plan) with copies of the record sheets included in **Appendix B**.

Ground Conditions

3.15 Made ground comprising clay, sand and gravel with anthropogenic debris (i.e. brick, ash, concrete, clinker etc) was recorded within exploratory hole sunk across the northern site area to depths of between 1.20m and 3.20m.

3.16 Natural superficial drift deposits comprising variable soft to firm clay with occasional peat traces, soft organic clay, firm peat, medium dense clayey sand and medium dense sandy gravel, were initially recorded within exploratory holes sunk by DTS Raeburn, to depths of

between 4.20m and 5.25m. These deposits were underlain by predominantly stiff slightly sandy slightly gravelly clay with occasional cobbles, to depths of between 9.60m and 11.10m.

3.17 Sandstone bedrock deposits were initially recorded at the rotary borehole locations from depths of between 9.30m and 11.10m. Intact coal, containing thin bands of mudstone, was also encountered at depths of between 24.80m to 29.10m, ranging in thickness of between 1.90m to 2.20m, immediately overlying mudstone bedrock deposits to a maximum recorded depth of 35.00m.

Groundwater

3.18 No groundwater was encountered during drilling of the boreholes completed by DTS Raeburn. However, groundwater levels were recorded within monitoring wells installed at the locations of BH1 to BH3, between depths of 1.30m and 7.75m below ground level (6.95m to 2.00m AOD), with the differences in water level considered to indicate the potential for separate bodes of perched water.

Ground Gas

3.19 Ground gas monitoring completed by DTS Raeburn did not record any significant levels of Carbon Dioxide and/or Methane within monitoring wells installed at the locations of BH1 to BH3, and as a result it was considered that a CS-1 classification was appropriate for this site, indicating gas protection measures are not required.

3.20 However, following a review of the results the overall monitoring period completed by Raeburn was noted to be limited with only 4 no. visits over a 3 week period. In addition, gas monitoring also revealed a single Carbon Dioxide concentration in excess of 5%. Therefore, within the Phase I report it was recommended that additional gas monitoring be undertaken for this site, in accordance with current guidance (CIRIA C665).

Contamination

3.21 From chemical testing completed by DTS Raeburn a low risk was considered to human health or controlled waters, based upon a commercial end use. In addition, no asbestos was identified within any of the made ground samples screened. However, as testing completed by DTS Raeburn was limited to the northern site area only further testing was recommended

as part of any future investigation works to confirm the level of potential risk across the site as a whole.

Buried Concrete

3.22 From the results of testing completed by DTS Raeburn soluble sulphate concentrations detected in the tested soils and groundwater were noted to fall into Design Sulphate Class DS-1. The soil pH values together with the presence of groundwater beneath the site also indicated an Aggressive Chemical Environment for Concrete (ACEC) Class of AC-1.

3.23 However, as the results of analysis for total (acid soluble) sulphate and total sulphur indicated the potential presence of pyrite within the made ground, DTA Raeburn considered it necessary to take account of the total potential sulphate (TPS, calculated by 3x total sulphur). From this analysis the test results indicates a 'characteristic value' for TPS of 0.7%, which falls into Design Sulphate Class DS-3 and a corresponding ACEC Class of AC-3. Therefore, it was recommended that any buried concrete placed in direct contact with the made ground should conform to Design Sulphate Class DS-3 and ACEC Class AC-3.

Foundations and Floor Slab

3.24 Within the report produced by DTS Raeburn shallow pad and strip foundations were not recommended due to the near-surface soils being very weak and highly compressible to a depth of 4.5m. In addition, it was also considered that vibro-replacement stone columns would offer no significant benefit. Taking this into account, DTS Raeburn recommended that piled foundations be used in combination with a suspended floor slab.

4 METHOD OF INVESTIGATION

Scope of Investigation Works

4.1 This investigation was undertaken to aid in assessing the level of potential risk to the site from shallow coal mining related activities, and to also provide a preliminary geo-environmental appraisal of ground conditions and potential environmental constraints, to aid in the future development works and foundation design.

4.2 The intrusive investigation works were undertaken between the 29th November 2021 and 6th January 2022, and comprised 3 no. mini percussive boreholes (referenced as WS01 to WS03) and 6 no. rotary open-hole boreholes (referenced as RO1 to RO5, including RO2A). The exploratory holes were positioned to target the location of the proposed Aldi store building in order to provide an assessment of ground conditions below this area of the site.

4.3 Copies of the exploratory hole records are included as **Appendix C** and the locations are shown on **Drawing G002** (Exploratory Hole Location Plan). All depths recorded are taken from below existing ground level, with the exploratory holes sunk to target the location of the proposed Aldi store, whilst also making allowance for access restrictions and buried utilities.

4.4 The mini-percussive boreholes were sunk in order to determine the nature of the upper superficial deposits in the general area of the proposed Aldi store to primarily aid in future foundation design. Disturbed samples were recovered as appropriate for soil descriptions and laboratory testing. In-situ standard penetration tests (SPT's) and hand shear vane tests (HSV's) were also carried out where appropriate to provide an assessment of the in-situ strength and density of the made ground and natural deposits encountered at the borehole locations.

4.5 Fieldwork and soil descriptions were carried out in general accordance with BS5930:2015+A1:2020 Code of Practice for Ground Investigations and BS10175:2011+A2:2017 Investigation of Potentially Contaminated Sites – Code of Practice. In addition, where applicable reference has also been to CIRIA Publication C733 'asbestos in soil and made ground: a guide to understanding and managing risks'.

4.6 As previously noted as the scope of works was designed solely to provide an appraisal of potential environmental constraints at the site to aid in future development works, gas and

groundwater monitoring was out-with the scope of the investigation works. However, during the investigation works combined gas and groundwater monitoring wells were installed at the locations of WS01 to WS03, to facilitate the completion of detailed ground gas risk assessment as part of any future Phase II investigation works.

Laboratory Chemical Testing

General Made Ground

4.7 In order to provide a preliminary assessment of potential contamination, representative samples of made ground recovered during the investigation works were screened for the following determinands:

- 4 no. samples screened for Arsenic, Boron, Copper, Cadmium, Chromium (total), Chromium (VI), Lead, Mercury, Nickel, Selenium, Zinc and TOC.
- 4 no. samples screened for Arsenic, Barium, Copper, Cadmium, Chromium (total), Molybdenum, Antimony, Copper, Mercury, Nickel, Lead, Selenium and Zinc (WAC Metals Suite).
- 4 no. samples screened for Polycyclic Aromatic Hydrocarbons (USEPA 16 PAH's).
- 4 no. samples screened for the presence of Asbestos.

4.8 In addition, to aid in providing a preliminary assessment of potential off-site disposal characterisation, 4 no. representative samples of made ground recovered from the borehole locations were also screened for Waste Acceptance Criteria (WAC) analysis. The results of the chemical analysis are included as **Appendix D**. The analyses were carried out at an MCERTS registered and UKAS accredited laboratory.

Laboratory Geotechnical Testing

4.9 As this investigation was designed to primarily provide an appraisal of potential environmental constraints at the site laboratory geotechnical related testing was generally out-with the scope of these works. However, based upon the findings of chemical analysis completed by DTS Raeburn, 4 no. samples of general made ground recovered from the boreholes were scheduled for water soluble sulphate and pH determinations to assess the potential for sulphate attack on buried concrete. The results of the laboratory testing are included as **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 in situ testing and sampling information are given on the exploratory hole records included as **Appendix C**. A summary of the ground conditions encountered is presented below:

Made Ground

5.2 During the investigation works made ground encountered within WS01 to WS03, sunk to target the location of the proposed Aldi store, was identified to depths of between 1.90m and 2.70m. These materials were noted to generally comprise dark brown and black sand and clay with occasional brick, concrete, ash and sand bands. At the rotary borehole locations made ground was also noted to vary in depth to between 0.90m and 2.10m within the general location of the proposed Aldi store.

Superficial (Drift) Deposits

5.3 Generally variable natural superficial (drift) deposits comprising very soft to soft sandy silt with fibrous peat, loose to medium dense sand and gravel, were initially recorded at the locations of WS01 to WS03 to depths of between 2.90m up to in excess of 4.45m.

5.4 Within WS02 and WS03 stiff clay deposits were also identified from depths of between 2.90m and 3.60m up to a maximum recorded depth of 4.45m, with grey clay deposits also noted at depth within the rotary boreholes from depths of between 3.70m and 6.30m. An exception was noted within RO3 where sand and gravel superficial deposits were recorded to a depth of 12.80m.

5.5 Within the rotary boreholes superficial deposits were recorded to depths of between 11.10m and 14.30m, generally increasing in thickness to the east and south-east.

Bedrock Deposits

5.6 Sandstone bedrock deposits were initially recorded at the rotary borehole locations to depths of between 18.50m and 25.90m. These deposits were in turn underlain by an intact and banded coal seam to depths of between 20.50m and 28.00m, which was noted to range in thickness between 2.00m and 3.20m.

5.7 Mudstone bedrock deposits (with occasional sandstone bands) were typically recorded immediately underlying the banded coal seam up to in excess of 31.50m. An exception was noted within R04 where coal deposits were noted as absent with interbedded sandstone and mudstone recorded underlying the initial sandstone deposits from a depth of 22.90m.

Sub-Surface Obstructions

5.8 No evidence of significant sub-surface obstruction (i.e. relict foundations, etc.) were identified within any of the exploratory hole locations. However, during completion of the rotary boreholes numerous boulders were noted occasionally contained within the superficial deposits which resulted in refusal of sampling equipment and casing at the location of R02. In addition, a band of siltstone and granite cobbles was also noted contained within the superficial deposits at the location of R01 between 5.10m and 6.00m.

Visual and/or Olfactory Evidence of Potential Contamination

5.9 No visual and/or olfactory evidence of potential significant contamination (i.e. hydrocarbons, asbestos containing materials, etc.) was noted at the borehole locations.

Coal Mining Risk Assessment

5.10 From the findings of the Phase I Geo-environmental Assessment (summarised in Section 3), it was recommended that a series of rotary boreholes be completed across the site to aid in assessing the level of potential risk to the development from shallow coal mining activities.

5.11 From BGS and CA data the shallowest coal seam below the site is recorded as the Bannock Band, which is shown to out-crop at rock-head level below and 100m west of the site. From CA data this seam is recorded as worked at a depth of 17m below the site, with an extraction thickness of 1.82m, dipping at a rate of 7.8 degrees to the west.

5.12 As part of the Phase I report, to aid in assessing the level of potential risk to the site from workings within the Bannock Band coal seam, mine abandonment plan NW1395 was obtained from the Coal Authority (CA) which shows the indicated extent of recorded workings within this seam, with an extract of this plan in relation to the site included as **Drawing G003** (Bannock Band Abandonment Plan Overlay). From **Drawing G003** it can be seen that workings within the Bannock Band seam are recorded to extend below the site as a whole, with extraction shown in the form of pillar and stall (room), forming a series of interconnected roadways with relatively large unmined 'pillars' of mineral left between to support the roof.

5.13 During the investigation works, 6 no. rotary open-hole boreholes (referenced as RO1 to RO5, including RO2A) were completed to target the general location of the proposed Aldi store, the locations of which are included in **Drawing G002**. A summary of the coal seams identified during the investigation works are provided in the table below.

Location	Surface level (mAOD)	Depth to rock-head (mBGL)	Depth to top and base of the coal seam (mBGL)	Depth to top and base of the coal seam (mAOD)	Thickness of coal seam (m)	Ratio rock cover (using 1.82m thick extraction thickness)*	Remarks
R01	10.1	11.1	25.9 to 28.0	-15.8 to -17.9	2.1	8.1	Intact Banded Coal
R02/RO2A	9.8	12.3	21.0 to 23.4	-11.2 to -13.6	2.4	4.8	Intact Banded Coal
R03	11.9	12.8	20.3 to 23.5	-8.4 to -11.6	3.2	4.1	Intact Banded Coal
R04	11.5	12.5	~	~	~	~	No workings or intact coal recorded
R05	11.65	14.5	18.5 to 20.5	-6.85 to -8.85	2.0	2.1	Intact Banded Coal

BGL – Below Ground Level; AOD – Above Ordnance Datum. * - Extraction thickness based on information contained within the CA Consultants Mining Report.

5.14 From the findings of the rotary investigation works, superficial (drift) deposits were noted to depths of between 11.10m and 14.30m, generally increasing in thickness to the east and south-east. Sandstone bedrock deposits were generally recorded at 'rock-head' level below the site.

5.15 An intact and banded coal seam was recorded at the majority of the rotary borehole locations from depths of between 18.50m and 25.90m (-6.85m to -15.8m AOD), to depths of between 20.50m and 28.00m (-8.85m to -17.9m AOD), ranging in thickness between 2.00m and 3.20m, including the separating stone bands, which is considered to be attributable to the Bannock Band coal seam. These results generally concur with the findings of the 3 no. previous rotary boreholes completed by DTS Raeburn across the northern site area, where the presence of an intact coal seam, containing thin bands of mudstone, was also recorded from depths of between 24.80m to 29.10m, ranging in thickness of between 1.90m to 2.20m.

5.16 During the investigation works no evidence of workings and/or intact coal was identified within R04 sunk to a depth of 30.00m below ground level, or -18.5m AOD.

5.17 In summary from the findings of the rotary boreholes an intact and banded coal seam has been identified below the site from depths of between 18.50m and 25.90m (4.00m to 14.8m below rock-head level), ranging in thickness between 2.00m to 3.20m, with the CA mining report also noting this seam as worked at a depth of 17m below the site, with an extraction thickness of 1.82m.

5.18 During the investigation works no evidence of voids, broken ground or loss of flush was recorded at any of the rotary borehole locations completed both during these investigation works and the previous works completed across the northern site area by DTS Raeburn in 2016, with intact banded coal noted typically the rotary holes, indicating a possible absence of workings within the Bannock Band seam below the site. However, as shown on the mine abandonment plan extract shown on **Drawing G003** workings within the Bannock Band seam are recorded to extend below the whole of the site at shallow depth, and as such the potential for intact coal identified at the rotary borehole locations to be representative of unmined 'pillars' of mineral left to support the roof between worked areas, cannot be wholly dismissed at this stage.

5.19 Based upon the recorded depths to rock-head and intact coal, the investigation works indicate a conservative rock cover ratio of between 2.1 and 8.1, indicating that there is insufficient rock cover below the site to mitigate against any void migration should workings be present within the Bannock Band seam, using the conventional 10 times seam thickness.

5.20 Therefore, as a precautionary measure it is recommended that an allowance be included for localised probing and grouting (if required) across to building footprint on a typical minimum 6m centre grid to more accurately assess the level of risk in this regard. Should workings be encountered an allowance should then be included for remedial works in the form of grouting to mitigate the risk to the development.

Groundwater

5.21 Groundwater was encountered within the mini percussive boreholes at depths of between 1.30m and 3.00m which is considered to be attributable to water contained within the upper superficial deposits below the site. It should be noted that groundwater levels vary seasonally and that a higher water table than recorded could occur.

Geotechnical Related Testing

5.22 The results of the geotechnical testing are presented in **Appendix D**.

Sulphate and pH Determinations

5.23 Within the made ground water soluble sulphate concentrations ranged between <10mg/l and 71mg/l with pH values between 8.5 and 8.7. These indicate a BRE Special Digest 1:2005 Design Sulphate Class DS-1 with an ACEC site classification AC-1.

6 CONTAMINATION APPRAISAL

6.1 The results of the contamination related testing are included as **Appendix D**. Generally, the results have been assessed using the LQM/CIEH Suitable for Use Levels (S4UL's) for Human Health Risk Assessment (Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3170; All rights reserved), which have been derived in accordance with current UK legislation, and national policy using the most recent version of the CLEA software (v1.06).

6.2 The derived S4UL's are based on the concept of minimal tolerable risk as described in SR2 (Environment Agency 2009a) which underpins all previous Environment Agency (EA) SGV's and other GAC's. As part of this assessment, it is noted that S4UL's do not incorporate any toxicological parameter changes to the CLEA base model, however recent toxicological data has been incorporated into the contaminant databases. Furthermore, S4UL GAC's are considered to be equivalent to the previously published Environment agency SGV's, and previous iterations of LQM/CIEH GAC's and as such are suitable for use in generic quantitative risk assessments under both planning and Part IIa regimes. Taking this into account, it is considered that the modified exposure assumptions adopted in S4UL's are sufficiently conservative in relation to assessing the level of potential risk to human health for the development and future end users.

6.3 Where no S4UL is available, reference has been made to appropriate Category 4 Screening Levels (C4SL's) and EIC/AGS:CL:AIRE GAC's for standard land uses, which are similarly considered to be sufficiently conservative in relation to assessing the level of potential risk to human health. For the purpose of this report, all S4UL's, C4SL's and CL:AIRE GAC's have been referred to as Generic Assessment Criteria (GAC).

6.4 With respect to the assessment, the most appropriate values are considered to be the GAC's for a commercial end use. Based on the laboratory results, an SOM of 6% has been used in the assessment.

Human Health Risk Appraisal

6.5 A summary of the contamination related testing is presented in the table on the following page.

Determinand	Maximum conc. mg / kg	No of Samples Tested	Generic Assessment Criteria (GAC) ⁽¹⁾ mg / kg	No of Samples Exceeding GAC
Metals and Metalloids				
Antimony	3.4	4	7500 ⁽³⁾	0
Arsenic	32	8	640	0
Barium	180	4	22000 ⁽³⁾	0
Boron	1.5	4	240000	0
Cadmium	0.24	8	190	0
Chromium (III)	50	8	8600	0
Chromium (VI)	<0.5	4	33	0
Lead	310	8	2330 ⁽²⁾	0
Mercury	0.81	8	1100	0
Molybdenum	4.3	4	17000 ⁽³⁾	0
Selenium	0.91	8	12000	0
Copper	140	8	68000	0
Nickel	65	8	980	0
Zinc	160	8	730000	0
Speciated PAH's (USEPA 16)				
Naphthalene	1.2	4	1100	0
Acenaphthylene	0.54	4	100000	0
Acenaphthene	1.4	4	100000	0
Fluorene	1.3	4	71000	0
Phenanthrene	15	4	23000	0
Anthracene	2.8	4	540000	0
Fluoranthene	19	4	23000	0
Pyrene	15	4	54000	0
Benzo(a)anthracene	8.1	4	180	0
Chrysene	7.8	4	350	0
Benzo(b)fluoranthene	9.1	4	45	0
Benzo(k)fluoranthene	3.3	4	1200	0
Benzo(a)pyrene	6.9	4	36	0
Indeno(1,2,3-cd)pyrene	4.9	4	510	0
Dibenz(a,h)anthracene	1.1	4	3.6	0
Benzo(g,h,i)perylene	4.1	4	4000	0
Speciated TPH's (TPH CWG)				
Aliphatic VPH C ₅ -C ₆	<1	4	12000	0
Aliphatic VPH C ₆ -C ₈	<1	4	40000	0
Aliphatic VPH C ₈ -C ₁₀	<1	4	11000	0
Aliphatic EPH C ₁₀ -C ₁₂	<1	4	47000	0
Aliphatic EPH C ₁₂ -C ₁₆	<1	4	90000	0
Aliphatic EPH C ₁₆ -C ₃₅	<1	4	1800000	0
Aliphatic EPH C ₃₅ -C ₄₄	<1	4	1800000	0
Aromatic VPH C ₅ -C ₇	<1	4	86000	0
Aromatic VPH C ₇ -C ₈	<1	4	180000	0
Aromatic VPH C ₈ -C ₁₀	<1	4	17000	0
Aromatic EPH C ₁₀ -C ₁₂	<1	4	34000	0
Aromatic EPH C ₁₂ -C ₁₆	<1	4	38000	0
Aromatic EPH C ₁₆ -C ₂₁	<1	4	28000	0
Aromatic EPH C ₂₁ -C ₃₅	280	4	28000	0
Aromatic EPH C ₃₅ -C ₄₄	<1	4	28000	0

Notes:

- (1) LQM/CIEH S4UL for Commercial end use.
- (2) Category 4 Screening Level (C4SL) for Commercial end use.
- (3) EIC/AGS/CL:AIRE GAC for Commercial end use.

6.6 In summary, from the results of the chemical analysis no levels of contaminants have been identified which exceed current assessment criteria based upon a commercial end use. Therefore, these materials are considered suitable for use within a commercial setting without representing a potential risk to human health (i.e. future end users).

Asbestos

6.7 In total, 4 no. samples of made ground were screened for asbestos fibres; none were detected.

Phytotoxic Contaminants

6.8 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 following table.

Determinand	Soil pH range	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	8.5-8.7	160	<200	<200	<300
Copper		140	<100	<135	<200
Nickel		65	<60	<75	<110

Notes

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

6.9 From these results, it can be seen that generally low levels of potentially phytotoxic contamination have been identified for the made ground samples screened indicating these materials are unlikely to potentially impact future plant growth. However, due to the presence of made ground on site it is recommended that further specialist advice be sought in relation to plant selection in any areas of soft landscaping.

7 DISCUSSION

7.1 The site is currently an existing Aldi Store with associated parking and servicing. The proposed development includes an extension to the rear of the existing retail store, with additional car parking facilities to be located to the south-west. This investigation was carried out to provide preliminary contamination and geotechnical related assessments for the site with respect to the proposed development.

Contamination Assessment

7.2 From the results of the chemical analysis no levels of contaminants have been identified which exceed current assessment criteria based upon a future commercial end use. Therefore, these materials are considered suitable for use within a commercial setting without representing a potential risk to human health (i.e. future end users). In addition, when considering the low levels of contaminants recorded within the made ground no significant risk is considered to controlled waters associated with these materials. These results support the findings of the previous contamination assessment completed by DTS Raeburn.

Disposal of Materials

7.3 To aid in providing a preliminary assessment of potential off-site disposal characterisation, as part of the investigation works waste acceptance criteria (WAC) testing was undertaken on 4 no. samples of the made ground recovered during the investigation works, the results of which are included in **Appendix D**. In addition, the results of the chemical analyses can also allow for an initial assessment to be made.

7.4 Following a review of the WAC analysis and soil screening results although generally low levels of contaminants were recorded for the samples screened, increased levels of Total Organic Carbon (TOC) were identified for all of the samples tested which exceed acceptance criteria for disposal at an Inert Landfill (3%), indicating that these materials will likely be characterised as Non-Hazardous for disposal.

7.5 In order to minimise potential costs associated with off-site disposal it is recommended that where possible made ground be accommodated and re-used on site as an engineered fill material (if considered to be suitable subject to earthworks testing). It should be noted any organic materials will not be suitable for use as a re-engineered fill.

7.6 Where offsite disposal of waste soils is required, the results of the investigation should be made available to the waste carrier/receiver in order to determine the waste classification, costs for disposal and the requirement for further testing. Sufficient time should be allowed in the site programme to effectively segregate soils based on material type, including the time allowed for any further laboratory classification analysis as required.

Coal Mining Risk Assessment

7.7 From the findings of the rotary investigation works an intact and banded coal seam has been identified below the site from depths of between 18.50m and 25.90m (4.00m to 14.8m below rock-head level), ranging in thickness between 2.00m to 3.20m, which is considered to be attributable to the Bannock Band coal seam.

7.8 No evidence of voids, broken ground or loss of flush was recorded at any of the rotary borehole locations completed both during these investigation works and the previous works completed across the northern site area by DTS Raeburn in 2016, indicating a possible absence of workings within the Bannock Band seam below the site.

7.9 However, as shown on the mine abandonment plan extract shown on **Drawing G003** workings within the Bannock Band seam are recorded to extend below the whole of the site at shallow depth, and as such the potential for intact coal identified at the rotary borehole locations to be representative of unmined 'pillars' of mineral left to support the roof between worked areas, cannot be wholly dismissed at this stage.

7.10 Based upon the recorded depths to rock-head and intact coal, the investigation works indicate a conservative rock cover ratio of between 2.1 and 8.1, indicating that there is insufficient rock cover below the site to mitigate against any void migration should workings be present within the Bannock Band seam, using the conventional 10 times seam thickness.

7.11 Therefore, as a precautionary measure it is recommended that an allowance be included for localised probing and grouting (if required) across to building footprint on a typical minimum 6m centre grid to more accurately assess the level of risk in this regard. Should workings be encountered an allowance should then be included for remedial works in the form of grouting to mitigate the risk to the development.

Foundations

7.12 Due to the variability of the upper made ground and superficial deposits identified during the investigation works, the use of traditional shallow foundations is not considered to represent a viable solution for this site.

7.13 In addition, due to the occasional presence of peat and very soft nature of the upper superficial deposits the use of ground improvement via stone columns is also unlikely to represent a viable solution for this site, due to the potential for the columns to bulge. However, ground improvement through the use of Controlled Modulus Columns (CMC) is considered to represent a viable solution, subject the removal of all remnant surface hard-standing and sub-surface obstructions.

7.14 Alternatively, a piled foundation solution could also represent a viable solution for this site, subject to removal of all sub-surface obstructions.

Floor Slabs

7.15 If ground improvement (CMC's) were to be utilised for this site it is recommended that these works be designed to also facilitate the use of a ground bearing floor slab. Alternatively, if a piled foundation solution was to be considered it is likely that a suspended floor slab would be required.

Excavations and Dewatering

7.16 If man entry is proposed into excavations the use of support to excavation sides is recommended, in line with health and safety guidelines. It should be noted that there is a potential for shallow groundwater ingresses to occur into future excavations. Any ingress that does occur should be controlled adequately by localised pumping from sumps within excavations under careful supervision to avoid loss of fines.

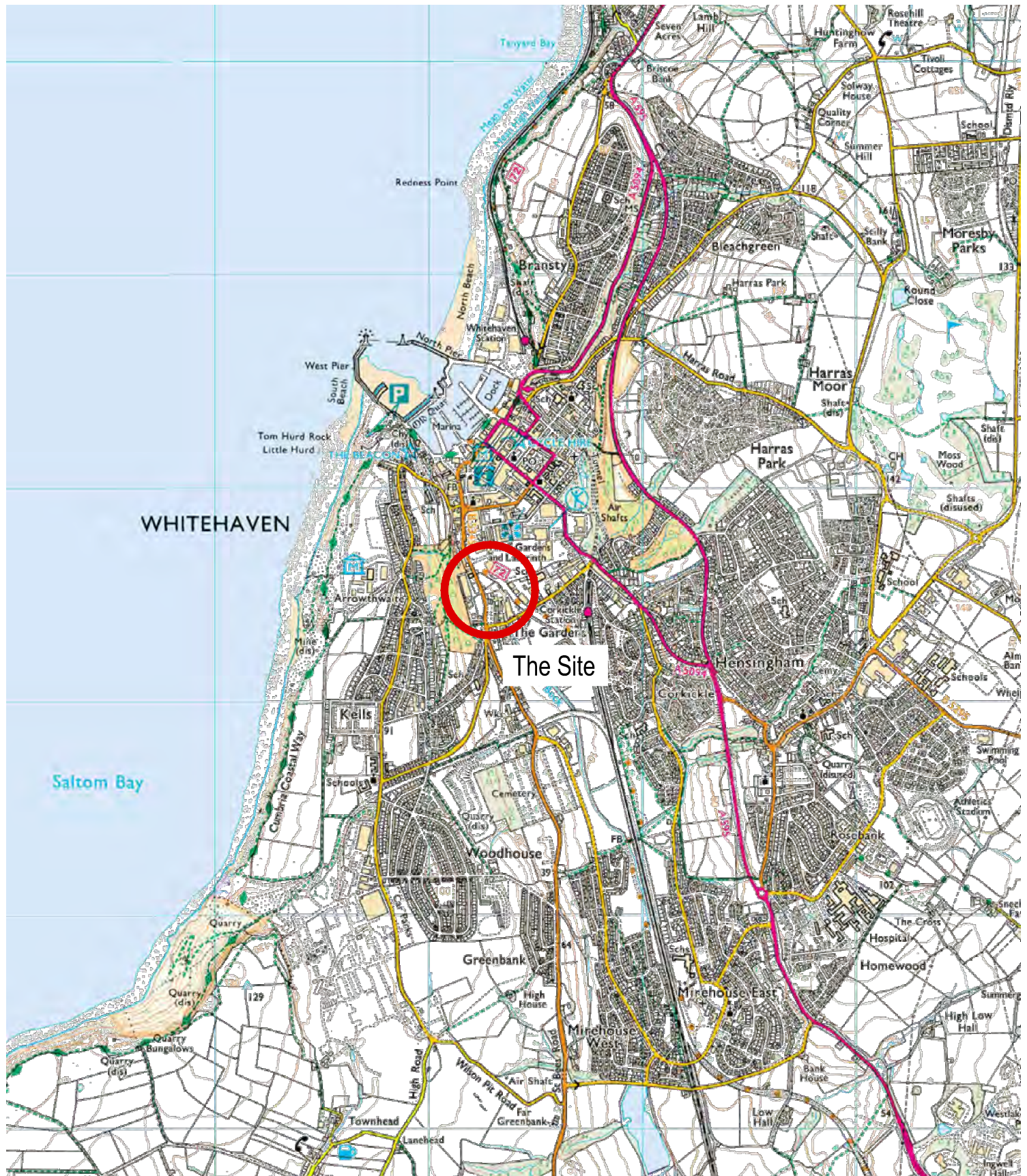
External Hard-Standing

7.17 Due to the nature of the shallow made ground and upper superficial deposits it is recommended that a conservative CBR value of 2% be initially adopted at this stage for these materials, subject to the completion of in-situ plate bearing tests at formation level during the development works.

Sulphate Attack on Buried Concrete

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

Drawings



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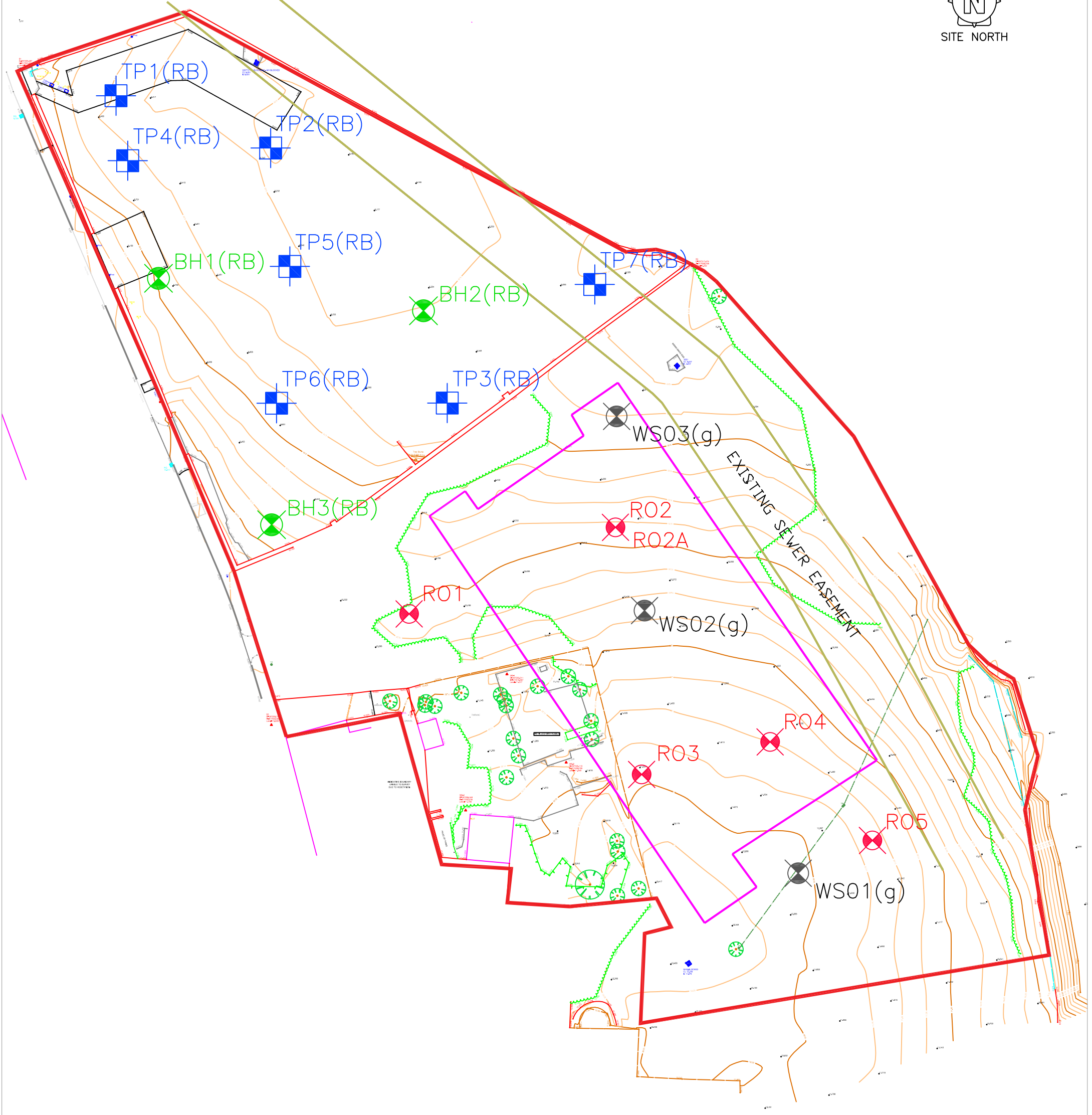
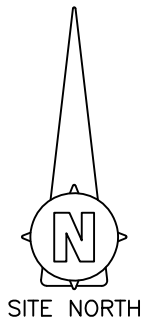
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NE13 9BA

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consulting engineers

Date	Revision	Checked	Rev.
Project Land off Preston Street, Whitehaven for Aldi Stores Ltd			
Title Site Location Plan			
Scale 1:25,000 at A4	Drawn AM	Checked ~	Date 03.10.18
Job No. P18-351	Drawing No. G001	Rev 0	



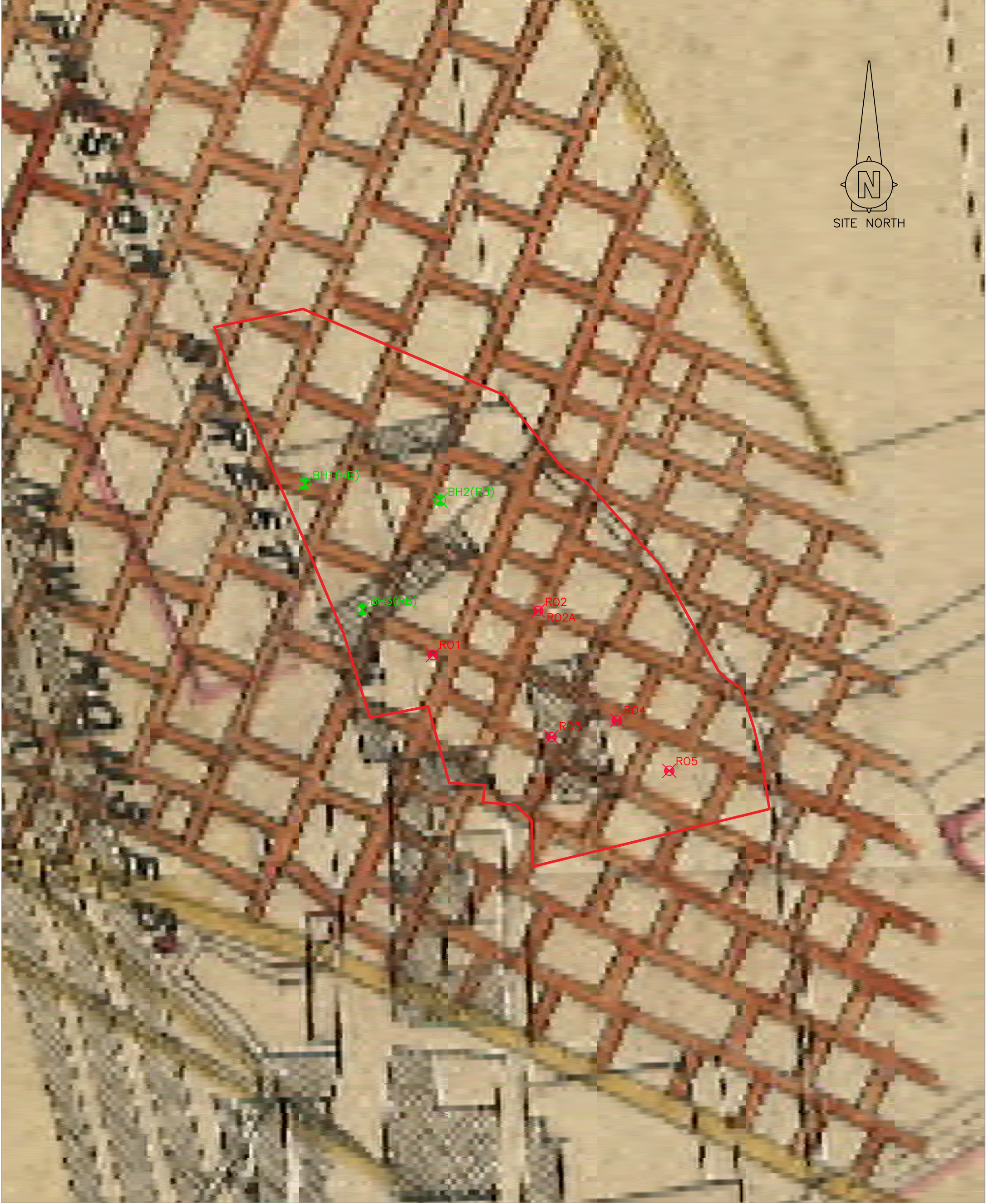
Key:

- Site Boundary
- Indicative Location of Proposed Aldi Store
- ✕^{RO} Rotary Borehole Location (3e 2021/2022)
- ⊗^{WS} Mini Percussive Borehole Location (3e 2021)
- ⊕^{TP(RB)} Trial Pit Location (DTS Raeburn 2016)
- ⊗^{BH(RB)} Cable Percussive & Rotary Borehole Location (DTS Raeburn 2016)



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Newcastle upon Tyne
NE13 9BA
tel: 0191 230 2993
www.3econsult.com

Project Preston Street, Whitehaven for Aldi Stores Limited			
Title Exploratory Hole Location Plan			
Scale NTS	Drawn NW	Checked ~	Date 26.01.22
Job No. P18-351	Drawing No. G002		Rev 0



Key:

- Indicative Site Boundary
- Rotary Borehole Location (3e 2021/2022)
- Cable Percussive & Rotary Borehole Location (DTS Raeburn 2016)



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Project Preston Street, Whitehaven for Aldi Stores Limited			
Title Bannock Band Abandonment Plan Overlay			
Scale NTS	Drawn NW	Checked ~	Date 26.01.22
Job No. P18-351	Drawing No. G003		Rev 0

Appendix A

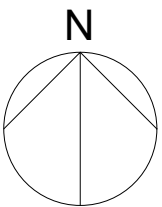
Proposed Development Plan

DRAFT

REV	DATE	DESCRIPTION	DRW	CHK
P04	2021-11-15	Right of access/fence indicated; additional retaining wall indicated	AdeL	-

SITE AREA (Store Plot)	10163 sq m	2.5 ac
STANDARD PARKING BAYS	2.4x5m	87
ACCESSIBLE PARKING BAYS	3.6x6.2m	6
PARENT & CHILD PARKING BAYS	2.9x5m	9
STAFF PARKING (not incl. in total)	.	4
TOTAL PARKING BAYS		102

ALDI BLADE STORE	
GROSS EXTERNAL FLOOR AREA	1978 sq m
GROSS INTERNAL AREA	1899 sq m
RETAIL AREA (Inc. Lobby)	1315 sq m
WELFARE BLOCK (Inc. Plant Room)	121sq m
WAREHOUSE (Inc. Loading Bay & Freezers)	423sq m



Client
Aldi Stores Ltd.



Project Title
Aldi - Whitehaven

Project Address
**Preston Street
Whitehaven**

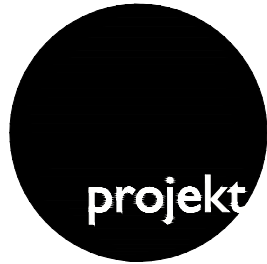
Drawing Title
Site Plan as Proposed

Job No.	Originator	Zone	Level	Type	Role
0470	PA	XX	00	DR	A
System Classification		Drawing No.		Suitability	Revision
PM_40-40_79-0002				S3	P04
Drawn	Checked	Date	Scale	Size	
AdeL	JWC	2021-01-08	1:500	A3	

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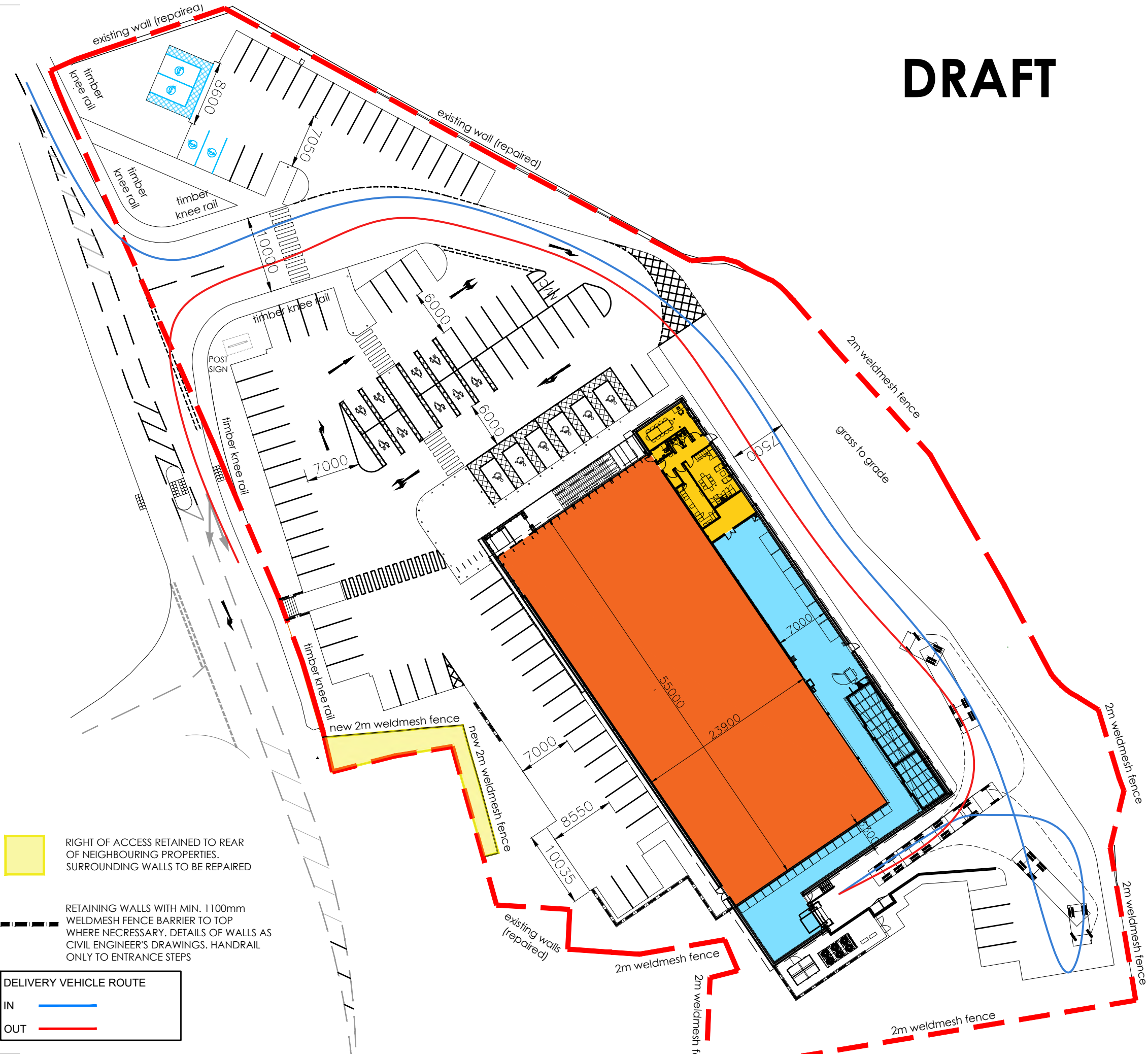
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RIGHT OF ACCESS RETAINED TO REAR OF NEIGHBOURING PROPERTIES. SURROUNDING WALLS TO BE REPAIRED

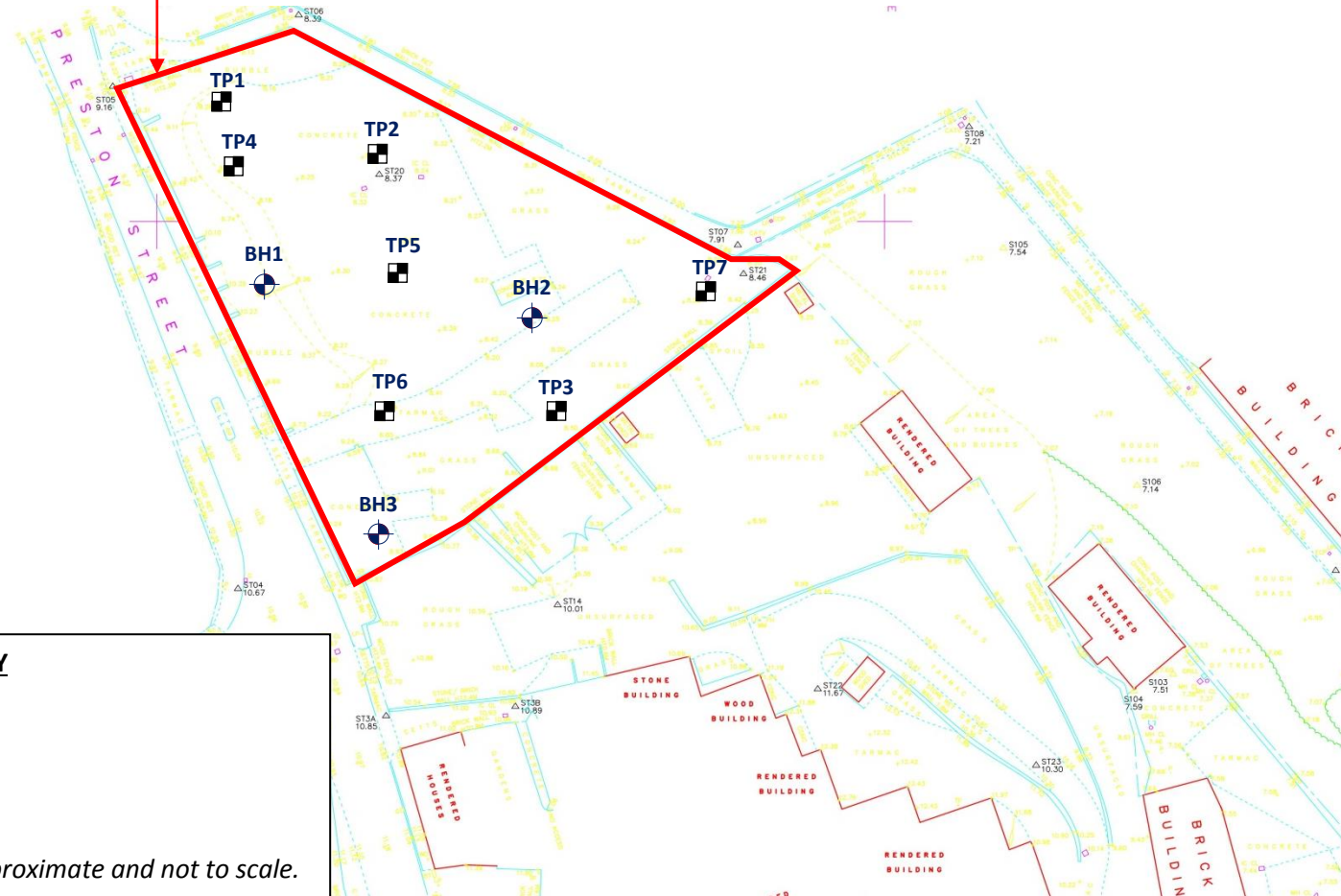
RETAINING WALLS WITH MIN. 1100mm WELDMESH FENCE BARRIER TO TOP WHERE NECESSARY. DETAILS OF WALLS AS CIVIL ENGINEER'S DRAWINGS. HANDRAIL ONLY TO ENTRANCE STEPS

DELIVERY VEHICLE ROUTE
IN
OUT

Appendix B

Previous Ground Investigation Data
(DTS Raeburn)

SITE BOUNDARY



KEY

- BH** Boreholes (BH1-BH3)
- TP** Trial Pits (TP1-TP7)

Locations of markers are approximate and not to scale.

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 GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

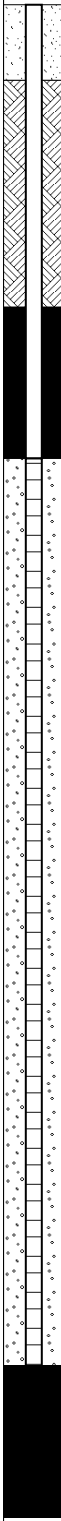
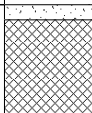
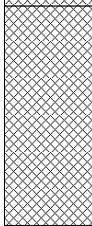
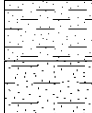
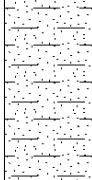
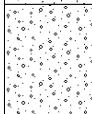
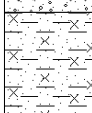
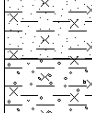
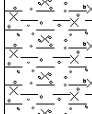
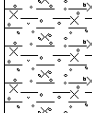
Moor Lane, Witton, Birmingham B6 7HG
 Telephone: +44(0)121 344 5885 Facsimile: +44(0)121 344 5888

FIGURE 3

Site Plan Indicating Exploratory Hole Locations
 Scale 1:1,000 @ A4

E12964/1: Preston Street, Whitehaven
 Client: Morbaine Limited

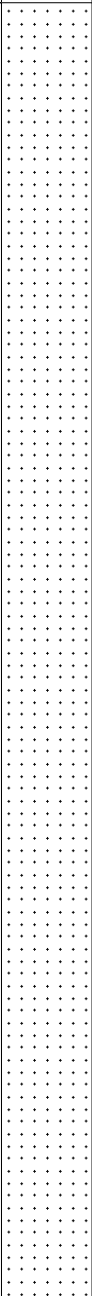
Project Name:	Whitehaven	Project No. E12964	Co-ords:	461840E - 6044095N	Hole Type: CP+RO
Location:	Preston Street, Whithaven, Cumbria		Level:	9.75m AOD	Scale: 1:50
Client:	Morbaine Ltd		Dates:	18/10/2016 - 19/10/2016	Logged by: JO/JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description			
		Depth (m bgl)	Type	Results							
		0.20	B	N=8 (1,2/3,2,2,1)	0.10	9.65		CONCRETE	1		
		0.30	D								
		0.80	B		0.75	9.00				MADE GROUND: Black and brown ashy, silty, gravelly, cobbly firm clay. Gravel and cobbles are angular to subrounded, fine to coarse of brick, mudstone, sandstone and ceramic.	
		0.80	D								
		1.20	D								
		1.20	SPT	N=6 (0,1/1,1,1,3)	2.20	7.55		Soft reddish brown very sandy CLAY. (Traces of vegetation)	2		
		1.70	B								
		2.20	D								
		2.20	SPT		2.60	7.15		Red slightly clayey fine to medium SAND.	3		
		2.70	B								
		3.20	D								
		3.20	SPT	N=16 (2,3/3,4,4,5)	4.15	5.60		4.15-4.95 Brown slightly clayey fine to medium SAND and subangular to subrounded fine to medium GRAVEL of sandstone and mudstone.	4		
		3.70	B								
		4.20	D								
		4.20	SPT		4.95	4.80		Stiff grey slightly silty, slightly gravelly, occasionally cobbly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone and mudstone.	5		
		4.70	B								
		4.95	B								
		5.20	U	6.00	3.75		Stiff grey slightly silty, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse with occasional cobbles of sandstone and mudstone.	6			
		5.70	D								
		6.00	B								
6.70	SPT										
7.50	B	N=52 (9,8/11,13,14,14)	9.60	0.15		Grey SANDSTONE with interbedded bands of silt/mudstone (driller)	7				
8.70	D										
9.00	B										
9.70	D										
9.70	SPT	50 (18,20/50 for 50mm)	9.60	0.15		Grey SANDSTONE with interbedded bands of silt/mudstone (driller)	8				
9.70	SPT										
									10		
Continued on next sheet											

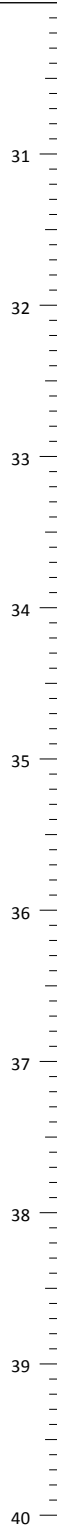
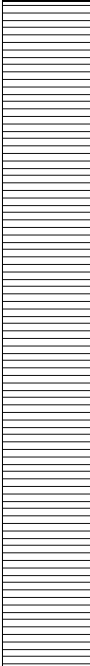
Remarks	Cable percussion drilling to 9.7m bgl, followed by rotary open hole methods to 35m bgl.	Final
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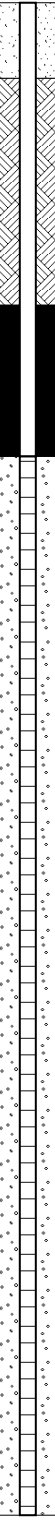
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Project Name:	Whitehaven	Project No. E12964	Co-ords:	461840E - 6044095N	Hole Type: CP+RO
Location:	Preston Street, Whithaven, Cumbria		Level:	9.75m AOD	Scale: 1:50
Client:	Morbaine Ltd		Dates:	18/10/2016 - 19/10/2016	Logged by: JO/JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
									21
									22
									23
									24
									25
									26
									27
									28
					28.60	-18.85		COAL (driller description)	29
					29.30	-19.55		MUDSTONE (driller description)	
					29.70	-19.95		COAL (driller description)	
								Continued on next sheet	30

Remarks	Cable percussion drilling to 9.7m bgl, followed by rotary open hole methods to 35m bgl.	Final
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Project Name:		Whitehaven		Project No. E12964		Co-ords:		461840E - 6044095N		Hole Type: CP+RO							
Location:		Preston Street, Whithaven, Cumbria				Level:		9.75m AOD		Scale: 1:50							
Client:		Morbaine Ltd				Dates:		18/10/2016 - 19/10/2016		Logged by: JO/JL							
Well	Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description									
		Depth (m bgl)	Type	Results													
					30.60	-20.85		MUDSTONE with bands of grey sandstone.									
																	
													35.00	-25.25		End of borehole at 35.00m bgl	

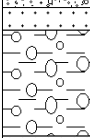
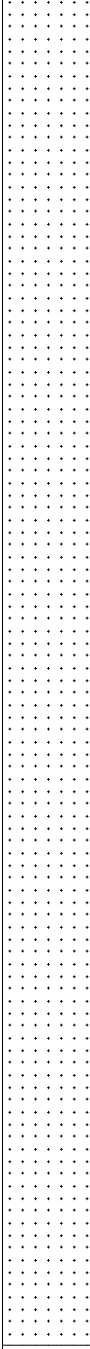
DTS RAE BURN GEOTECHNICAL & ENVIRONMENTAL ENGINEERING					Moor Lane, Witton, Birmingham, B6 7HG +44 (0) 121 3445885 enquiries@dts-raeburn.co.uk www.dts-raeburn.co.uk			Borehole No. BH2 Sheet 1 of 4			
Project Name:		Whitehaven		Project No. E12964		Co-ords:		461870E - 6044093N		Hole Type: CP+RO	
Location:		Preston Street, Whithaven, Cumbria				Level:		8.25m AOD		Scale: 1:50	
Client:		Morbaine Ltd				Dates:		19/10/2016 - 21/10/2016		Logged by: JO/JL	
Well	Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description			
		Depth (m bgl)	Type	Results							
		0.20	B	N=3 (0,1/0,1,1,1)	0.15	8.10		CONCRETE		1	
		0.30	D								
		0.60	B								
		0.80	D								
		1.20	D	N=4 (0,1/1,1,1,1)	2.30	5.95		MADE GROUND: brown ashy, slightly silty, sandy, angular to subrounded, fine to coarse gravel of sandstone, mudstone, brick, ceramic. (Some rootlets)		2	
		1.20	SPT					MADE GROUND: black ashy angular to subrounded, fine to coarse gravel of coal, brock and ceramic.			
		1.70	B					1.25-2.30 - Becoming clayey			
		2.20	D								
		2.20	SPT	N=40 (6,7/9,10,11,10)	5.85	2.40		MADE GROUND: soft purpley brown slightly sandy, slightly gravelly clay. Gravel is angular to subrounded, fine to medium of sandstone and brick.		3	
		2.70	B								
		3.00	B					Firm brownish grey PEAT.			
		3.20	D					Soft to firm grey slightly silty CLAY. (with occasional traces of peat)			
		3.70	B	N=50 (9,10/14,13,11,12)	4.20	4.05		Firm greyish brown, slightly sandy, gravelly, occasionally cobbly CLAY. Gravel and cobbles are angular to subrounded, fine to coarse of mudstone and sandstone.		4	
		3.70	D								
		4.20	D								
		4.20	SPT								
		4.70	B	N=40 (6,7/9,10,11,10)	5.85	2.40		Firm greyish brown, slightly sandy, gravelly, occasionally cobbly CLAY. Gravel and cobbles are angular to subrounded, fine to coarse of mudstone and sandstone.		5	
		5.70	D								
		6.00	B								
		6.70	D								
6.70	SPT	N=40 (6,7/9,10,11,10)	5.85	2.40		Stiff grey slightly sandy, slightly gravelly, occasionally cobbly CLAY. Gravel and cobbles are angular to subrounded, fine to coarse of mudstone and sandstone.		6			
7.50	B										
8.70	D										
9.00	B										
9.70	D	N=50 (9,10/14,13,11,12)	4.20	4.05		Continued on next sheet		10			
9.70	SPT										

Remarks

Cable percussion drilling to 10.4m bgl, followed by rotary open hole methods to 35m bgl.

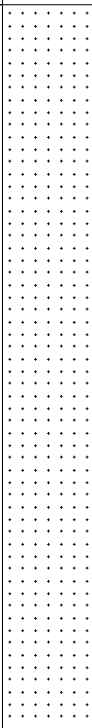
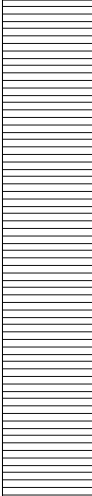
Final

Project Name:	Whitehaven	Project No. E12964	Co-ords:	461870E - 6044093N	Hole Type: CP+RO
Location:	Preston Street, Whithaven, Cumbria		Level:	8.25m AOD	Scale: 1:50
Client:	Morbaine Ltd		Dates:	19/10/2016 - 21/10/2016	Logged by: JO/JL

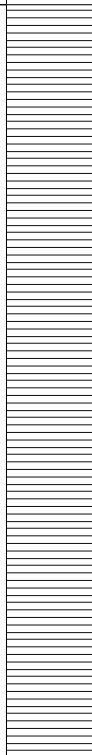
Well	Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description								
		Depth (m bgl)	Type	Results												
		10.40	SPT	0 (50 for 0mm/0 for 0mm)	10.25	-2.00		Hard grey SANDSTONE	11							
					10.40	-2.15		Brown grey BOULDER CLAY (drillers description)								
		10.40	SPT	0 (50 for 0mm/0 for 0mm)	11.10	-2.85		Grey SANDSTONE with occasional bands of dark grey siltstone (drillers description)	11							
								12								
								13								
								14								
								15								
								16								
								17								
								18								
								19								
								20								
								Continued on next sheet								

Remarks	Cable percussion drilling to 10.4m bgl, followed by rotary open hole methods to 35m bgl.	Final
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Project Name:	Whitehaven	Project No. E12964	Co-ords:	461870E - 6044093N	Hole Type: CP+RO
Location:	Preston Street, Whithaven, Cumbria		Level:	8.25m AOD	Scale: 1:50
Client:	Morbaine Ltd		Dates:	19/10/2016 - 21/10/2016	Logged by: JO/JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
					24.80	-16.55			21
							22		
							23		
							24		
					26.70	-18.45		COAL with thin bands of mudstone within (drillers description)	25
							26		
							Grey MUDSTONE with bands of grey sandstone (drillers description)	27	
								28	
Continued on next sheet									30

Remarks	Cable percussion drilling to 10.4m bgl, followed by rotary open hole methods to 35m bgl.	Final
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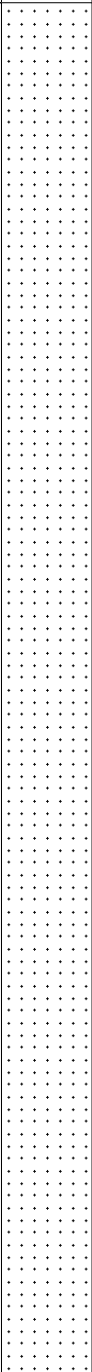
Project Name:		Whitehaven		Project No. E12964		Co-ords:		461870E - 6044093N		Hole Type: CP+RO		
Location:		Preston Street, Whithaven, Cumbria					Level:		8.25m AOD		Scale: 1:50	
Client:		Morbaine Ltd					Dates:		19/10/2016 - 21/10/2016		Logged by: JO/JL	
Well	Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description				
		Depth (m bgl)	Type	Results								
					35.00	-26.75			31			

Remarks	Cable percussion drilling to 9.65m bgl, followed by rotary open hole methods to 35m bgl.	Final
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Project Name:		Whitehaven		Project No. E12964		Co-ords:		461851E - 6044057N		Hole Type: CP+RO			
Location:		Preston Street, Whithaven, Cumbria					Level:		10.00m AOD		Scale: 1:50		
Client:		Morbaine Ltd					Dates:		24/10/2016		Logged by: JO/JL		
Well	Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description					
		Depth (m bgl)	Type	Results									
					12.00	-2.00				11			
								Grey SANDSTONE with bands of mudstone (drillers description)				12	
Continued on next sheet				13									
Continued on next sheet				14									
Continued on next sheet				15									
Continued on next sheet				16									
Continued on next sheet				17									
Continued on next sheet				18									
Continued on next sheet				19									
Continued on next sheet				20									

Remarks	Cable percussion drilling to 9.65m bgl, followed by rotary open hole methods to 35m bgl.										Final

Project Name:	Whitehaven	Project No. E12964	Co-ords:	461851E - 6044057N	Hole Type: CP+RO
Location:	Preston Street, Whithaven, Cumbria		Level:	10.00m AOD	Scale: 1:50
Client:	Morbaine Ltd		Dates:	24/10/2016	Logged by: JO/JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
					29.10	-19.10			21
									22
									23
									24
									25
									26
									27
									28
									29
									30
								COAL with thin bands of mudstone within (drillers description)	
								Continued on next sheet	

Remarks	Cable percussion drilling to 9.65m bgl, followed by rotary open hole methods to 35m bgl.	Final
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Project Name:	Whitehaven	Project No. E12964	Co-ords:	461851E - 6044057N	Hole Type: CP+RO
Location:	Preston Street, Whithaven, Cumbria		Level:	10.00m AOD	Scale: 1:50
Client:	Morbaine Ltd		Dates:	24/10/2016	Logged by: JO/JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
					31.30	-21.30			31
								Grey MUDSTONE with bands of sandstone (drillers description)	32
									33
									34
					35.00	-25.00		End of borehole at 35.00m bgl	35
									36
									37
									38
									39
									40

Remarks	Cable percussion drilling to 9.65m bgl, followed by rotary open hole methods to 35m bgl.	Final
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Project Name:	Whitehaven	Project No. E12964	Co-ords: 461836.00 - 6044115.00	Date: 19/10/2016
Location:	Preston Street, Whithaven, Cumbria	Dimensions (m):	Level: 8.25m AOD	Scale: 1:25
Client:	Morbaine Ltd	Final Depth: 4m		Logged by: JL

Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description	
	Depth (m bgl)	Type	Results					
	0.10			0.10	8.15		MADE GROUND : Brick	
	0.50	D					MADE GROUND : Black sandy fine to coarse, angular to sub-rounded GRAVEL of brick, sandstone, concrete and clinker.	
	1.00	D		0.90	7.35		MADE GROUND : Black clayey fine to coarse SAND with occasional brick fragments.	1
	1.50	B		1.40	6.85		Soft light grey CLAY (Alluvium)	2
	3.00	D		2.80	5.45		Light brown fine to medium quartz SAND with occasional clay bands. (River terrace deposits)	3
	4.00			4.00	4.25		End of trial pit at 4.00m bgl	4
								5

Remarks	Groundwater encountered at 3.9m bgl.	Final
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Project Name:	Whitehaven	Project No. E12964	Co-ords: 461853.00 - 6044105.00	Date:
			Level: 8.25m AOD	19/10/2016

Location:	Preston Street, Whithaven, Cumbria	Dimensions (m):		Scale: 1:25
Client:	Morbaine Ltd	Final Depth: 3.9m		Logged by: JL

Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description	
	Depth (m bgl)	Type	Results					
	0.25	D		0.10	8.15		MADE GROUND : Concrete - no rebar.	
							MADE GROUND : Black sandy fine to coarse angular to sub-rounded GRAVEL of brick, sandstone, concrete and clinker.	
	0.90	D		0.70	7.55		MADE GROUND : Black clayey fine to coarse SAND with occasional brick fragments.	1
	1.50	B		1.30	6.95		Soft light grey mottled orange CLAY with occasional sand partings. (Alluvium)	2
	2.50	D						
				3.10	5.15		Grey fine to medium quartz SAND (River terrace deposits)	3
	3.50	D						
				3.90	4.35		End of trial pit at 3.90m bgl	4
								5

Remarks	Groundwater standing at 3.7m bgl.	Final
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Project Name:	Whitehaven	Project No. E12964	Co-ords:	461870.00 - 6044076.00	Date: 19/10/2016
			Level:	8.20m AOD	

Location:	Preston Street, Whithaven, Cumbria	Dimensions (m):		Scale: 1:25
Client:	Morbaine Ltd	Final Depth: 3.9m		Logged by: JL

Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description	
	Depth (m bgl)	Type	Results					
	0.50	D					MADE GROUND : Black slightly sandy fine to coarse angular GRAVEL of brick, clinker and ceramic pottery with frequent cobbles of brick and broken pots.	1
	1.50	D						2
	2.50	D		2.20	6.00		MADE GROUND : Dark grey sandy gravelly CLAY. Gravel is of fine to coarse sub-angular to rounded sandstone with occasional fragments of brick and pottery.	3
	3.50	B		3.20	5.00			
				3.90	4.30		Firm grey sandy slightly gravelly CLAY gravel is fine to coarse, sub-angular to rounded grey sandstone. Occasional cobbles of grey sandstone. Rare boulders of grey sandstone. (Glacial Till)	
								4
							End of trial pit at 3.90m bgl	5

Remarks	Steady groundwater inflow at 2.2m bgl.	Final
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Project Name:	Whitehaven	Project No. E12964	Co-ords: 461837.00 - 6044107.00	Date: 19/10/2016
Location:	Preston Street, Whithaven, Cumbria	Dimensions (m):	Level: 8.30m AOD	Scale: 1:25
Client:	Morbaine Ltd	Final Depth: 4m		Logged by: JL

Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description	
	Depth (m bgl)	Type	Results					
	0.75	D		0.10	8.20		MADE GROUND : Concrete - no rebar.	
							MADE GROUND : Black sandy fine to coarse, angular to sub-rounded GRAVEL of brick, concrete and sandstone with frequent cobbles of brick, concrete and broken pipe.	1
	1.50	D		1.20	7.10		Soft to firm grey mottled light brown, slightly sandy CLAY. (Alluvium)	2
	3.00	B		2.40	5.90		Light brown fine to medium SAND with occasional clay bands. (River terrace deposits)	3
				4.00	4.30		End of trial pit at 4.00m bgl	4
								5

Remarks	Groundwater observed at base of Trial Pit (4.0m bgl)	Final
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Project Name:	Whitehaven	Project No. E12964	Co-ords: 461857.00 - 6044088.00	Date: 19/10/2016
Location:	Preston Street, Whithaven, Cumbria	Dimensions (m):		Scale: 1:25
Client:	Morbaine Ltd	Final Depth: 4m		Logged by: JL

Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description	
	Depth (m bgl)	Type	Results					
	0.25	D		0.10	8.30		MADE GROUND : Paving bricks	
							MADE GROUND : Black sandy fine to coarse, angular to sub-rounded GRAVEL of brick, sandstone, slate with frequent cobbles of brick and pottery	
	0.75	D		0.60	7.80		MADE GROUND : Black with grey patches clayey fine to coarse SAND with frequent fine to coarse gravel of brick and sandstone.	1
	1.50	B		1.30	7.10		Soft to firm grey mottled light brown slightly sandy CLAY. (Alluvium)	2
				2.60	5.80		Light brown fine to medium quartz SAND with occasional clay bands. (River terrace deposits)	3
	3.50	D						
				4.00	4.40		End of trial pit at 4.00m bgl	4
								5

Remarks	Groundwater seepage at base of Trial Pit (4.0m bgl).	Final
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Project Name:	Whitehaven	Project No. E12964	Co-ords:	461852.00 - 6044075.00	Date: 19/10/2016
			Level:	8.30m AOD	
Location:	Preston Street, Whithaven, Cumbria		Dimensions (m):		Scale: 1:25
Client:	Morbaine Ltd		Final Depth: 4m		Logged by: JL

Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description	
	Depth (m bgl)	Type	Results					
	0.50	D					MADE GROUND : Black sandy fine to coarse angular to sub-rounded GRAVEL of brick, sandstone and clinker with frequent cobble of brick. (Lead pipe found)	1
	1.30	D		1.20	7.10		MADE GROUND : Soft dark grey slightly sandy CLAY with occasional fragments of brick.	
	2.20	B		1.90	6.40		Soft grey slightly sandy CLAY. (Alluvium)	2
	3.50	D		3.20	5.10		Firm grey sandy slightly gravelly CLAY gravel is fine to coarse sub-angular to rounded grey sandstone, with occasional cobbles of grey sandstone. (Glacial Till)	3
				4.00	4.30		End of trial pit at 4.00m bgl	4
								5

Remarks	No groundwater encountered. Derelict lead pipe found at 0.5m bgl.	Final
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Project Name:	Whitehaven	Project No. E12964	Co-ords: 461903.00 - 6044092.00	Date: 19/10/2016
			Level: 8.45m AOD	

Location:	Preston Street, Whithaven, Cumbria	Dimensions (m):		Scale: 1:25
Client:	Morbaine Ltd	Final Depth: 1.9m		Logged by: JL

Water Strikes	Samples and In Situ Testing			Depth (m bgl)	Level (m AOD)	Legend	Stratum Description	
	Depth (m bgl)	Type	Results					
	0.25	D					MADE GROUND : Grass over brown slightly clayey sandy fine to medium, sub-rounded to rounded GRAVEL of sandstone and mudstone with many rootlets and rare glass fragments. (Topsoil)	
	0.80	D		0.60	7.85		MADE GROUND : Light brown slightly clayey slightly sandy GRAVELS and COBBLES of masonry stone (square cut faces)	1
				1.90	6.55		End of trial pit at 1.90m bgl	2
								3
								4
								5

Remarks	No groundwater encountered.	Final
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Appendix C

Exploratory Hole Record Sheets



Borehole Log

Borehole No.

WS01

Sheet 1 of 1

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: 297332.00 - 517485.00

Hole Type
WLS

Location: Whitehaven, Cumbria

Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 29/11/2021 - 29/11/2021

Logged By
AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		0.20	ES	N=13 (2,2/2,3,3,5)	0.30			MADE GROUND: Grass over dark brown and black sand with clay and occasional brick and concrete.	1		
		0.50	D					MADE GROUND: Brown sand with occasional coal flecks, brick and occasional clay bands.			
		1.00	D								
		1.00									
		1.50	D	N=8 (2,2/1,2,2,3)	2.70			2			
		2.00	D								
		2.00									
		3.00	D					N=9 (2,2/2,2,2,3)	3.20		3
		3.00									
		4.00	D	N=19 (6,6/5,5,5,4)	4.45		4				
		4.00									
End of borehole at 4.45 m									5		
									6		
									7		
									8		
									9		
									10		

Remarks

1. Groundwater encountered at a depth of 3.00m.





Borehole Log

Borehole No.

WS02

Sheet 1 of 1

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: 297311.00 - 517521.00

Hole Type
WLS

Location: Whitehaven, Cumbria

Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 29/11/2021 - 29/11/2021

Logged By
AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.70	ES	N=46 (25 for 50mm/22,12,8,4)	1.20			MADE GROUND: Grass over dark brown and black sand with clay and occasional brick and concrete.	1
		1.00							
		1.50	ES					MADE GROUND: Black sand with clay and occasional ash.	
		2.00	D	N=11 (3,4/2,3,3,3)	1.70			MADE GROUND: Brown silty sandy clay with occasional brick and red sand.	2
		2.00			1.90			Brown very silty clayey SAND.	
		2.50	D						
		3.00	D	HVP=120	2.90			Stiff red brown slightly sandy gravelly CLAY.	3
					3.00			Gravel is fine to coarse, subrounded to subangular of sandstone and mudstone.	
								End of borehole at 3.00 m	
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Groundwater encountered at a depth of 1.30m.





Borehole Log

Borehole No.

WS03

Sheet 1 of 1

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: 297308.00 - 517545.00

Hole Type
WLS

Location: Whitehaven, Cumbria

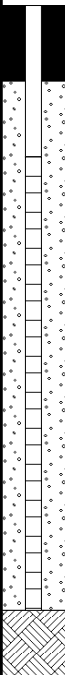
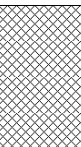
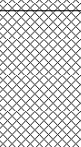
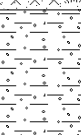
Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 29/11/2021 - 29/11/2021

Logged By
AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	ES					MADE GROUND: Grass over dark brown and black sand with clay and occasional brick and concrete.	
		1.00		N=8 (2,3/3,2,2,1)	1.00			MADE GROUND: Dark brown and black clay with sandstone, brick and occasional black sand bands.	1
		1.50	ES						
		2.00		N=0 (0,0/0,0,0,0) HVP=3	2.00				2
		2.30	D	HVP=2				Soft grey sandy SILT with fibrous peat.	
		2.70	D						
		3.00		N=4 (0,0/1,0,1,2) HVP=2					3
		3.70	D		3.60			Stiff grey gravelly CLAY,. Gravel is fine to coarse, subrounded to subangular of sandstone and mudstone.	4
		4.00		N=46 (8,8/10,10,12,14)	4.45				
								End of borehole at 4.45 m	5
									6
									7
									8
									9
									10

Remarks

1. Groundwater encountered at a depth of 2.00m.





Borehole Log

Borehole No.

R01

Sheet 1 of 4

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

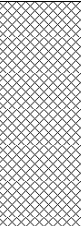
Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 06-12-2021 - 08-12-2021

Logged By
GE

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					1.50			MADE GROUND: Dark grey sand and gravel of limestone, clinker, concrete, brick, slag, coal and sandstone. (drillers description).	1
								Grey brown clayey gravelly fine to coarse SAND. (drillers description).	2
					5.10			Siltstone and granite cobbles. (drillers description)	5
					6.00			Grey boulder CLAY. (drillers description).	6
								Continued on next sheet	10

Remarks

Inspection Pit: 1hr. Gas: No gas detected. Flush: Water 100% returns. Comments: Slow drilling from 11.10m through sandstone deposits. Standing: 2 hours - fill bowser with water. Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R01

Sheet 2 of 4

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

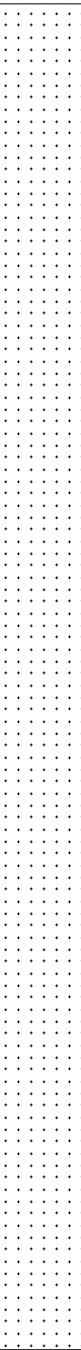
Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 06-12-2021 - 08-12-2021

Logged By
GE

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					11.10				11
								Strong light grey SANDSTONE. Occasionally white in colour.	12
									13
									14
									15
									16
									17
									18
									19
									20

Continued on next sheet

Remarks

Inspection Pit: 1hr. Gas: No gas detected. Flush: Water 100% returns. Comments: Slow drilling from 11.10m through sandstone deposits. Standing: 2 hours - fill bowser with water. Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R01

Sheet 4 of 4

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 06-12-2021 - 08-12-2021

Logged By
GE

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					31.50				31
								End of borehole at 31.50 m	32
									33
									34
									35
									36
									37
									38
									39
									40

Remarks

Inspection Pit: 1hr. Gas: No gas detected. Flush: Water 100% returns. Comments: Slow drilling from 11.10m through sandstone deposits. Standing: 2 hours - fill bowser with water. Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R02

Sheet 1 of 2

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

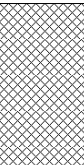
Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 08-12-2021 - 09-12-2021

Logged By
GE

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					1.10			MADE GROUND: Dark grey sand and gravel of limestone, clinker, concrete, brick, slag, and coal. (drillers description).	1
								Reddish brown slightly gravelly fine to coarse SAND. (drillers description).	2
					3.00			Reddish brown sandy gravelly CLAY. (drillers description).	3
								Grey boulder CLAY. (drillers description)	4
					5.00			---at 9.00m siltstone cobble	5
									6
									7
									8
									9
									10
Continued on next sheet									

Continued on next sheet

Remarks

Inspection Pit: 1hr. Gas: No gas detected. Flush: Water 100% returns to 12.30m. Loss of flush at 12.30m within sandstone. Comments: Slow drilling from 12.30m through sandstone deposits. Standing: 2 hours - fill bowser with water. Borehole terminated at 16.50m due to loss of flush as unable to case to rock-head due to presence of numerous cobbles and boulders within superficial deposits. Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R02

Sheet 2 of 2

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 08-12-2021 - 09-12-2021

Logged By
GE

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					10.60			Grey clayey SAND AND GRAVEL. (drillers description).	11
					12.30			Strong light grey SANDSTONE. (drillers description).	12
					14.00			Sandstone (drillers description). Loss of flush within sandstone deposits, with strata description based upon drilling rates maintained.	13
					16.50			End of borehole at 16.50 m	14
									15
									16
									17
									18
									19
									20

Remarks

Inspection Pit: 1hr. Gas: No gas detected. Flush: Water 100% returns to 12.30m. Loss of flush at 12.30m within sandstone. Comments: Slow drilling from 12.30m through sandstone deposits. Standing: 2 hours - fill bowser with water. Borehole terminated at 16.50m due to loss of flush as unable to case to rock-head due to presence of numerous cobbles and boulders within superficial deposits. Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R02A

Sheet 1 of 3

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 06-01-2022 - 06-01-2022

Logged By
SH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
								Borehole advanced through RO2 which was backfilled with bentonite to 16.50m. For strata description to 16.50m see record sheet for RO2.	1
									2
									3
									4
									5
									6
									7
									8
									9
									10

Continued on next sheet

Remarks

Borehole progressed through RO2 which was backfilled with bentonite to 16.50m. Gas: No gas detected. Flush: Water 100% returns. Standing: 4 hours - fill bowser with water. Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R02A

Sheet 3 of 3

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

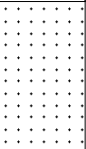
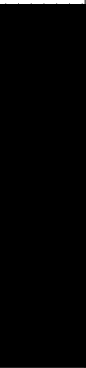
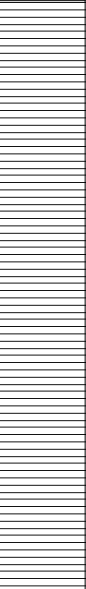
Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 06-01-2022 - 06-01-2022

Logged By
SH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					21.00				
								Black COAL with mudstone laminations. (drillers description).	21
					23.40				22
								Light grey MUDSTONE / SANDSTONE. (drillers description).	23
									24
									25
									26
					27.30				27
								End of borehole at 27.30 m	28
									29
									30

Remarks

Borehole progressed through RO2 which was backfilled with bentonite to 16.50m. Gas: No gas detected. Flush: Water 100% returns. Standing: 4 hours - fill bowser with water. Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R03

Sheet 1 of 3

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 05-01-2022 - 05-01-2022

Logged By
SH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
					0.20			MADE GROUND: Grass over topsoil. (drillers description).	1	
								MADE GROUND: Dark grey slightly clayey gravel of rubble. (drillers description).		
								MADE GROUND: Grey brown sandy gravel of ash with many cobbles. (drillers description).		
							1.40		Light brown slightly clayey SAND AND GRAVEL. (drillers description).	2
4.90		Grey brown, light grey clayey gravelly SAND. (drillers description).	5							
								6		
								7		
								8		
								9		
								10		
							Continued on next sheet			

Remarks

Inspection Pit: 1hr. Gas: No gas detected. Flush: Water 100% returns. Standing: 4 hours - fill bowser with water.
Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R03

Sheet 2 of 3

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 05-01-2022 - 05-01-2022

Logged By
SH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					12.80				11
									12
									13
									14
									15
									16
									17
									18
									19
									20

Dark grey SANDSTONE. (drillers description).

Continued on next sheet

Remarks

Inspection Pit: 1hr. Gas: No gas detected. Flush: Water 100% returns. Standing: 4 hours - fill bowser with water.
Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R03

Sheet 3 of 3

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 05-01-2022 - 05-01-2022

Logged By
SH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					20.30			Black COAL with mudstone / sandstone laminations. (drillers description)	21
					23.50			Grey MUDSTONE / SANDSTONE. (drillers description).	24
					28.80			End of borehole at 28.80 m	29
									30

Remarks

Inspection Pit: 1hr. Gas: No gas detected. Flush: Water 100% returns. Standing: 4 hours - fill bowser with water.
Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R04

Sheet 1 of 3

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 20-12-2021 - 21-12-2021

Logged By
SH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
					0.30			MADE GROUND: Rubble. (drillers description).	1	
								MADE GROUND: Light grey subangular to subrounded fine to medium gravel of ash, brick and coal. (drillers description).		
					0.90			Brown slightly clayey gravelly SAND. Gravel is fine to coarse subrounded of sandstone and coal. (drillers description).	2	
							2.10		Reddish brown clayey SAND. (drillers description).	3
					3.70				Light grey gravelly CLAY. (drillers description)	4
							6.30		Light grey gravelly boulder CLAY. (drillers description).	5
										6
										7
										8
										9
			10							
							Continued on next sheet			

Remarks

Inspection Pit: 1hr. Gas: No gas detected. Flush: Water 100% returns. Standing: 4 hours - fill bowser with water.
Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R04

Sheet 2 of 3

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

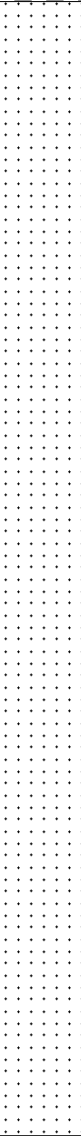
Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 20-12-2021 - 21-12-2021

Logged By
SH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					12.50				11
								Light grey SANDSTONE. (drillers description).	12
									13
									14
									15
									16
									17
									18
									19
									20

Continued on next sheet

Remarks

Inspection Pit: 1hr. Gas: No gas detected. Flush: Water 100% returns. Standing: 4 hours - fill bowser with water.
Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R04

Sheet 3 of 3

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 20-12-2021 - 21-12-2021

Logged By
SH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					20.10			Dark grey SANDSTONE inter bedded with black COAL. (drillers description).	21
									22
					22.90			Light grey inter bedded SANDSTONE AND MUDSTONE. (drillers description).	23
									24
									25
									26
									27
									28
									29
					30.00			End of borehole at 30.00 m	30

Remarks

Inspection Pit: 1hr. Gas: No gas detected. Flush: Water 100% returns. Standing: 4 hours - fill bowser with water.
Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R05

Sheet 1 of 3

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

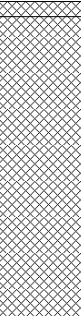
Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 04-01-2022 - 04-01-2022

Logged By
SH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10			MADE GROUND: Grass over top soil. (drillers description). MADE GROUND: Dark brown sandy gravelly clay with many cobbles. Gravel is fine to coarse of brick, sandstone and concrete. Cobbles are subangular of sandstone and concrete. (drillers description).	1
					2.10			Light yellowish brown SAND AND GRAVEL. (drillers description).	2
					6.30			Light grey slightly sand very gravelly CLAY. (drillers description)	7
								Continued on next sheet	10

Remarks

Inspection Pit: 1hr. Gas: No gas detected. Flush: Water 100% returns. Standing: 4 hours - fill bowser with water.
Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R05

Sheet 2 of 3

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 04-01-2022 - 04-01-2022

Logged By
SH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					14.50				11
									12
									13
									14
									15
									16
									17
									18
					18.50				19
									20

Light grey inter bedded MUDSTONE / SANDSTONE. (drillers description).

Inter bedded black COAL with occasional sandstone laminations. (drillers description).

Continued on next sheet

Remarks

Inspection Pit: 1hr. Gas: No gas detected. Flush: Water 100% returns. Standing: 4 hours - fill bowser with water.
Borehole backfilled with bentonite on completion.





Borehole Log

Borehole No.

R05

Sheet 3 of 3

Project Name: Aldi, Whitehaven

Project No.
P18-351

Co-ords: -

Hole Type
RO

Location: Whitehaven, Cumbria

Level:

Scale
1:50

Client: Aldi Stores Ltd

Dates: 04-01-2022 - 04-01-2022

Logged By
SH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					20.50				
								Light grey inter bedded SANDSTONE AND MUDSTONE. (drillers description).	21
									22
									23
									24
					25.00				25
								End of borehole at 25.00 m	26
									27
									28
									29
									30

Remarks

Inspection Pit: 1hr. Gas: No gas detected. Flush: Water 100% returns. Standing: 4 hours - fill bowser with water.
Borehole backfilled with bentonite on completion.



Appendix D

Laboratory Test Results



2183

Final Report

Report No.: 21-43704-1
Initial Date of Issue: 16-Dec-2021
Client 3E Consulting Engineers Ltd
Client Address:
2 Esh Plaza, Sir Bobby Robson Way
Great park
Newcastle upon Tyne
NE13 9BA

Contact(s): Alex Middleton

Project P18-351 Aldi, Whitehaven

Quotation No.: Q20-21147

Date Received: 10-Dec-2021

Order No.: P18-351

Date Instructed: 10-Dec-2021

No. of Samples: 4

Turnaround (Wkdays): 5

Results Due: 16-Dec-2021

Date Approved: 16-Dec-2021

Approved By:



Details: Glynn Harvey, Technical Manager

Results - Soil

Project: P18-351 Aldi, Whitehaven

Client: 3E Consulting Engineers Ltd	Chemtest Job No.:				21-43704	21-43704	21-43704	21-43704
Quotation No.: Q20-21147	Chemtest Sample ID.:				1337679	1337680	1337681	1337682
	Sample Location:				WS01	WS02	WS02	WS03
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.2	0.7	1.5	0.5
	Date Sampled:				29-Nov-2021	29-Nov-2021	29-Nov-2021	29-Nov-2021
	Asbestos Lab:				COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD				
ACM Type	U	2192		N/A	-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	25	22	26	24
Stones and Removed Materials	N	2030	%	0.020	< 0.020	< 0.020	< 0.020	< 0.020
pH	U	2010		4.0	8.5	8.6	8.7	8.7
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	< 0.40	0.63	0.54	1.5
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	0.010	< 0.010	0.071
Sulphate (Total)	U	2430	%	0.010	0.17	0.33	0.23	0.16
Arsenic	U	2450	mg/kg	1.0	14	25	30	31
Cadmium	U	2450	mg/kg	0.10	0.18	0.21	0.24	0.12
Chromium	U	2450	mg/kg	1.0	9.6	16	17	50
Copper	U	2450	mg/kg	0.50	29	48	140	64
Mercury	U	2450	mg/kg	0.10	0.81	0.47	0.36	0.73
Nickel	U	2450	mg/kg	0.50	20	36	61	65
Lead	U	2450	mg/kg	0.50	110	240	310	100
Selenium	U	2450	mg/kg	0.20	0.37	0.74	0.91	0.65
Zinc	U	2450	mg/kg	0.50	110	130	160	120
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon	U	2625	%	0.20	8.2	5.7	12	4.7
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	280	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	280	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	280	< 10

Results - Soil

Project: P18-351 Aldi, Whitehaven

Client: 3E Consulting Engineers Ltd	Chemtest Job No.:				21-43704	21-43704	21-43704	21-43704
Quotation No.: Q20-21147	Chemtest Sample ID.:				1337679	1337680	1337681	1337682
	Sample Location:				WS01	WS02	WS02	WS03
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.2	0.7	1.5	0.5
	Date Sampled:				29-Nov-2021	29-Nov-2021	29-Nov-2021	29-Nov-2021
	Asbestos Lab:				COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD				
Naphthalene	U	2800	mg/kg	0.10	1.2	< 0.10	1.1	1.1
Acenaphthylene	N	2800	mg/kg	0.10	0.41	< 0.10	0.54	0.43
Acenaphthene	U	2800	mg/kg	0.10	0.67	< 0.10	1.0	1.4
Fluorene	U	2800	mg/kg	0.10	0.40	< 0.10	0.83	1.3
Phenanthrene	U	2800	mg/kg	0.10	3.2	2.0	6.9	15
Anthracene	U	2800	mg/kg	0.10	1.2	1.9	1.4	2.8
Fluoranthene	U	2800	mg/kg	0.10	9.0	4.1	11	19
Pyrene	U	2800	mg/kg	0.10	7.6	3.3	9.6	15
Benzo[a]anthracene	U	2800	mg/kg	0.10	5.0	2.6	5.8	8.1
Chrysene	U	2800	mg/kg	0.10	4.3	2.1	6.1	7.8
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	5.9	< 0.10	7.1	9.1
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	2.3	< 0.10	2.4	3.3
Benzo[a]pyrene	U	2800	mg/kg	0.10	4.3	< 0.10	5.4	6.9
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	3.1	< 0.10	3.9	4.9
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	0.70	< 0.10	0.89	1.1
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10	2.6	< 0.10	3.7	4.1
Total Of 16 PAH's	N	2800	mg/kg	2.0	52	16	68	100

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenzo[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com



Final Report

Report No.: 21-43708-1
Initial Date of Issue: 20-Dec-2021
Client 3E Consulting Engineers Ltd
Client Address: 2 Esh Plaza, Sir Bobby Robson Way
Great park
Newcastle upon Tyne
NE13 9BA

Contact(s): Alex Middleton

Project P18-351 Aldi, Whitehaven

Quotation No.: Q20-21147

Date Received: 10-Dec-2021

Order No.: P18-351

Date Instructed: 10-Dec-2021

No. of Samples: 4

Turnaround (Wkdays): 7

Results Due: 20-Dec-2021

Date Approved: 20-Dec-2021

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Soil

Project: P18-351 Aldi, Whitehaven

Client: 3E Consulting Engineers Ltd	Chemtest Job No.:				21-43708	21-43708	21-43708	21-43708
Quotation No.: Q20-21147	Chemtest Sample ID.:				1337692	1337693	1337694	1337695
	Sample Location:				WS01	WS02	WS02	WS03
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.2	0.7	1.5	0.5
	Date Sampled:				29-Nov-2021	29-Nov-2021	29-Nov-2021	29-Nov-2021
Determinand	Accred.	SOP	Units	LOD				
Moisture	N	2030	%	0.020	25	24	26	24
Arsenic	M	2450	mg/kg	1.0	21	27	29	32
Barium	M	2450	mg/kg	10	150	160	180	170
Cadmium	M	2450	mg/kg	0.10	0.22	0.22	0.20	0.13
Chromium	M	2450	mg/kg	1.0	21	15	18	27
Molybdenum	M	2450	mg/kg	2.0	2.7	3.6	4.3	4.0
Antimony	N	2450	mg/kg	2.0	2.7	2.8	3.4	2.9
Copper	M	2450	mg/kg	0.50	52	56	110	68
Mercury	M	2450	mg/kg	0.10	1.0	0.47	0.31	0.45
Nickel	M	2450	mg/kg	0.50	33	39	54	56
Lead	M	2450	mg/kg	0.50	200	230	230	100
Selenium	M	2450	mg/kg	0.20	0.52	0.78	0.47	0.55
Zinc	M	2450	mg/kg	0.50	150	120	130	120

Results - 2 Stage WAC

Project: P18-351 Aldi, Whitehaven

Chemtest Job No: 21-43708							Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 1337692							Limits		
Sample Ref:							Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:									
Sample Location: WS01									
Top Depth(m): 0.2									
Bottom Depth(m):									
Sampling Date: 29-Nov-2021									
Determinand	SOP	Accred.	Units						
Total Organic Carbon	2625	M	%				4.5		
Loss On Ignition	2610	M	%				8.1		
Total BTEX	2760	M	mg/kg				< 0.010		
Total PCBs (7 Congeners)	2815	M	mg/kg				< 0.10		
TPH Total WAC	2670	M	mg/kg				220		
Total (Of 17) PAH's	2700	N	mg/kg				53		
pH	2010	M					8.4		
Acid Neutralisation Capacity	2015	N	mol/kg	0.015			To evaluate		
Eluate Analysis			2:1 mg/l	8:1 mg/l	2:1 mg/kg	Cumulative mg/kg 10:1	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1455	U	0.0037	0.0010	0.0072	0.012	0.5	2	25
Barium	1455	U	0.013	< 0.005	0.026	0.0086	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	70
Copper	1455	U	0.0025	0.0007	0.0049	0.0016	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.4	10	40
Lead	1455	U	0.0025	0.0005	0.0047	0.0065	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.003	< 0.003	< 0.003	4	50	200
Chloride	1220	U	< 1.0	< 1.0	< 10	< 10	800	15000	25000
Fluoride	1220	U	0.16	0.084	< 1.0	< 1.0	10	150	500
Sulphate	1220	U	1.5	< 1.0	< 10	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	78	22	150	250	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	7.0	< 2.5	< 50	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	25

Leachate Test Information	
Leachant volume 1st extract/l	0.291
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.111

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: P18-351 Aldi, Whitehaven

Chemtest Job No: 21-43708							Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 1337693							Limits			
Sample Ref:							Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID:										
Sample Location: WS02										
Top Depth(m): 0.7										
Bottom Depth(m):										
Sampling Date: 29-Nov-2021										
Determinand	SOP	Accred.	Units							
Total Organic Carbon	2625	M	%				4.2	3	5	6
Loss On Ignition	2610	M	%				7.6	--	--	10
Total BTEX	2760	M	mg/kg				< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg				< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg				83	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg				7.4	100	--	--
pH	2010	M					8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.016	--	To evaluate	To evaluate			
Eluate Analysis			2:1 mg/l	8:1 mg/l	2:1 mg/kg	Cumulative mg/kg 10:1	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg			
Arsenic	1455	U	0.0044	0.0048	0.0085	0.047	0.5	2	25	
Barium	1455	U	0.019	0.008	0.036	0.090	20	100	300	
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5	
Chromium	1455	U	0.0068	0.0018	0.013	0.022	0.5	10	70	
Copper	1455	U	0.0027	0.0016	0.0052	0.0025	2	50	100	
Mercury	1455	U	0.00018	< 0.00005	0.00034	0.00016	0.01	0.2	2	
Molybdenum	1455	U	0.0054	0.0009	0.010	0.013	0.5	10	30	
Nickel	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.4	10	40	
Lead	1455	U	0.0007	0.0006	0.0014	0.0060	0.5	10	50	
Antimony	1455	U	0.0019	< 0.0005	0.0036	0.0017	0.06	0.7	5	
Selenium	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.1	0.5	7	
Zinc	1455	U	0.008	< 0.003	0.016	0.007	4	50	200	
Chloride	1220	U	< 1.0	< 1.0	< 10	< 10	800	15000	25000	
Fluoride	1220	U	0.97	0.30	1.9	3.6	10	150	500	
Sulphate	1220	U	5.8	< 1.0	11	< 10	1000	20000	50000	
Total Dissolved Solids	1020	N	98	55	190	580	4000	60000	100000	
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-	
Dissolved Organic Carbon	1610	U	6.2	9.6	< 50	92	500	800	1000	

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	24

Leachate Test Information	
Leachant volume 1st extract/l	0.293
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.157

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: P18-351 Aldi, Whitehaven

Chemtest Job No: 21-43708							Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 1337694							Limits			
Sample Ref:							Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID:										
Sample Location: WS02										
Top Depth(m): 1.5										
Bottom Depth(m):										
Sampling Date: 29-Nov-2021										
Determinand	SOP	Accred.	Units							
Total Organic Carbon	2625	M	%				7.3	3	5	6
Loss On Ignition	2610	M	%				8.7	--	--	10
Total BTEX	2760	M	mg/kg				< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg				< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg				68	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg				46	100	--	--
pH	2010	M					8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.014	--	To evaluate	To evaluate			
Eluate Analysis			2:1 mg/l	8:1 mg/l	2:1 mg/kg	Cumulative mg/kg 10:1	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg			
Arsenic	1455	U	0.0061	0.0045	0.012	0.046	0.5	2	25	
Barium	1455	U	0.006	< 0.005	0.011	0.0040	20	100	300	
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5	
Chromium	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	70	
Copper	1455	U	0.0095	0.0051	0.018	0.0066	2	50	100	
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2	
Molybdenum	1455	U	0.0034	< 0.0002	0.0065	0.0024	0.5	10	30	
Nickel	1455	U	0.0018	0.0009	0.0034	0.0096	0.4	10	40	
Lead	1455	U	0.0017	0.0012	0.0033	0.012	0.5	10	50	
Antimony	1455	U	0.0031	0.0009	0.0060	0.011	0.06	0.7	5	
Selenium	1455	U	0.0014	0.0008	0.0027	0.0088	0.1	0.5	7	
Zinc	1455	U	< 0.003	< 0.003	< 0.003	< 0.003	4	50	200	
Chloride	1220	U	1.1	< 1.0	< 10	< 10	800	15000	25000	
Fluoride	1220	U	0.44	0.13	< 1.0	1.5	10	150	500	
Sulphate	1220	U	7.3	< 1.0	14	< 10	1000	20000	50000	
Total Dissolved Solids	1020	N	72	32	140	340	4000	60000	100000	
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-	
Dissolved Organic Carbon	1610	U	9.5	6.9	< 50	70	500	800	1000	

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	26

Leachate Test Information	
Leachant volume 1st extract/l	0.289
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.122

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: P18-351 Aldi, Whitehaven

Chemtest Job No: 21-43708							Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 1337695							Limits			
Sample Ref:							Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID:										
Sample Location: WS03										
Top Depth(m): 0.5										
Bottom Depth(m):										
Sampling Date: 29-Nov-2021										
Determinand	SOP	Accred.	Units							
Total Organic Carbon	2625	M	%				3.9	3	5	6
Loss On Ignition	2610	M	%				8.2	--	--	10
Total BTEX	2760	M	mg/kg				< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg				< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg				250	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg				67	100	--	--
pH	2010	M					8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg				< 0.0020	--	To evaluate	To evaluate
Eluate Analysis			2:1 mg/l	8:1 mg/l	2:1 mg/kg	Cumulative mg/kg 10:1	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg			
Arsenic	1455	U	0.014	0.0090	0.028	0.093	0.5	2	25	
Barium	1455	U	0.018	0.007	0.035	0.078	20	100	300	
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5	
Chromium	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	70	
Copper	1455	U	0.0068	0.0036	0.013	0.0047	2	50	100	
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2	
Molybdenum	1455	U	0.0090	0.0011	0.017	0.017	0.5	10	30	
Nickel	1455	U	0.0014	0.0005	0.0027	0.0060	0.4	10	40	
Lead	1455	U	0.0013	0.0012	0.0024	0.012	0.5	10	50	
Antimony	1455	U	0.0077	0.0019	0.015	0.023	0.06	0.7	5	
Selenium	1455	U	0.0017	0.0006	0.0033	0.0066	0.1	0.5	7	
Zinc	1455	U	0.004	< 0.003	0.007	0.003	4	50	200	
Chloride	1220	U	2.2	< 1.0	< 10	< 10	800	15000	25000	
Fluoride	1220	U	1.1	0.29	2.1	3.4	10	150	500	
Sulphate	1220	U	10	1.1	19	17	1000	20000	50000	
Total Dissolved Solids	1020	N	98	55	190	570	4000	60000	100000	
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-	
Dissolved Organic Carbon	1610	U	9.2	10	< 50	99	500	800	1000	

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	24

Leachate Test Information	
Leachant volume 1st extract/l	0.295
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.122

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge
650	Characterisation of Waste (Leaching WAC)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

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