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Ground Investigation Report
Bailey Bridge

Manchester City Council

MC/CHO/240960/17-2/R001

24th October 2024

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Document History

Issue	Date	Comment	Author	Chk'd	Apr'd
01	24/10/2024	Initial Issue	CHO	RHG/MHH	RHG

Executive Summary

Proposed Development	The client is proposing to refurbish and replace the existing bridge structure, whilst leaving the abutments in place. Total anticipated loads are expected to be approximately 50t (17t dead load and 33t live load).
Site Conditions	The Site comprises Bailey Bridge over the River Mersey within the vicinity of Chorlton Water Park to the north and Kenworthy Woods to the south, located at Manchester, M21 7PG.
Ground Conditions	Ground conditions consisted of up to 7.50m of Made Ground in BH102. Superficial Alluvium deposits were encountered within BH101 underlying the Made Ground to 7.50mbgl. Superficial River Terrace Deposits were encountered between 7.50mbgl to 10.00mbgl.
Contamination Assessment	The results of the contamination risk assessment confirm that the risk to the identified receptors is low, and specific remedial measures are unnecessary. Asbestos was identified in one of the samples.
Geotechnical Assessment	The foundations of the existing abutments were found to be in excess of 2.00mbgl, the base was not proven. It is expected that a strip foundation at 2.00mbgl would have a bearing capacity of c.100kPa within the Alluvium and 200kPa within the Made Ground Deposits. However, it is considered likely that the bridge foundations are piled. The loads of the new bridge to be installed will be less than the existing bridge. As such, the existing foundations are likely to be deemed sufficient to support the proposed loads, subject to confirmation of condition and structural engineers approval. A slope stability assessment should be carried out to determine whether the additional surcharge loads from construction plant will cause instability. Consideration needs to be given to the existing riverbank as it is a flood defence. It is assumed a working platform will be required for the crane and plant to operate from. Additional plate load/CBR testing will be required to enable design of the working platform. It is likely that a granular platform with geogrid and subbase improvement may be required.
Recommendations	The following further works are recommended: • Structural condition survey of the exposed abutments; • Detailed assessment of the proposed loading of the new structure and ability of the abutments to support the load; • Further investigations to include plate-load testing to facilitate the bearing pressures of the crane and other machinery.

This sheet is intended as a summary of the assessment of the Site in relation to ground contamination and geotechnical conditions. It does not provide a definitive engineering analysis.

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1. Introduction

1.1 General

Pick Everard were instructed by Manchester City Council (the Client) to undertake an intrusive ground investigation to support the re-use of the existing abutments for Barlow Hall Refuse Bailey Bridge, Chorlton Water Park, Manchester, M21 (the Site). The investigation works were undertaken in accordance with the specification provided by Pick Everard and the associated scoping document.

This assessment has been conducted in general accordance with industry guidance and standards including Land Contamination: Risk Management (LCRM) [1], BS10175: Investigation of Potentially Contaminated Sites – Code of Practice [2], BS 5930:2015 Code of practice for ground investigations [3], and BS EN 1997-2:2007 Eurocode 7: Geotechnical design. Ground investigation and testing [4].

1.2 Objectives

The objectives of this investigation were:

- To assess geotechnical ground conditions with regard to foundation and geotechnical design requirements;
- Develop a conceptual ground model of the site providing characteristic properties of encountered strata; and
- Provide recommendations for further investigation and remediation (if necessary).

Specific surveys related to any environmental elements other than those described in the specification have not been undertaken and, if required, such surveys should be undertaken by an accredited organisation. Where this assessment has revealed information that may have implications for the site, such as the obvious presence of invasive species, asbestos, or protected species, this has been noted for information.

1.3 Scope of Work

In order to achieve the objectives, the following scope of works was proposed:

- A review of previous reports;
- Intrusive ground investigation;
- Development of a ground model;
- Geotechnical Appraisal;
- Human health Generic Quantitative Risk Assessment (GQRA);

- Controlled Waters Risk Assessment; and
- Preliminary waste classification.

1.4 Documents Reviewed

The following documents have been reviewed to support our assessment:

- Barlow Hall Refuse Bailey Bridge Capacity Assessment (ref. 25539-25468-AGL-BAL-001-RP-EN-502-C01);
- Barlow Hall Farm Bailey Bridge Structure No.658 Special Inspection Report by Manchester City Council;
- Drawing 25539-26717-AGL-COM-001-DR-CD-201-P01 by Acrow; and
- Drawing 25539-26717-AGL-COM-001-DR-CD-101-P01 by Acrow.

This report should be read in conjunction with the above documents.

1.5 Limitations

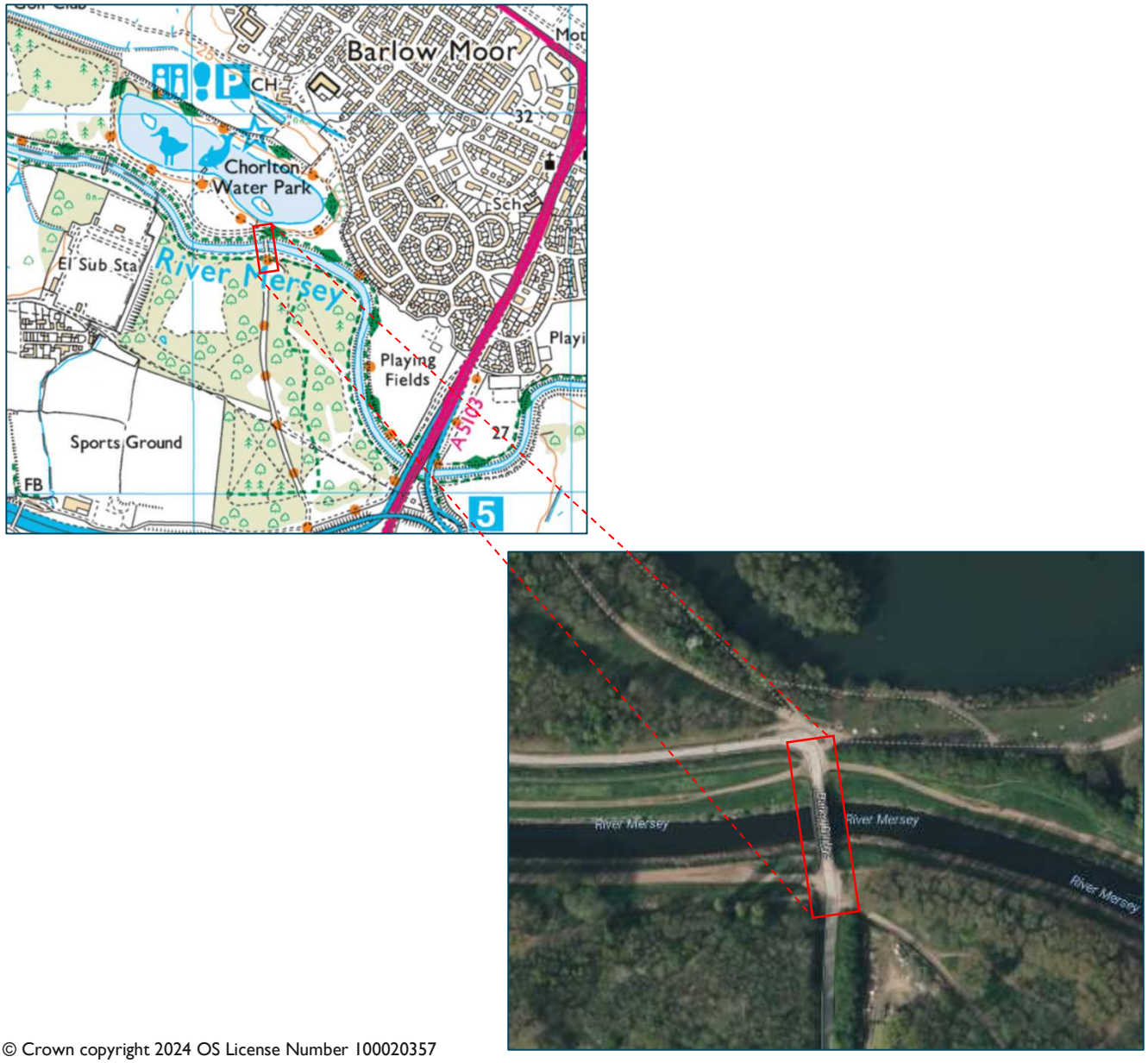
This report has been prepared for Manchester City Council only and should not be relied upon by any third party without the written permission of Pick Everard. This report should be read in its entirety, including all associated drawings and appendices. Pick Everard cannot be held responsible for any misinterpretation's arisings from the use of extracts of this report taken out of context. Any recommendations made or opinions expressed in this report are based on the results of the intrusive investigation and third-party information provided, and it is assumed that Severn Trent Water have reliability on this information. All reasonable care and skill have been applied in examining the information obtained, nevertheless Pick Everard cannot and does not guarantee the authenticity or reliability of the information it has relied upon from external sources.

The comments on groundwater are based on observations made at the time of the monitoring visits and Site investigation. It should be noted however that groundwater levels may vary from those reported due to seasonal or other effects.

2. Site Details

2.1 Site Location

The Site comprises a 'Bailey Bridge' over the River Mersey and the immediately surrounding area. The Site is located within the vicinity of Chorlton Water Park to the north and Kenworthy Woods to the south, located at Manchester, M21 7PG. The site area is approximately 6.70km south-west of Manchester City Centre and is centred on NGR: 382183, 391670. The location and layout are presented in Figure 1 below:



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Figure 1 – Site Location and Layout

2.2 Site Description

2.2.1 General

The investigation area comprises of Barlow Hall Bailey Bridge situated across the River Mersey. Several public footpaths are located within the surrounding area with the surfacing noted as predominantly soft with localised areas of gravel hardstanding/tarmacked track. Japanese knotweed and Himalayan Balsam are also located alongside the banks of the River Mersey and surrounding the existing Bailey Bridge abutments. The site generally slopes down towards the north however there is a significant elevation change from the top of the banks to the River Mersey flowing beneath the Bailey Bridge.

2.2.2 Surrounding Land Use

The site is bounded by:

North- Chorlton Water Park;

East- River Mersey and public parks. A compound used by the Environment Agency is present in the south-east;

South- Kennerly Woods and South Manchester Substation (Fairy Lane); and

West- River Mersey with public parks beyond.

2.3 Proposed Development

It is understood that the Client is proposing to refurbish and replace the existing bridge structure, whilst leaving the abutments in place. The walkway/cycleway width of the bridge is anticipated to be approximately 4.20m wide with steel decking units (anti-skid), whilst the overall width of the bridge is anticipated to be approximately 6.00m. Total anticipated loads are expected to be approximately 50t (17t dead load and 33t live load). Proposed design plans are provided as Drawing 25539-26717-AGL-COM-001-DR-CD-201-P01 and Drawing 25539-26717-AGL-COM-001-DR-CD-101-P01.

2.4 Site Setting

2.4.1 Site History

Freely available maps from the National Library of Scotland suggests the surrounding area around the bridge was predominantly agricultural fields with some residential developments between 1845 and 1966. Anecdotal information and information from the Manchester City Council Inspection Report has suggested the bridge was built circa 1971-1975 to provide access for construction traffic working on the M62 Motorway. The bridge was later used for accessing Barlow Hall Refuse Tip once the M62 works were complete. A temporary 5-year licence was granted for

this use which expired on 25th March 1982. This was later extended until March 1990. As well as this it is noted that these Bailey Bridges were used as WW11 military bridges.

2.4.2 Anticipated Geology

The BGS GeoIndex Viewer and BGS 1:10,000 maps do not report specific Made Ground deposits beneath the site. However, a covering of Made Ground, related to the construction of the bridge, is likely to be present. Additionally, it is understood that the river embankments constitute flood defences, and therefore are likely to have been built up from the original ground level.

Superficial deposits of Alluvium and River Terrace Deposits with Glaciofluvial Sheet Deposits and Devensian Till are recorded close to the site area. The Superficial Deposits are reported to be underlain by sandstones of the Helsby Sandstone Formation to the north, and siltstones, mudstones and sandstones of the Tarporley Siltstone Formation to the south.

2.4.3 Hydrology and Hydrogeology

The nearest surface water feature is the River Mersey, located beneath the Bailey Bridge and flowing east to west.

The superficial deposits are all classified as Secondary A Aquifers by the Environment Agency whilst the Helsby Sandstone Formation is classified as a Principal Aquifer, and the Tarporley Siltstone Formation as a Secondary B Aquifer.

3. Summary of Previous Reports

3.1 Barlow Hall Farm Bailey Bridge Structure No.658 Special Inspection Report

A Special Inspection Report was prepared by Manchester City Council in July 2013. A summary of the salient points of the assessment is provided below:

- The current Barlow Hall Farm Bailey Bridge is a single span structure which spans over the River Mersey in Chorlton Park, Manchester;
- The bridge was built circa 1971-1975 to provide access for construction traffic working on the M62 Motorway. The bridge was later used for accessing Barlow Hall Refuse Tip once the M62 works were complete. A temporary 5 year licence was granted for this use which expired on 25th March 1982. This was later extended until March 1990;
- Bailey Bridges were designed during World War II for military use. They were designed to be assembled without any heavy lifting equipment quickly and efficiently. Fatigue as a criterion for design was therefore discounted as Bailey type bridges were only intended to be in service for short periods of time.
- The bridge has an overall span of 30m (100 feet) and has a road width of 4.4m. A 1.3m high 'kee klamp' pedestrian guardrail has been installed along both edges of the bridge deck;
- A 17-tonne weight restriction and a 5mph speed limit have been implemented on the bridge;
- Enforced weight restrictions, which have been implemented following an assessment, ensure that the bridge does not become overburdened which may cause permanent damage or even collapse. Although the bridge may have been able to support heavier loads in the past, the assessment will factor in the condition of the structure as it is now which will include loss of section, degradation etc. Similarly, the speed restriction ensures that the effects of dynamic impact to the bridge deck are not sufficient enough to damage the structure; faster speeds result in increased dynamic impact. It is therefore imperative that these restrictions are enforced to safeguard the structure from damage.
- Paint degradation, delamination, surface corrosion was noted as well as missing bolts holding the steel edge bars.
- Vegetation growth was noted as well as Himalayan Balsam.

3.2 Barlow Hall Refuse Bailey Bridge Capacity Assessment (ref. 25539-25468-AGL-BAL-001-RP-EN-502-C01)

A Capacity Assessment was prepared by Acrow in February 2024. A summary of the salient points of the assessment is provided below:

- Paint degradation and chipping alongside mild to moderate patches of corrosion was noted in Bay 9 West;
- Severe corrosion and de-lamination was noted in Bay 1, Bay 10 East, and Bay 10 West;
- Severe corrosion and a torn gusset plate was noted in West Truss (south end);

- A deformed channel flange was noted in Bay 10 East;
- Possible impact damage was noted in Bay 4 West; and
- Overall widespread degradation, corrosion, rotted and even timber decks as well as missing transom clamps were noted.

4. Fieldwork

4.1 General

Pick Everard attended Site between the 19th and 23rd August 2024 to undertake intrusive ground investigation works comprising the following:

- Four hand dug and vacuum excavated trial pits (TH101 – TH104) adjacent to the bridge abutments, to a maximum depth of 2.10mbgl;
- Two cable percussive boreholes to a maximum depth of 10.00mbgl;
- Collection of samples for geotechnical and contamination purposes; and
- Installation of 2no. monitoring wells for the purposes of groundwater monitoring.

Upon completion of the intrusive works, a period of groundwater monitoring was completed between 6th and 20th September 2024.

An Exploratory Hole Location Plan is presented as Drawing No. PE-SK-C-0001, and exploratory hole logs are presented in Appendix A. The exploratory holes were supervised, logged, and sampled by a Pick Everard Engineer. Fieldworks were undertaken in general accordance with BS5930:2015. All exploratory hole records can be found within Appendix A. Groundwater monitoring results can be found within Appendix B.

4.2 Cable Percussive Boreholes

Two cable percussive boreholes (BH101 and BH102) were advanced to a maximum depth of 10.00mbgl. Standard Penetration Testing was undertaken at selected intervals with SPT Hammer Reference RM01. The boreholes were drilled using cable percussive methods until 10.00mbgl, where an SPT refusal was recorded. Representative soil samples were scheduled for geotechnical and chemical laboratory analysis. All exploratory hole records can be found within Appendix A.

4.3 Vacuum Excavation Pits / Hand Dug Pits

One vacuum excavation pit (TH101) was excavated in order to find the dimensions of the existing bridge abutment and the footings of the abutment. A single hand dug pit was completed (TH102) in order to confirm the extent of the concrete footing identified in TH101. The remaining two bridge abutments (TH103 and TH104) were exposed using hand digging tools in order to confirm the top dimensions. Due to access limitations and overgrown vegetation / presence of invasive species the final abutment dimension (north-east) could not be determined. TH101 identified a concrete footing 1.60mbgl from ground level (2.30mbgl from the bridge deck) extending out by 0.85 to the north (river side). Concrete rebar and a steel "U" section was noted within the footing. The pit was excavated to a

maximum depth of 2.10mbgl however the base of this footing was not encountered, therefore it is assumed it extends beyond this. TH102 was completed in order to verify the concrete footing was continuous between the southern abutments, which was subsequently confirmed, therefore the assumption is made that the slab is continuous and runs parallel. TH103 and TH104 confirmed the existing top dimensions of the abutments and were recorded as 0.90m in width. Sketches of the pits are included in Appendix A.

4.4 Laboratory Testing

A summary of the laboratory analysis undertaken on the environmental and geotechnical samples is presented in the table below.

Environmental	Geotechnical
- Pick Everard Soil Suite E (2 no. samples): • Moisture Content; • Heavy metals (As, Cd, Cr, CrVI, Cu, Pb, Hg, Ni, Se, Zn, V); • Asbestos Identification; • pH; • Electrical Conductivity; • Water soluble Sulphate; • Water soluble Boron; • Organic Matter; • Cyanide (total and free); and • Polycyclic Aromatic Hydrocarbons (PAH, EPA 16). • TPH Banded	- 6 no. Moisture Content; - 2 no. Atterberg 4-Point Plasticity; - 4 no. Particle Size Distribution Tests - 1 no. Direct Shear Box Tests - 5 no. BRE Suite D.

Table 1 – Summary of Environmental and Geotechnical Testing Schedules

Laboratory environmental results are presented in Appendix C, and geotechnical results are presented in Appendix D.

5. Encountered Subsurface Conditions

5.1 Made Ground

Made ground was encountered to a maximum depth of 2.10mbgl (24.94mAoD) on the southern side of the bridge and a maximum depth of 7.50mbgl (19.39mAoD) on the northern side of the bridge. Made Ground consisted of clayey silty gravelly sands and clayey silty sandy gravelly clays. The gravel comprised brick, concrete, quartzite, slate, glass and flint. A silty sandy gravel band was present within BH102 between 6.00mbgl (20.88mAoD) and 7.50mbgl (19.39mAoD).

5.2 Alluvium

Superficial deposits of Alluvium were underlying the Made Ground to a maximum proven depth of 7.50mbgl (19.54mAoD). These deposits were encountered in BH101 only, between 2.10mbgl (24.94mAoD) to 7.50mbgl (19.54mAoD) and consisted of clayey silty sands with clay layers and an organic odour.

5.3 River Terrace Deposits

Superficial deposits of River Terrace Deposits were underlying the Made Ground and Alluvium Deposits to a maximum proven depth of 10.00mbgl (17.04mAoD). The River Terrace Deposits consisted of silty gravelly sands and sandy silty gravels of quartzite.

5.4 Material Properties

5.4.1 Made Ground

5.4.1.1 Unit Weight

The unit weight for the Made Ground has been assumed as17kN/m^3 for Made Ground based on a coarse engineered fill; [8].

5.4.1.2 Standard Penetration Testing

The strength profile within the strata encountered has been assessed by reference to the results of Standard Penetration Tests (SPT) undertaken within the borehole. These tests have derived N-Values which have been corrected considering the energy loss induced by the hammer and transmitted by the drive rods, in accordance BS EN ISO 22476-3:2005 [9]. Six tests were undertaken within the Made Ground at depths of between 1.20m and 6.50mbgl. Extrapolated N_{60} values with depth are presented as Plots 1 to 3 within Appendix E.

The Made Ground Deposits generally show variable N_{60} values with a gradual increase with depth. A characteristic N_{60} value of 25 has been derived for the Made Ground Deposits.

5.4.1.3 Plasticity Testing

Laboratory plasticity testing was undertaken upon one sample of the Made Ground. A plasticity index of 14% was reported (moderate plasticity). A Modified Plasticity Index of 7.5% has been calculated in accordance with BRE Digest 240 [8]. The analysis indicates that the cohesive deposits have a medium plasticity, with a generally medium volume change potential. This is also shown in Plot 4, where the sample is classed as a clay. The characteristic modified plasticity index which has been used is 7.5%. The natural moisture content results of the Made Ground Deposits fall below the plastic limit. Atterberg limits are presented as Plot 5, and a combined A-Line as Plot 4 within Appendix E.

5.4.1.4 Undrained Shear Strength

Empirical correlation of plasticity index and SPT N_{60} values has been undertaken in accordance with CIRIA C143 [10] to provide an estimate of undrained shear strength (Cu) within cohesive Made Ground beneath the Site. An f1 value of 5kN/m^2 has been selected based upon a modified plasticity index result of 7.5%. In summary correlation between plasticity and N60 values in the Made Ground Deposits indicate an undrained shear strength (Cu) 75kPa at 1.20m.

5.4.1.5 Particle Size Distribution

Laboratory particle size distribution testing was undertaken upon three samples of Made Ground Deposits. The results of the testing indicated that the Made Ground Deposits consisted of very gravelly very silty sands and sandy gravels. The grading curves are presented as plots 6a and 6b in Appendix E.

5.4.1.6 Internal Angle of Friction

Laboratory shear box testing was completed on one sample from the Made Ground Deposits. This is summarised in the table below.

Determinant	BH102 3.00mbgl
Peak Shear Stress (kPa)	78.6
Apparent Cohesion c' (kPa)	0
Angle of Shearing Resistance ϕ (°)	41

Table 2: Summary of Shear Box Testing

Peak shear stress was recorded at 78.6kPa. Linear regression analysis provides apparent cohesion at -1.9kPa, with an apparent angle of internal friction of 41°. Results correlated from N_{60} values range from 34° to 41°, therefore a characteristic value of 35° has been derived.

5.4.1.7 Geotechnical Chemical Testing

Five samples of the Made Ground were scheduled for BRE SD1 testing. Sulphate values ranged between 95 mg/l to 700 mg/l, therefore a characteristic value of 700mg/l has been derived. The pH ranged from 7.8 to 11.1, therefore a characteristic value of 9 has been derived. It is considered that concrete beneath the site should be designed using a Design Sulphate class of DS-2 and an aggressive chemical environment for concrete (ACEC) class for location of AC-1 assuming mobile groundwater conditions.

5.4.2 Alluvium

5.4.2.1 Unit Weight

The unit weight for all materials have been assumed as 16kN/m^3 for the Alluvium Deposits based on low strength clays and very loose sands [8].

5.4.2.2 Standard Penetration Testing

The strength profile within the strata encountered has been assessed by reference to the results of Standard Penetration Tests (SPT) undertaken within the borehole. These tests have derived N-Values which have been corrected considering the energy loss induced by the hammer and transmitted by the drive rods, in accordance BS EN ISO 22476-3:2005 [9]. Six tests were undertaken within the Alluvium at depths of between 2.00mbgl and 7.50mbgl, of these two were undertaken recorded as self-weight. Extrapolated N_{60} values with depth are presented as Plots 1 to 3 within Appendix E.

The Alluvium generally show low N_{60} values with a gradual increase with depth. A characteristic N_{60} value 3 at has been derived for the Alluvium Deposits.

5.4.2.3 Plasticity Testing

Laboratory plasticity testing was undertaken upon two samples of the Alluvium Deposits. The results of the testing are summarised in the table below.

Location ID	Depth (m bgl)	% <425um	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Modified Plasticity Index (%)
BH101	6.50	100	40.7	47	32	15	15

Table 3 – Summary of Plasticity Testing for Alluvium

Modified Plasticity Index has been calculated in accordance with BRE Digest 240 [8]. The analysis indicates that the cohesive deposits have a medium plasticity, with a generally low volume change potential and the sample is classed as a silt. This is also shown in Plot 4. The characteristic modified plasticity index which has been used is 15%. The natural

moisture content results of the Alluvium Deposits fall below the plastic limit in all the tests, as shown in the Atterberg by depth data in Plot 5. Atterberg limits are presented as Plot 5, and a combined A-Line as Plot 4 within Appendix E.

5.4.2.4 Undrained Shear Strength

Empirical correlation of plasticity index and SPT N_{60} values has been undertaken in accordance with CIRIA C143 [10] to provide an estimate of undrained shear strength (Cu) within cohesive soils beneath the Site. An f1 value of 6kN/m^2 has been selected based upon a maximum laboratory plasticity index result of 15%. In summary correlation between plasticity and N60 values in the Alluvium Deposits indicate an undrained shear strength (Cu) 18kPa at 1.20m.

5.4.2.5 Internal Angle of Friction

The internal angle of friction for the materials encountered have been calculated in accordance with BS8004 [11], based upon the characteristic plasticity index value of 15%. An internal angle of friction of 27° has been calculated for the cohesive material within the Alluvium Deposits and 28° has been calculated for the granular material within these deposits.

5.4.2.6 Geotechnical Chemical Testing

One sample of the Made Ground was tested for geotechnical chemical testing. A sulphate value of 140 mg/l was recorded. The pH was recorded at 7.7. It is considered that concrete beneath the site should be designed using a Design Sulphate class of DS-1 and an aggressive chemical environment for concrete (ACEC) class for location of AC-1.

5.4.3 River Terrace Deposits

5.4.3.1 Unit Weight

The unit weight has been assumed as 19kN/m^3 for the River Terrace Deposits based on a dense gravel [8].

5.4.3.2 Standard Penetration Testing

The strength profile within the strata encountered has been assessed by reference to the results of Standard Penetration Tests (SPT) undertaken within the borehole. These tests have derived N-Values which have been corrected considering the energy loss induced by the hammer and transmitted by the drive rods, in accordance BS EN ISO 22476-3:2005 [9]. Four tests were undertaken within the River Terrace Deposits at depths of between 7.50mbgl and 10.00mbgl, of these refusals were noted at 10.00mbgl in both boreholes. Extrapolated N_{60} values with depth are presented as Plots 1 to 3 within Appendix E.

The River Terrace Deposits generally show an increase of N_{60} with depth. A characteristic N_{60} value of 30 has been derived for the River Terrace Deposits.

5.4.3.3 Internal Angle of Friction

The internal angle of friction for the River Terrace Deposits has been calculated as 34° based on the N_{60} values.

5.4.3.4 Geotechnical Chemical Testing

One sample of the River Terrace Deposits was tested for geotechnical chemical testing. A sulphate value of 254 mg/l was recorded. The pH was recorded at 6.7. It is considered that concrete beneath the site should be designed using a Design Sulphate class of DS-1 and an aggressive chemical environment for concrete (ACEC) class for location of AC-1.

5.5 Ground Model

The table below presents characteristic values for each material.

Material Property	Made Ground	Alluvium	River Terrace Deposits
Unit Weight γ (kN/m^3)	17	16	19
Characteristic N_{60}	25	3	30
Undrained Shear Strength c_u (kPa)	75	18	-
Effective Cohesion	0	0	0
Internal Angle of Friction ϕ (°)	35	28	34
Design Sulphate Class	DS-2, AC-1	DS-1, AC-1	DS-1, AC-1

Table 4 – Material Parameters

5.6 Groundwater

Groundwater strikes were recorded in BH101 at 7.50mbgl (19.54mAoD) rising to 7.00m (20.04mAoD) as a seepage and in BH102 at 7.50mbgl (19.39mAoD), rising to 3.00mbgl (23.88mAoD) after 20minutes. These strikes were recorded within the River Terrace Deposits. It is therefore considered there is a potential for the head of water to rise to 3.00mbgl (23.88mAoD). Return groundwater monitoring results indicated resting groundwater levels were recorded between 5.15mbgl and 5.45mbgl, the results of which can be summarised below.

Location ID	Response Zone (mbgl)	Groundwater Level (mbgl)		Groundwater Level (mAoD)	
		Max	Min	Min	Max
BH01	3.00 -10.00	5.44	5.40	21.60	21.64
BH02	8.00 – 10.00	5.27	5.15	21.61	21.73

Table 5 – Groundwater monitoring results

Furthermore, the water level of the River Mersey was recorded at 21.44mAoD during the topographic and bathymetric survey, suggesting it is likely in hydraulic continuity with the groundwater body.

5.7 Visual or Olfactory Contamination

Visual or olfactory evidence of contamination was not observed during the investigation works. Evidence of potential Asbestos Containing Material (ACM) was not observed during the investigation works.

5.8 Trial Holes

One vacuum excavation pit (TH101) was excavated in order to find the dimensions of the existing bridge abutment and the footings of the abutment. A single hand dug pit was completed (TH102) in order to confirm the extent of the concrete footing identified in TH101. The remaining two bridge abutments (TH103 and TH104) were exposed using hand digging tools in order to confirm the top dimensions. Due to access limitations and overgrown vegetation / presence of invasive species the final abutment dimension (north-east) could not be determined. TH101 identified a concrete footing 1.60mbgl (23.88mAoD) from ground level (2.30mbgl from the bridge deck) extending out by 0.85m to the north (river side). Concrete rebar and a steel "U" section was noted within the footing. The pit was excavated to a maximum depth of 2.10mbgl (21.38mAoD) however the base of this footing was not encountered, therefore it is assumed it extends beyond this. TH102 was completed in order to verify the concrete footing was continuous between the southern abutments, which was subsequently confirmed, therefore the assumption is made that the slab is continuous and runs parallel. TH103 (26.62mAoD) and TH104 (26.49mAoD) confirmed the existing top dimensions of the abutments and were recorded as 0.90m in width. All exploratory hole records can be found within Appendix A.

6. Geotechnical Assessment

An assessment of the geotechnical properties and ground conditions is given below with comments made relating to ground related development constraints.

6.1 Proposed Development

The proposed development works include the removal of the existing bridge utilising a crane situated on the southern bank and the installation of the new bridge utilising the existing foundations and abutments. Total anticipated loads are expected to be approximately 50t (17t dead load and 33t live load).

6.2 Existing Foundations

The investigation determined the foundations of the existing abutments to be in excess of 2.00mbgl, as the base of these was not proven. It is expected that a strip foundation at this depth would have a bearing capacity of 100kPa within the Alluvium and 200kPa within the Made Ground Deposits at 2.00mbgl. However, due to the presence of deep Alluvium and Made Ground, it is more likely that the bridge abutments have a piled foundation.

It is understood that the loads of the new bridge to be installed will be less than the loads of the existing bridge in place. As such, the existing foundations are likely to be deemed sufficient to support the proposed loads. A detailed assessment of the existing bearing capacity, proposed construction detailed, and structural condition and suitability should be undertaken to confirm this.

It may be possible to investigate the abutments further to determine pile depths and construction. This would likely cause significant disruption and damage to the structure however, at which point it may be more cost effective to replace the abutments in their entirety.

6.3 Buried Concrete

Sulphate and pH testing has been undertaken on five soil samples, from the Made Ground, Alluvium and River Terraced Deposits ranging from 1.20m – 9.50m bgl in depth. The results show maximum water-soluble sulphate concentrations of up to 703mg/l and a minimum pH value of 6.7. It is considered that concrete beneath the site should be designed using a Design Sulphate class of DS-2 and an aggressive chemical environment for concrete (ACEC) class for location of AC-1. Should new structures be installed below the level of the groundwater (c.7.50m bgl) then samples of the groundwater should be obtained to confirm this assessment. Furthermore, it is recommended the structural condition of the foundation is assessed to ensure the concrete is in a good condition and would be adequate for the design life of the new bridge to be installed.

6.4 Excavations

It is considered that excavation of the near surface soils should be readily achievable using conventional hydraulic excavation techniques. Excavations into shallow cohesive soils are likely to stay open for short periods of time, however support may be required for deeper excavations, or those left open for extended periods. There is a potential for shallow groundwater to be present and for the head of water to rise to 3.00mbgl (23.88mAoD), although strikes were recorded at 7.50mbgl (19.54mAoD and 19.39mAoD). Resting groundwater levels from the monitoring results were recorded between 5.15mbgl (21.73mAoD) and 5.44mbgl (21.60mAoD). As such, traditional sumping and pumping should be sufficient to dewater most excavations, although deeper excavation may need more intensive dewatering. Relate to elevation level.

Where excavations will require entry then consideration should be given to the need to provide trench support or to batter excavation sides to a safe angle. Excavations should not be entered without appropriate support and a full risk assessment should be completed prior to entry. Consideration should also be given to the existing bridge structure with any excavations designed to consider the interaction with this.

The concrete footings of the existing bridge abutments have been identified at 1.60mbgl however their bottom depth has not been proven. Consideration should be given to this, and it should be assumed these footings will be present around all abutments.

6.5 Slope Stability

The riverbank is approximately 8.00m high from the base of the river channel to the top of the slope, at a slope angle of approximately 1(v):1.2(h) (40 degrees). During removal and installation of the bridge, a crane and other plant/machinery will be required to be positioned close to the riverbank. A detailed slope stability assessment should be carried out to determine whether the additional surcharge loads from the construction plant will have an adverse effect on the slope stability. Furthermore, consideration needs to be given to the existing riverbank as it is a flood defence, and it would therefore need to be protected and maintained.

6.6 Working Platform

It is assumed a working platform will be required for the crane and plant to operate from. It is likely that additional plate load testing/CBR testing will be required to enable design of the working platform due to the presence of soft Alluvium deposits and variable made ground, it is likely that a granular platform with geogrid and subbase improvement may be required.

6.7 Geotechnical Risk Register

A geotechnical risk register has been developed for the Site. This is presented as Appendix F. The geotechnical risk register highlights key geotechnical risks to the works and presents proposed mitigation measures to manage the risks.

7. Contamination Assessment Criteria

7.1 Human Health

As part of the Generic Quantitative Risk Assessment (GQRA) soil concentrations have first been screened against Pick Everard Tier 1 Soil Screening Values (TSVs), adopted from the Suitable 4 Use Levels (S4ULs) published by the LQM/CIEH [12]. Where no published screening values are available Pick Everard have derived their own values using the Contaminated Land Exposure Assessment (CLEA) 1.07 model in accordance with the CLEA framework. All parameters used within the TSVs are the CLEA 1.07 defaults or LQM/CIEH values. Additionally, Soil Organic Matter (SOM) has been altered to include SOMs of 1% and 2.5% along with the default of 6% to better reflect the range of SOM content commonly found within shallow soils on Brownfield sites. This matches the LQM/CIEH approach to SOM [13]. All soil concentrations below TSVs are considered to pose a minimal risk to human health.

In March 2014 DEFRA together with Contaminated Land: In Real Environments (CL:AIRE) published Category 4 Screening Levels (C4SLs) for arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI and lead for soil using the CLEA Model. The C4SLs are considered suitable by DEFRA for use for Part 2A decisions and planning i.e., change of use. Where concentrations of the above determinants exceed the TSVs they have also been screened against C4SLs. Contaminant concentrations below C4SLs are considered to pose an acceptably low risk to human health.

Risks from land contamination in the UK are assessed on the 'suitability for use' principle, whereby pollutant linkages are considered with regard to the intended end use of the site, and the specific exposure pathways and receptors associated with that use. Due to the proposed works consisting of CSO with users at risk including construction workers and maintenance workers, the risk assessment has been carried out based on a Commercial land use scenario. In selecting the most appropriate screening values for this site, a Soil Organic Matter (SOM) of 2.5% has been used for samples collected from Made Ground based upon average results of laboratory SOM testing. The assessment criteria are included in Appendix G.

7.2 Controlled Waters

Given the nature of the proposed development and ownership of the site, assessment of the existing risk to controlled waters caused by Made Ground in the public realm etc. is beyond the scope of this report. A qualitative assessment of the risks to controlled waters posed by the development has instead been provided.

8. Contamination Assessment

8.1 Human Health Generic Quantitative Risk Assessment

Two soil samples were screened for contaminants of concern from Made Ground.

The results of the testing confirm that contaminant concentrations do not exceed Pick Everards TSV's protective of human health receptors.

Both samples were analysed for the presence of asbestos, of which BH102 (0.30m – 0.50m) detected Amosite and Chrysotile in the form of loose fibrous debris and loose fibres. Although not exclusive, chrysotile (white asbestos) is most commonly associated with asbestos cement materials and amosite (brown asbestos) with insulation board.

While the results of the GQRA suggest that he long term risk to construction workers is low, it should be noted that direct contact pathways will be active during construction works. This should be managed by appropriate use of PPE and good hygiene/site management procedures during the works. Additionally, the presence of asbestos in the soils may pose a risk to construction workers, and the advice of a suitably qualified asbestos consultant should be sought.

A copy of the contamination results is included in Appendix B.

8.2 Controlled Waters Risk Assessment

In considering the risks to controlled waters posed by the proposed development, consideration is given to the following:

- The lack of significant contamination identified within the soils;
- Significant groundwater not encountered until 7.50m bgl; and
- Generally contamination nature of the proposed construction (assuming a high degree of workmanship);

On the basis of the above, it is considered that the development does not pose a risk to controlled waters beneath the site or in the surrounding area.

9. Revised Conceptual Site Model

Following an assessment of the data Pick Everard have produced a Conceptual Site Model (CSM) in general accordance with LC:RM, and BS21365:2020 Conceptual Site Models for Potentially Contaminated Sites [14].

9.1 Contamination Assessment

Following on completion of an intrusive ground investigation, the following potential contaminant sources, pathways and receptors have been identified.

9.1.1 Identified Sources

Source No.	Name	Description	Contaminants of Concern
S1	Made ground	Made ground	• Inorganics (metals) • Organics • Asbestos • TPH & PAH

Table 7 – Potential Sources Identified

9.1.2 Identified Pathways

Pathway No.	Name	Description
P1	Dermal Contact with Soils and/or Dust	Construction workers and end users can come into dermal contact with contaminants.
P2	Accidental Ingestion of Soil	Construction workers may accidentally ingest soils while occupying the Site.
P3	Inhalation of Gases, Vapours or Dusts	Gases, vapours, and dusts may migrate through outdoor air spaces and be inhaled.
P4	Direct contact: Construction Materials	Direct contact of soils and/or groundwater with construction materials.

Table 8 – Potential Pathways Identified

9.1.3 Identified Receptors

Receptor No.	Name	Description
R1	Construction/Maintenance Workers	This includes construction workers during the redevelopment phase and potential long-term maintenance workers.
R2	Construction Materials	Construction materials can be at risk from certain contaminants. This includes buried concrete which can be affected by sulphate concentrations and pH.

Table 9 – Potential Receptors Identified

9.2 Conceptual Site Model

The Revised Conceptual Site Model based on the identified Source-Pathway-Receptor linkages identified above is presented in the table below.

Source	Pathway	Receptor	Risk	Comments
S1 – Made Ground	P1 - Dermal Contact P2 - Ingestion P3 - Inhalation	R1 – Construction Workers	Low/Moderate	While contaminant concentrations do not exceed the assessment criteria, direct contact pathways will remain active during the construction phase, and this should be managed by the use of PPE and good hygiene practices. The main contractor and/or client should appoint an asbestos consultant to advise on the asbestos risk and any necessary mitigation measures during construction.
	P5- Direct Contact	R2- Materials	Low	The risk to buried materials is considered to be low, and specific mitigation measures are unlikely to be necessary.

Table 10 –Conceptual Site Model

9.3 Risk Classifications

The significance of the potential source-pathway-receptor linkages identified above is based on the following criteria:

Risk	Description
Very High	Pollutant linkage is present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor. Acute risks to human health, catastrophic damage to buildings/property, major pollution of controlled waters. Further investigation and/or remediation is required.
High	Pollutant linkage may be present, and it is likely that the risk will occur over the long term. Chronic or acute risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures. Further investigation and/or remediation is required.
Moderate	Pollutant linkage may be present, and it is possible that harm could arise to the designated receptor from an identified hazard. Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures Further investigation and/or remediation is required.
Low/Moderate	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so. Pollution of non-sensitive waters, minor damage to buildings or structures. Further investigation and/or remediation may be required.

Risk	Description
Low	Pollutant linkage unlikely to be present, or risk of harm is minor. There may be a requirement for protective equipment during Site works to mitigate health effects, damage to non-sensitive ecosystems or species. Investigation or remediation unlikely to be necessary.
Very Low	Pollutant linkage is not present or may be present but the circumstances under which harm would occur are improbable. Investigation or remediation unlikely to be necessary.

Table 11 – Risk Classification

10. Remedial Recommendations

10.1 Soils

As asbestos has been identified, it is recommended that advice should be sought from a suitably qualified asbestos consultant. It is noted however that direct contact pathways will be active throughout the construction phase. Accordingly, standard PPE and good hygiene practices should be adopted while working with potentially contaminated soils (i.e. nitrile or work gloves, welfare facilities and no food/drink within the work area).

10.2 Controlled Waters

The results of the assessment confirm that the risk to controlled waters is low, and specific remedial measures are unnecessary.

10.3 Unexpected Contamination

For the duration of the redevelopment, a watching brief will need to be maintained for any previously unidentified soil and/or groundwater contamination. Particular attention should be paid to asbestos/Made Ground exposed beneath the Site.

If previously unidentified contamination is encountered, a suitably qualified Environmental Consultant shall be informed immediately, and the Contaminated Land Officer/Environmental Services at the local authority will also be informed of mitigation proposals for the area of concern.

11. Recommended Further Works

The following further works are recommended:

- Structural condition survey of the exposed abutments;
- Detailed assessment of the proposed loading of the new structure and ability of the abutments to support the load;
- Further investigations to include plate-load testing to facilitate the bearing pressures of the crane and other machinery.

12. References

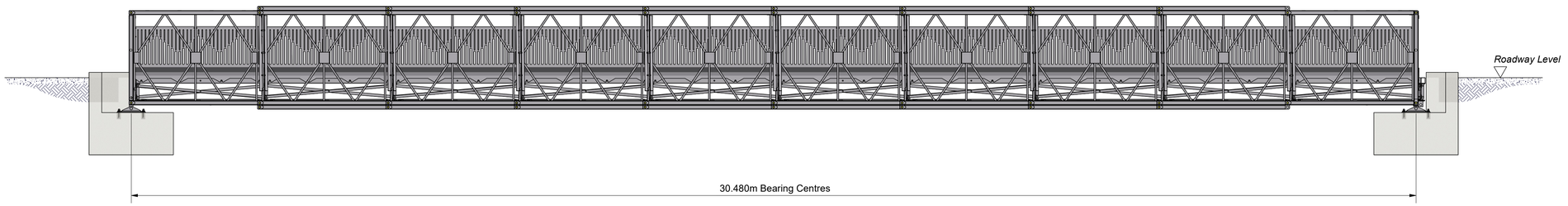
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3. BS 5930:2015 'Code of Practice for Site Investigations', British Standards Institution, London.
4. BS EN 1997-2:2007 Eurocode 7: 'Geotechnical design. Ground investigation and testing', British Standards Institution, London.
5. Barlow Hall Refuse Bailey Bridge Capacity Assessment (ref. 25539-25468-AGL-BAL-001-RP-EN-502-C01);
6. Barlow Hall Farm Bailey Bridge Structure No.658 Special Inspection Report by Manchester City Council;
7. Structural and Geotechnical – Fee Proposal, Bailey Bridge Abutment Assessment by Pick Everard (ref. MC/RHG/N00091/P001);
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15. BS EN 22282-1:2012 'Geotechnical Investigation and Testing. Geohydraulic Testing - General Rules', British Standards Institution, London.
16. Chartered Institute of Environmental Health / CL:AIRE. May 2008. Guidance on Comparing Soil Contamination Data with a Critical Concentration.
17. BS 21365:2020 'Conceptual Site Models for Potentially Contaminated Sites', British Standards Institution, London;

Drawings

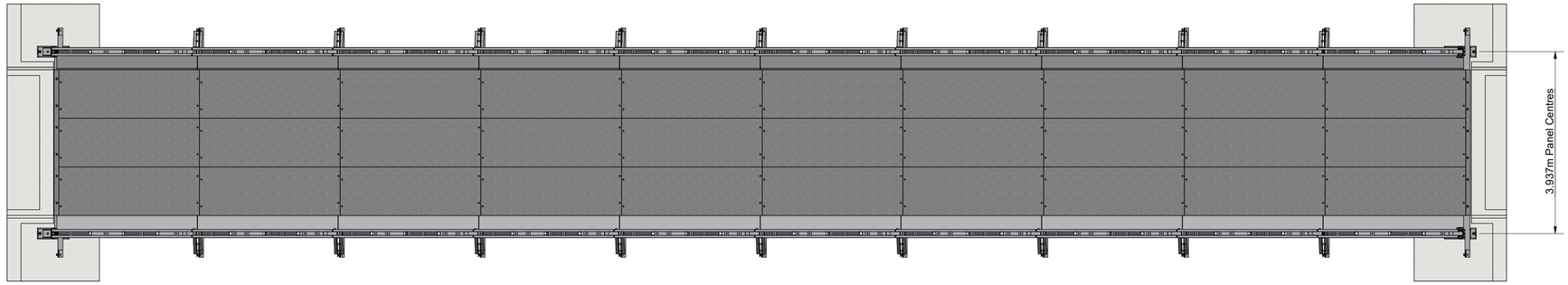
Drawing 25539-26717-AGL-COM-001-DR-CD-201-P01 by Acrow

Abutment 1
Female End of Bridge
(Fixed Bearings)

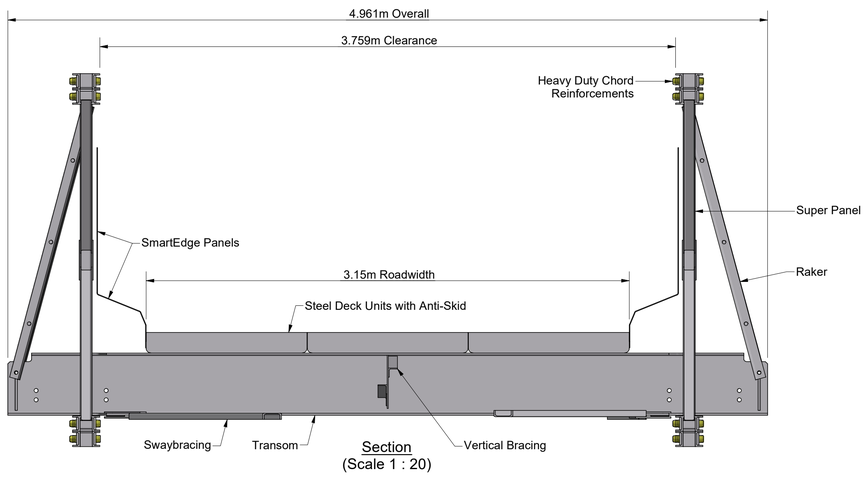
Abutment 2
Male End of Bridge
(Sliding Bearings)



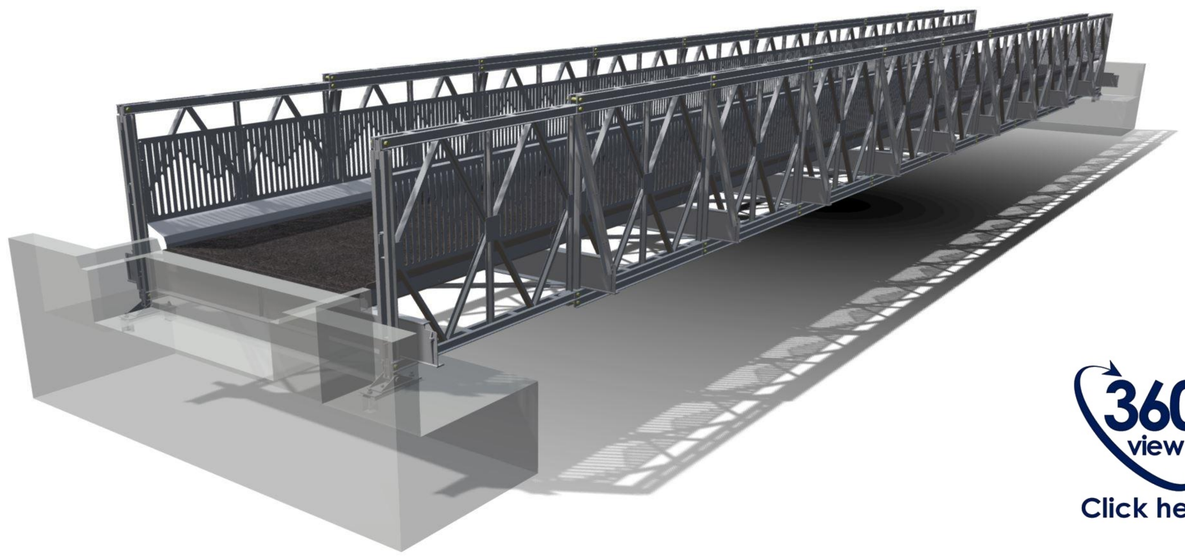
Elevation
(Scale 1 : 60)



Plan
(Scale 1 : 60)



Section
(Scale 1 : 20)



360° view
Click here

Revision	Details	Drawn By	Checked By	Auth By	Date
P01	Original	PW	IAM	-	10/04/2024

PRELIMINARY

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☎: +44 (0)1291 623801

Title:

Compact (200) Bridging

General Arrangement for a Single Span (10 Bay) 30.480m Bridge
3.15m Roadwidth - SSHRH Construction - Steel Deck Units with Anti-Skid
Complete with SmartEdge Panels

Manchester City Council — United Kingdom

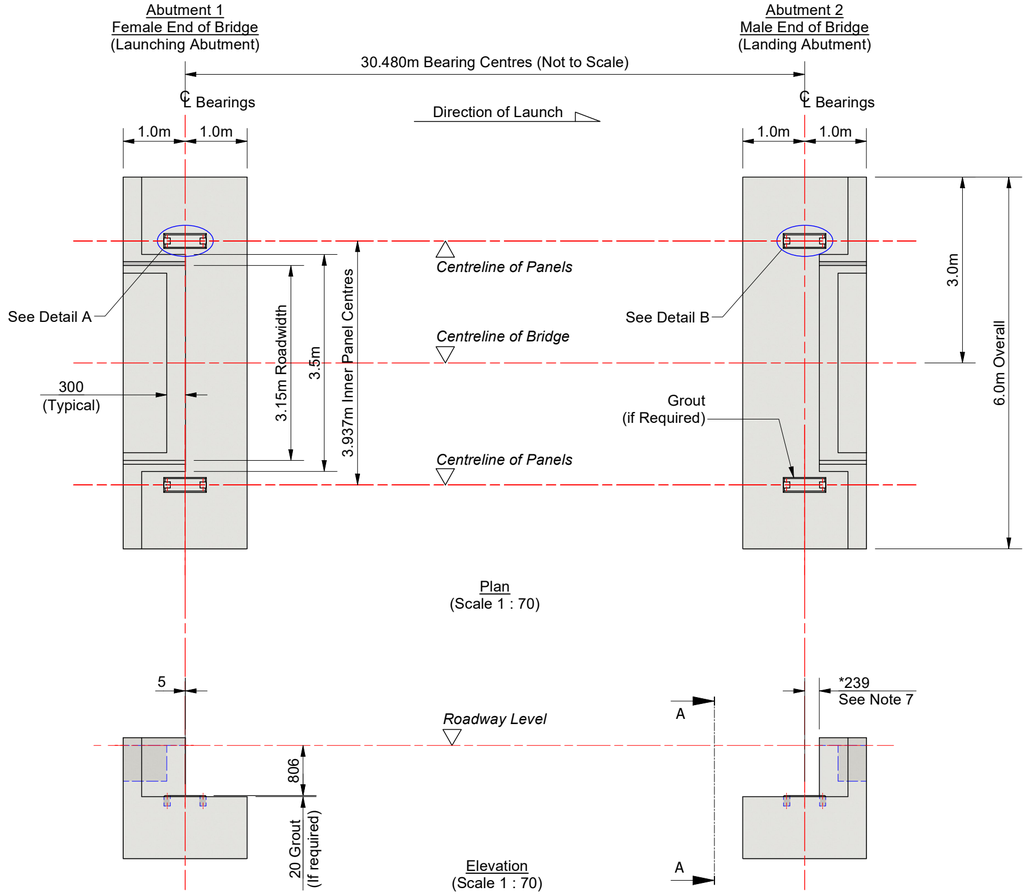
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Drawing No:

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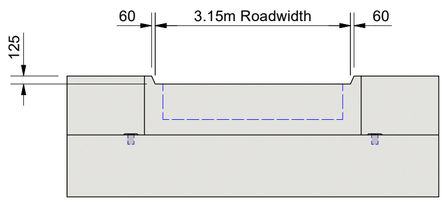
Project | Sale | Originator | Volume | Location | Type | Role | Number | Revision

Drawing 25539-26717-AGL-COM-001-DR-CD-101-P01

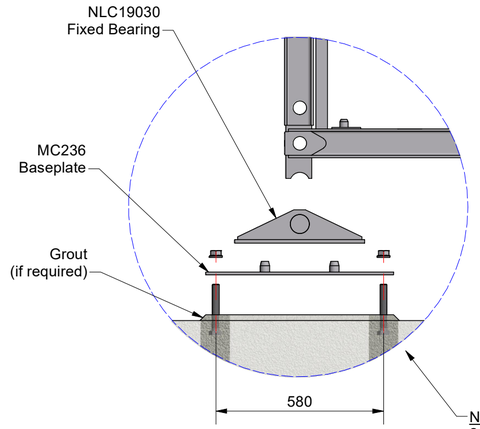


Plan
(Scale 1 : 70)

Elevation
(Scale 1 : 70)

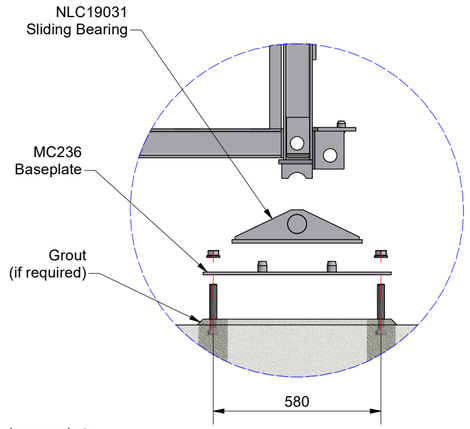


Section A-A
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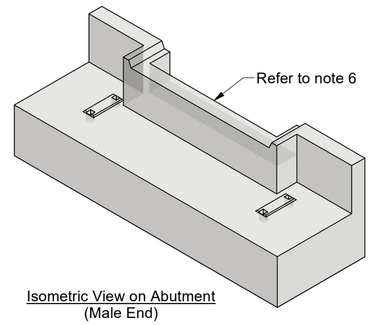


Detail A
Female End of Bridge
Fixed Bearing
(Scale 1 : 15)

NOTE:
2 No. 100mm x 100mm x 150mm deep pockets per panel line to accommodate M24 diameter holding down bolts, designed, detailed and supplied by others.
Detail B similar.



Detail B
Male End of Bridge
Sliding Bearing
(Scale 1 : 15)



Isometric View on Abutment
(Male End)

Vertical Reactions	
Dead Load	15t
Live Load	25t
Total	40t

NOTES:

The nominal reactions given are stated in metric tonnes and represent the maximum reactions that can occur at each abutment and include allowances for impact (where appropriate) and eccentricity (maldistribution).

To obtain the maximum reactions for one side of the bridge (i.e. per truss line) divide the values given above by two.

NOTES

1. The abutment details shown on this drawing are those that are geometrically required to accommodate the bridge superstructure.
2. The bridge foundations are to be designed and detailed locally, by others, to sustain the loads to which they will be subjected, both when in service and during the bridge installation, without settlement, taking due account of the site conditions.
3. Depending upon the ground conditions particular to the site, the base of the abutments may need to be extended forwards in order to sustain the load from the launching rollers, which are usually located 0.75 metres in front of the bridge bearing positions.
4. The foundations are to be constructed by others, using good quality concrete.
5. The foundation bolts are to be designed, detailed and supplied locally by others.
6. For ease of installation of the bridge, whether it is being jacked down off launching rollers or craned into position, the back walls of the abutments should not be constructed until the bridge has been installed upon its bearings. Starter bars for back wall reinforcement should be bent clear of the bridge during launching, and should be omitted completely in areas where jacks are to be used.
7. The dimension marked thus * on the diagram allows for 20 millimetres clearance between the back wall of the abutment and the ends of the bridge decking, at a temperature of 15°C. This dimension must be adjusted as necessary to suit the span of the bridge and cater for thermal expansion appropriate to the local temperature range.
8. The backwall heights include for 20mm of grout beneath the bearings, as shown. These dimensions must be adjusted to suit the actual depth of grout beneath the bearing required, to reflect the accuracy of abutment construction and the method of bearing / holding down bolt installation used by the contractor.
9. It is essential that all of the bearings on an abutment are set at the same level in order to avoid maldistribution of stresses in the bridge trusses.
10. The dimensions given on this drawing assume that the bridge is to be installed level. Where a longitudinal gradient is required, Acrow Global Engineers must be consulted for revised dimensions and advice as to the practicality of the proposed scheme.
11. This drawing may have been reduced and therefore may no longer be to scale.
12. All dimensions in mm unless noted otherwise.

Revision	Details	Drawn By	Checked By	Auth By	Date
P01	Original	PW	IAM	-	10/04/2024

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Title:

Compact (200) Bridging

Abutment Details for a Single Span (10 Bay) 30.480m Bridge 3.15m Roadwidth - SSHRH Construction - Steel Deck Units with Anti-Skid Complete with SmartEdge Panels

Manchester City Council — United Kingdom

ACROW

Drawing No:

25539-26665-AGL-COM-001-DR-CD-201-P01

Project	Sale	Originator	Volume	Location	Type	Role	Number	Revision
25539	26665	AGL	COM	001	DR	CD	201	P01

PE-SK-C-0001 – Exploratory Hole Location Plan

382100

382200

391700



LEGEND

- GI Boundary
- Cable Percussive Exploratory Hole
- Trial Pit Locations

Drawing Title: Exploratory Hole Location Plan

Project Name: MCC - Bailey Bridge

Client: MCC

Drawing No: PE-SK-C-0001

Drawn By: CHO

Checked By: RHG

Date: 10/09/2024

Rev No: 01

Scale: 1:500

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PICK EVERARD

382100

382200

Appendix A – Exploratory Hole Records

PICK EVERARD

Head Office: Halford House, Charles Street, Leicester, LE1 1HA

Tel: 0345 045 0050, email consultants@pickeverard.co.uk

Cable Percussive Borehole Record

Project:	Bailey Bridge Replacement	**Project No.** 240960	BH101
Client:	Manchester City Council	**Date Start:**	22/08/2024
Plant:	Dando 3000	**Date End:**	22/08/2024
Logged by CHO	**Checked by** RHG	**Ground Level:**	27.04mAOD
Sheet 1 of 1	**Scale** 1:55	**Coordinates:**	382188.60(E) 391630.24(N)

Stratum Description	Legend	Depth (m)	Level (m)	Sample and In Situ Testing: Type	Depth (m)	Results	Water Strikes	Well
MADE GROUND: Grey, silty, very gravelly, fine to coarse grained SAND. Gravel is fine to coarse, sub angular to sub rounded crushed aggregate. MG		0.20	26.84	ES	0.30 - 0.50			
MADE GROUND: Brown, silty, sandy, gravelly CLAY. Gravel is sub angular to sub rounded, fine to coarse fragments of brick, glass, concrete and sandstone. MG				B	0.50			
				D	0.50			
				ES	0.60 - 0.90			
				B	1.20			
				B	1.20			
				B	1.20 - 1.65			
				D	1.20 - 1.65			
Loose, dark grey, very silty/clayey, fine to coarse grained, SAND with frequent thickly laminated clay layers <0.10m and an organic odour. ALV		2.10	24.94	SPT	1.20	N=4 (1,1/1,1,1,1)		
				B	2.00 - 2.45			
				D	2.00 - 2.45			
				SPT	2.00	N=3 (1,0/1,1,0,1)		
				B	3.00 - 3.45			
				D	3.00			
				D	3.00 - 3.45			
				SPT	3.00	N=2 (2 for 225mm/2 for 225mm)		
				B	4.00 - 4.45			
				D	4.00 - 4.45			
				SPT	4.00	N=4 (1,1/1,1,1,1)		
				B	5.00 - 5.45			
				D	5.00 - 5.45			
				SPT	5.00	N=5 (1,1/1,1,1,2)		
				B	6.50 - 6.95			
				D	6.50			
				D	6.50 - 6.95			
				SPT	6.50	N=0 (0 for 450mm/0 for 0mm)		
Medium dense, brown, silty very gravelly fine to coarse SAND. Gravel is subangular to subrounded, fine to coarse quartzite. RTDU		7.50	19.54					
				B	8.00			
				B	8.00 - 8.45			
				SPT	8.00	N=19 (2,3/3,4,6,6)		
				B	9.50 - 9.95			
				SPT	9.50	N=50 (4,6/50 for 160mm)		
End of Borehole at 10.00m		10.00	17.04					

Hole Diameter		Casing Diameter		Chiselling				Groundwater			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Strike	Rising to	Time	Remarks
10.00	150	9.50	150					7.50	7.00	12:00	

Remarks

Location CAT scanned prior to excavation. Location started with Hand Dug Service Inspection pit to 1.20m. Groundwater struck at 7.50m bgl and recorded as a seepage rising to 7.00m bgl after 20 mins.

PICK EVERARD

Head Office: Halford House, Charles Street, Leicester, LE1 1HA

Tel: 0345 045 0050,
email consultants@pickeverard.co.uk

Cable Percussive Borehole Record

Project:	Bailey Bridge Replacement	**Project No.** 240960	BH102
Client:	Manchester City Council	**Date Start:**	23/08/2024
Plant:	Dando 3000	**Date End:**	23/08/2024
Logged by CHO	**Checked by** RHG	**Ground Level:**	26.88mAOD
		Coordinates:	382181.17(E) 391683.26(N)
Sheet 1 of 1	**Scale** 1:55		

Stratum Description	Legend	Depth (m)	Level (m)	Sample and In Situ Testing: Type	Depth (m)	Results	Water Strikes	Well
MADE GROUND: Dark brown, very clayey/silty, very gravelly, fine to coarse grained SAND. Gravel is sub angular to sub rounded, fine to coarse brick, concrete, slate, quartzite, glass and flint fragments. MG				ES	0.30 - 0.50			
				B	0.50			
				D	0.50			
				ES	0.80 - 1.00			
				B	1.20 - 1.65			
				D	1.20 - 1.65			
				SPT	1.20	N=26 (4,5/6,6,7,7)		
MADE GROUND: Light brown, silty, gravelly fine to coarse grained SAND. Gravel is sub angular to sub rounded, fine to coarse brick, concrete and quartzite fragments. MG		2.00	24.88	B	2.00 - 2.45			
				D	2.00			
				D	2.00 - 2.45			
				SPT	2.00	N=32 (5,5/6,7,9,10)		
				B	3.00			
				B	3.00 - 3.45			
				D	3.00 - 3.45			
				SPT	3.00	N=24 (10,10/5,5,7,7)		
MADE GROUND: Dark brown, very clayey, silty, gravelly, fine to coarse grained SAND with low cobble content. Gravel and cobbles are sub angular to sub rounded, fine to coarse brick and concrete. MG		4.00	22.88	B	4.00			
				B	4.00 - 4.45			
				D	4.00			
				D	4.00 - 4.45			
				SPT	4.00	N=32 (5,7/8,8,7,9)		
				B	5.00 - 5.45			
				D	5.00 - 5.45			
				SPT	5.00	N=50 (9,9/10,12,12,16)		
MADE GROUND: Dark Grey, silty, very sandy, sub angular to sub rounded, fine to coarse grained mudstone GRAVEL with fragments of brick and concrete. MG		6.00	20.88	B	6.50			
				B	6.50 - 6.95			
				D	6.50 - 6.95			
				SPT	6.50	N=47 (6,7/10,10,12,15)		
Medium dense, grey, subangular to subrounded, sandy silty, fine to coarse GRAVEL of quartzite. RTDU		7.50	19.39	B	8.00 - 8.45			
				D	8.00			
				D	8.00 - 8.45			
				SPT	8.00	N=36 (7,7/8,8,10,10)		
				B	9.50 - 9.95			
				D	9.50 - 9.95			
End of Borehole at 10.00m		10.00	16.89	SPT	9.50	N=50 (9,10/50 for 285mm)		

Hole Diameter		Casing Diameter		Chiselling				Groundwater			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Strike	Rising to	Time	Remarks
10.00	150	10.00	150					7.50	3.00	12:00	

Remarks

Location CAT scanned prior to excavation. Location started with Hand Dug Service Inspection pit to 1.20m. Groundwater was encountered at 7.50m bgl rising to 3.00m bgl after 20 mins.

PICK EVERARD

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Leicester,
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email consultants@pickeverard.co.uk

Trial Pit Record

Project No. 240960

TH101

Project:	Bailey Bridge Replacement
Client:	Manchester City Council
Plant:	Vaccum Excavator
Date Start:	20/08/2024
Date End:	20/08/2024

Logged by	Checked by		
CHO	RHG	**Ground Level:**	26.29mAOD
Sheet	**Scale**	**Coordinates:**	382187.64(E)
1 of 1	1:25		391640.66(N)

Stratum Description	Legend	Depth (m)	Level (m)	Sample and In Situ Testing: Type	Sample and In Situ Testing: Depth (m)	Sample and In Situ Testing: Results	Water Strikes	Well
Brown, clayey, slightly gravelly, sandy TOPSOIL with frequent roots and rootlets, and occasional brick and metal fragments. TOP								
MADE GROUND: Brown, clayey, slightly gravelly SAND with frequent roots/rootlets. Gravel is sub angular to sub rounded, fine to coarse brick, metal and concrete fragments. MG		0.40	26.29					
Concrete footing encountered, extending 0.80m out form the face of the abutment, and 1.10m to the side. the base of the footing was not encountered, and continues below the depth of the trial hole.								
End of Exploratory Hole at 2.10m		2.10	25.89					

1 2 3 4 5

Dimensions		Pit Stability	Groundwater			
Pit Length	Pit Width		Depth Strike	Rising to	Time	Remarks
2.90	0.40	Stable				

Remarks

Location CAT scanned prior to excavation. Trial hole terminated at 2.10m bgl due to maximum reach of vacuum excavator. Concrete 'footing' noted to extend below the max depth of the trial pit.

PICK EVERARD

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email consultants@pickeverard.co.uk

Trial Pit Record

Project:	Bailey Bridge Replacement	**Project No.** 240960	TH102
Client:	Manchester City Council	**Date Start:**	21/08/2024
Plant:	Insulated Hand Digging Tools	**Date End:**	21/08/2024

Logged by	Checked by	Ground Level:
CHO	RHG	**Coordinates:**
Sheet	**Scale**	
1 of 1	1:25	

Stratum Description	Legend	Depth (m)	Level (m)	Sample and In Situ Testing: Type	Depth (m)	Results	Water Strikes	Well
Brown, slightly gravelly, sandy TOPSOIL with fragments of brick and metal. TOP								
		0.40						
MADE GROUND: Brown, clayey, slightly gravelly SAND with frequent roots/rootlets. Gravel is sub angular to sub rounded, fine to coarse brick, metal and concrete fragments. MG								
		1.60						
End of Exploratory Hole at 1.60m								

1 2 3 4 5

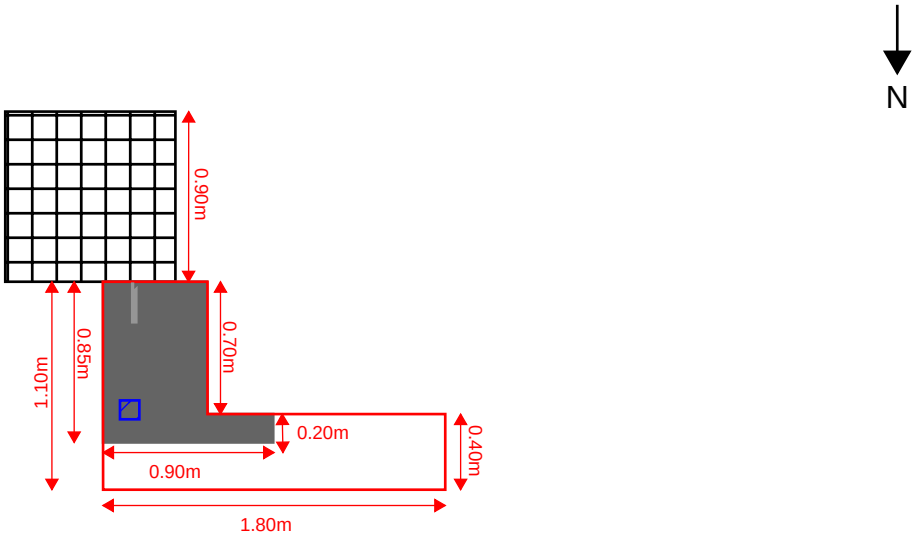
Dimensions		Pit Stability	Groundwater			
Pit Length	Pit Width	Stable	Depth Strike	Rising to	Time	Remarks
0.25	0.25					

Remarks

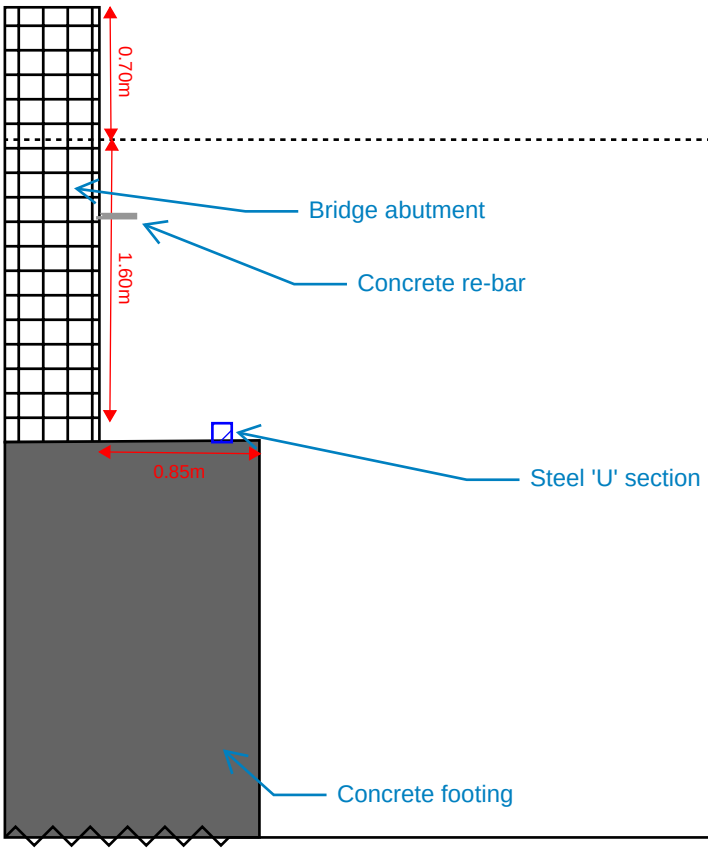
Location CAT scanned prior to excavation. Trial hole terminated at 1.60m bgl on concrete slabs.

PICK EVERARD	Sketch of Foundation Inspection Pit	Drawn By: CHO
		Date: 20/08/24
Project No.: 240960	Project Name: MCC - Bailey Bridge	Hole ID: TH101

Plan of Pit



Section of Pit



0.00mbgl - 2.10mbgl	MG: Brown clayey slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of brick, metal, material, slate, concrete, plastic and quartz. ... 0.40mbgl concrete rebar encountered. ... @1.30mbgl RSJ steel column.

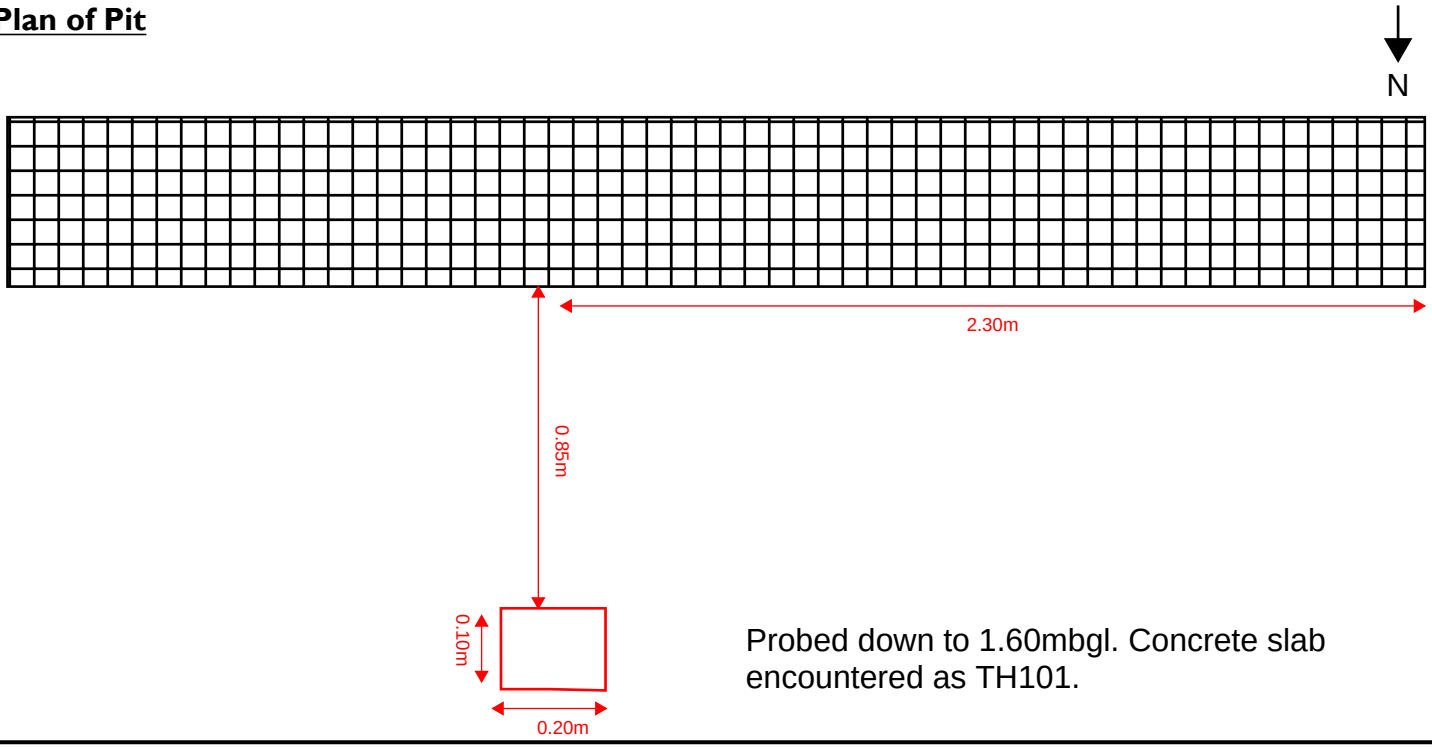
... E/O pit at 2.10mbgl

PICK EVERARD

Sketch of Foundation Inspection Pit

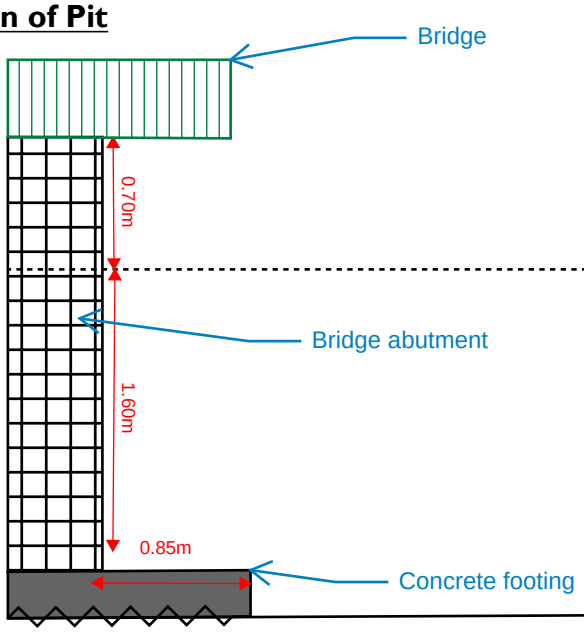
Drawn By: CHO		
Date: 20/08/24		
Project No.: 240960	Project Name: MCC - Bailey Bridge	Hole ID: TH102

Plan of Pit



Probed down to 1.60mbgl. Concrete slab encountered as TH101.

Section of Pit



0.00mbgl - 1.60mbgl	MG: Brown clayey slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of brick, metal, material, slate, concrete, plastic and quartz.

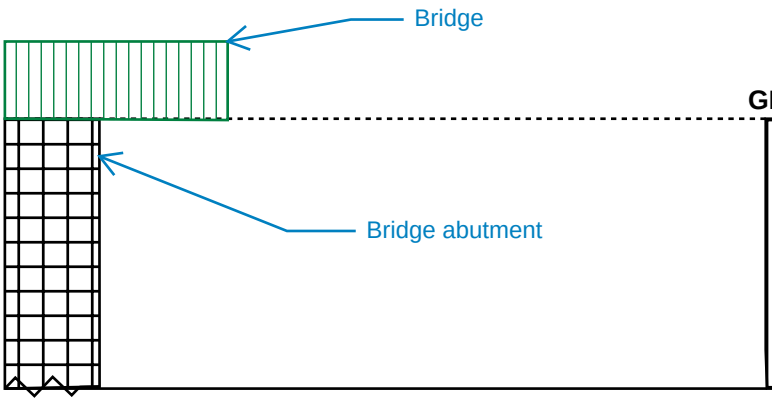
... E/O pit at 1.60mbgl

PICK EVERARD	Sketch of Foundation Inspection Pit	Drawn By: CHO
		Date: 21/08/24
Project No.: 240960	Project Name: MCC - Bailey Bridge	Hole ID: TH103

Plan of Pit



Section of Pit



0.00mbgl - 0.10mbgl	MG: Grass over brown clayey slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of brick, metal, material, slate, concrete, plastic and quartz.

... E/O pit at 0.10mbgl

PICK EVERARD

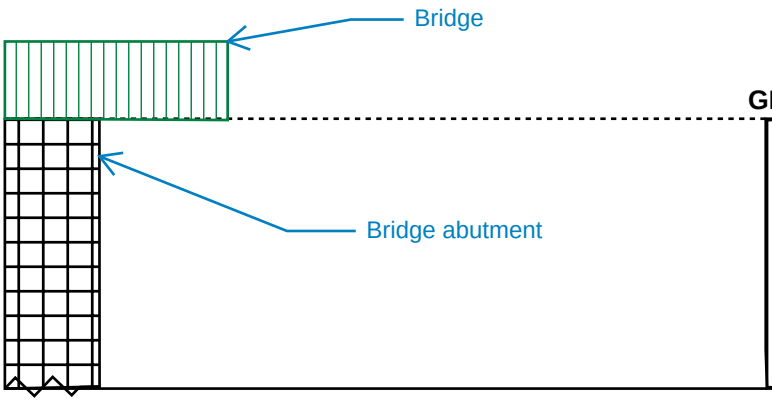
Sketch of Foundation Inspection Pit

Drawn By: CHO		
Date: 21/08/24		
Project No.: 240960	Project Name: MCC - Bailey Bridge	Hole ID: TH104

Plan of Pit



Section of Pit



0.00mbgl - 0.10mbgl	MG: Grass over brown clayey slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of brick, metal, material, slate, concrete, plastic and quartz.

... E/O pit at 0.10mbgl

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING UK LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	AR2499
Test Date:	04/01/2024
Report Date.	04/01/2024
File Name:	AR2499 (2).spt
Test Operator:	CM

Instrumented Rod Data

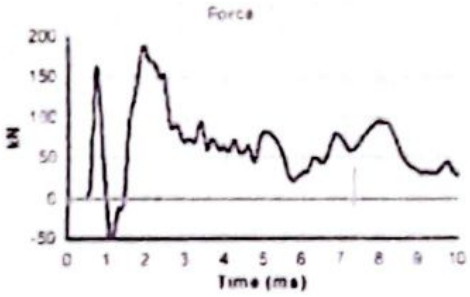
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_A (GPa):	200
Accelerometer No.1:	
Accelerometer No.2:	

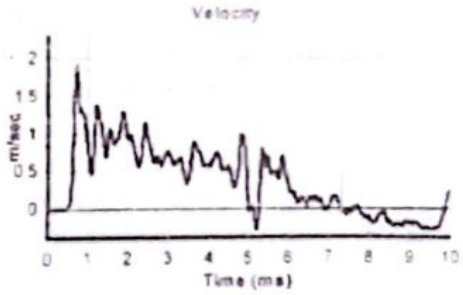
SPT Hammer Information

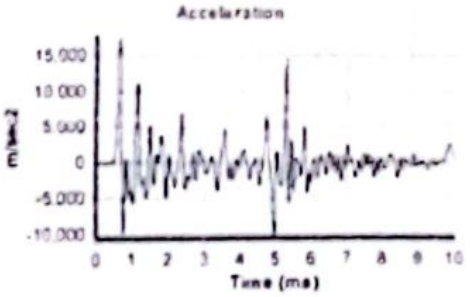
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

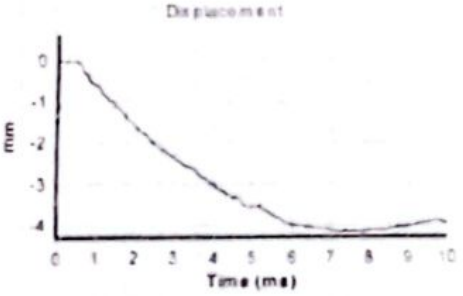
Comments / Location

VC - 63450









Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J)	332

Energy Ratio E_r (%): **70**

Signed: J.LOCK

Title: FITTER

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CamScanner

PICK EVERARD



Photo 1: TH101 Vac-ex pit



Photo 2: TH101 Foundations and 'U' steel structure

Site: Bailey Bridge

Project No: 240960

Client: MCC



Photo 3: TH101 Spoil



Photo 4: TH101 abutment dimension

Appendix B –Groundwater Monitoring Results

PICK EVERARD

GAS MONITORING RECORD SHEET

Client:	**Manchester City Council**				
Project:	**Bailey Bridge**	**Job No.:**	**240960**	**Instruments Used:**	Dip Meter
Weather:	**Overcast/sunny**	**Date:**	**06/09/2024**	**Monitored By:**	CHO

Installation No.	Differential Pressure (mbar)	Peak [1] CH4 (% vol)	Peak [1] CO2 (% vol)	Peak [1] O2 (% vol)	Peak [1] CO (ppm)	Peak [1] H2S (ppm)	Steady [2] CH4 (% vol)	Steady [2] CO2 (% vol)	Steady [2] O2 (% vol)	Steady [2] CO (ppm)	Steady [2] H2S (ppm)	Peak gas flow rate (l/hr)	Steady gas flow rate (l/hr)	Elevation of cover (m agl)	Water depth from ground (m bgl)	Water level AOD (m AOD)	Base depth from ground (m bgl)	Comments
BH102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.27	-	9.63	
BH01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.44	-	8.89	

Background Gas Levels:	CH_4 (% vol)	CO_2 (% vol)	O_2 (% vol)	CO (ppm)	H_2S (ppm)	Atmospheric Pressure (mbar)
Before Monitoring	-	-	-	-	-	-
After Monitoring	-	-	-	-	-	-

[1] The peak reading is the maximum recorded level during a monitoring event.

[2] The steady reading is the level which remained constant after approximately 1 minute.

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GAS MONITORING RECORD SHEET

Client:	**Manchester City Council**				
Project:	**Bailey Bridge**	**Job No.:**	**240960**	**Instruments Used:**	Dip Meter
Weather:	**Overcast/sunny**	**Date:**	**13/09/2024**	**Monitored By:**	CHO

Installation No.	Differential Pressure (mbar)	Peak [1] CH_4 (% vol)	Peak CO_2 (% vol)	Peak O_2 (% vol)	Peak CO (ppm)	Peak H_2S (ppm)	Steady [2] CH4 (% vol)	Steady CO2 (% vol)	Steady O2 (% vol)	Steady CO (ppm)	Steady H2S (ppm)	Peak gas flow rate (l/hr)	Steady gas flow rate (l/hr)	Elevation of cover (m agl)	Water depth from ground (m bgl)	Water level AOD (m AOD)	Base depth from ground (m bgl)	Comments
BH102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.15	-	9.66	
BH01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.40	-	8.90	

Background Gas Levels:	CH_4 (% vol)	CO_2 (% vol)	O_2 (% vol)	CO (ppm)	H_2S (ppm)	Atmospheric Pressure (mbar)
Before Monitoring	-	-	-	-	-	-
After Monitoring	-	-	-	-	-	-

[1] The peak reading is the maximum recorded level during a monitoring event.

[2] The steady reading is the level which remained constant after approximately 1 minute.

PICK EVERARD

GAS MONITORING RECORD SHEET

Client:	**Manchester City Council**				
Project:	**Bailey Bridge**	**Job No.:**	**240960**	**Instruments Used:**	Dio Meter
Weather:	**Overcast/sunny**	**Date:**	**20/09/2024**	**Monitored By:**	KDL

Installation No.	Differential Pressure (mbar)	Peak [1] CH_4 (% vol)	Peak CO_2 (% vol)	Peak O_2 (% vol)	Peak CO (ppm)	Peak H_2S (ppm)	Steady [2] CH4 (% vol)	Steady CO2 (% vol)	Steady O2 (% vol)	Steady CO (ppm)	Steady H2S (ppm)	Peak gas flow rate (l/hr)	Steady gas flow rate (l/hr)	Elevation of cover (m agl)	Water depth from ground (m bgl)	Water level AOD (m AOD)	Base depth from ground (m bgl)	Comments
BH102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.27	-	9.63	
BH01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.44	-	8.89	

Background Gas Levels:	CH_4 (% vol)	CO_2 (% vol)	O_2 (% vol)	CO (ppm)	H_2S (ppm)	Atmospheric Pressure (mbar)
Before Monitoring	-	-	-	-	-	-
After Monitoring	-	-	-	-	-	-

[1] The peak reading is the maximum recorded level during a monitoring event.

[2] The steady reading is the level which remained constant after approximately 1 minute.

Appendix C – Contamination Laboratory Report

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e: chandniodedra@pickeverard.co.uk

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Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 24-038847

Project / Site name:	Bailey Bridge	**Samples received on:**	27/08/2024
Your job number:	240960	**Samples instructed on/ Analysis started on:**	29/08/2024
Your order number:	220960-109379	**Analysis completed by:**	05/09/2024
Report Issue Number:	1	**Report issued on:**	05/09/2024
Samples Analysed:	2 soil samples		

Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 24-038847
Project / Site name: Bailey Bridge

Lab Sample Number				299509	299510
Sample Reference				BH101	BH102
Sample Number				ES1	ES1
Depth (m)				0.30-0.50	0.30-0.50
Date Sampled				22/08/2024	23/08/2024
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**		
Stone Content	%	0.1	NONE	52.3	33.3
Moisture Content	%	0.01	NONE	7.8	7.9
Total mass of sample received	kg	0.1	NONE	1.2	1.4

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Detected
Asbestos Analyst ID	N/A	N/A	N/A	MJN	MJN
Actinolite detected	Type	N/A	ISO 17025	-	Not-detected
Amosite detected	Type	N/A	ISO 17025	-	Detected
Anthophyllite detected	Type	N/A	ISO 17025	-	Not-detected
Chrysotile detected	Type	N/A	ISO 17025	-	Detected
Crocidolite detected	Type	N/A	ISO 17025	-	Not-detected
Tremolite detected	Type	N/A	ISO 17025	-	Not-detected
Asbestos Containing Material Types Detected (ACM)	Type	N/A	ISO 17025	-	Loose Fibrous Debris, Loose Fibres

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	9.1	11.1
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	190	520
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	95	260
Organic Matter (automated)	%	0.1	MCERTS	1	1.2

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.05	0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	0.06
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.27	0.72
Anthracene	mg/kg	0.05	MCERTS	0.06	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.44	1.2
Pyrene	mg/kg	0.05	MCERTS	0.43	0.99
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.25	0.45
Chrysene	mg/kg	0.05	MCERTS	0.25	0.57
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.38	0.69
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.09	0.27
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.26	0.39
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.18	0.31
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.22	0.36

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	2.89	6

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 24-038847
Project / Site name: Bailey Bridge

Lab Sample Number				299509	299510
Sample Reference				BH101	BH102
Sample Number				ES1	ES1
Depth (m)				0.30-0.50	0.30-0.50
Date Sampled				22/08/2024	23/08/2024
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**		
Heavy Metals / Metalloids					
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.6	8.7
Boron (water soluble)	mg/kg	0.2	MCERTS	0.6	6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.2	0.5
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	37	1100
Copper (aqua regia extractable)	mg/kg	1	MCERTS	17	77
Lead (aqua regia extractable)	mg/kg	1	MCERTS	48	79
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	28	38
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	5.1
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	68	290
Petroleum Hydrocarbons					
Petroleum Range Organics (EC6 - EC10) $_{HS_1D_TOTAL}$	mg/kg	1	ISO 17025	< 1.0	< 1.0
TPH (EC10 - EC25) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	23	30
TPH (EC25 - EC40) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	19	35

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 24-038847
Project / Site name: Bailey Bridge

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
299509	BH101	ES1	0.30-0.50	Brown clay and sand with gravel and stones
299510	BH102	ES1	0.30-0.50	Brown clay and sand with gravel and stones

Analytical Report Number : 24-038847
Project / Site name: Bailey Bridge

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
Total petroleum hydrocarbons by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS	In-house method	L076B/L088-PL	D/W	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080-PL	W	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS

Analytical Report Number : 24-038847
Project / Site name: Bailey Bridge

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099-PL	D	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Quality control parameter failure associated with individual result applies to calculated sum of individuals.
The result for sum should be interpreted with caution

Appendix D – Geotechnical Laboratory Reports

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022, cl 5.2 and 6

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

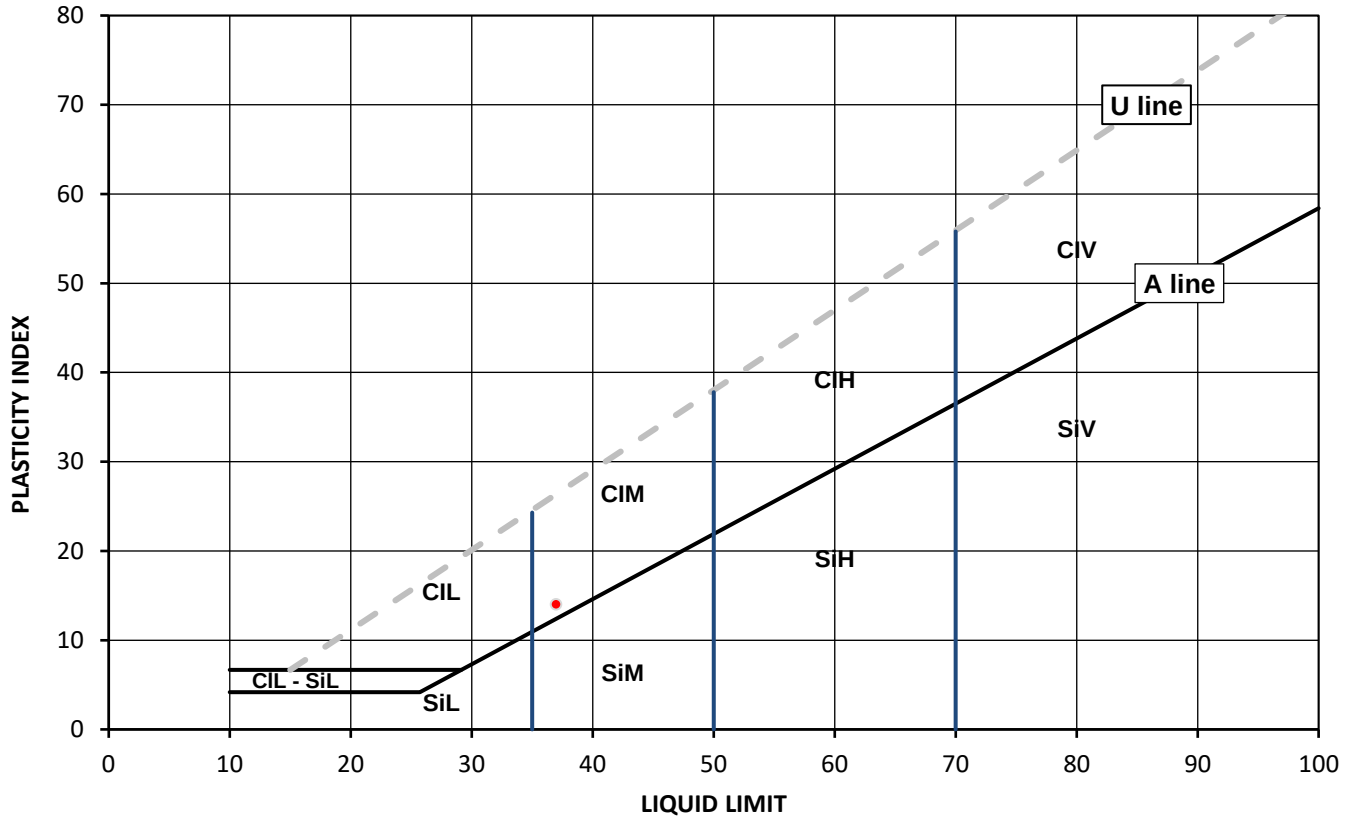
Client:	Pick Everard	Client Reference:	240960
Client Address:	Halford House, Charles Street, Leicester, Leicestershire, LE1 1HA	Job Number:	24-041537-1
		Date Sampled:	22/08/2024
		Date Received:	27/08/2024
Contact:	Chandni Odedra	Date Tested:	16/09/2024
Site Address:	Bailey Bridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	313686	Depth Top [m]:	1.20
Hole No.:	BH101	Depth Base [m]:	Not Given
Sample Reference:	4	Sample Type:	B
Sample Description:	Dark brown gravelly sandy silty CLAY with fragments of brick		
Sample Preparation:	Tested after washing to remove >0.425mm; The water content in the sample was decreased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
16.9	37	23	14	-0.43	1.43	54



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 30/09/2024

GF 337.13

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022, cl 5.2 and 6

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

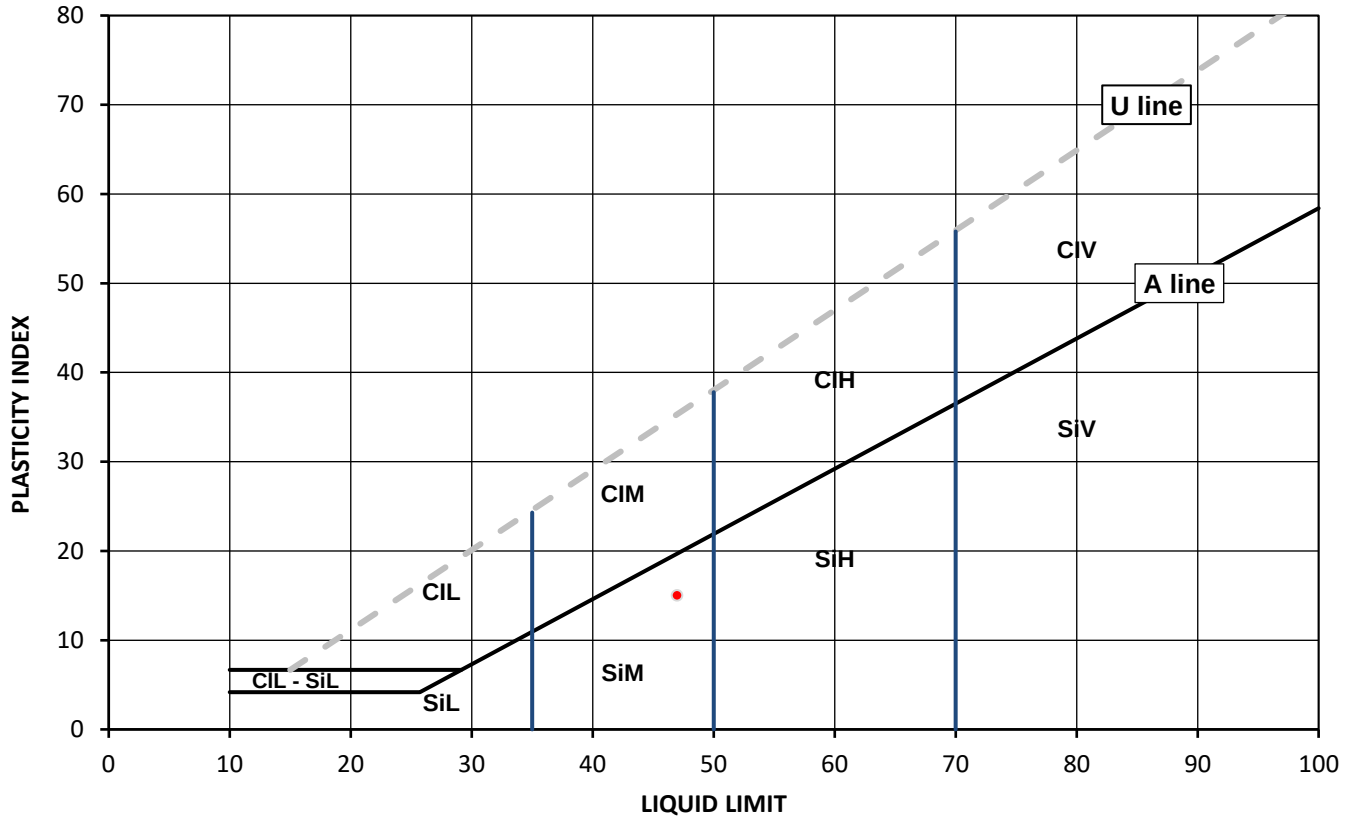
Client:	Pick Everard	Client Reference:	240960
Client Address:	Halford House, Charles Street, Leicester, Leicestershire, LE1 1HA	Job Number:	24-041537-1
		Date Sampled:	22/08/2024
		Date Received:	27/08/2024
Contact:	Chandni Odedra	Date Tested:	16/09/2024
Site Address:	Bailey Bridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	313688	Depth Top [m]:	6.50
Hole No.:	BH101	Depth Base [m]:	Not Given
Sample Reference:	14	Sample Type:	D
Sample Description:	Dark brown slighty sandy clayey SILT		
Sample Preparation:	Tested in natural condition; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
40.7	47	32	15	0.60	0.40	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

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Signed: Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 30/09/2024

GF 337.13

SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Pick Everard

Client Address: Halford House, Charles Street, Leicester, Leicestershire, LE1 1HA

Contact: Chandni Odedra

Site Address: Bailey Bridge

BS EN ISO 17892-12:2018+A2:2022 cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022, cl 5.2 and 6. W by BS EN ISO 17892-1:2014+A1:2022.

Client Reference: 240960
Job Number: 24-041537-1
Date Sampled: 22/08 - 23/08/2024
Date Received: 27/08/2024
Date Tested: 16/09/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	W	Liquid & Plastic Limit							Density		
		Reference	Depth Top m	Depth Base m	Type			%	% Passing 425um %	WL* %	Correlation Factor	Wp %	Ip %	Cone type	Sample Preparation	bulk Mg/m3	dry Mg/m3	PD Mg/m3
313686	BH101	4	1.20	Not Given	B	Dark brown gravelly sandy silty CLAY with fragments of brick	Atterberg 4 Point	16.9	54	37	-	23	14	80g/30 deg	W / D			
313687	BH101	8	3.00	Not Given	D	Dark brown slightly clayey SAND		23.3										
313688	BH101	14	6.50	Not Given	D	Dark brown slighty sandy clayey SILT	Atterberg 4 Point	40.7	100	47	-	32	15	80g/30 deg	N / I			
313690	BH102	22	2.00	Not Given	D	Brown clayey GRAVEL		11.7										
313693	BH102	26	4.00	Not Given	D	Dark brown slightly gravelly slightly clayey SAND with fragments of brick		15.7										
313695	BH102	32	8.00	Not Given	D	Brownish grey slightly sandy GRAVEL		9.9										

Note: # Non accredited; NP - Non plastic; N - Tested in natural condition, R - Tested after >0,425mm removed by hand, W - Tested after washing to remove >425mm; I - The water content in the sample was increased , D - The water content in the sample was decreased; * - One point liquid limit corrected as per the report Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

Comments:

Signed:

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Date Reported: 30/09/2024 **GF 362.15**

SUMMARY REPORT

DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS EN ISO 17892-1:2014+A1:2022, BS 1377-2: 2022, clause 4.1

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Pick Everard

Client Address: Halford House, Charles Street,
Leicester, Leicestershire,
LE1 1HA

Contact: Chandni Odedra

Site Address: Bailey Bridge

Client Reference: 240960
Job Number: 24-041537-1
Date Sampled: 22/08 - 23/08/2024
Date Received: 27/08/2024
Date Tested: 16/09/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC											
		Reference	Depth Top m	Depth Base m	Type			%											
313686	BH101	4	1.20	Not Given	B	Dark brown gravelly sandy silty CLAY with fragments of brick		16.9											
313687	BH101	8	3.00	Not Given	D	Dark brown slightly clayey SAND		23.3											
313688	BH101	14	6.50	Not Given	D	Dark brown slighty sandy clayey SILT		40.7											
313690	BH102	22	2.00	Not Given	D	Brown clayey GRAVEL		11.7											
313693	BH102	26	4.00	Not Given	D	Dark brown slightly gravelly slightly clayey SAND with fragments of brick		15.7											
313695	BH102	32	8.00	Not Given	D	Brownish grey slightly sandy GRAVEL		9.9											

Comments:

Signed:

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Date Reported: 30/09/2024

GF 126.18

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS EN ISO 17892-4:2016, BS 1377-2:2022 cl. 10

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

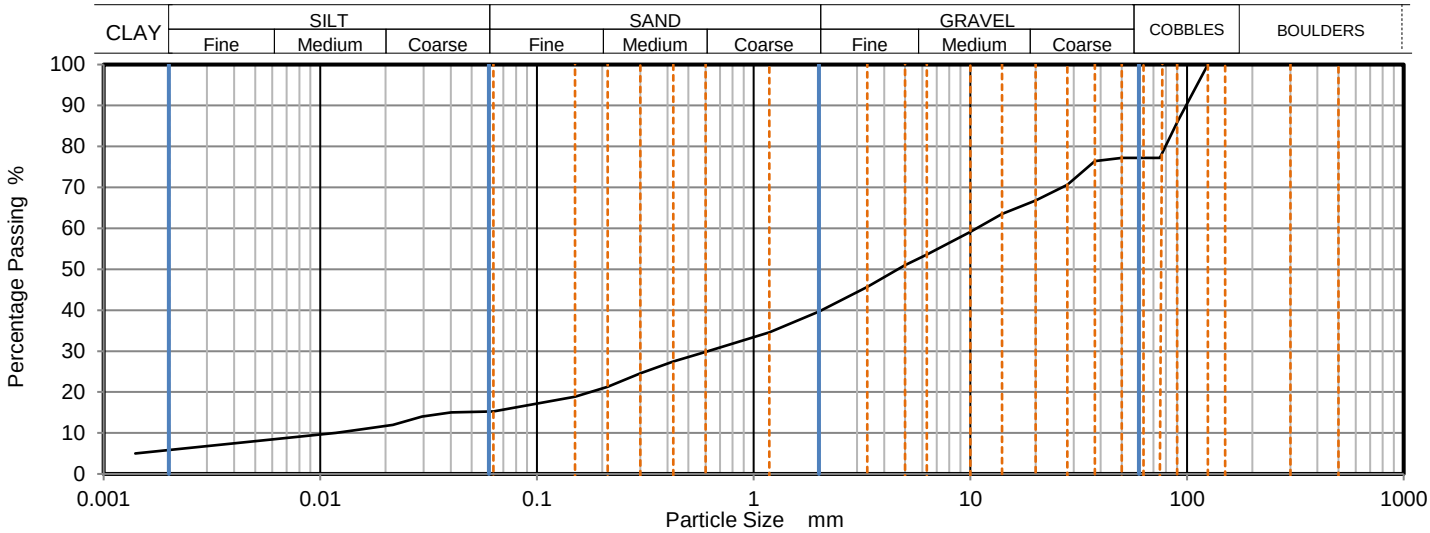
4041

Client:	Pick Everard	Client Reference:	240960
Client Address:	Halford House, Charles Street, Leicester, Leicestershire, LE1 1HA	Job Number:	24-041537-1
		Date Sampled:	22/08/2024
		Date Received:	27/08/2024
Contact:	Chandni Odedra	Date Tested:	21/09/2024
Site Address:	Bailey Bridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	313685	Depth Top [m]:	1.20
Hole No.:	BH101	Depth Base [m]:	Not Given
Sample Reference:	3	Sample Type:	B
Sample Description:	Dark brown sandy gravelly SILT with cobbles		
Sample Preparation:	Sample was quartered, oven dried at 106.1 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0402	15
300	100	0.0295	14
150	100	0.0216	12
125	100	0.0158	11
90	86	0.0118	10
75	77	0.0014	5
63	77		
50	77		
37.5	76		
28	71		
20	67		
14	64		
10	59		
6.3	54		
5	51		
3.35	46		
2	40		
1.18	35		
0.6	30	Particle density	(assumed)
0.425	28	2.65	Mg/m3
0.3	25		
0.212	21		
0.15	19		
0.063	15		

Sample Proportions	% dry mass
Very coarse	23.00
Gravel	37.00
Sand	24.00
Silt	10.00
Clay	6.00

Grading Analysis		
D100	mm	125
D60	mm	10.7
D30	mm	0.615
D10	mm	0.0105
Uniformity Coefficient		1000
Curvature Coefficient		3.4

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with ISO 17892 -4, by sieving and hydrometer sedimentation

Remarks:

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Signed: Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 30/09/2024

GF 366.11

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS EN ISO 17892-4:2016, BS 1377-2:2022 cl. 10

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

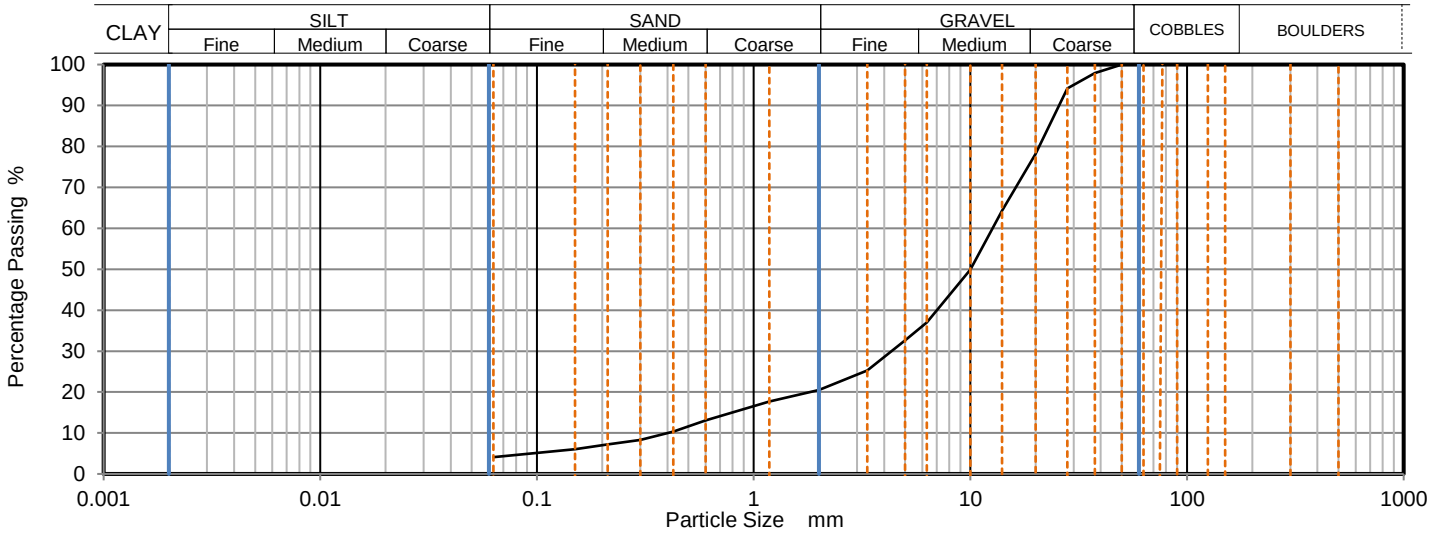
4041

Client:	Pick Everard	Client Reference:	240960
Client Address:	Halford House, Charles Street, Leicester, Leicestershire, LE1 1HA	Job Number:	24-041537-1
		Date Sampled:	22/08/2024
		Date Received:	27/08/2024
Contact:	Chandni Odedra	Date Tested:	21/09/2024
Site Address:	Bailey Bridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	313689	Depth Top [m]:	8.00
Hole No.:	BH101	Depth Base [m]:	Not Given
Sample Reference:	15	Sample Type:	B
Sample Description:	Greyish brown slightly sandy GRAVEL		
Sample Preparation:	Sample was quartered, oven dried at 106.1 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	98		
28	94		
20	78		
14	64		
10	50		
6.3	37		
5	33		
3.35	25		
2	21		
1.18	18		
0.6	13		
0.425	10		
0.3	8		
0.212	7		
0.15	6		
0.063	4		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	80.00
Sand	16.00
Fines <0.063 mm	4.00

Grading Analysis		
D100	mm	
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with ISO 17892 -4, by sieving on as received or wet sample

Remarks:

Signed: Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Date Reported: 30/09/2024

GF 366.11

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS EN ISO 17892-4:2016, BS 1377-2:2022 cl. 10

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

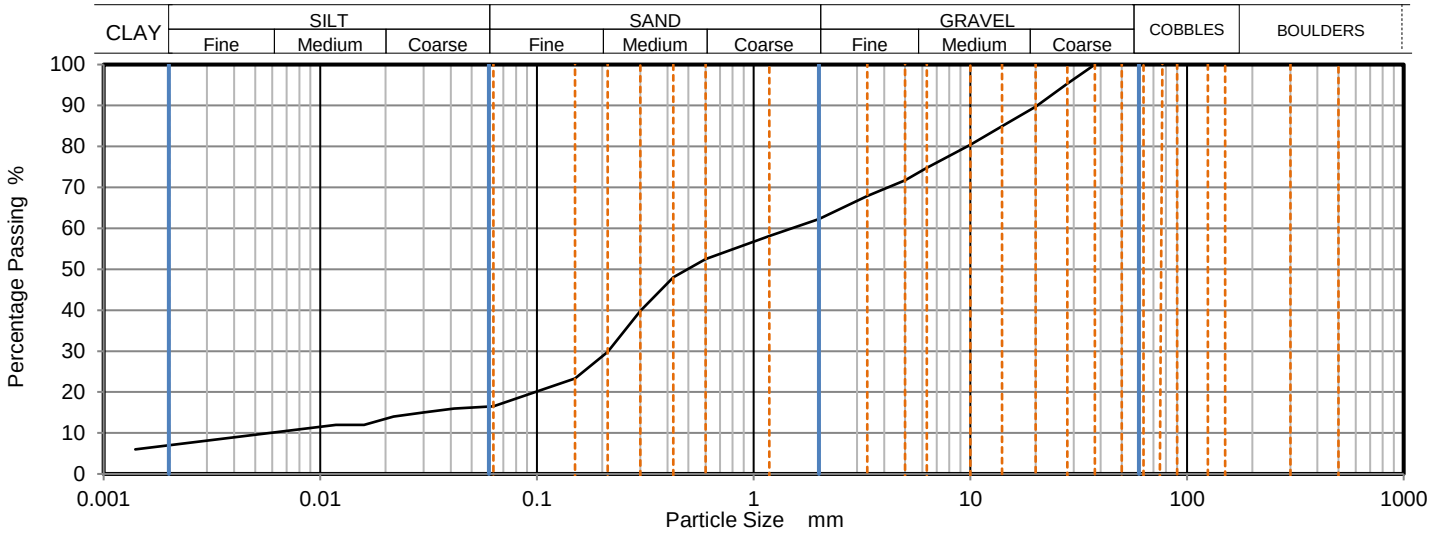
4041

Client:	Pick Everard	Client Reference:	240960
Client Address:	Halford House, Charles Street, Leicester, Leicestershire, LE1 1HA	Job Number:	24-041537-1
		Date Sampled:	23/08/2024
		Date Received:	27/08/2024
Contact:	Chandni Odedra	Date Tested:	21/09/2024
Site Address:	Bailey Bridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	313692	Depth Top [m]:	4.00
Hole No.:	BH102	Depth Base [m]:	Not Given
Sample Reference:	25	Sample Type:	B
Sample Description:	Dark brown very gravelly very sandy SILT		
Sample Preparation:	Sample was quartered, oven dried at 106.1 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0414	16
300	100	0.0301	15
150	100	0.0218	14
125	100	0.0159	12
90	100	0.0118	12
75	100	0.0014	6
63	100		
50	100		
37.5	100		
28	95		
20	90		
14	85		
10	80		
6.3	75		
5	72		
3.35	68		
2	62		
1.18	58		
0.6	53	Particle density	(assumed)
0.425	48	2.65	Mg/m3
0.3	40		
0.212	30		
0.15	23		
0.063	17		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	38.00
Sand	45.00
Silt	10.00
Clay	7.00

Grading Analysis		
D100	mm	37.5
D60	mm	1.5
D30	mm	0.213
D10	mm	0.00608
Uniformity Coefficient		250
Curvature Coefficient		5

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with ISO 17892 -4, by sieving and hydrometer sedimentation

Remarks:

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Signed: Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 30/09/2024

GF 366.11

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS EN ISO 17892-4:2016, BS 1377-2:2022 cl. 10

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

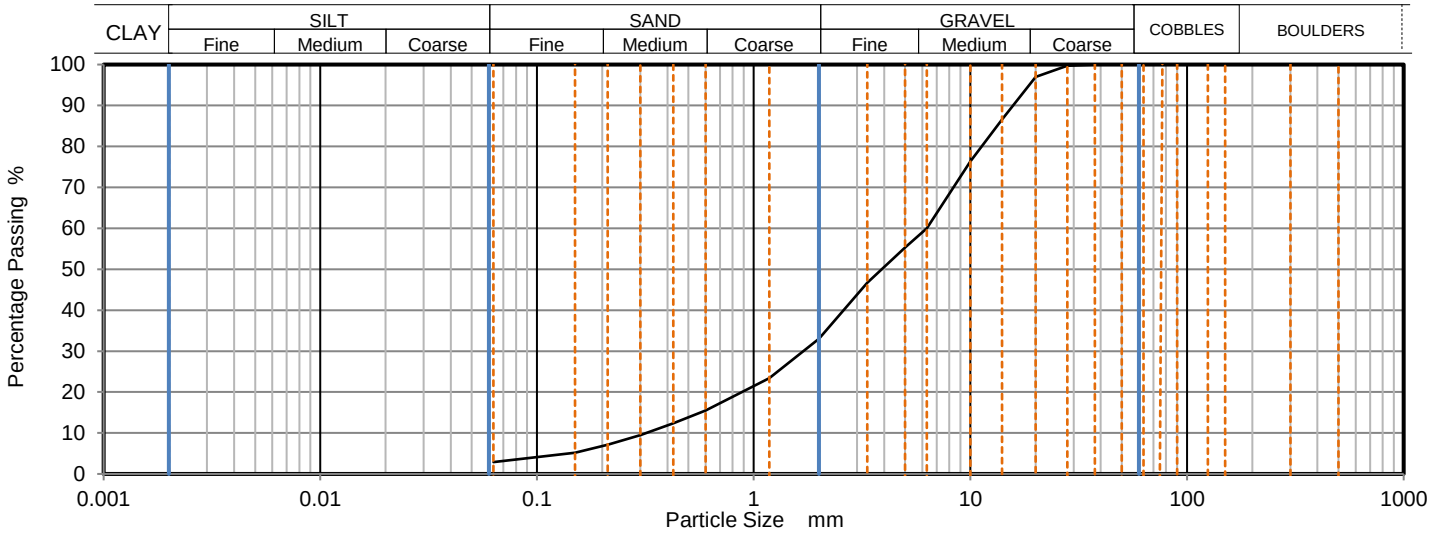
4041

Client:	Pick Everard	Client Reference:	240960
Client Address:	Halford House, Charles Street, Leicester, Leicestershire, LE1 1HA	Job Number:	24-041537-1
		Date Sampled:	23/08/2024
		Date Received:	27/08/2024
Contact:	Chandni Odedra	Date Tested:	21/09/2024
Site Address:	Bailey Bridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	313694	Depth Top [m]:	6.50
Hole No.:	BH102	Depth Base [m]:	Not Given
Sample Reference:	29	Sample Type:	B
Sample Description:	Dark brown sandy GRAVEL		
Sample Preparation:	Sample was quartered, oven dried at 106.1 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	97		
14	87		
10	76		
6.3	60		
5	55		
3.35	47		
2	33		
1.18	23		
0.6	16		
0.425	12		
0.3	10		
0.212	7		
0.15	5		
0.063	3		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	67.00
Sand	30.00
Fines <0.063 mm	3.00

Grading Analysis		
D100	mm	
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with ISO 17892 -4, by sieving on as received or wet sample

Remarks:

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Signed: Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 30/09/2024

GF 366.11

TEST CERTIFICATE

DIRECT SHEAR TEST USING THE SHEARBOX

Tested in Accordance with: BS EN ISO 17892-10:2018, BS 1377-2 Cl. 25.2:2022

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client:	Pick Everard	Client Reference:	240960
Client Address:	Halford House, Charles Street, Leicester, Leicestershire, LE1 1HA	Job Number:	24-041537-1
		Date Sampled:	23/08/2024
		Date Received:	27/08/2024
Contact:	Chandni Odedra	Date Tested:	23/09/2024
Site Address:	Bailey Bridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

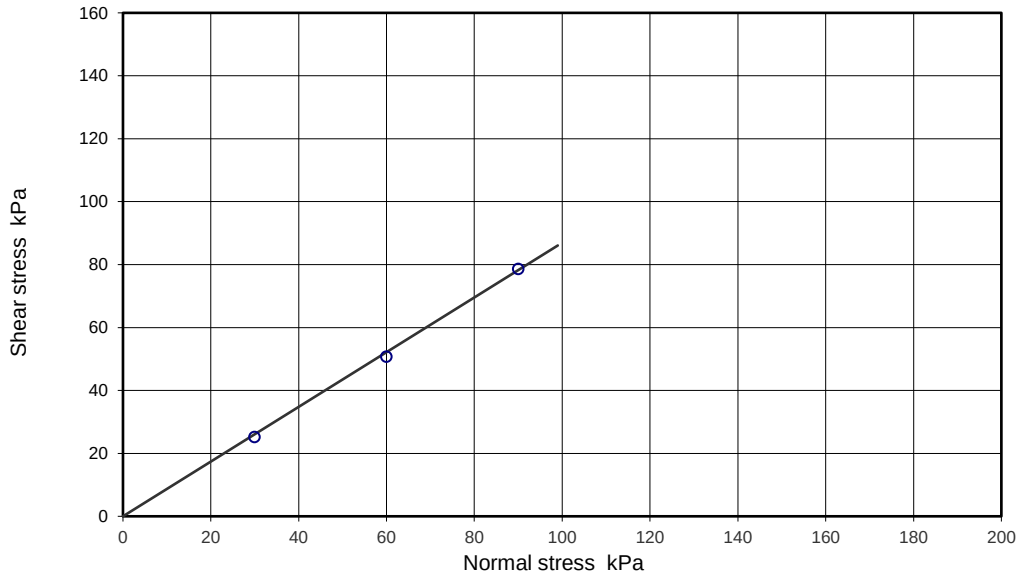
Laboratory Reference:	313691	Depth Top [m]:	3.00
Hole No.:	BH102	Depth Base [m]:	Not Given
Sample Reference:	23	Sample Type:	B
Sample Description:	Black very gravelly very sandy CLAY		
Preparation Details	Sample prepared from loose material		

Specimen Details	Test No.	1	2	3				
Initial	Height	20.1	20.1	20.1				mm
	Length	60.1	60.1	60.1				mm
	Breadth	60.1	60.1	60.1				mm
	Particle Density - (assumed)	2.65	2.65	2.65				Mg/m³
	Bulk Density	1.90	1.90	1.90				Mg/m³
	Water Content	21.4	21.4	21.4				%
	Dry density	1.57	1.57	1.57				Mg/m³
	Voids ratio	0.688	0.688	0.688				
	Degree of Saturation	82	82	82				%
Consolidation	Consolidation / Normal Stress applied	30	60	90				kPa
	Change in height during consolidation	0.432	0.775	1.030				mm
	Voids ratio after consolidation	0.652	0.623	0.602				
After test	Final Water content	25.3	23.4	22.7				%

Shearing stage(s)

Rate of displacement	Peak	0.01900	0.01900	0.01900				mm/min
	Residual							mm/min
Peak values, (o)	Relative horizontal displacement	3.31	3.79	5.96				mm
	Shear stress	25.2	50.7	78.6				kPa
	Vertical Movement at peak shear stress	0.51	0.92	1.41				mm
Residual values, (x)	No. of traverses (including peak run)	1	1	1				
	Relative horizontal displacement							mm
	Shear stress							kPa
	Vertical movement at residual shear stress							mm

Total test time 2 days



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	[-1.9]	0.00
Ø '	degrees	[41.5]	41.0

Residual strength, (x)

c 'R	kPa	not assessed	-
Ø 'R	degrees	not assessed	-

Remarks:

Signed: Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Date Reported: 30/09/2024

GF 442.5

TEST CERTIFICATE

DIRECT SHEAR TEST USING THE SHEARBOX

Tested in Accordance with: BS EN ISO 17892-10:2018, BS 1377-2 Cl. 25.2:2022

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

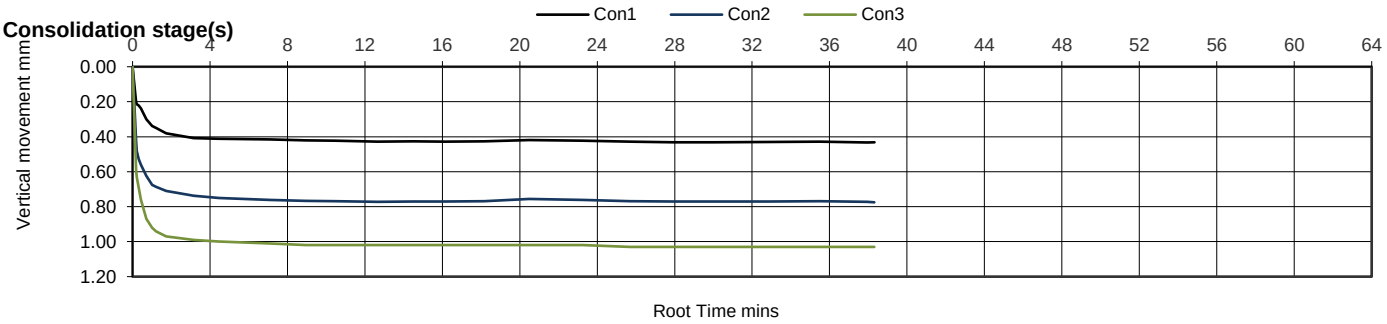
Client:	Pick Everard	Client Reference:	240960
Client Address:	Halford House, Charles Street, Leicester, Leicestershire, LE1 1HA	Job Number:	24-041537-1
		Date Sampled:	23/08/2024
		Date Received:	27/08/2024
Contact:	Chandni Odedra	Date Tested:	23/09/2024
Site Address:	Bailey Bridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

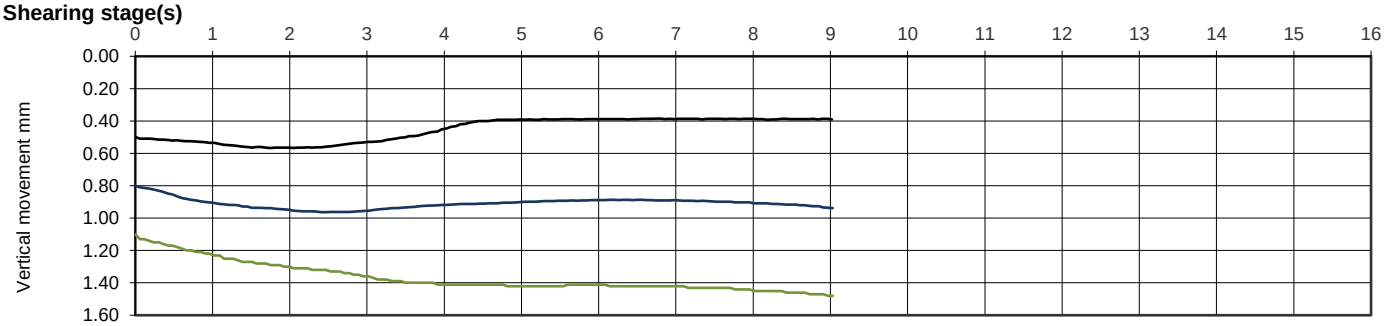
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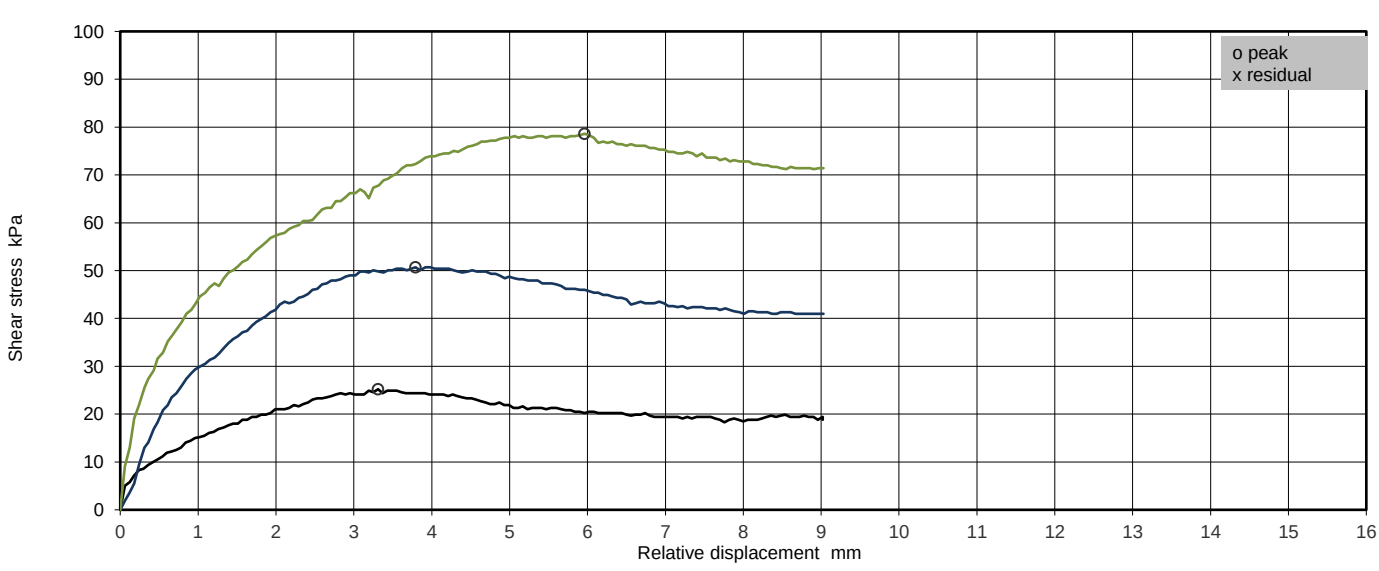
Laboratory Reference:	313691	Depth Top [m]:	3.00
Hole No.:	BH102	Depth Base [m]:	Not Given
Sample Reference:	23	Sample Type:	B
Sample Description:	Black very gravelly very sandy CLAY		

Consolidation stage(s)



Shearing stage(s)





Remarks:

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Signed: Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 30/09/2024

GF 442.5

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WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 24-041538

Project / Site name:	Bailey Bridge	**Samples received on:**	27/08/2024
Your job number:	240960	**Samples instructed on/ Analysis started on:**	10/09/2024
Your order number:	109379-240960	**Analysis completed by:**	19/09/2024
Report Issue Number:	1	**Report issued on:**	20/09/2024
Samples Analysed:	5 soil samples		

Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 24-041538
Project / Site name: Bailey Bridge
Your Order No: 109379-240960

Lab Sample Number				313700	313701	313702	313703	313704
Sample Reference				BH101	BH101	BH102	BH102	BH102
Sample Number				3	10	24	30	34
Depth (m)				1.20	4.00	3.00	6.50	9.50
Date Sampled				22/08/2024	22/08/2024	23/08/2024	23/08/2024	23/08/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	9.3	9.6	22.3
Moisture Content	%	0.01	NONE	17	22	12	20	10
Total mass of sample received	kg	0.1	NONE	0.5	0.5	0.3	0.5	0.5
General Inorganics								
pH (L099)	pH Units	N/A	MCERTS	7.9	7.7	8	7.8	6.7
Total Sulphate as SO_4	%	0.005	MCERTS	0.216	0.038	0.112	0.261	0.058
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1400	280	220	740	510
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	703	140	109	370	254
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	21	21	7.4	25	15
Total Sulphur	mg/kg	50	MCERTS	1700	270	680	4800	2000
Total Sulphur	%	0.005	MCERTS	0.17	0.027	0.068	0.476	0.201
Water Soluble Nitrate (2:1) as N	mg/kg	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Heavy Metals / Metalloids								
Magnesium (leachate equivalent)	mg/l	2.5	NONE	43	4.9	13	11	16
Magnesium (water soluble)	mg/kg	5	NONE	86	9.9	27	21	32

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 24-041538
Project / Site name: Bailey Bridge

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
313700	BH101	3	1.2	Brown clay and sand
313701	BH101	10	4	Brown clay and sand
313702	BH102	24	3	Brown sand with stones
313703	BH102	30	6.5	Brown sand with stones and glass
313704	BH102	34	9.5	Brown sand with stones

Analytical Report Number : 24-041538
Project / Site name: Bailey Bridge

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES	In-house method based on TRL 447	L038B	D	NONE
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES	In-house method	L038B	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser	In-house method	L082B	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099-PL	D	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Quality control parameter failure associated with individual result applies to calculated sum of individuals.
The result for sum should be interpreted with caution

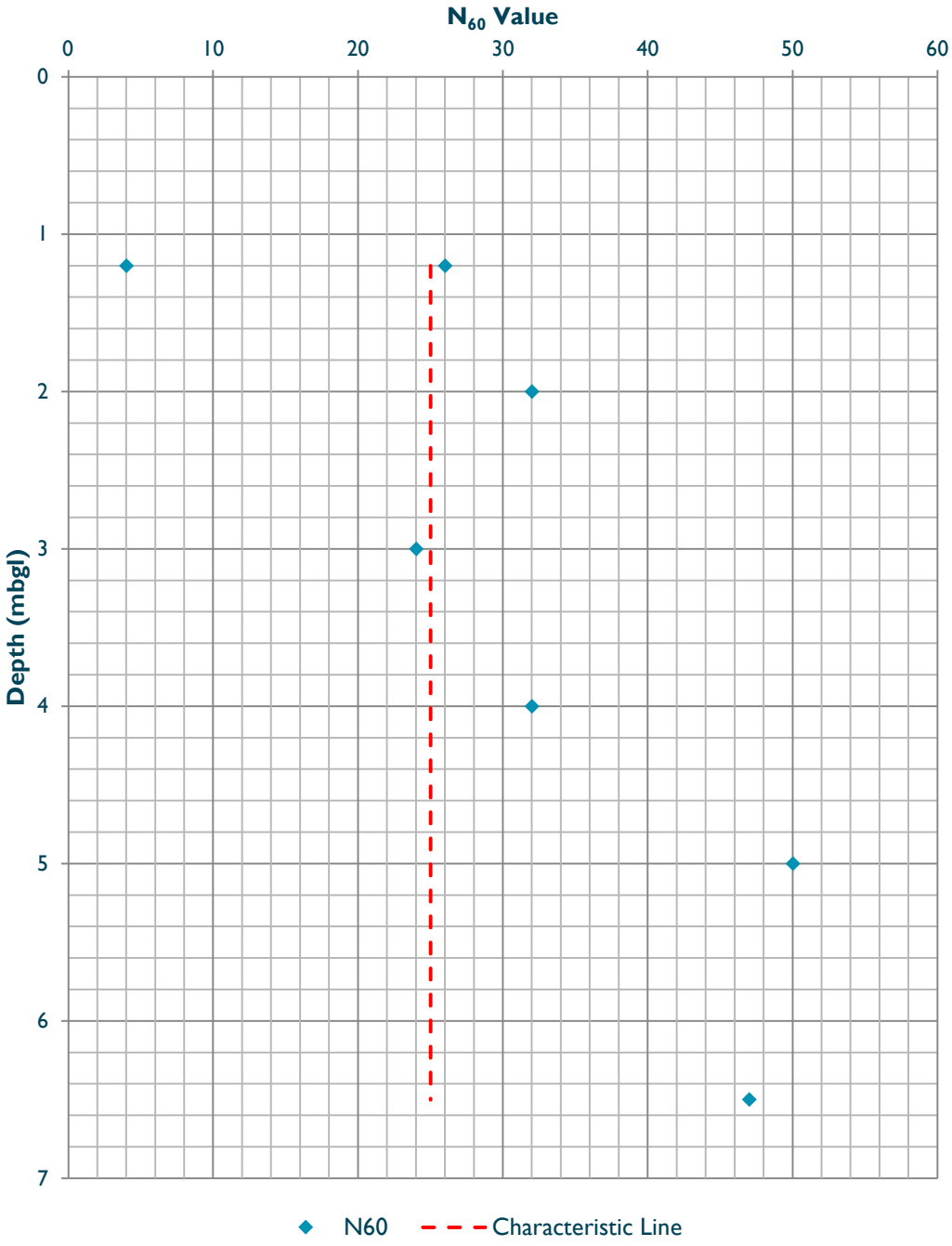
Appendix E – Geotechnical Data Plots

PICK EVERARD

SPT N_{60}

MG

Project:	Bailey Bridge Replacement 240960
Client:	Manchester City Council



Notes:

No. of tests: 7

Min Value: 4.00

Max Value: 50.00

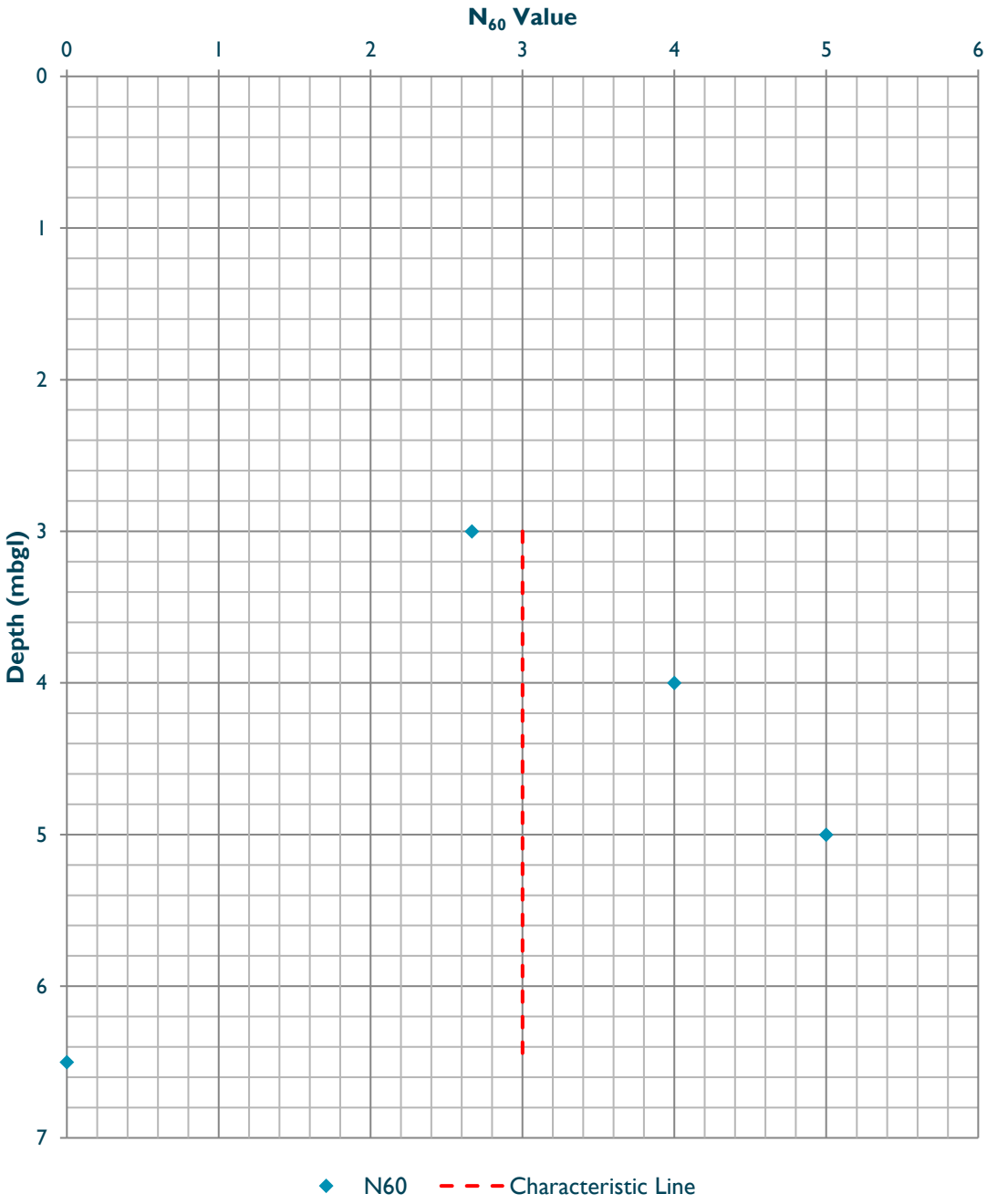
Plot No. 1

PICK EVERARD

SPT N_{60}

ALV

Project:	Bailey Bridge Replacement 240960
Client:	Manchester City Council



Notes:

No. of tests: 4

Min Value: 0.00

Max Value: 5.00

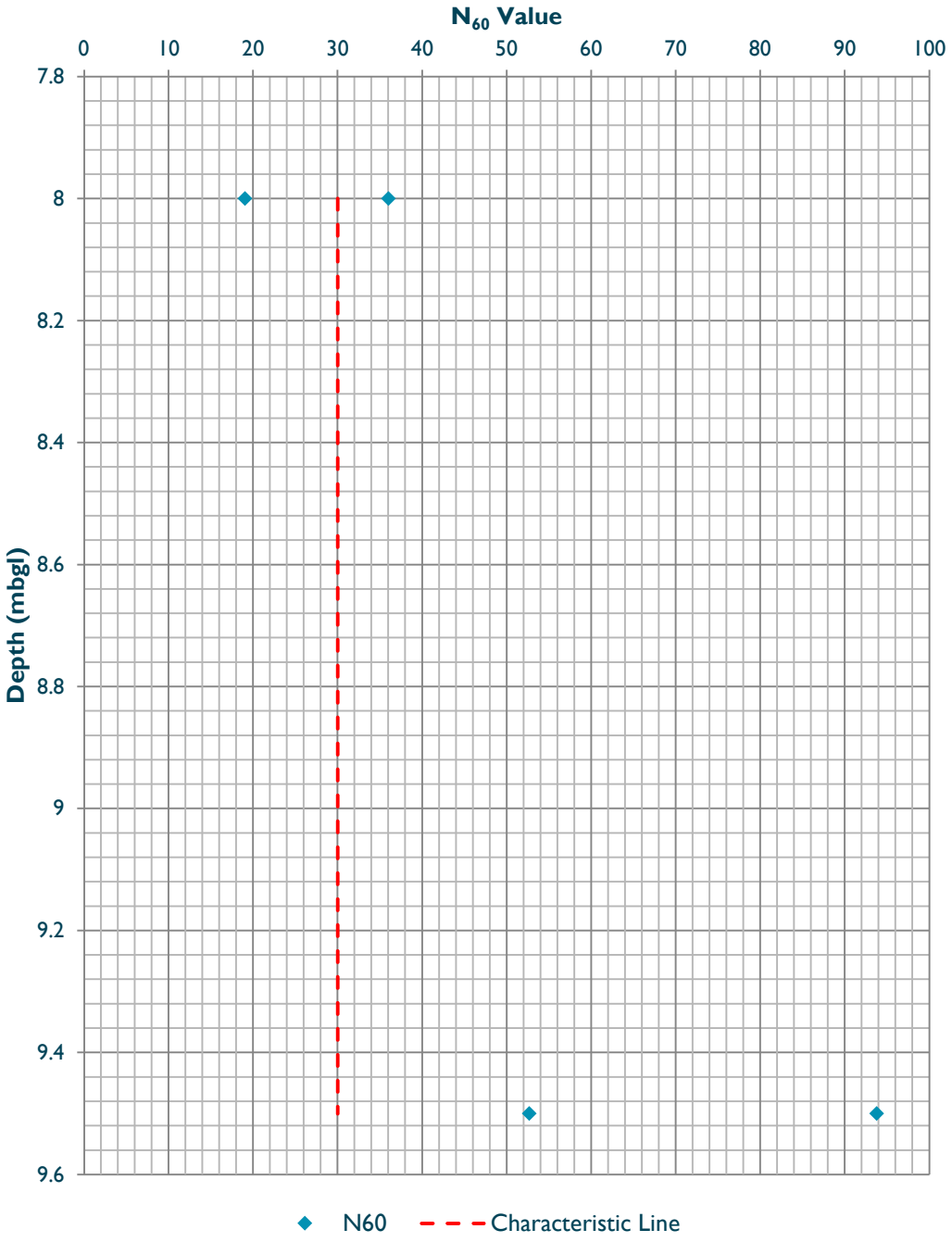
Plot No. **2**

PICK EVERARD

SPT N_{60}

RTDU

Project:	Bailey Bridge Replacement 240960
Client:	Manchester City Council



Notes:

No. of tests: 4

Min Value: 19.00

Max Value: 93.75

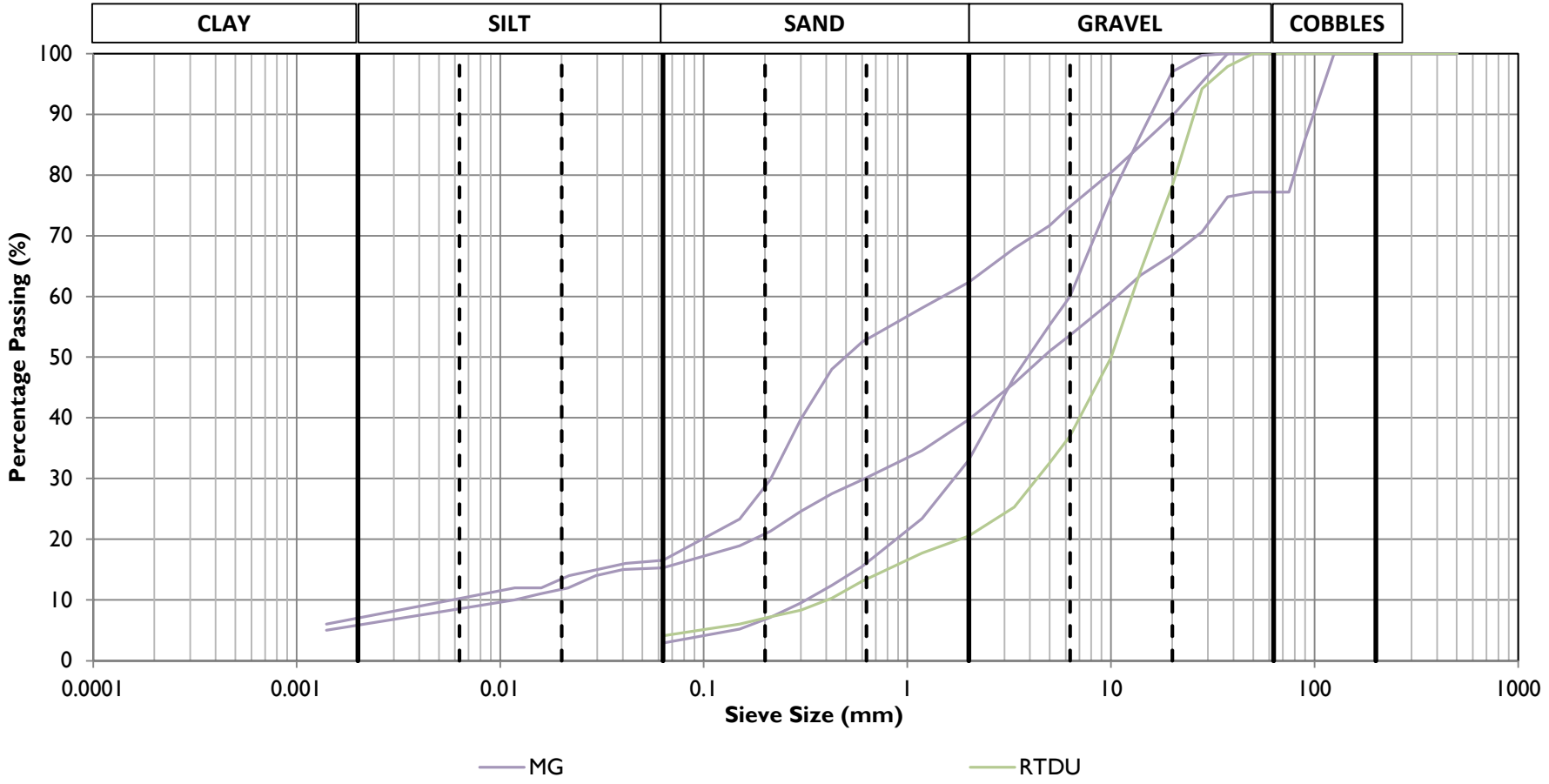
Plot No. **3**

PICK EVERARD

Particle Size Distribution

0

Project:	240960 Bailey Bridge Replacement
Client:	Manchester City Council



Notes:

Plot No.

6

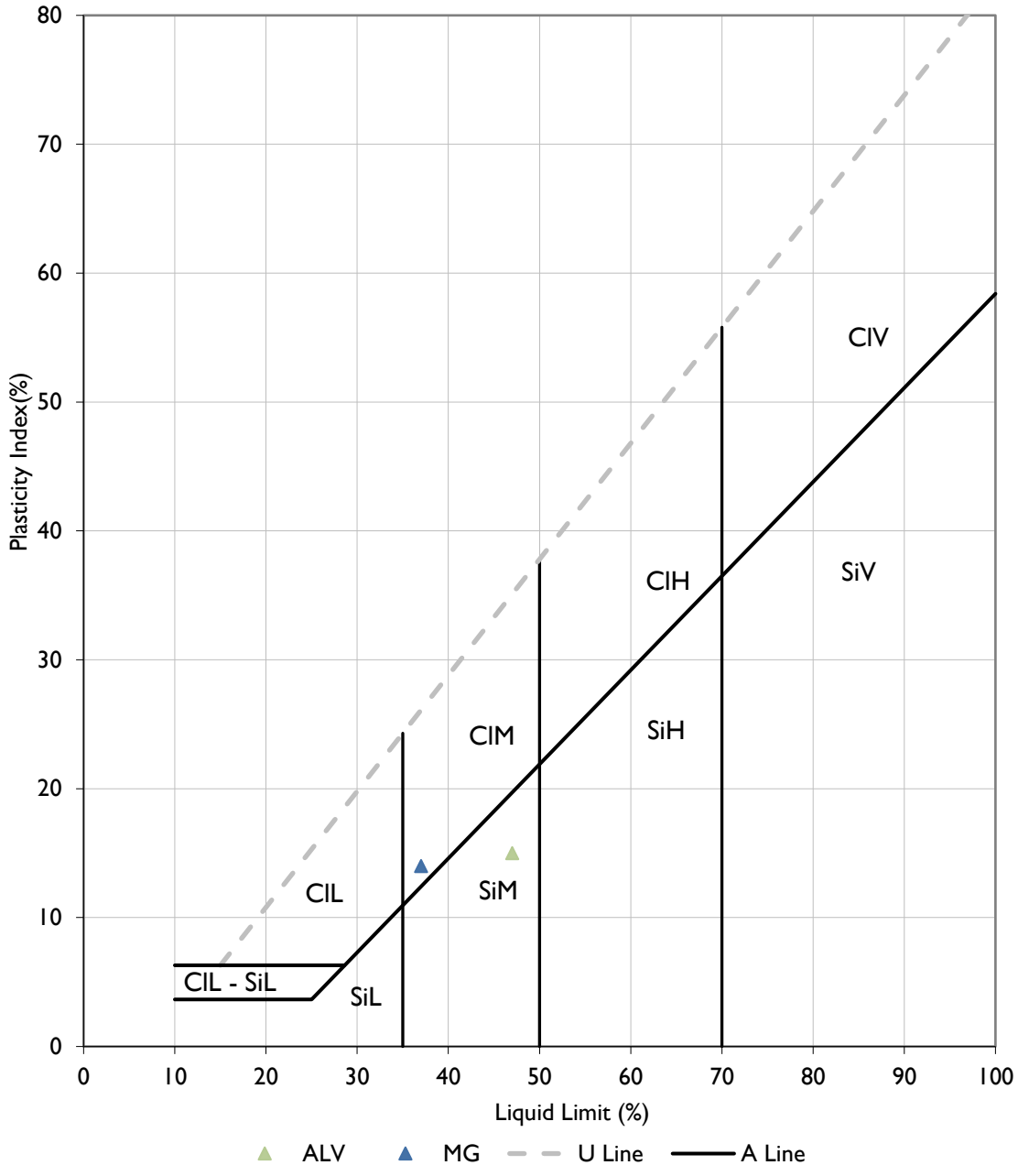
18/10/2024

PICK EVERARD

A Line

0

Project:	ailey Bridge Replaceme 240960
Client:	Manchester City Council



Notes: Plasticity Index not modified for % passing 425µm seive.

Plot No. 4

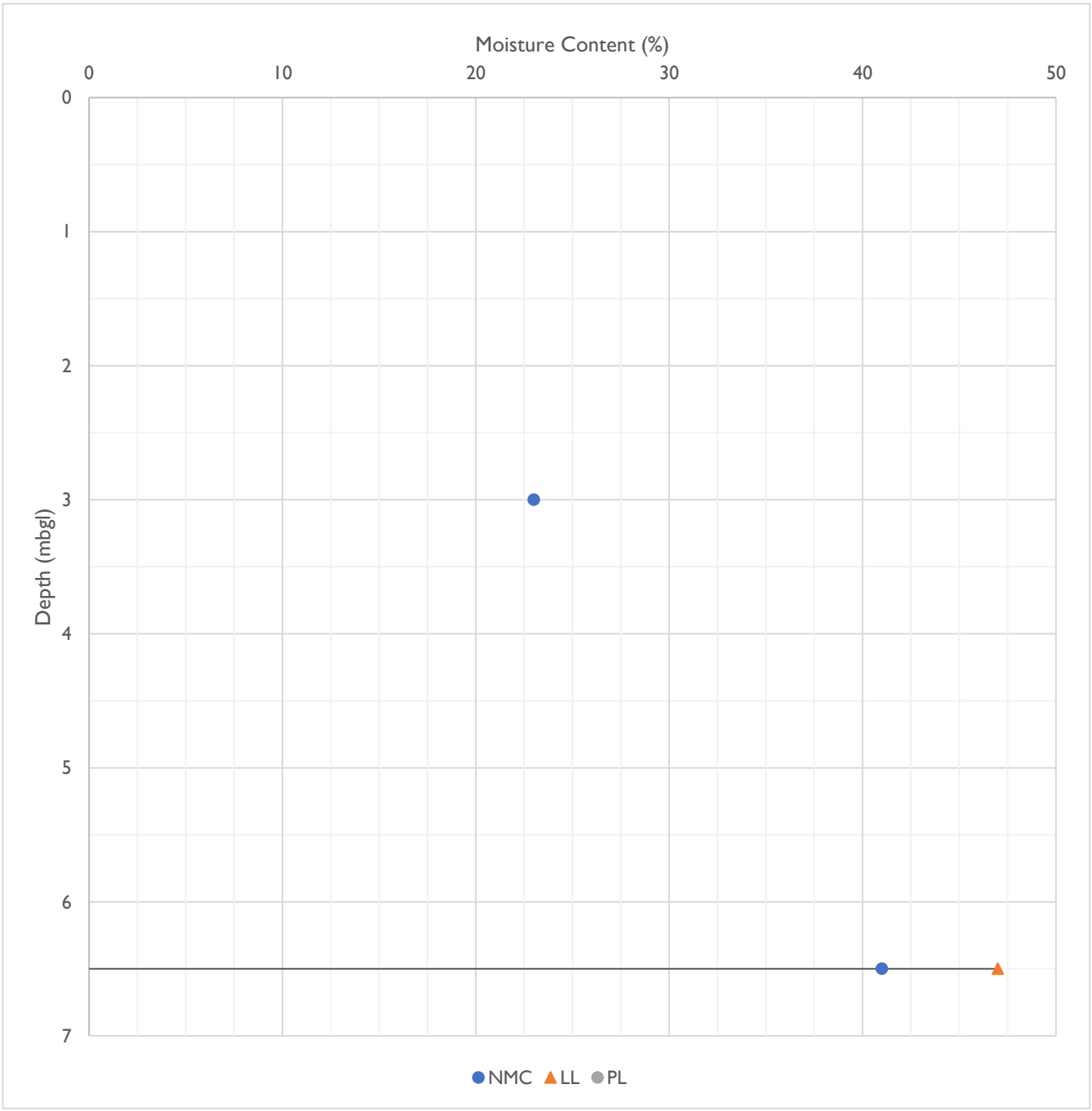
09/10/2024

PICK EVERARD

Atterberg Limits

ALV

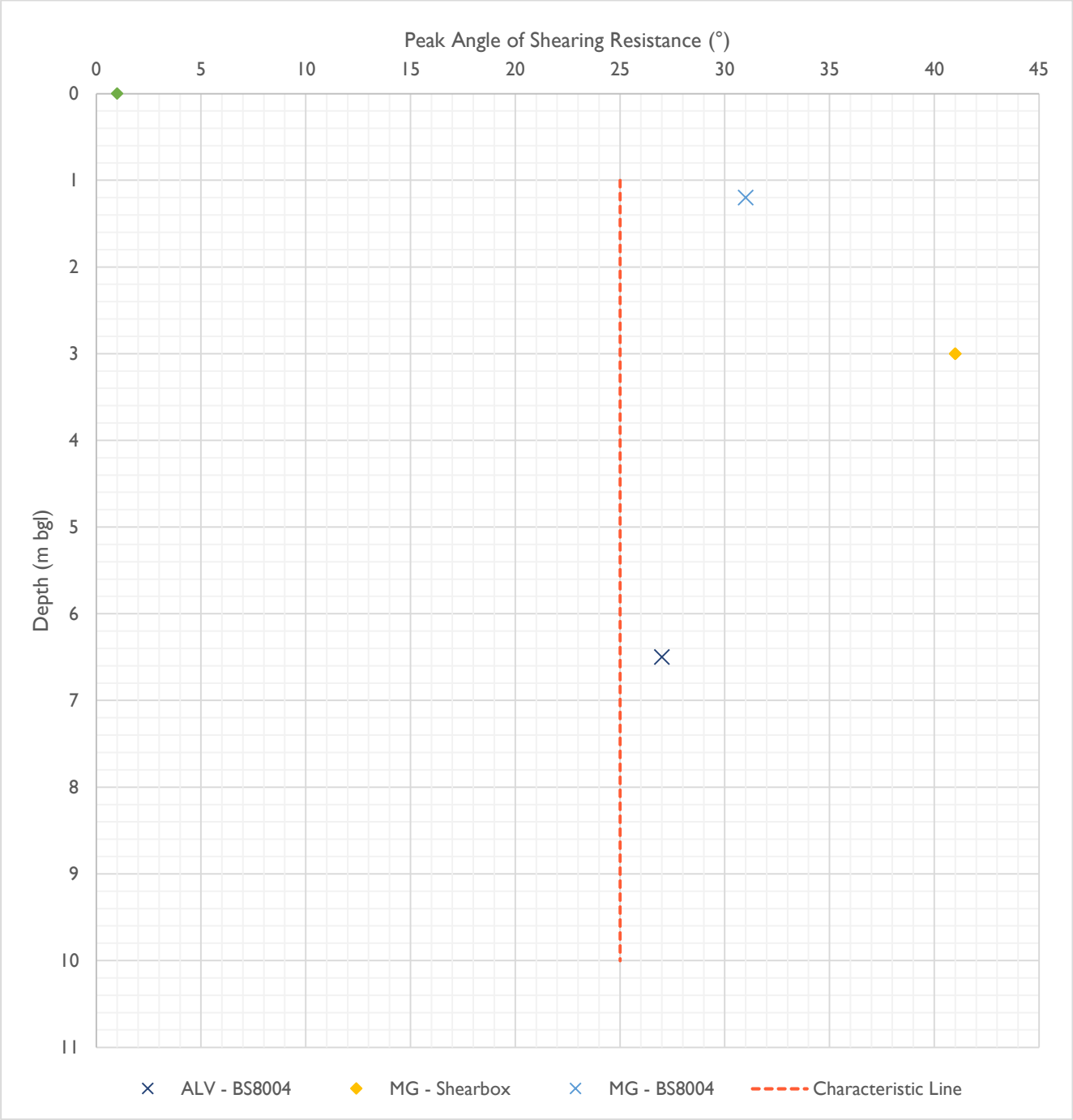
Project:	Bailey Bridge Replacement 240960
Client:	Manchester City Council



Notes:

Plot No. 5

PICK EVERARD	Peak Angle of Shearing Resistance	Project	Bailey Bridge Replacement 240960
		Client	Manchester City Council



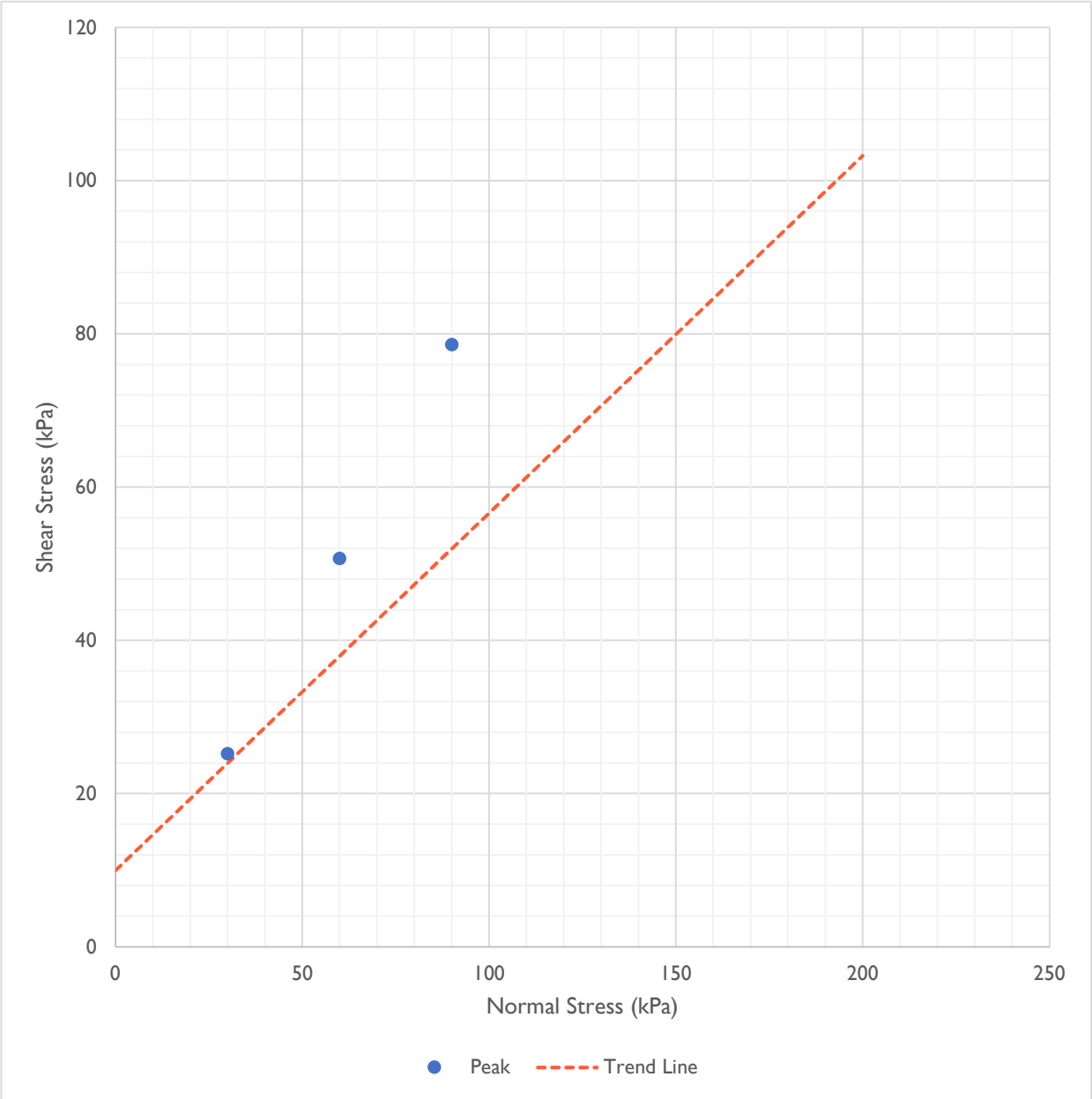
Notes:

Plot No. **7**

PICK EVERARD

Shearbox Test Results

Project	Bailey Bridge Replacement 240960
Client	Manchester City Council



Interpretation

C'	10	kPa
Internal Angle of Friction	25	°

Notes:

Plot No. **8**

18/10/2024

Appendix F – Geotechnical Risk Register

PICK EVERARD

Geotechnical Risk Register — Bailey Bridge — Ground Investigation Report

ID	Risk	Consequence	Pre-Mitigation P	Pre-Mitigation I	Pre-Mitigation Risk Rating	Mitigation	Post-mitigation P	Post-mitigation I	Post-mitigation Risk Rating	Comments
GT-001	Made Ground deeper than expected	Excessive settlements. Unsuitable bearing stratum for proposed infrastructure.	4	3	12	**Ground Investigation undertaken to identify Made Ground thickness at investigation location**. Design to consider risk on variable Made Ground thickness. Suitable construction control / supervision to be implemented to identify if assumptions are incorrect.	2	3	6	
GT-002	Groundwater shallower than expected.	Excavation instability. Groundwater not suitably considered in design calculations.	4	3	12	**Ground investigation undertaken to identify groundwater levels.** Design groundwater levels to follow British Standard / Eurocode guidance.	3	3	9	
GT-003	Groundwater rising shallower than expected.	Excavation instability. Groundwater not suitably considered in design calculations.	4	3	12	**Ground investigation undertaken to identify groundwater levels.** Design groundwater levels to follow British Standard / Eurocode guidance.	3	3	9	
GT-004	Groundwater above the abutments	Floatation risk.	4	3	12	**Ground investigation undertaken to identify groundwater strikes.** Design should consider the potential impact of uplift and floatation.	3	3	9	
GT-005	BRE SD1 Classification	Degradation of buried concrete over the design life of the works. Resulting failure of buried concrete elements.	3	4	12	**Ground investigation undertaken facilitating collection of soil samples to allow BRE SD1 classification.** Concrete mix design to consider BRE SD1 classification presented with the GIR.	2	4	8	
GT-006	Slope Stability	Excavation instability. Slope failure. Settlement. Unable to hold crane structures and other machinery.	3	4	12	**Ground investigation undertaken to identify design parameters to ensure slope failure does not occur.** Conservative assumptions to be made in the design. Suitable construction control / supervision to be implemented to identify if assumptions are incorrect.	2	4	8	
GT-007	Capacity of exisiting abutments	Unknown capacity resulting in failure. Excessive settlements. Unsuitable bearing stratum for proposed infrastructure.	3	4	12	**Ground investigation undertaken to identify the depth and dimensions of the abutments.** Conservative assumptions to be made in the design. Suitable construction control / supervision to be implemented to identify if assumptions are incorrect.	2	4	8	
GT-008	Groundwater above potential piles	Instability and potential floatation risk. Groundwater not suitably considered in design calculations.	3	4	12	**Ground investigation undertaken to identify groundwater strikes.** Design should consider the potential impact of uplift and floatation.	2	4	8	
GT-009	Flooding	Damage to structures.	3	4	12	Flood defence to be protected udring construction phase. Design to ensure no damage to exisiting flood defeces occur.	2	4	8	

Only mitigations in **bold** have been undertaken to date. Other mitigations are provided as recommendations for risk management at later design stages.

Appendix G – Assessment Criteria

SOIL - TIER ONE HUMAN HEALTH SCREENING VALUES

Status	End Use	Issue No	Issue Date
DRAFT	Commercial	1	04/07/16

Determinand	Units	SOIL ORGANIC MATTER			SOURCE
		1%	2.5%	6%	
pH		<5, >9			
Asbestos	%	Presence			
HEAVY METALS/METALLOIDS					
Arsenic	mg/kg	640			C4SL and CIEH/LQM S4ULs
Cadmium*	mg/kg	190			CIEH/LQM S4ULs
Chromium (III)	mg/kg	8,600			CIEH/LQM S4ULs
Chromium (VI)*	mg/kg	33			CIEH/LQM S4ULs
Lead*	mg/kg	2,300.00			C4SL
Mercury (Elemental)	mg/kg	58 ^{vap} (25.8)			CIEH/LQM S4ULs
Mercury (Inorganic)	mg/kg	1,100			CIEH/LQM S4ULs
Mercury (Methyl)	mg/kg	320			CIEH/LQM S4ULs
Nickel*	mg/kg	980			CIEH/LQM S4ULs
Selenium	mg/kg	12,000			CIEH/LQM S4ULs
Berylium	mg/kg	12			CIEH/LQM S4ULs
Boron	mg/kg	240,000			CIEH/LQM S4ULs
Vanadium	mg/kg	9,000			CIEH/LQM S4ULs
Copper	mg/kg	68,000			CIEH/LQM S4ULs
Zinc	mg/kg	730,000			CIEH/LQM S4ULs
GENERAL INORGANICS					
Easily Liberatable Cyanide (free)	mg/kg	36			Acute effects infant 1 dose 3g soil
US EPA PRIORITY PAHs					
Acenaphthene	mg/kg	84,000 (57.0)^{sol}	97,000 (141)^{sol}	100,000	CIEH/LQM S4ULs
Acenaphthylene	mg/kg	83,000 (86.1)^{sol}	97,000 (212)^{sol}	100,000	CIEH/LQM S4ULs
Anthracene	mg/kg	520,000	540,000	540,000	CIEH/LQM S4ULs
Benzo(a)Anthracene	mg/kg	170	170	180	CIEH/LQM S4ULs
Benzo(b)fluoranthene	mg/kg	44	44	45	CIEH/LQM S4ULs
Benzo(k)fluoranthene	mg/kg	1,200	1,200	1,200	CIEH/LQM S4ULs
Benzo(g,h,i)perylene	mg/kg	3,900	4,000	4,000	CIEH/LQM S4ULs
Benzo(a)Pyrene*	mg/kg	35	35	36	CIEH/LQM S4ULs
Chrysene	mg/kg	350	350	350	CIEH/LQM S4ULs
Di-benzo(a,h)anthracene	mg/kg	3.5	3.6	3.6	CIEH/LQM S4ULs
Fluoranthene	mg/kg	23,000	23,000	23,000	CIEH/LQM S4ULs
Fluorene	mg/kg	63000 (30.9)sol	68,000	71,000	CIEH/LQM S4ULs
Indeno(1,2,3-cd)pyrene	mg/kg	500	510	510	CIEH/LQM S4ULs
Naphthalene	mg/kg	190 (76.4)sol	460 (183)sol	1100 (432)sol	CIEH/LQM S4ULs
Phenanthrene	mg/kg	22,000	22,000	23,000	CIEH/LQM S4ULs
Pyrene	mg/kg	54,000	54,000	54,000	CIEH/LQM S4ULs
Coal Tar (Bap as surrogate marker)	mg/kg	15	15	15	CIEH/LQM S4ULs
Chlorinated Solvents					
1,2-Dichloroethane (1,2 DCA)	mg/kg	0.67	0.97	1.7	CIEH/LQM S4ULs
1,1,1-Trichloroethane (1,1,1 TCA)	mg/kg	660	1,300	3,000	CIEH/LQM S4ULs
1,1,1,2-Tetrachloroethane (1,1,1,2 PCA)	mg/kg	110	250	560	CIEH/LQM S4ULs
1,1,2,2-Tetrachloroethane (1,1,2,2 PCA)	mg/kg	270	550	1,100	CIEH/LQM S4ULs
Tetrachloroethene (PCE)	mg/kg	19	42	95	CIEH/LQM S4ULs
Tetrachloromethane (Carbon Tetrachloride)	mg/kg	2.9	6.3	14	CIEH/LQM S4ULs
Trichloroethene (TCE)	mg/kg	1.2	2.6	5.7	CIEH/LQM S4ULs
Trichloromethane (Chloroform)	mg/kg	99	170	350	CIEH/LQM S4ULs
Vinyl Chloride (VC)	mg/kg	0.059	0.077	0.12	CIEH/LQM S4ULs
Phenolics					
Phenol	mg/kg	440^{dir} (26,000)	690^{dir} (30,000)	1,300^{dir} (34,000)	CIEH/LQM S4ULs
TPH					
TPH Aliphatic >C5-6	mg/kg	3,200 (304)^{sol}	5,900 (558)^{sol}	12,000 (1,150)^{sol}	CIEH/LQM S4ULs
TPH Aliphatic >C6-8	mg/kg	7,800 (144)^{sol}	17,000 (322)^{sol}	40,000 (736)^{sol}	CIEH/LQM S4ULs
TPH Aliphatic >C8-10	mg/kg	2,000 (78)^{sol}	4,800 (190)^{vap}	11,000 (451)^{vap}	CIEH/LQM S4ULs
TPH Aliphatic >C10-12	mg/kg	9,700 (48)^{sol}	23,000 (118)^{vap}	47,000 (283)^{vap}	CIEH/LQM S4ULs
TPH Aliphatic >C12-16	mg/kg	59,000 (24)^{sol}	82,000 (59)^{sol}	90,000 (142)^{sol}	CIEH/LQM S4ULs
TPH Aliphatic >C16-35	mg/kg	1,600,000	1,700,000	1,800,000	CIEH/LQM S4ULs
TPH Aliphatic >C35-44	mg/kg	1,600,000	1,700,000	1,800,000	CIEH/LQM S4ULs
TPH Aromatic >EC5-7 (Benzene)*	mg/kg	26,000 (1,220)^{sol}	46,000 (2,260)^{sol}	86,000 (4,710)^{sol}	CIEH/LQM S4ULs
TPH Aromatic >EC7-8	mg/kg	56,000 (869)^{vap}	110,000 (1,320)^{sol}	180,000 (4,360)^{vap}	CIEH/LQM S4ULs
TPH Aromatic >EC8-10	mg/kg	3,500 (613)^{vap}	8,100 (1,500)^{vap}	17,000 (3,580)^{vap}	CIEH/LQM S4ULs
TPH Aromatic >EC10-12	mg/kg	16,000 (364)^{sol}	28,000 (899)^{sol}	34,000 (2,150)^{sol}	CIEH/LQM S4ULs
TPH Aromatic >EC12-16	mg/kg	36,000 (169)^{sol}	37,000	38,000	CIEH/LQM S4ULs
TPH Aromatic >EC16-21	mg/kg	28,000	28,000	28,000	CIEH/LQM S4ULs
TPH Aromatic >EC21-35	mg/kg	28,000	28,000	28,000	CIEH/LQM S4ULs
TPH Aromatic >EC35-44	mg/kg	28,000	28,000	28,000	CIEH/LQM S4ULs
TPH Aliphatic & Aromatic >EC44-70	mg/kg	28,000	28,000	28,000	CIEH/LQM S4ULs
Total TPH	mg/kg	**No Sum**	**No Sum**	**No Sum**	
BTEX					
Benzene*	mg/kg	27	47	70	CIEH/LQM S4ULs
Toluene	mg/kg	56,000^{vap} (869)	110,000^{vap} (1,920)	180,000^{vap} (4,360)	CIEH/LQM S4ULs
Ethylbenzene	mg/kg	5,700^{vap} (518)	13,000^{vap} (1,220)	27,000^{vap} (2,840)	CIEH/LQM S4ULs
m-Xylene	mg/kg	6,200^{vap} (625)	14,000^{vap} (1,470)	31,000^{vap} (3,460)	CIEH/LQM S4ULs
o-Xylene	mg/kg	6,600^{sol} (478)	15,000^{sol} (1,120)	33,000^{sol} (2,620)	CIEH/LQM S4ULs
p-Xylene	mg/kg	5,900^{sol} (576)	14,000^{sol} (1,350)	30,000^{sol} (3,170)	CIEH/LQM S4ULs
Xylenes (mixed isomers)	mg/kg	5,900^{sol} (576)	14,000^{sol} (1,350)	30,000^{sol} (3,170)	CIEH/LQM S4ULs

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