MetroWest

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council
6.25, Environmental Statement, Volume 4, Appendix 10.2, Annexes B to J
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, regulation 5(2)(a)
Planning Act 2008

Author: CH2M
Date: November 2019

NetworkRail · West of England Local Enterprise Partnership · West of England Combined Authority · HM Government · Bath & North East Somerset Council · Bristol City Council · North Somerset Council · South Gloucestershire Council · travelwest

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Ashton Vale Road Alternative Highway Access Preliminary Sources Study Report
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Author: CH2M
Date: November 2019

GEOTECHNICAL AND GEOENVIRONMENTAL DESK STUDY

Ashton Vale Road Alternative Highway Access, Preliminary Sources Study Report

Prepared for

North Somerset Council

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CH2M Hill
Burderop Park
Swindon
SN4 0QD

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1 Executive Summary

The MetroWest Scheme proposes the closure of the Ashton Gate level crossing on the Portishead rail line, located off the A3029 Winterstoke Road in southwest Bristol. This would require the construction of an alternative access road to connect the Ashton Gate Trading Estate to surrounding highways.

Two alternative access options have been proposed. Option B crosses a small brook (Longmoor Brook), and traverses along the edge of an historic landfill, entering the trading estate from the south-west. Option C proposes modifications to the existing A370, and construction of a new link road, entering the trading estate from the north-west.

This report has been prepared to address the following aspects of the proposed alternative access options:

- Collation and summary of relevant site data and ground investigation information undertaken in the vicinity, and geotechnical observations from a site walkover survey
- Development of a ground model and assessment of likely geotechnical, hydrogeological and geo-environmental risks
- Recommendations for further ground investigation.

No scheme specific ground investigation has been completed at this stage, although substantial information is available from ground investigation for the AVTM metrobus scheme in the area of part of Option B.

Option B is located over thick alluvial and landfill material and so there is potential for large amounts of settlement. Limited superficial deposits are expected beneath Option C.

Option C crosses a steep (~45-56^{o}) slope, created by an old clay pit excavated between 1917 and 1932. The condition of the slope is considered 'unproven', and further detailed investigation and inspection of the condition of the slope is recommended.

Coal mining activity is extensive in the area. Route Option B is located close to a known historic mine shaft (Ashton Vale Old Pit), however, from assessing all available information it is not expected to interfere with the planned route, although there is significant risk for unknown mine entries and shafts to be present which could affect the planned development.

Worked coal veins are likely to be present beneath both route options. There is potential for collapse up to approximately 10-20mBGL, thus significantly affecting the performance of piles.

The majority of risks relating to land contamination can be mitigated as part of scheme design or Health and Safety plan. The scheme design will need to address risks to the water environment, such as a piling risk assessment. The key implication to the scheme is cost associated with disposal of ground contamination, from the landfill areas. There are few options to treat or re-use this material, and disposal costs are likely to be approximately £250/m^3.

Outline recommendations for ground investigation scope are included in this report.

2 Introduction and Objectives

The MetroWest Scheme proposes the closure of the Ashton Gate level crossing on the Portishead rail line, located off the A3029 Winterstoke Road in southwest Bristol (refer to Figure 2-1). This would require the construction of an alternative access road to connect the Ashton Gate Trading Estate to surrounding highways.

Alternative access options to the Ashton Gate Trading Estate are being considered under the project title: Ashton Vale, Alternative Highway Access.

The Objective of this report is to review existing information on the ground conditions and document ground risk associated with the proposed Route Options. Two Route Options are being considered Route Option B and Route Option C. A summary of these Options is presented in Section 2.1 and drawings are presented in Appendix A.

Route Option B passes through the Manheim Car Auction site. Ground risk associated with this option has been studied previously, refer to (Appendix F):

> CH2M (2016). MetroWest Ashton Gate level crossing closure – high level review of geotechnical and geo-environmental issues for proposed alternative access route.

CH2M (2016) recommended the following tasks with respect to further research and definition of ground risk with respect to Route Option B (Through the Manheim Car Auction site):

1. A more detailed desk study to include:
    a. Attempting to obtaining information on the mine shaft in the area of the ETS waste transfer station and on the possible presence of shallow mine workings;
    b. Attempting to obtain previous ground investigation data from the BCFC stadium investigations;
    c. Assessment of the coal sub-crop geometry to assess the risk of the presence of shallow mine workings;
2. Undertake a Contamination Risk Assessment for the site, including review of landfill ground investigation data;
3. Undertake a detailed UXO risk assessment for the site.

This report addresses Point 1a, 1b, 1c and Point 2 above with respect to Route Option B and C. Note that CH2M (2016) did not consider Route Option C, which was included subsequent to the issue of CH2M (2016). Therefore, this Technical Memo extends the study area in order to inform and report upon the ground risk for Route Option C.

Point 3 above (a UXO detailed risk assessment) is a prerequisite for ground works (including ground investigation). Ground investigation will be necessary and it is assumed that this will only proceed once a decision on the preferred Route Option is made. Therefore, Point 3 is not undertaken herein, it is recommended that this is undertaken once a decision on the preferred Route Option is made.

2.1 Route Options

Figure 2-1 shows the approximate location of the two proposed routes. Detailed plans of the two proposed route options are provided in Appendix A.

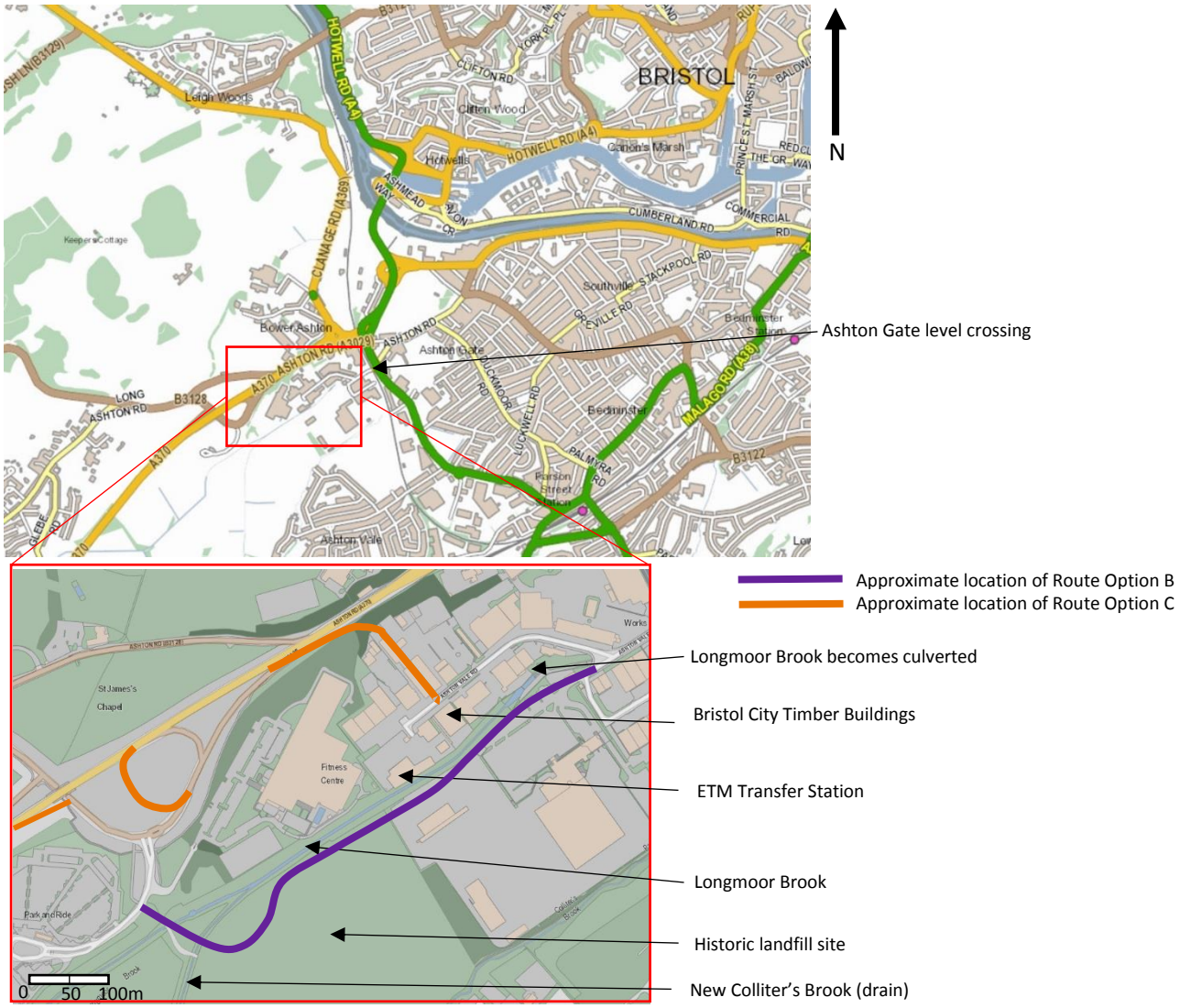


Figure 2-1: Site location map (Know your place). Approximate route options are indicated, the detailed route plans are provided in Appendix A.

2.1.1 Route Option B. Through Manheim Car Auction Site.

This is shown on the drawing in Appendix A. In summary, the scheme comprises a new access road approximately 650m long, from west to east.

- In the west, the new access road starts at the junction of the Long Ashton Park and Ride road and David Lloyd sports centre access road;
- The road heads southeast over Longmoor Brook and New Colliter's Brook immediately upstream of their confluence;
- The road continues parallel to Longmoor Brook on the south side of the brook and along the northern edge of the historic landfill site before entering the Manheim Car Auctions site in the northwest corner;
- The road continues parallel with Longmoor Brook, before joining Ashton Vale Road.

Details of the proposed development for Route Option B is provided by Section 9.

2.1.2 Route Option C. Directly from A370 from the North.

This is shown on the drawing in Appendix A. In summary, the scheme comprises from west to east:

- On the A370, a new southbound single lane with hard shoulder on-slip road;
- The existing path that runs parallel to the existing A370 off-slip is to be widened to 3m and converted to a shared foot/cycle path;
- The existing A370 off-slip is to be retained and converted into a new highway link road into the industrial estate;
- A new southbound off-slip is to be constructed;
- A new link road will provide an entrance to the industrial estate to join Ashton Vale Road from the north. North of the David Lloyd's Sports Centre the road will be in cut (1.5m) before spanning the existing slip road slope, where an elevated highway or embankment with retaining wall will be required;
- Associated amendment/improvements to existing junctions will also take place.

Details of the proposed development for Route Option C is provided by Section 9.

3 Sources of Information

3.1 Previous Site-Specific Ground Investigation

This desk study is primarily based upon previous geotechnical information obtained by CH2M for the Ashton Vale to Temple Meads (AVTM) Metrobus scheme, between 2010 and 2013 for the West of England Partnership / Bristol City council:

- Halcrow- Ashton Vale to Temple Meads and Bristol City Centre, geotechnical Desk Study 2012;
- Structural Soils- Ashton Vale to Temple Meads and Bristol City Centre, Ground Investigation 2013;
- RPS Explosives Engineering Services- Ashton Vale to Temple Meads, Detailed Desk Study for Potential Historic Unexploded Ordnance Contamination 2012;
- Halcrow- Bristol Rapid Transit Route Corridor & City Centre sections, Phase I Preliminary Risk Assessment 2010.

3.2 Adjacent Ground Investigation

The AVTM desk study made reference to some earlier reports prepared for the development of a new football stadium at the landfill site to the south of Route Option B:

- Ove Arup and Partners International Limited- Land at Ashton Vale Geo-Environmental Report 2002;
- URS- Bristol City Football Club Site Investigation, Geo-Environment Interpretative Report 2009;
- WSP- Bristol City Football Club Site Investigation, Environment Statement 2009.

3.3 Other Sources

A number of other sources of information have also been used:

- Ordnance Survey maps [map number: 154];
- British Geological Survey, 2016. Online borehole database http://mapapps.bgs.ac.uk/geologyofbritain/home.html [accessed January 2017];
- British Geological Survey, 1993. Geology of the Bristol District. Memoir for 1:63360 geological special sheet (England and Wales). Geological Survey of England and Wales;
- British Geological Survey (2004). Solid and Drift, 1:50000, sheet number: 264;
- Geological Survey of England and Wales, 1:10000, sheet number: ST57SE (1995)
- Historic maps from Bristol City Council 'Know Your Place' online application https://maps.bristol.gov.uk/knowyourplace/ [accessed January 2017];
- Environment Agency 'What's in your backyard?' website www.environment-agency.gov.uk/ [accessed January 2017];
- Google earth satellite and Streetview imagery www.google.com\earth [accessed January 2017];
- Coal Authority Shaft Plan and Data Sheets (2016);
- AVTM Coal Authority Report (2012).

3.4 Site Walkover

A site walkover was undertaken in January 2017. The site plan and photos are included in Appendix B.

The main observations relevant to Option B:

- Soft ground present south of Longmoor Brook (photos 3920-3922).
- Gently sloping banks of Longmoor Brook (approximately 0.5m high) and in parts, densely vegetated (photo 3918 and 3925).
- Black plastic liner visible in places on the southern bank of Longmoor Brook (photos 3926, 3932 and 3933).

The main observations relevant to Option C:

- Steep, likely cut, vegetated slope present north of David Lloyd's sports centre, with an approximately 4m high gabion wall located at the base. The gabion wall appeared in relatively good condition (see photos 3968-3973).
- Steep, uneven and vegetated ground, either side of a ditch located north of the park and ride (photos 3959-3963).

4 Site Description

4.1 Topography and Geomorphology

The site is located on the western edge of the city of Bristol in Ashton Vale (see Figure 2.1). The site is in the wide, level base of the SW-NE orientated valley of Ashton Vale with drainage running northeastwards. Natural drainage is poor, with soft, boggy ground found where the land is low-lying and where it has not been artificially raised or drained.

The land rises north of the brooks, with clay pits cut into the valley side north of the trading estates, steepening the valley slope. The land is less boggy, with a school and playing field located north of the A370. The A370 is a primary road running between Weston-super-Mare and Bristol. The by-pass at Long Ashton was constructed in the 1970s, and the land has been raised as part of the earthworks associated with the construction.

The valley to the southwest of the Manheim Car Auction is used for grazing or is untended wetland.

A topography survey was undertaken in February 2017.

4.1.1 Route Option B Topography

The Long Ashton Park and Ride and David Lloyd Entrance Road is at ~11mAOD. Longmoor Brook and New Colliter's Brook (where Route Option B crosses in the west) are at ~5mAOD, the land between the confluence of the brooks is ~7mAOD. The landfill is elevated in its centre (~11mAOD) and slopes towards the watercourses of Longmoor Brook to the north (~5mAOD), New Colliter's Brook to the west and Colliter's Brook to the south. Route Option B will traverse along the northern edge of the landfill at approximately 9mAOD before entering Manheim Car Auctions Site and joining Ashton Vale Road at ~9mAOD.

4.1.2 Route Option C Topography

The A370 varies in height from ~19mAOD in the west, north of the Park and Ride, to ~21mAOD north-east of David Lloyd's Sports Centre. The A370 is 20.4mAOD at the point where it is intended that the new link road for Option C starts to enter the industrial estate. This part of the route is proposed to be in cut (~1.5m), reducing the elevation difference between the link road and Ashton Vale Road below. The elevation difference is approximately 12m over a best estimate of between 8 and 12m, suggesting a slope angle of between 45^{o} and 56^{o} (see plate reference 3983-3985). An approximately 4m high gabion wall is located just north-east of the David Lloyd's sports centre.

In the west, where a new southbound single lane with hard shoulder on-slip road is to be constructed, there are dense brambles either side of a ditch at ~9.7mAOD. The ground slopes up from the ditch to the A370 to the north at ~19mAOD (over approximately 13m, giving a slope angle of ~38^{o}).

4.2 Man-Made Features

This desk study has attempted to identify the man-made features relevant to the two proposed routes, using the site walkover, maps and Google Earth. A full inventory and survey of existing highways, utilities and assets should be established, prior to construction. This will assist in evaluating risk assessment (to existing highways, utilities and assets).

4.2.1 Route Option B

The main features associated with Route Option B are;

- Long Ashton Park and Ride;
- AVTM (Currently under construction);
- Landfill;

- The Manheim Car Auction Site (generally level and appears to be on a slightly raised platform and mostly paved with asphalt);
- Ashton Gate and Cala trading estates including highways, services and infrastructure;
- Longmoor Brook and culvert.

4.2.2 Route Option C

The main features associated with Route Option C are;

- Long Ashton Park and Ride;
- David Lloyd's Sports Centre with associated car park on the slopes on the north side of Longmoor Brook;
- A370 and associated junctions with the B3128 (including overbridge) east of the Park and Ride;
- Ex quarry (Old Clay Pit north of trading estates);
- Ashton Gate and Cala trading estates including highways, services and infrastructure.

4.3 Hydrology

Longmoor Brook is channelised and raised slightly above the valley bottom. Large concrete structures are present on the north side of the auction site just before the brook goes into culverts running northeastwards beneath Ashton Gate and towards the tidal River Avon New Cut.

Figure 4-1: Photo of Longmoor Brook from footbridge. Looking northeast at Bristol City FC Stadium. Low shrubs and grass with occasional trees are visible on the gently sloping slopes.

During normal flow, Longmoor Brook is approximately 0.5m deep, with gentle slopes covered by low vegetation (see Figure 4.1). New Colliter's Brook joins Longmoor Brook south of the Long Ashton Park and Ride.

Historical maps indicate that Ashton Brook flowed from east to west between Longmoor Brook and Ashton Road to the north. Following the construction of the trading estates Ashton Brook becomes culverted, and then David Lloyds Sports Centre was constructed between 1994-1998 where Ashton Brook used to be located. Route Option C will cross the old alignment of Ashton Brook which may have been culverted.

Flood Zone 3- 1 in 100 or greater chance of river flooding annually.

Flood Zone 2- between 1 in 100 and 1 in 1000 chance of river flooding annually.

Figure 4-2: Showing the main river lines within the site and the potential flood zones (Environment Agency, What's in your backyard?).

Figure 4.2 shows the flood zones within the area. The western end of the proposed route is located within a Flood Zone 3; the rest of the route is not within any flood zone. Compensatory flood storage may be required, if Route Option B is the preferred option.

4.4 Site History

The area has a long history of development which is summarized in Table 4.1. This is primarily based on an Envirocheck Report (2012), obtained for the AVTM desk study and information from the Environment Agency website 'What's in your backyard?' [accessed January 2017].

The types of waste buried within the landfills include:

- Inert- "Waste which remains largely unaltered once buried such as glass, concrete, bricks, tiles, soil and stones." (EA What's in your backyard?)
- Industrial- "Waste from a factory or industrial process. It excludes waste from mines, quarries and agricultural wastes." (EA What's in your backyard?)
- Commercial- "Waste from premises used wholly or mainly for trade, business, sport, recreation or entertainment. Excludes household and industrial waste." (EA What's in your backyard?)
- Special- "Waste that has hazardous properties and is defined in the Special Waste Regulations 1996. Such properties may be flammable, irritant, toxic, harmful, carcinogenic or corrosive." (EA What's in your backyard?)
- Household- "Waste from dwellings of various types including houses, caravans, houseboats, campsites, prisons and wastes from schools, colleges and universities." (EA What's in your backyard?)

The EA provide outline information on the Landfill sites at Ashton Vale and Parsonage Farm (Figure 4.3):

- Phase 3 Landfill Site at Ashton Vale first received waste in 1985 and last received waste in 1991
  - Inert
  - Industrial
  - Commercial
- Phase 2 of Landfill Site at Parsonage Farm first received waste in 1983 and last received waste in 1991
  - Inert
  - Industrial

    - Commercial
- Land at Parsonage Farm and Phase 2 first received waste in 1981 and last received waste in 1988
    - Inert
    - Industrial
    - Commercial
    - Special
- Viridor Long Ashton first received waste in 1992, and no information is provided as to when it last received waste
    - Inert
    - Industrial
    - Commercial
    - Household

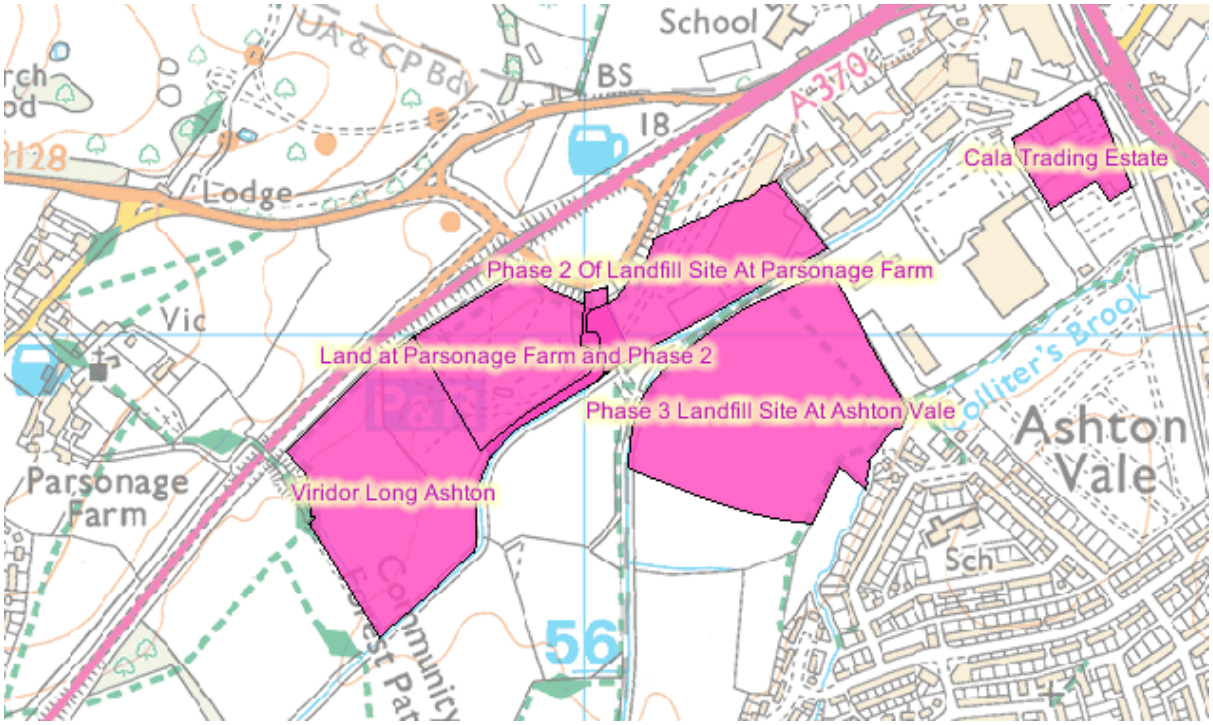


Figure 4-3: Landfill sites within the area (Environment Agency What's in your backyard?) (accessed January 2017)

Table 4-1: Summary of site history, tick indicates relevance of development details to each route. Envirocheck (2012) historical maps are provided in Appendix H.

Date	Development Details	Route Option B	Route Option C
1840s (Tithe Map)	• Northern part of site north of Longmoor Brook is off the map		
	• Longmoor Brook and Old Colliter's Brook shown at approximate current location. Predominantly agricultural land with field boundaries. 3 houses to east in current trading estate area	✓	
	• Coal pits shown to south and east.	✓	✓
1886-1894 (1st Edtn OS)	• Ashton Vale Works (shown variously as Iron Works, Brick and Coke) on north side of Longmoor Brook including clay pits to north and west, coke ovens and factory buildings in centre, colliery to east, railway lines in centre and east, and possible spoil heap to south along northern bank of Longmoor Brook.	✓	✓
	• Kennel farm shown approximately where current B3128 goes underneath the A370		✓
	• Ashton Road north of Kennel Farm		✓
	• Ashton Brook flowing west to east, north of Longmoor Brook		✓
	• Frayne's Colliery (disused) shown on south side of Ashton brook in current trading estate area	✓	✓
	• Housing to north east and Kennel Farm to north		✓
	• Air shaft and buildings labelled where Ashton Vale Old Pit is believed to be.	✓	
1900 - 1918	• Larger spoil heap alongside Longmoor Brook and larger clay pit to north Colliery on north side now labelled "Old Colliery" suggesting disused	✓	
	• Allotment gardens around former Frayne's colliery	✓	✓
	• Buildings and air shaft associated with Ashton Vale Old Pit no longer present	✓	
1930 - 1932	• Ashton Vale works now described as brick and tile works with kilns shown	✓	✓
	• Large clay pit between Ashton Brook and Ashton Road north of the current trading estates		✓
	• Allotments are now Saw Mills	✓	✓
	• Sign of raised filling in SE corner of landfill site	✓	
	• Marshy ground shown around Longmoor Brook	✓	
	• Bristol Water Works supply, highlighted to the north of Longmoor Brook	✓	✓
1946 Air Photo	• Possible labour or military camp occupying site of current car auctions site	✓	
	• Filling in SE corner of Ashton Fields landfill	✓	
	• Coke and brickworks appear to be disused and overgrown	✓	✓

Date	Development Details	Route Option B	Route Option C
1948-54	• Tanks labelled at sides of some buildings in labour camp	✓	✓
	• Saw Mills expanded and timber yards and joinery works make up eastern half of current trading estate	✓	✓
	• Clay pit between Ashton Brook and Ashton Road now labelled as Old Clay Pit		✓
	• Warehouse labelled as Ministry of Works present on current southern half of Manheim Car Auction site. Raised land indicated on edge of brook for development platform	✓	
	• Pond near the confluence of Longmoor Brook and New Colliter's Brook	✓	
1963	• Construction of Ashton Vale Road and trading estate with separate units, depots and builders yard shown on north side of Longmoor Brook. Raised land indicated around edge of trading estate for development platform	✓	✓
	• Ashton Brook culverted		✓
	• Ashton park Secondary school (with tennis courts and playing field) and houses constructed north of Ashton Road		✓
	• Large depot constructed at Manheim Car Auctions plot replacing previous camp, labelled "National Assistance Board Offices" (HM Stationary Office in 1974) and vehicle testing centre in NW corner (1974)	✓	
1969-1970	• A370 Brunel Way reprofiled to north with new junctions. Kennel Farm demolished.		✓
	• Depot shown at current ETM site, with tanks	✓	
1987-1989	• ETM site new buidings (1983)	✓	
	• Longmoor brook has been channelised with straight channel and regular side slopes and culvert construction. New Colliter's Brook constructed	✓	
	• Appears to be a footbridge crossing Longmoor Brook	✓	
	• Ashton Brook no longer visible		✓
1994-1996	• Park and Ride developed in phases commencing after 1991 and before 1999.	✓	✓
	• Fitness centre constructed over where Ashton Brook was located	✓	✓
1999-2016 (Google Earth Satellite Image)	• Manheim car auctions visible in 1999	✓	
	• Construction of AVTM	✓	

4.5 Regional Geology

A summary geological map from the AVTM Envirocheck Report (2012) is provided in Figure 4.4.

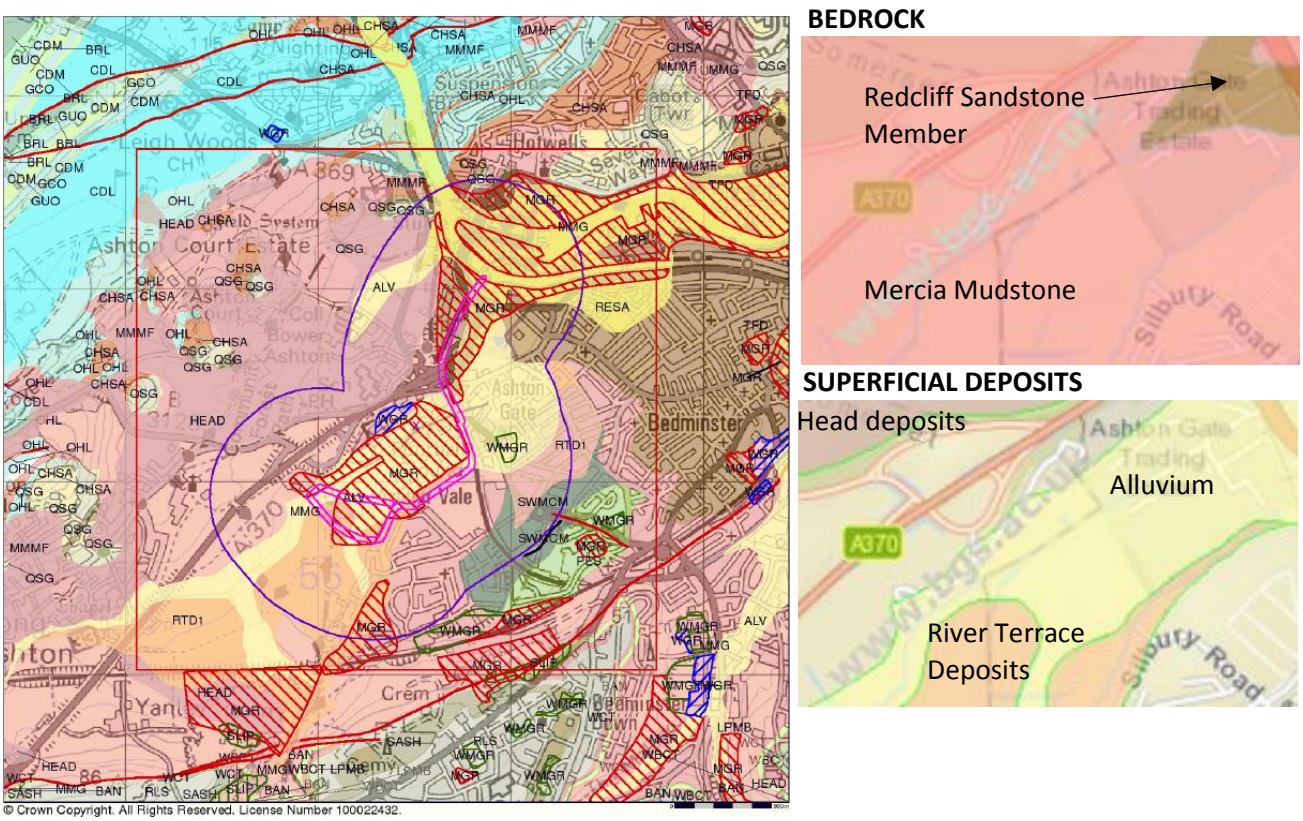


Figure 4-4: BGS Geological Map for site extracted from AVTM Envirocheck report (2012). Red hatched areas represent made ground such as landfills, earthworks and land raising.

4.5.1 Superficial Deposits

4.5.1.1 Route Option B

The Ashton Fields area typically comprises landfill (at the Long Ashton Park and Ride site and raised land south of Longmoor Brook at the 'Northern Fields' landfill site) or made ground of colliery spoil and iron works ash and clinker raised above existing floodplain (at the Ashton Vale Trading Estate), overlying soft alluvium, possibly with a desiccated crust and lenses of sand. Where there has been no artificial land raising, alluvium is located at surface in the valley bottom. The alluvium may overlie thin River Terrace Deposits (sand and gravel).

4.5.1.2 Route Option C

No superficial deposits are expected immediately south of the A370, although Head deposits consisting of sand, gravel or clay, formed from solifluction and soil creep outcrop north of the A370 (Figure 4.4).

4.5.2 Bedrock

Beneath any artificial or superficial deposits, Mercia Mudstone is present with occasional sandstone bands. The Mercia Mudstone Group has been differentiated between CIRIA C570 weathering Zones IVb and IVa, where the Mercia Mudstone generally resembles a stiff to very stiff CLAY, and Zones I to III, where the degree of weathering is less and the lithology is generally described as MUDSTONE interbedded with SILTSTONE or SANDSTONE beds (Table 4.2). The Mercia Mudstone unconformably overlies steeply dipping Coal Measures strata, with historic coal mining beneath both route options. Historically there were several coal mines in the area, and the former coal mine spoil and development platforms that raised the mines above the floodplain now form the site of the current trading estate and Manheim Car Auctions site (Route Option B).

To the east of both route options and underlying much of the Ashton Gate trading estate, the Redcliffe Sandstone Member of the Mercia Mudstone Group predominates.

Table 4-2: Mercia Mudstone weathering grades

Mercia Mudstone Group Weathering Grades (after CIRIA C570)

Weathering Zone	Generalised Geological Description
MMG Zone IVb and IVa	• Stiff to very stiff reddish brown slightly sandy silty CLAY.
MMG Zone III to I	• Very stiff reddish brown silty/sandy CLAY. • Extremely weak to weak thinly laminated to medium bedded reddish brown silty MUDSTONE. • Very weak to weak thinly to thickly laminated reddish brown clayey SILTSTONE. • Very weak to medium strong thinly to medium bedded reddish brown fine grained SANDSTONE.

4.6 Hydrogeology

Low lying ground within the area has a high groundwater level with occasional artesian water pressures encountered. Ground investigation within the area of Route Option B show that groundwater strikes range from -1.5mAOD to 8.2mAOD, often confined rising to 4.5mAOD to 8.2mAOD.

The Envirocheck Report (2012) and the Environment Agency website 'What's in your backyard?' indicate that both route options are located on a Secondary B Bedrock aquifer, which is predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

The superficial deposits beneath Route Option B are a Secondary A superficial aquifer, which is a permeable layer capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

Both route options are not located in a source protection zone. Historically the Redcliffe Sandstone member has been an important aquifer for Bristol. It is classified as a Secondary A Bedrock aquifer.

5 Anticipated Ground Conditions

No site-specific ground investigation has been undertaken for this scheme. However, ground investigation has been undertaken for the purpose of the AVTM scheme, which includes the southwest part of the Route Option B layout and confirms that the geological sequence for the low-lying ground is as expected from BGS records (Section 4.5 above).

Ground investigation from AVTM, the proposed new football stadium and BGS archives has been used to create cross sections and tables of typical ground condition for both Route Options. The exploratory hole logs and location plan are provided in Appendix C and D respectively.

5.1 Topsoil

Topsoil is likely to be encountered to areas of landscaping and parts of the Route Options which are yet undeveloped.

Local to the landfill, approximately 200mm of grass and rootlets has been proven within reddish brown gravelly clayey soil.

5.2 Made Ground and Fill

Made ground and fill should be expected across areas subject to previous development. Landfill is discussed in Section 5.3 below, elsewhere it is present at the trading estates and is shown by Figure 4.4. The source of fill is likely to be associated with previous industrial activity including past mining activity within the area. Earthwork fill also forms the embankment to the A370.

5.3 Landfill Material

The EA website 'What's in your backyard?' indicates that the type of waste buried in the landfills within the area is mainly inert, industrial and commercial with special and household waste buried at Land at Parsonage Farm and Viridor Long Ashton landfills respectively (see Section 4.4).

Trial Pits identified a capping to the landfill material consisting of cohesive sandy, gravelly clay, between 0.3m and 1.2m thick. The landfill material is highly variable, including but not restricted to waste packaging, timber, chipboard, concrete, masonry, metal, wire, rubber, polystyrene and ash. The thickness of the landfill material varies between 1 and 7m, down to a depth of approximately 5-6mAOD. Packaging waste dominates where the landfill material is thickest, while demolition material is found more towards the northern end of the landfill site.

5.4 Alluvium

The majority of the landfill material and the low-lying ground (which underlies Route Option B) overlies alluvial deposits. These deposits vary in thickness from 0m to 5.7m (typical thicknesses between 4 and 5m), with the base of the strata between 1 and 2mAOD. The alluvial deposits are likely to thin further up valley sides, and as such not likely to subcrop beneath much of Route Option C. Typically these soils are soft to firm grey and brown CLAY, mottled in places with occasional pseudo-fibrous peat.

5.5 Mercia Mudstone

Mercia Mudstone was found to consistently underlie the alluvial deposits.

The top of the Mercia Mudstone is weathered, and down to a depth of approximately 1-2m, reddish brown clay is recovered. The weathered zone is gradational and depth variable. The AVTM Ground Investigation identified that the top approximately 4m of Mercia Mudstone is Zone IVb and Iva which grades down to Zones I-III towards the base. BGS boreholes located adjacent to the A370 encountered moderately compact silt and sand and gravel up to 2.2m, above stiff to hard red brown marl. This is potentially further evidence of a weathered surface to the Mercia Mudstone.

Thin sandstone bands, varying in thickness between 0.45 and 1.65m, within the Mudstone are believed to represent "skerry" bands which are characteristic of the Mercia Mudstone Group (Hobbs et al., 2002). The thicknesses and continuity of the sandstone bands are variable.

5.6 Coal Measures

The Coal Measures are found to occur down to at least 40mbgl. Previous ground investigation has found that the core recovery is significantly less than the Mercia Mudstone, indicating that it is more fractured. The Coal Measures are generally recovered as mudstone with subordinate siltstone and sandstone bands with occasional coal lenses.

Bristol City FC new stadium ground investigation encountered a coal seam in two boreholes with a thickness of 0.7-1.1m (R14). Coal seams were also encountered in the AVTM ground investigation with thicknesses of 0.3-0.4m. The base of this coal seam was found to be between -11.46mAOD and -14.65mAOD. Partial hammering during drilling and loss of flush between depths of -10.63mAOD and -15mAOD were believed to represent historic mine workings associated with the Bedminster Great Coal (URS, 2009), although at these depths the Bedminster Toad Coal may be more likely (see section 6). It is thought that the partial loss of flush could represent collapsed mine workings, although it may have just been the heavy fracturing and poor rock quality of the Coal Measures.

Information regarding the historic coal mining beneath the site is included in Section 6 of this report.

5.7 Conceptual Ground Models

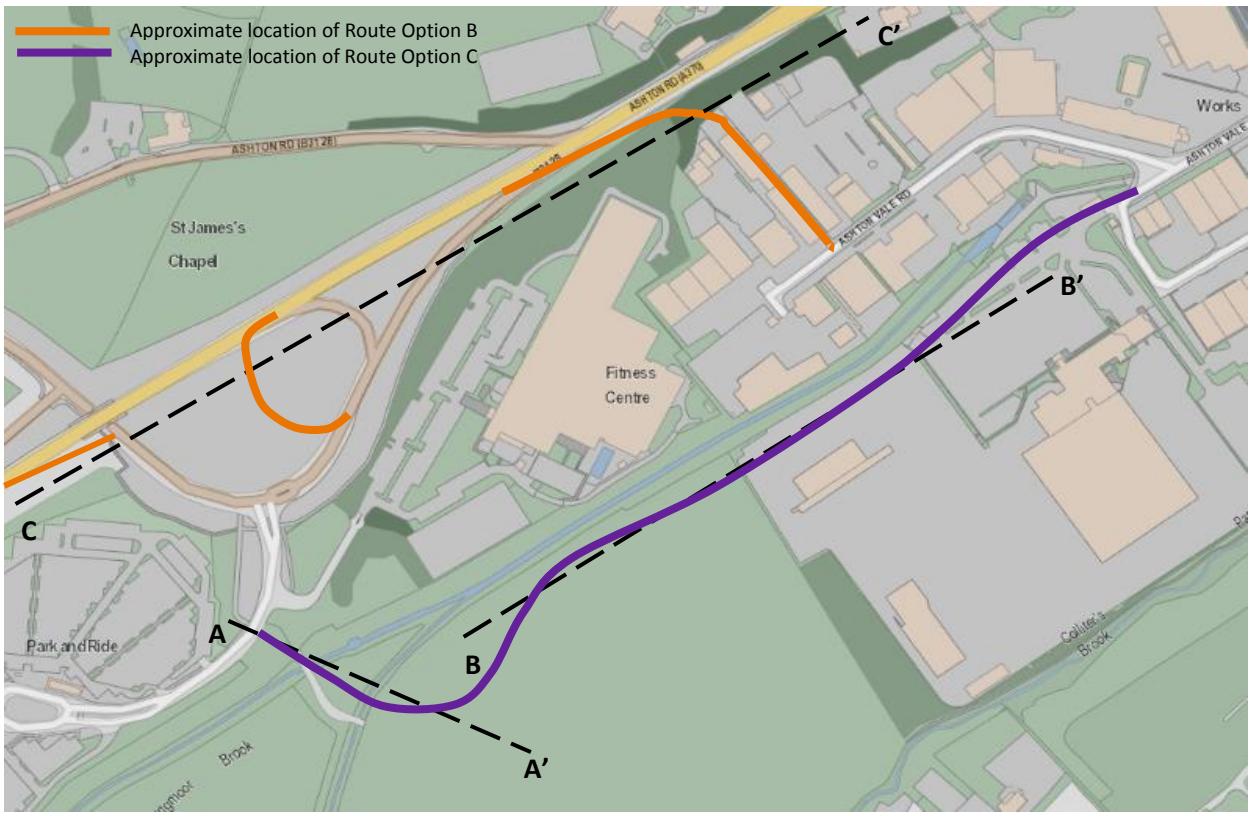


Figure 5-1: Route plan showing location of cross sections A-C.

5.7.1 Route Option B

The expected geology at the western crossing of Longmoor Brook for Route Option B is included in Table 5-1. This has been interpreted from boreholes and trial pits along the route (BH501, BH501A, BH502, BH512, BH513, BH514, BH515, BH516 and BH517). A schematic conceptual cross section is shown below (Figure 5.2).

Figure 5-2: Schematic conceptual cross section.

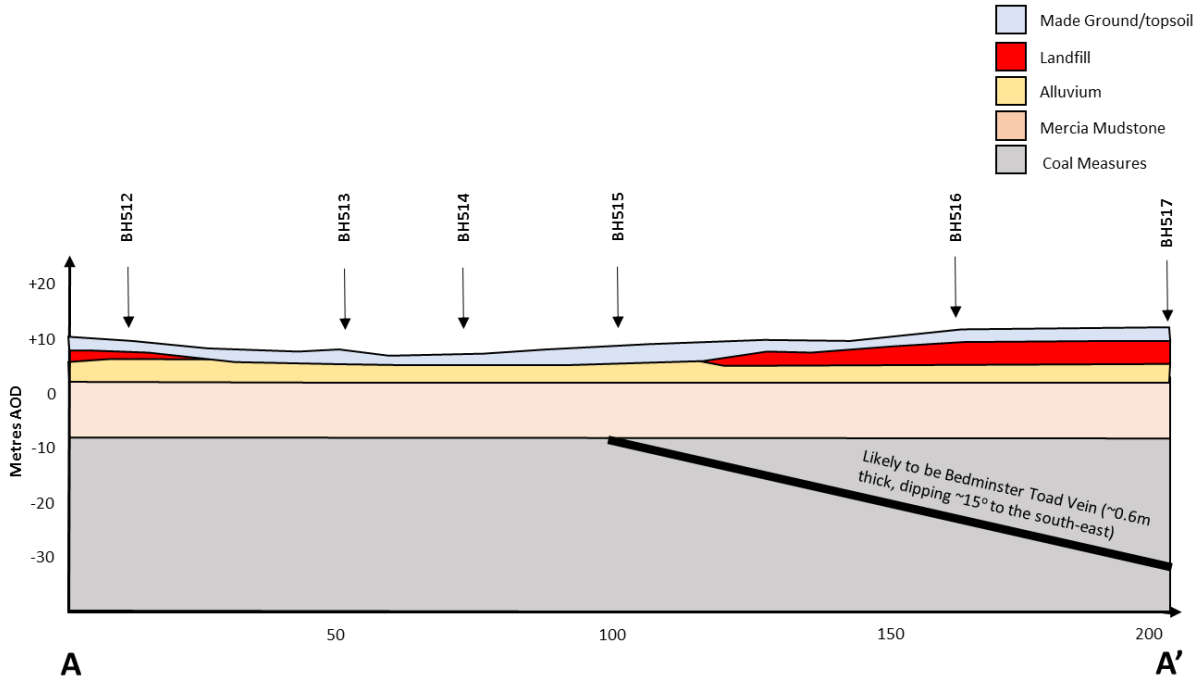


Table 5-1: Summary geology from BH512, BH513, BH514, BH515, BH516, BH517, BH501, BH501A and BH502. (Logs included in Appendix D)

Thickness (m)	Depth to top of strata (m)	Depth to top of strata (mAOD)	Geology	General Description
0-0.3	0	10	Topsoil	
~4-5	0-0.3	10-9.7	Made Ground-Landfill	Highly variable
4-5	5	6	Alluvium	Very soft to firm slightly sandy CLAY with occasional to frequent spongy pseudo fibrous peat.
~2	9-10	2	Mercia Mudstone	Very stiff, high strength CLAY. (Zone IVb)
~9	~11	-1	Mercia Mudstone	Extremely weak, thinly bedded, silty MUDSTONE with very weak thinly to thickly laminated fine grained sandstone beds (Zone I to III)
>4m	~20	-10	Coal Measures	Extremely weak to weak thinly laminated grey partially to distinctly weathered MUDSTONE and SILTSTONE. 0.32m thick coal encountered in BH504 from 21.08 to 21.40m, 0.36m thick coal encountered in BH515 from 22.94 to 23.30m depth and 0.42m and 0.30m thick coal encountered in BH502 from 19.90 to 20.32 and 21.30 to 21.60m depth

For the majority of the route along the edge of the landfill, the expected geology is shown in Table 5-2. This has been interpreted from boreholes and trial pits along the route (ST57SE91, ST57SE90, ST57SE89, S1, S4 and R2). A schematic conceptual cross section is shown below (Figure 5.3).

Figure 5-3: Schematic conceptual cross section.

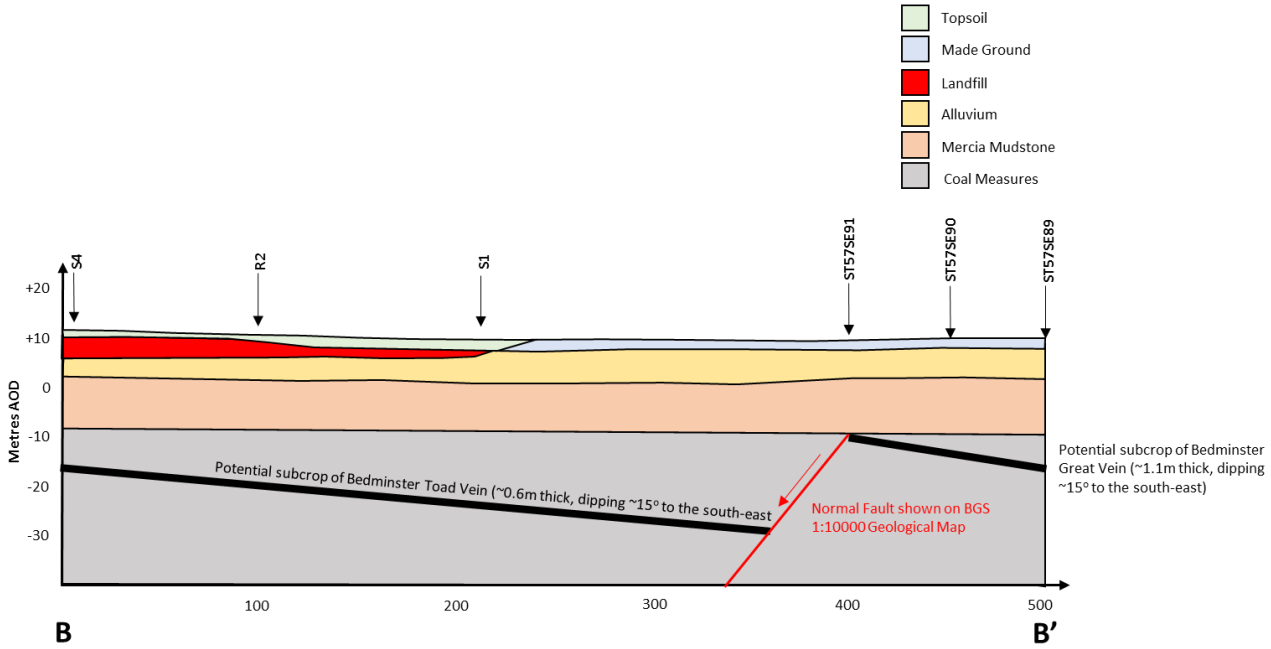


Table 5-2: Summary geology from S4, R2, BH206, S1, ST57SE91, ST57SE90 and ST57SE89. (Logs included in Appendix D).

Thickness (m)	Depth to top of strata	Depth to top of strata (mAOD)	Geology	General Description
0.3	0	11	Topsoil	
Made Ground=2m Landfill=5m	0.3	10.7	Landfill/ Made Ground	Landfill highly variable including paper, wood, plastic with refuse odour. Made Ground consists of ash, small rubble and brick fill
5-8	5	6	Alluvium	Grey/green CLAY, soft silty CLAY and PEAT
~2	10	1	Mercia Mudstone	Very stiff CLAY. (Zone IVb)
>10	12	-1	Mercia Mudstone/Redcliffe Sandstone Member	Interbedded extremely weak SANDSTONE, very stiff sandy CLAY and weak MUDSTONE
			Coal Measures	Anticipate similar as in Table 5-1.

The thickness of the Mercia Mudstone is unknown in this section as no boreholes along the route encountered the Coal Measures. Figure 5-3 provides an approximate depth, estimated from other boreholes in the surrounding area. It should therefore be treated cautiously.

When the route crosses into the trading estates at the eastern part of the route, the landfill ceases, and instead made ground consisting of ash and rubble fill is likely to be present. ST57SE91 reports 2m of ash fill over 0.75m of clay and rubble fill and then very soft alluvial clays and peat to about 7.5m depth, sandy gravel to 8.5m and stiff red clay (Mercia Mudstone) to the base of the hole at 10m depth.

5.7.2 Route Option C

The BGS geology viewer indicates that no superficial deposits should be encountered, however boreholes within the area indicate that Alluvium is present in the west.

BGS boreholes from between 1961 and 1965, ST57SE104, ST57SE105, ST57SE113, ST57SE106 and ST57SE73 are located along the alignment of the A370. The nearest borehole to Route Option C link road is ST57SE73 which indicates very limited superficial deposits consisting of reddish sandy loam with some fragments of calcareous sandstone and pebbles of chert, approximately 1.5m, overlying approximately 40m of the Mercia Mudstone Group overlying Coal Measures. The BGS geology viewer indicates that the superficial deposits are Head deposits formed from mass-movement such as solifluction and soil creep.

Within ST57SE106 and ST57SE105, a 1m to 2.2m layer of moderately compact red, brown sand/silt mixture or gravel is encountered above the Mercia Mudstone. This could be either Head deposits or weathered in-situ Mercia Mudstone. The Mercia Mudstone is described as a hard red/brown silty marl, with some layers of soft to firm red/brown silty marl. Further to the west within ST57SE105 and ST57SE104 Alluvium consisting of soft to firm clay and soft to very soft dark grey clayey silt and peat approximately 3m thick is encountered. Figure 5.4 and Table 5.3 show the expected geology beneath Route Option C.

Figure 5-4: Schematic conceptual cross section.

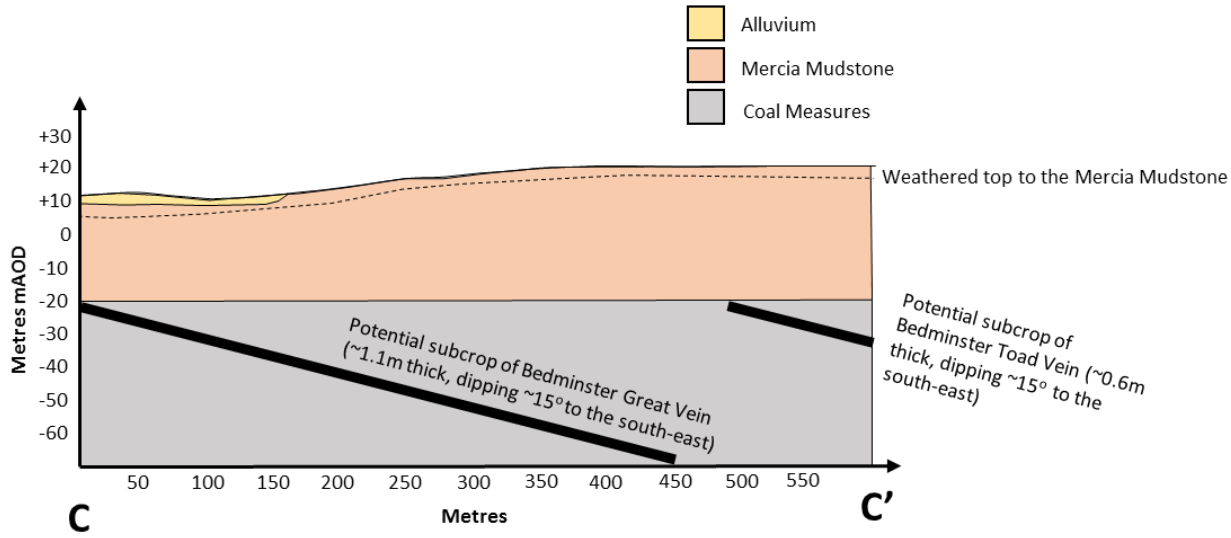


Table 5-3: Typical ground conditions for Route Option C from ST57SE104, ST57SE105, ST57SE106, ST57SE113 and ST57SE73 (Logs included in Appendix D)

Thickness (m)	Depth to top of strata	Depth to top of strata (mAOD)	Geology	General Description
0.3	0	8-21	Topsoil	

Thickness (m)	Depth to top of strata	Depth to top of strata (mAOD)	Geology	General Description
Alluvium present to the west up to 2.9m	0.3	8-9	Alluvium	Soft to firm CLAY and soft to very soft dark grey clayey SILT and PEAT
1-2.2	0.3-3	5-20	Head Deposits/Weathered Mercia Mudstone	moderately compact red, brown SAND/SILT mixture or GRAVEL
40	1.3-5m	4-18	Mercia Mudstone	Hard red/brown silty MARL
		-20	Coal Measures	Anticipate similar as in Table 5-1.

All the boreholes within the area were from before the construction of the A370. Therefore, the superficial deposits are likely to have changed. Potentially the soft superficial deposits may have been removed prior to construction and where embankments are present made ground will be encountered.

5.7.2.1 Route Option C, Slopes

The historical maps indicate that the slope where Route Option C enters the trading estates was created from an old clay pit excavated between 1917 and 1932. The geology of the slope is likely to be Mercia Mudstone. The slope is at a very steep angle (estimated to be 45° to 56°) and vegetated (see site photos in Appendix B). Historical maps do not show any obvious movement of the slope since the clay pit was excavated.

The condition of the slopes is considered 'unproven'; it was not possible to inspect slopes during the walkover due to land-access issues and it has not been possible to acquire any records of slope engineering (as-built) records nor any records of inspection.

Further detailed investigation and inspection of the condition of the slope is recommended, refer to Section 11.

6 Historic Coal Mining

Table 6.1 summarises currently available sources of information regarding historic coal mining beneath the Route Options B and C.

Table 6-1: Summary of Coal Mining records.

Title	Date	Author	Comment
Bristol Metrobus Ashton Vale to Temple Meads Coal Mining Archives	30/09/13	Bristol Coal Mining Archives Ltd	Brief letter report with hand drawn maps showing known shafts and coal seam subcrops
AVTM Coal Mining Risk Assessment	04/10/13	CH2MHill	Completed as part of planning application work for the AVTM route along Cumberland Rd
Non-Residential Coal Authority Mining Reports at Ashton Vale, Bristol	23/02/2012 17/08/2012 09/11/2012	Coal Authority	Part of Landmark Envirocheck Report for AVTM Desk Study. Includes map of shafts and details of shaft treatment if available.
Mine Abandonment Plans	Provided 11/05/2012	Coal Authority	Scans of historic mine plans
BCC Archive mining plans	Provided 01/11/12	Bristol City Council	Mining plans showing shaft locations but no key to workings outlines
South Bristol Link Coal Mining Archives	23/08/12	Bristol Coal Mining Archives Ltd	Brief letter report with hand drawn maps showing known shafts and coal seam subcrops mainly to south of Ashton fields
http://mapapps2.bgs.ac.uk/coalauthority/home.html	Accessed November	Coal Authority	Provides approximate location of shafts and development high risk areas
1:10000 BGS Bristol Geological Map		BGS	Provides coal seam subcrops

Figure 6-1: Map showing subcrop of coal seams. Adapted from 1:10000 BGS Geological Map. Dashed lines are subcrop contours of the Ashton Great Vein (interval of 35m). BCM stands for Below Coal Measures. Solid lines indicates first subcrop of coal seam beneath the site.

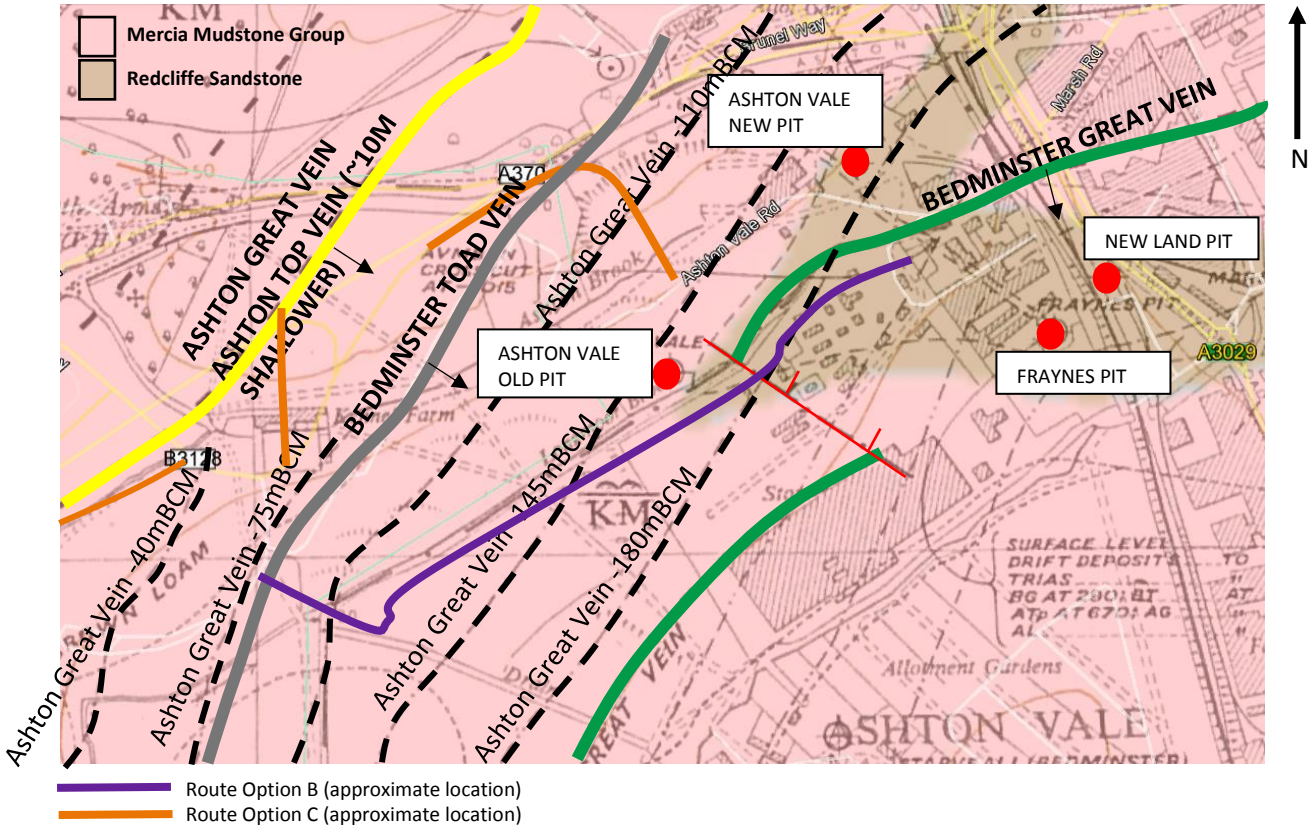


Figure 6-2: Coal Authority map showing the development high risk areas and the locations of mine entries.

Figure 6.2 shows that the area of the route near the Park and Ride is located in a Development High Risk Area. The Coal Authority indicates that a Coal Mining Risk Assessment must accompany the planning application, for both Route Option B and C.

6.1 Dip, Location and Thickness of Seams

Eight coal seams are recorded beneath the area. Stratigraphically, from shallowest to deepest, these are:

- Bedminster Top Coal (~0.3-1.0m thick) (worked);
- Bedminster Great Coal (~1.1m thick) (worked);
- Bedminster Little Coal (~0.5m thick);
- Bedminster Toad Coal (~0.6m thick);
- Ashton Top Coal (~0.1-0.9m thick) (worked);
- Ashton Great Coal (~0.9m thick) (worked);
- Ashton Little Coal (~0.6m thick) (worked);
- Ashton Gays Coal (~0.7m thick) (worked).

A Coal Authority non-residential mining report was obtained as part of the AVTM study and reports the following:

- Six coal seams have been worked in the likely zone of influence of the site at shallow to 340 m depth, and last worked in 1913.

The coal mine abandonment plans provided by the Coal Authority indicate that the Ashton Little Vein, Ashton Great Vein, Ashton Top Vein, Bedminster Great Vein and Bedminster Top Vein have all been worked within the area. Abandonment plans and mine shafts did not indicate that the Bedminster Toad Vein and Bedminster Little Vein have been worked within the area.

The veins are shown on the geological map orientated NE-SW in subcrop beneath the site (approximately 135° dip direction). 1:10000 BGS Geological Map for Bristol and Coal Mining plans indicate that the coal seams dip approximately 15°. However, depths of seams from mine shafts indicate that the dip can vary between 10 and 20°.

Bedminster Little Vein was not encountered within Ashton New Pit, Frayne's Pit, AVTM boreholes, or the 1:10000 BGS Geological Map although the BGS Memoir for Bristol indicates that Bedminster Little Vein was encountered approximately 25m below the Bedminster Great Vein at Staveall Pit. The Bedminster Top Vein does not subcrop beneath the proposed routes.

6.1.1 Route Option B

The 1:10000 BGS Geological Map indicates that the Bedminster Great Vein is affected by a north-west to south-east orientated fault. However, the underlying veins are not shown to be affected, possibly as the veins are not mapped in detail at such a depth. It is likely that the Bedminster Great Vein will be encountered approximately 20mbgl below the eastern section of Route Option B. Figure 5.2 and 5.3 shows the potential subcrop of coal veins beneath Route Option B.

The Bedminster Toad Vein is not indicated on the 1:10000 BGS Geological Map and the Coal Mine Abandonment Plans do not indicate that it has been worked in the area, however the Geological Memoir for Bristol indicates that it can be 75m above the Ashton Great Vein at the Ashton Vale New Pit, which indicates that it could subcrop beneath the Mercia Mudstone at the western part of Route B. Partial hammering during drilling and loss of flush between depths of -10.63mAOD and -15mAOD were believed to possibly represent historic mine workings (URS, 2009). Due to the fault this is most likely to represent workings on the Bedminster Toad Vein, as the Bedminster Great Vein subcrops further to the south. It is thought that the partial loss of flush could represent collapsed mineworkings, although it may have just been the heavy fracturing and poor rock quality of the Coal Measures.

Within the AVTM ground investigation coal seams were encountered in boreholes located near the confluence of Longmoor and New Colliter's Brook (0.32m thick coal encountered in BH504 from 21.08 to 21.40m, BH515 0.36m thick from 22.94 to 23.30m depth and 0.42m and 0.30m thick coal encountered in BH502 from 19.90 to 20.32 and 21.30 to 21.60m depth). These are likely to represent the Bedminster Toad Vein.

6.1.2 Route Option C

The Bedminster Great Vein could be encountered beneath the Mercia Mudstone at ~30mbgl (the thicknesses of the superficial deposits and Mercia Mudstone are unknown at this location), at the western end of Route Option C, where the proposed southbound single lane with hard shoulder on-slip road is to be constructed.

The Bedminster Toad Vein could be encountered beneath the Mercia Mudstone at ~40mbgl at the eastern end of Route Option C, where the link road to the industrial estates crosses the clay pit cut face. Figure 5.4 shows the potential subcrop of the veins beneath Route Option C.

6.2 Mine Entries

<u>Mine Shafts</u>

Collapse of mine shafts can present a significant risk in coal mining areas. Information obtained from the Coal Authority in 2016 (Appendix G) indicates the approximate location of the mine entry just north of Longmoor Brook. It is labelled as Ashton Vale Old Pit and is located to the east of the ETM buildings (Figure 6-3). Ashton Vale Old Pit is located approximately 50m from Route Option B. Information from the Coal Authority indicates that it is 198m deep and the treatment is unknown (Coal Authority, 2016).

Ashton Vale Old Pit and Ashton Vale New Pit are also indicated on 1907 coal mine plans. Bearings between the mine entries are between 217° and 220°, with distances approximately 250m. Using the BGS coordinates for Ashton Vale New Pit and the bearings and distances calculated, the position

of Old Pit is estimated and located. This is only a rough estimate due to the uncertainty in the accuracy of the position of Ashton Vale New Pit and also the scale restrictions of the historical mine plans. It does indicate however that the Coal Authority position of Ashton Vale Old Pit is a good estimate.

The 1889, 1894, 1903 and 1904 Ordnance Survey maps shows the position of the Ashton Vale Old Pit. This is represented as a series of small buildings consistently located in the same place. From the available information Figure 6-3 shows the best estimate of the location of Ashton Vale Old Pit, showing the mine buildings, and the Coal Authority estimate.

Figure 6-3 indicates that the Ashton Vale Old Pit should not interfere with the proposed scheme. Assuming 5m width of Ashton Vale Old Pit and 10m of superficial deposits with an approximate angle of friction of 30^{o}, the zone of influence of Ashton Vale Old Pit has been conservatively rounded to 50m.

There are many mine entries located in the surrounding area and there is potential for unknown entries and shafts to be present. Therefore, suitable ground investigation will be needed to locate and thus quantify the risks associated with collapsed shafts.

Figure 6-3: Map showing location of Ashton Vale Old Pit.

6.3 Summary

As the routes are located within the Coal Authority Development High Risk Area due to shallow workings a desk based Coal Mining Risk Assessment will be needed to be submitted with planning applications.

From assessing all available information, the Ashton Vale Old Pit is not expected to interfere with the planned route, although there is significant risk for unknown mine entries and shafts to be present which could affect the planned development.

Coal veins are likely to be present approximately 20mbgl beneath Route B at the crossing of Longmoor Brook and the eastern section beneath the trading estates. At the crossing the Bedminster Toad Vein is likely to subcrop and beneath the trading estates the Bedminster Great Vein will subcrop. It is known that the Bedminster Great Vein has been worked in the area.

Coal veins are likely to be present beneath the Mercia Mudstone ~30-40mbgl (the thicknesses of the superficial deposits and Mercia Mudstone are unknown for much of Route Option C). The Bedminster Great Vein is expected to subcrop where the proposed southbound single lane with hard shoulder on-slip road is to be constructed, and the Bedminster Toad Vein is expected to subcrop where the proposed link road to the industrial estates crosses the clay pit cut face.

The CIRIA Special Publication 32 indicates that the maximum height of collapse is often taken as between 5 and 10 times the seam thickness. Using 1.1m as the thickness of the Bedminster Great Vein and assuming that it has been worked, there is the potential for collapse up to approximately 10mBGL, thus significantly affecting the performance of piles.

7 Contamination Risk Assessment

7.1 Introduction

The following contamination risk assessment is based upon the Phase 1 Contaminated Land Risk Assessment carried out for the AVTM scheme. Therefore, this should be treated as a preliminary risk assessment and should be amended after ground investigation has been completed.

- Land contamination is considered due to the following reasons:
- Risk presented to humans - this includes construction workers, site users post construction, and nearby residents and businesses;
- Risk to the water environment - e.g. surface waters and groundwater;
- Risk to building structures - aggressive ground conditions; and
- Cost - disposal of contaminated ground can be major cost to projects.

Table 4.1 produced from the Envirocheck (2012) report, describes the previous land uses that the site has undergone. The key historical land uses that could lead to contamination are:

- 1886-1890- Ashton Vale Works (Iron Works, Brick and Coke) on north side of Longmoor Brook.
- Frayne's Colliery
- Spoil heaps and clay pits
- 1930-1932- Ashton Vale Works described as brick and tile works
- 1946- Possible labour or military camp occupying current car auctions site
- 1946- Filling of southeast corner of Ashton Field landfill site
- 1948-54- Saw Mills expanded and timber yards and joinery works make up eastern half of trading estate
- 1963- Construction of Ashton Vale Road and trading estate with depots and builders yard
- 1983- ETM site new buildings

Table 7.1 shows the potential contaminants that could be associated with the above land uses. This may not be a definitive list.

Table 7-1: Potential contaminants (not definitive list)

Potential Contaminants
Asbestos
Oil/Fuel Hydrocarbons
Polycyclic aromatic hydrocarbons (PAHs)
Heavy metals
Volatile/Semi Volatile Organic Compounds (VOCs, SVOCs)
Inorganics (ammonia, chloride etc.)
Ground gases
Pathogens, faecal coliforms

7.2 Sources, Pathways and Receptors

Table 7.2 shows the potential sources, pathways and receptors at the site

Table 7-2: List of sources, pathways and receptors at the site

Sources	Pathways	Receptors	
Contaminated Soil and Groundwater	Ingestion, Inhalation, Dermal Contact	Human Health	Construction workers
			Future Maintenance Workers
	Leaching, piling	Groundwater (minor aquifer)	
	Leaching, piling	Surface water	
	Migration via permeable strata	Infrastructure, foundations	
	Phytotoxic uptake	Plants	
Ground gases	Migration via permeable strata	Humans and infrastructure	

Table 7.3 shows the risks identified as part of the Phase 1 Contamination Risk Assessment for the AVTM project, completed in 2010 and modified for this project.

Site reconnaissance completed for the AVTM project did not identify any protected or invasive species in the site although the Phase 1 report does emphasize that they cannot be discounted at this stage as a detailed ecological survey had not been undertaken.

Further details of the ground conditions encountered during the AVTM ground investigations are detailed in Section 6 above.

7.3 Implications to Scheme

The majority of risks relating to land contamination can be mitigated as part of the scheme design, or as part of Health and Safety plan, through procedures to limit exposure to land contamination (for example, rules stopping eating and drinking on site, use of gloves, overalls, etc.).

The scheme design will need to address risks to the water environment, for example, piling through contaminated ground will require a piling risk assessment and the piling will be required to take measures to limit spread of contamination.

The key implication to the scheme is cost associated with disposal of ground contamination, in particular the areas of landfill. Some of the route options overlie landfill materials, and there are few options to treat or re-use this material. Disposal of this material is likely to be costly, at approximately £250/m^3.

Table 7-3: Risks associated with contamination on study site during redevelopment (classification assumes mitigation is applied as detailed in the comment column)

Source of Contamination	Pathways	Receptors	Consequence of Occurrence	Likelihood of Occurrence	Potential Significance (Risk Classification)	Comment
Contaminated Soil/Groundwater beneath site (made ground, landfill etc.)	Dermal Contact with Soils	**Human health** Construction Workers	Minor	Low likelihood	Very low risk	Mitigation to be set out in CEMP to manage H+S risks, environmental risks
	Inhalation of fugitive soil dust		Minor	Low likelihood	Very low risk	Mitigation to be set out in CEMP to manage H+S risks
	Inhalation of vapours outdoors		Minor	Low likelihood	Very low risk	Mitigation to be set out in CEMP to manage H+S risks
Contaminated Soil beneath site (Made Ground	Dermal Contact with Soils	**Human health** Future Maintenance Workers	Medium	Unlikely	Low Risk	Suitable PPE to be deployed; Management of incidence of unacceptable risk undertaken as part of H+S procedures
	Inhalation of vapours outdoors		Medium	Low likelihood	Low Risk	Suitable PPE to be deployed; Management of incidence of unacceptable risk undertaken as part of H+S procedures
	Ingestion of soil		Medium	Unlikely	Low Risk	Suitable PPE to be deployed; Management of incidence of unacceptable risk undertaken as part of H+S procedures
	Buildup of ground gases in building voids		High	Low Likelihood	Moderate Risk	Structures to be designed to minimise likelihood of ground gas accumulation. Entry to confined spaces controlled.
Contaminated Soil beneath site (Made Ground)	Phytotoxic Uptake (plant uptake via roots)	Plants within **landscaping** schemes on site once redeveloped	Minor	Low likelihood	Very low risk	Consideration required in landscaping plans;
Contaminated Soil beneath site (Made Ground)	Enhancement of Pathway via piling; (also, creation of	**Controlled waters receptors**	Minor	Unlikely	Very low risk	Possible development foundation solution. Typically mitigated using EA guidance;

Source of Contamination	Pathways	Receptors	Consequence of Occurrence	Likelihood of Occurrence	Potential Significance (Risk Classification)	Comment
	soakaway infiltration pathway through use of SUDs);					Mitigation to be set out in CEMP to manage H+S risks
Contaminated Soil beneath site (Made Ground)	Disturbance of soils leading to leaching; migration via unsaturated zone	**Controlled waters** Groundwater beneath the site (Minor Aquifer)	Medium	Low Likelihood	Low risk	Groundwater regime unknown within minor aquifer and hydraulic continuity with made ground and watercourses. Incidence of unacceptable risk cannot be discounted. Further characterisation is warranted
Contaminated soil/groundwater	Migration via permeable strata	**Infrastructure, foundations**	Minor	Low Likelihood	Very low risk	Foundation design to be based on ground investigation results and appropriate for the ground conditions encountered.

8 UXO

A detailed UXO report was carried out for the AVTM (which encompasses Route Option B) - RPS Explosives Engineering Services (2012).

The findings of the AVTM UXO report showed that Anti-Aircraft Artillery (AAA) positions and other WWII targeted positions are not located in the direct vicinity of the AVTM. However, many of these positions are found throughout Bristol. The nearest is on the outskirts of Bishopsworth at -2.62848, 51.4228, approximately 1.43km to the south. Eleven other AAA defenses are located within 10km of the site.

The AVTM UXO report also identified a decoy site at Long Ashton 1.91km north west and 6.9km south east, which increases the chances of unexploded shells within the area. There is also the possibility that the railway located at Ashton Gate may have been targeted during WWII.

The AVTM site was classified as a moderate risk which implies a similar risk for Route Option B, no specific studies have been undertaken for Route Option C but it is assumed that the risk will be at least moderate.

As discussed in Section 3, it is recommended that a detailed UXO is acquired prior to ground investigation and once a decision on the preferred Route Option is made.

9 Proposed Development

The MetroWest Scheme proposes the closure of the Ashton Gate level crossing on the Portishead rail line, located off the A3029 Winterstoke Road in southwest Bristol (refer to Figure 2-1).

Alternative access options to the Ashton Gate Trading Estate are being considered. Two Route Options are under review, Route Option B and Route Option C. A summary of these Options is as follows.

9.1 Route Option B

Two concrete integral bridges are proposed for this option spanning across Longmoor Brook & New Colliter's Brook respectively. The bridge decks support 2 lanes of traffic and two 2m wide pedestrian paths on both sides.

Decks include an insitu slab supported by 11No. 9m span precast TY beams across the reinforced concrete abutments, which are in turn supported by two rows of CFA piles.

N2 containment Vehicle parapets with 1.4m high with infill mesh are proposed at the top of the proposed edge beams.

Backfill to the abutments is composed of 6N granular fill, embankments slope at 1:2 slope.

Any requirements for ground treatment to mitigate differential settlement between embankment and structures are subject to further design.

9.2 Route Option C

An elevated bridge ramp is proposed to carry the highway from the at-grade junction to the top of the existing embankment slope. A multi-span viaduct with 2 pairs of 30m span weathering steel beams composite with an in-situ deck is considered. The concrete abutment at the top of the slope is set back to avoid any instability of the existing slope.

Various options for Retaining walls at the A370 slip road are currently under consideration. Depending on land made available there may be either a secant piled wall or an earthwork embankment (no retention). The existing ditch adjacent to the slip road may need to be culverted.

10 Geotechnical Risks

Based on the available information described above, an assessment is made below of the main potential geotechnical risk and issues that could affect the proposed Route Options. Geotechnical risk is presented relative to each Route Option.

These risks are used to form the basis of further studies and the objectives of intrusive ground investigation work. Recommendations for further studies in present are presented in Section 11.

<table>
<tr><th>Geotechnical Risk</th><th>Route Option B</th><th>Route Option C</th></tr>
<tr><td>Settlement

(Highly Compressible Soils)</td><td colspan="2">Highly compressible soils are present. These are mostly the superficial natural deposits overlying the low-lying ground to the south (prevalent to Route Option B but are also likely to parts of Route Option C).

Fill and made ground are also present, with unknown properties and may also indicate potential for large and unacceptable amounts of settlement.</td></tr>
<tr><td></td><td>Landfill is present underlying Route Option B which is expected to be highly compressible.</td><td></td></tr>
<tr><td>Frost Susceptibility</td><td colspan="2">Cohesive alluvial deposits are present and the Mercia Mudstone could be exposed as part of Route Option C. These deposits can be susceptible to frost heave.</td></tr>
<tr><td>Shrink/Swell</td><td colspan="2">Parts of the alluvial deposits and the Mercia Mudstone has potential for significant shrinking or swelling behavior.</td></tr>
<tr><td>Heave and chemical attack.</td><td colspan="2">Alluvial deposits have the potential for locally high concentrations of sulphate as does the Mercia Mudstone. Under certain conditions, oxidization can result heave, and can also be detrimental to concrete strength.</td></tr>
<tr><td>Slope Stability</td><td>Slope stability risk with respect to Route Option B is likely to be confined to the banks of local water courses and the slopes of the existing landfill. The stability of existing slopes should be reviewed during detailed design.</td><td>There is risk with respect the stability of existing slopes which will need to be quantified by further inspection* and ground investigation.

*Note that the area of site with the steepest slopes (and potentially the greatest risk) were out of bounds and could not be inspected as part of this study. It will be necessary to inspect these slopes (clay pit cut face) in order to evaluate their condition and in order to progress the design. Recommendation on further study is provided in Section 10.

The area of site which could not be inspected is as follows:
 

Excerpt of drawing number 674946.BD.29.01-OPC-01 B (Appendix A)</td></tr>
</table>

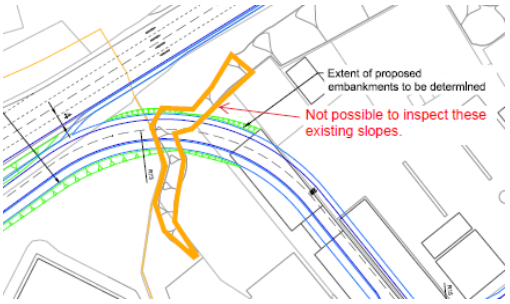
Coal Mining Subsidence	Shallow coal workings and recorded and unrecorded mine shafts are known to be present within close proximity to the site; the routes are located within the Coal Authority Development High Risk Area (refer to Section 5.0). A desk based Coal Mining Risk Assessment will be required for the desired Route Option.	
High Groundwater/ Flooding	Option B presents a solution on generally low-lying land and over land prone to flooding. Consequently, high groundwater levels are a risk throughout the site. Note also potential artesian groundwater conditions, therefore potential hazard with respect to the management of porewater pressures.	Option C presents a solution on land at a higher elevation (than Option B) which is outside of designated flood plain. However, potential artesian groundwater conditions could occur on the low-lying ground within the trading estate or by cutting into natural slopes, and as such there may be risk with respect to the management of porewater pressures.
Existing Assets and Utilities.	There is risk that changes in ground stress from the proposed development may cause failure or lead to unacceptable movement of existing highways, utilities and assets (such as existing buildings, retaining structures, culverts, etc.).	
	There are known assets e.g. Longmoor Brook Culvert, landfill infrastructure (drainage and gas venting/ management), as well as numerous services.	There are known assets e.g. slopes, highways drainage, an existing gabion wall at the David Lloyds Sports Centre as well as numerous services. With respect to the 'David Lloyd gabion wall'. It is recommended that as-built information is obtained (if possible) and ground investigation undertaken local to this asset in order to define/confirm ground conditions and as built information (e.g. foundation dimension, drainage provisions etc.). This information will be necessary in order evaluate the existing condition of the retaining structure, the effect of a highway to the crest of the wall and any requirements for strengthening/improvement if necessary. Recommendation is provided in Section 10.
	A full inventory and survey of existing highways, utilities and assets should be established. This will assist in evaluating risk assessment (to existing highways, utilities and assets).	
UXO	A moderate risk is assumed subject to a detailed UXO risk assessment of the preferred Route Option.	

11 Recommendations

11.1 Further Studies

In order to further evaluate geotechnical risk and for the purpose of further assessment of potential sources of contamination, further studies and ground investigation will be necessary. The scope of work will be dependent on the preferred Route Option and is based upon the proposed development (highlighted in Section 9).

It is recommended that further studies are undertaken prior to ground investigation:

Further Studies	Route Option B	Route Option C
Detailed study and inspection of existing slopes.	Not applicable.	Undertake a detailed inspection of the existing slopes which have thus far been out-of-bounds due to land access issues:  *Excerpt of drawing number 674946.BD.29.01-OPC-01 B (Appendix A)* • The following work is recommended prior to ground investigation: ○ Any as-built information on the construction (excavation/ engineering) of the slopes to be reviewed. And; ○ Any records of previous inspection to be reviewed. Then; ○ Slopes to be inspected for key indicators of existing instability; ○ Report required: Stability of Existing Slopes, presenting the key findings with recommendations with respect to furthering the design of Route Option C.
Coal Mining Risk Assessment	The site is within a High Risk Area and a Coal Mining Risk Assessment is a mandatory planning requirement. This should ideally be completed subsequent to ground investigation, and should be in accordance with the Coal Authority Guidance for Developers, Risk Based Approach to Development Management.	
Detailed UXO Risk Assessment.	Mandatory requirement prior to groundworks and ground investigation.	

11.2 Outline Scope for Ground Investigation

Recommendation for ground investigation is presented in Appendix E and is for the permanent works element of the proposed development highlighted in Section 9.

Requirements for ground investigation is dependent upon the complexity of the proposed Route Option and sensitivity of the design. The Outline Scope presented below should be reviewed against the scheme design prior to fieldwork.

Parts of Route Option B have been investigated for and behalf of the Client and for the purpose of AVTM. On the understanding that ground investigation for the AVTM will be available (without caveat) for the design of Route Option B the Outline Scope has been optimized to those parts of the site not previous subject to ground investigation. Should this not prove the case, further ground investigation will be necessary for the purpose of Route Option B.

12 Conclusions

This report has been prepared to address the following aspects of the proposed alternative access options for the Ashton Gate Trading Estate, in west Bristol:

- Collation and summary of relevant site data and ground investigation information undertaken in the vicinity, and geotechnical observations from a site walkover survey
- Development of a ground model and assessment of likely geotechnical, hydrogeological and geo-environmental risks
- Recommendations for further ground investigation.

The following conclusions are made with respect to the ground conditions and ground-related risks:

- The conceptual ground model for Option B, comprises:
    - 4-5m of highly variable Landfill material, overlying,
    - 4-5m of very soft to firm Alluvium, overlying,
    - 2m of weathered Mercia Mudstone, overlying,
    - 9m of Mercia Mudstone, overlying,
    - Coal Measures.
- The conceptual ground model for Option C, comprises:
    - Potentially Alluvium under the western section of the route,
    - 1-2m of Head deposits/weathered Mercia Mudstone, overlying,
    - 40m of Mercia Mudstone, overlying,
    - Coal Measures.

The key ground-related scheme hazards and risks are included in Section 10. The major site specific hazards are considered to be:

- Settlement-
    - highly compressible ground associated with alluvial deposits and unknown properties associated with landfill material and made ground.
- Slope stability-
    - uninspected slope associated with a historic clay pit north of David Lloyd's sports centre.
- Coal mining-
    - potential for unknown historic mine shafts and shallow coal working which could affect the performance of piles. The routes are located in a Coal Authority Development High Risk Area.

Contaminated land is expected due to the historic landfills located within the area. The majority of risks relating to land contamination can be mitigated as part of the scheme design, or as part of Health and Safety plan. The key implication to the scheme is cost associated with disposal of ground contamination. Disposal of this material is likely to be costly, at approximately £250/m3.

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Appendix A
Route Options

Existing 3m wide signal controlled pedestrian crossing to be replaced with 4m wide Toucan crossing which links into the wider cycling network

Ashton Road

Ramp access for pedestrians and cyclists

Winterstoke Rd traffic signal junction to be reconfigured due to the closure of the level crossing

Ashton Vale Rd level crossing likely to be closed

Modifications to existing priority junction

Babcock

Car transporter entrance and exit

Vehicle drop off/ pick up (12 Car Transporters)

Winterstoke Rd

Ashton Vale Road

New internal road from drop off to new gate house

327 parking spaces for customers

New customer entrance, with priority for customers over the internal road

New gate house

Imaging area

Access to be provided via back of the footpath between these points

David Lloyd Bristol

10 m wide area from Longmoor Brook

Longmoor Brook

Manheim

Existing signal junction to remain

Revised entrance to David Lloyd

Park and Ride

Potential headroom clearance of 4 m due to lowering of ground clearance under bridge

New link road

EA maintenance access

Existing woodland

New structure over Longmoor Brook

North Somerset/ Bristol City Council Boundary

South Bristol Link (under construction)

EA access

AVTM (under construction)

North Somerset/ Bristol City Council Boundary

A370

Pond

The Dovecote (PH)

Ashton Park Comprehensive School

County Gates

South Bristol Trade Park

Colliter's Brook

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SCALE 1:2500 (A3)

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Rev	By	Chkd	Apprvd	Date	Description
B	ECP	ADL	ADL	05/12/2016	Labels added
A	ECP	ADL	ADL	30/11/2016	10 m wide area from Longmoor Brook added EA maintenance access added

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Drawing

ASHTON VALE ROAD ALTERNATIVE HIGHWAY ACCESS OPTION B

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Approved by: AL	Date: 17/11/2016

Drawing No. 674946.BD.29.01-OPB-01

Revision B

Drawing Scale: 1:1250 @ A1

Existing 3m wide signal controlled pedestrian crossing to be replaced with 4m wide Toucan crossing which links into the wider cycling network

Existing Pelican crossing to be upgraded to a Toucan crossing

Ramp access for pedestrians and cyclists

Winterstoke Rd traffic signal junction to be reconfigured due to the closure of the level crossing

Ashton Vale Rd level crossing likely to be closed

New footway to tie into existing

New link road to be cut into the existing ground level to reduce the need for a structure.
Note: Bristol Water Main will require protecting

Extent of proposed embankments to be determined

North Somerset/ Bristol City Council Boundary

New southbound off slip

New embankment

Existing off slip to be retained and converted into a new highway link road into the Industrial Estate

Existing A370 southbound on slip to be removed

Amendments required to existing traffic signals

Existing path to be widened to 3.0m and converted to a shared foot/ cycle path

Indicative revised signal control junction

Existing off slip to remain

New left turn slip

New retaining structure

Existing path to be widened to 3.0m and converted to a shared foot/ cycle path

Indicative revised signal control junction

New southbound single lane with hard shoulder on slip

Longmoor Brook

AVTM (under construction)

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Rev	By	Chkd	Apprvd	Date	Description
A	ADS	AL	AL	04/01/2017	Alignment relocated away from 48 Ashton Vale Road

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Approved by: AL	Date: 18/11/2016

Drawing No.	Revision
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Appendix B
Site Walkover, Photos and Plan

Existing 3m wide signal controlled pedestrian crossing to be replaced with 4m wide Toucan crossing which links into the wider cycling network

Existing Pelican crossing to be upgraded to a Toucan crossing

Ramp access for pedestrians and cyclists

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Note: Bristol Water Main will require protecting

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Indicative revised signal control junction

New southbound single lane with hard shoulder on slip

Longmoor Brook

AVTM (under construction)

Ashton Park Comprehensive School

The Dovecote (PH)

Pond

Pond

ASHTON ROAD

County Gates

Longbrook House

Fitness Centre

Vehicle Testing Station

Longmoor Brook

Cottle's Brook

Drain

Drain

Drain

Drain

Club

Club

DRAFT

Uphill

3946 3947 3984 3983 3972 3971 3944 3943 3980 3969 3970 3973 3967 3968 3942 3941 3966 3940 3964 3939 3963 3937 3935 3932 3926 3925 3928 3930 3933 3924 3934 3955 3956 3958 3949 3950 3952 3954 3959 3960 3961 3922 3921 3920 3917 3918

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Appendix C
Previous Exploratory Hole Location Plan

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BGS ST57SE73

Ashton Road

Existing 3m wide signal controlled pedestrian crossing to be replaced with 4m wide Toucan crossing which links into the wider cycling network

Ramp access for pedestrians and cyclists

Babcock

Winterstoke Rd traffic signal junction to be reconfigured due to the closure of the level crossing

Modifications to existing priority junction

Ashton Vale Rd level crossing likely to be closed

North Somerset/ Bristol City Council Boundary

BGS ST57SE106

Car transporter entrance and exit

Ashton Vale Road

BGS ST57SE113

Access to be provided via back of the footpath between these points

New internal road from drop off to new gate house

Vehicle drop off/ pick up (12 Car Transporters)

BGS ST57SE89

Winterstoke Rd

327 parking spaces for customers

New customer entrance with priority for customers over the internal road

BGS ST57SE90

A370

BGS Ashton Vale Old Pit

BGS ST57SE91

New gate house

IN

OUT

Imaging area

David Lloyd Bristol

BGS ST57SE104

10 m wide area from Longmoor Brook

Manheim

BCFC S1

BCFC TP1

Longmoor Brook

BGS ST57SE105

BCFC TP111

Existing signal junction to remain

Potential headroom clearance of 4 m due to lowering of ground clearance under bridge

BCFC TP2

Revised entrance to David Lloyd

BCFC BH206

BCFC R2

Park and Ride

AVTM BH512

AVTM BH513

AVTM BH514

AVTM BH515

AVTM TP608

BCFC S4

New link road

AVTM TP609

AVTM BH517

EA maintenance access

BCFC TP4

Existing woodland

New structure over Longmoor Brook

North Somerset/ Bristol City Council Boundary

BCFC S5

South Bristol Link (under construction)

EA access

AVTM (under construction)

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Rev	By	Chkd	Apprvd	Date	Description
B	ECP	ADL	ADL	05/12/2016	Labels added
A	ECP	ADL	ADL	30/11/2016	10 m wide area from Longmoor Brook added EA maintenance access added

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674946.BD.29.01-OPB-01	B

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New embankment

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Amendments required to existing traffic signals

Indicative revised signal control junction

New left turn slip

Existing off slip to remain

New retaining structure

New southbound single lane with hard shoulder on slip

AVTM (under construction)

BGS ST57SE73
BGS ST57SE106
BGS ST57SE113
BGS ST57SE104
BGS ST57SE105
BGS ST57SE89
BGS ST57SE90
BGS Ashton Vale Old Pit
BGS ST57SE91
BCFC S1
BCFC TP1
BCFC TP111
BCFC TP2
BCFC BH206
BCFC R2
BCFC S4
BCFC TP3
AVTM BH512
AVTM BH513
AVTM BH514
AVTM BH515
AVTM TP608
AVTM TP609
AVTM BH516
AVTM BH517
BCFC TP4
BCFC S5

Ashton Park Comprehensive School
ASHTON ROAD
County Gates
The Dovecote (PH)
Pond
Longmoor Brook
Longwood House
Fitness Centre
Vehicle Testing Station
Drain
El Sub Sta
Pool
Club
Uphill

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Rev	By	Chkd	Apprvd	Date	Description
A	ADS	AL	AL	04/01/2017	Alignment relocated away from 49 Ashton Vale Road

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ASHTON VALE ROAD ALTERNATIVE HIGHWAY ACCESS OPTION C

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Drawing No.	Revision
674946.BD.29.01-OPC-01	A

Drawing Scale: 1:1250 @ A1

Drawing file path & name: \\bristol01\proj\Consulting\Projects\674946 NSC - 2016 Bristol Framework\674946.BD.29.01 Ashton Vale Alternate Access\06 AutoCAD\03 Outgoing\2017 01 04 Option C Rev A\674946.BD.29.01-OPC-01 Rev A.dwg

Appendix D
Previous Exploratory Hole Logs

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH512**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**28.05.13** End: **30.05.13**	**9.74**	**E:356037.4 N:170959.0**	**1** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										TOPSOIL: Soft brown reddish gravelly very clayey SILT. Gravel is subrounded fine to coarse of sandstone and limestone. (TOPSOIL)	9.44	(0.30) 0.30	
0.50	1	B								MADE GROUND: Soft friable brown mottled grey sandy very gravelly CLAY. Gravel is subangular to subrounded fine to coarse of limestone and silica, with gravel size bricks, asphalt, gravel size concrete, polythene sheet and frequent cobbles. (MADE GROUND)			
0.50	2	ES										(0.90)	
1.00	3	B											
1.00	4	ES									8.54	1.20	
1.20-1.65	1	SPT	4,2/2,7,5,7 N=21							MADE GROUND: Stiff reddish brown slightly gravelly slightly sandy CLAY with occasional charcoal. Gravel is fine to coarse subangular brick, concrete and ceramic. (MADE GROUND)		(0.20)	
1.20-1.40	8	B											
1.30		HP	c_u=150/125/140								8.34	1.40	
1.40-2.20	9	B								MADE GROUND: Greyish black sandy clayey fine to coarse GRAVEL of concrete, brick, limestone and charcoal. (MADE GROUND)			
1.60	5	ES								. . . at 1.40m depth fine to coarse angular gravel of concrete.		(0.80)	
										. . . odour of hydrocarbon.			
									1	. . . below 2.00m depth concrete.	7.54	2.20	
2.20-2.65	2	SPT	1,1/1,1,1,1 N=4							MADE GROUND: Soft greyish brown slightly gravelly slightly sandy CLAY. Gravel is fine to coarse concrete and limestone. (MADE GROUND)			
2.20-2.60	10	D										(0.40)	
											7.14	2.60	

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
28/05/13	15:00	3.80	None	121	3.80
28/05/13	17:00	5.00	None	121	2.40
29/05/13	08:00	5.00	None	121	2.80
29/05/13	16:45	15.50	8.20	121	3.00
30/05/13	08:00	15.50	8.20	121	2.60
30/05/13	15:45	25.00	8.20	121	2.80

General Remarks

1. Location CAT scanned prior to drilling and hand dug inspection pit to 1.20m depth.
2. Dynamic sampling from 1.20m to 9.70m depth.
3. Rotary coring from 9.70m to 25.00m depth.
4. Water strike at 3.80m depth, rising to 2.20m after 20 minutes.
5. Water flush used.
6. SPT hammer EQU250-2013 (E_r = 65.94%) used.

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**JG**	**BSaimen + REWilliams**	AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH512**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**28.05.13** End: **30.05.13**	**9.74**	**E:356037.4 N:170959.0**	**2** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
2.60-3.10	11	B								MADE GROUND: Greyish black brown slightly clayey sandy GRAVEL of fine to coarse brick, concrete, limestone and charcoal. (MADE GROUND)		(0.50)	
3.00	7	ES								. . . strong odour of hydrocarbon.	6.64	3.10	
3.20-3.90		$U_{(UT100)}$	50% recovery							MADE GROUND: Soft reddish brown gravelly slightly sandy CLAY with rare fragments of shell. Gravel is fine to coarse subangular medium mudstone, quartz, ceramic and brick. (MADE GROUND)			
3.30	6	ES										(1.00)	
3.70-4.10	12	D							▼1				
4.00		HP	c_u=20/25							. . . at 3.90m depth rare fragments of white shell.	5.64	4.10	
4.20-4.40	13	D								Soft low strength greyish brown slightly sandy CLAY with rare brown pseudo fibrous peat and lenses of brown silt/fine sand. (ALLUVIUM)			
4.20		HP	c_u=25/30/25										
4.40-4.90	14	$U_{(WS)}$											
4.95-5.00	15	D								. . . between 4.95 and 5.00m depth bed of brown plastic pseudo fibrous peat.			
5.00-5.45	3	SPT	1/1,1,1,1 N=4										

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**JG**	**BSaimen + REWilliams**	AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH512**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**28.05.13** End: **30.05.13**	**9.74**	**E:356037.4 N:170959.0**	**3** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										. . . below 5.50m depth becomes greyish brown with frequent brown spongy pseudo fibrous peat.			
5.70-5.90 5.70	16	D HP	c_u=25/30/37									(3.70)	
6.35-6.50	18	D											
6.50-7.20 6.50		$U_{(UT100)}$ HP	58 blows 71% recovery c_u=12/20/25							. . . at 6.50m depth becomes brown and very soft.			
										. . . at 7.60m depth fine to coarse subrounded gravel of limestone and sandstone.	1.94	7.80	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**JG**	**BSaimen + REWilliams**	AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH512**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**28.05.13** End: **30.05.13**	**9.74**	**E:356037.4 N:170959.0**	**4** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
7.80-8.40	19	B								. . . at 7.75m depth some pockets (<5mm) of greenish grey clayey sandy.			
7.80		HP	c_u=180/200/200							Very stiff very high strength reddish brown mottled greenish grey silty CLAY with occasional black and brown partly decomposed rootlets. (MERCIA MUDSTONE GROUP Zone IVb) . . . between 7.80 and 8.70m depth occasional black and brown partly decomposed rootlets. . . . at 8.30m depth cobble of angular greenish sandstone. . . . at 8.30 and 8.70m depth occasional greenish grey irregular pockets completley weathered sandstone/siltstone.			
8.50		HP	c_u=>225										
8.70-9.15	4	SPT(c)	5,6/8,10,12,12 N=42							. . . at 8.70 to 9.15m depth occasional black and brown partly decomposed rootlets.			
8.70-9.15	20	D										(2.10)	
9.00		HP	c_u=180/187										
9.15-9.60	21	$U_{(WS)}$											
9.60		HP	c_u=>225										
9.70-11.00				100	52	21	NI 80 170			Very weak thinly to thickly laminated greenish grey fine grained SANDSTONE with extremely weak thinly to thickly laminated reddish brown silty mudstone. Bedding fractures are 5 to 15° very closely to closely spaced undulating rough open clean/infilled with reddish brown clay. (MERCIA MUDSTONE GROUP Zone I) . . . at 10.20m depth occasional lenticular pockets (<3mm) of white gypsum.	-0.16	9.90	
10.15-10.35	22	CS											

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**JG**	**BSaimen + REWilliams**	AGS

GINT_LIBRARY_V8_04.GLB|Log COMPOSITE LOG | 727305_BRISTOL_RAPID_TRANSIT.GPJ - v8_04 | 29/10/13 - 16:53 | KJ
Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk.

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH512**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**28.05.13** End: **30.05.13**	**9.74**	**E:356037.4 N:170959.0**	**5** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
												(1.10)	
				100	52	21	NI 80 170			. . . below 10.65m depth red clay becomes hard. . . . between 10.70 and 11.00m depth greenish grey sandstone and red mudstone is completley weathered with pockets of completley weathered greenish grey sandstone of extremely weak greenish grey sandstone.	-1.26	11.00	
11.00-12.50 11.00-11.32	5	SPT(c)	7,8/17,28,5 for 15mm N=91*							Very stiff very high strength reddish brown mottled greenish grey silty CLAY. (MERCIA MUDSTONE GROUP Zone IVb)		(0.70)	
11.45-11.65 11.45	23	D HP	c_u=>225				NI						
				100	53	47				. . . at 11.65m depth band of weak greenish grey sandstone.	-1.96	11.70	
12.15-12.35	24	CS					90 120 200			Extremely weak thinly bedded silty MUDSTONE with occasional irregular pockets (<10mm) of extremely weak greenish grey fine sandstone/siltstone. Bedding is 5 to 10°. Joints are medium spaced 55 to 70° planar tight. Bedding fractures are 5 to 10° closely to medium spaced undulating rough partly open to moderately wide infilled with clay. (MERCIA MUDSTONE GROUP Zone I) . . . at 11.85m depth joint is 55° planar tight. . . . between 11.85 and 12.20m depth occasional irregular pockets of greenish grey very weak and extremely weak fine sandstone/siltstone. . . . from 12.05 to 12.12m depth joint is 70° planar tight.			
12.50-14.00 12.50-12.80	6	SPT(c)	8,7/19,31 for 70mm N=103*										
				100	97	83	NI 80 450			. . . between 12.80 and 13.30m depth bedding fractures are closely spaced (80-120mm).			

Description on next sheet

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**JG**	**BSaimen + REWilliams**	AGS

GINT_LIBRARY_V8_04.GLB|Log COMPOSITE LOG | 727305_BRISTOL_RAPID_TRANSIT.GPJ - v8_04 | 29/10/13 - 16:54 | KJ
Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk.

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH512**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**28.05.13** End: **30.05.13**	**9.74**	**E:356037.4 N:170959.0**	**6** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										. . . at 12.82, 12.90, 13.00 and 13.70m depth bedding fracture infilled with red clay (5mm).			
												(3.05)	
										. . . at 13.23m depth wall rock either side of the bedding fracture further weakened to mercia mudstone group zone IVb by weathering.			
				100	97	83	NI 80 450						
13.60-13.90	25	CS											
14.00-15.50										. . . between 14.00 and 14.75m depth bedding fracture closely to medium spaced.			
14.15-14.45	26	CS											
											-5.01	14.75	
				100	100	100	NI 220 300			Very weak thinly to medium bedded reddish brown SILTSTONE with occasional lenticular laminations of weak greenish grey fine grained sandstone/siltstone. Bedding fractures are 5 to 15° closely to medium spaced undulating rough infilled with red clay or clean. (MERCIA MUDSTONE GROUP Zone I)			
15.18-15.50	27	CS								. . . between 15.15 and 15.30m depth weak greenish grey fine sandstone/pockets.		(1.13)	
15.50-16.30				100	69	54				*Description on next sheet*			

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**JG**	**BSaimen + REWilliams**	

STRUCTURAL SOILS

BOREHOLE LOG

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Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**28.05.13** End: **30.05.13**	**9.74**	**E:356037.4 N:170959.0**	**7** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
							NI 220 300			. . . between 15.54 and 15.68m depth very weak siltstone contains pockets of greenish grey weak siltstone. . . . between 15.70 and 15.88m depth siltstone weathering to completley weathered very stiff reddish silty clay mercia mudstone group zone IVb.	-6.14	15.88	
16.00-16.20	28	CS		100	69	54	NI			Weak very thinly to medium bedded reddish brown and dark brown fine to coarse SANDSTONE. Bedding fractures are 5 to 10° closely medium spaced undulating rough open infilled with red sandy clay to 2mm. (MERCIA MUDSTONE GROUP Zone I)		(0.42)	
16.30-17.80										. . . between 15.88 and 16.00m depth sandstone is dark brown. . . . between 16.10 and 16.20m depth non intact. . . . between 16.15 and 16.60m depth sandstone becomes conglomeratic contains bands of subrounded fine to coarse gravel of sandstone along the bedding direction. . . . between 16.20 and 16.65m depth very closely to closely spaced joints dipping between 60 and 70° undulating rough clean.	-6.56	16.30	
16.65-17.00	29	CS					100 250 350			Very weak thickly laminated to thinly bedded reddish brown fine SANDSTONE with frequent lenticular/irregular laminations or pockets (<5mm) of greenish grey fine to medium sandstone. Bedding fractures are 5 to 15° closely to medium spaced undulating rough open infilled with red sandy clay. (MERCIA MUDSTONE GROUP Zone I)		(0.85)	
17.00-17.15	30	CS		100	90	90				. . . between 16.70 and 17.15m depth some irregular pockets <5mm of weak greenish grey sandstone.	-7.41	17.15	
17.20-17.30	31	CS					NI 100 250			Extremely weak thinly to medium bedded reddish brown silty MUDSTONE. (MERCIA MUDSTONE GROUP Zone I) . . . at 17.50m depth mudstone on either side of the bedding fractures is weakened due to continued weathering along the fracture. . . . at 17.60m depth non intact (possible joint).			
17.80-19.30										. . . between 17.80 and 19.30m depth bedding fracture are 10 to 25° closely to medium spaced planar rough/undulating rough infilled with reddish brown clay. . . . at 17.97 and 18.52m depth bedding fracture are 25° infilled with reddish brown silty clay.			
17.88-18.15	32	CS		90	90	90	100 180 500						

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**JG**	**BSaimen + REWilliams**	

STRUCTURAL SOILS

BOREHOLE LOG

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Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH512**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**28.05.13** End: **30.05.13**	**9.74**	**E:356037.4 N:170959.0**	**8** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
												(2.15)	
				90	90	90	100 180 500						
19.15	33	CS								. . . at 19.10 to 19.15m depth thin band of fine to medium red gravel of sandstone and quartz.			
										. . . between 19.10 and 19.20m depth mudstone becomes very weak.	-9.56	19.30	
19.30-20.50										Weak very thinly to medium bedded reddish brown fine to coarse SANDSTONE. Bedding fractures are 5 to 10° very closely to medium spaced undulating rough open infilled with sandy clay up to 10mm. (MERCIA MUDSTONE GROUP Zone I)			
19.35-19.45	34	CS								. . . at 19.65 to 19.75m depth joint is 70° undulating rough open infilled with sandy clay.			
				100	92	92	NI 200 350			. . . between 19.95 and 20.00m depth sandstone bedding fracture is extremely weak (due to continued weathering along the fracture and non intact).		(1.55)	
20.22-20.45	35	CS								. . . below 20.10m depth sandstone becomes conglomeratic containing fine to medium subrounded gravel of sandstone and quartz within reddish brown sandy matrix.			
20.50-22.00				100	87	60				. . . between 20.50 and 20.85m depth conglomeratic sandstone becomes extremely weak.			

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**JG**	**BSaimen + REWilliams**	

STRUCTURAL SOILS

BOREHOLE LOG

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727305	**28.05.13** End: **30.05.13**	**9.74**	**E:356037.4 N:170959.0**	**9** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
											-11.11	20.85	
21.10-21.25	36	CS		100	87	60	NI 70 170			Weak thinly laminated grey partially weathered SILTSTONE with occasional randomly orientated laminations of coal. Bedding fractures are 20 to 30° very closely to closely spaced undulating rough infilled with grey fine to medium gravel/greenish brown clay up to 4mm. (Partially weathered COAL MEASURES) . . . between 20.85 and 20.95m depth grey mudstone gravel embedded in extremely weak red sandstone (possible conglomerate indicates an unconformity on the depositional history). . . . between 20.95 and 21.05m depth siltstone is extremely weak. . . . between 20.95 and 22.45m depth siltstone weathered and disintergrated along randomly orientated coal laminations. . . . at 21.05 and 21.12m depth bedding fracture infilled with greyish brown clay up to 3mm. . . . between 21.40 and 21.56m depth joint is formed along the coal laminations and dips 85° infilled with reddish brown clay. . . . between 21.56 and 21.83m depth joint is vertical. . . . between 21.90 and 22.00m depth siltstone becomes extremely weak.		(1.60)	
22.00-23.50										. . . between 22.30 and 22.45m depth siltstone is extremely weak to very weak.	-12.71	22.45	
				100	80	60	NI 100 160			at 22.30 and 22.45m depth bedding fracture 25° infilled with fine to medium gravel of siltstone. Very weak/extremely weak thinly laminated grey partially weathered SILTSTONE with occasional randomly orientated laminations of coal. (Partially weathered COAL MEASURES) . . . between 22.45 and 23.80m depth siltstone weakened and displaced along randomly orientated coal laminations. . . . between 22.50 and 22.90m depth siltstone recovered as fine to coarse subrounded siltstone embedded is grey clay matrix (Possible conglomerate) . . . between 22.60 and 22.80m depth weathering penetrates downward along randomly orientated laminations of coal causing further loss of strength. . . . between 23.00 and 23.20m depth siltstone is very weak/extremely weak and		(1.45)	
23.20-23.30	37	CS											

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**JG**	**BSaimen + REWilliams**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH512**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**28.05.13** End: **30.05.13**	**9.74**	**E:356037.4 N:170959.0**	**10** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
				100	80	60				non intact.			
23.50-25.00							NI 100 160			. . . between 23.20 and 23.50m depth siltstone is very weak. between 23.20 and 23.50m depth bedding fractures are very closely spaced.			
										. . . at 23.85m depth joint is 35° planar rough open infilled with grey clay up to 2mm.	-14.16	23.90	
23.90		HP	c_u=87/112							Very weak to extremely weak grey highly to destructured MUDSTONE. Bedding is 10 to 15°. (Destructured COAL MEASURES)		(0.70)	
				100	43	18				. . . between 24.30 and 24.40m depth clay contains lithorelicts (completley weathered).			
							NI 100 150			. . . between 24.50 and 24.58m depth black vitreous extremely weak coal bed dipping at 15°.	-14.86	24.60	
24.60-24.78	38	CS								Weak to medium strong thinly laminated black and grey partially weathered SILTSTONE with occasional thin laminations of coal. (Partially weathered COAL MEASURES) . . . at 24.60 and 24.78m depth siltstone medium strong.		(0.40)	
										. . . between 24.90 and 25.00m depth siltstone non intact.	-15.26	25.00	
										Borehole terminated at 25.00m depth.			

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**JG**	**BSaimen + REWilliams**	AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH513**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**03.12.12** End: **11.12.12**	**8.22**	**E:356064.2 N:170941.4**	**1** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
0.10-0.30	1	B								MADE GROUND: Soft friable brown sandy clayey TOPSOIL. (MADE GROUND)	7.92	(0.30)	
0.30-0.50	2	B								MADE GROUND: Soft brown gravelly sandy CLAY. Gravel is angular to subangular fine to coarse of limestone and occasional brick. (MADE GROUND)		(0.30)	
0.50	3	ES								. . . at 0.40m depth boulder ~0.35m diameter of limestone.	7.62	0.60	
0.60-1.00	4	B								MADE GROUND: Firm light brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of brick and limestone. (MADE GROUND)			
1.00	5	ES											
1.00-2.00	7	B										(1.00)	
1.20-1.65	6	SPT(c)	7,3/2,3,3,4 N=12							. . . at 1.10 to 1.25m depth layers of concrete recovered as boulders up to 0.30m diameter.			
										. . . at 1.40 to 1.60m depth layers of concrete recovered as boulders up to 0.30m diameter.	6.62	1.60	
										Firm brown slightly sandy CLAY. (ALLUVIUM)			
2.00-2.45	8	SPT	1,2/2,2,2,3 N=9							. . . from 2.00m depth becomes locally poorly laminated with thin laminae of silty sand.			
2.00-2.50	10	B											
2.00	9	ES											
2.50-3.00	11	B								. . . at 2.50m depth becomes soft to firm coarse gravel-cobble size pockets.		(1.80)	

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
04/12/12	13:00	6.00	3.30	150	5.70
04/12/12	14:30	7.50	6.50	150	7.50
05/12/12	08:40	9.50	8.90	150	2.55
07/12/12	08:30	12.50	12.50	150	9.30
07/12/12	08:30	12.50	12.50	121	9.30
10/12/12	08:30	12.50	12.50	121	7.10
11/12/12	08:00	20.00	13.00	121	0.00

Chiselling / Slow Progress

From	To	Duration (hh:mm)
1.00	1.50	01:00

General Remarks

1. Location CAT scanned and inspection pit dug to 1.20m depth prior to drilling.
2. Concrete obstruction at 1.10 and 1.40m depth.
3. Cable percussion from 1.20m to 12.50m depth.
4. Rotary coring from 12.50m to 25.00m depth.
5. Water strike at 12.50m depth.
6. Water flush used.

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Beretta T44**	**AL + JP**	**BSaimen + EBall**	[redacted]

Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk.

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH513**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**03.12.12** End: **11.12.12**	**8.22**	**E:356064.2 N:170941.4**	**2** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
									2				
3.00-3.50	12	$U_{(UT100)}$	10 blows 100% recovery								4.82	3.40	
3.50-3.70	13	D								Very soft to soft dark grey silty CLAY with frequent fine to coarse gravel sized pockets of fibrous peat. (ALLUVIUM)			
3.50	14	ES											
3.50-4.00	15	B							1				
										. . . from 3.90m depth decrease in fibrous peat.		(1.10)	
4.00-4.45	16	SPT	N=0								3.72	4.50	
4.50-5.00	17	B								Very soft very low strength brown grey silty CLAY. (ALLUVIUM)		(0.70)	
5.00	18	ES											
5.00-5.50	19	$U_{(UT100)}$	15 blows 100% recovery								3.02	5.20	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

Chiselling / Slow Progress		
From	To	Duration (hh:mm)

General Remarks

7. SPT hammers EQU249-2012 (E_r = 64.87%) , EQU251-2012 (E_r = 72.73%) used.

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Beretta T44**	**AL + JP**	**BSaimen + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH513**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	End: **11.12.12**	**8.22**	**E:356064.2 N:170941.4**	**3** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										Firm locally stiff brown mottled blue grey silty CLAY. (ALLUVIUM)		(0.50)	
5.50-5.70	20	D									2.52	5.70	
5.70-6.30	21	B								Yellowish brown clayey subangular to subrounded fine to coarse GRAVEL of sandstone. (ALLUVIUM)		(0.60)	
6.30-6.50	22	B								Stiff reddish brown sandy CLAY with occasional angular to subangular fine to coarse extremely weak mudstone lithorelicts. (MERCIA MUDSTONE GROUP Zone IVa)	1.92	6.30	
6.50-7.00	23	$U_{(UT100)}$	150 blows										
7.00-7.20	24	D											
7.30-7.50	25	B								. . . from 7.30 to 7.50m depth angular to subangular fine to coarse gravel of sandstone.			
7.50-8.00	26	B											

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

Chiselling / Slow Progress		
From	To	Duration (hh:mm)

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Beretta T44**	**AL + JP**	**BSaimen + EBall**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH513**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	End: **11.12.12**	**8.22**	**E:356064.2 N:170941.4**	**4** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
8.00-8.45	27	SPT	4,4/5,6,6,7 N=24										
8.00-8.90	28	B											
8.90-9.50	29	B							3			(6.20)	
9.50-9.95	30	SPT	6,12/10,10,12,14 N=46										
10.00-10.50	31	B								. . . from 10.00m depth becomes very stiff and occasionally randomly fissured.			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Beretta T44**	**AL + JP**	**BSaimen + EBall**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH513**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	End: **11.12.12**	**8.22**	**E:356064.2 N:170941.4**	**5** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
10.50-11.00	32	B								. . . from 10.50m depth occasional grey green mottling.			
11.00-11.39	33	SPT	8,10/12,16,16,6 for 15mm N=62*										
11.50-12.50	34	B											
											-4.28	12.50	
12.50-14.00										Very stiff reddish brown mottled greenish grey silty CLAY with rare fine to coarse angular lithorelicts and pockets (<10mm) of greenish grey sandy. (MERCIA MUDSTONE GROUP Zone IVa)			
12.50-12.67	35	SPT	7,15/50 for 20mm N=750*								-4.42	12.64	
12.50-12.79	36	SPT(c)	19,6/27,38,35 for 35mm N=162*	100	83	7	NI 70 360			Extremely weak reddish brown thinly to medium bedded mottled green SILTSTONE with occasional lenticular or irregular shaped very weak greenish grey			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Beretta T44**	**AL + JP**	**BSaimen + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH513**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**03.12.12** End: **11.12.12**	**8.22**	**E:356064.2 N:170941.4**	**6** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
13.00-13.12	36	CS								siltstone. Fractures are 5 to 10° closely to medium spaced undulating rough infilled with reddish brown clay. (MERCIA MUDSTONE GROUP Zone I)		(0.86)	
							NI 70 360			. . . between 13.23 and 13.28m depth very stiff reddish brown clay formed by the complete weathering of extremely weak siltstone.			
										. . . between 13.30 and 13.50m depth irregular or lenticular shaped greenish grey completley weathered fine sandstone and extremely weak fine mudstone with extremely weak reddish brown siltstone.	-5.28	13.50	
				100	83	7							
13.60-13.78	37	CS								Very weak locally extremely weak reddish brown thinly to medium bedded SILTSTONE with rare greenish grey lenticular/irregular shaped very weak greenish grey fine sandstone or siltstone. Bedding fractures are 5 to 10° closely to medium spaced undulating rough partly open/open infilled with reddish brown clay. (MERCIA MUDSTONE GROUP Zone I)			
14.00-15.50										. . . at 14.17, 14.45, 14.54 and 14.90m depth bedding fractures are 5 to 10° undulating rough open infilled with some reddish brown clay.			
							60 280 350					(2.00)	
14.65-14.80	38	CS											
				100	100	80							
										. . . at 15.00 and 15.07m depth siltstone is locally extremely weak.			
										. . . between 15.10 and 15.22m depth rare lenticular and irregular greenish grey very weak siltstone.			
										. . . between 15.22 and 15.50m depth siltstone is extremely weak.			
										. . . at 15.30 and 15.38m depth bedding fractures are 5° undulating rough partly open.			
15.40-15.50	39	CS									-7.28	15.50	
15.50-17.00				80	80	80				Extremely weak reddish brown thinly to medium bedded SILTSTONE. Bedding is			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Beretta T44**	**AL + JP**	**BSaimen + EBall**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH513**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	End: **11.12.12**	**8.22**	**E:356064.2 N:170941.4**	**7** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										5 to 10°. Bedding fracture 5 to 10° closely to medium spaced undulating rough open infilled with reddish brown clay. (MERCIA MUDSTONE GROUP Zone I) . . . at 15.50 and 15.80m depth possible loss of recovery.			
				80	80	80	NI 250 350					(2.00)	
16.73-17.00	40	CS											
17.00-18.50										. . . between 17.30 and 17.38m depth non intact recovered as fine to coarse gravel of siltstone (possibly weathered and non intact).	-9.28	17.50	
				100	93	85	40 90 250			Very weak reddish brown thinly to medium bedded SILTSTONE. Bedding fractures are 5 to 10° closely to medium spaced undulating rough infilled with reddish brown clay/smears of clay. (MERCIA MUDSTONE GROUP Zone I) . . . at 17.50m depth greenish grey lenticular very weak siltstone up to 15mm.			
										. . . between 18.05 and 18.50m depth bedding fractures are closely spaced.			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Beretta T44**	**AL + JP**	**BSaimen + EBall**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH513**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**03.12.12** End: **11.12.12**	**8.22**	**E:356064.2 N:170941.4**	**8** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
18.30-18.40	41	CS		100	93	85						(1.55)	
18.50-20.00							40 90 250						
										. . . at 19.00m depth siltstone becomes extremely weak. below 19.00m depth red siltstone contains fine to coarse subangular to rounded fragments of grey siltstone (becomes conglomerate).	-10.83	19.05	
				87	67	33				Extremely weak thinly laminated extremely closely fissured grey and reddish mottled partially weathered MUDSTONE. Bedding is 5 to 15°. Fractures are 5 to 15° closely spaced undulating rough infilled with angular gravel of mudstone. (Partially weathered COAL MEASURES) . . . between 19.30 and 19.50m depth non intact recovered as fine to coarse gravel of grey and red mudstone.		(0.45)	
19.70-19.75	42	CS									-11.28	19.50	
							NI 90 170			Very weak thinly laminated grey partially weathered MUDSTONE with occasional dark grey plant fossils. bedding is 5 to 15°. Fractures are closely to closely spaced undulating rough infilled with fine to coarse gravel of grey mudstone. (Partially weathered COAL MEASURES) . . . at 19.55 and 19.67m depth bedding fracture dipping at 50°. . . . at 19.80 and 19.85m depth joint is 75° undulating rough open. . . . between 19.85 and 20.00m depth non intact recovered as fine to coarse gravel of grey mudstone. . . . between 20.00 and 20.60m depth fractures are extremely closely to closely spaced. . . . between 20.00 and 21.00m depth bedding dips at 15°. . . . between 20.60 and 20.85m depth non intact (possibly due to drilling).			
20.00-21.00				80	75	57							

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Beretta T44**	**AL + JP**	**BSaimen + EBall**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
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Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	End: **11.12.12**	**8.22**	**E:356064.2 N:170941.4**	**9** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
20.85-21.00	43	CS		80	75	57				. . . at 20.85m depth joint is 60° partly open.			
21.00-22.50										. . . between 21.00 and 21.60m depth possibly loss of recovery.			
				60	35	10				. . . at 21.60 and 21.65m depth extremely weak mudstone. . . . at 21.67 and 21.69m depth band of black extremely weak coal dipping at 40°. . . . at 21.74m depth joint dips at 50° undulating rough open with red smears of clay. . . . at 21.85m depth bedding fracture is 15° undulating rough with brown staining.		(4.50)	
22.00-22.10	44	CS					NI 90 170			. . . at 21.90m depth joint dips at 60° with non intact wall rock.			
										. . . at 22.23 and 22.28m depth non intact.			
										. . . at 22.35 and 22.50m depth highly weathered mudstone recovered as fine grey gravelly clay.			
22.50-24.00										. . . between 22.50 and 22.80m depth possible loss of recovery.			
				80	67	17							
23.35-23.50	45	CS											

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Beretta T44**	**AL + JP**	**BSaimen + EBall**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH513**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**03.12.12** End: **11.12.12**	**8.22**	**E:356064.2 N:170941.4**	**10** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
				80	67	17	NI 90 170			. . . at 23.50, 23.60. 23.70 and 23.78m depth fractures undulating rough infilled with fine to coarse crushed mudstone fragments. . . . at 23.90m depth sigmoidal veins of calcite dipping at 60°.	-15.78	24.00	
24.00-25.00				90	80	80	NI 180 350			Extremely weak to very weak thinly laminated grey partially weathered MUDSTONE with occasional plant fossils and thin bands of black coal. Fractures are closely to medium spaced. Bedding is 15°. (Partially weathered COAL MEASURES) . . . between 24.00 and 24.20m depth non intact recovered as fine to coarse extremely weak grey mudstone. . . . at 24.00 and 24.65m depth mudstone is extremely weak. . . . at 24.55m depth thin band of coal (20mm) dipping at 40°. . . . between 24.60 and 25.00m depth occasional incipient fractures. . . . below 24.65m depth becomes very weak. . . . at 24.85m depth calcite (2mm) veins running at 65°.	-16.78	(1.00) 25.00	
24.70-25.00	46	CS											
										Borehole terminated at 25.00m depth.			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Beretta T44**	**AL + JP**	**BSaimen + EBall**	[redacted]

AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH514**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**02.12.12** End: **05.12.12**	**7.20**	**E:356087.3 N:170934.2**	**1** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										MADE GROUND: Grass over TOPSOIL consisting of soft brown slightly gravelly sandy CLAY. Gravel is angular to subangular fine to coarse of limestone and sandstone. (MADE GROUND)	6.90	(0.30) 0.30	
0.50	1	B								MADE GROUND: Black gravelly sandy friable CLAY. Gravel is subangular to subrounded fine to coarse of limestone, brick, occasional clinker and occasional sandstone. (MADE GROUND)		(0.40)	
0.50	2	ES								. . . from 0.60m to 0.70m depth 2 No. cobble of limestone ~0.25m diameter.	6.50	0.70	
										Firm greyish black slightly sandy CLAY.		(0.20)	
											6.30	0.90	
										Firm to stiff reddish brown sandy CLAY locally friable.	6.20	1.00	
1.00-2.50	3	$U_{(UT100)}$	18 blows 100% recovery							Firm medium strength orange brown mottled grey slightly sandy CLAY. (ALLUVIUM)			
1.00	4	B										(0.65)	
1.00	5	ES											
1.00-1.65		B											
1.50		HP	c_u=65/65/60								5.55	1.65	
1.70-2.04	6	U	100% recovery							Soft very low strength orange brown mottled grey slightly sandy CLAY with occasional pockets (<0.3mm) brown silt. (ALLUVIUM)			
1.70		HP	c_u=37/40/37									(0.60)	
2.04-2.20	7	D							▼1				
2.04		HP	c_u=35/35								4.95	2.25	
2.25-2.50	8	B								Soft low strength grey slightly sandy organic CLAY with occasional brown pseudo-fibrous peat and rare brown fibrous peat remains and rare pockets (<5mm) of brown silt.			
2.25		HP	c_u=30/30										

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
03/12/12		2.10	None	121	2.10
04/12/12		4.00	None	121	0.00
05/12/12	09:00	8.00	8.00	121	0.00
05/12/12	17:00	8.00	8.00	121	1.90

General Remarks

1. Location CAT scanned prior to drilling and inspection pit dug to 1.20m depth.
2. Dynamic sampling from 1.20m to 8.00m depth.
3. Rotary coring from 8.00m to 22.80m depth.
4. Water strike at 2.10m depth.
5. Water flush used.
6. SPT hammer EQU083-2012 (E_r = 63.54%) used.

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**LH**	**BSaimen + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH514**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	End: **05.12.12**	**7.20**	**E:356087.3 N:170934.2**	**2** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
2.50-4.00		$U_{(UT100)}$	11 blows 100% recovery							(ALLUVIUM) . . . at 2.45m depth pocket (20mm) of brown silt.		(0.75)	
											4.20	3.00	
3.10-3.50	9	$U_{(WS)}$	100% recovery							Soft very low strength grey slightly sandy organic CLAY with occasional brown fibrous and pseudo-fibrous peat remains. (ALLUVIUM)			
3.50-4.00 3.50	10	B HP	c_u=22/22									(1.00)	
											3.20	4.00	
4.00-5.50		$U_{(UT100)}$	38 blows 0% recovery							Firm greenish grey slightly sandy CLAY with occasional brown pseudo-fibrous and fibrous peat. (ALLUVIUM)			
4.50-4.90		B										(0.90)	
											2.30	4.90	
4.90-5.50		B								Stiff reddish and orange brown slightly gravelly slightly silty CLAY.			

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**LH**	**BSaimen + EBall**	[redacted]

STRUCTURAL SOILS

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Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH514**

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727305	**02.12.12** End: **05.12.12**	**7.20**	**E:356087.3 N:170934.2**	**3** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										Gravel is subrounded to rounded fine to coarse of flint. (ALLUVIUM)		(0.60)	
											1.70	5.50	
5.50-7.00		$U_{(UT100)}$	28 blows 0% recovery							Very stiff very high strength reddish brown silty CLAY with lenticular occasional pockets/bands (<5mm) of greenish grey extremely fine sandstone/siltstone or completely weathered greenish grey fine sand. (MERCIA MUDSTONE GROUP Zone IVb)			
6.10		HP	c_u=>200							. . . between 6.20 to 6.60m depth extremely to very closely spaced lenticular pockets of greenish grey extremely weak fine sandstone/siltstone and pockets of completely weathered sandstone.			
7.00		HP	c_u=>200							. . . at 7.00m depth rare pockets of completely weathered greenish grey fine sandstone/siltstone. . . . below 7.00m depth clay is fissured.			

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**LH**	**BSaimen + EBall**	

STRUCTURAL SOILS

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Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH514**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**02.12.12** End: **05.12.12**	**7.20**	**E:356087.3 N:170934.2**	**4** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
7.50		HP	c_u=>200										
7.60-8.00	11	$U_{(UT100)}$	0% recovery										
8.00-9.50										. . . at 8.00m depth clay is very closely fissured. . . . between 8.00 to 9.50m depth clay is very stiff and greenish grey pockets of fine sandstone and weak sand.		(5.85)	
				100	0	0							
8.90		HP	c_u=>200										
9.50-11.00													
9.50-9.95	1	SPT	2,3/7,8,13,15 N=43										
9.50		HP	c_u=>225										
				100	0	0							

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**LH**	**BSaimen + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH514**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**02.12.12** End: **05.12.12**	**7.20**	**E:356087.3 N:170934.2**	**5** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
10.20		HP	c_u=>225										
10.30-10.65	12	CS		100	0	0				. . . below 10.60m depth clay becomes hard.			
11.00-12.50													
11.00-11.37	2	SPT	2,5/11,11,78 for 70mm N=136*										
11.00		HP	c_u=>225								-4.15	11.35	
11.45		HP	c_u=>225							Very weak reddish brown SILTSTONE with extremely closely spaced lenticular greenish grey fine sandstone/siltstone. (MERCIA MUDSTONE GROUP Zone I)	-4.25	11.45	
11.70-11.88	12	CS		100	44	38	NI			Very stiff/hard reddish brown silty CLAY. (MERCIA MUDSTONE GROUP Zone IVb)	-4.50	(0.25) 11.70	
11.87		HP	c_u=>225							Very weak reddish brown sandy SILTSTONE with extremely closely spaced lenticular greenish grey fine sandstone/siltstone. (MERCIA MUDSTONE GROUP Zone I)	-4.67	11.87	
12.10-12.25	13	CS								Very stiff/hard reddish brown silty CLAY. (MERCIA MUDSTONE GROUP Zone IVb)	-4.85	(0.18) 12.05	
12.40-12.45	14	CS					NI 50 60			Extremely weak reddish brown SILTSTONE with extremely to very closely to closely spaced thinly laminated to very thin beds of greenish grey fine sandstone/siltstone. Bedding is subhorizontal. (MERCIA MUDSTONE GROUP Zone I) . . . between 12.25 to 12.30m depth extremely weak reddish brown siltstone is	-5.10	(0.25) 12.30	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**LH**	**BSaimen + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
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Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**02.12.12** End: **05.12.12**	**7.20**	**E:356087.3 N:170934.2**	**6** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
12.50-14.00										fractured and non-intact.			
12.50-12.74	3	SPT	9,10/74,26 for 11mm N=349*							Extremely weak to very weak reddish brown fine silty SANDSTONE. Bedding is subhorizontal (5°). (MERCIA MUDSTONE GROUP Zone I) . . . between 12.50 to 12.80m depth possible loss of 30cm core possibly drilling induced.	-5.65	(0.55) 12.85	
13.00-13.30	15	CS		80	55	27	NI 140 270			Very weak reddish brown sandy SILTSTONE. Bedding fractures are 5° very closely to medium spaced undulating rough open infilled with slightly sandy clay (up to 5mm). (MERCIA MUDSTONE GROUP Zone II) . . . between 12.85 to 13.00m depth fractures are very closely spaced. . . . between 12.85 to 13.00m depth siltstone is extremely weak. . . . between 13.30 to 13.40m depth siltstone is non-intact.	-6.20	(0.55) 13.40	
13.45-13.60	16	CS								Extremely weak reddish brown sandy SILTSTONE with extremely closely spaced lenticular greenish grey fine sandstone/siltstone up to 50mm. Bedding fractures are 5° undulating closely spaced infilled with silty clay (up to 5mm). (MERCIA MUDSTONE GROUP Zone II) . . . between 13.40 to 13.62m depth siltstone is very weak below 13.65m depth it becomes extremely weak with weathered greenish grey siltstone/fine sandstone lenses.	-6.65	(0.45) 13.85	
13.85		HP	c_u=>225							. . . at 13.65m depth stiff reddish brown silty clay up to 40mm (probably completely weathered siltstone).	-6.80	14.00	
14.00-15.30				85	85	73	NI 250 450			Very stiff becoming hard reddish brown silty CLAY. (MERCIA MUDSTONE GROUP Zone IVb) Extremely weak thinly to medium bedded reddish brown SILTSTONE with rare greenish grey pockets (<10mm) of extremely weak fine sandstone/siltstone. Bedding fractures are 5° closely to medium spaced undulating rough with reddish clay (<1.5mm). (MERCIA MUDSTONE GROUP Zone I) . . . between 14.50 and 14.70m depth rare pockets of greenish grey fine sandstone/siltstone up to 20mm.			
14.59-14.78	17	CS											

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**LH**	**BSaimen + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH514**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	End: **05.12.12**	**7.20**	**E:356087.3 N:170934.2**	**7** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
				85	85	73							
15.30-16.30												(2.75)	
				100	100	90	NI 250 450			. . . at 16.08m depth bedding fractures 5° with softened wall rock.			
16.30-17.50										. . . at 16.30 and 16.75m depth occasional greenish grey lenticular extremely weak/very weak greenish grey fine sandstone up to 30mm within extremely weak reddish brown siltstone.			
16.55-16.80	18	CS									-9.55	16.75	
				83	70	67	NI 190 260			Very weak reddish brown thinly to medium bedded fine silty SANDSTONE. Bedding fractures are 5 to 15° very closely to medium spaced undulating rough infilled with reddish brown sandy clay. (MERCIA MUDSTONE GROUP Zone I) . . . between 16.75 and 16.83m depth lenticular very weak greenish grey fine to coarse sandstone. . . . at 17.03, 17.15, 17.48 and 17.63m depth bedding fractures are 5° undulating rough infilled with red sandy clay. . . . at 17.15m depth upper wall rock is extremely weak and non intact.		(1.35)	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**LH**	**BSaimen + EBall**	

STRUCTURAL SOILS

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Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	End: **05.12.12**	**7.20**	**E:356087.3 N:170934.2**	**8** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
17.50-18.50										. . . between 17.45 and 17.63m depth possible vertical incipient fracture possibly opened by drilling action.			
17.62-17.80	19	CS					NI 190 260			. . . between 17.85 and 18.10m depth becomes extremely weak.			
				100	80	60					-10.90	18.10	
18.10		HP	c_u=75/75				NI 30 150			Extremely weak thinly laminated grey fissile distinctly weathered MUDSTONE. Bedding is 5°. (Distinctly weathered COAL MEASURES)		(0.23)	
										. . . between 18.10 and 18.17m depth mudstone is completley weathered into firm brownish grey clay.	-11.13	18.33	
										. . . between 18.17 and 18.33m depth mudstone is extremely weak and crumbles into tabular fragments along the bedding.	-11.30	18.50	
18.50-19.30										Extremely weak thinly laminated greyish brown distinctly weathered fissile MUDSTONE with alternating thin beds of greyish brown fine clay. (Distinctly weathered COAL MEASURES) . . . extremely weak mudstone crumbles into tabular fragments of mudstone when handled.		(0.80)	
				100	38	19	NI 40 150			Extremely weak to very weak thinly laminated partially weathered grey MUDSTONE with occasional thick laminations of black coal. Bedding fractures are 5° extremely closely to closely spaced undulating rough infilled with grey brown clay fine to coarse gravel of mudstone. (Partially weathered COAL MEASURES)	-12.10	19.30	
19.30-20.80										. . . between 18.50 and 18.90m depth non intact recovered as fine to coarse tabular gravel of mudstone. . . . at 19.16m depth bedding fractures is 5° infilled with grey brown clay with non intact upper wall rock.			
				100	67	33	NI 100 150			Very weak thinly laminated grey distinctly weathered fissile MUDSTONE with very closely to closely spaced extremely weak thinly laminated grey friable mudstone and completley weathered mudstone. (Distinctly weathered COAL MEASURES) . . . at 19.60 and 19.75m depth extremely friable grey thinly laminated mudstone.		(1.00)	

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**LH**	**BSaimen + EBall**	

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727305	**02.12.12** End: **05.12.12**	**7.20**	**E:356087.3 N:170934.2**	**9** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										. . . between 20.00 and 20.10m depth extremely weak thinly laminated grey friable mudstone.	-13.10	20.30	
				100	67	33	NI 100 150			MUDSTONE recovered as stiff reddish brown and grey slightly sandy clay with frequent extremely weak lithorelicts of mudstone (destructured weathered mudstone). (Destructured COAL MEASURES)		(0.80)	
20.80-22.30											-13.90	21.10	
										Extremely weak to very weak thinly laminated grey partially weathered MUDSTONE with frequent thin laminations of black coal. Bedding is 5°. (Partially weathered COAL MEASURES) . . . between 21.10 and 21.30m depth very weak grey mudstone. . . . between 21.30 and 21.55m depth mudstone is extremely weak.		(0.45)	
				100	73	26	NI 100 260			. . . between 21.45 and 21.55m depth mudstone is highly weathered recovered as stiff reddish brown grey clay with extremely weak lithorelicts arranged in order.	-14.35	21.55	
21.64-21.74	20	CS								Strong thinly laminated grey fresh partially weathered SILTSTONE. (Partially weathered COAL MEASURES)		(0.30)	
										. . . at 21.75m depth fractures is 5° undulating rough infilled with reddish brown clay. . . . between 21.75 and 21.85m depth non intact.	-14.65	21.85	
										Extremely weak to very weak thinly laminated grey distinctly weathered MUDSTONE. Bedding fractures are 5 to 15° very closely to closely spaced undulating rough infilled with grey clay (up to 5mm). (Distinctly weathered COAL MEASURES)			
22.30-22.80				80	60	46				. . . between 22.30 and 22.80m depth mudstone extremely weak and crumbles		(0.95)	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**LH**	**BSaimen + EBall**	

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727305	**02.12.12** End: **05.12.12**	**7.20**	**E:356087.3 N:170934.2**	**10** of **10**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
				80	60	46	NI 100 260			into angular fragments when handled.	-15.60	22.80	
										Borehole terminated at 22.80m depth.			

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio MC300**	**LH**	**BSaimen + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH515**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**21.11.12** End: **27.11.12**	**8.85**	**E:356109.1 N:170928.4**	**1** of **11**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										MADE GROUND: Grass over TOPSOIL consisting of soft brown sandy CLAY with frequent roots.	8.75	0.10	
0.10-0.30	1	B								(MADE GROUND)		(0.20)	
										MADE GROUND: Firm grey mottled brown slightly sandy gravelly CLAY with frequent roots. Gravel is subangular to rounded fine to coarse of limestone, occasional brick and occasional concrete.	8.55	0.30	
0.30	2	ES								(MADE GROUND)			
0.30-0.40	3	B											
0.40-0.60	4	B											
										MADE GROUND: Firm grey brown slightly sandy gravelly CLAY with medium cobble content. Gravel is angular to subangular fine to coarse of limestone, concrete and brick.			
0.60-0.80	5	B								(MADE GROUND)			
0.70	6	ES								. . . at 0.40m depth frequent fragments of plastic, plastic bag, wood and ceramic.		(0.90)	
0.80-1.20	7	B								. . . from 0.60m to 0.80m depth black slightly clayey sandy angular to subangular fine to coarse gravel of limestone, brick, clinker and ash deposits. Fragments of metal, plastic and wood. Strong hydrocarbon odour.			
										. . . from 0.80m to 1.20m depth dense layers of plastic bags.	7.65	1.20	
1.20-1.51	8	SPT	1,2/9,32,9 for 10mm N=94*							MADE GROUND: Black-dark grey slightly clayey sandy angular to subangular fine to coarse GRAVEL of limestone, brick, clinker and ash deposits with fragments of metal and plastic. Slight hydrocarbon odour.			
1.20-1.40	9	B								(MADE GROUND)			
1.40-2.00	10	B								. . . from 1.20m to 1.40m depth predominantly plastic bags.			
2.00-2.22	11	SPT(c)	5,20/34,16 for 23mm N=153*										
2.00	12	ES										(2.00)	
2.00-3.00	13	B											

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
22/11/12	11:30	0.70	1.00	200	0.60
23/11/12	09:00	2.50	3.39	200	0.65
23/11/12	12:30	10.50	7.80	150	10.50
26/11/12	01:00	11.00	10.50	121	1.80
27/11/12	09:00	18.90	11.00	121	0.00

Chiselling / Slow Progress

From	To	Duration (hh:mm)
1.50	2.00	01:00
2.20	2.50	00:30

General Remarks

1. Location CAT scanned and inspection pit dug to 1.20m depth prior to drilling.
2. Rotary coring from 11.00m to 26.30m depth.
3. Strong hydrocarbon odour 0.60 to 0.80 and 1.20 to 3.20m depth.
4. Water strike at 10.50m depth.
5. Water flush used.

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

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Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**21.11.12** End: **27.11.12**	**8.85**	**E:356109.1 N:170928.4**	**2** of **11**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
3.00-3.45	14	SPT(c)	8,6/3,3,2,2 N=10										
3.00-3.40	15	B									5.65	3.20	
										Soft brown silty CLAY with occasional lenses of dark brown-black organic material. (ALLUVIUM)			
3.40-3.80	16	B											
3.50	34	ES											
3.80-4.00	17	B											
4.00-4.20	18	$U_{(UT100)}$	80 blows										
	20		20% recovery										
4.00-5.00	19	B								. . . from 4.00m to 5.00m depth occasional closely spaced thin laminae of red brown silty sand.			
4.10-4.20		D										(2.40)	

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	6. SPT hammers EQU083-2012 (E_r = 63.54%) , EQU251-2012 (E_r = 72.73%) used.

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

GINT_LIBRARY_V8_04.GLB|Log COMPOSITE LOG | 727305_BRISTOL_RAPID_TRANSIT.GPJ - v8_04 | 29/10/13 - 18:06 | KJ.
Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk.

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH515**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**21.11.12** End: **27.11.12**	**8.85**	**E:356109.1 N:170928.4**	**3** of **11**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
5.00-5.30	22	B								. . . from 5.00m to 5.60m depth very soft dark brown black clayey amorphous peat.			
5.00	35	ES											
5.20-5.65	21	SPT	1,1/1,1,1,1 N=4										
5.30-5.60	23	B									3.25	5.60	
5.60-6.00	24	B								Firm brown locally poorly laminated slightly sandy silty CLAY. (ALLUVIUM)			
6.00-6.50	25	$U_{(UT100)}$	20 blows 95% recovery									(1.40)	
6.50-6.70	26	D								. . . from 6.50m depth becoming reddish brown with occasional subangular to angular fine to coarse gravel of mudstone.			
6.50-7.00	27	B									1.85	7.00	
7.00-7.50	28	B								Firm reddish brown friable slightly sandy CLAY with occasional subangular to angular fine to coarse of weak mudstone lithorelicts. (MERCIA MUDSTONE GROUP Zone IVa)			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH515**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**21.11.12** End: **27.11.12**	**8.85**	**E:356109.1 N:170928.4**	**4** of **11**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
7.50-7.95	29	SPT	1,3/3,5,5,7 N=20							. . . from 7.50m depth becoming firm to stiff with occasional mudstone lithorelicts.			
8.00-9.00	30	B										(3.50)	
									1				
9.00-9.45	31	SPT	6,8/11,14,13,14 N=52										
9.50-10.50	32	B								. . . from 9.50m depth becoming stiff to very stiff with grey green weathering.			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH515**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**21.11.12** End: **27.11.12**	**8.85**	**E:356109.1 N:170928.4**	**5** of **11**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
									1		-1.65	10.50	
10.50-10.92	33	SPT	6,7/10,10,14,16 for 40mm N=57*							Very stiff reddish brown sandy CLAY with some very weak lithorelicts of mudstone. (MERCIA MUDSTONE GROUP Zone III)	-2.15	(0.50) 11.00	
11.00-12.50				100	0	0	NI			Hard reddish brown slightly sandy SILT with rare pinkish white fine to medium gravel sized nodules of gypsum. (MERCIA MUDSTONE GROUP Zone IVb)		(1.50)	
										. . . from 12.08m to 12.13m depth coarse gravel sized inclusions of hard greenish grey sand.			
										. . . from 12.38m depth frequent fine to medium gravel sized lenses of hard	-3.65	12.50	

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH515**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**21.11.12** End: **27.11.12**	**8.85**	**E:356109.1 N:170928.4**	**6** of **11**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
12.50-13.00										greenish grey fine sand.			
12.50-12.70	38	CS		100	100	64	50			Weak to medium strong reddish brown mottled greenish grey silty SANDSTONE. Discontinuities predominantly subhorizontal to 50° closely spaced smooth with occasional fine sand infill. (MERCIA MUDSTONE GROUP Zone I)	-4.15	(0.50) 13.00	
13.00-14.50										Medium strong thinly to thickly bedded reddish brown mottled greyish green silty SANDSTONE. Greenish grey sandstone occuring in horizontal lenses. Discontinuities predominantly subhorizontal closely to medium spaced rough to smooth with film of fine sand. (MERCIA MUDSTONE GROUP Zone I)			
13.00-13.12	36	SPT	25/68,32 for 10mm N=353*							. . . from 13.00m to 13.10m depth extremely weak.			
							100 350 700			. . . at 13.22m depth dissolution hole 10mm diameter partially infilled with chalky gypsum crystals.		(1.20)	
13.70-13.90	39	CS		100	100	97				. . . from 13.24m depth coarse quartz sand grains in the sandstone lenses . . . from 13.40m to 13.92m depth occasional subrounded fine quartzite gravel.			
										. . . from 13.96m to 14.17m depth band of greenish grey medium strong medium to coarse sandstone with rare reddish brown lenses. Rough boundaries.			
14.15-14.40	40	CS									-5.35	14.20	
14.50-15.90										Extremely weak thinly laminated reddish brown slightly sandy SILTSTONE. Discontinuities predominantly bedding fractures subhorizontal medium to widely spaced rough with no infill. (MERCIA MUDSTONE GROUP Zone I)			
14.50-14.62	37	SPT	25/69,31 for 15mm N=333*	100	100	96	NI 950			. . . from 14.50m to 14.60m depth becomes 50% mottled with greenish grey fine sand.			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH515**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**21.11.12** End: **27.11.12**	**8.85**	**E:356109.1 N:170928.4**	**7** of **11**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
				100	100	96	NI 950			. . . from 15.70m depth rare rounded fine gravel sized lenses of greenish grey fine sand. . . . from 15.85m to 15.90m depth lenses become frequent.		(2.45)	
15.90-17.40													
16.00-16.15	41	CS											
				100	100	92				Medium strong medium bedded yellowish grey fine to medium grained SANDSTONE with frequent subrounded coarse quartz sand grains and occasionally mottled with reddish brown siltstone. (MERCIA MUDSTONE GROUP Zone I)	-7.80	16.65	
												(0.35)	
											-8.15	17.00	
17.05-17.35	42	CS					50 350 750			Medium strong thinly to medium bedded reddish brown silty fine SANDSTONE with frequent subrounded coarse quartz sand grains. Discontinuities predominantly bedding fractures 5 - 10° rough straight with some fine sand infill. (MERCIA MUDSTONE GROUP Zone I)			
17.40-18.90				100	80	62							

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

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STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH515**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**21.11.12** End: **27.11.12**	**8.85**	**E:356109.1 N:170928.4**	**8** of **11**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
												(1.30)	
										. . . at 17.73m depth becomes weak.			
17.80	43	CS					50 350 750			. . . from 17.85m depth frequent angular fine grey mudstone gravel inclusions. Grades into almost entirely and fine to medium mudstone fragments. . . . from 17.85m to 18.30m depth with red silt matrix.			
				100	80	62					-9.45	18.30	
										Very weak to weak thinly laminated dark grey reddish brown distinctly weathered silty MUDSTONE. Discontinuities are extremely closely spaced to closely spaced smooth to rough with brown clay along the surfaces. (Distinctly weathered COAL MEASURES) . . . after 18.50m depth fissures become more widely spaced. . . . from 18.65m depth becomes extremely weak.			
18.90-20.30							NI 50					(1.55)	
				100	0	0				. . . from 19.40m to 19.55m depth extremely weak pinkish grey highly weathered siltstone.			
											-11.00	19.85	
										Hard pinkish grey silty CLAY with frequent specks of white chalky gypsum and rare angular medium to coarse hard		(0.23)	

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH515**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**21.11.12** End: **27.11.12**	**8.85**	**E:356109.1 N:170928.4**	**9** of **11**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										black coal fragments (possibly completely weathered mudstone) (COAL MEASURES)	-11.23	20.08	
				100	0	0				Extremely weak thinly laminated reddish dark grey silty partially weathered MUDSTONE. Discontinuities are closely spaced, crumbles along fissures into angular fine to coarse fragments with vitreous lustre on surfaces when handled. (Partially weathered COAL MEASURES)			
20.30-20.90							NI 50					(0.82)	
				100	0	0				. . . from 20.50m to 20.52m depth thin band of soft reddish brown silt.			
										. . . from 20.68m to 20.79m depth very wet reddish grey silty clay. Possibly highly to completely weathered mudstone.			
										. . . from 20.79m to 20.90m depth becomes weak to medium strong breaking into angular coarse blocks along wide fissures. Crumbles when handled.	-12.05	20.90	
20.90-21.80										Recovered as reddish grey slightly clayey gravel of angular fine to medium highly weathered extremely weak MUDSTONE. (Highly weathered COAL MEASURES)	-12.30	(0.25) 21.15	
21.25-21.40	44	CS		83	44	11	NI 30 200			Weak thinly laminated dark grey partially weathered MUDSTONE. Discontinuities subhorizontal to 10° extremely closely spaced to close space rough to smooth with red clay infill. (Partially weathered COAL MEASURES)			
										. . . at 21.30m depth 40° dipping rough undulating fracture with red clay smears on upper fracture surfaces. Lower surface is loose breaking into gravel.		(0.60)	
										. . . from 21.40m to 21.47m depth wide horizontal rough planar fracture infilled with gravelly clay. Red clay smears on lower fracture surface.	-12.90	21.75	
21.80-23.30										Very weak to weak thinly laminated dark grey mottled brown distinctly weathered MUDSTONE with red clay on fissure surfaces. Crumbles into fine fragments when handled. Locally gravelly. (Distinctly weathered COAL MEASURES)		(0.47)	
				100	32	0	NI				-13.37	22.22	
							NI 30 50			Weak to medium strong thinly laminated dark grey partially weathered MUDSTONE. Discontinuities very close to closely spaced rough to smooth with some clay infill. (Partially weathered COAL MEASURES)			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH515**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**21.11.12** End: **27.11.12**	**8.85**	**E:356109.1 N:170928.4**	**10** of **11**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
							NI 30 50			. . . at 22.47m depth 30° dipping tight rough undulating fracture infilled with gravelly clay. . . . at 22.50m depth 30° dipping tight rough undulating fracture with red clay on fracture surfaces. . . . from 22.50m to 22.65m depth 60°-20° dipping tight rough undulating fracture with red clay on fracture surfaces. Cross cuts bedding plane.		(0.72)	
				100	32	0					-14.09	22.94	
							NI			. . . at 22.65m depth 30° dipping very tight rough undulating fracture with clean surfaces. . . . from 22.70m to 22.86m depth highly weathered recovered as clayey gravel.		(0.36)	
										Dark grey black thinly laminated vitreous COAL recovered as angular fine gravel of coal.	-14.45	23.30	
23.30-24.80										(COAL MEASURES) . . . at 22.94m depth becoming darker grey almost black. Very weak to weak thinly laminated dark grey locally partially weathered MUDSTONE. Discontinuities are predominantly extremely close to close spaced smooth to rough with clay infill up to 2mm thick. (Partially weathered COAL MEASURES)			
23.90-24.10	45	CS											
				100	20	0	NI 50 90			. . . from 24.02m to 24.23m depth becomes extremely closely spaced fractured. . . . from 24.23m to 24.80m depth extremely closely spaced fracture. Fractures are tight rough undulating with red clay smears on surfaces.		(1.50)	
											-15.95	24.80	
24.80-26.30				100	67	33	50 100 200			Medium strong thinly bedded dark grey partially weathered MUDSTONE. Discontinuities are subhorizontal extremely close to closely spaced smooth			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH515**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**21.11.12** End: **27.11.12**	**8.85**	**E:356109.1 N:170928.4**	**11** of **11**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										to rough with occasional thin film of clay infill. (Partially weathered COAL MEASURES) . . . at 25.00m depth 60° dipping wide smooth undulating fracture smooth clean surfaces. . . . from 25.15m to 25.23m depth recovered as angular fine to medium mudstone gravel. Drilling induced. . . . from 25.35m to 25.55m depth recovered as angular fine to medium gravel.		(1.50)	
26.00-26.10	46	CS		100	67	33	50 100 200			. . . at 25.65m depth 20° dipping wide rough undulating fracture. Clean surfaces.	-17.45	26.30	
										Borehole terminated at 26.30m depth.			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk.

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH516**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**19.11.12** End: **28.11.12**	**11.24**	**E:356190.1 N:170912.9**	**1** of **6**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
0.10-0.50	1	B								MADE GROUND: Grass over soft to firm grey brown slightly sandy slightly gravelly locally friable CLAY with occasional roots. Gravel is subangular to rounded fine to coarse of limestone, sandstone and chert. (MADE GROUND)		(0.60)	
0.50	2	ES											
0.50-0.70	3	B									10.64	0.60	
0.70-0.80	4	B								MADE GROUND: Soft grey brown slightly sandy gravelly friable CLAY with low cobble content and occasional fragments of wood and fabric. Gravel is subangular to rounded fine to coarse of concrete, clinker and occasional ceramics. (MADE GROUND) . . . from 0.70m depth occasional fragments of pumice and plastic.			
0.80-1.20	6	B											
1.00	5	ES								. . . from 0.80m depth varying percentage of clay pockets. Increase in granular material predominantly medium to coarse gravel of limestone, sandstone and brick.			
1.20-1.65	7	SPT	3,3/6,7,4,5 N=22							. . . from 1.20m depth becoming dark grey-black in colour.		(1.40)	
1.20-2.00	8	B									9.24	2.00	
2.00	9	ES								MADE GROUND: Medium dense dark brown black locally clayey gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of brick, clinker, limestone and sandstone. (MADE GROUND) . . . from 2.00m to 2.50m depth driller notes strong methane odour.			
2.00-2.45	10	SPT	1,1/1,3,4,6 N=14										
2.00-2.50	11	B											

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
19/11/12	14:30	4.10	3.40	200	4.10
21/11/12	09:20	4.30	6.40	150	4.00
28/11/12		10.70	10.70	121	10.70

Chiselling / Slow Progress

From	To	Duration (hh:mm)

General Remarks

1. Location CAT scanned and inspection pit dug to 1.20m depth prior to drilling.
2. Cable percussion from 1.20m to 10.00m depth.
3. Rotary coring from 10.00m to 14.50m depth.
4. 8" casing reduced to 6" through bentonite seal at base of landfill (6.40m).
5. Water strike at 10.70m depth.

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH516**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**19.11.12** End: **28.11.12**	**11.24**	**E:356190.1 N:170912.9**	**2** of **6**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
2.50-3.00	12	B								. . . from 2.50m depth occasional metal fragments and cobbles of limestone and occasional concrete.		(2.00)	
3.00-3.45	13	SPT	1,13/5,3,4,4 N=16										
3.00-4.00	15	B											
3.50	14	ES							1		7.24	4.00	
4.00-4.45	16	SPT	3,3/3,4,3,3 N=13						1	MADE GROUND: Medium dense brown sandy occasionally slightly clayey angular to subangular fine to coarse GRAVEL of limestone, sandstone, clinker and brick. Occasional cobble of limestone, cobble size brick. (MADE GROUND)			
4.00-4.50	17	B											
4.10	21	W											
4.50-5.00	18	B								. . . from 4.50m depth increase in silty sand matrix.		(1.40)	

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	6. Water flush used. 7. SPT hammers EQU083-2012 (E_r = 63.54%) , EQU251-2012 (E_r = 72.73%) used.

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

GINT_LIBRARY_V8_04.GLB|Log COMPOSITE LOG | 727305_BRISTOL_RAPID_TRANSIT.GPJ - v8_04 | 29/10/13 - 11:04 | KJ
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STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH516**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**19.11.12** End: **28.11.12**	**11.24**	**E:356190.1 N:170912.9**	**3** of **6**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
5.00-5.45	19	SPT	2,3/3,2,1,2 N=8										
5.00	20	ES											
5.00-5.50	22	B									5.84	5.40	
5.50-6.00	23	B								MADE GROUND: Soft brown-orange brown silty CLAY with occasional angular fine to medium gravel of sandstone and occasional fragments of metal. (MADE GROUND)		(1.10)	
6.00-6.50	24	B								. . . at 6.00m depth large metal fragment.	4.74	6.50	
6.50-7.00	25	$U_{(UT100)}$	27 blows 100% recovery							Very soft very low strength dark grey becoming grey slightly sandy silty CLAY with occasional angular fine to medium gravel of sandstone and mudstone. (ALLUVIUM)			
7.00-7.10	26	D										(1.20)	
7.10-7.70	27	B								. . . from 7.10m depth fine to coarse gravel sized pockets of firm reddish brown clay becoming occasional.			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH516**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**19.11.12** End: **28.11.12**	**11.24**	**E:356190.1 N:170912.9**	**4** of **6**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
											3.54	7.70	
7.70-8.00	28	D								Stiff red brown and grey green slightly sandy weathered CLAY with occasional extremely weak fine to coarse mudstone lithorelicts. (MERCIA MUDSTONE GROUP Zone IVa)			
8.00-8.45	29	SPT	10,15/15,14,9,12 N=50										
8.50-9.50	30	B								. . . from 8.50m depth becoming stiff to very stiff with frequent coarse mudstone lithorelicts.		(2.30)	
9.50-9.89	31	SPT	5,7/10,14,20,6 for 18mm N=62*								1.24	10.00	

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

GINT_LIBRARY_V8_04.GLB|Log COMPOSITE LOG | 727305_BRISTOL_RAPID_TRANSIT.GPJ - v8_04 | 29/10/13 - 11:04 | KJ
Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk.

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH516**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**19.11.12** End: **28.11.12**	**11.24**	**E:356190.1 N:170912.9**	**5** of **6**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
10.00-11.50										Extremely weak thickly bedded reddish brown slightly sandy slightly micaceous SILTSTONE with rare subrounded medium gravel sized inclusions of yellowish grey/greenish grey partially to fully weathered fine sandstone. (MERCIA MUDSTONE GROUP Zone I)			
10.06-10.37	1	CS											
				100	100	100			1				
							NI 150 600			. . . from 11.20m to 11.28m depth frequent weak medium strong greenish grey sandstone inclusions.			
11.50-13.00													
11.50-11.94	32	SPT	12,13/18,30,20,27 N=95									(3.30)	
				100	70	67				. . . from 12.09m to 12.16m depth frequent weak to medium strong yellowish grey sandstone inclusions.			
12.30-12.48	2	CS											

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH516**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**19.11.12** End: **28.11.12**	**11.24**	**E:356190.1 N:170912.9**	**6** of **6**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
				100	70	67	NI 150 600			. . . from 12.92m to 13.00m depth frequent weak to medium strong yellowish grey sandstone inclusions.			
13.00-14.50							NI				-2.06	13.30	
13.68-13.88	3	CS		100	80	43	70 110 300			Medium strong thinly to thickly bedded strong reddish brown locally mottled yellowish grey medium SANDSTONE. Fractures are predominantly 10°-20° dipping open rough planar with clean surfaces. Occasionally infilled with angular fine to medium gravel. (REDCLIFF SANDSTONE FORMATION)		(1.20)	
										. . . at 14.00m depth rare rounded fine quartzite gravel.			
										. . . below 14.14m depth becomes extremely weak.	-3.26	14.50	
										Borehole terminated at 14.50m depth.			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**CSquires + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH517**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**26.11.12** End: **29.11.12**	**10.90**	**E:356254.3 N:170911.3**	**1** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
0.10-0.25	1	B								MADE GROUND: Grass over TOPSOIL consisting of soft brown slightly gravelly sandy CLAY with occasional cobbles of limestone. Gravel is subangular to rounded fine to coarse of limestone and sandstone. Occasional ceramic and occasional brick. Frequent roots. (MADE GROUND)	10.65	(0.25) 0.25	
0.30-0.60	3	B								MADE GROUND: Firm blue grey mottled brown slightly sandy CLAY with occasional roots. (MADE GROUND)	10.30	(0.35) 0.60	
0.40	2	ES											
0.60-1.00	4	B								MADE GROUND: Soft dark brown sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of limestone, brick and ceramic. Occasional asphalt and occasional fragments of glass. (MADE GROUND)	9.90	(0.40) 1.00	
1.00	5	ES								MADE GROUND: Medium dense brown grey black sandy clayey angular to subangular fine to coarse GRAVEL of limestone, sandstone and occasional brick. Occasional concrete, wood, plastic and metal. Damp. (MADE GROUND) . . . from 1.20m depth occasional ceramic, slate as ash deposits and cobbles of limestone and concrete.			
1.00-1.20	6	B											
1.20-1.65	7	SPT(c)	2,3/3,2,2,2 N=9										
1.20-2.00	8	B											
2.00-2.45	9	SPT	1,2/3,15,11,10 N=39							. . . at 2.00m depth predominantly cardboard and paper.		(2.00)	
2.00	10	ES											
2.00-3.00	11	B											

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
26/11/12	14:40	3.00	2.20	200	2.70
27/11/12	09:20	6.30	6.30	200	3.90

Chiselling / Slow Progress

From	To	Duration (hh:mm)

General Remarks

1. Location CAT scanned and inspection pit dug to 1.20m depth prior to drilling.
2. Cable percussion from 1.20m to 11.50m depth.
3. Rotary coring from 11.50m to 15.50m depth.
4. Water strike at 3.00m depth.
5. Water flush used.
6. SPT hammers EQU083-2012 (E_r = 63.54%) ,

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**BSaimen + EBall**	[redacted]

GINT_LIBRARY_V8_04.GLB|Log COMPOSITE LOG | 727305_BRISTOL_RAPID_TRANSIT.GPJ - v8_04 | 29/10/13 - 18:06 | KJ.
Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk.

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH517**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**26.11.12** End: **29.11.12**	**10.90**	**E:356254.3 N:170911.3**	**2** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
									1.1		7.90	3.00	
3.00-3.45	12	SPT	2,3/5,3,2,1 N=11							MADE GROUND: Soft locally firm dark brown sandy gravelly CLAY with frequent plant and cardboard fragments. Gravel is angular to subangular fine to coarse of limestone, bricks and occasional concrete. (MADE GROUND)			
3.00-4.00	14	B											
3.50	13	ES										(2.00)	
4.00-4.45	15	SPT	1/1,4,15,30 N=50							. . . from 4.00 to 4.50m depth colour change to light brown.			
4.00-4.50	16	B											
4.50-5.00	17	B								. . . from 4.50 to 5.00m depth predominantly cardboard and paper.	5.90	5.00	

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	EQU251-2012 (E_t = 72.73%) used.

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**BSaimen + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH517**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**26.11.12** End: **29.11.12**	**10.90**	**E:356254.3 N:170911.3**	**3** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
5.00-5.45	18	SPT	3,3/2,1,2,2 N=7							Soft very low strength locally firm blue grey mottled brown silty CLAY with occasional fine to medium gravel size lenses of sand. (ALLUVIUM)			
5.00	19	ES											
5.00-6.00	20	B											
										. . . from 6.00 to 7.00m depth lense of reddish brown slightly sandy clay.		(2.00)	
6.50-7.00	21	$U_{(UT100)}$	40 blows 100% recovery										
											3.90	7.00	
7.00-7.20	22	D								Stiff to very stiff red brown mottled grey green slightly sandy CLAY. (MERCIA MUDSTONE GROUP Zone IVb)			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**BSaimen + EBall**	[redacted]

AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH517**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**26.11.12** End: **29.11.12**	**10.90**	**E:356254.3 N:170911.3**	**4** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
7.50-8.00	23	B											
8.00-8.45	24	SPT	4,5/6,9,14,14 N=43									(2.50)	
8.50-9.50	25	B											
											1.40	9.50	
9.50-9.92	26	SPT	5,8/11,12,16,11 for 40mm N=57*							Very stiff red brown mottled grey green slightly sandy CLAY with occasional extremely weak subangular to rounded fine to medium mudstone lithorelicts. (MERCIA MUDSTONE GROUP Zone IVa)			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**BSaimen + EBall**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH517**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	End: **29.11.12**	**10.90**	**E:356254.3 N:170911.3**	**5** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
10.00-11.00	27	B										(2.00)	
11.00-11.37	28	SPT	4,7/12,15,23 for 70mm N=68*								-0.60	11.50	
11.50-12.60										Extremely weak thinly laminated reddish brown SILTSTONE with lenticular/irregular green grey siltstone/fine sandstone up to 50mm. Bedding is subhorizontal. Bedding fractures subhorizontal closely to medium spaced undulating smooth. (MERCIA MUDSTONE GROUP Zone I)			
11.50-11.70	29	CS											
11.70		HP	c_u=>225										
12.00-12.10	30	CS		100	68	7	NI 250 400			. . . between 11.70 to 11.98m depth bed of very stiff/hard reddish brown sandy clay (completely weathered siltstone). . . . at 11.98m depth bedding fracture is 5° undulating. . . . between 12.00 to 12.15m depth lenticular and irregular shaped greenish grey fine sandstone/siltstone.		(0.90)	
12.40-12.60	31	CS								. . . between 12.35 to 12.40m depth very stiff reddish brown silty clay (completely weathered siltstone).	-1.50	12.40 (0.20)	

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**BSaimen + EBall**	[redacted]

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH517**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	End: **29.11.12**	**10.90**	**E:356254.3 N:170911.3**	**6** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
				100	68	7				Weak reddish brown SILTSTONE with extremely closely spaced lenticular thick laminations/very thin beds of green grey fine sandstone. (MERCIA MUDSTONE GROUP Zone I)	-1.70	12.60	
12.60-14.00										Very weak locally extremely weak reddish brown SILTSTONE with rare lenticular/irregular greenish grey fine sandstone. Bedding fractures are 5 to 10° closely to medium spaced undulating rough infilled with red clay. (MERCIA MUDSTONE GROUP Zone I) . . . at 12.82m depth bed of clay up to 30mm.			
12.90-13.20	32	CS		100	89	82	NI 150 340			. . . at 13.17m depth bedding fracture 5° undulating rough open with fractured upper wall rock. . . . at 13.35m depth fracture is 10° undulating rough open with fractured lower wall rock. . . . between 13.40 to 13.50m depth occasional irregular greenish grey siltstone. . . . below 13.50m depth siltstone extremely weak.		(2.10)	
13.65		HP	c_u=175/175							. . . below 13.70m depth siltstone becomes very weak. . . . between 13.78 to 13.85m depth bed of weak greenish grey siltstone.			
13.90-14.00	33	CS											
14.00-15.50										. . . between 14.00 to 14.50m depth loss of recovery.			ZCL
14.40-14.55	34	CS											
14.50-14.75	29	SPT	17,8/100 for 70mm N=429*	73	73	73	NI 500 1100			. . . between 14.40 to 14.70m depth lenticular and irregular greenish grey siltstone up to 50mm.			
											-3.80	14.70	
										Extremely weak thinly laminated reddish brown silty MUDSTONE with rare lenticular/irregular greenish grey siltstone up to 15mm. Bedding fractures subhorizontal medium spaced rough. (MERCIA MUDSTONE GROUP Zone I)			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**BSaimen + EBall**	[redacted]

AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**BH517**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	End: **29.11.12**	**10.90**	**E:356254.3 N:170911.3**	**7** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
15.23-15.50	35	CS		73	73	73	NI 500 1100					(1.30)	
											-5.10	16.00	
										Borehole terminated at 15.50m depth.			

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:14**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion + Rotary Cored	**Dando 2000 + Comacchio MC300**	**AL + LH**	**BSaimen + EBall**	[redacted]

STRUCTURAL SOILS

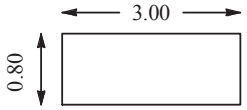
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**TP608**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	**29.11.12** End: **29.11.12**	**10.14**	**E:356138.3 N:170920.7**	**1** of **2**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results						
0.20 0.20	1 2	B ES				MADE GROUND: Grass over brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to medium brick, concrete and mudstone. Occasional plastic bags noted. . . . 1m long section of brick wall recovered at 0.30m depth.	9.64	(0.50) 0.50	
1.00 1.00	3 4	B ES				MADE GROUND: Landfill material comprising a mixture of clayey sand, bricks, concrete, tiles, wood, metal poles, plastic bags, ash and rope. . . . slightly hydrocarbon odour at 1.00m depth.	8.54	(1.10) 1.60	
2.00 2.00	5 6	B ES				MADE GROUND: Landfill material comprising a mixture of clayey sand, melange of wooden boards, chipboard, plastic bags, newspaper, occasional bricks and concrete. . . . pocket of black stained clay at 2.00m depth. Strong hydrocarbon odour.	7.44	(1.10) 2.70	
						Trial pit terminated at 2.70m depth.			

Plan (Not to Scale)



General Remarks

1. Location CAT scanned prior to excavation.
2. Trial pit dry and stable.
3. Trial pit backfilled on completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**REWilliams**	[redacted]

STRUCTURAL SOILS

TRIAL PIT LOG

Contract:		Client:		Trial Pit:
Bristol Rapid Transit Ashton Vale to Temple Meads		**Bristol City Council**		**TP608**
Contract Ref:	Start: **29.11.12**	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	End: **29.11.12**	**10.14**	**E:356138.3 N:170920.7**	**2** of **2**

TP608 Pit

TP608 Spoil

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**REWilliams**	

STRUCTURAL SOILS

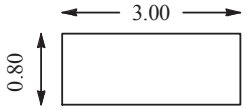
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Bristol Rapid Transit Ashton Vale to Temple Meads	**Bristol City Council**	**TP609**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	End: **29.11.12**	**11.14**	**E:356224.3 N:170910.5**	**1** of **2**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results						
						MADE GROUND: Grass over brown TOPSOIL of sandy CLAY.	11.04	0.10	
						MADE GROUND: Firm reddish brown and grey CLAY.		(0.70)	
0.50	1	B							
0.50	2	ES					10.34	0.80	
						MADE GROUND: Landfill material comprising of reddish clayey/silty/gravelly melange of brick, concrete, tiles, plastic and metal.		(0.70)	
1.00	3	B							
1.00	4	ES					9.64	1.50	
						MADE GROUND: Landfill material comprising of domestic/commercial waste, bin liners, paper, newspaper and plastic bags.		(0.50)	
							9.14	2.00	
						. . . at 2.00m depth large sack ~2m in length of polythene packaging strips.			
						Trial pit terminated at 2.00m depth.			

Plan (Not to Scale)



General Remarks

1. Location CAT scanned prior to excavation.
2. Trial pit dry and stable.
3. Trial pit backfilled upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**REWilliams**	

STRUCTURAL SOILS

TRIAL PIT LOG

Contract:		Client:		Trial Pit:
Bristol Rapid Transit Ashton Vale to Temple Meads		**Bristol City Council**		**TP609**
Contract Ref:	Start: **29.11.12**	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
727305	End: **29.11.12**	**11.14**	**E:356224.3 N:170910.5**	**2** of **2**

TP609 Pit

TP609 Spoil

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**REWilliams**	[redacted]

Appendix E
Recommendations for Ground Investigation

Route Option B: Draft Ground Investigation Scope (Table 1 of 2)

GI Area	Structure	Aims of GI	Outline Scope for GI

1	New bridge abutments over Longmoor Brook	• Obtaining a ground model, groundwater model and engineering parameters for **the purpose of designing a retaining structure**;
		• Obtain controlled environmental samples **for the purpose of environmental classification.**
			• For geoenvironmental aspects associated with engineering over/adjacent/through landfill, it may be necessary to acquire and test further groundwater, gas, or soil sampling. Either:
			  ○ The existing instrumentation (installed as part of AVTM) can be reinstated or;
			  ○ Further (replacement) instrumentation will be needed. For the purpose of the Draft GI Scope assume it will be necessary to replace instrumentation:
			  ▪ **3No. boreholes to ~20m with groundwater and gas monitoring;**
			  ▪ **4 to 6No. trial pits**
			• For engineering parameters, the assumption is that there is sufficient ground investigation from the previous (AVTM) ground investigation. This is a reasonable assumption but is dependent upon complexity/ sensitivity of the final design. Should the design require further information/testing, this can be acquired from boreholes listed above (and prescribed for geoenvironmental definition).

2	Filled abutment and highway over existing landfill (South abutment to Longmoor Brook crossing.)	• Obtaining a ground model, groundwater model and engineering parameters for **the purpose of designing/analysing an earth abutment**; • Obtain controlled environmental samples **for the purpose of environmental classification.**	
3	At grade highway over existing landfill (Parallel to and south of Longmoor Brook.)	• Obtaining a ground model, groundwater model and engineering parameters for **the purpose of at grade highway**; • Obtain controlled environmental samples **for the purpose of environmental classification.**	
4	At grade highways and junction improvement	• Obtaining a ground model, groundwater model and engineering parameters for **the purpose of at grade highway**; • Obtain controlled environmental samples **for the purpose of environmental classification.**	• 4 to 6 trial pits; • CBR testing.

Route Option B: Draft Ground Investigation Scope (Table 2 of 2)

Summary of GI Scope:

Further Study

The following studies are recommended ahead of Fieldwork:

- Detailed UXO assessment;

Coal Mining Risk Assessment (CMRA).

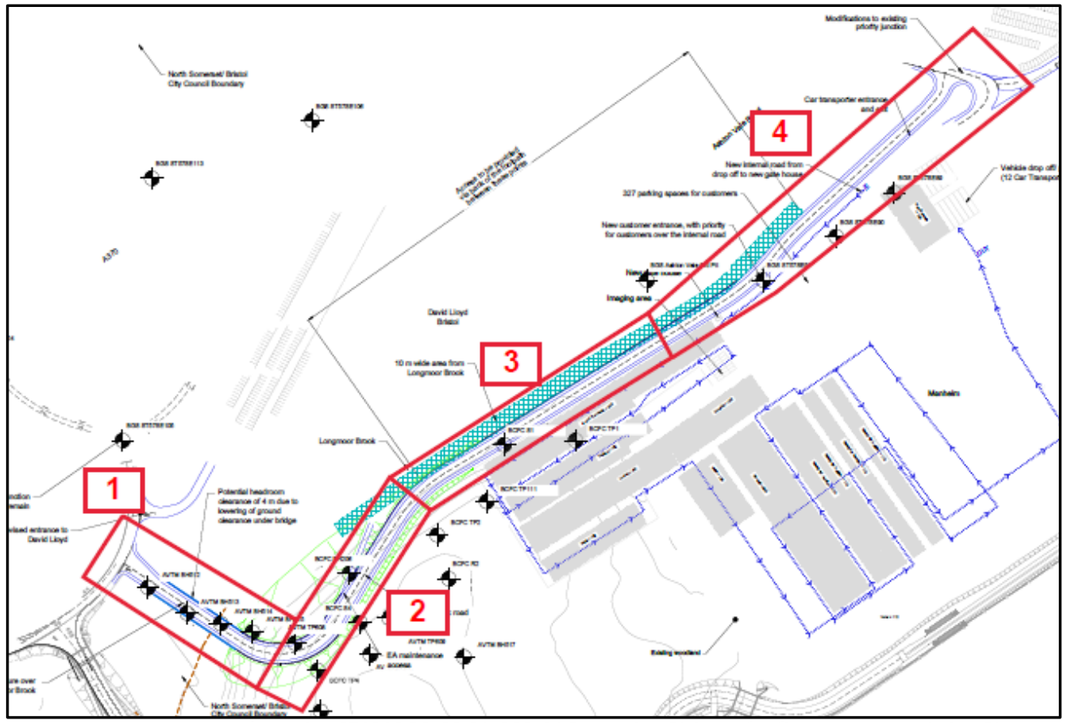
Fieldwork:

Prior to exploratory (trial pit and borehole) investigation the following work is recommended:

- Geophysics Survey: There is a risk of undetected mine entries in the area which may result in subsidence or collapse. A CMRA will inform the nature of the fieldwork, however ahead of a CMRA, the following work is assumed as a minimum requirement:
  - Geophysical survey over the footprint of the project (allowance 3 days). Anticipated to be electrical resistivity magnetic methods and/or ground penetrating radar;

Subject to further study and a geophysical survey the GI is assumed:

- 3No. Boreholes:
  - to 30m depth;
  - Instrumentation to all boreholes;
  - Weekly monitoring of gas and groundwater over 6 weeks;
  - Associated field testing, sampling and laboratory testing for engineering and geoenvironmental sampling;
- 8 - 12No. Trial pits:
  - Allowance 3 days;
  - Assume to 3m depth;
  - Associated field testing, sampling and laboratory testing for engineering and geoenvironmental sampling.



Excerpt and annotated copy of drawing 674946.BD.29.01-OPB-01 B showing GI Areas for fieldwork and existing GI.

Notes:

1. The outline ground investigation (GI) scope presented herein is to enable the progression of the design for the major structures and earthworks for the proposed Route Option summarised by Section 8 of the Preliminary Sources Study Report. The GI scope also considers what environmental sampling is necessary to further the definition of risk with respect to contaminated land (refer to Section 6 of the Preliminary Sources Study Report);
2. The scope of the GI is based upon scheme design and should be revised as the design progresses;
3. A need for further more specific ground investigation items may become apparent during later stages of the design for instance, inspection of existing services, assets and infrastructure, sensitivity of the design, potential hotspots of contamination, bridge inspection, etc.;
4. The outline ground investigation (GI) scope assumes that the stability and integrity of existing slopes are sound;
5. It is assumed that all previous geotechnical information for the Ashton Vale to Temple Meads (AVTM) Metrobus scheme, between 2010 and 2013 for the West of England Partnership / Bristol City council will be available and can be used for the purpose of the design. This allows economies in the scope of the GI which are reflected in the Draft Ground Investigation Scope (above). Should this not be possible, then the Scope will need to be increased.

Route Option C: Draft Ground Investigation Scope (Table 1 of 2)

GI Area	Structure	Aims of GI	Outline Scope for GI
1	<u>New Retaining Structure</u> An earthworks solution may be feasible. At present the Outline Scope for GI is based upon a retaining wall solution.	• Obtaining a ground model, groundwater model and engineering parameters for **the purpose of designing a retaining structure**; • Obtain controlled environmental samples **for the purpose of environmental classification.**	• 2No. boreholes to ~25m (at the top and bottom of the embankment); • Piezometer installations and subsequent groundwater and/or gas monitoring; • ~4 to 6No. trial pits; • Associated laboratory testing for classification and engineering properties.
2	<u>New Slip Roads</u> Assumes minimal disruption to the existing highway embankment and highways new highways to be at grade or no more than (say) 1.5m fill and nominal cut).	• Obtaining a ground model, groundwater model and engineering parameters **for designing new slip roads highways**; • Obtain controlled environmental samples **for the purpose of environmental classification.**	• 2No. boreholes to ~15m; • Piezometer installations and subsequent groundwater and/or gas monitoring; • 8 to 10No. trial pits; • Associated laboratory testing for classification, engineering properties.
3	<u>Ramp Approach/ David Lloyd Gabion</u> Existing gabion wall presents a 'pinch point' between the proposed existing highway of ~10 to 12m in plan.	• T**o assess the as-built detail of the existing gabion** (depth to foundation); • **To enable an assessment the stability of the existing retaining structure** (gabion) due to the new slip road to the crest; • Obtain controlled environmental samples **for the purpose of environmental classification.**	• 1No. borehole to the crest of the slope (behind the gabion) to ~20m; • Piezometer installation and subsequent groundwater and/or gas monitoring; • 3 to 4No. trial pits; • Associated laboratory testing for classification, engineering properties.
4	<u>'Drop Off'</u> Two options are being considered either: • **a piled solution** (for an elevated highway), o**r**; • **a filled embankment**. It has not been possible to inspect this area of site. Inspection is necessary prior to establishing a scope for the ground investigation	• To **evaluate ground risk associated with the existing slopes**; • **To facilitate an engineered solution** (either piling or embankment); • Obtain controlled environmental samples **for the purpose of environmental classification.**	**Walkover and geomorphological studies will be necessary and will inform the GI** (refer to Section 10 of the Preliminary Sources Study Report for recommendation). Ahead of this, the following scope is estimated: • 4No. boreholes to ~25m/30m (at the top and bottom of the existing slopes); • 2No. boreholes to the footprint of the highway to ~25m; • Piezometer installations and subsequent groundwater and/or gas monitoring; • 4 to 6No. trial pits; • Associated laboratory testing for classification and engineering properties.

Route Option C: Draft Ground Investigation Scope (Table 2 of 2)

Summary of GI Scope:

Further Study

The following studies are recommended ahead of Fieldwork:

- Detailed UXO assessment;

Coal Mining Risk Assessment (CMRA).

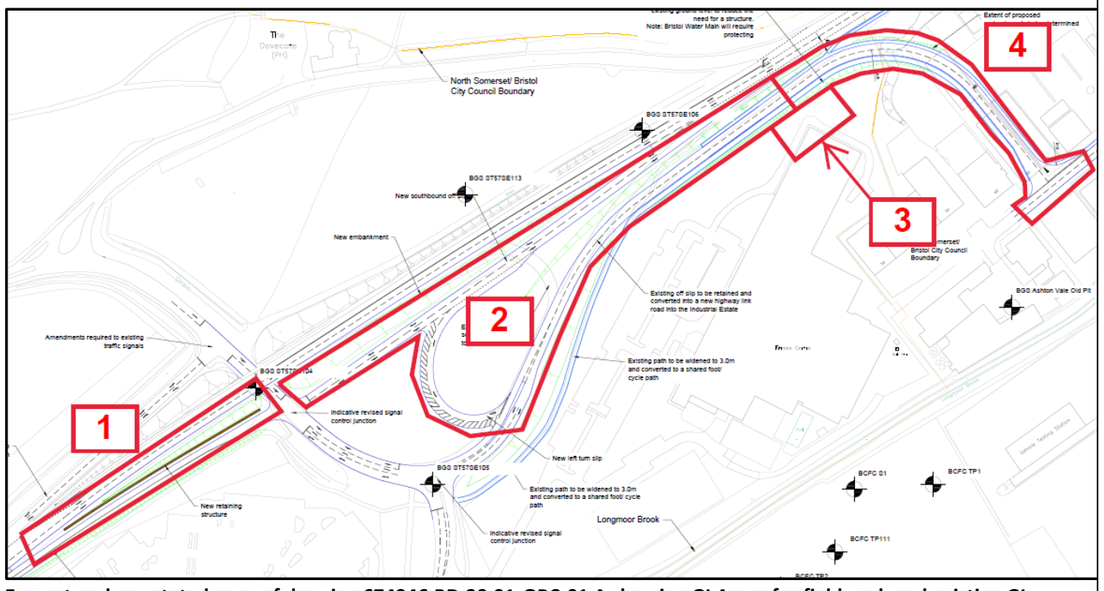
Fieldwork:

Prior to exploratory (trial pit and borehole) investigation the following work is recommended:

- <u>Geomorphological Walkover Survey</u>: access to and inspection of the existing slopes, landform and geological exposures of the area. The following scope is envisaged:
  - 1 day's attendance and inspection by 2No. geologists/geological engineers;
  - Reporting and assessment of risk, recommendation with respect to existing condition and further studies/ground investigation;
- <u>Geophysics Survey</u>: There is a risk of undetected mine entries in the area which may result in subsidence or collapse. A CMRA will inform the nature of the fieldwork, however ahead of a CMRA, the following work is assumed as a minimum requirement:
  - Geophysical survey over the footprint of the project (allowance 3 days). Anticipated to be electrical resistivity magnetic methods and/or ground penetrating radar;

Subject to further study and a geophysical survey the GI is assumed:

- 11No. Boreholes:
  - to 20m depth;
  - Instrumentation to all boreholes;
  - Weekly monitoring of gas and groundwater over 6 weeks;
  - Associated field testing, sampling and laboratory testing for engineering and geoenvironmental sampling;
- 20-25No. trial pits:
  - Allowance 5 days;
  - Assume to 3m depth;
  - Associated field testing, sampling and laboratory testing for engineering and geoenvironmental sampling



Excerpt and annotated copy of drawing 674946.BD.29.01-OPC-01 A showing GI Areas for fieldwork and existing GI.

Notes:

1. The outline ground investigation (GI) scope presented herein is to enable the progression of the design for the major structures and earthworks for the proposed Route Option summarised by Section 8 of the Preliminary Sources Study Report. The GI scope also considers what environmental sampling is necessary to further the definition of risk with respect to contaminated land (refer to Section 6 of the Preliminary Sources Study Report);
2. The scope of the GI is based upon scheme design and should be revised as the design progresses;
3. A need for further more specific ground investigation items may become apparent during later stages of the design for instance, inspection of existing services, assets and infrastructure, sensitivity of the design, potential hotspots of contamination, bridge inspection, etc.;
4. The outline ground investigation (GI) scope assumes that the stability and integrity of existing slopes are sound;
5. It is assumed that all previous geotechnical information for the Ashton Vale to Temple Meads (AVTM) Metrobus scheme, between 2010 and 2013 for the West of England Partnership / Bristol City council will be available and can be used for the purpose of the design.

Appendix F
CH2M (2016) Technical Note

TECHNICAL MEMORANDUM

Metrowest Ashton Gate level crossing closure – high level review of geotechnical and geo-environmental issues for proposed alternative access route.

PREPARED FOR:	R Rosenberg / A Seek
COPY TO:	
PREPARED BY:	Mike Floyd
DATE:	February 9th 2016
PROJECT NUMBER:	467470.BQ.04.22
REVISION NO.:	Draft A
APPROVED BY:	

Executive Summary

This high level review of two proposed alternative access routes to the Ashton Gate Trading Estate is based on previous assessments made for the nearby Ashton Vale to Temple Meads Metrobus scheme. Significant ground constraints are identified including: a potential mine shaft at or near to the ETS waste transfer station at the western end of the route with treatment and exact location not known; the route crosses or is very close to two landfill sites containing mixed waste and compressible materials, and crosses floodplain that comprises soft compressible alluvium and possibly peat. Recommendations are made for further assessment and ground investigation should the scheme proceed.

Introduction and Objectives of this Note

The Metrowest scheme proposes the closure of the Ashton Gate level crossing on the Portishead line, located off the A3029 Winterstoke Rd in south west Bristol. Options are being considered for an alternative access road to the Ashton Gate Trading Estate.

This note provides a high level geotechnical review of an alternative access road option which may also include a proposed area of compensatory land for the Manheim Car Auction site. Also included is a brief assessment of the likely requirements for additional ground investigation

This review is based primarily on geotechnical information obtained by CH2M for the Ashton Vale to Temple Meads (AVTM) Metrobus scheme, between 2010 and 2013 for the West of England Partnership / Bristol City Council. This included a geotechnical desk study and supervision of a large ground investigation (GI) undertaken by Structural Soils Ltd. The AVTM scheme is currently under construction under a design and build contract by Balfour Beatty. No information has been obtained for this assessment from any ground investigations that have been undertaken in the area since 2013, nor from the ongoing BB construction activities.

Associated issues such as utilities, land access permission, public rights of way, flood risk, environment and ecology, are not included in this assessment. A geotechnical walkover of the site has not been made, although most of the area has previously been visited prior to current AVTM construction. This note does not replace the requirements for a geotechnical walkover, a full geotechnical desk study and a contaminated land risk assessment. A Designers Risk Assessment and geotechnical risk register should be completed should the scheme proceed further.

Proposed Scheme

There are currently two options for proposed alternative access:

Option 1. Through Manheim Car Auctions

This is shown on the following sketches:

- Drawing 467470.BQ.04.20-SK702 Rev A (dated 08/01/16), titled as 'Option 1'
- Two hand annotated sketches amending the above drawing to show alternative layouts for the revised Manheim Car Auctions site
- Drawing 467470.BQ.04.20-730 Rev A (dated 11/12/15) showing the proposed road alignment to the west of the car auctions site.

In summary the scheme comprises from west to east:

- A revised layout with the new access road starting at the junction of the Long Ashton Park and Ride road and David Lloyd sports centre access road.
- The road heading southeast over Longmoor Brook and New Colliters Brook immediately upstream of their confluence, with a curved bridge.
- The road continuing parallel to Longmoor Brook on the south side of the brook and along the northern edge of the historic landfill site before entering the Manheim Car Auctions site in the northwest corner.
- Crossing the northern edge of the car auctions site through current forecourt car parking areas
- Crossing the culverted Longmoor Brook and joining onto Ashton Vale Road
- Providing an area of alternative auction site for vehicle drop-off and storage along the eastern side of the Ashton Field landfill site, exact area to be confirmed

Option 2. Through ETM Waste Transfer Station

The waste transfer station location is shown as a sketch on an air photo.

The route is that same as above but instead of the road entering the Manheim Car Auctions site on the south side of Longmoor Brook, the road re-crosses Longmoor Brook between the Car Auction site and the David Lloyd sports centre and goes through a current waste transfer station owned by ETM, to join near to the western end of Ashton Vale Road.

Site Description

The site is in the wide, level base of the SW-NE orientated valley of Ashton Vale with drainage running northeastwards. Natural drainage is poor, with soft, boggy ground found where the land has not been artificially raised or drained.

The valley to the southwest is used for grazing or is untended wetland. There is a park and ride and sports centre on the slopes on the north side and housing and allotments on the slopes to the south. The Ashton Gate and Cala trading estates are to the east.

The site of the historic landfill site, is elevated in its centre and slopes towards the watercourses of Longmoor Brook to the north, New Colliters Brook to the west and Old Colliters Brook to the south. The landfill has a clay and topsoil cap and is grassed.

Manheim Car Auctions site is generally level and appears to be on a slightly raised platform and mostly paved with asphalt.

Longmoor Brook is channelised and raised slightly above the valley bottom. Large concrete structures are present on the north side of the auction site just before the brook goes into culverts running north-eastwards beneath Ashton Gate and towards the tidal River Avon New Cut.

Site History

The area has a long history of development and changes to the ground profile summarized in Table 1 based primarily on an Envirocheck Report, which included historic OS mapping, obtained for the AVTM desk study in 2012. The historic mapping provides very little information about the development of the landfill sites.

TABLE 1
Summary of Site History

Date	Development Details
1840s (Tithe Map)	• Northern part of site north of Longmoor Brook is off the map • Longmoor Brook and Old Colliters Brook shown at approximate current location. Predominantly agricultural land with field boundaries. 3 houses to east in current trading estate area • Coal pits shown to south and east.
1886-1890 (1st Edtn OS)	• Ashton Vale Works (shown variously as Iron Works, Brick and Coke) on north side of Longmoor Brook including clay pits to north and west, coke ovens and factory buildings in centre, colliery to east, railway lines in centre and east, and possible spoil heal to south along northern bank of Longmoor Brook. • Ashton Brook flowing west to east north of Longmoor Brook • Frayne's Colliery (disused) shown on south side of brook in current trading estate area • Housing to north east and Kennel Farm to north
1900 - 1918	• Larger spoil heap alongside Longmoor Brook and larger clay pit to north Colliery on north side now labelled "Old Colliery" suggesting disused • Allotment gardens around former Frayne's colliery • Ashton Brook becomes partially culverted
1930 - 1932	• Ashton Vale works now described as brick and tile works with kilns shown • Allotments are now Saw Mills • Sign of raised filling in SE corner of landfill site • Marshy ground shown around Longmoor Brook
1946 Air Photo	• Possible labour or military camp occupying site of current car auctions site • Filling in SE corner of Ashton Fields landfill • Coke and brickworks appear to be disused and overgrown
1948-54	• Tanks labelled at sides of some buildings in labour camp • Saw Mills expanded and timber yards and joinery works make up eastern half of current trading estate • Warehouse labelled as Ministry of Works present on current southern half of Manheim Car Auction site. Raised land indicated on edge of brook for development platform
1963	• Construction of Ashton Vale Rd and trading estate with separate units, depots and builders yard shown on north side of Longmoor Brook. Raised land indicated around edge of trading estate for development platform • Large depot constructed at Manheim Car Auctions plot replacing previous camp, labelled "National Assistance Board Offices" (HM Stationary Office in 1974) and vehicle testing centre in NW corner (1974)
1969-1970	• A370 Brunel Way reprofiled to north with new junctions. Kennel Farm demolished. • Depot shown at current ETS site, with tanks
1987-1989	• ETS site new buidings (1983) • Longmoor brook has been channelised with straight channel and regular side slopes and culvert construction. New Colliters Brook constructed
1994-1996	• Park and Ride developed in phases commencing after 1991 and before 1999. • Fitness centre constructed
2006	• Manheim car auctions possibly developed between 1999 and 2006

Geology

A summary geological map from the AVTM Envirocheck Report is provided in Figure 1. Generally ground investigation in the area for the AVTM scheme has confirmed the findings of desk study work.

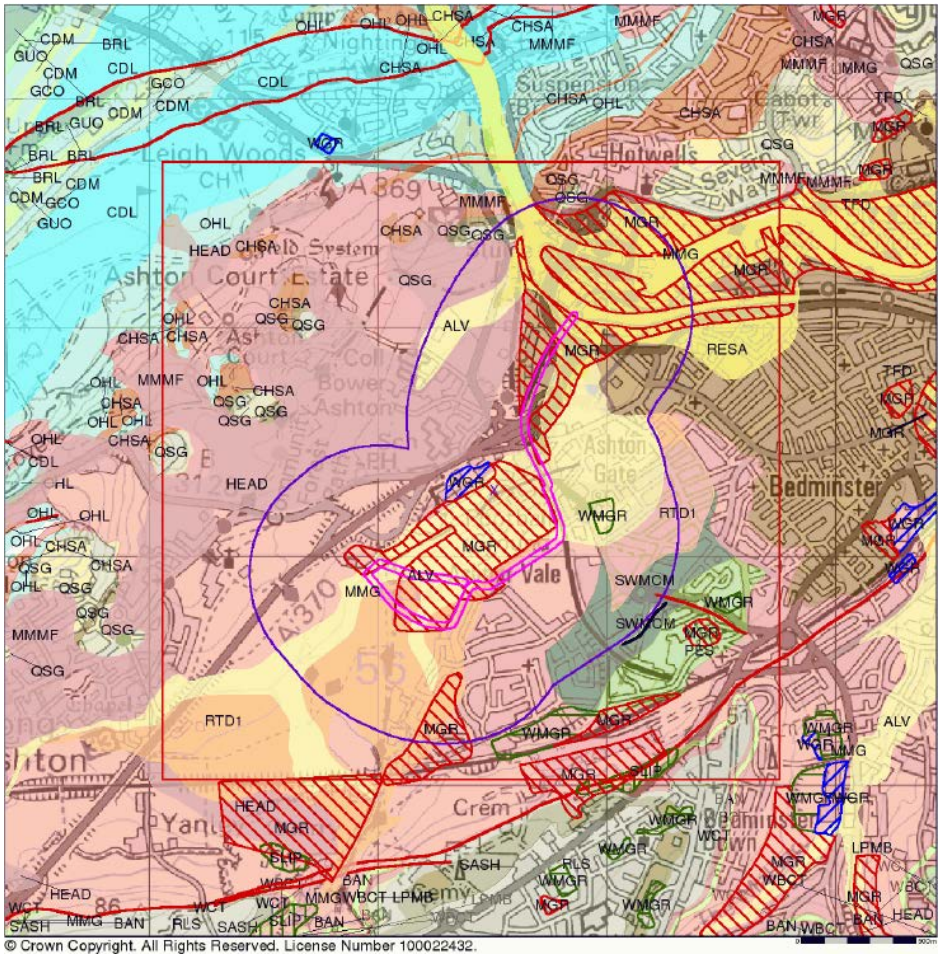


Figure 1. BGS Geological Map for site extracted from AVTM Envirocheck report (2012)
Note red hatching indicates made ground such as landfill, earthworks, land raising

In summary, the Ashton Fields area typically comprises landfill (at the Long Ashton Park and Ride site and raised land south of Longmoor Brook at the 'Northern Fields' landfill site) or made ground of colliery spoil and iron works ash and clinker raised above existing floodplain (at the Ashton Vale Trading Estate), overlying soft alluvium, possibly with a desiccated crust and lenses of sand. Where there has been no artificial land raising, alluvium is located at surface in the valley bottom. The area can be difficult to access by wheeled vehicle. The alluvium may overlie thin River Terrace Deposits (sand and gravel).

Beneath the alluvium, Mercia Mudstone is present with occasional sandstone bands. The Mercia Mudstone unconformably overlies steeply dipping Coal Measures strata, with historic coal mining beneath the site. The area has a high groundwater level with occasional artesian water pressures encountered.

The Mercia Mudstone Group is expected to be encountered across the site beneath Made Ground and superficial deposits of Alluvium (predominantly clays and silts with some sand), possibly overlying. The Mercia Mudstone Group unconformably overlies steeply dipping Coal Measures strata that contain coal seams that have been worked. Historically there were several coal mines in the

area, and the former coal mine spoil and development platforms that raised the mines above the floodplain now form the site of the current trading estate and Manheim Car Auctions site.

Close to the site to the northeast and underlying much of the Ashton Gate trading estate, the Redcliffe Sandstone Member of the Mercia Mudstone Group predominates. The Mercia Mudstone Group has been differentiated between CIRIA C570 weathering Zones IVb and IVa, where the Mercia Mudstone generally resembles a stiff to very stiff CLAY, and Zones I to III, where the degree of weathering is less and the lithology is generally described as MUDSTONE interbedded with SILTSTONE or SANDSTONE beds (Table 2).

TABLE 2
Mercia Mudstone Group Weathering Grades (after CIRIA C570)

Weathering Zone	Generalised Geological Description
MMG Zone IVb and IVa	• Stiff to very stiff reddish brown slightly sandy silty CLAY.
MMG Zone III to I	• Very stiff reddish brown silty/sandy CLAY. • Extremely weak to weak thinly laminated to medium bedded reddish brown silty MUDSTONE. • Very weak to weak thinly to thickly laminated reddish brown clayey SILTSTONE. • Very weak to medium strong thinly to medium bedded reddish brown fine grained SANDSTONE.

Existing Ground Investigation Results

There are two main sources of previous ground investigation data:

- Ashton Vale to Temple Meads Metrobus Scheme Ground Investigation (Structural Soils Ltd, 2013).
- Bristol City Football Club (BCFC) proposed stadium development, various ground investigations, summarized in Table 3. Much of this data has not been made available and a detailed review has not been made. Our assessment of this data is limited to the findings of the WSP environmental statement by WSP (2008).

A detailed assessment of the available information has not been made at this stage and is recommended should the scheme progress.

TABLE 3
Summary of Existing Ground Investigation Reports – Proposed Stadium Area

Title	Date	Author	Comment
Bristol City FC Ashton Vale Site Assessment. Geo-Environmental Interpretive Report	8th June 2009	URS	Issue No. 2 Ref 49310761/BRRP00003 Investigation made in two phases predominantly on landfill area: Aug 2008 (13 trial pits in landfill area Structural Soils Ltd); Feb-March 2009 (16 trial pits in landfill area, 10 boreholes in landfill and adjacent, 14 rotary core and open hole for shallow coal workings, 18 to 40m depth, CC Ltd). Identified coal mine workings for (probable) Bedminster Great Vein in SE corner of the site, dipping to the east, treatment recommended for stadium development. Groundwater and gas monitoring. Geotechnical and environmental sampling and testing. Report includes schematic cross sections
Appendix B to above report. Bristol Coal Mining Archive Report	Aug 2008	Bristol Coal Mining Archives Ltd	Provides details of main worked seams and pit locations.. Subcrop of Bedminster Great Vein marked running SW-NE across landfill area and beyond parallel and closer to Old Colliters Brook than Longmoor Brook.

TABLE 3
Summary of Existing Ground Investigation Reports – Proposed Stadium Area

Title	Date	Author	Comment
Appendix C to above report. Previous Site Information – WSP Investigation	July 2008	WSP	8 shallow boreholes in landfill area and to SW, mainly for environmental assessment, plus surface water sampling and testing.
Appendix C to above report. Previous Site Information – WSP Investigation	April 2009	CC Ground Investigations Ltd	Factual ground investigation report, April 2009 for URS
Appendix H to above report. Accelerated Investigation	Aug 2008	Structural Soils Ltd & Sever Trent Laboratories	Trial pit logs and chemical analyses.
New Stadium for BCFC. Environmental Statement Ashton Gateway Project. Chapter 10 Ground Conditions and Contamination	June 2009	WSP	References investigations by WSP (2008-09), URS (2009) and Arup (2002), plus information from the Coal Authority. Further references older investigations: Arup (1990, Haul Waste Ltd, gas monitoring), 1994 David Lloyd Tennis Centre, 2001 Structural Soils Ltd.
Preliminary Landfill Gas Assessment, Ashton Gateway Project	27 Oct 2008	WSP	Drilling and monitoring of six cable percussion boreholes, included in July 2008 reference above.
Archaeological Desk Based Assessment of land at Ashton Vale Bristol for Ashton Gateway Development	Dec 2008	Bristol & Region Archaeological Services	Report No 2024/2008. Includes pre OS mapping and aerial photography

Tables 4 to 6 summarise the ground conditions encountered during the AVTM ground investigation in 2013.

TABLE 4
Summary of Ground Conditions – Long Ashton Park and Ride and Longmoor Brook
BH501, 501A, 512, 513 and 514, TP601

Thickness (m)	Depth to top of stratum (m)	Geology	General description
0.00 to 0.30	0.00	Topsoil	
1.00 to 4.00	0.00 to 0.30	Made Ground	Very soft to firm sandy gravelly CLAY to slightly clayey slightly sandy GRAVEL with ceramic, clinker, brick, limestone, sandstone, concrete, tarmac, ash and rare wood.
3.70 to 4.80	3.00 to 4.00	Alluvium	Very soft to firm slightly sandy to silty (organic in places) CLAY with occasional brown pseudo-fibrous peat.
2.10 to 7.25	7.00 to 8.00	Mercia Mudstone Group - Generally Zone IVb and IVa	See Table 1
6.50 to 11.00	10.00 to 14.50	Mercia Mudstone Group – Generally Zone I to III	See Table 1
>4.00 to >7.00	21.00	Coal Measures	Extremely weak to weak thinly laminated grey partially to distinctly weathered MUDSTONE and SILTSTONE.

TABLE 5
Summary of Ground Conditions – Ashton Fields (Off Landfill on W and SW side)
BH502, 503, 504, 505 and 506, TP602, 602A, 603, 603A, 604, 604A

Thickness (m)	Depth to top of stratum (m)	Geology	General description
0.20	0.00	Topsoil	
0.00 to 1.90	0.20	Made Ground	Very soft to firm silty to slightly sandy CLAY with occasional spongy pseudo-fibrous peat
1.10 to 5.25	0.20 to 1.90	Alluvium	Very soft to firm silty to slightly sandy CLAY with occasional to frequent spongy pseudo-fibrous peat.
1.40 to 6.20	1.10 to 5.25	Mercia Mudstone Group - Generally Zone IVb and IVa	See Table 1
4.20 to 8.50	5.85 to 11.50	Mercia Mudstone Group – Generally Zone I to III	See Table 1
> 5.00 to >14.00	12.00 to 20.00	Coal Measures	Extremely weak to weak thinly laminated grey unweathered to destructured MUDSTONE. 0.42m and 0.30m thick coal encountered in BH502 from 19.90 to 20.32 and 21.30 to 21.60m depth: - Extremely weak to very weak dark grey black slightly gravelly distinctly weathered to destructured fine to coarse SANDSTONE made of cemented coal particles. 0.32m thick coal encountered in BH504 from 21.08 to 21.40m: - Extremely weak black vitreous COAL recovered as fine to coarse angular sandy gravel of coal.

TABLE 6
Summary of Ground Conditions – Ashton Fields (On Landfill)
BH515, 516, 517 and 518, TP608, 609 and 610

Thickness (m)	Depth to top of stratum (m)	Geology	General description
0.20	0.00	Topsoil	
3.20 to 7.20	0.20	Made Ground - Landfill	Highly variable
0.00 to 3.80	3.00 to 6.50	Alluvium	
2.30 to 4.50	7.00 to 8.00	Mercia Mudstone Group – Generally Zone IVb and IVa	See Table 1
>3.00 to 7.80	10.00 to 11.50	Mercia Mudstone Group – Generally Zone I to III	See Table 1
>8.00	18.30	Coal Measures	Extremely weak to weak thinly laminated reddish grey to dark grey partially to distinctly weathered MUDSTONE. One coal seam was encountered in BH515 0.36m thick from 22.94 to 23.30m depth: Dark grey black thinly laminated vitreous COAL

Inspection of ground investigation location plans for the BCFC Stadium development shows that several boreholes have been completed close to the proposed road alignment, generally to the south through the landfill. These include URS (2008) borehole S1 which encountered 3.30m of Made Ground (landfill), then very soft to soft clay alluvial deposits to 9m depth, and then stiff becoming very stiff red brown clay (weathered Mercia Mudstone) to the base of the hole at 11.93m depth.

The British Geological Survey have a web based access to historic borehole records. One borehole dated 1958 was sunk on the northern side of the Manheim Car Auction site, (previously HMSO depot). This reported approximately 2m of ash fill over 0.75m of clay and rubble fill and then very soft alluvial clays and peat to about 7.5m depth, sandy gravel to 8.5m and stiff red clay (Mercia Mudstone) to the base of the hole at 10m depth.

Coal Mining

Table 7 summarises currently available sources of information.

TABLE 7
Summary of Coal Mining Records

Title	Date	Author	Comment
Bristol Metrobus Ashton Vale to Temple Meads Coal Mining Archives	30/09/13	Bristol Coal Mining Archives Ltd	Brief letter report with hand drawn maps showing known shafts and coal seam subcrops
AVTM Coal Mining Risk Assessment	04/10/13	CH2MHill	Completed as part of planning application work for the AVTM route along Cumberland Rd
Non Residential Coal Authority Mining Reports at Ashton Vale, Bristol	23/02/2012 17/08/2012 09/11/2012	Coal Authority	Part of Landmark Envirocheck Report for AVTM Desk Study. Includes map of shafts and details of shaft treatment if available.
Mine Abandonment Plans	Provided 11/05/2012	Coal Authority	Scans of historic mine plans
BCC Archive mining plans	Provided 01/11/12	Bristol City Council	Mining plans showing shaft locations but no key to workings outlines
South Bristol Link Coal Mining Archives	23/08/12	Bristol Coal Mining Archives Ltd	Brief letter report with hand drawn maps showing known shafts and coal seam subcrops mainly to south of Ashton fields

It is important to note that the Coal Mine Risk Assessment obtained for the AVTM scheme may not cover all of the site.

Mine Shafts

Collapse of mine shafts can present a significant risk in coal mining areas. Three coal mine shafts are shown on the 1974 BGS geological map and reported in the accompanying memoirs in the Ashton Vale area:

- Ashton Vale Colliery (NGR 356560 171370)
- Frayne's Colliery (NGR 356930 171210)
- Starveall Pit (NGR 356520 170830)

The Coal Authority report shows five mine entries recorded in the area and provides a location plan and details of treatment. However, this report did not extend across all of the site. Inspection of the Coal Authority interactive viewer has identified a shaft located at or close to the ETS depot on the north side of Longmoor Brook. This is at the western end of the Ashton Vale Colliery and on the British Geological Survey online borehole records is called "Ashton Vale Old Pit". This has been further confirmed by inspection of coal mine plans. The first edition OS map (c. 1889) shows buildings in this area that may be the shaft top.

A new Coal Authority report is recommended to confirm if there are more details about this shaft, such as record of its treatment.

The shaft location is also identified on the Coal Authority interactive viewer as a Coal Authority Development High Risk Area for which a Coal Mine Risk Assessment will be required. Similar High Risk Development Areas are also present at the western end of the proposed route, close to the Long Ashton Park and Ride.

Mine Workings

Seven coal seams are recorded beneath the area (Ref **Error! Reference source not found.**). Stratigraphically, from shallowest to deepest, these are:

- Bedminster Top Coal (0.3-1.0m thick);
- Bedminster Great Coal (1.1m thick);
- Bedminster Little Coal (0.5m thick);
- Bedminster Toad Coal (0.6m thick);
- Ashton Top Coal (0.1-0.9m thick);
- Ashton Great Coal (0.9m thick);
- Ashton Little Coal (0.6m thick).

The seams are shown on the geological map orientated NE-SW in subcrop beneath the site.

A Coal Authority non-residential mining report was obtained as part of the AVTM study and reports the following:

- Six coal seams have been worked in the likely zone of influence of the site at shallow to 340 m depth, and last worked in 1913;
- One seam of fireclay has been worked in the likely zone of influence of the site at 310 m depth, and last worked in 1900;

The proposed route will be close to a Coal Authority Development High Risk Area at the western end close to the Long Ashton Park and Ride, and at the shaft location close to the ETS yard.

Based on the Coal Authority Interactive Viewer which does not identify the site a High Risk Development Area due to shallow workings, it is likely that the depths of workings is such that they will not pose a risk to the road construction. Based on AVTM boreholes, there is approximately 20m of cover (alluvium and Mercia Mudstone) above the Coal Measures and the seams are likely to be significantly deeper. However, a more detailed assessment is recommended to review the seam dip and subcrop in more details as there are is a recognized risk of shallow workings in the vicinity.

Landfill and Contamination Potential

The proposed route will cross the northern extent of the 'Southern Fields' historic landfill site, and possibly the 'Northern Fields' landfill site at the David Lloyd sports centre and Park and Ride area. The Environment Agency 'What's in My Backyard' website shows the following details:

- For the area south of Longmoor Brook: "Phase 3 Landfill Site at Ashton Vale" receiving waste between November 1985 and December 1991
- For the area north of Longmoor Brook: "Phase 2 Landfill Site at Parsonage Farm" receiving waste between October 1983 and June 1991

The route will be passing over or close to areas of Made Ground that include former landfill sites and industrial areas including coal, iron, coke, brick and tile manufacturer and industrial areas. The ETS site is currently a Waste Transfer Station. There is therefore likely to be contamination and landfill gas present on site. A contamination risk assessment will be required should the scheme progress further. Based on the conclusions of the AVTM Metrobus scheme, these risks should be manageable for the intended development.

To minimise landfill tax applied to the disposal of contaminated material, the proposed development should seek to minimise excavation of the ground.

Geotechnical and Geo-Environmental Issues

Below is a summary of the key issues identified from this review of available information

- Flooding from Longmoor Brook. Depending on the road alignment and elevation, raised embankments and flood protection and erosion protection to embankments may be required. If the development is on floodplain, compensatory flood storage may be required.
- High groundwater table may cause flooding of excavations. There is potential for artesian groundwater pressures in both alluvial deposits and bedrock.
- There is potential for methane gas to be present in landfill, coal mine workings, historic made ground, and peat / organic deposits;
- There are very soft and soft alluvial deposits and possibly peat present beneath the site with low CBR values, low shear strength and high compressibility with potential for differential settlement to occur. Ground treatment and geotextile reinforcement may be required depending on the design of any embankment construction and the loads to be imparted to the ground.
- Adjacent to the route on both sides of Longmoor Brook there are historic landfill sites, the lateral extent of which is not clearly defined and may be present beneath the road alignment. There is also raised land at the Ashton Gate trading estate of unknown composition, but likely to predominantly ash, clay and clinker fill. There is potential for soft and compressible materials with settlement risks and the presence of contaminated ground with additional waste disposal costs and possible measures required to prevent the migration of contaminants
- There is the presence of the ETS Waste Transfer station and other historic industrial development in the area with potential for shallow contamination. It should be noted that waste management licenses and designs at the waste transfer station should prevent contamination to the ground today.
- An historic coal mine shaft is indicated to be present in the area of the ETS waste transfer station. The exact location, size and how this shaft has been treated (backfill, capped or not treated) is currently not known. Further desk study, investigation and treatment considerations will be required to mitigate the risk of shaft collapse affecting the road.
- Variable weathering of Mercia Mudstone bedrock which may be soft to firm clay in places, causing differential settlement and affecting the depth of foundations of any structures required along the route. Also variable presence of sandstone bands / presence of the Redcliffe Sandstone unit
- Subcropping coal seams beneath Mercia Mudstone and potential for mine workings with void migration and unrecorded mine shafts; subsidence risk.
- Based on UXO assessment undertaken for the AVTM scheme, the site should be considered to have a medium risk for WWII unexploded ordnance (UXO). A detailed UXO risk assessment will be required and risk mitigation measures are likely to be necessary for excavations into materials that pre-date WWII.

Recommendations

Should the scheme proceed, the following are recommended:

- A more detailed desk study to include:
    - Attempting to obtaining information on the mine shaft in the area of the ETS waste transfer station and on the possible presence of shallow mine workings.
    - Attempting to obtain previous ground investigation data from the BCFC stadium investigations.

    - Assessment of the coal subcrop geometry to assess the risk of the presence of shallow mine workings.
- Undertake a Contamination Risk Assessment for the site, including review of landfill ground investigation data.
- Undertake a detailed UXO risk assessment for the site.
- Road alignment, pavement and drainage designs should try to minimize the amount of disposal required of excavated materials.
- Ground investigation will be necessary for detailed design and is likely to include:
    - A phased mine shaft investigation that depending on access constraints may include geophysical survey, trenching and inclined boreholes.
    - A shallow coal workings investigation at any structures, such as bridge foundations requiring boreholes.
    - Geophysical survey and trenching to identify the extent of landfill each side of Longmoor Brook.

Appendix G
Coal Authority Shaft Plan and Data Sheet

The Coal Authority

Issued by:
The Coal Authority, Property Search Services, 200 Lichfield Lane, Berry Hill, Mansfield, Nottinghamshire, NG18 4RG
Website: www.groundstability.com Phone: 0345 762 6848

CH2M
BURDEROP PARK
SWINDON
SN4 0QD

Our reference:	**51001272767001**
Your reference:	
Date of your enquiry:	**27 September 2016**
Date we received your enquiry:	**27 September 2016**
Date of issue:	**29 September 2016**

This report is for the property described in the address below and the attached plan.

Shaft Plan and Data Sheets

MANHEIM AUCTIONS, 33 ASHTON VALE ROAD, ASHTON, BRISTOL, BRISTOL, BS3 2AZ

I refer to the enquiry dated 27 September 2016, received 27 September 2016, in connection with the above.

As requested I enclose the mine entry data sheet(s) held for the mine entry/entries referred to.

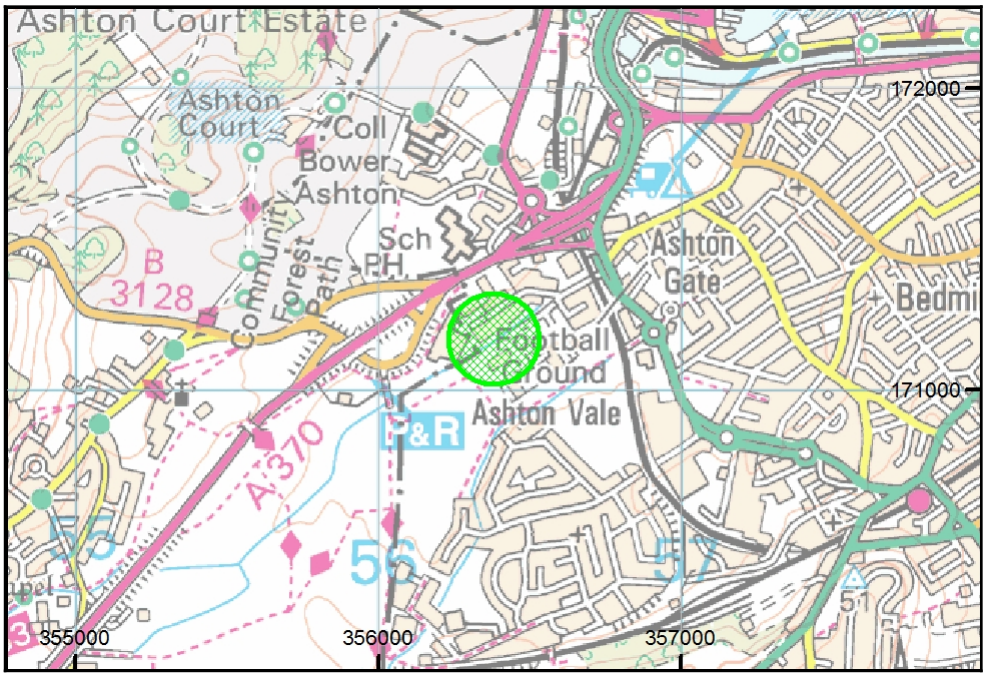
Mine Entry Data

Shaft/adit:	Shaft
Reference:	356171-001
Source:	Ab plans 5033 SWR3429 SW3989 Geological Sheet 1960 Ed 1/10560 O.S Sheet 1887 1888 1938 Ed Other: Bristol Environmental Geological Study
Colliery name:	Unknown
Entry name:	Ashton Vale Old Pit
Date abandoned:	Unknown
Depth of superficial deposits (m):	Unknown
Depth of shaft (m):	198.0
Diameter of shaft (m):	Unknown
Probable adit azimuth:	Not Applicable
Treatment details:	Unknown
Conveyance:	Not Applicable
Easting:	356381
Northing:	171169
Other information:	None

Issued by:	The Coal Authority, 200 Lichfield Lane, Mansfield, Nottinghamshire, NG18 4RG
Tax Point Date:	27 September 2016
Issued to:	CH2M BURDEROP PARK SWINDON SN4 0QD
Property Search for:	MANHEIM AUCTIONS, 33 ASHTON VALE ROAD, ASHTON, BRISTOL, BRISTOL, BS3 2AZ
Reference Number:	51001272767001
Date of Issue:	29 September 2016
Cost:	£45.50
VAT @ 20%:	£9.10
Total Received:	£54.60
VAT Registration	598 5850 68

Location map

Approximate position of enquiry



This plan shows the approximate location of the disused mine entry / entries referred to in the attached mining report. For reasons of clarity, mine entry symbols may not be drawn to the same scale as the plan.

Property owners have the benefit of statutory protection (under the Coal Mining Subsidence Act 1991). This contains provision for the making good, to the reasonable satisfaction of the owner, of physical damage from disused coal mine workings including disused coal mine entries. A leaflet setting out the rights and obligations of either the Coal Authority or other responsible persons under the 1991 Act can be obtained by visiting www.groundstability.com.

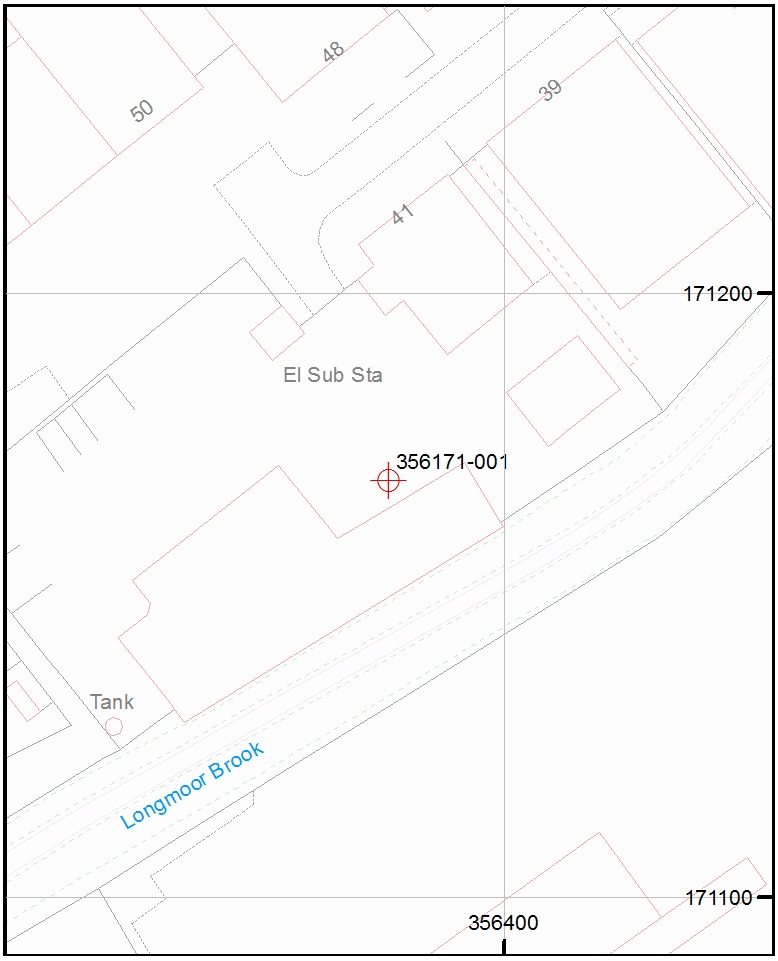
If you wish to discuss the relevance of any of the information contained in this report, you should seek the advice of a qualified mining engineer or surveyor. If you or your advisor wish to examine the source plans from which the information has been taken, these are available to view, free of charge, at our Head Office in Mansfield. To book an appointment please ring 01623 637225. Should you or your advisor wish to carry out a physical investigation that may enter, disturb or interfere with any disused mine entry, prior permission of the owner must be sought. For coal mine entries, the owner will normally be the Coal Authority.

The Coal Authority, regardless of responsibility and in conjunction with other public bodies, provide an emergency call out facility in coalfield areas to assess the public safety implications of mining features (including disused mine entries).

Our emergency telephone number is 01623 646333.

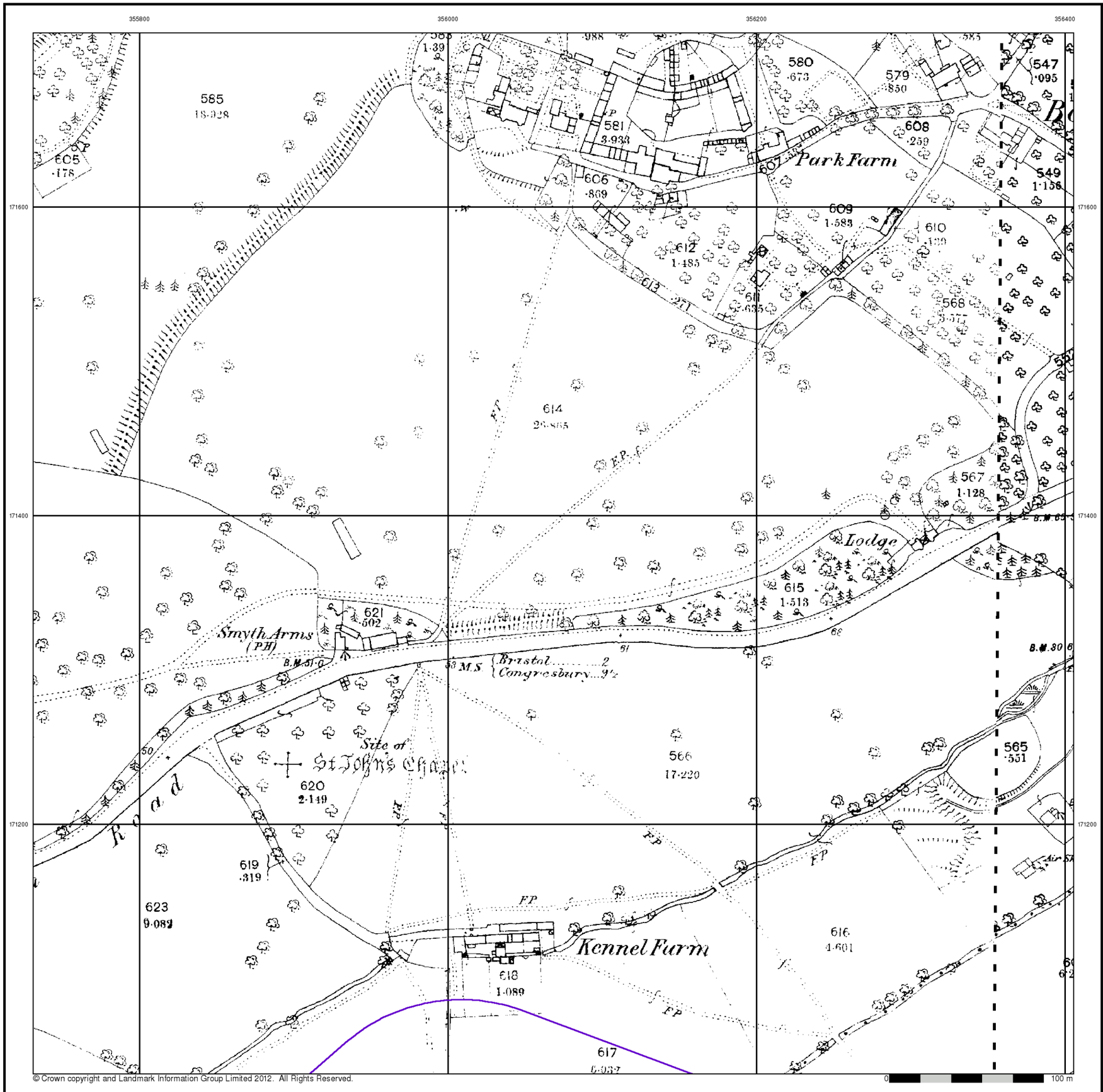
Key

Disused Adit or Mineshaft



Mapping sourced from Ordnance Survey

Appendix H
Envirocheck (2012) Historic maps



Envirocheck®

Somerset

Published 1894

Source map scale - 1:2,500

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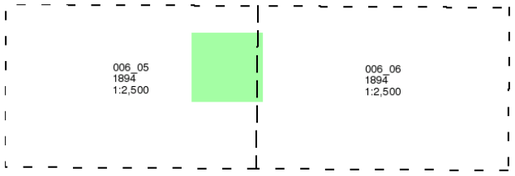
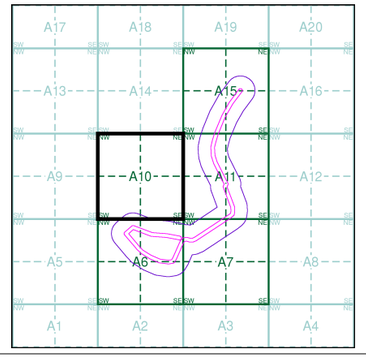
Map Name(s) and Date(s)



Historical Map - Segment A10



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Customer Ref:	GAVTMR032
National Grid Reference:	356510, 171290
Slice:	A
Site Area (Ha):	7.93
Search Buffer (m):	100

Site Details

Site at, Ashton Vale, City of Bristol

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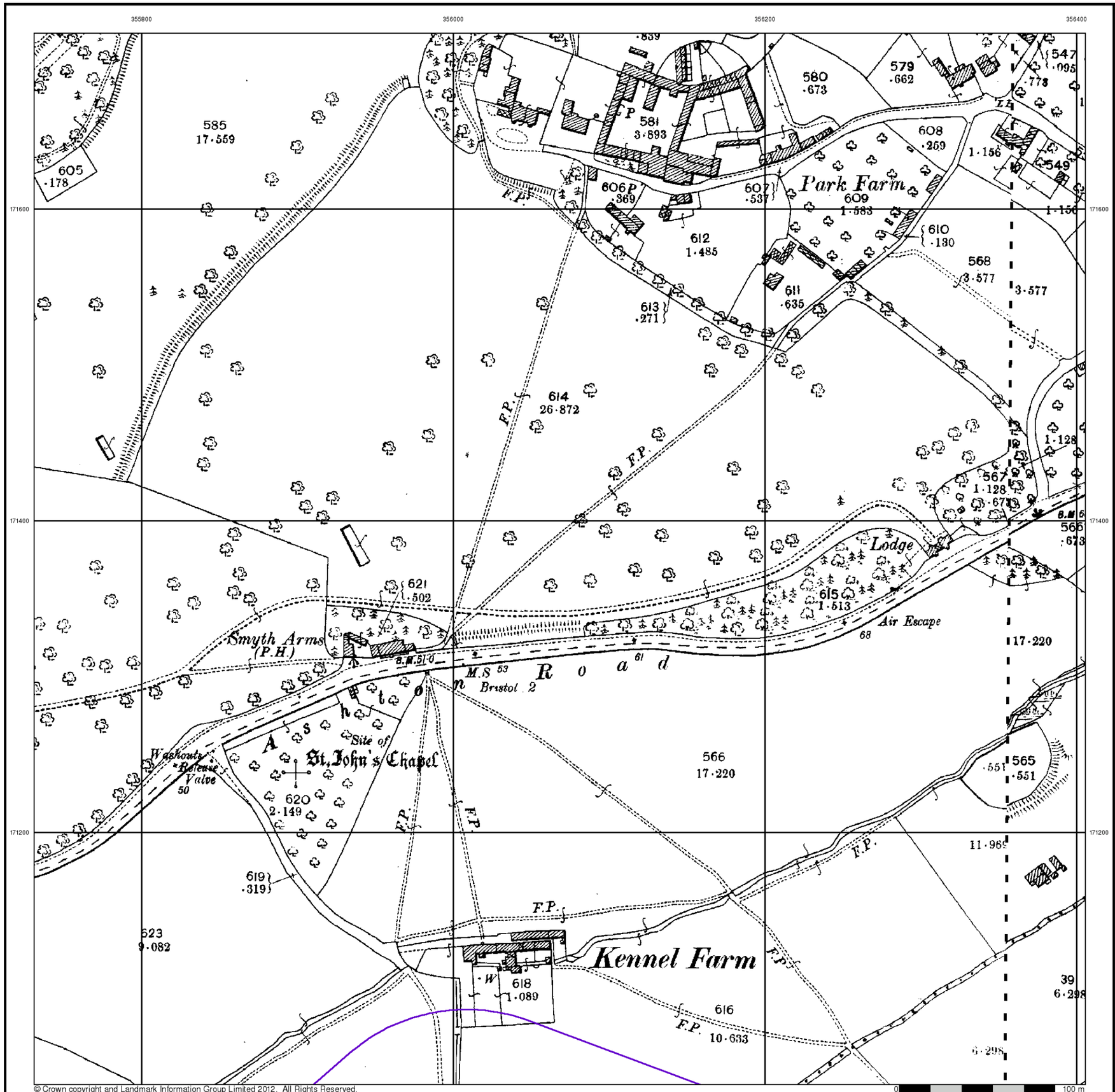
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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Published 1903 - 1904

Source map scale - 1:2,500

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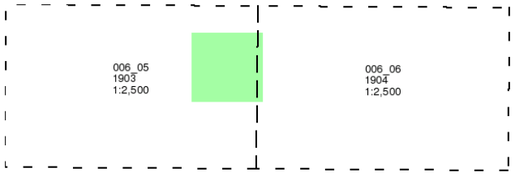
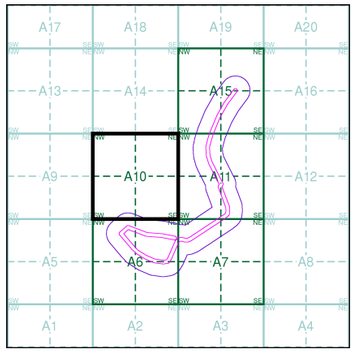


Historical Map - Segment A10



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Gloucestershire

Published 1904

Source map scale - 1:2,500

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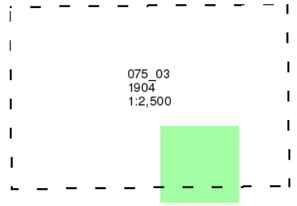
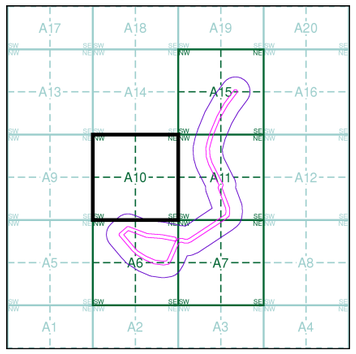


Historical Map - Segment A10



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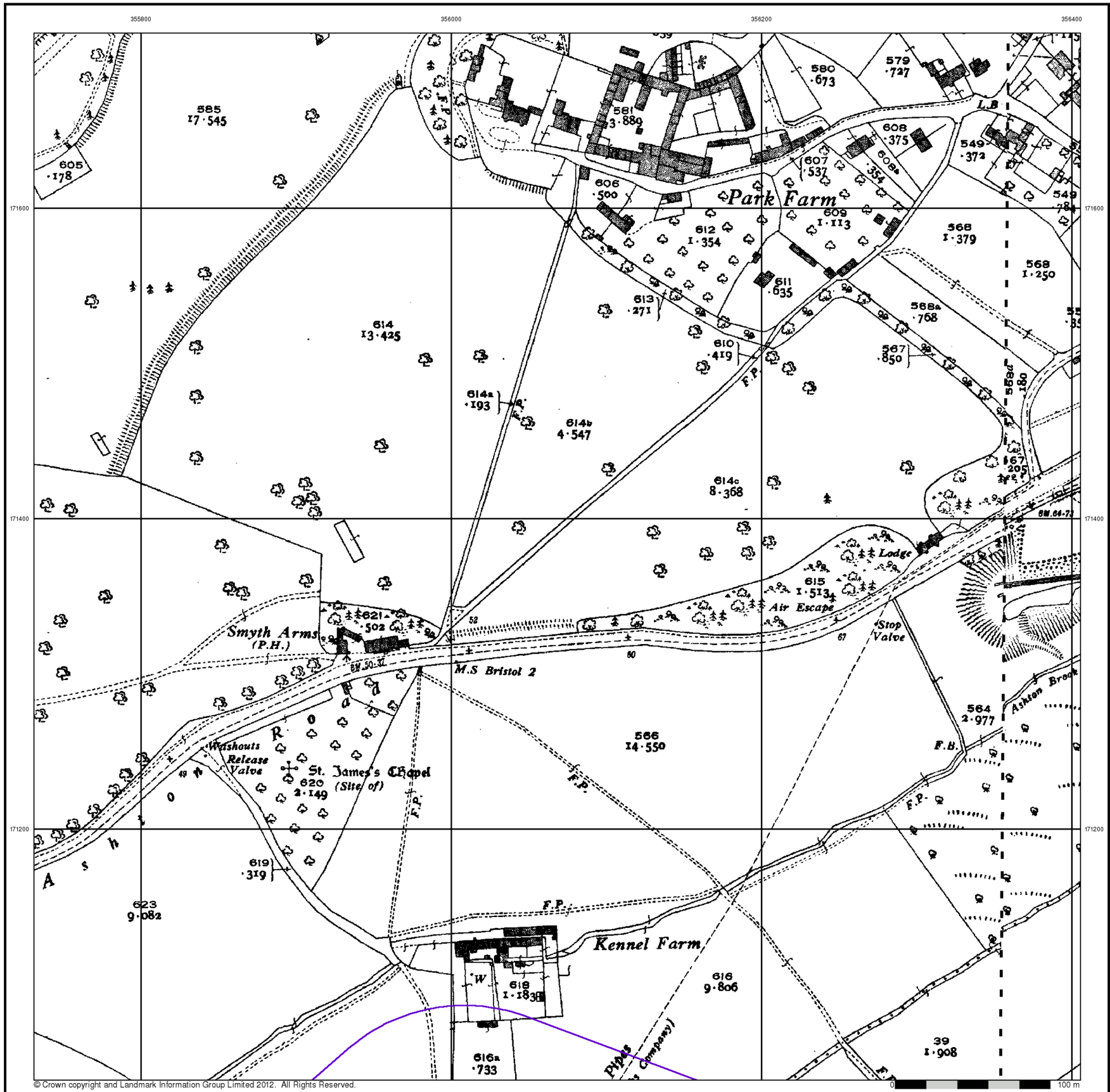

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Somerset

Published 1931 - 1932

Source map scale - 1:2,500

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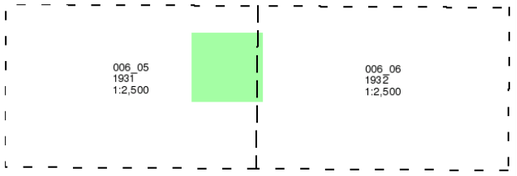

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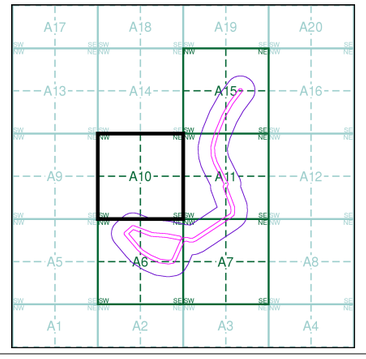

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Ordnance Survey Plan

Published 1953

Source map scale - 1:1,250

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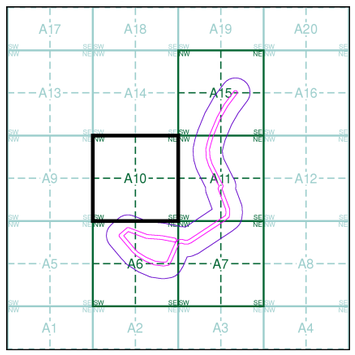
Map Name(s) and Date(s)

ST5671NW
1953
1:1,250

ST5671SW
1953
1:1,250

Historical Map - Segment A10



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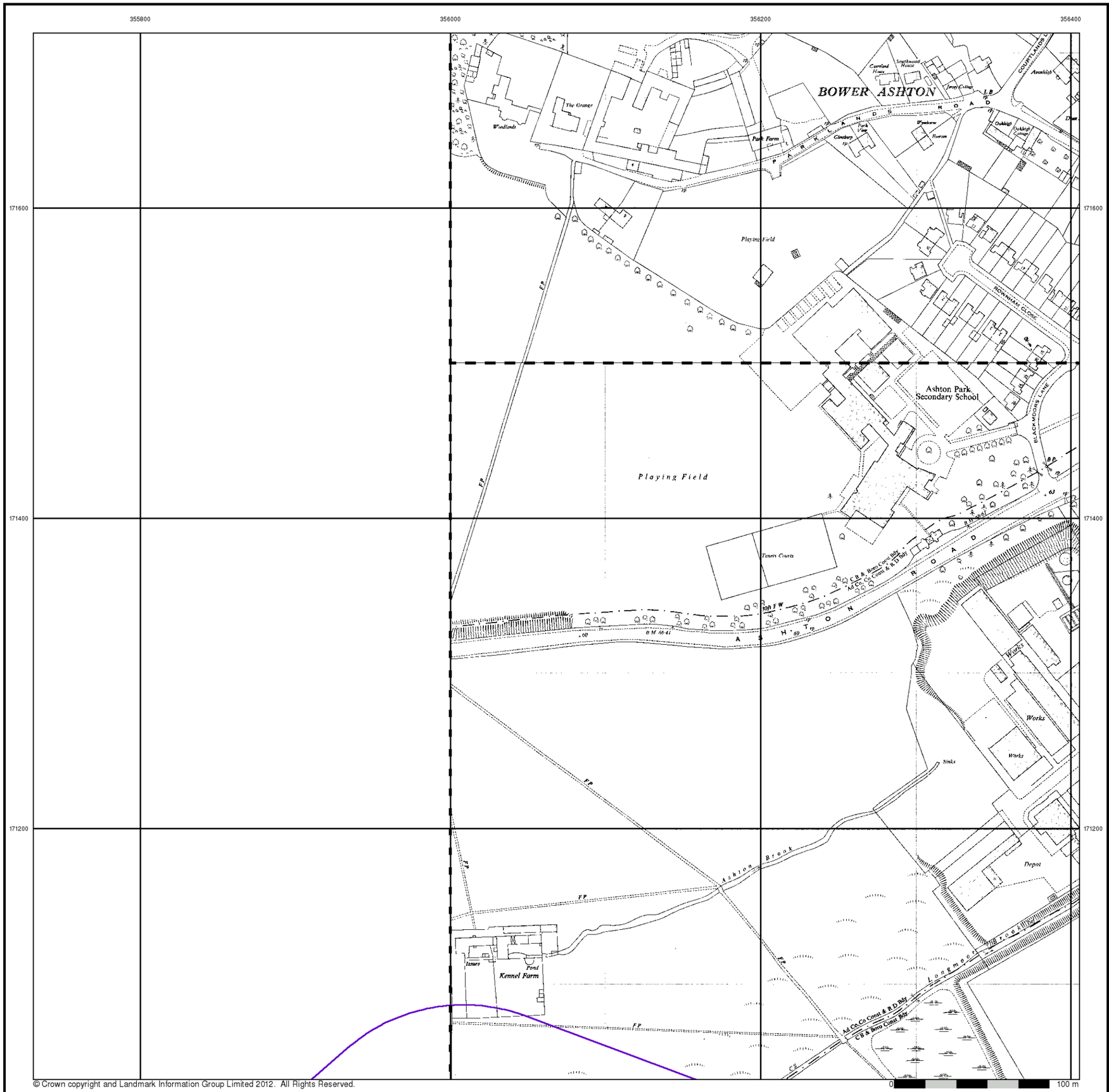

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Ordnance Survey Plan

Published 1963

Source map scale - 1:1,250

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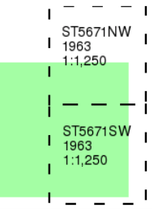
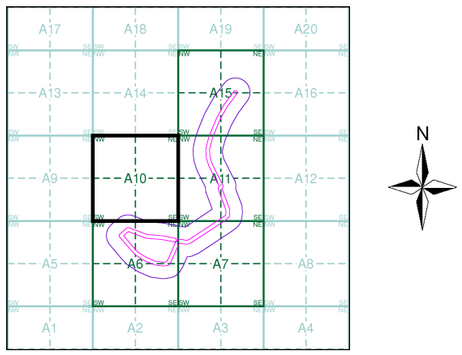


Historical Map - Segment A10



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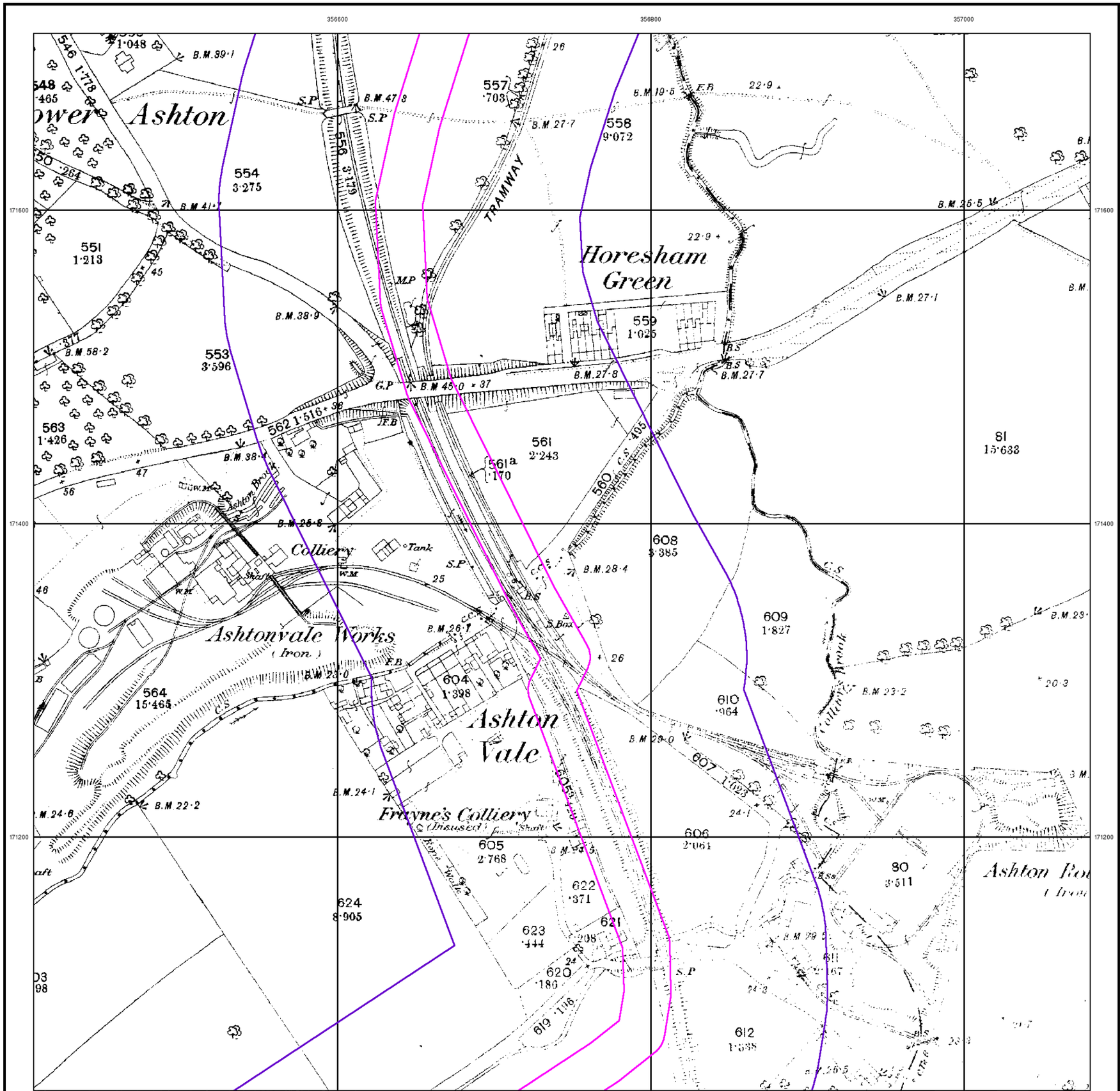

Envirocheck®

Somerset

Published 1894

Source map scale - 1:2,500

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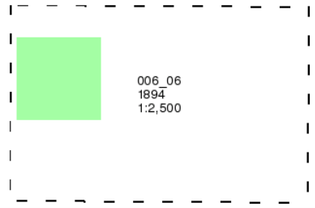
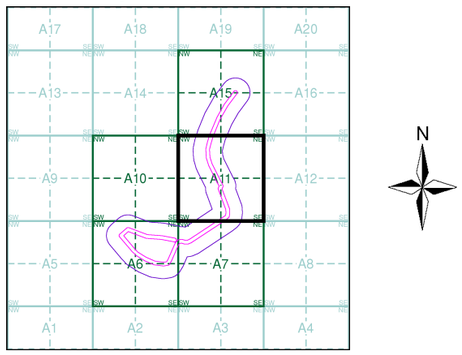
Map Name(s) and Date(s)



Historical Map - Segment A11



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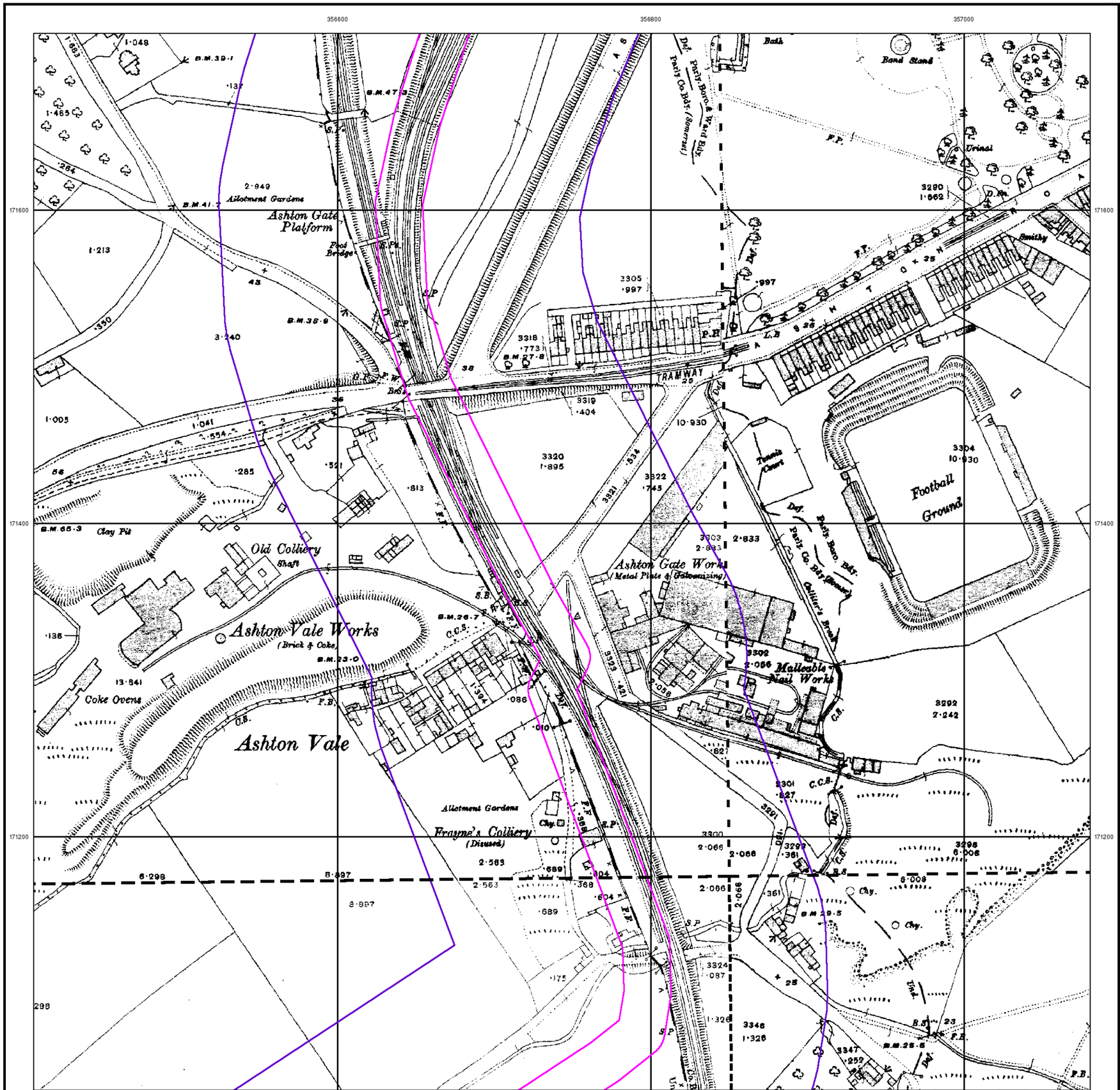

Envirocheck®

Gloucestershire

Published 1916 - 1918

Source map scale - 1:2,500

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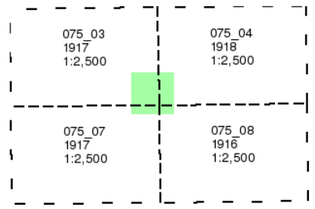
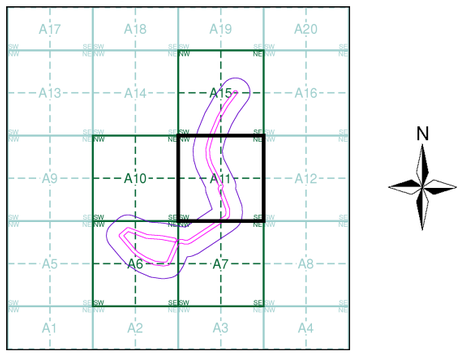
Map Name(s) and Date(s)



Historical Map - Segment A11



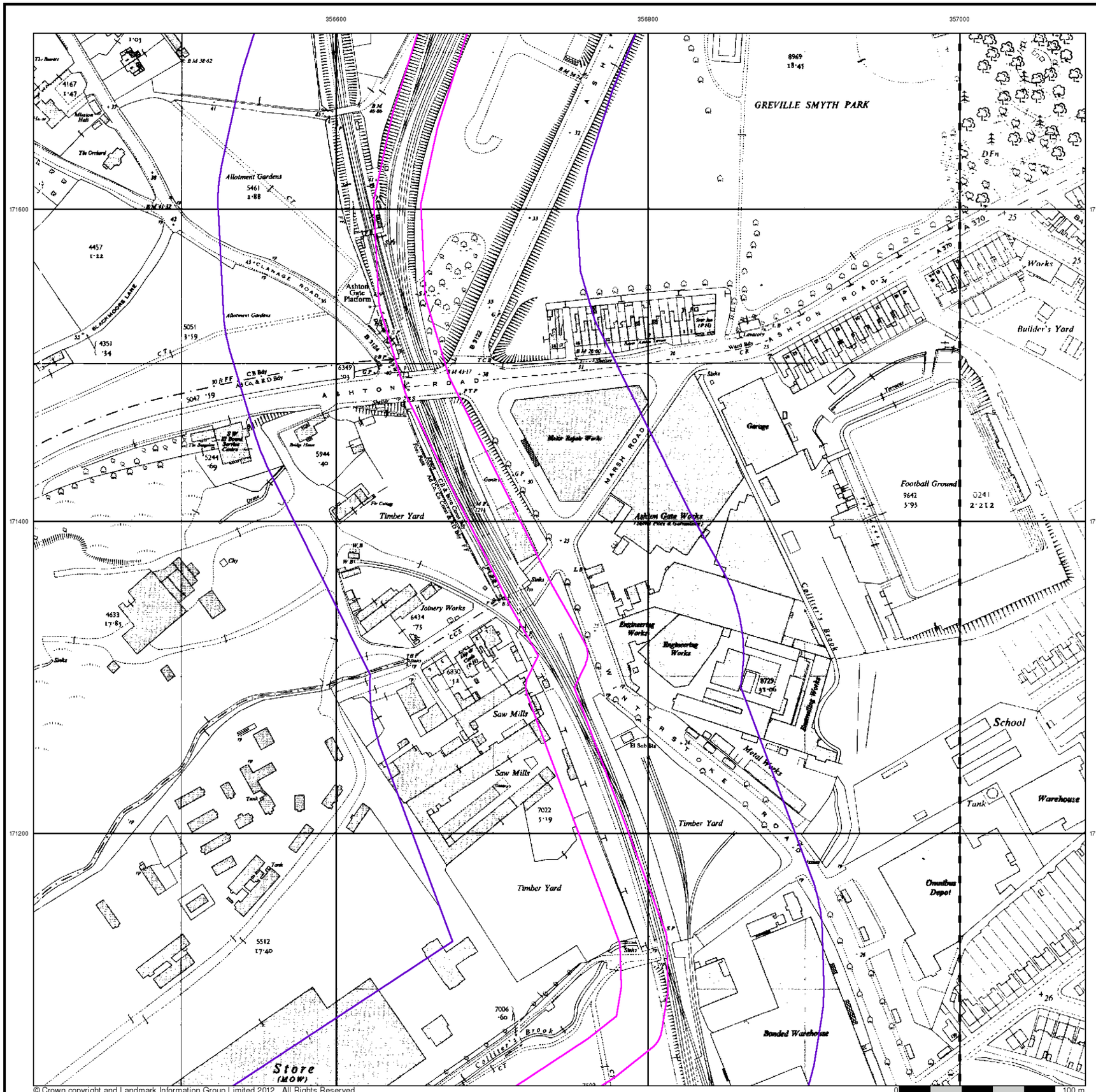
Order Details

Order Number:	37704596_1_1
Customer Ref:	GAVTMR032
National Grid Reference:	356510, 171290
Slice:	A
Site Area (Ha):	7.93
Search Buffer (m):	100

Site Details

Site at, Ashton Vale, City of Bristol

Landmark® Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Envirocheck®

Ordnance Survey Plan

Published 1948 - 1954

Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

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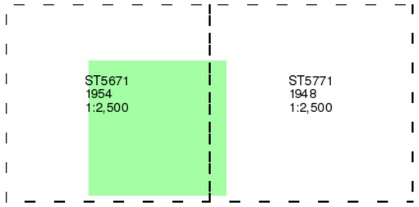
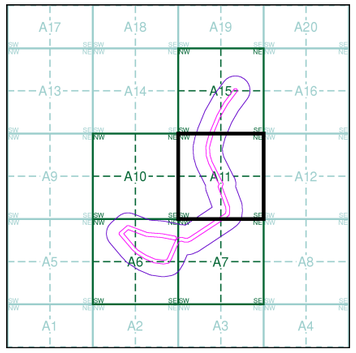


Historical Map - Segment A11



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Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

MetroWest

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council
6.25, Environmental Statement, Volume 4, Appendix 10.2, Annex B2
Factual Geotechnical Report, Portishead Car Park
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, regulation 5(2)(a)
Planning Act 2008

Author: CH2M
Date: November 2019

Network Rail · West of England Local Enterprise Partnership · West of England Combined Authority · HM Government · Bath & North East Somerset Council · Bristol City Council · North Somerset Council · South Gloucestershire Council · travelwest

FACTUAL GEOTECHNICAL REPORT

CONTRACT: **Portishead Car Park**
Harbour Road
Portishead
Somerset

CLIENT: **North Somerset Council**
Town Hall
Walliscote Grove Road
Weston-super-Mare
Somerset
BS23 1UJ

FAO: Mr P. Stewart

REPORT NO: 16-78919/AD/FGReport

PREPARED BY:
[redacted]
A. Dean BSc (Hons)

CHECKED & APPROVED BY:
[redacted]
R. J. Holloway BSc (Hons) MSc FGS CEnv MCIWEM C.WEM

DATE: **31 January 2017**

ACS Testing Ltd. Unit 14 Blackhill Road West, Holton Heath Trading Park, Poole, Dorset BH16 6LE.
Ph 01202 622858 – Fax 01202 625045 – Email geo@acstesting.co.uk – www.acsgroupofcompanies.co.uk

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- ACST – 16-79208
- ACSE – 16-06089-01
- ACSE – 16-06089-01 WAC
- ACSE – 16-06100 - 01
- ACSE – 16-06100-01 WAC
- CatWaste Soil Results

1.0 INTRODUCTION

1.1 Instructions

1.1.1 ACS were instructed by Mr Paul Stewart of North Somerset Council on 20/11/15 to carry out intrusive investigatory works to aid the design of proposed car parks to service the MetroWest Phase 1 Scheme.

1.1.2 The scope of the investigation was prepared and outlined in a Ground Investigation Specification prepared by CH2M on behalf of North Somerset Council.

1.1.3 The objectives of this report are to provide additional information of the geological, geotechnical, hydrogeological and geo-environmental conditions at the site to aid the design of car parks, infrastructure and the highway/roundabout relocation at Portishead.

1.1.4 Initial instructions were to carry out intrusive investigations at two sites, Portishead and also Pill. However, prior to the commencement it was found that access to the site at Pill was restricted by a chain padlocked gate and a large number of derelict cars situated in the entrance. North Somerset Council informed ACS that access would not be possible at the proposed time of the investigation. Therefore, this report has been prepared in relation the investigation at Portishead only.

1.2 Report Limitations

1.2.1 This report has been prepared in accordance with the instructions received from CH2M on behalf of North Somerset Council and includes the findings of in situ and laboratory testing.

1.2.2 It should be appreciated that there may be areas of the site that have not been investigated where ground conditions and geotechnical parameters may vary from those encountered. It should also be acknowledged that features or ground conditions identified may be more widespread than those revealed.

1.2.3 The information contained in this report is intended for the sole use of North Somerset Council.

1.2.4 The conclusions made in this report are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the number of locations where the ground was investigated; no liability can be accepted for conditions not revealed by the investigation or testing undertaken.

1.2.5 The investigation has followed best practice at the date of preparation of the report, in line with the instructions received. Changes in codes of practice and / or legislation, made after preparation of this report could invalidate the conclusions presented within this report.

2.0 SITE CONDITIONS

2.1 The site is open land to the south of Harbour Road, Portishead, Somerset.

2.2 The site is an irregular shape and is accessed via a small steel palisade gate which is connected to a palisade fence which runs partially along the eastern boundary of the site. The northern boundary of the site is marked by a public footpath running parallel with the road. The southern boundary is marked by a metal chain link fence with the western boundary adjacent to the gravel footpath.

2.3 At the time of the initial visit the site was very overgrown with large shrubs including Cow Parsley, Willow Herb, Thistle, Brambles and sparse Japanese Knotweed. A line of dense vegetation was also present along the eastern and northern boundaries which was formed of brambles and trees including Birch and Oak. The western area of the site was heavily overgrown with several large Oak trees present along the southern boundary.

2.4 Historically the site had been railway land with two sets of rails still present, merging into one line from east to west with a buffer stop at the most western point of the tracks. The tracks are raised compared to the other parts of the site and a black ash ballast material is noted to underlie the tracks. Remnants of an old concrete post fence running parallel to the railway line is noted alongside the northern ditch.

2.5 The northern part of the site is lower than the central area where the track is located, at a similar level to that of the road to the north. Between the tracks and the northern part of the site is a small ditch which is heavily vegetated, the northern part of the site has a slight slope downwards to the south where the ditch is present. The same feature can be seen on the southern side of the railway tracks where there is also a ditch between the most southerly part of the site and the tracks. Both ditches are most noticeable to the east, with the western part of the site appearing to be more level, however thick vegetation may mask the actual topography.

2.6 A badger sett was recorded on the site underlying one of the sleepers on the railway track in the central area of the site. It was unknown if the sett was active, however as a precaution a 10m exclusion was set up around in in order to prevent vehicle movement above the it.

2.7 To the north of the site there are a number of commercial units/buildings, a nursing home and residential flats. To the south of the site there are again commercial units and buildings along with a supermarket to the south-west. A river runs close to the western boundary of the site

2.8 Photographs taken during the site works are included as Appendix B.

3.0 GEOLOGY

3.1 On-line geological British Geological Survey (BGS) mapping and BGS Geological Map Sheet 264 shows the whole site to be underlain by Made Ground. Superficial Tidal Flat Deposits comprising clay and silt are noted to underlie the Made Ground.

3.2 Bedrock deposits underlying the site are recorded to be Mudstone and Halite-stone of the Mercia Mudstone Group.

3.3 Details of ground conditions identified within previous investigation on the site are contained within the Ground Investigation Specification supplied by CH2M. Cone Penetration Testing just to the east of the study site found Tidal Flat Deposits comprising very soft to firm clays proved to a depth of 15.00m.

4.0 HYDROGEOLOGY AND HYDROLOGY

4.1 The Environment Agency Groundwater Vulnerability Map shows the superficial deposits to be unproductive strata with the bedrock deposits classified as a Secondary (B) Aquifer.

4.2 Secondary (B) Aquifers are defined as predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering (EA Definition).

4.3 The site is not located above a Groundwater Source Protection Zone (SPZ).

4.4 The Flood Map obtained from the Environment Agency website shows that the site is within an area classified as Flood Zone 3. It is also noted that the site is deemed to be currently benefiting from flood defence.

4.5 Environment Agency maps are included as Appendix C.

5.0 INVESTIGATORY WORKS

5.0.1 An intrusive investigation was undertaken by ACS Testing Ltd in December 2016. Locations for the investigation were chosen by the Client in order to provide adequate coverage of the site.

5.0.2 During an initial walkover of the site CH2M informed ACS that three of the Trial Pit locations, TPPH01, TPPH02 and TPPH07, were positioned in order to find services of which the exact location were unknown. This information was not supplied to ACS prior to the start of the investigation and therefore the three positions were removed from the investigation as this was out of the scope of works and safety measures were not in place to carry out service investigations.

5.0.3 The locations that were carried out were cleared by a trained ACS Geo-Environmental Engineer using a Cable Avoidance Tool.

5.0.4 It should be noted that due to the size and access restrictions of the CPTu Tracked Truck some locations were altered.

5.0.5 Locations of the exploratory holes are shown on the Exploratory Hole Location Plan included as Appendix D. Exact positions of Trial Pits and CPTu Tests are shown in Table 1 below.

Exploratory Hole	*Easting*	*Northing*	*Ground Level (mAOD)*
TPPH03	347299	176431	107.78
TPPH04	347367	176410	107.44
TPPH05	347443	176407	107.49
TPPH06	347515	176397	107.36
TPPHSA	347453	176403	107.47
CPT01	347457	176401	107.49
CPT02	347475	176401	107.61
CPT03	347490	176362	107.69
CPT04	347510	176388	107.70
CPT05	347364	176407	107.53
CPT06	347387	176413	106.83

Table 1. Positions of exploratory holes.

5.1 Trial Pits

5.1.1 Five trial pits were excavated using a JCB 3CX Backhoe Excavator with a 600mm bucket to a maximum depth of 3.50m. Samples were collected from within the trial pits and later scheduled for geotechnical and contamination testing. The trial pits were logged in accordance with BS5930:2015.

5.1.2 All trial pits were backfilled upon completion, compacted in layers with arisings returned in reverse order to preserve the natural stratigraphy.

5.1.3 Trial Pit logs are included as Appendix E.

5.2 Infiltration Testing

5.2.1 BRE 365 infiltration testing was carried out within one trial pit to assess the potential for soakaway drainage to be used on site. Test certificates are included as Appendix F.

5.3 TRL DCP Testing

5.3.1 TRL Dynamic Cone Penetrometer (DCP) testing was carried out within four trial pits TPPH03-06 at 1m depth in order to obtain a California Bearing Ratio (CBR) value for the ground at this depth.

5.3.2 Copies of the TRL DCP result certificates are included as Appendix G

5.4 CPTu Testing

5.4.1 Lankelma Ltd carried out 7no. Seismic Piezocone Tests (CPTu) on the 16/12/2016 using a 20.5 tonne track-truck mounted CPT unit equipped with a 17 tonne capacity hydraulic ram set.

5.4.2 Cone measurements included cone tip resistance, friction sleeve resistance and dynamic pore water pressure as well as down-hole seismic testing.

5.4.3 One test (CPT03) did not reach the intended depths due to the very dense nature of the materials encountered. Test CPT03A was carried out 1m from CPT03 and reached the required depth.

5.4.4 A copy of the report produced by Lankelma Ltd including the findings of the investigation is included as Appendix H.

5.5 Geotechnical & Basic Chemical Testing

5.5.1 Nine soil samples were tested for Natural Moisture Content, Liquid Limit and Plastic Limit. From these tests the Plasticity Indices can be calculated which can be used to determine the shrinkage potential of cohesive soils.

5.5.2 Six soil samples underwent wet sieve testing in order to determine Particle Size Distribution (PSD) in accordance with BS 1377: Part 2. All of these samples also underwent sedimentation testing to determine the percentages of fine material.

5.5.3 Seven soil samples were tested for the UKSGI Suite D for potentially aggressive ground conditions in order to assist the specification of future buried concrete.

5.5.4 Six soil samples were tested for Organic Matter Content.

5.5.5 Copies of laboratory test certificates are included as Appendix I.

5.6 Contamination Testing

5.6.1 Five soil samples were scheduled for the UKSGI Suite E in order to assess if any contamination is present within the soils across the site. All five samples were run through the CatWaste Soil program to determine if any of the samples had hazardous properties.

5.6.2 Three soil samples were scheduled for the UKSGI Suite K for leachate testing. This was tested in order to determine if the ground units on site are a source of risk to sensitive water receptors.

5.6.2 Copies of laboratory test certificates and CatWasteSoil report are included as Appendix I.

5.7 Waste Acceptance Criteria Testing

5.7.1 Two samples were tested for UKSGI Suite L (modified) to assist with the classification for materials which may be necessary to dispose of off-site.

5.7.2 Copies of laboratory test certificates are included as Appendix I.

6.0 GROUND CONDITIONS

6.1 Summarised Ground Conditions

6.1.1 Summarised ground conditions found within the boreholes on site are shown in Table 2 below.

Unit	*Locations Encountered*	*Minimum depth encountered (m)*	*Thickness (m)*
TOPSOIL	TPPH05, TPPH06 & TPPHSA	Ground Level	0.30-0.68
MADE GROUND	TPPH03, TPPH04, TPPH06 & TPPHSA	Ground Level – 0.35	0.40-1.23
DESICCATED SUPERFICIAL DEPOSITS	TPPH03, TPPH04, TPPH05 & TPPHSA	0.68-1.23	0.87-1.20
TIDAL FLAT DEPOSITS	All Locations	1.30-2.40	Proven to 1.65

Table 2. Summarised ground conditions

6.1.2 Topsoil

Identified within three of the exploratory hole locations from ground level to a maximum depth of 0.68m. The unit typically comprises a soft brown sandy gravelly SILT.

6.1.3 Made Ground

Made Ground was identified within four of the exploratory holes and recorded to a maximum depth of 1.30m within TPPH06. The unit varied across the site with the locations alongside the railway tracks having Made Ground typically comprising a dark grey SAND and GRAVEL with abundant clinker, brick, glass, macadam and stone, typical of a railway ballast. The other areas of the site were found to have Made Ground units comprising grey SILT and SAND with black gravel noted in TPPH06 at 1.20m depth.

6.1.4 Desiccated Superficial Deposits

Identified within four exploratory holes to a maximum depth of 2.40m. The unit typically comprised a stiff greyish mottled brown clayey sandy SILT.

6.1.5 Tidal Flat Deposits

Found within all exploratory holes on site and proven to 3.50m. The unit typically comprises a very soft to soft bluish grey silty CLAY. Some rare firm areas are noted throughout.

6.2 Groundwater

6.2.1 Groundwater seepage was noted in three of the trial pits excavated. Seepage into the pits was recorded at depths ranging from 2.70-2.90mbgl. No standing groundwater was recorded within any of the excavations.

6.3 Infiltration Testing

6.3.1 Infiltration testing was carried out in one of the trial pits in order to assess the suitability of soakaway drainage for the proposed development.

6.3.2 One test was carried out within TPPHSA on 13/12/2016. The test was carried out for a total of 152 minutes with a fall of 3cm recorded over this period. Due to the time constraints an infiltration rate was unable to be calculated due to the water level not reaching a 25% level within the pit.

6.3.3 It is therefore assumed that soakaway drainage will not be feasible at the site.

6.4 TRL DCP Testing

6.4.1 TRL DCP testing was carried out within four of the trial pits. Testing was commenced at 1m depth in all trial pits as requested within the scope of works.

6.4.2 It is possible to calculate CBR values from the results of TRL DCP testing. Results of the testing has recorded CBR values of 7% or higher in all locations apart from TPPH03 where a lowest value of 4% was recorded.

6.4.3 Results of the TRL DCP testing is included as Appendix G.

7.0 GEOTECHNICAL TESTING RESULTS

7.1 Index Properties - Moisture Content and Atterberg Limit testing (LL/PL/PI)

7.1.1 In accordance with NHBC 4.2, shrinkable soils are those containing more than 35% fine particles (60µm) and have a Modified Plasticity Index of 10% or greater. The Modified Plasticity Index is calculated as the Plasticity Index of the soil multiplied by the percentage of particles less than 425µm.

7.1.2 The Modified Plasticity Index can be used to determine the volume change potential of the underlying soil. The table below summarises the volume change potential of soils based on the Modified Plasticity Index.

Modified Plasticity Index	*Volume Change Potential*
40% and greater	High
20% to less than 40%	Medium
10% to less than 20%	Low
Less than 10%	Non-Shrinkable

Table 3. Modified Plasticity Index relating to Volume Change Potential.

7.1.3 The results of the laboratory testing are shown in Table 3 below.

Reference (Depth)	*Moisture Content %*	*Percentage passing 425µm sieve (%)*	*Plastic Limit (%)*	*Liquid Limit (%)*	*Plasticity Index (%)*	*Modified Plasticity Index (%)*
TPPH03 (1.30m)	44	100	27	71	44	44
TPPH03 (2.70m)	32	99	20	60	40	39.60
TPPH04 (1.60m)	23	100	19	55	36	36
TPPH04 (2.10m)	35	100	19	53	34	34
TPPH04 (2.60m)	31	100	18	50	32	32
TPPH05 (1.20m)	21	100	17	48	31	31
TPPH05 (2.60m)	27	100	17	44	27	27
TPPH05 (3.10m)	41	100	20	59	39	39
TPPH06 (2.00m)	30	100	20	51	31	31
					Minimum	*44*
					Maximum	*27*

Table 4. Moisture content and Atterberg Limit testing results

7.1.4 The results of the testing have revealed the samples to have a medium to high shrinkage potential.

7.1.5 Shrinkable soils are subject to change in volumes as their moisture content is altered. Soil moisture contents vary seasonally and influenced by a number of factors including the action of tree roots. The resulting shrinkage or swelling of the soil can cause subsidence or heave damage to foundations, the structures they support and services.

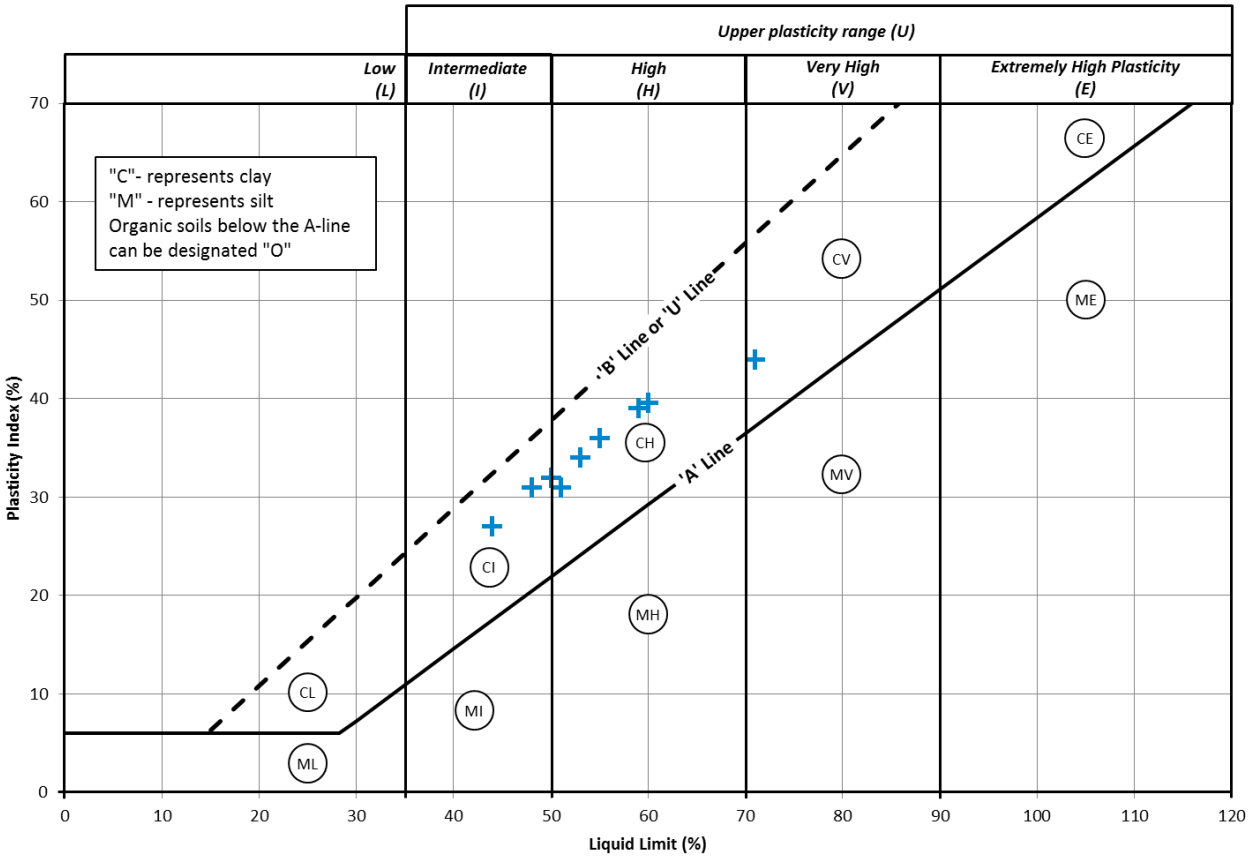


Figure 1. Results of LL/PL/PI testing plotted on an A-Chart

7.2 Particle Size Distribution Testing

7.2.2 Six sample were tested to determine the Particle Size Distribution by wet sieving and sedimentation testing. Figure 4 below summarises the results of the testing.

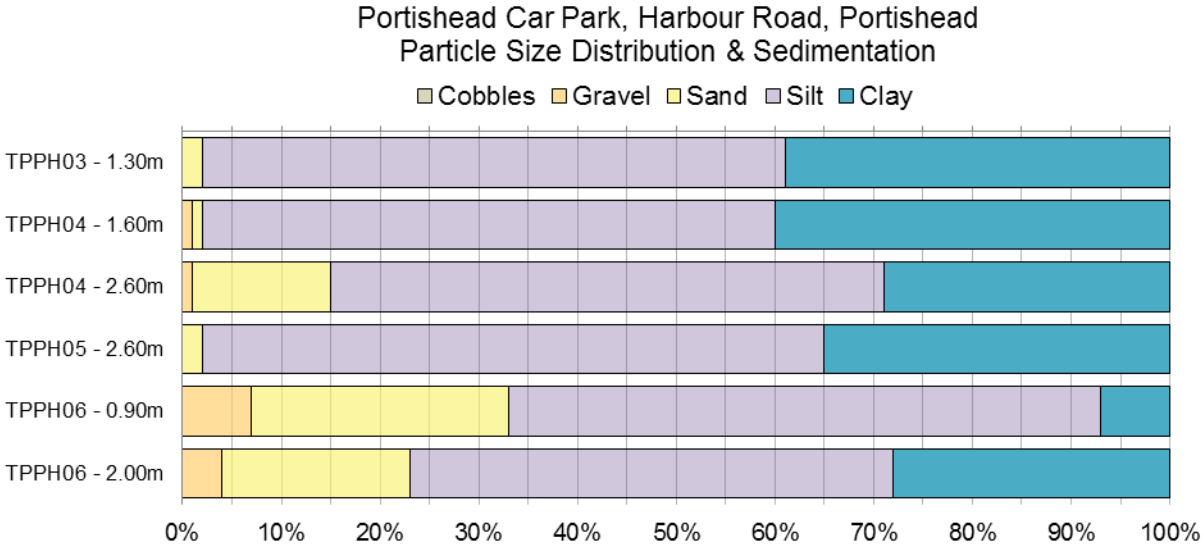


Figure 2. Summary of Particle Size Distribution determined by wet sieve and sedimentation method.

7.4 Aggressive Ground Chemical Suite

7.4.1 The basic results of UK SGI Suite D testing are shown in Table 5 below and a complete set of results are recorded on the Laboratory certificates are included in Appendix H.

Trial Pit no.	*Depth (m)*	*pH*	*Water Soluble Chloride mg/l*	*Water Soluble Sulphate mg/l*	*Water Soluble Nitrate mg/l*	*Magnesium mg/kg*
TPPH03	0.30	6.5	<3.00	3.99	<0.01	2760
TPPH03	2.70	8.3	18.9	11.6	0.822	9190
TPPH04	1.60	8.1	10.8	8.16	0.90	8530
TPPH04	2.10	7.6	8.06	471	0.22	9540
TPPH05	1.00	7.9	7.12	14.9	0.27	7530
TPPH06	0.40	7.8	12.0	53.9	0.24	3240
TPPH06	2.00	8.7	109	225	0.36	9170

Table 5. Basic Chemical Test Results.

7.5 Organic Matter Content Results

7.5.1 The results for Organic Matter Content testing are shown in Table 6 below. The certificates for this testing are included as Appendix H.

Borehole no.	*Depth (m)*	*Organic Matter Content (%)*
TPPH03	0.90	3.17
TPPH04	1.60	0.40
TPPH04	2.60	1.04
TPPH05	2.60	1.90
TPPH06	0.90	1.60
TPPH06	2.00	0.92

Table 6. Organic Matter Content Test Results

8.0 QUALITY STATEMENT

8.1 We confirm that in preparing this report we have exercised reasonable skill and care in order to produce accurate details.

8.2 We confirm that testing has been conducted in accordance with relevant Standards, as requested by the Client, with reference to the Organisation's Quality Manual Procedures.

8.3 The results and contents of this report are based upon in situ and laboratory testing.

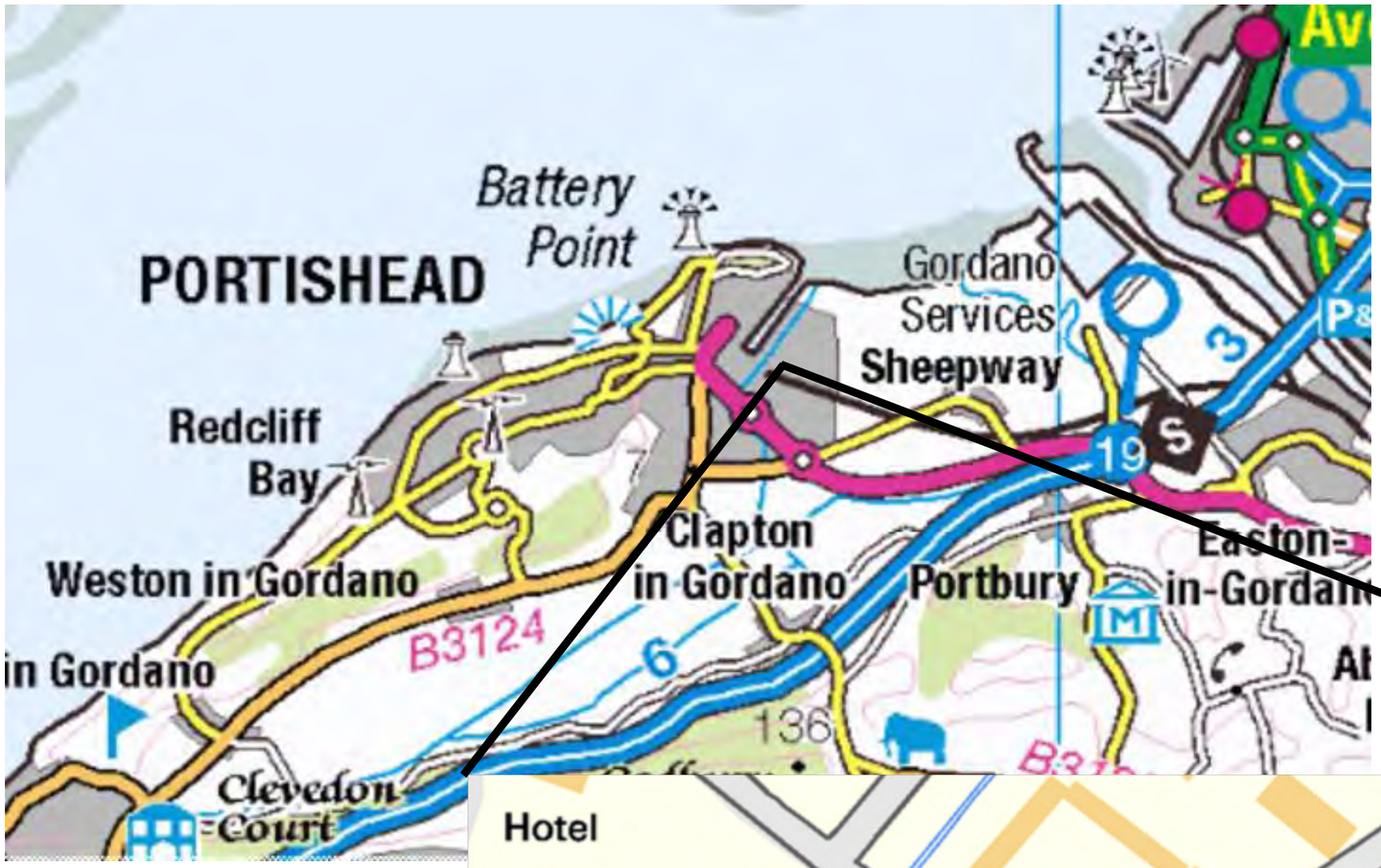
8.4 Consequently, comments contained herein are derived from the determination of the results from the in situ and laboratory testing.

8.5 ACS Testing warrants only the accuracy of the test result and information contracted to be supplied to the Client but will accept no liability in respect of the use to which the Client puts such information or the purpose for which such information was requested.

8.6 Unless specifically assigned and confirmed in writing within the terms of the Agreement/Written Order the Organisation asserts and retains all Copyright and other Intellectual Property rights, in and over the report and its contents.

APPENDIX A

SITE LOCATION PLAN – 16-78919/01



ACS TESTING LTD
UNIT 14 BLACKHILL ROAD WEST
HOLTON HEATH TRADING PARK
POOLE, DORSET
BH16 6LE
T: 01202 628647
E: geo@acstesting.co.uk

DO NOT SCALE

KEY:

REV	DESCRIPTION	BY	CHK	APP	DATE

CLIENT:

North Somerset Council

SITE:

Portishead Car Park, Harbour Road, Portishead, Somerset

DRAWING TITLE:

Site Location Plan

SCALE:	@
JOB NO.	16-78919
DRAWING NO.	16-78919/01
DATE.	19/01/2016
REVISION.	

NOTES:

APPENDIX B

PHOTOGRAPHIC RECORD PLATES 1-26

Plate 1. View west on to the site from Quays Avenue. Note the steel palisade fence and gate providing access onto the site.

Plate 2. View west of the site along the existing railway tracks.

Plate 3. View north-west from the entrance gate on to site. Slight slope is noted downwards towards the north of the site.

Plate 4. View south-west from the central area of the site. Note off site buildings that run adjacent to the southern boundary. A small ditch is present between the location where the photograph was taken and the site boundary. Note overgrowth which is present across the site.

Plate 5. View western of the northern area of the site. The trackway seen was created using a tracked machine with a CH2M ecologist present. Note the tree/shrub line running on site parallel to the northern boundary.

Plate 6. View east back across the site from the central area. Note upwards slope from the north up to the south of the site.

Plate 7. View west along the railway tracks in the western third of the site. The two sets of track begin to join into one line at this point.

Plate 8. View north of a historic buffer stop located at the western end of the railway line.

Plate 9. View south-west along the public footpath located off site adjacent to the western site boundary. Note the river running south to north in the right of the image.

Plate 10. View east along the northern site boundary with Harbour Road.

Plate 11. View west of the north-eastern corner of the site.

Plate 12. TPPH03 material at 0.40m - railway ballast.

Plate 13. TPPH03 1.30m depth – Desiccated Superficial Deposit arisings.

Plate 14. TPPH03 – 2.70m – Tidal Flat Deposits

Plate 15. TPPH04 – 0.40m – Made Ground.

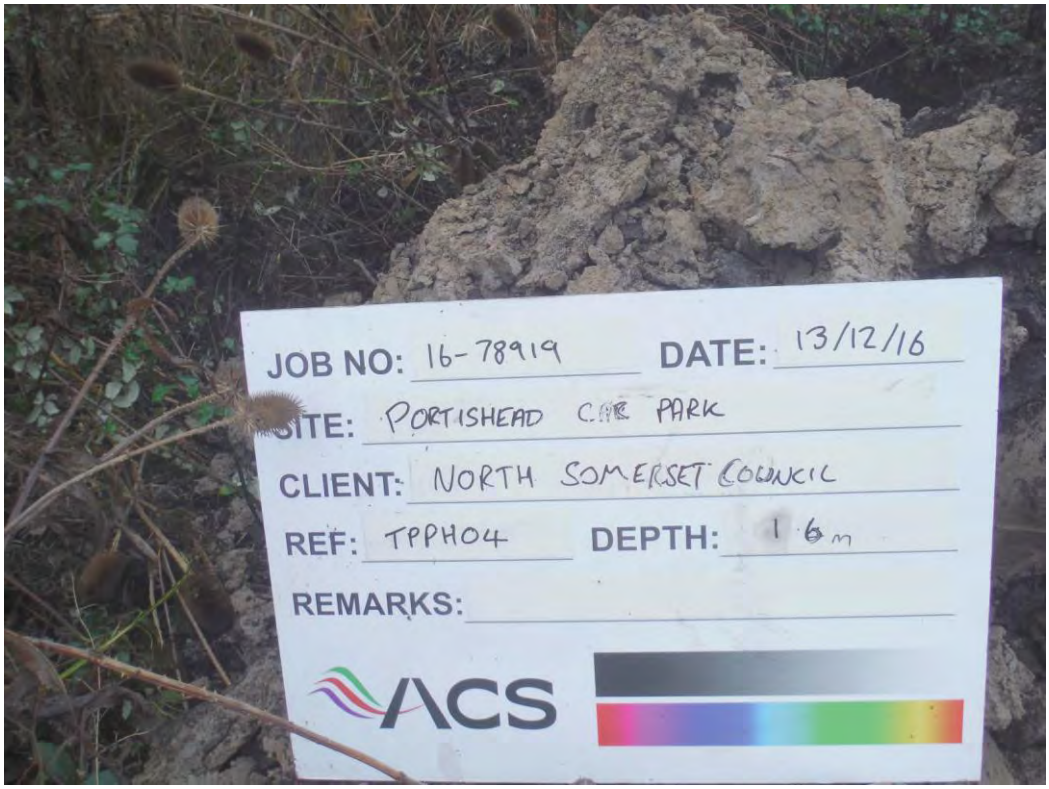


Plate 16. TPPH04 – 1.60m – Desiccated Superficial Deposits

Plate 17. TPPH04 – 2.40m – Tidal Flat Deposits

Plate 18. View within TPPH04, water in base is from gradual seepage from the base of the pit.

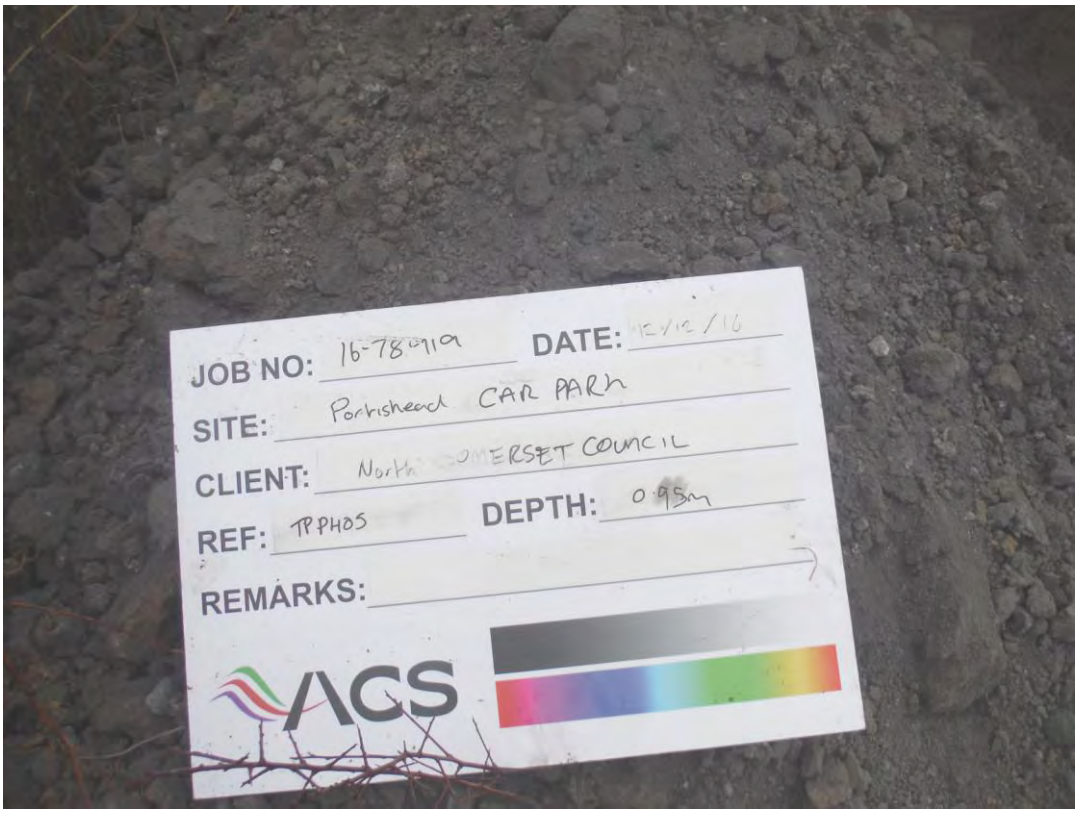


Plate 19. TPPH05 – 0.95m – Made Ground.

Plate 20. TPPH05 – 2.20m – Tidal Flat Deposits

Plate 21. TPPH06 – 0.30m – Made Ground

Plate 22. View within TPPH06 of the dark grey gravel, potentially cover/surround for a service.

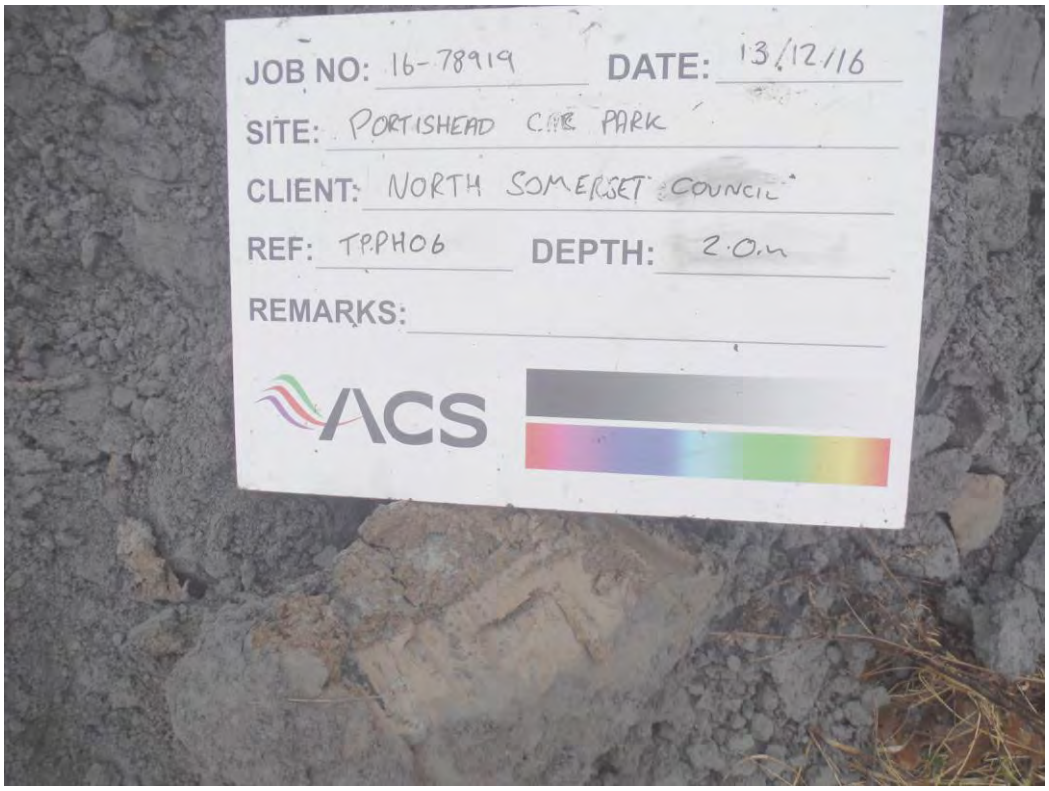


Plate 23. TPPH06 – 2.00m – Desiccated Superficial Deposits.

Plate 24. CPTu Tracked Truck in the position of CPT02.

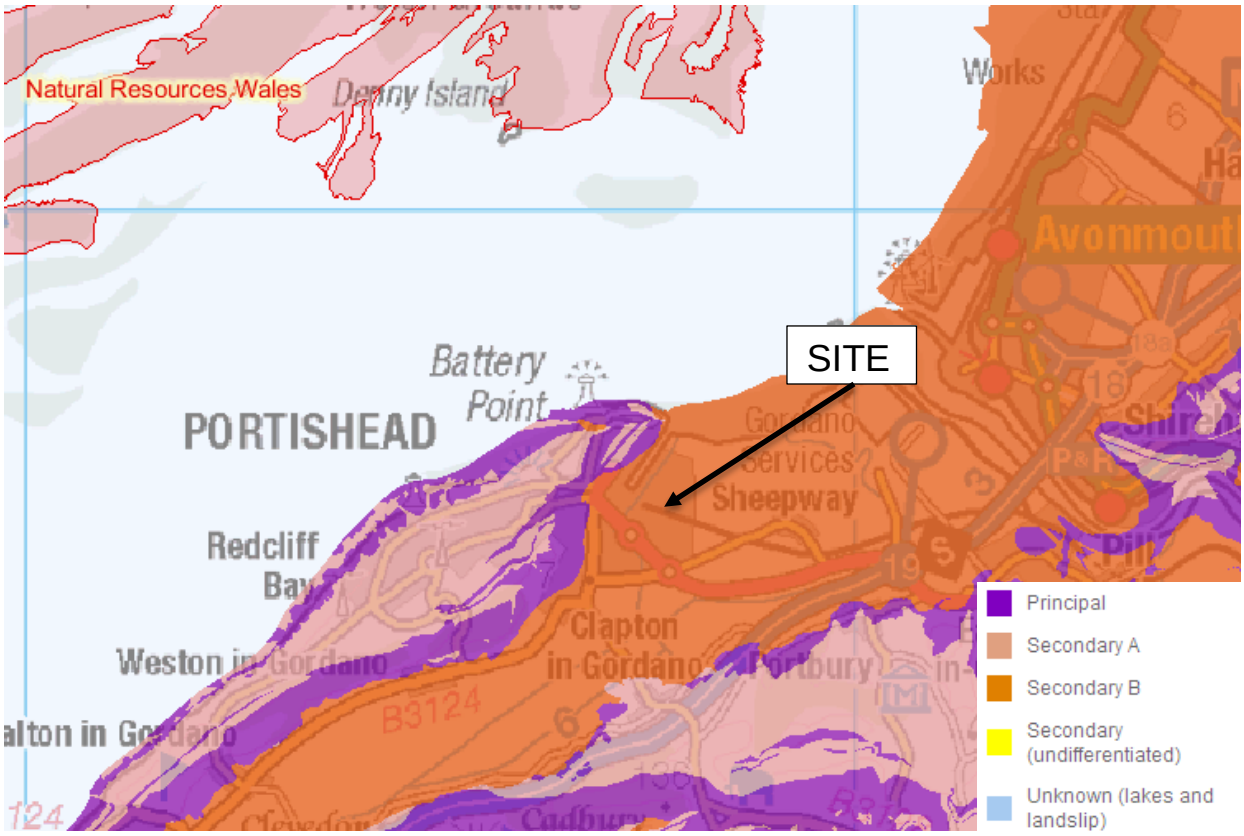
Plate 25. CPTu Tracked Truck in the position of CPT04

Plate 26. CPTu Tracked Truck in position of CPT05.

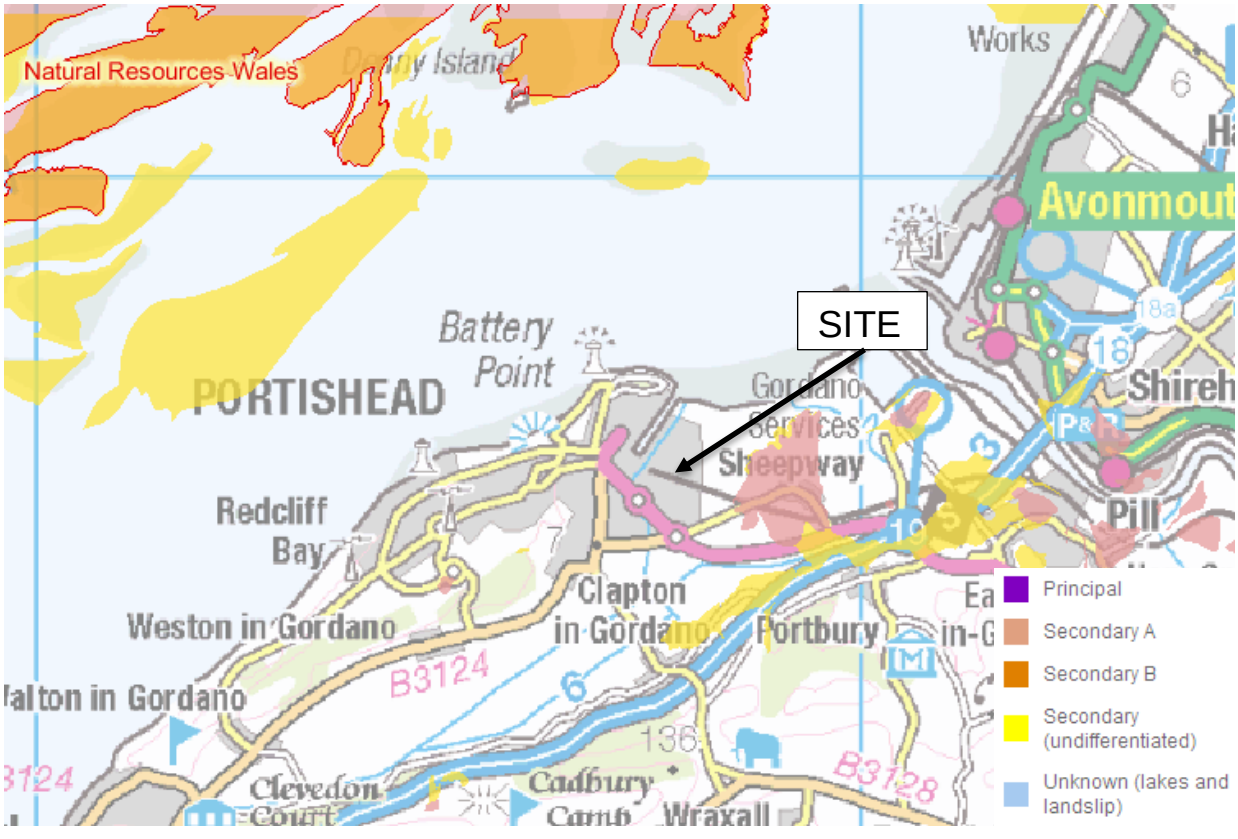
APPENDIX C

ENVIRONMENT AGENCY MAPS 1-2

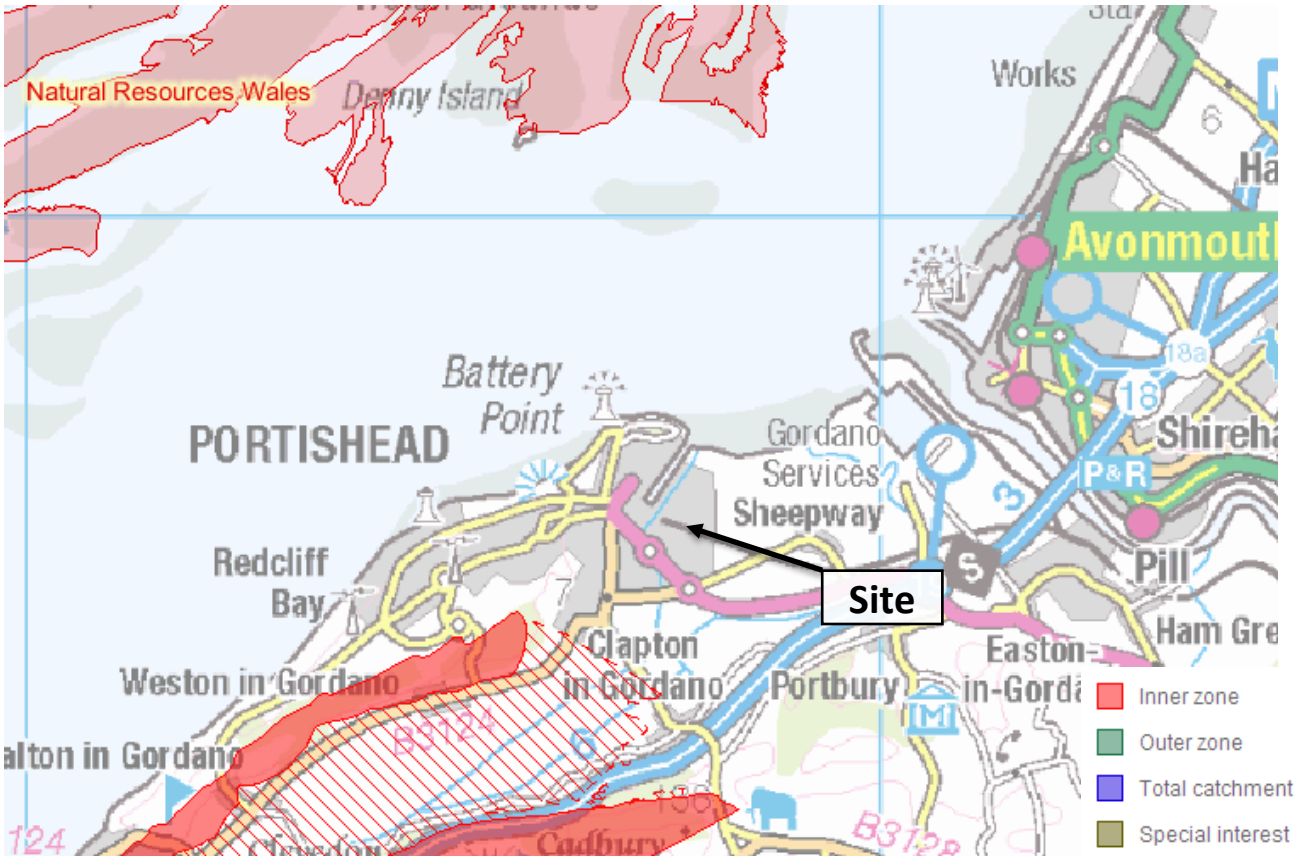
EA Bedrock Aquifer Map



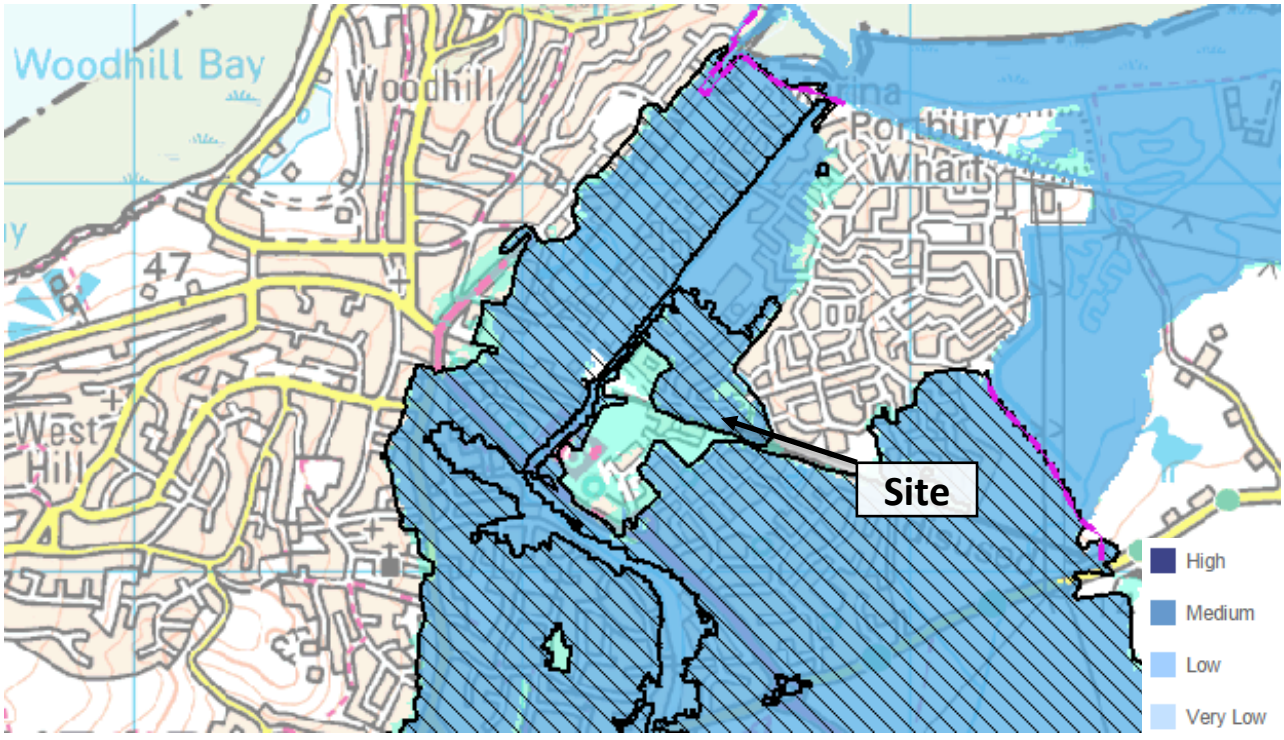
EA Superficial Deposits Aquifer Map



EA Groundwater Source Protection Zones

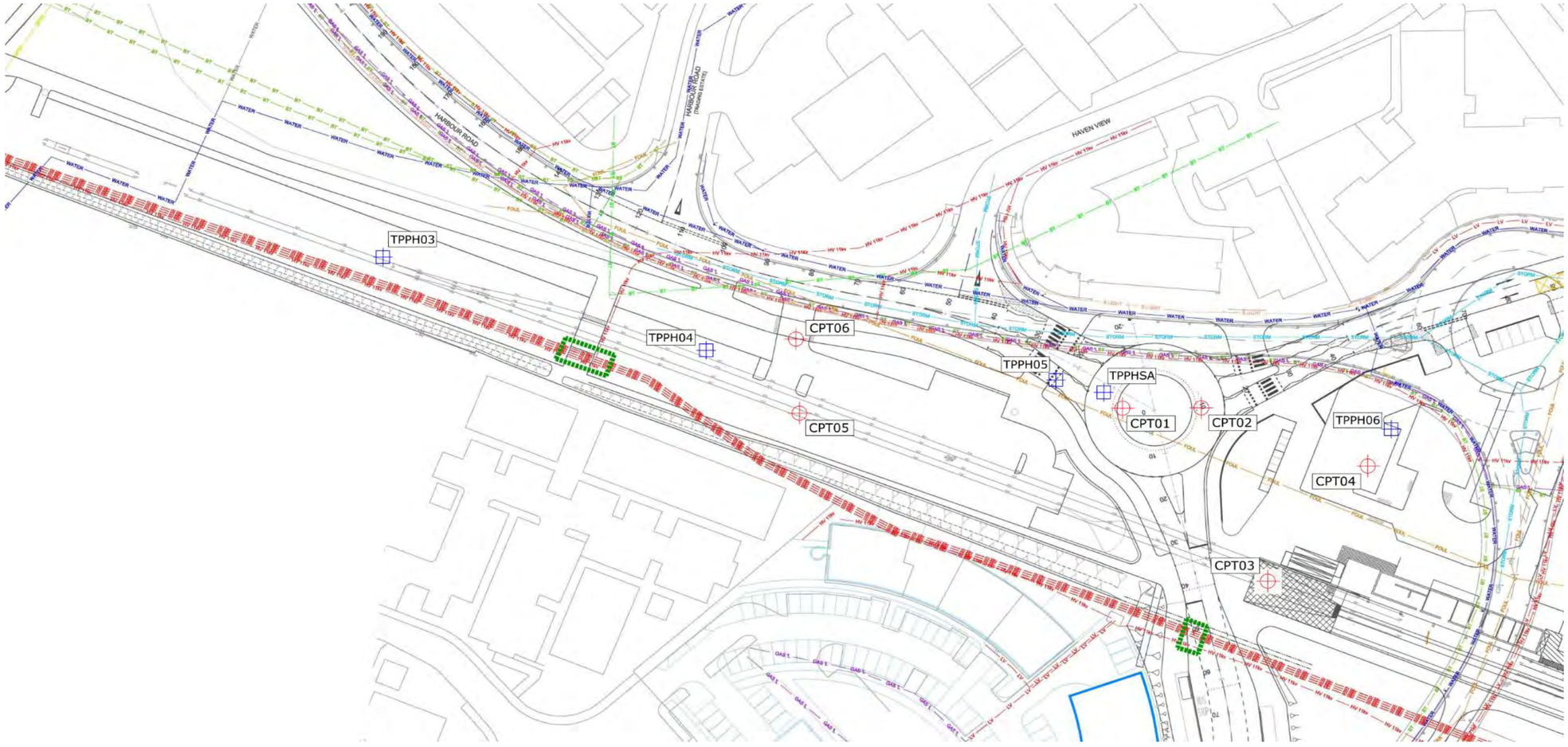


EA Risk of Flooding from Rivers & the Sea



APPENDIX D

EXPLORATORY HOLE LOCATION PLAN – 16-78919/02



ACS TESTING LTD
UNIT 14 BLACKHILL ROAD WEST
HOLTON HEATH TRADING PARK
POOLE, DORSET
BH16 6LE
T: 01202 628647
E: geo@acstesting.co.uk

DO NOT SCALE

KEY:

CPTu

Trial Pit

REV	DESCRIPTION	BY	CHK	APP	DATE

CLIENT:

North Somerset Council

SITE:

Portishead Car Park, Harbour Road, Portishead, Somerset

DRAWING TITLE:

Site Location Plan

SCALE:	@
JOB NO.	16-78919
DRAWING NO.	16-78919/02
DATE.	19/01/2016
REVISION.	

NOTES:

APPENDIX E

TRIAL PIT LOGS

ACS Testing Ltd
Tel: 01202 622858
Fax: 01202 625045
Email: testing@acstesting.co.uk
www.acstesting.co.uk

TRIAL PIT LOG

Trial Pit No.
TPPH03
Sheet 1 of 1

Client	North Somerset Council	**Depth (m):** 3.50	**Dimensions (m):** 1.90 × 0.60	**Lab Ref.**	**Hole Type** TP
Site	Portishead Car Park			**Plant Used:** JCB 3CX ECO Wheeled Excavator with 600mm bucket	**Scale** 1:20
Location	Land at Harbour Road, Portishead, Somerset				**Logged By** AD
Ground Level (mAOD):	107.78	**Co-ords:**	347299.0E, 176431.0N	**Date(s)**	12/12/2016

All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Water Strikes	Sample (Type) Depth	Testing		
							Depth	Type	Results
	MADE GROUND. Dark grey gravelly SAND. Gravel is fine, medium and coarse; angular to sub-rounded of clinker, brick, macadam, glass and stone.		(0.45)						
	MADE GROUND. Grey sandy GRAVEL. Gravel is fine, medium and coarse; angular to sub-rounded of stone and clinker.	0.45 (107.33)	(0.75)						
1	Stiff grey mottled brown clayey sandy SILT. Becoming very clayey with depth.	1.20 (106.58)	(1.20)						
2	Soft to firm bluish grey silty CLAY.	2.40 (105.38)	(1.10)						
3	End of Trial Pit at 3.500m	3.50 (104.28)							
4									

Remarks: Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930.

Pit Stability: Stable

Technical Notes (where applicable):
Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930. Chalk descriptions in accordance with CIRIA C574.

Groundwater: Groundwater not encountered.

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TRIAL PIT LOG

Trial Pit No.
TPPH04
Sheet 1 of 1

Client	North Somerset Council	**Depth (m):** 3.00	**Dimensions (m):** 2.10 × 0.60	**Lab Ref.**	**Hole Type** TP
Site	Portishead Car Park			**Plant Used:** JCB 3CX ECO Wheeled Excavator with 600mm bucket	**Scale** 1:20
Location	Land at Harbour Road, Portishead, Somerset				**Logged By** AD
Ground Level (mAOD):	107.44	**Co-ords:**	347367.0E, 176410.0N	**Date(s)**	12/12/2016

All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Water Strikes	Sample (Type) Depth	Testing: Depth	Testing: Type	Testing: Results
1	MADE GROUND. Dark grey very gravelly SAND. Gravel is fine, medium and coarse; angular to sub-rounded of clinker, stone and brick. Wood recorded below 0.60m.		(1.23)						
	Stiff grey mottled brown clayey SILT.	1.23 (106.21)	(0.87)						
2	Very soft to soft bluish grey silty CLAY.	2.10 (105.34)	(0.90)		▼				
3	End of Trial Pit at 3.000m	3.00 (104.44)							
4									

Remarks: Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930.

Pit Stability: Stable

Technical Notes (where applicable):
Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930. Chalk descriptions in accordance with CIRIA C574.

Groundwater: Water seepage from base up to 2.90m.

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Tel: 01202 622858
Fax: 01202 625045
Email: testing@acstesting.co.uk
www.acstesting.co.uk

TRIAL PIT LOG

Trial Pit No.
TPPH05
Sheet 1 of 1

Client	North Somerset Council	**Depth (m):** 3.50	**Dimensions (m):** 1.80 × 0.60	**Lab Ref.**	**Hole Type** TP
Site	Portishead Car Park			**Plant Used:** JCB 3CX ECO Wheeled Excavator with 600mm bucket	**Scale** 1:20
Location	Land at Harbour Road, Portishead, Somerset				**Logged By** AD
Ground Level (mAOD):	107.46	**Co-ords:**	347443.0E, 176407.0N	**Date(s)**	13/12/2016

All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Water Strikes	Sample (Type) Depth	Testing Depth	Testing Type	Testing Results
	TOPSOIL. Soft greyish brown sandy gravelly SILT. Gravel is fine, medium and coarse; sub-angular to rounded of stone.		(0.68)						
	Stiff greyish brown clayey sandy SILT.	0.68 (106.78)	(1.17)						
	Soft to firm brownish grey silty CLAY.	1.85 (105.61)	(0.95)		▼				
	Very soft bluish grey silty CLAY.	2.80 (104.66)	(0.70)						
	End of Trial Pit at 3.500m	3.50 (103.96)							

1
2
3
4

Remarks: Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930.

Pit Stability: Stable

Technical Notes (where applicable):
Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930. Chalk descriptions in accordance with CIRIA C574.

Groundwater: Small amount of water seepage at 2.70m.

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Tel: 01202 622858
Fax: 01202 625045
Email: testing@acstesting.co.uk
www.acstesting.co.uk

TRIAL PIT LOG

Trial Pit No.
TPPH06
Sheet 1 of 1

Client	North Somerset Council	**Depth (m):** 2.10	**Dimensions (m):** 1.70 × 0.60	**Lab Ref.**	**Hole Type** TP
Site	Portishead Car Park			**Plant Used:** JCB 3CX ECO Wheeled Excavator with 600mm bucket	**Scale** 1:20
Location	Land at Harbour Road, Portishead, Somerset				**Logged By** AD
Ground Level (mAOD):	107.36	**Co-ords:**	347515.0E, 176397.0N	**Date(s)**	13/12/2016

All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Water Strikes	Sample (Type) Depth	Testing Depth	Testing Type	Testing Results
	TOPSOIL. Soft brown clayey sandy gravelly SILT. Gravel is fine, medium and coarse; angular to sub-rounded of stone.		(0.35)						
	MADE GROUND. Grey mottled brown clayey sandy SILT. Rare brick noted. Black gravel noted in the northern end of the pit at 1.20m, possible unknown service.	0.35 (107.01)	(0.95)						
1	Grey silty SAND.	1.30 (106.06)	(0.60)						
	Firm grey mottled brown clayey SILT.	1.90 (105.46)							
2	End of Trial Pit at 2.100m	2.10 (105.26)							
3									
4									

Remarks: Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930.

Pit Stability: Stable

Technical Notes (where applicable):
Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930. Chalk descriptions in accordance with CIRIA C574.

Groundwater: Groundwater not encountered.

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Tel: 01202 622858
Fax: 01202 625045
Email: testing@acstesting.co.uk
www.acstesting.co.uk

TRIAL PIT LOG

Trial Pit No.
TPPHSA
Sheet 1 of 1

Client	North Somerset Council	**Depth (m):** 2.70	**Dimensions (m):** 1.80 × 0.60	**Lab Ref.**	**Hole Type** TP
Site	Portishead Car Park			**Plant Used:** JCB 3CX ECO Wheeled Excavator with 600mm bucket	**Scale** 1:20
Location	Land at Harbour Road, Portishead, Somerset				**Logged By** AD
Ground Level (mAOD):	107.47	**Co-ords:**	347453.0E, 176403.0N	**Date(s)**	13/12/2016

All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Water Strikes	Sample (Type) Depth	Testing: Depth	Testing: Type	Testing: Results
	TOPSOIL. Soft brown sandy gravelly SILT. Gravel is fine, medium and coarse; angular to sub-rounded of stone.								
	MADE GROUND. Grey silty gravelly SAND. Gravel is fine, medium and coarse; angular to sub-rounded of stone.	0.30 (107.17)	(0.40)						
1	Stiff grey mottled brown clayey SILT.	0.70 (106.77)	(1.10)						
2	Soft bluish grey silty CLAY.	1.80 (105.67)	(0.90)		▼				
	End of Trial Pit at 2.700m	2.70 (104.77)							
3									
4									

Remarks: Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930.

Pit Stability: Stable

Technical Notes (where applicable):
Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930. Chalk descriptions in accordance with CIRIA C574.

Groundwater: Small amount of water seepage at base.

APPENDIX F

INFILTRATION TESTING CERTIFICATE - TPPHSA

ACS Testing Ltd
Tel: 01202 622858
testing@acstesting.co.uk
www.acstesting.co.uk

SOIL INFILTRATION RATE

In accordance with BRE Digest 365 "Soakaway Design"

Job Reference :	16-78919	**Client :**	North Somerset Council
Client Reference :	TPPHSA	**Site :**	Portishead Car Park
Test Number :	1	**Location :**	Portishead, Somerset

Date Tested :

13/12/2016

Technician :

AD

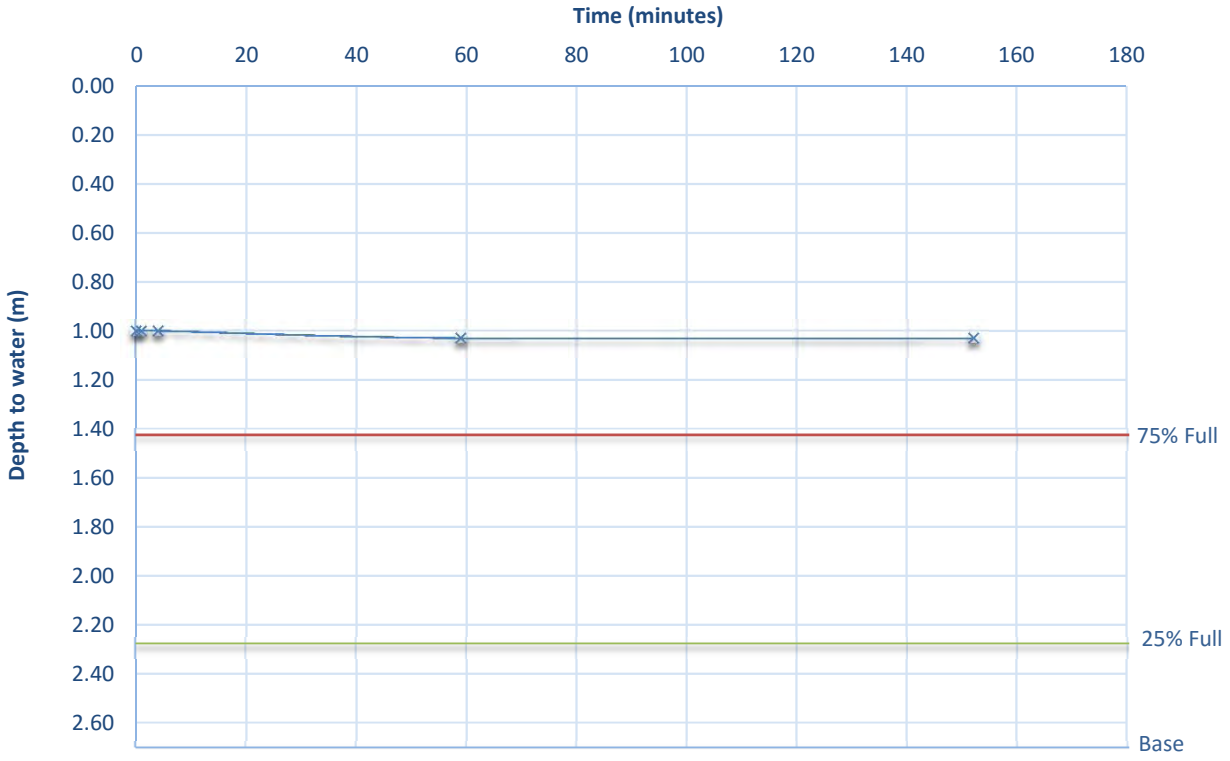
Weather :

Overcast

Parameters	
Length	1.80 m
Breadth	0.60 m
Depth	2.70 m
Water Level	1.00 m
Max Eff. Depth	1.70 m
V_{p75-25}	0.92 m^3
a_{p50}	5.16 m^2
t_{p75-25}	0 s
p75%	1.43 m
p25%	2.28 m

Time Elapsed		Depth to Water (m)
Minutes	Seconds	
0	0	1.00
1	60	1.00
4	240	1.00
59	3540	1.03
152	9120	1.03

Time to drain	Minutes	Seconds
75%	N/A	
25%	N/A	



Remarks:

Unable to calculate infiltration rate as water did not reach 25% level.

Soil Infiltration Rate = X ms^{-1}

Approved by: R J Holloway *Principal Geo-Environmental Engineer*

Date : 31/01/2017

APPENDIX G

TRL DCP RESULT CERTIFICATES

Penetration Data Report

Project Name: 16-78919 - TRL DCP - North Somerset Council - Portishead Station

Chainage (km):	3.000	Surface Type:	Unpaved
Direction:	TPPH03	Thickness (mm):	0
Location/Offset:	Lay-by / other	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	104	Surface Moisture:	Moderate
Test Date:	12/12/2016	Moisture adjustment factor:	Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	104	0.00					
2	2	2	134	15.00					
3	1	3	150	16.00					
4	1	4	170	20.00					
5	1	5	191	21.00					
6	1	6	279	88.00					
7	1	7	335	56.00					
8	1	8	380	45.00					
9	1	9	434	54.00					
10	1	10	508	74.00					
11	1	11	577	69.00					
12	1	12	630	53.00					
13	1	13	669	39.00					
14	1	14	703	34.00					
15	1	15	730	27.00					
16	2	17	772	21.00					
17	2	19	810	19.00					
18	2	21	852	21.00					
19	3	24	901	16.33					
20	2	26	947	23.00					

Penetration Data Report

Project Name: 16-78919 - TRL DCP - North Somerset Council - Portishead Station

Chainage (km):	4.000	Surface Type:	Unpaved
Direction:	TPPH04	Thickness (mm):	0
Location/Offset:	Lay-by / other	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	111	Surface Moisture:	Wet
Test Date:	13/12/2016	Moisture adjustment factor:	Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	111	0.00	26	1	36	950	39.00
2	1	1	140	29.00					
3	1	2	153	13.00					
4	2	4	169	8.00					
5	3	7	205	12.00					
6	3	10	234	9.67					
7	3	13	277	14.33					
8	2	15	309	16.00					
9	2	17	352	21.50					
10	1	18	382	30.00					
11	1	19	415	33.00					
12	1	20	441	26.00					
13	1	21	467	26.00					
14	1	22	497	30.00					
15	1	23	528	31.00					
16	2	25	589	30.50					
17	1	26	625	36.00					
18	1	27	657	32.00					
19	1	28	690	33.00					
20	1	29	721	31.00					
21	1	30	754	33.00					
22	1	31	790	36.00					
23	2	33	849	29.50					
24	1	34	877	28.00					
25	1	35	911	34.00					

Penetration Data Report

Project Name: 16-78919 - TRL DCP - North Somerset Council - Portishead Station

Chainage (km):	5.000	Surface Type:	Unpaved
Direction:	TPPH05	Thickness (mm):	0
Location/Offset:	Lay-by / other	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	67	Surface Moisture:	Moderate
Test Date:	12/12/2016	Moisture adjustment factor:	Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	67	0.00	26	2	41	830	20.50
2	1	1	102	35.00	27	2	43	875	22.50
3	1	2	130	28.00	28	1	44	900	25.00
4	1	3	157	27.00	29	1	45	924	24.00
5	1	4	188	31.00	30	1	46	943	19.00
6	1	5	211	23.00					
7	1	6	236	25.00					
8	1	7	250	14.00					
9	1	8	270	20.00					
10	2	10	300	15.00					
11	2	12	335	17.50					
12	2	14	374	19.50					
13	2	16	415	20.50					
14	1	17	434	19.00					
15	1	18	453	19.00					
16	1	19	478	25.00					
17	2	21	525	23.50					
18	1	22	550	25.00					
19	2	24	582	16.00					
20	3	27	615	11.00					
21	3	30	649	11.33					
22	3	33	689	13.33					
23	2	35	720	15.50					
24	2	37	750	15.00					
25	2	39	789	19.50					

Penetration Data Report

Project Name: 16-78919 - TRL DCP - North Somerset Council - Portishead Station

Chainage (km):	6.000	Surface Type:	Unpaved
Direction:	TPPH06	Thickness (mm):	0
Location/Offset:	Lay-by / other	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	45	Surface Moisture:	Wet
Test Date:	13/12/2016	Moisture adjustment factor:	Not adjusted

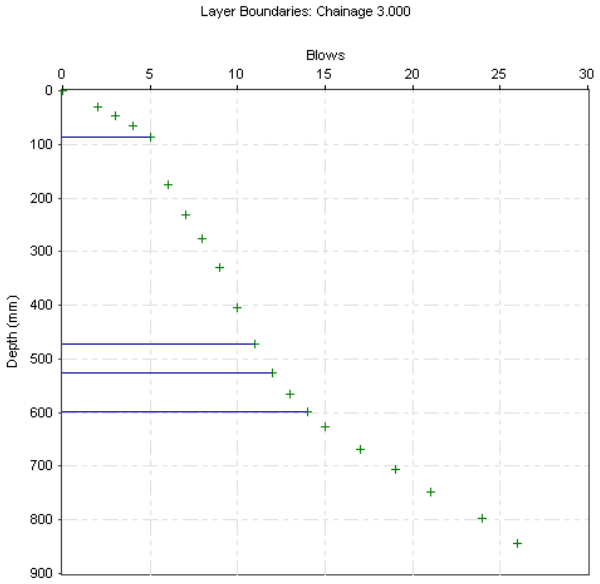
No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	45	0.00	26	1	37	792	30.00
2	1	1	73	28.00	27	1	38	822	30.00
3	1	2	95	22.00	28	1	39	850	28.00
4	2	4	127	16.00	29	1	40	883	33.00
5	2	6	151	12.00	30	1	41	917	34.00
6	2	8	172	10.50	31	1	42	954	37.00
7	3	11	200	9.33					
8	3	14	222	7.33					
9	2	16	255	16.50					
10	2	18	283	14.00					
11	2	20	316	16.50					
12	2	22	360	22.00					
13	1	23	381	21.00					
14	1	24	402	21.00					
15	1	25	421	19.00					
16	1	26	446	25.00					
17	2	28	501	27.50					
18	1	29	526	25.00					
19	1	30	562	36.00					
20	1	31	601	39.00					
21	1	32	640	39.00					
22	1	33	680	40.00					
23	1	34	709	29.00					
24	1	35	734	25.00					
25	1	36	762	28.00					

UK DCP V3.1

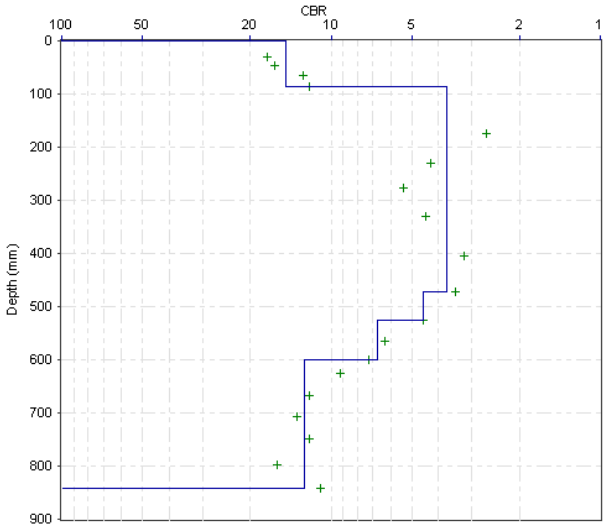
DCP Layer Strength Analysis Report

Project Name: 16-78919 - TRL DCP - North Somerset Council - Portishead Station

Chainage (km):	3.000	Surface Type:	Unpaved
Direction:	TPPH03	Thickness (mm):	0
Location/Offset:	Lay-by / other	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	104	Surface Moisture:	Moderate
Test Date:	12/12/2016	Moisture adjustment factor:	Not adjusted



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	17.40	15	87	87	Base	0.04	0.13	0.13	0.13
2	64.33	4	386	473	Base	0.01	0.16	0.16	0.16
3	53.00	5	53	526	Base	0.01	0.03	0.03	0.03
4	36.50	7	73	599	Base	0.02	0.05	0.05	0.05
5	20.33	13	244	843	Base	0.03	0.32	0.32	0.32

Pavement Strength

	Layer Contribution		
Layer	**SN**	**SNC**	**SNP**
Surface	--	--	--
Base	0.69	0.69	0.69
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	0.69	0.69	0.69

CBR Relationship:

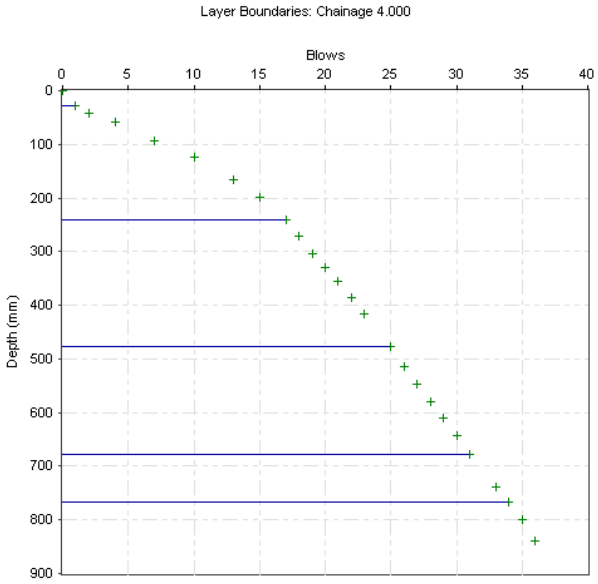
TRL equation: $\log_{10}(CBR) = 2.48 - 1.057 \times \log_{10}(Strength)$

Report produced by .....

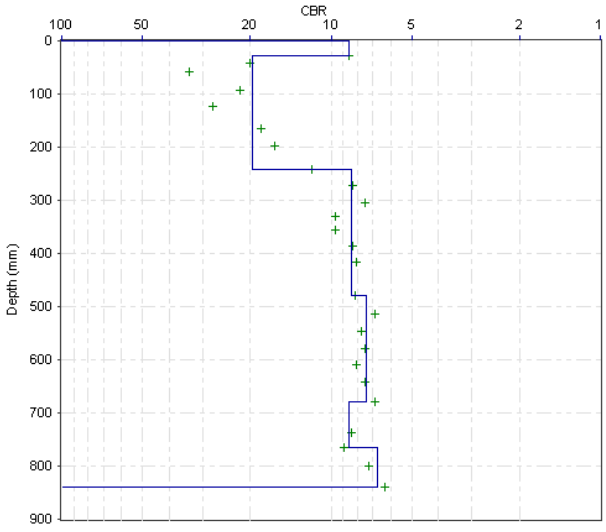
DCP Layer Strength Analysis Report

Project Name: 16-78919 - TRL DCP - North Somerset Council - Portishead Station

Chainage (km):	4.000	Surface Type:	Unpaved
Direction:	TPPH04	Thickness (mm):	0
Location/Offset:	Lay-by / other	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	111	Surface Moisture:	Wet
Test Date:	13/12/2016	Moisture adjustment factor:	Not adjusted



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	29.00	9	29	29	Base	0.02	0.03	0.03	0.03
2	13.25	20	212	241	Base	0.05	0.42	0.42	0.42
3	29.63	8	237	478	Base	0.02	0.22	0.22	0.22
4	33.50	7	201	679	Base	0.02	0.16	0.16	0.16
5	29.00	9	87	766	Base	0.02	0.08	0.08	0.08
6	36.50	7	73	839	Base	0.02	0.05	0.05	0.05

Pavement Strength

	Layer Contribution		
Layer	SN	SNC	SNP
Surface	--	--	--
Base	0.96	0.96	0.96
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	0.96	0.96	0.96

CBR Relationship:

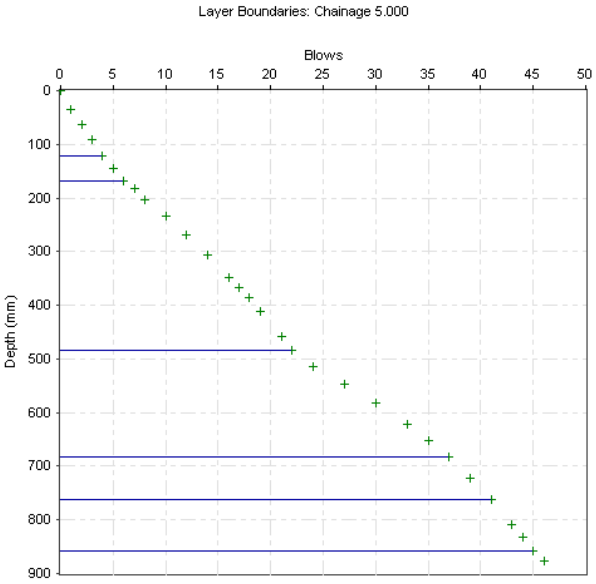
TRL equation: $\log_{10}(CBR) = 2.48 - 1.057 \times \log_{10}(Strength)$

Report produced by .....

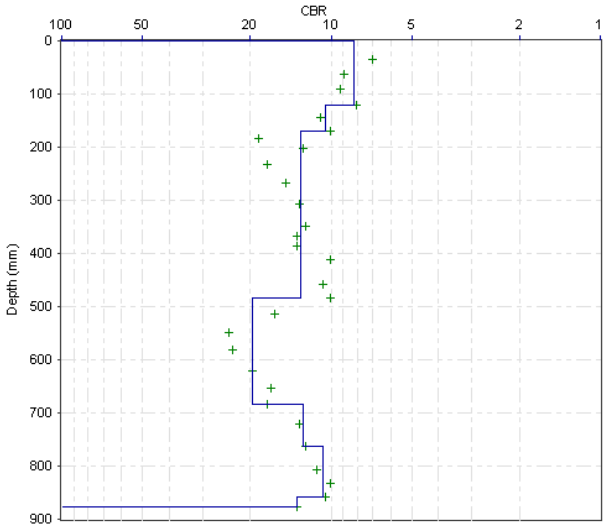
DCP Layer Strength Analysis Report

Project Name: 16-78919 - TRL DCP - North Somerset Council - Portishead Station

Chainage (km):	5.000	Surface Type:	Unpaved
Direction:	TPPH05	Thickness (mm):	0
Location/Offset:	Lay-by / other	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	67	Surface Moisture:	Moderate
Test Date:	12/12/2016	Moisture adjustment factor:	Not adjusted



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	30.25	8	121	121	Base	0.02	0.11	0.11	0.11
2	24.00	10	48	169	Base	0.03	0.05	0.05	0.05
3	19.63	13	314	483	Base	0.03	0.43	0.43	0.43
4	13.33	20	200	683	Base	0.05	0.39	0.39	0.39
5	20.00	13	80	763	Base	0.03	0.11	0.11	0.11
6	23.50	11	94	857	Base	0.03	0.11	0.11	0.11
7	19.00	13	19	876	Base	0.04	0.03	0.03	0.03

Pavement Strength

	Layer Contribution		
Layer	**SN**	**SNC**	**SNP**
Surface	--	--	--
Base	1.22	1.22	1.22
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	1.22	1.22	1.22

CBR Relationship:

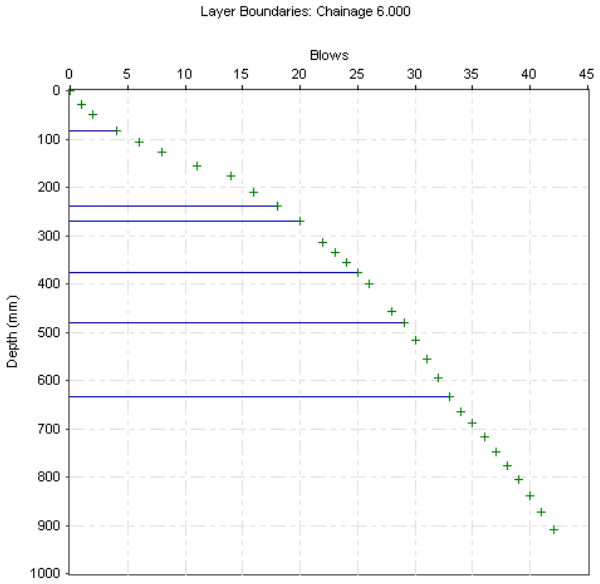
TRL equation: $\log_{10}(CBR) = 2.48 - 1.057 \times \log_{10}(Strength)$

Report produced by .....

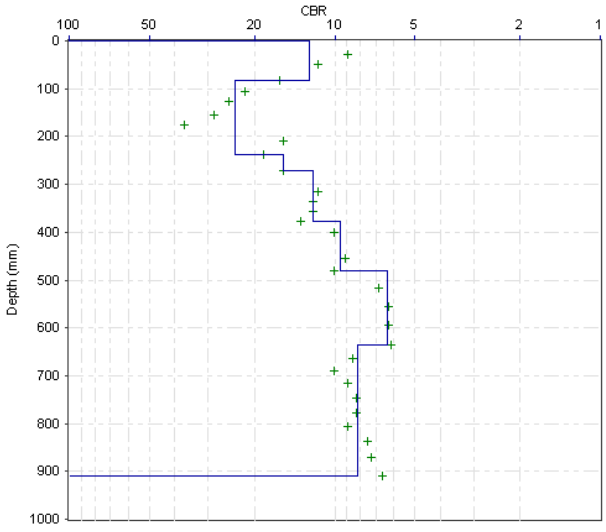
DCP Layer Strength Analysis Report

Project Name: 16-78919 - TRL DCP - North Somerset Council - Portishead Station

Chainage (km):	6.000	Surface Type:	Unpaved
Direction:	TPPH06	Thickness (mm):	0
Location/Offset:	Lay-by / other	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	45	Surface Moisture:	Wet
Test Date:	13/12/2016	Moisture adjustment factor:	Not adjusted



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	20.50	12	82	82	Base	0.03	0.11	0.11	0.11
2	11.14	24	156	238	Base	0.06	0.36	0.36	0.36
3	16.50	16	33	271	Base	0.04	0.05	0.05	0.05
4	21.00	12	105	376	Base	0.03	0.13	0.13	0.13
5	26.25	10	105	481	Base	0.03	0.11	0.11	0.11
6	38.50	6	154	635	Base	0.02	0.11	0.11	0.11
7	30.44	8	274	909	Base	0.02	0.24	0.24	0.24

Pavement Strength

	Layer Contribution		
Layer	**SN**	**SNC**	**SNP**
Surface	--	--	--
Base	1.11	1.11	1.11
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	1.11	1.11	1.11

CBR Relationship:

TRL equation: $\log_{10}(CBR) = 2.48 - 1.057 \times \log_{10}(Strength)$

Report produced by .....

APPENDIX H

LANKELMA LTD CPTu REPORT – P-106539-1

LANKELMA Limited
Cold Harbour Barn, Cold Harbour Lane, Iden
East Sussex, TN31 7UT
T: +44 (0)1797 280050
E: info@lankelma.com
www.lankelma.com

PORTISHEAD

SOIL INVESTIGATION

CPT REPORT

Cone Penetration Test
Standard Data Interpretation

Project Ref.: P-106539-1




PROJECT:	Portishead

CLIENT:	ACS Testing

FIELDWORK

CPT Rig	17.9 tonne track-truck CPT unit (UK20)
Date Fieldwork Started	16th December 2016
Date Fieldwork Completed	16th December 2016
Lankelma's Representative	Chris Dimelow
Client's Representative	Anthony Elkins

REPORT

Status	Revision	Action	Date	Name
Final	00	Completed	16/12/16	Chris Player
		Checked	19/12/16	Emma Stickland
		Approved	19/12/16	Joseph Hobbs

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APPENDIX B Cone Penetration Test Results - Raw Data Plots
APPENDIX C Standard Interpretation Results

1 INTRODUCTION

At the request of ACS Testing, a CPT led soils investigation was carried out on project *Portishead*.

Site location:

Land at Harbour Road
Portishead
Bristol
BS20 7BL

1.1 COMPLETED WORKS

- 7 nr. Piezocone Tests (CPTu);
- Factual report plus standard geotechnical data interpretation.

The *Summary Tables* section contains tabulated summaries of the works done together with analysis results where necessary.

2 FIELDWORK

2.1 CONE PENETRATION TESTING

Cone Penetration Tests were performed with a 17.9 tonne track-truck mounted CPT unit (UK20) equipped with a 17 tonne capacity hydraulic ram set.

An electric penetrometer of a type conforming to the requirements of BS ISO 22476-1:2012 was used on this project. Cone measurements included cone tip resistance, friction sleeve resistance and dynamic pore water pressure (Piezometer) sampled at a 10mm resolution. Cone maintenance, checks and calibrations were carried out in accordance with recommendations of BS8422:2003, and ASTM E74-13a as referenced by the British Standard. The management of calibration records is in accordance with ISO10012. Copies of all calibration certificates for the cones used are presented in Appendix A. Refer to the cone calibration certificates for the cone type and dimensional data.

The piezometer filter element was located in the u_2 position between the cone and friction sleeve and was replaced after every test. The pore pressure system was saturated with de-aired 1000 cSt silicone fluid.

2.2 FIELD LOGISTICS

The client was responsible for the positioning and re-survey of all investigative locations.

The target depth for the investigation was 10 m. Table 1 details the final test depths and reasons for test termination (*Refusal Factor).* Termination depths were advised to, and agreed with, the client's on-site representative.

3 RAW DATA REDUCTION AND PRESENTATION

The CPT results are presented in Appendix B. The corrected cone resistance (q_t), local side friction, pore water pressure, friction ratio and inclination are all presented against depth and elevation in accordance with recommendations of the BS ISO 22476-1:2012. CPT data and the associated derived geotechnical parameters are included in the AGS 3.1 and 4.0 data files provided.

Penetration length readings are corrected for inclination and sleeve readings are depth corrected for the dimensional offset between cone tip and sleeve during post processing. An additional shift of -80mm is applied to the sleeve to account for tip failure zone offset (see 'CPT Interpretation Notes'). 'Rod spikes' (artefacts of the 1 m interval pause for rod string addition) are filtered from the cone tip and sleeve data.

4 INTERPRETATIVE DATA

4.1 IN-SITU STRESS CONDITIONS

The in-situ total and effective stress states are calculated based on an assumed total unit weight of soil (17 kN/m^3 above the inferred piezometric surface and 18 kN/m^3 below) and a hydrostatic pore pressure state. The depth of the piezometric surface has been estimated for each specific location based on interpretation of piezocone measurements or other observations by Lankelma. Where location specific information was not available, the depth has been assumed at a generic 2.0 mBGL based on other locations or information provided by the client. Hydrostatic pore pressure data are applied in calculation of stress normalised geotechnical parameters.

In the event that complex groundwater regimes are clearly identified, multiple piezometric surfaces will be applied.

4.2 SOIL BEHAVIOUR TYPE

The Soil Behaviour Type (SBT) has been interpreted using the Robertson 1990 classification system based on the stress normalised cone resistance (Qt) and normalised friction sleeve resistance (Fr).

(See glossary of terms and symbols Appendix A)

The results are presented on the plots of Appendix C - *Standard Interpretation Results*.

4.3 SOIL BEHAVIOUR TYPE - *IC* INDEX

The Soil Behaviour Type (SBT) is presented as the Soil Behaviour Type Index, I_C, for both stress-normalised and non-normalised evaluations according to the charts of Robertson (1998 & 2010) applicable to predominantly silicate soils.

The I_c provides a continuous profile of SBT variation with depth such that the end user may choose appropriate stratigraphic subdivisions. The basis of I_c and its approximation of the original chart classification zones may be seen from Appendix A figure 'CPT Soil Behaviour Type Chart'. The loss of fidelity is dominantly in zones 1 (*sensitive fine grained)* and zones 8 & 9 (*overconsolidated or cemented*). To account for this approximation a profile of sensitivity and OCR is provided in the Standard Interpretation Results (see section 'Geotechnical Parameters').

Non-stress normalised SBT index I_C:

$$I_c = \left[\left(3.47 - \log(\frac{q_c}{\sigma_{atm}})^2\right)^2 + (logR_f + 1.22)^2\right]^{0.5}$$

Stress-normalised SBT index I_C:

$$I_c = ((3.47 - \log Q_t)^2 + (\log F_r + 1.22)^2)^{0.5}$$

(See glossary of terms and symbols Appendix A)

The results are presented on the plots of Appendix C - *Standard Interpretation Results*.

4.4 GEOTECHNICAL PARAMETERS

4.4.1 RELATIVE DENSITY

The relative density of sands is calculated based on an empirical relationship proposed by Jamiolkowski *et al.* (2001) based on a large database of undisturbed frozen samples and calibration chamber tests. The expected accuracy may be evaluated from the figures presented below.

$$D_r = 100\left[0.268 \cdot \ln\left(\frac{q_t/\sigma_{atm}}{\sqrt{\sigma_{vo}'/\sigma_{atm}}}\right) - k\right]$$

(See glossary of terms and symbols Appendix A - *General Information*)
K = Compressibility dependant constant. For medium compressibility = -0.675 (applied generic value), for high compressibility and sands with significant carbonate or calcareous composition <=1, for low compressibility >=-2.0

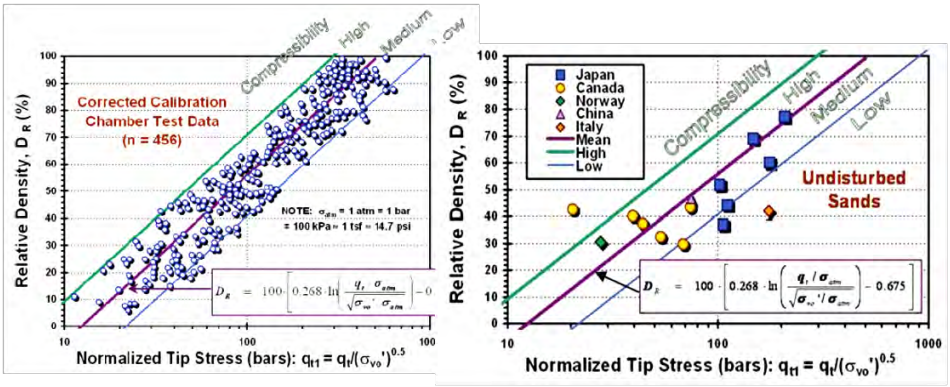

Figure 4-1 Relative density with normalised tip stress and sand compressibility from calibration chamber tests (left) and undisturbed frozen samples (right). Jamiolkowski *et al.* (2001) (Reproduced from NCHRP Synthesis 368 (2007)).

The results are presented on the plots of Appendix C - *Standard Interpretation Results*.

4.4.2 UNDRAINED SHEAR STRENGTH

S_u is estimated from the net cone tip resistance using the following equation:

$$s_u = \frac{(q_c - \sigma_{vo})}{N_k}$$ (Lunne *et al*. (1981))

where N_k is an empirical cone factor.

Research has shown that the cone factor N_k varies between 11 and 21 for normally to moderately overconsolidated soils with an average value of 14. The N_k factor tends to increase with plasticity and decrease with sensitivity. S_U values are presented for N_k factors of 15 and 20.

The results are presented on the plots of Appendix C - *Standard Interpretation Results*.

4.4.3 OVERCONSOLIDATION RATIO

The preconsolidation stress of clays is calculated based on the method proposed by Mayne (1995) and Demers and Leroueil (2002):

$$\sigma_p' = k \cdot (q_t - \sigma_{vo}) = 0.33(q_t - \sigma_{vo})$$
$$OCR = \sigma_p'/\sigma_{v0}'$$

(See glossary of terms and symbols Appendix A)

The factor k may be expected to lie within the range 0.2 to 0.5 with 0.33 representing the average. Higher values of k are recommended for aged heavily overconsolidated clays (Robertson, 2009) and may be calibrated accordingly. The figure below demonstrates the

expected accuracy of the above methods in prediction of preconsolidation stress, of particular note is the under prediction for fissured clays.

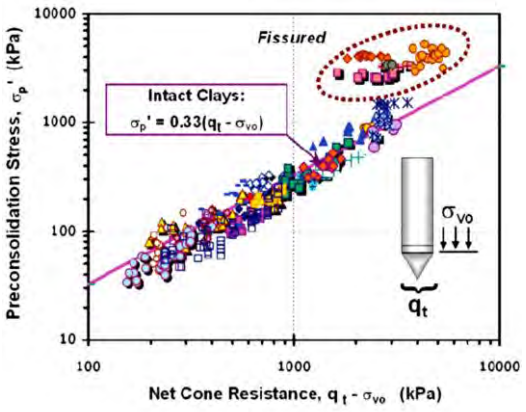

Figure 4-2 Preconsolidation stress from net cone resistance in clays (Reproduced from Mayne (2007)).

4.4.4 SENSITIVITY

The sensitivity of the soil, as defined by the ratio of undrained shear strength to remoulded shear strength, is calculated using the factored normalised cone resistance (S_u) and remoulded shear strength taken as equal to the direct friction sleeve measurement:

$s_t = 0.073 \cdot \frac{q_t - \sigma_{v0}}{f_s}$ (Mayne (2007))

(See glossary of terms and symbols Appendix A - *General Information*)

The results are presented on the plots of Appendix C - *Standard Interpretation Results*.

5 CPT DATA INTERPRETATION NOTES

Provided below is an inexhaustive set of cautionary notes on interpretation of the acquired CPT data with reference to examples within the dataset where appropriate.

SOIL BEHAVIOUR TYPE

The soil behaviour type (SBT) as defined by Robertson *et al.* (1986) is not intended to replace soil classification based on particle size fractions. Rather, the SBT will generally show bias in the classification towards the soil fraction that dominates soil behaviour in response to cone penetration (Cone tip: analogous to bearing capacity failure, friction sleeve: analogous to remoulded S_u or simple shear). In general the stress-normalised SBT will be more accurate, but may be less reliable at very shallow depths (1-2 m) due to low confining stresses.

DRAINED AND UNDRAINED SOIL BEHAVIOUR

Geotechnical parameters appropriate for drained and undrained cone penetration conditions are derived for drained and undrained soil behaviour types (SBTs) respectively, however to account for uncertainty in the SBT correlation with drainage behaviour, all parameters are derived over the range of mixed soil types 'Silt Mixtures' and 'Sand Mixtures' or *Ic* 2.05-2.95 (Robertson, 2010). For partially drained conditions, or for partially saturated low permeability soils, error will be introduced within derived parameters.

Piezocone dynamic pore water pressures behaviour, dissipations or other site specific observations may be used to identify the appropriate limits of application. Dissipations to t_{50} exceeding 30 seconds indicate undrained penetration behaviour (Kim *et al.,* 2010).

DYNAMIC PORE PRESSURE DATA

During penetration, strong dilation in shear at the cone shoulder may result in cavitation and desaturation of the piezo system and may take time to recover (up to 1 m penetration). Penetration through soils of partial saturation will provide unrepresentative readings and may desaturate the piezo system introducing variable error.

CONE TIP AND SLEEVE OFFSET

The accuracy of the SBT, over thin layers and at layer boundaries, is sensitive to offset error in the friction ratio. Penetration through zones of anisotropic soil stiffness may lead to offset of the cone tip and sleeve readings due to variation in the tip failure zone shape/depth. The friction ratio is often inaccurate in heavily disturbed soils with a 'blocky' macro fabric. An example of the offset effect on the friction ratio may be seen for CPT02 at 0.80 m.

For this investigation a friction sleeve depth offset correction of -80mm was applied together with a 5 data point moving average on the friction ratio to minimise the influence of this effect on derived parameters.

CONE TYPE

The reference cone type has a 10 cm^2 projected cone tip area and 150 cm^2 friction sleeve area, however it is common to use the larger 15 cm^2 cone with 225 cm^2 friction sleeve area for improved sensitivity and penetration depth potential. Use of the 15 cm^2 cone will have the following known influences on data with respect to the reference 10 cm^2:

- More pronounced transitions zones and thin layer effects (larger zone of influence and failure zone).
- Possible marginal increase in u_2 position dynamic pore pressures during undrained/partially drained penetration.

TRANSITION ZONES AND THIN LAYER EFFECTS

During penetration at the boundary between soils of contrasting stiffness, a transition zone is often evident prior to mobilization of the true soil stiffness. These should be cautiously ignored in assessment of soil behaviour type and parameter evaluation. Where the stiff layer is thin (<~0.5m) the true stiffness will not be fully mobilised. The effect for thin low stiffness layers is less significant. Procedures for thin-layer effect correction are provided by Robertson and Wride (1998). In choosing characteristic values of the tip, sleeve and derived parameter results, large scale peak and trough values may be more representative of the local value.

GRAVELS

The presence of gravel or larger clasts in a soil is often characterised by short peaks in the CPT tip and sleeve readings, possibly with associate inclinometer 'shake' and/or sharp reductions in pore water readings due to dilation effects. Frequent gravels in soft or loose soils may generate highly erroneous friction ratio values. Where gravels are matrix supported the tip and sleeve peaks may be ignored or filtered in choosing characteristic values for bulk behaviour. Illustration of behaviour indicative of gravels is displayed for CPT03 at 0.50 m.

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SUMMARY TABLES

Table 1 CPT Test Summary

TEST ID	FINAL DEPTH (mBGL)	Cone ID {C=Cone tip; F=Friction Sleeve; I= Inclination; P = Piezo; S=Subtraction cone; 15/10 = cone projected area (cm2))}	CPT RIG	PRE DRILLED / INSPECTION PIT (m)	CASING DEPTH (m)	REFUSAL FACTOR	DISSIPATIONS	SEISMIC CONE	SAMPLES	EASTING	NORTHING	ELEVATION (m)	DATE OF TEST	REMARKS
CPT01	10.03	S15-CFIP.819	UK20			Target depth							16/12/2016	
CPT02	10.05	S15-CFIP.819	UK20			Target depth							16/12/2016	
CPT03	0.65	S15-CFIP.819	UK20			Tip load							16/12/2016	
CPT03A	10.03	S15-CFIP.819	UK20			Target depth							16/12/2016	
CPT04	10.03	S15-CFIP.819	UK20			Target depth							16/12/2016	
CPT05	10.00	S15-CFIP.819	UK20			Target depth							16/12/2016	
CPT06	10.03	S15-CFIP.819	UK20			Target depth							16/12/2016	

CPT Test Plots are presented in Appendices B & C

APPENDIX A GENERAL INFORMATION

LIST OF FIGURES

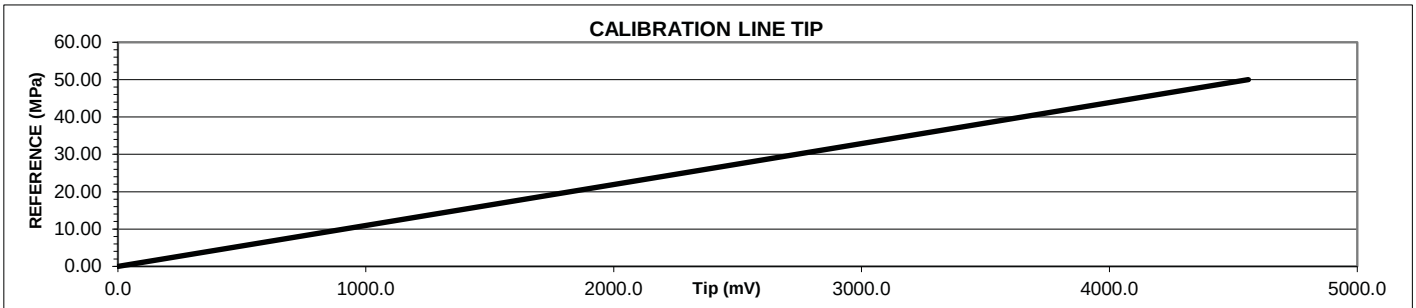
Description	Pages Included
Cone Calibration Certificate: S15-CFIP.819	1
Data Sheet: 17.9 Tonne Track-Truck CPT Unit (UK20)	1
CPT Soil Behaviour Type Chart	1
Glossary of Terms	1

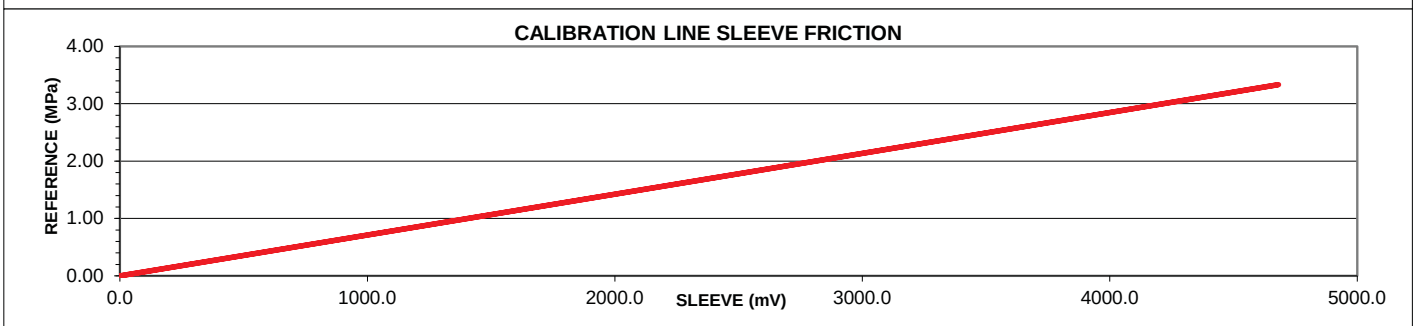
CALIBRATION CERTIFICATE

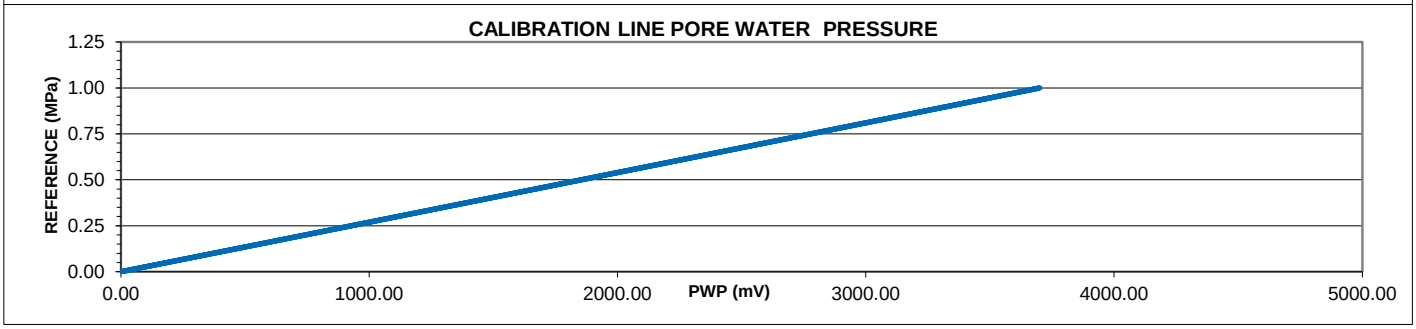
Geopoint-S15-150kN-2MPa

Cone Serial Number: S15-CFIIP.819

REFERENCE INSTRUMENTS:	CONE END RESISTANCE	SLEEVE FRICTION	PORE WATER PRESSURE
ID	5623	5623	4009509
TYPE	Richmond 300	Richmond 300	Druck DPI 104
UNCERTAINTY (±%)	0.1	0.1	0.05
Nominal pressure (MPa,MPa,MPa)	50.00	3.33	1.00
Maximum pressure (MPa,MPa,MPa)	100.00	6.67	2.00
Area (cm^2)	15	225	N/A
Sensitivity (mV/MPa)	91.20	1404.54	3699.83
Calibration file scaling factor:			
Nominal cal force (kN, kN, BAR)	75	75	10
Calibration number (mV)	4560	4682	3700
Zero point (mV)	268	103	15
Sensitivity (mV/kN, mV/kN, mV/BAR)	60.803	62.424	369.983
Inclination factors (mV)	X -20°= 564, 0°= 2525, 20°= 4578	/ Y -20°= 514, 0°= 2441, 20°= 4498	
Measured alpha factor:	0.69		
Uncertainty (%):			
Reproducibility	0.22	0.09	0.09
Linearity	0.16	0.09	0.10
Hysteresis	0.10	0.05	0.06
Combined expanded (k=2)	0.61	0.96	0.31
Application class	1	1	1







Instrument:	S15-150kN	Location:	Lankelma Calibration Laboratory
Serial Number:	S15-CFIIP.819	Temperature(° C)	20.0
Manufacturer:	Geopoint	Calibration Engineer	A Harman
Date of calibration:	30/11/2016	Calibration Expiry	27/02/2017

Calibration signed and dated by:

[redacted]

Digitally signed by Alastair Harman
DN: cn=Alastair Harman, o=Lankelma Ltd, ou=Instrument Engineer, email=Alastairharman@lankelma.com, c=GB
Date: 2016.11.30 16:17:53 Z

Calibration checked and dated by:

[redacted]

Digitally signed by Emma Stickland
DN: cn=Emma Stickland, o=Lankelma, ou=Engineering, email=emmastickland@lankelma.com, c=GB
Date: 2016.12.01 14:23:58 Z

UK20
TRACK-TRUCK RIG

Our track-truck is suitable for most geotechnical sites. This rig is driven as a self-contained HGV to site where it can deploy its tracks to cope with soft or uneven terrain.

The track-truck can be driven from an on-board remote control either from the cabin or externally, and complies with Euro 4 emission standards for use in London's low emissions zones (LEZ).

Performance Rates

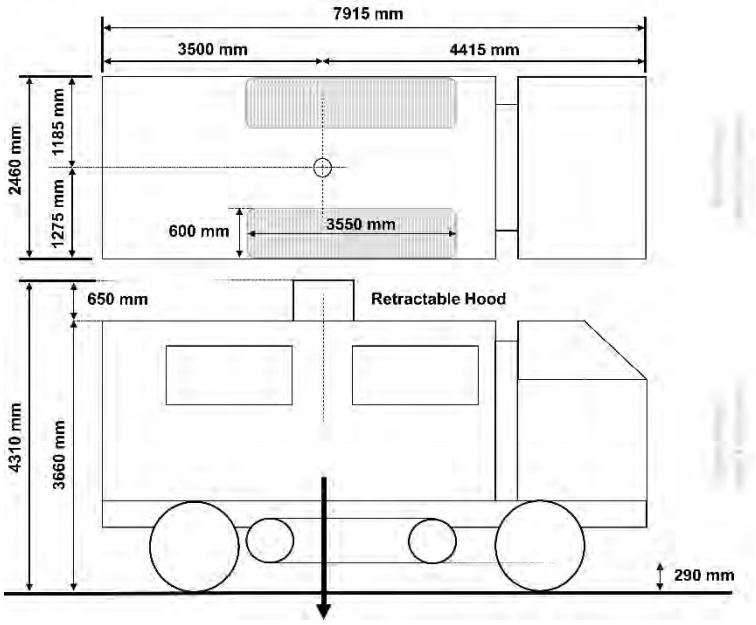
An expected 120 to 150 m of standard CPTu testing can be executed in a day (dependent on site conditions and access).

Applications

- Specialist testing
  - Seismic
  - Pressuremeter
  - Magnetometer
  - Video cone
  - Push-in Vane
- Installations
  - VWP
  - Piezometer
  - Inclinometer
- Sampling
  - MOSTAP
  - Shelby

TECHNICAL DETAILS

Rig Weight	17.9 T
Maximum Operating Ram Capacity	17.5 T
Maximum Travelling Speed	86 km/h
Track Material	Steel
Track Length	3.55 m
Track Width	0.60 m
Jack Plate Dimensions	Tracks act as jacks
Jack Arrangements	1 nr. on each side
Maximum Ground Clearance on Jacks	0.29 m
Maximum Ground Bearing Pressure	Wheels – 300 kPa Tracks – 48 kPa
Maximum Testing Gradient	10 degrees
Maximum Traversing Gradient	30 degrees (operator assessed)
Noise Output at 2 m	Testing – 69.5 dBA Driving – 78.7 dBA
Clamp Arrangement	Hydraulic Catching – Semi Automatic
Ram Stroke	1.2 m
Maximum Casing Size	55 mm

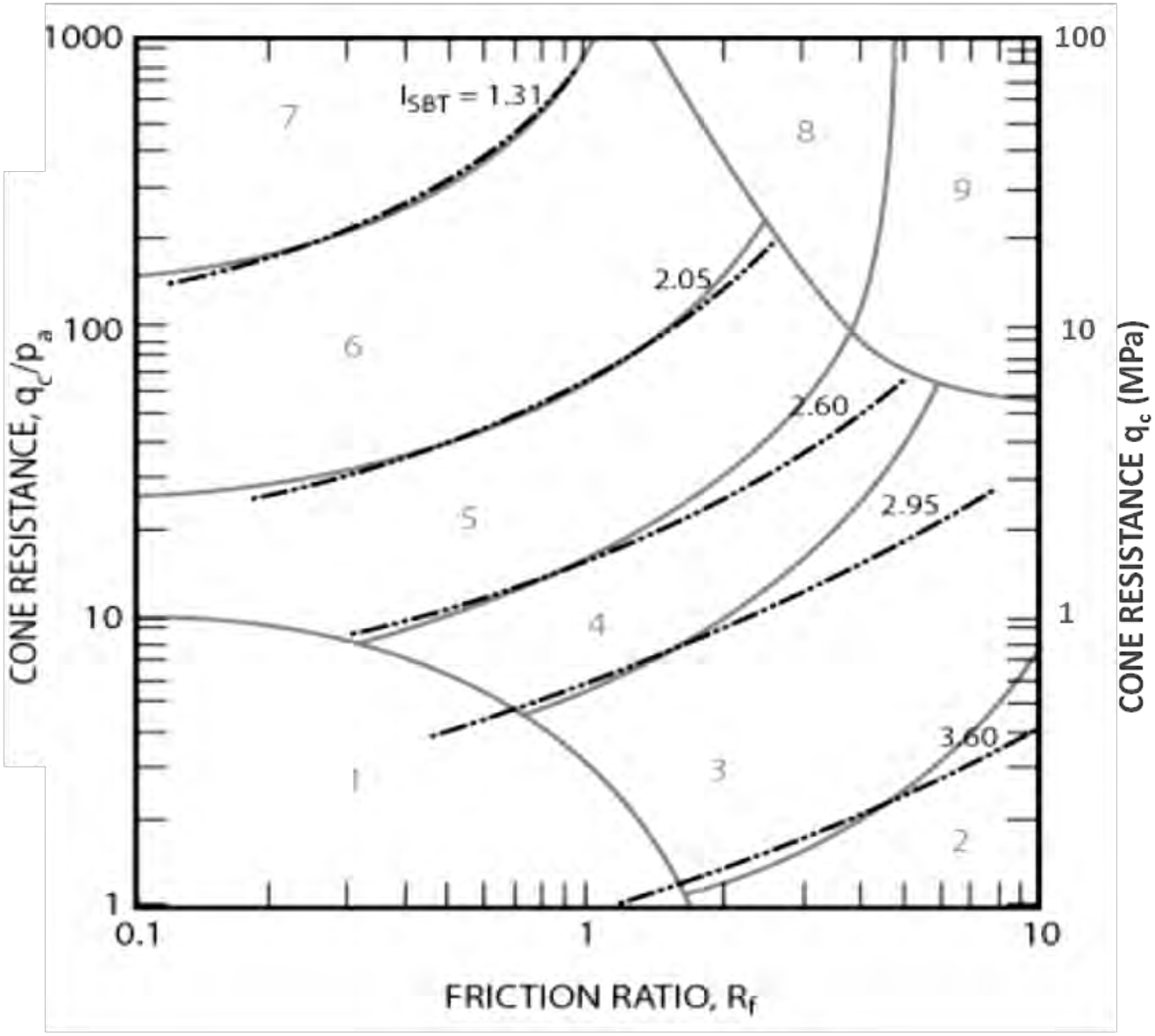


www.lankelma.com

Tel: **+44 (0)1797 280050** Fax: **+44 (0)1797 280195** Email: **info@lankelma.com**

Lankelma Limited, Cold Harbour Barn, Cold Harbour Lane, Iden, East Sussex. TN31 7UT

CPT SOIL BEHAVIOUR TYPE CHART



Non-normalised SBT chart by Robertson *et al.* (2010) based on dimensionless cone resistance (qc/Pa) and friction ration, Rf, showing contours of *Ic* index. The chart is also applicable to stress-normalised tip/sleeve values Q_t and F_r.

Zone	**Soil Behaviour Type (SBT)**		
1	Sensitive fine-grained	6	Sands: clean sand to sandy silt
2	Clay – organic soil	7	Dense sand to gravelly sand
3	Clays: Clay to silty clay	8	Stiff sand to clayey sand*
4	Silt mixtures: clayey silt to silty clay	9	Stiff fine grained*
5	Sand mixtures: Silty sand to sandy silt	**Overconsolidated or cemented*	

GLOSSARY OF CPT TERMS AND SYMBOLS

SYMBOLS

q_c :- **Cone resistance.** The total force acting on the cone Q_c, divided by the projected area of the cone, A_c; **(q_c=Q_c/A_c)**.

f_s :- **Friction sleeve resistance.** The total frictional force acting on the friction sleeve, F_s, divided by its surface area, A_s.**f_s= F_s/A_s.**

q_t :- **Corrected cone resistance.** The cone resistance q_c corrected for unequal pore water pressure effects on the cone face and shoulder.

R_f :- **Friction ratio** The ratio, expressed as a percentage, of the sleeve friction, f_s, to the cone resistance, q_c, both measured at the same depth; **[R_f= (f_s/q_c) · 100].**

Q_t :- **Stress normalised cone resistance** (Method 1) **= (q_c – σ_v)/σ'_v**

q_{t1}:- **Stress normalised cone resistance** (Method 2) **= (q_t)/(σ'_v)$^{0.5}$**

F_r:- **Normalised friction sleeve resistance = f_s /(q_c- σ_v)**

σ_v:- **Total overburden stress**

σ'_v:- **Effective overburden stress**

σ_{atm}, or, P_a:- **Reference atmospheric stress = 100kPa**

***I_c*:-** **Soil Behaviour Type Index**

B_q :- **Pore pressure ratio.** The net pore pressure normalized with respect to the net cone resistance. = **(u_2 – u_0)/(q_t .σ_v)**

TERMS

Cone Tip:- The conical tip section of the cone penetrometer.

Friction sleeve:- The section of the cone penetrometer upon which the sleeve friction is measured, located behind the cone tip.

Piezocone:- A cone penetrometer with a pore pressure measurement system.

Dynamic pore pressure:- The pore pressure generated during penetration and measured by a pore pressure sensor. u_1 when measured on the conical tip face, u_2 when measured just behind the conical tip.

APPENDIX B CONE PENETRATION TEST RESULTS

RAW DATA PLOTS

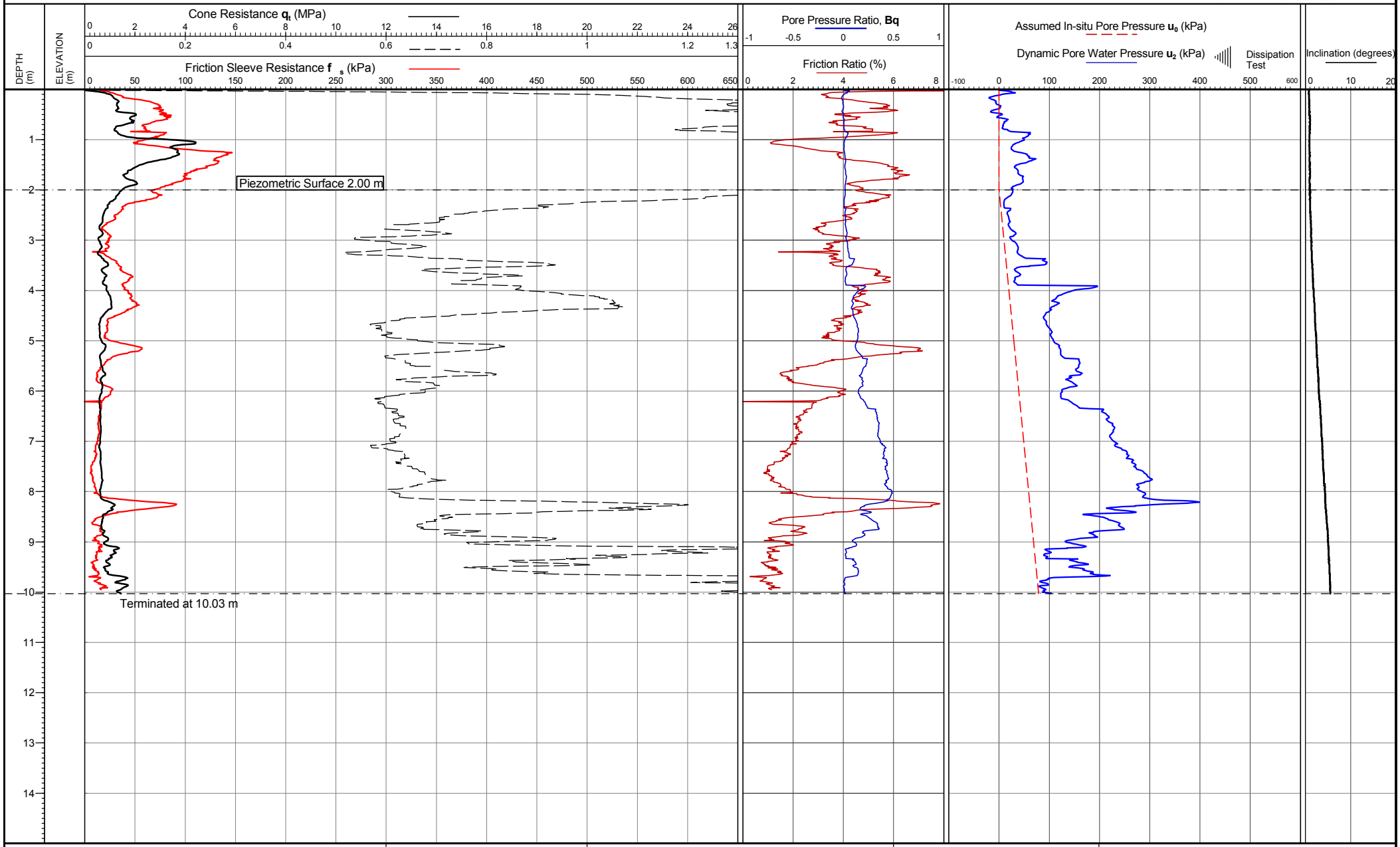
LIST OF FIGURES:

Test ID		Pages included
Cone Penetration Test	CPT01	1
Cone Penetration Test	CPT02	1
Cone Penetration Test	CPT03	1
Cone Penetration Test	CPT03A	1
Cone Penetration Test	CPT04	1
Cone Penetration Test	CPT05	1
Cone Penetration Test	CPT06	1

Client: ACS TESTING

Project: PORTISHEAD

LANKELMA



Cone area (mm2):1500
Cone ID: S15-CFIP.819
Operator: Paul Dimelow
Rig Used: UK20
Date of test: 16/12/2016 10:54:43

Location: Bristol, UK
Coordinates: ,
Elevation:

Remarks:
*Piezometric surface origin: Approx. local value from piezo data analysis

Termination Remark: Target depth

Date of plot: 16-12-16

Lankelma Project Ref: P-106539-1

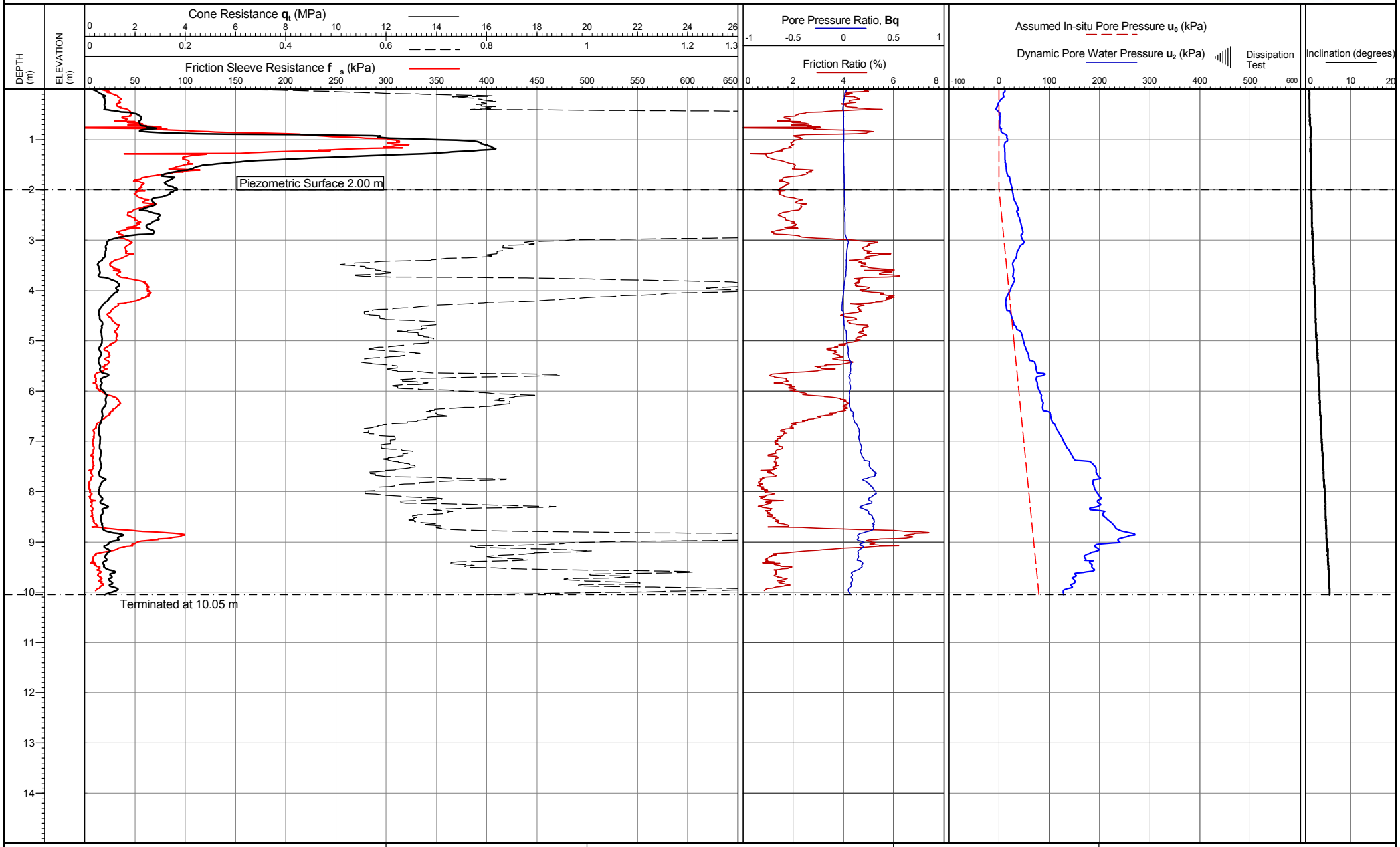
Checked by: Chris Player

TEST ID: CPT01

Client: ACS TESTING

Project: PORTISHEAD

LANKELMA



Cone area (mm2):1500
Cone ID: S15-CFIP.819
Operator: Paul Dimelow
Rig Used: UK20
Date of test: 16/12/2016 10:13:02

Location: Bristol, UK
Coordinates: ,
Elevation:

Remarks:
*Piezometric surface origin: Approx. local value from piezo data analysis

Termination Remark: Target depth

Date of plot: 16-12-16

Lankelma Project Ref: P-106539-1

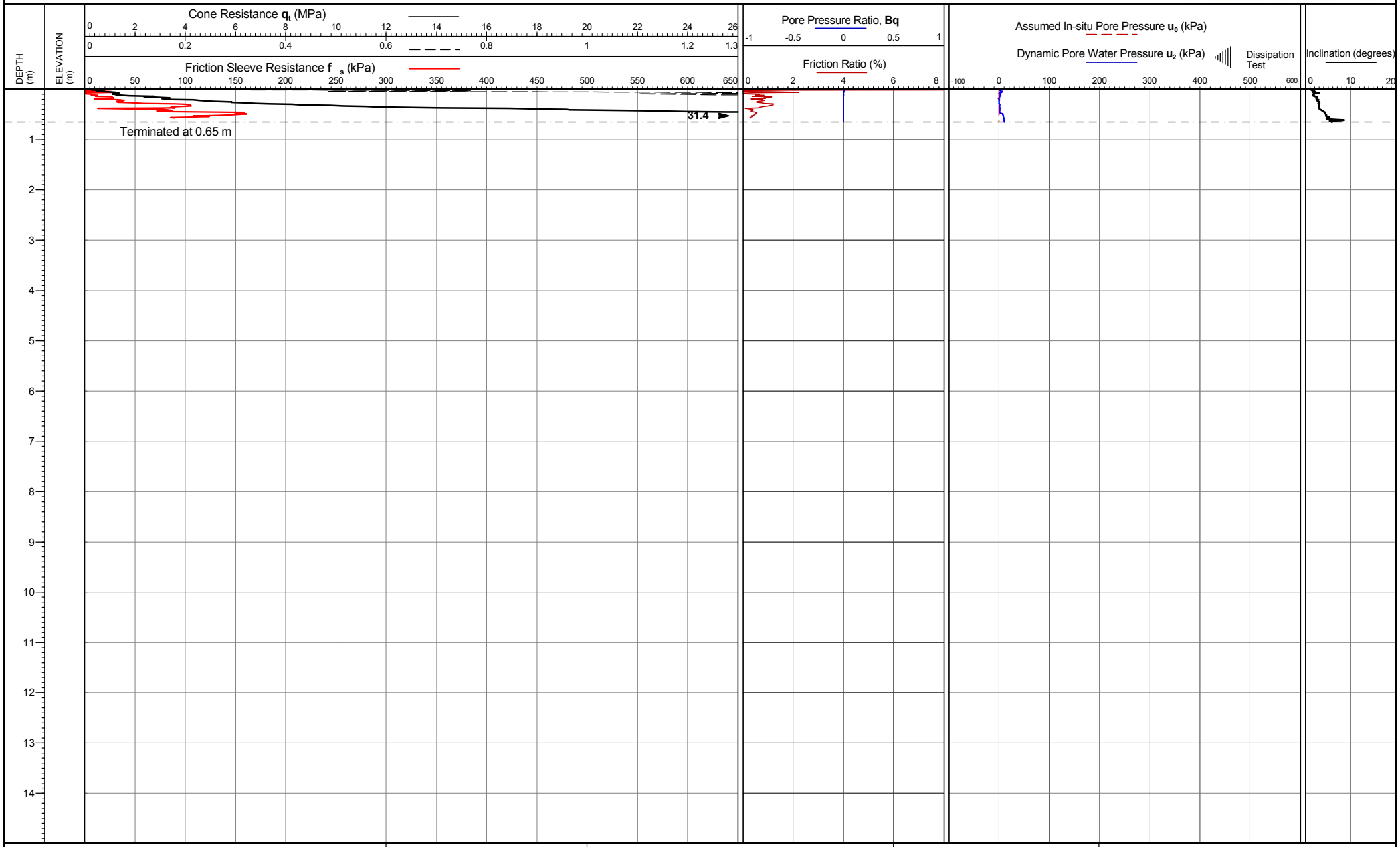
Checked by: Chris Player

TEST ID: CPT02

Client: ACS TESTING

Project: PORTISHEAD

LANKELMA



Cone area (mm2):1500
Cone ID: S15-CFIP.819
Operator: Paul Dimelow
Rig Used: UK20
Date of test: 16/12/2016 08:40:39

Location: Bristol, UK
Coordinates: ,
Elevation:

Remarks:
*Piezometric surface origin: Approx. local value from piezo data analysis

Termination Remark: Tip load

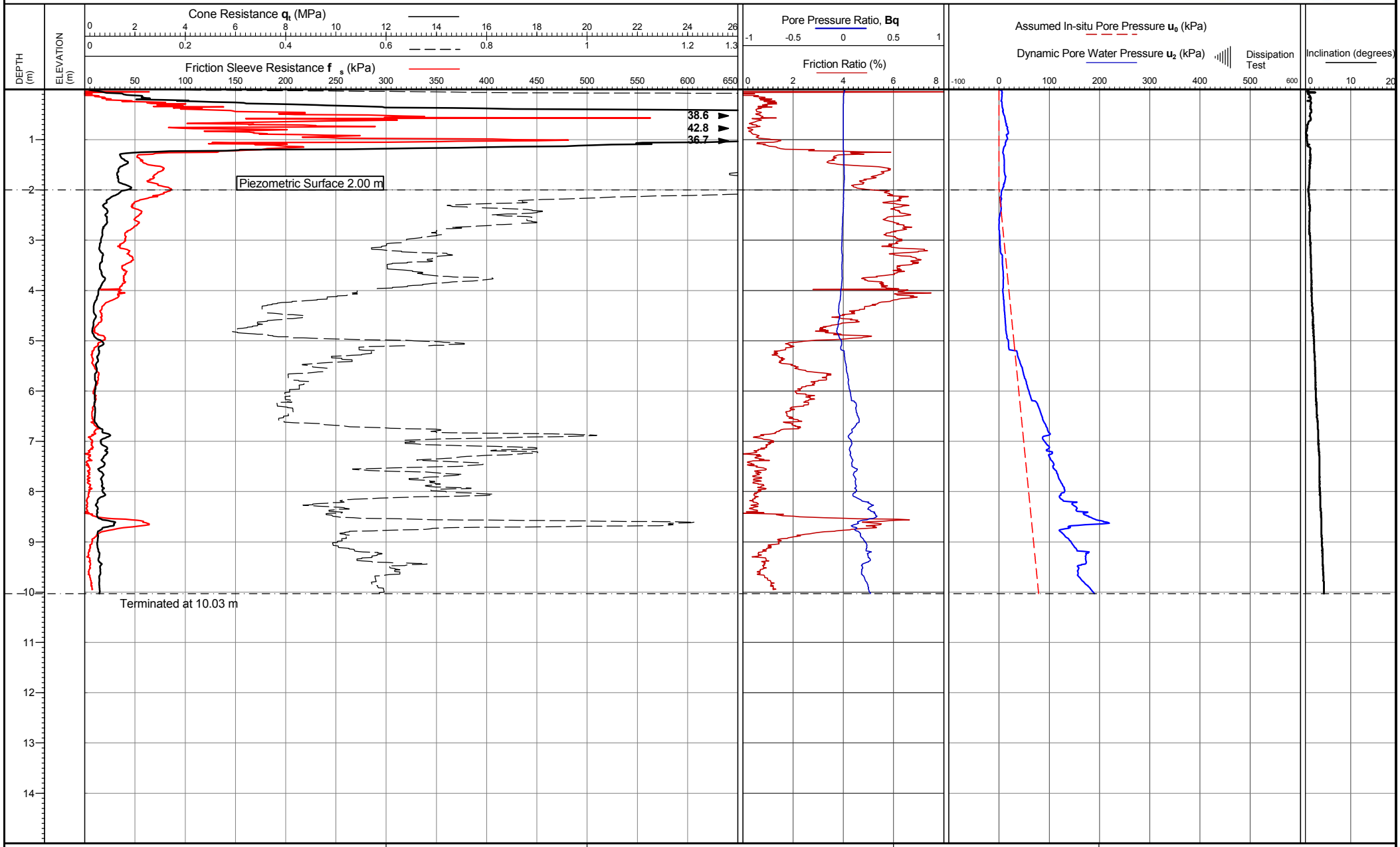
Date of plot: 16-12-16
Lankelma Project Ref: P-106539-1
Checked by: Chris Player

TEST ID: CPT03

Client: ACS TESTING

Project: PORTISHEAD

LANKELMA



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Cone ID: S15-CFIP.819
Operator: Paul Dimelow
Rig Used: UK20
Date of test: 16/12/2016 08:50:43

Location: Bristol, UK
Coordinates: ,
Elevation:

Remarks:
*Piezometric surface origin: Approx. local value from piezo data analysis

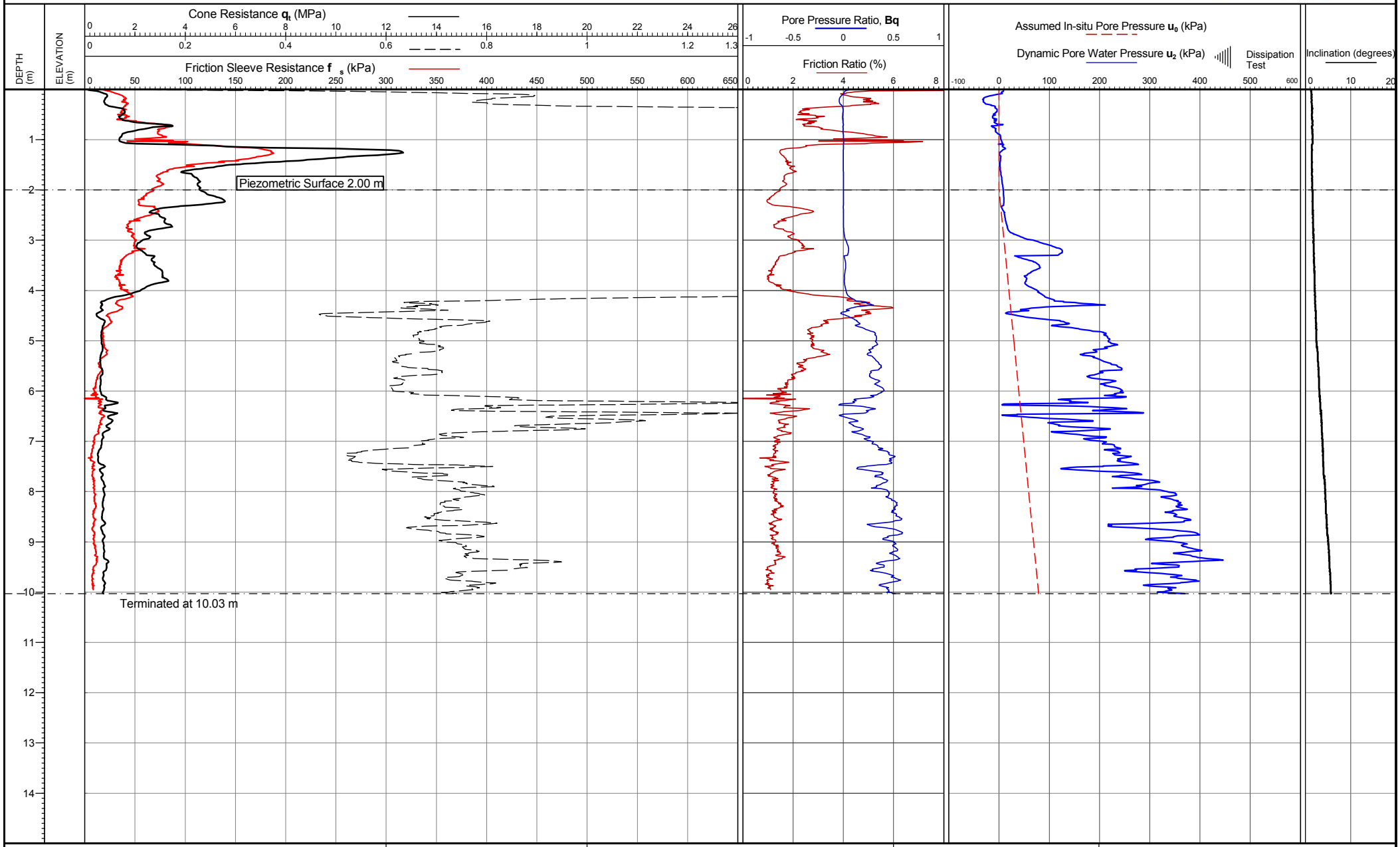
Termination Remark: Target depth

Date of plot: 16-12-16
Lankelma Project Ref: P-106539-1

Checked by: Chris Player

TEST ID: CPT03A

Client: ACS TESTING **Project: PORTISHEAD**



Cone area (mm2):1500
Cone ID: S15-CFIP.819
Operator: Paul Dimelow
Rig Used: UK20
Date of test: 16/12/2016 09:37:54

Location: Bristol, UK
Coordinates: ,
Elevation:

Remarks:
*Piezometric surface origin: Approx. local value from piezo data analysis

Termination Remark: Target depth

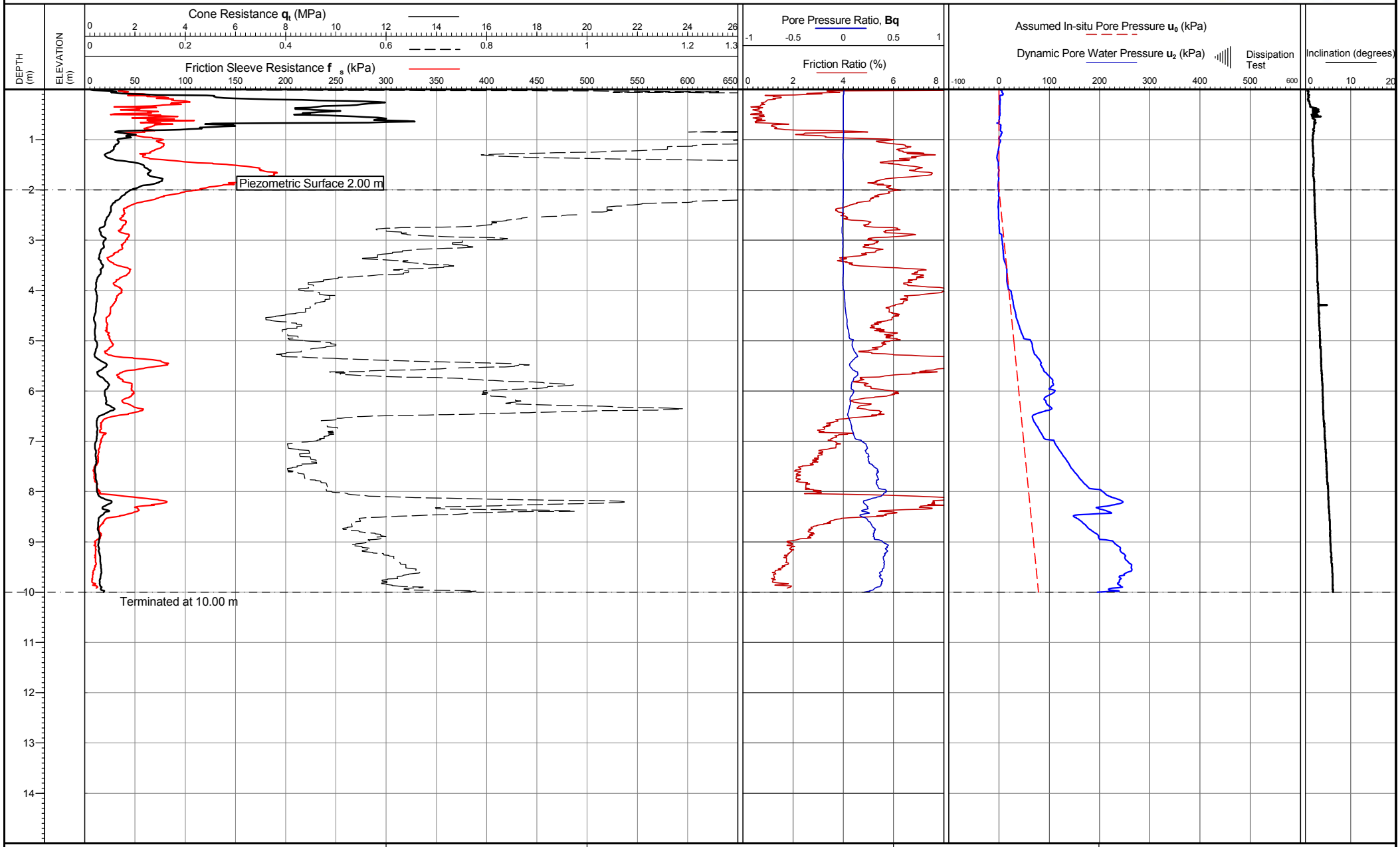
Date of plot: 16-12-16
Lankelma Project Ref: P-106539-1
Checked by: Chris Player

TEST ID: CPT04

Client: ACS TESTING

Project: PORTISHEAD

LANKELMA



Cone area (mm2):1500
Cone ID: S15-CFIP.819
Operator: Paul Dimelow
Rig Used: UK20
Date of test: 16/12/2016 11:31:09

Location: Bristol, UK
Coordinates: ,
Elevation:

Remarks:
*Piezometric surface origin: Approx. local value from piezo data analysis

Termination Remark: Target depth

Date of plot: 16-12-16

Lankelma Project Ref: P-106539-1

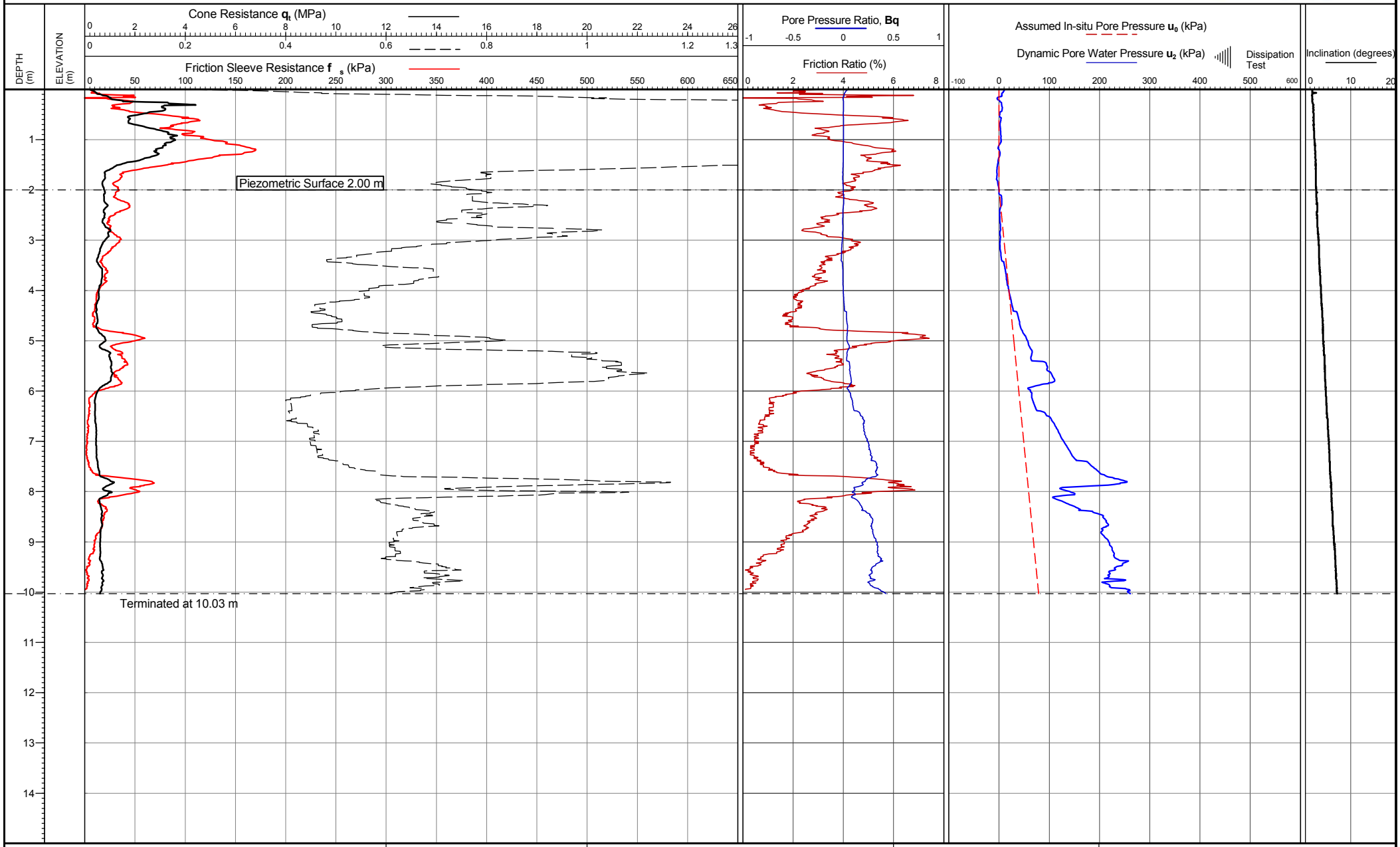
Checked by: Chris Player

TEST ID: CPT05

Client: ACS TESTING

Project: PORTISHEAD

LANKELMA



Cone area (mm2):1500
Cone ID: S15-CFIP.819
Operator: Paul Dimelow
Rig Used: UK20
Date of test: 16/12/2016 12:04:16

Location: Bristol, UK
Coordinates: ,
Elevation:

Remarks:
*Piezometric surface origin: Approx. local value from piezo data analysis

Termination Remark: Target depth

Date of plot: 16-12-16
Lankelma Project Ref: P-106539-1

Checked by: Chris Player

TEST ID: CPT06

APPENDIX C STANDARD INTERPRETATION RESULTS

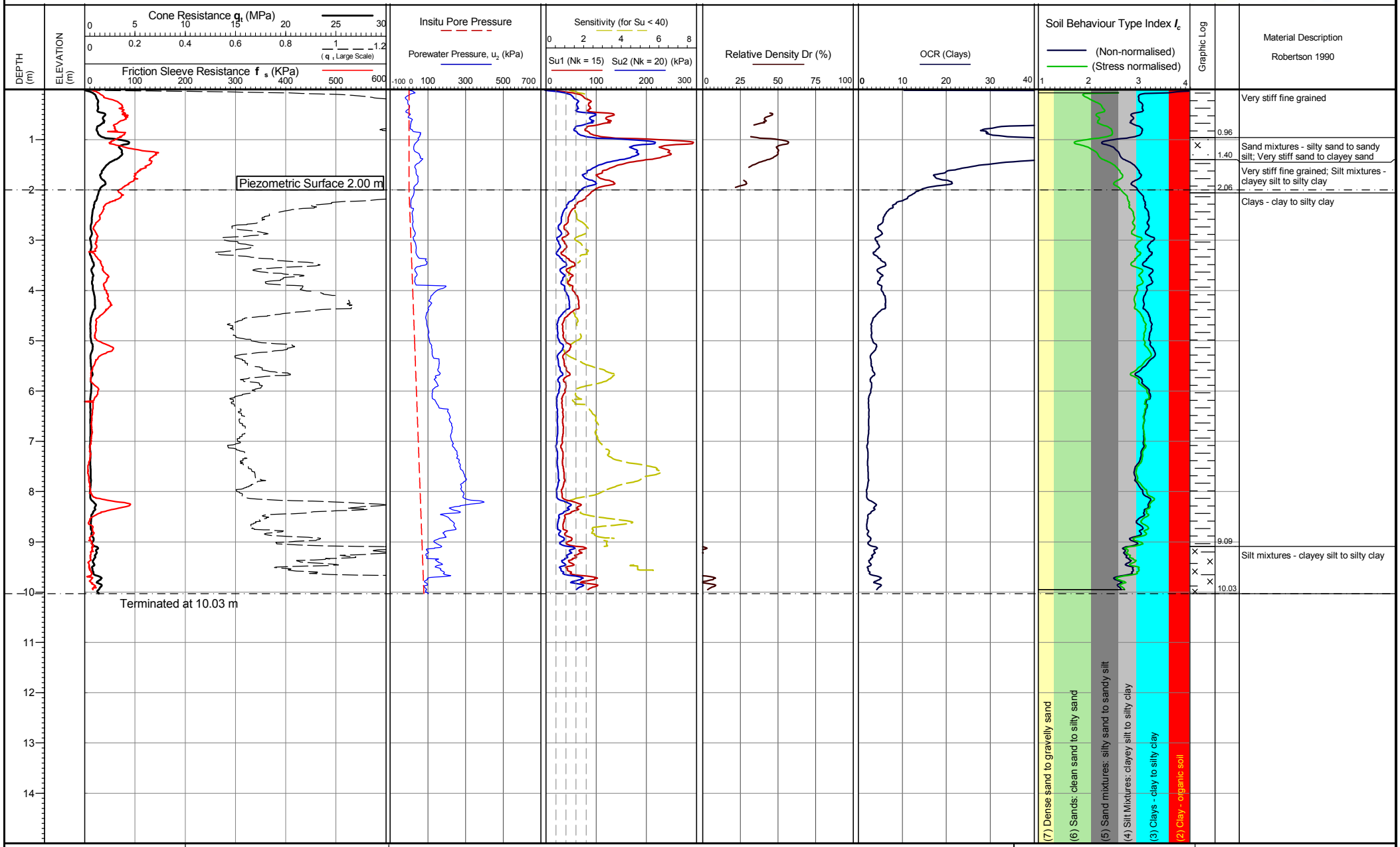
LIST OF FIGURES:

Test ID		Pages included
Cone Penetration Test	CPT01	1
Cone Penetration Test	CPT02	1
Cone Penetration Test	CPT03	1
Cone Penetration Test	CPT03A	1
Cone Penetration Test	CPT04	1
Cone Penetration Test	CPT05	1
Cone Penetration Test	CPT06	1

Client: ACS TESTING

Project: PORTISHEAD

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.819
Operator: Paul Dimelow
Rig Used: UK20
Date of test: 16/12/2016 10:54:43

Location: Bristol, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Piezometric surface origin: Approx. local value from piezo data analysis

Termination Remark: Target depth

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 16-12-16

Lankelma Project Ref: P-106539-1

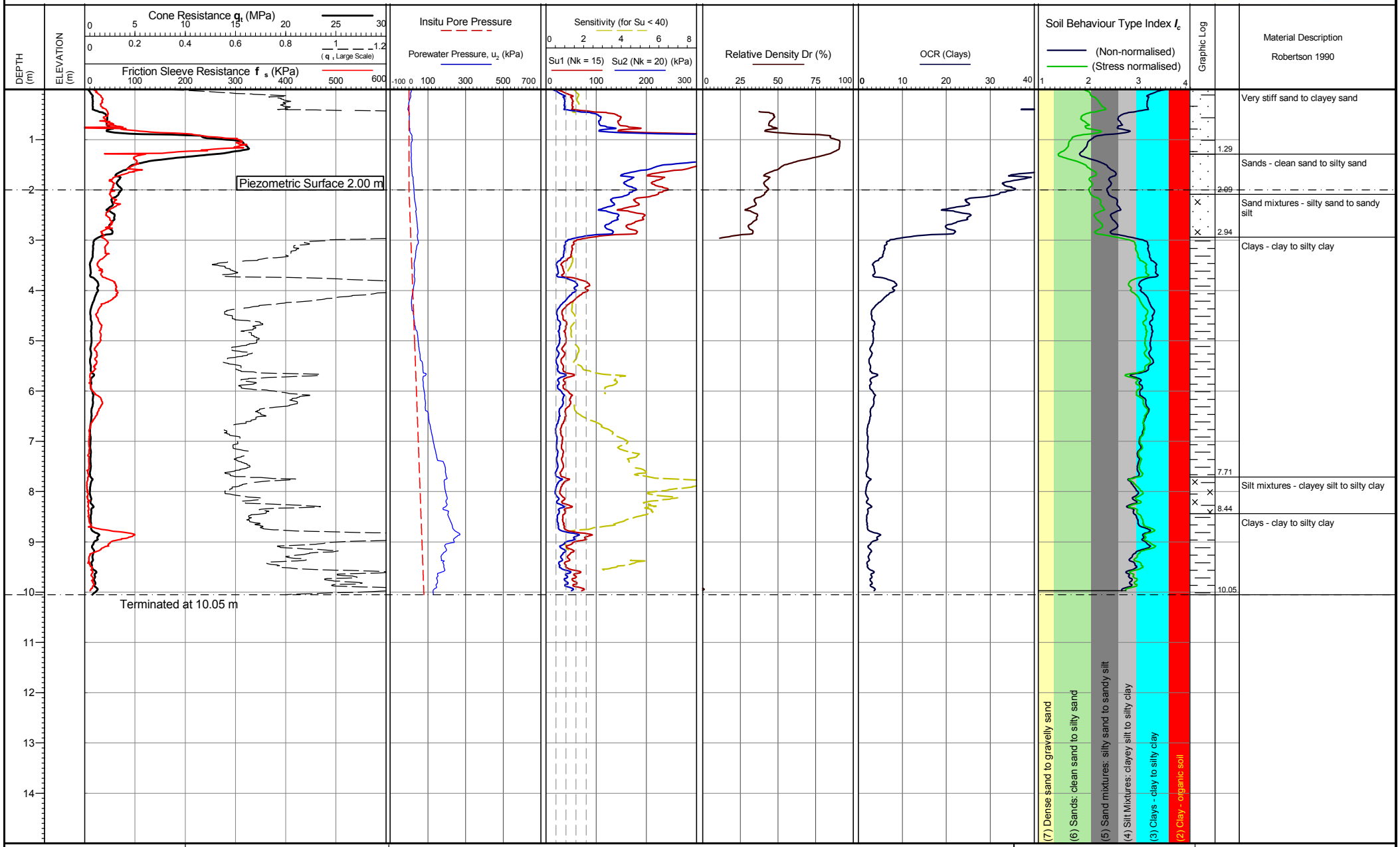
Checked by: Chris Player

TEST ID: CPT01

Client: ACS TESTING

Project: PORTISHEAD

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.819
Operator: Paul Dimelow
Rig Used: UK20
Date of test: 16/12/2016 10:13:02

Location: Bristol, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Piezometric surface origin: Approx. local value from piezo data analysis

Termination Remark:
Target depth

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 16-12-16

Lankelma Project Ref: P-106539-1

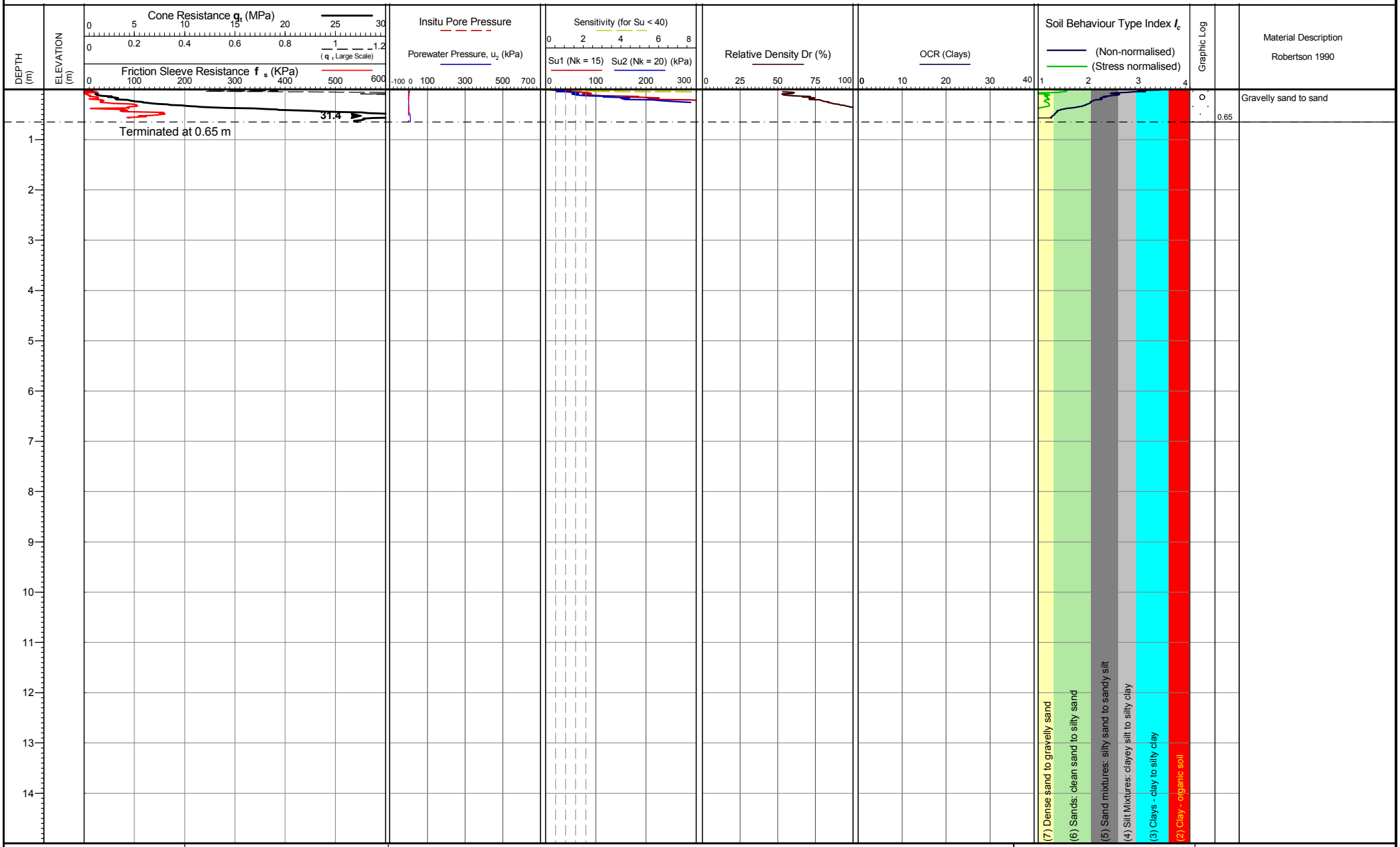
Checked by: Chris Player

TEST ID: CPT02

Client: ACS TESTING

Project: PORTISHEAD

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.819
Operator: Paul Dimelow
Rig Used: UK20
Date of test: 16/12/2016 08:40:39

Location: Bristol, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Piezometric surface origin: Approx. local value from piezo data analysis

Termination Remark:
Tip load

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 16-12-16

Lankelma Project Ref: P-106539-1

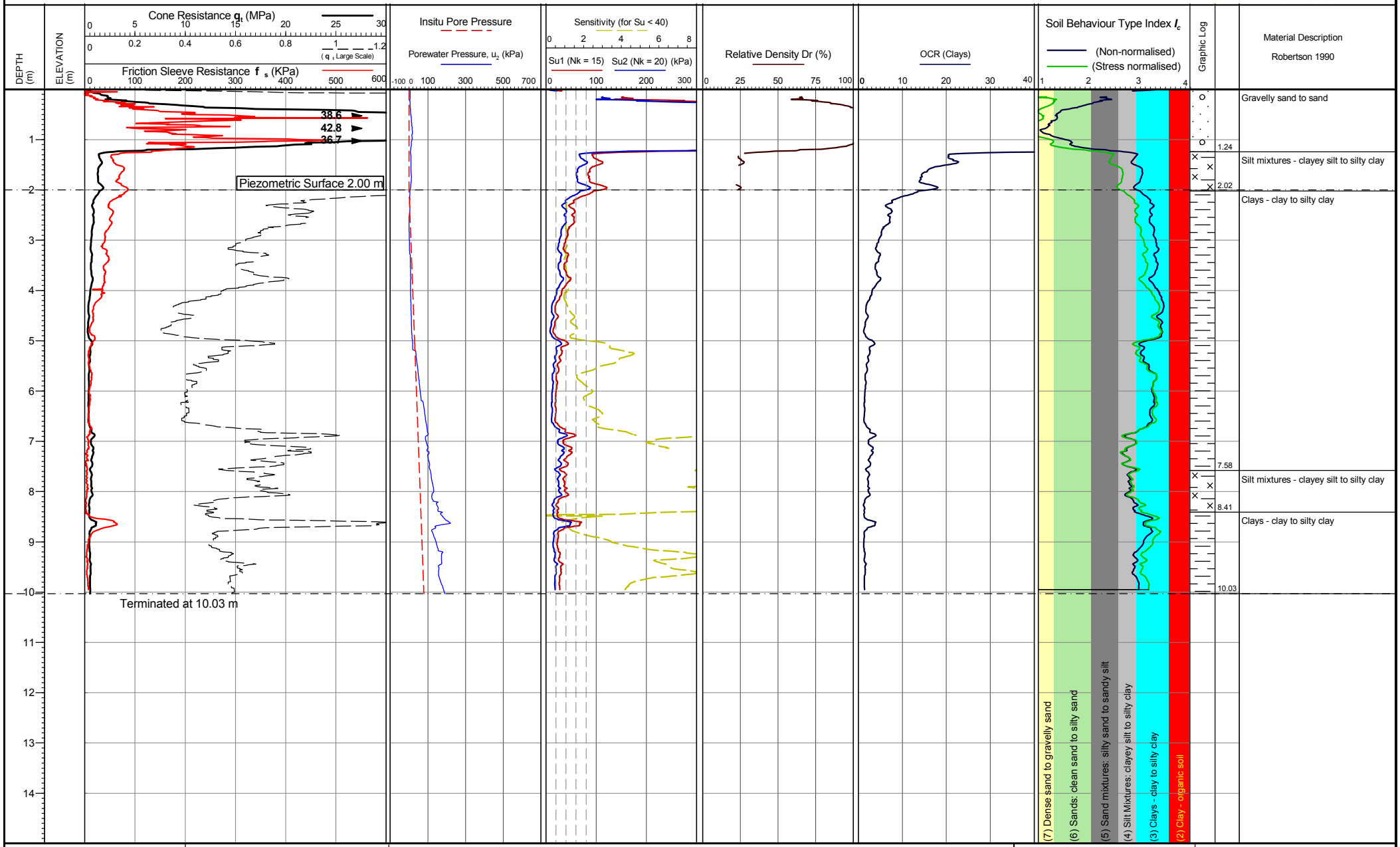
Checked by: Chris Player

TEST ID: CPT03

Client: ACS TESTING

Project: PORTISHEAD

LANKELMA



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ConeID: S15-CFIP.819
Operator: Paul Dimelow
Rig Used: UK20
Date of test: 16/12/2016 08:50:43

Location: Bristol, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Piezometric surface origin: Approx. local value from piezo data analysis

Termination Remark:
Target depth

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 16-12-16

Lankelma Project Ref: P-106539-1

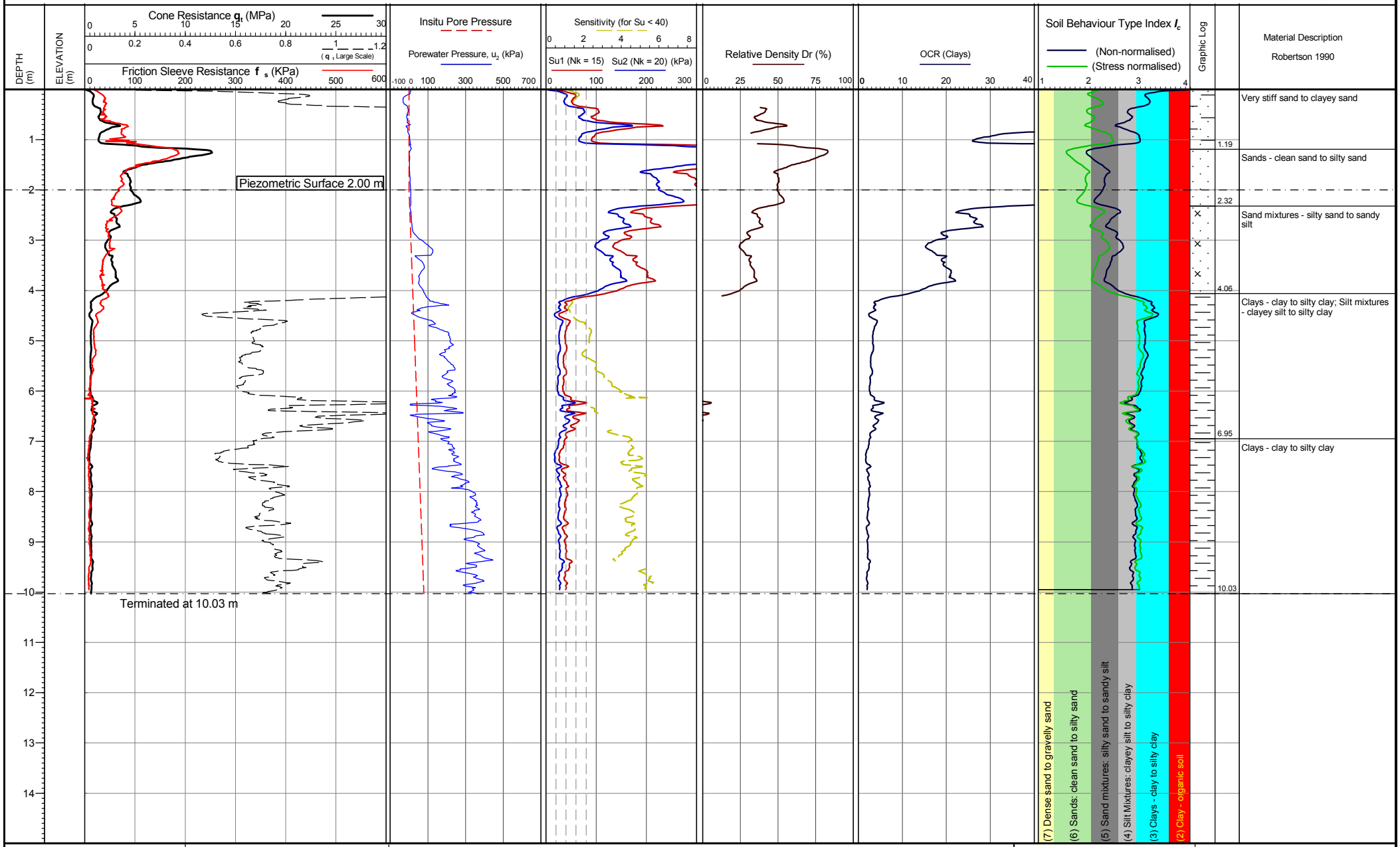
Checked by: Chris Player

TEST ID: CPT03A

Client: ACS TESTING

Project: PORTISHEAD

LANKELMA



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ConeID: S15-CFIP.819
Operator: Paul Dimelow
Rig Used: UK20
Date of test: 16/12/2016 09:37:54

Location: Bristol, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Piezometric surface origin: Approx. local value from piezo data analysis

Termination Remark:
Target depth

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 16-12-16

Lankelma Project Ref: P-106539-1

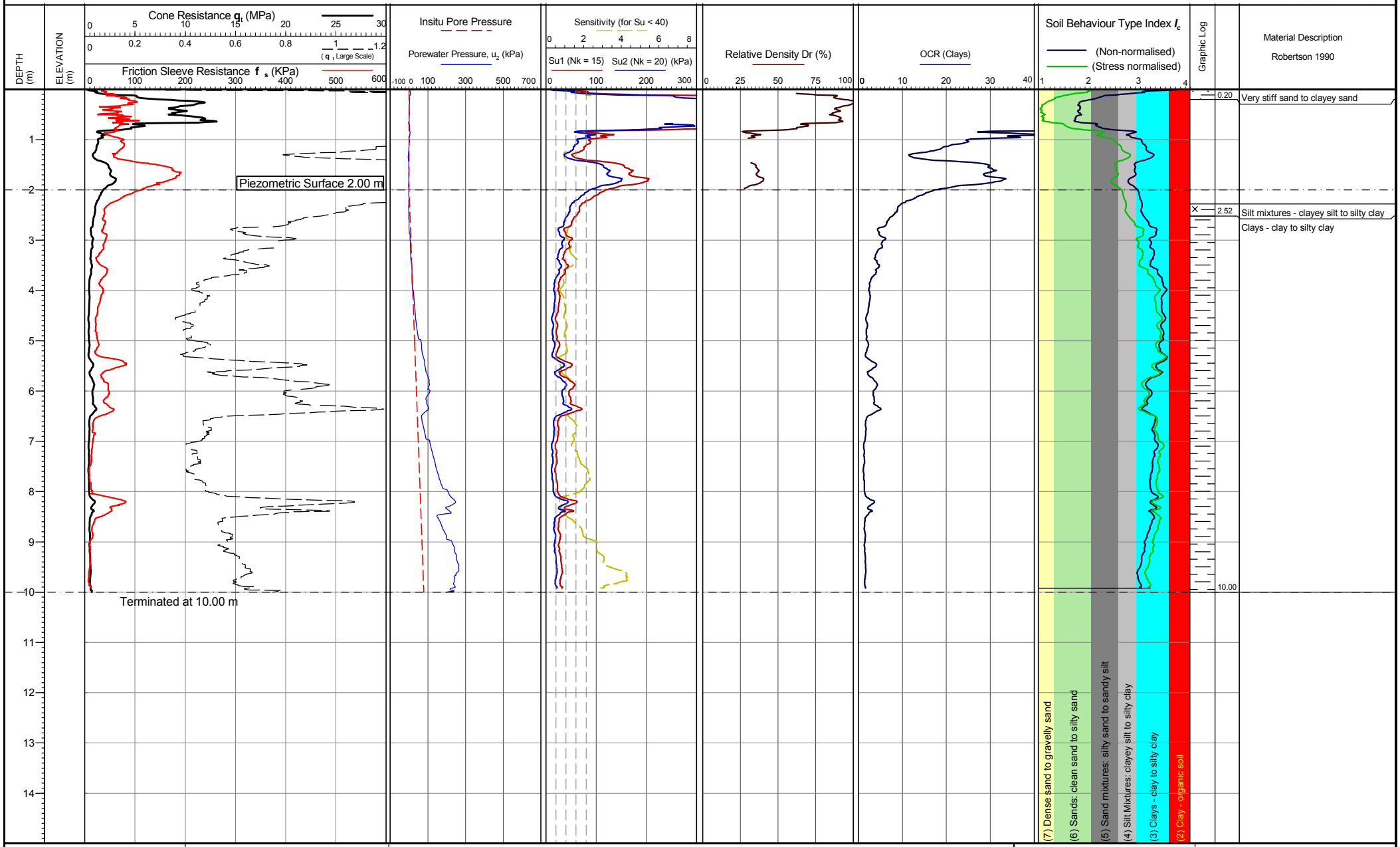
Checked by: Chris Player

TEST ID: CPT04

Client: ACS TESTING

Project: PORTISHEAD

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.819
Operator: Paul Dimelow
Rig Used: UK20
Date of test: 16/12/2016 11:31:09

Location: Bristol, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Piezometric surface origin: Approx. local value from piezo data analysis

Termination Remark:
Target depth

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 16-12-16

Lankelma Project Ref: P-106539-1

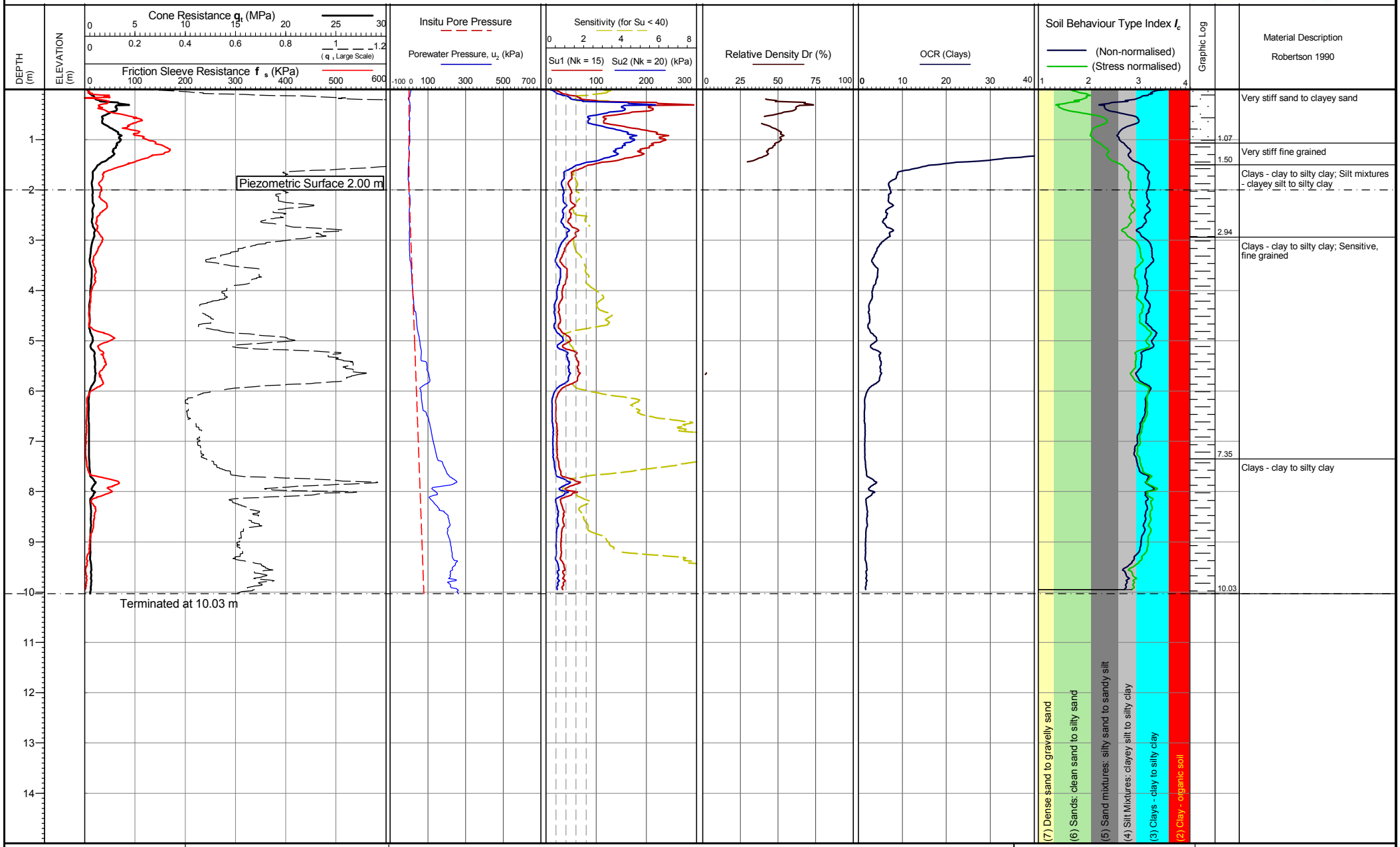
Checked by: Chris Player

TEST ID: CPT05

Client: ACS TESTING

Project: PORTISHEAD

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.819
Operator: Paul Dimelow
Rig Used: UK20
Date of test: 16/12/2016 12:04:16

Location: Bristol, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Piezometric surface origin: Approx. local value from piezo data analysis

Termination Remark:
Target depth

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 16-12-16

Lankelma Project Ref: P-106539-1

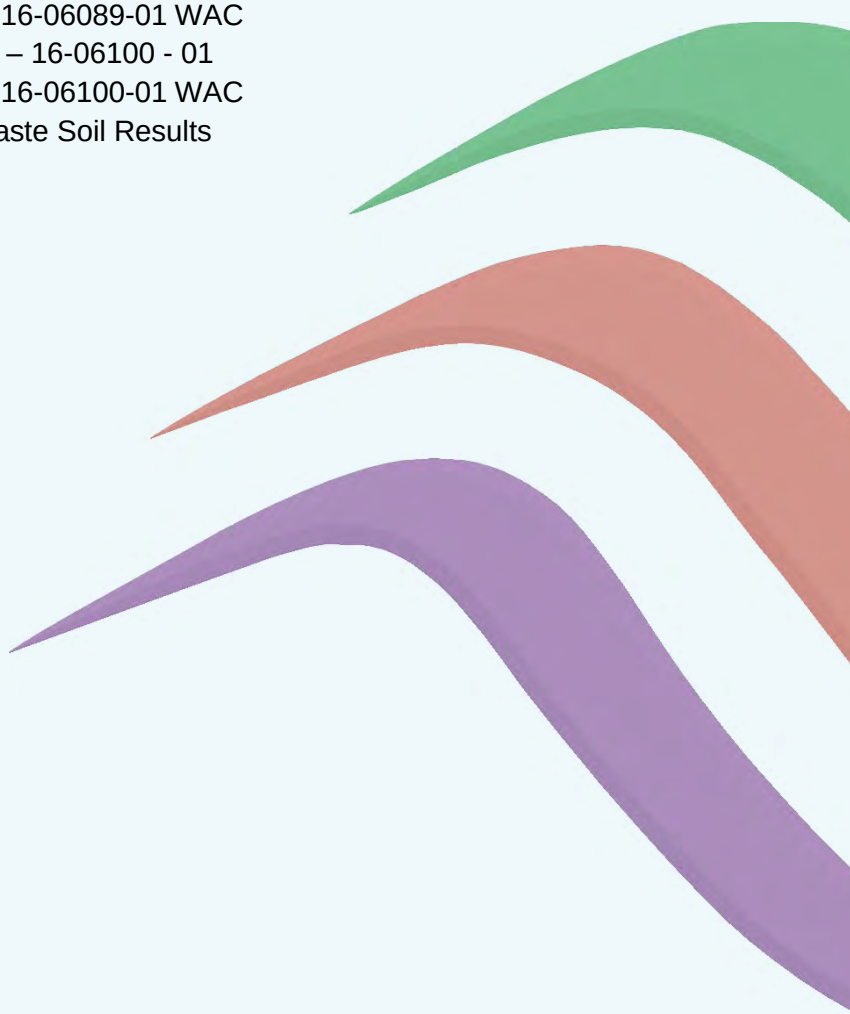
Checked by:
Chris Player

TEST ID: CPT06

APPENDIX I

LABORATORY TEST CERTIFICATES

ACST – 16-79161
ACST – 16-79208
ACSE – 16-06089-01
ACSE – 16-06089-01 WAC
ACSE – 16-06100 - 01
ACSE – 16-06100-01 WAC
CatWaste Soil Results



www.acsgroupofcompanies.co.uk

CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.2

Laboratory reference no(s) :	**16-79161 - 310512** Head Office Certificate No : **310512-16-79161-S2**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road, Weston-super-Mare, BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH03**
Location of sample on site :	**1.30m**
Borehole/pit no / depth :	**N/A** @ **N/A** m
Date sampled :	**12/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Grey moittled brown clayey sandy SILT**
Total mass received :	**1.05** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2 : 1990**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

The test specimen was oven dried at :	**108** °C
Moisture content :	**44** **%**

Remarks : **NONE**

[redacted]

Tested by : **JASSAS** Date tested : **20.12.2016** Approved : Date : **13/01/2017**

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Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
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CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0

Laboratory reference no(s) :	**16-79161 - 310512** Head Office Certificate No : **310512-16-79161-S4**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road** **Weston-super-Mare** **BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH03**
Location of sample on site :	**1.30m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**12/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Grey moittled brown clayey sandy SILT**
Total mass received :	**1.05** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	**0**	%
Proportion of material passing 425 µm test sieve	:	**100**	%

Plastic limit	:	**27**	%
Liquid limit	:	**71**	%
Plasticity index	:	**44**	%
Liquidity index	:	**0.386**	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

[redacted]

Tested by : **DHJAS** Date tested : **11.01.2017** Approved : Date : **13/01/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.2

Laboratory reference no(s) :	**16-79161 - 310513** Head Office Certificate No : **310513-16-79161-S2**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road, Weston-super-Mare, BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH03**
Location of sample on site :	**2.70m**
Borehole/pit no / depth :	**N/A** @ **N/A** m
Date sampled :	**12/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Bluish grey silty CLAY**
Total mass received :	**1.41** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2 : 1990**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

The test specimen was oven dried at :	**108** °C
Moisture content :	**32** **%**

Remarks : **None**

[redacted]

Tested by : **JASSASSDC** Date tested : **20.12.2016** Approved : Date : **03/01/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

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Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

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CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0

Laboratory reference no(s) :	**16-79161 - 310513** Head Office Certificate No : **310513-16-79161-S4**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road** **Weston-super-Mare** **BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH03**
Location of sample on site :	**2.70m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**12/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Bluish grey silty CLAY**
Total mass received :	**1.41** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	**1**	%
Proportion of material passing 425 µm test sieve	:	**99**	%

Plastic limit	:	**20**	%
Liquid limit	:	**60**	%
Plasticity index	:	**40**	%
Liquidity index	:	**0.308**	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

[redacted]

Tested by : **DHJAS** Date tested : **03.01.2017** Approved : Date : **05/01/2017**

Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
Blackhill Road West
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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.2

Laboratory reference no(s) :	**16-79161 - 310515** Head Office Certificate No : **310515-16-79161-S2**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road, Weston-super-Mare, BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH04**
Location of sample on site :	**1.60m**
Borehole/pit no / depth :	**N/A** @ **N/A** m
Date sampled :	**12/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Grey mottled brown clayey SILT**
Total mass received :	**1.44** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2 : 1990**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

The test specimen was oven dried at :	**108** °C
Moisture content :	**23** **%**

Remarks : **None**

[redacted]

Tested by : **JASSASSDC** Date tested : **20.12.2016** Approved : Date : **03/01/2017**

Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
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CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0

Laboratory reference no(s) :	**16-79161 - 310515** Head Office Certificate No : **310515-16-79161-S4**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road** **Weston-super-Mare** **BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH04**
Location of sample on site :	**1.60m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**12/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Grey mottled brown clayey SILT**
Total mass received :	**1.44** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	**0**	%
Proportion of material passing 425 µm test sieve	:	**100**	%

Plastic limit	:	**19**	%
Liquid limit	:	**55**	%
Plasticity index	:	**36**	%
Liquidity index	:	**0.111**	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

[redacted]

Tested by : **DHJAS** Date tested : **03.01.2017** Approved : Date : **05/01/2017**

Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.2

Laboratory reference no(s) :	**16-79161 - 310518** Head Office Certificate No : **310518-16-79161-S2**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road, Weston-super-Mare, BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH04**
Location of sample on site :	**2.10m**
Borehole/pit no / depth :	**N/A** @ **N/A** m
Date sampled :	**12/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Bluish grey silty CLAY**
Total mass received :	**0.95** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2 : 1990**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

The test specimen was oven dried at :	**108** °C
Moisture content :	**35** **%**

Remarks : **None**

[redacted]

Tested by : **JASSASSDC** Date tested : **20.12.2016** Approved : Date : **03/01/2017**

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Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

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TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0

Laboratory reference no(s) :	**16-79161 - 310518** Head Office Certificate No : **310518-16-79161-S4**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road** **Weston-super-Mare** **BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH04**
Location of sample on site :	**2.10m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**12/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Bluish grey silty CLAY**
Total mass received :	**0.95** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	**0**	%
Proportion of material passing 425 µm test sieve	:	**100**	%

Plastic limit	:	**19**	%
Liquid limit	:	**53**	%
Plasticity index	:	**34**	%
Liquidity index	:	**0.471**	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

[redacted]

Tested by : **DHJAS** Date tested : **03.01.2017** Approved : Date : **05/01/2017**

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Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.2

Laboratory reference no(s) :	**16-79161 - 310520** Head Office Certificate No : **310520-16-79161-S2**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road, Weston-super-Mare, BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH04**
Location of sample on site :	**2.60m**
Borehole/pit no / depth :	**N/A** @ **N/A** m
Date sampled :	**12/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Bluish grey silty CLAY**
Total mass received :	**1.61** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2 : 1990**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

The test specimen was oven dried at :	**108** °C
Moisture content :	**31** **%**

Remarks : **None**

[redacted]

Tested by : **JASSASSDC** Date tested : **20.12.2016** Approved : Date : **03/01/2017**

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Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

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Unit 14
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TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0

Laboratory reference no(s) :	**16-79161 - 310520** Head Office Certificate No : **310520-16-79161-S4**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road** **Weston-super-Mare** **BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH04**
Location of sample on site :	**2.60m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**12/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Bluish grey silty CLAY**
Total mass received :	**1.61** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	**0**	%
Proportion of material passing 425 µm test sieve	:	**100**	%

Plastic limit	:	**18**	%
Liquid limit	:	**50**	%
Plasticity index	:	**32**	%
Liquidity index	:	**0.406**	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

[redacted]

Tested by : **DHJAS** Date tested : **03.01.2017** Approved : Date : **05/01/2017**

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Unit 14
Blackhill Road West
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Poole
Dorset BH16 6LE

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Fax 01202 626046

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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.2

Laboratory reference no(s) :	**16-79161 - 310523** Head Office Certificate No : **310523-16-79161-S2**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road, Weston-super-Mare, BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH05**
Location of sample on site :	**1.20m**
Borehole/pit no / depth :	**N/A** @ **N/A** m
Date sampled :	**13/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Greyish brown clayey sandy SILT**
Total mass received :	**1.37** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2 : 1990**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

The test specimen was oven dried at :	**108** °C
Moisture content :	**21** **%**

Remarks : **NONE**

Tested by : **DHJASSAS** Date tested : **20.12.2016** Approved : [redacted] Date : **13/01/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

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Unit 14
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Holton Heath Trading Park
Poole
Dorset BH16 6LE

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TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0

Laboratory reference no(s) :	**16-79161 - 310523** Head Office Certificate No : **310523-16-79161-S4**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road** **Weston-super-Mare** **BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH05**
Location of sample on site :	**1.20m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**13/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Greyish brown clayey sandy SILT**
Total mass received :	**1.37** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**N/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	**0**	%
Proportion of material passing 425 µm test sieve	:	**100**	%

Plastic limit	:	**17**	%
Liquid limit	:	**48**	%
Plasticity index	:	**31**	%
Liquidity index	:	**0.129**	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

[redacted]

Tested by : **DHJAS** Date tested : **06.01.2017** Approved : Date : **10/01/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
Any statement of compliance with a given specification relates only to the test covered by this certificate.
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Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.2

Laboratory reference no(s) :	**16-79161 - 310524** Head Office Certificate No : **310524-16-79161-S2**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road, Weston-super-Mare, BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH05**
Location of sample on site :	**2.60m**
Borehole/pit no / depth :	**N/A** @ **N/A** m
Date sampled :	**13/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Brownish grey silty CLAY**
Total mass received :	**1.83** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2 : 1990**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

The test specimen was oven dried at :	**108** °C
Moisture content :	**27** **%**

Remarks : **None**

Tested by : **JASSASSDC** Date tested : **20.12.2016** Approved : [redacted] Date : **03/01/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

Any statement of compliance with a given specification relates only to the test covered by this certificate.

Opinions and interpretations, if stated, are not within the scope of our UKAS accreditation

Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
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CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0

Laboratory reference no(s) :	**16-79161 - 310524** Head Office Certificate No : **310524-16-79161-S4**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road** **Weston-super-Mare** **BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH05**
Location of sample on site :	**2.60m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**13/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Brownish grey silty CLAY**
Total mass received :	**1.83** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	**0**	%
Proportion of material passing 425 µm test sieve	:	**100**	%

Plastic limit	:	**17**	%
Liquid limit	:	**44**	%
Plasticity index	:	**27**	%
Liquidity index	:	**0.370**	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

[redacted]

Tested by : **DHJAS** Date tested : **09.01.2017** Approved : Date : **11/01/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Testing Limited
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Wales No. 4639658

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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.2

Laboratory reference no(s) :	**16-79161 - 310526** Head Office Certificate No : **310526-16-79161-S2**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road, Weston-super-Mare, BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH05**
Location of sample on site :	**3.10m**
Borehole/pit no / depth :	**N/A** @ **N/A** m
Date sampled :	**13/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Bluish grey silty CLAY**
Total mass received :	**1.41** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2 : 1990**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

The test specimen was oven dried at :	**108** °C
Moisture content :	**41** **%**

Remarks : **None**

[redacted]

Tested by : **JASSASSDC** Date tested : **20.12.2016** Approved : Date : **03/01/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

Any statement of compliance with a given specification relates only to the test covered by this certificate.

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Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Testing Limited
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CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0

Laboratory reference no(s) :	**16-79161 - 310526** Head Office Certificate No : **310526-16-79161-S4**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road** **Weston-Super-Mare** **BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**In-Situ**
Client reference/data :	**TPPH05**
Location of sample on site :	**3.10m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**13/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Bluish grey silty CLAY**
Total mass received :	**1.41** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**N/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	**0**	%
Proportion of material passing 425 µm test sieve	:	**100**	%

Plastic limit	:	**20**	%
Liquid limit	:	**59**	%
Plasticity index	:	**39**	%
Liquidity index	:	**0.538**	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

[redacted]

Tested by : **DHJAS** Date tested : **06.01.2017** Approved : Date : **10/01/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Testing Limited
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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.2

Laboratory reference no(s) :	**16-79161 - 310530** Head Office Certificate No : **310530-16-79161-S2**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road, Weston-super-Mare, BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH06**
Location of sample on site :	**2.00m**
Borehole/pit no / depth :	**N/A** @ **N/A** m
Date sampled :	**13/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Grey mottled brown clayey SILT**
Total mass received :	**1.33** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2 : 1990**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

The test specimen was oven dried at :	**108** °C
Moisture content :	**30** **%**

Remarks : **None**

Tested by : **JASSASSDC** Date tested : **20.12.2016** Approved : [redacted] Date : **03/01/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

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Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
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CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0

Laboratory reference no(s) :	**16-79161 - 310530** Head Office Certificate No : **310530-16-79161-S4**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall** **Walliscote Grove Road** **Weston-super-Mare** **BS23 1UJ**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**in-situ**
Client reference/data :	**TPPH06**
Location of sample on site :	**2.00m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**13/12/2016**
Sampled by :	**AD**
Date received :	**19/12/2016**
Material description :	**Grey mottled brown clayey SILT**
Total mass received :	**1.33** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None Submitted**
Client's indicated specification(s) :	**n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	**0**	%
Proportion of material passing 425 µm test sieve	:	**100**	%

Plastic limit	:	**20**	%
Liquid limit	:	**51**	%
Plasticity index	:	**31**	%
Liquidity index	:	**0.323**	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

[redacted]

Tested by : **DHJAS** Date tested : **11.01.2017** Approved : Date : **13/01/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

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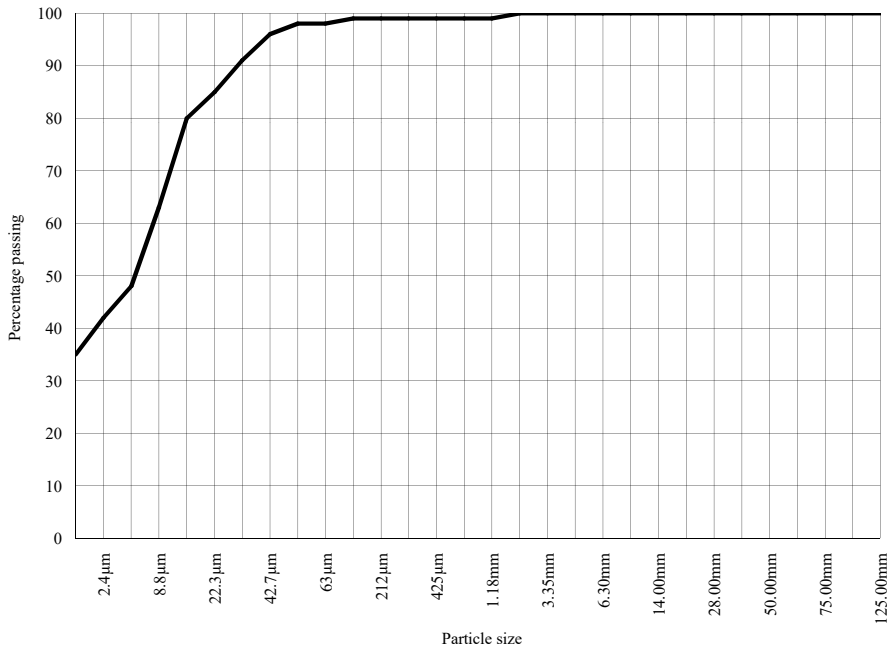
CERTIFICATE OF TEST - DETERMINATION OF PARTICLE SIZE DISTRIBUTION BY WET SIEVE & SEDIMENTATION (HYDROMETER METHOD) TESTED IN ACCORDANCE WITH BS 1377 : PART 2 : 1990 : CLAUSES 9.2 & 9.5

Laboratory reference no(s) :	**16-79208 - 310811** Head Office Certificate No : **310811-16-79208-S33B**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall Walliscote Grove Road, Weston-super-Mare,**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**In Situ**
Client reference/data :	**TPPH03**
Location of sample on site :	**1.30m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**12/12/2016**
Sampled by :	**AD**
Date received :	**20/12/2016**
Material description :	**Grey brown clay sand SILT**
Total mass received :	**1.83** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None submitted**
Client's indicated specification(s) :	**N/A**

Particle Size	Percentage passing
	Actual
125.00mm	**100**
90.00mm	**100**
75.00mm	**100**
63.00mm	**100**
50.00mm	**100**
37.50mm	**100**
28.00mm	**100**
20.00mm	**100**
14.00mm	**100**
10.00mm	**100**
6.30mm	**100**
5.00mm	**100**
3.35mm	**100**
2.00mm	**100**
1.18mm	**99**
600µm	**99**
425µm	**99**
300µm	**99**
212µm	**99**
150µm	**99**
63µm	**98**
50.6µm	**98**
42.7µm	**96**
30.8µm	**91**
22.3µm	**85**
16.1µm	**80**
8.8µm	**63**
4.6µm	**48**
2.4µm	**42**
1.4µm	**35**



Composition					
Particle size fraction (mm)	**Cobbles**	**Gravel**	**Sand**	**Silt**	**Clay**
	200.0 - 60.0	60.0 - 2.00	2.00 - 0.06	0.06 - 0.002	0.002
Particle Proportions	**0**	**0**	**2**	**59**	**39**

Remarks : **None**

Tested by : **DH/RC** Date tested : **06.01.2017** Approved by: [redacted] Date : **11/01/2017**

Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
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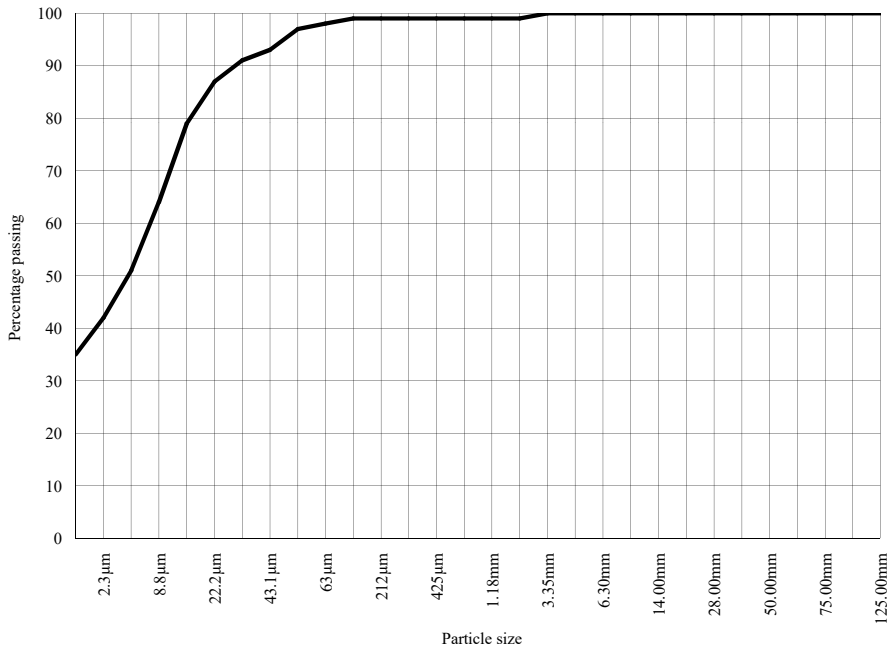
CERTIFICATE OF TEST - DETERMINATION OF PARTICLE SIZE DISTRIBUTION BY WET SIEVE & SEDIMENTATION (HYDROMETER METHOD) TESTED IN ACCORDANCE WITH BS 1377 : PART 2 : 1990 : CLAUSES 9.2 & 9.5

Laboratory reference no(s) :	**16-79208 - 310812** Head Office Certificate No : **310812-16-79208-S33B**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall Walliscote Grove Road, Weston-super-Mare,**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**In Situ**
Client reference/data :	**TPPH04**
Location of sample on site :	**1.60m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**13/12/2016**
Sampled by :	**AD**
Date received :	**20/12/2016**
Material description :	**Grey brown clay SILT**
Total mass received :	**9.23** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None submitted**
Client's indicated specification(s) :	**N/A**

Particle Size	Percentage passing
	Actual
125.00mm	**100**
90.00mm	**100**
75.00mm	**100**
63.00mm	**100**
50.00mm	**100**
37.50mm	**100**
28.00mm	**100**
20.00mm	**100**
14.00mm	**100**
10.00mm	**100**
6.30mm	**100**
5.00mm	**100**
3.35mm	**100**
2.00mm	**99**
1.18mm	**99**
600µm	**99**
425µm	**99**
300µm	**99**
212µm	**99**
150µm	**99**
63µm	**98**
50.6µm	**97**
43.1µm	**93**
30.8µm	**91**
22.2µm	**87**
16.1µm	**79**
8.8µm	**64**
4.6µm	**51**
2.3µm	**42**
1.4µm	**35**



Composition					
Particle size fraction (mm)	**Cobbles**	**Gravel**	**Sand**	**Silt**	**Clay**
	200.0 - 60.0	60.0 - 2.00	2.00 - 0.06	0.06 - 0.002	0.002
Particle Proportions	**0**	**1**	**1**	**58**	**40**

Remarks : **None**

[redacted]

Tested by : **DH/RC** Date tested : **06.01.2017** Approved by: Date : **11/01/2017**

Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
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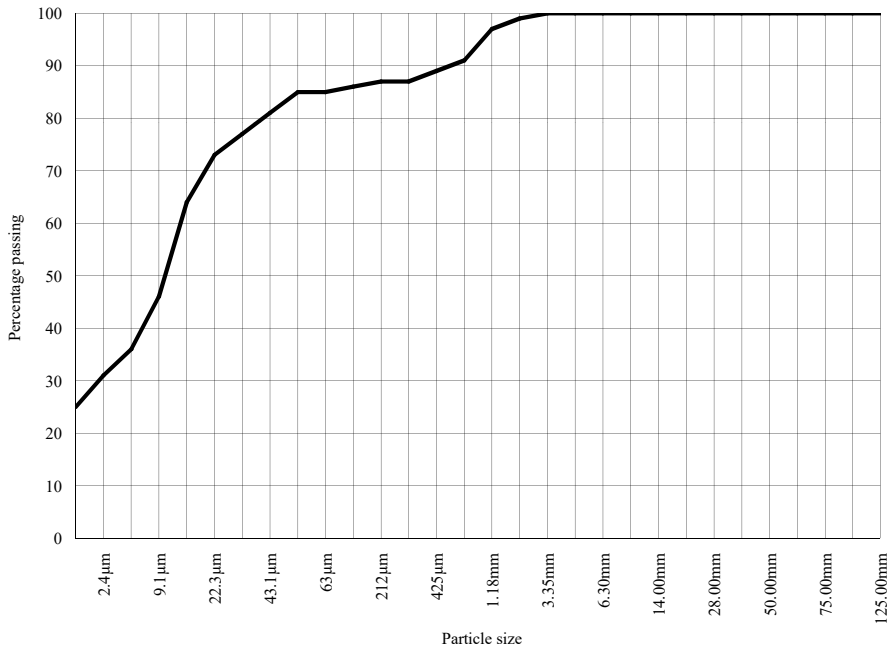
CERTIFICATE OF TEST - DETERMINATION OF PARTICLE SIZE DISTRIBUTION BY WET SIEVE & SEDIMENTATION (HYDROMETER METHOD) TESTED IN ACCORDANCE WITH BS 1377 : PART 2 : 1990 : CLAUSES 9.2 & 9.5

Laboratory reference no(s) :	**16-79208 - 310813** Head Office Certificate No : **310813-16-79208-S33B**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall Walliscote Grove Road, Weston-super-Mare,**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**In Situ**
Client reference/data :	**TPPH04**
Location of sample on site :	**2.60m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**13/12/2016**
Sampled by :	**AD**
Date received :	**20/12/2016**
Material description :	**Blue grey silt CLAY**
Total mass received :	**3.77** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None submitted**
Client's indicated specification(s) :	**N/A**

Particle Size	Percentage passing
	Actual
125.00mm	**100**
90.00mm	**100**
75.00mm	**100**
63.00mm	**100**
50.00mm	**100**
37.50mm	**100**
28.00mm	**100**
20.00mm	**100**
14.00mm	**100**
10.00mm	**100**
6.30mm	**100**
5.00mm	**100**
3.35mm	**100**
2.00mm	**99**
1.18mm	**97**
600µm	**91**
425µm	**89**
300µm	**87**
212µm	**87**
150µm	**86**
63µm	**85**
50.6µm	**85**
43.1µm	**81**
31.0µm	**77**
22.3µm	**73**
16.4µm	**64**
9.1µm	**46**
4.7µm	**36**
2.4µm	**31**
1.4µm	**25**



Composition					
Particle size fraction (mm)	**Cobbles**	**Gravel**	**Sand**	**Silt**	**Clay**
	200.0 - 60.0	60.0 - 2.00	2.00 - 0.06	0.06 - 0.002	0.002
Particle Proportions	**0**	**1**	**14**	**56**	**29**

Remarks : **None**

[redacted]

Tested by : **DH/RC** Date tested : **06/01/2017** Approved by: Date : **11/01/2017**

Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
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Blackhill Road West
Holton Heath Trading Park
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Dorset BH16 6LE
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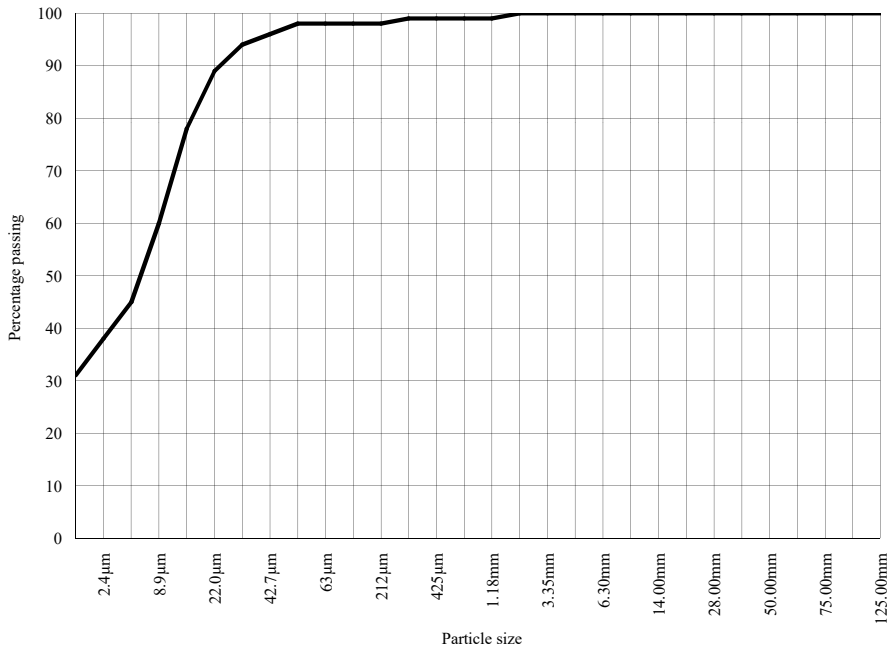
Laboratory reference no(s) :	**16-79208 - 310814** Head Office Certificate No : **310814-16-79208-S33B**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall Walliscote Grove Road, Weston-super-Mare,**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**In Situ**
Client reference/data :	**TPPH05**
Location of sample on site :	**2.60m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**12/12/2016**
Sampled by :	**AD**
Date received :	**20/12/2016**
Material description :	**Brown grey silt CLAY**
Total mass received :	**7.64** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None submitted**
Client's indicated specification(s) :	**N/A**

Particle Size	Percentage passing
	Actual
125.00mm	**100**
90.00mm	**100**
75.00mm	**100**
63.00mm	**100**
50.00mm	**100**
37.50mm	**100**
28.00mm	**100**
20.00mm	**100**
14.00mm	**100**
10.00mm	**100**
6.30mm	**100**
5.00mm	**100**
3.35mm	**100**
2.00mm	**100**
1.18mm	**99**
600µm	**99**
425µm	**99**
300µm	**99**
212µm	**98**
150µm	**98**
63µm	**98**
50.6µm	**98**
42.7µm	**96**
30.5µm	**94**
22.0µm	**89**
16.2µm	**78**
8.9µm	**60**
4.7µm	**45**
2.4µm	**38**
1.4µm	**31**



Composition					
Particle size fraction (mm)	**Cobbles**	**Gravel**	**Sand**	**Silt**	**Clay**
	200.0 - 60.0	60.0 - 2.00	2.00 - 0.06	0.06 - 0.002	0.002
Particle Proportions	**0**	**0**	**2**	**63**	**35**

Remarks : **None**

[redacted]

Tested by : **DH/RC** Date tested : **11.01.2017** Approved by: Date : **11/01/2017**

Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
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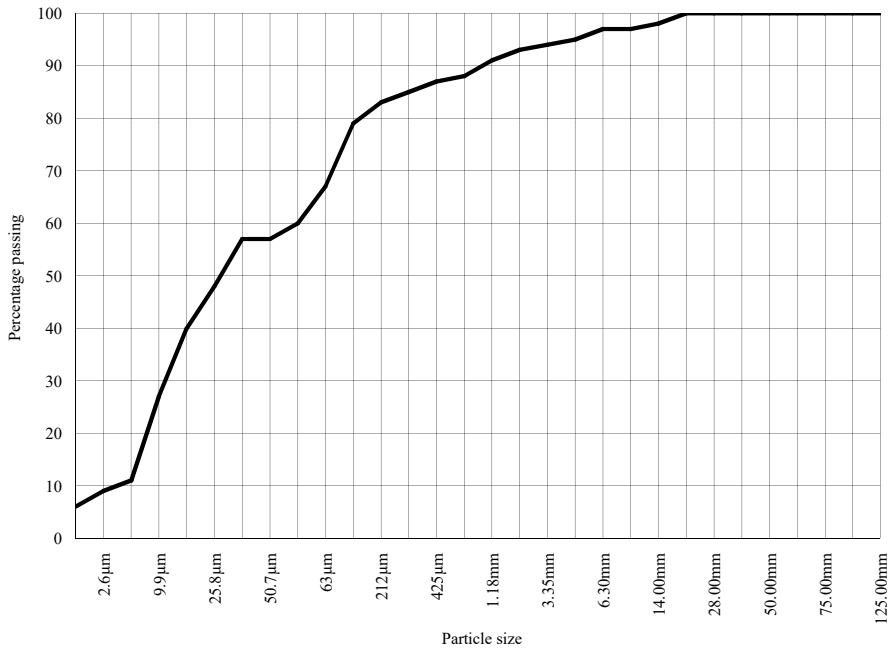
CERTIFICATE OF TEST - DETERMINATION OF PARTICLE SIZE DISTRIBUTION BY WET SIEVE & SEDIMENTATION (HYDROMETER METHOD) TESTED IN ACCORDANCE WITH BS 1377 : PART 2 : 1990 : CLAUSES 9.2 & 9.5

Laboratory reference no(s) :	**16-79208 - 310815** Head Office Certificate No : **310815-16-79208-S33B**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall Walliscote Grove Road, Weston-super-Mare,**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**In Situ**
Client reference/data :	**TPPH06**
Location of sample on site :	**0.90m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**13/12/2016**
Sampled by :	**AD**
Date received :	**20/12/2016**
Material description :	**MADE GROUND. Grey brown sand SILT**
Total mass received :	**15.58** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**Yes - See enclosed**
Client's indicated specification(s) :	**N/A**

Particle Size	Percentage passing
	Actual
125.00mm	**100**
90.00mm	**100**
75.00mm	**100**
63.00mm	**100**
50.00mm	**100**
37.50mm	**100**
28.00mm	**100**
20.00mm	**100**
14.00mm	**98**
10.00mm	**97**
6.30mm	**97**
5.00mm	**95**
3.35mm	**94**
2.00mm	**93**
1.18mm	**91**
600µm	**88**
425µm	**87**
300µm	**85**
212µm	**83**
150µm	**79**
63µm	**67**
60.2µm	**60**
50.7µm	**57**
35.9µm	**57**
25.8µm	**48**
18.6µm	**40**
9.9µm	**27**
5.1µm	**11**
2.6µm	**9**
1.5µm	**6**



Composition					
Particle size fraction (mm)	**Cobbles**	**Gravel**	**Sand**	**Silt**	**Clay**
	200.0 - 60.0	60.0 - 2.00	2.00 - 0.06	0.06 - 0.002	0.002
Particle Proportions	**0**	**7**	**26**	**60**	**7**

Remarks : **None**

[redacted]

Tested by : **DH/RC** Date tested : **06.01.2017** Approved by: Date : **11/01/2017**

Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
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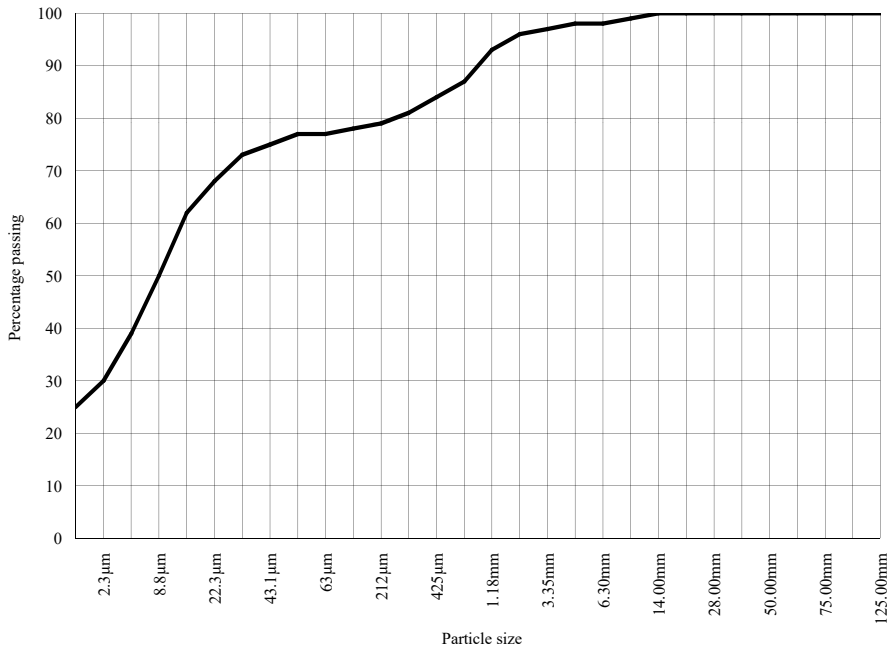
CERTIFICATE OF TEST - DETERMINATION OF PARTICLE SIZE DISTRIBUTION BY WET SIEVE & SEDIMENTATION (HYDROMETER METHOD) TESTED IN ACCORDANCE WITH BS 1377 : PART 2 : 1990 : CLAUSES 9.2 & 9.5

Laboratory reference no(s) :	**16-79208 - 310816** Head Office Certificate No : **310816-16-79208-S33B**
Client :	**North Somerset Council**
Certificate address :	**Accounts Payable Team, 1B/15 Town Hall Walliscote Grove Road, Weston-super-Mare,**
Contract :	**Portishead & Pill Station Car Parks**
Source of material (as indicated by client) :	**In Situ**
Client reference/data :	**TPPH06**
Location of sample on site :	**2.00m**
Borehole/pit no / depth	**N/A** @ **N/A** m
Date sampled :	**13/12/2016**
Sampled by :	**AD**
Date received :	**20/12/2016**
Material description :	**Grey brown clay SILT**
Total mass received :	**6.75** kg
Method of preparation :	**BS 1377 : Part 1 & Part 2**
Variation from test procedure :	**None**
Location & orientation of test specimen within original sample :	**N/A**
Sampling certificate :	**No - None submitted**
Client's indicated specification(s) :	**N/A**

Particle Size	Percentage passing
	Actual
125.00mm	**100**
90.00mm	**100**
75.00mm	**100**
63.00mm	**100**
50.00mm	**100**
37.50mm	**100**
28.00mm	**100**
20.00mm	**100**
14.00mm	**100**
10.00mm	**99**
6.30mm	**98**
5.00mm	**98**
3.35mm	**97**
2.00mm	**96**
1.18mm	**93**
600µm	**87**
425µm	**84**
300µm	**81**
212µm	**79**
150µm	**78**
63µm	**77**
51.1µm	**77**
43.1µm	**75**
30.8µm	**73**
22.3µm	**68**
16.2µm	**62**
8.8µm	**50**
4.6µm	**39**
2.3µm	**30**
1.4µm	**25**



Composition					
Particle size fraction (mm)	**Cobbles**	**Gravel**	**Sand**	**Silt**	**Clay**
	200.0 - 60.0	60.0 - 2.00	2.00 - 0.06	0.06 - 0.002	0.002
Particle Proportions	**0**	**4**	**19**	**49**	**28**

Remarks : **None**

Tested by : **DH/RC** Date tested : **11.01.2017** Approved by: Date : **11/01/2017**

Head Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Testing Limited
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Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset
BH16 6LE

Certificate of Analysis

Certificate Number : 16-06089-Issue 1-Page: 1

Report Fao:	GEO RESULTS
Site Address:	Portishead & Pill Station Car Parks
Client Order No:	16-79161
Date of Sampling:	12/12/2016
Date Received:	19/12/2016
Report Date:	13/01/2017

Please find your certificates of test attached for your samples received in the laboratory on 19/12/2016 under our laboratory reference 16-06089.

Remarks:

None

Results reviewed by:

[redacted]

David Redfern ***Technical Supervisor***

Test Certificates approved by:

[redacted]

Mark Rowley ***Laboratory Manager***

Any opinions or interpretations indicated are outside the scope of our UKAS accreditation.
This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.
Excel copies of reports are valid only when accompanied by this PDF certificate.
Client's Sample Description / ACS Material Description are noted for reference only.

ACSE Sample Number	**26572**	**26573**	**26574**
Sample ID	**310510 - 16-79161**	**310511 - 16-79161**	**310514 - 16-79161**
Clients Sample Ref.	**TPPH03**	**TPPH03**	**TPPH03**
Location / Sample Depth (m)	**0.30m**	**0.90m**	**2.70m**
Date Sampled	**12/12/2016**	**12/12/2016**	**12/12/2016**
Time Sampled			
Sample deviating codes	**g**		**g**
Client's Sample Description			
ACS Testing Material Description	**Dark grey gravelly S AND**	**Grey sandy GRAVEL**	**Bluish grey silty CL AY**
Principal Matrix (as received)	**GRAVEL**	**GRAVEL**	**CLAY**

Determination	Units	Method		Result	AS	Result	AS	Result	AS
Anions									
Water Soluble Chloride	mg/l	MT/ACSE/204	AD	< 3.00	*g	-----		**18.9**	*g
Water Soluble Nitrate	mg/l	MT/ACSE/204	AD	< 0.01	*g	-----		**0.82**	*g
Water Soluble Sulphate	mg/l	MT/ACSE/204	AD	**3.99**	*g	-----		**11.6**	*g
BS 1377									
Organic Matter	%	BS 1377	AR	-----		**3.17**		-----	
Metals (Soil)									
Magnesium	mg/kg	MT/ACSE/201	AD	**2760**		-----		**9190**	
TS Total Sulphur	%	MT/ACSE/201	AD	**0.082**		-----		**0.015**	
pH and Conductivity									
pH (2.5:1) (@ 20°C)	units	MT/ACSE/301	AD	**6.5**	*g	-----		**8.3**	*g
Sulphates									
Acid Soluble Sulphate	%SO4	NAM/ACSE/X34	AD	< 0.01		-----		< 0.01	

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
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ACSE Sample Number	**26575**	**26576**	**26577**
Sample ID	**310516 - 16-79161**	**310517 - 16-79161**	**310519 - 16-79161**
Clients Sample Ref.	**TPPH04**	**TPPH04**	**TPPH04**
Location / Sample Depth (m)	**1.60m**	**1.60m**	**2.10m**
Date Sampled	**12/12/2016**	**12/12/2016**	**12/12/2016**
Time Sampled			
Sample deviating codes	**g**		**g**
Client's Sample Description			
ACS Testing Material Description	**Grey mottled brown c layey SILT**	**Grey mottled brown c layey SILT**	**Bluish grey silty CL AY**
Principal Matrix (as received)	**CLAY**	**CLAY**	**CLAY**

Determination	Units	Method		Result	AS	Result	AS	Result	AS
Anions									
Water Soluble Chloride	mg/l	MT/ACSE/204	AD	**10.8**	*g	**-----**		**8.06**	*g
Water Soluble Nitrate	mg/l	MT/ACSE/204	AD	**0.90**	*g	**-----**		**0.22**	*g
Water Soluble Sulphate	mg/l	MT/ACSE/204	AD	**8.16**	*g	**-----**		**471**	*g
BS 1377									
Organic Matter	%	BS 1377	AR	**-----**		**0.40**		**-----**	
Metals (Soil)									
Magnesium	mg/kg	MT/ACSE/201	AD	**8530**		**-----**		**9540**	
TS Total Sulphur	%	MT/ACSE/201	AD	**0.017**		**-----**		**0.831**	
pH and Conductivity									
pH (2.5:1) (@ 20°C)	units	MT/ACSE/301	AD	**8.1**	*g	**-----**		**7.6**	*g
Sulphates									
Acid Soluble Sulphate	%SO4	NAM/ACSE/X34	AD	< 0.01		**-----**		< 0.01	

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
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ACSE Sample Number	**26578**	**26579**	**26580**
Sample ID	**310521 - 16-79161**	**310522 - 16-79161**	**310525 - 16-79161**
Clients Sample Ref.	**TPPH04**	**TPPH05**	**TPPH05**
Location / Sample Depth (m)	**2.60m**	**1.00m**	**2.60m**
Date Sampled	**12/12/2016**	**13/12/2016**	**13/12/2016**
Time Sampled			
Sample deviating codes		**g**	
Client's Sample Description			
ACS Testing Material Description	**Bluish grey silty CL AY**	**Greyish brown clayey sandy SILT**	**Brownish grey silty CLAY**
Principal Matrix (as received)	**CLAY**	**CLAY**	**CLAY**

Determination	Units	Method		Result	AS	Result	AS	Result	AS
Anions									
Water Soluble Chloride	mg/l	MT/ACSE/204	AD	-----		**7.12**	*g	-----	
Water Soluble Nitrate	mg/l	MT/ACSE/204	AD	-----		**0.27**	*g	-----	
Water Soluble Sulphate	mg/l	MT/ACSE/204	AD	-----		**14.9**	*g	-----	
BS 1377									
Organic Matter	%	BS 1377	AR	**1.04**		-----		**1.98**	
Metals (Soil)									
Magnesium	mg/kg	MT/ACSE/201	AD	-----		**7530**		-----	
TS Total Sulphur	%	MT/ACSE/201	AD	-----		**0.018**		-----	
pH and Conductivity									
pH (2.5:1) (@ 20°C)	units	MT/ACSE/301	AD	-----		**7.9**	*g	-----	
Sulphates									
Acid Soluble Sulphate	%SO4	NAM/ACSE/X34	AD	-----		< 0.01		-----	

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

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ACSE Sample Number	**26581**	**26582**	**26583**
Sample ID	**310527 - 16-79161**	**310528 - 16-79161**	**310529 - 16-79161**
Clients Sample Ref.	**TPPH06**	**TPPH06**	**TPPH06**
Location / Sample Depth (m)	**0.40m**	**0.90m**	**2.00m**
Date Sampled	**13/12/2016**	**13/12/2016**	**13/12/2016**
Time Sampled			
Sample deviating codes	**g**		**g**
Client's Sample Description			
ACS Testing Material Description	**Grey mottled brown c layey sandy SILT**	**Grey mottled brown c layey sandy SILT**	**Grey mottled brown c layey SILT**
Principal Matrix (as received)	**SILT**	**SILT**	**CLAY**

Determination	Units	Method		Result	AS	Result	AS	Result	AS
Anions									
Water Soluble Chloride	mg/l	MT/ACSE/204	AD	**12.0**	*g	-----		**109**	*g
Water Soluble Nitrate	mg/l	MT/ACSE/204	AD	**0.24**	*g	-----		**0.36**	*g
Water Soluble Sulphate	mg/l	MT/ACSE/204	AD	**53.9**	*g	-----		**225**	*g
BS 1377									
Organic Matter	%	BS 1377	AR	-----		**1.60**		-----	
Metals (Soil)									
Magnesium	mg/kg	MT/ACSE/201	AD	**3240**		-----		**9170**	
TS Total Sulphur	%	MT/ACSE/201	AD	**0.032**		-----		**0.032**	
pH and Conductivity									
pH (2.5:1) (@ 20°C)	units	MT/ACSE/301	AD	**7.8**	*g	-----		**8.7**	*g
Sulphates									
Acid Soluble Sulphate	%SO4	NAM/ACSE/X34	AD	< 0.01		-----		< 0.01	

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
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ACSE Sample Number	**26584**
Sample ID	**310531 - 16-79161**
Clients Sample Ref.	**TPPH06**
Location / Sample Depth (m)	**2.00m**
Date Sampled	**13/12/2016**
Time Sampled	
Sample deviating codes	
Client's Sample Description	
ACS Testing Material Description	**Grey mottled brown c layey SILT**
Principal Matrix (as received)	**CLAY**

Determination	Units	Method		Result AS
Anions				
Water Soluble Chloride	mg/l	MT/ACSE/204	AD	-----
Water Soluble Nitrate	mg/l	MT/ACSE/204	AD	-----
Water Soluble Sulphate	mg/l	MT/ACSE/204	AD	-----
BS 1377				
Organic Matter	%	BS 1377	AR	**0.92**
Metals (Soil)				
Magnesium	mg/kg	MT/ACSE/201	AD	-----
TS Total Sulphur	%	MT/ACSE/201	AD	-----
pH and Conductivity				
pH (2.5:1) (@ 20℃)	units	MT/ACSE/301	AD	-----
Sulphates				
Acid Soluble Sulphate	%SO4	NAM/ACSE/X34	AD	-----

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
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Wales No. 6000065

Technical Information for Analytical Results

Analysis

* - denotes analysis covered by our UKAS accreditation
# - denoted analysis covered by our MCERTS certification
AD = Sample tested in air dried condition.
AR = Sample tested in as-received condition.
D = Sample tested in dry condition.
L = Laboratory prepared leachate
SC = sub contracted

Where results are less than the limit of detection, the value of 0 is used in calculations.

Deviating Codes

Deviating Samples

The use of any of the following symbols indicates that the sample was deviating and it is possible therefore that the results provided may not be representative of the sample taken.

a – The date and/or time of sampling has not been provided, therefore it is not known if the time lapse between sampling and analysis has exceeded the acceptable holding time(s). It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
b – No sampling time given (waters only) unable to confirm if samples are within acceptable holding times.
c – This Test Item was received in an inappropriate container; it is possible that sample and/or analyte integrity has not been maintained and that the results are non-representative of the original sample taken.
d – On receipt, the temperature of the sample received was found to fall outside the recommendations of EN ISO 18512:2007 Soils & Granular Wastes.
e – The sample was received in a container that had been filled incorrectly which may have compromised sample and/or analyte integrity, rendering the results non-representative ofthe original sample taken.
f – The delay between Sampling and Sample Receipt is greater than the recommended holding time for the analyte of interest in this matrix. It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
g – The delay between Sampling and Analysis is greater than the recommended holding time for the analyte of interest in this matrix. It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.

The following Additional Deviating Sample Codes may also be used.

I/S – Insufficient sample mass/volume received for accurate quantification of this analyte.
U/S – The sample received was deemed unsuitable for accurate determination of this analyte using the Test Methods available.

Deviating Methods

Z – A minor deviation from the Test Method was necessary but this is deemed to have had no impact on the Test Result, the legitimacy of the method validation or the Accreditation Status of the Test Method.
Y – A significant deviation from the Test Method was necessary which is deemed to have had no impact on the Test Result, however, due to a lack of sufficient supporting validation, the Accreditation Status of the Method has been removed.
W – The normal LOD of the instrument/method could not be attained, thus an elevated LOD or LOQ has been applied to the Test Data, however, the data reported meets the requirements of the Client and does not affect compliance with the specification limit (where applicable).
V – One of the QA/QC parameters failed, however, the increased implied Uncertainty associated with the Test Result meets the requirements of the Client and does not affect compliance with the specification limit (where applicable) (Quality Manual, Section 18.2.9).
U – The precision acceptance criteria associated with the Test Method could not be met but the Test Result fulfils the Client's objectives and the elevated Uncertainty does not affect compliance with the specification limit (where applicable) (Quality Manual, Section 18.8.10).
T – The Test Method used was supplied by the Client and involved a simple modification of a Test Method for which ACSE holds accreditation (Quality Manual, Section 18.3.8).

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

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ACS Testing Ltd
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset
BH16 6LE

Certificate of Analysis

Certificate Number : 16-06100-Issue 1-Page: 1

Report Fao:	GEO RESULTS
Site Address:	Portishead & Pill Station Car Parks
Client Order No:	16-79208
Date of Sampling:	12/12/2016
Date Received:	20/12/2016
Report Date:	18/01/2017

Please find your certificates of test attached for your samples received in the laboratory on 20/12/2016 under our laboratory reference 16-06100.

Remarks:

None

Results reviewed by:

[redacted]

David Redfern ***Technical Supervisor***

Test Certificates approved by:

[redacted]

Mark Rowley ***Laboratory Manager***

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Client's Sample Description / ACS Material Description are noted for reference only.

ACSE Sample Number	**26610**	**26611**	**26612**
Sample ID	**310806 - 16-79208**	**310807 - 16-79208**	**310808 - 16-79208**
Clients Sample Ref.	**TPPH03**	**TPPH04**	**TPPH04**
Location / Sample Depth (m)	**0.30m**	**0.40m**	**1.10m**
Date Sampled	**12/12/2016**	**13/12/2016**	**13/12/2016**
Time Sampled			
Sample deviating codes	**fg**	**g**	**g**
Client's Sample Description			
ACS Testing Material Description	**MADE GROUND. Grey SA ND**	**MADE GROUND. Grey SA ND**	**MADE GROUND. Grey SA ND**
Principal Matrix (as received)	**SAND**	**SAND**	**SAND**

Determination	Units	Method		Result	AS	Result	AS	Result	AS
Anions									
Sulphate	mg/l	MT/ACSE/204	L	< 3.00	*	**43.7**	*	-----	
Water Soluble Sulphate	mg/l	MT/ACSE/204	AD	**4.61**	*g	**23.0**	*g	**28.6**	*g
BTEX									
Benzene	mg/kg	MT/ACSE/101	AR	**0.17**	*fg	-----		-----	
Ethylbenzene	mg/kg	MT/ACSE/101	AR	< 0.10	*fg	-----		-----	
m+p-xylene	mg/kg	MT/ACSE/101	AR	< 0.19	*fg	-----		-----	
o-xylene	mg/kg	MT/ACSE/101	AR	< 0.10	*fg	-----		-----	
Toluene	mg/kg	MT/ACSE/101	AR	< 0.10	*fg	-----		-----	
Total BTEX	mg/kg	MT/ACSE/101	AR	< 0.50	*fg	-----		-----	
Carbon									
TOC (Total Organic Carbon)	%	MT/ACSE/102	AR	**30.2**	*	-----		-----	
FOC	%	MT/ACSE/102	AR	**0.305**		**0.293**		**0.230**	
Loss on Ignition									
Loss on Ignition (440 ℃)	%	MT/ACSE/302	AD	**5.0**	*g	-----		-----	
Metals (Leachate)									
Arsenic	mg/l	MT/ACSE/205	L	< 0.003	*g	< 0.003	*g	-----	
Boron	mg/l	MT/ACSE/205	L	**0.056**		**0.075**		-----	
Cadmium	mg/l	MT/ACSE/205	L	< 0.0003	*g	< 0.0003	*g	-----	
Chromium	mg/l	MT/ACSE/205	L	< 0.001	*g	**0.001**	*g	-----	
Copper	mg/l	MT/ACSE/205	L	**0.008**	*g	**0.017**	*g	-----	
Mercury	mg/l	MT/ACSE/202	L	**0.0002**	*g	< 0.0001	*	-----	
Nickel	mg/l	MT/ACSE/205	L	**0.0011**	*g	**0.0060**	*g	-----	
Lead	mg/l	MT/ACSE/205	L	**0.005**	*g	< 0.004	*g	-----	
Zinc	mg/l	MT/ACSE/205	L	**0.014**	*g	**0.033**	*g	-----	
Metals (Soil)									
Arsenic	mg/kg	MT/ACSE/201	AD	**59.8**	*#	**54.0**	*#	**70.1**	*#
Cadmium	mg/kg	MT/ACSE/201	AD	**4.52**	*#	**5.46**	*#	**4.52**	*#
Chromium	mg/kg	MT/ACSE/201	AD	**34.2**	*#	**46.7**	*#	**32.9**	*#
Copper	mg/kg	MT/ACSE/201	AD	**146**	*#	**408**	*#	**302**	*#
Mercury	mg/kg	MT/ACSE/202	AD	**0.26**	*#g	**0.31**	*#g	**2.27**	*#g
Nickel	mg/kg	MT/ACSE/201	AD	**73.3**	*#	**85.0**	*#	**66.2**	*#
Lead	mg/kg	MT/ACSE/201	AD	**326**	*#	**183**	*#	**1970**	*#
Zinc	mg/kg	MT/ACSE/201	AD	**530**	*#	**532**	*#	**1460**	*#
Boron (Hot Water Soluble)	mg/kg	NAM/ACSE/X08	AD	**0.14**		**1.62**		**0.51**	
Organic Matter									
Soil Organic Matter	%	NAM/ACSE/X29	AD	**1.4**		**2.5**		**2.6**	
Petroleum Hydrocarbons									
Total TPH (C10-C40)	mg/kg	MT/ACSE/105	AR	**114**	*#fg	**114**	*#g	**72.4**	*#g
pH and Conductivity									
pH (@ 20℃)	units	MT/ACSE/301	L	**7.9**	*	**7.7**	*	-----	
pH (@ 20℃)	units	MT/ACSE/301	AD	**6.9**	*fg	**6.5**	*g	**6.6**	*g
Phenols									
Total Phenol (Sum of 4 specific phenols)	mg/kg	MT/ACSE/107	AD	< 0.05		< 0.05		< 0.05	

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

Quality Testing & Materials Consultancy to the Construction Industry

ACSE Sample Number	**26610**	**26611**	**26612**
Sample ID	**310806 - 16-79208**	**310807 - 16-79208**	**310808 - 16-79208**
Clients Sample Ref.	**TPPH03**	**TPPH04**	**TPPH04**
Location / Sample Depth (m)	**0.30m**	**0.40m**	**1.10m**
Date Sampled	**12/12/2016**	**13/12/2016**	**13/12/2016**
Time Sampled			
Sample deviating codes	**fg**	**g**	**g**
Client's Sample Description			
ACS Testing Material Description	**MADE GROUND. Grey SA ND**	**MADE GROUND. Grey SA ND**	**MADE GROUND. Grey SA ND**
Principal Matrix (as received)	**SAND**	**SAND**	**SAND**

Determination	Units	Method		Result	AS	Result	AS	Result	AS
Poly Aromatic Hydrocarbons									
Naphthalene	mg/kg	MT/ACSE/106	AD	**0.76**	*#g	**0.64**	*#g	**1.03**	*#g
Acenaphthylene	mg/kg	MT/ACSE/106	AD	**1.06**	*#g	**0.53**	*#g	**0.49**	*#g
Acenaphthene	mg/kg	MT/ACSE/106	AD	**0.16**	*#g	**0.12**	*#g	**0.25**	*#g
Fluorene	mg/kg	MT/ACSE/106	AD	**0.43**	*#g	**0.29**	*#g	**0.51**	*#g
Phenanthrene	mg/kg	MT/ACSE/106	AD	**1.94**	*#g	**1.85**	*#g	**2.53**	*#g
Anthracene	mg/kg	MT/ACSE/106	AD	**4.10**	*#g	**2.44**	*#g	**2.44**	*#g
Fluoranthene	mg/kg	MT/ACSE/106	AD	**5.71**	*#g	**3.17**	*#g	**4.01**	*#g
Pyrene	mg/kg	MT/ACSE/106	AD	**5.86**	*#g	**3.12**	*#g	**3.73**	*#g
Benzo (a) anthracene	mg/kg	MT/ACSE/106	AD	**1.74**	*#g	**1.34**	*#g	**1.70**	*#g
Chrysene	mg/kg	MT/ACSE/106	AD	**2.44**	*#g	**2.17**	*#g	**2.62**	*#g
Benzo (b) fluoranthene	mg/kg	MT/ACSE/106	AD	**2.99**	*#g	**2.85**	*#g	**3.36**	*#g
Benzo (k) fluoranthene	mg/kg	MT/ACSE/106	AD	**1.00**	*#g	**0.94**	*#g	**0.95**	*#g
Benzo (a) pyrene	mg/kg	MT/ACSE/106	AD	**1.55**	*#g	**1.07**	*#g	**1.85**	*#g
Indeno (1 2 3-CD) pyrene	mg/kg	MT/ACSE/106	AD	**1.08**	*#g	**1.09**	*#g	**1.39**	*#g
Dibenzo(a h)anthracene	mg/kg	MT/ACSE/106	AD	**0.46**	*#g	**0.42**	*#g	**0.47**	*#g
Benzo(g h i)perylene	mg/kg	MT/ACSE/106	AD	**1.25**	*#g	**1.36**	*#g	**1.49**	*#g
Total PAH	mg/kg	MT/ACSE/106	AD	**32.5**	*#g	**23.4**	*#g	**28.8**	*#g
Polychlorinated Biphenyls (PCBs)									
PCB (7 Congeners)	mg/kg	MT/ACSE/104	AD	< 1.00		**-----**		**-----**	
Subcontracted Analysis									
Total Cyanide	mg/kg	SC	SC	**Attached**		**Attached**		**Attached**	
Asbestos Fibre ID	SC	SC	SC	**Attached**		**Attached**		**Attached**	
Total Cyanide	mg/l	SC	L	**Attached**		**Attached**		**-----**	
Waters and Leachates									
Ammoniacal Nitrogen	mg/l	MT/ACSE/203	L	**0.04**	*	**0.03**	*	**-----**	

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

Quality Testing & Materials Consultancy to the Construction Industry

ACSE Sample Number	**26613**	**26614**
Sample ID	**310809 - 16-79208**	**310810 - 16-79208**
Clients Sample Ref.	**TPPH05**	**TPPH06**
Location / Sample Depth (m)	**0.30m**	**0.90m**
Date Sampled	**12/12/2016**	**12/12/2016**
Time Sampled		
Sample deviating codes	**fg**	**fg**
Client's Sample Description		
ACS Testing Material Description	**TOPSOIL. Grey brown SILT**	**MADE GROUND. Grey br own sand SILT**
Principal Matrix (as received)	**LOAM**	**SILT**

Determination	Units	Method		Result	AS	Result	AS
Anions							
Sulphate	mg/l	MT/ACSE/204	L	-----		**14.2**	*
Water Soluble Sulphate	mg/l	MT/ACSE/204	AD	**15.1**	*g	**118**	*g
BTEX							
Benzene	mg/kg	MT/ACSE/101	AR	-----		**0.23**	*fg
Ethylbenzene	mg/kg	MT/ACSE/101	AR	-----		< 0.10	*fg
m+p-xylene	mg/kg	MT/ACSE/101	AR	-----		< 0.19	*fg
o-xylene	mg/kg	MT/ACSE/101	AR	-----		< 0.10	*fg
Toluene	mg/kg	MT/ACSE/101	AR	-----		< 0.10	*fg
Total BTEX	mg/kg	MT/ACSE/101	AR	-----		< 0.50	*fg
Carbon							
TOC (Total Organic Carbon)	%	MT/ACSE/102	AR	-----		**3.17**	*
FOC	%	MT/ACSE/102	AR	**0.0511**		**0.0320**	
Loss on Ignition							
Loss on Ignition (440 ℃)	%	MT/ACSE/302	AD	-----		**2.0**	*g
Metals (Leachate)							
Arsenic	mg/l	MT/ACSE/205	L	-----		**0.007**	*g
Boron	mg/l	MT/ACSE/205	L	-----		**0.142**	
Cadmium	mg/l	MT/ACSE/205	L	-----		< 0.0003	*g
Chromium	mg/l	MT/ACSE/205	L	-----		**0.002**	*g
Copper	mg/l	MT/ACSE/205	L	-----		**0.005**	*g
Mercury	mg/l	MT/ACSE/202	L	-----		**0.0002**	*g
Nickel	mg/l	MT/ACSE/205	L	-----		< 0.0003	*g
Lead	mg/l	MT/ACSE/205	L	-----		< 0.004	*g
Zinc	mg/l	MT/ACSE/205	L	-----		**0.007**	*g
Metals (Soil)							
Arsenic	mg/kg	MT/ACSE/201	AD	**51.3**	*#	**52.4**	*#
Cadmium	mg/kg	MT/ACSE/201	AD	**2.07**	*#	**0.69**	*#
Chromium	mg/kg	MT/ACSE/201	AD	**53.6**	*#	**25.9**	*#
Copper	mg/kg	MT/ACSE/201	AD	**38.7**	*#	**30.6**	*#
Mercury	mg/kg	MT/ACSE/202	AD	**0.17**	*#g	**0.29**	*g
Nickel	mg/kg	MT/ACSE/201	AD	**37.5**	*#	**34.8**	*#
Lead	mg/kg	MT/ACSE/201	AD	**132**	*#	**18.3**	*#
Zinc	mg/kg	MT/ACSE/201	AD	**236**	*#	**52.1**	*#
Boron (Hot Water Soluble)	mg/kg	NAM/ACSE/X08	AD	**0.46**		**0.54**	
Organic Matter							
Soil Organic Matter	%	NAM/ACSE/X29	AD	**3.0**		**1.7**	
Petroleum Hydrocarbons							
Total TPH (C10-C40)	mg/kg	MT/ACSE/105	AR	< 50.0	*#fg	< 50.0	*#fg
pH and Conductivity							
pH (@ 20℃)	units	MT/ACSE/301	L	-----		**7.8**	*
pH (@ 20℃)	units	MT/ACSE/301	AD	**6.6**	*fg	**6.9**	*fg

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

Quality Testing & Materials Consultancy to the Construction Industry

ACSE Sample Number	**26613**	**26614**
Sample ID	**310809 - 16-79208**	**310810 - 16-79208**
Clients Sample Ref.	**TPPH05**	**TPPH06**
Location / Sample Depth (m)	**0.30m**	**0.90m**
Date Sampled	**12/12/2016**	**12/12/2016**
Time Sampled		
Sample deviating codes	**fg**	**fg**
Client's Sample Description		
ACS Testing Material Description	**TOPSOIL. Grey brown SILT**	**MADE GROUND. Grey br own sand SILT**
Principal Matrix (as received)	**LOAM**	**SILT**

Determination	Units	Method		Result	AS	Result	AS
Phenols							
Total Phenol (Sum of 4 specific phenols)	mg/kg	MT/ACSE/107	AD	< 0.05		< 0.05	
Poly Aromatic Hydrocarbons							
Naphthalene	mg/kg	MT/ACSE/106	AD	**0.19**	*#g	**0.24**	*#g
Acenaphthylene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Acenaphthene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Fluorene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Phenanthrene	mg/kg	MT/ACSE/106	AD	**0.28**	*#g	**0.14**	*#g
Anthracene	mg/kg	MT/ACSE/106	AD	**0.15**	*#g	< 0.10	*#g
Fluoranthene	mg/kg	MT/ACSE/106	AD	**0.20**	*#g	< 0.10	*#g
Pyrene	mg/kg	MT/ACSE/106	AD	**0.16**	*#g	< 0.10	*#g
Benzo (a) anthracene	mg/kg	MT/ACSE/106	AD	**0.10**	*#g	< 0.10	*#g
Chrysene	mg/kg	MT/ACSE/106	AD	**0.13**	*#g	< 0.10	*#g
Benzo (b) fluoranthene	mg/kg	MT/ACSE/106	AD	**0.17**	*#g	< 0.10	*#g
Benzo (k) fluoranthene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Benzo (a) pyrene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Indeno (1 2 3-CD) pyrene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Dibenzo(a h)anthracene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Benzo(g h i)perylene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Total PAH	mg/kg	MT/ACSE/106	AD	< 2.00	*#g	< 2.00	*#g
Polychlorinated Biphenyls (PCBs)							
PCB (7 Congeners)	mg/kg	MT/ACSE/104	AD	-----		< 1.00	
Subcontracted Analysis							
Total Cyanide	mg/kg	SC	SC	**Attached**		**Attached**	
Asbestos Fibre ID	SC	SC	SC	**Attached**		**Attached**	
Total Cyanide	mg/l	SC	L	-----		**Attached**	
Waters and Leachates							
Ammoniacal Nitrogen	mg/l	MT/ACSE/203	L	-----		< 0.02	*

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
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Wales No. 6000065

Quality Testing & Materials Consultancy to the Construction Industry

Technical Information for Analytical Results

Analysis

* - denotes analysis covered by our UKAS accreditation
# - denoted analysis covered by our MCERTS certification
AD = Sample tested in air dried condition.
AR = Sample tested in as-received condition.
D = Sample tested in dry condition.
L = Laboratory prepared leachate
SC = sub contracted

Where results are less than the limit of detection, the value of 0 is used in calculations.

Deviating Codes

Deviating Samples

The use of any of the following symbols indicates that the sample was deviating and it is possible therefore that the results provided may not be representative of the sample taken.

a – The date and/or time of sampling has not been provided, therefore it is not known if the time lapse between sampling and analysis has exceeded the acceptable holding time(s). It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
b – No sampling time given (waters only) unable to confirm if samples are within acceptable holding times.
c – This Test Item was received in an inappropriate container; it is possible that sample and/or analyte integrity has not been maintained and that the results are non-representative of the original sample taken.
d – On receipt, the temperature of the sample received was found to fall outside the recommendations of EN ISO 18512:2007 Soils & Granular Wastes.
e – The sample was received in a container that had been filled incorrectly which may have compromised sample and/or analyte integrity, rendering the results non-representative ofthe original sample taken.
f – The delay between Sampling and Sample Receipt is greater than the recommended holding time for the analyte of interest in this matrix. It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
g – The delay between Sampling and Analysis is greater than the recommended holding time for the analyte of interest in this matrix. It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.

The following Additional Deviating Sample Codes may also be used.

I/S – Insufficient sample mass/volume received for accurate quantification of this analyte.
U/S – The sample received was deemed unsuitable for accurate determination of this analyte using the Test Methods available.

Deviating Methods

Z – A minor deviation from the Test Method was necessary but this is deemed to have had no impact on the Test Result, the legitimacy of the method validation or the Accreditation Status of the Test Method.
Y – A significant deviation from the Test Method was necessary which is deemed to have had no impact on the Test Result, however, due to a lack of sufficient supporting validation, the Accreditation Status of the Method has been removed.
W – The normal LOD of the instrument/method could not be attained, thus an elevated LOD or LOQ has been applied to the Test Data, however, the data reported meets the requirements of the Client and does not affect compliance with the specification limit (where applicable).
V – One of the QA/QC parameters failed, however, the increased implied Uncertainty associated with the Test Result meets the requirements of the Client and does not affect compliance with the specification limit (where applicable) (Quality Manual, Section 18.2.9).
U – The precision acceptance criteria associated with the Test Method could not be met but the Test Result fulfils the Client's objectives and the elevated Uncertainty does not affect compliance with the specification limit (where applicable) (Quality Manual, Section 18.8.10).
T – The Test Method used was supplied by the Client and involved a simple modification of a Test Method for which ACSE holds accreditation (Quality Manual, Section 18.3.8).

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
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Poole
Dorset BH16 6LE
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Wales No. 6000065

Quality Testing & Materials Consultancy to the Construction Industry

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 17-88216

11-Jan-17

Client	ACS Environmental Unit 14b Blackhill Road West Holton Heath Trading Park Poole Dorset BH16 6LE
Our Reference	17-88216
Client Reference	(not supplied)
Order No	E/16-06100/1222
Contract Title	E/16-06100/1222
Description	3 Water samples.
Date Received	09-Jan-17
Date Started	09-Jan-17
Date Completed	11-Jan-17
Test Procedures	Identified by prefix DETSn (details on request).
Notes	Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By [redacted]

Rob Brown
Business Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Water Samples

Our Ref 17-88216
Client Ref
Contract Title E/16-06100/1222

			Lab No	1107571	1107572	1107573
			Sample ID	26610	26611	26614
			Depth			
			Other ID			
			Sample Type	WATER	WATER	WATER
			Sampling Date	n/s	n/s	n/s
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Inorganics						
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40

Key: n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 17-88216
Client Ref
Contract E/16-06100/1222

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1107571	26610 WATER		PB 1L	Sample date+time not supplied, Cyanide/Mono pHoh (7 days)	
1107572	26611 WATER		PB 1L	Sample date+time not supplied, Cyanide/Mono pHoh (7 days)	
1107573	26614 WATER		PB 1L	Sample date+time not supplied, Cyanide/Mono pHoh (7 days)	

Key: P-Plastic B-Bottle

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

Disposal

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

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

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 16-87661

06-Jan-17

Client	ACS Environmental Unit 14b Blackhill Road West Holton Heath Trading Park Poole Dorset BH16 6LE
Our Reference	16-87661
Client Reference	(not supplied)
Order No	E/16-06100/1222
Contract Title	(not supplied)
Description	5 Misc samples.
Date Received	23-Dec-16
Date Started	23-Dec-16
Date Completed	06-Jan-17
Test Procedures	Identified by prefix DETSn (details on request).
Notes	Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By [redacted]

Rob Brown
Business Manager

UKAS TESTING
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Summary of Chemical Analysis
Misc Samples

Our Ref 16-87661
Client Ref
Contract Title

	Lab No	1105079	1105080	1105081	1105082	1105083
	Sample ID	26610	26611	26612	26613	26614
	Depth					
	Other ID					
	Sample Type	MISC	MISC	MISC	MISC	MISC
	Sampling Date	12/12/16	13/12/16	13/12/16	12/12/16	12/12/16
	Sampling Time	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Inorganics						
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

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

Information in Support of the Analytical Results

Our Ref 16-87661
Client Ref
Contract

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1105079	26610 MISC	12/12/16	PG		
1105080	26611 MISC	13/12/16	PG		
1105081	26612 MISC	13/12/16	PG		
1105082	26613 MISC	12/12/16	PG		
1105083	26614 MISC	12/12/16	PG		

Key: P-Plastic G-Bag

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

Soil Analysis Notes

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

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

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

Disposal

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

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

ENVIROCHEM
Analytical Laboratories Ltd.
12 The Gardens
Broadcut, Fareham
Hampshire
PO16 8SS

1227
Tel: (01329) 287777
Fax: (01329) 287755
www.envirochem.co.uk
office@envirochem.co.uk

Our Ref: J113204 Rev. 2 FI: 5
Your Ref: E/16-06100/1221
Date: 03/01/2017

Asbestos Fibre Identification Report

Client: ACS Environmental Testing Ltd
Unit 14B Blackhill Road West, Holton Heath Trading Park, Poole, Dorset, BH16 6LE

Site Address: 26610, 26611, 26612, 26613, 26614,

Sampled By: ACS Environmental Testing Ltd

Date sampled/received: 23rd December 2016

Date analysed: 29th December 2016

Analyst/s: Ewelina Kowalczyk Pariyar

Analysis Location: 12 The Gardens, Broadcut, Fareham, Hampshire, PO16 8SS

ANALYTICAL PROCEDURE

Fibre identification was carried out in accordance with the documented `in-house' methods based on the HSE Guidance Note HSG 248. These employed stereo microscopy, polarized microscopy and dispersion staining techniques.

RESULTS

Sample No.	Sample Ref.	Location	Asbestos Detected	Asbestos Type
26610	BS399026	Sand	No	
26611	BS399027	Sand	No	
26612	BS399028	Sand	No	
26613	BS399029	Loam	No	

NOTES:
1. Sample(s) were examined for the presence of 6 types of asbestos fibres: crocidolite (blue), amosite (brown), chrysotile (white), anthophyllite, actinolite and tremolite.
2. Samples collected by the client are evaluated using information provided by the client. For samples collected by the client the date of receipt is deemed to be the same as the date sampled.
3. Envirochem is a UKAS accredited laboratory for sampling and identification of asbestos containing materials.
4. Comments, observations and opinions are outside the scope of UKAS accreditation.
5. The analytical method in the HSG248 does not quantify the amount of asbestos present, therefore UKAS accreditation does not permit quantification.
6. If, during fibre identification, only 1 or 2 fibres are seen and identified as asbestos, then the term 'trace asbestos identified' is used.

SIGNATURE: [redacted] Authorised signatory PRINT NAME: Mathew Griffiths

ENVIROCHEM
Analytical Laboratories Ltd.
12 The Gardens
Broadcut, Fareham
Hampshire
PO16 8SS

1227
Tel: (01329) 287777
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Our Ref: J113204 Rev. 2 FI: 5
Your Ref: E/16-06100/1221
Date: 03/01/2017

Asbestos Fibre Identification Report

Client:	ACS Environmental Testing Ltd Unit 14B Blackhill Road West, Holton Heath Trading Park, Poole, Dorset, BH16 6LE
Site Address:	26610, 26611, 26612, 26613, 26614,
Sampled By:	ACS Environmental Testing Ltd
Date sampled/received:	23rd December 2016
Date analysed:	29th December 2016
Analyst/s:	Ewelina Kowalczyk Pariyar
Analysis Location:	12 The Gardens, Broadcut, Fareham, Hampshire, PO16 8SS

ANALYTICAL PROCEDURE

Fibre identification was carried out in accordance with the documented `in-house' methods based on the HSE Guidance Note HSG 248. These employed stereo microscopy, polarized microscopy and dispersion staining techniques.

RESULTS

Sample No.	Sample Ref.	Location	Asbestos Detected	Asbestos Type
26614	BS399030	Silt	No	

NOTES:
1. Sample(s) were examined for the presence of 6 types of asbestos fibres: crocidolite (blue), amosite (brown), chrysotile (white), anthophyllite, actinolite and tremolite.
2. Samples collected by the client are evaluated using information provided by the client. For samples collected by the client the date of receipt is deemed to be the same as the date sampled.
3. Envirochem is a UKAS accredited laboratory for sampling and identification of asbestos containing materials.
4. Comments, observations and opinions are outside the scope of UKAS accreditation.
5. The analytical method in the HSG248 does not quantify the amount of asbestos present, therefore UKAS accreditation does not permit quantification.
6. If, during fibre identification, only 1 or 2 fibres are seen and identified as asbestos, then the term 'trace asbestos identified' is used.

SIGNATURE: [redacted] Authorised signatory PRINT NAME: Mathew Griffiths

ACS Testing Ltd
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset
BH16 6LE

Certificate of Analysis
Landfill Waste Acceptance Criteria (WAC)

Certificate Number : 16-06100-Issue 1-Page: 1

Report Fao:	GEO RESULTS
Site Address:	Portishead & Pill Station Car Parks
Customer Order No:	16-79208
Date of Sampling:	12/12/2016
Date Received:	20/12/2016
Report Date:	18/01/2017

Please find your certificates of test attached for your samples received in the laboratory on 20/12/2016 under our laboratory reference 16-06100.

Remarks:

None

Results reviewed by:

[redacted]

David Redfern *Technical Supervisor*

Results approved by:

[redacted]

Mark Rowley *Laboratory Manager*

Any opinions or interpretations indicated are outside the scope of our UKAS accreditation.
This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.
Excel copies of reports are valid only when accompanied by this PDF certificate.
Client's Sample Description / ACS Material Description are noted for reference only.

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680

Fax 01202 628642

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

Quality Testing & Materials Consultancy to the Construction Industry

4150

Certificate No. 16-06100-Issue 1-Page: 2

Site Address Portishead & Pill Station Car Parks

ACSE Sample Number	26610
Sample ID	310806 - 16-79208
Clients Sample Ref.	TPPH03
Location / Sample Depth (m)	0.30m
Time Sampled	
Date Sampled	12/12/2016
Sample Deviating Codes	fg
Client's Sample Description	
ACS Testing Material Description	MADE GROUND. Grey SAND
Principal Matrix (as received)	SAND

LANDFILL WASTE ACCEPTANCE CRITERIA (WAC)

TEST VALUES

Mass of Undried Test Portion (Mw)	175	g	Volume of Leachant Used (L2)	0.350	litres
Mass of Dried Test Portion (Mp)	175	g	Volume of Leachant Used (L8)	1.400	litres
Moisture Content Ratio (MC)	0.0	%	Volume of Eluate (VE1)	0.270	litres
Dry Matter Content (DR)	100	%	Volume of Eluate (VE2)	1.372	litres

SOLIDS ANALYSIS

Analyte	Method	AS	Sample Condition for Analysis	**Results**	LANDFILL WASTE ACCEPTANCE CRITERIA SPECIFICATION		
					Inert Waste	Stable non-reactive hazardous waste in non-hazardous landfill	Hazardous waste
Total Organic Carbon (%)	MT/ACSE/102	*	As received	**30.2**	3 %	5 %	6 %
Loss on ignition (%)	MT/ACSE/302	*g	Air dried at 30°C	**5.0**	---	---	10 %
BTEX (mg/kg)	MT/ACSE/101	*fg	As received	**< 0.50**	6	---	---
PCBs (7 congeners) (mg/kg)	MT/ACSE/104		Air dried at 30°C	**< 1.00**	1	---	---
Mineral oil (C10 - C40) (mg/kg)	MT/ACSE/105	*#fg	As received	**114**	500	---	---
PAHs (mg/kg)	MT/ACSE/106	*#g	Air dried at 30°C	**32.5**	100	---	---
pH (units)	MT/ACSE/301	*fg	Air dried at 30°C	**6.9**	---	>6	---

ELUATE ANALYSIS

Analyte	Method	AS	Concentration in Eluate (mg/l)		Amount Leached (mg/kg)		LANDFILL WASTE ACCEPTANCE CRITERIA SPECIFICATION		
							BS EN 12457-3:2002 LIMIT VALUES (mg/kg) at L/S 10		
Eluate Preparation	LP/ACSE/102	*					Inert Waste	Stable non-reactive hazardous waste in non-hazardous landfill	Hazardous waste
Liquid : Solid Ratio (L/S)	LP/ACSE/101	*	**L/S 2**	**L/S 8**	**L/S 2**	**L/S 10**			
pH (units)	MT/ACSE/301	*	8.0	8.4					
Temperature (°C)	MT/ACSE/301		20	20					
Conductivity (mS/m)	MT/ACSE/303	*	17.6	8.32					
Arsenic	MT/ACSE/205	*	0.012	0.012	0.024	**0.120**	0.5	2	25
Barium	MT/ACSE/205	*	0.288	0.0658	0.575	**1.00**	20	100	300
Cadmium	MT/ACSE/205	*	< 0.0003	< 0.0003	< 0.0006	**< 0.003**	0.04	1	5
Chromium (total)	MT/ACSE/205	*	0.003	0.002	0.007	**0.022**	0.5	10	70
Copper	MT/ACSE/205	*	0.014	0.006	0.028	**0.076**	2	50	100
Mercury	MT/ACSE/202	*	0.0002	0.0002	0.0004	**0.0018**	0.01	0.2	2
Molybdenum	MT/ACSE/205	*	0.0040	0.0033	0.008	**0.034**	0.5	10	30
Nickel	MT/ACSE/205	*	0.0046	0.0014	0.009	**0.019**	0.4	10	40
Lead	MT/ACSE/205	*	0.006	< 0.004	0.011	**< 0.040**	0.5	10	50
Antimony	MT/ACSE/205	*	0.031	0.016	0.063	**0.180**	0.06	0.7	5
Selenium	MT/ACSE/205	*	< 0.006	< 0.006	< 0.012	**< 0.060**	0.1	0.5	7
Zinc	MT/ACSE/205	*	0.026	0.017	0.053	**0.189**	4	50	200
Chloride	MT/ACSE/204	*	< 3.00	< 3.00	< 6.00	**< 30.0**	800	15000	25000
Fluoride	MT/ACSE/204	*	0.53	0.26	1.06	**3.02**	10	150	500
Sulphate	MT/ACSE/204	*	8.38	< 3.00	16.8	**< 30.00**	1000	20000	50000
Total dissolved solids	MT/ACSE/304	*	145	60	290	**731.1**	4000	60000	100000
Phenol index	MT/ACSE/107	*	< 0.05	< 0.05	< 0.100	**< 0.50**	1	---	---
Dissolved organic carbon	MT/ACSE/103	*	14.2	3.91	28.4	**55.0**	500	800	1000

Comments: (comments are beyond the scope of UKAS accreditation)

Denotes individual sample results which exceed the landfill waste acceptance criteria for Inert Waste

The landfill waste acceptance criteria limits are provided for guidance only.
Eluates prepared in accordance with BS EN 12457-3:2002*

Certificate No. 16-06100-Issue 1-Page: 3

Site Address Portishead & Pill Station Car Parks

ACSE Sample Number	26614
Sample ID	310810 - 16-79208
Clients Sample Ref.	TPPH06
Location / Sample Depth (m)	0.90m
Time Sampled	
Date Sampled	12/12/2016
Sample Deviating Codes	fg
Client's Sample Description	
ACS Testing Material Description	MADE GROUND. Grey brown sand SILT
Principal Matrix (as received)	SILT

LANDFILL WASTE ACCEPTANCE CRITERIA (WAC)

TEST VALUES

Mass of Undried Test Portion (Mw)	175	g	Volume of Leachant Used (L2)	0.350	litres
Mass of Dried Test Portion (Mp)	175	g	Volume of Leachant Used (L8)	1.400	litres
Moisture Content Ratio (MC)	0.0	%	Volume of Eluate (VE1)	0.283	litres
Dry Matter Content (DR)	100	%	Volume of Eluate (VE2)	1.358	litres

SOLIDS ANALYSIS

Analyte	Method	AS	Sample Condition for Analysis	**Results**	LANDFILL WASTE ACCEPTANCE CRITERIA SPECIFICATION		
					Inert Waste	Stable non-reactive hazardous waste in non-hazardous landfill	Hazardous waste
Total Organic Carbon (%)	MT/ACSE/102	*	As received	**3.17**	3 %	5 %	6 %
Loss on ignition (%)	MT/ACSE/302	*g	Air dried at 30°C	**2.0**	---	---	10 %
BTEX (mg/kg)	MT/ACSE/101	*fg	As received	**< 0.50**	6	---	---
PCBs (7 congeners) (mg/kg)	MT/ACSE/104		Air dried at 30°C	**< 1.00**	1	---	---
Mineral oil (C10 - C40) (mg/kg)	MT/ACSE/105	*#fg	As received	**< 50.0**	500	---	---
PAHs (mg/kg)	MT/ACSE/106	*#g	Air dried at 30°C	**< 2.00**	100	---	---
pH (units)	MT/ACSE/301	*fg	Air dried at 30°C	**6.9**	---	>6	---

ELUATE ANALYSIS

Analyte	Method	AS	Concentration in Eluate (mg/l)		Amount Leached (mg/kg)		LANDFILL WASTE ACCEPTANCE CRITERIA SPECIFICATION		
							BS EN 12457-3:2002 LIMIT VALUES (mg/kg) at L/S 10		
Eluate Preparation	LP/ACSE/102	*					Inert Waste	Stable non-reactive hazardous waste in non-hazardous landfill	Hazardous waste
Liquid : Solid Ratio (L/S)	LP/ACSE/101	*	**L/S 2**	**L/S 8**	**L/S 2**	**L/S 10**			
pH (units)	MT/ACSE/301	*	7.9	8.5					
Temperature (°C)	MT/ACSE/301		20	20					
Conductivity (mS/m)	MT/ACSE/303	*	32.3	9.52					
Arsenic	MT/ACSE/205	*	0.003	0.020	0.007	**0.169**	0.5	2	25
Barium	MT/ACSE/205	*	0.273	0.0660	0.546	**0.995**	20	100	300
Cadmium	MT/ACSE/205	*	< 0.0003	< 0.0003	< 0.0006	**< 0.003**	0.04	1	5
Chromium (total)	MT/ACSE/205	*	0.006	0.002	0.011	**0.025**	0.5	10	70
Copper	MT/ACSE/205	*	0.006	0.004	0.011	**0.041**	2	50	100
Mercury	MT/ACSE/202	*	0.0002	0.0001	0.0004	**0.0013**	0.01	0.2	2
Molybdenum	MT/ACSE/205	*	0.123	0.0199	0.245	**0.365**	0.5	10	30
Nickel	MT/ACSE/205	*	0.0018	0.0011	0.004	**0.012**	0.4	10	40
Lead	MT/ACSE/205	*	< 0.004	< 0.004	< 0.008	**< 0.040**	0.5	10	50
Antimony	MT/ACSE/205	*	0.009	< 0.003	0.017	**< 0.030**	0.06	0.7	5
Selenium	MT/ACSE/205	*	0.023	< 0.006	0.046	**< 0.060**	0.1	0.5	7
Zinc	MT/ACSE/205	*	0.008	0.005	0.016	**0.059**	4	50	200
Chloride	MT/ACSE/204	*	6.05	< 3.00	12.1	**< 30.0**	800	15000	25000
Fluoride	MT/ACSE/204	*	1.14	0.91	2.28	**9.48**	10	150	500
Sulphate	MT/ACSE/204	*	70.7	7.44	141	**176.7**	1000	20000	50000
Total dissolved solids	MT/ACSE/304	*	255	75	510	**1041**	4000	60000	100000
Phenol index	MT/ACSE/107	*	< 0.05	< 0.05	< 0.100	**< 0.50**	1	---	---
Dissolved organic carbon	MT/ACSE/103	*	8.06	2.62	16.1	**35.0**	500	800	1000

Comments: (comments are beyond the scope of UKAS accreditation)

Denotes individual sample results which exceed the landfill waste acceptance criteria for Inert Waste

The landfill waste acceptance criteria limits are provided for guidance only.
Eluates prepared in accordance with BS EN 12457-3:2002*

Technical Information for Analytical Results

Analysis

* - denotes analysis covered by our UKAS accreditation
# - denoted analysis covered by our MCERTS certification
AD = Sample tested in air dried condition.
AR = Sample tested in as-received condition.
D = Sample tested in dry condition.
L = Laboratory prepared leachate
SC = sub contracted

Where results are less than the limit of detection, the value of 0 is used in calculations.

For Phenol index, m- and p- cresol are reported as mixed isomers, calibrated with reference to a p-cresol reference solution.
The individual concentrations of m- and p- cresol cannot be quantified using this method, however, the result reported for the mixed isomers will be an over estimation of the true result in samples where m-cresol is present.

Deviating Codes

Deviating Samples

The use of any of the following symbols indicates that the sample was deviating and it is possible therefore that the results provided may not be representative of the sample taken.

a – The date and/or time of sampling has not been provided, therefore it is not known if the time lapse between sampling and analysis has exceeded the acceptable holding time(s). It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
b – No sampling time given (waters only) unable to confirm if samples are within acceptable holding times.
c – This Test Item was received in an inappropriate container; it is possible that sample and/or analyte integrity has not been maintained and that the results are non-representative of the original sample taken.
d – On receipt, the temperature of the sample received was found to fall outside the recommendations of EN ISO 18512:2007 Soils & Granular Wastes.
e – The sample was received in a container that had been filled incorrectly which may have compromised sample and/or analyte integrity, rendering the results non-representative ofthe original sample taken.
f – The delay between Sampling and Sample Receipt is greater than the recommended holding time for the analyte of interest in this matrix. It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
g – The delay between Sampling and Analysis is greater than the recommended holding time for the analyte of interest in this matrix. It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.

The following Additional Deviating Sample Codes may also be used.

I/S – Insufficient sample mass/volume received for accurate quantification of this analyte.
U/S – The sample received was deemed unsuitable for accurate determination of this analyte using the Test Methods available.

Deviating Methods

Z – A minor deviation from the Test Method was necessary but this is deemed to have had no impact on the Test Result, the legitimacy of the method validation or the Accreditation Status of the Test Method.
Y – A significant deviation from the Test Method was necessary which is deemed to have had no impact on the Test Result, however, due to a lack of sufficient supporting validation, the Accreditation Status of the Method has been removed.
W – The normal LOD of the instrument/method could not be attained, thus an elevated LOD or LOQ has been applied to the Test Data, however, the data reported meets the requirements of the Client and does not affect compliance with the specification limit (where applicable).
V – One of the QA/QC parameters failed, however, the increased implied Uncertainty associated with the Test Result meets the requirements of the Client and does not affect compliance with the specification limit (where applicable) (Quality Manual, Section 18.2.9).
U – The precision acceptance criteria associated with the Test Method could not be met but the Test Result fulfils the Client's objectives and the elevated Uncertainty does not affect compliance with the specification limit (where applicable) (Quality Manual, Section 18.8.10).
T – The Test Method used was supplied by the Client and involved a simple modification of a Test Method for which ACSE holds accreditation (Quality Manual, Section 18.3.8).

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

Quality Testing & Materials Consultancy to the Construction Industry

ATKINS CatWasteSoil

Classification Assessment Tool of Soil Wastes - Hazard Summary Sheet

Site Name	Portishead & Pill Station Car Parks
Location	Portishead & Pill Station Car Parks
Site ID	
Job Number	16-06100
Date	18/01/2017
User Name	edward.davies@acstesting.co.uk
Company Name	ACS Testing Ltd

Hole ID	Sample Depth	Hazardous Waste Y/N	HP1	HP2	HP3	HP4	HP5	HP6	HP7	HP8	HP9	HP10	HP11	HP12	HP13	HP14	HP15	HP16
26610	0m	N	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
26611	0m	N	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
26612	0m	Y	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No
26613	0m	N	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
26614	0m	N	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

This output data has been generated by the CAT-Waste Soil waste classification tool provided by Atkins Consultants Ltd and J.McArdle Contracts and should be read in conjuntion with the standard Terms and Conditions

16:19 31/01/2017

ATKINS CatWasteSoil

Classification Assessment Tool of Soil Wastes - Individual Compound Information

Site Name	Portishead & Pill Station Car Parks
Location	Portishead & Pill Station Car Parks
Site ID	
Job Number	16-06100
Date	18/01/2017
User Name	edward.davies@acstesting.co.uk
Company Name	ACS Testing Ltd

Hole ID	Sample Depth	Contaminant	Contaminant Concentration (%)	Hazardous Waste Y/N	Hazard Property	Individual Hazard Statements Exceeded	Cumulative Hazard Statements Exceeded	Additional Hazard Statements (see notes section)
26610	0m	pH	0.00000	N				
26610	0m	Benzene	0.00002	N				H225 test
26610	0m	Naphthalenene	0.00008	N				H228 test
26610	0m	Acenaphthylene	0.00011	N				
26610	0m	Acenaphthene	0.00002	N				
26610	0m	Fluorene	0.00004	N				
26610	0m	Phenanthrene	0.00019	N				
26610	0m	Anthracene	0.00041	N				
26610	0m	Fluoranthene	0.00057	N				
26610	0m	Pyrene	0.00059	N				
26610	0m	Benzo(a)anthracene	0.00017	N				
26610	0m	Chrysene	0.00024	N				
26610	0m	Benzo(b)fluoranthene	0.00030	N				
26610	0m	Benzo(k)fluoranthene	0.00010	N				
26610	0m	Benzo(a)pyrene	0.00015	N				
26610	0m	Indeno(1,2,3-cd)pyrene	0.00011	N				
26610	0m	Di-benz(a,h,)anthracene	0.00005	N				
26610	0m	Benzo(g,h,i)perylene	0.00012	N				
26610	0m	(sum of congeners or total P	0.00002	N				
26610	0m	ydrocarbon/oil with marker	0.01141	N				H225 test
26610	0m	Arsenic	0.00917	N				
26610	0m	Boron	0.00033	N				
26610	0m	Cadmium	0.00084	N				
26610	0m	Chromium (Total)	0.00499	N				
26610	0m	Copper	0.03670	N				
26610	0m	Lead	0.03259	N				
26610	0m	Mercury	0.00003	N				
26610	0m	Nickel	0.01932	N				
26610	0m	Zinc	0.00000	N				
26610	0m	Zincx	0.13098	N				
26610	0m	Free Cyanide	0.00010	N				H224 test
26611	0m	pH	0.00000	N				

ATKINS CatWasteSoil

Classification Assessment Tool of Soil Wastes - Individual Compound Information

Site Name	Portishead & Pill Station Car Parks
Location	Portishead & Pill Station Car Parks
Site ID	
Job Number	16-06100
Date	18/01/2017
User Name	edward.davies@acstesting.co.uk
Company Name	ACS Testing Ltd

Hole ID	Sample Depth	Contaminant	Contaminant Concentration (%)	Hazardous Waste Y/N	Hazard Property	Individual Hazard Statements Exceeded	Cumulative Hazard Statements Exceeded	Additional Hazard Statements (see notes section)
26611	0m	Naphthalenene	0.00006	N				H228 test
26611	0m	Acenaphthylene	0.00005	N				
26611	0m	Acenaphthene	0.00001	N				
26611	0m	Fluorene	0.00003	N				
26611	0m	Phenanthrene	0.00018	N				
26611	0m	Anthracene	0.00024	N				
26611	0m	Fluoranthene	0.00032	N				
26611	0m	Pyrene	0.00031	N				
26611	0m	Benzo(a)anthracene	0.00013	N				
26611	0m	Chrysene	0.00022	N				
26611	0m	Benzo(b)fluoranthene	0.00029	N				
26611	0m	Benzo(k)fluoranthene	0.00009	N				
26611	0m	Benzo(a)pyrene	0.00011	N				
26611	0m	Indeno(1,2,3-cd)pyrene	0.00011	N				
26611	0m	Di-benz(a,h,)anthracene	0.00004	N				
26611	0m	Benzo(g,h,i)perylene	0.00014	N				
26611	0m	ydrocarbon/oil with marker	0.01137	N				H225 test
26611	0m	Arsenic	0.00829	N				
26611	0m	Boron	0.00376	N				
26611	0m	Cadmium	0.00101	N				
26611	0m	Chromium (Total)	0.00682	N				
26611	0m	Copper	0.10248	N				
26611	0m	Lead	0.01833	N				
26611	0m	Mercury	0.00003	N				
26611	0m	Nickel	0.02241	N				
26611	0m	Zinc	0.00000	N				
26611	0m	Zincx	0.13136	N				
26611	0m	Free Cyanide	0.00010	N				H224 test
26612	0m	pH	0.00000	N				
26612	0m	Naphthalenene	0.00010	N				H228 test
26612	0m	Acenaphthylene	0.00005	N				
26612	0m	Acenaphthene	0.00003	N				

ATKINS CatWasteSoil

Classification Assessment Tool of Soil Wastes - Individual Compound Information

Site Name	Portishead & Pill Station Car Parks
Location	Portishead & Pill Station Car Parks
Site ID	
Job Number	16-06100
Date	18/01/2017
User Name	edward.davies@acstesting.co.uk
Company Name	ACS Testing Ltd

Hole ID	Sample Depth	Contaminant	Contaminant Concentration (%)	Hazardous Waste Y/N	Hazard Property	Individual Hazard Statements Exceeded	Cumulative Hazard Statements Exceeded	Additional Hazard Statements (see notes section)
26612	0m	Fluorene	0.00005	N				
26612	0m	Phenanthrene	0.00025	N				
26612	0m	Anthracene	0.00024	N				
26612	0m	Fluoranthene	0.00040	N				
26612	0m	Pyrene	0.00037	N				
26612	0m	Benzo(a)anthracene	0.00017	N				
26612	0m	Chrysene	0.00026	N				
26612	0m	Benzo(b)fluoranthene	0.00034	N				
26612	0m	Benzo(k)fluoranthene	0.00009	N				
26612	0m	Benzo(a)pyrene	0.00018	N				
26612	0m	Indeno(1,2,3-cd)pyrene	0.00014	N				
26612	0m	Di-benz(a,h,)anthracene	0.00005	N				
26612	0m	Benzo(g,h,i)perylene	0.00015	N				
26612	0m	hydrocarbon/oil with marker	0.00724	N				H225 test
26612	0m	Arsenic	0.01076	N				
26612	0m	Boron	0.00118	N				
26612	0m	Cadmium	0.00084	N				
26612	0m	Chromium (Total)	0.00480	N				
26612	0m	Copper	0.07580	N				
26612	0m	Lead	0.00000	N				
26612	0m	Leadx	0.19729	Y	HP14		H410	
26612	0m	Mercury	0.00023	N				
26612	0m	Nickel	0.01746	N				
26612	0m	Zinc	0.00000	N				
26612	0m	Zincx	0.36145	Y	HP14		H410	
26612	0m	Free Cyanide	0.00010	N				H224 test
26613	0m	pH	0.00000	N				
26613	0m	Naphthalenene	0.00002	N				H228 test
26613	0m	Acenaphthylene	0.00001	N				
26613	0m	Acenaphthene	0.00000	N				
26613	0m	Fluorene	0.00001	N				
26613	0m	Phenanthrene	0.00003	N				

ATKINS CatWasteSoil

Classification Assessment Tool of Soil Wastes - Individual Compound Information

Site Name	Portishead & Pill Station Car Parks
Location	Portishead & Pill Station Car Parks
Site ID	
Job Number	16-06100
Date	18/01/2017
User Name	edward.davies@acstesting.co.uk
Company Name	ACS Testing Ltd

Hole ID	Sample Depth	Contaminant	Contaminant Concentration (%)	Hazardous Waste Y/N	Hazard Property	Individual Hazard Statements Exceeded	Cumulative Hazard Statements Exceeded	Additional Hazard Statements (see notes section)
26613	0m	Anthracene	0.00002	N				
26613	0m	Fluoranthene	0.00002	N				
26613	0m	Pyrene	0.00002	N				
26613	0m	Benzo(a)anthracene	0.00001	N				
26613	0m	Chrysene	0.00001	N				
26613	0m	Benzo(b)fluoranthene	0.00002	N				
26613	0m	Benzo(k)fluoranthene	0.00001	N				
26613	0m	Benzo(a)pyrene	0.00001	N				
26613	0m	Indeno(1,2,3-cd)pyrene	0.00001	N				
26613	0m	Di-benz(a,h,)anthracene	0.00000	N				
26613	0m	Benzo(g,h,i)perylene	0.00001	N				
26613	0m	hydrocarbon/oil with marker	0.00232	N				H225 test
26613	0m	Arsenic	0.00787	N				
26613	0m	Boron	0.00106	N				
26613	0m	Cadmium	0.00038	N				
26613	0m	Chromium (Total)	0.00783	N				
26613	0m	Copper	0.00973	N				
26613	0m	Lead	0.01317	N				
26613	0m	Mercury	0.00002	N				
26613	0m	Nickel	0.00988	N				
26613	0m	Zinc	0.00000	N				
26613	0m	Zincx	0.05815	N				
26613	0m	Free Cyanide	0.00010	N				H224 test
26614	0m	pH	0.00000	N				
26614	0m	Benzene	0.00002	N				H225 test
26614	0m	Naphthalenene	0.00002	N				H228 test
26614	0m	Acenaphthylene	0.00000	N				
26614	0m	Acenaphthene	0.00001	N				
26614	0m	Fluorene	0.00000	N				
26614	0m	Phenanthrene	0.00001	N				
26614	0m	Anthracene	0.00000	N				
26614	0m	Fluoranthene	0.00000	N				

ATKINS CatWasteSoil

Classification Assessment Tool of Soil Wastes - Individual Compound Information

Site Name	Portishead & Pill Station Car Parks
Location	Portishead & Pill Station Car Parks
Site ID	
Job Number	16-06100
Date	18/01/2017
User Name	edward.davies@acstesting.co.uk
Company Name	ACS Testing Ltd

Hole ID	Sample Depth	Contaminant	Contaminant Concentration (%)	Hazardous Waste Y/N	Hazard Property	Individual Hazard Statements Exceeded	Cumulative Hazard Statements Exceeded	Additional Hazard Statements (see notes section)
26614	0m	Pyrene	0.00000	N				
26614	0m	Benzo(a)anthracene	0.00000	N				
26614	0m	Chrysene	0.00000	N				
26614	0m	Benzo(b)fluoranthene	0.00000	N				
26614	0m	Benzo(k)fluoranthene	0.00000	N				
26614	0m	Benzo(a)pyrene	0.00000	N				
26614	0m	Indeno(1,2,3-cd)pyrene	0.00000	N				
26614	0m	Di-benz(a,h,)anthracene	0.00000	N				
26614	0m	Benzo(g,h,i)perylene	0.00000	N				
26614	0m	Arsenic	0.00804	N				
26614	0m	Boron	0.00125	N				
26614	0m	Cadmium	0.00013	N				
26614	0m	Chromium (Total)	0.00378	N				
26614	0m	Copper	0.00768	N				
26614	0m	Lead	0.00183	N				
26614	0m	Mercury	0.00003	N				
26614	0m	Nickel	0.00916	N				
26614	0m	Zinc	0.00000	N				
26614	0m	Zincx	0.01287	N				
26614	0m	Free Cyanide	0.00010	N				H224 test

MetroWest

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council
6.25, Environmental Statement, Volume 4, Appendix 10.2, Annex C1
Portishead Station and Car Park
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, regulation 5(2)(a)
Planning Act 2008

Author: CH2M
Date: November 2019

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N

MARTINGALE W

Trading Estate

Mast

MALIN PARADE

FINISTERRE PARADE

PHOENIX WAY

HAVEN VIEW

TPPH03

TPPH04

TPPH05

TPPH06

CPT1

BH1

Portishead Station

Sta

MARJORAM WAY

CPT3

CPT4

BH2

CPT6

School

Warehouse

SERBERT ROAD

SERBERT WAY

Hotel

QUAYS AVENUE

GALINGALE WAY

MULBERRY AVE

CONFERENCE AVENUE

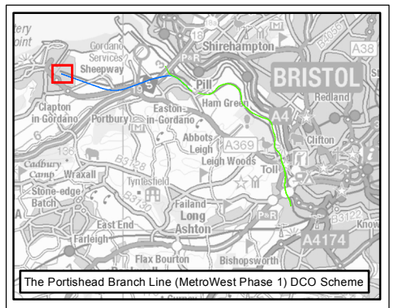
TYDEMAN ROAD

LAMBOURNE WAY

A369

8m

0 50 100
Metres



KEY

Exploratory Holes

- September 2015 Ground Investigation (Structural Soils Ltd)
- November 2015 Ground Investigation (ACS Group)

Portishead Branch Line

- The Nationally Significant Infrastructure Project (NSIP) Works
- New Station
- Temporary construction compounds

Order Limits

- Land to be used temporarily
- Land to be acquired

Rev	By	Chkd	Apprvd	Date	Description
0	ArC	HF	CFF	16/07/2019	First draft

Client

travelwest

Bath & North East Somerset, Bristol, North Somerset and South Gloucestershire Councils working together to improve your local transport

CH2M HILL
Geospatial
Burderop Park, Swindon, SN4 0QD
Tel: +44 (0)1793 812479 Fax: +44 (0)1793 812089
www.ch2m.com

Project :
Portishead Branch Line (MetroWest Phase 1)

Drawing :
Appendix C1
Exploratory Hole Location Plan - Portishead Station and Car Park

Drawn By :	Andy Collinson	Date: 18/07/2019
Checked By :	Hannah Foster	Date: 18/07/2019
Approved By :	Carolyn Francis	Date: 18/07/2019

Drawing No. : 674946-001-040

Revision 00-0

Drawing Scale : 1:2,500 @ A3

Document Path: \\swin-fs-06\Consulting\we\Environmental_Assessment\Projects\MetroWest Phase 1\GIS\MXDs\Geology and Contaminated Land \674946-001-024-Exploratory_Holes_C1.mxd

MetroWest

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council
6.25, Environmental Statement, Volume 4, Appendix 10.2, Annex C2 Avon Road Bridge and Pill Station
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, regulation 5(2)(a)
Planning Act 2008

Author: CH2M
Date: November 2019

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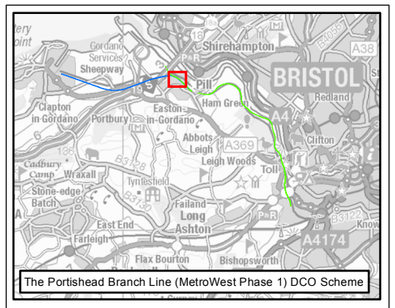
N

BH3B
BH3
FDTP1
FDTP2
BH6
BH4
BH5
Pill Station

Drain
Drain
River Avon
AVON ROAD
MARINE PARADE
MARINER'S WAY
AVON R
SEVERN ROAD
LODWAY CLOSE
MONMOUTH ROAD
Lodway
HARDWICK ROAD
OAK GROVE
Pill
24m
27m
STATION
HEYWOOD TERR
UNDERBANKS
THE POPLARS
LODWAY
Hall
PO
Liby
PW

0 40 80
Metres



KEY

Exploratory Holes

- September 2015 Ground Investigation (Structural Soils Ltd)

Portishead Branch Line

- The Nationally Significant Infrastructure Project (NSIP) Works
- New Station
- Temporary construction compounds

Order Limits

- Land to be used temporarily
- Land to be acquired

Rev	By	Chkd	Apprvd	Date	Description
0	ArC	HF	CFF	16/07/2019	First draft

Client

travelwest
Bath & North East Somerset, Bristol, North Somerset and South Gloucestershire Councils working together to improve your local transport

CH2M HILL
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Burderop Park, Swindon, SN4 0QD
Tel: +44 (0)1793 812479 Fax: +44 (0)1793 812089
www.ch2m.com

Project :
Portishead Branch Line (MetroWest Phase 1)

Drawing :
Appendix C2
Exploratory Hole Location Plan - Avon Road Bridge and Pill Station

Drawn By :	Andy Collinson	Date: 18/07/2019
Checked By :	Hannah Foster	Date: 18/07/2019
Approved By :	Carolyn Francis	Date: 18/07/2019

Drawing No. : 674946-001-040
Revision 00-0

Drawing Scale : 1:2,117 @ A3

Document Path: \\swin-fs-06\Consulting\we\Environmental_Assessment\Projects\MetroWest Phase 1\GIS\MXDs\Geology and Contaminated Land \674946-001-024-Exploratory_Holes_C2.mxd

MetroWest

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council
6.25, Environmental Statement, Volume 4, Appendix 10.2, Annex D1
Portishead Station and Car Park
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, regulation 5(2)(a)
Planning Act 2008

Author: CH2M
Date: November 2019

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ACS Testing Ltd
Tel: 01202 622858
Fax: 01202 625045
Email: testing@acstesting.co.uk
www.acstesting.co.uk

TRIAL PIT LOG

Trial Pit No.
TPPH03
Sheet 1 of 1

Client	North Somerset Council	**Depth (m):** 3.50	**Dimensions (m):** 1.90 × 0.60	**Lab Ref.**	**Hole Type** TP
Site	Portishead Car Park			**Plant Used:** JCB 3CX ECO Wheeled Excavator with 600mm bucket	**Scale** 1:20
Location	Land at Harbour Road, Portishead, Somerset				**Logged By** AD
Ground Level (mAOD):	107.78	**Co-ords:**	347299.0E, 176431.0N	**Date(s)**	12/12/2016

All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Water Strikes	Sample (Type) Depth	Testing		
							Depth	Type	Results
	MADE GROUND. Dark grey gravelly SAND. Gravel is fine, medium and coarse; angular to sub-rounded of clinker, brick, macadam, glass and stone.		(0.45)						
	MADE GROUND. Grey sandy GRAVEL. Gravel is fine, medium and coarse; angular to sub-rounded of stone and clinker.	0.45 (107.33)	(0.75)						
1	Stiff grey mottled brown clayey sandy SILT. Becoming very clayey with depth.	1.20 (106.58)	(1.20)						
2	Soft to firm bluish grey silty CLAY.	2.40 (105.38)	(1.10)						
3	End of Trial Pit at 3.500m	3.50 (104.28)							
4									

Remarks: Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930.

Pit Stability: Stable

Technical Notes (where applicable):
Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930. Chalk descriptions in accordance with CIRIA C574.

Groundwater: Groundwater not encountered.

ACS Testing Ltd
Tel: 01202 622858
Fax: 01202 625045
Email: testing@acstesting.co.uk
www.acstesting.co.uk

TRIAL PIT LOG

Trial Pit No.
TPPH04
Sheet 1 of 1

Client	North Somerset Council	**Depth (m):** 3.00	**Dimensions (m):** 2.10 × 0.60	**Lab Ref.**	**Hole Type** TP
Site	Portishead Car Park			**Plant Used:** JCB 3CX ECO Wheeled Excavator with 600mm bucket	**Scale** 1:20
Location	Land at Harbour Road, Portishead, Somerset				**Logged By** AD
Ground Level (mAOD):	107.44	**Co-ords:**	347367.0E, 176410.0N	**Date(s)**	12/12/2016

All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Water Strikes	Sample (Type) Depth	Testing: Depth	Testing: Type	Testing: Results
1	MADE GROUND. Dark grey very gravelly SAND. Gravel is fine, medium and coarse; angular to sub-rounded of clinker, stone and brick. Wood recorded below 0.60m.		(1.23)						
	Stiff grey mottled brown clayey SILT.	1.23 (106.21)	(0.87)						
2	Very soft to soft bluish grey silty CLAY.	2.10 (105.34)	(0.90)		▼				
3	End of Trial Pit at 3.000m	3.00 (104.44)							
4									

Remarks: Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930.

Pit Stability: Stable

Technical Notes (where applicable):
Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930. Chalk descriptions in accordance with CIRIA C574.

Groundwater: Water seepage from base up to 2.90m.

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Tel: 01202 622858
Fax: 01202 625045
Email: testing@acstesting.co.uk
www.acstesting.co.uk

TRIAL PIT LOG

Trial Pit No.
TPPH05
Sheet 1 of 1

Client	North Somerset Council	**Depth (m):** 3.50	**Dimensions (m):** 1.80 × 0.60	**Lab Ref.**	**Hole Type** TP
Site	Portishead Car Park			**Plant Used:** JCB 3CX ECO Wheeled Excavator with 600mm bucket	**Scale** 1:20
Location	Land at Harbour Road, Portishead, Somerset				**Logged By** AD
Ground Level (mAOD):	107.46	**Co-ords:**	347443.0E, 176407.0N	**Date(s)**	13/12/2016

All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Water Strikes	Sample (Type) Depth	Testing: Depth	Testing: Type	Testing: Results
	TOPSOIL. Soft greyish brown sandy gravelly SILT. Gravel is fine, medium and coarse; sub-angular to rounded of stone.		(0.68)						
	Stiff greyish brown clayey sandy SILT.	0.68 (106.78)	(1.17)						
	Soft to firm brownish grey silty CLAY.	1.85 (105.61)	(0.95)		▼				
	Very soft bluish grey silty CLAY.	2.80 (104.66)	(0.70)						
	End of Trial Pit at 3.500m	3.50 (103.96)							

1
2
3
4

Remarks: Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930.

Pit Stability: Stable

Technical Notes (where applicable):
Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930. Chalk descriptions in accordance with CIRIA C574.

Groundwater: Small amount of water seepage at 2.70m.

ACS Testing Ltd
Tel: 01202 622858
Fax: 01202 625045
Email: testing@acstesting.co.uk
www.acstesting.co.uk

TRIAL PIT LOG

Trial Pit No.
TPPH06
Sheet 1 of 1

Client	North Somerset Council	**Depth (m):** 2.10	**Dimensions (m):** 1.70 × 0.60	**Lab Ref.**	**Hole Type** TP
Site	Portishead Car Park			**Plant Used:** JCB 3CX ECO Wheeled Excavator with 600mm bucket	**Scale** 1:20
Location	Land at Harbour Road, Portishead, Somerset				**Logged By** AD
Ground Level (mAOD):	107.36	**Co-ords:**	347515.0E, 176397.0N	**Date(s)**	13/12/2016

All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Water Strikes	Sample (Type) Depth	Testing Depth	Testing Type	Testing Results
	TOPSOIL. Soft brown clayey sandy gravelly SILT. Gravel is fine, medium and coarse; angular to sub-rounded of stone.		(0.35)						
	MADE GROUND. Grey mottled brown clayey sandy SILT. Rare brick noted. Black gravel noted in the northern end of the pit at 1.20m, possible unknown service.	0.35 (107.01)	(0.95)						
1	Grey silty SAND.	1.30 (106.06)	(0.60)						
	Firm grey mottled brown clayey SILT.	1.90 (105.46)							
2	End of Trial Pit at 2.100m	2.10 (105.26)							
3									
4									

Remarks: Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930.

Pit Stability: Stable

Technical Notes (where applicable):
Consistency of fine grained soil assessed by hand worked tests in accordance with BS5930. Chalk descriptions in accordance with CIRIA C574.

Groundwater: Groundwater not encountered.

KEY TO EXPLORATORY HOLE LOGS - SUMMARY OF ABBREVIATIONS

SAMPLING

Sample type codes

B	=	Bulk disturbed sample.
C	=	Core sample.
CS	=	Core sample taken from rotary core for lab testing.
D	=	Small disturbed sample.
DSPT	=	Small disturbed sample originating from SPT test.
ES	=	Soil sample for environmental testing.
ExU	=	Extruded undisturbed sample remnants.
U	=	Undisturbed driven tube sample - Number of blows indicated. % recovery reported.

Undisturbed sample detail codes

$U_{(UT100)}$	=	Undisturbed sample UT100

IN-SITU TESTING

$SPT_{(c)}$	=	Standard Penetration Test using a solid 60 degree cone.
SPT	=	Standard Penetration Test using split spoon sampler. ($SPT_{(NR)}$ indicates 'No Sample Recovery').
	=	* denotes extrapolated N value. NP denotes 'No Penetration'.
HP	=	Hand Penetrometer Test. Value given as shear strength c_u, in kPa.
V	=	Field Vane Test. Peak value (c_u) & Residual value (c_r), given as shear strength in kPa.

ROTARY DRILLING INFORMATION

W	=	Water flush returns (%)
TCR	=	Total core recovery (%)
SCR	=	Solid core recovery (%)
RQD	=	Rock quality designations (%)
If	=	Fracture spacing (mm). In the fracture column (i) denotes discontinuity is infilled (refer to Fracture Table for details). Where variable the minimum - average - maximum spacing may be quoted. 'NI' denotes non-intact core. 'NA' denotes not applicable.

All lengths used to determine rock core mechanical properties taken along the centre line of the core.
Obvious induced fractures have been ignored.
The assessment of solid core is based on lengths that show a full diameter and not necessarily a full circumference.
AZCL = Assessed zone of core loss.

ADDITIONAL NOTES

1. All soil and rock descriptions and legends in general accordance with BS EN ISO 14688-1, 14688-2, 14689-1, and BS5930:1999 including Amendment 2 (2010).
2. Material types divided by a broken line (- - -) indicates an unclear boundary.
3. The data on any sheet within the report showing the AGS icon is available in the AGS format.

STRUCTURAL SOILS

Contract Reference: **730673**

KEY TO EXPLORATORY HOLE LOGS - SUMMARY OF GRAPHIC SYMBOLS

WATER COLUMN SYMBOLS

First water strike, second water strike etc.

Standing water level following first strike, standing water level following second strike etc.

Seepage.

Standing water level recorded at documented date.

MATERIAL GRAPHIC LEGENDS

 CLAY	 Clayey gravelly SAND	 Gravelly clayey SAND	 Conglomerate
 Clayey sandy GRAVEL	 Sandy clayey GRAVEL	 Silty gravelly CLAY	 MADE GROUND
 Mudstone	 PEAT	 Possible MADE GROUND	 Sandstone
 Sandy CLAY	 Sandy silty CLAY	 Sandy GRAVEL	 Gravelly sandy CLAY
 Sandy gravelly CLAY	 Siltstone	 Sandy PEAT	 Silty CLAY

INSTRUMENTATION SYMBOLS

 Asphalt	 Backfill	 Bentonite seal	 Concrete
 Gravel filter	 Stopcock cover	 Flush cover	
 Plain pipe	 Slotted pipe		

GINT_LIBRARY_V8_05.GLB!Grf:Text G - LEGEND - 2 OF 2 | 730673_METROWEST.GPJ - v8_05 | 29/01/16 - 15:30 | IE
Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email:admin@soils.co.uk.

STRUCTURAL SOILS

INSPECTION PIT LOG

Contract:	Client:	Trial Pit:
MetroWest	**Arup**	**CPT1**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**09.09.15** End: **09.09.15**	**7.84**	**E:347488.3 N:176362.2**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: Dark brownish slightly silty gravelly CLAY with abundant roots and rootlets. Gravel is angular to subangular fine to coarse ballast and limestone.	(0.30)	
							0.30	
0.60	1	ES	1TUB,1J,1VOC			MADE GROUND: Dark greyish black clayey sandy GRAVEL with a low cobble content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse limestone, granite and ballast. Cobbles are angular ballast, limestone and granite up to 20mm.		
						. . . at 0.75m cobble content becomes high.	(0.90)	
							1.20	
1.20-1.30	2	D				POSSIBLE MADE GROUND: Dark brown mottled grey gravelly CLAY with a low cobble content. Gravel is angular to subangular fine to coarse limestone, granite and ballast. Cobbles are angular tabular shape ballast, limestone and granite up to 150mm.	1.30	
						Inspection pit hand dug to 1.30m depth.		

General Remarks

1. Location CAT and Genny scanned prior to excavation.
2. Inspection pit remained dry and stable.
3. Backfilled with arisings on completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**AASmith**	

STRUCTURAL SOILS

INSPECTION PIT LOG

Contract:	Client:	Trial Pit:
MetroWest	**Arup**	**CPT3**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**08.09.15** End: **08.09.15**	**7.75**	**E:347633.5 N:176310.7**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: Dark brownish black slightly sandy gravelly CLAY with abundant roots and rootlets. Sand is fine to coarse. Gravel is angular to subangular fine to coarse ballast, limestone, clinker and slag.	0.20	
0.20 0.20-0.70	1 4	ES B	1TUB,1J,1VOC			MADE GROUND: Dark grey to black clayey sandy GRAVEL with frequent rootlets and a low cobble content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse ballast, limestone, clinker and slag. Cobbles are angular limestone, ballast, slag and clinker up to 150mm.	(0.50) 0.70	
0.70	2	ES	1TUB,1J,1VOC			MADE GROUND: Dark grey clayey gravelly COBBLES. Gravel is angular to subangular fine to coarse limestone, clinker, ballast and slag. Cobbles are angular calcified limestone and sandstone up to 200mm.	(0.40) 1.10	
						Dark greyish brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse limestone and sandstone. Cobbles are angular calcified mudstone and sandstone.	1.20	
1.20	3	ES	1TUB,1J,1VOC			Inspection pit hand dug to 1.20m depth.		

General Remarks

1. Location CAT and Genny scanned prior to excavation.
2. Inspection pit remained dry and stable.
3. Backfilled with arisings on completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**AASmith**	

STRUCTURAL SOILS

INSPECTION PIT LOG

Contract:	Client:	Trial Pit:
MetroWest	**Arup**	**CPT4**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**08.09.15** End: **08.09.15**	**7.71**	**E:347666.5 N:176298.9**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: Dark brown to black silty slightly sandy CLAY with a high organic content and abundant roots and rootlets. Sand is fine to coarse.	(0.30) 0.30	
0.30-0.80	2	B				MADE GROUND: Dark grey slightly clayey sandy GRAVEL with a low cobble content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse ballast and limestone. Cobbles are angular spherical to tabular ballast up to 150mm.	(0.50) 0.80	
0.50	1	ES	1TUB,1J,1VOC			MADE GROUND: Dark grey clayey COBBLES. Cobbles are angular to subangular spherical to tabular ballast and calcified limestone up to 200mm.	1.00	
1.00-1.20	3	D				Dark brown mottled red sandy gravelly CLAY with a low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse limestone. Cobbles are angular tabular shape limestone up to 200mm.	1.20	
						Inspection pit hand dug to 1.20m depth.		

General Remarks

1. Location CAT and Genny scanned prior to excavation.
2. Inspection pit remained dry and stable.
3. Backfilled with arisings on completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**AASmith**	

STRUCTURAL SOILS

INSPECTION PIT LOG

Contract:	Client:	Trial Pit:
MetroWest	**Arup**	**CPT6**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**07.09.15** End: **07.09.15**	**7.64**	**E:347742.4 N:176271.9**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.10-0.80	2	B				MADE GROUND: Black organic slightly silty slightly sandy CLAY with abundant rootlets. Sand is fine to coarse.	0.10	
0.30	1	ES	1TUB,1J,1VOC			MADE GROUND: Dark grey clayey sandy GRAVEL with occasional rootlets and cobbles. Sand is fine to coarse. Gravel is angular to subangular fine to coarse ballast. Cobbles are tabular angular ballast up to 140mm.	(0.70)	
0.80-1.20	3	D				MADE GROUND: Dark grey clayey gravelly COBBLES. Gravel is angular to subangular fine to coarse ballast. Cobbles are angular tabular ballast and calcified limestone up to 150mm.	0.80 (0.35)	
						Dark greyish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse ballast.	1.15 1.20	
						Inspection pit hand dug to 1.20m depth.		

General Remarks

1. Location CAT and Genny scanned prior to excavation.
2. Inspection pit remained dry and stable.
3. Backfilled with arisings on completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**AASmith**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH1**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**15.09.15** End: **18.09.15**	**8.09**	**E:347545.7 N:176344.4**	**1** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
										MADE GROUND: Soft dark brown slightly sandy slightly gravelly CLAY with frequent roots (<10mm diameter) and rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse flint, ballast and brick.	0.20	
0.40	1	B								MADE GROUND: Dark grey to black clayey sandy GRAVEL with a low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse ballast, slag, clinker and limestone. Cobbles are angular tabular limestone and slag up to 200mm.	(1.00)	
0.50	2	ES										
0.80	3	B										
1.00	4	ES									1.20	
1.20-1.65	1	SPT	N=4							Very stiff greyish brown slightly sandy CLAY with occasional black mottling of organic matter. Sand is fine to coarse.		
1.50	5	D										
1.80		HP	c_u=150								(1.30)	
1.90	6	D										
2.10		HP	c_u=162									
2.20-2.60	7	U										
2.60-2.70	8	D									2.50	
2.60		HP	c_u=125							Stiff greyish brown mottled bluish grey slightly sandy CLAY with occasional brown mottling of organic matter. Sand is fine to coarse.		
2.70-3.15	2	SPT	N=6								(0.70)	
3.00-3.20	9	D									3.20	
3.40		HP	c_u=72							Stiff greyish brown mottled bluish grey slightly sandy CLAY with occasional brown organic matter. Sand is fine to coarse.		
3.50-3.70	10	D										
3.70-4.00	11	U									(1.00)	
4.00-4.20	12	D										
4.00		HP	c_u=75								4.20	
4.20-4.65	3	SPT	N=6							Very soft dark bluish grey CLAY.		

Window run 111mm dia (100% rec) — 1.80 to 2.60

Window run 111mm dia (100% rec) — 2.60 to 3.40

Window run 111mm dia (100% rec) — 3.40 to 4.20

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
15/09/15	16:30	1.20	None	400	Dry
16/09/15	08:00	1.20	None	400	Dry
16/09/15	17:00	9.60	8.95	131	3.00
17/09/15	09:00	9.00	8.95	131	3.20
17/09/15	17:30	20.30	18.00	116	3.80
18/09/15	08:00	18.80	18.00	116	3.90
18/09/15	17:00	21.90	18.00	116	3.60
18/09/15	08:00	18.80	18.20	116	3.90

General Remarks

1. Location CAT and Genny scanned prior to excavation.
2. Inspection pit remained dry and stable.
3. Dynamic sampling from ground level to 18.30m. Rotary coring of soft rock using T6-116 barrel with PCD bit and water flush between 18.30m to 21.90m with limited non intact recovery. 20.40m to 21.90m drilled using open hole techiques to obtain CPT at base of the hole.
4. 50mm diameter HDPE and 19mm diameter PVC gas and groundwater

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**AASmith + BSaimen**	

GINT_LIBRARY_V8_05.GLB LibVersion: v8_05 - Lib0004 PrjVersion: v8_05 - Core+Logs 0003 | Log COMPOSITE LOG | 730673_METROWEST.GPJ - v8_05 | 21/01/16 - 15:13 | IF:
Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk.

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH1**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **18.09.15**	**8.09**	**E:347545.7 N:176344.4**	**2** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
										Very soft dark bluish grey CLAY. *(stratum copied from 4.20m from previous sheet)*		
4.70-4.80	13	D									(1.20)	
4.80		HP	c_u=12									
5.00-5.10	14	D		Window run 111mm dia (100% rec)								
5.00		HP	c_u=25									
5.20		HP	c_u=<12							. . . at 5.20m a thin band (50mm) of amorphous peat.	5.40	
5.40-5.50	15	D								Very soft bluish grey CLAY with rare rootlets (<1mm diameter).		
5.60		HP	c_u=<12									
5.65		HP	c_u=25									
5.70-6.30	46	U	75 blows 44% recovery									
5.70		HP	c_u=25									
6.30-6.40	16	D										
6.60		HP	c_u=<12/<12/<12									
6.70-6.80	17	D		Window run 111mm dia (100% rec)								
7.00		HP	c_u=<12/<12/<12									
7.10-7.20	18	D										
7.30		HP	c_u=<12/<12/<12									
7.40-7.50	19	D										
7.50-7.95	4	SPT(c)	N=4								(5.10)	
8.20-8.30	20	D		Window run 111mm dia (70% rec)								
8.20		HP	c_u=<12/<12/<12									
8.60-8.70	21	D										
8.60		HP	c_u=25/<12/<12									

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

monitoring standpipes installed as shown. Response zones are 1.00m to 5.00m and 6.00m to 18.00m.

5. SPT hammer EQU083-2014 (E_r = 63.49%) used.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**AASmith + BSaimen**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH1**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **18.09.15**	**8.09**	**E:347545.7 N:176344.4**	**3** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
9.00-9.60	47	U	13 blows 0% recovery							Very soft bluish grey CLAY with rare rootlets (<1mm diameter). *(stratum copied from 5.40m from previous sheet)*		
				Window run 111mm dia (75% rec)								
9.70-9.80	22	D										
10.10-10.20	23	D										
10.40-10.50	24	D								. . . at 10.40m slightly silty clay band.	10.50	
10.50-10.95	5	SPT(c)	N=3							Very soft bluish grey slightly sandy CLAY with frequent thin laminae of fine to medium grey sand.		
11.00	25	D										
11.00		HP	c_u=5	Window run 111mm dia (70% rec)								
11.40	26	D										
11.50		HP	c_u=5									
11.70-12.00	27	D										
12.00-12.45	6	SPT(c)	N=1									
12.00		HP	c_u=5								(3.80)	
12.50	28	D		Window run 111mm dia (70% rec)								
12.80		HP	c_u=5									
12.90	29	D										
13.00		HP	c_u=5									
13.20	30	D										
13.20		HP	c_u=15									

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**AASmith + BSaimen**	AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH1**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **18.09.15**	**8.09**	**E:347545.7 N:176344.4**	**4** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
13.50-14.10	48	U	32 blows 100% recovery							Very soft bluish grey slightly sandy CLAY with frequent thin laminae of fine to medium grey sand. *(stratum copied from 10.50m from previous sheet)*		
14.10-14.55	7	SPT(c)	N=6								14.30	
14.40		HP	c_u=38							Soft bluish grey slightly sandy CLAY with occasional thin laminae of fine to medium sand.		
14.50-14.70	31	D									(0.70)	
14.70		HP	c_u=38									
14.90-15.00	32	D									15.00	
14.90		HP	c_u=30							Soft bluish grey silty CLAY with rare brown peat.		
15.00-15.45	8	SPT(c)	N=5									
15.50	33	D										
15.60		HP	c_u=30									
15.90-16.05	34	D									(1.95)	
16.05-16.50	35	D										
16.10		HP	c_u=30									
16.20		HP	c_u=38									
16.50-16.95	9	SPT(c)	N=6									
16.80-16.95	36	D										
16.90		HP	c_u=20								16.95	
16.95-17.25	37	D								Bluish grey gravelly very clayey SAND. Sand is fine to coarse. Gravel is subrounded to rounded white sandstone and brown sandstone.	(0.30)	
17.25-17.50	38	D								Reddish brown sandy clayey GRAVEL with a low cobble content. Sand is fine to coarse. Gravel is fine to coarse white and grey sandstone. Cobbles are sub angular to subrounded sandstone.	17.25 (0.40)	
17.50-17.88	10	SPT(c)	N=65*								17.65	
17.50-17.65	39	D								Firm reddish brown gravelly slightly sandy CLAY. Sand is fine to medium. Gravel is rounded fine to coarse white sandstone.	(0.30)	
17.65-17.95	40	D									17.95	

Mechanical Log: Window run 111mm dia (60% rec) — 13.50 to 14.30; Window run 111mm dia (95% rec) — 14.30 to 16.95; Window run 111mm dia (60% rec) — 16.95 to 17.65

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**AASmith + BSaimen**	

GINT_LIBRARY_V8_05.GLB LibVersion: v8_05 - Lib0004 PrjVersion: v8_05 - Core+Logs 0003 | Log COMPOSITE LOG | 730673_METROWEST.GPJ - v8_05 | 21/01/16 - 15:13 | IF.
Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk.

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH1**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **18.09.15**	**8.09**	**E:347545.7 N:176344.4**	**5** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
17.95-18.30	41	D		Window run 111mm dia (60% rec)						Very stiff reddish brown slightly sandy CLAY with occasional fragments of fine to medium extremely weak mudstone. *(stratum copied from 17.95m from previous sheet)*		
18.00		HP	c_u=62									
18.20		HP	c_u=187									
18.30-19.80												
18.80-19.10	42	D								. . . between 18.80m and 20.10m core affected by rotary drilling and recovered non intact.		
				20	0	0						
19.10-19.30	43	D										
19.80-20.40											(3.95)	
19.80	44	D										
20.10-20.40	45	D		80	40	0						
20.40-21.90												
20.40-20.78	11	SPT(c)	N=66*									
				0	0	0					21.90	
21.90-22.27	12	SPT(c)	N=68*							Borehole terminated at 21.90m depth.		

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**AASmith + BSaimen**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH2**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **14.09.15**	**7.77**	**E:347705.7 N:176285.7**	**1** of **18**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
										MADE GROUND: Black slightly silty slightly sandy GRAVEL. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse limestone and clinker.		
0.40	1	B									(1.00)	
0.60	2	ES										
0.80	3	B									1.00	
1.00	4	ES								MADE GROUND: Brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse limestone. Cobbles are subangular limestone.		
1.10	5	D									1.20	
1.20		HP	c_u=125/112/87							Stiff light greyish brown mottled orange slightly sandy CLAY with occasional black organic specks.		
1.25-1.70	1	SPT	N=6									
1.50-1.64	5	D										
1.50	6	ES										
1.50		HP	c_u=75/62/100									
1.70		HP	c_u=160/125/150									
1.75-1.90	7	D		Window run 101mm dia (100% rec)						. . . at 1.75m mottling is orangish red.	(1.20)	
1.92-2.32	8	U										
											2.40	
2.40-3.00	8	$U_{(UT100)}$	31 blows 75% recovery							Stiff light bluish grey mottled orange slightly sandy CLAY.		
2.70	9	ES								. . . at 2.70m woody stem from plant along edge of sample (may have fell in).		
3.00-3.45	2	SPT	N=6								(1.30)	
3.00-3.10	10	D		Window run 101mm dia (95% rec)								
3.10		HP	c_u=87/75/87									
3.40-3.70	11	B										
											3.70	
										Soft light bluish grey mottled orangish brown slightly sandy CLAY.		
3.90-4.50	55	$U_{(UT100)}$	28 blows 75% recovery									
3.90	12	V	c_u=38									
4.00-4.15		D		Window run 101mm dia (66% rec)							(1.00)	
4.40-4.60	13	ES										

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
07/09/15	17:30	5.40	None	116	0.00
08/09/15	16:30	11.80	10.28	116	2.00
09/09/15	08:00	11.60	11.62	116	2.20
09/09/15	17:00	18.50	18.54	116	0.10
10/09/15	08:00	18.50	18.54	116	0.30
10/09/15	15:00	19.70	19.44	116	1.10
11/09/15	08:00	21.40	19.44	116	1.20
11/09/15	17:00	23.60	21.40	116	0.10

General Remarks

1. Location CAT scanned prior to excavation.
2. Hand dug inspection pit to 1.20m depth.
3. Borehole located in the 6 foot.
4. Dynamic sampling from ground level to 18.50m. Rotary coring of soft rock using T6-116 barrel with PCD bit and water flush between 18.50m to 29.70m.
5. 50mm diameter HDPE gas and groundwater monitoring standpipes installed as shown. Response zone is 0.80m to 20.00m

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**IFoster + RLynes + BSaimen**	AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH2**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **14.09.15**	**7.77**	**E:347705.7 N:176285.7**	**2** of **18**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
4.50-4.95	3	SPT	N=3							Soft light bluish grey mottled orangish brown slightly sandy CLAY.		
4.70	56	$U_{(UT100)}$	26 blows 100% recovery							*(stratum copied from 3.70m from previous sheet)* . . . at 4.60m black organic matter (possible decaying roots).	4.70	
										Dark brown spongy pseudo-fibrous PEAT.	4.90	
										Very soft light grey slightly sandy CLAY with occasional plant remains.		
5.40	15	ES										
5.60-6.00	16	D									(2.00)	
6.00-6.45	4	$SPT_{(NR)}$	N=2									
6.40-6.50	17	D										
6.50-6.80	18	ES										
6.80-6.90	19	D									6.90	
6.80		HP	c_u=13							Grey silty CLAY with occasional brown plant remains.		
6.90-7.30	20	B										
7.30-7.90	59	$U_{(UT100)}$	18 blows 80% recovery								(1.60)	
7.90-8.35	5	SPT	N=2									
7.90-8.50	21	D										
											8.50	
8.50-8.80	22	D								Soft grey slightly sandy CLAY with occasional thin laminae of grey fine to medium sand and some plant remains.		
8.80-9.40	60	$U_{(UT100)}$	15 blows 100% recovery									

Window run 101mm dia (66% rec)

Window run 101mm dia

Window run 101mm dia (80% rec)

Window run 101mm dia (50% rec)

Window run 101mm dia (60% rec)

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
14/09/15	08:00	23.60	21.40	116	0.60
14/09/15	17:00	28.20	21.40	116	1.90

General Remarks

6. SPT hammer EQU083-2014 (E_r = 63.49%) used.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**IFoster + RLynes + BSaimen**	AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH2**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **14.09.15**	**7.77**	**E:347705.7 N:176285.7**	**3** of **18**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
8.90		HP	c_u=15							Soft grey slightly sandy CLAY with occasional thin laminae of grey fine to medium sand and some plant remains. *(stratum copied from 8.50m from previous sheet)*	(1.70)	
9.40-9.85	6	SPT	N=2							Window run 101mm dia (60% rec)		
9.80-10.00	23	D										
9.90		HP	c_u=<15									
10.00-10.20	24	D									10.20	
10.20-10.30	25	D								Spongy pseudo-fibrous PEAT with occasional banding of soft grey clay.	10.30	
10.30-10.90	61	$U_{(UT100)}$	19 blows 75% recovery							Soft grey slightly sandy CLAY with rare banding of spongy pseudo-fibrous peat (up to 4mm thick).	(0.80)	
10.90-11.35	7	SPT	N=16							Window run 101mm dia (80% rec)		
10.90		HP	c_u=<10								11.10	
11.00-11.20	26	D								Soft grey slightly sandy CLAY.	11.30	
11.30		HP	c_u=25/30							Grey silty SAND. Sand is fine to medium.		
11.50-12.60	27	B										
11.60-12.40	62	$U_{(UT100)}$	54 blows 100% recovery								(1.30)	
12.40-12.85	8	SPT	N=6							Window run 101mm dia (80% rec)	12.60	
12.70-12.80	28	D								Soft grey slightly sandy CLAY.		
12.70		HP	c_u=<12								(0.40)	
12.90		HP	c_u=<12								13.00	
13.05	29	D								Firm fibrous slightly sandy PEAT.	13.25	
13.30	30	D								*Description on next sheet*		
13.30-13.90	64	$U_{(UT100)}$	24 blows							Window run 101mm dia (50% rec)	(0.35)	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**IFoster + RLynes + BSaimen**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH2**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **14.09.15**	**7.77**	**E:347705.7 N:176285.7**	**4** of **18**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
	31		75% recovery							Soft grey slightly sandy CLAY with occasional decomposed plant matter (peat). Sand is fine to medium. *(stratum copied from 13.25m from previous sheet)*	13.60	
13.50		D										
13.60		HP	c_u=<12								(0.50)	
13.80		HP	c_u=<12							Soft grey slightly sandy CLAY with frequent decomposed roots/rootlets.		
13.90-14.35	9	SPT	N=7								14.10	
14.10-15.20	32	B		Window run 101mm dia (50% rec)						Grey silty SAND. Sand is fine to medium.	(1.10)	
										. . . from 14.80m to 15.00m no recovery.	15.20	
15.00-15.45	10	SPT	N=24							Soft grey slightly sandy CLAY. Sand is fine.		
15.30-15.50	33	D									(0.35)	
15.30		HP	c_u=<12								15.55	
15.55-16.10	34	B		Window run 101mm dia (90% rec)						Grey silty SAND. Sand is fine to medium.	(0.55)	
											16.10	
16.10-16.20	35	D								Soft grey slightly sandy CLAY.	16.20	
16.15		HP	c_u=<12							Grey silty slightly SAND. Sand is fine to medium.	16.30	
16.30-16.50	36	D								Soft grey slightly sandy CLAY.		
16.50-16.95	11	SPT	N=23								(0.80)	
16.80-17.00	37	D								. . . at 16.80m and 16.90m with <50mm interbeds of grey silty sand.	17.10	
17.00		HP	c_u=<12	Window run 101mm dia (85% rec)								
17.15-17.35	38	D								Firm brown amorphous sandy PEAT with shelly fragments. Becoming dark brown towards base. . . . between 17.25m and 17.35m fibrous wood.	(0.30)	
17.40-17.60	40	D								Soft black with grey mottling slightly sandy CLAY with frequent fibrous organic matter.	17.40	
17.50		HP	c_u=20								17.60	
17.60-17.75	39	B								Grey silty slightly gravelly SAND. Gravel is subrounded to rounded fine to coarse limestone and siltstone.	17.70	
17.80-18.20	12	SPT(c)	N=61*	Window run 101mm dia (100% rec)							17.80	
17.80-17.90	41	D								*Description on next sheet*	17.90	
											18.00	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**IFoster + RLynes + BSaimen**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH2**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **14.09.15**	**7.77**	**E:347705.7 N:176285.7**	**5** of **18**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
17.90-18.00	42	D								Brown sandy GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse sandstone and siltstone.	18.15	
18.00-18.15	43	D										
18.15-18.50	44	D		Window run 101mm dia (100% rec)								
										Grey and yellowish brown sandy CLAY. Sand is fine to coarse.	(0.35)	
										Grey very clayey gravelly SAND. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse sandstone and limestone.	18.50	
18.50-19.20				13	13	0				Greyish brown very clayey very sandy GRAVEL. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse sandstone and siltstone.		
										Extremely weak reddish brown MUDSTONE crumbles into fine to medium angular lithorelicts of extremely weak mudstone up to 5mm.		
19.20-19.70										Extremely weak reddish brown MUDSTONE crumbles into fine to medium gravel sized angular lithorelicts of extremely weak mudstone up to 5mm.		
19.20-19.65	45	B		100	0	0				. . . gravel becomes more coarser towards the base of the stratum.		
19.70-21.40										. . . between 19.65m and 19.70m extremely weak mudstone crumbles into fine to medium gravel sized lithorelicts.		
19.70-20.15	13	SPT(c)	N=29									
19.70-21.20	46	B									(3.40)	
				88	0	0						
21.40-22.10												
21.40-21.69	14	SPT(c)	N=111*									
				83	36	36					21.90	
21.90-22.10	47	CS								*Description on next sheet*		
22.10-23.60							40					
							100					
				83	57	31	190					

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**IFoster + RLynes + BSaimen**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH2**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **14.09.15**	**7.77**	**E:347705.7 N:176285.7**	**6** of **18**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
							40 100 190			Very weak reddish brown MUDSTONE crumbles into angular fine to coarse gravel sized lithorelicts of extremely weak mudstone when handled. Occasional greenish grey mottling of siltstone. Fracture set 1 subhorizontal closely to closely spaced undulating rough partly open to open clean/smears of red clay up to 25mm. *(stratum copied from 21.90m from previous sheet)*	(1.35)	
23.15-23.30	48	CS		83	57	31					23.25	
										Extremely weak reddish brown MUDSTONE crumbles into angular fine to coarse gravel sized extremely weak mudstone up to 15mm.	(0.35)	
23.60-25.10											23.60	
23.60-23.88	15	SPT(c)	N=120*							Extremely weak to very weak reddish brown MUDSTONE crumbles into angular fine to coarse gravel sized extremely to very weak lithorelicts of reddish brown mudstone. Fracture set 1 subhorizontal closely to medium spaced undulating rough open clean/smears of red clay up to 0.25mm.		
24.40-24.70	49	CS		87	80	33					(2.65)	
							111 180 420					
25.10-25.37	16	SPT(c)	N=130*									
25.30-26.80												
26.10-26.30	50	CS		67	40	20					26.25	
										Weak reddish brown silty MUDSTONE with occasional greenish grey patches of siltstone recovered non intact as cobble and gravel of weak mudstone up to 70mm.	(0.35)	
							NI 100 160				26.60	
26.60-28.10										*Description on next sheet*		
26.60-26.81	17	SPT(c)	N=143*	67	60	40						

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**IFoster + RLynes + BSaimen**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH2**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **14.09.15**	**7.77**	**E:347705.7 N:176285.7**	**7** of **18**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
										Extremely weak reddish brown MUDSTONE crumbles into angular fine to medium lithorelicts of extremely weak mudstone. Fracture set 1 subhorizontal extremely closely to closely spaced undulating rough open clean/smears of red clay. *(stratum copied from 26.60m from previous sheet)*		
27.52-27.68	51	CS		67	60	40	NI 100 160				(2.30)	
28.10-29.70										. . . between 28.10m and 28.25m mercia mudstone group zone II becomes mercia mudstone group zone I, mudstone gains strength and it becomes weak.		
28.10-28.30	18	SPT(c)	N=150*									
28.10-28.20	52	CS									28.90	
				94	69	52	NI 70 130			Weak reddish brown silty MUDSTONE with rare greenish grey patches up to 15mm of siltstone. Fractures are subhorizontal extremely closely to closely spaced undulating rough open to moderately wide infilled with red clay/fine to medium fragments of mudstone.	(0.45)	
29.20-29.35	53	CS									29.35	
										Extremely weak reddish brown MUDSTONE crumbles into angular fine to coarse lithorelicts of extremely weak red mudstone.	(0.35)	
29.70-29.86	19	SPT(c)	N=214*							. . . between 29.35m and 29.40m firm red clay with occasional lithorelicts of mudstone up to 10mm.	29.70	
										Borehole terminated at 29.70m depth.		

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**IFoster + RLynes + BSaimen**	AGS

MetroWest

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council
6.25, Environmental Statement, Volume 4, Appendix 10.2, Annex D2 Avon Road Bridge and Pill Station
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, regulation 5(2)(a)
Planning Act 2008

Author: CH2M
Date: November 2019

NetworkRail · West of England Local Enterprise Partnership · West of England Combined Authority · HM Government · Bath & North East Somerset Council · Bristol City Council · North Somerset Council · South Gloucestershire Council · travelwest

KEY TO EXPLORATORY HOLE LOGS - SUMMARY OF ABBREVIATIONS

SAMPLING

Sample type codes

B	=	Bulk disturbed sample.
C	=	Core sample.
CS	=	Core sample taken from rotary core for lab testing.
D	=	Small disturbed sample.
DSPT	=	Small disturbed sample originating from SPT test.
ES	=	Soil sample for environmental testing.
ExU	=	Extruded undisturbed sample remnants.
U	=	Undisturbed driven tube sample - Number of blows indicated. % recovery reported.

Undisturbed sample detail codes

$U_{(UT100)}$	=	Undisturbed sample UT100

IN-SITU TESTING

$SPT_{(c)}$	=	Standard Penetration Test using a solid 60 degree cone.
SPT	=	Standard Penetration Test using split spoon sampler. ($SPT_{(NR)}$ indicates 'No Sample Recovery').
	=	* denotes extrapolated N value. NP denotes 'No Penetration'.
HP	=	Hand Penetrometer Test. Value given as shear strength c_u, in kPa.
V	=	Field Vane Test. Peak value (c_u) & Residual value (c_r), given as shear strength in kPa.

ROTARY DRILLING INFORMATION

W	=	Water flush returns (%)
TCR	=	Total core recovery (%)
SCR	=	Solid core recovery (%)
RQD	=	Rock quality designations (%)
If	=	Fracture spacing (mm). In the fracture column (i) denotes discontinuity is infilled (refer to Fracture Table for details). Where variable the minimum - average - maximum spacing may be quoted. 'NI' denotes non-intact core. 'NA' denotes not applicable.

All lengths used to determine rock core mechanical properties taken along the centre line of the core.
Obvious induced fractures have been ignored.
The assessment of solid core is based on lengths that show a full diameter and not necessarily a full circumference.
AZCL = Assessed zone of core loss.

ADDITIONAL NOTES

1. All soil and rock descriptions and legends in general accordance with BS EN ISO 14688-1, 14688-2, 14689-1, and BS5930:1999 including Amendment 2 (2010).
2. Material types divided by a broken line (- - -) indicates an unclear boundary.
3. The data on any sheet within the report showing the AGS icon is available in the AGS format.

STRUCTURAL SOILS

Contract Reference: **730673**

KEY TO EXPLORATORY HOLE LOGS - SUMMARY OF GRAPHIC SYMBOLS

WATER COLUMN SYMBOLS

First water strike, second water strike etc.

Standing water level following first strike, standing water level following second strike etc.

Seepage.

Standing water level recorded at documented date.

MATERIAL GRAPHIC LEGENDS

 CLAY	 Clayey gravelly SAND	 Gravelly clayey SAND	 Conglomerate
 Clayey sandy GRAVEL	 Sandy clayey GRAVEL	 Silty gravelly CLAY	 MADE GROUND
 Mudstone	 PEAT	 Possible MADE GROUND	 Sandstone
 Sandy CLAY	 Sandy silty CLAY	 Sandy GRAVEL	 Gravelly sandy CLAY
 Sandy gravelly CLAY	 Siltstone	 Sandy PEAT	 Silty CLAY

INSTRUMENTATION SYMBOLS

 Asphalt	 Backfill	 Bentonite seal	 Concrete
 Gravel filter	 Stopcock cover	 Flush cover	
 Plain pipe	 Slotted pipe		

GINT_LIBRARY_V8_05.GLB!Grf:Text G - LEGEND - 2 OF 2 | 730673_METROWEST.GPJ - v8_05 | 29/01/16 - 15:30 | IE
Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email:admin@soils.co.uk.

STRUCTURAL SOILS

INSPECTION PIT LOG

Contract:	Client:	Trial Pit:
MetroWest	**Arup**	**BH3**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**17.09.15**	**---**	**---**	**1** of **1**
	End: **17.09.15**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: Black tarmac 50% aggregate content.	0.10	
0.20 0.20-0.40	1 2	ES B				POSSIBLE MADE GROUND: Dark reddish brown slightly silty very gravelly SAND with frequent rootlets. Sand is fine to coarse. Gravel is subangular fine to coarse brick and sandstone.	(0.40) 0.50	
						Trial pit terminated at 0.50m depth due to proximity of services.		

General Remarks

1. Location CAT and Genny scanned prior to excavation.
2. Inspection pit abandoned due to services, backfilled with arisings and reinstated with asphalt.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**AASmith**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH3B**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**17.09.15** End: **28.09.15**	**11.45**	**E:352102.0 N:176267.5**	**1** of **9**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
										MADE GROUND: ASPHALT.	0.10	
										MADE GROUND: Black to grey clayey gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse brick, limestone, sandstone and flint.	0.30	
0.30	1	ES										
0.40-0.60	2	B								Soft dark brownish red slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse brick and sandstone.	(0.40)	
											0.70	
										Firm reddish brown sandy CLAY. Sand is fine to coarse.		
0.85		V	c_u=50									
0.85		V	c_r=16									
1.00-1.10	3	B										
1.20	4	ES										
1.20		V	c_u=66	Window run 101mm dia - (100% rec)							(1.30)	
1.20		V	c_r=22									
1.40-1.50	3	D										
1.90	5	$U_{(UT100)}$	39 blows 75% recovery								2.00	
2.00-2.20	7	D								Stiff light reddish brown slightly sandy CLAY. Sand is fine.		
2.10-2.55	1	SPT	N=20	Window run 101mm dia (100% rec)								
2.25		HP	c_u=175									
2.40-2.50	8	D									(1.00)	
2.50-2.90	9	U										
2.90-3.00	10	D									3.00	
3.00-3.45	2	SPT(c)	N=21							Very stiff reddish brown slightly sandy CLAY with frequent angular fine to medium fragments of extremely weak mudstone up to 3mm.		
3.20-3.50	11	D		Window run 101mm dia (100% rec)								
3.50		HP	c_u=>250								(0.80)	
3.80-5.30											3.80	
3.80-4.16	3	SPT(c)	N=73*							Stiff becoming very stiff reddish brown slightly sandy CLAY.	(0.30)	
3.80-4.00	12	D									4.10	
4.00		HP	c_u=250	100	7	7	90 180 400			*Description on next sheet*		
4.20-5.70												

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
21/09/15	17:00	4.20	2.40	116	0.80
22/09/15	08:00	4.20	2.40	116	1.70
22/09/15	16:00	13.20	2.40	116	Dry

General Remarks

1. Location CAT and Genny scanned prior to excavation.
2. Hand dug inspection pit to 1.20m depth.
3. Dynamic sampling from ground level to 3.80m. Rotary coring of soft rock using T6-116 barrel with PCD bit and water flush between 3.60m to 13.20m.
4. 50mm diameter HDPE gas and groundwater monitoring standpipes installed as shown. Response zone is 0.80m to 13.20m.
5. SPT hammer EQU083-2014 (E_r = 63.49%) used.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**AASmith + RLynes + BSaimen**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH3B**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **28.09.15**	**11.45**	**E:352102.0 N:176267.5**	**2** of **9**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
4.45-4.60	13	CS		100 100 100	7 100 100	7 96 96	90 180 400			Extremely weak very thinly to thinly bedded reddish brown MUDSTONE. Bedding fractures are subhorizontal closely to medium spaced undulating rough open moderately wide with highly weakened upper and lower fracture surface. *(stratum copied from 4.10m from previous sheet)*	(1.45)	
											5.55	
5.55-5.70	14	CS								Very weak very thinly bedded to thinly bedded reddish brown silty MUDSTONE with occasional thin laminae of greyish green fine to coarse sandstone. Bedding fractures are subhorizontal closely to medium spaced undulating rough open infilled with red clay up to 2mm.		
5.70-7.20 5.70-5.89	4	SPT(c)	N=135*				100 180 430				(1.35)	
				100	100	100						
6.60-6.90	15	CS									6.90	
6.95-7.10	16	CS								Very weak yellow fine to medium SANDSTONE.	7.10	
7.20-8.00 7.20-7.40	5	SPT(c)	N=130*							Very weak very thinly to thinly bedded reddish brown silty MUDSTONE with rare inclusions of very weak yellow fine to medium sandstone.	7.30	
										Very weak very thinly bedded reddish brown silty MUDSTONE interbedded with very weak laminated yellow fine to medium sandstone.	7.45	
				100	42	42					(0.35)	
7.75-7.90	17	CS								Strong thinly bedded reddish brown silty MUDSTONE with lenticular yellow fine to medium sandstone inclusions.	7.80	
										Very weak laminated reddish brown silty MUDSTONE with occasional lenticular yellow fine to medium sandstone inclusions.	8.00	
8.00-9.00										Medium strong brownish yellow fine to coarse SANDSTONE with occasional lenticular reddish brown silty mudstone (up to 10mm). Bedding fractures are subhorizontal close to mediumly spaced undulating rough.		
8.40-8.70	18	CS		98	98	98	120 260 310				(1.35)	
										. . . reduction in flush returns below 8.70m.		

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**AASmith + RLynes + BSaimen**	AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH3B**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **28.09.15**	**11.45**	**E:352102.0 N:176267.5**	**3** of **9**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
9.00-10.20												
9.10-9.25	19	CS					120 260 310				9.35	
9.55-9.80	20	CS		100	76	61	160 180 210			Very weak thinly bedded reddish brown silty MUDSTONE with occasional lenticular yellowish brown fine to medium sandstone inclusions (up to 10mm). Bedding fractures are subhorizontal close to medium spaced undulating smooth.	(0.50) 9.85	
10.10-10.20	21	CS					15 30 50			Very weak very thinly to thinly bedded silty MUDSTONE interbedded with very weak greenish grey siltstone. Bedding fractures are subhorizontal extremely closely spaced undulating rough open green silt/red clay.	10.10	
10.20-11.70										Strong pinkish red matrix supported CONGLOMERATE. Clasts are subangular fine to medium grey sandstone. Matrix is fine silt and clay. . . . no flush returns below 10.20m.	10.30	
10.50-10.85	22	CS		100	90	63	25 220 330			Strong dark brownish red matrix supported CONGLOMERATE. Clasts are angular to subangular fine to coarse sandstone and calcite gravel. Matrix is fine silt and clay. Fractures and bedding fractures are subhorizontal to 10° open filled with red silt and clay extremely closely to medium spaced undulating rough.	(1.00) 11.30	
11.45-11.55	23	CS								Strong dark reddish mottled creamy pink matrix supported CONGLOMERATE. Clasts are gravel to cobble sized angular sandstone, mudstone and calcite. Fractures are subhorizontal open filled with red silt and clay extremely close to medium spaced undulating rough.		
11.70-13.20												
12.00-12.10	24	CS		100	47	7	15 180 380			. . . at 12.20m medium strong grey mudstone boulder larger than core barrel.	(1.90)	
12.95-13.15	25	CS									13.20	
										Borehole terminated at 13.20m depth.		

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**DW**	**AASmith + RLynes + BSaimen**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH4**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**16.11.15** End: **17.11.15**	**24.08**	**E:352374.9 N:176021.7**	**1** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
0.25	1	ES								MADE GROUND: Dark brown sandy slightly gravelly CLAY with frequent roots, rootlets and occasional snail shells. Sand is medium to coarse. Gravel is subangular fine.	(0.70)	
0.30	2	B								. . . at 0.45m layer of sandstone cobbles.	0.70	
0.75	3	ES								MADE GROUND: Light orangish brown sandy slightly gravelly CLAY with occasional rootlets. Sand is fine to coarse. Gravel is angular fine to medium red mudstone.	(1.00)	
0.80	4	B										
1.20	5	U		Window run 101mm dia (100% rec)							1.70	
1.20		V	c_u=100									
1.20		V	c_r=25									
1.30	6	D										
1.70-3.00												
1.70	7	DSPT								MADE GROUND: Very stiff brown sandy slightly gravelly CLAY. Gravel is angular fine to coarse sandstone and concrete.	(0.30)	
1.70-1.92	20	SPT	N=231*								2.00	
1.85		HP	c_u=5							MADE GROUND: CONCRETE, matrix supported with angular fine to coarse clasts of brown limestone voids up to 30mm.	(0.48)	
				100						. . . at 2.35m concrete cavities horizontal fracture with brown discolouration.	2.48	
2.48-2.55	8	D									2.55	
2.50		HP	c_u=110/90							Stiff greenish grey silty CLAY with occasional extremely weak lithorelicts of gypsum siltstone (weathered siltstone).		
2.70-2.90	9	D								Very stiff reddish brown silty CLAY with occasional angular fine to coarse lithorelicts of extremely weak mudstone up to 5mm.	(0.90)	
2.70		HP	c_u=200									
3.00-4.00												
3.00-3.45	21	SPT	N=38								3.45	
3.40		HP	c_u=125	100	55	55				Extremely weak reddish brown silty MUDSTONE crumbles into angular fine to coarse fragments of extremely weak mudstone up to 20mm. Mudstone contains rare gypsum veining up to 5mm. Bedding fractures subhorizontal closely to widely spaced undulating rough open with red clay up to 2.5mm.		
3.90	10	D					150					
4.00-5.00							220					
4.00-4.21	22	SPT	N=250*				400					
				100	70	60						

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
16/11/15	16:00	4.00	1.70	116	1.80
17/11/15	08:00	4.00	1.70	116	2.00
17/11/15	16:00	12.50	1.70	116	2.00

General Remarks

1. Location CAT and Genny scanned prior to excavation.
2. Hand dug inspection pit to 1.20m depth.
3. Dynamic sampling from ground level to 1.70m. Rotary coring of soft rock using T6-116 barrel with PCD bit and water flush between 1.70m to 12.50m.
4. 40mm diameter HDPE gas and groundwater monitoring standpipes installed as shown. Response zone is 1.50m to 10.50m.
5. SPT hammer ADP02-2015 (E_r = 71.42%) used.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**ADP**	**BSaimen + RLynes**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH4**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**16.11.15** End: **17.11.15**	**24.08**	**E:352374.9 N:176021.7**	**2** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
4.70-4.90	11	CS		100	70	60				Extremely weak reddish brown silty MUDSTONE crumbles into angular fine to coarse fragments of extremely weak mudstone up to 20mm. Mudstone contains rare gypsum veining up to 5mm. Bedding fractures subhorizontal closely to widely spaced undulating rough open with red clay up to 2.5mm. *(stratum copied from 3.45m from previous sheet)*		
5.00-6.50												
5.00-5.24	23	SPT	N=167*									
				100	100	100					(4.95)	
6.30-6.45	12	CS					150					
6.50-8.00							220					
6.50-6.64	24	SPT	N=300*				400					
7.00-7.20	13	CS										
				100	87	80						
7.90-8.00	14	CS										
8.00-9.50												
8.00-8.13	25	SPT	N=300*								8.40	
				100	100	100				Extremely to very weak reddish brown MUDSTONE with occasional greenish grey siltstone bands.		
							180					
							330					
							450					
8.85-9.00	15	CS										

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**ADP**	**BSaimen + RLynes**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH4**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**16.11.15** End: **17.11.15**	**24.08**	**E:352374.9 N:176021.7**	**3** of **7**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
				100	100	100				Extremely to very weak reddish brown MUDSTONE with occasional greenish grey siltstone bands. *(stratum copied from 8.40m from previous sheet)*		
9.50-11.00												
9.50-9.65	26	SPT	N=273*								(2.55)	
9.70-9.99	16	CS					180 330 450					
				100	89	83				. . . at 10.32m undulating rough fracture infilled with firm clay.		
10.47-10.66	17	CS									10.95	
11.00-12.50										Medium strength light greyish green sandy CONGLOMERATE. Matrix supported. Matrix is light green sandy siltstone. Clasts are angular to subrounded fine gravel, quartz, calcite and black mineral. Fractures are drilling induced.	(0.33)	
11.00-11.20	18	CS									11.28	
11.00-11.05	27	SPT	N=750*							Very weak reddish brown MUDSTONE. Crumbles into angular blocks. . . . at 11.43m undulating rough fracture infilled with reddish brown clay.	11.45	
				67	67	67					11.72	
11.82-12.00	19	CS								Weak reddish brown MUDSTONE. Distinctly weathered to sandy clay with lithreolicts up to 2-3mm. No fractures.		
										Weak reddish brown MUDSTONE. Breaks into angular blocks. . . . at 11.80m undulating rough joint with black staining on surface.	(0.78)	
											12.50	
12.50-12.63	28	SPT	N=375*							Borehole terminated at 12.50m depth.		

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**ADP**	**BSaimen + RLynes**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH5**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**18.11.15** End: **19.11.15**	**24.78**	**E:352391.2 N:176005.7**	**1** of **8**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
										MADE GROUND: Dark brown sandy gravelly CLAY with frequent roots, rootlets and leaf litter. Sand is fine to coarse. Gravel is angular to subangular fine to coarse. (TOPSOIL)	0.15 / 0.30	
0.20	1	ES										
0.25	2	B										
0.50	3	B								MADE GROUND: Light yellowish grey slightly clayey sandy GRAVEL with frequent roots. Sand is fine to coarse. Gravel is angular to subangular fine to coarse granite (possible ballast) mortar/cement, brick and concrete.	(0.60)	
0.70	4	ES										
										MADE GROUND: Dark brown sandy slightly gravelly CLAY with occasional roots. Sand is fine to coarse. Gravel is subangular fine to medium limestone and mudstone.	0.90 / (0.55)	
1.00	5	B										
1.05	6	ES										
1.20-1.65	1	SPT	N=21							MADE GROUND: Very soft extremely low strength light reddish brown mottled black sandy slightly gravelly CLAY with frequent roots and plant remains. Sand is fine to coarse. Gravel is subangular fine reddish brown mudstone. (Possible reworked clay)	1.45 / (0.45)	
1.20-1.45	7	D										
1.30		HP	c_u=5									
1.55		HP	c_u=75									
1.60-1.80	8	D								Soft medium to high strength light reddish brown mottled greyish green slightly sandy gravelly CLAY with frequent roots. Sand is fine to coarse. Gravel is angular to subangular fine reddish brown mudstone.	1.90	
1.70		HP	c_u=75									
1.95		HP	c_u=150									
2.00-2.45	2	SPT	N=26							. . . . between 1.50m and 1.56m band of very soft greyish green silty clay.		
2.30-2.45	9	D								Firm high strength light reddish brown slightly sandy CLAY with occasional greyish green sandy nodules.	(1.30)	
2.30		HP	c_u=86									
2.50		HP	c_u=150									
2.80-3.00	10	U										
3.00-4.00												
3.00-3.45	3	SPT	N=49								3.20	
3.00-3.20	11	D								Extremely weak distinctly weathered light reddish brown MUDSTONE with frequent light greyish green sandy nodules. Crumbles into lithorelics up to 10mm.		
3.20-3.45	12	D										
3.30		HP	c_u=100									
3.60-3.85	13	CS										
3.60		HP	c_u=175									
4.00-5.00												
4.00-4.29	4	SPT	N=107*									
4.20		HP	c_u=100									
4.30-4.50	14	D										

Window run 110mm dia (100% rec)

Window run 110mm dia (100% rec)

100 | 100 | 95 | 95

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
18/11/15	17:00	6.50	1.70	116	2.00
19/11/15	08:00	6.50	1.70	116	2.00
19/11/15	17:00	12.50	1.70	116	2.10

General Remarks

1. Location CAT and Genny scanned prior to excavation.
2. Hand dug inspection pit to 1.20m depth.
3. Dynamic sampling from ground level to 1.70m. Rotary coring of soft rock using T6-116 barrel with PCD bit and water flush between 2.00m to 12.50m.
4. 40mm diameter HDPE gas and groundwater monitoring standpipes installed as shown. Response zone is 3.00m to 6.00m.
5. SPT hammer ADP02-2015 (E_r = 71.42%) used.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**ADP**	**RLynes + BSaimen**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH5**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**18.11.15** End: **19.11.15**	**24.78**	**E:352391.2 N:176005.7**	**2** of **8**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
4.55		HP	c_u=25							Extremely weak distinctly weathered light reddish brown MUDSTONE with frequent light greyish green sandy nodules. Crumbles into lithorelics up to 10mm. *(stratum copied from 3.20m from previous sheet)* . . . at 4.60m layer of harder mudstone recovered as medium gravel surrounded by extremely weak mudstone of lower strength than the rest of the unit (possible fracture). . . . at 5.20m gypsum gravel in clay matrix (weathered gypsum vein).	(4.46)	
4.70-5.00	15	D		100	95	95						
5.00-6.50												
5.00-5.26	5	SPT	N=143*									
5.00-5.30	16	D										
5.30		HP	c_u=200									
5.50		HP	c_u=225									
5.80-6.10	17	D		90	90	90						
6.00		HP	c_u=150									
6.30-6.50	18	D										
6.40		HP	c_u=150									
6.50-8.00												
6.50-6.72	6	SPT	N=167*									
6.60		HP	c_u=75									
6.80-7.00	19	D										
7.00		HP	c_u=175									
7.30-7.45	20	D		100	100	100						
7.50		HP	c_u=225									
7.60	21	C									7.66	
										Very weak reddish brown MUDSTONE.	(0.44)	
8.00-9.50											8.10	
8.00-8.17	7	SPT	N=167*							Weak reddish brown silty MUDSTONE with occasional greenish grey siltstone up to 15mm. Bedding fractures are subhorizontal closely to widely spaced undulating rough open to moderately wide infilled with red clay/fine to medium fragments of mudstone. Weathering penetrates downward and along the fractures and weakens and weathers the upper and lower fracture surfaces up to 50mm. . . . at 8.26m bedding fracture is 5° undulating rough. Lower wall rock weathers into very weak		
				100	97	90	80 200 650					
8.80-9.10	22	C										

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**ADP**	**RLynes + BSaimen**	AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH5**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**18.11.15** End: **19.11.15**	**24.78**	**E:352391.2 N:176005.7**	**3** of **8**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
				100	97	90				MMG-II. . . . at 8.80m bedding fracture is 5° undulating rough open. Upper fracture surface weathers into extremely weak MMG-II up to 50mm. Weak reddish brown silty MUDSTONE with occasional greenish grey siltstone up to 15mm. Bedding fractures are subhorizontal closely to widely spaced undulating rough open to moderately wide infilled with red clay/fine to medium fragments of mudstone. Weathering penetrates downward and along the fractures and weakens and weathers the upper and lower fracture surfaces up to 50mm. *(stratum copied from 8.10m from previous sheet)*		
9.50-11.00 9.50-9.62 9.60-9.90	8 23	SPT C	N=333*								(3.60)	
				100	100	100	80 200 650					
10.85-11.00	24	C										
11.00-12.50 11.00-11.10	9	SPT	N=600*								11.70	
11.70-11.95	25	C		70	67	64	25 40 230			Medium strong thinly laminated greenish grey CONGLOMERATE. Matrix supported. Matrix constitutes more than 70%. Clasts are subangular to subrounded grey siltstone, quartz and green mudstone/siltstone. Bedding fractures are subhorizontal (5°) very closely to medium spaced undulating rough open clean.	(0.35) 12.05	
							100 200 350			Very weak reddish brown sandy MUDSTONE. Bedding fractures are subhorizontal very closely to medium spaced undulating rough open to moderately wide infilled with reddish brown clay up to 3mm.	(0.45) 12.50	
12.30-12.50	26	C										
12.50-12.65	10	SPT	N=214*							Borehole terminated at 12.50m depth.		

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Comacchio GEO 205**	**ADP**	**RLynes + BSaimen**	

GINT_LIBRARY_V8_05.GLB LibVersion: v8_05 - Lib0004 PrjVersion: v8_05 - Core+Logs 0003 | Log COMPOSITE LOG | 730673_METROWEST.GPJ - v8_05 | 21/01/16 - 15:18 | IF.
Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk.

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH6**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**30.09.15** End: **02.10.15**	**22.68**	**E:352408.7 N:176033.6**	**1** of **8**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
										MADE GROUND: Tarmac.	0.05	
0.10-0.50	1	B								MADE GROUND: Light grey slightly clayey slightly silty sandy GRAVEL with a low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse limestone and sandstone.	(0.45)	
											0.50	
0.50-1.00	2	B								Very stiff dark red mottled light greenish grey slightly sandy CLAY. Sand is fine to coarse. Occasional rootlets.	(0.90)	
1.20-1.65	1.65	SPT	N=28									
											1.40	
1.40-2.10										Soft reddish brown slightly sandy silty CLAY with rare greenish black organic inclusions (up to 10mm diameter) and rare bluish grey silty inclusions (up to 5mm diameter). Sand is fine to coarse.	(0.50)	
1.50-1.65	3	D		100								
											1.90	
1.95-2.10	4	CS								Firm to stiff reddish brown silty CLAY with rare bluish green lenticular silty inclusions.	2.10	
2.10-3.00										Very soft to soft dark reddish brown slightly sandy silty CLAY. Sand is fine to coarse.	(0.80)	
2.10-2.90	5	D		56								
											2.90	
										Firm dark reddish brown silty CLAY.	3.00	
3.00-4.50										Extremely weak thinly laminated reddish brown partially weathered MUDSTONE.	(2.00)	
3.00-3.26	3.26	SPT	N=143*									
3.50-3.70	6	D		73	27	0						

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
30/09/15	18:30	2.10	1.30	120	Dry
01/10/15	08:00	2.10	1.30	120	Dry
01/10/15	18:00	8.90	2.30	120	2.00
02/10/15	08:00	8.90	2.30	120	4.00
02/10/15	18:00	12.00	2.30	120	2.00

General Remarks

1. Location CAT and Genny scanned prior to excavation.
2. Hand dug inspection pit to 1.20m depth
3. Dynamic sampling from ground level to 1.40m. Rotary coring of soft rock using T6-116 barrel with PCD bit and water flush between 1.40m to 12.00m.
4. 50mm diameter HDPE gas and groundwater monitoring standpipes installed as shown. Response zone is 8.50m to 12.70m.
5. SPT hammer AR019-2015 (E_r = 68.04%) used.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Beretta T41**	**TOR**	**AASmith + APope**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH6**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**30.09.15** End: **02.10.15**	**22.68**	**E:352408.7 N:176033.6**	**2** of **8**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
4.50-6.00										Extremely weak thinly laminated reddish brown partially weathered MUDSTONE. *(stratum copied from 3.00m from previous sheet)*	5.00	
5.15-5.25	8	CS		73	60	19				Very weak thinly bedded reddish brown MUDSTONE.	(0.70)	
5.70-5.90	9	CS								Weak to medium strong thinly bedded dark reddish brown MUDSTONE.	5.70	
6.00-7.50											(0.70)	
6.00-6.22	6.19	SPT(c)	N=214*								6.40	
				70	60	27				Very weak thinly to very thinly bedded dark reddish brown MUDSTONE.	(0.70)	
6.85-7.10	10	CS									7.10	
7.10-7.30	7	D								Weak to medium strong very thinly bedded dark reddish brown MUDSTONE.	(0.80)	
7.50-8.90											7.90	
7.85-8.25	11	CS		100	93	86	110 190 390			Weak thinly bedded dark reddish brown MUDSTONE. Fractures are closely to medium spaced subhorizontal undulating rough to smooth open 1-2mm and infilled with red silty clay.	(1.00)	
8.90-9.40				80	70	34				*Description on next sheet*	8.90	

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Beretta T41**	**TOR**	**AASmith + APope**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
MetroWest	**Arup**	**BH6**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **02.10.15**	**22.68**	**E:352408.7 N:176033.6**	**3** of **8**

Depth (m)	Samples & Testing: No	Type	Results	Mechanical Log: TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instrumentation	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
9.10-9.30	12	CS		80	70	34				Weak to very weak thinly bedded dark reddish brown MUDSTONE. *(stratum copied from 8.90m from previous sheet)*	(0.50) 9.40	
9.40-10.90												
9.45-9.90	14	CS								Weak thinly bedded dark reddish brown MUDSTONE.	(0.30) 9.70	
9.80-9.95	13	CS								Medium strong to strong bluish grey fine grained SILTSTONE.	(0.30) 10.00	
				100	80	73				Weak to reddish brown MUDSTONE.	(1.10) 11.10	
10.90-11.70												
				112	112	112				Medium strong reddish brown MUDSTONE.	(1.60) 12.70	
11.40-11.70	15	CS										
12.00-12.45	12.45	SPT(c)	N=7									
12.45-12.70	12.70	SPT(c)	N=60*									
										Borehole terminated at 12.00m depth.		

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Dynamic sampling + Rotary Cored	**Beretta T41**	**TOR**	**AASmith + APope**	AGS

STRUCTURAL SOILS

TRIAL PIT LOG

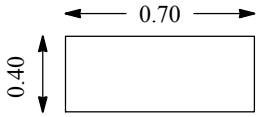
Contract:	Client:	Trial Pit:
MetroWest	**Arup**	**FDTP1**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	**16.09.15**	**---**	**---**	**1** of **1**
	End: **16.09.15**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.10	1	ES	1TUB,1J1,1VOC			MADE GROUND: Black tarmac.	(0.20) 0.20	
						MADE GROUND: Dark brown to red sandy COBBLES. Sand is fine to coarse. Cobbles are angular tabular bricks up to 200mm.	(0.30) 0.50	
0.70-1.10	3	B				MADE GROUND: Dark brown clayey gravelly SAND with occasional rootlets and low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse brick, limestone, glass and ballast. Cobbles are angular tabular bricks up to 150mm.	(0.20) 0.70	
0.90	2	ES	1TUB,1J,1VOC			POSSIBLE MADE GROUND: Dark reddish brown very clayey SAND with occasional rootlets. Sand is fine to coarse.	(0.40) 1.10	
1.10 1.10		V V	c_u=48 c_r=18			Trial pit terminated at 1.10m depth.		

Brickwork 0.60m; 0.10m; Concrete 0.50m

Plan (Not to Scale)



General Remarks

1. Location CAT and Genny scanned prior to excavation.
2. Pit remained stable.
3. Position backfilled with arisings and reinstated with asphalt.

All dimensions in metres | Scale: **1:10**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**AASmith**	

STRUCTURAL SOILS

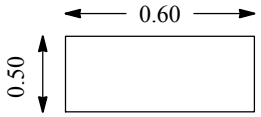
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
MetroWest	**Arup**	**FDTP2**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
730673	End: **16.09.15**	**---**	**---**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: Black tarmac.	(0.15) 0.15	
0.30	1	ES	1TUB,1J1,1VOC		Brickwork 0.60m	MADE GROUND: Dark brownish black clayey sandy GRAVEL with a low cobble and boulder content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse brick, concrete, limestone and sandstone. Cobbles are angular tabular bricks up to 200mm. Boulders are angular tabular brick and concrete up to 250mm.	(0.50) 0.65	
0.65-0.90	2	D			0.10m Concrete 0.40m	Very soft dark brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse limestone and sandstone.	(0.25) 0.90	
0.90-1.20	4	D			0.20m	Soft reddish brown slightly sandy silty CLAY. Sand is fine to coarse.	(0.30) 1.20	
0.95	3	ES	1TUB,1J1,1VOC					
1.20		V	c_u=48/58			Trial pit terminated at 1.20m depth.		
1.20		V	c_r=16/18					

Plan (Not to Scale)



General Remarks

1. Location CAT and Genny scanned prior to excavation.
2. Pit remained stable.
3. Position backfilled with arisings and reinstated with asphalt.

All dimensions in metres | Scale: **1:10**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**AASmith**	

MetroWest

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council
6.25, Environmental Statement, Volume 4, Appendix 10.2, Annex E Laboratory Certificates
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, regulation 5(2)(a)
Planning Act 2008

Author: CH2M
Date: November 2019

Technical Information for Analytical Results

Analysis

* - denotes analysis covered by our UKAS accreditation
# - denoted analysis covered by our MCERTS certification
AD = Sample tested in air dried condition.
AR = Sample tested in as-received condition.
D = Sample tested in dry condition.
L = Laboratory prepared leachate
SC = sub contracted

Where results are less than the limit of detection, the value of 0 is used in calculations.

Deviating Codes

Deviating Samples

The use of any of the following symbols indicates that the sample was deviating and it is possible therefore that the results provided may not be representative of the sample taken.

a – The date and/or time of sampling has not been provided, therefore it is not known if the time lapse between sampling and analysis has exceeded the acceptable holding time(s). It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
b – No sampling time given (waters only) unable to confirm if samples are within acceptable holding times.
c – This Test Item was received in an inappropriate container; it is possible that sample and/or analyte integrity has not been maintained and that the results are non-representative of the original sample taken.
d – On receipt, the temperature of the sample received was found to fall outside the recommendations of EN ISO 18512:2007 Soils & Granular Wastes.
e – The sample was received in a container that had been filled incorrectly which may have compromised sample and/or analyte integrity, rendering the results non-representative ofthe original sample taken.
f – The delay between Sampling and Sample Receipt is greater than the recommended holding time for the analyte of interest in this matrix. It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
g – The delay between Sampling and Analysis is greater than the recommended holding time for the analyte of interest in this matrix. It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.

The following Additional Deviating Sample Codes may also be used.

I/S – Insufficient sample mass/volume received for accurate quantification of this analyte.
U/S – The sample received was deemed unsuitable for accurate determination of this analyte using the Test Methods available.

Deviating Methods

Z – A minor deviation from the Test Method was necessary but this is deemed to have had no impact on the Test Result, the legitimacy of the method validation or the Accreditation Status of the Test Method.
Y – A significant deviation from the Test Method was necessary which is deemed to have had no impact on the Test Result, however, due to a lack of sufficient supporting validation, the Accreditation Status of the Method has been removed.
W – The normal LOD of the instrument/method could not be attained, thus an elevated LOD or LOQ has been applied to the Test Data, however, the data reported meets the requirements of the Client and does not affect compliance with the specification limit (where applicable).
V – One of the QA/QC parameters failed, however, the increased implied Uncertainty associated with the Test Result meets the requirements of the Client and does not affect compliance with the specification limit (where applicable) (Quality Manual, Section 18.2.9).
U – The precision acceptance criteria associated with the Test Method could not be met but the Test Result fulfils the Client's objectives and the elevated Uncertainty does not affect compliance with the specification limit (where applicable) (Quality Manual, Section 18.8.10).
T – The Test Method used was supplied by the Client and involved a simple modification of a Test Method for which ACSE holds accreditation (Quality Manual, Section 18.3.8).

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

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ACS Testing Ltd
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset
BH16 6LE

Certificate of Analysis

Certificate Number : 16-06100-Issue 1-Page: 1

Report Fao:	GEO RESULTS
Site Address:	Portishead & Pill Station Car Parks
Client Order No:	16-79208
Date of Sampling:	12/12/2016
Date Received:	20/12/2016
Report Date:	18/01/2017

Please find your certificates of test attached for your samples received in the laboratory on 20/12/2016 under our laboratory reference 16-06100.

Remarks:

None

Results reviewed by:

[redacted]

David Redfern *Technical Supervisor*

Test Certificates approved by:

[redacted]

Mark Rowley *Laboratory Manager*

Any opinions or interpretations indicated are outside the scope of our UKAS accreditation.
This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.
Excel copies of reports are valid only when accompanied by this PDF certificate.
Client's Sample Description / ACS Material Description are noted for reference only.

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628642

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

Quality Testing & Materials Consultancy to the Construction Industry

4150

ACSE Sample Number	**26610**	**26611**	**26612**
Sample ID	**310806 - 16-79208**	**310807 - 16-79208**	**310808 - 16-79208**
Clients Sample Ref.	**TPPH03**	**TPPH04**	**TPPH04**
Location / Sample Depth (m)	**0.30m**	**0.40m**	**1.10m**
Date Sampled	**12/12/2016**	**13/12/2016**	**13/12/2016**
Time Sampled			
Sample deviating codes	**fg**	**g**	**g**
Client's Sample Description			
ACS Testing Material Description	**MADE GROUND. Grey SA ND**	**MADE GROUND. Grey SA ND**	**MADE GROUND. Grey SA ND**
Principal Matrix (as received)	**SAND**	**SAND**	**SAND**

Determination	Units	Method		Result	AS	Result	AS	Result	AS
Anions									
Sulphate	mg/l	MT/ACSE/204	L	< 3.00	*	**43.7**	*	-----	
Water Soluble Sulphate	mg/l	MT/ACSE/204	AD	**4.61**	*g	**23.0**	*g	**28.6**	*g
BTEX									
Benzene	mg/kg	MT/ACSE/101	AR	**0.17**	*fg	-----		-----	
Ethylbenzene	mg/kg	MT/ACSE/101	AR	< 0.10	*fg	-----		-----	
m+p-xylene	mg/kg	MT/ACSE/101	AR	< 0.19	*fg	-----		-----	
o-xylene	mg/kg	MT/ACSE/101	AR	< 0.10	*fg	-----		-----	
Toluene	mg/kg	MT/ACSE/101	AR	< 0.10	*fg	-----		-----	
Total BTEX	mg/kg	MT/ACSE/101	AR	< 0.50	*fg	-----		-----	
Carbon									
TOC (Total Organic Carbon)	%	MT/ACSE/102	AR	**30.2**	*	-----		-----	
FOC	%	MT/ACSE/102	AR	**0.305**		**0.293**		**0.230**	
Loss on Ignition									
Loss on Ignition (440 ℃)	%	MT/ACSE/302	AD	**5.0**	*g	-----		-----	
Metals (Leachate)									
Arsenic	mg/l	MT/ACSE/205	L	< 0.003	*g	< 0.003	*g	-----	
Boron	mg/l	MT/ACSE/205	L	**0.056**		**0.075**		-----	
Cadmium	mg/l	MT/ACSE/205	L	< 0.0003	*g	< 0.0003	*g	-----	
Chromium	mg/l	MT/ACSE/205	L	< 0.001	*g	**0.001**	*g	-----	
Copper	mg/l	MT/ACSE/205	L	**0.008**	*g	**0.017**	*g	-----	
Mercury	mg/l	MT/ACSE/202	L	**0.0002**	*g	< 0.0001	*	-----	
Nickel	mg/l	MT/ACSE/205	L	**0.0011**	*g	**0.0060**	*g	-----	
Lead	mg/l	MT/ACSE/205	L	**0.005**	*g	< 0.004	*g	-----	
Zinc	mg/l	MT/ACSE/205	L	**0.014**	*g	**0.033**	*g	-----	
Metals (Soil)									
Arsenic	mg/kg	MT/ACSE/201	AD	**59.8**	*#	**54.0**	*#	**70.1**	*#
Cadmium	mg/kg	MT/ACSE/201	AD	**4.52**	*#	**5.46**	*#	**4.52**	*#
Chromium	mg/kg	MT/ACSE/201	AD	**34.2**	*#	**46.7**	*#	**32.9**	*#
Copper	mg/kg	MT/ACSE/201	AD	**146**	*#	**408**	*#	**302**	*#
Mercury	mg/kg	MT/ACSE/202	AD	**0.26**	*#g	**0.31**	*#g	**2.27**	*#g
Nickel	mg/kg	MT/ACSE/201	AD	**73.3**	*#	**85.0**	*#	**66.2**	*#
Lead	mg/kg	MT/ACSE/201	AD	**326**	*#	**183**	*#	**1970**	*#
Zinc	mg/kg	MT/ACSE/201	AD	**530**	*#	**532**	*#	**1460**	*#
Boron (Hot Water Soluble)	mg/kg	NAM/ACSE/X08	AD	**0.14**		**1.62**		**0.51**	
Organic Matter									
Soil Organic Matter	%	NAM/ACSE/X29	AD	**1.4**		**2.5**		**2.6**	
Petroleum Hydrocarbons									
Total TPH (C10-C40)	mg/kg	MT/ACSE/105	AR	**114**	*#fg	**114**	*#g	**72.4**	*#g
pH and Conductivity									
pH (@ 20℃)	units	MT/ACSE/301	L	**7.9**	*	**7.7**	*	-----	
pH (@ 20℃)	units	MT/ACSE/301	AD	**6.9**	*fg	**6.5**	*g	**6.6**	*g
Phenols									
Total Phenol (Sum of 4 specific phenols)	mg/kg	MT/ACSE/107	AD	< 0.05		< 0.05		< 0.05	

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

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ACSE Sample Number	**26610**	**26611**	**26612**
Sample ID	**310806 - 16-79208**	**310807 - 16-79208**	**310808 - 16-79208**
Clients Sample Ref.	**TPPH03**	**TPPH04**	**TPPH04**
Location / Sample Depth (m)	**0.30m**	**0.40m**	**1.10m**
Date Sampled	**12/12/2016**	**13/12/2016**	**13/12/2016**
Time Sampled			
Sample deviating codes	**fg**	**g**	**g**
Client's Sample Description			
ACS Testing Material Description	**MADE GROUND. Grey SA ND**	**MADE GROUND. Grey SA ND**	**MADE GROUND. Grey SA ND**
Principal Matrix (as received)	**SAND**	**SAND**	**SAND**

Determination	Units	Method		Result	AS	Result	AS	Result	AS
Poly Aromatic Hydrocarbons									
Naphthalene	mg/kg	MT/ACSE/106	AD	**0.76**	*#g	**0.64**	*#g	**1.03**	*#g
Acenaphthylene	mg/kg	MT/ACSE/106	AD	**1.06**	*#g	**0.53**	*#g	**0.49**	*#g
Acenaphthene	mg/kg	MT/ACSE/106	AD	**0.16**	*#g	**0.12**	*#g	**0.25**	*#g
Fluorene	mg/kg	MT/ACSE/106	AD	**0.43**	*#g	**0.29**	*#g	**0.51**	*#g
Phenanthrene	mg/kg	MT/ACSE/106	AD	**1.94**	*#g	**1.85**	*#g	**2.53**	*#g
Anthracene	mg/kg	MT/ACSE/106	AD	**4.10**	*#g	**2.44**	*#g	**2.44**	*#g
Fluoranthene	mg/kg	MT/ACSE/106	AD	**5.71**	*#g	**3.17**	*#g	**4.01**	*#g
Pyrene	mg/kg	MT/ACSE/106	AD	**5.86**	*#g	**3.12**	*#g	**3.73**	*#g
Benzo (a) anthracene	mg/kg	MT/ACSE/106	AD	**1.74**	*#g	**1.34**	*#g	**1.70**	*#g
Chrysene	mg/kg	MT/ACSE/106	AD	**2.44**	*#g	**2.17**	*#g	**2.62**	*#g
Benzo (b) fluoranthene	mg/kg	MT/ACSE/106	AD	**2.99**	*#g	**2.85**	*#g	**3.36**	*#g
Benzo (k) fluoranthene	mg/kg	MT/ACSE/106	AD	**1.00**	*#g	**0.94**	*#g	**0.95**	*#g
Benzo (a) pyrene	mg/kg	MT/ACSE/106	AD	**1.55**	*#g	**1.07**	*#g	**1.85**	*#g
Indeno (1 2 3-CD) pyrene	mg/kg	MT/ACSE/106	AD	**1.08**	*#g	**1.09**	*#g	**1.39**	*#g
Dibenzo(a h)anthracene	mg/kg	MT/ACSE/106	AD	**0.46**	*#g	**0.42**	*#g	**0.47**	*#g
Benzo(g h i)perylene	mg/kg	MT/ACSE/106	AD	**1.25**	*#g	**1.36**	*#g	**1.49**	*#g
Total PAH	mg/kg	MT/ACSE/106	AD	**32.5**	*#g	**23.4**	*#g	**28.8**	*#g
Polychlorinated Biphenyls (PCBs)									
PCB (7 Congeners)	mg/kg	MT/ACSE/104	AD	< 1.00		**-----**		**-----**	
Subcontracted Analysis									
Total Cyanide	mg/kg	SC	SC	**Attached**		**Attached**		**Attached**	
Asbestos Fibre ID	SC	SC	SC	**Attached**		**Attached**		**Attached**	
Total Cyanide	mg/l	SC	L	**Attached**		**Attached**		**-----**	
Waters and Leachates									
Ammoniacal Nitrogen	mg/l	MT/ACSE/203	L	**0.04**	*	**0.03**	*	**-----**	

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

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ACSE Sample Number	**26613**	**26614**
Sample ID	**310809 - 16-79208**	**310810 - 16-79208**
Clients Sample Ref.	**TPPH05**	**TPPH06**
Location / Sample Depth (m)	**0.30m**	**0.90m**
Date Sampled	**12/12/2016**	**12/12/2016**
Time Sampled		
Sample deviating codes	**fg**	**fg**
Client's Sample Description		
ACS Testing Material Description	**TOPSOIL. Grey brown SILT**	**MADE GROUND. Grey br own sand SILT**
Principal Matrix (as received)	**LOAM**	**SILT**

Determination	Units	Method		Result	AS	Result	AS
Anions							
Sulphate	mg/l	MT/ACSE/204	L	-----		**14.2**	*
Water Soluble Sulphate	mg/l	MT/ACSE/204	AD	**15.1**	*g	**118**	*g
BTEX							
Benzene	mg/kg	MT/ACSE/101	AR	-----		**0.23**	*fg
Ethylbenzene	mg/kg	MT/ACSE/101	AR	-----		< 0.10	*fg
m+p-xylene	mg/kg	MT/ACSE/101	AR	-----		< 0.19	*fg
o-xylene	mg/kg	MT/ACSE/101	AR	-----		< 0.10	*fg
Toluene	mg/kg	MT/ACSE/101	AR	-----		< 0.10	*fg
Total BTEX	mg/kg	MT/ACSE/101	AR	-----		< 0.50	*fg
Carbon							
TOC (Total Organic Carbon)	%	MT/ACSE/102	AR	-----		**3.17**	*
FOC	%	MT/ACSE/102	AR	**0.0511**		**0.0320**	
Loss on Ignition							
Loss on Ignition (440 ℃)	%	MT/ACSE/302	AD	-----		**2.0**	*g
Metals (Leachate)							
Arsenic	mg/l	MT/ACSE/205	L	-----		**0.007**	*g
Boron	mg/l	MT/ACSE/205	L	-----		**0.142**	
Cadmium	mg/l	MT/ACSE/205	L	-----		< 0.0003	*g
Chromium	mg/l	MT/ACSE/205	L	-----		**0.002**	*g
Copper	mg/l	MT/ACSE/205	L	-----		**0.005**	*g
Mercury	mg/l	MT/ACSE/202	L	-----		**0.0002**	*g
Nickel	mg/l	MT/ACSE/205	L	-----		< 0.0003	*g
Lead	mg/l	MT/ACSE/205	L	-----		< 0.004	*g
Zinc	mg/l	MT/ACSE/205	L	-----		**0.007**	*g
Metals (Soil)							
Arsenic	mg/kg	MT/ACSE/201	AD	**51.3**	*#	**52.4**	*#
Cadmium	mg/kg	MT/ACSE/201	AD	**2.07**	*#	**0.69**	*#
Chromium	mg/kg	MT/ACSE/201	AD	**53.6**	*#	**25.9**	*#
Copper	mg/kg	MT/ACSE/201	AD	**38.7**	*#	**30.6**	*#
Mercury	mg/kg	MT/ACSE/202	AD	**0.17**	*#g	**0.29**	*g
Nickel	mg/kg	MT/ACSE/201	AD	**37.5**	*#	**34.8**	*#
Lead	mg/kg	MT/ACSE/201	AD	**132**	*#	**18.3**	*#
Zinc	mg/kg	MT/ACSE/201	AD	**236**	*#	**52.1**	*#
Boron (Hot Water Soluble)	mg/kg	NAM/ACSE/X08	AD	**0.46**		**0.54**	
Organic Matter							
Soil Organic Matter	%	NAM/ACSE/X29	AD	**3.0**		**1.7**	
Petroleum Hydrocarbons							
Total TPH (C10-C40)	mg/kg	MT/ACSE/105	AR	< 50.0	*#fg	< 50.0	*#fg
pH and Conductivity							
pH (@ 20℃)	units	MT/ACSE/301	L	-----		**7.8**	*
pH (@ 20℃)	units	MT/ACSE/301	AD	**6.6**	*fg	**6.9**	*fg

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

Quality Testing & Materials Consultancy to the Construction Industry

ACSE Sample Number	**26613**	**26614**
Sample ID	**310809 - 16-79208**	**310810 - 16-79208**
Clients Sample Ref.	**TPPH05**	**TPPH06**
Location / Sample Depth (m)	**0.30m**	**0.90m**
Date Sampled	**12/12/2016**	**12/12/2016**
Time Sampled		
Sample deviating codes	**fg**	**fg**
Client's Sample Description		
ACS Testing Material Description	**TOPSOIL. Grey brown SILT**	**MADE GROUND. Grey br own sand SILT**
Principal Matrix (as received)	**LOAM**	**SILT**

Determination	Units	Method		Result	AS	Result	AS
Phenols							
Total Phenol (Sum of 4 specific phenols)	mg/kg	MT/ACSE/107	AD	< 0.05		< 0.05	
Poly Aromatic Hydrocarbons							
Naphthalene	mg/kg	MT/ACSE/106	AD	**0.19**	*#g	**0.24**	*#g
Acenaphthylene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Acenaphthene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Fluorene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Phenanthrene	mg/kg	MT/ACSE/106	AD	**0.28**	*#g	**0.14**	*#g
Anthracene	mg/kg	MT/ACSE/106	AD	**0.15**	*#g	< 0.10	*#g
Fluoranthene	mg/kg	MT/ACSE/106	AD	**0.20**	*#g	< 0.10	*#g
Pyrene	mg/kg	MT/ACSE/106	AD	**0.16**	*#g	< 0.10	*#g
Benzo (a) anthracene	mg/kg	MT/ACSE/106	AD	**0.10**	*#g	< 0.10	*#g
Chrysene	mg/kg	MT/ACSE/106	AD	**0.13**	*#g	< 0.10	*#g
Benzo (b) fluoranthene	mg/kg	MT/ACSE/106	AD	**0.17**	*#g	< 0.10	*#g
Benzo (k) fluoranthene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Benzo (a) pyrene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Indeno (1 2 3-CD) pyrene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Dibenzo(a h)anthracene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Benzo(g h i)perylene	mg/kg	MT/ACSE/106	AD	< 0.10	*#g	< 0.10	*#g
Total PAH	mg/kg	MT/ACSE/106	AD	< 2.00	*#g	< 2.00	*#g
Polychlorinated Biphenyls (PCBs)							
PCB (7 Congeners)	mg/kg	MT/ACSE/104	AD	-----		< 1.00	
Subcontracted Analysis							
Total Cyanide	mg/kg	SC	SC	**Attached**		**Attached**	
Asbestos Fibre ID	SC	SC	SC	**Attached**		**Attached**	
Total Cyanide	mg/l	SC	L	-----		**Attached**	
Waters and Leachates							
Ammoniacal Nitrogen	mg/l	MT/ACSE/203	L	-----		< 0.02	*

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

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Fax 01202 628680

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Technical Information for Analytical Results

Analysis

* - denotes analysis covered by our UKAS accreditation
# - denoted analysis covered by our MCERTS certification
AD = Sample tested in air dried condition.
AR = Sample tested in as-received condition.
D = Sample tested in dry condition.
L = Laboratory prepared leachate
SC = sub contracted

Where results are less than the limit of detection, the value of 0 is used in calculations.

Deviating Codes

Deviating Samples

The use of any of the following symbols indicates that the sample was deviating and it is possible therefore that the results provided may not be representative of the sample taken.

a – The date and/or time of sampling has not been provided, therefore it is not known if the time lapse between sampling and analysis has exceeded the acceptable holding time(s). It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
b – No sampling time given (waters only) unable to confirm if samples are within acceptable holding times.
c – This Test Item was received in an inappropriate container; it is possible that sample and/or analyte integrity has not been maintained and that the results are non-representative of the original sample taken.
d – On receipt, the temperature of the sample received was found to fall outside the recommendations of EN ISO 18512:2007 Soils & Granular Wastes.
e – The sample was received in a container that had been filled incorrectly which may have compromised sample and/or analyte integrity, rendering the results non-representative ofthe original sample taken.
f – The delay between Sampling and Sample Receipt is greater than the recommended holding time for the analyte of interest in this matrix. It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
g – The delay between Sampling and Analysis is greater than the recommended holding time for the analyte of interest in this matrix. It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.

The following Additional Deviating Sample Codes may also be used.

I/S – Insufficient sample mass/volume received for accurate quantification of this analyte.
U/S – The sample received was deemed unsuitable for accurate determination of this analyte using the Test Methods available.

Deviating Methods

Z – A minor deviation from the Test Method was necessary but this is deemed to have had no impact on the Test Result, the legitimacy of the method validation or the Accreditation Status of the Test Method.
Y – A significant deviation from the Test Method was necessary which is deemed to have had no impact on the Test Result, however, due to a lack of sufficient supporting validation, the Accreditation Status of the Method has been removed.
W – The normal LOD of the instrument/method could not be attained, thus an elevated LOD or LOQ has been applied to the Test Data, however, the data reported meets the requirements of the Client and does not affect compliance with the specification limit (where applicable).
V – One of the QA/QC parameters failed, however, the increased implied Uncertainty associated with the Test Result meets the requirements of the Client and does not affect compliance with the specification limit (where applicable) (Quality Manual, Section 18.2.9).
U – The precision acceptance criteria associated with the Test Method could not be met but the Test Result fulfils the Client's objectives and the elevated Uncertainty does not affect compliance with the specification limit (where applicable) (Quality Manual, Section 18.8.10).
T – The Test Method used was supplied by the Client and involved a simple modification of a Test Method for which ACSE holds accreditation (Quality Manual, Section 18.3.8).

Head Office
Unit 14B
Blackhill Road West
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Poole
Dorset BH16 6LE

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Fax 01202 628680

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Quality Testing & Materials Consultancy to the Construction Industry

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 17-88216

11-Jan-17

Client	ACS Environmental Unit 14b Blackhill Road West Holton Heath Trading Park Poole Dorset BH16 6LE
Our Reference	17-88216
Client Reference	(not supplied)
Order No	E/16-06100/1222
Contract Title	E/16-06100/1222
Description	3 Water samples.
Date Received	09-Jan-17
Date Started	09-Jan-17
Date Completed	11-Jan-17
Test Procedures	Identified by prefix DETSn (details on request).
Notes	Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By [redacted]

Rob Brown
Business Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Water Samples

Our Ref 17-88216
Client Ref
Contract Title E/16-06100/1222

			Lab No	1107571	1107572	1107573
			Sample ID	26610	26611	26614
			Depth			
			Other ID			
			Sample Type	WATER	WATER	WATER
			Sampling Date	n/s	n/s	n/s
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Inorganics						
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40

Key: n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 17-88216
Client Ref
Contract E/16-06100/1222

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1107571	26610 WATER		PB 1L	Sample date+time not supplied, Cyanide/Mono pHoh (7 days)	
1107572	26611 WATER		PB 1L	Sample date+time not supplied, Cyanide/Mono pHoh (7 days)	
1107573	26614 WATER		PB 1L	Sample date+time not supplied, Cyanide/Mono pHoh (7 days)	

Key: P-Plastic B-Bottle

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

Disposal

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

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

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 16-87661

06-Jan-17

Client	ACS Environmental Unit 14b Blackhill Road West Holton Heath Trading Park Poole Dorset BH16 6LE
Our Reference	16-87661
Client Reference	(not supplied)
Order No	E/16-06100/1222
Contract Title	(not supplied)
Description	5 Misc samples.
Date Received	23-Dec-16
Date Started	23-Dec-16
Date Completed	06-Jan-17
Test Procedures	Identified by prefix DETSn (details on request).
Notes	Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By [redacted]

Rob Brown
Business Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Misc Samples

Our Ref 16-87661
Client Ref
Contract Title

	Lab No	1105079	1105080	1105081	1105082	1105083
	Sample ID	26610	26611	26612	26613	26614
	Depth					
	Other ID					
	Sample Type	MISC	MISC	MISC	MISC	MISC
	Sampling Date	12/12/16	13/12/16	13/12/16	12/12/16	12/12/16
	Sampling Time	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Inorganics						
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

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

Information in Support of the Analytical Results

Our Ref 16-87661
Client Ref
Contract

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1105079	26610 MISC	12/12/16	PG		
1105080	26611 MISC	13/12/16	PG		
1105081	26612 MISC	13/12/16	PG		
1105082	26613 MISC	12/12/16	PG		
1105083	26614 MISC	12/12/16	PG		

Key: P-Plastic G-Bag

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

Soil Analysis Notes

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

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

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

Disposal

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

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

ENVIROCHEM
Analytical Laboratories Ltd.
12 The Gardens
Broadcut, Fareham
Hampshire
PO16 8SS

Tel: (01329) 287777
Fax: (01329) 287755
www.envirochem.co.uk
office@envirochem.co.uk

UKAS TESTING 1227

Our Ref: J113204 Rev. 2 FI: 5
Your Ref: E/16-06100/1221
Date: 03/01/2017

Asbestos Fibre Identification Report

Client: ACS Environmental Testing Ltd
Unit 14B Blackhill Road West, Holton Heath Trading Park, Poole, Dorset, BH16 6LE

Site Address: 26610, 26611, 26612, 26613, 26614,

Sampled By: ACS Environmental Testing Ltd

Date sampled/received: 23rd December 2016

Date analysed: 29th December 2016

Analyst/s: Ewelina Kowalczyk Pariyar

Analysis Location: 12 The Gardens, Broadcut, Fareham, Hampshire, PO16 8SS

ANALYTICAL PROCEDURE

Fibre identification was carried out in accordance with the documented `in-house' methods based on the HSE Guidance Note HSG 248. These employed stereo microscopy, polarized microscopy and dispersion staining techniques.

RESULTS

Sample No.	Sample Ref.	Location	Asbestos Detected	Asbestos Type
26610	BS399026	Sand	No	
26611	BS399027	Sand	No	
26612	BS399028	Sand	No	
26613	BS399029	Loam	No	

NOTES:
1. Sample(s) were examined for the presence of 6 types of asbestos fibres: crocidolite (blue), amosite (brown), chrysotile (white), anthophyllite, actinolite and tremolite.
2. Samples collected by the client are evaluated using information provided by the client. For samples collected by the client the date of receipt is deemed to be the same as the date sampled.
3. Envirochem is a UKAS accredited laboratory for sampling and identification of asbestos containing materials.
4. Comments, observations and opinions are outside the scope of UKAS accreditation.
5. The analytical method in the HSG248 does not quantify the amount of asbestos present, therefore UKAS accreditation does not permit quantification.
6. If, during fibre identification, only 1 or 2 fibres are seen and identified as asbestos, then the term 'trace asbestos identified' is used.

SIGNATURE: [redacted] Authorised signatory PRINT NAME: Mathew Griffiths

ENVIROCHEM
Analytical Laboratories Ltd.
12 The Gardens
Broadcut, Fareham
Hampshire
PO16 8SS

1227
Tel: (01329) 287777
Fax: (01329) 287755
www.envirochem.co.uk
office@envirochem.co.uk

Our Ref: J113204 Rev. 2 FI: 5
Your Ref: E/16-06100/1221
Date: 03/01/2017

Asbestos Fibre Identification Report

Client:	ACS Environmental Testing Ltd Unit 14B Blackhill Road West, Holton Heath Trading Park, Poole, Dorset, BH16 6LE
Site Address:	26610, 26611, 26612, 26613, 26614,
Sampled By:	ACS Environmental Testing Ltd
Date sampled/received:	23rd December 2016
Date analysed:	29th December 2016
Analyst/s:	Ewelina Kowalczyk Pariyar
Analysis Location:	12 The Gardens, Broadcut, Fareham, Hampshire, PO16 8SS

ANALYTICAL PROCEDURE

Fibre identification was carried out in accordance with the documented `in-house' methods based on the HSE Guidance Note HSG 248. These employed stereo microscopy, polarized microscopy and dispersion staining techniques.

RESULTS

Sample No.	Sample Ref.	Location	Asbestos Detected	Asbestos Type
26614	BS399030	Silt	No	

NOTES:
1. Sample(s) were examined for the presence of 6 types of asbestos fibres: crocidolite (blue), amosite (brown), chrysotile (white), anthophyllite, actinolite and tremolite.
2. Samples collected by the client are evaluated using information provided by the client. For samples collected by the client the date of receipt is deemed to be the same as the date sampled.
3. Envirochem is a UKAS accredited laboratory for sampling and identification of asbestos containing materials.
4. Comments, observations and opinions are outside the scope of UKAS accreditation.
5. The analytical method in the HSG248 does not quantify the amount of asbestos present, therefore UKAS accreditation does not permit quantification.
6. If, during fibre identification, only 1 or 2 fibres are seen and identified as asbestos, then the term 'trace asbestos identified' is used.

SIGNATURE: [redacted] Authorised signatory PRINT NAME: Mathew Griffiths

Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

SUPPLEMENT TO TEST REPORT 15/06221/1

Envirolab Job Number: 15/06221
Issue Number: 2 **Date:** 29 October, 2015

Client:
Structural Soils Limited (Bristol)
The Old School
Stillhouse Lane
Bedminster
Bristol
UK
BS3 4EB

Project Manager: enviro@soils.co.uk/Iain Foster/Lisa Frost/Mike Add
Project Name: Arup Metrowest
Project Ref: 730673
Order No: N/A
Date Samples Received: 14/09/15
Date Instructions Received: 23/09/15
Date Analysis Completed: 28/10/15

Prepared by:

[redacted]
Melanie Marshall
Laboratory Coordinator

Approved by:

[redacted]
Iain Haslock
Analytical Consultant

Envirolab Job Number: 15/06221

Client Project Name: Arup Metrowest

Client Project Ref: 730673

Lab Sample ID	15/06221/1	15/06221/2	15/06221/3	15/06221/4	15/06221/5	15/06221/6	15/06221/12	15/06221/13	Units	Method ref
Client Sample No	1	1	1	1	2	4	1	1		
Client Sample ID	CPT1	CPT3	CPT4	CPT6	BH1	BH2	BH3	BH3B		
Depth to Top	0.60	0.20	0.50	0.30	0.50	1.00	0.20	0.30		
Depth To Bottom										
Date Sampled	09-Sep-15	08-Sep-15	08-Sep-15	07-Sep-15			17-Sep-15	17-Sep-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4A	4A	4AE	4A	6AE	4AE	5A		
% Stones >10mm$_A^{\#}$	24.0	53.2	38.7	49.7	13.5	48.3	4.0	7.4	% w/w	A-T-044
pH$_D^{M\#}$	8.50	8.53	8.47	8.39	10.11	8.62	8.65	8.69	pH	A-T-031s
pH BRE$_D^{M\#}$	-	-	-	-	-	8.68	-	-	pH	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	<0.01	<0.01	<0.01	<0.01	0.12	0.01	0.03	0.03	g/l	A-T-026s
Sulphate BRE (water sol 2:1)$_D^{M\#}$	-	-	-	-	-	11	-	-	mg/l	A-T-026s
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	A-T-050s
Arsenic$_D^{M\#}$	12	3	9	6	28	5	12	15	mg/kg	A-T-024s
Boron (water soluble)$_D^{M\#}$	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	A-T-027s
Cadmium$_D^{M\#}$	<0.5	0.9	0.9	1.3	8.9	<0.5	1.2	0.8	mg/kg	A-T-024s
Copper$_D^{M\#}$	46	14	43	26	99	8	72	46	mg/kg	A-T-024s
Chromium$_D^{M\#}$	15	9	10	17	402	8	18	20	mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	A-T-040s
Lead$_D^{M\#}$	255	22	128	42	616	15	91	102	mg/kg	A-T-024s
Mercury$_D$	0.33	<0.17	0.53	0.28	<0.17	0.34	0.28	0.24	mg/kg	A-T-024s
Nickel$_D^{M\#}$	20	8	15	33	35	7	22	18	mg/kg	A-T-024s
Zinc$_D^{M\#}$	590	84	313	134	1370	41	224	529	mg/kg	A-T-024s

Envirolab Job Number: 15/06221

Client Project Name: Arup Metrowest

Client Project Ref: 730673

Lab Sample ID	15/06221/1	15/06221/2	15/06221/3	15/06221/4	15/06221/5	15/06221/6	15/06221/12	15/06221/13	Units	Method ref
Client Sample No	1	1	1	1	2	4	1	1		
Client Sample ID	CPT1	CPT3	CPT4	CPT6	BH1	BH2	BH3	BH3B		
Depth to Top	0.60	0.20	0.50	0.30	0.50	1.00	0.20	0.30		
Depth To Bottom										
Date Sampled	09-Sep-15	08-Sep-15	08-Sep-15	07-Sep-15			17-Sep-15	17-Sep-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4A	4A	4AE	4A	6AE	4AE	5A		
Leachate Prep BS EN 12457-1 (2:1)$_A$	*	*	*	*	*	*	*	*		A-T-046
pH (leachable)$_A^\#$	7.90	7.82	7.56	7.19	8.82	7.81	8.35	8.14	pH	A-T-031w
Sulphate (leachable)$_A^\#$	<1.00	<1.00	<1.00	<1.00	45.97	14.78	<1.00	18.39	mg/l	A-T-026w
Arsenic (leachable)$_A^\#$	2	3	7	5	29	1	4	7	µg/l	A-T-025w
Boron (leachable)$_A^\#$	12	25	21	40	40	61	<10	38	µg/l	A-T-025w
Cadmium (leachable)$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/l	A-T-025w
Copper (leachable)$_A^\#$	6	5	5	11	4	2	5	6	µg/l	A-T-025w
Chromium (leachable)$_A^\#$	<1	<1	<1	<1	28	<1	<1	3	µg/l	A-T-025w
Chromium (hexavalent) (leachable)$_A$	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/l	A-T-040w
Lead (leachable)$_A^\#$	4	4	1	8	5	<1	<1	2	µg/l	A-T-025w
Mercury (leachable)$_A^\#$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	µg/l	A-T-025w
Nickel (leachable)$_A^\#$	<1	2	3	2	<1	<1	<1	<1	µg/l	A-T-025w
Zinc (leachable)$_A^\#$	7	24	9	20	2	<1	<1	4	µg/l	A-T-025w

Envirolab Job Number: 15/06221

Client Project Name: Arup Metrowest

Client Project Ref: 730673

Lab Sample ID	15/06221/1	15/06221/2	15/06221/3	15/06221/4	15/06221/5	15/06221/6	15/06221/12	15/06221/13	Units	Method ref
Client Sample No	1	1	1	1	2	4	1	1		
Client Sample ID	CPT1	CPT3	CPT4	CPT6	BH1	BH2	BH3	BH3B		
Depth to Top	0.60	0.20	0.50	0.30	0.50	1.00	0.20	0.30		
Depth To Bottom										
Date Sampled	09-Sep-15	08-Sep-15	08-Sep-15	07-Sep-15			17-Sep-15	17-Sep-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4A	4A	4AE	4A	6AE	4AE	5A		
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_A^{\#}$	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD		A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_D$	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		Gravimetry

Envirolab Job Number: 15/06221

Client Project Name: Arup Metrowest

Client Project Ref: 730673

Lab Sample ID	15/06221/1	15/06221/2	15/06221/3	15/06221/4	15/06221/5	15/06221/6	15/06221/12	15/06221/13	Units	Method ref
Client Sample No	1	1	1	1	2	4	1	1		
Client Sample ID	CPT1	CPT3	CPT4	CPT6	BH1	BH2	BH3	BH3B		
Depth to Top	0.60	0.20	0.50	0.30	0.50	1.00	0.20	0.30		
Depth To Bottom										
Date Sampled	09-Sep-15	08-Sep-15	08-Sep-15	07-Sep-15			17-Sep-15	17-Sep-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4A	4A	4AE	4A	6AE	4AE	5A		
PAH 16										
Acenaphthene$_A^{M\#}$	0.05	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01	mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	0.04	0.01	0.03	0.01	0.07	<0.01	0.02	<0.01	mg/kg	A-T-019s
Anthracene$_A^{M\#}$	0.20	0.03	0.07	0.05	0.35	0.03	0.07	<0.02	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.73	0.09	0.20	0.15	1.28	0.10	0.67	0.07	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.68	0.11	0.30	0.16	0.92	0.09	0.91	0.10	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	1.68	0.21	0.69	0.36	1.73	0.19	1.27	0.14	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.30	0.06	0.22	0.09	0.39	0.05	0.61	0.09	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	0.38	<0.07	0.15	0.08	0.57	<0.07	0.34	<0.07	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	1.28	0.15	0.42	0.29	1.22	0.15	0.87	0.11	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	0.11	<0.04	0.07	<0.04	0.11	<0.04	0.13	<0.04	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	1.56	0.20	0.40	0.36	2.66	0.18	1.14	0.15	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	0.04	<0.01	0.01	<0.01	0.14	<0.01	<0.01	<0.01	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.38	0.07	0.24	0.11	0.54	0.07	0.63	0.07	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	0.20	<0.03	0.05	0.03	0.05	<0.03	<0.03	<0.03	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	0.70	0.07	0.15	0.11	1.41	0.05	0.31	0.07	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	1.56	0.18	0.38	0.35	1.92	0.18	1.08	0.13	mg/kg	A-T-019s
PAH (total 16)$_A^{M\#}$	9.90	1.25	3.37	2.17	13.4	1.15	8.06	0.93	mg/kg	A-T-019s

Envirolab Job Number: 15/06221 **Client Project Name: Arup Metrowest**

Client Project Ref: 730673

Lab Sample ID	15/06221/1	15/06221/2	15/06221/3	15/06221/4	15/06221/5	15/06221/6	15/06221/12	15/06221/13	Units	Method ref
Client Sample No	1	1	1	1	2	4	1	1		
Client Sample ID	CPT1	CPT3	CPT4	CPT6	BH1	BH2	BH3	BH3B		
Depth to Top	0.60	0.20	0.50	0.30	0.50	1.00	0.20	0.30		
Depth To Bottom										
Date Sampled	09-Sep-15	08-Sep-15	08-Sep-15	07-Sep-15			17-Sep-15	17-Sep-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4A	4A	4AE	4A	6AE	4AE	5A		
SVOC										
Hexachlorobenzene$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Diethyl phthalate$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Dimethyl phthalate$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Dibenzofuran$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Carbazole$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Butylbenzyl phthalate $_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Bis(2-ethylhexyl)phthalate$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Bis(2-chloroethoxy)methane$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Bis(2-chloroethyl)ether$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
4-Nitrophenol$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
4-Methylphenol$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
4-Chloro-3-methylphenol$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
2-Nitrophenol$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
2-Methylphenol$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
2-Chlorophenol$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
2,6-Dinitrotoluene$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
2,4-Dinitrotoluene$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
2,4-Dimethylphenol$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
2,4-Dichlorophenol$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
2,4,6-Trichlorophenol$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
2,4,5-Trichlorophenol$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
2-Chloronaphthalene$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
2-Methylnaphthalene$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Bis(2-chloroisopropyl)ether$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
2,4-Dinitrophenol$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
4,6-Dinitro-2-methylphenol$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Phenol $_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Pentachlorophenol$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
n-Nitroso-n-dipropylamine$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
n-Dioctylphthalate$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
n-Dibutylphthalate$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Nitrobenzene$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s

Envirolab Job Number: 15/06221

Client Project Name: Arup Metrowest

Client Project Ref: 730673

Lab Sample ID	15/06221/1	15/06221/2	15/06221/3	15/06221/4	15/06221/5	15/06221/6	15/06221/12	15/06221/13	Units	Method ref
Client Sample No	1	1	1	1	2	4	1	1		
Client Sample ID	CPT1	CPT3	CPT4	CPT6	BH1	BH2	BH3	BH3B		
Depth to Top	0.60	0.20	0.50	0.30	0.50	1.00	0.20	0.30		
Depth To Bottom										
Date Sampled	09-Sep-15	08-Sep-15	08-Sep-15	07-Sep-15			17-Sep-15	17-Sep-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4A	4A	4AE	4A	6AE	4AE	5A		
Isophorone$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Hexachloroethane$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Hexachlorocyclopentadiene$_A$	<100	<100	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052s
Perylene$_A$	498	240	415	<100	237	125	333	271	µg/kg	A-T-052s

Envirolab Job Number: 15/06221 **Client Project Name: Arup Metrowest**

Client Project Ref: 730673

Lab Sample ID	15/06221/1	15/06221/2	15/06221/3	15/06221/4	15/06221/5	15/06221/6	15/06221/12	15/06221/13	Units	Method ref
Client Sample No	1	1	1	1	2	4	1	1		
Client Sample ID	CPT1	CPT3	CPT4	CPT6	BH1	BH2	BH3	BH3B		
Depth to Top	0.60	0.20	0.50	0.30	0.50	1.00	0.20	0.30		
Depth To Bottom										
Date Sampled	09-Sep-15	08-Sep-15	08-Sep-15	07-Sep-15			17-Sep-15	17-Sep-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4A	4A	4AE	4A	6AE	4AE	5A		
VOC										
Dichlorodifluoromethane$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Chloromethane$_A^\#$	<1	11	<1	13	6	<1	<1	10	µg/kg	A-T-006s
Vinyl Chloride$_A^\#$	<1	<1	<1	<1	<1	<1	<1	7	µg/kg	A-T-006s
Bromomethane$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Chloroethane$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Trichlorofluoromethane$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,1-Dichloroethene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Carbon Disulphide$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Dichloromethane $_A$	<5	<5	<5	<5	27	<5	<5	<5	µg/kg	A-T-006s
trans 1,2-Dichloroethene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,1-Dichloroethane$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
cis 1,2-Dichloroethene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
2,2-Dichloropropane$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Bromochloromethane$_A^\#$	<5	<5	<5	<5	<5	<5	<5	<5	µg/kg	A-T-006s
Chloroform$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,1,1-Trichloroethane$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,1-Dichloropropene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Carbon Tetrachloride$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,2-Dichloroethane$_A^\#$	<2	<2	<2	<2	<2	<2	<2	<2	µg/kg	A-T-006s
Benzene $_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Trichloroethene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,2-Dichloropropane$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Dibromomethane$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Bromodichloromethane$_A^\#$	<10	<10	<10	<10	<10	<10	<10	<10	µg/kg	A-T-006s
cis 1,3-Dichloropropene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Toluene $_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
trans 1,3-Dichloropropene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,1,2-Trichloroethane$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,3-Dichloropropane$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Tetrachloroethene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Dibromochloromethane$_A^\#$	<3	<3	<3	<3	<3	<3	<3	<3	µg/kg	A-T-006s
1,2-Dibromoethane$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s

Envirolab Job Number: 15/06221

Client Project Name: Arup Metrowest

Client Project Ref: 730673

Lab Sample ID	15/06221/1	15/06221/2	15/06221/3	15/06221/4	15/06221/5	15/06221/6	15/06221/12	15/06221/13	Units	Method ref
Client Sample No	1	1	1	1	2	4	1	1		
Client Sample ID	CPT1	CPT3	CPT4	CPT6	BH1	BH2	BH3	BH3B		
Depth to Top	0.60	0.20	0.50	0.30	0.50	1.00	0.20	0.30		
Depth To Bottom										
Date Sampled	09-Sep-15	08-Sep-15	08-Sep-15	07-Sep-15			17-Sep-15	17-Sep-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4A	4A	4AE	4A	6AE	4AE	5A		
Chlorobenzene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,1,1,2-Tetrachloroethane$_A$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Ethylbenzene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
m & p Xylene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
o-Xylene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Styrene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Bromoform$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Isopropylbenzene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,1,2,2-Tetrachloroethane$_A$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,2,3-Trichloropropane$_A^\#$	*<1*	<1	*<1*	<1	<1	<1	<1	<1	µg/kg	A-T-006s
Bromobenzene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
n-Propylbenzene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
2-Chlorotoluene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,3,5-Trimethylbenzene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
4-Chlorotoluene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
tert-Butylbenzene$_A^\#$	<2	<2	<2	<2	<2	<2	<2	<2	µg/kg	A-T-006s
1,2,4-Trimethylbenzene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
sec-Butylbenzene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
4-Isopropyltoluene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,3-Dichlorobenzene$_A$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,4-Dichlorobenzene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
n-Butylbenzene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,2-Dichlorobenzene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,2-Dibromo-3-chloropropane$_A$	<2	<2	<2	<2	<2	<2	<2	<2	µg/kg	A-T-006s
1,2,4-Trichlorobenzene$_A$	<3	<3	<3	<3	<3	<3	<3	<3	µg/kg	A-T-006s
Hexachlorobutadiene$_A^\#$	<1	<1	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006s
1,2,3-Trichlorobenzene$_A$	<3	<3	<3	<3	<3	<3	<3	<3	µg/kg	A-T-006s

Envirolab Job Number: 15/06221

Client Project Name: Arup Metrowest

Client Project Ref: 730673

Lab Sample ID	15/06221/1	15/06221/2	15/06221/3	15/06221/4	15/06221/5	15/06221/6	15/06221/12	15/06221/13	Units	Method ref
Client Sample No	1	1	1	1	2	4	1	1		
Client Sample ID	CPT1	CPT3	CPT4	CPT6	BH1	BH2	BH3	BH3B		
Depth to Top	0.60	0.20	0.50	0.30	0.50	1.00	0.20	0.30		
Depth To Bottom										
Date Sampled	09-Sep-15	08-Sep-15	08-Sep-15	07-Sep-15			17-Sep-15	17-Sep-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4A	4A	4AE	4A	6AE	4AE	5A		
TPH CWG										
Ali >C5-C6$_A^\#$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C6-C8$_A^\#$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C8-C10$_A^\#$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C10-C12$_A^\#$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C12-C16$_A^\#$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C16-C21$_A^\#$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C21-C35$_A^\#$	<0.1	<0.1	<0.1	<0.1	3.0	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Total Aliphatics$_A$	<0.1	<0.1	<0.1	<0.1	3.0	<0.1	<0.1	<0.1	mg/kg	A-T-022+23s
Aro >C5-C7$_A^\#$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C7-C8$_A^\#$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C8-C9$_A^\#$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C9-C10$_A^\#$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	mg/kg	A-T-022s
Aro >C10-C12$_A^\#$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C12-C16$_A^\#$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C16-C21$_A^\#$	2.3	0.2	0.7	0.3	1.7	<0.1	0.4	<0.1	mg/kg	A-T-023s
Aro >C21-C35$_A^\#$	3.4	0.7	0.3	0.6	0.3	<0.1	0.5	<0.1	mg/kg	A-T-023s
Total Aromatics$_A$	5.8	0.9	1.1	0.9	1.9	<0.1	0.9	<0.1	mg/kg	A-T-022+23s
TPH (Ali & Aro)$_A$	5.8	0.9	1.1	0.9	4.9	<0.1	0.9	<0.1	mg/kg	A-T-022+23s
BTEX - Benzene$_A^\#$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Toluene$_A^\#$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A^\#$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - m & p Xylene$_A^\#$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - o Xylene$_A^\#$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
MTBE$_A^\#$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s

Envirolab Job Number: 15/06221

Client Project Name: Arup Metrowest

Client Project Ref: 730673

Lab Sample ID	15/06221/14	15/06221/15							Units	Method ref
Client Sample No	2	1								
Client Sample ID	FDTP1	FDTP2								
Depth to Top	0.90	0.30								
Depth To Bottom										
Date Sampled	16-Sep-15	16-Sep-15								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5AE	6AE								
% Stones >10mm$_A^{\#}$	13.6	<0.1							% w/w	A-T-044
pH$_D^{M\#}$	8.44	8.69							pH	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	0.06	<0.01							g/l	A-T-026s
Phenols - Total by HPLC$_A$	<0.2	<0.2							mg/kg	A-T-050s
Arsenic$_D^{M\#}$	9	9							mg/kg	A-T-024s
Boron (water soluble)$_D^{M\#}$	1.1	<1.0							mg/kg	A-T-027s
Cadmium$_D^{M\#}$	<0.5	1.4							mg/kg	A-T-024s
Copper$_D^{M\#}$	23	30							mg/kg	A-T-024s
Chromium$_D^{M\#}$	22	19							mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1	<1							mg/kg	A-T-040s
Lead$_D^{M\#}$	48	136							mg/kg	A-T-024s
Mercury$_D$	<0.17	0.59							mg/kg	A-T-024s
Nickel$_D^{M\#}$	19	15							mg/kg	A-T-024s
Zinc$_D^{M\#}$	93	182							mg/kg	A-T-024s

Envirolab Job Number: 15/06221

Client Project Name: Arup Metrowest

Client Project Ref: 730673

Lab Sample ID	15/06221/14	15/06221/15							Units	Method ref
Client Sample No	2	1								
Client Sample ID	FDTP1	FDTP2								
Depth to Top	0.90	0.30								
Depth To Bottom										
Date Sampled	16-Sep-15	16-Sep-15								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5AE	6AE								
Leachate Prep BS EN 12457-1 (2:1)$_A$	*	*								A-T-046
pH (leachable)$_A^\#$	7.71	7.89							pH	A-T-031w
Sulphate (leachable)$_A^\#$	59.94	14.86							mg/l	A-T-026w
Arsenic (leachable)$_A^\#$	2	11							µg/l	A-T-025w
Boron (leachable)$_A^\#$	222	48							µg/l	A-T-025w
Cadmium (leachable)$_A^\#$	<1	<1							µg/l	A-T-025w
Copper (leachable)$_A^\#$	3	6							µg/l	A-T-025w
Chromium (leachable)$_A^\#$	<1	5							µg/l	A-T-025w
Chromium (hexavalent) (leachable)$_A$	<0.05	<0.05							mg/l	A-T-040w
Lead (leachable)$_A^\#$	<1	7							µg/l	A-T-025w
Mercury (leachable)$_A^\#$	<0.1	<0.1							µg/l	A-T-025w
Nickel (leachable)$_A^\#$	<1	<1							µg/l	A-T-025w
Zinc (leachable)$_A^\#$	<1	3							µg/l	A-T-025w

Envirolab Job Number: 15/06221

Client Project Name: Arup Metrowest

Client Project Ref: 730673

Lab Sample ID	15/06221/14	15/06221/15							Units	Method ref
Client Sample No	2	1								
Client Sample ID	FDTP1	FDTP2								
Depth to Top	0.90	0.30								
Depth To Bottom										
Date Sampled	16-Sep-15	16-Sep-15								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5AE	6AE								
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_A^{\#}$	NAD	Chrysotile								A-T-045
Asbestos Matrix (visual)$_A$	-	Board								A-T-045
Asbestos Matrix (microscope)$_A$	-	Loose fibres								A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_D$	N/A	No								Gravimetry
Asbestos in Soil Quantification % Composition (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing)$_D$	-	0.019							% w/w	A-T-054

Envirolab Job Number: 15/06221

Client Project Name: Arup Metrowest

Client Project Ref: 730673

Lab Sample ID	15/06221/14	15/06221/15							Units	Method ref
Client Sample No	2	1								
Client Sample ID	FDTP1	FDTP2								
Depth to Top	0.90	0.30								
Depth To Bottom										
Date Sampled	16-Sep-15	16-Sep-15								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5AE	6AE								
PAH 16										
Acenaphthene$_A^{M\#}$	0.12	0.20							mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	0.06	0.44							mg/kg	A-T-019s
Anthracene$_A^{M\#}$	0.65	1.51							mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	2.10	5.89							mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	1.85	6.05							mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	2.42	7.87							mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.99	3.02							mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	0.69	2.36							mg/kg	A-T-019s
Chrysene$_A^{M\#}$	2.27	6.85							mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	0.27	0.78							mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	4.32	12							mg/kg	A-T-019s
Fluorene$_A^{M\#}$	0.15	0.46							mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	1.06	3.52							mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	0.05	0.32							mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	2.75	6.19							mg/kg	A-T-019s
Pyrene$_A^{M\#}$	3.57	10.3							mg/kg	A-T-019s
PAH (total 16)$_A^{M\#}$	23.3	67.8							mg/kg	A-T-019s

Lab Sample ID	15/06221/14	15/06221/15							Units	Method ref
Client Sample No	2	1								
Client Sample ID	FDTP1	FDTP2								
Depth to Top	0.90	0.30								
Depth To Bottom										
Date Sampled	16-Sep-15	16-Sep-15								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5AE	6AE								
SVOC										
Hexachlorobenzene$_A$	<100	<100							µg/kg	A-T-052s
Diethyl phthalate$_A$	<100	<100							µg/kg	A-T-052s
Dimethyl phthalate$_A$	<100	<100							µg/kg	A-T-052s
Dibenzofuran$_A$	<100	188							µg/kg	A-T-052s
Carbazole$_A$	<100	527							µg/kg	A-T-052s
Butylbenzyl phthalate $_A$	<100	<100							µg/kg	A-T-052s
Bis(2-ethylhexyl)phthalate$_A$	<100	<100							µg/kg	A-T-052s
Bis(2-chloroethoxy)methane$_A$	<100	<100							µg/kg	A-T-052s
Bis(2-chloroethyl)ether$_A$	<100	<100							µg/kg	A-T-052s
4-Nitrophenol$_A$	<100	<100							µg/kg	A-T-052s
4-Methylphenol$_A$	<100	<100							µg/kg	A-T-052s
4-Chloro-3-methylphenol$_A$	<100	<100							µg/kg	A-T-052s
2-Nitrophenol$_A$	<100	<100							µg/kg	A-T-052s
2-Methylphenol$_A$	<100	<100							µg/kg	A-T-052s
2-Chlorophenol$_A$	<100	<100							µg/kg	A-T-052s
2,6-Dinitrotoluene$_A$	<100	<100							µg/kg	A-T-052s
2,4-Dinitrotoluene$_A$	<100	<100							µg/kg	A-T-052s
2,4-Dimethylphenol$_A$	<100	<100							µg/kg	A-T-052s
2,4-Dichlorophenol$_A$	<100	<100							µg/kg	A-T-052s
2,4,6-Trichlorophenol$_A$	<100	<100							µg/kg	A-T-052s
2,4,5-Trichlorophenol$_A$	<100	<100							µg/kg	A-T-052s
2-Chloronaphthalene$_A$	<100	<100							µg/kg	A-T-052s
2-Methylnaphthalene$_A$	<100	<100							µg/kg	A-T-052s
Bis(2-chloroisopropyl)ether$_A$	<100	<100							µg/kg	A-T-052s
2,4-Dinitrophenol$_A$	<100	<100							µg/kg	A-T-052s
4,6-Dinitro-2-methylphenol$_A$	<100	<100							µg/kg	A-T-052s
Phenol $_A$	<100	<100							µg/kg	A-T-052s
Pentachlorophenol$_A$	<100	<100							µg/kg	A-T-052s
n-Nitroso-n-dipropylamine$_A$	<100	<100							µg/kg	A-T-052s
n-Dioctylphthalate$_A$	<100	1090							µg/kg	A-T-052s
n-Dibutylphthalate$_A$	<100	<100							µg/kg	A-T-052s
Nitrobenzene$_A$	<100	<100							µg/kg	A-T-052s

Envirolab Job Number: 15/06221

Client Project Name: Arup Metrowest

Client Project Ref: 730673

Lab Sample ID	15/06221/14	15/06221/15							Units	Method ref
Client Sample No	2	1								
Client Sample ID	FDTP1	FDTP2								
Depth to Top	0.90	0.30								
Depth To Bottom										
Date Sampled	16-Sep-15	16-Sep-15								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5AE	6AE								
Isophorone$_A$	<100	<100							µg/kg	A-T-052s
Hexachloroethane$_A$	<100	<100							µg/kg	A-T-052s
Hexachlorocyclopentadiene$_A$	<100	<100							µg/kg	A-T-052s
Perylene$_A$	196	1690							µg/kg	A-T-052s

Lab Sample ID	15/06221/14	15/06221/15							Units	Method ref
Client Sample No	2	1								
Client Sample ID	FDTP1	FDTP2								
Depth to Top	0.90	0.30								
Depth To Bottom										
Date Sampled	16-Sep-15	16-Sep-15								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5AE	6AE								
VOC										
Dichlorodifluoromethane$_A^\#$	<1	<1							µg/kg	A-T-006s
Chloromethane$_A^\#$	<1	<1							µg/kg	A-T-006s
Vinyl Chloride$_A^\#$	<1	<1							µg/kg	A-T-006s
Bromomethane$_A^\#$	<1	<1							µg/kg	A-T-006s
Chloroethane$_A^\#$	<1	<1							µg/kg	A-T-006s
Trichlorofluoromethane$_A^\#$	<1	<1							µg/kg	A-T-006s
1,1-Dichloroethene$_A^\#$	<1	<1							µg/kg	A-T-006s
Carbon Disulphide$_A^\#$	<1	<1							µg/kg	A-T-006s
Dichloromethane $_A$	<5	<5							µg/kg	A-T-006s
trans 1,2-Dichloroethene$_A^\#$	<1	<1							µg/kg	A-T-006s
1,1-Dichloroethane$_A^\#$	<1	<1							µg/kg	A-T-006s
cis 1,2-Dichloroethene$_A^\#$	<1	<1							µg/kg	A-T-006s
2,2-Dichloropropane$_A^\#$	<1	<1							µg/kg	A-T-006s
Bromochloromethane$_A^\#$	<5	<5							µg/kg	A-T-006s
Chloroform$_A^\#$	<1	<1							µg/kg	A-T-006s
1,1,1-Trichloroethane$_A^\#$	<1	<1							µg/kg	A-T-006s
1,1-Dichloropropene$_A^\#$	<1	<1							µg/kg	A-T-006s
Carbon Tetrachloride$_A^\#$	<1	<1							µg/kg	A-T-006s
1,2-Dichloroethane$_A^\#$	<2	<2							µg/kg	A-T-006s
Benzene $_A^\#$	<1	<1							µg/kg	A-T-006s
Trichloroethene$_A^\#$	<1	<1							µg/kg	A-T-006s
1,2-Dichloropropane$_A^\#$	<1	<1							µg/kg	A-T-006s
Dibromomethane$_A^\#$	<1	<1							µg/kg	A-T-006s
Bromodichloromethane$_A^\#$	<10	<10							µg/kg	A-T-006s
cis 1,3-Dichloropropene$_A^\#$	<1	<1							µg/kg	A-T-006s
Toluene $_A^\#$	<1	<1							µg/kg	A-T-006s
trans 1,3-Dichloropropene$_A^\#$	<1	<1							µg/kg	A-T-006s
1,1,2-Trichloroethane$_A^\#$	<1	<1							µg/kg	A-T-006s
1,3-Dichloropropane$_A^\#$	<1	<1							µg/kg	A-T-006s
Tetrachloroethene$_A^\#$	<1	<1							µg/kg	A-T-006s
Dibromochloromethane$_A^\#$	<3	<3							µg/kg	A-T-006s
1,2-Dibromoethane$_A^\#$	<1	<1							µg/kg	A-T-006s

Lab Sample ID	15/06221/14	15/06221/15							Units	Method ref
Client Sample No	2	1								
Client Sample ID	FDTP1	FDTP2								
Depth to Top	0.90	0.30								
Depth To Bottom										
Date Sampled	16-Sep-15	16-Sep-15								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5AE	6AE								
Chlorobenzene$_A^\#$	<1	<1							µg/kg	A-T-006s
1,1,1,2-Tetrachloroethane$_A$	<1	<1							µg/kg	A-T-006s
Ethylbenzene$_A^\#$	<1	<1							µg/kg	A-T-006s
m & p Xylene$_A^\#$	<1	<1							µg/kg	A-T-006s
o-Xylene$_A^\#$	<1	<1							µg/kg	A-T-006s
Styrene$_A^\#$	<1	<1							µg/kg	A-T-006s
Bromoform$_A^\#$	<1	<1							µg/kg	A-T-006s
Isopropylbenzene$_A^\#$	<1	<1							µg/kg	A-T-006s
1,1,2,2-Tetrachloroethane$_A$	<1	<1							µg/kg	A-T-006s
1,2,3-Trichloropropane$_A^\#$	<1	*<1*							µg/kg	A-T-006s
Bromobenzene$_A^\#$	<1	<1							µg/kg	A-T-006s
n-Propylbenzene$_A^\#$	<1	<1							µg/kg	A-T-006s
2-Chlorotoluene$_A^\#$	<1	<1							µg/kg	A-T-006s
1,3,5-Trimethylbenzene$_A^\#$	<1	<1							µg/kg	A-T-006s
4-Chlorotoluene$_A^\#$	<1	<1							µg/kg	A-T-006s
tert-Butylbenzene$_A^\#$	<2	<2							µg/kg	A-T-006s
1,2,4-Trimethylbenzene$_A^\#$	<1	<1							µg/kg	A-T-006s
sec-Butylbenzene$_A^\#$	<1	<1							µg/kg	A-T-006s
4-Isopropyltoluene$_A^\#$	<1	<1							µg/kg	A-T-006s
1,3-Dichlorobenzene$_A$	<1	<1							µg/kg	A-T-006s
1,4-Dichlorobenzene$_A^\#$	<1	<1							µg/kg	A-T-006s
n-Butylbenzene$_A^\#$	<1	<1							µg/kg	A-T-006s
1,2-Dichlorobenzene$_A^\#$	<1	<1							µg/kg	A-T-006s
1,2-Dibromo-3-chloropropane$_A$	<2	<2							µg/kg	A-T-006s
1,2,4-Trichlorobenzene$_A$	<3	<3							µg/kg	A-T-006s
Hexachlorobutadiene$_A^\#$	<1	<1							µg/kg	A-T-006s
1,2,3-Trichlorobenzene$_A$	<3	<3							µg/kg	A-T-006s

Envirolab Job Number: 15/06221

Client Project Name: Arup Metrowest

Client Project Ref: 730673

Lab Sample ID	15/06221/14	15/06221/15							Units	Method ref
Client Sample No	2	1								
Client Sample ID	FDTP1	FDTP2								
Depth to Top	0.90	0.30								
Depth To Bottom										
Date Sampled	16-Sep-15	16-Sep-15								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5AE	6AE								
TPH CWG										
Ali >C5-C6$_A^\#$	<0.01	<0.01							mg/kg	A-T-022s
Ali >C6-C8$_A^\#$	<0.01	<0.01							mg/kg	A-T-022s
Ali >C8-C10$_A^\#$	<0.01	<0.01							mg/kg	A-T-022s
Ali >C10-C12$_A^\#$	<0.1	<0.1							mg/kg	A-T-023s
Ali >C12-C16$_A^\#$	<0.1	<0.1							mg/kg	A-T-023s
Ali >C16-C21$_A^\#$	<0.1	<0.1							mg/kg	A-T-023s
Ali >C21-C35$_A^\#$	<0.1	<0.1							mg/kg	A-T-023s
Total Aliphatics$_A$	<0.1	<0.1							mg/kg	A-T-022+23s
Aro >C5-C7$_A^\#$	<0.01	<0.01							mg/kg	A-T-022s
Aro >C7-C8$_A^\#$	<0.01	<0.01							mg/kg	A-T-022s
Aro >C8-C9$_A^\#$	<0.01	<0.01							mg/kg	A-T-022s
Aro >C9-C10$_A^\#$	<0.01	<0.01							mg/kg	A-T-022s
Aro >C10-C12$_A^\#$	<0.1	<0.1							mg/kg	A-T-023s
Aro >C12-C16$_A^\#$	<0.1	<0.1							mg/kg	A-T-023s
Aro >C16-C21$_A^\#$	2.2	12.3							mg/kg	A-T-023s
Aro >C21-C35$_A^\#$	0.6	36.1							mg/kg	A-T-023s
Total Aromatics$_A$	2.8	48.5							mg/kg	A-T-022+23s
TPH (Ali & Aro)$_A$	2.8	48.5							mg/kg	A-T-022+23s
BTEX - Benzene$_A^\#$	<0.01	<0.01							mg/kg	A-T-022s
BTEX - Toluene$_A^\#$	<0.01	<0.01							mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A^\#$	<0.01	<0.01							mg/kg	A-T-022s
BTEX - m & p Xylene$_A^\#$	<0.01	<0.01							mg/kg	A-T-022s
BTEX - o Xylene$_A^\#$	<0.01	<0.01							mg/kg	A-T-022s
MTBE$_A^\#$	<0.01	<0.01							mg/kg	A-T-022s

REPORT NOTES

Notes - Soil chemical analysis
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones and brick and concrete fragments >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis. For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

Notes - General
This report shall not be reproduced, except in full, without written approval from Envirolab.
Subscript "A" indicates analysis performed on the sample as received. "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve, unless asbestos is found to be present in which case all analysis is performed on the sample as received.
All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts.
All analysis is performed on the sample as received for soil samples from outside the European Union and this supercedes any "D" subscripts.
Superscript "M" indicates method accredited to MCERTS.
If results are in italic font they are associated with an AQC failure. These are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

TPH analysis of water by method A-T-007
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Asbestos in soil
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if present as discrete fibres/fragments. Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations.

Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Analytical results reflect the quality of the sample at the time of analysis only. Opinions and interpretations expressed are outside the scope of our accreditation.

Please contact us if you need any further information.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 15/07765
Issue Number: 1 **Date:** 14 December, 2015

Client:
Structural Soils Limited (Bristol)
The Old School
Stillhouse Lane
Bedminster
Bristol
UK
BS3 4EB

Project Manager: enviro@soils.co.uk/Iain Foster
Project Name: Metrowest
Project Ref: 730673
Order No: N/A
Date Samples Received: 26/11/15
Date Instructions Received: 02/12/15
Date Analysis Completed: 11/12/15

Prepared by:

[redacted]
Lianne Bromiley
Senior Client Manager

Approved by:

[redacted]
Iain Haslock
Analytical Consultant

UKAS TESTING
1247

Envirolab Job Number: 15/07765

Client Project Name: Metrowest

Client Project Ref: 730673

Lab Sample ID	15/07765/1	15/07765/2	15/07765/3	15/07765/4	15/07765/5	15/07765/6			Units	Method ref
Client Sample No	1	2	1	1	1	1				
Client Sample ID	BH1	BH1	BH2	BH3B	BH4	BH6				
Depth to Top	12.00	3.00	13.00	9.00	6.00	10.00				
Depth To Bottom										
Date Sampled	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
pH (w)$_A^{\#}$	8.63	8.20	8.47	7.86	8.07	7.82			pH	A-T-031w
Electrical conductivity @ 20degC (w)$_A^{\#}$	6250	2590	9190	640	599	693			µs/cm	A-T-037w
Ammoniacal nitrogen (w)$_A^{\#}$	5.90	1.16	12	<0.02	0.18	<0.02			mg/l	A-T-033w
Nitrogen, Total Oxidised TOxN (w)$_A^{\#}$	<0.1	<0.1	<0.1	12.6	0.1	4.0			mg/l	A-T-026w
Sulphate (w)$_A^{\#}$	9	59	11	40	79	60			mg/l	A-T-026w
Phenols - Total by HPLC (w)$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/l	A-T-050w
Arsenic (dissolved)$_A^{\#}$	12	3	15	3	5	8			µg/l	A-T-025w
Boron (dissolved)$_A^{\#}$	1520	472	2080	51	101	133			µg/l	A-T-025w
Cadmium (dissolved)$_A^{\#}$	<0.2	<0.2	<1.0	<0.2	<0.2	<0.2			µg/l	A-T-025w
Copper (dissolved)$_A^{\#}$	<1	<1	<5	<1	<1	3			µg/l	A-T-025w
Chromium (dissolved)$_A^{\#}$	1	<1	<5	<1	<1	<1			µg/l	A-T-025w
Chromium (hexavalent) (w)$_A^{\#}$	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05			mg/l	A-T-040w
Lead (dissolved)$_A^{\#}$	<1	<1	<5	<1	<1	<1			µg/l	A-T-025w
Mercury (dissolved)$_A^{\#}$	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1			µg/l	A-T-025w
Nickel (dissolved)$_A^{\#}$	4	3	<5	<1	2	2			µg/l	A-T-025w
Zinc (dissolved)$_A^{\#}$	2	1	<5	3	3	1			µg/l	A-T-025w

Envirolab Job Number: 15/07765

Client Project Name: Metrowest

Client Project Ref: 730673

Lab Sample ID	15/07765/1	15/07765/2	15/07765/3	15/07765/4	15/07765/5	15/07765/6			Units	Method ref
Client Sample No	1	2	1	1	1	1				
Client Sample ID	BH1	BH1	BH2	BH3B	BH4	BH6				
Depth to Top	12.00	3.00	13.00	9.00	6.00	10.00				
Depth To Bottom										
Date Sampled	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
PAH 16MS (w)										
Acenaphthene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	A-T-019w
Acenaphthylene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	A-T-019w
Anthracene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	A-T-019w
Benzo(a)anthracene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.01			µg/l	A-T-019w
Benzo(a)pyrene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.02			µg/l	A-T-019w
Benzo(b)fluoranthene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.03			µg/l	A-T-019w
Benzo(ghi)perylene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.02			µg/l	A-T-019w
Benzo(k)fluoranthene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.03			µg/l	A-T-019w
Chrysene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.03			µg/l	A-T-019w
Dibenzo(ah)anthracene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	A-T-019w
Fluoranthene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	0.01	0.02			µg/l	A-T-019w
Fluorene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	A-T-019w
Indeno(123-cd)pyrene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.02			µg/l	A-T-019w
Naphthalene $(w)_A^{\#}$	<0.01	<0.01	0.02	<0.01	<0.01	<0.01			µg/l	A-T-019w
Phenanthrene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	A-T-019w
Pyrene $(w)_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.03			µg/l	A-T-019w
PAH (total 16) $(w)_A^{\#}$	<0.01	<0.01	0.02	<0.01	0.01	0.21			µg/l	A-T-019w

Envirolab Job Number: 15/07765

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Lab Sample ID	15/07765/1	15/07765/2	15/07765/3	15/07765/4	15/07765/5	15/07765/6			Units	Method ref
Client Sample No	1	2	1	1	1	1				
Client Sample ID	BH1	BH1	BH2	BH3B	BH4	BH6				
Depth to Top	12.00	3.00	13.00	9.00	6.00	10.00				
Depth To Bottom										
Date Sampled	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
SVOC (excluding PAH-16) (w)										
2,4,5-Trichlorophenol$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
2,4,6-Trichlorophenol$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
2,4-Dichlorophenol$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
2,4-Dimethylphenol$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
2,4-Dinitrotoluene$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
2,6-Dinitrotoluene$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
2-Chloronaphthalene$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
2-Chlorophenol$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
2-Methylnaphthalene$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
2-Methylphenol$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
2-Nitrophenol$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
4-Bromophenyl phenyl ether$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
4-Chloro-3-methylphenol$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
Bis(2-chloroisopropyl)ether$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
4-Methylphenol$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
4-Nitrophenol$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
Bis(2-chloroethyl)ether$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
Bis(2-chloroethoxy)methane$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
Bis(2-ethylhexyl)phthalate$_A$	<2	<2	<2	<2	<2	<2			µg/l	A-T-052w
Butylbenzyl phthalate $_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
Carbazole$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
Dibenzofuran$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
n-Dibutylphthalate$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
n-Dioctylphthalate$_A$	<10	<10	<10	<10	<10	<10			µg/l	A-T-052w
n-Nitroso-n-dipropylamine$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
Diethyl phthalate$_A$	<1	<1	<1	<1	1	<1			µg/l	A-T-052w
Dimethyl phthalate$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
Hexachlorobenzene$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
Pentachlorophenol$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
Phenol $_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
Hexachloroethane$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
Nitrobenzene$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w

Envirolab Job Number: 15/07765

Client Project Name: Metrowest

Client Project Ref: 730673

Lab Sample ID	15/07765/1	15/07765/2	15/07765/3	15/07765/4	15/07765/5	15/07765/6			Units	Method ref
Client Sample No	1	2	1	1	1	1				
Client Sample ID	BH1	BH1	BH2	BH3B	BH4	BH6				
Depth to Top	12.00	3.00	13.00	9.00	6.00	10.00				
Depth To Bottom										
Date Sampled	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
Isophorone$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
Hexachlorocyclopentadiene$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w
Perylene$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-052w

Envirolab Job Number: 15/07765

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Lab Sample ID	15/07765/1	15/07765/2	15/07765/3	15/07765/4	15/07765/5	15/07765/6			Units	Method ref
Client Sample No	1	2	1	1	1	1				
Client Sample ID	BH1	BH1	BH2	BH3B	BH4	BH6				
Depth to Top	12.00	3.00	13.00	9.00	6.00	10.00				
Depth To Bottom										
Date Sampled	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
VOC (w)										
Dichlorodifluoromethane$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Chloromethane$_A^\#$	<10	<10	<10	<10	<10	<10			µg/l	A-T-006w
Vinyl Chloride$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Bromomethane$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Chloroethane$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Trichlorofluoromethane$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
trans 1,2-Dichloroethene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Dichloromethane$_A$	<5	<5	<5	<5	<5	<5			µg/l	A-T-006w
Carbon Disulphide$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
1,1-Dichloroethene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
1,1-Dichloroethane$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
cis 1,2-Dichloroethene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Bromochloromethane$_A^\#$	<5	<5	<5	<5	<5	<5			µg/l	A-T-006w
Chloroform$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
2,2-Dichloropropane$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
1,2-Dichloroethane$_A^\#$	<2	<2	<2	<2	<2	<2			µg/l	A-T-006w
1,1,1-Trichloroethane$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
1,1-Dichloropropene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Benzene $_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Carbon Tetrachloride$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Dibromomethane$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
1,2-Dichloropropane$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Bromodichloromethane$_A^\#$	<10	<10	<10	<10	<10	<10			µg/l	A-T-006w
Trichloroethene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
cis 1,3-Dichloropropene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
trans 1,3-Dichloropropene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
1,1,2-Trichloroethane$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Toluene $_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
1,3-Dichloropropane$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Dibromochloromethane$_A^\#$	<3	<3	<3	<3	<3	<3			µg/l	A-T-006w
1,2-Dibromoethane$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Tetrachloroethene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w

Envirolab Job Number: 15/07765

Client Project Name: Metrowest

Client Project Ref: 730673

Lab Sample ID	15/07765/1	15/07765/2	15/07765/3	15/07765/4	15/07765/5	15/07765/6			Units	Method ref
Client Sample No	1	2	1	1	1	1				
Client Sample ID	BH1	BH1	BH2	BH3B	BH4	BH6				
Depth to Top	12.00	3.00	13.00	9.00	6.00	10.00				
Depth To Bottom										
Date Sampled	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
1,1,1,2-Tetrachloroethane$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Chlorobenzene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Ethylbenzene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
m & p Xylene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Bromoform$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Styrene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
1,1,2,2-Tetrachloroethane$_A$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
o-Xylene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
1,2,3-Trichloropropane$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Isopropylbenzene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
Bromobenzene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
2-Chlorotoluene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
n-propylbenzene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
4-Chlorotoluene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
1,2,4-Trimethylbenzene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
4-Isopropyltoluene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
1,3,5-Trimethylbenzene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
1,2-Dichlorobenzene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
1,4-Dichlorobenzene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
sec-Butylbenzene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
tert-Butylbenzene$_A^\#$	<2	<2	<2	<2	<2	<2			µg/l	A-T-006w
1,3-Dichlorobenzene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
n-butylbenzene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w
1,2-Dibromo-3-chloropropane$_A^\#$	<2	<2	<2	<2	<2	<2			µg/l	A-T-006w
1,2,4-Trichlorobenzene$_A^\#$	<3	<3	<3	<3	<3	<3			µg/l	A-T-006w
1,2,3-Trichlorobenzene$_A^\#$	<3	<3	<3	<3	<3	<3			µg/l	A-T-006w
Hexachlorobutadiene$_A^\#$	<1	<1	<1	<1	<1	<1			µg/l	A-T-006w

Envirolab Job Number: 15/07765

Client Project Name: Metrowest

Client Project Ref: 730673

Lab Sample ID	15/07765/1	15/07765/2	15/07765/3	15/07765/4	15/07765/5	15/07765/6			Units	Method ref
Client Sample No	1	2	1	1	1	1				
Client Sample ID	BH1	BH1	BH2	BH3B	BH4	BH6				
Depth to Top	12.00	3.00	13.00	9.00	6.00	10.00				
Depth To Bottom										
Date Sampled	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15	24-Nov-15				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
TPH CWG										
Ali >C5-C6 $(w)_A^{\#}$	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
Ali >C6-C8 $(w)_A^{\#}$	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
Ali >C8-C10 $(w)_A^{\#}$	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
Ali >C10-C12 $(w)_A^{\#}$	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Ali >C12-C16 $(w)_A^{\#}$	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Ali >C16-C21 $(w)_A^{\#}$	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Ali >C21-C35 $(w)_A^{\#}$	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Total Aliphatics $(w)_A$	<5	<5	<5	<5	<5	<5			µg/l	A-T-022+23w
Aro >C5-C7 $(w)_A^{\#}$	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
Aro >C7-C8 $(w)_A^{\#}$	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
Aro >C8-C9 $(w)_A^{\#}$	<1	<1	1	<1	<1	<1			µg/l	A-T-022w
Aro >C9-C10 $(w)_A^{\#}$	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
Aro >C10-C12 $(w)_A^{\#}$	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Aro >C12-C16 $(w)_A^{\#}$	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Aro >C16-C21 $(w)_A^{\#}$	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Aro >C21-C35 $(w)_A^{\#}$	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Total Aromatics $(w)_A$	<5	<5	<5	<5	<5	<5			µg/l	A-T-022+23w
TPH (Ali & Aro) $(w)_A$	<5	<5	<5	<5	<5	<5			µg/l	A-T-022+23w
BTEX - Benzene $(w)_A^{\#}$	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
BTEX - Toluene $(w)_A^{\#}$	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
BTEX - Ethyl Benzene $(w)_A^{\#}$	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
BTEX - m & p Xylene $(w)_A^{\#}$	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
BTEX - o Xylene $(w)_A^{\#}$	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
MTBE $(w)_A^{\#}$	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w

REPORT NOTES

Notes - Soil chemical analysis
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones and brick and concrete fragments >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis. For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

Notes - General
This report shall not be reproduced, except in full, without written approval from Envirolab.
Subscript "A" indicates analysis performed on the sample as received. "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve, unless asbestos is found to be present in which case all analysis is performed on the sample as received.
All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supersedes any "A" subscripts.
All analysis is performed on the sample as received for soil samples which are positive for asbestos and/or if they are from outside the European Union and this supercedes any "D" subscripts.
Superscript "M" indicates method accredited to MCERTS.
If results are in italic font they are associated with an AQC failure. These are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

TPH analysis of water by method A-T-007
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Asbestos in soil
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if present as discrete fibres/fragments. Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations.

Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Analytical results reflect the quality of the sample at the time of analysis only. Opinions and interpretations expressed are outside the scope of our accreditation.

Please contact us if you need any further information.

MetroWest

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council
6.25, Environmental Statement, Volume 4, Appendix 10.2, Annex F WM3 and WAC Results
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, regulation 5(2)(a)
Planning Act 2008

Author: CH2M
Date: November 2019

ACS Testing Ltd
Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset
BH16 6LE

Certificate of Analysis
Landfill Waste Acceptance Criteria (WAC)

Certificate Number : 16-06100-Issue 1-Page: 1

Report Fao:	GEO RESULTS
Site Address:	Portishead & Pill Station Car Parks
Customer Order No:	16-79208
Date of Sampling:	12/12/2016
Date Received:	20/12/2016
Report Date:	18/01/2017

Please find your certificates of test attached for your samples received in the laboratory on 20/12/2016 under our laboratory reference 16-06100.

Remarks:

None

Results reviewed by:

[redacted]

David Redfern *Technical Supervisor*

Results approved by:

[redacted]

Mark Rowley *Laboratory Manager*

Any opinions or interpretations indicated are outside the scope of our UKAS accreditation.
This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.
Excel copies of reports are valid only when accompanied by this PDF certificate.
Client's Sample Description / ACS Material Description are noted for reference only.

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680

Fax 01202 628642

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

Quality Testing & Materials Consultancy to the Construction Industry

4150

Certificate No. 16-06100-Issue 1-Page: 2

Site Address Portishead & Pill Station Car Parks

ACSE Sample Number	26610
Sample ID	310806 - 16-79208
Clients Sample Ref.	TPPH03
Location / Sample Depth (m)	0.30m
Time Sampled	
Date Sampled	12/12/2016
Sample Deviating Codes	fg
Client's Sample Description	
ACS Testing Material Description	MADE GROUND. Grey SAND
Principal Matrix (as received)	SAND

LANDFILL WASTE ACCEPTANCE CRITERIA (WAC)

TEST VALUES

Mass of Undried Test Portion (Mw)	175	g	Volume of Leachant Used (L2)	0.350	litres
Mass of Dried Test Portion (Mp)	175	g	Volume of Leachant Used (L8)	1.400	litres
Moisture Content Ratio (MC)	0.0	%	Volume of Eluate (VE1)	0.270	litres
Dry Matter Content (DR)	100	%	Volume of Eluate (VE2)	1.372	litres

SOLIDS ANALYSIS

Analyte	Method	AS	Sample Condition for Analysis	**Results**	LANDFILL WASTE ACCEPTANCE CRITERIA SPECIFICATION		
					Inert Waste	Stable non-reactive hazardous waste in non-hazardous landfill	Hazardous waste
Total Organic Carbon (%)	MT/ACSE/102	*	As received	**30.2**	3 %	5 %	6 %
Loss on ignition (%)	MT/ACSE/302	*g	Air dried at 30°C	**5.0**	---	---	10 %
BTEX (mg/kg)	MT/ACSE/101	*fg	As received	**< 0.50**	6	---	---
PCBs (7 congeners) (mg/kg)	MT/ACSE/104		Air dried at 30°C	**< 1.00**	1	---	---
Mineral oil (C10 - C40) (mg/kg)	MT/ACSE/105	*#fg	As received	**114**	500	---	---
PAHs (mg/kg)	MT/ACSE/106	*#g	Air dried at 30°C	**32.5**	100	---	---
pH (units)	MT/ACSE/301	*fg	Air dried at 30°C	**6.9**	---	>6	---

ELUATE ANALYSIS

Analyte	Method	AS	Concentration in Eluate (mg/l)		Amount Leached (mg/kg)		LANDFILL WASTE ACCEPTANCE CRITERIA SPECIFICATION		
							BS EN 12457-3:2002 LIMIT VALUES (mg/kg) at L/S 10		
Eluate Preparation	LP/ACSE/102	*					Inert Waste	Stable non-reactive hazardous waste in non-hazardous landfill	Hazardous waste
Liquid : Solid Ratio (L/S)	LP/ACSE/101	*	**L/S 2**	**L/S 8**	**L/S 2**	**L/S 10**			
pH (units)	MT/ACSE/301	*	8.0	8.4					
Temperature (°C)	MT/ACSE/301		20	20					
Conductivity (mS/m)	MT/ACSE/303	*	17.6	8.32					
Arsenic	MT/ACSE/205	*	0.012	0.012	0.024	**0.120**	0.5	2	25
Barium	MT/ACSE/205	*	0.288	0.0658	0.575	**1.00**	20	100	300
Cadmium	MT/ACSE/205	*	< 0.0003	< 0.0003	< 0.0006	**< 0.003**	0.04	1	5
Chromium (total)	MT/ACSE/205	*	0.003	0.002	0.007	**0.022**	0.5	10	70
Copper	MT/ACSE/205	*	0.014	0.006	0.028	**0.076**	2	50	100
Mercury	MT/ACSE/202	*	0.0002	0.0002	0.0004	**0.0018**	0.01	0.2	2
Molybdenum	MT/ACSE/205	*	0.0040	0.0033	0.008	**0.034**	0.5	10	30
Nickel	MT/ACSE/205	*	0.0046	0.0014	0.009	**0.019**	0.4	10	40
Lead	MT/ACSE/205	*	0.006	< 0.004	0.011	**< 0.040**	0.5	10	50
Antimony	MT/ACSE/205	*	0.031	0.016	0.063	**0.180**	0.06	0.7	5
Selenium	MT/ACSE/205	*	< 0.006	< 0.006	< 0.012	**< 0.060**	0.1	0.5	7
Zinc	MT/ACSE/205	*	0.026	0.017	0.053	**0.189**	4	50	200
Chloride	MT/ACSE/204	*	< 3.00	< 3.00	< 6.00	**< 30.0**	800	15000	25000
Fluoride	MT/ACSE/204	*	0.53	0.26	1.06	**3.02**	10	150	500
Sulphate	MT/ACSE/204	*	8.38	< 3.00	16.8	**< 30.00**	1000	20000	50000
Total dissolved solids	MT/ACSE/304	*	145	60	290	**731.1**	4000	60000	100000
Phenol index	MT/ACSE/107	*	< 0.05	< 0.05	< 0.100	**< 0.50**	1	---	---
Dissolved organic carbon	MT/ACSE/103	*	14.2	3.91	28.4	**55.0**	500	800	1000

Comments: (comments are beyond the scope of UKAS accreditation)

Denotes individual sample results which exceed the landfill waste acceptance criteria for Inert Waste

The landfill waste acceptance criteria limits are provided for guidance only.
Eluates prepared in accordance with BS EN 12457-3:2002*

Certificate No. 16-06100-Issue 1-Page: 3

Site Address Portishead & Pill Station Car Parks

ACSE Sample Number	26614
Sample ID	310810 - 16-79208
Clients Sample Ref.	TPPH06
Location / Sample Depth (m)	0.90m
Time Sampled	
Date Sampled	12/12/2016
Sample Deviating Codes	fg
Client's Sample Description	
ACS Testing Material Description	MADE GROUND. Grey brown sand SILT
Principal Matrix (as received)	SILT

LANDFILL WASTE ACCEPTANCE CRITERIA (WAC)

TEST VALUES

Mass of Undried Test Portion (Mw)	175	g	Volume of Leachant Used (L2)	0.350	litres
Mass of Dried Test Portion (Mp)	175	g	Volume of Leachant Used (L8)	1.400	litres
Moisture Content Ratio (MC)	0.0	%	Volume of Eluate (VE1)	0.283	litres
Dry Matter Content (DR)	100	%	Volume of Eluate (VE2)	1.358	litres

SOLIDS ANALYSIS

Analyte	Method	AS	Sample Condition for Analysis	**Results**	LANDFILL WASTE ACCEPTANCE CRITERIA SPECIFICATION		
					Inert Waste	Stable non-reactive hazardous waste in non-hazardous landfill	Hazardous waste
Total Organic Carbon (%)	MT/ACSE/102	*	As received	**3.17**	3 %	5 %	6 %
Loss on ignition (%)	MT/ACSE/302	*g	Air dried at 30°C	**2.0**	---	---	10 %
BTEX (mg/kg)	MT/ACSE/101	*fg	As received	**< 0.50**	6	---	---
PCBs (7 congeners) (mg/kg)	MT/ACSE/104		Air dried at 30°C	**< 1.00**	1	---	---
Mineral oil (C10 - C40) (mg/kg)	MT/ACSE/105	*#fg	As received	**< 50.0**	500	---	---
PAHs (mg/kg)	MT/ACSE/106	*#g	Air dried at 30°C	**< 2.00**	100	---	---
pH (units)	MT/ACSE/301	*fg	Air dried at 30°C	**6.9**	---	>6	---

ELUATE ANALYSIS

Analyte	Method	AS	Concentration in Eluate (mg/l)		Amount Leached (mg/kg)		LANDFILL WASTE ACCEPTANCE CRITERIA SPECIFICATION		
							BS EN 12457-3:2002 LIMIT VALUES (mg/kg) at L/S 10		
Eluate Preparation	LP/ACSE/102	*					Inert Waste	Stable non-reactive hazardous waste in non-hazardous landfill	Hazardous waste
Liquid : Solid Ratio (L/S)	LP/ACSE/101	*	**L/S 2**	**L/S 8**	**L/S 2**	**L/S 10**			
pH (units)	MT/ACSE/301	*	7.9	8.5					
Temperature (°C)	MT/ACSE/301		20	20					
Conductivity (mS/m)	MT/ACSE/303	*	32.3	9.52					
Arsenic	MT/ACSE/205	*	0.003	0.020	0.007	**0.169**	0.5	2	25
Barium	MT/ACSE/205	*	0.273	0.0660	0.546	**0.995**	20	100	300
Cadmium	MT/ACSE/205	*	< 0.0003	< 0.0003	< 0.0006	**< 0.003**	0.04	1	5
Chromium (total)	MT/ACSE/205	*	0.006	0.002	0.011	**0.025**	0.5	10	70
Copper	MT/ACSE/205	*	0.006	0.004	0.011	**0.041**	2	50	100
Mercury	MT/ACSE/202	*	0.0002	0.0001	0.0004	**0.0013**	0.01	0.2	2
Molybdenum	MT/ACSE/205	*	0.123	0.0199	0.245	**0.365**	0.5	10	30
Nickel	MT/ACSE/205	*	0.0018	0.0011	0.004	**0.012**	0.4	10	40
Lead	MT/ACSE/205	*	< 0.004	< 0.004	< 0.008	**< 0.040**	0.5	10	50
Antimony	MT/ACSE/205	*	0.009	< 0.003	0.017	**< 0.030**	0.06	0.7	5
Selenium	MT/ACSE/205	*	0.023	< 0.006	0.046	**< 0.060**	0.1	0.5	7
Zinc	MT/ACSE/205	*	0.008	0.005	0.016	**0.059**	4	50	200
Chloride	MT/ACSE/204	*	6.05	< 3.00	12.1	**< 30.0**	800	15000	25000
Fluoride	MT/ACSE/204	*	1.14	0.91	2.28	**9.48**	10	150	500
Sulphate	MT/ACSE/204	*	70.7	7.44	141	**176.7**	1000	20000	50000
Total dissolved solids	MT/ACSE/304	*	255	75	510	**1041**	4000	60000	100000
Phenol index	MT/ACSE/107	*	< 0.05	< 0.05	< 0.100	**< 0.50**	1	---	---
Dissolved organic carbon	MT/ACSE/103	*	8.06	2.62	16.1	**35.0**	500	800	1000

Comments: (comments are beyond the scope of UKAS accreditation)

Denotes individual sample results which exceed the landfill waste acceptance criteria for Inert Waste

The landfill waste acceptance criteria limits are provided for guidance only.
Eluates prepared in accordance with BS EN 12457-3:2002*

Technical Information for Analytical Results

Analysis

* - denotes analysis covered by our UKAS accreditation
# - denoted analysis covered by our MCERTS certification
AD = Sample tested in air dried condition.
AR = Sample tested in as-received condition.
D = Sample tested in dry condition.
L = Laboratory prepared leachate
SC = sub contracted

Where results are less than the limit of detection, the value of 0 is used in calculations.

For Phenol index, m- and p- cresol are reported as mixed isomers, calibrated with reference to a p-cresol reference solution.
The individual concentrations of m- and p- cresol cannot be quantified using this method, however, the result reported for the mixed isomers will be an over estimation of the true result in samples where m-cresol is present.

Deviating Codes

Deviating Samples

The use of any of the following symbols indicates that the sample was deviating and it is possible therefore that the results provided may not be representative of the sample taken.

a – The date and/or time of sampling has not been provided, therefore it is not known if the time lapse between sampling and analysis has exceeded the acceptable holding time(s). It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
b – No sampling time given (waters only) unable to confirm if samples are within acceptable holding times.
c – This Test Item was received in an inappropriate container; it is possible that sample and/or analyte integrity has not been maintained and that the results are non-representative of the original sample taken.
d – On receipt, the temperature of the sample received was found to fall outside the recommendations of EN ISO 18512:2007 Soils & Granular Wastes.
e – The sample was received in a container that had been filled incorrectly which may have compromised sample and/or analyte integrity, rendering the results non-representative ofthe original sample taken.
f – The delay between Sampling and Sample Receipt is greater than the recommended holding time for the analyte of interest in this matrix. It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
g – The delay between Sampling and Analysis is greater than the recommended holding time for the analyte of interest in this matrix. It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.

The following Additional Deviating Sample Codes may also be used.

I/S – Insufficient sample mass/volume received for accurate quantification of this analyte.
U/S – The sample received was deemed unsuitable for accurate determination of this analyte using the Test Methods available.

Deviating Methods

Z – A minor deviation from the Test Method was necessary but this is deemed to have had no impact on the Test Result, the legitimacy of the method validation or the Accreditation Status of the Test Method.
Y – A significant deviation from the Test Method was necessary which is deemed to have had no impact on the Test Result, however, due to a lack of sufficient supporting validation, the Accreditation Status of the Method has been removed.
W – The normal LOD of the instrument/method could not be attained, thus an elevated LOD or LOQ has been applied to the Test Data, however, the data reported meets the requirements of the Client and does not affect compliance with the specification limit (where applicable).
V – One of the QA/QC parameters failed, however, the increased implied Uncertainty associated with the Test Result meets the requirements of the Client and does not affect compliance with the specification limit (where applicable) (Quality Manual, Section 18.2.9).
U – The precision acceptance criteria associated with the Test Method could not be met but the Test Result fulfils the Client's objectives and the elevated Uncertainty does not affect compliance with the specification limit (where applicable) (Quality Manual, Section 18.8.10).
T – The Test Method used was supplied by the Client and involved a simple modification of a Test Method for which ACSE holds accreditation (Quality Manual, Section 18.3.8).

Head Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office
Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

Quality Testing & Materials Consultancy to the Construction Industry

ATKINS CatWasteSoil

Classification Assessment Tool of Soil Wastes - Hazard Summary Sheet

Site Name	Portishead & Pill Station Car Parks
Location	Portishead & Pill Station Car Parks
Site ID	
Job Number	16-06100
Date	18/01/2017
User Name	edward.davies@acstesting.co.uk
Company Name	ACS Testing Ltd

Hole ID	Sample Depth	Hazardous Waste Y/N	HP1	HP2	HP3	HP4	HP5	HP6	HP7	HP8	HP9	HP10	HP11	HP12	HP13	HP14	HP15	HP16
26610	0m	N	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
26611	0m	N	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
26612	0m	Y	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No
26613	0m	N	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
26614	0m	N	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

This output data has been generated by the CAT-Waste Soil waste classification tool provided by Atkins Consultants Ltd and J.McArdle Contracts and should be read in conjuntion with the standard Terms and Conditions

16:19 31/01/2017

ATKINS CatWasteSoil

Classification Assessment Tool of Soil Wastes - Individual Compound Information

Site Name	Portishead & Pill Station Car Parks
Location	Portishead & Pill Station Car Parks
Site ID	
Job Number	16-06100
Date	18/01/2017
User Name	edward.davies@acstesting.co.uk
Company Name	ACS Testing Ltd

Hole ID	Sample Depth	Contaminant	Contaminant Concentration (%)	Hazardous Waste Y/N	Hazard Property	Individual Hazard Statements Exceeded	Cumulative Hazard Statements Exceeded	Additional Hazard Statements (see notes section)
26610	0m	pH	0.00000	N				
26610	0m	Benzene	0.00002	N				H225 test
26610	0m	Naphthalenene	0.00008	N				H228 test
26610	0m	Acenaphthylene	0.00011	N				
26610	0m	Acenaphthene	0.00002	N				
26610	0m	Fluorene	0.00004	N				
26610	0m	Phenanthrene	0.00019	N				
26610	0m	Anthracene	0.00041	N				
26610	0m	Fluoranthene	0.00057	N				
26610	0m	Pyrene	0.00059	N				
26610	0m	Benzo(a)anthracene	0.00017	N				
26610	0m	Chrysene	0.00024	N				
26610	0m	Benzo(b)fluoranthene	0.00030	N				
26610	0m	Benzo(k)fluoranthene	0.00010	N				
26610	0m	Benzo(a)pyrene	0.00015	N				
26610	0m	Indeno(1,2,3-cd)pyrene	0.00011	N				
26610	0m	Di-benz(a,h,)anthracene	0.00005	N				
26610	0m	Benzo(g,h,i)perylene	0.00012	N				
26610	0m	(sum of congeners or total P	0.00002	N				
26610	0m	ydrocarbon/oil with marker	0.01141	N				H225 test
26610	0m	Arsenic	0.00917	N				
26610	0m	Boron	0.00033	N				
26610	0m	Cadmium	0.00084	N				
26610	0m	Chromium (Total)	0.00499	N				
26610	0m	Copper	0.03670	N				
26610	0m	Lead	0.03259	N				
26610	0m	Mercury	0.00003	N				
26610	0m	Nickel	0.01932	N				
26610	0m	Zinc	0.00000	N				
26610	0m	Zincx	0.13098	N				
26610	0m	Free Cyanide	0.00010	N				H224 test
26611	0m	pH	0.00000	N				

ATKINS CatWasteSoil

Classification Assessment Tool of Soil Wastes - Individual Compound Information

Site Name	Portishead & Pill Station Car Parks
Location	Portishead & Pill Station Car Parks
Site ID	
Job Number	16-06100
Date	18/01/2017
User Name	edward.davies@acstesting.co.uk
Company Name	ACS Testing Ltd

Hole ID	Sample Depth	Contaminant	Contaminant Concentration (%)	Hazardous Waste Y/N	Hazard Property	Individual Hazard Statements Exceeded	Cumulative Hazard Statements Exceeded	Additional Hazard Statements (see notes section)
26611	0m	Naphthalenene	0.00006	N				H228 test
26611	0m	Acenaphthylene	0.00005	N				
26611	0m	Acenaphthene	0.00001	N				
26611	0m	Fluorene	0.00003	N				
26611	0m	Phenanthrene	0.00018	N				
26611	0m	Anthracene	0.00024	N				
26611	0m	Fluoranthene	0.00032	N				
26611	0m	Pyrene	0.00031	N				
26611	0m	Benzo(a)anthracene	0.00013	N				
26611	0m	Chrysene	0.00022	N				
26611	0m	Benzo(b)fluoranthene	0.00029	N				
26611	0m	Benzo(k)fluoranthene	0.00009	N				
26611	0m	Benzo(a)pyrene	0.00011	N				
26611	0m	Indeno(1,2,3-cd)pyrene	0.00011	N				
26611	0m	Di-benz(a,h,)anthracene	0.00004	N				
26611	0m	Benzo(g,h,i)perylene	0.00014	N				
26611	0m	ydrocarbon/oil with marker	0.01137	N				H225 test
26611	0m	Arsenic	0.00829	N				
26611	0m	Boron	0.00376	N				
26611	0m	Cadmium	0.00101	N				
26611	0m	Chromium (Total)	0.00682	N				
26611	0m	Copper	0.10248	N				
26611	0m	Lead	0.01833	N				
26611	0m	Mercury	0.00003	N				
26611	0m	Nickel	0.02241	N				
26611	0m	Zinc	0.00000	N				
26611	0m	Zincx	0.13136	N				
26611	0m	Free Cyanide	0.00010	N				H224 test
26612	0m	pH	0.00000	N				
26612	0m	Naphthalenene	0.00010	N				H228 test
26612	0m	Acenaphthylene	0.00005	N				
26612	0m	Acenaphthene	0.00003	N				

ATKINS CatWasteSoil

Classification Assessment Tool of Soil Wastes - Individual Compound Information

Site Name	Portishead & Pill Station Car Parks
Location	Portishead & Pill Station Car Parks
Site ID	
Job Number	16-06100
Date	18/01/2017
User Name	edward.davies@acstesting.co.uk
Company Name	ACS Testing Ltd

Hole ID	Sample Depth	Contaminant	Contaminant Concentration (%)	Hazardous Waste Y/N	Hazard Property	Individual Hazard Statements Exceeded	Cumulative Hazard Statements Exceeded	Additional Hazard Statements (see notes section)
26612	0m	Fluorene	0.00005	N				
26612	0m	Phenanthrene	0.00025	N				
26612	0m	Anthracene	0.00024	N				
26612	0m	Fluoranthene	0.00040	N				
26612	0m	Pyrene	0.00037	N				
26612	0m	Benzo(a)anthracene	0.00017	N				
26612	0m	Chrysene	0.00026	N				
26612	0m	Benzo(b)fluoranthene	0.00034	N				
26612	0m	Benzo(k)fluoranthene	0.00009	N				
26612	0m	Benzo(a)pyrene	0.00018	N				
26612	0m	Indeno(1,2,3-cd)pyrene	0.00014	N				
26612	0m	Di-benz(a,h,)anthracene	0.00005	N				
26612	0m	Benzo(g,h,i)perylene	0.00015	N				
26612	0m	hydrocarbon/oil with marker	0.00724	N				H225 test
26612	0m	Arsenic	0.01076	N				
26612	0m	Boron	0.00118	N				
26612	0m	Cadmium	0.00084	N				
26612	0m	Chromium (Total)	0.00480	N				
26612	0m	Copper	0.07580	N				
26612	0m	Lead	0.00000	N				
26612	0m	Leadx	0.19729	Y	HP14		H410	
26612	0m	Mercury	0.00023	N				
26612	0m	Nickel	0.01746	N				
26612	0m	Zinc	0.00000	N				
26612	0m	Zincx	0.36145	Y	HP14		H410	
26612	0m	Free Cyanide	0.00010	N				H224 test
26613	0m	pH	0.00000	N				
26613	0m	Naphthalenene	0.00002	N				H228 test
26613	0m	Acenaphthylene	0.00001	N				
26613	0m	Acenaphthene	0.00000	N				
26613	0m	Fluorene	0.00001	N				
26613	0m	Phenanthrene	0.00003	N				

ATKINS CatWasteSoil

Classification Assessment Tool of Soil Wastes - Individual Compound Information

Site Name	Portishead & Pill Station Car Parks
Location	Portishead & Pill Station Car Parks
Site ID	
Job Number	16-06100
Date	18/01/2017
User Name	edward.davies@acstesting.co.uk
Company Name	ACS Testing Ltd

Hole ID	Sample Depth	Contaminant	Contaminant Concentration (%)	Hazardous Waste Y/N	Hazard Property	Individual Hazard Statements Exceeded	Cumulative Hazard Statements Exceeded	Additional Hazard Statements (see notes section)
26613	0m	Anthracene	0.00002	N				
26613	0m	Fluoranthene	0.00002	N				
26613	0m	Pyrene	0.00002	N				
26613	0m	Benzo(a)anthracene	0.00001	N				
26613	0m	Chrysene	0.00001	N				
26613	0m	Benzo(b)fluoranthene	0.00002	N				
26613	0m	Benzo(k)fluoranthene	0.00001	N				
26613	0m	Benzo(a)pyrene	0.00001	N				
26613	0m	Indeno(1,2,3-cd)pyrene	0.00001	N				
26613	0m	Di-benz(a,h,)anthracene	0.00000	N				
26613	0m	Benzo(g,h,i)perylene	0.00001	N				
26613	0m	hydrocarbon/oil with marker	0.00232	N				H225 test
26613	0m	Arsenic	0.00787	N				
26613	0m	Boron	0.00106	N				
26613	0m	Cadmium	0.00038	N				
26613	0m	Chromium (Total)	0.00783	N				
26613	0m	Copper	0.00973	N				
26613	0m	Lead	0.01317	N				
26613	0m	Mercury	0.00002	N				
26613	0m	Nickel	0.00988	N				
26613	0m	Zinc	0.00000	N				
26613	0m	Zincx	0.05815	N				
26613	0m	Free Cyanide	0.00010	N				H224 test
26614	0m	pH	0.00000	N				
26614	0m	Benzene	0.00002	N				H225 test
26614	0m	Naphthalenene	0.00002	N				H228 test
26614	0m	Acenaphthylene	0.00000	N				
26614	0m	Acenaphthene	0.00001	N				
26614	0m	Fluorene	0.00000	N				
26614	0m	Phenanthrene	0.00001	N				
26614	0m	Anthracene	0.00000	N				
26614	0m	Fluoranthene	0.00000	N				

ATKINS CatWasteSoil

Classification Assessment Tool of Soil Wastes - Individual Compound Information

Site Name	Portishead & Pill Station Car Parks
Location	Portishead & Pill Station Car Parks
Site ID	
Job Number	16-06100
Date	18/01/2017
User Name	edward.davies@acstesting.co.uk
Company Name	ACS Testing Ltd

Hole ID	Sample Depth	Contaminant	Contaminant Concentration (%)	Hazardous Waste Y/N	Hazard Property	Individual Hazard Statements Exceeded	Cumulative Hazard Statements Exceeded	Additional Hazard Statements (see notes section)
26614	0m	Pyrene	0.00000	N				
26614	0m	Benzo(a)anthracene	0.00000	N				
26614	0m	Chrysene	0.00000	N				
26614	0m	Benzo(b)fluoranthene	0.00000	N				
26614	0m	Benzo(k)fluoranthene	0.00000	N				
26614	0m	Benzo(a)pyrene	0.00000	N				
26614	0m	Indeno(1,2,3-cd)pyrene	0.00000	N				
26614	0m	Di-benz(a,h,)anthracene	0.00000	N				
26614	0m	Benzo(g,h,i)perylene	0.00000	N				
26614	0m	Arsenic	0.00804	N				
26614	0m	Boron	0.00125	N				
26614	0m	Cadmium	0.00013	N				
26614	0m	Chromium (Total)	0.00378	N				
26614	0m	Copper	0.00768	N				
26614	0m	Lead	0.00183	N				
26614	0m	Mercury	0.00003	N				
26614	0m	Nickel	0.00916	N				
26614	0m	Zinc	0.00000	N				
26614	0m	Zincx	0.01287	N				
26614	0m	Free Cyanide	0.00010	N				H224 test

MetroWest

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council
6.25, Environmental Statement, Volume 4, Appendix 10.2, Annex G Chemical Assessment Criteria
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, regulation 5(2)(a)
Planning Act 2008

Author: CH2M
Date: November 2019

Table G.1: Generic Assessment Criteria (GAC) for Soils Assessment

Determinand	Units	GAC	GAC Source (see notes)
Metals			
Arsenic	mg/kg	79	A
Cadmium	mg/kg	220	A
Chromium	mg/kg	1500	B
Copper	mg/kg	12000	B
Mercury	mg/kg	120*	B
Nickel	mg/kg	230	B
Lead	mg/kg	630	A
Zinc	mg/kg	81000	B
Boron (Hot Water Soluble)	mg/kg	21000	B
pH (@ 20 °C)	-	n/a	n/a
Carbon			
Total Organic Carbon (TOC)	%	-	-
Fraction of Organic Carbon (FOC)	%	-	-
Loss on Ignition (400 °C)	%	-	-
Soil Organic Matter (SOM)	%	-	-
Water Soluble Sulphate	mg/l	-	-
Total Petroleum Hydrocarbons (TPH)			
Aliphatic >C5-C6	mg/kg	570000	B
Aliphatic >C6-C8	mg/kg	600000	B
Aliphatic >C8-C10	mg/kg	13000	B
Aliphatic >C10-C12	mg/kg	13000	B
Aliphatic >C12-C16	mg/kg	13000	B
Aliphatic >C16-C35	mg/kg	250000	B
Aliphatic >C35-C44	mg/kg	250000	B
Aromatic >C5-C7	mg/kg	56000	B
Aromatic >C7-C8	mg/kg	56000	B
Aromatic >C8-C10	mg/kg	5000	B
Aromatic >C10-C12	mg/kg	5000	B

Table G.1: Generic Assessment Criteria (GAC) for Soils Assessment

Determinand	Units	GAC	GAC Source (see notes)
Aromatic >C12-C16	mg/kg	5100	B
Aromatic >C16-C21	mg/kg	3800	B
Aromatic >C21-C35	mg/kg	3800	B
Aromatic >C35-C44	mg/kg	3800	B
Total TPH (C10-C40)	mg/kg	-	-
(Semi) Volatile Organic Compounds (VOC)***			
Chloromethane	mg/kg	0.01	D
Speciated Polycyclic Aromatic Hydrocarbons (PAH)			
Naphthalene	mg/kg	4900	B
Acenaphthylene	mg/kg	15000	B
Acenaphthene	mg/kg	15000	B
Fluorene	mg/kg	9900	B
Phenanthrene	mg/kg	3100	B
Anthracene	mg/kg	74000	B
Fluoranthene	mg/kg	3100	B
Pyrene	mg/kg	7400	B
Benzo(a)anthracene	mg/kg	29	B
Chrysene	mg/kg	57	B
Benzo(b)fluoranthene	mg/kg	7.1	B
Benzo(k)fluoranthene	mg/kg	190	B
Benzo(a)pyrene	mg/kg	10	A
Indeno(1,2,3-cd)pyrene	mg/kg	82	B
Dibenzo(a,h)anthracene	mg/kg	0.57	B
Benzo(g,h,i)perylene	mg/kg	640	B
Total PAH	mg/kg	-	-
Total Phenol (Sum of 4 specific phenols)	mg/kg	440	B
Total Cyanide	mg/kg	-	-

Table G.1: Generic Assessment Criteria (GAC) for Soils Assessment

Determinand	Units	GAC	GAC Source (see notes)
Polychlorinated Biphenyls (PCB) (7 Congeners)	mg/kg	0.008	C
Asbestos Screening	-	n/a	n/a
BTEX			
Benzene	mg/kg	140**	A
Ethylbenzene	mg/kg	24000	B
m+p-xylene	mg/kg	41000	B
o-xylene	mg/kg	41000	B
Toluene	mg/kg	56000	B
Total BTEX	mg/kg	-	-

Notes:
A - Department for Environment, Food and Rural Affairs December. 2014. SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination.
B - Nathanail, C.P., McCaffrey, C., Gillett, A.G., Ogden, R.C. and Nathanail, J.F. 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham.
C - Environment Agency. 2009. Soil Guideline Values for dioxins, furans and dioxin-like PCBs in soil, Science Report SC050021 / Dioxins SGV.
D - EIC/AGS/CL:AIRE. 2010. Soil Generic Assessment Criteria for Human Health Risk Assessment.
* S4UL based on Inorganic Mercury.
** Based on 6% SOM.
*** Determinands only reported if detected and GAC are available.

Table G.2: CWSC for Leachate and Groundwater Assessment

Determinand	Units	EQS	DWS
Metals			
Arsenic	mg/l	0.05	-
Boron	mg/l	-	1
Cadmium	mg/l	0.00008 to 0.00025	-
Chromium	mg/l	0.0047	-
Chromium VI	mg/l	0.0034	-
Copper	mg/l	0.001*	-
Mercury	mg/l	0.00007	-
Nickel	mg/l	0.004*	-
Lead	mg/l	0.0012*	-
Zinc	mg/l	0.014*^	-
Speciated Polyaromatic Hydrocarbons (PAH)			
Acenaphthene	µg/l	-	-
Acenaphthylene	µg/l	-	-
Anthracene	µg/l	0.1	-
Benzo(a)anthracene	µg/l	-	-
Benzo(b)fluoranthene	µg/l	0.00017^^	-
Benzo(ghi)perylene	µg/l	0.00017^^	-
Benzo(k)fluoranthene	µg/l	0.00017^^	-
Benzo(a)pyrene	µg/l	0.00017	-
Chrysene	µg/l	-	-
Dibenzo(a,h)anthracene	µg/l	-	-
Fluoranthene	µg/l	0.0063	-
Fluorene	µg/l	-	-
Indeno(1,2,3-cd)pyrene	µg/l	0.00017^^	-
Naphthalene	µg/l	2	-
Phenanthrene	µg/l	-	-
Pyrene	µg/l	-	-

Table G.2: CWSC for Leachate and Groundwater Assessment

Determinand	Units	EQS	DWS
Total PAH (Sum of USEPA 16)	µg/l	-	-
pH (@ 20 °C)	-	6 to 9	-
Total Cyanide	µg/l	1	-
Ammoniacal Nitrogen	mg/l	0.3**	-
Sulphate	mg/l	400***	-

Notes:
* Screening value assumes bioavailable concentrations for copper, lead, nickel and zinc.
** Screening value for total ammonia for a 'good' status river'.
*** Operational EQS for sulphate (Environment Agency and DEFRA, 2016).
^ Zinc screening value includes ambient background concentration for the River Avon catchment.
^^ Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene must be monitored for
comparison with the biota EQS or the corresponding AA-EQS in water.

MetroWest

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council
6.25, Environmental Statement, Volume 4, Appendix 10.2, Annex H Gas Monitoring Results
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, regulation 5(2)(a)
Planning Act 2008

Author: CH2M
Date: November 2019

IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks
Round 1	Rising	Falling	1010	1011	GA2000 SN-GA13842 + Ground: Wet + Wind: Light + Air Temp: 10DegC
Round 2	Fluctuating	Falling	1012	1008	GA2000 SN-GA13842 + Ground: Damp + Wind: Light + Air Temp: 7DegC
Round 3	Rising	Fluctuating	1019	1020	GA2000 SN-GA13842 + Ground: Dry + Wind: Light + Air Temp: 10DegC
Round 4	Fluctuating	Rising	1021	1022	GA2000 SN-GA13842 + Dipmeter + Weather: Rain + Ground: Damp + Wind: Light + Air Temp: 6DegC
Round 5	Fluctuating	Rising	1015	1016	Dipmeter + Weather: Overcast + Ground: Damp + Wind: Medium + Air Temp: 8DegC
Round 6	Fluctuating	Rising	994	996	Dipmeter + Weather: Overcast + Ground: Damp + Wind: Light + Air Temp: 9DegC

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH1	2	50	1	18.00	---	6.00 to 18.00	19/11/2015 12:15:00	1011	1011	$6.8_{(I)}$	-	-	-	-	-	-	-
BH1	2	50	1		---	6.00 to 18.00	15 secs	-	-	$5.2_{(I)}$	-	-	-	-	-	-	-
BH1	2	50	1		---	6.00 to 18.00	30 secs	-	-	$-0.6_{(SS)}$	-	-	-	-	-	-	-
BH1	2	50	1 (2)	18.00	---	6.00 to 18.00	19/11/2015 12:16:00	-	-	-	-	0.0	0.0	20.9	0.0	0.0	0.0
BH1	2	50	1 (2)		---	6.00 to 18.00	15 secs	-	-	-	-	0.6	0.0	20.0	0.0	1.0	0.0
BH1	2	50	1 (2)		---	6.00 to 18.00	30 secs	-	-	-	-	0.6	0.0	19.5	0.0	1.0	0.0
BH1	2	50	1 (2)		---	6.00 to 18.00	60 secs	-	-	-	-	0.6	0.0	19.4	0.0	1.0	0.0
BH1	2	50	1 (2)		---	6.00 to 18.00	90 secs	-	-	-	-	0.6	0.0	19.4	0.0	1.0	0.0
BH1	2	50	1 (2)		---	6.00 to 18.00	120 secs	-	-	-	-	0.6	0.0	19.5	0.0	1.0	0.0
BH1	2	50	1 (2)		---	6.00 to 18.00	180 secs	-	-	-	-	0.5	0.0	19.6	0.0	1.0	0.0
BH1	2	50	1 (2)		---	6.00 to 18.00	240 secs	-	-	-	-	0.5	0.0	19.6	0.0	1.0	0.0
BH1	2	50	1 (2)		---	6.00 to 18.00	300 secs	-	-	-	-	0.5	0.0	19.7	0.0	1.0	-
BH1	2	50	1 (3)	18.00	18.62	6.00 to 18.00	19/11/2015 12:22:00	-	-	-	2.10	-	-	-	-	-	-
BH1	1	19	1	5.00	---	1.00 to 5.00	19/11/2015 12:25:00	1012	1012	$0.0_{(I)}$	-	-	-	-	-	-	-
BH1	1	19	1		---	1.00 to 5.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH1	1	19	1 (2)	5.00	---	1.00 to 5.00	19/11/2015 12:26:00	-	-	-	-	0.0	0.0	20.9	0.0	0.0	0.0
BH1	1	19	1 (2)		---	1.00 to 5.00	15 secs	-	-	-	-	4.9	0.0	15.4	0.0	0.0	0.0
BH1	1	19	1 (2)		---	1.00 to 5.00	30 secs	-	-	-	-	5.0	0.0	11.9	0.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB

Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	13/01/16			730673

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH1	1	19	1 (2)		---	1.00 to 5.00	60 secs	-	-	-	-	4.8	0.0	12.7	0.0	0.0	0.0
BH1	1	19	1 (2)		---	1.00 to 5.00	90 secs	-	-	-	-	4.7	0.0	13.0	0.0	0.0	0.0
BH1	1	19	1 (2)		---	1.00 to 5.00	120 secs	-	-	-	-	4.6	0.0	13.1	0.0	0.0	0.0
BH1	1	19	1 (2)		---	1.00 to 5.00	180 secs	-	-	-	-	4.2	0.0	14.0	0.0	0.0	0.0
BH1	1	19	1 (2)		---	1.00 to 5.00	240 secs	-	-	-	-	4.0	0.0	14.4	0.0	0.0	0.0
BH1	1	19	1 (2)		---	1.00 to 5.00	300 secs	-	-	-	-	3.6	0.0	15.4	0.0	0.0	0.0
BH1	1	19	1 (2)		---	1.00 to 5.00	360 secs	-	-	-	-	3.2	0.0	16.5	0.0	0.0	0.0
BH1	1	19	1 (2)		---	1.00 to 5.00	420 secs	-	-	-	-	3.0	0.0	17.2	0.0	0.0	0.0
BH1	1	19	1 (2)		---	1.00 to 5.00	480 secs	-	-	-	-	2.6	0.0	17.9	0.0	0.0	0.0
BH1	1	19	1 (2)		---	1.00 to 5.00	540 secs	-	-	-	-	2.5	0.0	18.2	0.0	0.0	0.0
BH1	1	19	1 (2)		---	1.00 to 5.00	600 secs	-	-	-	-	2.4	0.0	18.5	0.0	0.0	0.0
BH1	1	19	1 (3)	5.00	4.61	1.00 to 5.00	19/11/2015 12:37:00	-	-	-	2.57	-	-	-	-	-	-
BH1	2	50	2	18.00	---	6.00 to 18.00	24/11/2015 09:00:00	1012	1012	$0.1_{(I)}$	-	-	-	-	-	-	-
BH1	2	50	2		---	6.00 to 18.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH1	2	50	2 (2)	18.00	---	6.00 to 18.00	24/11/2015 09:01:00	-	-	-	-	0.0	0.0	20.9	0.0	0.0	0.0
BH1	2	50	2 (2)		---	6.00 to 18.00	15 secs	-	-	-	-	0.2	0.0	20.9	0.0	3.0	0.0
BH1	2	50	2 (2)		---	6.00 to 18.00	30 secs	-	-	-	-	0.2	0.0	20.9	0.0	2.0	0.0
BH1	2	50	2 (2)		---	6.00 to 18.00	60 secs	-	-	-	-	0.2	0.0	20.9	0.0	0.0	0.0
BH1	2	50	2 (2)		---	6.00 to 18.00	90 secs	-	-	-	-	0.2	0.0	20.9	0.0	0.0	0.0
BH1	2	50	2 (2)		---	6.00 to 18.00	120 secs	-	-	-	-	0.2	0.0	20.9	0.0	0.0	0.0
BH1	2	50	2 (2)		---	6.00 to 18.00	180 secs	-	-	-	-	0.1	0.0	20.9	0.0	0.0	0.0
BH1	2	50	2 (2)		---	6.00 to 18.00	240 secs	-	-	-	-	0.1	0.0	20.9	0.0	0.0	0.0
BH1	2	50	2 (2)		---	6.00 to 18.00	300 secs	-	-	-	-	0.1	0.0	20.9	0.0	0.0	0.0
BH1	2	50	2 (3)	18.00	18.51	6.00 to 18.00	24/11/2015 09:07:00	-	-	-	2.01	-	-	-	-	-	-
	Remarks: Samples taken.																

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STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB

Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	13/01/16			730673

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH1	1	19	2	5.00	---	1.00 to 5.00	24/11/2015 09:25:00	1013	1013	$0.0_{(I)}$	-	-	-	-	-	-	-
BH1	1	19	2		---	1.00 to 5.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH1	1	19	2 (2)	5.00	---	1.00 to 5.00	24/11/2015 09:26:00	-	-	-	-	0.0	0.0	20.9	0.0	0.0	0.0
BH1	1	19	2 (2)		---	1.00 to 5.00	15 secs	-	-	-	-	3.3	0.0	18.0	0.0	0.0	0.0
BH1	1	19	2 (2)		---	1.00 to 5.00	30 secs	-	-	-	-	3.5	0.0	15.6	0.0	0.0	0.0
BH1	1	19	2 (2)		---	1.00 to 5.00	60 secs	-	-	-	-	3.6	0.0	15.2	0.0	0.0	0.0
BH1	1	19	2 (2)		---	1.00 to 5.00	90 secs	-	-	-	-	3.8	0.0	15.0	0.0	0.0	0.0
BH1	1	19	2 (2)		---	1.00 to 5.00	120 secs	-	-	-	-	3.7	0.0	15.2	0.0	0.0	0.0
BH1	1	19	2 (2)		---	1.00 to 5.00	180 secs	-	-	-	-	3.6	0.0	15.4	0.0	0.0	0.0
BH1	1	19	2 (2)		---	1.00 to 5.00	240 secs	-	-	-	-	3.5	0.0	15.6	0.0	0.0	0.0
BH1	1	19	2 (2)		---	1.00 to 5.00	300 secs	-	-	-	-	3.4	0.0	15.9	0.0	0.0	0.0
BH1	1	19	2 (2)		---	1.00 to 5.00	360 secs	-	-	-	-	3.2	0.0	16.3	0.0	0.0	0.0
BH1	1	19	2 (2)		---	1.00 to 5.00	420 secs	-	-	-	-	3.1	0.0	16.7	0.0	0.0	0.0
BH1	1	19	2 (2)		---	1.00 to 5.00	480 secs	-	-	-	-	2.9	0.0	17.2	0.0	0.0	0.0
BH1	1	19	2 (2)		---	1.00 to 5.00	540 secs	-	-	-	-	2.8	0.0	17.6	0.0	0.0	0.0
BH1	1	19	2 (2)		---	1.00 to 5.00	600 secs	-	-	-	-	2.7	0.0	17.9	0.0	0.0	0.0
BH1	1	19	2 (3)	5.00	---	1.00 to 5.00	24/11/2015 09:37:00	-	-	-	-	-	-	-	-	-	-
Remarks: Samples taken.																	
BH1	2	50	3	18.00	---	6.00 to 18.00	02/12/2015 10:15:00	1019	1019	$-0.3_{(I)}$	-	-	-	-	-	-	-
BH1	2	50	3		---	6.00 to 18.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH1	2	50	3 (2)	18.00	---	6.00 to 18.00	02/12/2015 10:16:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH1	2	50	3 (2)		---	6.00 to 18.00	15 secs	-	-	-	-	0.2	0.0	20.6	-	0.0	0.0
BH1	2	50	3 (2)		---	6.00 to 18.00	30 secs	-	-	-	-	0.3	0.0	20.5	-	0.0	0.0
BH1	2	50	3 (2)		---	6.00 to 18.00	60 secs	-	-	-	-	0.3	0.0	20.5	-	0.0	0.0
BH1	2	50	3 (2)		---	6.00 to 18.00	90 secs	-	-	-	-	0.3	0.0	20.5	-	0.0	0.0

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Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	**13/01/16**			**730673**

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH1	2	50	3 (2)		---	6.00 to 18.00	120 secs	-	-	-	-	0.3	0.0	20.5	-	0.0	0.0
BH1	2	50	3 (2)		---	6.00 to 18.00	180 secs	-	-	-	-	0.3	0.0	20.5	-	0.0	0.0
BH1	2	50	3 (2)		---	6.00 to 18.00	240 secs	-	-	-	-	0.3	0.0	20.5	-	0.0	0.0
BH1	2	50	3 (2)		---	6.00 to 18.00	300 secs	-	-	-	-	0.2	0.0	20.5	-	0.0	0.0
BH1	2	50	3 (2)		---	6.00 to 18.00	360 secs	-	-	-	-	0.2	0.0	20.5	-	0.0	0.0
BH1	2	50	3 (2)		---	6.00 to 18.00	420 secs	-	-	-	-	0.2	0.0	20.6	-	0.0	0.0
BH1	2	50	3 (3)	18.00	18.55	6.00 to 18.00	02/12/2015 10:24:00	-	-	-	1.95	-	-	-	-	-	-
BH1	1	19	3	5.00	---	1.00 to 5.00	02/12/2015 11:10:00	1020	1020	0.0$_{(I)}$	-	-	-	-	-	-	-
BH1	1	19	3		---	1.00 to 5.00	30 secs	-	-	0.0$_{(SS)}$	-	-	-	-	-	-	-
BH1	1	19	3 (2)	5.00	---	1.00 to 5.00	02/12/2015 11:11:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH1	1	19	3 (2)		---	1.00 to 5.00	15 secs	-	-	-	-	0.6	0.0	20.9	-	0.0	0.0
BH1	1	19	3 (2)		---	1.00 to 5.00	30 secs	-	-	-	-	0.8	0.0	19.8	-	0.0	0.0
BH1	1	19	3 (2)		---	1.00 to 5.00	60 secs	-	-	-	-	1.5	0.0	18.9	-	0.0	0.0
BH1	1	19	3 (2)		---	1.00 to 5.00	90 secs	-	-	-	-	1.5	0.0	18.8	-	0.0	0.0
BH1	1	19	3 (2)		---	1.00 to 5.00	120 secs	-	-	-	-	1.4	0.0	18.8	-	0.0	0.0
BH1	1	19	3 (2)		---	1.00 to 5.00	180 secs	-	-	-	-	1.3	0.0	19.0	-	0.0	0.0
BH1	1	19	3 (2)		---	1.00 to 5.00	240 secs	-	-	-	-	1.2	0.0	19.1	-	0.0	0.0
BH1	1	19	3 (2)		---	1.00 to 5.00	300 secs	-	-	-	-	1.1	0.0	19.2	-	0.0	0.0
BH1	1	19	3 (2)		---	1.00 to 5.00	360 secs	-	-	-	-	1.1	0.0	19.3	-	0.0	0.0
BH1	1	19	3 (2)		---	1.00 to 5.00	420 secs	-	-	-	-	1.0	0.0	19.4	-	0.0	0.0
BH1	1	19	3 (2)		---	1.00 to 5.00	480 secs	-	-	-	-	1.0	0.0	19.4	-	0.0	0.0
BH1	1	19	3 (2)		---	1.00 to 5.00	540 secs	-	-	-	-	1.0	0.0	19.5	-	0.0	0.0
BH1	1	19	3 (2)		---	1.00 to 5.00	600 secs	-	-	-	-	1.0	0.0	19.5	-	0.0	0.0
BH1	1	19	3 (3)	5.00	19.87	1.00 to 5.00	02/12/2015 11:22:00	-	-	-	17.04	-	-	-	-	-	-
BH1	2	50	4	18.00	---	6.00 to 18.00	11/12/2015 10:55:00	-	-	0.0$_{(SS)}$	-	-	-	-	-	-	-

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Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	**13/01/16**			**730673**

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH1	2	50	4		---	6.00 to 18.00	30 secs	-	-	-	-	-	-	-	-	-	-
BH1	2	50	4 (2)	18.00	---	6.00 to 18.00	11/12/2015 10:57:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH1	2	50	4 (2)		---	6.00 to 18.00	15 secs	-	-	-	-	0.4	0.0	20.8	-	0.0	0.0
BH1	2	50	4 (2)		---	6.00 to 18.00	30 secs	-	-	-	-	0.4	0.0	20.8	-	0.0	0.0
BH1	2	50	4 (2)		---	6.00 to 18.00	60 secs	-	-	-	-	0.4	0.0	20.8	-	0.0	0.0
BH1	2	50	4 (2)		---	6.00 to 18.00	90 secs	-	-	-	-	0.3	0.0	20.9	-	0.0	0.0
BH1	2	50	4 (2)		---	6.00 to 18.00	120 secs	-	-	-	-	0.3	0.0	20.9	-	0.0	0.0
BH1	2	50	4 (2)		---	6.00 to 18.00	180 secs	-	-	-	-	0.2	0.0	20.9	-	0.0	0.0
BH1	2	50	4 (2)		---	6.00 to 18.00	240 secs	-	-	-	-	0.2	0.0	20.9	-	0.0	0.0
BH1	2	50	4 (2)		---	6.00 to 18.00	300 secs	-	-	-	-	0.2	0.0	20.9	-	0.0	0.0
BH1	2	50	4 (3)	18.00	18.63	6.00 to 18.00	11/12/2015 11:03:00	-	-	-	2.12	-	-	-	-	-	-
BH1	1	19	4	5.00	---	1.00 to 5.00	11/12/2015 11:05:00	1022	1022	$0.1_{(I)}$	-	-	-	-	-	-	-
	Remarks: Original paperwork disintegrated.																
BH1	2	50	5	18.00	---	6.00 to 18.00	16/12/2015 08:38:00	1015	1015	$-8.7_{(I)}$	-	-	-	-	-	-	-
BH1	2	50	5		---	6.00 to 18.00	660 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH1	2	50	5 (2)	18.00	---	6.00 to 18.00	16/12/2015 08:52:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH1	2	50	5 (2)		---	6.00 to 18.00	15 secs	-	-	-	-	0.2	0.0	20.9	-	1.0	0.0
BH1	2	50	5 (2)		---	6.00 to 18.00	30 secs	-	-	-	-	0.2	0.0	20.9	-	1.0	0.0
BH1	2	50	5 (2)		---	6.00 to 18.00	60 secs	-	-	-	-	0.3	0.0	20.9	-	1.0	0.0
BH1	2	50	5 (2)		---	6.00 to 18.00	90 secs	-	-	-	-	0.3	0.0	20.9	-	1.0	0.0
BH1	2	50	5 (2)		---	6.00 to 18.00	120 secs	-	-	-	-	0.3	0.0	20.9	-	1.0	0.0
BH1	2	50	5 (2)		---	6.00 to 18.00	180 secs	-	-	-	-	0.3	0.0	20.9	-	1.0	0.0
BH1	2	50	5 (2)		---	6.00 to 18.00	240 secs	-	-	-	-	0.3	0.0	20.9	-	1.0	0.0
BH1	2	50	5 (2)		---	6.00 to 18.00	300 secs	-	-	-	-	0.2	0.0	20.9	-	1.0	0.0
BH1	2	50	5 (2)		---	6.00 to 18.00	360 secs	-	-	-	-	0.2	0.0	20.9	-	1.0	0.0

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Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	13/01/16			730673

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH1	2	50	5 (2)		---	6.00 to 18.00	420 secs	-	-	-	-	0.2	0.0	20.9	-	1.0	0.0
BH1	2	50	5 (3)	18.00	18.58	6.00 to 18.00	16/12/2015 09:00:00	-	-	-	1.95	-	-	-	-	-	-
BH1	1	19	5	5.00	---	1.00 to 5.00	16/12/2015 09:05:00	1016	1016	$0.0_{(I)}$	-	-	-	-	-	-	-
BH1	1	19	5		---	1.00 to 5.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH1	1	19	5 (2)	5.00	---	1.00 to 5.00	16/12/2015 09:07:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH1	1	19	5 (2)		---	1.00 to 5.00	15 secs	-	-	-	-	2.7	0.0	18.9	-	0.0	0.0
BH1	1	19	5 (2)		---	1.00 to 5.00	30 secs	-	-	-	-	2.7	0.0	17.5	-	0.0	0.0
BH1	1	19	5 (2)		---	1.00 to 5.00	60 secs	-	-	-	-	2.8	0.0	17.4	-	0.0	0.0
BH1	1	19	5 (2)		---	1.00 to 5.00	90 secs	-	-	-	-	2.8	0.0	17.4	-	0.0	0.0
BH1	1	19	5 (2)		---	1.00 to 5.00	120 secs	-	-	-	-	2.9	0.0	17.2	-	0.0	0.0
BH1	1	19	5 (2)		---	1.00 to 5.00	180 secs	-	-	-	-	2.8	0.0	17.4	-	0.0	0.0
BH1	1	19	5 (2)		---	1.00 to 5.00	240 secs	-	-	-	-	2.7	0.0	17.6	-	0.0	0.0
BH1	1	19	5 (2)		---	1.00 to 5.00	300 secs	-	-	-	-	2.6	0.0	17.9	-	0.0	0.0
BH1	1	19	5 (2)		---	1.00 to 5.00	360 secs	-	-	-	-	2.4	0.0	18.2	-	0.0	0.0
BH1	1	19	5 (2)		---	1.00 to 5.00	420 secs	-	-	-	-	2.2	0.0	18.6	-	0.0	0.0
BH1	1	19	5 (2)		---	1.00 to 5.00	480 secs	-	-	-	-	2.1	0.0	18.9	-	0.0	0.0
BH1	1	19	5 (2)		---	1.00 to 5.00	540 secs	-	-	-	-	2.0	0.0	19.2	-	0.0	0.0
BH1	1	19	5 (2)		---	1.00 to 5.00	600 secs	-	-	-	-	1.9	0.0	19.4	-	0.0	0.0
BH1	1	19	5 (3)	5.00	4.85	1.00 to 5.00	16/12/2015 09:18:00	-	-	-	1.96	-	-	-	-	-	-
BH1	2	50	6	18.00	---	6.00 to 18.00	08/01/2016 12:05:00	996	996	$0.1_{(I)}$	-	-	-	-	-	-	-
BH1	2	50	6		---	6.00 to 18.00	120 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH1	2	50	6 (2)	18.00	---	6.00 to 18.00	08/01/2016 12:08:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH1	2	50	6 (2)		---	6.00 to 18.00	15 secs	-	-	-	-	0.7	0.0	20.4	-	1.0	0.0
BH1	2	50	6 (2)		---	6.00 to 18.00	30 secs	-	-	-	-	0.6	0.0	20.0	-	1.0	0.0
BH1	2	50	6 (2)		---	6.00 to 18.00	60 secs	-	-	-	-	0.5	0.0	20.0	-	1.0	0.0

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Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH1	2	50	6 (2)		---	6.00 to 18.00	90 secs	-	-	-	-	0.5	0.0	20.1	-	0.0	0.0
BH1	2	50	6 (2)		---	6.00 to 18.00	120 secs	-	-	-	-	0.4	0.0	20.2	-	0.0	0.0
BH1	2	50	6 (2)		---	6.00 to 18.00	180 secs	-	-	-	-	0.4	0.0	20.3	-	0.0	0.0
BH1	2	50	6 (2)		---	6.00 to 18.00	240 secs	-	-	-	-	0.3	0.0	20.3	-	0.0	0.0
BH1	2	50	6 (2)		---	6.00 to 18.00	300 secs	-	-	-	-	0.3	0.0	20.3	-	0.0	0.0
BH1	2	50	6 (2)		---	6.00 to 18.00	360 secs	-	-	-	-	0.3	0.0	20.4	-	0.0	0.0
BH1	2	50	6 (3)	18.00	18.60	6.00 to 18.00	08/01/2016 12:15:00	-	-	-	1.60	-	-	-	-	-	-
BH1	1	19	6	5.00	---	1.00 to 5.00	08/01/2016 12:21:00	996	996	$0.0_{(I)}$	-	-	-	-	-	-	-
BH1	1	19	6		---	1.00 to 5.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH1	1	19	6 (2)	5.00	---	1.00 to 5.00	08/01/2016 12:22:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH1	1	19	6 (2)		---	1.00 to 5.00	15 secs	-	-	-	-	1.0	0.0	20.4	-	0.0	0.0
BH1	1	19	6 (2)		---	1.00 to 5.00	30 secs	-	-	-	-	1.1	0.0	19.8	-	0.0	0.0
BH1	1	19	6 (2)		---	1.00 to 5.00	60 secs	-	-	-	-	1.2	0.0	19.6	-	0.0	0.0
BH1	1	19	6 (2)		---	1.00 to 5.00	90 secs	-	-	-	-	1.2	0.0	19.6	-	0.0	0.0
BH1	1	19	6 (2)		---	1.00 to 5.00	120 secs	-	-	-	-	1.2	0.0	19.6	-	0.0	0.0
BH1	1	19	6 (2)		---	1.00 to 5.00	180 secs	-	-	-	-	1.1	0.0	19.7	-	0.0	0.0
BH1	1	19	6 (2)		---	1.00 to 5.00	240 secs	-	-	-	-	1.1	0.0	19.8	-	0.0	0.0
BH1	1	19	6 (2)		---	1.00 to 5.00	300 secs	-	-	-	-	1.0	0.0	19.9	-	0.0	0.0
BH1	1	19	6 (2)		---	1.00 to 5.00	360 secs	-	-	-	-	1.0	0.0	19.9	-	0.0	0.0
BH1	1	19	6 (2)		---	1.00 to 5.00	420 secs	-	-	-	-	1.0	0.0	20.0	-	0.0	0.0
BH1	1	19	6 (3)	5.00	4.85	1.00 to 5.00	08/01/2016 12:30:00	-	-	-	1.60	-	-	-	-	-	-
BH2	1	50	1	19.80	---	1.00 to 19.80	19/11/2015 13:25:00	1010	1011	$0.4_{(I)}$	-	-	-	-	-	-	-
BH2	1	50	1		---	1.00 to 19.80	30 secs	-	-	$0.1_{(SS)}$	-	-	-	-	-	-	-
BH2	1	50	1 (2)	19.80	---	1.00 to 19.80	19/11/2015 13:26:00	-	-	-	-	0.0	0.0	20.9	0.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB

Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	13/01/16			730673

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH2	1	50	1 (2)		---	1.00 to 19.80	15 secs	-	-	-	-	3.4	0.0	19.4	0.0	1.0	0.0
BH2	1	50	1 (2)		---	1.00 to 19.80	30 secs	-	-	-	-	3.4	0.0	18.3	0.0	1.0	0.0
BH2	1	50	1 (2)		---	1.00 to 19.80	60 secs	-	-	-	-	3.4	0.0	18.2	0.0	1.0	0.0
BH2	1	50	1 (2)		---	1.00 to 19.80	90 secs	-	-	-	-	3.4	0.0	18.2	0.0	1.0	0.0
BH2	1	50	1 (2)		---	1.00 to 19.80	120 secs	-	-	-	-	3.3	0.0	18.2	0.0	1.0	0.0
BH2	1	50	1 (2)		---	1.00 to 19.80	180 secs	-	-	-	-	3.0	0.0	18.4	0.0	1.0	0.0
BH2	1	50	1 (2)		---	1.00 to 19.80	240 secs	-	-	-	-	2.7	0.0	18.5	0.0	0.0	1.0
BH2	1	50	1 (2)		---	1.00 to 19.80	300 secs	-	-	-	-	2.5	0.0	18.6	0.0	0.0	0.0
BH2	1	50	1 (2)		---	1.00 to 19.80	360 secs	-	-	-	-	2.3	0.0	18.7	0.0	0.0	1.0
BH2	1	50	1 (2)		---	1.00 to 19.80	420 secs	-	-	-	-	2.2	0.0	18.7	0.0	0.0	1.0
BH2	1	50	1 (2)		---	1.00 to 19.80	480 secs	-	-	-	-	2.1	0.0	18.8	0.0	0.0	1.0
BH2	1	50	1 (2)		---	1.00 to 19.80	540 secs	-	-	-	-	2.0	0.0	18.9	0.0	0.0	1.0
BH2	1	50	1 (2)		---	1.00 to 19.80	600 secs	-	-	-	-	1.9	0.0	18.9	0.0	0.0	1.0
BH2	1	50	1 (3)	19.80	19.02	1.00 to 19.80	19/11/2015 13:37:00	-	-	-	1.70	-	-	-	-	-	-
BH2	1	50	2	19.80	---	1.00 to 19.80	24/11/2015 09:15:00	1011	1011	$0.0_{(I)}$	-	-	-	-	-	-	-
BH2	1	50	2		---	1.00 to 19.80	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH2	1	50	2 (2)	19.80	---	1.00 to 19.80	24/11/2015 09:16:00	-	-	-	-	0.0	0.0	20.9	0.0	0.0	0.0
BH2	1	50	2 (2)		---	1.00 to 19.80	15 secs	-	-	-	-	1.3	0.3	20.6	6.0	1.0	0.0
BH2	1	50	2 (2)		---	1.00 to 19.80	30 secs	-	-	-	-	1.3	0.3	20.4	6.0	1.0	0.0
BH2	1	50	2 (2)		---	1.00 to 19.80	60 secs	-	-	-	-	1.1	0.2	20.5	4.0	1.0	0.0
BH2	1	50	2 (2)		---	1.00 to 19.80	90 secs	-	-	-	-	0.8	0.1	20.7	2.0	0.0	0.0
BH2	1	50	2 (2)		---	1.00 to 19.80	120 secs	-	-	-	-	0.7	0.1	20.7	2.0	0.0	0.0
BH2	1	50	2 (2)		---	1.00 to 19.80	180 secs	-	-	-	-	0.6	0.1	20.8	2.0	0.0	0.0
BH2	1	50	2 (2)		---	1.00 to 19.80	240 secs	-	-	-	-	0.6	0.1	20.8	2.0	0.0	0.0
BH2	1	50	2 (2)		---	1.00 to 19.80	300 secs	-	-	-	-	0.5	0.1	20.9	2.0	0.0	0.0

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Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	13/01/16			730673

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH2	1	50	2 (3)	19.80	---	1.00 to 19.80	24/11/2015 09:22:00	-	-	-	-	-	-	-	-	-	-
	Remarks: Samples taken.																
BH2	1	50	3	19.80	---	1.00 to 19.80	02/12/2015 10:50:00	1020	1020	$0.3_{(I)}$	-	-	-	-	-	-	-
BH2	1	50	3		---	1.00 to 19.80	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH2	1	50	3 (2)	19.80	---	1.00 to 19.80	02/12/2015 10:51:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH2	1	50	3 (2)		---	1.00 to 19.80	15 secs	-	-	-	-	1.1	0.0	20.3	-	2.0	0.0
BH2	1	50	3 (2)		---	1.00 to 19.80	30 secs	-	-	-	-	1.1	0.0	20.2	-	0.0	0.0
BH2	1	50	3 (2)		---	1.00 to 19.80	60 secs	-	-	-	-	0.8	0.0	20.3	-	0.0	0.0
BH2	1	50	3 (2)		---	1.00 to 19.80	90 secs	-	-	-	-	0.6	0.0	20.4	-	0.0	0.0
BH2	1	50	3 (2)		---	1.00 to 19.80	120 secs	-	-	-	-	0.5	0.0	20.5	-	0.0	0.0
BH2	1	50	3 (2)		---	1.00 to 19.80	180 secs	-	-	-	-	0.4	0.0	20.5	-	0.0	0.0
BH2	1	50	3 (2)		---	1.00 to 19.80	240 secs	-	-	-	-	0.3	0.0	20.6	-	0.0	0.0
BH2	1	50	3 (2)		---	1.00 to 19.80	300 secs	-	-	-	-	0.3	0.0	20.6	-	0.0	0.0
BH2	1	50	3 (2)		---	1.00 to 19.80	360 secs	-	-	-	-	0.4	0.0	20.5	-	0.0	0.0
BH2	1	50	3 (2)		---	1.00 to 19.80	420 secs	-	-	-	-	0.4	0.0	20.5	-	0.0	0.0
BH2	1	50	3 (2)		---	1.00 to 19.80	480 secs	-	-	-	-	0.3	0.0	20.5	-	0.0	0.0
BH2	1	50	3 (2)		---	1.00 to 19.80	540 secs	-	-	-	-	0.3	0.0	20.5	-	0.0	0.0
BH2	1	50	3 (2)		---	1.00 to 19.80	600 secs	-	-	-	-	0.4	0.0	20.5	-	0.0	0.0
BH2	1	50	3 (3)	19.80	19.05	1.00 to 19.80	02/12/2015 11:02:00	-	-	-	1.74	-	-	-	-	-	-
BH2	1	50	4	19.80	---	1.00 to 19.80	11/12/2015 10:45:00	1022	1022	$0.0_{(I)}$	-	-	-	-	-	-	-
BH2	1	50	4		---	1.00 to 19.80	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH2	1	50	4 (2)	19.80	---	1.00 to 19.80	11/12/2015 10:47:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH2	1	50	4 (2)		---	1.00 to 19.80	15 secs	-	-	-	-	2.2	0.0	20.5	-	0.0	0.0
BH2	1	50	4 (2)		---	1.00 to 19.80	30 secs	-	-	-	-	2.2	0.0	20.1	-	0.0	0.0
BH2	1	50	4 (2)		---	1.00 to 19.80	60 secs	-	-	-	-	1.8	0.1	20.1	-	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	**13/01/16**			**730673**

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH2	1	50	4 (2)		---	1.00 to 19.80	90 secs	-	-	-	-	1.2	0.1	20.5	-	0.0	0.0
BH2	1	50	4 (2)		---	1.00 to 19.80	120 secs	-	-	-	-	1.0	0.0	20.6	-	0.0	0.0
BH2	1	50	4 (2)		---	1.00 to 19.80	180 secs	-	-	-	-	0.9	0.0	20.7	-	0.0	0.0
BH2	1	50	4 (2)		---	1.00 to 19.80	240 secs	-	-	-	-	0.9	0.0	20.7	-	0.0	0.0
BH2	1	50	4 (2)		---	1.00 to 19.80	300 secs	-	-	-	-	0.9	0.0	20.7	-	0.0	0.0
BH2	1	50	4 (3)	19.80	19.00	1.00 to 19.80	11/12/2015 10:53:00	-	-	-	1.67	-	-	-	-	-	-
BH2	1	50	5	19.80	---	1.00 to 19.80	16/12/2015 09:27:00	1017	1017	$0.0_{(I)}$	-	-	-	-	-	-	-
BH2	1	50	5		---	1.00 to 19.80	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH2	1	50	5 (2)	19.80	---	1.00 to 19.80	16/12/2015 09:30:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH2	1	50	5 (2)		---	1.00 to 19.80	15 secs	-	-	-	-	0.2	0.0	20.9	-	0.0	0.0
BH2	1	50	5 (2)		---	1.00 to 19.80	30 secs	-	-	-	-	0.2	0.0	20.9	-	0.0	0.0
BH2	1	50	5 (2)		---	1.00 to 19.80	60 secs	-	-	-	-	0.2	0.0	20.8	-	0.0	0.0
BH2	1	50	5 (2)		---	1.00 to 19.80	90 secs	-	-	-	-	0.2	0.0	20.8	-	0.0	0.0
BH2	1	50	5 (2)		---	1.00 to 19.80	120 secs	-	-	-	-	0.2	0.0	20.8	-	0.0	0.0
BH2	1	50	5 (2)		---	1.00 to 19.80	180 secs	-	-	-	-	0.2	0.0	20.7	-	0.0	0.0
BH2	1	50	5 (2)		---	1.00 to 19.80	240 secs	-	-	-	-	0.2	0.0	20.8	-	0.0	0.0
BH2	1	50	5 (2)		---	1.00 to 19.80	300 secs	-	-	-	-	0.2	0.0	20.8	-	0.0	0.0
BH2	1	50	5 (2)		---	1.00 to 19.80	360 secs	-	-	-	-	0.2	0.0	20.8	-	0.0	0.0
BH2	1	50	5 (3)	19.80	19.00	1.00 to 19.80	16/12/2015 09:37:00	-	-	-	1.64	-	-	-	-	-	-
BH2	1	50	6	19.80	---	1.00 to 19.80	08/01/2016 12:37:00	997	996	$0.0_{(I)}$	-	-	-	-	-	-	-
BH2	1	50	6		---	1.00 to 19.80	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH2	1	50	6 (2)	19.80	---	1.00 to 19.80	08/01/2016 12:41:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH2	1	50	6 (2)		---	1.00 to 19.80	15 secs	-	-	-	-	2.5	0.0	20.5	-	1.0	0.0
BH2	1	50	6 (2)		---	1.00 to 19.80	30 secs	-	-	-	-	2.6	0.0	19.4	-	1.0	0.0
BH2	1	50	6 (2)		---	1.00 to 19.80	60 secs	-	-	-	-	1.6	0.0	20.0	-	1.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	13/01/16			730673

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH2	1	50	6 (2)		---	1.00 to 19.80	90 secs	-	-	-	-	0.9	0.0	20.4	-	0.0	0.0
BH2	1	50	6 (2)		---	1.00 to 19.80	120 secs	-	-	-	-	0.7	0.0	20.5	-	0.0	0.0
BH2	1	50	6 (2)		---	1.00 to 19.80	180 secs	-	-	-	-	0.7	0.0	20.6	-	0.0	0.0
BH2	1	50	6 (2)		---	1.00 to 19.80	240 secs	-	-	-	-	0.6	0.0	20.6	-	0.0	0.0
BH2	1	50	6 (2)		---	1.00 to 19.80	300 secs	-	-	-	-	0.7	0.0	20.6	-	0.0	0.0
BH2	1	50	6 (2)		---	1.00 to 19.80	360 secs	-	-	-	-	0.6	0.0	20.6	-	0.0	0.0
BH2	1	50	6 (2)		---	1.00 to 19.80	420 secs	-	-	-	-	0.6	0.0	20.6	-	0.0	0.0
BH2	1	50	6 (2)		---	1.00 to 19.80	480 secs	-	-	-	-	0.6	0.0	20.6	-	0.0	0.0
BH2	1	50	6 (3)	19.80	19.07	1.00 to 19.80	08/01/2016 12:50:00	-	-	-	1.29	-	-	-	-	-	-
BH3B	1	50	1	13.00	---	1.00 to 13.00	19/11/2015 11:05:00	-	-0.05	$0.0_{(I)}$	-	-	-	-	-	-	-
BH3B	1	50	1		---	1.00 to 13.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH3B	1	50	1 (2)	13.00	---	1.00 to 13.00	19/11/2015 11:06:00	-	-	-	-	0.0	0.0	20.9	0.0	0.0	0.0
BH3B	1	50	1 (2)		---	1.00 to 13.00	15 secs	-	-	-	-	1.4	0.0	19.1	0.0	0.0	0.0
BH3B	1	50	1 (2)		---	1.00 to 13.00	30 secs	-	-	-	-	1.4	0.0	17.3	0.0	0.0	0.0
BH3B	1	50	1 (2)		---	1.00 to 13.00	60 secs	-	-	-	-	1.4	0.0	17.1	0.0	0.0	0.0
BH3B	1	50	1 (2)		---	1.00 to 13.00	90 secs	-	-	-	-	1.4	0.0	17.1	0.0	0.0	0.0
BH3B	1	50	1 (2)		---	1.00 to 13.00	120 secs	-	-	-	-	1.4	0.0	17.0	0.0	0.0	0.0
BH3B	1	50	1 (2)		---	1.00 to 13.00	180 secs	-	-	-	-	1.4	0.0	16.9	0.0	0.0	0.0
BH3B	1	50	1 (2)		---	1.00 to 13.00	240 secs	-	-	-	-	1.4	0.0	16.8	0.0	0.0	0.0
BH3B	1	50	1 (2)		---	1.00 to 13.00	300 secs	-	-	-	-	1.3	0.0	16.8	0.0	0.0	0.0
BH3B	1	50	1 (3)	13.00	12.78	1.00 to 13.00	19/11/2015 11:12:00	-	-	-	4.37	-	-	-	-	-	-
BH3B	1	50	2	13.00	---	1.00 to 13.00	24/11/2015 13:05:00	1011	1011	$0.0_{(I)}$	-	-	-	-	-	-	-
BH3B	1	50	2		---	1.00 to 13.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH3B	1	50	2 (2)	13.00	---	1.00 to 13.00	24/11/2015 13:06:00	-	-	-	-	0.1	0.0	20.9	0.0	0.0	0.0

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STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB

Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	**13/01/16**			**730673**

Contract: **MetroWest**

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IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH3B	1	50	2 (2)		---	1.00 to 13.00	15 secs	-	-	-	-	1.8	0.0	18.4	0.0	0.0	0.0
BH3B	1	50	2 (2)		---	1.00 to 13.00	30 secs	-	-	-	-	1.8	0.0	17.4	0.0	0.0	0.0
BH3B	1	50	2 (2)		---	1.00 to 13.00	60 secs	-	-	-	-	1.8	0.0	17.4	0.0	0.0	0.0
BH3B	1	50	2 (2)		---	1.00 to 13.00	90 secs	-	-	-	-	1.8	0.0	17.4	0.0	0.0	0.0
BH3B	1	50	2 (2)		---	1.00 to 13.00	120 secs	-	-	-	-	1.8	0.0	17.4	0.0	0.0	0.0
BH3B	1	50	2 (2)		---	1.00 to 13.00	180 secs	-	-	-	-	1.8	0.0	17.4	0.0	0.0	0.0
BH3B	1	50	2 (2)		---	1.00 to 13.00	240 secs	-	-	-	-	1.8	0.0	17.5	0.0	0.0	0.0
BH3B	1	50	2 (2)		---	1.00 to 13.00	300 secs	-	-	-	-	1.7	0.0	17.6	0.0	0.0	0.0
BH3B	1	50	2 (2)		---	1.00 to 13.00	360 secs	-	-	-	-	1.7	0.0	17.7	0.0	0.0	0.0
BH3B	1	50	2 (3)	13.00	12.79	1.00 to 13.00	24/11/2015 13:13:00	-	-	-	4.44	-	-	-	-	-	-
	Remarks: Samples taken.																
BH3B	1	50	3	13.00	---	1.00 to 13.00	02/12/2015 08:23:00	1019	1019	$0.0_{(I)}$	-	-	-	-	-	-	-
BH3B	1	50	3		---	1.00 to 13.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH3B	1	50	3 (2)	13.00	---	1.00 to 13.00	02/12/2015 08:24:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH3B	1	50	3 (2)		---	1.00 to 13.00	15 secs	-	-	-	-	1.7	0.0	18.6	-	0.0	0.0
BH3B	1	50	3 (2)		---	1.00 to 13.00	30 secs	-	-	-	-	1.7	0.0	17.7	-	0.0	0.0
BH3B	1	50	3 (2)		---	1.00 to 13.00	60 secs	-	-	-	-	1.7	0.0	17.6	-	0.0	0.0
BH3B	1	50	3 (2)		---	1.00 to 13.00	90 secs	-	-	-	-	1.7	0.0	17.6	-	0.0	0.0
BH3B	1	50	3 (2)		---	1.00 to 13.00	120 secs	-	-	-	-	1.7	0.0	17.6	-	0.0	0.0
BH3B	1	50	3 (2)		---	1.00 to 13.00	180 secs	-	-	-	-	1.7	0.0	17.6	-	0.0	0.0
BH3B	1	50	3 (2)		---	1.00 to 13.00	240 secs	-	-	-	-	1.7	0.0	17.6	-	0.0	0.0
BH3B	1	50	3 (2)		---	1.00 to 13.00	300 secs	-	-	-	-	1.7	0.0	17.7	-	0.0	0.0
BH3B	1	50	3 (3)	13.00	12.79	1.00 to 13.00	02/12/2015 08:30:00	-	-	-	4.17	-	-	-	-	-	-
BH3B	1	50	4	13.00	---	1.00 to 13.00	11/12/2015 10:10:00	1021	1021	$0.0_{(I)}$	-	-	-	-	-	-	-
BH3B	1	50	4		---	1.00 to 13.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-

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STRUCTURAL SOILS
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Bristol BS3 4EB

Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	13/01/16			730673

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH3B	1	50	4 (2)	13.00	---	1.00 to 13.00	11/12/2015 10:11:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH3B	1	50	4 (2)		---	1.00 to 13.00	15 secs	-	-	-	-	2.3	0.0	19.7	-	0.0	0.0
BH3B	1	50	4 (2)		---	1.00 to 13.00	30 secs	-	-	-	-	2.3	0.0	17.9	-	0.0	0.0
BH3B	1	50	4 (2)		---	1.00 to 13.00	60 secs	-	-	-	-	2.3	0.0	17.9	-	0.0	0.0
BH3B	1	50	4 (2)		---	1.00 to 13.00	90 secs	-	-	-	-	2.3	0.0	17.9	-	0.0	0.0
BH3B	1	50	4 (2)		---	1.00 to 13.00	120 secs	-	-	-	-	2.3	0.0	17.8	-	0.0	0.0
BH3B	1	50	4 (2)		---	1.00 to 13.00	180 secs	-	-	-	-	2.3	0.0	17.9	-	0.0	0.0
BH3B	1	50	4 (2)		---	1.00 to 13.00	240 secs	-	-	-	-	2.3	0.0	17.9	-	0.0	0.0
BH3B	1	50	4 (2)		---	1.00 to 13.00	300 secs	-	-	-	-	2.3	0.0	18.0	-	0.0	0.0
BH3B	1	50	4 (3)	13.00	12.78	1.00 to 13.00	11/12/2015 10:17:00	-	-	-	4.25	-	-	-	-	-	-
BH3B	1	50	5	13.00	---	1.00 to 13.00	16/12/2015 10:05:00	1017	1017	$0.0_{(I)}$	-	-	-	-	-	-	-
BH3B	1	50	5		---	1.00 to 13.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH3B	1	50	5 (2)	13.00	---	1.00 to 13.00	16/12/2015 10:07:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH3B	1	50	5 (2)		---	1.00 to 13.00	15 secs	-	-	-	-	2.1	0.0	18.9	-	0.0	0.0
BH3B	1	50	5 (2)		---	1.00 to 13.00	30 secs	-	-	-	-	2.2	0.0	17.7	-	0.0	0.0
BH3B	1	50	5 (2)		---	1.00 to 13.00	60 secs	-	-	-	-	2.2	0.0	17.6	-	0.0	0.0
BH3B	1	50	5 (2)		---	1.00 to 13.00	90 secs	-	-	-	-	2.2	0.0	17.6	-	0.0	0.0
BH3B	1	50	5 (2)		---	1.00 to 13.00	120 secs	-	-	-	-	2.2	0.0	17.6	-	0.0	0.0
BH3B	1	50	5 (2)		---	1.00 to 13.00	180 secs	-	-	-	-	2.2	0.0	17.5	-	0.0	0.0
BH3B	1	50	5 (2)		---	1.00 to 13.00	240 secs	-	-	-	-	2.2	0.0	17.5	-	0.0	0.0
BH3B	1	50	5 (2)		---	1.00 to 13.00	300 secs	-	-	-	-	2.2	0.0	17.5	-	0.0	0.0
BH3B	1	50	5 (3)	13.00	12.79	1.00 to 13.00	16/12/2015 10:13:00	-	-	-	4.01	-	-	-	-	-	-
BH3B	1	50	6	13.00	---	1.00 to 13.00	08/01/2016 11:35:00	996	996	$0.0_{(I)}$	-	-	-	-	-	-	-
BH3B	1	50	6		---	1.00 to 13.00	60 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH3B	1	50	6 (2)	13.00	---	1.00 to 13.00	08/01/2016 11:38:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0

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STRUCTURAL SOILS
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Bristol BS3 4EB

Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	**13/01/16**			**730673**

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH3B	1	50	6 (2)		---	1.00 to 13.00	15 secs	-	-	-	-	1.6	0.0	19.9	-	0.0	0.0
BH3B	1	50	6 (2)		---	1.00 to 13.00	30 secs	-	-	-	-	1.6	0.0	18.5	-	0.0	0.0
BH3B	1	50	6 (2)		---	1.00 to 13.00	60 secs	-	-	-	-	1.6	0.0	18.4	-	0.0	0.0
BH3B	1	50	6 (2)		---	1.00 to 13.00	90 secs	-	-	-	-	1.6	0.0	18.4	-	0.0	0.0
BH3B	1	50	6 (2)		---	1.00 to 13.00	120 secs	-	-	-	-	1.6	0.0	18.5	-	0.0	0.0
BH3B	1	50	6 (2)		---	1.00 to 13.00	180 secs	-	-	-	-	1.5	0.0	18.5	-	0.0	0.0
BH3B	1	50	6 (2)		---	1.00 to 13.00	240 secs	-	-	-	-	1.5	0.0	18.5	-	0.0	0.0
BH3B	1	50	6 (2)		---	1.00 to 13.00	300 secs	-	-	-	-	1.5	0.0	18.6	-	0.0	0.0
BH3B	1	50	6 (3)	13.00	12.79	1.00 to 13.00	08/01/2016 11:44:00	-	-	-	3.44	-	-	-	-	-	-
BH4	1	50	1	10.50	---	1.50 to 10.50	19/11/2015 09:00:00	1010	1010	$-0.1_{(I)}$	-	-	-	-	-	-	-
BH4	1	50	1		---	1.50 to 10.50	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH4	1	50	1 (2)	10.50	---	1.50 to 10.50	19/11/2015 09:01:00	-	-	-	-	0.0	0.0	20.9	0.0	0.0	0.0
BH4	1	50	1 (2)		---	1.50 to 10.50	15 secs	-	-	-	-	0.1	0.0	20.9	0.0	140.0	0.0
BH4	1	50	1 (2)		---	1.50 to 10.50	30 secs	-	-	-	-	0.1	0.0	20.9	0.0	97.0	0.0
BH4	1	50	1 (2)		---	1.50 to 10.50	60 secs	-	-	-	-	0.1	0.0	20.9	0.0	37.0	0.0
BH4	1	50	1 (2)		---	1.50 to 10.50	90 secs	-	-	-	-	0.1	0.0	20.9	0.0	23.0	0.0
BH4	1	50	1 (2)		---	1.50 to 10.50	120 secs	-	-	-	-	0.1	0.0	20.9	0.0	15.0	0.0
BH4	1	50	1 (2)		---	1.50 to 10.50	180 secs	-	-	-	-	0.1	0.0	20.9	0.0	8.0	0.0
BH4	1	50	1 (2)		---	1.50 to 10.50	240 secs	-	-	-	-	0.1	0.0	20.9	0.0	8.0	0.0
BH4	1	50	1 (2)		---	1.50 to 10.50	300 secs	-	-	-	-	0.1	0.0	20.9	0.0	7.0	0.0
BH4	1	50	1 (3)	10.50	10.63	1.50 to 10.50	19/11/2015 09:07:00	-	-	-	3.01	-	-	-	-	-	-
BH4	1	50	2	10.50	---	1.50 to 10.50	24/11/2015 14:35:00	1007	1007	$-0.6_{(I)}$	-	-	-	-	-	-	-
BH4	1	50	2		---	1.50 to 10.50	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH4	1	50	2 (2)	10.50	---	1.50 to 10.50	24/11/2015 14:36:00	-	-	-	-	0.0	0.0	20.9	0.0	0.0	0.0

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Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	13/01/16			730673

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH4	1	50	2 (2)		---	1.50 to 10.50	15 secs	-	-	-	-	0.1	0.0	19.6	0.0	>500	1.0
BH4	1	50	2 (2)		---	1.50 to 10.50	30 secs	-	-	-	-	0.1	0.0	19.8	0.0	348.0	1.0
BH4	1	50	2 (2)		---	1.50 to 10.50	60 secs	-	-	-	-	0.1	0.0	20.5	0.0	130.0	1.0
BH4	1	50	2 (2)		---	1.50 to 10.50	90 secs	-	-	-	-	0.1	0.0	20.7	0.0	87.0	1.0
BH4	1	50	2 (2)		---	1.50 to 10.50	120 secs	-	-	-	-	0.1	0.0	20.7	0.0	73.0	1.0
BH4	1	50	2 (2)		---	1.50 to 10.50	180 secs	-	-	-	-	0.1	0.0	20.8	0.0	52.0	0.0
BH4	1	50	2 (2)		---	1.50 to 10.50	240 secs	-	-	-	-	0.1	0.0	20.9	0.0	48.0	0.0
BH4	1	50	2 (2)		---	1.50 to 10.50	300 secs	-	-	-	-	0.1	0.0	20.9	0.0	39.0	0.0
BH4	1	50	2 (3)	10.50	10.40	1.50 to 10.50	24/11/2015 14:42:00	-	-	-	3.57	-	-	-	-	-	-
	Remarks: Samples taken. Water level 6.11m depth after sampling.																
BH4	1	50	3	10.50	---	1.50 to 10.50	02/12/2015 09:00:00	1018	1018	$0.0_{(I)}$	-	-	-	-	-	-	-
BH4	1	50	3		---	1.50 to 10.50	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH4	1	50	3 (2)	10.50	---	1.50 to 10.50	02/12/2015 09:01:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH4	1	50	3 (2)		---	1.50 to 10.50	15 secs	-	-	-	-	0.2	0.0	14.3	-	173.0	0.0
BH4	1	50	3 (2)		---	1.50 to 10.50	30 secs	-	-	-	-	0.2	0.0	13.9	-	151.0	0.0
BH4	1	50	3 (2)		---	1.50 to 10.50	60 secs	-	-	-	-	0.2	0.0	15.0	-	127.0	0.0
BH4	1	50	3 (2)		---	1.50 to 10.50	90 secs	-	-	-	-	0.2	0.0	15.3	-	123.0	0.0
BH4	1	50	3 (2)		---	1.50 to 10.50	120 secs	-	-	-	-	0.2	0.0	15.4	-	121.0	0.0
BH4	1	50	3 (2)		---	1.50 to 10.50	180 secs	-	-	-	-	0.2	0.0	15.3	-	119.0	0.0
BH4	1	50	3 (2)		---	1.50 to 10.50	240 secs	-	-	-	-	0.2	0.0	15.2	-	112.0	0.0
BH4	1	50	3 (2)		---	1.50 to 10.50	300 secs	-	-	-	-	0.2	0.0	13.7	-	84.0	0.0
BH4	1	50	3 (3)	10.50	10.46	1.50 to 10.50	02/12/2015 09:07:00	-	-	-	3.54	-	-	-	-	-	-
BH4	1	50	4	10.50	---	1.50 to 10.50	11/12/2015 09:30:00	1021	1021	$0.0_{(I)}$	-	-	-	-	-	-	-
BH4	1	50	4		---	1.50 to 10.50	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH4	1	50	4 (2)	10.50	---	1.50 to 10.50	11/12/2015 09:32:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0

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Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	13/01/16			730673

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH4	1	50	4 (2)		---	1.50 to 10.50	15 secs	-	-	-	-	0.4	0.0	17.8	-	0.0	0.0
BH4	1	50	4 (2)		---	1.50 to 10.50	30 secs	-	-	-	-	0.3	0.0	15.8	-	0.0	0.0
BH4	1	50	4 (2)		---	1.50 to 10.50	60 secs	-	-	-	-	0.3	0.0	16.4	-	1.0	0.0
BH4	1	50	4 (2)		---	1.50 to 10.50	90 secs	-	-	-	-	0.3	0.0	16.5	-	1.0	0.0
BH4	1	50	4 (2)		---	1.50 to 10.50	120 secs	-	-	-	-	0.3	0.0	16.6	-	1.0	0.0
BH4	1	50	4 (2)		---	1.50 to 10.50	180 secs	-	-	-	-	0.3	0.0	16.6	-	1.0	0.0
BH4	1	50	4 (2)		---	1.50 to 10.50	240 secs	-	-	-	-	0.3	0.0	16.6	-	1.0	0.0
BH4	1	50	4 (2)		---	1.50 to 10.50	300 secs	-	-	-	-	0.3	0.0	16.3	-	1.0	0.0
BH4	1	50	4 (3)	10.50	10.33	1.50 to 10.50	11/12/2015 09:38:00	-	-	-	3.85	-	-	-	-	-	-
BH4	1	50	5	10.50	---	1.50 to 10.50	16/12/2015 10:29:00	1016	1016	$0.0_{(I)}$	-	-	-	-	-	-	-
BH4	1	50	5		---	1.50 to 10.50	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH4	1	50	5 (2)	10.50	---	1.50 to 10.50	16/12/2015 10:33:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH4	1	50	5 (2)		---	1.50 to 10.50	15 secs	-	-	-	-	0.6	0.0	15.8	-	1.0	0.0
BH4	1	50	5 (2)		---	1.50 to 10.50	30 secs	-	-	-	-	0.5	0.0	14.6	-	1.0	0.0
BH4	1	50	5 (2)		---	1.50 to 10.50	60 secs	-	-	-	-	0.4	0.0	16.7	-	1.0	0.0
BH4	1	50	5 (2)		---	1.50 to 10.50	90 secs	-	-	-	-	0.3	0.0	16.8	-	1.0	0.0
BH4	1	50	5 (2)		---	1.50 to 10.50	120 secs	-	-	-	-	0.3	0.0	16.7	-	1.0	0.0
BH4	1	50	5 (2)		---	1.50 to 10.50	180 secs	-	-	-	-	0.4	0.0	16.5	-	1.0	0.0
BH4	1	50	5 (2)		---	1.50 to 10.50	240 secs	-	-	-	-	0.4	0.0	16.4	-	1.0	0.0
BH4	1	50	5 (2)		---	1.50 to 10.50	300 secs	-	-	-	-	0.4	0.0	16.3	-	1.0	0.0
BH4	1	50	5 (3)	10.50	10.42	1.50 to 10.50	16/12/2015 10:39:00	-	-	-	3.68	-	-	-	-	-	-
BH4	1	50	6	10.50	---	1.50 to 10.50	08/01/2016 10:41:00	994	994	$0.0_{(I)}$	-	-	-	-	-	-	-
BH4	1	50	6		---	1.50 to 10.50	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH4	1	50	6 (2)	10.50	---	1.50 to 10.50	08/01/2016 10:42:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH4	1	50	6 (2)		---	1.50 to 10.50	15 secs	-	-	-	-	1.5	0.0	18.5	-	0.0	0.0

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STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB

Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	13/01/16			730673

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH4	1	50	6 (2)		---	1.50 to 10.50	30 secs	-	-	-	-	1.2	0.0	14.8	-	0.0	0.0
BH4	1	50	6 (2)		---	1.50 to 10.50	60 secs	-	-	-	-	1.0	0.0	15.7	-	0.0	0.0
BH4	1	50	6 (2)		---	1.50 to 10.50	90 secs	-	-	-	-	0.9	0.0	16.2	-	0.0	0.0
BH4	1	50	6 (2)		---	1.50 to 10.50	120 secs	-	-	-	-	0.9	0.0	16.3	-	0.0	0.0
BH4	1	50	6 (2)		---	1.50 to 10.50	180 secs	-	-	-	-	1.0	0.0	16.0	-	0.0	0.0
BH4	1	50	6 (2)		---	1.50 to 10.50	240 secs	-	-	-	-	0.9	0.0	16.3	-	0.0	0.0
BH4	1	50	6 (2)		---	1.50 to 10.50	300 secs	-	-	-	-	1.0	0.0	16.1	-	0.0	0.0
BH4	1	50	6 (2)		---	1.50 to 10.50	360 secs	-	-	-	-	1.1	0.0	15.1	-	0.0	0.0
BH4	1	50	6 (2)		---	1.50 to 10.50	420 secs	-	-	-	-	1.2	0.0	14.5	-	0.0	0.0
BH4	1	50	6 (2)		---	1.50 to 10.50	480 secs	-	-	-	-	1.2	0.0	14.6	-	0.0	0.0
BH4	1	50	6 (2)		---	1.50 to 10.50	540 secs	-	-	-	-	1.2	0.0	14.9	-	0.0	0.0
BH4	1	50	6 (2)		---	1.50 to 10.50	600 secs	-	-	-	-	1.2	0.0	14.9	-	0.0	0.0
BH4	1	50	6 (3)	10.50	10.40	1.50 to 10.50	08/01/2016 10:53:00	-	-	-	3.17	-	-	-	-	-	-
BH5	1	50	2	6.00	---	3.00 to 6.00	24/11/2015 15:00:00	1007	1008	$0.4_{(I)}$	-	-	-	-	-	-	-
BH5	1	50	2		---	3.00 to 6.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH5	1	50	2 (2)	6.00	---	3.00 to 6.00	24/11/2015 15:01:00	-	-	-	-	0.0	0.0	20.9	0.0	0.0	0.0
BH5	1	50	2 (2)		---	3.00 to 6.00	15 secs	-	-	-	-	0.0	0.0	20.8	0.0	42.0	0.0
BH5	1	50	2 (2)		---	3.00 to 6.00	30 secs	-	-	-	-	0.1	0.0	20.5	0.0	50.0	0.0
BH5	1	50	2 (2)		---	3.00 to 6.00	60 secs	-	-	-	-	0.1	0.0	20.4	0.0	51.0	0.0
BH5	1	50	2 (2)		---	3.00 to 6.00	90 secs	-	-	-	-	0.1	0.0	20.2	0.0	55.0	0.0
BH5	1	50	2 (2)		---	3.00 to 6.00	120 secs	-	-	-	-	0.1	0.0	20.0	0.0	58.0	0.0
BH5	1	50	2 (2)		---	3.00 to 6.00	180 secs	-	-	-	-	0.2	0.0	19.2	0.0	57.0	0.0
BH5	1	50	2 (2)		---	3.00 to 6.00	240 secs	-	-	-	-	0.2	0.0	18.5	0.0	47.0	0.0
BH5	1	50	2 (2)		---	3.00 to 6.00	300 secs	-	-	-	-	0.2	0.0	17.7	0.0	29.0	0.0

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Bristol BS3 4EB

Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	**13/01/16**			**730673**

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH5	1	50	2 (3)	6.00	6.01	3.00 to 6.00	24/11/2015 15:07:00	-	-	-	5.44	-	-	-	-	-	-
	Remarks: No samples taken.																
BH5	1	50	3	6.00	---	3.00 to 6.00	02/12/2015 09:30:00	1018	1018	$1.7_{(I)}$	-	-	-	-	-	-	-
BH5	1	50	3		---	3.00 to 6.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH5	1	50	3 (2)	6.00	---	3.00 to 6.00	02/12/2015 09:31:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH5	1	50	3 (2)		---	3.00 to 6.00	15 secs	-	-	-	-	0.5	0.0	17.0	-	19.0	0.0
BH5	1	50	3 (2)		---	3.00 to 6.00	30 secs	-	-	-	-	0.5	0.0	15.9	-	23.0	0.0
BH5	1	50	3 (2)		---	3.00 to 6.00	60 secs	-	-	-	-	0.5	0.0	15.7	-	23.0	0.0
BH5	1	50	3 (2)		---	3.00 to 6.00	90 secs	-	-	-	-	0.5	0.0	15.7	-	23.0	0.0
BH5	1	50	3 (2)		---	3.00 to 6.00	120 secs	-	-	-	-	0.5	0.0	15.7	-	22.0	0.0
BH5	1	50	3 (2)		---	3.00 to 6.00	180 secs	-	-	-	-	0.5	0.0	15.6	-	19.0	0.0
BH5	1	50	3 (2)		---	3.00 to 6.00	240 secs	-	-	-	-	0.6	0.0	15.5	-	12.0	0.0
BH5	1	50	3 (2)		---	3.00 to 6.00	300 secs	-	-	-	-	0.7	0.0	15.3	-	6.0	0.0
BH5	1	50	3 (2)		---	3.00 to 6.00	360 secs	-	-	-	-	1.2	0.0	14.6	-	2.0	0.0
BH5	1	50	3 (2)		---	3.00 to 6.00	420 secs	-	-	-	-	1.3	0.0	14.5	-	1.0	0.0
BH5	1	50	3 (2)		---	3.00 to 6.00	480 secs	-	-	-	-	1.3	0.0	14.4	-	1.0	0.0
BH5	1	50	3 (2)		---	3.00 to 6.00	540 secs	-	-	-	-	1.4	0.0	14.4	-	1.0	0.0
BH5	1	50	3 (2)		---	3.00 to 6.00	600 secs	-	-	-	-	1.4	0.0	14.5	-	1.0	0.0
BH5	1	50	3 (3)	6.00	6.02	3.00 to 6.00	02/12/2015 09:42:00	-	-	-	4.45	-	-	-	-	-	-
BH5	1	50	4	6.00	---	3.00 to 6.00	11/12/2015 09:40:00	1021	1021	$0.1_{(I)}$	-	-	-	-	-	-	-
BH5	1	50	4		---	3.00 to 6.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH5	1	50	4 (2)	6.00	---	3.00 to 6.00	11/12/2015 09:42:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH5	1	50	4 (2)		---	3.00 to 6.00	15 secs	-	-	-	-	0.9	0.0	19.4	-	0.0	0.0
BH5	1	50	4 (2)		---	3.00 to 6.00	30 secs	-	-	-	-	0.8	0.0	18.4	-	0.0	0.0
BH5	1	50	4 (2)		---	3.00 to 6.00	60 secs	-	-	-	-	0.7	0.0	18.4	-	0.0	0.0

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Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	**13/01/16**			**730673**

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH5	1	50	4 (2)		---	3.00 to 6.00	90 secs	-	-	-	-	0.8	0.0	18.3	-	0.0	0.0
BH5	1	50	4 (2)		---	3.00 to 6.00	120 secs	-	-	-	-	0.8	0.0	18.2	-	1.0	0.0
BH5	1	50	4 (2)		---	3.00 to 6.00	180 secs	-	-	-	-	0.8	0.0	18.0	-	0.0	0.0
BH5	1	50	4 (2)		---	3.00 to 6.00	240 secs	-	-	-	-	0.9	0.0	17.9	-	0.0	0.0
BH5	1	50	4 (2)		---	3.00 to 6.00	300 secs	-	-	-	-	0.9	0.0	17.7	-	0.0	0.0
BH5	1	50	4 (3)	6.00	6.01	3.00 to 6.00	11/12/2015 09:48:00	-	-	-	4.64	-	-	-	-	-	-
BH5	1	50	5	6.00	---	3.00 to 6.00	16/12/2015 10:44:00	1016	1016	$0.0_{(I)}$	-	-	-	-	-	-	-
BH5	1	50	5		---	3.00 to 6.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH5	1	50	5 (2)	6.00	---	3.00 to 6.00	16/12/2015 10:47:00	-	-	-	-	0.7	0.0	19.0	-	1.0	0.0
BH5	1	50	5 (2)		---	3.00 to 6.00	15 secs	-	-	-	-	0.6	0.0	18.9	-	1.0	0.0
BH5	1	50	5 (2)		---	3.00 to 6.00	30 secs	-	-	-	-	0.5	0.0	19.0	-	1.0	0.0
BH5	1	50	5 (2)		---	3.00 to 6.00	60 secs	-	-	-	-	0.5	0.0	19.0	-	1.0	0.0
BH5	1	50	5 (2)		---	3.00 to 6.00	90 secs	-	-	-	-	0.6	0.0	18.9	-	1.0	0.0
BH5	1	50	5 (2)		---	3.00 to 6.00	120 secs	-	-	-	-	0.6	0.0	18.7	-	1.0	0.0
BH5	1	50	5 (2)		---	3.00 to 6.00	180 secs	-	-	-	-	0.7	0.0	18.6	-	1.0	0.0
BH5	1	50	5 (2)		---	3.00 to 6.00	240 secs	-	-	-	-	0.7	0.0	18.4	-	1.0	0.0
BH5	1	50	5 (2)		---	3.00 to 6.00	360 secs	-	-	-	-	0.7	0.0	18.2	-	1.0	0.0
BH5	1	50	5 (3)	6.00	6.02	3.00 to 6.00	16/12/2015 10:54:00	-	-	-	4.57	-	-	-	-	-	-
BH5	1	50	6	6.00	---	3.00 to 6.00	08/01/2016 10:56:00	993	993	$0.0_{(I)}$	-	-	-	-	-	-	-
BH5	1	50	6		---	3.00 to 6.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH5	1	50	6 (2)	6.00	---	3.00 to 6.00	08/01/2016 10:58:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH5	1	50	6 (2)		---	3.00 to 6.00	15 secs	-	-	-	-	0.6	0.0	19.7	-	0.0	0.0
BH5	1	50	6 (2)		---	3.00 to 6.00	30 secs	-	-	-	-	0.4	0.0	20.0	-	0.0	0.0
BH5	1	50	6 (2)		---	3.00 to 6.00	60 secs	-	-	-	-	0.4	0.0	20.2	-	0.0	0.0
BH5	1	50	6 (2)		---	3.00 to 6.00	90 secs	-	-	-	-	0.4	0.0	20.2	-	0.0	0.0

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Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	13/01/16			730673

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH5	1	50	6 (2)		---	3.00 to 6.00	120 secs	-	-	-	-	0.4	0.0	20.2	-	0.0	0.0
BH5	1	50	6 (2)		---	3.00 to 6.00	180 secs	-	-	-	-	0.4	0.0	20.1	-	0.0	0.0
BH5	1	50	6 (2)		---	3.00 to 6.00	240 secs	-	-	-	-	0.4	0.0	20.1	-	0.0	0.0
BH5	1	50	6 (2)		---	3.00 to 6.00	300 secs	-	-	-	-	0.4	0.0	20.0	-	0.0	0.0
BH5	1	50	6 (3)	6.00	6.02	3.00 to 6.00	08/01/2016 11:04:00	-	-	-	4.12	-	-	-	-	-	-
BH6	1	50	1	12.00	11.74	8.50 to 12.00	19/11/2015	-	-	-	9.63	-	-	-	-	-	-
	Remarks: Unable to obtain readings due to casing being flooded.																
BH6	1	50	2	12.00	---	8.50 to 12.00	24/11/2015 15:15:00	1008	1008	$0.0_{(I)}$	-	-	-	-	-	-	-
BH6	1	50	2		---	8.50 to 12.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH6	1	50	2 (2)	12.00	---	8.50 to 12.00	24/11/2015 15:16:00	-	-	-	-	0.1	0.0	20.9	0.0	0.0	0.0
BH6	1	50	2 (2)		---	8.50 to 12.00	15 secs	-	-	-	-	0.8	0.0	19.6	0.0	0.0	0.0
BH6	1	50	2 (2)		---	8.50 to 12.00	30 secs	-	-	-	-	0.9	0.0	18.7	0.0	0.0	0.0
BH6	1	50	2 (2)		---	8.50 to 12.00	60 secs	-	-	-	-	1.3	0.0	17.4	0.0	0.0	0.0
BH6	1	50	2 (2)		---	8.50 to 12.00	90 secs	-	-	-	-	1.4	0.0	17.1	0.0	0.0	0.0
BH6	1	50	2 (2)		---	8.50 to 12.00	120 secs	-	-	-	-	1.4	0.0	17.1	0.0	0.0	0.0
BH6	1	50	2 (2)		---	8.50 to 12.00	180 secs	-	-	-	-	1.4	0.0	17.1	0.0	0.0	0.0
BH6	1	50	2 (2)		---	8.50 to 12.00	240 secs	-	-	-	-	1.4	0.0	17.0	0.0	0.0	0.0
BH6	1	50	2 (2)		---	8.50 to 12.00	300 secs	-	-	-	-	1.4	0.0	17.0	0.0	0.0	0.0
BH6	1	50	2 (3)	12.00	11.93	8.50 to 12.00	24/11/2015 15:22:00	-	-	-	9.79	-	-	-	-	-	-
	Remarks: Samples taken.																
BH6	1	50	3	12.00	---	8.50 to 12.00	02/12/2015	-	-	-	-	-	-	-	-	-	-
	Remarks: Unable to obtain readings due to parked vehicle.																
BH6	1	50	4	12.00	---	8.50 to 12.00	11/12/2015 09:30:00	-	-	-	-	-	-	-	-	-	-
	Remarks: Unable to obtain readings due to parked vehicle.																

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Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	13/01/16			730673

Contract: **MetroWest**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH6	1	50	5	12.00	---	8.50 to 12.00	16/12/2015	-	-	-	-	-	-	-	-	-	-
Remarks: Unable to obtain readings due to parked vehicle.																	
BH6	1	50	6	12.00	---	8.50 to 12.00	08/01/2016 11:10:00	995	995	$0.0_{(I)}$	-	-	-	-	-	-	-
BH6	1	50	6		---	8.50 to 12.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH6	1	50	6 (2)	12.00	---	8.50 to 12.00	08/01/2016 11:12:00	-	-	-	-	0.0	0.0	20.9	-	0.0	0.0
BH6	1	50	6 (2)		---	8.50 to 12.00	15 secs	-	-	-	-	0.4	0.0	16.4	-	0.0	0.0
BH6	1	50	6 (2)		---	8.50 to 12.00	30 secs	-	-	-	-	0.4	0.0	15.4	-	0.0	0.0
BH6	1	50	6 (2)		---	8.50 to 12.00	60 secs	-	-	-	-	0.4	0.0	14.9	-	0.0	0.0
BH6	1	50	6 (2)		---	8.50 to 12.00	90 secs	-	-	-	-	0.4	0.0	14.9	-	0.0	0.0
BH6	1	50	6 (2)		---	8.50 to 12.00	120 secs	-	-	-	-	0.4	0.0	14.8	-	0.0	0.0
BH6	1	50	6 (2)		---	8.50 to 12.00	180 secs	-	-	-	-	0.4	0.0	14.5	-	0.0	0.0
BH6	1	50	6 (2)		---	8.50 to 12.00	240 secs	-	-	-	-	0.4	0.0	14.2	-	0.0	0.0
BH6	1	50	6 (2)		---	8.50 to 12.00	300 secs	-	-	-	-	0.4	0.0	14.0	-	0.0	0.0
BH6	1	50	6 (3)	12.00	10.47	8.50 to 12.00	08/01/2016 11:18:00	-	-	-	9.53	-	-	-	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB

Compiled By	Date	Checked By	Date	Contract Ref:
[redacted]	**13/01/16**			**730673**

Contract: **MetroWest**

MetroWest

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council
6.25, Environmental Statement, Volume 4, Appendix 10.2, Annex I Track Ballast Testing Result
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, regulation 5(2)(a)
Planning Act 2008

Author: CH2M
Date: November 2019

Network Rail · West of England Local Enterprise Partnership · West of England Combined Authority · HM Government · Bath & North East Somerset Council · Bristol City Council · North Somerset Council · South Gloucestershire Council · travelwest

Sample ID THLT	Sample No. THLT	ELR	TID	Mile	Yards	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Total Petroleum Hydrocarbons	Asbestos (presence/absence)
C4SL/S4UL Open space (res)						79	7.71[1]	12000	630	230	81000	3800[2]	
C4SL/S4UL Open space (not near residential)						170	220[1]	44000	1300	3400	170000	7900[2]	
C4SL/S4UL comercial						640	33[1]	68000	2330	980	730000	17000[2]	
ABS	2	POD	2100	120	770	1.2	27.2	107.8	123.2	79.9	360.8	45.2	nd
ABS	3	POD	1100	120	880	11.2	23.3	56.5	19.1	44.4	96.9	68.0	nd
ABS	4	POD	2100	120	990	25.6	23.2	98.0	181.4	65.9	320.0	119.5	nd
ABS	5	POD	1100	120	1100	8.2	33.6	41.3	108.2	73.1	142.8	33.4	nd
ABS	6	POD	2100	120	1210	12.0	29.6	64.9	90.6	60.8	116.9	120.8	nd
ABS	8	POD	1100	120	1490	15.1	28.0	71.8	143.0	72.2	265.6	89.4	nd
SP	9	POD	1100	120	1501	1.2	20.9	38.5	295.8	55.7	1020.1	60.4	nd
ABS	10	POD	1100	120	1512	13.5	25.5	61.0	211.5	55.8	434.4	109.1	nd
ABS	11	POD	2100	120	1540	25.4	21.9	74.9	249.4	74.7	415.6	50.7	nd
ABS	12	POD	1100	120	1650	21.5	28.0	73.2	160.6	59.7	195.8	187.5	nd
ABS	13	POD	2100	121	0	3.0	21.2	67.1	279.7	62.4	517.6	50.6	nd
ABS	14	POD	3100	121	95	10.7	33.0	73.2	172.7	93.9	362.1	141.9	nd
ABS	15	POD	3100	121	222	2.3	24.9	136.1	470.5	117.4	1097.8	187.7	nd
ABS	16	POD	3100	121	330	9.3	22.5	39.1	50.2	53.7	115.3	54.2	nd
ABS	17	POD	3100	121	453	9.6	19.5	88.2	47.0	50.0	97.4	235.6	nd
SP	18	POD	3100	121	550	8.1	16.3	37.0	9.9	28.2	83.3	13.0	nd
ABS	19	POD	3100	121	663	11.4	20.9	45.7	23.8	42.7	95.2	25.5	nd
SP	20	POD	3100	121	770	8.1	18.4	62.1	11.2	41.9	75.6	16.8	nd
ABS	21	POD	3100	121	880	11.0	32.9	35.9	8.5	57.2	67.4	35.2	nd
ABS	22	POD	3100	121	1005	10.0	25.9	29.8	13.4	60.8	66.2	10.0	nd
ABS	23	POD	3100	121	1115	12.2	25.4	48.1	35.8	55.0	127.9	110.1	nd
SP	24	POD	3100	121	1225	8.6	16.5	70.4	14.3	33.6	86.2	11.0	nd
SP	25	POD	3100	121	1320	7.1	15.7	50.2	8.7	35.0	88.1	16.7	nd
ABS	26	POD	3100	121	1430	1.2	16.8	42.7	235.1	52.7	1065.7	55.6	nd
ABS	27	POD	3100	121	1525	12.7	16.5	108.4	495.6	80.4	824.1	87.1	nd
ABS	28	POD	3100	121	1650	9.8	24.0	101.5	245.4	76.4	575.6	56.2	nd
ABS	29	POD	3100	122	0	5.3	21.5	230.9	820.5	88.7	1046.1	63.6	nd
ABS	30	POD	3100	122	125	29.7	27.0	77.3	102.9	56.7	119.9	43.7	nd
ABS	31	POD	3100	122	220	8.1	23.5	43.7	57.0	58.4	105.6	58.7	nd
ABS	32	POD	3100	122	330	9.7	24.5	52.0	135.0	48.2	280.3	58.5	nd
ABS	33	POD	3100	122	440	1.2	20.2	45.5	164.5	60.9	467.1	81.8	nd
ABS	34	POD	3100	122	495	2.0	20.1	64.5	341.2	63.7	773.0	57.0	nd
ABS	35	POD	3100	122	505	10.9	28.2	75.8	196.6	70.1	213.0	66.4	nd
ABS	36	POD	3100	122	554	62.4	23.5	94.4	298.0	66.5	358.0	35.7	nd
ABS	37	POD	3100	122	564	10.2	26.7	55.4	97.3	54.3	125.5	99.8	nd
ABS	38	POD	3100	122	638	11.4	21.2	82.4	235.4	66.8	531.8	107.0	nd
ABS	39	POD	3100	122	713	6.1	24.1	58.1	201.7	67.7	295.1	192.2	nd
SP	40	POD	3100	122	726	1.2	14.6	34.0	442.6	68.0	1204.1	52.0	nd
ABS	41	POD	3100	122	738	9.1	13.3	19.5	52.2	41.5	94.0	18.2	nd
ABS	42	POD	3100	122	860	10.1	21.6	90.1	383.5	71.7	692.7	106.7	nd
SP	43	POD	3100	122	871	10.8	22.8	94.8	200.7	73.2	336.6	216.2	nd
ABS	44	POD	3100	122	883	22.8	24.2	82.0	165.8	81.7	296.3	64.7	nd
ABS	45	POD	3100	122	990	20.3	4.1	93.1	788.8	132.6	1190.4	62.4	nd
ABS	46	POD	3100	122	1142	10.2	28.3	34.4	44.2	50.9	82.5	58.0	nd
ABS	47	POD	3100	122	1152	6.0	22.1	33.2	33.3	45.5	48.2	43.1	nd
ABS	48	POD	3100	122	1262	9.2	18.5	47.0	6.4	32.5	77.2	10.0	nd
ABS	49	POD	3100	122	1372	23.4	25.8	87.7	87.4	70.6	99.6	100.1	nd
ABS	50	POD	3100	122	1382	13.7	23.6	56.6	68.8	52.4	76.1	93.5	nd
ABS	51	POD	3100	122	1431	13.6	40.6	41.9	48.9	85.7	88.7	126.6	nd
SP	52	POD	3100	122	1440	16.5	24.4	37.9	39.9	62.2	97.8	43.3	nd
ABS	53	POD	3100	122	1448	17.3	31.2	48.0	74.9	64.5	114.2	83.7	nd
ABS	54	POD	3100	122	1540	26.8	40.3	58.5	95.9	96.0	149.0	54.3	nd
SP	55	POD	3100	122	1605	11.2	93.1	53.4	47.0	215.6	126.6	263.6	nd
SP	56	POD	3100	122	1615	7.3	38.6	79.0	53.3	92.4	114.2	37.0	nd
ABS	57	POD	3100	122	1625	8.7	47.2	68.7	85.3	136.1	148.3	151.8	nd
ABS	58	POD	3100	123	0	5.3	27.2	26.6	34.3	61.3	77.7	135.2	nd
ABS	59	POD	3100	123	110	5.5	28.5	28.3	40.1	63.5	93.8	48.6	nd
ABS	60	POD	3100	123	209	5.4	39.6	17.3	26.2	77.0	66.8	31.9	nd
SP	61	POD	3100	123	219	3.5	30.3	51.7	79.2	74.3	105.2	54.9	nd

Sample ID THLT	Sample No. THLT	ELR	TID	Mile	Yards	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Total Petroleum Hydrocarbons	Asbestos (presence/absence)
C4SL/S4UL Open space (res)						79	7.71[1]	12000	630	230	81000	3800[2]	
C4SL/S4UL Open space (not near residential)						170	220[1]	44000	1300	3400	170000	7900[2]	
C4SL/S4UL comercial						640	33[1]	68000	2330	980	730000	17000[2]	
ABS	63	POD	3100	123	330	10.4	25.9	50.3	81.5	62.4	130.2	118.3	nd
COP	1	POD	3100	123	353	7.2	24.9	27.1	31.1	42.7	152.0	589.7	nd
COP	2	POD	3100	123	397	1.3	34.2	23.8	129.0	66.0	179.8	37.4	nd
ABS	64	POD	3100	123	470	14.6	25.6	34.2	77.4	62.9	143.6	75.9	nd
SP	65	POD	3100	123	480	7.1	27.0	23.6	42.4	59.5	87.1	50.8	nd
ABS	66	POD	3100	123	489	16.6	23.9	48.0	55.6	72.9	141.5	40.9	nd
ABS	67	POD	3100	123	616	7.7	26.4	35.6	71.8	65.4	174.8	58.8	nd
ABS	68	POD	3100	123	717	2.2	28.0	45.5	121.3	79.0	184.6	54.4	nd
SP	69	POD	3100	123	728	4.2	23.0	47.9	121.1	56.5	183.5	60.2	nd
ABS	70	POD	3100	123	739	10.9	26.7	61.5	123.6	75.3	210.5	57.1	nd
ABS	71	POD	-	123	880	10.9	21.7	26.2	32.7	47.5	66.6	107.6	nd
ABS	72	POD	-	123	990	8.9	61.6	32.2	30	101.5	62.9	110.2	nd
ABS	73	POD	-	123	1100	7.3	21.4	32.4	48.7	55.6	83.4	98.7	nd
ABS	74	POD	-	123	1210	12	25.9	54.3	57.1	60.4	76.5	76.1	nd
ABS	75	POD	-	123	1318	12.6	37.6	66	83.4	63.9	193.6	81.2	nd
ABS	76	POD	-	123	1363	11.1	25.9	40.1	52.1	48.1	90.8	71.2	nd
ABS	78	POD	-	123	1395	9.2	25.6	37.1	41.3	50.6	102.5	66.4	nd
ABS	79	POD	-	123	1430	9.8	37.5	19.4	36.4	47.7	51.2	170.4	nd
ABS	80	POD	-	123	1540	15.4	30.8	41.8	53.7	62.9	119.9	52.8	nd
ABS	81	POD	-	123	1677	1.2	5.1	83.1	535	90.1	1517.5	298	nd
ABS	82	POD	-	123	1687	13.6	30.4	81.9	98.3	64.8	171.7	32	nd
ABS	83	POD	-	124	2	16.3	19.2	99.9	355.8	96.6	662	90.6	nd
ABS	84	POD	-	124	12	1.2	13.8	65.2	520.2	91.1	1261.1	219.8	nd
ABS	85	POD	-	124	116	7.3	25.1	35.7	170.5	58	206.5	156.1	nd
ABS	87	POD		124	196	28.2	25.6	108.3	149.1	96.2	293	122.3	nd
ABS	88	POD		124	330	24.5	26.1	74	101.2	69.9	186.6	252	nd
ABS	89	POD		124	440	37.1	1.2	154.8	1074.1	122.3	2775.3	118.6	nd
ABS	90	POD		124	550	45.6	18	135.3	601.6	89.3	920.9	117	nd
ABS	91	POD		124	660	40.2	1.2	149.3	1059.6	124.2	2432.4	83	nd
ABS	92	POD		124	770	10	27.7	84.8	259.7	81.3	671.4	116.3	nd
ABS	93	POD		124	880	1.2	11.8	131.2	742.2	105.3	2681	59.8	nd
ABS	94	POD		124	990	14.6	30.7	76.7	88.3	83.9	350.8	123.3	nd
ABS	95	POD		124	1100	9.2	16.8	124.6	604.2	119.9	2664.6	77.9	nd
ABS	96	POD		124	1210	36.3	1.2	182	771.8	153.7	3437.8	98.9	nd
ABS	97	POD		124	1320	10.2	29	75	118.5	62.1	331.2	94.7	nd
ABS	98	POD		124	1430	5.9	30.4	73.9	212	83.5	211.4	127.3	nd
ABS	99	POD		124	1540	8.2	28.1	47.5	56	63.1	91.8	317.2	nd
ABS	100	POD		124	1650	12.4	29.1	54.9	53.5	72.8	136.2	314.7	nd
ABS	101	POD		125	0	12.8	26.7	59.4	115.1	69.6	277.6	179.1	nd
ABS	102	POD		125	120	20.9	18.9	59.5	276.9	82.1	532.3	92.8	nd
ABS	103	POD		125	220	22	23	57.9	177.6	89.4	314.8	154.7	nd
ABS	104	POD		125	330	26.9	28	57.4	57.8	66.8	134.5	204.5	nd
ABS	105	POD		125	438	21	28.4	53.3	73.8	77.1	199.7	92.4	nd
ABS	106	POD		125	579	9.8	23.9	55.5	97.9	59.9	188.4	76.6	nd
SP	107	POD		125	610	6.6	26.6	41.6	39.6	55.1	99.7	30.5	nd
ABS	108	POD		125	634	11.9	21.3	27.6	15	42.9	109.2	432.9	nd
ABS	111	POD		125	858	14.9	24.9	53.3	44.4	48.1	106.7	139.5	nd
ABS	112	POD		125	990	14.2	22.6	18	73.2	44.7	151.1	63.6	nd
ABS	113	POD		125	1100	1.2	19	24	111.4	49.3	125.9	87	nd
ABS	114	POD		125	1232	19.8	20.4	48.3	150.1	69.1	250.5	67.2	nd
ABS	115	POD		125	1387	10.2	20.8	47.9	43.4	51.3	80.4	44.2	nd
ABS	116	POD		125	1397	11.9	27.1	32.8	42.7	66.3	120.7	199.1	nd
ABS	117	POD		125	1540	2.4	22.9	28	133.2	52.1	430.7	48.1	nd
ABS	118	POD		125	1722	12.8	1.2	236.4	1417.6	180.5	3984.4	142.1	nd
SP	119	POD		125	1732	25.6	15.3	284.8	417.1	101.4	766.4	67.1	nd
SP	121	POD		126	57	1.6	22.4	76.8	190.4	60.3	432.7	40	nd
ABS	122	POD		126	67	54.4	1.2	380.7	1357.3	165.2	3508.8	62.4	nd
ABS	123	POD		126	221	8.6	24.3	28.8	46.6	58	173.9	225.6	nd
ABS	124	POD		126	330	8.6	18.4	87.4	17.4	33.9	96.3	70.4	nd
ABS	125	POD		126	440	6.9	26.1	50.8	270.9	98.4	1064.9	27.3	nd
ABS	126	POD		126	550	5.4	21.3	54.6	256.6	63.5	846.8	83.2	nd
SP	128	POD		126	645	12.1	25.6	27.1	96.2	55.2	353	676.1	nd
ABS	129	POD		126	653	11	29.9	45.3	103.7	61.8	229.2	161.2	nd
Disused Section (from URS Trackbed Report 2014													

Sample ID THLT	Sample No. THLT	ELR	TID	Mile	Yards	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Total Petroleum Hydrocarbons	Asbestos (presence/absence)
C4SL/S4UL Open space (res)						79	7.71[1]	12000	630	230	81000	3800[2]	
C4SL/S4UL Open space (not near residential)						170	220[1]	44000	1300	3400	170000	7900[2]	
C4SL/S4UL comercial						640	33[1]	68000	2330	980	730000	17000[2]	
ABS	1					1.2	1.2	145.7	1461.3	172.9	4953.3	10.0	nd
ABS	2					10.1	28.7	119.5	139.2	97.2	590.0	10.0	nd
ABS	3					1.2	1.2	145.8	1368.8	166.7	5032.0	19.0	nd
ABS	4					1.2	21.9	92.5	301.2	76.1	913.1	25.0	nd
ABS	5					16.6	1.2	269.4	1741.5	222.2	5516.7	10.0	nd
ABS	6					17.3	27.3	13.0	14.1	57.0	67.8	34.0	nd
ABS	7					1.2	12.1	80.3	501.5	122.4	3956.7	10.0	nd
ABS	8					1.2	1.2	233.6	1558.1	166.4	8416.1	10.0	nd
ABS	9					1.2	26.5	73.6	261.6	87.1	915.8	13.0	nd
ABS	10					18.1	30.3	47.3	63.6	91.3	201.4	12.0	nd
ABS	11					11.9	37.8	37.7	53.8	99.2	160.7	10.0	nd
ABS	12					1.2	1.2	186.7	1363.2	160.2	3642.8	60.0	nd
ABS	13					1.2	54.1	102.7	316.9	166.7	1049.8	55.0	nd
ABS	14					1.2	48.9	111.8	769.8	370.4	1597.5	68.0	nd
ABS	15					1.2	1.2	608.9	2066.3	383.4	5128.0	32.0	nd
ABS	16					1.2	1.2	315.2	1696.5	156.0	3348.2	25.0	nd
DP	17					1.2	16.5	31.1	290.2	88.7	919.8	90.0	nd
DP	18					7.4	19.1	45.7	219.8	89.3	887.7	15.0	nd
DP	19					5.8	17.7	13.6	37.7	58.3	129.1	16.0	nd
DP	20					8.9	22.2	18.9	40.0	57.7	118.2	14.0	nd
ABS	21					8.1	38.1	33.8	28.5	97.0	107.4	10.0	nd
ABS	22					10.0	49.8	58.4	30.9	142.1	106.1	98.0	nd
ABS	23					10.5	24.9	33.3	38.4	70.8	105.7	10.0	nd
ABS	24					16.8	41.0	43.8	62.3	86.4	181.1	10.0	nd

Table 1 - Comparison of Track Bed Chemical analysis against Human Health C4SL/S4UL

Notes

1 Target from Chromium VI has been applied as a worst case scenarion to total Chromium results

2 The lowest target for the TPH bans has been applied to total TPH as a worst case scenario

MetroWest

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council
6.25, Environmental Statement, Volume 4, Appendix 10.2, Annex J Risk Assessment Methodology
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, regulation 5(2)(a)
Planning Act 2008

Author: CH2M
Date: November 2019

Risk assessment is the process of collating known information on a hazard or set of hazards in order to estimate actual or potential risks to receptors. Receptors can be connected with the hazard under consideration via one or several exposure pathways (e.g. the pathway of direct contact). Risks are generally managed by isolating or removing the hazard, isolating the receptor, or by intercepting the exposure pathway. Without the three essential components of a source (hazard), pathway and receptor, there can be no risk. Thus, the mere presence of a hazard at a site does not mean that there will necessarily be attendant risks. The following risk assessment thus focuses on those parts of the site where hazards or potential hazards have been identified and is not general to the whole site.

Hazards

Potential sources of contamination are identified for the site, based on a review of the current and previous site uses. Not only the nature but also the likely extent of any contamination is considered, e.g. whether such contamination is likely to be localised or widespread.

Receptors

The varying effects of a hazard on individual receptors depends largely on the sensitivity of the target. Receptors include any people, animal or plant population, or natural or economic resources within the range of the source which are connected to the source by the transport pathway. Receptors can, in addition, extend to remediation processes and future construction materials that may be adversely affected by on-site contamination. In general, however, receptors can be divided into a number of groups depending on the final use of the site.

Pathways

The mere presence of contamination does not infer a risk. The exposure pathway determines the dose delivered to the receptor and the effective dose determines the extent of the adverse effect on the receptor. The pathway which transports the contaminants to the receptor or target generally involves conveyance via soil, water or air.

Exposure Assessment

By considering the source, pathway and receptor, an assessment is made for each contaminant on a receptor by receptor basis with reference to the significance and degree of the risk. In assessing this information, a measure is made of whether the source contamination can reach a receptor, determining whether it is of a major or minor significance. The exposure risks are assessed against the present site conditions.

A risk assessment has been undertaken for the site to identify the main potential land contamination constraints to development and potential contaminant linkages based upon a review of the site history, ground conditions and environmental setting. The method for risk evaluation has been based on CIRIA (2001) guidance ‘Contaminated Land Risk Assessment - A Guide to Good Practice’, which is a qualitative method of interpreting the risks based on the magnitudes of both the potential consequence (severity) and the probability (likelihood) of the risk occurring. Risk is based on a consideration of both:

The likelihood of an event (probability); [takes into account both the presence of the hazard and receptor and the integrity of the pathway].

The severity of the potential consequence [takes into account both the potential severity of the hazard and the sensitivity of the receptor].

In order to then determine the risk to the identified receptor, both the likelihood and severity of the potential hazard is input into a risk assessment matrix as follows:

		Consequence			
		Severe	**Medium**	**Mild**	**Minor/ Negligible**
Probability (Likelihood)	***High Likelihood***	Very high risk	High risk	Moderate risk	Moderate/Low risk
	Likely	High risk	Moderate risk	Moderate/Low risk	Low risk
	Low Likelihood	Moderate risk	Moderate/Low risk	Low risk	Very low risk
	Unlikely	Moderate/Low risk	Low risk	Very low risk	Very low risk

Under such a classification system the following categorisation of risk has been developed and the terminology adopted as follows:

Term	Description
Very high risk	Severe harm to a receptor may already be occurring OR a high likelihood that severe harm will arise to a receptor, unless immediate remedial action works / mitigation measures are undertaken.
High risk	Harm is likely to arise to a receptor, and is likely to be severe, unless appropriate remedial actions / mitigation measures are undertaken. Remedial works may be required in the short term, but likely to be required over the long term.
Moderate risk	Possible that harm could arise to a receptor but low likelihood that such harm would be severe. Harm is likely to be medium. Some remedial works may be required in the long term.
Moderate/ low risk	Possible that harm could arise to a receptor, but where a combination of likelihood and consequence results in a risk that is above low, but is not of sufficient concern to be classified as medium. It can be driven by cases where there is an acute risk which carries a severe consequence, but where the exposure is unlikely.
Low risk	Possible that harm could arise to a receptor. Such harm would at worse normally be mild.
Very low risk	Low likelihood that harm could arise to a receptor. Such harm unlikely to be any worse than mild.

The colour coding for each risk category is used in the risk assessment summary table. The classifications for consequences and likelihood of occurrence are as follows:

Classification	Definition
Severe	Acute risks to human health Short-term risk of pollution of sensitive water resource (e.g. major spillage into controlled waters) Impact on controlled waters e.g. large-scale pollution or very high levels of contamination Catastrophic damage to buildings or property 9e.g. explosion causing building collapse) Ecological system effects – irreversible adverse changes to a protected location. Immediate risks.
Medium	Chronic risks to human health Pollution of sensitive water resources (e.g. leaching of contaminants into controlled waters) Ecological system effects – substantial adverse changes to a protected location. Significant damage to buildings, structures and services (e.g. damage rendering a building unsafe to occupy, such as foundation damage)
Mild	Non-permanent health effects to human health Pollution of non-sensitive water resources (e.g. pollution of non-classified groundwater) Damage to buildings, structures and services (e.g. damage rendering a building unsafe to occupy, such as foundation damage) Substantial damage to non-sensitive environments (unprotected ecosystems e.g. crops)
Minor/ Negligible	Non-permanent health effects to human health (easily prevented by appropriate use of PPE) Minor pollution to non-sensitive water resources Minor damage to non-sensitive environments (unprotected ecosystems e.g. crops) Easily repairable effects of damage to buildings, structures, services or the environment (e.g. discoloration of concrete, loss of plants in a landscaping scene).

Classification	Definition
High Likelihood	An event is very likely to occur in the short term, and is almost inevitable over the long term OR there is evidence at the receptor of harm or pollution
Likely	It is probably that an event will occur. It is not inevitable, but possible in the short term and likely over the long term
Low Likelihood	Circumstances are possible under which an event could occur. It is by no means certain that even over a longer period such an event would take place, and less likely in the short term
Unlikely	It is improbable that an event would occur even in the very long term

At each stage of the investigation or development of a site, the source-pathway-receptor model should be critically examined to determine whether the assumptions made in its creation are still valid or require modification to reflect the greater degree of understanding of the ground conditions.