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Port Street

Environmental Impact Assessment (EIA)

Screening and Scoping Report

October 2021

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1. Introduction

1.1. This Environmental Impact Assessment (EIA) Screening and Scoping report has been prepared in respect of the proposals for the development of Port Street ('The Site') as identified within the Piccadilly Basin Strategic Regeneration Framework (SRF). The Site is located within Manchester City Centre and is bounded by Great Ancoats Street to the north, Brownsfield Mill and a surface car park to the east, a surface car park to the south and Port Street to the west.

1.2. Select Property Group ('The Applicant') will be submitting an applicant for Full Planning Permission to deliver a residential-led development with ground floor commercial uses, car and cycle parking and public realm. The term "Proposed Development" used within this Report refers to all stages of construction and operation of the development.

1.3. This Screening and Scoping Report is submitted to Manchester City Council as a request for a Scoping Opinion under Regulation 15 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017.

1.4. In accordance with Regulation 15, paragraph 2(a), this report contains:

- A plan sufficient to identify the land enclosed at Appendix 1.
- A brief description of the nature and purpose of the Proposed Development and of its possible effects on the environment.
- An explanation of the likely significant effects of the development on the environment.

EIA Requirements

1.5. The EIA process is the mechanism by which development proposals are appraised in relation to the environmental criteria as well as socio-economic, engineering and technical considerations. The EIA process defines the context of the Proposed Development and examines the issues considered pertinent.

1.6. The purpose of the EIA is to establish both the nature of the Proposed Development and the environment within which it is likely to take place in order to identify likely significant effects on the environment that may arise. This is also undertaken by comparing the existing situation at the start of the work (baseline) with the situation once the Proposed Development is in place.

1.7. The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 require that any proposed development falling within the description of a 'Schedule 2 development' within the meaning of the Regulations, will be subject to an EIA where such development is likely to have 'significant' effects on the environment by virtue of such factors as its nature, size or location (Reuglation 4(2)).

1.8. The Proposed Development falls under the category of "Infrastructure Projects – Urban Development Projects" (Schedule 2, 10, (b)) as described in the Regulations. The applicable threshold above which EIA is likely to be required for a site of over 5 hectare (ha) or if the development includes more than 150 dwellings. The indicative thresholds and criteria state that:

"In addition to the physical scale of such developments, consideration should be given to the potential increase in traffic, emissions and noise. EIA is unlikely to be required for the redevelopment of land unless the new development is on a significantly greater scale than the previous use, or the types of impact are of a markedly different nature or there is a high level of contamination."

1.9. The Proposed Development will deliver up to 500 residential dwellings within an up to 35 storeys building with associated residential amenity space, 500 sq.m of ground floor commercial space alongside associated landscaping, public realm, boundary treatment, car parking and cycle parking. Therefore, it is considered the proposals exceed the applicable Schedule 2 thresholds as outlined above, indicating that an EIA is more likely to be required.

1.10. Given the nature of the Proposed Development, an EIA is considered appropriate to test the likely significant effects of the Proposed Development. The Applicant therefore proposes to submit an Environmental Statement (in relation to certain topic areas where there is likely to be a significant effect of the environment) in support of the planning application.

Purpose of the Scoping Report

1.11. The process of identifying likely significant effects on the environment which should be addressed by the EIA is termed 'scoping' and the results are presented as a Scoping Report.

1.12. This Scoping Report sets out the framework within which the Environmental Statement ('ES') will be produced and the topic areas and information that will be contained within the document. It is issued to Manchester City Council ('MCC') as the Local Planning Authority ('LPA') for circulation to Statutory Consultees and other organisations who are invited to express their views on the proposed scope of the EIA, or suggest additional issues which may be considered to be of significance. The views expressed by Statutory Consultees will then be used by the LPA to inform the formal Scoping Opinion.

1.13. The LPA is required to respond to a formal request for a Scoping Opinion within five weeks of registering receipt.

1.14. Should the proposed scope of the EIA be accepted by the LPA, the intention would be that any future application relating to the Proposed Development would be accompanied by an EIA which would be produced by the team as set out in Table 1 and coordinated by Deloitte Real Estate (IEMA EIA Quality Mark registered). The consultants have provided technical input to this initial EIA Scoping Report.

Note: although Deloitte has read the input of Select Property Group, SimpsonHaugh, Hoare Lee, Salford Archaeology, WSP, Penny Anderson, Enfusion, Stephen Levrant: Heritage Architecture, Fisher Acoustics, Amion, GIA, Re-Form and Curtins (together "the Consultant Inputs") for consistency and provide observations based on our knowledge and experience, we accept no liability or responsibility for the Consultant's Inputs and will not be responsible for the technical content.

Table 1.1 EIA Project Team

Topic	Assessment carried out by	Qualifications
The Applicant	Select Property Group	N/A
Town Planning, EIA Coordination	Deloitte	RTPI/ RICS, IEMA EIA Quality Mark
Architect	Simpson Haugh	RIBA
Air Quality	Hoare Lee	
Archaeology	Salford Archaeology	BA, MA, CIfA
Climate Change	WSP	BSc, BArcch, MSC, Qualified BREEAM Assessor, CIBSE Affiliate Member, BREEAM AP, CEnv.
Ecology	Penny Anderson	
Ground Conditions	WSP	MSc, BSc (Hons), CGeol, FGS
Human Health	Enfusion	BSc, MSc, CEnv, FIEMA

Topic	Assessment carried out by	Qualifications
Heritage	Stephen Levrant: Heritage Architecture	BA(Hons), MA, MSc, IHBC
Noise and Vibration	Fisher Acoustics	BEng(Hons) CEng MIOA
Socio-Economic	Amion	
Sunlight, Daylight and Overshadowing	GIA	MSc
Townscape and Visual Impact	Re-Form	BA (Hons), BSc (Hons), MA, BLA, CMLI, MA
Traffic and Transport	Curtins	BSc, MSc, FCIHT, TPP
Water Resources	WSP	
Wind	GIA	MEng, CEng, FICE

1.15. Section 2 of this report provides a site description and outlines the nature of the Proposed Development. Section 3 sets out the proposed scope and structure of that an ES would take and who might need to be consulted. Section 4 provides details of the proposed EIA methodology, which would be used in assessing the Proposed Development. Section 5 sets out the key issues that would be addressed by the EIA.

2. Site Description and Proposed Development

Site Description

2.1. The Proposed Development Site ("the Site") is located on the corner of Great Ancoats Street and Port Street and is within the neighbourhood of Ancoats on the northern part of Manchester City Centre.

2.2. The Site extends to approximately 0.48 hectares (4845 sqm) and is bound by Great Ancoats Street to the north, Brownsfield Mill and a surface car park to the east, surface car park to the south and Port Street to the west.

2.3. The Site is comprised of a surface level car park of low-quality hardstanding. The site levels drop by circa 2m from the northern and western boundaries to a lower level which also forms part of the car park. There is no vegetation on site. The Site can be accessed by foot or on vehicle by using the car park entrances on Port Street.

2.4. There are a mixture of uses surrounding the Site. Immediately to the west of the Site there is The Astley, Oxid House and The Wentwood which are mid to high rise apartment buildings with some ground floor commercial frontages as well as a surface level car park. To the north of the Site, across Great Ancoats Street is the heart of Ancoats, this is a newly regenerated area of Manchester containing a mixture of mid-rise developments including residential and commercial uses. To the east of the Site is Brownsfield Mill, a Grade II* Listed mill building which has been recently refurbished to create new apartments and the Rochdale Canal. To the south of the Site is a number of mid to high-rise development comprising a residential use and sit within the centre of the Piccadilly Basin.

2.5. A Site location plan is provided at Appendix 1.

Site Specific Environmental Designations

Air Quality

2.6. The Site is located within the Greater Manchester Air Quality Management Area.

Ecology

2.7. There are no statutory designated sites for nature conservation within or immediately adjacent to the Site. The Site and adjacent land is not identified as a Priority Habitat.

2.8. The Site lies within 4.9 km to Rochdale Canal Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI), 6.3 km of the Hollinwood Branch Canal SSSI and 8.7km Huddersfield Narrow Canal SSSI. The Site lies within the SSSI Impact Risk Zones for the above sites. The development proposals do not meet SSSI Impact Risk Zone criteria for which the LPA must consult with Natural England.

2.9. The Rochdale Canal is located 48m south of the Site; however, the section of the canal that is designated as a Special Area of Conservation (SAC) is located 4.9km from the Site. Due to this designation the canal is an offsite ecological receptor along with two Sites of Biological Interest (SBI) – Rochdale Canal: Stott's Lane – Ducie Street Basin 48m south of the Site and Ashton Canal (West) located 238m south. Offsite ecological receptor adverse impacts on the SAC and two SBIs can be prevented through the implementation of a CMP resulting in no significant adverse impacts to the receptors.

Flood Risk and Drainage

2.10. According to the Environment Agency Flood Map, the Site is located within Flood Zone 1 which is defined as land having less than 1 in 1,000 annual probability of river or sea flooding. The Rochdale Canal is located circa 50m southeast of the Site, behind Brownsfield Mill. The Site also falls within the Conurbation Core Critical Drainage Area in the Salford and Trafford Critical Drainage Area (CDA), designated in 2011.

Heritage

2.11. The Site is not located within a Conservation Area and there are no Listed Buildings within the Site. The Site is located adjacent to the Ancoats Conservation Area to the north and the Stevenson Square Conservation Area is located circa 90m southwest of the Site. There are 50 Grade II and II* Listed Buildings and Structures within a 250m radius of the Site. The nearest Listed Buildings are listed below:

- Grade II* Listed Brownsfield Mill (adjacent to Site on eastern boundary)
- Grade II* Former Rochdale Canal Warehouse (circa 40m south)
- Grade II Listed Rochdale canal towpath footbridge and associated ramps opposite Brownsfield Mill (circa 45m east)
- Grade II Listed Rochdale Canal lock number 82, to east of Great Ancoats Street (circa 55m north)
- Grade II Listed Rochdale Canal lock number 83, to the east of Tariff Street (circa 70m south)
- Grade II Listed 72-76, Newton Street (circa 55m west)

2.12. A list of the Grade II* Listed Buildings and Structures is provided below:

- Grade II* Decker Old Mill (circa 185m north)
- Grade II* New Mill (circa 205m north)
- Grade II* Royal Mill (circa 95 north)
- Grade II* Dale Warehouse (circa 215m south)
- Grade II* Paragon Mill (circa 130m north)

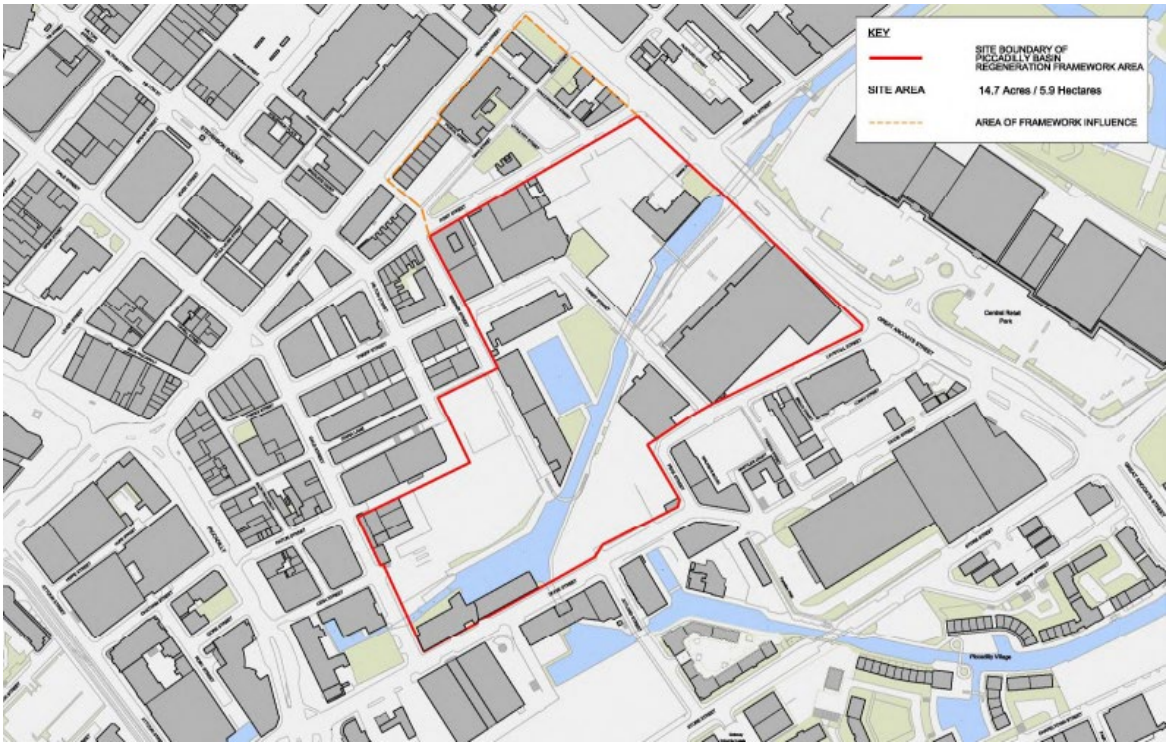
Site Context

2.13. The Site is located within the Piccadilly Ward and sits on the Piccadilly Basin. This area of Manchester falls within the study area of multiple strategic regeneration frameworks (SRF's) that have been created to develop a vision and strategy that will guide the regeneration of these areas. These include the HS2 Piccadilly SRF (March 2014), Piccadilly Basin SRF (October 2016), Portugal Street East SRF (2017) and Manchester Piccadilly SRF (March 2018).

2.14. The 2014 HS2 SRF provides high level proposals for the area surrounding the Piccadilly station that has stemmed from the arrival of HS2 into Manchester. This was later refreshed by the 2018 Manchester Piccadilly SRF which builds on the principles established in 2014 but has incorporated a number of changes and refinements to reflect investable changes in the market and overall vision for HS2. The Piccadilly Basin falls within the Manchester Piccadilly SRF and supports the objective to: "reinforce the grain, acknowledging the scale of neighbouring city blocks and reinvigorating connections that existed in the past. The use mix in this area would be governed by demand but a variety of residential development, focused on the canal basins, would be encouraged. Opportunity to invigorate this very under used section of the canal network and improve the pedestrian connection between the Ashton and Rochdale canals."

2.15. The Piccadilly Basin SRF relates to a 5.9ha site situated at the north eastern part of Manchester City Centre and is identified within Figure 2.1 below. The framework envisions Piccadilly Basin as an area that presents the opportunity to create a well-connected neighbourhood community with a mix of office, residential, retail and leisure and has the potential to develop a strong identity due to the presence of the Rochdale Canal and a number of historical assets.

Figure 2.1 Piccadilly Strategic Regeneration Framework Area, 2016

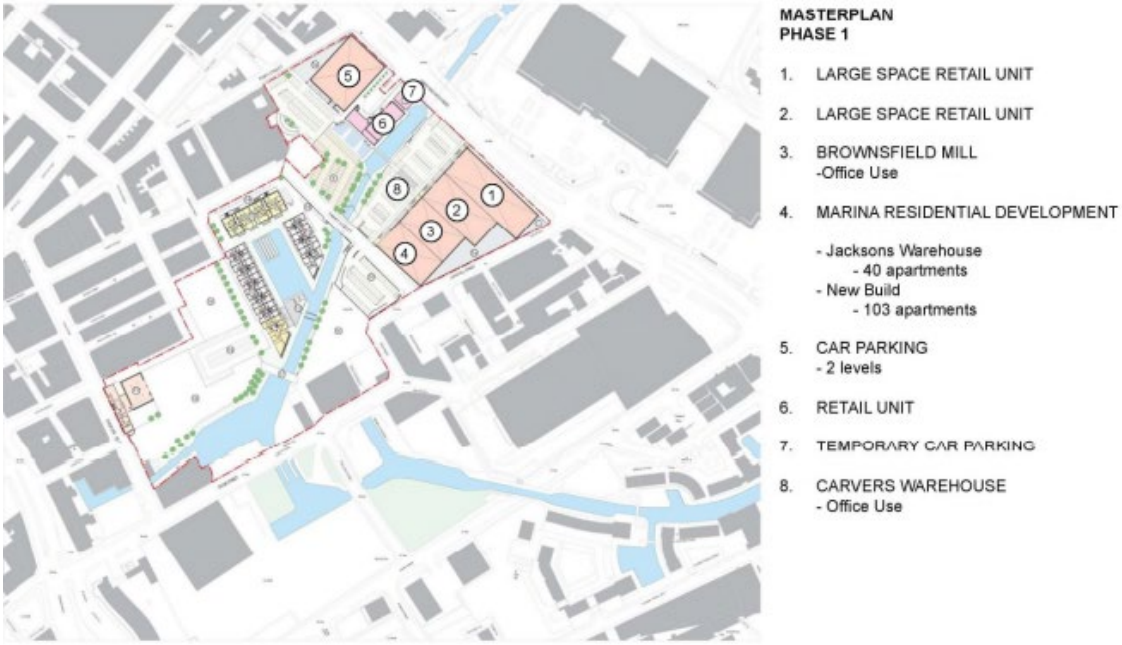


2.16. To date, significant progress has been made to deliver the regeneration of the Piccadilly Basin:

- Refurbishment of the Grade II* Listed Jackson's Warehouse and construction of Vantage Quay for residential development, as well as the formation of the Marina which connects these sites;
- Construction of the Urban Exchange Retail Park, adjacent to Great Ancoats Street at the north east of the site;
- A 232-space multi-storey car park on Tariff Street;
- Investment in public realm including the Canal, in addition to the formation of the Marina;
- Refurbishment of the Grade II* Listed Brownsfield Mill to create high quality residences; and,
- Development of Burlington House, an 11-storey residential building comprising 91 residential apartments.

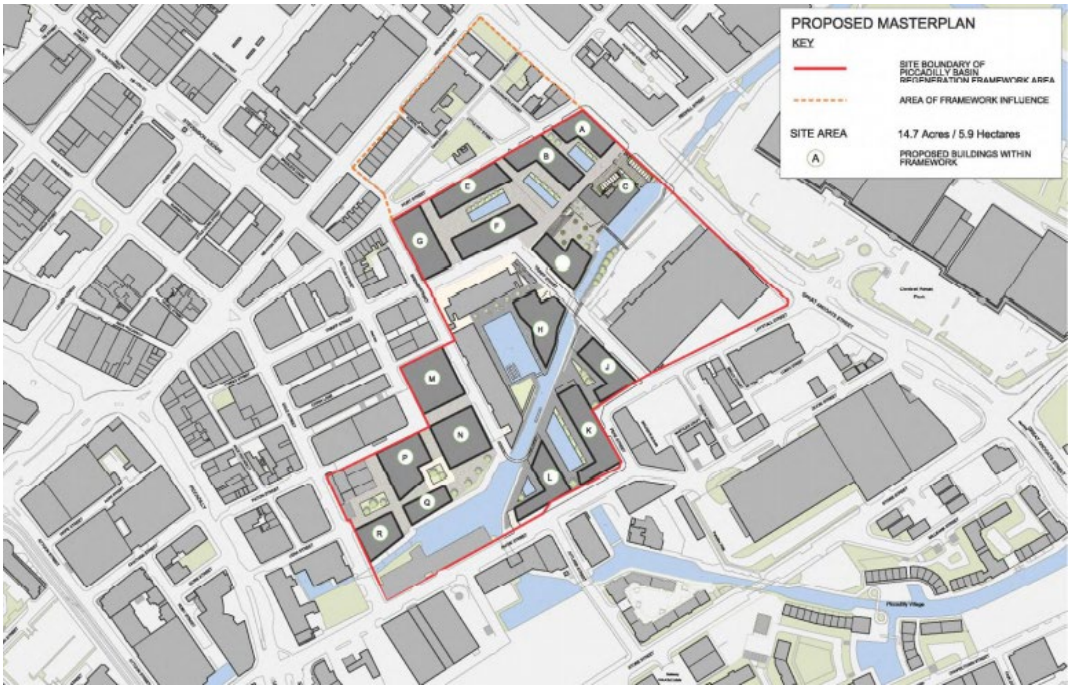
2.17. In 1998, planning permission was granted for a mixed-use development that included residential, retail, licensed retail and studio office uses and provided Piccadilly Basin with a masterplan produced by Simpson Haugh (see Figure 2.2). The planning permission has now been implemented and therefore remains extant in perpetuity. Later in 2007, another application was submitted for a mixed-use development incorporating 58 residential units, a ground floor restaurant/cafe unit with related access, servicing, landscaping and associated works at land bounded by Tariff Street, Rochdale Canal and Marina, however this was never implemented.

Figure 2.2 Piccadilly Basin Masterplan, 1998



2.18. Within the 2016 Piccadilly Basin SRF, a master planning exercise was undertaken by the same architect, Simpson Haugh, in order to create a vision for the area and inform the development principles. This is shown below in Figure 3.3. The framework sets out guidelines for the Site in regard to scale, massing and density and proposed a residential-led mixed-use development of approximately 32 storeys in height on the Site.

Figure 2.3 Piccadilly Basin SRF Masterplan, 2016



Planning History

2.19. Table 2.1 below sets out the relevant planning history fo the Site.

Table 2.1 Planning History

Reference	Description	Status
083678/FO/2007/C3	Erection of two 6 storey blocks with ground (plus mezzanine) floor commercial uses (including retail, use class A1 and offices use class B1) with 159 residential units above (Use Class C3) together with ancillary parking, servicing, public space and landscaping	14 September 2007
054382/FO/CITY3/98	A mixed use development of housing, A1 retail, licensed retail & studio offices including works to listed buildings & canal structures.	Approved 10 August 1998
043345/DT/CMDC/93	Redevelopment of land at canal gardens for office development, mixed office/ leisure/retail and student accommodation	Refused 25 June 1993

The Proposed Development

2.20. The Proposed Development would involve the construction of a residential-led development comprised of up to 500 residential units and up to 35 storeys in height with ground floor commercial uses (use Class E and Sui Generis) 30 car parking spaces and 500 cycle parking spaces and approximately 3,000 sqm of external area, landscaping, access and other associated works. It should be noted that the proposed figures are not fixed and are part of an evolving design.

2.21. In summary, the Proposed Development comprises:

Table 2.2 Development Parameters

	Proposed Parameters
Site area	0.48 ha (4845 sqm)
Residential Use (Use Class C3)	Up to 500 apartments
Other uses	Up to 500 sqm retail space Up to 1250 sqm amenity space
Building footprint	Approximately 45,000 sqm GIA
External Area	Approximately 3,000 sqm
Building Height	Up to 35 storeys in height including ground.
Parking	Up to 30 car park spaces and 10 disabled spaces (all EVC) 100% cycle parking provision

3. Scope, Structure and Consultation

Scope

3.1. A scoping exercise has been carried out in order to determine the likely significant effects on the environment that may arise as a result of the Proposed Development. This process has enabled the team to determine which technical disciplines are pertinent to the Proposed Development and the scope of assessment required in order for any likely significant effects on the environment to be addressed as part of a future EIA process.

3.2. This process has taken account of the proposed construction activities, relevant planning policy, knowledge of the Site and the professional opinion of the project team.

3.3. The information presented in the ES will be provided in accordance with Schedule 4 of the EIA Regulations and will include:

- A description of the Proposed Development;An outline of the main alternatives studied;A description of the aspects of the environment likely to be significantly affected by the Proposed Development;A description of the likely significant effects of the Proposed Development on the environment; description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment;A non-technical summary; andAn indication of any difficulties encountered by the applicant in compiling the required information.

3.4. The introductory chapters of the ES will provide the following information:

- An introduction to the ES in a legislative and site specific context;Description of the Site and Proposed Development;Alternatives considered and project design evolution; EIA methodology; Construction methodology and programme;Stakeholder engagement; ES structure; and Details of the EIA project team.
- The geographical coverage of the EIA will be determined by a number of factors including:
- The physical extent of work;The nature of the baseline environment, including the location of sensitive receptors;The distance over which effects will be significant; andThe presence and type of “pathways” along which impacts may be spread.

Environmental Disciplines to be Scoped Out of the EIA

3.5. It is considered that the following disciplines will not give rise to likely significant effects on the environment and would therefore not require inclusion in the ES. An explanation for each discipline is given below.

Agricultural Circumstances

3.6. The Site is entirely on brownfield land so there would be no effects in respect to agriculture. This discipline can therefore be scoped out of the EIA and will not be assessed as part of the planning application.

Air Quality

3.7. Air Quality will be **scoped out** of the ES as the Proposed Development is not anticipated to cause significant impacts to the local air quality during the construction or operational phases.

3.8. The works being undertaken during the construction phase include demolition, earthworks, construction and trackout. It is anticipated that dust and particulate matter emissions produced during construction phase activities would be inherently controlled through the implementation of a Construction Environmental Management Plan (CEMP). Therefore, the effects of dust and particulate matter emissions released during

the construction phase of the Proposed Development from on-site activities are unlikely to be considered significant.

3.9. Road traffic generated by the Proposed Development during its construction phase is currently unknown. However it is considered unlikely that the change in traffic flow as a result of the construction of the Proposed Development will exceeds the criteria in the EPUK and IAQM guidance, i.e. will be greater than 100 Light Duty Vehicles and/or 25 Heavy Duty Vehicles as an annual average daily traffic (AADT), then the impact of this traffic on existing receptors is unlikely to be significant. The implementation of a CEMP including a strategy for traffic management to define local routes to be used by HGVs generated by construction activities can also be implemented to reduce possibly impacts as required.

3.10. During the operational phase based on initial information to date it is envisaged that the Proposed Development will result in a net reduction in trip generation and thus road traffic compared to the existing site use; therefore, negligible beneficial air quality impact from operational road traffic are anticipated. Further to this the car parking spaces that will be offered on site will include provision for Electric Vehicle charging infrastructure, and a sustainable travel plan will be included further reducing the air quality impacts of the Proposed Development.

3.11. The proposed energy strategy is expected to be zero emission technology such as Air Source Heat Pumps which result in no combustion emission and therefore result in no significant impact to local air quality.

3.12. However, an Air Quality Assessment (AQA) will be submitted as a stand-alone report to fully assess the above and accompany the Environmental Impact Assessment. Additionally, within this, a baseline assessment will be undertaken to identify any existing air quality issues and a modelling exercises will be completed to allow for a site suitability assessment. Appropriate mitigation will be included within the design following the Site Suitability assessment to ensure Air Quality Objectives are met for the proposed end use.

Archaeology

3.13. The Site lies on the fringe of Manchester's historic core, but does not form part of a conservation area. There are no designated heritage assets, such as listed buildings, within the Site and there are no below-ground archaeological remains that are afforded statutory protection as designated heritage assets that would require preservation in-situ. There is, however, a grade II* listed building, known as Brownsfield Mill, located nearby the southern boundary of the Site. The Ancoats Conservation Area is located immediately to the north of the Site, and the Stevenson Square Conservation Area is located c 80m to the west of the Site.

3.14. Historic mapping shows that the Site comprised undeveloped land owned by Mr D Leech in the eighteenth century. By the early nineteenth century, an arm of the Rochdale canal had been constructed within the Site, along with numerous yards, wharfs, stores and workshops. Workers' houses and a public house known as 'The Big Tub' fronted Great Ancoats Street from the early nineteenth century. By the mid-twentieth century, a machine tool works and a garage had been constructed within the Site and the canal arm had been partially filled. From 1994, the canal arm is no longer shown on mapping. The Site now comprises a car park.

3.15. There is little evidence to suggest any potential for prehistoric, Romano-British or medieval remains to exist within the Site. The Site has the potential to contain features and artefacts deriving from the industrial period, together with the foundations of early nineteenth-century workers' houses. Whilst there is some potential for below-ground remains of local importance to survive in-situ, it is unlikely that the predicted impact of development will be significant. It would thus be appropriate for archaeological issues to be 'scoped out' of an Environmental Statement.

3.16. The archaeology can be **scoped out** of the ES given that a comprehensive archaeological desk-based assessment is being prepared to assess the potential impact of the Proposed Development on the sub-surface archaeological resource. This will enable a decision regarding any further works to be made in consultation with GMAAS. This approach is in line with the National Planning Policy Framework (NPPF) and local planning policies.

Aviation

3.17. At a maximum of 35 storeys (+ ground), the Proposed Development, at 142.100m AOD exceeds the 90 AOD aviation safeguarding threshold. Manchester Airport Group (MAG), Barton Aerodrome and NATS will be contacted for consultation advice. It is considered from professional experience of similar scale developments within this area of MCC that the Proposed Development will not give rise to aviation conflicts which cannot be resolved via appropriate mitigation to avoid any residual impacts arising. Therefore, it is considered that the aviation discipline will not give rise to likely significant effects on the environment and would therefore not require inclusion in the Environmental Statement. This discipline is therefore **scoped out** of the EIA.

Ecology

3.18. An initial desk based study confirms that the Site is located in a highly urban environment in Manchester City Centre. It comprises entirely of existing hardstanding that is in use as a car park. The Site is bounded to the north east and north west by Great Ancoats Street and Port Street, respectively both of which have street lighting. Great Ancoats Street in particular is a large, busy road.

3.19. There are no semi-natural habitats within the Site and no features which have the potential to be used by nesting birds or roosting/foraging bats. There are two buildings immediately adjacent to the site, Sam's Yard to the south west and Brownsfield Mill to the south east but these buildings will not be impacted by the Proposed Development.

3.20. The Rochdale Canal is located further to the south east (beyond the Brownsfield Mill building noted above, and further car parking) with no habitat connectivity to the Site. An initial review of the Defra Multi-Agency Geographic Information for the Countryside (MAGIC) website (www.defra.gov.uk) confirms that there are no statutory designated sites within or adjacent to the Site. The nearest statutory designated site is Clayton Vale Local Nature Reserve which is some 2km away to the east and with no habitat connectivity to the Site. The Rochdale Canal is designated as a Special Area of Conservation (SAC) but the designated reach is located some 5km to the east of the Site with not potential for direct or indirect effects likely to arise from the Proposed Development.

3.21. A Preliminary Ecological Appraisal will be undertaken for the site comprising an Extended Phase 1 Habitat Survey and desk study consultation with Greater Manchester Ecology Unit (GMEU) in August 2021. It is anticipated that the Extended Phase 1 Habitat survey will confirm the lack of habitats and features with potential to support nesting birds and roosting/foraging bats within the Site. The survey will include a preliminary ground level assessment of the adjacent buildings to support nesting birds and roosting bats and this would be followed by a more detailed bat surveys, if required. Any impact on nesting birds or roosting bats (should the buildings be found to have potential) would be limited to indirect disturbance only with appropriate mitigation recommendations detailed in a stand-alone ecology report.

3.22. The desk study consultation with GMEU will confirm the presence of any non-statutory designated sites and protected/notable species within a 2km search area and this will also be presented in the stand-alone ecology report. The report will also detail recommendations for ecological enhancement to be incorporated into the Proposed Development.

3.23. In view of the above it is considered highly unlikely that any significant ecological effects would arise as a result of the Proposed Development and on this basis it is concluded that ecology can be **scoped out** of the ES.

Ground Conditions

3.24. In respect of contaminated land, a Phase 1 Desk Study and a Phase 2 Ground Investigation have been undertaken for the Site. These reports will be submitted as part of the planning application and are included in Appendix 5.

3.25. The Phase 2 Ground Investigation has recorded limited sources of contamination within soils, asbestos fibres were identified in 2no. samples, no bulk asbestos was identified. The Phase 2 report concludes that there is low risk posed to human health and a low risk posed to controlled waters. Soils from the limited locations where soil contamination and asbestos fibres in soils were noted are to be removed as part of the redevelopment, as part of the basement excavation. Any material imported to site will be verified in accordance with a remediation strategy. Should there be an opportunity for the reuse of materials on Site, this will be completed in accordance with a materials management plan (MMP) to ensure the materials are suitable for reuse.

3.26. With reference to the information above, there are no identified negative adverse significant effects that would require assessment within an EIA. It is therefore proposed that Ground Conditions be **scoped out** of an EIA assessment.

Traffic and Transport

3.27. The Site is currently used as a surface level car park. Spaces are not formally marked out, but on-site observations have shown there to be at least 75-80 cars parked on the Site on a typical day. There is potentially room for even more than this.

3.28. In comparison, the Proposed Development will have 27 car parking spaces that will be used by future residents.

3.29. The 27 spaces will generate significantly less activity than the existing situation and therefore there is likely to be a significant betterment in terms of traffic generation and highway impact.

3.30. There are no other traffic and transport matters that would warrant EIA and therefore Traffic and Transport should be **scoped out.**

Water Resources

3.31. There is no main river or local natural watercourse in the vicinity of the Site and therefore the development will have no impact of on river morphology.

3.32. The closest surface water feature is the Rochdale Canal which is approximately 40 meters from the south eastern boundary of the Site. However, it should be noted that there is an existing development between the Site and the Rochdale Canal and the Site has no direct frontage on to the Canal, although access will to the Canal can be gained by a proposed / improved public right of way.

3.33. The Proposed Development will have a negligible impact on the local water environment during its operation and therefore should be **scoped out**.

3.34. The Site is located within Flood Zone 1 and is therefore at low risk of flooding from rivers or the sea. A Flood Risk Assessment (FRA) will be prepared to the requirements of the NPPF to accompany the Planning Application. The FRA will assess all potential sources of flood risk to the Site and the impact of development on flood risk elsewhere in the local catchment to ensure this is not increased as a result of the development.

3.35. A comprehensive drainage strategy for both foul and surface water will be developed in consultation with relevant stakeholders, including United Utilities and Manchester City Council as Lead Local Flood Authority (LLFA).

3.36. The drainage strategy will incorporate Sustainable Drainage Systems (SuDS) in accordance with local policy requirements. Where appropriate, green SuDS features will be championed to provide benefits to water quality as well as amenity and biodiversity benefits.

3.37. Peak surface water runoff rates will be reduced from pre development rates to either a minimum 50% reduction from existing brownfield runoff rates or where possible to greenfield runoff rates.

Scoping Summary

3.38. Table 3.1 provides a summary of the scoping exercise undertaken and what disciplines will be considered within the EIA and which are proposed to be scoped out of the EIA (and subject to a standalone technical report).

Table 3.1 EIA Scoping Summary

Discipline	ES Chapter	Non-EIA Assessment	Consultant
Agricultural Circustances	✗	✗	n/a
Air Quality	✗	✓	Hoare Lee
Archaehology	✗	✓	Salford Archaeology
Aviation	✗	✗	n/a
Climate Change	✓	✗	WSP
Ecology	✗	✓	Penny Anderson
Ground Conditions	✗	✓	WSP
Heritage	✓	✗	Stephen Levrant: Heritage Architecture
Human Health	✓	✗	Enfusion
Noise and Vibration	✓	✗	Fisher Acoustics
Socio-Economic	✓	✗	Amion
Sunlight, Daylight and Overshadowing	✓	✗	GIA
Townscape and Visual Impact	✓	✗	ReForm
Traffic and Transport	✗	✓	Curtins
Water Resources	✗	✓	WSP
Wind	✓	✗	GIA

Cumulative Effects Assessment

3.39. An assessment of the cumulative effect of the Proposed Development and other committed developments within a defined radius of the Site, including those with recent Planning Permissions and reasonably foreseeable to come forward in the near future will be undertaken as part of the EIA.

3.40. There is no agreed / standard threshold for how far the assessment should go; therefore a professional judgement has been taken regarding which schemes to highlight, taking into consideration the surrounding context of the Site.

3.41. Where the construction of schemes is well progressed these will be treated as part of the baseline and not as committed developments.

3.42. Full details of the committed developments to be included as part of the cumulative effects assessment are set out at Appendix 2.

3.43. The Applicant seeks the agreement from the LPA to the scope of committed developments and invites guidance on any additional schemes not listed.

Consultation

3.44. The following statutory consultees should be consulted through the EIA Scoping process:

- Manchester City Council (MCC) – Contaminated Land, Environmental Health, Flood Risk, Highways, Tree Officer (Technical Officers);
- Transport for Greater Manchester (TfGM);
- Environment Agency (EA);
- Greater Manchester Police Secure by Design;
- Historic England;
- Greater Manchester Archaeological Advisory Service;
- Mancheser Airport Safeguarding;
- Natural England;
- NATS;
- Greater Manchester Ecological Unit; and,
- United Utilities.

3.45. We would grateful for confirmation of which stakeholders have been consulted as part of the Scoping Opinion.

4. Proposed EIA Methodology

4.1. The EIA would assess both the construction and operational phases of the Proposed Development.

4.2. The ES would comprise two volumes, the first of would set out the findings with respect to each of the environmental disciplines that have been examined as part of the EIA. Volume 2 would include all the supporting documents and technical appendices relating to the chapters. A Non-Technical Summary (NTS) would be produced and form a standalone document.

4.3. Each ES chapter would follow the headings set out below to ensure the final document is transparent, consistent and accessible.

- Introduction;
- Legislative and Policy Context;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Identification and Evaluation of Key Effects;
- Mitigation Measures;
- Cumulative Effects;
- Residual Effects; and
- Summary.

4.4. Each chapter sub-heading is explained in further detail below.

4.5. A reference list will also be provided as relevant with each ES chapter.

Introduction

4.6. This section will introduce the assessment discipline and the purpose for which it is being undertaken.

Legislative and Policy Context

4.7. This section will include a summary of national, regional and local policies of relevance to the environmental discipline and assessment. Relevant legislation will be summarised where applicable.

Assessment Methodology and Significance Criteria

4.8. This section will provide an explanation of methods used in undertaking the technical study with reference to published standards, guidelines and best practice. The application of significance criteria will also be discussed.

4.9. It will also outline any difficulties encountered in compiling the required information.

Baseline Conditions

4.10. This will include a description of the environment as it is currently and as it is expected to change given the project were not to proceed (i.e. 'do-nothing' scenario). The method used to obtain this information will be clearly identified. Baseline data will be collected in such a way that the importance of the particular subject area to be affected can be placed in its context and surroundings so that the effects of the proposed changes can be predicted.

Identification and Evaluation of Likely Significant Effects

4.11. This section will identify the likely significant effects on the environment resulting from the Proposed Development.

4.12. The significance of an environmental effect is determined by the interaction of magnitude and sensitivity, whereby the effects can be positive or negative. The criteria to be used in carrying out this process are detailed below; it should be noted that these tables provide a standardised set of criteria, which may not be applicable to all technical disciplines considered within the EIA – where relevant, individual consultants may use a variation of the criteria and this will be clearly explained within the methodology.

Prediction of Impact Magnitude

4.13. The methodology for determining the scale or magnitude of change caused by the impact is set out in Table 4.1.

Table 4.1 Methodology for Asssessing Magnitude of Change

Magnitude of Change	Criteria for assessing magnitude of change caused by an impact
Major	Total loss or major/substantial alteration to key elements/features of the baseline (pre-development) conditions such that the post development character/composition/attributes will be fundamentally changed.
Moderate	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of the baseline will be materially changed.
Minor	A minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible/detectable but not material. The underlying character/composition/attributes of the baseline condition will be similar to the pre-development circumstances/situation.
Negligible	Very little change from baseline conditions. Change barely distinguishable, approximating to a 'no change' situation.

Prediction of Receptor Sensitivity

4.14. The sensitivity of a receptor is based on the relative importance of the receptor using the scale set out in Table 4.2.

Table 4.2 Methodology for Determining Sensitivity

Sensitivity	Examples of receptor
High	The receptor/resource has little ability to absorb change without fundamentally altering its present character, or is of international or national importance.
Moderate	The receptor/resource has moderate capacity to absorb change without significantly altering its present character, or is of high importance.
Low	The receptor/resource is tolerant of change without detriment to its character, is of low or local importance.

Assessment of Effect Significance

4.15. Effect significance will be calculated using the matrix in Table 4.3. This illustrates the interaction between impact magnitude and receptor sensitivity.

Table 4.3: Effect Significance Matrix

Magnitude	Sensitivity		
	High	Moderate	Low
Major	Major Adverse/Beneficial	Major - Moderate Adverse/Beneficial	Moderate - Minor Adverse/Beneficial
Moderate	Major - Moderate Adverse/Beneficial	Moderate – Minor Adverse/Beneficial	Minor Adverse/Beneficial
Minor	Moderate – Minor Adverse/Beneficial	Minor Adverse/Beneficial	Minor - Negligible
Negligible	Negligible	Negligible	Negligible

Mitigation Measures

4.16. Adverse effects will be considered for mitigation and specific mitigation measures put forward, where practicable. Mitigation measures considered may include modification of the project, compensation and the provision of alternative solutions as well as pollution control. The extent of the mitigation measures and how these will be effective will be discussed. Where the effectiveness is uncertain or depends upon assumptions about operating procedures, data will be introduced to justify the acceptance of these assumptions.

4.17. The approach to mitigation will follow best practice guidance, which suggests a hierarchical approach. The UNEP EIA Training Resource Manual (2002) advises that impacts should ideally be:

- Avoided; if notMinimised; and/orCompensated.

4.18. Three 'types' of mitigation are characterised in IEMA's Special Report – The State of Environmental Impact Assessment Practice in the UK (2011):

- EIA influence at design stage;Standard construction practices for minimising effects; andFollow-up actions for implementation post-consent.

4.19. Clear details of when and how the mitigation measures were carried out, or will be carried out, are to be given within the Environmental Statement. When certainty of impact magnitude and/or effectiveness of mitigation over time exists, monitoring programmes will be proposed to enable subsequent adjustment of mitigation measures, as necessary.

4.20. The opportunity for enhancement measures will also be considered where appropriate.

Cumulative Effects

4.21. Two types of cumulative effect will be assessed:

- Type 1 - Cumulative effects are the interactions between effects of the construction and development works on a single receptor.Type 2 - Cumulative effects are those that arise from incremental changes caused by other past, present or reasonably foreseeable actions together with the construction and development works.

4.22. The cumulative effects of the Proposed Development and the identified committed developments will be assessed. A list of known committed developments is set out at Appendix 2. The Council are requested to review and comment on this list in their Scoping Opinion.

Residual Effects

4.23. The residual effects, i.e. the effects of the Proposed Development assuming implementation of proposed mitigation, will be determined. The residual effects represent the overall likely significant effect of the Proposed Development on the environment having taken account of practicable/available mitigation measures.

5. Environmental Statement Chapters

5.1. Under each section topic, a summary of the content of the section, the methodology and scope of assessment is given. Where relevant, the assumptions of the assessment are described. Current relevant legislation or recognised guidance for individual assessments will be adhered to, where necessary.

Climate Change

Introduction

5.2. This Chapter of the ES will be prepared by WSP and assess the Proposed Development's impacts on and vulnerability to climate change. The requirement to consider a project's impact on and vulnerability to climate change results from the 2014 amendment to the EIA Directive (2014/52). The Directive has been fully transposed into UK law in the EIA Regulations.The Directive requires:

"A description of the likely significant effects of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change."

5.3. An assessment of the vulnerability of the Proposed Development to climate change has not been included within this chapter because the Proposed Development's resilience and adaptation to climate change has been considered within the design and access statement and relevant technical reports such as the flood risk assessment. As such this chapter considers the impacts and effects of the Proposed Development in terms the contribution of the Proposed Development to climate change: The Greenhouse Gas (GHG) emissions assessment.

Legislative and Policy Context

Legislation

5.4. The applicable legislative context for the GHG assessment of the Proposed Development comprises:

- Climate Change Act 2008 (2050 Target Amendment) Order 2019[1];
- Planning and Energy Act 2008[2];
- Carbon Budgets, 2016[3]; and
- UK Climate Change Risk Assessment (2017)[4].

5.5. In addition, the Building Regulations (2016)[5] and The Carbon Plan (2011)[6] are also applicable to the GHG assessment for the Proposed Development.

National Planning Policy

5.6. The National Planning Policy Framework (2019): Chapter 14 meeting the challenge of climate change, flooding and coastal change establishes that Local Planning Authorities *"should take a proactive approach to mitigating and adapting to climate change"*[7] has been considered in defining the scope and focus of the assessment presented this chapter.

Local Planning Policy

5.7. In July 2019 Manchester City Council declared a climate emergency acknowledging that the council needs to act on the causes and impacts of climate change. The applicable local policy for the GHG assessment of the Proposed Development comprises:

- Greater Manchester Spatial Framework Revised Draft8;
- Manchester's Local Development Framework, Core Strategy Development Plan Document9; and

- Manchester Climate Change Framework 2020-2510.

Baseline Conditions

5.8. In the baseline scenario, GHG emissions occur constantly and widely as a result of human and natural activity including energy consumption (fuel, power), industrial processes, land use and land use change. The GHG assessment will only consider instances in which the Proposed Development results in additional or avoided emissions in comparison to the existing baseline scenario and its assumed evolution (future baseline). The baseline scenario is assumed to be the same for all EIA scenarios.

5.9. There has been no previous assessment undertaken to date in relation to GHG emissions and the Proposed Development to inform the baseline conditions.

Existing Baseline

5.10. The current land use of the Site is a surface level car park. Therefore, the current use of the Site is likely to generate some traffic flows and associated carbon emissions.

5.11. The operation and management of the Site will likely require some components and bulk materials for minor maintenance works and repairs. These materials will have embodied emissions associated with them, and the transport emission to and on the Site. The associated energy and embodied baseline emissions are anticipated to be small, and as such will not be quantified.

5.12. As a result, there are some transport GHG emissions but zero operational and embodied GHG emissions associated with the existing baseline of the Site.

Future Baseline

5.13. The future baseline scenario for traffic emissions will be determined by applying TEMPro growth factors to baseline traffic data. Regarding operational emissions for embodied carbon and building emissions, the amount of coal in the UK electricity mix has substantially decreased in recent years and low and zero carbon technologies (including photovoltaic, wind and nuclear energy) have been increasingly used to generate a larger portion of the UK's electricity. This has resulted in a reduction of carbon emissions generated from grid-supplied electricity. As the grid decarbonises, the lower amounts of emissions created through using on-site electricity will result in a lower carbon impact.

5.14. Also, as the UK has committed to becoming net-zero carbon by 2050, that means GHG emissions would be dramatically reduced and any remaining emissions offset, neutralising environmental impact from GHG emissions and slowing climate change. In addition, in January 2021 the Government announced the Future Homes standard that proposes no new gas boilers should be installed in new homes by 2025, meaning that new homes will be heated solely by electric systems (such as heat pumps) or other alternatives, which will be low in GHG emissions following grid decarbonisation.

Potential Significant Effects

5.15. The GHG emissisons from the Proposed Development are anticipated to be significant however the impact will be contextualised comparing to national carbon budgets to provide a sense of scale. The scope of the GHG assessment will include emissions associated with embodied and transport carbon during construction stage scoping out emissions associated with land use, land use change and forestry. Regarding operation stage, the assessment will include the embodied carbon emissions from replacements, the building and transport emissons, while scoping out in-use emissions, maintance, repair and land use, land use change and forestry. The assessment scopes in embodied carbon emissions during the end of life stage of the Propsed Development.

Assessment Methodology

Technical Scope

5.16. The assessment follows the emerging best practice. Current best practice is reflected in IEMA (2017) *Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance*. This guidance advocates a *'good practice'* approach where GHG emissions are always considered and reported but at varying degrees of detail depending on the EIA and the project in question.

5.17. In line with the guidance, this report sets out the methodological approach that has been taken to address GHG emissions associated with the Proposed Development. This means providing the assessment approach, calculating the baseline, determining the significance of each GHG emission source scoped into the assessment and setting out strategies for mitigation.

5.18. Existing sources of GHG emissions prior to construction and operation of the Proposed Development (i.e. without development) are identified to assess the current baseline. Sources of GHG emissions following the construction and during operation of the Proposed Development are then assessed, from which the significance, mitigation measures and residual effects are determined. The GHG assessment will not be restricted by geographical area but instead will include any increase or decrease in emissions as a result of the Proposed Development, wherever this may be.

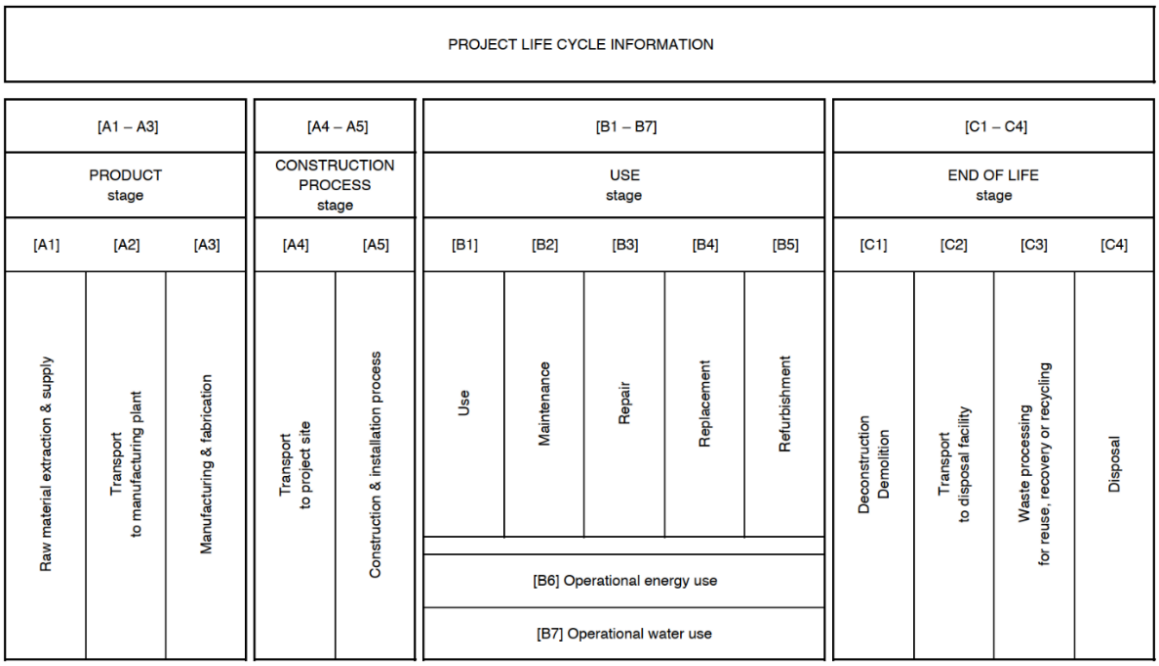
5.19. The lifecycle stages for the Proposed Development have been identified with reference to the Royal Institution of Chartered Surveyors (RICS) guidance[11], provided in Figure 5.1 below. The life cycle stages to be included in the scope are:

- Construction stage A1-5– embodied carbon emissions associated with manufacturing, transport, replacement and disposal of the existing and proposed building elements;
- Operational stage B4, B6 – embodied carbon emissions associated with replacement/refurbishment of building parts, building emissions associated with buildings' energy use, as well as transport emissions such a vehicle numbers and distances by building users; and
- End of life stage C1-C4 – embodied carbon emissions associated with decommissioning, stripping out, disassembly, deconstruction and demolition operations as well as from transport, processing and disposal of materials.

10 Manchester Climate Change Agency (2020) Manchester Climate Change Framework 2020-25

11 RICS (2017). Whole life carbon assessment for the built environment. Available at: https://www.rics.org/globalassets/rics-website/media/news/whole-life-carbon-assessment-for-the--built-environment-november-2017.pdf (Accessed: 13/05/2021)

Figure 5.1: RIBA Project Lifecycle



5.20. Table 5.4 explains in further detail the life cycle stages which were scoped in and out.

5.21. For all lifecycle stages of the Proposed Development, the assessment will include the following:

- Collection of available data/information on the scale of GHG emitting activities (e.g. number of vehicle trips, kWh electricity, construction emissions) for future baseline. In each case this will cover the Proposed Development's lifespan (60 years); and
- Calculation of the GHG emissions by applying a suitable emissions factor (tCO2e per unit of emissions generating activity).

Baseline Assessment

5.22. The baseline data for the GHG assessment will be sourced from the following locations:

- One Click Software - Embodied Carbon Calculation;
- Energy Statement submitted as a supporting planning document;
- Transport Assessment submitted as a supporting planning document;
- Department for Business, Energy & Industrial Strategy, 2020 Government GHG Conversion Factors for Company Reporting;
- Department for Business, Energy & Industrial Strategy, 2005 to 2018 UK local and regional CO2 emissions – data tables, 2018; and
- Royal Institute of British Architects (RIBA) 2030 Climate Challenge.

Construction Assessment

Embodied Carbon Emissions

5.23. To inform the assessment during the Proposed Development lifecycle stages, an assessment of embodied carbon emissions has been undertaken.

5.24. Carbon Designer, which is a calculation tool on One Click Life-Cycle Assessment software, has been used to calculate the embodied carbon emissions for one of the two proposed buildings. Then the results of carbon per m2 were multiplied for both residential towers. This procedure is suitable for early stage projects where building shape and areas are available.

5.25. Inputs used to inform the software were based on floor area provided, number of floors, each building use and material assumptions that were coordinated with the design of the Proposed Development. The result includes data related to manufacturing, transport, replacement and disposal of the existing and proposed building elements.

Transport Emissions

5.26. The carbon emissions (CO2e) associated with transportation used during the construction stage where calculated as part of the embodied carbon emissions described above.

Operational Assessment

Embodied Carbon Emissions

5.27. The same procedure has been followed as described above. The results refer to the replacement/refurbishment of building parts during use stage. The RICS assumptions on material and building component lifespans have been used for this assessment.

Building Emissions

5.28. For the regulated carbon emissions from the new buildings during the operational stage, an Energy statement was prepared by Element Sustainability.

5.29. The building energy use has been assumed to be compliant with Part L (Conservation of Fuel and Power) of the Building Regulations 2010 (2013 edition with 2016 amendments). Also, the effect of energy efficiency improvements and the low carbon technologies have been considered.

5.30. An average predicted decarbonisation factor for the grid electricity has been taken into account. As electricity generation becomes less carbon intensive, GHG emissions from electricity use will reduce while GHG emissions from gas would remain on-the-whole stagnant.

Transport Emissions

5.31. In order to calculate the operational traffic associated with the Proposed Development, the number of trips per vehicle/transport mode, and the average trip distance have been multiplied by emissions factors for each key vehicle type. The data required where provided by Curtins, and they align with the Transport Assessment and Framework Travel Plan). The 2021 Defra emissions factor selected for each vehicle type represents the closest match. This is summarised in Table 5.1.

Table 5.1 – Transport Emissions Calculation Methodology

Metric	Unit	Car	Light Goods Vehicle (LGV)	Heavy Goods Vehicle (HGV)	Taxi	Bus
Total Distance (A)	km / year	A=CxD	A=CxD	A=CxD	A=BxD	A=BxD
Total Person Trips (B)	people trips / year	-	-	-	B	B
Total Vehicle Trips (C)	vehicle trips / year	C	C	C	-	-

Average Trip Length (D)	km / trip	D	D	D	D	D
Emissions Factor Description	n/a	Average car, unknown fuel, per km	Average van (<3.5 tonnes), unknown fuel)	Diesel HGV, Rigid (3.5-7.5 tonnes), per km	Regular taxi (non-black cab), per passenger km	Local Bus (not London), per passenger km
Emissions Factor Value	kg CO2e/km	0.1715	0.24017	0.45835	0.1488	0.1023
Total	kgCO2e	-	-	-	-	-

5.32. For the operational phase, the assessment considers the GHG emissions from the Proposed Development once fully completed and using current emissions factors.

5.33. The use of electric vehicles (Battery Electric Vehicles-BEV, Plug-in Hybrid Electric Vehicles-PHEV and Hybrid vehicles) have been taken into account as a percentage of the total number of trips, following data from the Vehicle Licencing Statistics 2020. No further analysis has been undertaken as to the long term increases in vehicle efficiency, further switching to electric vehicles and possible increase in autonomous vehicle use. These would likely reduce the total GHG emissions associated with the Proposed Development.

End-of-life Assessment

Embodied Carbon Emissions

5.34. The same procedure has been followed as described above. The results refer to the end of life of materials.

Significance Criteria

5.35. There are currently no agreed thresholds for what level of GHG emissions is considered significant in the context of the EIA Regulations. With regards to assigning significance, the IEMA guidance provides guidance on how to assess GHG emissions in EIA:

"When evaluating significance, all new GHG emissions contribute to a significant negative environmental effect; however, some projects will replace existing development that have higher GHG profiles. The significance of a project's emissions should therefore be based on its net impact, which may be positive or negative……

…. Whilst there is no single preferred method to evaluate significance, extensive research is being undertaken to explore significance, thresholds for GHG emission assessments, and science-based targets. "

5.36. In the absence of being able to assign a significance level, IEMA further provides some guidance on contextualising a project's GHG emissions:

"Under the principle that all GHG emissions might be considered significant, and the ongoing research of how to actually measure significance, it is down to the practitioner's professional judgement on how best to contextualise a project's GHG impact.

Generating a project's carbon contribution, will enable the impact of your project, to be contextualised against sectoral, local or national carbon budgets. This will provide the practitioner and the Local Planning Authority with a sense of scale."

5.37. Therefore, to contextualise the carbon emissions of the Proposed Development, these have been compared to:

- National and Regional (Great Manchester) Carbon Budgets (Table 5.2-5.3); and
- Royal Institute of British Architects (RIBA) 2030 Climate Challenge (Table 5.2-5.4) targets.

5.38. Carbon budgets place restrictions on the amount of GHG emissions the UK can emit over a five-year period - expressed in millions of tonnes of carbon dioxide equivalents (MtCO2e). The UK is the first country to set legally binding carbon budgets. Every tonne of GHG emitted between now and 2050 will be counted towards the budget. If emissions rise in one sector, the UK will have to reduce emissions in another sector to balance the budget. Then the UK carbon budget is apportioned locally, including Great Manchester.

Table 5.2 - National carbon budgets set by the Government (MtCO2e)

Carbon Budget Period	UK Carbon Budget (MtCO2e)	Great Manchester Carbon Budget (MtCO2e)
Third: 2018-2022	2,544	36
Fourth: 2023-2027	1,950	17
Fifth: 2028-2032	1,725	8
Sixth: 2033-2037	965	4

5.39. The RIBA has developed targets for embodied carbon and operational energy use. These consider the latest recommendations from the Green Construction Board and have been developed by the RIBA in consultation with other UK professional bodies. The targets are progressive yet realistic, and a vital first step to ensure the construction industry has delivered the significant reductions necessary by 2030 in order to have a realistic prospect of achieving net zero carbon for the whole UK building stock by 2050. The operational energy targets have been converted to operational carbon targets based on the government-published predicted electricity carbon factors for 2021 (Grid Average-Domestic, as per Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal), expressed in thousands of tonnes of carbon dioxide equivalents (ktCO2e) and kilowatt-hours per square metre (kWh/m2).

Table 5.3 – RIBA 2030 Climate Challenge target metrics for domestic buildings

RIBA Sustainable Outcome Metrics	Business As Usual	2025 Targets	2030 Targets
Embodied Carbon (kgCO2e/m2) (Lifecycle stages A-C)	1200	< 800	< 625
Operational Energy (kWh/m2 /y)	120	< 60	< 35
Operational Carbon (kgCO2e/m2/y)	18	< 9	< 5

Effect Significance

5.40. As explained above, the overall carbon emissions (operational, embodied and transport) of the Proposed Development have been contextualised by comparing these to the UK Carbon Budgets (combined embodied, operational and transport carbon emissions over a period of 5 years). In addition, separate comparisons have been conducted for the embodied and operational carbon emissions over 1 year with the RIBA Climate Challenge Targets. Finally, regarding the transport carbon, in the absence of specific targets, the transport carbon emissions from the Proposed Development have been compared with the regional transport carbon emissions and with the existing baseline of the Site, in an effort to contextualise them.

5.41. Based on the above classification and contextualisation, our professional judgement has been used to define the overall significance of effect (adverse or beneficial) of the Proposed Development as follows:

- Major effect: where the Proposed Development could be expected to have a considerable effect on the achievement of national, regional or local carbon budgets; and where the Proposed Development exceeds the "Business as Usual" for embodied carbon and operational energy performance as defined by the RIBA guidance;
- Moderate effect: where the Proposed Development could be expected to have a noticeable effect on the achievement of national, regional or local carbon budgets; and where the Proposed Development meets the "Business as Usual" for embodied carbon and operational energy performance as defined by the RIBA guidance;
- Minor effect: where the Proposed Development could be expected to result in a very slight noticeable effect on the achievement of national, regional or local carbon budgets; and where the Proposed Development meets the "2025 Targets" for the embodied carbon and operational energy targets defined by the RIBA guidance; and
- Negligible: where the Proposed Development could be expected to have no discernible effect on the achievement of national, regional or local carbon budgets; and where the Proposed Development meets the "2030 Targets" for embodied carbon and operational energy targets defined by the RIBA guidance.

5.42. As per IEMA guidance, all new GHG emissions contribute to a significant negative environmental effect, so regardless of the level of significance, any negative GHG effect should be treated as significant.

Scenarios to be assessed

5.43. The scenarios to be assessed are:

- Existing baseline.
- Future baseline without the Proposed Development.
- Operational phase with the Proposed Development.

Summary of Assessment of Scope

5.44. The receptor of the assessment will be the climate.

5.45. The emissions sources which have the potential to impact on the receptor, described as elements with their associated lifecycle stage during the Proposed Development lifespan, have been identified using guidance from IEMA. Professional judgement has been used to consider which elements have the potential to give rise to likely significant effects during construction, operation and end of life of the Proposed Development. The proposed scope of the assessment is consistent with the framework for the quantification of GHG emissions presented in British Standard (BS) EN 15978:2011 'Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method.

5.46. The following elements in Table 5.4 are proposed to be scoped in or out of further consideration in the EIA.

Table 5.4 - Summary of Assessment of Scope

Receptor	Impact	Potential Effect	Scoped In / Out
Product stage (manufacture and transport of raw materials to suppliers) A1-3	GHG emissions during the construction phase of the Proposed Development.	Raw materials required for the Proposed Development will result in embodied emissions and have the potential to be large.	Scoped In
Transport of materials to site A4	GHG emissions during the construction phase of the Proposed Development.	Construction stage emissions from fuel / energy consumption due to the delivery of material to site have the potential to be large.	Scoped In
Plant and equipment use during construction A5	GHG emissions during the construction phase of the Proposed Development.	Fuel / energy consumption of plant and equipment used during construction would generate GHG emissions.	Scoped In
Land use, land use change and forestry A5	GHG emissions during the construction phase of the Proposed Development.	Emissions from the disposal of biomass are not expected to be large.	Scoped Out
Disposal of waste A5	GHG emissions during the construction phase of the Proposed Development.	Emissions from the disposal of waste are unlikely to be large, due to a large proportion of construction waste being inert.	Scoped In
Replacement and refurbishment B2-5	GHG emissions during the operation phase of the Proposed Development.	The replacement and refurbishment of the Proposed Development would release a potentially large magnitude of emissions.	Scoped In
Operational Energy Use B6	GHG emissions during the operation phase of the Proposed Development.	In-use electricity emissions will be released on an annual basis due to the building use.	Scoped In
End-user emissions (regional traffic flows) – traffic B9/D	GHG emissions during the operation phase of the Proposed Development.	Changes to regional traffic flows are expected and this has the potential to result in a large change in GHG emissions.	Scoped In
In-use Emissions B1	GHG emissions during the operation phase of the Proposed Development.	This is not considered to be a large emission source.	Scoped Out
Maintenance B2-5	GHG emissions during the operation phase of the Proposed Development.	Maintenance associated with the Proposed Development is not considered to be a large emissions source as only a small amount will be additional to the maintenance that already takes place within the region.	Scoped Out
Repair B2-5	GHG emissions during the operation phase of the Proposed Development.	The Proposed Development is designed to be maintained rather than repaired, therefore subsequent repair emissions sources are not considered to be large.	Scoped Out
Land use, land use change and forestry B8	GHG emissions during the operation phase of the Proposed Development.	The reduction in carbon sequestration due to the Proposed Development is not considered to be large.	Scoped Out

Receptor	Impact	Potential Effect	Scoped In / Out
Decommissioning process C1-C4	GHG emissions during the end of life phase of the Proposed Development.	Any emissions arising from decommissioning, stripping out, disassembly, deconstruction and demolition operations as well as from transport, processing and disposal of materials at the end of life of the project.	Scoped In

5.47. The assessment will not consider any specific Committed Developments relevant to the Proposed Development because the assessment will consider the cumulative effect of all GHG that cause climate change, and therefore the assessment of the GHG due to the Proposed Development implicitly assesses the cumulative effect of GHG emissions and contextualises these compared to the UK Carbon Budgets and RIBA 2030 Climate Change .

Heritage

Introduction

5.48. This Chapter of the ES will be prepared by Heritage Architecture Ltd and assesses the likely built heritage impacts of the proposals upon the site and surrounding area.

Legislative and Policy Context

Legislation

5.49. The Planning (Listed Buildings and Conservation Areas) Act 1990 is of relevance to the proposals as it provides specific protection for buildings and areas of special architectural or historic interest, over and above that provided by development management.

5.50. The Site is situated within the setting of a number of listed buildings, Section 66 of the Act is of relevance, as it requires the LPA to "have *special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses*," when considering whether to grant planning permission.

5.51. Section 72 of the Act must also be recognised in line with the proposals, as it embodies the '*general duty as respects* conservation *areas in exercise of planning functions*.' As the Site is situated within the setting of the Castlefield Conservation Area and the Ancoats Conservation Area, it will be clear any proposed development of considerable height on the Site will have some potential to impact external views within the designated areas.

National Planning Policy

5.52. Section 16 of the National Planning Policy Framework (NPPF) sets out the Government's planning policies on the conservation of the historic environment.

5.53. The policies in the NPPF constitute the Government's view of what sustainable development in England means in practice. In these terms, development proposals which fail to give due weight to the conservation of heritage assets are deemed not to be sustainable development and consequently should not be supported. This is because one of the key dimensions of sustainability is protecting and enhancing our historic environment.

5.54. In accordance with the legislation, the NPPF's core principles, which underpin decision-taking, require that Planning decisions should contribute to conserving designated heritage assets in a manner proportionate to their significance, so that they can be enjoyed for their contribution to the quality of life of this and future generations (paragraph 189).

5.55. The NPPF stresses that "great weight" should be given to the conservation of designated heritage assets (NPPF paragraph 199), emphasising the need to avoid substantial harm, in terms of demolition, alteration or the compromise of its setting. It will be clear that the redevelopment of a site adjacent to heritage assets could affect the setting of them, and that could be either beneficial or harmful. The fundamental objective is to ensure that the balance of the impact on the heritage assets is demonstrably beneficial, minimising any negative impact on their significance.

5.56. The NPPF establishes a clear hierarchy of significance for heritage assets, which is reflected in the adopted local policy (see below) and Historic England's guidance on measuring impact. Consequently, it is important that the relevant hierarchy of heritage assets surrounding the Site is understood, in order to apply proportionate consideration to the Proposals.

5.57. The 'designated heritage asset' status of the identified Listed Buildings and Conservation Areas requires that any potential 'harm' must be weighted and balanced against the potential advantages of the particular development. It is thus necessary to establish whether the effects of the proposals outweigh any perceived harm, in the context of the statutory duties set out above.

Local Planning Policy

5.58. The relevant, local heritage Planning Policies maintains the same focus as the NPPF. The City Council's heritage policies focus on the fundamental importance of *"preserving or, where possible, enhancing the historic environment"*. The following policies from Manchester's Core Strategy (2012) are of importance to the heritage assets considered within this statement.

5.59. ***Policy CC9 (Design and Heritage)*** states that development in Manchester City Centre should preserve or enhance the heritage assets that have been identified, including listed buildings, conservation areas and scheduled ancient monuments. The policy also establishes that new development must support the range of uses the Council expects in the City Centre and contribute to a coherent and integrated physical environment.

5.60. ***Policy EN3 (Heritage)*** states that throughout the City, MCC will encourage development that complements and takes advantage of the distinct historic and heritage features of its districts and neighbourhoods. New developments must be designed to support MCC in preserving or, where possible, enhancing the historic environment, the character, setting and accessibility of areas and buildings of acknowledged importance.

5.61. The Council's key regeneration objective is tempered by the need to ensure that: *"historic sites and areas of particular heritage value should be both safeguarded for the future and, where possible, enhanced for their own heritage merits and as part of wider* heritage *regeneration proposals"* (paragraph 12.21, Policy EN3*).* The policy thus evidently requires development proposals to be sensitive to the inherent values of the designated heritage asset, with any impact justified by clear, documentary evidence. This report aims to demonstrate how this requirement is addressed by the current proposal.

Guidance

5.62. Assessment of the Built Heritage resource accords with the requirements of the NPPF, and the guidance set out in Historic England's Advice Note 12, *'Statements of Heritage Significance: Analysing Significance in heritage Assets'* (October 2019). The recent guidance calls for a staged approach, which provides relevant and proportionate information sufficient to inform decision-making.

5.63. In 2015 Historic England released three Good Practice Advice notes supporting the implementation of national policy and the related guidance in the PPG. The advice notes do not constitute a statement of Government policy itself, nor do they seek to prescribe a single methodology or particular data sources. Good Practice Advice Note 2 (Managing Significance in Decision-Taking in the Historic Environment – March 2015) and Good Practice Advice Note 3 (The Setting of Heritage Assets – as amended December 2017) were both utilised as part of this assessment in order to gain a full understanding of the relevant issues, alongside the NPPF and PPG.

5.64. In particular, the present assessment takes account of the advice contained within the revised version of Advice Note 3 on understanding what constitutes the setting of a Listed Building, Conservation Area or other heritage asset, and the selection of assets the settings of which may be considered to be affected by development in a particular location, as well as the approach to the selection of indicative key views of a proposed development in context with existing heritage assets.

5.65. The ICOMOS Guidance on 'Heritage Impact Assessments' (January 2011) and Planning Practice Guidance (July, 2019) has also been utilised as part of this assessment.

Baseline Conditions

5.66. Due to the proposed scale of the Proposed Development, an initial study area of a 500m radius was proposed. Following on-site surveys and the information provided by the Zone of Visual Influence (ZVI) study (Simpson Haugh), the study area was reduced to 250m. This is considered to be proportionate due to the dense urban environment which characterises the city centre to the west of the Site which subsequently limits views across the townscape.

5.67. Within a 250m study area of the Site there are the following designated heritage assets:

- 28 Listed Buildings
- 2 Conservation Areas

5.68. Please refer to Figure 5.2 and the Table 5.5 below for a full list of the designated heritage assets scoped in as part of the assessment.

Figure 5.2: Designated Heritage Assets with the 250m study area of the Site



Table 5.5: Designated Heritage Assets with the 250m study area of the Site

Number, Figure 1	Name	Designation and Grade	Potential to be indirectly impacted by the Proposed Development and scoped in for assessment
1	72-76, NEWTON STREET	Grade II Listed Building	No
2	ROYAL MILL	Grade II* Listed Building	Yes
3	FORMER WAREHOUSE AND OFFICES OF OLD MILL, DECKER MILL, AND NEW MILL	Grade II Listed Building	Yes
4	NEWTON BUILDINGS	Grade II Listed Building	No
5	BRADLEY HOUSE	Grade II Listed Building	No
6	ROCHDALE CANAL RETAINING WALL ON SOUTH SIDE OF REDHILL STREET, WEST OF UNION STREET BRIDGE	Grade II Listed Building	Yes
7	Nos. 69-77, LEVER STREET and No. 10, BRADLEY STREET	Grade II Listed Building	No
8	LANGLEY BUILDING	Grade II Listed Building	No

9	DERROS BUILDING	Grade II Listed Building	Yes
10	50-62 PORT STREET	Grade II Listed Building	Yes
11	BROWNSFIELD MILL	Grade II* Listed Building	Yes
12	Nos. 49 – 51 DALE STREET	Grade II Listed Building	No
13	SEDGWICK MILL	Grade II Listed Building	Yes
14	49 NEWTON STREET	Grade II Listed Building	No
15	45, 47 and 47A HILTON STREET	Grade II Listed Building	Yes
16	ROCHDALE CANAL LOCK NUMBER 82, TO EAST OF GREAT ANCOATS STREET	Grade II Listed Building	Yes
17	32 AND 34 LAYSTALL STREET	Grade II Listed Building	No
18	ROCHDALE CANAL LOCK NUMBER 83, TO THE EAST OF TARIFF STREET	Grade II Listed Building	Yes
19	45 AND 47 NEWTON STREET	Grade II Listed Building	No
20	ROCHDALE CANAL TOWPATH FOOTBRIDGE AND ASSOCIATED RAMPS OPPOSITE BROWNSFIELD MILL	Grade II Listed Building	Yes
21	MARLSBRO HOUSE	Grade II Listed Building	No
22	FORMER JUNCTION WORKS AT PARADISE WHARF	Grade II Listed Building	No
23	FORMER NEWTON POLICE STATION	Grade II Listed Building	No
24	PARAGON MILL	Grade II* Listed Building	No
25	35 DALE STREET	Grade II Listed Building	No
26	FORMER ROCHDALE CANAL WAREHOUSE	Grade II* Listed Building	Yes
27	FOURWAYS HOUSE	Grade II Listed Building	No
28	NUMBERS 4, 6 & 8 AND ATTACHED SCREEN WALLS	Grade II Listed Building	No
Green	Stevenson Square Conservation Area	Conservation Area	Yes
Purple	Ancoats Conservation Area	Conservation Area	Yes
Yellow	Smithfield Conservation Area	Conservation Area	No

Potential Significant Effects

5.69. Designated heritage assets adjacent to the Site could be affected directly or indirectly by the construction phase. Impacts could be related to construction traffic, noise, dust, site hoarding/ scaffolding etc. The potential effects of the construction phase could result in temporary, adverse effects on the ability to understand and appreciate the settings of the heritage assets identified.

5.70. Designated heritage assets in visual conjunction with the Site could be affected indirectly, through permanent changes to their settings from the presence of the Proposed Development. The potential effects of the operational phase could result in the ability to understand and appreciate the setting of the heritage assets identified.

5.71. Identified designated heritage assets which are not visible from the Proposed Development and from which the development cannot be seen are not considered to be affected by the development and are scoped out.

5.72. Please refer to Table 5.6 below for the committed developments that will be included within the assessment.

Assessment Methodology

Technical Scope

5.73. This ES chapter will outline potential built heritage impacts and effects (both direct and indirect) of the Proposed Development.

5.74. A cumulative effects assessment will assess potential combined effects of the Proposed Development and the other key reasonably foreseeable developments (under application or with extant planning permission) as set out in Appendix 3 of this Report.

Baseline Assessment

5.75. The baseline assessment will be undertaken using a combination of desk-based review of plans, maps, records, and other documents followed by on-site surveys in order to identify and assess the heritage interest of the designated heritage assets. It also establishes the way in which the settings and the Site contribute to the heritage interest of these assets.

5.76. Consideration will also be given to the historical development, building types and materials, key views to the notable historic buildings which contribute to the identification of the built form, and understanding of the special interest of the area.

5.77. The above receptors are valued and the potential impact of the Proposed Development on this value assessed giving a significance of effect. Individual viewpoints from which to undertake a visual assessment will be determined by on-site surveys and subsequent correspondence with the LPA.

5.78. The chapter will include a visual impact assessment. A total of 12 viewpoints have been identified; 6 short range views and 6 medium-to-long range views.

5.79. In order to predict the magnitude and significance of effect of the potential visual impact of the Proposed Development, the following criteria is considered:

- The sensitivity and proximity of receptors;
- The nature of the existing views;
- The degree of change to existing views and visibility of the Proposed Development; and
- The availability and amenity of alternative views.

5.80. The relative 'value' and importance attributed to the identified heritage assets largely coincides with their national or local status. In line with ICOMOS terminology, Grade I buildings are considered to be of very high significance; Grade II* of high significance; Grade II medium, and Locally Listed buildings are, comparatively, of low heritage significance.

5.81. As stated within Planning Practice Guidance (July 2019), all heritage assets have a setting, regardless of their identified status. The contribution of setting to the significance of a heritage asset is a key consideration when determining the overall 'value'. This provides a baseline from which to understand the capacity for change. A detailed significance appraisal will therefore be undertaken in order to understand the Site's capacity for change and provide a baseline from which the relative impact on the built historic environment can be deduced.

5.82. The assessment methodology for the Historic Environment is a synthesis of established guidance, best practice and professional judgement. In accordance with an adapted form of the methodology set out in the ICOMOS Guidance on 'Heritage Impact Assessments' (January 2011), in which the value of heritage attributes is assessed in relation to statutory designations, and priorities or recommendations set out in national research agendas, and ascribed values.

5.83. The baseline which might be affected by the Proposed Development are valued and the impact on them is assessed in order to give a significance of effect.

Construction Assessment

5.84. The assessment methodology and approach to the relative impact on heritage assets during the construction phase is based on evidence-based assumptions in relation to common issues such as demolition, dust, noise, site hoarding and scaffolding.

Operational Assessment

5.85. The assessment methodology and approach to the relative impact on heritage assets during the operational phase will be assessed utilising the suite of application plans and drawings and verified CGIs of the Proposed Development and professional judgement.

Summary of Assessment Scope

5.86. Table 6 below summarises the Historic Built Environment receptors and potential effects that have been scoped in to be assessed in the Environmental Statement.

Table 5.6: Summary of Assessment of Scope

Receptor	Impact	Potential Effect	Scoped In / Out
Listed Buildings identified in Figure 1	Indirect	Minor-to-moderate beneficial and adverse impacts expected on ability to appreciate heritage interest of listed building	In
Conservation Areas identified in Figure 1	Indirect	Minor- to – moderate beneficial and adverse impacts expected on ability to appreciate character and appearance of the conservation area.	In

5.87. For completeness, an assessment of committed developments has been considered in Appendix 3 of this report.

Human Health

Introduction

5.88. The following section outlines the methods and scope of the assessment that are expected to be required to examine the likely human health impacts of the Proposed Development on the Site and surrounding area. The Environmental Impact Assessment Regulations (May 2017) amendments included making explicit the requirement to consider population and human health. There is no prescribed EIA definition for human health but the identification, description, and assessment of effects on human health is well established in the UK for Strategic Environmental Assessment (SEA). Consideration of human health and well-being within EIA is separate from Health Impact Assessment (HIA), although each process can inform the other.

5.89. The complexities of development planning for human health are reported, due to the multiple determinants of health and wellbeing, and the need for cross-sectoral understanding and collaboration. There are linkages between the global ecosystem, the natural and built environments, the local economy with communities, people, and their lifestyles, and likely interactions between different sectors.

5.90. It is considered that most of the factors scoped into the EIA can have impacts on health and quality of life/wellbeing – both positive and negative – and both physical and mental through townscape, air quality, climate change resilience, flood risk, noise, provision of/accessibility to good quality housing and employment, health and community services, transport, and green infrastructure. The overall approach to human health will be to consider the summary findings of each relevant technical topic and align these with their interconnectedness into the themes for healthy urban planning. The assessment will consider the potential impacts on human health from the Proposed Development on identified receptors during demolition, construction and operation.

Legislative and Policy Context

5.91. The legislative context for each technical topic and of relevance to human health is considered in the section for that topic.

National Planning Policy

National Planning Policy Framework (NPPF [updated 2019 and revised in 2021])

5.92. The revised NPPF acknowledges the importance of considering health impacts during the planning process and covers many issues that are directly related to the determinants of health. The NPPF identifies the three overarching objectives – economic, social and environmental – that are *interdependent and need to be pursued in mutually supportive ways* in order to achieve sustainable development (paragraph 8). The social objective should support *"strong, vibrant and healthy communities… by creating a high quality built environment, with accessible local services that reflect the community's needs and support its health, social and cultural well-being."*

5.93. Chapter 8 covers promoting healthy and safe communities, acknowledging that planning policies and decisions should aim to achieve healthy, inclusive and safe places which:

"a) promote social interaction, including opportunities for meetings between people who might not otherwise come into contact with each other – for example through mixed-use developments, strong neighbourhood centres, street layouts that allow for easy pedestrian and cycle connections within and between neighbourhoods, and active street frontages.

b) are safe and accessible, so that crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion – for example through the use of clear and legible pedestrian routes, and high quality public space, which encourage the active and continual use of public areas; and

c) enable and support healthy lifestyles, especially where this would address identified local health and well-being needs – for example through the provision of safe and accessible green infrastructure, sports facilities, local shops, access to healthier food, allotments and layouts that encourage walking and cycling." (paragraph 92)."

5.94. Social, recreational and cultural facilities and services should *"support the delivery of local strategies to improve health, social and cultural wellbeing for all sections of the community*" (paragraph 93). "*It is important that sufficient choice of school places is available to meet the needs of existing and new communities"* (paragraph 95). Public safety should be promoted and *"take into account wider security and defence requirements"* (paragraph 97).

5.95. *"Access to a network of high quality open spaces and opportunities for sport and physical activity is important for the health and wellbeing of communities" (paragraph 98).* Sustainable transport should be promoted and this *"can help improve air quality and public health" (paragraph 105). "An effective use of land should be promoted in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions" (paragraph 119). "Developments should create places that are safe, inclusive and accessible and which promote health and wellbeing…" (paragraph 130). "New development must be appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health…" (paragraph 185).*

Public Health England (PHE) Strategy (2019)

5.96. The Strategy sets out how PHE intends to protect and improve the public's health and reduce inequalities during 2020 to 2025. The Strategy recognises that the longer term, societal drivers of change represent the principal challenge facing the public's health. However, there are opportunities now, including *"place-based approaches*". The 10 priorities include "*healthier diets, healthier weight; cleaner air; and better mental health"* with the aim to incorporate the reduction of health inequalities into each of the 10 priorities. The purpose of PHE is to protect and improve the nation's health and reduce health inequalities. This is guided by aims – *"to keep people safe; to prevent poor health; to narrow the health gap; and the support a strong economy".*

Sub-Regional Planning Policy

Places for Everyone – Joint Development Plan (Greater Manchester Councils, 2021)

5.97. The Greater Manchester Spatial Framework (GMSF, Publication Draft, 2020) has now been withdrawn but nine of the previous ten Councils have agreed to progress with a Joint Plan that will build upon the evidence base already collected. It may be noted that the GMSF Vision includes GM as *"a place where people live healthy lives"*; and Strategic Objectives include No 10 *"to promote the health and wellbeing of communities".* The overall draft Strategy and many of the policies in the plan support improvements in health and wellbeing, and reductions in health inequalities, such as by *"promoting a successful economy; increasing supply of high quality and affordable homes; enabling people to adopt healthier lifestyles; and reducing risks to human health".*

Local Planning Policy

Manchester City Council (MCC) Core Strategy (adopted 2012)

5.98. MCC's Core Strategy is the key document in Manchester's Local Development Plan. it is founded on a Vision to 2027 that includes *"an increased and sustainable healthy population…".* Policies relevant to health are as follows:

- Policy SP1 Spatial Principles includes requirement that development should make a positive contribution to neighbourhoods including *"making a positive contribution to the health, safety and wellbeing of residents".*
- Policy CC1 Primary Economic Development Focus: City Centre and Fringe states that the focus of employment growth is in the City Centre and will be a suitable location for consideration of high density buildings.
- Policy CC3 Housing advises that the most intensive development of housing will be in the City Centre.
- Policy CC6 High Density Development is a location where land should be used to maximise its efficiency.
- Policy CC7 Mixed Use Development guides that the City Centre presents the most viable opportunities for mixed use development.

- Policy CC10 A Place for Everyone advises that the City Centre will develop as a location which appeals to a wide range of residents and visitors.
- Policy EC1 Employment and Economic Growth in Manchester requires development proposals to make the best possible use of a site in terms of efficient use of space and including application of best practice in security design.
- Policy H1 Overall Housing Provision defines high-density developments as those with over 75 units and states that they are appropriate in the City Centre.
- Policy H12 Purpose Built Student Accommodation (PBSA) will be supported where the development satisfies certain criteria.
- Policy EN4 seeks to reduce CO2 emission and reduce fuel poverty by enabling low and zero carbon development.
- Policy EN8 Adaptation to Climate Change includes requirements to minimise flood risk and reduce urban overheating.
- Policy EN9 Green Infrastructure provides guidance on provision of new, and improvements to, the quality and accessibility of existing green infrastructure assets.
- Policies EN10 & 11 safeguard and create new open space, sport and recreation facilities.
- Health is further protected through Policies EN14 Flood Risk, EN16 Air Quality, EN17 Water Quality, and EN18 Contaminated Land & Ground Stability
- Policy T1 Sustainable Transport requires *"delivery of a sustainable, high quality, integrated transport system to encourage modal shift away from car travel… and to prepare for carbon free modes of transport".*
- Policy T2 will actively manage the pattern of development to ensure that there are accessible areas of opportunity and need.
- Policy T3 supports proposals that contribute to an economically and environmentally sustainable transport network through strategic integration of strategic transport projects. Progression towards sustainable transport will promote healthier living and well-being.
- Policy DM1 Development Management requires that all development should have regard to specific issues including *"Effects on amenity, including privacy, light, noise, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation";* Accessibility*: buildings and neighbourhoods fully accessible to disabled people, access to new development by sustainable transport modes"; "Community safety & crime prevention"; and "Design for Health".*

Guidance

Public Health England (PHE) Spatial Planning for Health (2017)

5.99. Provides evidence of links between spatial planning and health, focusing on five key built environment topics – neighbourhood design, housing, healthier food, natural and sustainable environment, and transport.

Public Health England (PHE) Health Impact Assessment in Spatial Planning (2020)

5.100. Provides a guide for local authority public health and planning teams setting out process and practice with regard to the wider determinants of health and wellbeing for plan-making and the planning application process. The guide is mostly associated with the plan-making and associated strategic environmental assessment processes. However, it does include an annex on integrating HIA in EIA and it does confirm the importance of a *"proportionate and justified approach".*

The Manchester Strategy - Our Manchester (2016)

5.101. The Manchester Strategy to 2025 comprises the Vision and five themes for the strategy including a progressive and equitable city where *"health will improve…".*

Baseline Conditions

5.102. Different study areas will be used for the assessment of individual human health impacts, according to each relevant technical topic. Overall, the study area will be the site with local surrounds, and the wider study area of Manchester City for the themes for healthy urban living and based upon professional judgement.

5.103. Baseline data will be gathered from a range of publicly available sources of information and will draw upon local health and wellbeing information and priorities, for example, published local authority health profiles through Public Health England (PHE, 2017-2019) and Office for National Statistics (ONS) for health and life expectancies (2017-2019) , and as reported by Manchester City Council . The key baseline from the other technical topics will be considered where relevant. It is not anticipated to be necessary to undertake primary research or surveys specific to the Human Health chapter.

Assessment Methodology

5.104. There is no standard methodology for assessing health in EIA and the complexities of investigating health impacts are recognised, for example, by Public Health England (PHE) with their Wider Determinants of Health tool that details the multiple determinants for health and the need for cross-sectoral understanding. This guidance is primarily focused on spatial plan makers and public health practitioners, but the principles and checklist can be applied to major development proposals. The recent Health Impact Assessment in Spatial Planning (PHE, 2020) similarly focuses on spatial planning and SEA but does include an annex on integrating HIA in EIA and asserts the importance of a "proportionate and justified approach". The EIA professional body Institute of Environmental Assessment & Management (IEMA) has prepared outline guidance for practitioners – Health in EIA, a Primer for a Proportionate Approach (2017) - it is important that health in EIA is proportionate, balanced, and relevant.

5.105. The health impact assessment will consider the direct implications for health such as the provision of housing and employment. Also, implications such as those arising through pollution, air quality, or safety risks, and accessibility to healthcare facilities and sustainable transport (public, cycling and walking) for healthy living. It will further consider the wider implications for health and well-being, such as disturbance/nuisance, provision and accessibility to green infrastructure, amenity, cultural and recreational facilities.

5.106. It is proposed that the assessment will consider the four Themes for health and wellbeing, as identified by the Healthy Urban Development Unit , as follows:

- Healthy Housing
- Active Travel
- Healthy Environment
- Vibrant Neighbourhoods

5.107. Each technical impact assessment is subject to its own standards, regulations, and methods of assessment. The key findings from each topic will be considered such that any significant impacts for human health are clearly presented in a separate chapter. The key impacts for health will be considered and inter-relationships will be integrated within the four themes identified for healthy urban living.

5.108. Sensitive receptors will include future users and occupiers of the Site and the surrounding local area, and will include:

- On-site operatives during construction.
- existing residents, businesses, communities around the Site, as well as any other sensitive receptors identified by the technical assessments.
- future users and visitors of the Site.

5.109. Effects that are described as 'minor' or 'negligible' are determined to be 'Not Significant' and effects that are described as 'moderate' or 'major' are determined to be 'Significant'. This takes into account the sensitivities of receptors as high, moderate, low. The criteria and categories of significance applied in the health impact assessment are, as follows:

- Major Adverse/Beneficial – important considerations at local or district scale; if adverse, are potential concerns to the project and may become key factors in the decision-making process.

- Moderate Adverse/Beneficial – modest important local effects that, if adverse, are not likely to be key issues for decision-making.
- Minor Adverse/Beneficial – Slight, short, or highly localised effects that, if adverse, are unlikely to be important in the decision-making process.
- Negligible – no appreciable effects on health factors.

5.110. Standardised sectoral thresholds and significance criteria will be used for each of the relevant technical factors that contribute to health and well-being. The overall likely significant effects on health will then be determined in a qualitative way using professional judgment.

Summary of Assessment of Scope

5.111. For each technical chapter, the relevant committed developments will be considered and any elements relevant to human health will be identified. For example, during the construction phase there may be possibilities for cumulative effects on transport, air quality and noise – all of which are likely to be mitigated through implementation of a Construction Environmental Management Plan (CEMP). There are also likely to be cumulative effects for employment and local expenditure; and provision of employment is known to have beneficial effects on health and wellbeing. During the operational phase, there may be effects from any cumulative increase in population and pressure on facilities and services; the cumulative effects for housing and employment/economy are likely to be beneficial. The Human Health chapter will consider the relevant cumulative effects identified from each of the other technical chapters and, using professional judgment, assess any significant interactions within the four themes for healthy urban living – Healthy Housing; Active Travel; Healthy Environment; and Vibrant Neighbourhoods.

Noise and Vibration

Introduction

5.112. This assessment will consider the potential impact of noise and vibration from the Proposed Development on the surrounding noise sensitive receptors during the construction and operational phases. Any significant impacts to existing and proposed sensitive receptors will be identified and subsequent mitigation measures will be proposed. Where mitigation measures are proposed, the anticipated residual impacts will also be identified.

5.113. The ES Chapter will be prepared by Fisher Acoustics.

Baseline Conditions

5.114. Manned daytime and night time noise surveys will be carried out at the location of the proposed building and at locations representative of the noise climate at nearby sensitive receptors such as nearby residential accommodation on Port Street (‘The Astley’) and Binns Place (‘Avro’).

5.115. There are no notable sources of existing vibration at and around the Site that would be able to impact upon the proposed or existing properties at and around the Site. Therefore, no baseline measurements of vibration at the Site are proposed.

Method of Assessment

- Potential noise and vibration effects during the construction works and the completed development to be addressed in the ES will include:
- Temporary noise and vibration nuisance due to enabling and construction works associated with daytime and (if required) night time works;
- Noise nuisance to existing surrounding sensitive receptors due to road vehicle movements generated during the construction works - associated with daytime and (if required) night time works;
- Noise generated from permanent fixed building services plant;
- Noise egress such as amplified sound from proposed residential leisure uses and commercial spaces;
- and
- The cumulative operational impacts associated with this and other proposed schemes within the locality will be established and assessed. This will principally be in relation to building services noise and the control of commercial noise egress with the assessments undertaken in line with the methods outlined in this scoping report.
- It is not intended to carry out a noise assessment relating to the movement of cars to and from the proposed car park, in line with the guidance given in Design Manual for Roads and Bridges discussed below.

5.116. The noise and vibration impact assessment will be undertaken with reference to the following standards and guidance documents:

- Planning & Noise, Technical Guidance' issued by Manchester City Council (2015)
- World Health Organisation 'Guidelines for Community Noise' (1999)
- National Planning Policy Framework (NPPF) (2019)
- Noise Policy Statement for England (NPSE)
- BS 5228 – Noise and vibration control on construction and open sites
- BS 7385 – Evaluation and measurement for vibration in buildings
- BS 6472 – Guide to evaluation of human exposure to vibration in buildings: Part 1 – Vibration sources other than blasting
- BS 4142 – Methods for rating and assessing industrial and commercial sound
- BS 8233 – Guidance on sound insulation and noise reduction for buildings
- BS 7445 – Description and measurement of environmental noise
- Calculation of Road Traffic Noise, Department of Transport (1988)
- ANC Guidelines: Measurement and Assessment of Ground borne Noise and Vibration (2001)
- IEMA 'Guidelines for Noise Impact Assessment' (2014)
- Environmental Protection Act (EPA) [Sections 79 and 80]
- Control of Pollution Act (CoPA) [Sections 60 and 61].

5.117. The potential effects of the Proposed Development on the surrounding area, and on nearby noise sensitive premises, will be assessed by calculation with respect to the relevant criteria.

5.118. The construction noise and vibration assessment will be based on the guidance given in BS 5228:2009 Noise and Vibration Control on Construction and Open Sites and BS 7385 'Evaluation and Measurement for Vibration in Buildings, Part 2: Guide to Damage Levels from Ground-borne Vibration'.

5.119. Identification of potentially sensitive noise and vibration receptors on and surrounding the Site and categorisation of the 'sensitivity' in accordance with EIA terminology, as illustrated in Table 5.7.

Table 5.7: Receptor sensitivity

Sensitivity of receptor	Description
High	Residential properties, hotels and hostels
Moderate	Commercial, health care and educational buildings
Low	Residential amenity, retail buildings and industrial buildings

5.120. The magnitude of impact shall be defined in accordance with recognised noise and vibration guidance and corresponding EIA terminology (Major, Moderate, Minor, Negligible).

5.121. In terms of nature and scale of effects, effects will be defined as either adverse, beneficial or neutral in nature.

5.122. The scale of effects will refer to guidance within the Noise Policy Statement for England (NPSE), the decision making includes identifying whether the overall effect of the noise exposure generated by a development is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level. The definitions for the different effect levels are outlined below:

- Significant Observed Adverse Effect Level (SOAEL): The level of noise exposure above which significant adverse effects on health and quality of life occur.
- Lowest Observed Adverse Effect Level (LOAEL): The level of noise exposure above which adverse effects on health and quality of life can be detected.
- No Observed Effect Level (NOEL): The level of noise exposure below which no effect at all on health or quality of life can be detected.

5.123. Typically, effects (either before or after mitigation) that are major or moderate in scale shall be considered as 'significant effects' i.e., exceeds the LOAEL. The exception to this will be temporary non-permanent sources where a moderate effect would be considered acceptable as it does not exceed the SOAEL.

Construction Phase

5.124. Significance criteria for assessing the effect of construction plant noise and vibration, including demolition, are based broadly on the guidance set out in BS 5228-1&2: 2009+A1:1014 'Code of practice for noise and vibration control on construction and open Sites', and are presented in Table 5.8.

Table 5.8: Significance criteria for assessing construction noise and vibration

Effect category	Daytime Noise Levels	Vibration Levels
Negligible	Lower than existing ambient L_{Aeq}, or greater than the existing ambient L_{Aeq} but less than the threshold noise level	Peak particle velocity (PPV) less than 0.14 mm/s.

Effect category	Daytime Noise Levels	Vibration Levels
	(dependent on existing ambient noise levels).	
Minor Adverse	Greater than existing ambient L_{Aeq} and between the threshold noise level and threshold noise level +5 dB (dependent on existing ambient noise levels).	PPV regularly exceeding 0.14 mm/s, but less than 0.2 mm/s.
Moderate Adverse	Greater than the threshold noise level +5 dB (dependent on existing ambient noise levels) but for no more than 10 days in any month.	PPV regularly exceeding 0.2 mm/s, but less than 1.0 mm/s.
Major Adverse	Greater than the threshold noise level +5 dB (dependent on existing ambient noise levels) for more than 10 days in any month.	PPV regularly exceeding 1.0 mm/s.

Operational Phase

5.125. The operational noise affects will be assessed with respect to the baseline measurements and where appropriate the baseline for the development year.

5.126. There are no vibration sources associated with the operational phase of the Proposed Development.

5.127. The Design Manual for Roads and Bridges (DMRB) (Vol 11 Environmental Assessment Part 7 Noise and Vibration (2011 –Revision 1)) advises that the threshold criteria used for traffic noise assessment during the day is a permanent change in magnitude of 1 dB LA10,18h in the short term (i.e. on opening) or a 3 dB LA10,18h change in the long term (typically 15 years after project opening).

5.128. Furthermore, the DMRB also states that a change in noise level of 1 dB LA10,18h is equivalent to a 25% increase or a 20% decrease in traffic flow, assuming other factors remain unchanged and a change in noise level of 3 dB LA10,18h is equivalent to a 100% increase or a 50% decrease in traffic flow.

5.129. Given that the expected increase in road traffic on local roads due to the operation of the Proposed Development is less than 25%, the threshold criteria are not expected to be reached. Therefore, a specific assessment of operational phase traffic noise is not currently proposed and has been scoped out of the assessment.

5.130. For the assessment of building services noise, reference will be made to BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'.

5.131. Criteria for the assessment are set in accordance with BS 4142 and the Institute of Acoustics (IOA) / Institute of Environmental Management and Assessment (IEMA) 'Guidelines for Noise Impact Assessment' as described in Table 5.9.

Table 5.9: Significance criteria for assessing operational noise impact

Effect Category	Increase in noise level (dB)	Description
Negligible	<1	Noise increase is unlikely to be discernible
Minor Adverse	1.0 to 2.9	A slight increase in noise levels may be perceived in affected buildings and outdoor recreational areas

Effect Category	Increase in noise level (dB)	Description
Moderate Adverse	3 to 4.9	Increase in noise levels is likely to be noticeable in affected buildings and outdoor recreational areas
Major Adverse	>5	Increase in noise level is likely to be clearly perceivable and could have a significant impact on the continued use of a building

Summary of Assessment Scope

5.132. The key considerations associated with the noise and vibration impact of the Proposed Development are summarised in Table 5.10.

5.133. The impact of these key considerations on each of the nearby noise sensitive premises identified below will be considered in the noise and vibration chapter of the ES.

A. Dwellings on Port Street ('The Astley')

B. Dwellings on Binns Place ('Avro')

C. Dwellings on Great Ancoats Street ('MM2')

D. Dwellings on Tariff Street ('Jacksons Warehouse')

Table 5.10: Summary of Noise and Vibration Assessment Scope

Receptor	Impact	Potential Effect	Scoped In / Out
Dwellings within the proposed development	Noise impact of environmental noise levels due to, for instance, road traffic.	Permanent effects on human activity and health (e.g. annoyance, speech communication, sleep disturbance). Any potential effects will be mitigated via the facade design of dwellings within the development.	In
	Noise impact of new external fixed plant items associated with the development	Permanent effects on human activity and health (e.g. annoyance, speech communication, sleep disturbance). Any potential effects will be mitigated via the facade design of dwellings within the development and the design of new external fixed plant items associated with the development.	In
	Noise impact of any amplified music associated with the amenity/leisure spaces and commercial units within f the development	Permanent effects on human activity and health (e.g. annoyance, speech communication, sleep disturbance). Any potential effects will be mitigated via the facade design of dwellings within the development and any premises with amplified music associated with the development.	In

Receptor	Impact	Potential Effect	Scoped In / Out
	Cumulative noise impact in conjunction with other developments in the area.	Permanent effects on human activity and health (e.g. annoyance, speech communication, sleep disturbance). Any potential effects will be mitigated via the facade design of dwellings within the development.	In
Existing and proposed nearby dwellings	Noise and vibration impact of temporary construction activities, including demolition	Temporary effects on human activity and health (e.g. annoyance, speech communication, sleep disturbance). Any potential effects will be mitigated or controlled via the construction noise and vibration assessment.	In
	Noise impact of temporary construction traffic	Permanent effects on human activity and health (e.g. annoyance, speech communication, sleep disturbance). Any potential effects will be mitigated or controlled via the construction noise and vibration assessment.	In
	Noise impact of new external fixed plant items associated with the development	Permanent effects on human activity and health (e.g. annoyance, speech communication, sleep disturbance). Any potential effects will be mitigated via the design of new external fixed plant items associated with the development.	In
	Noise impact of any amplified music associated with the development	Permanent effects on human activity and health (e.g. annoyance, speech communication, sleep disturbance). Any potential effects will be mitigated via the facade design of any premises with amplified music associated with the development.	In
	Cumulative noise impact in conjunction with other developments	Permanent effects on human activity and health (e.g. annoyance, speech communication, sleep disturbance).	In

5.134. For completeness, an assessment of committed developments has been considered in Appendix 3 of this report.

Socio-Economic

Introduction

5.135. This Chapter of the ES will be prepared by AMION Consulting and assesses the likely Socio-economic impacts of the proposals upon the Site and surrounding area.

5.136. The key objectives of the socio-economic assessment are as follows:

- To review the local economy and determine the associated socio-economic issues in the context of the Proposed Development.
- To identify the principal socio-economic impacts (both positive and negative) that may result from the Proposed Development on-site and across the wider economy and assess the significance of these effects within a defined area of impact.
- To recommend measures for avoiding or reducing any identified adverse effects, and/or enhancing positive effects where possible.
- To highlight the significance of any residual effects that would remain after mitigation.

5.137. Baseline socio-economic data was collected, and information gathered from interested parties to inform and scope an initial assessment of the economic impact of the Proposed Development. This economic impact assessment will be updated, along with the baseline data, and will be issued as part of the full Environmental Statement.

Legislative and Policy Context

5.138. As part of the baseline analysis and to inform the assessment of potential socio-economic impacts, a review of national, regional, and local policy context will be undertaken.

Legislation

5.139. There is no specific statutory guidance for the assessment of socio-economic impacts within the EIA regulations.

5.140. The relevant UK planning and other strategic policies relevant to the assessment of socio-economic impact are outlined below.

National Planning Policy

5.141. National Planning Policy Framework - The contribution of the proposed development to core objectives within the Framework will be assessed. In particular, it will examine the extent to which this important regeneration scheme will fulfill the over-arching social objective: "*to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being*"

5.142. As part of the wider regeneration of the Piccadilly Basin, the assessment will also test the contribution to key economic objectives, focused upon job creation and prosperity particularly in relation to "*contributing to building a strong, responsive and competitive economy, by ensuring that sufficient land of the right type is available in the right places and at the right time to support growth and innovation*".

Other National Policy

5.143. COVID-19 Recovery – The Proposed Development can make a significant contribution to a sustainable COVID-19 recovery and the ambition to 'Build Back Better'. The Proposed Development will accelerate the regeneration of the Ancoats community, and the housing development will ensure that the progress, confidence, and momentum in the national COVID recovery effort is sustained.

5.144. Levelling up - The Government has placed significant emphasis on regional growth to support 'levelling up' across the country. The Site presents a substantial opportunity to enable neighbourhood renewal and tackle inequalities within Ancoats communities. The Proposed Development will bring in significant inward private investment into a deprived community in need of regeneration and renewal.

5.145. Brownfield Development – Recent Government policy has reinforced the priority of developing brownfield land. Several major funding schemes and policies mechanisms have been announced that aim to increase residential development on brownfield land. The Proposed Development represents an opportunity to deliver circa. 450 new homes, across a range of bedrooms and all on brownfield land.

Sub-Regional Policy

5.146. Northern Powerhouse – The Government has reaffirmed their commitment to supporting people across the North Powerhouse reach their full potential. Attracting foreign direct investment, delivering new infrastructure and supporting SMEs has been focal to the Northern Powerhouse's drive for improved opportunities. Supporting growth in a skilled and mobile labour market will be critical to supporting wider growth objectives.

5.147. Greater Manchester Local Enterprise Partnership (LEP) Local Industrial Strategy - The LEP plans to maximise its digital growth, ensure growth benefits all people and places, attract innovative firms and achieve carbon neutrality by 2038. The assessment will examine the potential impact of the Proposed Development, focusing upon its role in unlocking the development of a key brownfield site within a highly accessible location in the heart of the City. At a spatial level, it will consider the role of the scheme in supporting the regeneration of key locations to drive inclusive economic growth, including the heart of Greater Manchester from Etihad Campus in the east to Trafford Park in the west.

5.148. Greater Manchester Strategy - The Strategy identifies relevant priorities such as opportunities for progression; a thriving economy; world-class connectivity; safe, decent, and affordable housing; a green city-region; stronger communities; and an age-friendly greater Manchester. The Proposed Development will support the delivery of housing, creating a vibrant and resilient neighbourhood with high-quality housing and employment prospects. In particular, the housing priority states Greater Manchester plans for 10,000 new homes each year up to 2035, a figure supported by the Greater Manchester Strategic Housing Assessment. The Proposed Development will provide a valuable contribution to these targets.

Local Policy

5.149. Manchester Core Strategy - The Core Strategy highlights that approximately 60,000 new dwellings will be provided in Manchester between 2009 and 2027 (average of 3,333 dwellings per year), with an affordable housing target of 20% for new development. Additionally, the Strategy notes that East Manchester cannot be characterised as part of stable neighbourhood type and has a shortage of attractive family housing, although new housing developments in Ancoats, New Islington, Holt Town and Lower Medlock is slowly changing this profile. The Proposed Development aligns with this strategy through the provision of new housing in Ancoats.

5.150. Manchester City Centre Strategic Plan - In accordance with the Core Strategy's ambition to expand the city centre to support economic growth and improve quality of life within the periphery, Ancoats is highlighted within the Strategic Plan as a place that could support a range of housing tenures to meet demand.

5.151. Manchester's Economic Recovery and Investment Plan - The City Council, in partnership with private sector and other stakeholders, have set out how Manchester plans to respond to the Covid-19 pandemic and reinvigorate its economy.

5.152. Piccadilly Basin SRF – The framework sets out guidelines for the Site in regard to scale, massing and density. According to this, the Site will be residential-led mixed-use up to 32 storeys in height.

5.153. The socio-economic chapter will also review other policy areas relevant to the assessment of social and economic factors.

Consultations

5.154. We will engage with relevant officers at Manchester City Council to ensure that the baseline analysis fully reflects conditions at the local level. Consultations will also focus upon potential measures relating to impact mitigation (and benefit maximisation), including opportunities for alignment.

5.155. Where appropriate, consultation will also be undertaken with other organisations relevant to understanding the potential social and economic impact of the scheme, including the Greater Manchester Combined Authority.

Baseline Conditions

5.156. Prior to considering the socio-economic effects, it is necessary to establish a clear understanding of baseline socio-economic conditions within the geographical areas relevant to the site. Trends in the change over time of key socio-economic indicators will be analysed and compared to those for the North West and nationally.

5.157. The socio-economic assessment will detail local socio-economic conditions, including a full analysis of the following issues:

- Population
- Housing (tenure)
- Education and learning (existing schools)
- Health Care (GP Practices)
- Employment (economic activity rate and sectoral employment analysis
- Local labour market (resident employment by occupation, qualification level and resident earnings)
- Unemployment and worklessness
- Deprivation

5.158. As part of the baselines analysis within the ES Technical Paper, consideration will be given to how the baseline would evolve in absence of the Proposed Development, albeit recognising the impact of the wider macro-economic factors.

5.159. Baseline data for Manchester, collected across the key indicator groups above, is highlighted in Table 5.11 below:

Table 5.11: Key socio-economic indicators

Socio-economic indicators	Area of Impact (* denotes 2011 Census data)	Manchester	Greater Manchester	England
Demographics (2019)				
Resident population	71,792	552,858	2,835,686	56,286,961
Working age population (16-64)	59,447	389,646	1,803,177	35,116,566
Economic activity (resident based) (2020)				
Economically active	64.6%*	72.5%	76.7%	79.5%
In employment	51.1%*	66.3%	72.5%	75.7%
Unemployed (Claimant rate) (July 2021)	4.8%*	8.3%	7.1%	5.7%
Employment by occupation (resident based)				
SOC 1-3	50.8%*	51.9%	47.4%	50.6%
SOC 4-6	21.9%*	22.7%	27.8%	27.9%
SOC 7-9	27.3%*	24.8%	24.3%	21.3%
Qualifications (resident based)				
NVQ 4 and above	-	47.7%	39.1%	42.8%
NVQ 3 and above	-	64.2%	57.8%	61.3%

NVQ 2 and above	-	75.5%	75.5%	78.2%
NVQ 1 and above	-	85.2%	86.7%	88.2%
Other qualifications	-	6.9%	5.7%	5.7%
No qualifications	-	7.8%	7.7%	6.2%
Earnings (gross weekly) (2020)				
By place of residence	-	£537.9	£549.8	£589.8
By place of work	-	£599.8	£553.7	£589.9

Potential Significant Effects

5.160. It is anticipated that the Proposed Development will result in a range of potentially significant socio-economic impacts during both the construction and operational phases. These impacts may occur as a direct result of the Proposed Development or indirectly, for example through supply chain and employee expenditure within the local economy.

5.161. The likely socio-economic impacts during the construction phase and operational phase of the Proposed Development are set out in turn below.

Construction Phase

5.162. The socio-economic assessment will consider the following potential impacts during the construction phase:

- Temporary employment generated through the construction of the Proposed Development – this will include direct employment associated with the Site, as well as indirect and induced employment (multiplier effects) from supply chain expenditure and the expenditure in the local economy of workers employed during the Construction Phase.
- Short-term increase in economic output (GVA) - in line with the temporary employment impact, this will again take account of the direct, indirect, and induced economic output impact during the Construction Phase.
- Creation of training and apprenticeship opportunities during the Construction Phase.
- Effects on local facilities and services, specifically schools and healthcare facilities, from the increase in construction workforce.
- Wider socio-economic impacts – this will include those impacts, which although difficult to quantify, are important in understanding the overall socio-economic effect of the Proposed Development. For example, consideration will be given to wider impacts such as image and perceptions of the local area and crime/security.

Operational Phase

5.163. The socio-economic assessment will consider the following potential impacts during the operational phase:

- Creation of direct, indirect, and induced long-term employment opportunities from the proposed uses on the Site.
- Creation of additional spend, supporting wider off-site employment within the Manchester economy.
- Long-term increase in economic output (GVA) resulting from the direct, indirect, and induced impacts of the Proposed Development during the Operational Phase.
- Increase in business rate revenue generated due to the provision of new employment floorspace on the Site.
- Increase in council tax revenue generated due to the provision of new homes on the Site.
- Creation of training and apprenticeship opportunities during the Operational Phase.
- Effect on local labour market, specifically in terms of employment opportunities generated by the Proposed Development for residents of Manchester.
- Effect on local facilities and services, such as schools and healthcare facilities, due to the increase in population and workforce in the local economy.
- Wider socio-economic impacts - consideration will be given to wider positive impacts of the Proposed Development such as:
    - image, and perceptions of the local area; and
    - catalytic regeneration effects that will underpin the long-term regeneration plans for Manchester.

Assessment Methodology

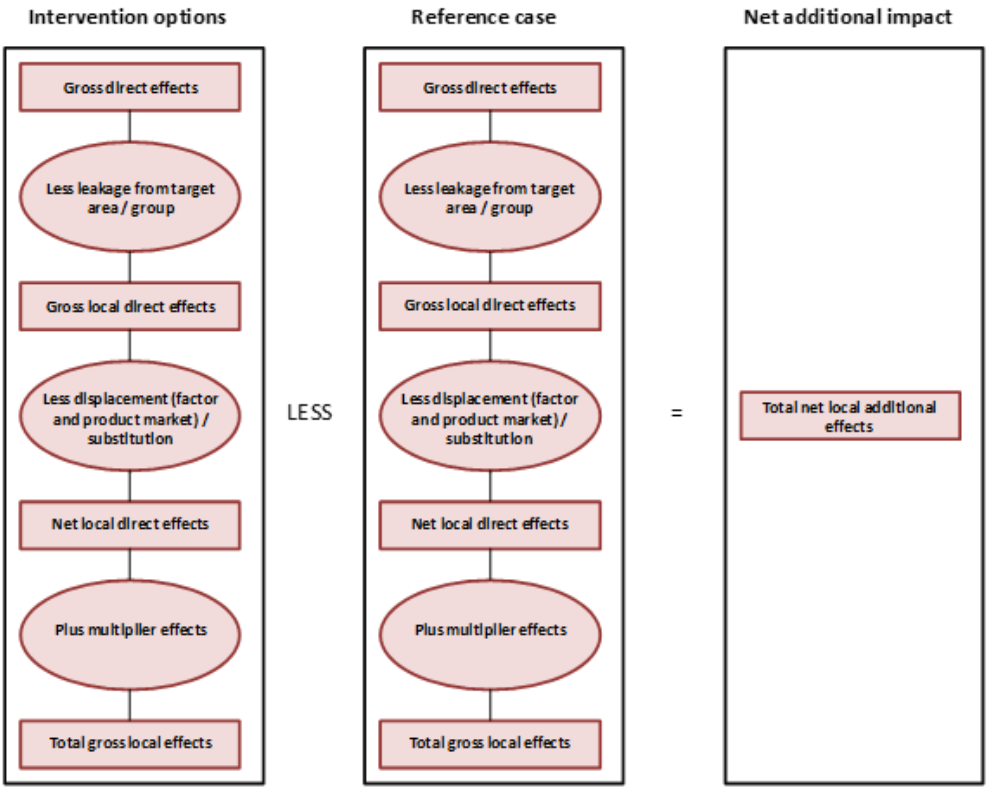
Technical Scope

5.164. The scope of the assessment of socio-economic impacts will be undertaken using the following methodology:

- A review of the strategic policy context to provide an outline of the relevant national and sub-national / local social and economic objectives of the area.
- Identification of the impact area, in relation to each potential socio-economic impact, for the assessment of the Proposed Development.
- A desktop review of all publicly available information on current socio-economic and labour market conditions in the study area to establish the baseline using accepted Government sources, such as the Census and Office for National Statistics (ONS) data, including the baseline indicator groups and assembled data outlined above.
- Assessment of likely significant socio-economic effects of the Proposed Development during the Construction and Operational Phases based on sensitivity value of receptor and magnitude of effect.
- Recommendation of mitigation measures where necessary.
- Assessment of significance of residual effects assuming that the mitigation measures are implemented.
- Identification of likely significant additive / cumulative effects regarding other consented schemes in the local area.
- Consideration of synergistic effects including the in-combination / interaction of socio-economic effects with other ES topic areas.

5.165. Qualitative and quantitative assessments will be undertaken on a phase-by-phase basis having regard to assessment methodologies from published guidance, including:

- Homes and Communities Agency's (HCA's) Additionality Guide and Employment Densities Guide:
- HCA's Calculating Cost Per Job Best Practice Note;
- The Department of Communities and Local Government (DCLG) Appraisal Guide;



- Department for Business, Innovation and Skills (BIS) Occasional Paper No.1; and
- Professional judgement.

5.166. Key to understanding the socio-economic effects of the Proposed Development will be determining its net additional impact or 'additionality'. This is the extent to which activity takes place at all, on a larger scale, earlier or within a specific designated area or target group as a result of the intervention. The approach to assessing the net additional impact of a project is shown diagrammatically in Figure 5.3.

5.167. In order to assess the additionality of the Proposed Development, the following factors will be considered:

- Leakage – the proportion of outputs that benefit those outside of the area of impact.
- Displacement – the proportion of outputs accounted for by reduced outputs elsewhere in the area of impact. Displacement may occur in both the factor and product markets.
- Multiplier effects – further economic activity associated with additional local income and local supplier purchases.
- Deadweight – outputs which would have occurred without the Proposed Development. This is referred to as the reference case.

5.168. The above approach to assessing the additional impact of a project is consistent with central Government guidance for physical development projects, including the recently published Appraisal Guide (2016) by the Department for Communities and Local Government (DCLG).

Receptors

5.169. Table 5.12 sets out a definition of the receptor criteria that will be used to inform the significance of effects.

Table 5.12: Receptors

Nature of Impact	Receptor
International	• The receptor is of international importance • It has Socio-economic value outside of the UK
National	• The receptor is of national importance • It is identified as a key priority within national policy
Regional	• The receptor is of regional importance • It is identified as a key priority within regional policy
County / sub-region	• The receptor is of importance at the county / sub-regional level • It is identified as a key priority within policy for the county / sub-region
Borough/District	• The receptor is of importance to Manchester • It is identified as a key priority within policy for Manchester
Local/Neighbourhood	• The receptor is of importance locally • It is identified as a key priority locally

Environmental Impacts

5.170. In relation to socio-economics, there are no published standards against which the predicted impacts of a development can be assessed in terms of defining magnitude of effect. The approach adopted therefore takes into account the socio-economic profile of the area and industry knowledge of similar projects being brought forward across the sub-region. As set out in Table 5.13, for a number of the socio economic impacts, thresholds have been identified to categorise the magnitude of effect. For other impacts, such as wider socio-economic effects, it is necessary to make a more subjective judgement.

Impact Prediction Confidence

5.171. It is also of value to attribute a level of confidence by which the predicted impact has been assessed. The criteria for these definitions are set out below:

Table 5.13: impact prediction confidence

Confident level	Description
High	The predicted impact is either certain i.e. a direct impact, or believed to be very likely to occur, based on reliable information or previous experience.
Low	The predicted impact and its levels are best estimates, generally derived from first principles of relevant theory and experience of the assessor. More information may be needed to improve confidence levels.

Significance of Effects

5.172. Having determined the nature of the impact, its level of receptor (international to local) and level of environmental impact (substantial to neutral and positive or negative), , a significance matrix will be utilised to determine the significance of effect and level of confidence assigned.

5.173. As part of this Scoping Chapter, an initial assessment of the significance of effect has been undertaken for the Construction Phase and Operational Phase. It is important to note, however, that even where the confidence level is identified as 'high' as it reflects established guidance and benchmarks, the assessment will be subject to further revision as the proposals are finalised.

Baseline Assessment

5.174. The baseline assessment will consider the current nature of the uses on the Site and assess the deadweight position.

Construction Assessment

Table 5.14: Summary of Assessment of Scope – Construction Phase

Receptor	Impact	Potential Effect	Scoped In / Out
Construction and property / professional service sector workforce	Temporary increase in employment	Minor/Moderate	In
Construction and property / professional service sector	Short-term increase in economic output (GVA)	Minor/Moderate	In
Trainees within the local and wider impact areas	Training and apprenticeship opportunities	Minor/Moderate	In
Residents within the local impact area	Effects on local services and facilities	Negligible	In

5.175. In addition, the assessment will consider potential wider effects in the construction phase linked to key externalities including the potential impact on well-being for local residents.

Operational Assessment

Table 5.15: Summary of Assessment of Scope – Operational Phase

Receptor	Impact	Potential Effect	Scoped In / Out
Residents within the local and wider impact area	Creation of long-term employment opportunities	Minor positive effect	In
Retail and leisure service sector businesses	Long-term increases in economic output (GVA)	Minor positive effect	In
Retail and leisure service sector businesses	Increase in local expenditure by residents on goods and services	Moderate positive effect	In
Residents of Manchester City Council	Increase in business rate revenue	Negligible effect	In
Residents of Manchester City Council	Increase in council tax revenue	Minor positive effect	In
Businesses within the local and wider impact area	Effect on local labour market	Moderate positive effect	In
Residents within the local and wider impact area	Commuting and migration impact	Negligible effect	In
Residents within the local impact area	Effect on local services and facilities	Minor effect	In

Scenarios to be assessed

5.176. A series of alternatives have been considered as part of the evolution of the proposals. These will be documented within the ES, identifying how environmental considerations have influenced the proposals.

5.177. For completeness, an assessment of committed developments has been considered in Appendix 3 of this report.

Sunlight, Daylight and Overshadowing

Introduction

5.178. This Chapter of the ES will be prepared by GIA and assesses the likely daylight, sunlight and overshadowing impacts of the proposals upon the Site and surrounding area.

Legislative and Policy Context

National Planning Policy

Revised National Planning Policy Framework 2021

5.179. The National Planning Policy Framework stipulates that *"…Planning policies and decisions should ensure that developments… create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users."*

5.180. The National Planning Policy Framework (NPPF) adopted on the 27th March 2012, updated in 2021 stipulates that *"…planning policies and decisions should always seek to secure a good standard of amenity for existing and future occupants of land and buildings."*

5.181. Paragraph 125 further states:

"Area-based character assessments, design guides and codes and masterplans can be used to help ensure that land is used efficiently while also creating beautiful and sustainable places. Where there is an existing or anticipated shortage of land for meeting identified housing needs, it is especially important that planning policies and decisions avoid homes being built at low densities, and ensure that developments make optimal use of the potential of each site. In these circumstances:

[…]

c) In this context, when considering applications for housing, authorities should take a flexible approach in applying policies or guidance relating to daylight and sunlight, where they would otherwise inhibit making efficient use of a site (as long as the resulting scheme would provide acceptable living standards)."

The National Planning Policy Guidance (NPPG) 2019

5.182. The National Planning Practice Guidance (NPPG) – Making Efficient Use of Land, published on 22 July 2019, Paragraph: 006 Reference ID: 66-006-20190722 states that:

"Where a planning application is submitted, local planning authorities will need to consider whether the proposed development would have an unreasonable impact on the daylight and sunlight levels enjoyed by neighbouring occupiers, as well as assessing whether daylight and sunlight within the development itself will provide satisfactory living conditions for future occupants."

5.183. Paragraph 007 Reference ID: 66-007-20190722 also states:

"All developments should maintain acceptable living standards. What this means in practice, in relation to assessing appropriate levels of sunlight and daylight, will depend to some extent on the context for the development as well as its detailed design. For example in areas of high-density historic buildings, or city centre locations where tall modern".

Local Planning Policy

Manchester Core Strategy (2012 – 2027)

5.184. Policy DM1 – Development Management – States that all developments should have regard to the effects on amenity including privacy, light, noise, vibration, air quality and odours.

5.185. Policy EN2 – Tall Buildings – States that, by their very size, tall buildings can have a significant impact on the local environment and its micro-climate. It is therefore expected that this impact be modelled and that submissions for tall buildings also include appropriate measures to create an attractive, pedestrian friendly local environment.

Guide to Development in Manchester Supplementary Planning Document and Planning Guidance (Adopted April 2007)

5.186. The SPD sets out a series of design principles which should be considered and implemented where necessary, those measures relevant to this assessment are:

- Minimise reliance on energy-using equipment for heating, cooling, lighting and natural ventilation.
- Site layout and building design principles should maximise the capture and use of daylight and passive solar energy, whilst avoiding excessive solar gain in the summer.
- Consider the impacts of overshadowing.

Guidance

Building Research Establishment (BRE) 'Site Layout Planning for Daylight and Sunlight – A Guide to Good Practice', Second Edition, 2011

5.187. The Building Research Establishment (BRE) Guidelines 'Site Layout Planning for Daylight and Sunlight – A Guide to Good Practice 2011, 2nd edition' (released October 2011) provides advice on site layout planning to achieve good sunlighting and daylighting within buildings, and in the open spaces between them. It is intended for use by building designers, developers, consultants and Local Planning Authorities (LPAs). The advice it gives is not mandatory and should not be used as an instrument of planning policy, it states:

"This guide is a comprehensive revision of the 1991 edition of Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice. It is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location."

5.188. It also states:

"The advice is given here is not mandatory and the guide should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer. In special circumstances the developer or planning authority may wish to use different target values… in an area with modern high rise buildings, a higher degree of obstruction maybe unavoidable if new developments are to match the height and proportions of existing building" (para.1.6).

5.189. In addition, the BRE Guidelines state (para. 1.3) that, *"it is intended to be read in conjunction with the interior daylighting recommendations in the British Standard 8206-2 Code of practice for daylighting, and in the CIBSE publication Lighting guide: daylighting and window design".*

British Standard (BS) 8206-2:2008: 'Lighting for Buildings – Part 2: Code of Practice for Daylighting'

5.190. The British Standard 8206 part 2 provides recommendations regarding the design for daylight in buildings and sets out various methods for assessing daylight. The document states:

"Daylighting gives to a building a unique variety and interest. An interior which looks gloomy, or which does not have a view to the outside when this could reasonably be expected, will be considered unsatisfactory by its users."

EN17037:2019 Daylight in Buildings (December 2018)

5.191. The new European Standard for Daylighting, or EN17037 was published in December 2018. Most local authorities continue to refer to the BRE guidelines. The BRE hope to secure funding and re-write the BRE guidelines in the financial year beginning April 2019, with the view of a revised publication in 2020. These timescales leave a fair degree of ambiguity as to when the new European Standard will become part of planning policy and what the transition between standards will be. In the meantime, The BRE guidelines and BS8206 remain the relevant tests.

Daylighting and window design: Lighting Guide LG10 (CIBSE) (1999)

5.192. This guide replaces the CIBSE Applications Manual Window Design (1987) and provides a daylight design guide. It states:

"when daylighting decisions are made, however, they will have implications for other, interrelated aspects of window performance such as solar heat gain, winter heat loss, provision of view, acoustic performance, privacy, security and protection from fire."

Baseline Conditions

5.193. Baseline studies are currently being undertaken by GIA. The baseline assessment will review the daylight and sunlight conditions within each of the surrounding residential properties in the Proposed Development area's present form.

Potential Significant Effects

5.194. In order to predict the significance of any potential impacts, it will be necessary to understand the context of the area, and sensitivity of the existing surrounding buildings, and how this should affect the application of the guidance set out in the BRE Guide.

5.195. The BRE Guide does not provide explicit targets on what constitutes minor, moderate of major adverse impacts. For daylight and sunlight, the BRE Guidelines outline the approach within the accompanying Appendix I, in terms of assigning criteria to assess the effects (para I3-I8):

"Adverse impacts occur when there is a significant decrease in the amount of skylight and sunlight reaching an existing building where it is required…The assessment of impact will depend on a combination of factors, and there is no simple rule of thumb that can be applied."

"Where the loss of skylight or sunlight fully meets the guidelines, the impact is assessed as negligible or minor adverse. Where the loss of light is well within the guidelines, or only a small number of windows or limited area of open space lose light (within the guidelines), a classification of negligible impact is more appropriate. Where the loss of light is only just within the guidelines and a larger number of windows or open space are affected, a minor adverse impact would be more appropriate, especially if there is a particularly strong requirement for daylight and sunlight in the affected building or open space."

"Where the loss of skylight or sunlight does not meet the guidelines in this book, the impact is assessed as minor, moderate or major adverse. Factors tending towards a minor adverse impact include:

- *Only a small number of windows are affected;*
- *The loss of light is only marginally outside the guidelines;*
- *An affected room has other sources of skylight or sunlight; and*
- *The affected building only has a low level of requirement for skylight or sunlight."*

5.196. The classification of major adverse is documented within Paragraph 7 of the BRE Guidelines:

"Factors tending towards a major adverse impact include:

- *a large number of windows are affected;*
- *the loss of light is substantially outside the guidelines;*
- *all the windows in a particular property are affected; and*
- *the affected indoor spaces have a particular strong requirement for skylight or sunlight, e.g. a living room in a dwelling".*

5.197. Beneficial impacts occur when there is a significant increase in the amount of skylight and sunlight reaching an existing building. Beneficial impacts should be worked out on the same principles as adverse impacts."

5.198. There is no guidance on what constitutes a moderate adverse impact.

5.199. Therefore, best practice guidance and professional judgment will be used to determine any impacts based on the guidance set out in Appendix I of the BRE Guidelines, the NPPF and the NPPG. Potential effects will be identified as beneficial, adverse or negligible, and their magnitude of effects will be set out as Minor, Moderate and Major.

Assessment Methodology

Technical Scope

5.200. The BRE Guidelines suggest that residential properties have the highest requirement for daylight and sunlight and states that:

"the guidelines are intended for use for rooms in adjoining dwellings where light is required, including living rooms, kitchens and bedrooms."

5.201. The technical analyses carried out to inform the daylight, sunlight, and overshadowing, assessment will be undertaken by creating a digital three-dimensional (3D) model of the existing Site and Proposed Development.

5.202. The 3D model uses Waldram Diagrams to establish the VSC and 3D geometric calculations for daylight distribution. This model (which is orientated to north by the use of Ordnance Survey (OS) information) enables the path of the sun to be tracked throughout the year to establish the shadow cast by the existing and proposed buildings and thus calculate the sun hours on ground in each scenario.

5.203. Only those surrounding residential properties which have windows facing towards the Site will be included in the assessment. If a nearby residential property has no windows facing the Site, these properties would not be affected by the Proposed Development in terms of light.

Baseline Assessment

5.204. The baseline assessment will review the daylight and sunlight conditions within each of the surrounding residential properties in the Proposed Development area's present form.

Construction Assessment

5.205. Owing to the evolving and changing nature of demolition and construction activities, the assessment of potential effects during demolition and construction of the Proposed Development on daylight and sunlight to surrounding properties will not be modelled. Instead, a qualitative assessment will be undertaken using professional judgement and experience.

5.206. Since the potential daylight and sunlight effects relating to demolition and construction works will vary throughout the construction programme and gradually increase to the potential effects identified for the completed Proposed Development, the interim construction effects are not assessed quantitatively as it is considered that the completed Proposed Development represents the worst-case assessment in terms of likely daylight, sunlight and overshadowing.

Operational Assessment

5.207. The following approaches are undertaken to assess the effect on the sensitive receptors of surrounding properties when the Proposed Development is completed and operational.

Daylight:

- Vertical Sky Component (VSC); and
- No Sky Line (NSL) Method.

Sunlight:

- Annual Probable Sunlight Hours (APSH).

Scenarios to be assessed

5.208. The properties set out below will be considered due to their proximity to the Site, and their use.

5.209. The assessment has considered other adjacent residential properties and due to the distance and orientation from the proposed development, they are unlikely to be affected, so they will not be assessed in detail.

5.210. The following scenarios will be assessed and considered, and will be reported within this Chapter of the ES:

- Scenario 1: Baseline configuration (pre-development); and
- Scenario 2: Proposed Development

5.211. Schemes under construction and with planning consent but not under construction have been included in the baseline scenario, in line with the BRE Guide, and so no separate technical assessment of the cumulative impact is required.

5.212. There are no amenity areas located in close proximity to the site. As such, no overshadowing assessment is required.

5.213. The BRE guidelines provide that 'glare or solar dazzle can occur when sunlight is reflected from a façade or area of metal cladding'. This is considered an issue in relation to road users and train drivers whereby an instance of reflection can obscure the view of traffic signals and thus have the potential to cause an accident.

5.214. At this stage, the details of the façade treatment for the Proposed Development are not yet known and it cannot be determined if a solar glare assessment will be necessary. As such, solar glare is **scoped out** of the EIA, however this will be reviewed as the design progresses and once the façade details are known, should the detailed façade design comprise of large areas of glazing, a solar glare assessment will be undertaken for any sensitive road junctions within 500 metres of the Site where the Proposed Development would be visible within a drivers field of view.

Summary of Assessment of Scope

Table 5.16 Summary of Assessment of Scope

Receptor	Impact	Potential Effect	Scoped In / Out
The Astley	Daylight/sunlight	Negligible to Moderate Adverse	In
Avro Apartments	Daylight/sunlight	Negligible to Moderate Adverse	In
MM2 Apartments	Daylight/sunlight	Negligible to Moderate Adverse	In
Wentworth Apartments	Daylight/sunlight	Negligible to Moderate Adverse	In

Jacksons Warehouse	Daylight/sunlight	Negligible to Moderate Adverse	In
Burlington House	Daylight/sunlight	Negligible to Moderate Adverse	In

5.215. For completeness, an assessment of committed developments has been considered in Appendix 3 of this report.

Townscape and Visual Impact

Introduction

5.216. This Chapter of the ES will be prepared by re-form Landscape Architecture and will assessthe likely Townscape and Visual impacts of the proposals upon the Site and surrounding area.

5.217. This chapter will assess the effects of the Proposed Development on townscape character and visual amenity. In particular it will identify and assess the anticipated effects of change resulting from the Proposed Development on the character and features of the townscape; and on people's views and visual amenity within the Townscape and Visual Impact Assessment Study Area.

5.218. The chapter will set out the methods used to assess the baseline conditions currently existing at the Site and surroundings, the potential direct and indirect effects of the development arising from the construction stage and completed development, the mitigation measures required to prevent, reduce, or offset the effects and the residual effects.

Legislative and Policy Context

Legislation

5.219. European Landscape Convention (Article 1).

National Planning Policy

5.220. Paragraph 126 of the NPPF 2021 states:

"The creation of high quality, beautiful and sustainable buildings and places is fundamental to what the planning and development process should achieve. Good design is a key aspect of sustainable development, creates better places in which to live and work and helps make development acceptable to communities. Being clear about design expectations, and how these will be tested, is essential for achieving this. So too is effective engagement between applicants, communities, local planning authorities and other interests throughout the process."

5.221. Paragraph 130, of the NPPF 2021 states:

"Planning policies and decisions should ensure that developments:

a) will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development;

b) are visually attractive as a result of good architecture, layout and appropriate and effective landscaping;

c) are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities);

d) establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit;

e) optimise the potential of the site to accommodate and sustain an appropriate amount and mix of development (including green and other public space) and support local facilities and transport networks; and

f) create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users; and where crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion and resilience."

Local Planning Policy

5.222. The Manchester Local Development Framework, Core Strategy and Development Plan Document set out a number of relevant policies including:

- Policy EN1 Design Principles and Strategic Character Areas - recognises the need to consider the City's heritage and continue the rich pattern of activity in the core area, positively contribute to street level experience and enhance existing and provide new areas of meaningful open space, and the

maintenance and improvement of the City's permeability.

- Policy EN2 Tall Buildings - Sets out a design objective to ensure that tall buildings complement the City's key existing building assets and make a positive contribution to the evolution of a unique, attractive and distinctive Manchester, including to its skyline and approach views.

- Policy EN3 Heritage – seeks to preserve or enhance the character and setting of heritage assets across the city.

- Policy EN9 Green Infrastructure – seeks to promote new planting, particularly where this can enhance green links in the urban area.

- Policy CC6 High Density Development - City Centre development will generally be high-density. It is a location where land should be used to maximise its efficiency. The appropriate scale, massing and height of development in the City Centre will significantly exceed what is appropriate elsewhere in the City. Development will need to have regard to the Council's approach to tall buildings (policy EN2), but any proposals which do not reflect the importance of maximising the development opportunities in the City Centre will only be supported where this accords with wider Core Strategy objectives.

5.223. Policy CC9 Design and Heritage - seeks to deliver the highest standards of development in terms of appearance.

Baseline Conditions

5.224. The baseline conditions relevant to the topic include:

- Urban structure and built form, including urban grain, scale, massing, density and building height;
- Heritage assets, including listed buildings and conservation areas
- Green infrastructure and public realm;
- Movement and connectivity, including legibility and permeability, public rights of way and classifications (A roads, B roads etc);
- The aesthetic and perceptual aspects of the townscape: Scale, complexity, openness, enclosure and activity;
- The condition of the townscape, i.e. the state of an individual area; and
- Reference to policy or designations as an indicator of recognised value, including specific features or characteristics that justify the designation of the area.

Potential Significant Effects

5.225. The potential for the Proposed Development to cause change to the townscape and visual baseline will be actively considered throughout the preparation of proposals to avoid, or reduce the level of, such change. It is, however, anticipated that the following landscape and visual effects will occur during the construction and operation of the development:

- Effects on the townscape character areas (including neighbouring areas from which the proposed development will be visible)
- Effects on townscape features and elements
- Effects on views experienced by people within the study area (day and night)

5.226. The assessment will also consider cumulative visual effects and reference existing committed developments within the adjacent context. Given the built up nature of the surrounding context it seems appropriate to take into account buildings within 250m of the site. Committed schemes beyond that will be seen within the wider context of the City and are not deemed to contribute to the setting of this scheme.

Assessment Methodology

Technical Scope

5.227. This sets out the methodology adopted within this Townscape and Visual Assessment (TVA) to assess the townscape and visual effects of the proposed intervention. The methodology is informed by guidance contained within;

- Guidelines for Landscape and Visual Impact Assessment (The Landscape Institute and Institute of Environmental Assessment, 3rd Edition, 2013), often referred to as 'GLVIA 3'. Note: Terminology within GLVIA 3 (e.g. susceptibility) that is referred to within this methodology is recognised as being interchangeable between 'landscape' and 'townscape' assessment.
- Townscape Character Assessment Technical Information Note 05/2017 - Revised April 2018 (The Landscape Institute).
- As defined within GLVIA 3 'Townscape' refers to areas where the built environment is dominant and includes buildings, the relationship between them, different types of urban spaces and relationship between buildings and space. Townscape also reflects the relationship between people and place.
- Townscape and visual matters are separate, although closely related and interlinked issues, and will be dealt with as such throughout the TVA.

Baseline Assessment

5.228. The initial step of the TVA will be to review the existing townscape and visual resource in the vicinity of the Proposed Development, known as the 'baseline' townscape and visual conditions. This is a process of gathering information, as part of a desk study and subsequent field survey work, to understand features and characteristics of the townscape, the way it is experienced, it's quality and value or importance of the visual resources in the vicinity of the proposed intervention. The data collected forms the basis from which the townscape and visual effects of the intervention are identified and assessed.

5.229. The baseline study records the existing elements that make up the townscape in the study area and will include:

- Urban structure and built form, including urban grain, scale, massing, density and building height;
- Heritage assets, including listed buildings and Conservation Areas;
- Green infrastructure and public realm;
- Movement and connectivity, including legibility and permeability, public rights of way and classifications (A roads, B roads etc);
- The aesthetic and perceptual aspects of the townscape: Scale, complexity, openness, enclosure and activity;
- The condition of the townscape, i.e. the state of an individual area; and
- Reference to policy or designations as an indicator of recognised value, including specific features or characteristics that justify the designation of the area.
- This informs a concise description of the existing character of the intervention site and its surrounding townscape context and enables the classification of the townscape into distinct character areas or types, which share common features and characteristics.

5.230. The visual baseline study records and establishes the following:

- The area in which the intervention may be visible. This is identified by a process of map interpretation and / or digital mapping to construct a map showing the area from which the proposed intervention may theoretically be visible, or its Zone of Theoretical Visibility (ZTV).
- The different types of people or townscape settings (receptors) which may experience views of the proposed intervention and the viewpoints where they will be affected.
- The nature of the views at the viewpoint.

Construction Assessment

5.231. Townscape and visual effects during the construction phase are generally unlikely to be greater than those for the Proposed Development on completion, and will be of a temporary duration. It is assumed that a tower crane will be required and, due to its height, it is likely that the size of the area experiencing townscape and visual effects in the short term through the presence of the crane will be larger than for the completed development.

Operational Assessment

5.232. The operational phase of the development is likely to result in some adverse townscape and visual effects. Lighting of the development will cause night-time effects. These are, however, unlikely to be uncharacteristic of the city centre context, and will be seen in the context of highway and commercial lighting in the immediate vicinity.

Scenarios to be assessed

5.233. A series of committed developments will be taken into account as part of the cumulative assessment.

5.234. Cumulative townscape effects are defined as effects that can impact on either the physical fabric or character of the townscape or any special values attached to it. (GLVIA 3 Chapter 7.3)

5.235. Cumulative visual effects are defined as effects that can be caused by combined visibility, which occurs where the observer is able to see two more developments from one viewpoint and / or sequential effects which over when the observer has to move another viewpoint to see different developments. (GLVIA 3 Chapter 7.3). Sequential effects may be assessed for travel along regularly used routes such as major roads or popular paths.

5.236. The approach to assessing cumulative effects is guided by the same principles as to the approach to the initial project assessment and considers a combination of susceptibility and value (sensitivity) and magnitude of change to determine the combined effects.

5.237. The purpose of cumulative townscape and visual effects is to identify additional changes caused by the proposed intervention in addition to other similar developments, or as the combined effect of a set of developments taken together.

5.238. The assessment of cumulative effects in the report will focus specifically on the effects of the proposed intervention in addition to other developments of a similar scale and type within a distance radius defined and justified within the main report. This is based upon a ZTV (Zone of Theoretical Visibility) exercise. Beyond the extent of the defined radius, it is considered that there will be no likely perceivable change to views of the proposed intervention on Site, and no likely cumulative townscape effects in relation to the proposed intervention on Site.

Summary of Assessment of Scope

5.239. This chapter will assess the effects of the Proposed Development on townscape character and visual amenity. In particular it will identify and assess the anticipated effects of change resulting from the Proposed Development on the character and features of the townscape; and on people's views and visual amenity within the Townscape and Visual Impact Assessment Study Area.

NOTE: View locations and specific receptors to be set out within a separate TVA scoping document with position of views agreed with the planning team prior to assessment.

5.240. For completeness, an assessment of committed developments has been considered in Appendix 3 of this report.

Wind Microclimate

Introduction

5.241. This Chapter of the ES will be prepared by GIA and will assess the likely Wind Microclimate impacts of the proposals upon the Site and surrounding area.

Legislative and Policy Context

5.242. The assessment was performed using the London Docklands Development Corporation (LDDC) variant of the Lawson Comfort Criteria. The Lawson Criteria are well-established in the UK for quantifying wind conditions in relation to build developments and, although not a UK 'standard', the criteria are recognised by local authorities as a suitable benchmark for wind assessments. The LDDC variant is established as the most practically applicable variant of the Lawson criteria, and is used industry wide. The Lawson Criteria (LDDC variant) have been adopted for this assessment.

5.243. The assessment will have due regard to the provisions of the following policy and guidance.

National Planning Policy

National Planning Policy Framework

5.244. The National Planning Policy Framework (NPFF) was revised in July 2021 by the Department of Communities and Local Government (DCLG). The relevant paragraphs are as follows:

5.245. Paragraph 130 of the National Planning Policy Framework states that:

"Planning policies and decisions should ensure that developments:

will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development;

are visually attractive as a result of good architecture, layout and appropriate and effective landscaping;

are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities);

establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit;

optimise the potential of the site to accommodate and sustain an appropriate amount and mix of development (including green and other public space) and support local facilities and transport networks; and

create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users; and where crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion and resilience."

5.246. There is no specific planning policy guidance dealing with microclimate in terms of pedestrian comfort set out in the revised NPPF.

Planning Policy Guidance

5.247. The Department for Communities and Local Government (DCLG) web-based Planning Practice Guidance resource includes a section on design and sets out how a building's size and shape can affect the wind microclimate. The section addressing Design - How should buildings and the spaces between them be considered? 'Consider scale' Paragraph O26, states that: "Account should be taken of local climatic conditions, including daylight and sunlight, wind, temperature and frost pockets."

Local Planning Policy

Manchester Core Strategy (2012 – 2027)

5.248. **Policy EN2 – Tall Buildings** – States that, by their very size, tall buildings can have a significant impact on the local environment and its micro-climate. It is therefore expected that this impact be modelled and that submissions for tall buildings also include appropriate measures to create an attractive, pedestrian friendly local environment.

Baseline Conditions

5.249. For an urban location within the UK, as the Proposed Development Site is, wind microclimate conditions would be expected to be suitable for a mixture of sitting, standing, and walking.

5.250. Precise baseline conditions will be calculated during the assessment.

5.251. Future baseline conditions are expected to be of a similar order to the existing baseline conditions, although the precise distribution of the local microclimate may change as new schemes are constructed.

Potential Significant Effects

5.252. Wind effects will be assessed by combining on-site and local wind speeds with 30 years-worth of weather data for Manchester Airport, corrected for terrain local to the airport and the Proposed Development Site, to obtain annual and seasonal frequency and magnitude of wind speeds across the model.

5.253. Data from Manchester Airport is used due to the proximity to the Site (15km) and the quality of the data available.

5.254. This allows the 'grading' of the pedestrian level winds according to the Lawson Comfort Criteria, which is shown below.

Table 5.17: Lawson Comfort Criteria (LDDC variant)

Comfort Category	Mean Wind Speed (5% exceedance)	Description
Sitting	4m/s	Acceptable for outdoor sitting use (e.g. cafes, benches, balconies)
Standing	6m/s	Acceptable for main building entrances, pick-up / drop-off points and bus stops
Walking (leisure)	8m/s	Acceptable for strolling
Walking (business)	10m/s	Acceptable for external pavements, walking purposefully without lingering
Uncomfortable	>10m/s	Not comfortable for regular pedestrian access

Table 5.18: Lawson Safety Criteria (LDDC variant)

Safety Category	Mean Wind Speed (0.0022% exceedance)	Description
No Safety Exceedance	<15m/s	

S15 (distress)	>15m/s	Unsafe for frail individuals, or cyclists
S20 (safety)	>20m/s	Wind conditions considered unsafe for all users

5.255. For a mixed-use urban area within which the Proposed Development Site is located, the desired wind microclimate would typically need to have areas acceptable for sitting, standing (including at entrances of buildings) and walking use.

5.256. During operation, exceedance of either S15 or S20 will be classified as unsafe.

5.257. During construction or decommission, it can reasonably be assumed that the Proposed Development Site will be occupied by busy construction workers, who are unlikely to be frail individuals. As such, only S20 exceedances are classified as unsafe for on-site effects during these phases. Note that this does not apply to any existing public realm within the site which is not due to be closed off throughout construction.

5.258. Any areas which show up as either unsafe (annually) or uncomfortable (for winter) are considered unsuitable, unless they are in locations where pedestrian access can be controlled in the event of strong winds. This applies to all thoroughfares (for pedestrians) and roads (for cyclists) around the Proposed Development.

5.259. There is public realm in the form of the Rochdale Canal towpath, which is targeted to be suitable for standing during the summer months and leisure walking in the winter months.

5.260. There are proposed ameity spaces within the Development, which are targeted to be suitable for a mixture of occasional sitting and standing during the summer months. This will allow user to choose to sit in “calmer” areas and engage in more active pursuits in “windier” areas.

5.261. There are bus stops along Great Ancoats Street, which are targeted to be suitable for standing.

5.262. The areas immediately outside any building entrances should be suitable for standing use during winter to provide a “buffer” between the still conditions in interior spaces and the general thoroughfare. This applies both to the entrances of the Proposed Development and also off-site entrances. There are off-site entrances which will require specific attention both to the north east of Great Ancoats Street

Assessment Methodology

Technical Scope

5.263. The assessment will be performed using GIA’s high-resolution Computational Fluid Dynamics (CFD) process, with details captured down to 5cm on the target building.

5.264. The model for the surrounds will be constructed using CAD from VU.CITY, to provide an accurate representation of both buildings and terrain for the entire 400m radius of surrounds.

5.265. An atmospheric boundary layer which is appropriate for a dense urban location will be used.

5.266. The pedestrian level wind speeds measured from the CFD will be combined with 30 years of wind data collected from Manchester International Airport, corrected for the difference in local terrain between the weather stations and the Site.

Baseline Assessment

5.267. Baseline conditions will be established through CFD assessment of the existing site, with 3D models of all schemes within a 400m radius included in the study.

5.268. Pedestrian comfort and safety will be recorded at 1.5m above ground level for the site and immediate surrounding area.

Construction Assessment

5.269. During the construction of the Proposed Development, once the building height is above the average height of the surrounding buildings, there is potential for wind effects around the base of the building. This potential will become greater as the Proposed Development reaches its full height.

5.270. The extent and severity of these effects will be derived from comparison of baseline conditions and operational effects.

Operational Assessment

5.271. CFD assessment of a 3D model of the Proposed Development, included within the baseline model, will be undertaken to measure and mitigate any potential wind issues.

5.272. Pedestrian comfort and safety will be assessed at 1.5m above the ground level for the Site and immediate surrounds, and at 1.5m above any terraces within the Proposed Development.

Scenarios to be assessed

5.273. The following scenarios will be assessed and considered, and reported within the Chapter of the ES:

- Baseline;
- Proposed Development in baseline surrounds; and
- Proposed Development in cumulative surrounds.

5.274. Schemes under construction have been included in the baseline scenario, and schemes with planning consent but not under construction have been included in the cumulative scenarios only.

Summary of Assessment of Scope

Table 5.19 Summary of Assessment of Scope

Receptor	Impact	Potential Effect	Scoped In / Out
General Thoroughfares	Medium	Negligible to Major Adverse	In
Building Entrances on Proposed Development	High	Negligible to Major Adverse	In
Building Entrances to North West of Port Street and North East of Great Ancoats Street	High	Negligible to Major Adverse	In
Bus Stops on Great Ancoats Street	High	Negligible to Major Adverse	In
Public Realm along Rochdale Canal Towpath	High	Negligible to Major Adverse	In
Proposed On-Site Amenity	High	Negligible to Major Adverse	In

5.275. For completeness, an assessment of committed developments has been considered in Appendix 3 of this report.

Appendix 1 – Site Location Plan

Appendix 2 – List of Committed Developments

Application Reference	Description of Development Proposals	Date Approved	Map No.	Distance from Site	Status
Baseline					
27 Dale Street / Tribeca House 116401/FO/2017 25-27 Dale Street Manchester M1 1EY	Erection of 6 storey building (plus plant level) above basement level to create office accommodation Class B1 at 1st to 5th floors and ground floor and basement (A1 (Shop), A3 (Restaurant and Cafe) and A4 (Drinking Establishment) Use) with repair up to second floor and reinstatement from 2nd floor to roof of former central feature above former entrance block, removal of brick and stone wall to Bunsen Street elevation, remains of existing chimney to gable wall of 25 Dale Street and existing stair and lift core from basement, ground and 1st floor.	27 October 2017	1	0.23km	Nearing completion.
Oldham Street Manchester 110074/FO/2015/C2 Land At 76 - 82 Oldham Street And Land Bounded By Spear Street, Warwick Street And Houldsworth Street Ancoats Manchester M4 1LF	Demolition of existing building and site structures and construction of 2no. mixed use buildings (Buildings A and B). Building A - Part 4, part 5, part 6 and part 8 storey building including ground floor and plus basement with ancillary facilities services and commercial use (A1, A3, B1) at ground floor and basement levels, 72 residential apartments (C3) above and 2 green roofs. Building B - Part 3 and part 5 storey building including ground floor and plus basement with 100 cycle parking spaces, building services and commercial space at basement level and 9 car parking spaces, ancillary facilities and services and commercial space (A1, A3, B1) at ground floor level and 28 residential apartments (C3) above and 1 green roof.	30 August 2016	2	0.24km	Under Construction. Structure progressed.
Finlays Yard 115529/FO/2017 Land To Rear Of 56 Dale Street Mangle Street Manchester M1 2HN	Construction of 14 new build residential apartments (Use Class C3) and associated ancillary spaces. Minor alterations to Grade II listed building (56 Dale Street).	3 July 2017	3	0.26km	Under Construction. Structure significantly progressed.
Oldham Road 125686/FO/2019 Site Bound By Oldham Road To The South East, Marshall Street To The North East, Chadderton	Erection of a12-storey residential building (Use Class C3) comprising 144 residential units, with ground floor commercial use (Use Class A1, A2, A3, B1, and /or D1 (excluding Places of Worship)) (144 sqm) or	18 December 2020	4	0.34km	Under construction. On site in May 21.

Application Reference	Description of Development Proposals	Date Approved	Map No.	Distance from Site	Status
Street To The North West, And Addington Street To The South West Manchester	ancillary residents lounge, disabled car parking, with highways, landscaping and other associated works following demolition of existing buildings.				
One Silk Street 120893/FO/2018 Land Bounded By Bengal Street, Primrose Street, Radium Street And Silk Street Manchester M4 6AQ	Erection of a 9 storey building to form ground, first and second floor office accommodation (Use Class B1) (3124 sqm) together with 75 residential apartments (Use Class C3a) with associated car parking, amenity provision and other associated works following demolition of existing buildings	21 June 2019	5	0.37km	Under construction. Main structure progressed.
New Islington Phase III 122598/FO/2019 Land Between Coppersmith Road, Lockyard Lane And New Islington Marina Manchester	Proposed erection of a residential development comprising 34 no. 3 storey dwellinghouses, 2 no. 6 storey apartment blocks comprising 60 no. apartments with commercial space at the ground floor (Use Classes A1, A2, A3, A4, B1 and D1) with outdoor seating, all with associated car parking, landscaping, public realm works and boundary treatments	2 March 2020	6	0.38km	Under construction.
New Cross / Addington Street 124888/FO/2019 Land Bound By Addington Street, Marshall Street, Cross Keys Street And Chadderton Street Manchester M4 4RJ	Erection of a 6-9 storey residential building (Use Class C3) comprising 80 no. dwellings including 9 no. townhouses and 71 no. apartments with residents lounge, refuse, plant, new substation, cycle storage, an internal landscaped courtyard and improvements to the adjacent footways on Marshall Street, Chadderton Street, Addington Street and Cross Keys Street and other associated works following removal of existing car park	17 January 2020	7	0.39km	On site in March.
Oxygen 115545/FO/2017 Land Between Millbank Street Store Street Manchester M1 2WB	Resubmission of application ref no 110276 (Demolition of existing buildings and erection of 12 townhouses and 345 (109 x one bed and 236 x 2 bed) apartments, ground floor commercial unit (243sq. m, Use Classes A1, A2, B1 and D1 (excluding places of worship, church halls, public halls and non- residential education and training centres) within a part 31, part 15, part 9 storey building, 77 basement and 20 surface parking spaces, 180 cycle parking spaces, ancillary tenant amenity facilities including outdoor communal amenity space at roof level above the 9 and 15 storey elements , associated hard and soft landscaping and other associated works including servicing access and 9 off site parking spaces). Amendments comprise addition of 3 residential units (2 x penthouse and 1x 2	6 June 2017	8	0.4km	Under construction. Nearly complete.

Application Reference	Description of Development Proposals	Date Approved	Map No.	Distance from Site	Status
	bed), amendments to bedroom numbers in townhouses, increase in height (for penthouse) to 32 storeys, removal of one amenity space and addition of 2 x parking spaces.				
Islington Wharf Phase 4 126669/FO/2020 *Land Bound By Old Mill Street & Great Ancoats Street Manchester M4 6EE*	*Erection of a Part 16/ Part 11 storey building to form 106 no. apartments (C3 Use Class) together with ground floor commercial uses (Use Class A1, A2 A3 and/or B1), with associated ancillary space, surface car parking, landscaping and associated works*	*5 August 2020*	*15*	*0.36km*	*Started on site in August.*
Cumulative					
Eider House 115178/FO/2017 Part Site Of Existing Car Park Bounded By Ducie Street, The Rochdale Canal, Peak Street, Tariff Street (Multi-Storey Car Park) And Remainder Of Surface Car Park Manchester M1 2JL	Erection of 2 linked buildings ranging in height from 8 to 10 storeys (plus roof top plant room) to provide residential accommodation (Use Class C3) comprising 18 x 1 bed, 84 x 2 bed, 15 x 3 bed, 2 x duplex (4 bed) and 9 townhouses (7 x 3 bed, 1 x 2 bed and 1 x 4 bed) (128 units in total) works to create provision for access and servicing, hard and soft landscaping (to include a secure external area and public realm linking Ducie Street to the Rochdale Canal) and associated works following the demolition of existing buildings. Development to include 128 cycle parking spaces.	16 January 2018	9	0.12km	No start on site.
Laystall Street 128911/FO/2020 32 - 34 Laystall Street Manchester M1 2JZ	Erection of 9 storey residential building (Use Class C3) comprising 89 residential units (28 x 1 bed and 61 x 2 bed) and conversion of and 3 storey extension to 32-34 Laystall Street for use as offices (Class E) with associated external works following demolition of outrigger and associated structures along with other associated works including access, servicing, landscaping and secure cycle parking	Under determination	10	0.17km	Under determination.
Lomax Street 120149/FO/2018 Car Park Between 57 And 59 Ducie Street Manchester M1 2JQ	Erection of 7 to 8 storey residential building (Class C3) to provide 41 apartments (7 x 1-bedroom 1-person apartments, 6 x 1-bedroom 2-person apartments, 6 x 2-bedroom 3-person apartments, 22 x 2-bedroom 4-person apartments) with associated landscaping and other works.	19 March 2019	11	0.23km	No start on site.
Little Lever Street 112670/FO/2016 2 Little Lever Street Manchester M1 1HR	Erection of seven storey hotel extension (60 beds) with glazed bridge link at third floor to connect to rear elevation of Gardens Hotel	29 October 2018	12	0.26km	No start on site.
Store Street 126608/FO/2020 Land To The South Of Store Street Manchester M1 2NE	Erection of part 4, part 11 storey residential (Class C3) development (with roof top plant room) comprising 66 (Class C3) residential units (3 x 2 bed town houses, 46 x two bed apartments and 17 x one bed apartments) together with associated car parking (10 spaces including 5 EVC spaces), cycle parking (66 spaces) communal roof terrace (level 6), landscaping and ancillary	20 November 2020	13	0.34km	No start on site.

Application Reference	Description of Development Proposals	Date Approved	Map No.	Distance from Site	Status
	infrastructure including rooftop PV panels, alterations to access onto Store Street				
Bendix Street 125681/FO/2019 Site Bound By Thompson Street To The North East, Oldham Road To The South, Bendix Street To The South West And A Building Occupied By Turning Point To The North West Manchester	Erection of a ground plus 12-storey residential building (Use Class C3) comprising 161 residential units, with ground floor commercial use (Use Class A1, A2, A3, B1, and / or D1 (excluding Places of Worship)) (160sqm) or ancillary residents lounge, disabled car parking, with highways, landscaping and other associated works following demolition of existing buildings	23 April 2021	14	0.36km	No start on site.
Toyoko Inn 121014/FO/2018 12 - 16 Piccadilly Manchester M1 3AN	Erection of 23 storey building (land at no. 14-16 Piccadilly) plus plant level and conversion of adjacent building (no. 12 Piccadilly) (basement to fourth floor) to create 356 bedroom hotel above ground floor breakfast room and lobby.	18 January 2018	16	0.38km	No start on site. MMA to drawings approved 10 December 2019
40 Swan Street 128997/FO/2020 40 Swan Street Manchester M4 5JG	Erection of a ground plus 9-storey building to form 118 no. residential apartments (Use Class C3), including amenity areas, ground floor food and beverage/ commercial units (Sui Generis/ Use Class E), public realm and landscaping, with supporting infrastructure and associated works following demolition of existing building	22 September 2021	17	0.41km	No start on site.
Peelers Yard 125678/FO/2019 Site Bound By Bendix Street To The North East, Chadderton Street To The South East, Goulden Street To The South West And Cross Keys Street To The North West Manchester	Erection of 8-storey residential building (Use Class C3) comprising 73 residential units, with ground floor commercial use (Classes A1, A2, A3, B1 and D1 (excluding Places of Worship)) (205 sqm); alterations to the retained perimeter wall and chimney including the introduction of a light box; disabled car parking, highways, landscaping and other associated works Alterations to the retained perimeter wall and chimney structure, including the introduction of a light box and erection of an 8-storey residential building (Use Class C3) comprising 73 residential units, with flexible ground floor commercial use (Use Class A1, A2, A3, A4, A5, B1 and / or D1), associated landscape and other associated works.	18 December 202	18	0.41km	No start on site.

Committed Developments Map


18
14
5
7
4
17
2
6
1
12
3
10
11
15
9
8
16
13

Appendix 3 – Committed Developments by discipline

Climate Change

The assessment will not consider any specific Committed Developments relevant to the Proposed Development because the assessment will consider the cumulative effect of all GHG that cause climate change, and therefore the assessment of the GHG due to the Proposed Development implicitly assesses the cumulative effect of GHG emissions and contextualises these compared to the UK Carbon Budgets and RIBA 2030 Climate Change.

Heritage

Application Reference	Map No.	Distance from Site	Scoped in / Out
Becca House 116401/FO/2017 25-27 Dale Street Manchester M1 1EY	1	0.23km	Out
110074/FO/2015/C2 Land At 76 - 82 Oldham Street And Land Bounded By Spear Street, Warwick Street And Houldsworth Street Ancoats Manchester M4 1LF	2	0.24km	Out
115529/FO/2017 Land To Rear Of 56 Dale Street Mangle Street Manchester M1 2HN	3	0.26km	Out
125686/FO/2019 Site Bound By Oldham Road To The South East, Marshall Street To The North East, Chadderton Street To The North West, And Addington Street To The South West Manchester	4	0.34km	Out
120893/FO/2018 Land Bounded By Bengal Street, Primrose Street, Radium Street And Silk Street Manchester M4 6AQ	5	0.37km	Out
122598/FO/2019 Land Between Coppersmith Road, Lockyard Lane And New Islington Marina Manchester	6	0.38km	Out

124888/FO/2019 Land Bound By Addington Street, Marshall Street, Cross Keys Street And Chadderton Street Manchester M4 4RJ	7	0.39km	Out
115545/FO/2017 Land Between Millbank Street Store Street Manchester M1 2WB	8	0.4km	Out
115178/FO/2017 Part Site Of Existing Car Park Bounded By Ducie Street, The Rochdale Canal, Peak Street, Tariff Street (Multi-Storey Car Park) And Remainder Of Surface Car Park Manchester M1 2JL	9	0.12km	In
128911/FO/2020 32 - 34 Laystall Street Manchester M1 2JZ	10	0.17km	Out
120149/FO/2018 Car Park Between 57 And 59 Ducie Street Manchester M1 2JQ	11	0.23km	Out
112670/FO/2016 2 Little Lever Street Manchester M1 1HR	12	0.26km	Out
126608/FO/2020 Land To The South Of Store Street Manchester M1 2NE	13	0.34km	Out
125681/FO/2019 Site Bound By Thompson Street To The North East, Oldham Road To The South, Bendix Street To The South West And A Building Occupied By Turning Point To The North West Manchester	14	0.36km	Out
126669/FO/2020 Land Bound By Old Mill Street & Great Ancoats Street Manchester M4 6EE	15	0.36km	In
121014/FO/2018 12 - 16 Piccadilly Manchester M1 3AN	16	0.38km	Out
128997/FO/2020 40 Swan Street Manchester M4 5JG	17	0.41km	Out

125679/LO/2019 Site Bound By Bendix Street To The North East, Chadderton Street To The South East, Goulden Street To The South West And Cross Keys Street To The North West Manchester	18	0.41km	Out

Human Health

For each technical chapter, the relevant committed developments will be considered and any elements relevant to human health will be identified. For example, during the construction phase there may be possibilities for cumulative effects on transport, air quality and noise – all of which are likely to be mitigated through implementation of a Construction Environmental Management Plan (CEMP). There are also likely to be cumulative effects for employment and local expenditure; and provision of employment is known to have beneficial effects on health and wellbeing. During the operational phase, there may be effects from any cumulative increase in population and pressure on facilities and services; the cumulative effects for housing and employment/economy are likely to be beneficial. The Human Health chapter will consider the relevant cumulative effects identified from each of the other technical chapters and, using professional judgment, assess any significant interactions within the four themes for healthy urban living – Healthy Housing; Active Travel; Healthy Environment; and Vibrant Neighbourhoods.

Noise

Application Reference	Map No.	Distance from Site	Scoped In / Out
Becca House 116401/FO/2017 25-27 Dale Street Manchester M1 1EY	1	0.23km	In
110074/FO/2015/C2 Land At 76 - 82 Oldham Street And Land Bounded By Spear Street, Warwick Street And Houldsworth Street Ancoats Manchester M4 1LF	2	0.24km	In
115529/FO/2017 Land To Rear Of 56 Dale Street Mangle Street Manchester M1 2HN	3	0.26km	Out
125686/FO/2019 Site Bound By Oldham Road To The South East, Marshall Street To The North East, Chadderton Street To The North West, And Addington Street To The South West Manchester	4	0.34km	Out
120893/FO/2018 Land Bounded By Bengal Street, Primrose Street, Radium Street And Silk Street Manchester	5	0.37km	Out

M4 6AQ			
122598/FO/2019 Land Between Coppersmith Road, Lockyard Lane And New Islington Marina Manchester	6	0.38km	Out
124888/FO/2019 Land Bound By Addington Street, Marshall Street, Cross Keys Street And Chadderton Street Manchester M4 4RJ	7	0.39km	Out
115545/FO/2017 Land Between Millbank Street Store Street Manchester M1 2WB	8	0.4km	Out
115178/FO/2017 Part Site Of Existing Car Park Bounded By Ducie Street, The Rochdale Canal, Peak Street, Tariff Street (Multi-Storey Car Park) And Remainder Of Surface Car Park Manchester M1 2JL	9	0.12km	In
128911/FO/2020 32 - 34 Laystall Street Manchester M1 2JZ	10	0.17km	In
120149/FO/2018 Car Park Between 57 And 59 Ducie Street Manchester M1 2JQ	11	0.23km	In
112670/FO/2016 2 Little Lever Street Manchester M1 1HR	12	0.26km	Out
126608/FO/2020 Land To The South Of Store Street Manchester M1 2NE	13	0.34km	Out
125681/FO/2019 Site Bound By Thompson Street To The North East, Oldham Road To The South, Bendix Street To The South West And A Building Occupied By Turning Point To The North West Manchester	14	0.36km	Out
126669/FO/2020 Land Bound By Old Mill Street & Great Ancoats Street Manchester M4 6EE	15	0.36km	Out
121014/FO/2018 12 - 16 Piccadilly Manchester	16	0.38km	Out

M1 3AN			
128997/FO/2020 40 Swan Street Manchester M4 5JG	17	0.41km	Out
125679/LO/2019 Site Bound By Bendix Street To The North East, Chadderton Street To The South East, Goulden Street To The South West And Cross Keys Street To The North West Manchester	18	0.41km	Out

Socio-Economic

Application Reference	Map No.	Distance from Site	Scoped in / Out
Becca House 116401/FO/2017 25-27 Dale Street Manchester M1 1EY	1	0.23km	In
110074/FO/2015/C2 Land At 76 - 82 Oldham Street And Land Bounded By Spear Street, Warwick Street And Houldsworth Street Ancoats Manchester M4 1LF	2	0.24km	In
115529/FO/2017 Land To Rear Of 56 Dale Street Mangle Street Manchester M1 2HN	3	0.26km	In
125686/FO/2019 Site Bound By Oldham Road To The South East, Marshall Street To The North East, Chadderton Street To The North West, And Addington Street To The South West Manchester	4	0.34km	In
120893/FO/2018 Land Bounded By Bengal Street, Primrose Street, Radium Street And Silk Street Manchester M4 6AQ	5	0.37km	In
122598/FO/2019 Land Between Coppersmith Road, Lockyard Lane And New Islington Marina Manchester	6	0.38km	In

124888/FO/2019 Land Bound By Addington Street, Marshall Street, Cross Keys Street And Chadderton Street Manchester M4 4RJ	7	0.39km	In
115545/FO/2017 Land Between Millbank Street Store Street Manchester M1 2WB	8	0.4km	In
115178/FO/2017 Part Site Of Existing Car Park Bounded By Ducie Street, The Rochdale Canal, Peak Street, Tariff Street (Multi-Storey Car Park) And Remainder Of Surface Car Park Manchester M1 2JL	9	0.12km	In
128911/FO/2020 32 - 34 Laystall Street Manchester M1 2JZ	10	0.17km	In
120149/FO/2018 Car Park Between 57 And 59 Ducie Street Manchester M1 2JQ	11	0.23km	In
112670/FO/2016 2 Little Lever Street Manchester M1 1HR	12	0.26km	In
126608/FO/2020 Land To The South Of Store Street Manchester M1 2NE	13	0.34km	In
125681/FO/2019 Site Bound By Thompson Street To The North East, Oldham Road To The South, Bendix Street To The South West And A Building Occupied By Turning Point To The North West Manchester	14	0.36km	In
126669/FO/2020 Land Bound By Old Mill Street & Great Ancoats Street Manchester M4 6EE	15	0.36km	In
121014/FO/2018 12 - 16 Piccadilly Manchester M1 3AN	16	0.38km	In
128997/FO/2020 40 Swan Street Manchester M4 5JG	17	0.41km	In

125679/LO/2019 Site Bound By Bendix Street To The North East, Chadderton Street To The South East, Goulden Street To The South West And Cross Keys Street To The North West Manchester	**18**	0.41km	In

Sunlight, Daylight and Overshadowing

Application Reference	Map No.	Distance from Site	Scoped in / Out
Becca House 116401/FO/2017 25-27 Dale Street Manchester M1 1EY	**1**	0.23km	In
110074/FO/2015/C2 Land At 76 - 82 Oldham Street And Land Bounded By Spear Street, Warwick Street And Houldsworth Street Ancoats Manchester M4 1LF	**2**	0.24km	In
115529/FO/2017 Land To Rear Of 56 Dale Street Mangle Street Manchester M1 2HN	**3**	0.26km	In
125686/FO/2019 Site Bound By Oldham Road To The South East, Marshall Street To The North East, Chadderton Street To The North West, And Addington Street To The South West Manchester	**4**	0.34km	Out
120893/FO/2018 Land Bounded By Bengal Street, Primrose Street, Radium Street And Silk Street Manchester M4 6AQ	**5**	0.37km	Out
122598/FO/2019 Land Between Coppersmith Road, Lockyard Lane And New Islington Marina Manchester	**6**	0.38km	Out
124888/FO/2019 Land Bound By Addington Street, Marshall Street, Cross Keys Street And Chadderton Street Manchester M4 4RJ	**7**	0.39km	Out
115545/FO/2017 Land Between Millbank Street Store Street Manchester	**8**	0.4km	Out

M1 2WB			
115178/FO/2017 Part Site Of Existing Car Park Bounded By Ducie Street, The Rochdale Canal, Peak Street, Tariff Street (Multi-Storey Car Park) And Remainder Of Surface Car Park Manchester M1 2JL	9	0.12km	In
128911/FO/2020 32 - 34 Laystall Street Manchester M1 2JZ	10	0.17km	In
120149/FO/2018 Car Park Between 57 And 59 Ducie Street Manchester M1 2JQ	11	0.23km	In
112670/FO/2016 2 Little Lever Street Manchester M1 1HR	12	0.26km	In
126608/FO/2020 Land To The South Of Store Street Manchester M1 2NE	13	0.34km	Out
125681/FO/2019 Site Bound By Thompson Street To The North East, Oldham Road To The South, Bendix Street To The South West And A Building Occupied By Turning Point To The North West Manchester	14	0.36km	Out
126669/FO/2020 Land Bound By Old Mill Street & Great Ancoats Street Manchester M4 6EE	15	0.36km	Out
121014/FO/2018 12 - 16 Piccadilly Manchester M1 3AN	16	0.38km	Out
128997/FO/2020 40 Swan Street Manchester M4 5JG	17	0.41km	Out
125679/LO/2019 Site Bound By Bendix Street To The North East, Chadderton Street To The South East, Goulden Street To The South West And Cross Keys Street To The North West Manchester	18	0.41km	Out

Townscape and Visual Impact

Application Reference	Map No.	Distance from Site	Scoped in / Out
Becca House 116401/FO/2017 25-27 Dale Street Manchester M1 1EY	**1**	0.23km	In
110074/FO/2015/C2 Land At 76 - 82 Oldham Street And Land Bounded By Spear Street, Warwick Street And Houldsworth Street Ancoats Manchester M4 1LF	**2**	0.24km	In
115529/FO/2017 Land To Rear Of 56 Dale Street Mangle Street Manchester M1 2HN	**3**	0.26km	In
125686/FO/2019 Site Bound By Oldham Road To The South East, Marshall Street To The North East, Chadderton Street To The North West, And Addington Street To The South West Manchester	**4**	0.34km	Out
120893/FO/2018 Land Bounded By Bengal Street, Primrose Street, Radium Street And Silk Street Manchester M4 6AQ	**5**	0.37km	Out
122598/FO/2019 Land Between Coppersmith Road, Lockyard Lane And New Islington Marina Manchester	**6**	0.38km	Out
124888/FO/2019 Land Bound By Addington Street, Marshall Street, Cross Keys Street And Chadderton Street Manchester M4 4RJ	**7**	0.39km	Out
115545/FO/2017 Land Between Millbank Street Store Street Manchester M1 2WB	**8**	0.4km	Out
115178/FO/2017 Part Site Of Existing Car Park Bounded By Ducie Street, The Rochdale Canal, Peak Street, Tariff Street (Multi-Storey Car Park) And Remainder Of Surface Car Park	**9**	0.12km	In

Manchester M1 2JL			
128911/FO/2020 32 - 34 Laystall Street Manchester M1 2JZ	**10**	0.17km	In
120149/FO/2018 Car Park Between 57 And 59 Ducie Street Manchester M1 2JQ	**11**	0.23km	In
112670/FO/2016 2 Little Lever Street Manchester M1 1HR	**12**	0.26km	In
126608/FO/2020 Land To The South Of Store Street Manchester M1 2NE	**13**	0.34km	Out
125681/FO/2019 Site Bound By Thompson Street To The North East, Oldham Road To The South, Bendix Street To The South West And A Building Occupied By Turning Point To The North West Manchester	**14**	0.36km	Out
126669/FO/2020 Land Bound By Old Mill Street & Great Ancoats Street Manchester M4 6EE	**15**	0.36km	Out
121014/FO/2018 12 - 16 Piccadilly Manchester M1 3AN	**16**	0.38km	Out
128997/FO/2020 40 Swan Street Manchester M4 5JG	**17**	0.41km	Out
125679/LO/2019 Site Bound By Bendix Street To The North East, Chadderton Street To The South East, Goulden Street To The South West And Cross Keys Street To The North West Manchester	**18**	0.41km	Out

Wind

Application Reference	Map No.	Distance from Site	Scoped in / Out

Becca House 116401/FO/2017 25-27 Dale Street Manchester M1 1EY	1	0.23km	In
110074/FO/2015/C2 Land At 76 - 82 Oldham Street And Land Bounded By Spear Street, Warwick Street And Houldsworth Street Ancoats Manchester M4 1LF	2	0.24km	In
115529/FO/2017 Land To Rear Of 56 Dale Street Mangle Street Manchester M1 2HN	3	0.26km	In
125686/FO/2019 Site Bound By Oldham Road To The South East, Marshall Street To The North East, Chadderton Street To The North West, And Addington Street To The South West Manchester	4	0.34km	In
120893/FO/2018 Land Bounded By Bengal Street, Primrose Street, Radium Street And Silk Street Manchester M4 6AQ	5	0.37km	In
122598/FO/2019 Land Between Coppersmith Road, Lockyard Lane And New Islington Marina Manchester	6	0.38km	In
124888/FO/2019 Land Bound By Addington Street, Marshall Street, Cross Keys Street And Chadderton Street Manchester M4 4RJ	7	0.39km	In
115545/FO/2017 Land Between Millbank Street Store Street Manchester M1 2WB	8	0.4km	In
115178/FO/2017 Part Site Of Existing Car Park Bounded By Ducie Street, The Rochdale Canal, Peak Street, Tariff Street (Multi-Storey Car Park) And Remainder Of Surface Car Park Manchester M1 2JL	9	0.12km	In
128911/FO/2020 32 - 34 Laystall Street Manchester M1 2JZ	10	0.17km	In

120149/FO/2018 Car Park Between 57 And 59 Ducie Street Manchester M1 2JQ	11	0.23km	In
112670/FO/2016 2 Little Lever Street Manchester M1 1HR	12	0.26km	In
126608/FO/2020 Land To The South Of Store Street Manchester M1 2NE	13	0.34km	In
125681/FO/2019 Site Bound By Thompson Street To The North East, Oldham Road To The South, Bendix Street To The South West And A Building Occupied By Turning Point To The North West Manchester	14	0.36km	In
126669/FO/2020 Land Bound By Old Mill Street & Great Ancoats Street Manchester M4 6EE	15	0.36km	In
121014/FO/2018 12 - 16 Piccadilly Manchester M1 3AN	16	0.38km	In
128997/FO/2020 40 Swan Street Manchester M4 5JG	17	0.41km	Out
125679/LO/2019 Site Bound By Bendix Street To The North East, Chadderton Street To The South East, Goulden Street To The South West And Cross Keys Street To The North West Manchester	18	0.41km	Out

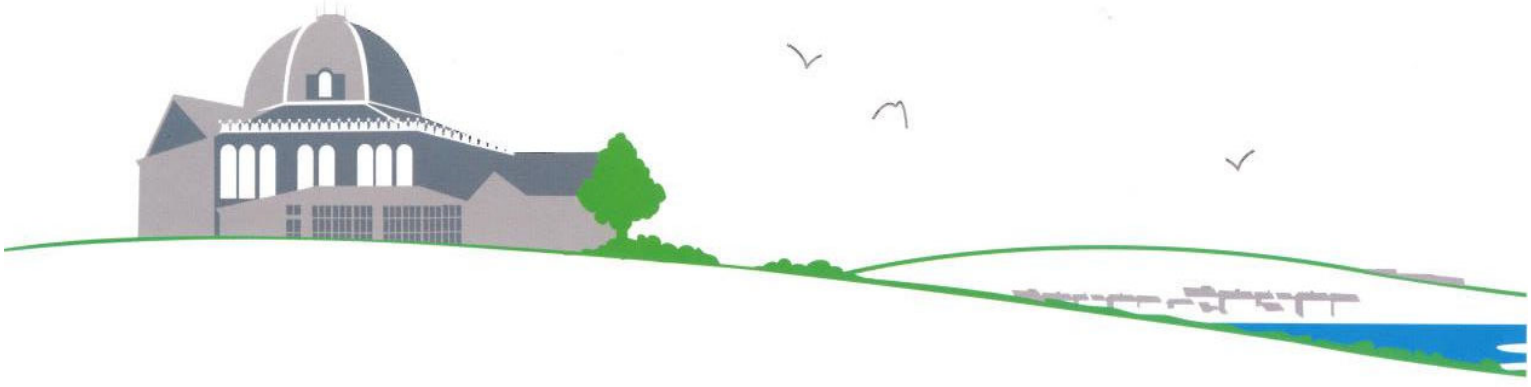
Appendix 4 – Phase 1 Ecology Report

Penny Anderson Associates Ltd
CONSULTANT ECOLOGISTS

MANCHESTER (PORT STREET) LTD

PORT STREET, MANCHESTER CITY CENTRE

EXTENDED PHASE 1 HABITAT SURVEY
DRAFT



MANCHESTER (PORT STREET) LTD

PORT STREET, MANCHESTER CITY CENTRE

EXTENDED PHASE 1 HABITAT SURVEY
DRAFT

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September 2021

This project has been undertaken in accordance with PAA policies and procedures on quality assurance.

Signed:_____

Penny Anderson Associates Ltd
CONSULTANT ECOLOGISTS

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1. INTRODUCTION

1.1 Penny Anderson Associates Ltd (PAA) was commissioned by Manchester (Port Street) Ltd to carry out an extended Phase 1 habitat survey at Port Street, Manchester City Centre (hereafter referred to as the 'site').

1.2 This report describes the methods and results of an extended Phase 1 habitat survey carried out on 23rd August 2021 and of the supporting desk study.

Site Location and Proposals

1.3 The site is located between Great Ancoats Street, Manchester and Manchester Piccadilly Station, at postcode M1 2FJ.

1.4 The survey area is an urban city centre site comprising hardstanding with sparse vegetation and some limited areas of self-seeded scrub. The wider surrounding land use is primarily urban development comprising roads, offices, residential buildings and car parking areas. The Rochdale Canal runs 40m south-east of the site.

1.5 The site extends to approximately 0.48 hectares (4845sqm) and is bound by Great Ancoats Street to the north, Brownsfield Mill and a surface car park to the east, a surface car park to the south and Port Street to the west. The site consists of an area of hard standing that is currently being used as a surface car park.

1.6 The proposals for the site are for a mixed use residential-led development at the site.

Legislative Context

1.7 A range of international and national legislation has been established in the UK to protect important nature conservation sites and priority species. At the international level, European Union (EU) Directives require individual member states to implement their conservation provisions nationally for the benefit of Europe as a whole. These Directives have been transposed into UK law by the Conservation of Habitats and Species Regulations 2017 (amended); further details can be obtained from the Joint Nature Conservation Committee (JNCC) web site at www.jncc.defra.gov.uk.

1.8 Other international conventions include: the Bern Convention on the Conservation of European Wildlife and Natural Habitats (1979), which requires the maintenance of populations of wild flora and fauna, giving particular protection to endangered and vulnerable species; and the Bonn Convention on the Conservation of Migratory Species of Wild Animals (1979), which requires the protection of migratory species throughout their entire range. The above conventions are implemented in England and Wales via the Wildlife and Countryside Act (WCA) (1981) (as amended) and Countryside and Rights of Way (CRoW) Act 2000. This legislation also protects important habitats and sites such as Sites of Special Scientific Interest (SSSI).

1.9 At the national level, the UK Post-2010 Biodiversity Framework published in 2012 is the Government's response to the Convention on Biological Diversity (2010). It describes the UK's biological resources, commits a detailed plan for the protection of these resources within the UK's devolved framework across England, Wales, Scotland and Northern Ireland. The document identifies future priorities for nature conservation and adopts a more strategic approach, including ecosystem services and sustainability alongside biodiversity. Despite administrative changes following devolution, there is still an underlying objective of protecting and enhancing a range of priority species and habitats, often still based on the objectives and classifications of the original UK Biodiversity Action Plan. Biodiversity 2020 is England's national biodiversity strategy. Building on the Natural Environment White Paper published in 2011, this provides a means of delivering the international and EU commitments to biodiversity. Under Biodiversity 2020, Priority Species and Habitats referred to are those of 'Principal Importance' for the conservation of biodiversity in

England listed on Section 41 (England) of the Natural Environment and Rural Communities (NERC) Act 2006.

1.10 Finally, the National Planning Policy Framework (NPPF 2021) provides guidance for local authorities on the content of the Local Plans and is a material consideration in determining planning applications. Briefly, with an overall focus on sustainable development, the NPPF states that developments should aim to engender positive outcomes for habitats and biodiversity, with a particular focus on the maintenance and creation of ecological networks.

1.11 The NPPF identifies the following principals that should be applied by local planning authorities when determining planning applications:

a. if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;

b. development on land within or outside a SSSI, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of SSSI;

c. development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists; and

d. development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to improve biodiversity in and around developments should be integrated as part of their design, especially where this can secure measurable net gains for biodiversity or enhance public access to nature where this is appropriate.

1.12 The NPPF states that the planning system should contribute to and enhance the natural environment through a range of actions, including:

- protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils;
- recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services; and
- minimising impacts on biodiversity and providing net gains for biodiversity including establishing coherent ecological networks that are more resilient to current and future pressures.

1.13 To protect and enhance biodiversity and geodiversity, plans should:

- Identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity; wildlife corridors and stepping stones that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation; and
- promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity.

1.14 Relevant protected species legislation summaries are presented as Appendix 1.

Invasive Non-native Plant Species

1.15 Certain non-native plant species that have been introduced into the UK are regarded as being a threat to native biodiversity. Legislative measures have, therefore, been put in place to prevent the spread of these invasive species in the wild.

1.16 Under Section 14 of the WCA, 1981 (as amended), it is illegal to introduce plants listed under Part II of Schedule 9 of the WCA into the wild or sell these species. Offences include causing the spread of viable plant material or neglecting to contain or appropriately manage non-native species.

1.17 Commonly introduced Schedule 9 plant species include non-native cotoneaster species, specifically, small-leaved cotoneaster[1] (*Cotoneaster microphylla*) and wall cotoneaster (*C. horizontalis*), Himalayan balsam (*Impatiens glandulifera*) and Japanese knotweed (*Reynoutria japonica*).

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[1] *Plant names follow Stace 2019*

2. METHODS

Desk Study

2.1 A request for details of protected and notable species and locally designated sites within 2km of the centre of the site was made to Greater Manchester Ecology Unit (GMEU), with data returned in September 2021. Additionally, the Multi-Agency Geographic Information for the Countryside (MAGIC[2]) website was consulted for details of statutory designated sites and Priority Habitats within a 2km search area from the centre of the site along with additional protected species data.

2.2 It is important to note that the desk study results provide an indication of the species present in and around the site, and do not confirm current presence or absence of any species. Protected species are often under-recorded in county wildlife databases.

Extended Phase 1 Habitat Survey

2.3 An extended Phase 1 habitat survey was undertaken by Ecologist Beth Howes[3] on 23rd August 2021.

2.4 All methods, equipment and assessment criteria were consistent with current good practice guidelines for each survey type and the surveyor was competent for the assigned tasks based on the CIEEM competency framework (CIEEM 2017).

2.5 The survey was carried out in accordance with the methodology in the *Handbook for Phase 1 Habitat Survey* (JNCC 2010). This entailed mapping, describing and collating plant species lists for habitats within the site boundary. The broad habitat types were mapped, with each habitat type coded according to the standard JNCC Phase 1 habitat survey procedure.

2.6 Each plant species was assigned abundance codes within each habitat. This was done using the 'DAFOR' scale (where: d = dominant; a = abundant; f = frequent; o = occasional; r = rare), which provides an indication of the relative abundance of each plant species present within a particular habitat. Common names and scientific names according to Stace (2019) are provided in the species list (Appendix 2) but common names only are referred to in the text.

2.7 The survey was 'extended' (Institute of Environmental Assessment 1995, CIEEM 2017) to include notes on fauna and habitats which could potentially support protected or notable species. The presence of, or potential for, protected or notable species was noted on the field map and in the written target notes (TN) during the survey.

Limitations

2.8 All parts of the site were accessed within the optimal timeframe for a survey of this type and no significant constraints on the assessment were noted.

[2] *https://magic.defra.gov.uk/MagicMap.aspx (last accessed 16/09/2021)*

[3] *Qualifying Member of the Chartered Institute of Ecology and Environmental Management (CIEEM)*

3. RESULTS

Desk Study

3.1 The desk study utilised data obtained from GMEU in September 2021, searching within a 2km radius of the site centre. The MAGIC search engine was also used to obtain additional data on European Protected Species (EPS) licences, as well as designated and non-designated sites and habitats. Results are presented below with selected data provided in Appendix 3.

Statutory Protected Sites

European Sites

3.2 European protected sites include Special Areas of Conservation (SAC), Special Protection Areas (SPA), RAMSAR wetland sites, possible SAC, potential SPA and proposed RAMSAR sites.

3.3 The MAGIC search confirmed that there are no European Protected Sites within the 2km search area. A section of the Rochdale Canal is designated as a SAC for its populations of floating water-plantain (*Luronium natans*) and this is *c.*4.8km to the north-west of the site, however, the canal itself does continue on beyond the SAC designation to within 40m of the site. At the closest point to the site, the canal is designated as a Site of Biological Interest (SBI) (see below).

Sites of Special Scientific Interest

3.4 SSSI represent a selection of this country's best wildlife and geological sites, and cover approximately 7% of the terrestrial area of the country (with over 4,000 separate sites in England).

3.5 No SSSI sites were identified in the 2km search area.

3.6 The site does, however, fall within the Impact Risk Zone[4] (IRZ) of two designated sites:

- Rochdale Canal SSSI/SAC (*c.*4.8km to the north-west of the site); and
- Hollinwood Branch Canal SSSI (*c.*6km west of the site).

3.7 The SSSI IRZ maps indicate that Natural England should be consulted on proposals that include the following, however, none of these are associated with the current development proposals for this site:

- Airports, helipads and other aviation proposals;
- Any industrial/agricultural development that could cause air pollution (incl: industrial processes, livestock and poultry units with floorspace > 500m², slurry lagoons > 750m² and manure stores > 3500t); and
- General combustion processes > 50MW energy input. Including energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion.

[4] *The Impact Risk Zones are a GIS tool developed by Natural England to make a rapid initial assessment of the potential risks to SSSIs posed by development proposals. They define zones around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts.*

National and Local Nature Reserves

3.8 No National Nature Reserves or Local Nature Reserves were identified within the 2km search area.

Non-Statutory Protected Sites

3.9 Two SBI were identified within the 2km search area, as summarised below with details presented in Appendix 3:

- Rochdale Canal – Stott's lane to Ducie Basin is the closest section of the canal to the site, located *c.*40m south-east of the site boundary. This SBI supports important populations of floating water-plantain, and pondweed species (*Potamogeton* spp.). The SBI also includes the nearby New Islington Marina. American pondweed (*P. epihydrus*), a Red Data Book species, is reported to be present in the Manchester section of the canal. The population of this species is considered the best in Great Britain; and
- The Ashton Canal (West) is located 260m south of the survey area. It is a navigable canal containing a rich aquatic habitat supporting various species of conservation importance, including populations of floating water plantain and grass-wrack pondweed (*Potamogeton compressus*). Grass-wrack pondweed is a species listed in Cheffings and Farrell (2005, as amended), A Vascular Plant Red List for England (Stroh *et al.* 2014) and is a Species of Principal Importance in England under Section 41 (S41) of the NERC Act 2006.

Regionally Important Geological Sites

3.10 Four Regionally Important Geological Sites (RIGS) are found within the 2km search area, however, all are some distance (>1km) from the site and two of the four are collections housed within museums. The two *in situ* sites are:

- Canal Cutting – Rochdale Canal; and;
- Canalside Cliff – Coal Wharf Car Park.

Priority Habitats

3.11 Several areas of Priority Habitat deciduous woodland, as well as Priority Habitat wood-pasture and parkland were noted within the 2km search area. The closest of these habitats to the site boundary is located 1.01km east and is separated from the site by a major road and urban development land. All other areas of Priority Habitat deciduous woodland or wood-pasture and parkland are located over 1.05km from the site boundary.

3.12 Several areas of Open Mosaic Habitats on Previously Developed Land were also identified within the 2km search area. The closest of these areas to the site boundary is located 160m north-east and is separated from the site by a major road.

Protected and Notable Species

Granted European Protected Species Application

3.13 Fifteen granted EPS license applications for bats were returned within the 2km search area on MAGIC. Twelve EPS licenses were granted for common pipistrelle (*Pipistrellus pipistrellus*), two for soprano pipistrelle (*P. pygmaeus*) and common pipistrelle, and one for brown long-eared bat (*Plecotus auritus*). Table 1 shows the location and date of each licence granted.

3.14 No records were presented for EPS licenses for other species within the search area.

Table 1 Bat European Protected Species Licenses

Species	License to Allow	Date License Granted	Date License Expires	Distance from Site Boundary
Common pipistrelle and soprano pipistrelle	Destruction of a resting place	2010	2012	1980m N
Common pipistrelle	Destruction of a resting place	2012	2013	1380m SW
Brown long-eared	Destruction of a resting place and breeding site	2012	2015	1380m SW
Common pipistrelle	Destruction of a resting place	2013	2015	230m N
Common pipistrelle	Destruction of a resting place	2013	2016	1515m SW
Common pipistrelle	Destruction of a resting place	2014	2015	1500m S
Common pipistrelle and soprano pipistrelle	Destruction of a resting place	2014	2017	530m SW
Common pipistrelle	Destruction of a resting place	2014	2019	270m NE
Common pipistrelle	Destruction of a resting place	2014	2020	1170m NW
Common pipistrelle	Destruction of a resting place	2015	2015	700m NW
Common pipistrelle	Destruction of a resting place	2015	2016	1935m S
Common pipistrelle	Destruction of a resting place	2015	2020	700m NW
Common pipistrelle	Destruction of a resting place	2016	2016	270m NE
Common pipistrelle	Destruction of a resting place	2016	2016	225m N
Common pipistrelle	Destruction of a resting place	2017	2019	1250m NW

Bats

3.15 Fifty-two bat roosts were recorded in the 2km search area within the GMEU dataset. Table 2 shows the number of roost records of each bat species recorded in the 2km search zone and the proximity to the site of the closest record for each species.

3.16 In addition, numerous records were returned for signs of bats within the 2km search area; these recordings were for brown long-eared bat (one record), common pipistrelle (over 100 records), Daubenton's bat (*Myotis daubentonii*) (one record), noctule (*Nyctalus noctula*) (one record), pipistrelle species (*Pipistrellus* sp.) (15 records), soprano pipistrelle (five records) and unidentified bat species (four records). The closest record to the site is for common pipistrelle, located 100m north-east of the site boundary.

Table 2 Bat Roost Records

Common Name	Scientific Name	No. of Roost Records	Closest of these Records (approx. distance and direction from site boundary)
Common pipistrelle	*Pipistrellus pipistrellus*	45	200m SE
Daubenton's bat	*Myotis daubentoni*	1	1.95km W
Myotis species	*Myotis* sp.	1	675m S
Pipistrelle species	*Pipistrelle* sp.	4	297m SW
Soprano pipistrelle	*Pipistrellus pygmaeus*	1	431m SW

Badger

3.17 A single record of a badger (*Meles meles*) sett was identified within the 2km search area. This record is located over 900m from the site boundary.

3.18 Sixteen signs of badger were recorded within the 2km search area. The closest of these records is located over 900m from site boundary.

3.19 Due to the sensitive nature of this data the precise locations are not presented in this report.

Otter and Water Vole

3.20 A single record for otter (*Lutra lutra*) was returned within the 2km search area. The record dates from 2013 and is located 1560m north-west of the site boundary.

3.21 No records of water vole (*Arvicola amphibius*) were returned within the 2km search area.

Other Mammals

3.22 Eight records for hedgehog (*Erinaceus europaeus*) were identified within the 2km search area, the closest record to the site boundary dates from 2020 and is located 280m south.

Birds

3.23 All nesting birds, their nests and eggs are protected from harm under the WCA, 1981 (as amended). In addition, species listed under Schedule 1 of the WCA are further protected against disturbance when breeding.

3.24 A number of bird species are listed under Section 41 in the NERC Act (2006) as species 'of principal importance for the purpose of conserving biodiversity'. These species are often known as the 'S41 species'. There is a legal requirement for a public body to 'have regard to' these species in relation to maintaining biodiversity. The S41 list overlaps somewhat with the UK Biodiversity Action Plan species, with national or local targets to maintain and enhance populations.

3.25 Furthermore, the Birds of Conservation Concern (BoCC) report lists those bird species that are classed as being of High (Red listed) and Medium (Amber Listed) conservation concern based on population monitoring (Eaton *et al.* 2015). This Red and Amber classification helps guide the assessment of bird species of conservation interest on or near to a site, alongside legislative and policy requirements.

3.26 A small number Schedule 1 species, including peregrine falcon (*Falco peregrinus*) and black redstart (*Phoenicurus ochruros*), were recorded within the 2km search area but due to the confidentiality of this data the species is not presented in this report. All protected and notable bird species records within the 2km search area are listed in Table 3, along with their conservation status.

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Table 3 Bird Species of Principal Importance

Common Name	Scientific Name	Amber[5] Listed	Red Listed	Section 41 Priority Species[6]
Bullfinch	*Pyrrhula pyrrhula*	x		x
Cuckoo	*Cuculus canorus*		x	x
Curlew	*Numenius arquata*		x	x
Dunnock	*Prunella modularis*	x		x
Herring gull	*Larus argentatus*		x	x
House sparrow	*Passer domesticus*		x	x
Lapwing	*Vanellus vanellus*		x	x
Lesser redpoll	*Acanthis caberet*		x	x
Linnet	*Linaria cannabina*		x	x
Skylark	*Alauda arvensis*		x	x
Song thrush	*Turdus philomelos*		x	x
Starling	*Sturnus vulgaris*		x	x
Yellow wagtail	*Motacilla flava*		x	x

Amphibians and Reptiles

3.27 No great crested newt (*Triturus cristatus,* GCN*)* records were returned within the 2km search area. Consultation with Natural England's GCN Geoportal revealed no known locations with confirmed presence of GCN within 2km of the central grid reference.

3.28 An Ordnance Survey map search revealed a section on the Manchester Canal 35m south-east of the site. No ponds were found within 500m of the site boundary.

3.29 No records for other amphibians or reptiles were returned in the 2km search area.

Invertebrates

3.30 Seven records for the Section 41 moth species cinnabar moth (*Tyria jacobaeae*) were returned from the 2km data search. The closest record to the site boundary is located 154m south-west and dates from 2017.

White-clawed Crayfish and Notable Fish

3.31 No records of white-clawed crayfish (*Austropotamobius pallipes*) or notable fish species were returned from the 2km search area, however, the SBI information sheet for Rochdale Canal notes the presence of several fish species and the use of Islington Wharf Marina as a coarse fish nursery.

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[5] *The UK's birds can be split in to three categories of conservation importance - red, amber and green. Red is the highest conservation priority, with species needing urgent action. Amber is the next most critical group, followed by green.*

[6] *Species of Principal Importance under Section 41 of the NERC Act 2006.*

Notable Plant Species

3.32 Three notable plant species records were returned within the 2km search area;

3.33 Grass-wrack pondweed is a nationally scarce and endangered plant, a species of Principal Importance. A single record was returned, located 1.3km south-west of the site boundary at Bridgewater Basin. This record dates from 2005.

3.34 Two records for yellow bird's nest (*Hypopitys monotropa*) were returned within the 2km search area. These records both date from 2017 and are located 1.25km north-east of the site boundary, adjacent to St Catherines Primary School.

3.35 Two records for floating water plantain were returned within the 2km search area. These records both date from 2001 and are located along the Aston Canal. The closest record to the site boundary is 695m to the east.

Phase 1 Habitat Survey

3.36 Figure 1 presents the habitat map. Botanical species lists for the habitats encountered are presented in Appendix 2 and site photographs in Appendix 4.

3.37 The site comprised hardstanding with ephemeral/short perennial species growing along the edges. The parking area comprised two levels with a brick wall surrounding much of the lower level. Scrub species, including self-seeded butterfly-bush, were scattered along the tops of the walls and growing within crevices in the brickwork. A narrow strip of tall ruderal species was present along the boundary of Great Ancoats Street.

Self-seeded Vegetation

3.38 The edges of the hardstanding areas are colonising with a mixture of forbs and grasses typical of urban areas in Manchester, with occasional bittercress species, dandelion, herb-Robert, ribwort plantain, Yorkshire-fog, sweet vernal grass, smooth hawk's-beard, pineappleweed and locally frequent jointed rush, field horsetail and white clover.

3.39 The vegetation comprised a range of plant species typical of unmanaged urban grassland and ruderal self-seeded habitats.

Tall Ruderal

3.40 A narrow strip of tall ruderal vegetation, dominated by common nettle, was present along the north-eastern boundary of the site which runs adjacent to Great Ancoats Street. Other species present included broad-leaved willowherb, broadleaved dock, Michaelmas-daisy, mugwort, red valerian and hemp agrimony.

Hardstanding

3.41 Much of the site is dominated by hardstanding (including compacted rubble/stone, concrete and asphalt), currently used for car parking. These areas have very little vegetation developed across them either because of recent regular use or due to the relatively intact nature of the hardstanding.

Scrub and Trees

3.42 The more well-developed vegetation on site comprises a small area of bramble-dominated scrub with hedge bindweed and honeysuckle. This occurs within the western corner of the site (Figure 1).

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3.43 There are occasional butterfly-bush shrubs self-seeded along the tops and within the brickwork of the walls within the site. Young tree species such as field maple and silver birch were also infrequently scattered along the tops of the brick walls.

Non-native Invasive Plants

3.44 Wall cotoneaster, the Schedule 9 Invasive Non-native Species (INNS), in the WCA, 1981 (as amended) was recorded within the site boundary (Figure 1, TN1).

Protected Species

3.45 Given the relative isolation of the site from larger areas of semi-natural habitat, and the lack of suitable refugia for protected species, it was concluded that the only species considered relevant to this assessment were bats, breeding birds potentially nesting in the denser vegetation and foraging black redstart.

Breeding Birds

3.46 Several bird species were recorded in the local area. There is potential for bird nesting in the denser shrub/scrub areas.

3.47 There are no suitable features to support nesting black redstart, however, there is some limited opportunity for this species to forage on site. The suitability is limited by the dominance of intact hard standing and frequent disturbance. Occasional use of the site by foraging black redstarts cannot be ruled out, as there are some localised areas of sparsely vegetated stony ground that the species can be associated with in the UK. The site is, however, unlikely to form an important forage resource.

3.48 Parts of the site are suitable for ground foraging birds of open habitats, such as dunnock[7] (*Prunella modularis*), house sparrow (*Passer domesticus*) and starling (*Sturnus vulgaris*), which can be present in urban habitats. The level of general activity on site is likely to deter foraging, however, as indicated by the limited observations of birds on site during the survey.

Bats

3.49 The site contains no potential tree roost sites for bats as there are no mature trees or larger trees with suitable features such as rot holes, cankers or splits. Similarly, no buildings are present on site, however, the brick walls which surround the lower level of the car park do contain some gaps in the mortar. Due to the low level of these gaps and the use of lighting within the car park it is considered unlikely that the walls provide suitable roosting opportunities for bats.

3.50 Overall, there is **negligible** potential for bats to be roosting on site.

3.51 The hardstanding and scattered vegetation provides only very limited foraging habitat for bats. Street lighting, together with the lack of vegetation and connectivity to other semi-natural habitats, significantly diminishes its potential for bat foraging.

3.52 Adjacent to the site there are two red brick buildings with pitched tile roofs that offer some potential for roosting bats. These buildings were not accessed during this survey as they are off-site.

[7] *The names of birds follow British Ornithologists' Union 2017*

4. SUMMARY AND RECOMMENDATIONS

Summary

Desk Study

4.1 The desk study identified that the site is within the IRZ of Rochdale Canal SSSI and Hollinwood Branch Canal SSSI. Natural England should be consulted if development proposals are to include certain activities that might impact the features of the designated site, however, no such activities are associated with the proposed development.:

4.2 The nearest Priority Habitat to the site is an area of open mosaic habitat which is located 160m north-east from the site boundary. This habitat is separated from the site by a major road and is sufficiently distant not to be impacted by any development within the site boundary.

Habitats

4.3 The extended Phase 1 habitat survey highlighted no features of significant nature conservation interest within the site. The plant species list was limited to species that are common and typical of early successional communities of urban sites. None of the plant species recorded within the site are either Nationally Scarce or Nationally Rare (Hill *et al.* 2004) or of any other conservation significance (Cheffings and Farrell 2005, as amended, Stroh *et al*. 2014).

4.4 The Schedule 9 listed INNS wall cotoneaster was recorded within the site boundary in a single location at TN1.

Protected Species

Bats

4.5 The site provides a small area of low quality bat foraging habitat and is unlikely to be used by significant numbers of foraging bats. The loss of or disturbance to the vegetation due to predicted increased public use and lighting of the site under the proposed development is, therefore, predicted to have a negligible impact on the conservation status of bats within the local area and Greater Manchester.

4.6 The brick walls within the site are generally in good condition and any crevice features present are considered to be too low to the ground and too well-lit for use by roosting bats. No other structures of buildings were present on the site.

4.7 Two buildings off site, but adjacent to the site, have some potential features capable of supporting roosting bats and the nearby Rochdale Canal likely acts as a commuting and foraging route for bats. Any development proposals should take account of the potential importance of these off-site features for bats.

Breeding Birds

4.8 Some areas of dense scrub provide suitable nesting habitat for a range of common bird species. As such, any necessary vegetation clearance should be undertaken outside of the breeding season for birds. The site is considered to provide a relatively limited foraging resource for local populations of birds.

4.9 The site lies within the Greater Manchester Black Redstart Priority Area (Greater Manchester Biodiversity Partnership 2008). The site is also considered to have only very limited foraging potential for black redstart and, therefore, is unlikely to form a key part of the foraging habitat for

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any local populations of black redstart. No features suitable for nesting black redstart were present.

Recommendations

4.10 Any vegetation clearance of the dense scrub areas should be undertaken outside of the breeding season for birds (i.e. avoiding the March to August inclusive period).

4.11 If vegetation clearance within the March to August (inclusive) period is unavoidable then a suitable experienced Ecologist should carefully inspect the vegetation for active nests no more than 48 hours before clearance starts. If no active nests are present, then vegetation clearance can proceed. If an active birds' nest is found, then the nest would need to be protected and retained undisturbed until the nest became inactive. An undisturbed area of approximately 2m around the nest is usually sufficient to maintain a suitable buffer, however, this can vary with the species of bird and advice would be given by the Ecologist.

4.12 The removal of wall cotoneaster from site should be undertaken in such a way at to avoid incidental spread of this INNS, as required under Schedule 9 of the WCA.

4.13 The development proposals should take account of the presence of buildings adjacent to the site with bat roost potential, along with the nearby Rochdale Canal which is likely to form an important foraging and commuting resource for bats. Measures to consider include preparing an ecologically sensitive lighting plan to avoid excessive illumination of the building roofs and the canal area during construction and operation, and also considering any significant disturbance during construction (noise and vibration) on any roosting bats potentially roosting within the buildings adjacent to the site.

Enhancement Opportunities

4.14 to add once design freeze issued.

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6. ABBREVIATIONS

BoCC	Birds of Conservation Concern
CIEEM	Chartered Institute of Ecology and Environmental Management
CRoW	Countryside and Rights of Way
EPS	European Protected Species
EU	European Union
GCN	Great Crested Newt(s)
GMEU	Greater Manchester Ecology Unit
INNS	Invasive Non-Native Species
IRZ	Impact Risk Zone(s)
JNCC	Joint Nature Conservation Committee
MAGIC	Multi Agency Geographic Information for the Countryside
NERC	National Environment and Rural Communities
NPPF	National Planning Policy Framework
PAA	Penny Anderson Associates Ltd
RIGS	Regionally Important Geological/geomorphological Site(s)
SAC	Special Area(s) of Conservation
SBI	Site(s) of Biological Importance
SPA	Special Protection Area(s)
SSSI	Site(s) of Special Scientific Interest
TN	Target Note(s)
WCA	Wildlife and Countryside Act

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FIGURE

384800 384850 384900

398450

398400

TARGET NOTES
1. Wall contoneaster
2. Butterfly bush

Port Street

A665 – Great Ancoats Street

1

2



Legend

- Survey boundary

Habitat

- Dense scrub
- Tall ruderal
- Ephemeral/short perennial
- Hardstanding
- Pay station
- Fence
- Wall
- Scattered scrub
- Target note

N

British National Grid
Projection: Transverse Mercator
False Easting: 400000.000000
False Northing: -100000.000000
Central Meridian: -2.000000
Scale Factor: 0.999601
Latitude Of Origin: 49.000000

ISO A3

Metres

0 2.5 5 10 15

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Discipline: Ecology

Title:

PHASE 1 HABITATS

Scale	1:418	Drawing No.	Figure 1
Drawn By	CC	Originator: BH	Date: 03/09/2021
PAA Ref.		Revision	1.0

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Figure 1 - Phase 1 Habitats Port Street - MSPL01 CC 030921.mxd

APPENDICES

APPENDIX 1

Relevant Protected Species Legislation Summaries

SUMMARY OF THE LEGISLATION RELATING TO BATS

All wild species of bat are protected under the Wildlife and Countryside Act (WCA) 1981, which has also been amended by later legislation, including the Countryside and Rights of Way (CRoW) Act 2000 and the Conservation of Habitats and Species Regulations 2017 (amended), and this legislation is applicable to England and Wales. Bats are listed on Schedule 5 of the WCA and are therefore subject to some the provisions of Section 9 which, with the amendments, make it an offence to:

- Intentionally or recklessly disturb a bat while it is occupying a structure or place which it uses for shelter or protection (S9:4b).
- Intentionally or recklessly obstruct access to any structure or place used for shelter or protection by a bat (S9:4c).

There are additional offences in relation to buying and selling (S9:5) any live or dead animal of this species or anything derived from them.

Bat species are also listed under Annexes IIa and IVa of the EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora, also known as the 'Habitats Directive'. Inclusion on Annex IVa means they are consequently identified as European Protected Species (EPS) and protected under the Conservation of Habitats and Species Regulations 2017 (amended).

The Conservation of Habitats and Species Regulations 2017 (amended) state that a person commits an offence if they:

(a) deliberately capture, injure or kill any wild animal of a European protected species,

(b) deliberately disturb wild animals of any such species, in such a way as –

  (i) to impair their ability to survive, to breed or reproduce, or to rear their young, or

  (ii) in the case of animals of a hibernating or migratory species, to hibernate or migrate, or

  (iii) to affect significantly the local distribution or abundance of the species to which they belong;

(c) deliberately take or destroy the eggs of such an animal, or

(d) damage or destroy a breeding site or resting place of such an animal.

Under these Regulations it is an offence to damage or destroy a breeding site or resting place whether the animal is in occupation or not, and protection extends to all life stages of the animal in question. There are additional offences relating to possession, control and sale of a live or dead bat or part of such an animal.

In addition, seven native British bat species, including the soprano pipistrelle (*Pipistrellus pygmaeus*) and the brown long-eared bat (*Plecotus auritus*), that are frequently found in buildings, are listed as a 'Priority Species' under the under the 2011 biodiversity strategy for England, *Biodiversity 2020: A strategy for England's wildlife and ecosystem services,* under the 2012 UK Post-2010 UK Biodiversity Framework. These Priority Species are also referred to as 'species of principal importance' for the conservation of biodiversity in England and Wales within Section 74 of the CRoW Act 2000, and Sections 41 (England) and 42 (Wales) of the Natural Environment and Rural Communities (NERC) Act 2006.

In addition, the National Planning Policy Framework (NPPF 2019) has an overall focus on sustainable development, and states that developments should aim to engender positive outcomes for habitats and biodiversity, with a particular focus on the maintenance and creation of ecological networks. Furthermore, the NPPF also states that any planning proposals for which significant negative impacts on biodiversity cannot be avoided, mitigated or compensated for should be refused. Reference is made to Circular 06/2005 *Biodiversity and Geological Conservation - Statutory Obligations and Their Impact within the Planning System* in respect of statutory obligations for biodiversity and geodiversity conservation.

The commitment to preserving, restoring or enhancing biodiversity is further emphasised for England and Wales in Section 40 of the NERC Act 2006.

Please note: the above text provides a brief summary of the legislation in relation to bats in England and Wales and the original Acts, Regulations and any amendments should be referred to for the precise wording.

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SUMMARY OF LEGISLATION RELATING TO BLACK REDSTART

All wild species of breeding birds and their nests are protected under Part 1 of the Wildlife and Countryside Act (WCA) 1981, as amended by later legislation including the Countryside and Rights of Way (CRoW) Act 2000.

Black redstarts (*Phoenicurus ochruros*) are additionally protected as they are listed on Schedule 1 of the WCA. Therefore, black redstarts, their nests, eggs and young are fully protected at all times throughout England and Wales.

Part 1 (Section 1:1) of the WCA states that:

'If any person intentionally,

(a) kills, injures or takes any wild bird;

(b) takes, damages or destroys the nest of any wild bird while that nest is in use or being built; or

(c) takes or destroys an egg of any wild bird,

he shall be guilty of an offence.'

Part 1 (Section 1:5) of the WCA (amended by the CRoW Act 2000) states that:

'If any person intentionally or recklessly,

(a) disturbs any wild bird included in Schedule 1 while it is building a nest or is in, on or near a nest containing eggs or young; or

(b) disturbs dependent young of such a bird,

he shall be guilty of an offence and liable to a special penalty.'

In addition, the black redstart is identified as a bird species of moderate conservation concern ('Amber' listed) due to its declining breeding population and its rarity as a breeding species within Britain.

Please note: the above text provides a brief summary of the legislation in relation to black redstart for England and Wales and the original Act and any amendments should be referred to for the precise wording.

Penny Anderson Associates Ltd
CONSULTANT ECOLOGISTS

SUMMARY OF THE LEGISLATION RELATING TO BREEDING BIRDS

All wild species of breeding birds and their nests are protected under Part 1 of the Wildlife and Countryside Act (WCA) 1981, as amended by later legislation including the Countryside and Rights of Way (CRoW) Act 2000. This legislation applies in England and Wales.

Part 1 (Section 1:1) of the WCA states that:

> 'If any person intentionally,
>
> (a) kills, injures or takes any wild bird;
>
> (b) takes, damages or destroys the nest of any wild bird while that nest is in use or being built; or
>
> (c) takes or destroys an egg of any wild bird,
>
> he shall be guilty of an offence.'

Part 1 (Section 1:5) of the WCA (amended by the CRoW Act 2000) refers to specific birds listed on Schedule 1 of the WCA, and states that:

> 'If any person intentionally or recklessly,
>
> (a) disturbs any wild bird included in Schedule 1 while it is building a nest or is in, on or near a nest containing eggs or young; or
>
> (b) disturbs dependent young of such a bird,
>
> he shall be guilty of an offence and liable to a special penalty.'

Schedule 1 includes birds such as Western barn owl (*Tyto alba*), black redstart (*Phoenicurus ochruros*), woodlark (*Lullula arborea*) and Cetti's warbler (*Cettia cetti*). Please refer to the WCA for a complete list of Schedule 1 species.

Some provisions are made to allow the killing and taking of certain species under certain circumstances, as follows:

- Birds listed on Schedule 2 (Part 1) of the Act may be taken or killed outside of the 'close season' for each individual species (the 'close season' is defined by the Act). This includes various wild duck and geese species.
- Birds listed on Schedule 2 (Part 2) of the Act may be killed or taken by authorised persons at all times. This includes species such as carrion crow (*Corvus corone*), Eurasian magpie (*Pica pica*), feral pigeon[1] (*Columba livia*) and greater Canada goose (*Branta canadensis*). An 'authorised person' is defined as a person who has written authorisation to undertake the act from the relevant statutory authority. The written authority is in the form of a licence, either a general licence which covers a number of the more typical 'pest' species, or an individual licence for other individual species. In England these licences are issued by Natural England and in Wales by the Welsh Assembly Government.

Please note: the above text provides a brief summary of the legislation in relation to breeding birds in England and Wales and the original Act and any amendments should be referred to for the precise wording.

[1] *Also known as rock dove*

APPENDIX 2

Botanical Species List

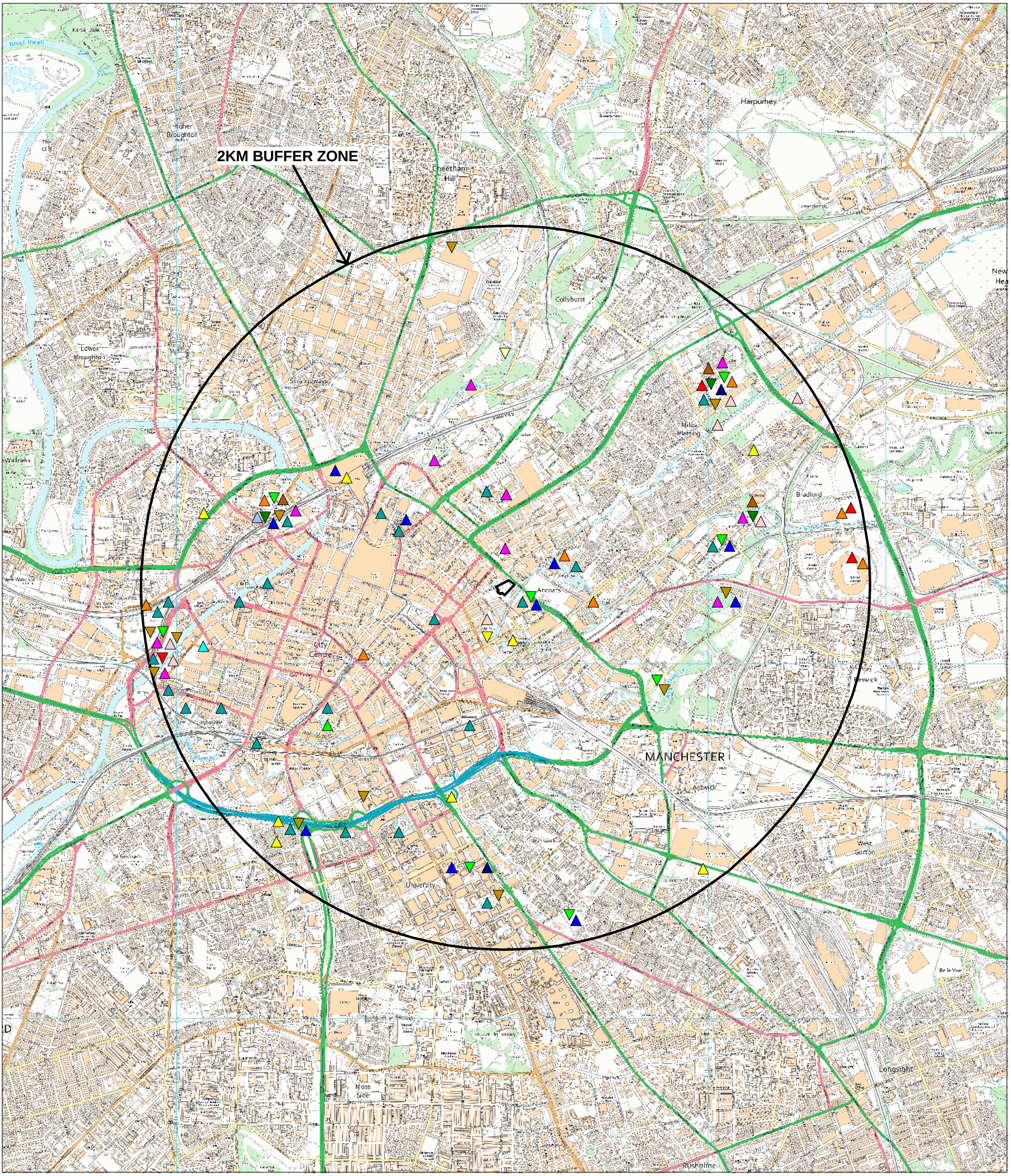
Appendix 2 Botanical Species List

Common Name	Scientific Name	DAFOR
Woody Species		
Bramble	*Rubus fruticosus agg.*	LA
Butterfly-bush	*Buddleja davidii*	F
Field maple	*Acer campestre*	R
Goat willow	*Salix caprea*	O
Honeysuckle	*Lonicera periclymenum*	LF
Silver birch	*Betula pendula*	O
Wall cotoneaster	*Cotoneaster horizontalis*	R
Herbs, Grasses and Ferns		
Bittercress species	*Cardamine sp.*	O
Broad-leaved dock	*Rumex obtusifolius*	O-LF
Broad-leaved willowherb	*Epilobium montanum*	LF
Common dog-violet	*Viola riviniana*	O
Common nettle	*Urtica dioica*	LA
Creeping buttercup	*Ranunculus repens*	O
Dandelion	*Taraxacum officinale agg.*	O
Field horsetail	*Equisetum arvense*	LF
Greater plantain	*Plantago major*	F
Hedge bindweed	*Calystegia sepium*	LA
Hemp-agrimony	*Eupatorium cannabinum*	O
Herb-Robert	*Geranium robertianum*	O
Jointed rush	*Juncus articulatus*	LF
Late cotoneaster	*Cotoneaster lacteus*	R
Meadow buttercup	*Ranunculus acris*	R
Michaelmas-daisy	*Aster schreberi*	O
Mugwort	*Artemisia vulgaris*	O-LF
Perennial rye-grass	*Lolium perenne*	O-LF
Pineappleweed	*Matricaria discoidea*	O
Red valerian	*Centranthus ruber*	O
Redshank	*Persicaria maculosa*	O
Ribwort plantain	*Plantago lanceolata*	O
Rough meadow-grass	*Poa trivialis*	O-LF
Smooth hawk's-beard	*Crepis capillaris*	O
Spear thistle	*Cirsium vulgare*	O
Sweet vernal-grass	*Anthoxanthum odoratum*	O
Wall barley	*Hordeum murinum*	O
Weld	*Reseda luteola*	O
White clover	*Trifolium repens*	LF
Yorkshire fog	*Holcus lanatus*	O

KEY
D-Dominant, A-Abundant, F-Frequent, O-Occasional, R-Rare, L-Locally

APPENDIX 3

Desk Study Data



KEY

SECTION 41 SPECIES

- BULLFINCH
- CUCKOO
- CURLEW
- DUNNOCK
- GRS-WRK PONDWEED
- HEDGEHOG
- HERRING GULL
- HOUSE SPARROW
- LAPWING
- LESSER REDPOLL
- LINNET
- S41 MOTH
- SKYLARK
- SONG THRUSH
- SP. FLYCATCHER
- STARLING
- YELLOW BIRD'S-NEST
- YELLOW WAGTAIL

GREATER MANCHESTER ECOLOGY UNIT
ECOLOGICAL SEARCH - SJ 84834 98428
PORT STREET - MAP 5

SCALE 1:20,000

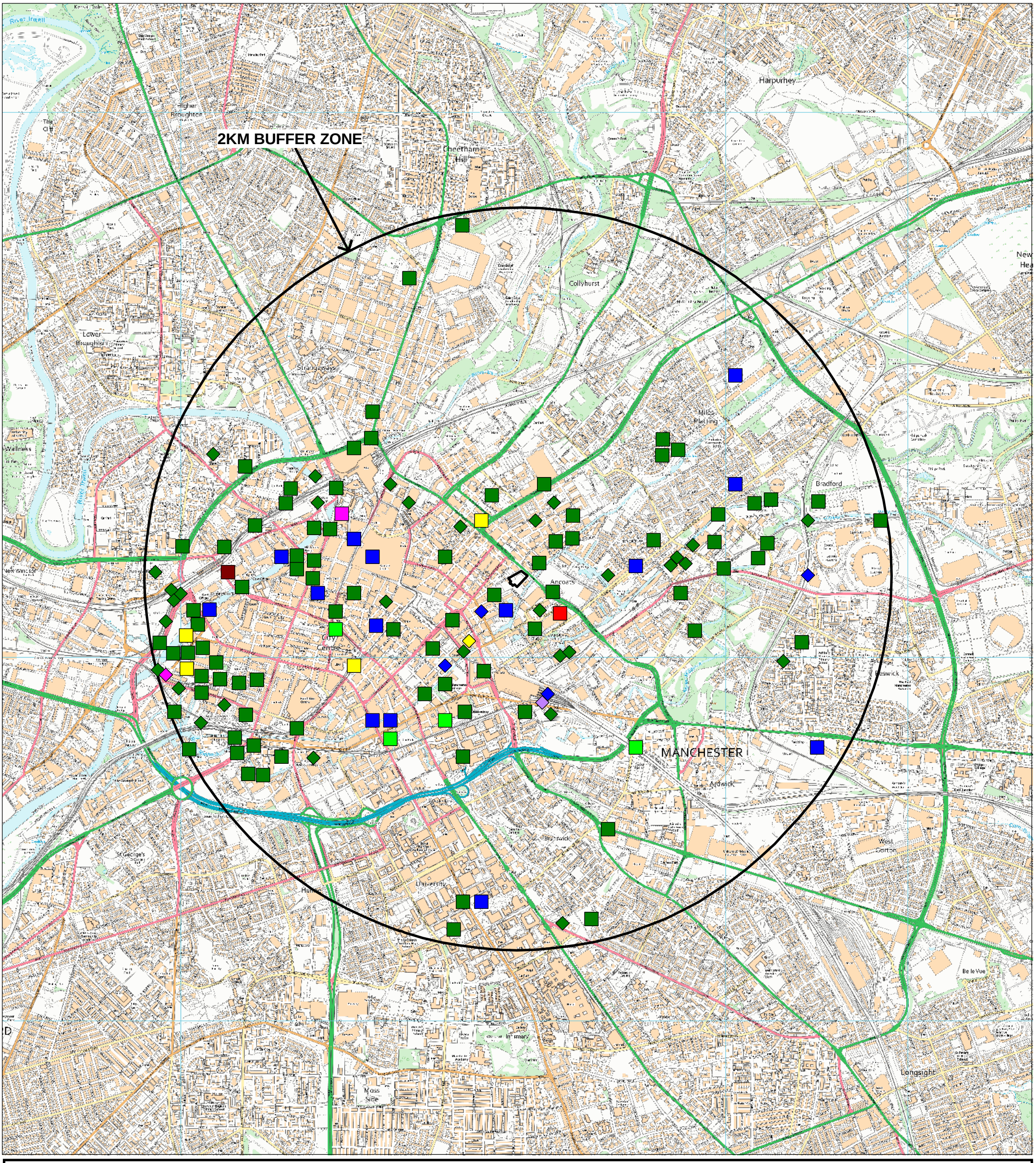
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Greater Manchester Ecology Unit

Telephone 0161 342 4409
Email: gmeu@tameside.gov.uk

Date Produced: 03/09/2021



KEY

BAT ROOSTS

- COMMON PIPISTRELLE
- DAUBENTON'S BAT
- MYOTIS SP
- PIPISTRELLE SP
- SOPRANO PIPISTRELLE

BATS OTHER SIGNS

- BAT SP
- BROWN LONG-EARED BAT
- COMMON PIPISTRELLE
- DAUBENTON'S BAT
- NOCTULE BAT
- PIPISTRELLE SP
- SOPRANO PIPISTRELLE

GREATER MANCHESTER ECOLOGY UNIT
ECOLOGICAL SEARCH - SJ 84834 98428
PORT STREET - MAP 4

SCALE 1:20,000

BAT DATA COURTESY OF SOUTH LANCS BAT GROUP

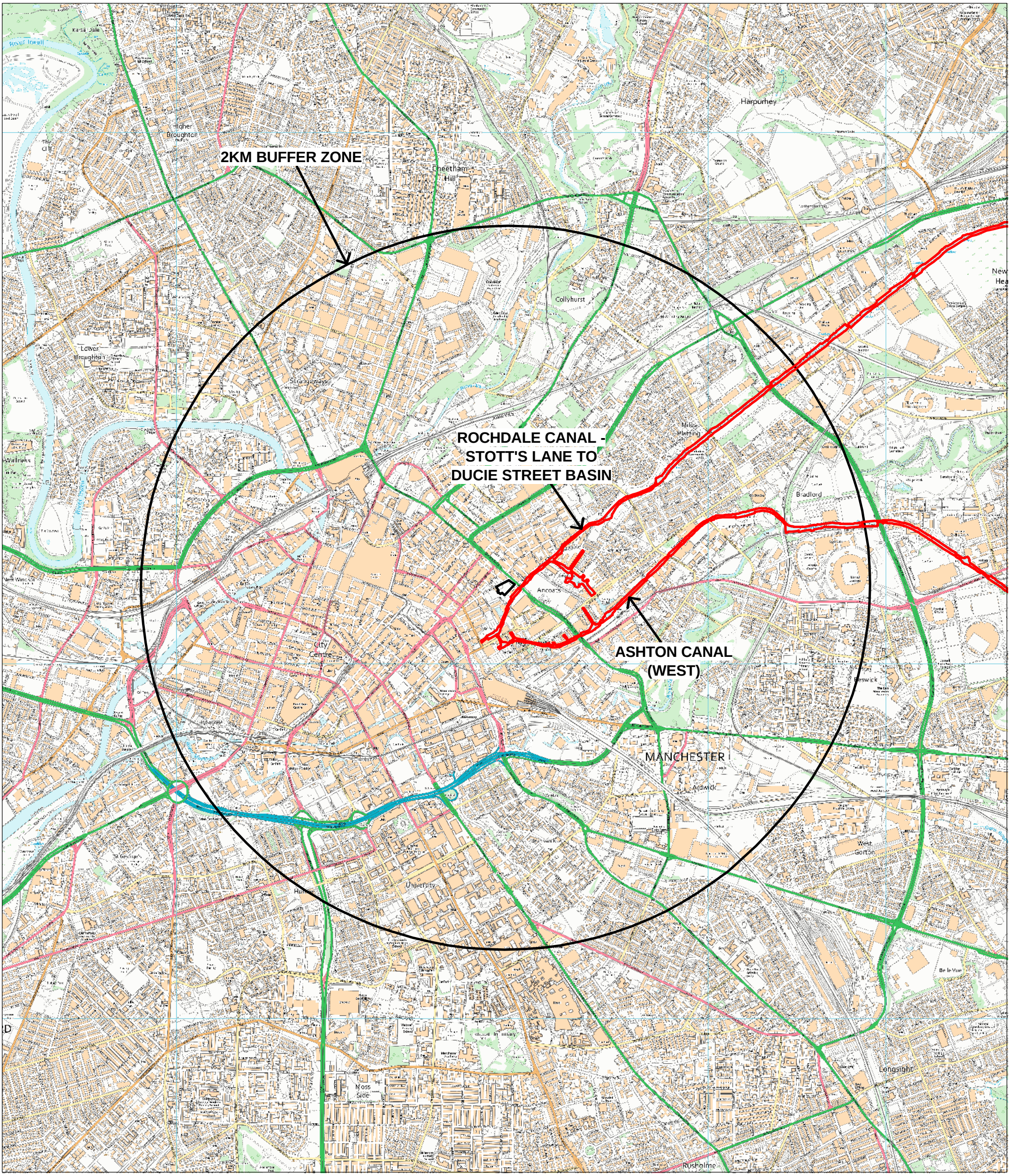
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Date Produced: 03/09/2021



KEY

SITE OF BIOLOGICAL IMPORTANCE

SBI BOUNDARY

GREATER MANCHESTER ECOLOGY UNIT
ECOLOGICAL SEARCH - SJ 84834 98428
PORT STREET - MAP 1

SCALE 1:20,000

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APPENDIX 4

Photographs



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



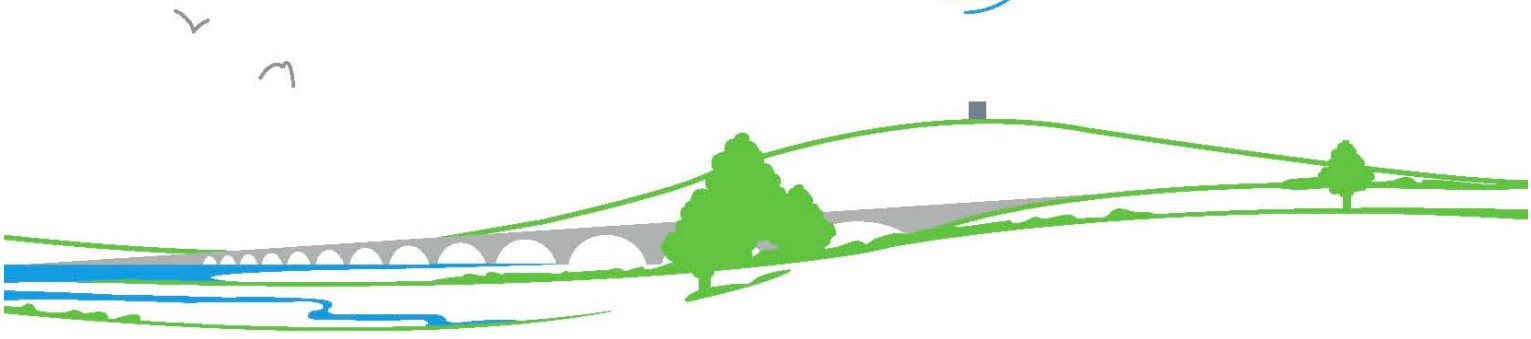
Photo 7



Photo 8

Penny Anderson Associates Ltd

CONSULTANT ECOLOGISTS



Park Lea, 60 Park Road, Buxton, Derbyshire SK17 6SN

Registered Office as Above | Registered in England & Wales | Company No. 4223109 | Directors: Mrs P Anderson Mr P Worrall Miss S Rogers

Appendix 5 – Phase 1 Ground Conditions Report

Select Property Group

PORT STREET, MANCHESTER

Interpretative Ground Investigation Report



70084785-WSP-GEO-IGR-001
SEPTEMBER 2021

CONFIDENTIAL

Select Property Group

PORT STREET, MANCHESTER

Interpretative Ground Investigation Report

CONFIDENTIAL

PROJECT NO. 70084785

OUR REF. NO. 70084785-WSP-GEO-IGR-001

DATE: SEPTEMBER 2021

WSP

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QUALITY CONTROL

Issue/revision	First issue (R00)	Revision 1 (R01)	Revision 2 (R02)
Remarks	Draft issue awaiting factual report, full laboratory testing and ground gas and groundwater monitoring.	Interim issue updated with geotechnical testing	Final issue updated with completed monitoring and asbestos quantification
Date	June 2021	June 2021	September 2021
Prepared by	R. Home / N Gilmour	R. Home	R. Home / N Gilmour
Signature			
Checked by	R. Thompson / D Watts	R Thompson	R. Thompson / D Watts
Signature			
Authorised by	M Neden / S Claxton	M Neden	M Neden / S Claxton
Signature			
Project number	70084785		
Report number	70084785-WSP-GEO-IGR-001		
File reference	\\uk.wspgroup.com\Central Data\Projects\70084xxx\70084785 - Port Street, Manchester - Phase 2 Works\03 WIP\01 Geotechnics\07_Reports		

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SOIL AND GROUNDWATER SCREENING RESULTS

1 INTRODUCTION

1.1 AUTHORISATION

On the instruction of Manchester Port Street Limited., and in accordance with the fee proposal dated April 2021, WSP has undertaken geotechnical and geo-environmental consultancy works for the proposed Port Street development located at the corner of Port Street and Great Ancoats Street, Manchester (**Figure A.1** in **Appendix A**).

1.2 OBJECTIVES & SCOPE OF WORKS

The main objectives of the work are to identify potential developmental constraints with respect to geotechnical design, contamination, and ground gas.

The scope of works comprised:

- Targeted intrusive investigation;
- Laboratory geotechnical and chemical testing;
- Groundwater / ground gas monitoring;
- Derivation of a conceptual ground model;
- Contamination risk assessment considering human health and the wider environment;
- Ground gas risk assessment; and,
- Derivation of geotechnical parameters.

This report is intended to fulfil the requirements of a Ground Investigation Report (GIR) as detailed in BS EN 1997-2:2007 (BSI, 2007).

1.3 BACKGROUND & DEVELOPMENT PROPOSALS

The proposed development comprises two towers of 33 storeys and 19 storeys linked by a lower level structure formed in a 'C' shape. A semi-basement is proposed that links the two towers, roughly orientated with an existing split level / retaining wall.

Development proposals are presented in **Appendix B**.

1.4 PREVIOUS REPORTS

The following report has been prepared previously for the site and should be read in conjunction with this report:

- Cundall. 2021. *Port Street, Manchester. Phase I Geotechnical & Environmental Assessment*. Report Ref: 1030002.RPT.GL.001

1.5 CONFIDENTIALITY

This report is addressed to and may be relied upon by the following:

Select Property Group

This assessment has been prepared for the sole use of the above-named party. This report shall not be relied upon or transferred to any other parties without the express written authorisation of WSP. No responsibility will be accepted where this report is used in its entirety, or in part, by any other party.

1.6 LIMITATIONS

This report is presented as Interim awaiting the results of long-term testing of ground gas and groundwater. Therefore, any interpretation or analysis within this report may be subject to change following receipt of these data.

The investigation and interpretation have been based on the specific Proposed Development (**Appendix B**) and may not be suitable for alternate developments.

Information provided by others is taken in good faith as being accurate. WSP cannot and will not accept liability for any deficiencies in third part information. General limitations are presented in **Appendix C**.

2 THE SITE & EXISTING INFORMATION

2.1 SITE DESCRIPTION & TOPOGRAPHY

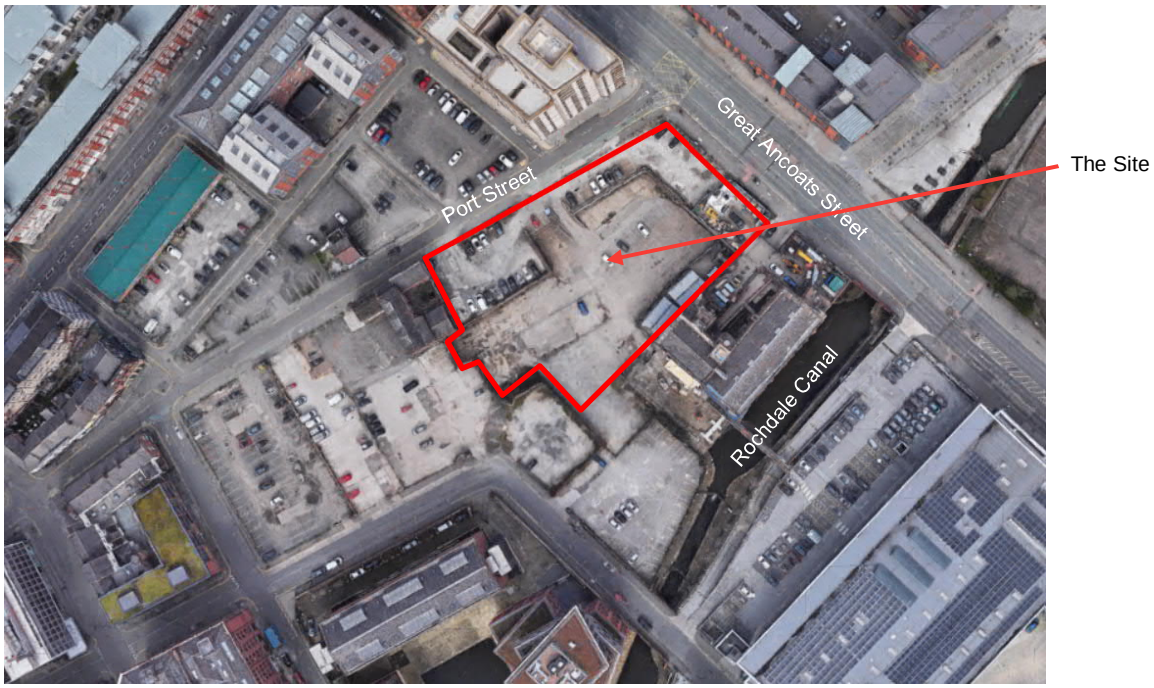
The site comprises an irregular shaped parcel of land, covering approximately 0.49ha, located at the corner of Great Ancoats Street and Port Street. The site lies approximately 600m north of Manchester Piccadilly Station and at the boundary of the Ancoats and Northern Quarter areas of Manchester city centre.

The approximate centre of the site is located at National Grid Reference 384863E, 398461N.

The site is currently occupied by a split-level car park. Adjacent to the north-eastern boundary (Port Street) and the north-western boundary (Great Ancoats Street) the site lies at between 49m and 50m AOD. Over the southern and eastern parts of the site, ground level lies at approximately 47.5m AOD. The two halves of the site are separated by concrete / brick retaining wall with a ramp connecting them. Surfacing across the site comprises a mixture of cobble setts, tarmac, concrete, and unbound hardcore.

A site location plan is presented as **Figure A.1** in **Appendix A** and an aerial photograph of the site is presented below.

Photograph 2-1 - Aerial Photogrpah of the Site



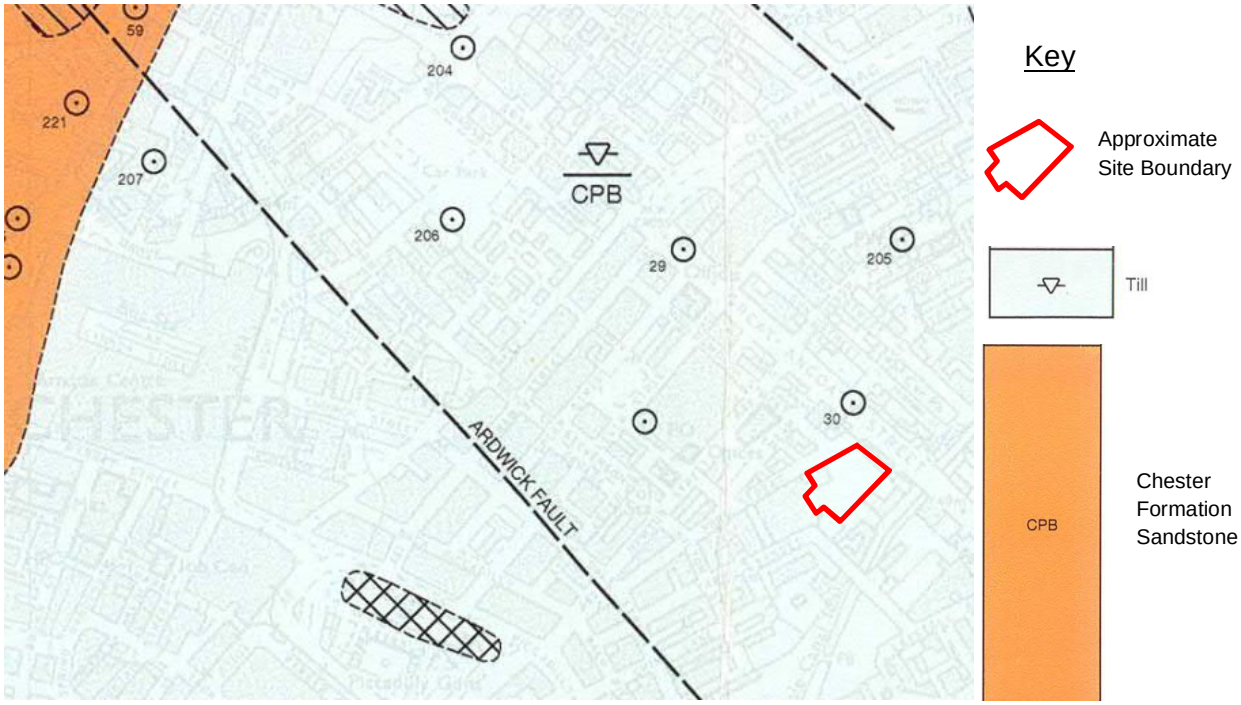
3 ENVIRONMENTAL SETTING

The following section presents a summary of the environmental setting and site history. For a more detailed assessment, reference should be made to the Phase 1 Geotechnical & Environmental Assessment (Cundall, 2021).

3.1 GEOLOGY

Published geological mapping (BGS, 2004) indicates the site to be underlain by Glacial Till and sandstone of the Chester Formation (formerly the Chester Pebble Beds Formation). An extract of the geological map is presented below.

Figure 3-1 - Extract from Solid & Drift Map (BGS, 2004)



C12/014-CLSCSL British Geological Survey. ©NERC. All rights reserved.
Reproduced from BGS map "Manchester & Salford Sheet SJ89NW Solid & drift Ed. 1:10,000" by permission of the British Geological Survey. ©NERC. All rights reserved.

3.2 HYDROGEOLOGY

The superficial deposits are classified as a "Secondary Aquifer – Undifferentiated" and the underlying bedrock is classified as a "Principal Aquifer".

3.3 HYDROLOGY

The Rochdale Canal is the closest surface water body and is located approximately 30m to the southeast of the site.

3.4 SITE HISTORY

The following information is a summary from the Phase I report (Cundall, 2021) to which reference should be made for more detail.

From the earliest maps viewed (1850s) the north-eastern most part of the site was used as residential housing with private gardens. A ‘basin’ connected to the local canal system (later called the Rochdale Canal) was situated in the western half of the site with the remainder of the site occupied by industrial buildings (including sawmills and Timber Yards) and wharfs. The surrounding area comprised a mix of residential and industrial land uses including wharfs, sawmills and cotton mills.

No significant changes occurred until the 1948 map when the ‘basin’ no longer appears. In its place is Hills Service Garage and a yard; the ‘basin’ having likely been infilled both onsite and immediately offsite to the southeast. A Machine Tool Works was located in the far west of the site during this time and the function of several more industrial buildings surrounding the site are now shown to include a paint works, engineering works and a brass and iron works.

An above ground tank is shown in the centre of the site on the 1954 edition of the map however, it is no longer present on the 1963 map, when much of the site is occupied by garages. The Rochdale Canal is now labelled as disused, and there is a general decrease in the amount of industrial buildings surrounding the site.

By 1992 only a single industrial building labelled as ‘works’ existed in the northwest corner of the site along with the residential houses in the northeast. Th e remainder of the site was open ground / yard area during this time. The surrounding area continued to see a reduction in industrial buildings.

At some time between 1999 and 2021 (there are no maps covering this period) the remaining buildings on site were removed and the site’s primary use became a split-level open car parking area as it remains to the present date.

4 PRELIMINARY CONCEPTUAL SITE MODEL

4.1 POTENTIAL SOURCES OF CONTAMINATION

WSP has reviewed the Preliminary Conceptual Model (CSM) produced by Cundall and has identified the following potential sources of contamination:

- Contaminants of concern relating to Made Ground materials and the infilled Canal Basin (e.g. heavy metals and asbestos within fill materials).

4.2 POTENTIAL EXPOSURE PATHWAYS

Relevant potential pathways are considered to be:

- Inhalation of asbestos fibres if liberated from soils.
- Direct contact, ingestion and inhalation of other soil-bound chemical substances.
- Inhalation of vapours associated with volatile substances in soil or groundwater.
- Migration of leachable/ mobile contaminants through soil and groundwater.
- Direct contact between contaminants and buried services.

4.3 POTENTIAL RECEPTORS

Relevant potential receptors are considered to be:

- Construction workers during redevelopment.
- Neighbouring site users.
- Future site users (i.e. site users, site workers, maintenance workers).
- Underlying groundwater and the wider groundwater environment.
- Surface waters: Rochdale Canal located approximately 30m south east of the site boundary.

4.4 PRELIMINARY CONCEPTUAL SITE MODEL (CSM)

The potential risks from any contamination within soil and groundwater are assessed based on the environmental setting of the site, anticipated ground conditions, potential sources of contamination associated with known former uses and the proposed future use of the site.

The source-pathway-receptor model forms the basis of the risk assessment; potential risks are only considered to exist where there is a credible source (e.g. chemical substance capable of causing harm); a pathway for migration of the source to the receptor; and a sensitive receptor that could be affected (e.g. nearby river or site users). A source-pathway-receptor contaminant linkage assessment is termed a conceptual site model (CSM). A preliminary CSM is produced prior to intrusive ground investigation and is refined following collection of site-specific data (if appropriate).

A qualitative risk ranking has been applied to the potentially complete contaminant linkages presented in Table 3-1 (based on CIRIA C552 '*Contaminated Land Risk Assessment: A Guide to Good practice'*, 2001), which considers a combination of the potential severity of the harm and the likelihood of the harm occurring. The CIRIA risk ranking summary table is provided below.

Classification	Definition
Very High Risk	Severe harm to a receptor may already be occurring, or a high likelihood severe harm will arise to a receptor, unless immediate remedial works / mitigation measures are undertaken.
High Risk	Harm is likely to arise to a receptor, and is likely to be severe, unless appropriate remedial actions / mitigation measures are undertaken. Remedial works may be required in the short-term, but likely to be required over the long-term.
Moderate Risk	Possible that harm could arise to a receptor, but low likelihood that such harm would be severe. Harm is likely to be mild. Some remedial works may be required in the long-term.
Moderate / Low Risk	Possible that harm could arise to a receptor, but where a combination of likelihood and consequence results in a risk that is above low, but is not of sufficient concern to be classified as mild. Limited further investigation may be required to clarify the risk. If necessary, remediation works are likely to be limited in extent.
Low Risk	Possible that harm could arise to a receptor. Such harm, at worst, would normally be mild.
Very Low Risk	Low likelihood that harm could arise to a receptor. Such harm is unlikely to be any worse than mild.

Table 4-1 – Preliminary Conceptual Site Model

Potential Sources	Potential Pathways	Potential Receptors	Probability of Complete Linkage	Consequence if Linkage Present	Risk Level	Potential for complete pollutant linkage
Asbestos associated with Made Ground	Liberation followed by inhalation	Construction workers during redevelopment	Low Likelihood	Medium	Moderate/ Low	Made Ground may contain asbestos fibres that could be liberated during ground works. However, Made Ground is considered likely to be limited in depth with no evidence of specific filling or levelling works (with the exception of the infilled canal basin located in the western portion of the site). Appropriate work control procedures would be required to control any exposure risk during the works.
		Neighbouring site users during redevelopment	Low Likelihood	Medium	Moderate/ Low	
		Site end users (post development)	Low Likelihood	Medium	Moderate/ Low	If asbestos fibres are present within Made Ground and this material remains near the surface in soft landscaped areas of the redevelopment, end users could be exposed.
		Site maintenance workers (post development)	Low Likelihood	Medium	Moderate/ Low	Made Ground may contain asbestos fibres that could be liberated during future excavation works. However, Made Ground is considered likely to be limited in depth with no evidence of specific filling or levelling works. Measures to prevent exposure during future excavations may be required.
Chemicals of concern associated with Made Ground	Direct contact, ingestion, dust inhalation	Construction Workers (during redevelopment)	Likely	Minor	Low	Exposure of construction workers to contamination in soils and groundwater is possible during construction, particularly during groundworks. Use of appropriate PPE will likely sufficiently mitigate risk.

Potential Sources	Potential Pathways	Potential Receptors	Probability of Complete Linkage	Consequence if Linkage Present	Risk Level	Potential for complete pollutant linkage
Chemicals of concern from spills / leaks from previous historical and current uses on site including: ▪ Heavy metals ▪ Total petroleum Hydrocarbons (TPH) ▪ Polycyclic aromatic hydrocarbons (PAHs) ▪ Phenols ▪ Asbestos		Adjacent site users	Unlikely	Minor	Very Low	Adjacent site users unlikely to be exposed to chemical contamination during construction due to limited construction period and use of appropriate standard construction control procedures including dust suppression as required. Following construction, no viable exposure pathway.
		Site end users (post development)	Unlikely	Medium	Low	Whilst an area of soft landscaping is proposed following construction of the multi storey residential blocks, the majority of the site will be covered in hardstanding therefore unlikely end users and maintenance workers could be exposed.
		Site maintenance workers (post development)	Likely	Minor	Low	Future maintenance workers could be exposed if completing excavations (e.g. utility installation) in affected areas although exposure times would be limited. Would likely be appropriately managed by use of suitable PPE.
	Leaching / mobilisation and migration	Secondary (Undifferentiated) / Principal Aquifer / surface waters	Low Likelihood	Medium	Moderate/ Low	If chemicals of concern are present they could leach from site soils and migrate to the water table and/or offsite water receptors (Rochdale Canal is the closest surface water body and is located approximately 30m to the southeast of the site – it is assumed that when the basin was backfilled a relatively impermeable barrier was constructed adjacent to the canal). A piling risk assessment may also be required to confirm whether piling will introduce new / preferential migration pathways. Measures may need to be taken

Potential Sources	Potential Pathways	Potential Receptors	Probability of Complete Linkage	Consequence if Linkage Present	Risk Level	Potential for complete pollutant linkage
						to prevent mobilisation of chemicals of concern during construction.
	Direct Contact	Water Supply pipes (post development)	Likely	Medium	Moderate	If below ground water supply pipes were placed in contaminated soils the pipes could be vulnerable.
Hazardous ground gases arising from Made Ground / organic soils	Accumulation in confined spaces followed by inhalation, asphyxiation, explosion	Construction workers	Unlikely	Medium	Low	Widespread / deep Made Ground and / or natural organic-rich soils not expected; therefore, viable source of significant ground gas likely to be absent.
		Neighbouring site users	Unlikely	Medium	Low	
		Site end users and maintenance workers	Unlikely	Medium	Low	

5 GROUND INVESTIGATION

5.1 FIELDWORK

A ground investigation was scoped by Cundall to provide geotechnical information to support the cost-effective design of the substructures and data to assess the contamination status of the site.

Minor amendments were made to the scope, which was subsequently adopted by WSP.

Fieldworks were undertaken between 4 and 18 May 2021 by Geotechnics Limited and observed by WSP. The works undertaken are summarised in **Table 5-1**.

Table 5-1 – Summary of Fieldwork

Investigation Method	No. of Positions	Depth (m BGL*)	Notes
Cable percussion borehole with rotary follow on	4 (BH01 – BH04)	40.0 – 40.9	
Window sample borehole	8 (WS01 – WS08)	0.3 – 6.45	WS05 was terminated at 0.3m where suspected asbestos was encountered

* metres below ground level

The procedures followed in the investigation were in general accordance with guidance presented in BS 5930:2015 and BS 10175:2011 (BSI, 2013, 2015).

Draft logs and chemical testing are presented in **Appendix D**.

An exploratory hole location plan is presented as **Dwg. 70084785-WSP-GEO-EHLP-001** in **Appendix A**.

MONITORING INSTALLATIONS

Combined groundwater and gas monitoring installations were placed in selected boreholes. Details of the installations are presented on the exploratory hole records and summarised in **Table 5-2**.

Table 5-2 – Summary of Monitoring Installations

Exploratory Hole	Standpipe (mm)	Screen Top & base (m BGL)	Strata Installed
BH01	50	1.0 – 5.0	Made Ground and Cohesive Glacial Till
BH02	50	10.0 – 16.0	Cohesive Glacial Till
BH03	50	0.5 – 1.4	Made Ground
BH04	50	2.0 – 10.0	Cohesive Glacial Till
WS01	50	0.5 – 2.8	Made Ground

SURVEYING

All exploratory holes were surveyed by Geotechnics, with the easting, northing, and Ordnance Datum elevation presented on the exploratory hole records.

5.2 IN-SITU TESTING

STANDARD PENETRATION TESTING

Standard Penetration Tests (SPTs) were performed within the cable percussion and window sample boreholes. The test results are presented on the exploratory hole records and a plot of SPT N_{60} (corrected for hammer efficiency) versus elevation is presented as **Figure A.2** in **Appendix A**.

5.3 LABORATORY TESTING

Geotechnical and chemical testing scheduled by WSP comprised the following:

GEOTECHNICAL TESTING

- Moisture content;
- Atterberg Limits;
- Particle Size Distribution;
- Undrained Unconsolidated Triaxial;
- Oedometer;
- Point Load index;
- Unconfined Compressive Strength;
- pH; and,
- Water soluble sulphate (2:1)

Geotechnical testing results are presented in **Appendix D**. At the time of writing not all geotechnical testing was available, and this report will be updated upon receipt of all the factual data.

CHEMICAL TESTING – SOILS

Samples of Made Ground and natural soils were submitted for laboratory chemical analysis of the following determinants.

- Metals suite – arsenic, cadmium, chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium and zinc;
- PAHs;
- TPHCWG;
- Asbestos identification;
- Asbestos content quantification (2 samples);
- Soil Organic Matter (SOM);
- pH;
- phenols; and,
- Water-soluble sulphate.

CHEMCIAL TESTING – WATER

Groundwater was sampled from monitoring wells BH03 and BH04 during the first monitoring round in May 2021. Laboratory chemical analysis of the groundwater samples comprised the following determinants:

- Cyanide (total);
- Metals suite – arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc;
- PAHs;
- TPHCWG including benzene, toluene, ethylbenzene and xylene (BTEX);

- pH;
- Phenols (monohydric);
- Sulphide; and,
- Water-soluble sulphate

5.4 GROUNDWATER & GROUND GAS MONITORING VISITS

Six ground gas/ groundwater monitoring visits were specified over a three-month period in accordance with guidance presented in BS 8484:2015 (BSI, 2019) and CIRIA C665 (Wilson et al, 2007) for a moderate sensitivity, low ground gas generation potential site. Results of the groundwater and ground gas results are provided in the Geotechnics Factual Report in **Appendix D**.

6 GROUND SUMMARY

6.1 STRATA

Published geological mapping (BGS, 2004) and the site history suggest a sequence of Made Ground, overlying Glacial Till, and sandstone bedrock of the Chester Formation. The ground investigation generally confirmed this sequence. However, layers of granular Glacial Till were also recorded in the cable percussion boreholes towards the base of the superficial deposits.

On the basis of the information obtained, the following ground summary has been derived for the site.

Table 6-1 – Ground Model

Strata		Typical Description	Depth to Base (m BGL)	Elevation of Base (m AOD)	Thickness (m)	Notes
Surfacing		Asphalt / Concrete	0.02 – 0.2	47.31 – 49.67	0.02 – 0.2	Recorded in every borehole except BH02 and WS02
Subbase		Grey slightly sandy fine to coarse limestone gravel	0.1	48.97 – 49.62	0.05 – 0.1	Only recorded in BH01 and BH02
Made Ground	Granular	Slightly clayey sandy fine to coarse gravel of mudstone, sandstone, brick, and concrete	>0.3 – >6.45	41.1 – 48.02	>0.1 - >2.75	Granular Made Ground was recorded in every borehole except BH02 where only Cohesive Made Ground was recorded. In six of the boreholes a layer of Cohesive Made Ground was recorded underlying the Granular Made Ground. In WS01 Cohesive Made Ground was recorded between two layers of Granular Made Ground
	Cohesive	Firm slightly sandy slightly gravelly silt with a low cobble content. Gravel and cobbles are brick, concrete and clinker	1.2 – 3.7	43.85 – 47.02	0.2 – 2.6	
Upper Cohesive Glacial Till		Firm becoming stiff slightly sandy slightly gravelly clay with occasional lenses of sand	13.5 – 19.0	30.72 – 33.93	12.5 – 16.3	Recorded in all boreholes that penetrated the Made Ground
Upper Granular Glacial Till		Dense becoming very dense gravelly fine to coarse sand	18.95 – 23.5	23.93 – 29.27	2.9 – 10.0	Greatest thickness recorded in BH04 where the Granular Glacial Till was recorded directly overlying the sandstone
Lower Cohesive Glacial Till		Stiff slightly gravelly sandy clay with a low cobble content	20.7 – 23.5	24.02 – 28.37	0.9 – 4.5	Greatest thickness recorded in BH03 where the Lower Cohesive Glacial Till was recorded directly overlying the sandstone. Not recorded in BH04
Lower Granular Glacial Till		Very dense gravelly fine to coarse sand with a low cobble content	24.2 – 24.37	24.7 – 25.52	1.2 – 3.67	Only recorded in BH01 and BH02

Strata	Typical Description	Depth to Base (m BGL)	Elevation of Base (m AOD)	Thickness (m)	Notes
Weathered Chester Formation Sandstone	Extremely weak reddish-brown sandstone. Recovered as sand	24.0 – 25.2	22.93 – 24.67	0.03 – 1.0	
Intact Chester Formation Sandstone	Very weak to weak reddish-brown fine to medium grained sandstone, locally contains gravel sized clasts and thin bands of mudstone	>40.9	<7.02	>16.5	

6.2 GROUNDWATER

Groundwater strikes recorded during the investigation and monitoring are summarised in **Table 6-2**. This section will be updated when groundwater monitoring results are complete. No groundwater monitoring results were recorded for BH02 due to damage to the well bungs.

The results suggest discontinuous perched groundwater bodies within the Made Ground and Glacial Till.

Table 6-2 – Summary of Groundwater Strikes & Monitoring Levels

Borehole	Ground Level (m AOD)	Groundwater Strike Level & Depth, m AOD (m bgl)		Monitoring Level (m AOD)		Stratum / Notes
		Initial	After 20 minutes	Min.	Max.	
BH01	49.72	29.02 (20.7)	32.12 (17.6)	44.97 (2.94)	46.78 (4.75)	Strike in Granular Glacial Till rising into Cohesive Glacial Till. Dry on third visit
BH02	49.07	-	-	-	-	Well damaged and no monitoring possible
BH03	47.52	46.32 (1.2)	Seepage	46.58 (0.78)	46.74 (0.94)	Strike in Cohesive Made Ground. Dry on third visit
BH04	47.43	-	-	42.30 (2.24)	45.19 (5.13)	Cohesive Glacial Till
WS01	47.55	47.05 (0.5)	Seepage	47.28 (0.2)	47.35 (0.27)	Strike in Granular Made Ground. Flooded on first, fourth, fifth, and sixth visits

Borehole	Ground Level (m AOD)	Groundwater Strike Level & Depth, m AOD (m bgl)		Monitoring Level (m AOD)		Stratum / Notes
		Initial	After 20 minutes	Min.	Max.	
WS03	47.51	47.01 (0.5)	Seepage	-	-	Granular Made Ground
WS04	47.73	47.23 (0.5)	Seepage	-	-	Granular Made Ground
WS06	49.06	44.06 (5.0)	Seepage	-	-	Cohesive Glacial Till

() Numbers in brackets represent groundwater depth in m BGL

6.3 EVIDENCE OF CONTAMINATION

No visual or olfactory evidence of contamination was noted during the investigation.

7 GROUND CONDITIONS & MATERIAL PROPERTIES

7.1 GENERAL

The following section discusses the ground conditions and material properties determined from the ground investigation and geotechnical testing described in **Section 4**.

Where necessary, determination of geotechnical parameters has been based on cautious estimates of laboratory derived results, published correlations, and field tests, complemented with engineering judgement.

Where material parameters are assumed, derived by calculation, or taken from published sources, further details are provided as to their derivation.

7.2 MADE GROUND

Made Ground was recorded in all exploratory positions below an asphalt or concrete surfacing, except BH02, where no surfacing was recorded. The surfacing ranged in thickness between 0.02m and 0.2m.

In BH01 and BH02 a 0.05m to 0.1m thick layer of limestone gravel subbase was recorded but was absent from the rest of the site.

Granular Made Ground was recorded in every exploratory hole except BH02, where only Cohesive Made Ground was recorded. In six of the boreholes (BH01, BH03, WS01, WS03, WS06 and WS07), the Granular Made Ground was underlain by a layer of Cohesive Made Ground and in WS01, a second layer of Granular Made Ground was recorded beneath the Cohesive Made Ground.

Exploratory holes located on the higher side of the retaining wall recorded Made Ground to depths between 2.5m and 2.7m BGL. The depth to the base of the Made Ground was greatest in WS01 (>6.45m BGL) and WS03 (3m BGL) located in the centre of the site within the footprint of the former canal basin. Across the remainder of the site, the depth to the base of the Made Ground ranged between 1.0m (BH04) and 1.4m BGL (BH04).

The thickness of the Granular Made Ground varied between 0.7m and > 2.75. thick and generally comprised a slightly clayey sandy fine to coarse gravel or mudstone, sandstone, brick, and concrete with occasional cobbles of brick and concrete. Where recorded, the Cohesive Made Ground varied between 0.2m (WS07) and 2.6m (BH02) and generally comprised firm slightly sandy slightly gravelly silt with a low cobble content. Gravel and cobbles comprised fragments of brick, concrete, and clinker.

The results of the in-situ and laboratory geotechnical testing are summarised in **Table 7-1.**

Table 7-1 – Summary of In-Situ & Laboratory Testing – Made Ground

Parameter	No. of Tests	Min – Max	Mean
Granular Made Ground			
SPT N_{60}*	9	1 – 34	16
Water soluble sulphate SO_4 (2:1) (mg/l)	10	10 – 349	101

Parameter	No. of Tests	Min – Max	Mean
pH	10	7.4 – 9.9	8.4
SPT $N1_{60}$†	9	2 - 52	20
Cohesive Made Ground			
SPT N_{60}*	7	0 – 179	11$
Water soluble sulphate SO_4 (2:1) (mg/l)	4	68 – 1927	610
pH	4	6.9 – 8.4	7.9

* corrected for hammer efficiency

† corrected for hammer efficiency

$ extrapolated value excluded from mean

Due to the limited data and its inherent variability, values of shear strength and stiffness have not been derived for the Made Ground.

UNIT WEIGHT

Based on the mean SPT N_{60} results and field descriptions for the Granular and Cohesive Made Ground the soils have been classified as medium dense gravel and low strength silt respectively in accordance with BS 5930:2015 (BSI, 2015) and corresponding to a unit weight of 17kN/m^2 for medium dense gravel and low strength silt above the water table in accordance with BS 8002:2015 (BSI, 2015).

7.3 GLACIAL TILL

Glacial Till was recorded in every borehole that penetrated the Made Ground. The Glacial Till comprised an upper cohesive layer (Upper Cohesive Glacial Till) that was recorded to depths between 13.5m and 19.0m BGL (30.72m - 33.93m AOD) with thicknesses between 12.5m and 16.3m. In all the cable percussion boreholes the upper cohesive layer was underlain by a granular layer (Upper Granular Glacial Till) to depths between 18.95m BGL and 23.5m BGL (23.93m – 29.27m AOD). The thickness of the granular layer ranged between 2.9m in BH02 and 10m in BH04. In BH04, this granular layer was recorded directly overlying the sandstone bedrock.

In BH01, BH02, and BH03 a lower layer of cohesive Glacial Till (Lower Cohesive Glacial Till) was recorded to depths between 20.7m and 23.5m BGL (24.02m – 28.37m AOD) with thicknesses of 0.9m (BH02) to 4.55m (BH03). In BH03, this lower cohesive layer of Glacial Till was recorded to directly overly the sandstone bedrock.

In BH01 and BH02 a second, lower layer of granular Glacial Till (Lower Granular Glacial Till) was recorded to depths between 24.2m and 24.37m BGL (24.7m – 25.52m AOD) with thicknesses of 1.2m and 3.67m respectively.

Cohesive Glacial Till generally comprised a firm becoming stiff slightly sandy slightly gravelly clay with occasional cobbles and occasional laminae and lenses of sand.

The Granular Glacial Till generally comprised dense becoming very dense gravelly fine to coarse sand.

In-situ and laboratory testing are summarised in **Table 7-2**.

Table 7-2 – Summary of In-Situ & Laboratory Testing – Glacial Till

Parameter		No. of Tests	Min – Max	Mean
Cohesive Glacial Till				
SPT N_{60}		56	1 – 161	34
Moisture Content (%)		30	10 – 34	18
Liquid Limit (%)		17	26 – 48	36
Plastic Limit (%)			11 – 26	17
Plasticity Index (%)			17	11 – 22
Undrained shear strength, c_u (kN/m^2) – laboratory triaxial		9	55 – 203	124
Coefficient of volume compressibility, m_v (m^2/MN at σ_v' +100kN/m^2)		2	0.041 & 0.047	0.044
Bulk Density (Mg/m^3)		9	2.20 – 2.25	2.1
Water soluble sulphate SO_4 (2:1) (mg/l)		6	32 – 220	83
pH		6	8.1 – 8.7	8.3
Granular Glacial Till				
SPT N_{60}		17	37 – 225	109
SPT $N1_{60}$		17	23 – 128	63
Particle Size Distribution (%)	Cobble	7	0 – 35	14
	Gravel		4 – 54	32
	Sand		11 – 59	35
	Silt / Clay		2 – 37	19
Water soluble sulphate SO_4 (2:1) (mg/l)		2	52 & 128	90
pH		2	8.3 & 8.7	8.5

COHESIVE GLACIAL TILL

UNDRAINED SHEAR STRENGTH

The undrained shear strength, c_u has been estimated from the following relationship with SPT N_{60}:

$c_u(kN/m^2) = f_1 N_{60}$ (Clayton, 1995)

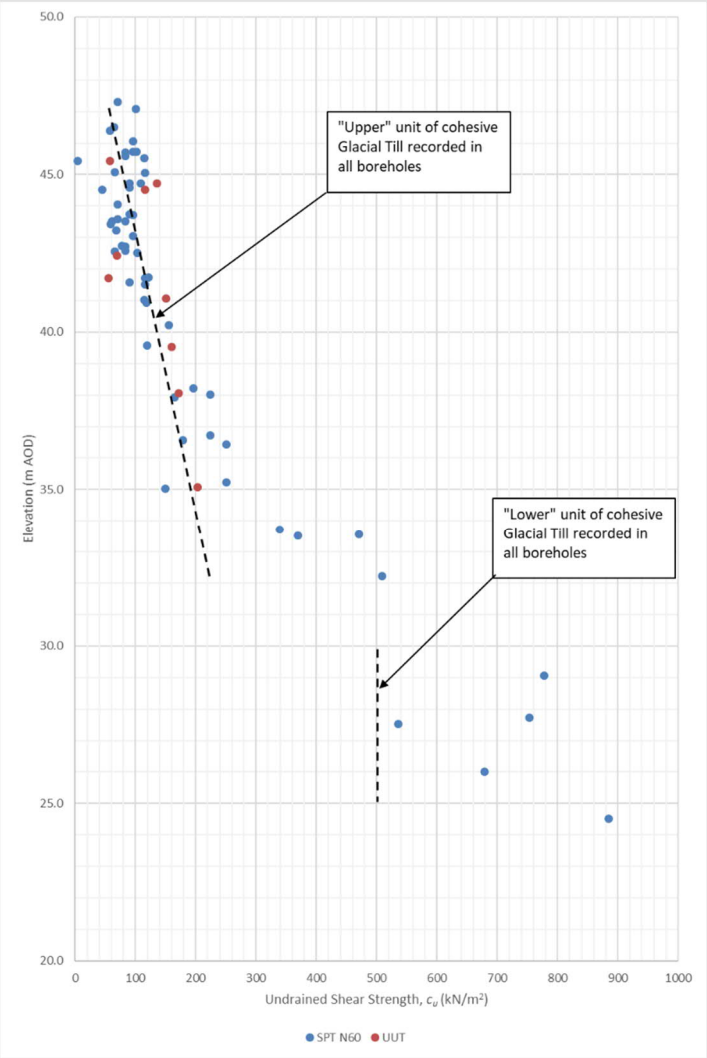
Where *f1* is a factor related to the plasticity index, taken as 5.5 based on a mean plasticity index of 18% (Stroud, 1975).

The results of the above relationship and the laboratory triaxial testing are presented on **Figure 7-1**. For the Upper Cohesive Glacial Till recoded in all the boreholes the following profile of undrained shear strength is considered appropriate:

c_u = 50kN/m^2 at 47m AOD increasing linearly to 200kN/m^2 at 32m AOD

For the Lower Cohesive Glacial Till recorded in BH01 and BH02, an undrained shear strength of 450kN/m^2 is considered appropriate.

Figure 7-1 - Undrained Shear Strength vs Elevation - Cohesive Glacial Till



STIFFNESS

Values of drained Young's Modulus, *E'* have been derived from the following relationships:

$E'(MN/m^2) = 0.9N_{60}$ (Clayton, 1995);

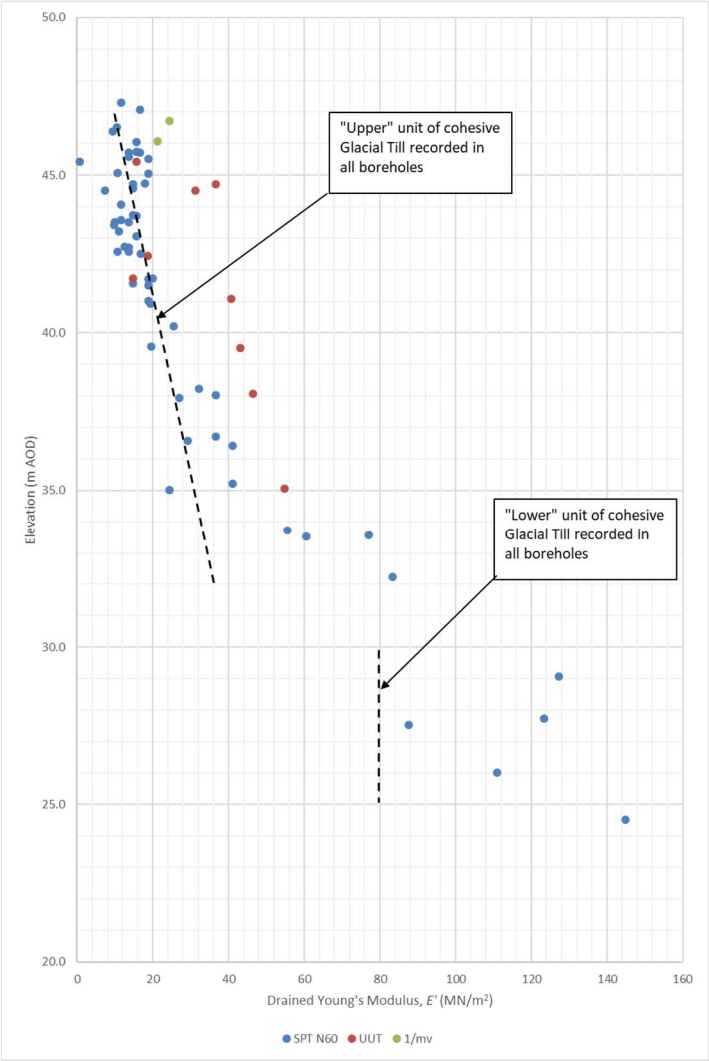
$E'(MN/m^2) = 270c_u/1000$ (Stroud and Butler, 1975)

$E'(MN/m^2) = 1/m_v$

Where m_v is taken at in-situ effective stress plus 100kN/m^2 from a recompression curve

The results of the above relationship are presented on **Figure 7-2**.

Figure 7-2 - Drained Young's Modulus vs Elevation - Cohesive Glacial Till



There is a discrepancy between the values of Young's Modulus derived from the laboratory triaxial relationship and from the SPT N_{60} relationship, with values derived from laboratory testing suggesting a higher stiffness than the SPT N_{60} relationship. A lower bound value has been taken and for the Upper Cohesive Glacial Till recorded in all the boreholes the following profile of drained Young's Modulus is considered appropriate:

E' = 10MN/m^2 at 47m AOD increasing linearly to 35MN/m^2 at 32m AOD

For the Lower Cohesive Glacial Till recorded in BH01 and BH02, an undrained shear strength of 80MN/m^2 is considered appropriate.

UNIT WEIGHT

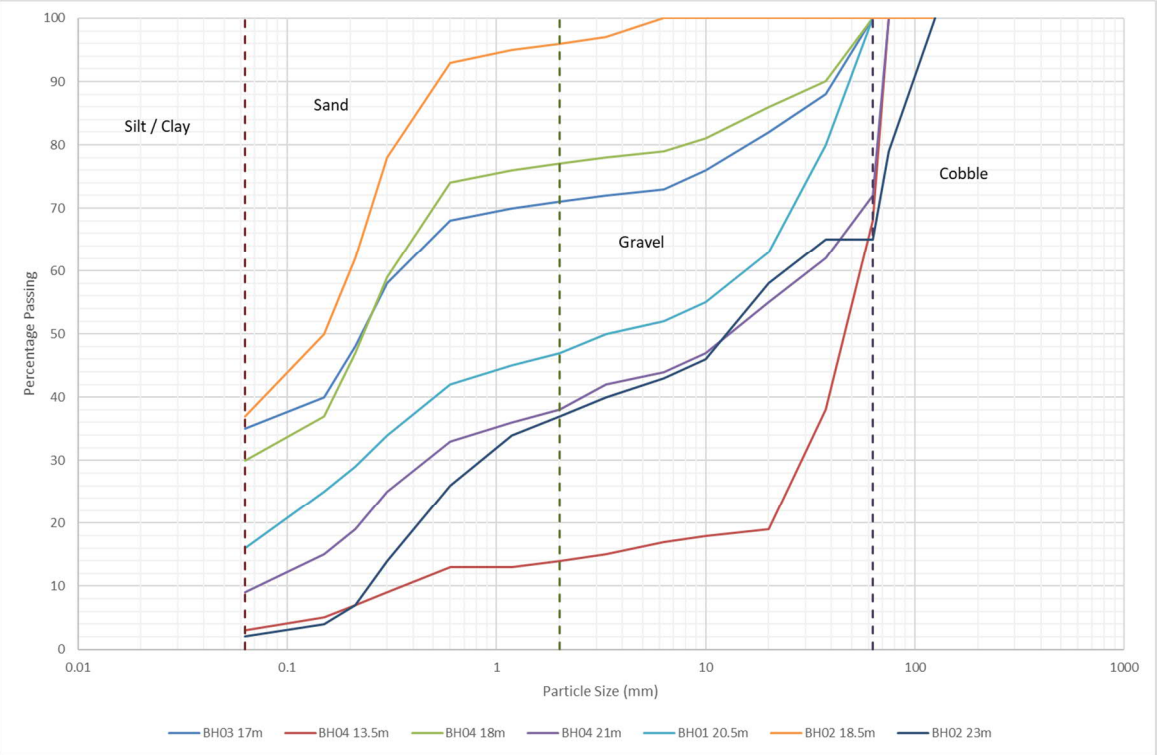
Based on measurement of bulk density and guidance given in BS 8002:2015 (BSI, 2015), a bulk unit weight of 20.5kN/m^3 is considered appropriate.

GRANULAR GLACIAL TILL

PARTICLE SIZE DISTRIBUTION

Results of the particle size distribution tests are shown on **Figure 7-3**. The particle size distribution tests indicate a variable fines fraction and the unit varied between a very clayey Sand/Gravel and a slightly clayey sand/gravel with high cobble content.

Figure 7-3 - Particle Size Distribution - Granular Glacial Till

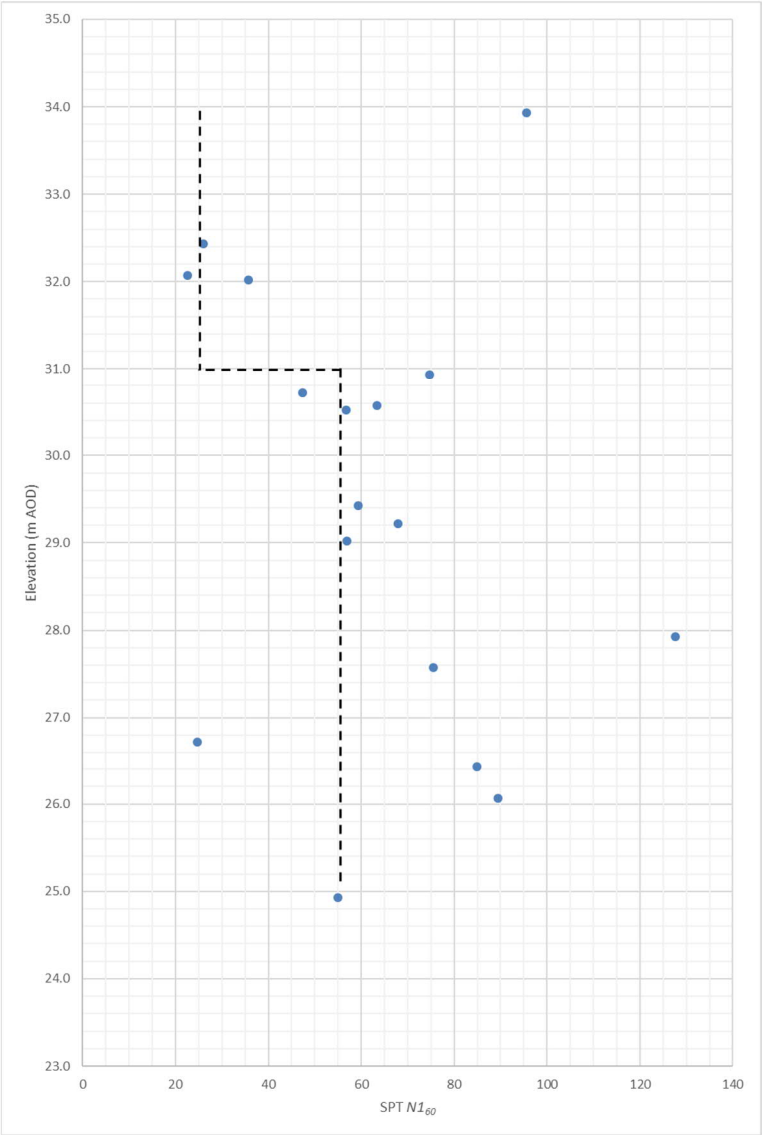


SHEAR STRENGTH

A correlation between peak effective angle of internal friction, φ'_{pk} and SPT $N1_{60}$ (corrected for hammer efficiency and effective stress) has been shown by Stroud (1989). **Figure 7-4** presents a plot of SPT $N1_{60}$ versus elevation for the Granular Glacial Till.

Based on **Figure 7-4** a representative SPT $N1_{60}$ of 25 is considered appropriate for the Granular Glacial Till above 31m AOD, increasing to 55 below 31m AOD, corresponding to peak effective angles of internal friction of 35° and 41° respectively.

Figure 7-4 - SPT $N1_{60}$ vs Elevation - Granular Glacial Till



STIFFNESS

The drained Young's Modulus, *E'* has been determined from the following relationship:

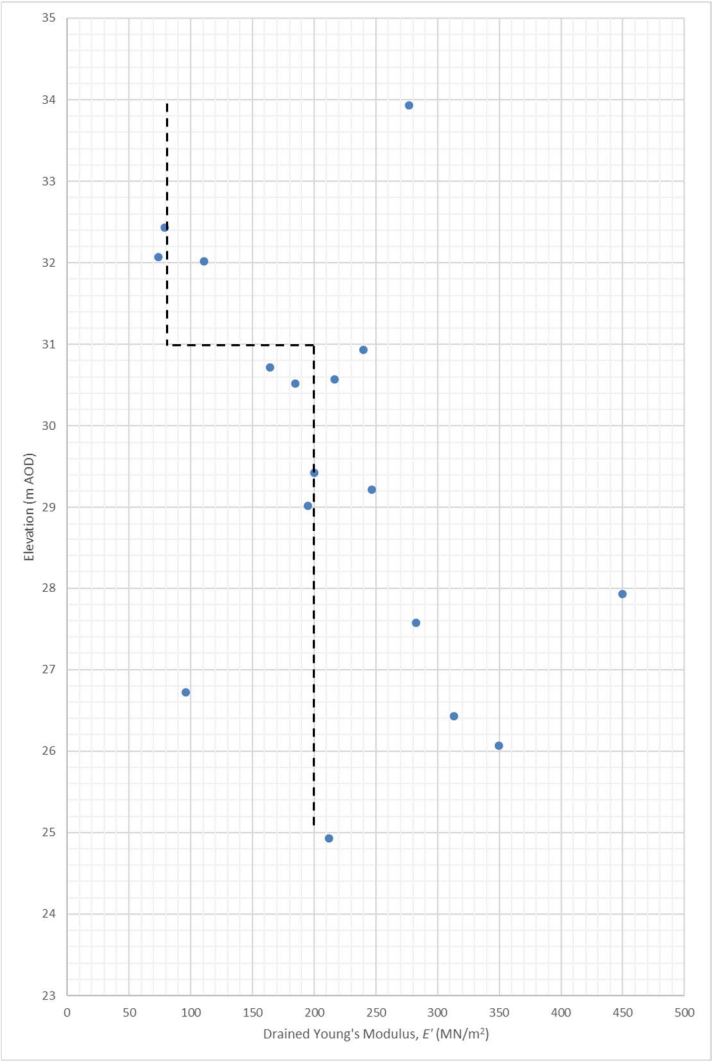
$E'(MN/m^2) = 2N_{60}$ (Clayton, 1995)

Values determined using this method are presented on **Figure 7-5** and, based on this, the following profile of drained Young's Modulus is considered appropriate:

E' = 80MN/m^2 above 31m AOD

E' = 200MN/m^2 below 31m AOD

Figure 7-5 - Drained Young's Modulus vs Elevation - Granular Glacial Till



UNIT WEIGHT

The SPT N_{60} results indicate that the Granular Glacial Till is a dense to very dense sandy gravel (BS 5930, (BSI, 2015)) corresponding to a unit weight of 20kN/m^3 for a dense to very dense gravel above the water table in accordance with BS 8002:2015 (BSI, 2015).

7.4 CHESTER FORMATION SANDSTONE

Chester Formation Sandstone was recorded underlying the Glacial Till at elevations between 23.93m and 25.52m AOD, indicating the bedrock level is relatively uniform.

The sandstone is recorded as comprising an upper weathered zone, grading with depth into intact rock. Within this report the weathered zone has been taken as the depth over which the sandstone is recorded as having been recovered as fine to coarse sand. In the boreholes this zone is recorded to be between 0.03m and 1m thick.

The intact rock is generally recorded as very weak to weak fine to medium grained sandstone with rare well-rounded gravel sized clasts of quartz and mudstone. Rare thin to thick mudstone laminae are also recorded.

The main discontinuity set, likely representing bedding, is recorded as subhorizontal, undulating, and varies between very close and medium spacing. A second discontinuity set is recorded dipping between 35° and 45°, planar, clean and is generally widely and irregularly spaced.

In-situ and laboratory geotechnical testing is summarised in **Table 7-3**.

Table 7-3 – Summary of In-Situ & Laboratory Testing – Chester Formation Sandstone

Parameter	No. of Tests	Min – Max	Mean
SPT N_{60}	6	463 – 900*	623
SPT $N1_{60}$	6	223 – 442	306
Axial Point Load Index, I_{S50} (MN/m^2)	12	0.09 – 0.32	0.19
Unconfined Compressive Strength (MN/m^2)	8	6.4 – 8.6	7.3
Bulk Density (Mg/m^3)	8	2.09 – 2.27	2.19

* extrapolated values

WEATHERED CHESTER FORMATION SANDSTONE

Based on the borehole records, the highly weathered zone has been interpreted as being typically 1m thick.

SHEAR STRENGTH

The weathered sandstone has been taken as that stratum that is recovered as being recovered as sand and, as such, is considered as a granular soil. In-situ testing indicates a very dense sand and, based on the SPT $N1_{60}$ results, a characteristic φ'_{pk} of 42° is considered appropriate (Stroud, 1989).

STIFFNESS

Based on WSP's experience and engineering judgement, a drained Young's Modulus of 250MN/m^2 is considered appropriate for the Weathered Chester Formation Sandstone.

UNIT WEIGHT

The SPT N_{60} results indicate that the Weathered Chester Formation Sandstone is equivalent to a very dense sand (BS 5930, (BSI, 2015)), corresponding to a unit weight of 19kN/m^3 for a very dense sand above the groundwater table, in accordance with BS 8002:2015 (BSI, 2015).

INTACT CHESTER FORMATION SANDSTONE

UNIT WEIGHT

The unit weight has been calculated from the mean bulk density testing and a characteristic unit weight of 21.5kN/m^3 is considered appropriate.

UNCONFINED COMPRESSIVE STRENGTH

Figure 7-6 presents a plot of unconfined compressive strength versus depth below rockhead (m brh) based on point load testing and direct laboratory UCS testing of samples of the Intact Chester Formation Sandstone.

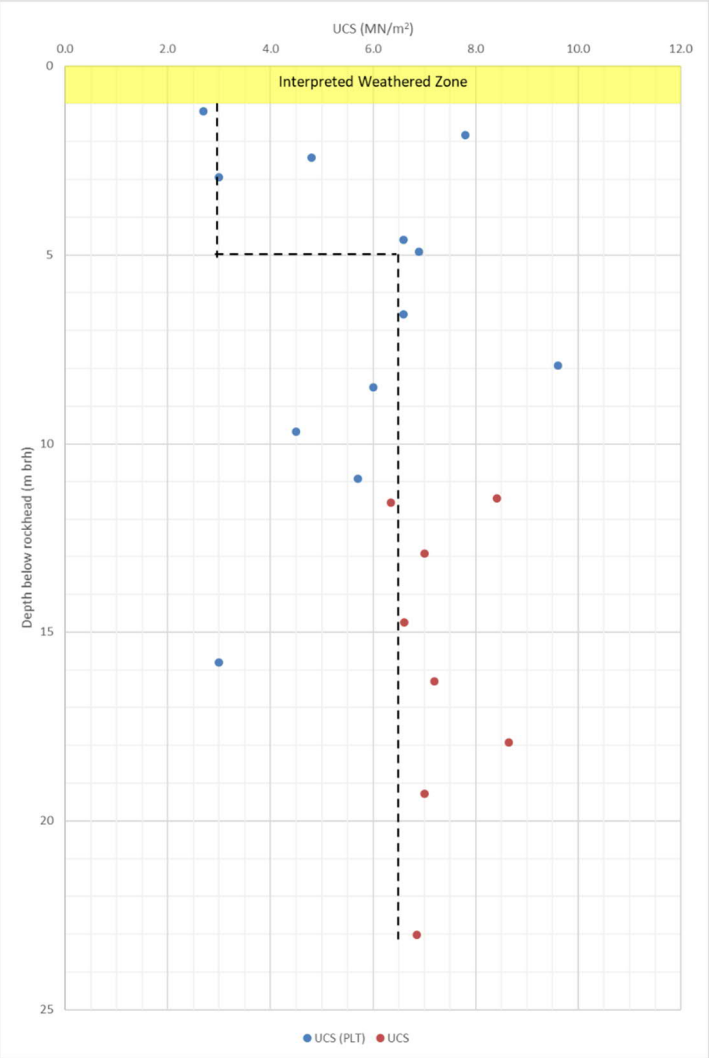
The point load index (I_{S50}) is converted to an equivalent UCS through the application of a correction factor, *K*. This correction factor is derived by correlating I_{S50} results with direct UCS tests at equivalent depths and a *K* factor of 30 has been adopted for the site.

Based on **Figure 7-6**, the following profile of UCS is considered appropriate for the intact Chester Formation Sandstone:

UCS = 3MN/m^2 between 1m and 5m brh

UCS = 6.5MN/m^2 below 5m brh

Figure 7-6 - Unconfined Compressive Strength vs Dpeth below Rockhead – Chester Formation Sandstone



STIFFNESS

The mass modulus of the Intact Chester Formation Sandstone has been derived from the following relationship derived by Whitworth and Turner (1989) and presented in CIRIA 181 (Gannon et al, 1990):

$E_m(MN/m^2) = 275 \cdot \sqrt{UCS}$

Based on the characteristic UCS given in the previous section, the relationship suggests the following profile of Young's Modulus:

E' = 470MN/m^2 between 1m and 5m brh

E' = 700MN/m^2 below 5m brh

7.5 SUMMARY OF CHARACTERISTIC PARAMETERS

Table 7-4 – Summary of Characteristic Parameters

Parameter	Characteristic Value	Justification
Granular Made Ground		
Moist Bulk Unit Weight, γ_b (kN/m^3)	17	Low strength silt – BS 8002) BSI, 2015)
Cohesive Made Ground		
Moist Bulk Unit Weight, γ_b (kN/m^3)	17	Medium dense gravel – BS 8002 (BSI, 2015)
Cohesive Glacial Till		
Moist Bulk Unit Weight, γ_b (kN/m^3)	21.5	High to very high strength clay – BS 8002 (BSI, 2015)
Undrained Shear Strength, c_u (kN/m^2)	50kN/m^2 at 47m AOD, increasing linearly to 200kN/m^2 at 32m AOD For the Lower Cohesive Glacial Till recorded in BH01 and BH02, an undrained shear strength of 450kN/m^2 is considered appropriate.	Figure 7-1
Stiffness, E' (MN/m^2)	E' = 10MN/m^2 at 47m AOD increasing linearly to 35MN/m^2 at 32m AOD For the Lower Cohesive Glacial Till recorded in BH01 and BH02, an undrained shear strength of 80MN/m^2 is considered appropriate.	SPT N_{60} testing (Clayton, 1995)
Granular Glacial Till		
Moist Bulk Unit Weight, γ_b (kN/m^3)	20kN/m^3	Dense to very dense gravel – BS 8002 (BSI, 2015)
Peak angle of shearing resistance, φ'_{peak} (°)	35° above 31m AOD 41° below 31m AOD	SPT $N1_{60}$ testing (Stroud, 1989)
Stiffness, E' (MN/m^2)	E' = 80MN/m^2 above 31m AOD E' = 200MN/m^2 below 31m AOD	SPT N_{60} testing (Clayton, 1995)
Weathered Chester Formation Sandstone		
Moist Bulk Unit Weight, γ_b (kN/m^3)	19	Very dense sand – BS 8002 (BSI, 2015)
Peak angle of shearing resistance, φ'_{peak} (°)	42	SPT $N1_{60}$ testing (Stroud, 1989)
Stiffness, E' (MN/m^2)	250	Engineering judgement

Parameter	Characteristic Value	Justification
Intact Chester Formation Sandstone		
Moist Bulk Unit Weight, γ_b (kN/m^3)	21.5	Mean of laboratory testing
UCS, σ_c (MN/m^2)	3MN/m^2 between 1m and 5m brh 6.5MN/m^2 below 5m brh	Figure 7-6
Stiffness, E' (MN/m^2)	470MN/m^2 between 1m and 5m brh 700MN/m^2 below 5m brh	$E' = 275\sqrt{UCS}$ (Whitworth & Taylor, 1989)

8 GEOTECHNICAL & ENGINEERING ASSESSMENT

8.1 DEVELOPMENT PROPOSALS

It is understood that the proposed development comprises two towers of 33 storeys and 19 storeys linked by a lower level structure formed in a 'C' shape.

A semi-basement is proposed that links the two towers, roughly orientated with an existing split level / retaining wall. The semi-basement will house car and bike parking and plant.

Paved and landscaped external areas will be provided along the southwest and southeast boundaries.

Development proposals are presented in **Appendix B**.

8.2 GEOTECHNICAL CATEGORY

It is considered that the structures fall within Geotechnical Category 2 as defined in BS EN 1997-1:2004+A1:2013 (BSI, 2014). These are structures and foundations with no exceptional risk, difficult ground, or loading conditions.

8.3 STRUCTURAL FOUNDATIONS

Given the form of the development, the likely structural loads, and the underlying ground conditions, it is not considered feasible to support the structures on pad or raft foundations. As a result, the use of piled foundations is considered appropriate. The use of either continuous flight auger (CFA) or rotary bored piles considered to be the most suitable piling techniques.

8.4 PILE ASSESSMENT

AXIAL CAPACITY

Based on the preliminary characteristic parameters presented in **Section 6**, an initial assessment of the pile capacity has been made. This be reviewed when laboratory test data is available. The ground model for the assessment is presented in **Table 8-1,** with strata depths based on the elevated portion of the site.

Table 8-2 provides a summary of pile lengths and resistances. Pile lengths in brackets indicate the approximate pile length from the lower site level. Pile lengths may also vary depending on the extent of the fill to the historic basin. Lengths should be refined when the extents of the basin and pile layout are confirmed.

Table 8-1 – Pile Design Ground Model Input Parameters

Strata	Depth to Base (m BGL)	Design Parameters	Comments
Made Ground	3	γ_b = 17kN/m^3	No negative or positive contribution to skin friction
Upper Cohesive Glacial Till	19	γ_b = 21.5kN/m^3 c_u = 50kN/m^2 at 3m BGL increasing to 200kN/m^2 at 19m BGL α = 0.6	Characteristic skin friction limited to 70kN/m^2

Strata	Depth to Base (m BGL)	Design Parameters	Comments
Upper Granular Glacial Till	22	γ_b = 21kN/m^3 φ'_{pk} = 35°	Characteristic skin friction limited to 100kN/m^2
Lower Cohesive Glacial Till	23	γ_b = 21.5kN/m^3 c_u = 450kN/m^2 α = 0.3	Characteristic skin friction limited to 70kN/m^2
Lower Granular Glacial Till	24	γ_b = 21kN/m^3 φ'_{peak} = 41°	Characteristic skin friction limited to 100kN/m^2
Weathered Chester Formation Sandstone	25	γ_b = 19kN/m^3 φ'_{peak} = 42°	Characteristic skin friction limited to 100kN/m^2

Axial resistances have been derived in accordance with Design Approach 1 as presented in the National Annex to BS EN 1997-1:2004 (BSI, 2004). This assessment has been carried out for single 0.6m and 0.75m diameter CFA piles terminating within the Glacial Till. Compressive resistances ($R_{c;d}$) are summarised in **Table 8-2**. To control settlements, the pile lengths have been checked with a factor of 1.2 on shaft resistance.

For the purposes of this assessment, it has been assumed that the serviceability limit state will be verified by load tests (preliminary and/or working) carried out on more than 1% of constructed piles to loads not less than 1.5 times the representative load for which they are designed.

Table 8-2 – Summary of Pile Resistances

Pile Diameter (mm)	Pile Length* (m)	$R_{c;d}$ (kN) - ULS			Nominal Shaft Resistance (kN)	SLS - Shaft Resistance (FoS 1.2) (kN)	Structural Capacity † (kN)
		Nominal	C1	C2			
600	15 (12)	1730	1235	845	1315	1095	5260
	20 (17)	10850	7750	4740	2030	1690	
	25 (23)	31190	22280	13370	2920	2440	
750	15 (12)	2290	1635	1110	1640	1365	8210
	20 (17)	16320	11660	7085	2540	2115	
	25 (23)	47825	34160	20420	3650	3040	

* Assumes pile installation level equal to level at borehole

† assumes C40 concrete

() brackets indicate pile lengths and capacities for ground model based on BH04

DESIGN RESPONSIBILITY

The pile resistances presented in **Table 8-2** are provided for guidance only. Pile design should be undertaken by, and remain the sole responsibility of, a specialist piling contractor who will determine the most appropriate and cost-effective pile type for the site based on their own interpretation of the site investigation data, their own installation techniques, and experience of piling in similar ground conditions.

WORKING PLATFORM

For all piling operations on the site, the design, construction, and maintenance of a working platform in accordance with guidance presented in BRE 470 "*Working platforms for tracked plant*" (2004) will be required.

PILE TESTING

It is considered appropriate that pile testing is undertaken for all structures. It is considered that as a minimum this should comprise one sacrificial test pile per structure and serviceability testing on more than 1% of constructed piles to loads not less than 1.5 times the representative load for which they are designed. Integrity testing should be undertaken on all piles.

A piling specification should be completed prior to piling works commencing.

OBSTRUCTIONS

Whilst not encountered during the ground investigation, the risk of obstructions associated with the historical canal is considered to be high and the risk of relict construction within the Made Ground across the remainder of the site is also considered to be high. Obstructions may significantly hinder the installation of bearing piles and groundworks in general.

A detailed strategy will be required for managing obstructions within the Made Ground to minimise potential delays on site and associated abnormal costs. Such a strategy may comprise proof digging or probing in advance of pile installation. This should limit the risk of piles encountering obstructions. The time taken to remove obstructions and reinstate unstable ground will need to be carefully considered.

Whilst not encountered, and generally not a significant risk in Manchester, the risk of boulders within the Glacial Till will also need to be considered by the specialist piling contractor.

8.5 FLOOR SLABS

It is considered that with appropriate re-engineering of the Made Ground, ground bearing floors could be utilised on the upper part of the site i.e. outside the semi basement/former canal basin. Alternatively, suspended ground floor construction could be used.

Within the semi basement, the car park and cycle store lie over the former canal basin, and it is assumed that a conventional flexible surface will be used (See **Section 8.7** for further design guidance). As discussed below, some additional investigation is recommended to investigate the depth and competency of the deeper Made Ground associated with the canal basin. For the plant room, a conventional ground slab will be required and, subject to confirmation of loadings, and appropriate re-engineering of the Made Ground, a ground bearing slab may prove feasible.

8.6 RETAINING WALL

The proposed development includes a semi-basement situated approximately in line with the existing retaining wall / split level and new reinforced concrete retaining walls will be required to achieve the design. The proposed slab level is unknown but is assumed that levels will either need to be raised on the upper part of the site or lowered under the semi-basement to achieve the required heights.

The nature of the wall will be dictated by the underlying ground conditions and the retained height required. Outwith the former canal basin, where Made Ground depths are relatively shallow, it may be feasible to found the wall within the underlying Glacial Till. If adopted, then prior to casting, the footings for the wall, the formation should be proof rolled and inspected by an appropriately qualified geotechnical engineer. Any soft spots identified should be excavated and replaced with well-compacted granular fill.

The Made Ground is not considered a suitable bearing stratum and where the Made Ground is deeper, for example in the vicinity of WS01 and WS03 (former canal arm), the retaining wall will likely need to be supported on piled foundations or formed by contiguous piled walling.

Some additional investigation would be recommended to refine the retaining wall strategy (see below).

Careful consideration will need to be given to backfilling behind the walls as the nature of the backfill used will have an effect on the wall design, with the use of selected granular fill likely leading to a more economic design.

The wall design should be undertaken in accordance with the requirements of BS EN 1997-1:2004+A1:2013 (BSI, 2014).

8.7 EXTERNAL PAVED AREAS

A new access point will be constructed on Port Street, giving access to the semi-basement parking.

Made Ground will likely form the subgrade and, based on the predominantly granular nature of these soils, a California Bearing Ratio (CBR) in the region of 5% may be achievable with appropriate preparation.

The access road will cross the former canal basin and some additional consideration will need to be greater depths of Made Ground identified. If still in place, the canal walls will need to be removed and the area appropriately benched. Outside the canal basin, any sub structure remains should be “grubbed out” to a minimum depth of 500mm below the underside of the formation to prevent hard spots from forming and again, appropriately benched. Any resulting voids or low areas from these works should be backfilled with well compacted granular fill.

The completed subgrade should be proof rolled with a heavy roller, inspected by an engineer and any additional soft spots or unsuitable soils identified removed and replaced with well compacted granular fill.

8.8 GENERAL BELOW GROUND EXCAVATIONS

The stability of Made Ground or granular soils should not be relied upon in unsupported excavations. Safe working conditions should be ensured at all times where persons are required to

work in any excavations. This can be achieved by the use of ground support or battering back to a safe angle.

Based on groundwater observations recorded during the ground investigation and groundwater monitoring, excavations are unlikely to encounter the main groundwater table, however excavations are likely to encounter inflows of perched groundwater from within the Made Ground and historic features such as the former canal basin. Such inflows may be locally heavy and persistent, particularly during periods of inclement weather. The advice of a specialist dewatering contractor should be sought at the earliest opportunity and a licence will be required for the disposal of groundwater.

A licence will be required for the disposal of groundwater.

Further reference should be made to CIRIA Report 97 "*Trenching practice*" (Irvine & Smith, 2001) and Report C515 "*Groundwater control – design and practice*" (Preene et al, 2000).

8.9 CHEMICAL ATTACK ON BURIED CONCRETE

Twenty-two samples of Granular Made Ground, Cohesive Made Ground, Cohesive Glacial Till, and Granular Glacial Till have been tested for water soluble sulphate concentration and pH. The assessment of Design Sulphate Class and Aggressive Chemical Environment for Concrete (ACEC) has been undertaken in accordance with guidance presented in BRE SD1 "*Concrete in aggressive ground*" (BRE, 2005).

The mean of the highest 20% of sulphate concentrations has been taken as the characteristic value for the soil samples. Based on this, a Design Sulphate Class of DS-2 and ACEC of AC-2 are considered appropriate for below ground concrete.

Groundwater chemical testing will be undertaken on samples taken during the monitoring programme and this section will be updated upon completion of the testing.

8.10 ADDITIONAL GROUND INVESTIGATION WORKS

Additional ground investigations are considered prudent to assess the deeper Made Ground and any relict substructures associated with the former canal basin and define areas, where the semi-basement walls could be designed as ground bearing (subject to confirmation of height).

It is considered that these works should comprise a series of machine excavated trial pits and a single cable percussive borehole.

8.11 GEOTECHNICAL RISK REGISTER

A preliminary Geotechnical Risk Register for the scheme is presented in **Table 8-3.**

Table 8-3 – Preliminary Geotechnical Risk Register

Hazard	Cause	Consequence	Perceived Level of Risk Without Control	Control Adopted	Risk Ownership
Unforeseen ground conditions	Ground conditions differ from those assumed within the design	Delays on site Possible re-design of foundations, retaining structures etc. Financial implications	High	Desk based study and intrusive investigation undertaken to inform the ground model and facilitate design. Note: ground investigation only samples a limited amount of the ground and conditions may exist between exploratory holes that are not identified by the ground investigation and cannot be anticipated from interpretation of the available data. As such, the risk of unforeseen ground conditions cannot be entirely mitigated	Client
Poor performance of external areas and retaining walls	Poor ground conditions in the central area of the site	Delays on site Financial implications Remedial works required	Moderate	Area of deeper Made Ground identified by boreholes WS01 and WS03 Trial pitting and an additional borehole is considered appropriate to prove the depth of the Made Ground and delineate the extent of the former canal basin	Designer
Excessive pile settlement, possible pile failure	Variations in strata	Additional piles may be required Financial implications Damage to structure	Moderate	Risk to be considered by contractor. Account to be taken of the variation of materials within the Glacial Till Appropriate monitoring of piling operations to confirm arisings and pile termination stratum	Piling Contractor
Excessive pile settlement, possible pile failure	Depth of weak/soft deposits related to former canal basin are deeper or more laterally extensive than anticipated	Additional piles may be required Financial implications Damage to structure	Moderate	Supplementary investigative works undertaken to delineate the basin extents. Risk to be considered by contractor. Appropriate monitoring of piling operations to confirm arisings and pile termination stratum	Client/ Contractor

Hazard	Cause	Consequence	Perceived Level of Risk Without Control	Control Adopted	Risk Ownership
Piles fail to reach design level	Use of inappropriate rig/piling method	Additional piles may be required Financial implications Delays on site	Moderate	Piling Contractor to use an appropriate piling method based on a conservative assessment of ground conditions.	Piing Contractor
Piles fail to reach design level	Obstructions in the Made Ground	Piles cannot be installed Delays whilst obstructions are removed Financial implications	High	Principal Contractor and Piling Contractor to assess the risk of obstructions and implement suitable mitigation measures.	Principal Contractor/Piling Contractor
Piles fail to reach design level	Boulders in Glacial Till	Piles cannot be installed Delays whilst obstructions are removed Financial implications	Low	Piling Contractor to assess the risk and implement suitable mitigation measures.	Piling Contractor
Bearing piles fail to provide adequate capacity	Ground conditions worse than anticipated Variations in rockhead Inappropriate assessment of the ground investigation data	Additional piles may be required Financial implications Delays on site Damage to structure	Low / moderate	Phase I desk study and intrusive investigation undertaken to inform ground model and facilitate design. Pile design to be undertaken by a competent contractor based on their own conservative assessment of the ground investigation data. Appropriate monitoring of piling operations. Any indication of changing/differing ground conditions to be reported. Pile testing to be incorporated at an early stage.	Piling Contractor/Client

Hazard	Cause	Consequence	Perceived Level of Risk Without Control	Control Adopted	Risk Ownership
Bearing piles constructed outwith planned locations	Poor setting out	Pile design may need to be revisited Additional piles may be required	Moderate	Appropriate supervision of pile setting out and installation. Use of appropriately experienced contractor. Works to be undertaken to an agreed specification.	Piling Contractor
Poor performance of retaining walls	Inadequate founding strata Unsuitable backfill Poor design	Damage to structure Remedial works required Financial implications	Moderate	Trial pitting and an additional borehole is considered appropriate to prove the depth of the Made Ground and delineate the extent of the former canal basin Walls to be founded on competent natural strata or piled. Formation to be inspected by a suitably qualified and experienced geotechnical engineer. Backfill material to be appropriately specified and placed in accordance with an earthworks specification. Walls to be designed in accordance with current best practice considering all temporary, permanent and accidental loading conditions.	Contractor and Designer
Poor performance of ground bearing slabs and internal paved areas	Poor ground conditions within former canal basin Poor preparation of formation Poor placement of fill, use of inadequate fill materials Inadequate design	Remedial works required Financial implications	Moderate	Trial pitting and an additional borehole is considered appropriate to prove the depth of the Made Ground and delineate the extent of the former canal basin Formation to be adequately prepared and validated. Use of suitable material, placed to an adequate standard Preparation of an earthworks specification for use by the Contractor Pavement design to suit subgrade strength.	Contractor and Designer

Hazard	Cause	Consequence	Perceived Level of Risk Without Control	Control Adopted	Risk Ownership
Poor performance of external paved areas	Poor ground conditions within former canal basin Poor preparation of formation Poor placement of fill, use of inadequate fill materials Inadequate design	Remedial works required Financial implications	Moderate	Trial pitting and an additional borehole is considered appropriate to prove the depth of the Made Ground and delineate the extent of the former canal basin Formation to be adequately prepared and validated. Use of suitable material, placed to an adequate standard Preparation of an earthworks specification for use by the Contractor Pavement design to suit subgrade strength.	Contractor and Designer
Collapse of excavations Damage to adjacent structures and infrastructure	Insufficient ground support, poor design of batters/ground support	Health & Safety implications Financial implications Delays on site	High	Temporary works to be appropriately designed to consider ground stability, groundwater level, loading and proximity and nature of site boundaries. Stability to be ensured by competent design and use of ground support, appropriate safe batters, or underpinning.	Contractor
Difficult excavation	Obstructions in Made Ground	Financial implications Delays on site	High	A detailed strategy for obstruction removal should be implemented to ensure that abnormal costs are appropriately managed.	Contractor
Excessive groundwater ingress into excavations	Groundwater levels higher than currently anticipated. Bodies of perched water	Health & Safety implications Delays to programme	High	Allowance to be made for dewatering during excavations. Dewatering works to be assessed and designed by a competent specialist contactor.	Contractor / Designer
Toppling of piling rig	Failure of working platform	Health and safety implications	High	Platform to be designed and maintained in accordance with current good practice	Piling Contractor & Principal Contractor

Hazard	Cause	Consequence	Perceived Level of Risk Without Control	Control Adopted	Risk Ownership
Damage to services	Inappropriate buried services assessment	Delays Health and safety issues Financial / legal implications	High	Undertake appropriate services search and undertake diversion/disconnection where necessary. Appropriate supervision of pile setting out and installation.	Contractor
Degradation of below ground concrete	Inappropriate concrete assessment	Remedial works required Financial implications	Moderate	Further chemical testing to be undertaken. Undertake sufficient number of sulphate and pH tests. Appropriate assessment of groundwater activity.	Designer
Groundwater contamination	Piles create preferential pathway for contaminants in Made Ground into underlying aquifer Piling method carries contaminants into aquifer	Contamination of aquifer Financial implications Delays	Moderate to low	Ground investigation and laboratory testing undertaken to allow assessment of the contamination status of the ground. Concrete will be cast directly against soil/rock minimising the risk of flow path developing along the sides of the pile. Piles are likely to be installed using CFA methods and, as such, contaminants are likely to be drawn towards the surface during installation. Piling method to be confirmed and agreed with relevant statutory authorities in advance of works.	Designer / Contractor
Groundwater contamination	Contamination of aquifer with materials related to the piling operations	Contamination of aquifer Financial implications Delays	Low	Rock is not considered fissured or permeable enough to allow concrete to bleed into the aquifer. Piling method to be confirmed and agreed with relevant statutory authorities.	Designer / Contractor

Hazard	Cause	Consequence	Perceived Level of Risk Without Control	Control Adopted	Risk Ownership
Exposure to asbestos containing materials and general contamination	Presence of asbestos and contamination within Made Ground	Health and Safety implications	Moderate	Ground investigation and laboratory testing undertaken to allow assessment of the contamination status of the ground. The Principal Contractor to provide the Piling Contractor with all available relevant information regarding ground contamination. The Contractor shall review all available ground investigation data and prepare their own method statements and risk assessments considering the specialist works to be undertaken in accordance with all applicable guidance and legislation, including the Control of Asbestos Regulations 2012.	Principal Contractor, Piling Contractor, & Client

9 GENERIC QUANTITATIVE RISK ASSESSMENT

9.1 INTRODUCTION

This section provides a contaminated land Generic Quantitative Risk Assessment (GQRA) of the plausible contamination source-pathway-receptor linkages identified in the preliminary CSM (Section 4).

9.2 HUMAN HEALTH RISK ASSESSMENT

Legislation and guidance on the assessment of potentially contaminated sites acknowledges the need for a tiered risk-based approach. It incorporates a comparison of site contaminant levels against generic assessment criteria (GAC), including a qualitative assessment of risk using the source-pathway-receptor model. The purpose of this GQRA is to assess potential risks to human health based on the proposed future end users of the site.

To provide a consistent methodology for the assessment of contaminants, a series of soil GAC screening values have been derived by WSP using the Environment Agency's CLEA model. Further details on the risk assessment approach and methodology for the derivation of GAC are provided in Appendix E.

Based on the proposed development of the site for multi storey residential housing the soil chemical data was compared against GAC representative of a residential end use (without plant uptake)

An Soil Organic Matter (SOM) content of 2.9% was recorded in soil samples, therefore a SOM of 3% was used to screen the samples against GACs.

9.3 LABORATORY CHEMICAL ANALYSIS RESULTS

A total of 16 soil samples (14 samples of Made Ground and two samples of natural soil) were taken from eleven exploratory hole locations across the site. Samples were submitted for a range of inorganic and organic compounds based on the potential contaminants of concern identified in the preliminary CSM.

Samples were collected at depths between 0.3 and 3.0 m bgl and targeted different strata. The chemical laboratory certificates are included in Appendix D. The screening of soil analytical results against GAC is included in Appendix F.

9.3.1 HEAVY METALS

Concentrations in exceedance of the respective GACs were recorded for arsenic, lead and cyanide.

- Arsenic concentrations in excess of assessment criteria (35mg/kg) were recorded in three samples of Made Ground, ranging between 50mg/kg and 76mg/kg.
- Lead concentrations in excess of assessment criteria (188mg/kg) were recorded in six samples of Made Ground from across the site, ranging between 220mg/kg and 100mg/kg and one natural soils sample (1000mg/kg); and
- A cyanide concentration in excess of assessment criteria (15mg/kg) was recorded in one sample of Made Ground from WS01 (0.50m bgl).

9.3.2 TOTAL PETROLEUM HYDROCARBONS (TPH)

Hydrocarbon concentrations in excess of laboratory detection limits were recorded in four samples. Hydrocarbons were recorded in BH01 in natural soils at 2.00m bgl (35mg/kg) and in BH02 and WS01, within Made Ground at 0.50m (420 and 480mg/kg TPH respectively, comprising both mid to heavy end aromatics and aliphatics.

The highest reported concentration was recorded in WS08 (15,000mg/kg) mainly comprising mid-heavy end aromatic and aliphatic fractions. No exceedances of adopted assessment criteria were recorded.

Hazard Indices (HI) for petroleum hydrocarbon compounds have been calculated for all analysed samples. This approach is considered appropriate to assess the risk from contaminants of concern to human health where the contaminants may have an additive toxicological effect on internal organs. The estimation of additive effects is achieved by calculating a hazard quotient (HQ) for each TPH fraction by dividing the recorded concentration by the respective GAC and then summing the HQs to give the HI. For a residential end use a threshold HI of 1 has been assumed. Where the HI is greater than 1, further assessment of the risk is recommended. A HI of 6.6 was calculated for TPH concentrations in WS08 (0.6m bgl). The exceedance in WS08 is driven by elevated concentrations of aliphatic compounds.

9.3.3 POLYCYCLIC AROMATIC HYDROCARBONS (PAH)S

Total PAH concentrations range from 1.9mg/kg (WS01 at 2.00m bgl) to 240mg/kg (WS01 at 0.50m bgl).

Two exceedances of adopted assessment criteria for benzo(a)pyrene (1.7mg/kg) were recorded (BH02 at 0.5m bgl; 7.9 mg/kg and WS01 at 0.5m bgl; 9.5 mg/kg).

9.3.4 PHENOLS

No exceedances of adopted assessment criteria were recorded.

9.3.5 ASBESTOS

Two samples of Made Ground were reported by the laboratory to include asbestos fibre bundles:

- WS01 0.50m – Chrysotile (white) asbestos fibre bundles
- WS08 0.60m - Amosite (brown) and chrysotile fibre bundles.

Asbestos quantification testing was undertaken on both asbestos positive samples. Asbestos contents of 0.001% (WS01) and 0.02% (WS08) were recorded. WSP note, although not identified in other samples from the site, asbestos fibres may be encountered in Made Ground in un-investigated locations at the site.

9.3.6 HUMAN HEALTH RISK ASSESSMENT SUMMARY

Elevated concentrations of arsenic, lead, cyanide and benzo(a)pyrene in exceedance of their respective GACs were recorded (in both Made Ground and natural soils) from across the site and over a range of depths including at shallow depth below ground level. Asbestos was also identified in two samples.

9.3.7 WASTE CLASSIFICATION

WSP screened the results from the 16 soil samples using the online hazardous waste classification software 'Haz Waste Online'. Haz waste online' classification determined that all soil samples were classed as 'Non-hazardous' waste, with the exception of two samples (WS01 at 0.5m bgl and WS08 at 0.6m bgl) which were classified as Hazardous based on zinc (WS01) and TPH (WS08).

A summary of the Haz Waste online screening results is shown in Table 9-1.

Table 9-1 – WSP 2021 Waste Classification Screening (Haz Waste Online)

Sample Location	Depth (m)	WM3 Waste Classification
BH02	0.50	Non-Hazardous
BH02	3.00	Non-Hazardous
BH01	1.00	Non-Hazardous
BH01	2.00	Non-Hazardous
BH04	0.60	Non-Hazardous
BH03	0.30	Non-Hazardous
WS01	0.30	Non-Hazardous
WS01	0.50	Hazardous
WS01	2.00	Non-Hazardous
WS03	0.60	Non-Hazardous
WS03	2.00	Non-Hazardous
WS04	0.30	Non-Hazardous
WS07	2.00	Non-Hazardous
WS08	0.60	Hazardous
WS02A	1.00	Non-Hazardous
WS06	1.00	Non-Hazardous

Any waste containing asbestos cannot be classified as inert waste. The recorded asbestos contents within the two asbestos positive Made Ground samples are below the hazardous waste limit of 0.1%. Waste with an asbestos content below the hazardous waste limit may be classified as non-hazardous.

Further assessment of waste class will be required once plans for material disposal have been finalised and additional testing may be required including Waste Acceptance Criteria (WAC) analysis.

9.4 CONTROLLED WATERS RISK ASSESSMENT

A Generic Controlled Waters Assessment has been undertaken by comparing directly measured chemical concentrations in groundwater samples with published Water Quality Standards (WQS) which are protective of surface water or groundwater resources. This provides an initial conservative assessment of potential risks from contamination to groundwater and surface waters and assumes there is a viable migration pathway.

The site overlies a bedrock Principal Aquifer (Chester Formation Sandstone) and is within close proximity to Rochdale Canal, both considered to be viable controlled waters receptors in this assessment. Therefore, WQS relevant to both drinking water and surface water receptors have been used in this assessment to provide an initial assessment of risks to controlled waters from chemical concentrations in groundwater.

9.4.1 WATER QUALITY STANDARDS

Appropriate published WQS are selected for use in this assessment based on both a hierarchy of relevance to England and Wales and the nature of the controlled waters receptor. In this case, the assessment has been completed using WQS protective of groundwater (Principal Aquifer) and surface waters (Rochdale Canal).

Surface Waters

- Environmental Quality Standards (EQS) from The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.
- Where an Environmental Quality Standard (EQS) is not available then an alternative standard has been used where appropriate. With respect to petroleum hydrocarbons, WSP refers to the CL:AIRE 2017 guidance to derive alternative assessment criteria.

Groundwater

- UK Drinking Water Quality Standards (DWS) from the Water Supply (Water Quality) Regulation 2000 (amended 2004).
- World Health Organisation Petroleum Products in Drinking Water (2008);
- World Health Organisation Guidelines for Drinking Water Quality, Fourth Edition, Volume 1, (2017).

Groundwater samples were obtained from BH03 and BH04. The recorded concentrations of determinants were screened against the adopted GAC; the screening results are included in Appendix F.

9.4.2 CONTROLLED WATERS ASSESSMENT – GROUNDWATER

In the groundwater sample from BH03 selenium was recorded at a concentration of 20µg/l, exceeding the adopted groundwater GAC of 10µg/l.

None of the other screened determinants exceeded the respective GAC.

9.4.3 CONTROLLED WATERS ASSESSMENT – SURFACE WATERS

The following determinants were recorded in exceedance of the respective surface water GACs:

- BH03: Chromium at a concentration of 7.4µg/l, exceeding the GAC of 4.7µg/l (based on an assumed water hardness of 100-200 mg$CaCO_3$/l in the receiving water body);
- BH03: Copper at a concentration of 2.6µg/l, exceeding the GAC of 1.0µg/l;
- BH04: Fluoranthene at a concentration of 0.02µg/l, exceeding the GAC of 0.0063µg/l.

Note that the limits of detection (LOD) for the following determinants exceeded the respective surface water GAC and screening of concentrations recorded as <LOD could not be undertaken:

- Cyanide (total);
- Aromatic C16-C21 petroleum hydrocarbons;

- Aromatic C21-C35 petroleum hydrocarbons;
- Fluoranthene;
- Benzo(a)pyrene;
- Phenol (monohydric).

9.4.4 CONTROLLED WATERS ASSESSMENT SUMMARY

Marginally elevated concentrations of heavy metals, hydrocarbons and PAH have been recorded in groundwater from the two sampled monitoring wells on the site. Given the closest sensitive surface water course (Rochdale Canal) is likely lined with a relatively impermeable barrier (clay lined or similar) and the presence of low-permeability superficial strata beneath the site, migration of contaminants of concern towards the controlled waters receptors including the underlying Principal aquifer is likely limited. Given the historic industrial land uses in the wider area contaminants present within soil and groundwater on the site are unlikely to significantly affect the water quality of the receptors. In addition, the proposed development is anticipated to further limit infiltration of surface water into and percolation through soils on the site through increased areas of non-permeable groundcover. The risks to controlled waters is therefore considered to be low.

9.5 GROUND GAS RISK ASSESSMENT

An assessment of risks from hazardous ground gases was undertaken in accordance with CIRIA C665 guidance.

9.5.1 GROUND GAS CONCEPTUAL SITE MODEL

Potential sources of hazardous ground gases comprise soils with a high organic content and Made Ground deposits on or within close proximity to the site.

The principal migration pathways for ground gases are considered to be granular Made Ground and granular superficial deposits and accumulation in enclosed spaces.

Receptors at risk from hazardous ground gases or soil vapours include:

- Future site users;
- Construction and maintenance workers (confined spaces and trenches); and,
- Confined spaces within future buildings and infrastructure (potentially explosive atmospheres).

9.5.2 GAS MONITORING RESULTS

Ground gas monitoring was undertaken within the five monitoring wells installed on the site. Monitoring wells BH01, BH03 and BH04 were monitored on six occasions between May and August 2021. BH02 was monitored on three occasions between May and June 2021 only, due to inaccessibility caused by damage to the well headworks on two occasions and due to flooding on one occasion. WS01 was monitored on two occasions in June 2021 only, due to flooding during the remaining site visits.

Publicly accessible historical weather records[1] for the Manchester area indicate that a falling atmospheric pressure trend preceded gas monitoring rounds 2, 3, 5 and 6.Atmospheric pressures recorded on site during each monitoring round ranged between 1003 (round 4) and 1015 (round 5).

A maximum steady-state flow rate of 4.9l/hr was recorded in WS01; however, the response zone of the well was recorded as flooded. Steady-state flow rates in the remaining monitoring wells did not exceed 0.2l/hr (recorded in BH01). A maximum steady-state methane concentration of 13.3% vol was recorded in WS01; however, the response zone was recorded as flooded. Steady-state methane concentrations above the limit of detection were recorded in BH01 (0.1% vol) and BH04 (0.2% vol). Methane was not recorded in BH02 and BH03. A maximum steady-state carbon dioxide concentration of 6.0% vol was recorded in BH02; however, no groundwater level recorded or information on the flooding status of the well is available for this monitoring round. Steady-state carbon dioxide concentrations in the remaining monitoring wells ranged between 4.8% vol (BH04) and 1.1% vol (BH01). Depleted oxygen concentrations between 0.7% vol and 13.4% vol were recorded in BH02 to BH04.

9.5.3 GROUND GAS DATA QUALITY

The response zone in monitoring well WS01 was noted to be fully flooded during both undertaken monitoring rounds. It is noted that monitoring of groundwater levels was not possible during the three monitoring rounds undertaken of BH02 due to damaged headworks. Therefore, the flooding status of the response zone in this borehole could not be assessed. Flow rates and gas concentrations recorded in these monitoring wells are not considered to be representative of actual ground gas conditions and have therefore not been used to calculate a gas screening value for the site.

9.5.4 GROUND GAS RISK ASSESSMENT

An assessment of risk from hazardous ground gases has been undertaken by deriving a gas screening value (GSV) for the site. GSVs have been based on maximum recorded hazardous gas flow rates. In accordance with BS8485:2015+A1:2019 and CIRIA C665 hazardous gas flow rates from boreholes have been calculated by multiplying recorded maximum borehole flow rates with maximum gas concentrations (methane and carbon dioxide). Flow rates and gas concentrations recorded in flooded monitoring wells (WS01) and wells for which no groundwater levels were recorded during monitoring (BH02) have been excluded from the assessment.

A GSV of 0.0004l/hr was derived for methane, based on a steady-state methane concentration of 0.2% vol (BH04) and a steady-state flow rate of 0.2l/hr (BH04). A GSV of 0.0096l/hr was derived for carbon dioxide, based on a steady-state carbon dioxide concentration of 4.8% vol (BH04) and a steady-state flow rate of 0.2l/hr (BH04). Both GSVs are below the threshold of 0.07l/hr for a

[1] WeatherOnline Historical Weather Data, accessed via https://www.weatheronline.co.uk/weather/maps/city?LANG=en&WMO=03334&ART=LDR&CONT=ukuk&R=0&LEVEL=150&REGION=0003&LAND=NOR&NOREGION=0&MOD=&TMX=&TMN=&SON=&PRE=&MONAT=&OFFS=&SORT=.

Characteristic Situation (CS) classification of CS2 for which ground gas protection measures would be required.

Although the gas monitoring data from up to two monitoring wells has potentially been impacted by flooded response zones, given the size of the site, the number of unflooded monitoring wells and the encountered strata on the site, the available gas monitoring data is considered sufficient to inform the hazardous ground gas risk assessment. The atmospheric conditions during which the ground gas data has been obtained are considered to sufficiently represent potential worst-case conditions during which an increased release of hazardous ground gases would occur.

A ground gas classification as CS1 is therefore considered appropriate for the site.

9.5.5 RADON GAS

The UK Radon Atlas (Health Protection Agency 2007)[2] indicates the site to lie within a lower probability radon area where less than 1% of properties are estimated to be at or above the radon action level. Radon protection measures are therefore not considered to be required for the proposed development.

9.6 WATER SUPPLY PIPE MATERIALS ASSESSMENT

Whilst there are is no fixed water supply pipe route for the site at present, a water supply pipe materials assessment has been included.

UKWIR Guidance states that there should be no departure from its provisions “except where formally approved by the Water Company, such departure being technically justifiable or representing advances in knowledge or product development.”

A summary of test results for made ground versus the threshold limits published by UKWIR is provided in Table 9-2 to Table 9-5 below. No assumptions have been made regarding the depth that pipes may be laid below ground level due to the topography of the site.

[2] Health Protection Agency, UK Radon Atlas, accessed via https://www.ukradon.org/information/ukmaps.

Table 9-2 – UKWIR Screening Detected Organic Contaminants and Maximum Detections

Laboratory & Date of Samples: **DETs** **10/05/2021 - 11/05/2021 – Cable Percussion Boreholes (with rotary follow on)** **04/05/2021 – 07/05/2021 – Window Sample Boreholes** **Depth Range of Samples: 0.30m – 3.0m**		**Maximum Concentrations Detected**			
Group #	Parameter Group	Units	Detection Limit	Max Concentration	Sample Code / Hole
1	Extended VOC Suite	mg/kg	N/A[a]	N/A[a]	N/A[a]
1a	BTEX + MTBE	mg/kg	0.5	<0.5	All holes
2	Extended SVOC Suite (with TIC)*	mg/kg	0.1	240	WS01 (0.50m)
2e	Phenols	mg/kg	0.3	2.2	WS01 (0.50m)
2f	Cresols and chlorinated phenols	mg/kg	N/A[a]	N/A[a]	N/A[a]
3	Mineral Oils C11-C20	mg/kg	N/A[a]	N/A[a]	N/A[a]
4	Mineral Oils C21-C40	mg/kg	N/A[a]	N/A[a]	N/A[a]
5	Corrosive (conductivity, redox, pH)	µS/cm, mV, pH units	N/A, N/A, N/A	pH:7 – 6.9	All holes
2a	Ethers	b	b	b	b
2b	Nitrobenzene	b	b	b	b
2c	Ketones	b	b	b	b
2d	Aldehydes	b	b	b	b
6	Amines	b	b	b	b

Notes:

* - PAHs assessed as a proxy for SVOCs

a – Not applicable as not analysed within ground investigation scope. Assumed fail in Table 9-4 below.

b – Not applicable as not suspected at site following desk study review

The following screening criteria, provided by UKWIR, were used to evaluate the materials:

Table 9-3 – UKWIR Screening Criteria (PE/PVC)

Parameter Group		PE Threshold Concentration (mg/kg)	PVC Threshold Concentration (mg/kg)
1	Extended VOC Suite (with TIC)	0.5	0.125
1a	BTEX + MTBE	0.1	0.03
2	Extended SVOC Suite (with TIC)	2	1.4
2e	Phenols	2	0.4
2f	Cresols and chlorinated phenols	2	0.04
3	Mineral Oils C11-C20	10	N/A
4	Mineral Oils C21-C40	500	N/A

Table 9-4 – UKWIR Material Selection Table

Parameter Group		Pipe Material Selection	
		PE	PVC
1	Extended VOC Suite (with TIC)	NT	NT
1a	BTEX + MTBE	Pass	Pass
2	Extended SVOC Suite (with TIC)	Fail	Fail
2e	Phenols	Fail	Fail
2f	Cresols and chlorinated phenols	NT	NT
3	Mineral Oils C11-C20	Fail	Pass
4	Mineral Oils C21-C40	Fail	Pass
5	Corrosive (conductivity, redox, pH)	Pass	Pass
2a	Ethers	N/A	N/A
2b	Nitrobenzene	N/A	N/A
2c	Ketones	N/A	N/A
2d	Aldehydes	N/A	N/A
6	Amines	N/A	N/A

Parameter Group	Pipe Material Selection	
	PE	PVC
Pipes that pass chemical thresholds	Fail	Fail
Preferred Selection	☒	☒

Table 9-5 – UKWIR Screening Criteria (Wrapped Steel/Wrapped DI/Copper)

Parameter Group		Wrapped Steel	Wrapped Ductile Iron	Copper
5	Corrosive (Conductivity, Redox, pH)	Corrosive if pH<7 and conductivity >40µS/cm	Corrosive if pH<5, Eh not neutral and conductivity >40µS/cm	Corrosive if pH<5 or >8 and Eh positive

Based on the available data and on a preliminary basis, WSP would advise water supply pipes to be laid conform to Barrier Pipe specifications, although that it is noted that Wrapped Steel, Wrapped Ductile Iron and/or Copper may be appropriate subject to confirmatory conductivity and redox testing. Should development be progressed, then recommendations will need to be confirmed on finalisation of pipe run locations in relation to test locations. Confirmation of final pipe specifications must be agreed with the water provider.

10 REFINED CONCEPTUAL SITE MODEL

10.1 INTRODUCTION

This section provides a refinement of the preliminary CSM which was presented in Section 4.4. Plausible source-pathway-receptor contaminant linkages have been refined in line with industry good practice (principally CLRM and R&D66).

The refined CSM provides an updated understanding of the site based on the findings of the site investigation and analytical results and draws on the ground, hydrogeological and contamination models presented previously.

10.2 POTENTIAL SOURCES OF CONTAMINATION

Table 10-1 presents a summary of the identified potential sources of current and historical contamination present at the site.

Table 10-1 - Revised Potential Sources of Contamination

Potential Primary Source	Evidence of Impact (Secondary Source)	Potential Contaminants of Concern Identified
ON-SITE		
Made Ground	▪ No evidence of staining or odours observed in the field. ▪ No evidence of VOCs.	▪ PAHs ▪ Heavy Metals ▪ Asbestos ▪ TPH (based on hazard index) and risk to standard water pipes) ▪ Phenol (based on risk to standard water pipes)

10.3 POTENTIAL EXPOSURE PATHWAYS

Possible exposure pathways between the identified contaminants and human health receptors include the digestion or inhalation of contaminated soil or dust during earthworks and construction. Exposure of human health receptors following the completion of the development include digestion or inhalation of contaminated soils in uncovered areas.

Possible exposure pathways between the identified contaminants of concern and the controlled waters receptors include the vertical and lateral migration through saturated pore space.

In the context of the proposed land use, the following receptors of soil and/or groundwater impact were identified.

10.4 POTENTIAL RECEPTORS

In the context of the proposed land use, the following receptors of soil and/or groundwater impact were identified:

- Construction workers during redevelopment.
- Neighbouring site users.
- Future site users (i.e. site users, site workers, maintenance workers).

- Underlying groundwater and the wider groundwater environment.
- Surface waters: Rochdale Canal located approximately 30m south east of the site boundary.
- Risks to potable water pipes.

10.5 PLAUSIBLE CONTAMINANT LINKAGES

Table 10-2 provides a revised evaluation of the potential contaminant linkages that were considered to be plausible for the future use of the site. It uses the current site investigation findings to refine the assessment in Section 4.

Table 10-2 - Summary of Plausible Contaminant Linkages

Potential Contaminants	Potential Pathways	Potential Receptors	Comments
Free asbestos fibres in soils	Inhalation of asbestos fibres.	Construction workers Future site users Future maintenance workers	**Moderate** – Asbestos was identified in two soil samples, (quantification results outstanding) Large areas of Made Ground are present at the site and asbestos fibres may be encountered in Made Ground in un-investigated locations at the site. Appropriate work control procedures would be required to control any exposure risk during the works.
Contaminants in Soils	Dermal contact, ingestions, inhalation of impacted Made Ground and soil particles.	Construction workers Future site users Future maintenance workers	**Moderate** – Exceedances of human health assessment criteria were recorded during the investigation for a number of contaminants.
	Vertical leaching from impacted soil and lateral migration of impacted groundwater from on-site	Principal Aquifer Rochdale Canal	**Low** – Given the concentration of contaminants recorded in soil and groundwater beneath the site and the distance to the nearest surface water receptor, it is considered at this stage that the risk from contaminated soils and groundwater to controlled waters is low to moderate.

11 CONCLUSIONS & RECOMMENDATIONS

11.1 REMEDIATION REQUIREMENTS

11.1.1 HUMAN HEALTH

It is considered that in areas of hard cover (roadways/ pavements etc), this will provide adequate mitigation to future site users in respect of direct human health risks in relation to any existing contamination in underlying soils. However, appropriate remedial measures or mitigation will be required in areas where the concentration of contaminants of concern in shallow site soils present an unacceptable risk to sensitive receptors in proposed areas of soft landscaping.

It is considered likely the most feasible strategy to address the risks associated with contaminated soils will include the removal of the identified source soils (Made Ground) by excavation and disposal off site to either a licensed disposal facility (landfill) or a licensed treatment facility, subject to final cut and fill requirements/generation of surplus soils. The use of an in-ground barrier (such as a geotextile / geomembrane) and cover system should also be considered to minimise the volumes of material to be removed from site where possible.

WSP note the thickness of any cover system to be used will require to be designed in conjunction with final design levels for the proposed development and should be discussed with the local planning authority to confirm acceptance.

Risks to groundworkers and below ground maintenance workers during the redevelopment should be mitigated by using appropriate site controls and by using personal protective equipment (PPE) in accordance with statutory health and safety regulations.

Free asbestos fibres have been identified within Made Ground at shallow depth in two locations in the north of the site. Given the results of the asbestos screening of Made Ground, asbestos contamination of soils is not anticipated to be widespread on the site; however, asbestos impacted Made Ground may still be present in un-investigated areas of the site. If a cover system is identified as being the most appropriate remedial technique to address the already identified risks to human health, the presence of asbestos should be considered during its design.

The risks posed to human health receptors from asbestos fibres during groundworks can be mitigated by implementing safe working practices and by using appropriate PPE. Should bulk ACM or free asbestos fibres be encountered during any stage of the proposed groundworks future site developers and contractors have a duty of care under the CAR 2012 to implement an Asbestos Management Plan and to mitigate potential human health risks.

11.1.2 CONTROLLED WATERS

The risks to controlled waters from contaminants of concern in soil and groundwater on the site are considered to be low and remedial measures are not considered to be warranted.

11.1.3 GAS PROTECTION MEASURES

The assessment of risks from hazardous ground gases on the site did not identify an unacceptable risk to the proposed development or human health receptors. A ground gas classification of CS1 is

considered appropriate for the site. Gas protection measures are not considered to be required for the proposed development.

11.2 RE-USE OF MATERIALS

If the re-use of excavated soils within the development is required, this should be documented by using a Materials Management Plan (MMP) in accordance with CL:AIRE's 'Definition of Waste: Development Industry Code of Practice' (DoWCoP).

Contaminated soils (Made Ground and natural soils) can only be re-used on the site where they are suitable for use. Where soils are re-used under an MMP, a Verification Plan and subsequent Verification Report will be required. Further sampling of soils is likely to be required to demonstrate that soils are suitable for their intended re-use.

11.3 WASTE MANAGEMENT

Any materials which are surplus to requirement and which are intended for off-site disposal will be considered a waste and should be characterised and disposed of under appropriate duty of care in accordance with 'Technical Guidance WM3: Waste Classification - Guidance on the classification and assessment of waste'.

Based on the recorded contaminants of concern, the majority of Made Ground soils excavated for off-site disposal may be classified as non-hazardous waste, with materials from around two areas (WS01 at 0.5m bgl and WS08 at 0.6m bgl) to be disposed of as Hazardous Waste. Further WAC testing has been scheduled on the samples from these locations and a refined waste classification for these locations will be provided in a updated version of this report.

Any excavated soils containing asbestos (either visible ACM or soils containing .0.1% asbestos) will require a classification as hazardous waste in accordance with WM3. Asbestos was recorded in two locations and further assessment will be provided in a updated version of this report.

Further sampling and testing of soils intended for off-site disposal will likely be required to enable a waste classification assessment.

11.4 BURIED UTILITIES

New underground utilities should be constructed with materials appropriate to the level of contamination present on the site or should be placed within corridors of clean fill material to aid in the protection of pipework and ducts and to limit direct exposure of maintenance workers to contaminated soil.

11.5 WATER SUPPLY PIPES

New proposed water supply pipes in contact with Made Ground may be at risk of infiltration by contaminants of concern. Water supply pipes should be constructed with materials appropriate to the level of contamination present on the site (see section 9.6) or should be placed within corridors of clean fill material to aid in the protection of pipework and ducts and to limit direct exposure of maintenance workers to contaminated soil.

11.6 VERIFICATION OF MITIGATION MEASURES

- It is recommended that a Remediation Strategy is prepared for the proposed development to define the remedial objectives and to set out how the remedial works will be verified.
- As part of the design measures in the proposed development, all works should be verified by an independent specialist and reported in a verification report.

12 CONCLUSIONS & FURTHER WORKS

12.1 GEOTECHNICAL

- The use of CFA or rotary bored piles is considered appropriate for the support of structural loads.
- It is considered that with appropriate ground preparation, ground bearing slabs could be utilised outwith the semi-basement area. Within the semi-basement, the use of a flexible surface has been assumed for the car park and bike store. A conventional ground bearing slab may be feasible for the plant room.
- Retaining walls may be either be founded within the Cohesive Glacial Till or piled, subject to additional ground investigation and more detailed assessment.
- The stability of any Made Ground or granular soils should not be relied upon in unsupported excavations.
- A detailed strategy for managing obstructions within the Made Ground should be developed to minimise potential delays on site and associated abnormal costs.
- A preliminary Design Sulphate Class of DS-2 and Aggressive Chemical Environment classification of AC-2 is considered appropriate for below ground concrete, subject to the results of outstanding chemical testing of water samples.
- Deep Made Ground (potentially >6.45m BGL) was recorded in WS01 within the approximate footprint of the former canal basin. Further ground investigation works, comprising a cable percussion borehole and a trial pitting exercise, should be undertaken to prove the depth of the Made Ground and delineate the position of the former canal basin.

12.2 GEO-ENVIRONMENTAL

12.2.1 SUMMARY OF IDENTIFIED CONTAMINATION

Concentrations in exceedance of the adopted assessment criteria protective of human health have been identified for arsenic, lead, cyanide and benzo(a)pyrene in exceedance of their respective GACs were recorded (in both Made Ground and natural soils) from across the site and over a range of depths including at shallow depth below ground level. Two samples of Made Ground were reported by the laboratory to have asbestos fibre bundles. The asbestos content within these two samples was recorded as below the hazardous waste limit of 0.1%.

Marginally elevated concentrations of heavy metals, hydrocarbons and PAH have been recorded in groundwater on the site. The risks to controlled waters is considered to be low and remedial measures are not considered to be warranted.

The site is considered to be at a very low risk from hazardous ground gases and gas protection measures are not considered to be required. The site is not indicated to be in an area where radon gas protection measures are required for new buildings.

12.2.2 SUMMARY OF OUTLINE REMEDIATION CONSIDERATIONS

The identified contamination within the Made Ground at the site is considered to require the following remediation measures to mitigate the risks to human health with respect to the proposed development:

- Placement of clean cover soils in landscaped areas to mitigate against risks from direct exposure of site users to contaminated soils;

- Monitoring and management of risks from dispersed asbestos fibres in soils and ACM within buildings during bulk earthworks; and
- Verification of remediation measures by an independent specialist.

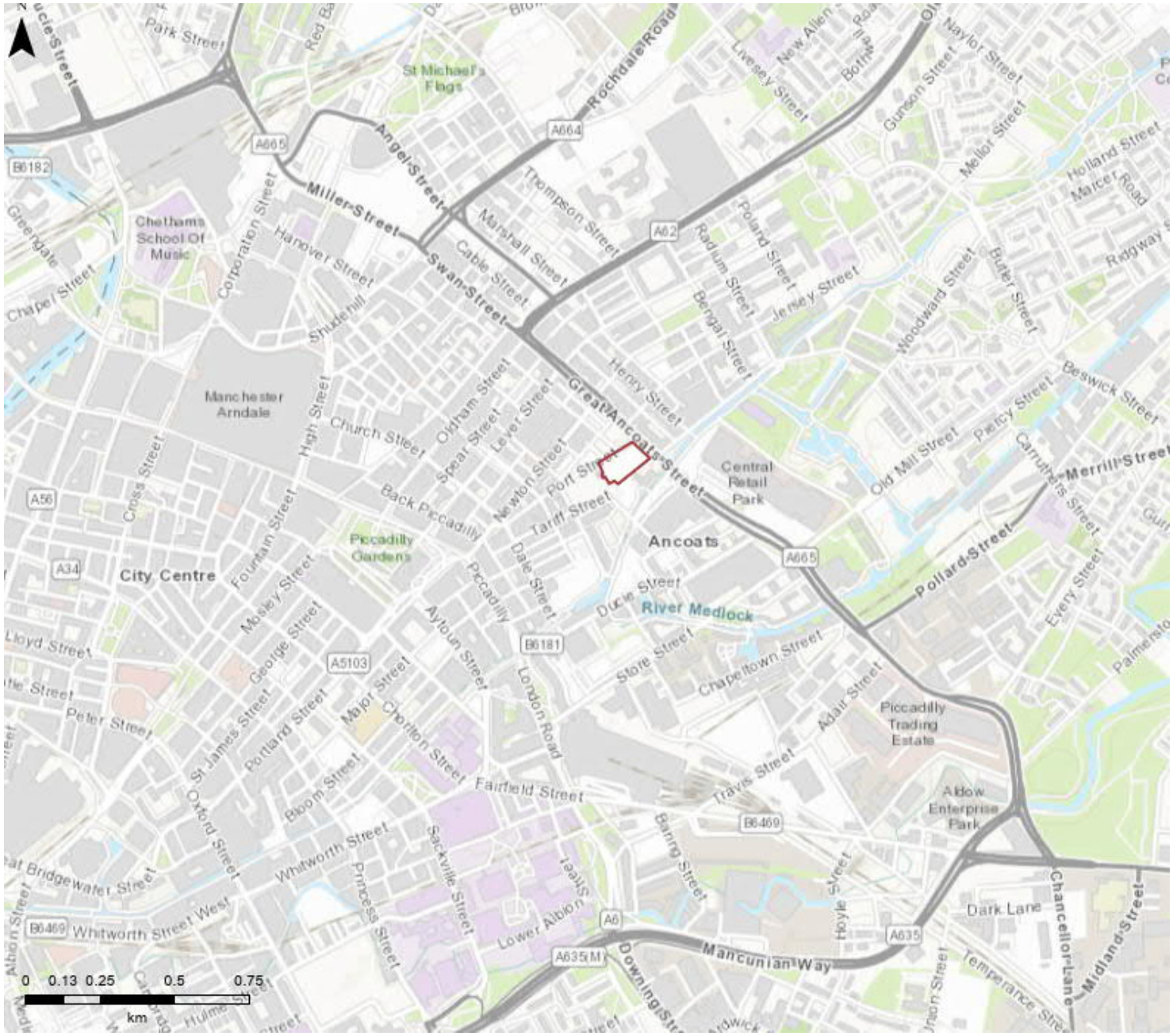
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Appendix A

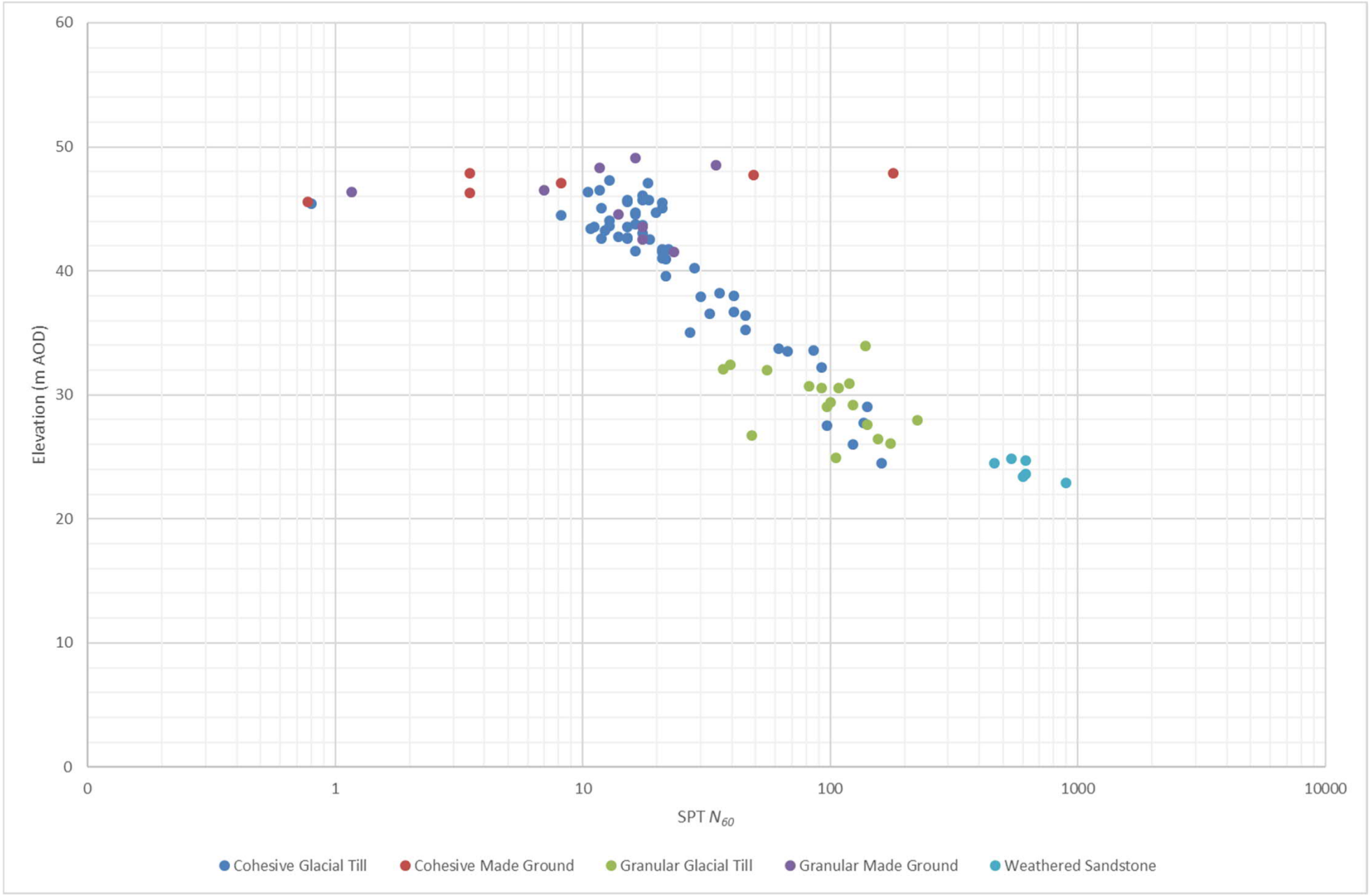
FIGURES & DRAWINGS

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8 First Street, Manchester M15 4RP
Tel: 0161 200 5000

Project No.	70084785	Scale	NTS
Date	September 2021	Figure No.	A.1
Project	Port Street, Manchester	Drawn by	RH
Title	Site Location Plan	Checked by	MN



8 First Street, Manchester M15 4RP
Tel: 0161 200 5000

Project No.	70084785	Scale	NTS
Date	September 2021	Figure No.	A.2
Project	Port Street, Manchester	Drawn by	RH
Title	SPT N_{60} vs Elevation	Checked by	RT

File name \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70084XXX\70084785 - PORT STREET, MANCHESTER - PHASE 2 WORKS\03 WIP\01 GEOTECHNICS\06_SITE DATA\05_CAD DRAWING\5277_001B_EHLP.DW

KEY

CABLE PERCUSSION BOREHOLE WITH ROTARY FOLLOW ON

WINDOW SAMPLE BOREHOLE

DO NOT SCALE

BH01 BH02 BH03 BH04

WS01 WS02 WS03 WS04 WS05 WS06 WS07 WS08

HOLDSWORTH STREET

LITTLE PITT STREET

PORT STREET

ROCHDALE CANAL

CAR PARK Hardcore

CAR PARK Concrete

CAR PARK Tarmac

Tarmac Concrete Cobbles Grass Paving Inaccessible Conc Base Kiosk Bunker Ramp Wall Steps Sapling Tactile Paving

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	09/06/2021	RH	FIRST ISSUE	RT	RT

DRAWING STATUS: S2 - FOR INFORMATION

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M15 4RP
T+ 44 (0) 161 200 5000
wsp.com

CLIENT: SELECT PROPERTY GROUP

ARCHITECT: SIMPSONHAUGH

PROJECT: PORT STREET, MANCHESTER

TITLE: EXPLORATORY HOLE LOCATION PLAN

SCALE @ A3:	CHECKED:	APPROVED:
NTS	RT	RT

PROJECT No:	DESIGNED:	DRAWN:	DATE:
70084785	RH	RH	June 21

DRAWING No: 70084785-WSP-GEO-EHLP-001

REV: P01

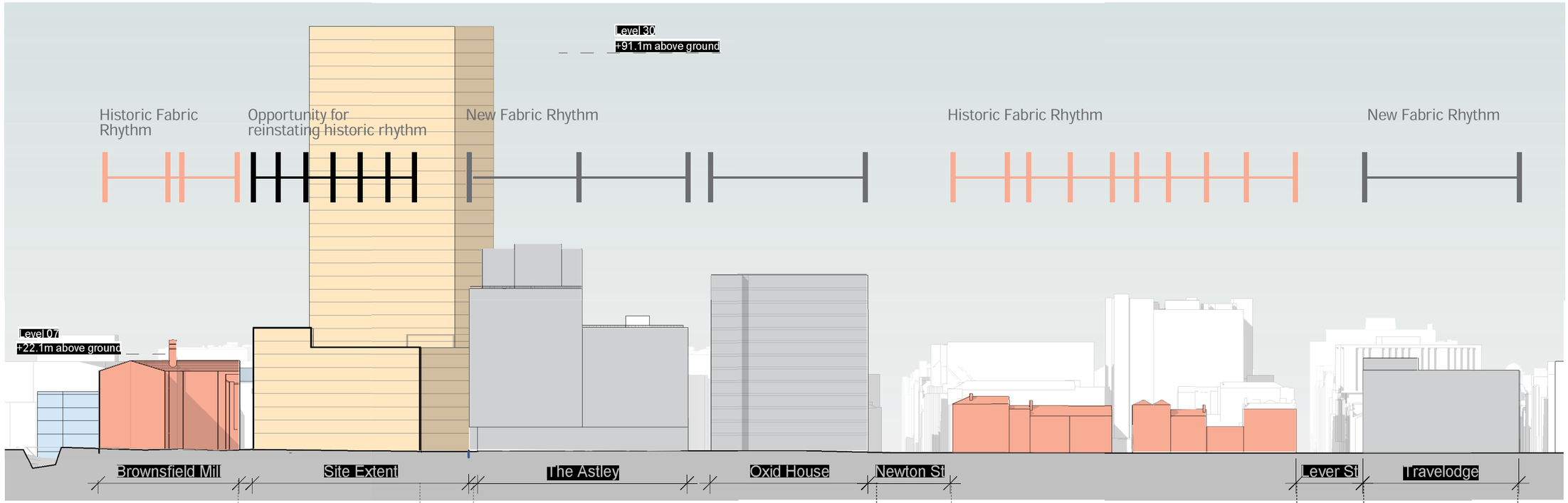
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Appendix B

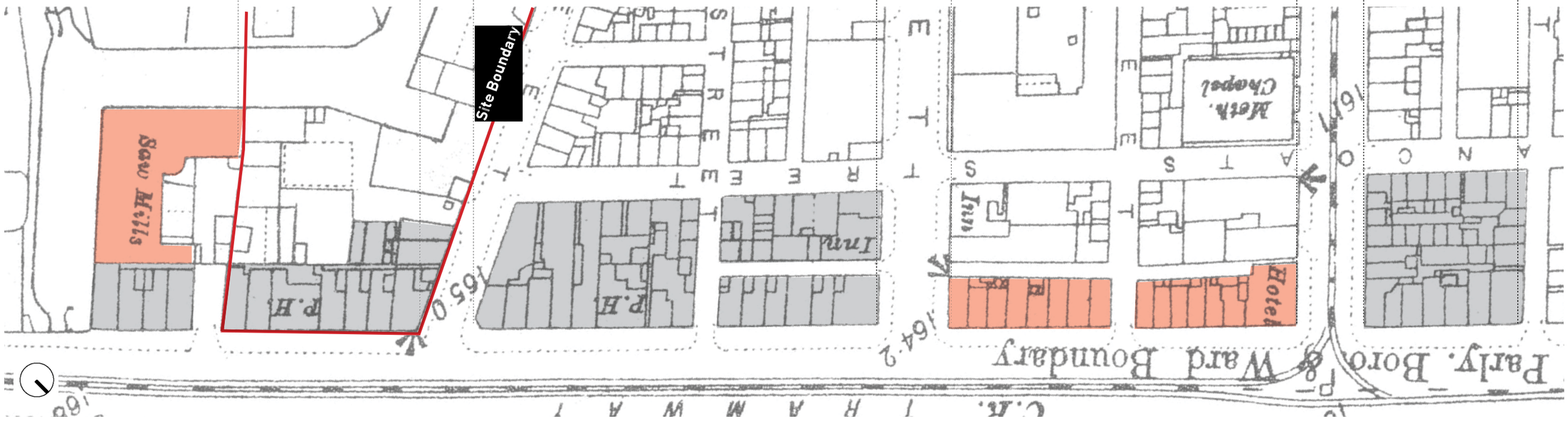
DEVELOPMENT PROPOSALS

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GREAT ANCOATS STREET URBAN GRAIN

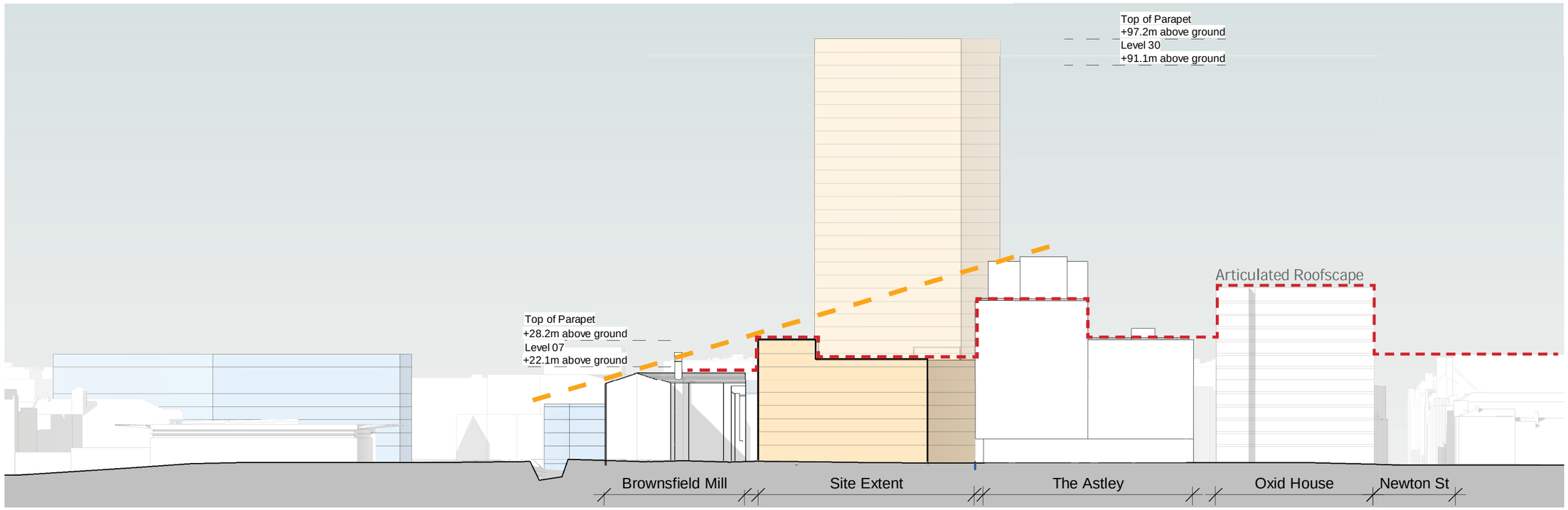


East Elevation
Great Ancoats Street

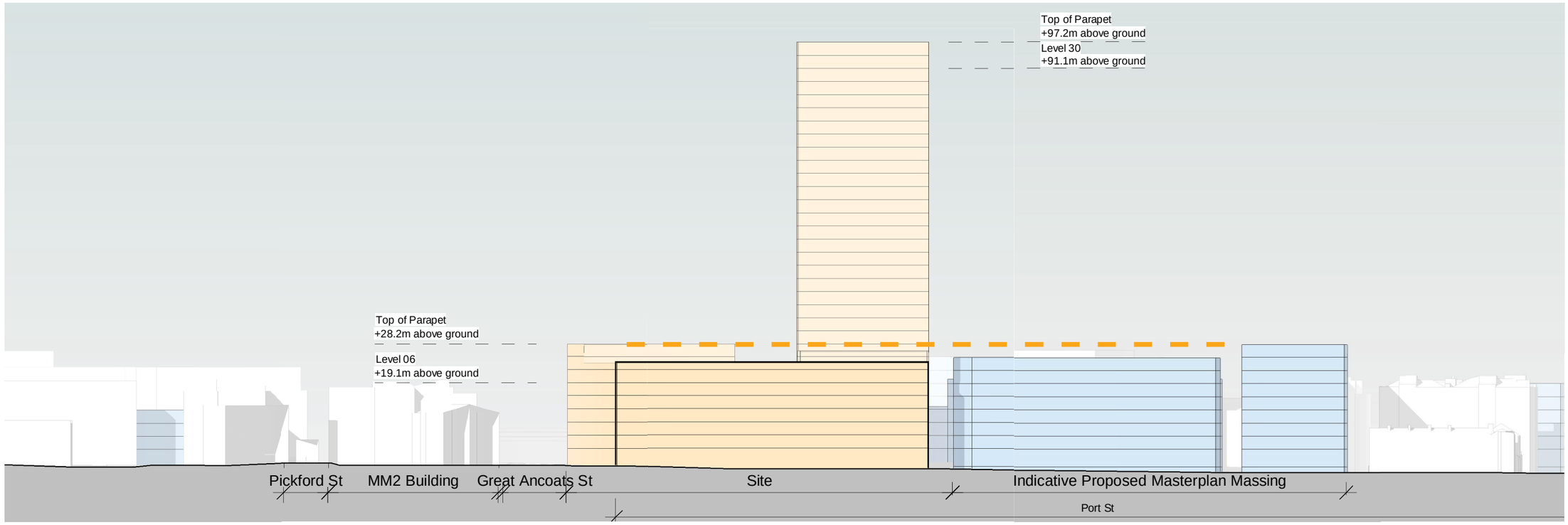


1923 Street Plan

- Proposal
- Remaining Urban Grain
- Demolished & New Buildings

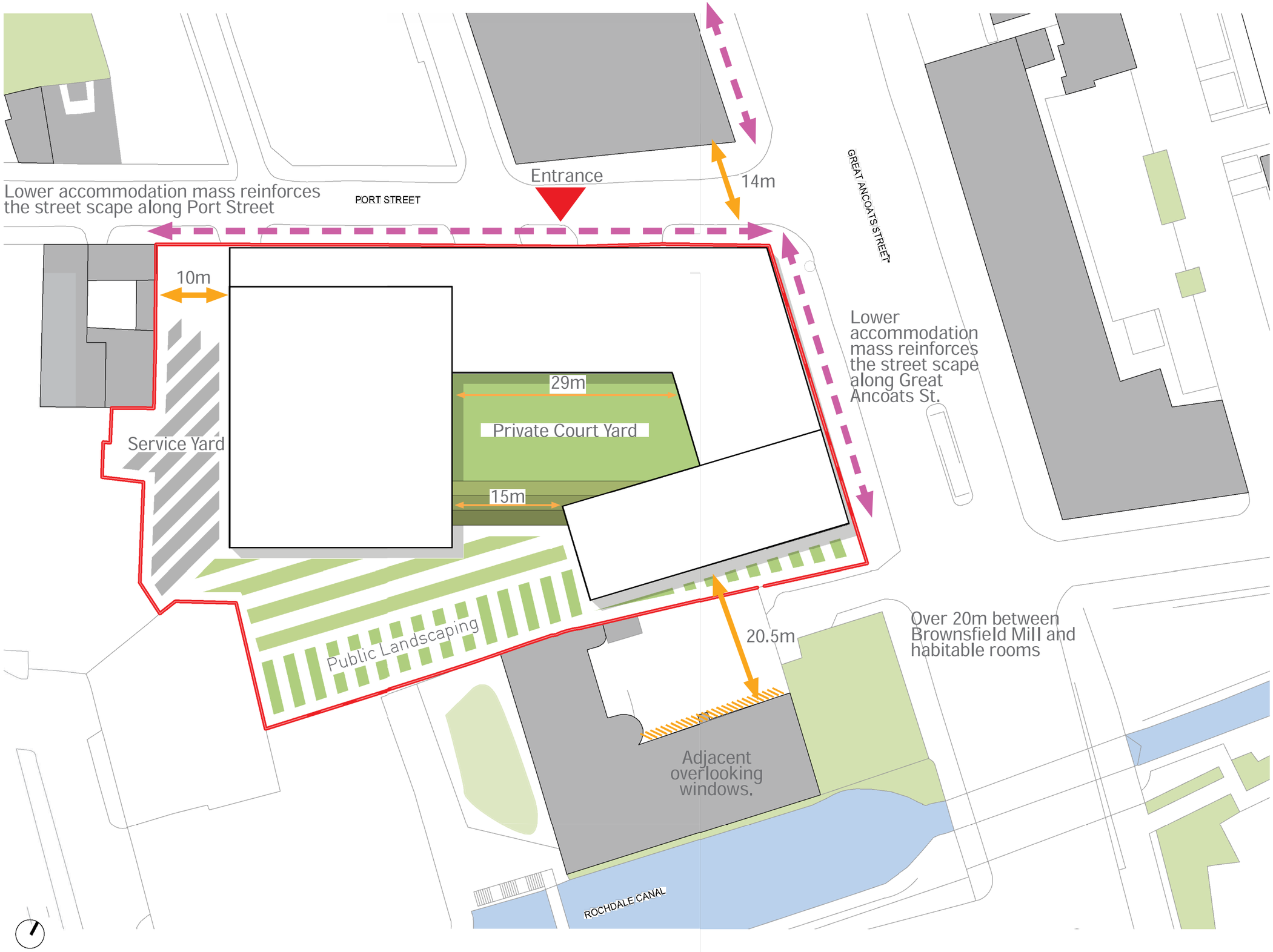


East Elevation - Great Ancoats Street



North Elevation - Port Street

SITE STRATEGY DIAGRAM



415 APARTMENTS - 12 UNIT TOWER - GROUND FLOOR PLAN



PORT STREET

GREAT ANCOATS STREET

Bike Store

Car Park

Plant

ROCHDALE CANAL

Key:

- 1 Bed 2 Person
- 2 Bed 4 Person
- 3 Bed 6 Person
- Townhouse
- Duplex
- Amenity

Appendix C

GENERAL LIMITATIONS

Confidential

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

GENERAL

1. WSP UK Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.

2. Unless explicitly agreed otherwise, in writing, this report has been prepared under WSP UK Limited standard Terms and Conditions as included within our proposal to the Client.

3. Project specific appointment documents may be agreed at our discretion and a charge may be levied for both the time to review and finalise appointments documents and also for associated changes to the appointment terms. WSP UK Limited reserves the right to amend the fee should any changes to the appointment terms create an increase risk to WSP UK Limited.

4. The report needs to be considered in the light of the WSP UK Limited proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEO ENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

Coverage: *This section covers reports with the following titles or combination of titles: phase 1; desk top study; geo environmental assessment; development appraisal; preliminary environmental risk assessment; constraints report; due diligence report; geotechnical development review; environmental statement; environmental chapter; project scope summary report (PSSR), program environmental impact report (PEIR), geotechnical development risk register; and, baseline environmental assessment.*

5. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. WSP UK Limited cannot be held responsible for any disclosures that are provided post production of our report and will not automatically update our report.

6. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, WSP UK Limited reserves the right to review such information and, if warranted, to modify the opinions accordingly.

7. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.

8. WSP UK Limited does not warrant work / data undertaken / provided by others.

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

INTRUSIVE INVESTIGATION REPORTS

Coverage: *The following report titles (or combination) may cover this category of work: geo environmental site investigation; geotechnical assessment; GIR (Ground Investigation reports); preliminary environmental and geotechnical risk assessment; and, geotechnical risk register.*

9. The investigation has been undertaken to provide information concerning either:

- **i.** The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or
- **ii.** Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.

10. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.

11. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.

12. For geotechnical investigations the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.

13. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.

14. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

15. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, WSP UK Limited has used reasonable skill and care to extrapolate conditions between these points based upon assumptions to develop our interpretation and conclusions. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation. Conditions can change between investigation points and these interpretations should be considered indicative.

16. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated

with the WSP UK Limited risk assessment process have been outlined within the body or associated appendix of the report.

17. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.

18. Where soil contamination concentrations recorded as part of this investigation are used for commentary on potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed.

19. The results of the asbestos testing are factually reported and interpretation given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and / or trace loose asbestos fibres within the soil matrix at the site.

20. If costs have been included in relation to additional site works, and / or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

21. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.

22. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIAL STRATEGY REPORTS

23. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected on the basis of the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

24. The outputs of the Detailed Quantitative Risk Assessments are based upon WSP UK Limited manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.

25. Prior to adoption on site they will need discussing and agreeing with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of WSP UK Limited. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

GEOTECHNICAL DESIGN REPORT (GDR)

26. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS)

27. These reports are factual in nature and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of an earthworks or remedial works.

28. The data is presented and will be compared with assessment criteria.

Appendix D

FACTUAL INFORMATION

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GEOTECHNICS

geotechnical and geoenvironmental specialists

Ground Investigation



www.geotechnics.co.uk

Port Street, Manchester

Factual Report

for
Manchester (Port Street) Limited

Engineer : WSP UK Limited

Project Number PN214228

September 2021

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Ground Investigation
at

Factual Report

Port Street, Manchester

for
Manchester (Port Street) Limited

Engineer :
WSP UK Limited

Project No:
PN214228
September 2021

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Ground Investigation
at
Port Street
Manchester

Factual Report

Project No: PN214228
September 2021

1.0 INTRODUCTION

A geotechnical and geoenvironmental investigation was undertaken by Geotechnics Limited at the site of a proposed high-rise residential development comprising one 33 storey apartment block and one 19 storey apartment block. The investigation was carried out to the instructions of the Engineer, WSP UK Limited on behalf of the Client, Manchester (Port Street) Limited. This report describes the work undertaken and presents the data obtained.

2.0 OBJECT AND SCOPE OF THE INVESTIGATION

The object of the investigation was to obtain information on the ground and groundwater conditions relating to the design of the proposed works within the limitations posed by trial hole numbers, locations, depths, methods adopted and the scope of approved in situ and laboratory testing. The investigation comprised cable percussive with rotary follow-on boreholes, dynamic sample boreholes, in situ and laboratory testing and reporting. A Factual Report was also commissioned.

3.0 PRESENTATION

A description of the site and a summary of the procedures followed during the investigation process are presented in Sections 4 to 6. The factual data so obtained are presented in Appendices 2 to 10 of this report. Attention is drawn to the General Notes and Investigation Procedures presented in Appendix 11. to aid an understanding of the procedures followed and the context in which the report should be read.

In addition, data in electronic format in accordance with "The Electronic Transfer of Geotechnical Data from Ground Investigations" published by the AGS (the AGS Format) are presented together with a copy of the report in electronic PDF format.

4.0 THE SITE

4.1 Location

The site is located west of the Ancoats area of Manchester approximately 500m north of Piccadilly Station. The approximate Ordnance Survey National Grid Reference for the site is SJ 84839 98427 and an extract from the relevant 1:25,000 Scale O.S. Map is included as Appendix 1.

4.2 Description

The site is approximately rectangular in shape with dimensions of 83m north-east to south-west and 47m north-west to south-east. The site covers an area of approximately 0.50Ha.

The site is currently used as a car park and the surface comprises concrete hardstanding. Access to the site is via the Citipark car parking entrance off Port Street to the north.

The site is bordered by the A665 Ring Road to the north-east and Port Street to the north-west. Other existing carparks and industrial buildings border the site to the south and east. The Rochdale Canal lies approximately 35m to the south-east of the site.

4.3 Site Geology

The 1:50,000 scale map published by the British Geological Survey, Sheet 85 Bedrock and Superificial (Manchester) dated 2011, shows the site to be underlain by Till of Devensian age comprising *clay to sandy clay, unsorted, with common pebbles, cobbles and some boulders (diamicton)*.

The superficial deposits are indicated to be underlain by the Chester Pebble Beds Formation, part of the Sherwood Sandstone Group of Lower Triassic age comprising *Sandstone, reddish brown, moderately cemented*.

Made Ground is not indicated on or adjacent to the site based on the BGS maps. However, given the site's

location and current use as an active car park, Made Ground associated with construction work will be present.

4.4 Hydrogeology

The DEFRA Magic Map website, https://magic.defra.gov.uk/MagicMap.aspx, accessed on 16th June 2021, shows the superficial deposits under the site to act as a Secondary (Undifferentiated) Aquifer.

The British Geological Society website, http://mapapps2.bgs.ac.uk/geoindex/home.html, accessed on 16th June 2021, shows the bedrock under the site to act as a Highly Productive Aquifer, describing it as *'Principal sandstone aquifer up to 600m thick and yielding up to 125l/s. Quality good but hard and becomes saline beneath confining Mercia Mudstone'.*

5.0 PROCEDURE

5.1 Commissioning

The work was awarded following submission of a tender for work designed by the Engineer for ground investigation of the site in accordance with their requirements.

5.2 General

The procedures followed in this site investigation are based on *BS 5930: 2015 + A1:2020 – Code of Practice for Site Investigations* and *BS 10175:2011+A2:2017 - Investigation of Potentially Contaminated Sites*. The soils and rocks encountered have been described in accordance with BS5930:2015 + A1:2020 and BS EN ISO 14688-1:2018 and BS EN ISO 14689:2018. The Cable Percussive with Rotary follow-on Borehole and Dynamic Sample Borehole Records are included in Appendices 2 and 4 respectively. Their approximate positions are shown on the Exploratory Hole Location Plan in Appendix 10.

The Exploratory Hole locations were specified by WSP UK Limited. The co-ordinates and levels shown on the Exploratory Hole Records were measured using a Leica GPS survey device. The depths quoted on the exploratory hole records are in metres below ground level.

At each exploratory hole location inspection pit was excavated using hand tools to a depth of 1.20m below ground level to check for the presence of underground services. Prior to and on completion of the excavation, the location was scanned using a cable avoidance tool (CAT). At those locations where concrete was present at ground level, 350mm diameter coring was used to advance the exploratory hole through the concrete and facilitate the excavation of the inspection pit. Details of the concrete coring is included on the appropriate exploratory hole records.

5.3 Cable Percussive with Rotary follow-on Boreholes

Four (4 No.), 150mm-250mm diameter boreholes (numbered BH01 to BH04) were sunk by Cable Percussion Tool techniques to depths varying between 24.00m and 25.20m below ground level. The work was carried out between 4th and 13th May 2021.

Representative disturbed (D and B) and driven open-tube thin-walled (UT) samples of the soils encountered were obtained at regular intervals. Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata. In addition, environmental soil samples (ES) were recovered at the depths indicated on the Borehole Records.

On encountering groundwater, boring operations were suspended for 20 minutes in order to record any rise in water level. Full details of groundwater observations during site work are included on the Borehole Records. It should be noted that the addition of water to the borehole as part of the drilling process may have masked the presence of groundwater in the borehole. Where water was added it has been noted on the Borehole Records.

All four (4 No.) locations were continued by rotary coring techniques to depths varying between 40.00m and 40.90m below ground level. The rotary coring commenced through the base of Cable Percussion Boreholes (BH01 to BH04) which had been left open and cased to facilitate coring as instructed by the Engineer. This element of the work was carried out during the period between 11th and 18th May 2021.

The drilling equipment on this particular contract utilised air-mist as the flushing medium.

Rock cores were extruded horizontally in transparent liners and placed into suitable core boxes. Photographs of the individual core boxes are included in Appendix 3.

On completion, standpipes were installed in Boreholes BH01-BH04 (see Section 5.5).

5.4 Dynamic Sample Boreholes

Eight (8 No.) Dynamic Sample Boreholes (numbered WS01 to WS08) were undertaken at the site to depths varying between 4.00m and 6.45m below ground level. WS05 was terminated within it's inspection pit at 0.30m below ground level after encountering potential asbestos. The work was carried out between 5th and 7th May 2021.

The Dynamic Samples were taken using the super-heavy Dynamic Probe apparatus which drives lined steel tubes into the ground in 1m lengths. Samples are retrieved in the plastic liners. The retrieved liners were split and the recovered soils described before being sub-sampled into ES, D and B samples as shown on the Borehole Records. The hole is cased and progress depends on the nature of the strata penetrated. Full details of the casing used are included on the Borehole Records.

Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata.

Groundwater observations are included on the Borehole Records where appropriate and any rise in water level was recorded over 20 minutes whilst drilling operations were suspended.

On completion, a standpipe was installed in Borehole WS01 (see Section 5.5). The other boreholes were backfilled with arisings and bentonite.

5.5 Instrumentation and Monitoring

Long-term monitoring of the gas and groundwater levels was made possible by the installation of standpipes as follows:

Exploratory Hole	Standpipe Slotted Pipe & Filter Zone (m)
BH01	1.00 to 5.00
BH02	10.00 to 16.00
BH03	0.50 to 1.40
BH04	2.00 to 10.00
WS01	0.50 to 2.80

Monitoring of the gas and groundwater levels at the site commenced on 26th May 2021 with five further visits every fortnight.

On each of the monitoring visits a record of the groundwater level in the standpipes was obtained. On the first visit where water was recorded, samples were obtained (where possible) following a purging of three times volumes of water in the standpipe.

In addition to the groundwater levels, the following parameters were measured and recorded in each standpipe using a GA5000 Gas Analyser:-

- Concentrations (% Vol) of CH_4, O_2, CO_2, along with CH_4 and (ppm) H_2S, CO
- Flow Rate
- Barometric Pressure

The results of the monitoring are presented in Appendix 5.

6.0 LABORATORY TESTING

6.1 Geotechnical

The laboratory testing schedule was specified by the Engineer. The tests were carried out in Professional Soil Limited's UKAS accredited Laboratory (Testing No. 4043) and were undertaken in accordance with the appropriate Standards as indicated below and on the Laboratory Test Certificate in Appendix 6 (soils). Any descriptions, opinions and interpretations are outside the scope of UKAS accreditation.

The tests undertaken can be summarised as follows:-

BS 1377:1990 Test No.		**Test Description**
Part 2		
3.2	30 No.	Moisture Content Determination
4.3 & 5.3	18 No.	Liquid and Plastic Limit Determination
9.2 & 9.3	7 No.	Mechanical Analysis - Sieving
Part 5		
3	2 No.	One-Dimensional Consolidation Test

Part 8

8	12 No.	Shear Strength Measurement - Unconsolidated Undrained Triaxial Compression Test – Quick Triaxial

ISRM Testing Methods

12 No.	Point Load Determination
8 No.	Unconfined Compressive Strength Determination

The results of the rock testing are presented in Appendix 7.

The following tests were carried out at the laboratories of Chemtech Environmental.

BRE Special Digest 1 Suite

10 No. Suites comprising:-
Soluble Sulphate
pH

The results of these are included in Appendix 6.

6.2 Contamination

Selected samples of soil and groundwater were tested at the laboratories of Derwentside Environmental Testing Services (UKAS Accredited Laboratory No. 2139) for potential site contamination. The determinands were specified by the Engineer and are detailed on the results sheets in Appendices 8 (soil) and 9 (groundwater). together with the test result as well as the test method, accreditation and detection limit.

Signed for and on behalf of Geotechnics Limited.

Prepared by:

Conor Southall
BSc (Hons), FGS
Engineer

Reviewed by:

Colin Dodd
BSc (Hons), MSc, CEng, MICE
Principal Engineer

APPENDIX I

Site Location Plan

SITE LOCATION PLAN



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Ground Investigation
at
Port Street, Manchester
for
Manchester (Port Street) Limited

GEOTECHNICS
geotechnical and geoenvironmental specialists

APPENDIX 2

Cable Percussive with Rotary follow-on Borehole Records, SPT Summary Sheets and SPT Energy Certificates

DATA SHEET - Symbols and Abbreviations used on Records

Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
TC	Thermal Conductivity
TR	Thermal Resistivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecone Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content

(All other strengths from undrained triaxial testing)

S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/- (mm)	Total blows/penetration
( )	Extrapolated value

Groundwater

Water Strike

Depth Water Rose To

Instrumentation



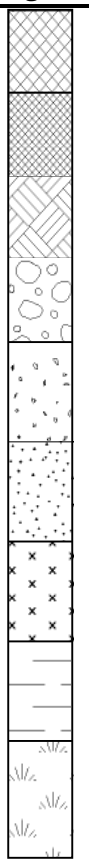
Seal

Filter

Seal

Strata

Legend



Made Ground Granular

Made Ground Cohesive

Topsoil

Cobbles and Boulders

Gravel

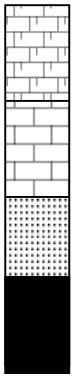
Sand

Silt

Clay

Peat

Note: Composite soil types shown by combined symbols



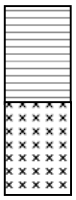
Chalk

Limestone

Sandstone

Coal

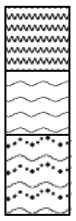
Strata, Continued



Mudstone

Siltstone

Metamorphic Rock

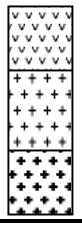


Fine Grained

Medium Grained

Coarse Grained

Igneous Rock



Fine Grained

Medium Grained

Coarse Grained

Backfill Materials



Arisings

Bentonite Seal

Concrete

Fine Gravel Filter

General Fill

Gravel Filter

Grout

Sand Filter

Tarmacadam

Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	Fractures/metre
FRACTURE SPACING (m)	Maximum Minimum
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss

(where core recovery is unknown it is assumed to be at the base of the run)

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER**
Engineer **WSP UK LIMITED**
Borehole **BH01**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**
National Grid Coordinates **384875.4** E **398465.8** N
Ground Level **49.72** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD
							G.L.		49.72
0.05	D					MADE GROUND: Black tarmacadam.	0.05		49.67
0.10- 0.55	B					MADE GROUND: Grey slightly sandy angular to subangular fine to coarse gravel of limestone.	0.10		49.62
0.10	ES								
0.30	ES								
0.50	ES								
0.60	D					MADE GROUND: Orangish brown slightly clayey angular to subangular cobbles of brick.			
0.65- 1.10	B								
1.00	ES					Below 1.20m, medium dense.			
1.20- 1.65	B								
1.20- 1.65		(DRY)			C28				
							1.70		48.02
1.80	D					MADE GROUND: Firm to stiff dark grey slightly sandy slightly gravelly silt with a low cobble content. Gravel is angular to subangular fine to coarse of brick, concrete and clinker.			
2.00- 2.45	B								
2.00	ES								
2.00- 2.45		1.70 (DRY)			C42				
2.70	D						2.70		47.02
3.00	ES					Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone, sandstone, quartz and slate.			
3.00- 3.45	UT62	2.90 (DRY)							
3.75	D								
4.00- 4.45	B								
4.00- 4.45	D	3.10 (DRY)			C15				
4.75	D								
5.00- 5.45	UT53	4.50 (DRY)							
5.90	D								
6.50- 6.95	B						6.50		43.22
6.50- 6.95	D	4.50 (DRY)			S10	Firm thinly to thickly laminated greyish brown slightly sandy CLAY.			
7.30	D								
							7.50		42.22
8.00- 8.45	UT36	6.10 (DRY)				Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone and sandstone.			
9.00	D								
9.50- 9.95	B								
9.50- 9.95	D	7.60 (DRY)			S23				

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	NF/IT
3.10	0.25	Cable Percussion	NF/IT
18.00	0.20	Cable Percussion	NF/IT
25.20	0.15	Cable Percussion	NF/IT
40.20	0.12	Rotary Core	SG/TH

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			11/05/21	08:00
13.50	13.10	DRY	11/05/21	18:00
13.50	13.10	DRY	12/05/21	08:00
22.29	22.00	17.80	12/05/21	18:00
22.29	22.00		13/05/21	08:00
25.27	25.00	23.10	13/05/21	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
20.70	20.50	17.60	20		Moderate inflow.

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml vial, 2 x 258ml amber glass jars and 1 x plastic jar.
A 50mm standpipe was installed to 5.00m with a geowrapped slotted section from 1.00m to 5.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 5.00m, gravel filter up to 1.00m, bentonite seal up to 0.20m, concrete up to ground level.
Chiselling: 25.00-25.20m for 60 minutes.
Flush: 25.20-40.20m, Air/Mist, 100% return.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER**
Engineer **WSP UK LIMITED**
Borehole **BH01**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**
National Grid Coordinates **384875.4** E **398465.8** N
Ground Level **49.72** m OD

Scale 1:50

Sampling			Properties			Strata			
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD
10.50	D								
11.00-11.45	B								
11.00-11.45	UTF 61	8.60 (DRY)							
11.50-11.95	B								
11.50-11.95	D	8.60 (DRY)			S29				
12.50	D								
13.00-13.45	B					Below 13.00m, very stiff.			
13.00-13.45	D	12.10 (DRY)			S33				
14.00	D								
14.50-14.95	B								
14.50-14.95	D	13.60 (DRY)			S37				
15.50	D						15.50		34.22
						Very stiff brownish grey slightly gravelly sandy CLAY with bands of grey fine to coarse sand (up to 100mm thick). Gravel is subangular to subrounded fine to coarse of mudstone, siltstone, sandstone,			
16.00-16.45	B								
16.00-16.45	D	15.80 (DRY)			S50	quartz and coal.			
16.90	D								
17.50-17.95	B								
17.50-17.85		17.50 (15.70)			C50/ 200				
18.50	D								
19.00-19.45	B						19.00		30.72
19.00-19.38		19.00 (17.50)			C50/ 225	Dense reddish brown slightly gravelly very clayey fine to coarse SAND. Gravel is subangular to rounded fine to coarse of mudstone, sandstone and quartz.			
19.80	D								

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
				25.20	25.00	24.60	14/05/21	08:00						
				37.20	25.20		14/05/21	18:00						
				37.20	25.20	34.30	17/05/21	08:00						
				40.20	25.20		17/05/21	18:00						

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER** | Engineer **WSP UK LIMITED** | **Borehole** **BH01** Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED** | National Grid Coordinates **384875.4** E **398465.8** N | Ground Level **49.72** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD
20.50-20.95	B								
20.50-20.80	D	20.50 (19.30)			S50/ 150				
21.50	D								
22.00-22.45	B								
22.00-22.29		22.00 (17.40)			C50/ 135	Stiff brown slightly gravelly sandy CLAY with a low cobble content and bands of gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and quartz.	22.00		27.72
23.00-23.45		23.50 (21.00)			C39	Dense brown gravelly fine to coarse SAND with a low cobble content. Gravel is subangular to rounded fine to coarse of mudstone and sandstone.	23.00		26.72
23.50-23.95	B								
						Very weak reddish brown SANDSTONE.	24.20		25.52
25.00-25.07		25.00 (22.10)			C50/30				
25.20	D						25.20		24.52
25.20-25.27		25.00 (22.50)			C50/40				

Core Run/Depth (Core Dia/Time)	Depth Cased	TCR/SCR / Type	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General	Detail	Depth	Legend	Level m OD
25.20-26.70	25.20	100 89	0.24 0.01	50	(9) (NI) (10) (NI)	Very weak reddish brown fine to medium grained SANDSTONE with occasional subrounded to rounded fine gravel of quartz. Discontinuities are closely to medium spaced, subhorizontal, undulating, rough with occasional sand infill (up to 3mm).				
26.70-28.20	25.20	92 26	0.06 0.01	0	(12) (AZCL) (>30) (NI)		Below 26.82m, discontinuities are extremely to very closely spaced.	27.53		22.19
						Extremely weak reddish brown fine to medium grained SANDSTONE recovered as reddish brown slightly gravelly sand.				
28.20-29.70	25.20	67 25	0.10 0.01	6	(AZCL) (NI)			28.72		21.00
					(>30) (NI) (12) (NI)	Very weak reddish brown fine to coarse grained SANDSTONE interbedded with very thin beds of reddish brown mudstone. Discontinuities are extremely to very closely spaced, subhorizontal, undulating, rough with sand infill (up to 10mm).		29.60 29.70		20.12 20.02
29.70-31.20	25.20	0 0	0.01 0.01	0	(20)					

Boring

Depth	Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER** | Engineer **WSP UK LIMITED** | **Borehole** **BH01** | Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED** | National Grid Coordinates **384875.4** E **398465.8** N | Ground Level **49.72** m OD

Scale 1:50

Core Run/Depth (Core Dia/Time)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
29.70-29.79	**25.20 (ADDED)**				**C100/ 20 (AZCL)**	**Weak reddish brown fine to medium grained SANDSTONE. Discontinuities are very closely spaced, subhorizontal, planar, rough and clean.**				
31.20-32.70	**25.20**	**89 4**	**0.06 0.01**	**0**		**No recovery - possible extremely weak reddish brown fine to coarse grained SANDSTONE.**				
31.20-31.44	**25.20 (ADDED)**				**C100/ 85 (NI)**					
32.70-34.20	**25.20**	**100 37**	**0.21 0.01**	**31**	**(10) (NI) (10)**	**Weak reddish brown fine to medium grained SANDSTONE with occasional subrounded to rounded fine to medium gravel of quartz. Discontinuities are closely to medium spaced, subhorizontal, undulating, rough and clean.**		**32.70** **32.91** **33.86**		**17.02** **16.81** **15.86**
34.20-35.70	**25.20**	**71 3**	**0.05 0.01**	**0**	**(AZCL) (NI)**	**Extremely weak reddish brown fine to coarse grained SANDSTONE with occasional thick laminae of extremely weak reddish brown mudstone recovered as reddish brown gravelly sand.**		**34.64**		**15.08**
35.70-37.20	**25.20**	**94 16**	**0.10 0.01**	**6**	**(AZCL) (NI) (18) (NI) (24)**	**Weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are closely spaced, subhorizontal, undulating, rough with occasional sand infill (up to 5mm).** **Extremely weak reddish brown fine to coarse grained SANDSTONE recovered as gravelly sand.**		**36.60** **36.73** **37.05** **37.26**		**13.12** **12.99** **12.67** **12.46**
37.20-38.70	**25.20**	**100 52**	**0.42 0.01**	**47**	**(NI) (4)**	**Very weak reddish brown fine grained SANDSTONE. Discontinuities are very closely to closely spaced, subhorizontal, undulating, rough and clean.** **Extremely weak reddish brown fine to coarse grained SANDSTONE recovered as gravelly sand.**		**37.97** **38.70**		**11.75** **11.02**
38.70-40.20	**25.20**	**91 33**	**0.13 0.01**	**15**	**(AZCL) (>30) (NI) (20) (NI)**	**Very weak to weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are very closely to closely spaced, subhorizontal to inclined (20 deg.), undulating, rough with**		**40.03**		**9.69**

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER**

Engineer **WSP UK LIMITED**

Borehole **BH01**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**

National Grid Coordinates **384875.4** E **398465.8** N

Ground Level **49.72** m OD

Drilling | Properties/Sampling | Strata — Scale 1:50

Core Run/Depth (Core Dia/Time)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
					(20)	occasional sand infill (up to 5mm).		40.03		9.69
						Extremely weak reddish brown fine to medium grained SANDSTONE recovered as slightly gravelly sand.		40.20		9.52
						Weak to medium strong reddish brown fine to medium grained SANDSTONE. Discontinuities are closely to medium spaced, subhorizontal, undulating, rough and clean.				
						Very weak reddish brown fine to coarse grained SANDSTONE with occasional thin to thick laminae of extremely weak reddish brown mudstone. Discontinuities are extremely closely to closely spaced, subhorizontal, undulating, rough with sand infill (up to 10mm).				
						Weak reddish brown fine to medium grained SANDSTONE. Discontinuities are very closely spaced, subhorizontal, undulating, rough with occasional sand infill (up to 5mm).				
						End of Borehole				

Drilling | Progress | Groundwater

Drilling Depth	Hole Dia	Technique	Crew	Progress Depth of Hole	Depth Cased	Depth to Water	Date	Time	Groundwater Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER**
Engineer **WSP UK LIMITED**
Borehole **BH02**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**
National Grid Coordinates **384819.8** E **398429.2** N
Ground Level **49.07** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD
							G.L.		49.07
0.10	B					MADE GROUND: Grey slightly sandy angular to subangular fine to coarse gravel of limestone.	0.10		48.97
0.10	ES								
0.30	ES								
0.50	ES					MADE GROUND: Dark brown slightly sandy slightly gravelly silt with a low cobble content. Gravel is angular to subangular fine to coarse of mudstone, brick and concrete.			
1.00	B								
1.00	ES								
1.20	D								
1.20- 1.48		1.20 (DRY)			S64/ 125				
1.50	B								
2.00	B					At 2.00m, medium dense.			
2.00	D								
2.00	ES								
2.00- 2.45		2.00 (DRY)			S17				
							2.70		46.37
3.00	B					Firm brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone, sandstone, quartz and coal.			
3.00	ES								
3.00	UT55	3.00 (DRY)							
3.80- 3.90	D								
4.00- 4.45	B								
4.00- 4.45	D	4.00 (DRY)			S11				
4.80- 4.90	D								
5.00- 5.45	UT30	5.00 (DRY)							
5.45- 5.55	D								
6.00- 6.10	D								
6.50- 6.95	B								
6.50- 6.95	D	6.50 (DRY)			S11				
							7.30		41.77
7.50- 7.60	D					Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone, quartz and coal.			
8.00- 8.45	UT50	8.00 (DRY)							
8.45- 8.55	D								
9.00- 9.10	D								
9.50- 9.95	B								
9.50- 9.95	D	9.50 (DRY)			S20				

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	AH/SG
3.00	0.25	Cable Percussion	AH/SG
3.50	0.20	Cable Percussion	AH/SG
16.00	0.20	Cable Percussion	SP
24.40	0.15	Cable Percussion	SP
40.90	0.12	Rotary Core	SG/TH

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			10/05/21	08:00
3.50	3.50	DRY	10/05/21	18:00
3.50	3.50	DRY	11/05/21	08:00
14.00	14.00	DRY	11/05/21	18:00
14.00	14.00	DRY	12/05/21	08:00
20.23	20.00	ADDED	12/05/21	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

AGS

Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml vial, 2 x 258ml amber glass jars and 1 x plastic jar.
Water was added to assist boring below 15.50m.
SPTs at 1.20m and 2.00m were undertaken by Steve Green using his trip hammer.
A 50mm standpipe was installed to 16.00m with a geowrapped slotted section from 10.00m to 16.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 16.00m, gravel filter up to 10.00m, bentonite seal up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Figure **1 of 5**
22/06/2021

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER**
Engineer **WSP UK LIMITED**
Borehole **BH02**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**
National Grid Coordinates **384819.8** E **398429.2** N
Ground Level **49.07** m OD

Scale 1:50

Sampling			Properties			Strata			
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD
10.50-10.60	D								
11.00-11.45	UT60	11.00 (DRY)							
						Stiff brown slightly sandy slightly gravelly CLAY with a low cobble content. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone, sandstone and quartz.	11.10		37.97
11.45-11.55	D								
12.00-12.10	D								
12.50-12.95	B								
12.50-12.95	D	12.50 (DRY)			S30				
13.50-13.60	D								
14.00-14.45	UT52	14.00 (DRY)							
							14.40		34.67
14.45-14.55	D					Stiff brown slightly sandy slightly gravelly CLAY with a low cobble content and occasional lenses of brown fine to medium sand (up to 100mm thick). Gravel is subangular to subrounded fine to coarse of mudstone, siltstone and sandstone.			
15.00-15.10	D								
15.50-15.95	B								
15.50-15.84	D	15.50 (DRY)			S50/ 190				
16.50-16.60	D								
							16.90		32.17
17.00-17.45	B					Dark to very dark orangish brown gravelly fine to coarse SAND. Gravel is subrounded to rounded fine to coarse of mudstone and siltstone.			
17.00-17.45	D	17.00 (ADDED)			S34				
18.00-18.10	D								
18.50-18.77	B								
18.50-18.77	D	18.50 (ADDED)			S50/ 150				
19.50-19.60	D								
							19.80		29.27
20.00-20.23	B								
20.00-20.23	D								

Boring

Depth	Hole Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
20.23	20.00	WET	13/05/21	08:00
24.50	24.40	ADDED	13/05/21	18:00
24.50	24.40	23.00	17/05/21	08:00
30.40	24.40		17/05/21	18:00
30.40	24.40		18/05/21	08:00
40.90	24.40		18/05/21	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks AGS **Chiselling: 1.60-1.80m for 60 minutes.**
Flush: 24.40-40.90m, Air/Mist, 100% return.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

geotechnics

BOREHOLE RECORD - Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER** | Engineer **WSP UK LIMITED** | **Borehole** **BH02** Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED** | National Grid Coordinates **384819.8** E **398429.2** N | Ground Level **49.07** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD
		20.00 (ADDED)			S50/ 115	Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone, sandstone, quartz and coal.			
							20.70		28.37
21.00-21.10	D					Very dense reddish brown gravelly slightly silty fine to coarse SAND. Gravel is subrounded to rounded fine to coarse of mudstone, sandstone and quartz.			
21.50-21.71	B								
21.50-21.71	D	21.50 (ADDED)			S50/ 115				
22.50-22.60	D								
23.00-23.16	B								
23.00-23.17	D	23.00 (ADDED)			S50/93				
24.00-24.10	D								
24.20-24.50	B								
24.20-24.27		24.20 (ADDED)			S50/30				
						Very weak brownish red SANDSTONE.	24.37		24.70
							24.40		24.67

Core Run/Depth (Core Dia/Time)	Depth Cased	TCR/SCR / Type	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General	Detail	Depth	Level m OD
					(7)	Weak to medium strong reddish brown fine to medium grained SANDSTONE with occasional thin laminae of extremely weak reddish brown mudstone. Discontinuities are closely to medium spaced, subhorizontal, undulating, rough and clean.	Between 25.40-25.90m, extremely weak reddish brown fine to coarse grained sandstone.		
24.40-25.90	24.40	100 87	0.24 0.01	71	(NI) 50/10				
24.50-24.54	24.50 (ADDED)				(4)				
25.90-27.40	24.40	57 11	0.03 0.01	0	(AZCL)				
					(8)				
								26.88	22.19
					(NI)	Extremely weak reddish brown fine to coarse grained SANDSTONE interlaminated with thin to thick laminae of reddish brown mudstone, recovered as gravelly sand.			
27.40-28.90	24.40	100 21	0.05 0.01	0					
27.40-27.58	24.40 (ADDED)				C100/ 95			27.89	21.18
					(14)	Very weak reddish brown fine to medium grained SANDSTONE. Discontinuities are closely spaced, subhorizontal, undulating, rough with fine to medium sand infill (up to 10mm).		28.40	20.67
					(NI)				
28.90-30.40	24.40	84 3	0.04 0.01	0	(AZCL)				
					(NI)	Extremely weak reddish brown fine to coarse grained SANDSTONE recovered as gravelly slightly silty sand.			

Boring

Depth	Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER** | Engineer **WSP UK LIMITED** | Borehole / Project No **BH02** / **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED** | National Grid Coordinates **384819.8 E 398429.2 N** | Ground Level **49.07** m OD

Drilling | Properties/Sampling | Strata | Scale 1:50

Core Run/Depth (Core Dia/Time)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
30.40-31.90	24.40	92 5	0.07 0.01	0	(AZCL) (NI)					
31.90-33.40	24.40	82 4	0.06 0.01	0	(AZCL) (NI)			33.40		15.67
33.40-34.90	24.40	94 45	0.08 0.01	0	(AZCL) (>30) (NI) (7)	Extremely to very weak reddish brown fine to medium grained SANDSTONE. Discontinuities are very closely to closely spaced, subhorizontal, undulating, rough with fine to medium sand infill (up to 20mm).				
34.90-36.40	24.40	81 27	0.14 0.01	16	(AZCL) (>30) (NI) (21)			36.40		12.67
36.40-37.90	24.40	94 72	0.13 0.01	31	(AZCL) (NI) (10)	Weak reddish brown fine to coarse grained SANDSTONE with occasional thick laminae of extremely weak reddish brown mudstone. Discontinuities are very closely to closely spaced, subhorizontal, undulating, rough and clean.	At 37.20m, grey reduction spot.			
37.90-39.40	24.40	100 73	0.26 0.01	46	(NI) (6)	Weak to medium strong reddish brown fine to medium grained SANDSTONE. Discontinuities are closely to medium spaced, subhorizontal, undulating, rough and clean.	At 38.88m, grey reduction spot.	38.64		10.43
39.40-40.90	24.40	100 90	0.34 0.01	80			Between 39.73-39.80m, weak reddish brown mudstone.			

Drilling | Progress | Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER**
Engineer **WSP UK LIMITED**
Borehole **BH02**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**
National Grid Coordinates **384819.8** E **398429.2** N
Ground Level **49.07** m OD

Drilling | Properties/Sampling | Strata | Scale 1:50

Core Run/Depth (Core Dia/Time)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
					(5)					
						End of Borehole		40.90		8.17

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER**
Engineer **WSP UK LIMITED**
Borehole **BH03**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**
National Grid Coordinates **384872.7** E **398446.7** N
Ground Level **47.52** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Level m OD
							G.L.	47.52
						MADE GROUND: Black tarmacadam.	0.05	47.47
0.19	ES						0.20	47.32
0.20	D					MADE GROUND: Grey concrete.		
0.25- 0.45	B						0.50	47.02
0.30	ES					MADE GROUND: Black gravelly slightly silty fine to coarse sand. Gravel is angular to subangular fine		
0.50	D					to coarse of clinker, concrete and brick fragments.	0.70	46.82
0.55- 0.65	B						0.90	46.62
0.60	ES					MADE GROUND: Grey slightly silty angular to subangular fine to coarse gravel of limestone. Low		
0.70	D					cobble content.		
0.75- 0.85	B						1.40	46.12
0.90	D					MADE GROUND: Black gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of		
0.95- 1.20	B					clinker, concrete and brick fragments.		
1.00	ES							
1.20- 1.65	UT77	(DAMP)				POSSIBLE MADE GROUND: Firm to stiff brown mottled grey slightly sandy slightly gravelly CLAY with		
1.70	D					relict root traces. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone,		
1.80	D					quartz and occasional brick fragments.		
2.00- 2.45	B							
2.00- 2.45	D	1.60			S17			
2.00	ES	(DRY)						
2.80	D					Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse		
3.00- 3.45	UT59	1.60 (DRY)				of mudstone, siltstone, sandstone, slate and quartz.		
3.50	D							
3.80	D							
4.00- 4.45	B						4.00	43.52
4.00- 4.45	D	3.10 (DRY)			S9	Firm brown slightly sandy slightly gravelly CLAY with occasional bands (up to 20mm thick) of brown fine to medium sand. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone, sandstone and coal. Between 4.00-4.45m, firm.		
4.80	D							
5.00- 5.45	UT35	4.70 (DRY)						
5.50	D							
5.90	D							
6.50- 6.95	B							
6.50- 6.95	D	4.70 (DRY)			S17			
7.75	D							
8.00- 8.45	UT70	6.20 (DRY)						
8.90	D							
9.50- 9.95	B					Below 9.50m, very stiff.		
9.50- 9.95	D	9.20 (DRY)			S33			

Boring

Depth	Hole Dia	Technique	Crew
0.20	0.35	Concrete Core	AJ
1.20	0.35	Inspection Pit	NF/IT
18.50	0.20	Cable Percussion	NF/IT
24.00	0.15	Cable Percussion	NF/IT
40.50	0.12	Rotary Core	SG/TH

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			04/05/21	08:00
5.50	4.70	DRY	04/05/21	18:00
5.50	4.70	5.20	05/05/21	08:00
10.00	9.20	DRY	05/05/21	18:00
10.00	9.20	DRY	06/05/21	08:00
12.95	12.90	12.20	06/05/21	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	In Mins	Depth Sealed	Remarks on Groundwater
1.20					Seepage - no rise.

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml vial, 2 x 258ml amber glass jars and 1 x plastic jar.
Water was added to assist boring between 11.40m and 12.10m, and between 14.30m and 18.50m.
A 50mm standpipe was installed to 1.40m with a geowrapped slotted section from 0.50m to 1.40m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 1.40m, gravel filter up to 0.50m, bentonite seal up to 0.20m, concrete up to ground level.
Flush: 24.00-40.50m, Air/Mist, 100% return.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **JD**

Figure **1 of 5**
22/06/2021

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER**
Engineer **WSP UK LIMITED**
Borehole **BH03**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**
National Grid Coordinates **384872.7** E **398446.7** N
Ground Level **47.52** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD
10.50	D								
11.00-11.45	UT88	10.60 (DRY)							
11.50	D					Brown slightly gravelly fine to coarse SAND. Gravel is subangular to rounded fine to medium of mudstone, siltstone and quartz.	11.40		36.12
11.80	D								
12.10	D					Stiff brown sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone, quartz and coal.	12.10		35.42
12.50-12.95	B								
12.50-12.95	D	12.40 (12.20)			S22				
13.50	D								
14.00-14.43	D	13.80 (DRY)			S50/ 275				
15.00	D								
15.30	D					Dark brown sandy subrounded to rounded fine to coarse GRAVEL of mudstone, siltstone and sandstone with a low cobble content.	15.30		32.22
15.50-15.95	B								
15.50-15.95		15.50 (14.30)			C45				
16.00	D								
17.00-17.45	B					Below 17.00, very dense.			
17.00-17.35	D	16.90 (15.50)			S50/ 200				
18.00	D								
18.50-18.95	B								
18.50-18.84	D	18.50 (17.10)			S50/ 190				
						Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone, sandstone and quartz with a low cobble content. With occasional bands (up to 35mm thick) of sandy fine to medium gravel.	18.95		28.57
20.00-20.45	B								

Boring

Depth	Hole Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
12.95	12.90	DRY	07/05/21	08:00
18.95	18.50	17.60	07/05/21	18:00
18.95	18.50	17.60	10/05/21	08:00
24.00	24.00	21.40	10/05/21	18:00
24.00	24.00	22.40	12/05/21	08:00
33.00	24.00		12/05/21	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **JD**

Figure **2 of 5**
22/06/2021

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER** | Engineer **WSP UK LIMITED** | **Borehole** **BH03** Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED** | National Grid Coordinates **384872.7 E 398446.7 N** | Ground Level **47.52** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD
20.00-20.33		20.00 (18.30)			C50/ 190				
21.50-21.95	B								
21.50-21.76		21.50 (19.80)			C50/ 150				
22.70	D								
23.00-23.45	B								
23.00-23.27		23.00 (21.10)			C50/ 115				
23.50	D						23.50		24.02
						Very weak to weak reddish brown slightly gravelly SANDSTONE.			
23.90-23.96		23.60 (21.40)			C50/30		24.00		23.52

Core Run/Depth (Core Dia/Time)	Depth Cased	TCR/SCR / Type	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General	Detail	Depth	Legend	Level m OD
24.00-25.50	24.00	92 56	0.14 0.01	48	(AZCL) (NI) (6)	Weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are very closely to closely spaced, subhorizontal, undulating, stepped, rough with fine to coarse sand infill (up to 4mm).				
25.50-27.60	24.00	95 64	0.20 0.01	40	(AZCL) (10)			26.29		21.23
					(NI) (10) (NI) (18) (AZCL)	Very weak to weak reddish brown fine grained SANDSTONE with frequent thin laminae of extremely weak reddish brown mudstone. Discontinuities are extremely to very closely spaced, subhorizontal, undulating, rough with fine sand and fine subangular to rounded gravel infill.		26.58 27.16		20.94 20.36
27.60-28.50	24.00	93 43	0.10 0.01	6	(>30) (NI) (12)	Weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are very closely to closely spaced, subhorizontal, undulating, stepped, rough with fine to coarse sand infill (up to 4mm).		28.08		19.44
28.50-30.00	24.00	86 28	0.08 0.01	0	(AZCL) (NI) (16) (18)	Extremely weak reddish brown fine to medium grained SANDSTONE recovered as gravelly sand.		28.70 29.73		18.82 17.79

Boring

Depth	Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
33.00	24.00	14.60	13/05/21	08:00
40.50	24.00		13/05/21	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **JD**

Figure **3 of 5**

22/06/2021

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER**
Engineer **WSP UK LIMITED**
Borehole **BH03**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**
National Grid Coordinates **384872.7** E **398446.7** N
Ground Level **47.52** m OD

Scale 1:50

Core Run/Depth (Core Dia/Time)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
								30.06		17.46
30.00-31.50	24.00	100 82	0.30 0.01	58	(NI) (>30) (NI) (6) (NI) (6)	Weak to medium strong reddish brown fine grained SANDSTONE. Discontinuities are closely spaced, subhorizontal to inclined (15 deg.), undulating, rough and clean.		30.30		17.22
31.50-33.00	24.00	100 67	0.23 0.01	38	(NI) (12)	Extremely to very weak reddish brown fine to medium grained SANDSTONE interlaminated with extremely weak reddish brown mudstone with occasional reduction spots of grey fine to medium grained sandstone. Discontinuities are extremely closely spaced, subhorizontal, undulating, rough with sand infill (up to 7mm).		31.66		15.86
								32.36		15.16
								32.73		14.79
33.00-34.50	24.00	100 26	0.15 0.01	10	(NI) (9) (NI)	Weak to medium strong reddish brown fine to coarse grained SANDSTONE with occasional subangular to rounded fine gravel of quartz. Discontinuities are closely spaced, subhorizontal, undulating, rough with occasional sand infill (up to 4mm).		33.07		14.45
								34.00		13.52
34.50-36.00	24.00	100 59	0.29 0.01	48	(>30) (8) (NI) (7)	Extremely to very weak reddish brown MUDSTONE mainly recovered as subrounded to rounded fine to coarse gravel. Discontinuities are closely spaced, subhorizontal, undulating, rough with occasional sand infill (up to 4mm).		35.20		12.32
36.00-37.50	24.00	86 53	0.26 0.01	36	(AZCL) (28) (NI) (10) (NI)	Weak to medium strong reddish brown fine to medium grained SANDSTONE with occasional think laminae of fine grained siltstone and occasional subrounded to rounded fine gravel of quartz. Discontinuities are very closely to medium spaced, subhorizontal, undulating, rough with sand infill (up to 10mm).	Between 31.30-31.35m, inclined (45 deg.), planar, rough and clean discontinuity.	37.24		10.28
37.50-39.00	24.00	80 36	0.10 0.01	6	(AZCL) (>30) (NI) (>30)	Weak to medium strong reddish brown fine to medium grained SANDSTONE. Discontinuities are closely to medium spaced, subhorizontal, undulating, rough with sand infill (up to 10mm).				
39.00-40.50	24.00	85 44	0.22 0.01	18	(AZCL) (>30) (NI)	Very weak reddish brown fine to medium grained SANDSTONE interlaminated with thin to thick laminae of extremely weak reddish brown mudstone. Non intact.				

Drilling

Depth	Hole Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **JD**

Figure **4 of 5**
22/06/2021

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER**

Engineer **WSP UK LIMITED**

Borehole **BH03**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**

National Grid Coordinates **384872.7** E **398446.7** N

Ground Level **47.52** m OD

Drilling | Properties/Sampling | Strata — Scale 1:50

Core Run/Depth (Core Dia/Time)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
					(>30) (NI) (8)	Weak to medium strong reddish brown fine to coarse grained SANDSTONE with occasional subrounded to rounded fine gravel of quartz. Discontinuities are closely spaced, subhorizontal, undulating to stepped, rough and clean.		40.09		7.43
						Extremely weak reddish brown fine to coarse grained SANDSTONE interlaminated with thin laminae of extremely weak reddish brown mudstone. Non intact.		40.50		7.02
						Weak to medium strong reddish brown fine to medium grained SANDSTONE with thick laminae of reddish brown mudstone. Discontinuities are medium spaced, subhorizontal, undulating, rough with occasional sand infill (up to 3mm).				
						Weak to medium strong reddish brown fine to medium grained SANDSTONE with occasional subrounded to rounded fine gravel of quartz. Discontinuities are closely to medium spaced, subhorizontal, undulating, rough and clean.	Between 35.40-35.50m, inclined (45 deg.), undulating, rough and clean discontinuity. Between 36.48-36.58m, extremely weak reddish brown mudstone.			
						Very weak to weak reddish brown fine to coarse grained SANDSTONE with many thin to thick laminae of extremely weak mudstone. Discontinuities are very closely spaced, subhorizontal, undulating, rough with sand infill (up to 10mm).				
						Medium strong reddish brown fine to medium grained SANDSTONE. Discontinuities are closely spaced, subhorizontal, undulating, rough and clean.				
						End of Borehole				

Drilling

Depth	Hole Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **JD**

Figure **5 of 5**
22/06/2021

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER** | Engineer **WSP UK LIMITED** | Borehole / Project No **BH04** / **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED** | National Grid Coordinates **384823.0 E, 398402.4 N** | Ground Level **47.43** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD
							G.L.		47.43
0.10- 0.60	B					MADE GROUND: Grey concrete.	0.10		47.33
0.10- 0.60	D								
0.10- 0.20	ES					MADE GROUND: Black gravelly slightly silty fine to coarse sand with a low cobble content. Gravel is angular to subangular fine to coarse of clinker, concrete and brick fragments.	0.60		46.83
0.30- 0.40	ES								
0.60- 1.00	B								
0.60- 1.00	D								
0.60- 0.70	ES								
1.00- 1.20	D					MADE GROUND: Dark grey sandy gravelly silt with a low cobble content. Gravel is angular to subangular fine to coarse of clinker, concrete and brick fragments.	1.00		46.43
1.00- 1.10	ES								
1.20- 1.65	UT21	1.20 (DRY)							
1.65- 1.75	D					Soft brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone, sandstone, slate and quartz.			
2.00- 2.45	B								
2.00- 2.45	D	2.00 (DRY)			S1/450	At 2.00m, very soft.			
2.00	ES								
2.80- 2.90	D								
3.00- 3.45	UT20	3.00 (DRY)							
3.45- 3.55	D								
3.80- 3.90	D						3.80		43.63
4.00- 4.45	B					Firm brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and quartz.			
4.00- 4.45	D	4.00 (DRY)			S9				
4.80- 4.90	D								
5.00- 5.45	UT42	5.00 (DRY)					5.00		42.43
5.45- 5.55	D					Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone and sandstone.			
6.00- 6.10	D								
6.50- 6.95	B								
6.50- 6.95	D	6.50 (DRY)			S18				
7.50- 7.60	D								
8.00- 8.45	UT50	8.00 (DRY)							
8.45- 8.55	D								
9.00- 9.10	D								
9.50- 9.95	B								
9.50- 9.95	D	9.50 (DRY)			S25				

Boring Progress

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time
0.10	0.35	Concrete Core	AJ	G.L.			04/05/21	08:00
1.20	0.35	Inspection Pit	SP	7.00	5.00	DRY	04/05/21	18:00
1.70	0.25	Cable Percussion	SP	7.00	5.00	DRY	05/05/21	08:00
15.00	0.20	Cable Percussion	SP	13.79	13.50	DRY	05/05/21	18:00
24.50	0.15	Cable Percussion	SP	13.79	13.50	DRY	06/05/21	08:00
40.00	0.12	Rotary Core	SG/TH	17.60	17.50	ADDED	06/05/21	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml vial, 2 x 258ml amber glass jars and 1 x plastic jar.
Water was added to assist boring between 13.50m and 17.60m.
A 50mm standpipe was installed to 10.00m with a geowrapped slotted section from 2.00m to 10.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 10.00m, gravel filter up to 2.00m, bentonite seal up to 0.20m, concrete up to ground level.
Chiselling: 24.00-24.50m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **JD**

Figure **1 of 5**

22/06/2021

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER**
Engineer **WSP UK LIMITED**
Borehole **BH04**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**
National Grid Coordinates **384823.0** E **398402.4** N
Ground Level **47.43** m OD

Scale 1:50

Sampling			Properties			Strata			
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD
10.50-10.60	D								
11.00-11.45	B						11.00		36.43
11.00-11.45	D	11.00 (DRY)			S38	Stiff to very stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone, sandstone, quartz and coal.			
12.00-12.10	D								
12.50-12.95	UT100	12.95 (DRY)							
12.95-13.05	D								
13.50-13.79	B						13.50		33.93
13.50-13.78	D	13.50 (DRY)			S50/ 130	Very dark brown sandy slightly silty subrounded to rounded fine to coarse GRAVEL of mudstone, siltstone, sandstone and quartz with a medium cobble content.			
14.50-14.60	D								
15.00-15.45	B						15.00		32.43
15.00-15.45	D	15.00 (ADDED)			S33	Dense reddish brown slightly gravelly slightly silty fine to coarse SAND. Gravel is subangular to rounded fine to medium of sandstone and quartz.			
							15.50		31.93
16.00-16.10	D					Brown gravelly fine to medium SAND. Gravel is subangular to rounded fine to medium of sandstone, quartz and coal.			
16.50-16.76	B								
16.50-16.76	D	16.50 (ADDED)			S50/ 150				
17.50-17.60	D								
18.00-18.29	B								
18.00-18.29	D	18.00 (ADDED)			S50/ 180				
19.00-19.10	D								
19.50-19.70	B								
19.50-19.67	D	19.50 (ADDED)			S50/80				

Boring

Depth	Hole Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
17.60	17.50	ADDED	07/05/21	08:00
22.82	22.50	ADDED	07/05/21	18:00
22.82	22.50	ADDED	10/05/21	08:00
24.50	24.50	ADDED	10/05/21	18:00
24.50	24.50		11/05/21	08:00
40.00	24.50	16.80	11/05/21	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks **Flush: 24.50-40.00m, Air/Mist, 100% return.**

Logged by **JD**

Figure **2 of 5**
22/06/2021

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER**
Engineer **WSP UK LIMITED**
Borehole **BH04**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**
National Grid Coordinates **384823.0** E **398402.4** N
Ground Level **47.43** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD
20.50-20.60	D								
21.00-21.26	B								
21.00-21.26	D	21.00 (DRY)			S50/ 115				
22.00-22.10	D					Below 22.00m, low cobble content.			
22.50-22.82	B								
22.50-22.82	D	22.50 (ADDED)			S50/ 170				
23.50-23.60	D						23.50		23.93
						Very weak to weak reddish brown fine to coarse grained SANDSTONE.			
24.00-24.08	B								
24.00-24.08		24.00 (ADDED)			S50/30				
24.50-24.56		24.50 (ADDED)			S50/20		24.50		22.93

Core Run/Depth (Core Dia/Time)	Depth Cased	TCR/SCR / Type	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General	Detail	Depth	Legend	Level m OD
24.50-26.00	24.50	93 47	0.14 0.01	9	(AZCL) (NI) (27) (NI)	Very weak reddish brown fine to coarse grained SANDSTONE with occasional subrounded to rounded fine gravel of quartz. Discontinuities are very closely to extremely closely spaced, subhorizontal, undulating, rough with fine sand infill (up to 3mm thick).		25.53		21.90
26.00-27.50	24.50	85 58	0.11 0.01	21	(>30) (NI) (9) (AZCL) (>30) (NI)	Very weak to weak reddish brown fine to coarse grained SANDSTONE with frequent subrounded to rounded fine to medium gravel of mudstone and quartz. Discontinuities are closely to very closely spaced, subhorizontal, undulating, rough with fine to coarse sand infill (up to 10mm thick).		27.25		20.18
27.50-29.00	24.50	95 80	0.35 0.01	56	(16) (AZCL) (NI) (10) (NI) (7)	Very weak to weak reddish brown fine to coarse grained SANDSTONE with closely spaced laminae of extremely weak reddish brown mudstone. Discontinuities are closely to very closely spaced, subhorizontal, undulating, rough with fine to coarse sand infill (up to 10mm		27.69		19.74
29.00-30.50	24.50	90 86	0.37 0.03	69	(AZCL) (5) (>30)			29.82		17.61

Boring

Depth	Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **JD**

Figure **3 of 5**
22/06/2021

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER** | Engineer **WSP UK LIMITED** | Borehole / Project No **BH04** / **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED** | National Grid Coordinates **384823.0 E, 398402.4 N** | Ground Level **47.43** m OD

Scale 1:50

Core Run/Depth (Core Dia/Time)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
					(12)	thick).				
30.50-32.00	24.50	89 89	0.35 0.05	74	(AZCL) (6)	Weak reddish brown medium grained SANDSTONE with occasional laminae of subrounded to rounded fine to coarse gravel of mudstone and quartz. Discontinuities are closely to medium spaced, subhorizontal, planar, rough with medium sand infill (up to 2mm).	At 28.09m, 50mm band of subangular fine to coarse gravel.			
32.00-33.50	24.50	93 93	0.51 0.05	70	(AZCL) (5)	Weak reddish brown medium to coarse grained SANDSTONE with occasional subrounded to rounded fine to medium gravel of mudstone and quartz. Discontinuities are closely spaced, subhorizontal, undulating, rough with medium to coarse sand infill (up to 5mm).	Below 30.67m, discontinuities are very closely to medium spaced and clean. At 31.52m, inclined (35 deg.) planar, smooth and clean discontinuity. At 33.40m, medium to coarse sand infill (20mm thick).			
33.50-35.00	24.50	92 83	0.45 0.01	51	(AZCL) (>30) (NI) (7)		At 33.83m, 50mm bed of extremely weak reddish brown mudstone, recovered as gravel.			
35.00-36.50	24.50	94 60	0.25 0.01	23	(AZCL) (>30) (12)		Below 35.09m, very weak.			
								35.83		11.60
36.50-38.00	24.50	95 63	0.01	48	(NI) (20) (AZCL) (NI) (7) (NI) (8)	Weak to medium strong reddish brown fine to medium grained SANDSTONE with occasional thin laminae of extremely weak reddish brown mudstone. Discontinuities are closely spaced, subhorizontal, planar, rough with fine sand and occasional fine to medium gravel infill (up to 50mm).				
38.00-39.50	24.50	87 20	0.11 0.01	7	(AZCL) (20) (NI) (>30)	Extremely weak to very weak reddish brown fine to medium grained SANDSTONE interbedded with extremely weak reddish brown mudstone. Recovered as non-intact.		38.37		9.06
								39.12		8.31
39.50-40.00	24.50	20 20	0.10 0.10	20	(AZCL) (20)	Very weak to weak thinly bedded reddish brown fine to medium grained SANDSTONE. Discontinuities are		40.00		7.43

Drilling

Depth	Hole Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **JD**

Figure **4 of 5**

22/06/2021

geotechnics

BOREHOLE RECORD – Cable Percussion and Rotary

Project **PORT STREET, MANCHESTER**

Engineer **WSP UK LIMITED**

Borehole **BH04**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**

National Grid Coordinates **384823.0** E **398402.4** N

Ground Level **47.43** m OD

Drilling | Properties/Sampling | Strata — Scale 1:50

Core Run/Depth (Core Dia/Time)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
						extremely to very closely spaced, subhorizontal to inclined (up to 30 deg.), planar, smooth and clean.		**40.00**		**7.43**
						End of Borehole				

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **JD**

Figure **5 of 5**
22/06/2021

geotechnics

Fieldwork Results - SPT Results Summary

Project PORT STREET, MANCHESTER **Project No** PN214228

Client MANCHESTER (PORT STREET) LIMITED

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' 10 20 30 40 50
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		
BH01	1.20	48.52	C	-	7	10	5	8	7	8	28	
BH01	2.00	47.72	C	-	14	10	13	9	10	10	42	
BH01	4.00	45.72	C	-	2	2	2	4	4	5	15	
BH01	6.50	43.22	S	-	1	2	2	2	3	3	10	
BH01	9.50	40.22	S	-	2	3	4	5	6	8	23	
BH01	11.50	38.22	S	-	3	4	5	7	7	10	29	
BH01	13.00	36.72	S	-	4	5	6	8	8	11	33	
BH01	14.50	35.22	S	-	2	3	5	9	8	15	37	
BH01	16.00	33.72	S	-	5	7	10	12	14	14	50	
BH01	17.50	32.22	C	-	9	14	15	21	14/50		50/200	
BH01	19.00	30.72	C	-	6	10	13	17	20		50/225	
BH01	20.50	29.22	S	-	11	14	23	27			50/150	
BH01	22.00	27.72	C	-	10	13	28	22/60			50/135	
BH01	23.00	26.72	C	-	5	8	9	9	10	11	39	
BH01	25.00	24.72	C	-	25/40		50/30				50/30	
BH01	25.20	24.52	C	-	25/30		50/40				50/40	
BH01	29.70	20.02	C	-	25/70		100/20				100/20	
BH01	31.20	18.52	C	-	12	13	74	26/10			100/85	

Driller	Neil Forester
Hammer No.	TH1
Energy Ratio, Er (%)	73.85
Calibration Date	22/01/2021

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

Fieldwork Results - SPT Results Summary

Project PORT STREET, MANCHESTER **Project No** PN214228

Client MANCHESTER (PORT STREET) LIMITED

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' 10 20 30 40 50
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		
BH02	1.20	47.87	S	-	4	7	14	50/50			64/125	>
BH02	2.00	47.07	S	-	2	2	4	4	5	4	17	*
BH02	4.00	45.07	S	-	2	2	2	3	3	3	11	*
BH02	6.50	42.57	S	-	1	1	2	2	3	4	11	*
BH02	9.50	39.57	S	-	2	2	4	4	7	5	20	*
BH02	12.50	36.57	S	-	4	5	6	8	8	8	30	*
BH02	15.50	33.57	S	-	8	13	17	22	11/40		50/190	>
BH02	17.00	32.07	S	-	3	5	6	7	10	11	34	*
BH02	18.50	30.57	S	-	12	13/40	22	28			50/150	>
BH02	20.00	29.07	S	-	11	14/40	23	27/40			50/115	>
BH02	21.50	27.57	S	-	15	10/20	30	20/40			50/115	>
BH02	23.00	26.07	S	-	25		37	13/18			50/93	>
BH02	24.20	24.87	S	-	25/40		50/30				50/30	>
BH02	24.50	24.57		-	25/25		50/10				50/10	>
BH02	27.40	21.67	C	-	17	8/10	75	25/20			100/95	>

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

Fieldwork Results - SPT Results Summary

Project PORT STREET, MANCHESTER **Project No** PN214228

Client MANCHESTER (PORT STREET) LIMITED

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N'
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		10 20 30 40 50
BH03	2.00	45.52	S	-	2	3	4	4	4	5	17	*
BH03	4.00	43.52	S	-	2	1	2	2	2	3	9	*
BH03	6.50	41.02	S	-	2	3	3	4	5	5	17	*
BH03	9.50	38.02	S	-	4	5	6	7	9	11	33	*
BH03	12.50	35.02	S	-	3	4	5	5	6	6	22	*
BH03	14.00	33.52	S	-	12	11	13	14	14	9/50	50/275	>
BH03	15.50	32.02	C	-	6	10	11	10	11	13	45	*
BH03	17.00	30.52	S	-	9	14	15	22	13/50		50/200	>
BH03	18.50	29.02	S	-	11	12	11	21	18/40		50/190	>
BH03	20.00	27.52	C	-	12	13/60	17	20	13/40		50/190	>
BH03	21.50	26.02	C	-	15	10/30	21	29			50/150	>
BH03	23.00	24.52	C	-	10	13	29	21/40			50/115	>
BH03	23.90	23.62	C	-	25/30		50/30				50/30	>

Driller	Neil Forester
Hammer No.	TH1
Energy Ratio, Er (%)	73.85
Calibration Date	22/01/2021

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

Fieldwork Results - SPT Results Summary

Project PORT STREET, MANCHESTER **Project No** PN214228

Client MANCHESTER (PORT STREET) LIMITED

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' 10 20 30 40 50
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		
BH04	2.00	45.43	S	-	1	-	-	-	-	-	1/450	*
BH04	4.00	43.43	S	0	1	1	2	2	2	3	9	*
BH04	6.50	40.93	S	-	2	2	3	4	4	7	18	*
BH04	9.50	37.93	S	-	3	3	5	5	8	7	25	*
BH04	11.00	36.43	S	-	5	5	8	8	10	12	38	*
BH04	13.50	33.93	S	-	11	14	25	25/55			50/130	>
BH04	15.00	32.43	S	-	7	9	8	9	8	8	33	*
BH04	16.50	30.93	S	-	17	8/30	25	25			50/150	>
BH04	18.00	29.43	S	-	14	11/30	20	20	10/30		50/180	>
BH04	19.50	27.93	S	-	18	7/10	40	10/5			50/80	>
BH04	21.00	26.43	S	-	10	15/70	30	20/40			50/115	>
BH04	22.50	24.93	S	-	1	3	23	12	15/20		50/170	>
BH04	24.00	23.43	S	-	25/45		50/30				50/30	>
BH04	24.50	22.93	S	-	25/40		50/20				50/20	>

Driller	Stranger Price
Hammer No.	SRL2
Energy Ratio, Er (%)	72.00
Calibration Date	28/05/2020

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

James Fisher Testing Services
Ruby House
40a Hardwick Grange
Woolton
Warrington
WA1 4RF

SPT Hammer Ref:	SRL2
Test Date:	28/05/2020
Report Date:	29/05/2020
File Name:	SRL2.spt
Test Operator:	MV

Instrumented Rod Data

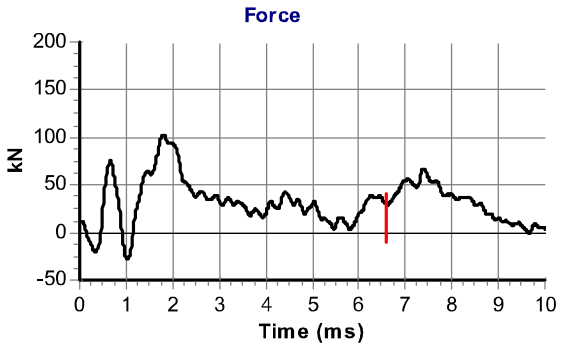
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.5
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	11855
Accelerometer No.2:	9983

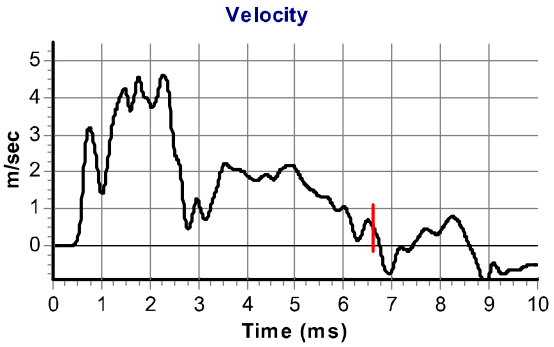
SPT Hammer Information

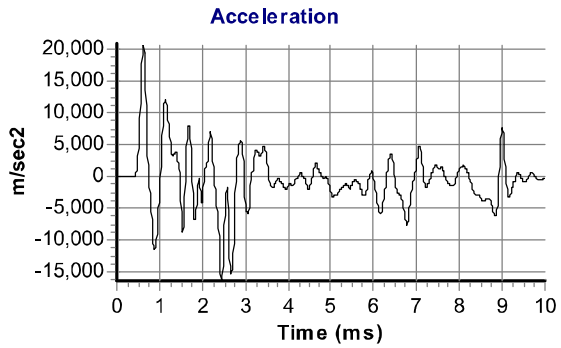
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.5

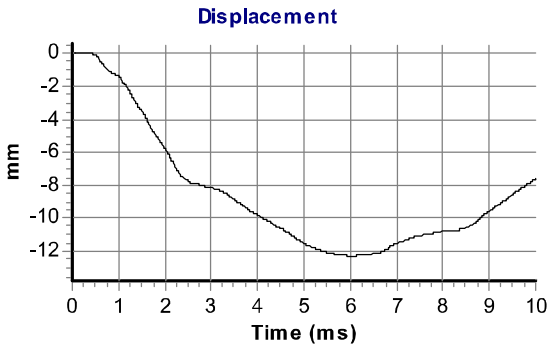
Comments / Location

Client - Strata Renewables
Location - JFTS Laboratory
Hammer Type - Window Sampler









Calculations

Area of Rod A (mm2):	970
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	342

Energy Ratio E_r (%): **72**

Signed: Oliver Turpin
Title: Team Leader

SPTMAN ver.2.00 All rights reserved, Testconsult ©2010

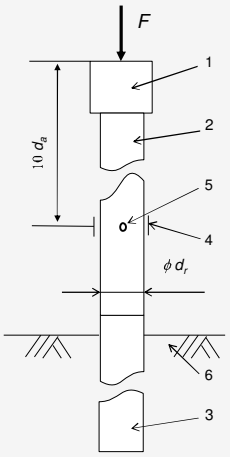
SPT Calibration Report

Hammer Energy Measurement Report

Type of Hammer		SPT HAMMER
Test No		EQU2770
Client		FORESTER DRILLING
Test Depth (m)		9.70
Mass of hammer	m =	63.5kg
Falling height	h =	0.76m
E_{theor} =	$m \times g \times h$ =	473J

Characteristics of the instrumented rod

Diameter	d_r =	0.052 m
Length of instrumented rod		0.558 m
Area	A =	11.61 cm²
Modulus	E_a =	206843 MPa



Key

1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

F Force
d_r Diameter of rod

Fig. B.1 and B.2
BS EN ISO 22476-3 : 2005 + A1 : 2011

DATE OF TEST	VALID UNTIL	HAMMER ID
22/01/2021	22/01/2022	TH1

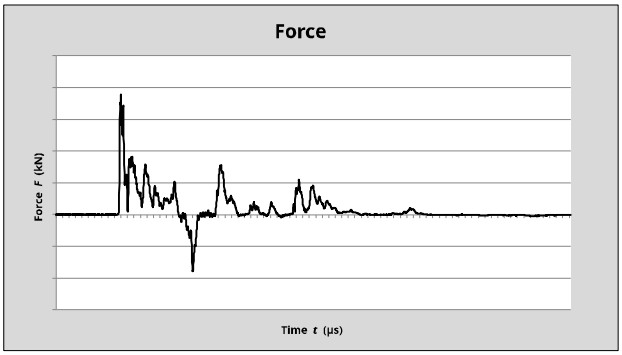
E_{meas} = **0.349** kN-m

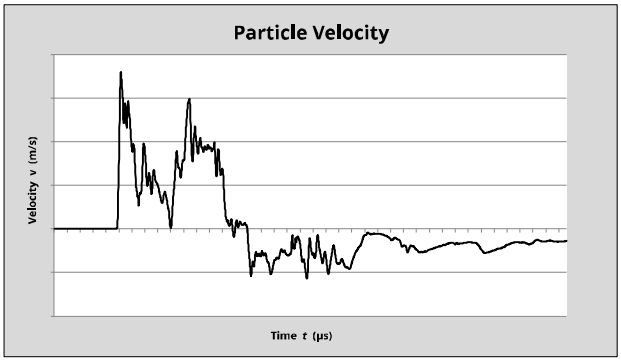
E_{theor} = **0.473** kN-m

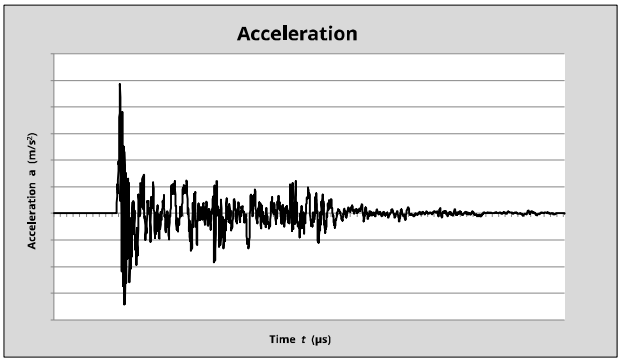
Comments

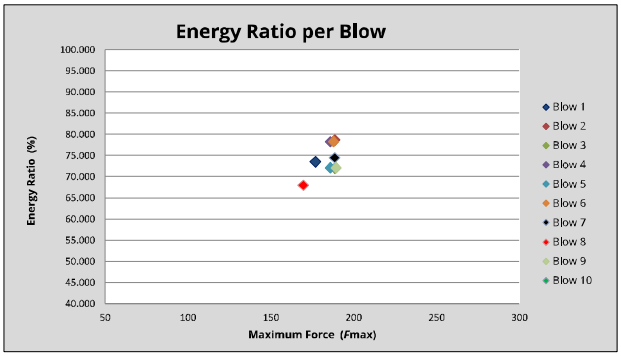
Energy Ratio (Er) = $\frac{E_{meas}}{E_{theor}}$ **73.85%**

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Equipe SPT Analyzer Operator	Certificate prepared by	Certificate checked by	Certificate date
AF			27/01/2021

© Copyright 2021 **Equipe Group**, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232 Email: info@equipegroup.com

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:	AR1760
Test Date:	18/05/2020
Report Date:	18/05/2020
File Name:	AR1760.spt
Test Operator:	CM

Instrumented Rod Data

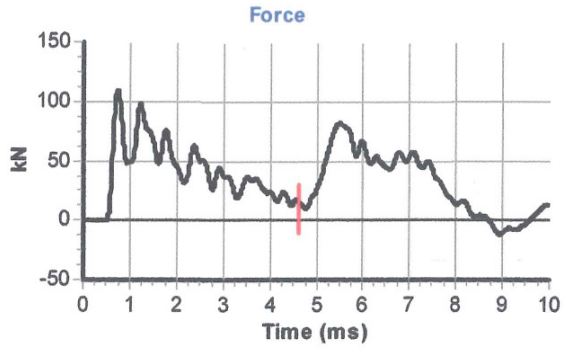
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	7080
Accelerometer No.2:	11609

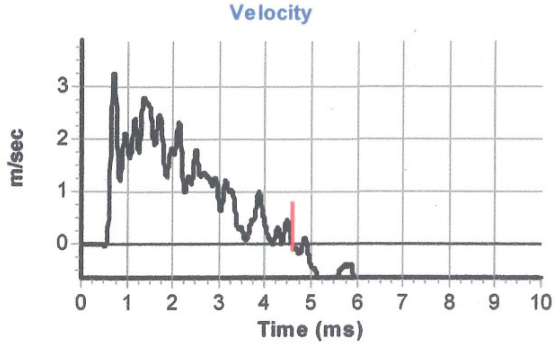
SPT Hammer Information

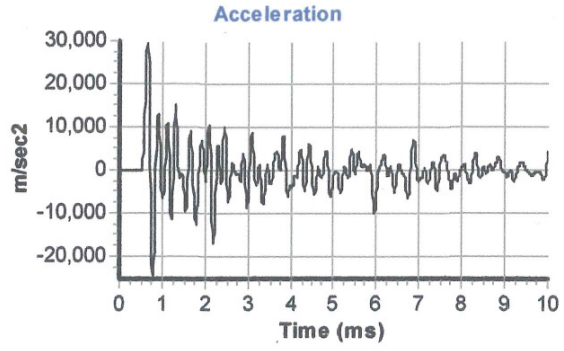
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

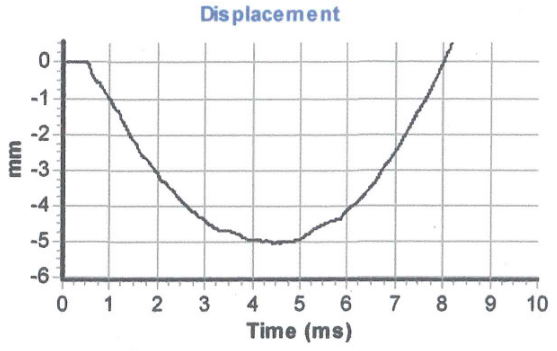
Comments / Location

RAY MAKLIN









Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	309

Energy Ratio E_r (%): **65**

Signed: C.McCLUSKEY

Title: FITTER

The recommended calibration interval is 12 months

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APPENDIX 3

Rotary Core Photographs

Project Number : PN214228

Project : Port Street



BH01 Box 1 25.20-28.20m

PHOTOGRAPHS

Project Number : PN214228

Project : Port Street



BH01 Box 2 28.20-31.20m

Project Number : PN214228

Project : Port Street



BH01 Box 3 31.20-34.20m

Project Number : PN214228

Project : Port Street

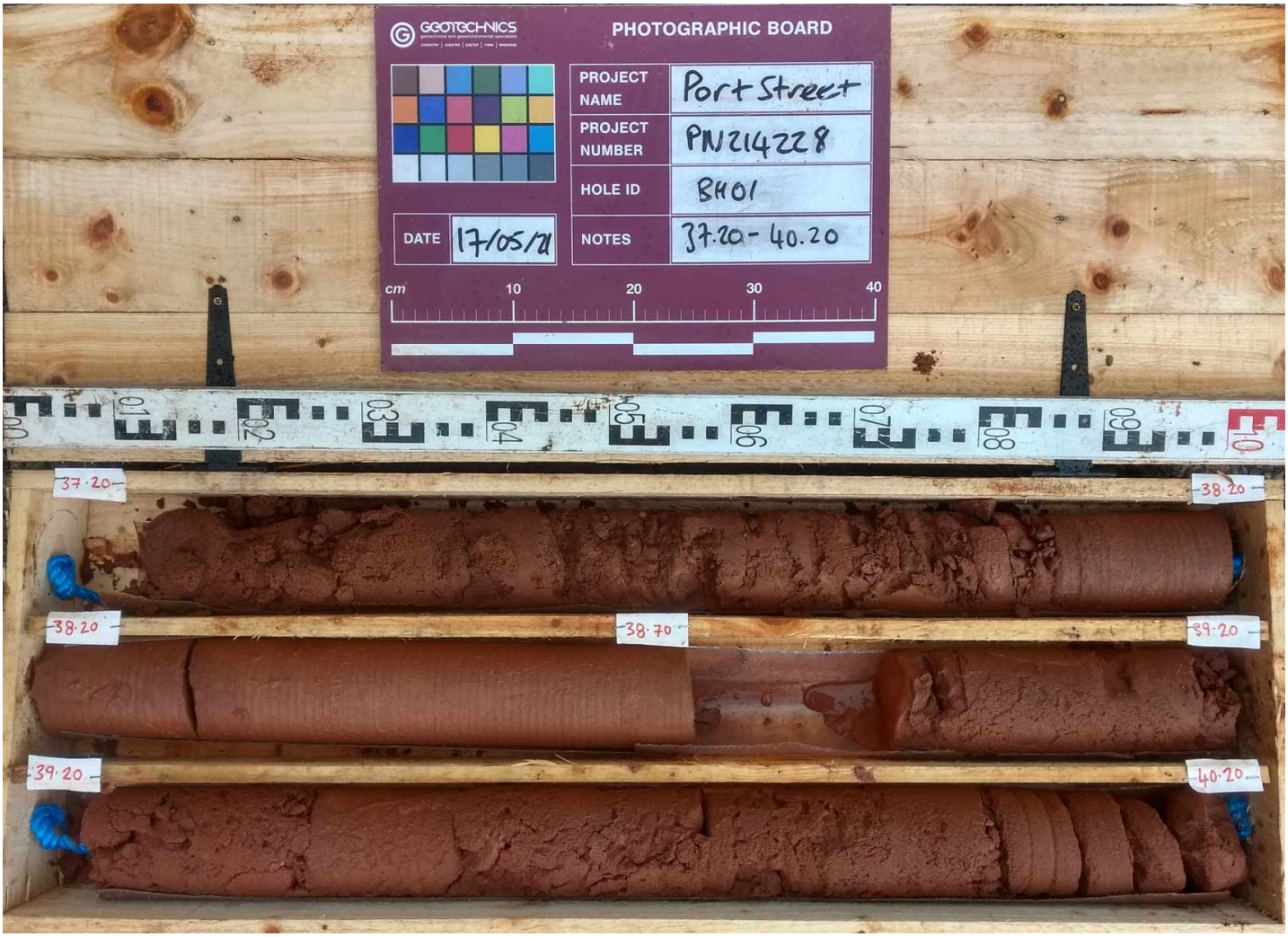


BH01 Box 4 34.20-37.20m

PHOTOGRAPHS

Project Number : PN214228

Project : Port Street



BH01 Box 5 37.20-40.20m

PHOTOGRAPHS

Project Number : PN214228

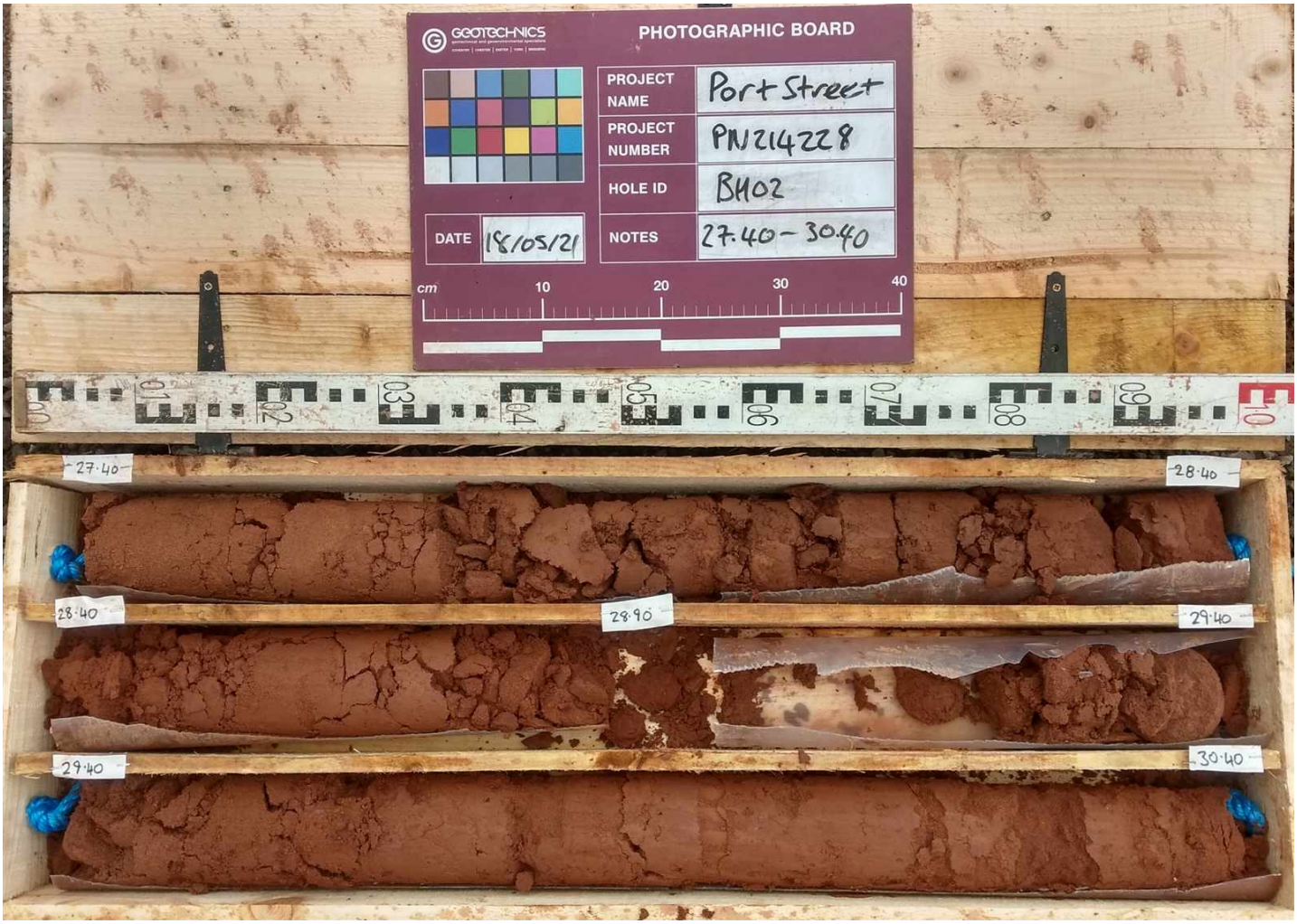
Project : Port Street



BH02 Box 1 24.40-27.40m

Project Number : PN214228

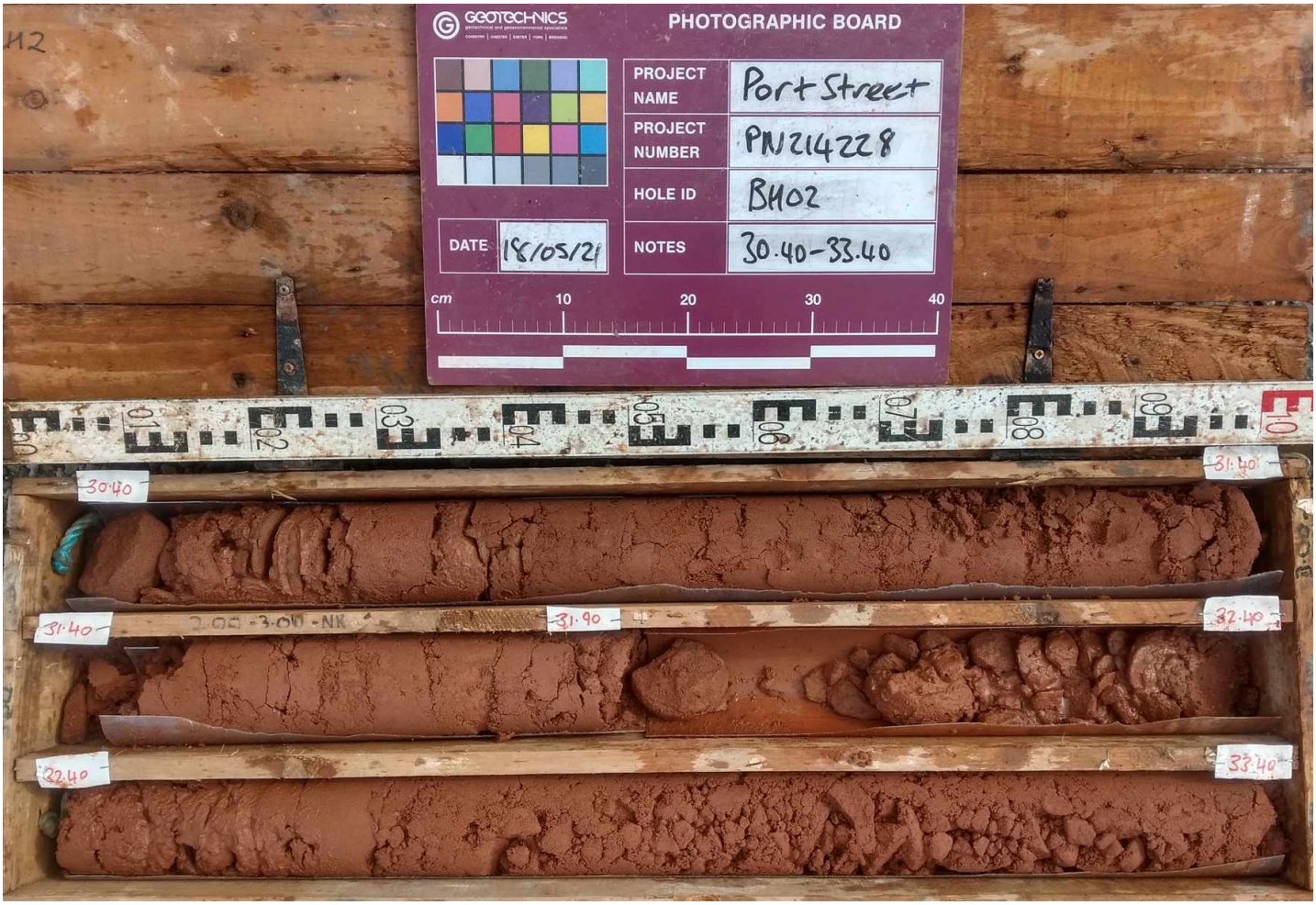
Project : Port Street



BH02 Box 2 27.40-30.40m

Project Number : PN214228

Project : Port Street



BH02 Box 3 30.40-33.40m

PHOTOGRAPHS

Project Number : PN214228

Project : Port Street



BH02 Box 4 33.40-36.40m

Project Number : PN214228

Project : Port Street



BH02 Box 5 36.40-39.40m

PHOTOGRAPHS

Project Number : PN214228

Project : Port Street



BH02 Box 6 39.40-40.90m

PHOTOGRAPHS

Project Number : PN214228

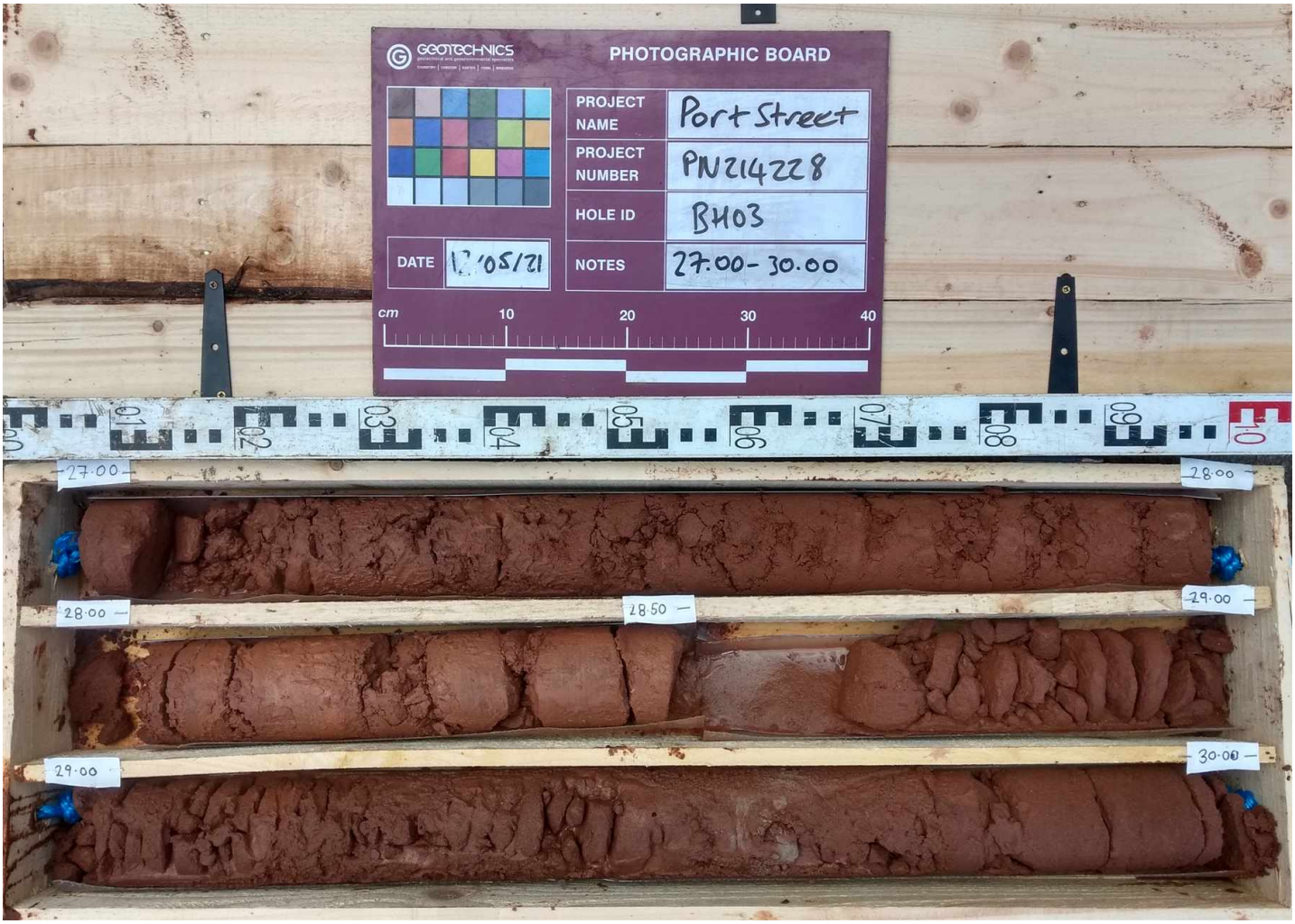
Project : Port Street



BH03 Box 1 24.00-27.00m

Project Number : PN214228

Project : Port Street



BH03 Box 2 27.00-30.00m

Project Number : PN214228

Project : Port Street



BH03 Box 3 30.00-33.00m

PHOTOGRAPHS

Project Number : PN214228

Project : Port Street



BH03 Box 4 33.00-36.00m

PHOTOGRAPHS

Project Number : PN214228

Project : Port Street



BH03 Box 5 36.00-39.00m

Project Number : PN214228

Project : Port Street



BH03 Box 6 39.00-40.50m

PHOTOGRAPHS

Project Number : PN214228

Project : Port Street



BH04 Box 1 24.50-27.50m

PHOTOGRAPHS

Project Number : PN214228

Project : Port Street



BH04 Box 2 27.50-30.50m

Project Number : PN214228

Project : Port Street



BH04 Box 3 30.50-33.50m

Project Number : PN214228

Project : Port Street



BH04 Box 4 33.50-36.50m

PHOTOGRAPHS

Project Number : PN214228

Project : Port Street



BH04 Box 5 36.50-40.50m

APPENDIX 4

Dynamic Sample Borehole Records, SPT Summary Sheets and SPT Energy Certificates

DATA SHEET - Symbols and Abbreviations used on Records

Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
TC	Thermal Conductivity
TR	Thermal Resistivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecone Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content

(All other strengths from undrained triaxial testing)

S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/- (mm)	Total blows/penetration
( )	Extrapolated value

Groundwater

Water Strike

Depth Water Rose To

Instrumentation



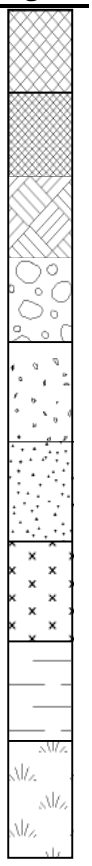
Seal

Filter

Seal

Strata

Legend



Made Ground Granular

Made Ground Cohesive

Topsoil

Cobbles and Boulders

Gravel

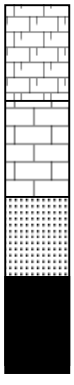
Sand

Silt

Clay

Peat

Note: Composite soil types shown by combined symbols



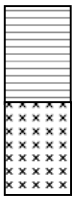
Chalk

Limestone

Sandstone

Coal

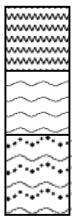
Strata, Continued



Mudstone

Siltstone

Metamorphic Rock

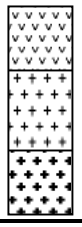


Fine Grained

Medium Grained

Coarse Grained

Igneous Rock



Fine Grained

Medium Grained

Coarse Grained

Backfill Materials



Arisings

Bentonite Seal

Concrete

Fine Gravel Filter

General Fill

Gravel Filter

Grout

Sand Filter

Tarmacadam

Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	Fractures/metre
FRACTURE SPACING (m)	Maximum Minimum
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss

(where core recovery is unknown it is assumed to be at the base of the run)

BOREHOLE RECORD – Windowless Sampler

Project **PORT STREET, MANCHESTER**
Engineer **WSP UK LIMITED**
Borehole **WS01**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**
National Grid Coordinates **384840.3** E **398424.9** N
Ground Level **47.55** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		47.55
0.10	ES					MADE GROUND: Grey concrete.	0.20		47.35
0.30	ES					MADE GROUND: Black sandy angular to subrounded fine to coarse gravel of sandstone, brick and clinker. Sand includes ash.			
0.60	ES								
1.00	ES					At 1.20m, very loose.			
1.20- 1.65	D	1.20 (WET)			S1				
1.60	D								
1.80	D						1.80		45.75
2.00- 2.45	D	2.00 (WET)			S1/450	MADE GROUND: Very soft grey clay.			
2.00	ES								
2.50	B								
3.00- 4.00	B					At 3.00m, firm.			
3.00- 3.45	D	3.00 (WET)			S12				
3.00	ES								
3.01	D								
							3.70		43.85
4.00- 5.00	B					MADE GROUND: Black sandy angular to subrounded fine to coarse gravel of sandstone, brick and clinker. Sand includes ash.			
4.00- 4.45	D	3.00 (DRY)			S15				
4.01	D								
5.00- 6.00	B								
5.00- 5.45	D	3.00 (DRY)			S15				
5.01	D								
6.00- 6.45	D	3.00 (DRY)			S20				
6.01	D								
							6.45		41.10
						End of Borehole			

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	SG/TH
6.45	0.10	Windowless Sampler	SG/TH

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			05/05/21	08:00
6.45	3.00	DRY	05/05/21	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.50				2.70	Slow seepage.

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml vial, 2 x 258ml amber glass jars and 1 x plastic jar.
A 50mm standpipe was installed to 2.80m with a geowrapped slotted section from 0.50m to 2.80m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 2.80m, gravel filter up to 0.40m, bentonite seal up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Figure **1 of 1**
22/06/2021

geotechnics

BOREHOLE RECORD – Windowless Sampler

Project **PORT STREET, MANCHESTER**

Engineer **WSP UK LIMITED**

Borehole **WS02**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**

National Grid Coordinates **384896.0** E **398440.9** N

Ground Level **50.30** m OD

Scale 1:50

Sampling			Properties			Strata			
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		50.30
0.10	ES					MADE GROUND: Dark brown sandy slightly clayey angular to subrounded fine to coarse gravel of mudstone, sandstone and brick with fragments of glass and timber.			
0.30	ES								
0.60	ES								
1.00	ES								
1.20- 1.65		1.20 (DRY)			S14	At 1.20m, medium dense.			
2.00- 2.45	D	2.00			S10	At 2.00m, loose.			
2.00	ES	(DRY)							
							2.60		47.70
						Firm brown slightly sandy CLAY.			
3.00- 3.80	B								
3.00- 3.45	D	3.00			S11				
3.00	ES	(DRY)							
3.90	D								
							4.00		46.30
						End of Borehole			

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	SG/TH	G.L.			07/05/21	08:00						None encountered.
4.00	0.10	Windowless Sampler	SG/TH	4.00	3.00	DRY	07/05/21	18:00						

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml vial, 2 x 258ml amber glass jars and 1 x plastic jar.
Windowless sample location terminated at 4.00m. Casing deviating causing borehole to collapse.
Backfill details from base of hole: bentonite seal up to 0.50m, arisings up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Figure **1 of 1**
22/06/2021

geotechnics

BOREHOLE RECORD - Windowless Sampler

Project **PORT STREET, MANCHESTER**

Engineer **WSP UK LIMITED**

Borehole **WS03**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**

National Grid Coordinates **384831.7** E **398418.0** N

Ground Level **47.51** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		47.51
0.10	ES					MADE GROUND: Grey concrete.	0.20		47.31
0.30	ES					MADE GROUND: Dark brown sandy slightly clayey angular to subrounded fine to coarse gravel of mudstone, sandstone, brick and concrete with fragments of timber.			
0.60	ES								
1.00	ES						1.00		46.51
1.20	B					POSSIBLE MADE GROUND: Very soft brown slightly sandy slightly gravelly CLAY. Gravel is rounded to subrounded fine to medium of mudstone and sandstone.			
1.20- 1.65		1.20 (WET)			S3				
1.80	D								
2.00	B								
2.00- 2.45	D	2.00 (WET)			S0/450				
2.00	ES								
							2.50		45.01
						POSSIBLE MADE GROUND: Soft dark grey CLAY.			
2.80	D								
3.00	B						3.00		44.51
3.00- 3.45		3.00 (DRY)			S7	Firm to stiff brown sandy CLAY.			
3.80	D								
4.00	B								
4.00- 4.45	D	3.00 (DRY)			S13				
4.80	D								
5.00- 5.45	D	3.00 (DRY)			S16				
5.60	D								
5.80	D								
6.00- 6.45	D	3.00 (DRY)			S18				
							6.45		41.06
						End of Borehole			

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	SG/TH
6.45	0.10	Windowless Sampler	SG/TH

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			05/05/21	08:00
6.45	3.00	DRY	05/05/21	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.50				2.50	Slow seepage.

Remarks

AGS

Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml vial, 2 x 258ml amber glass jars and 1 x plastic jar.
Backfill details from base of hole: bentonite seal up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Figure **1 of 1**
22/06/2021

geotechnics

BOREHOLE RECORD – Windowless Sampler

Project **PORT STREET, MANCHESTER**
Engineer **WSP UK LIMITED**
Borehole **WS04**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**
National Grid Coordinates **384852.5** E **398403.6** N
Ground Level **47.73** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		47.73
0.10	ES					MADE GROUND: Dark grey tarmacadam.	0.05		47.68
0.30	ES					MADE GROUND: Dark reddish brown sandy slightly clayey angular to subrounded fine to coarse gravel including mudstone, sandstone, brick and concrete.			
0.60	ES								
1.00	ES						1.00		46.73
1.20- 1.65	D	1.20 (WET)			S6	MADE GROUND: Dark grey slightly sandy angular to subrounded fine to coarse gravel of mudstone, sandstone and brick. With fragments of timber.	1.30		46.43
						FIrm brown sandy CLAY.			
2.00	B								
2.00- 2.45	D	2.00			S15				
2.00	ES	(DRY)							
2.01	D								
3.00	B								
3.00- 3.45	D	3.00			S17				
3.01	D	(DRY)							
4.00- 4.45	D	3.00			S14				
4.01	D	(DRY)							
5.00	B								
5.00- 5.45	D	3.00			S12				
5.01	D	(DRY)							
6.00	B								
6.00- 6.45	D	3.00			S19				
6.01	D	(DRY)							
						End of Borehole	6.45		41.28

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	SG/TH
6.45	0.10	Windowless Sampler	SG/TH

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			05/05/21	08:00
6.45	3.00	DRY	05/05/21	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.50				1.50	Slow seepage.

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml vial, 2 x 258ml amber glass jars and 1 x plastic jar.
Backfill details from base of hole: bentonite seal up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Figure **1 of 1**
22/06/2021

geotechnics

BOREHOLE RECORD - Windowless Sampler

Project **PORT STREET, MANCHESTER**

Engineer **WSP UK LIMITED**

Borehole **WS05**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**

National Grid Coordinates **384842.8** E **398439.4** N

Ground Level **47.55** m OD

Scale 1:50

Sampling			Properties		Strata			
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	Description	Depth	Legend	Level m OD
					MADE GROUND: Grey concrete.	**G.L.**		**47.55**
					MADE GROUND: Tiling containing possible asbestos.	**0.20**		**47.35**
					End of Borehole	**0.30**		**47.25**

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.30	**0.40**	**Inspection Pit**	**SG/TH**	**G.L.**			**05/05/21**	**08:00**						**None**
				0.30		**DRY**	**05/05/21**	**18:00**						**encountered.**

Remarks

Inspection pit hand excavated to 0.30m depth and no services were found.
Potential asbestos containing material encountered at 0.30m depth. Windowless sample location terminated on instruction from the client.
Backfill details from base of hole: arisings up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Figure **1 of 1**
22/06/2021

geotechnics

BOREHOLE RECORD - Windowless Sampler

Project **PORT STREET, MANCHESTER**

Engineer **WSP UK LIMITED**

Borehole **WS06**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**

National Grid Coordinates **384810.1** E **398417.5** N

Ground Level **49.06** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		49.06
0.10	ES					MADE GROUND: Black tarmacadam.	0.02		49.04
0.30	ES					MADE GROUND: Dark brown sandy slightly clayey angular to subrounded fine to coarse gravel of mudstone, sandstone, brick and concrete with fragments of glass and timber. Low cobble content.			
0.60	ES								
1.00	ES								
1.20- 1.80	B						1.20		47.86
1.20- 1.65		1.20 (DRY)			S3	MADE GROUND: Dark grey slightly sandy slightly gravelly clay. Gravel is angular to subrounded fine to medium of sandstone and brick.			
2.00- 2.80	B								
2.00- 2.45	D	2.00			S7				
2.00	ES	(DRY)							
						Firm to stiff brown slightly sandy CLAY.	2.50		46.56
3.00- 3.80	B								
3.00- 3.45	D	3.00			S15				
3.00	ES	(DRY)							
3.90	D					Below 4.00m, sandy.			
4.00- 4.80	B								
4.00- 4.45	D	3.00 (DRY)			S18				
4.90	D								
5.00- 5.80	B								
5.00- 5.45	D	3.00 (DRY)			S11				
5.90	D								
6.00- 6.45	D	3.00 (DRY)			S15				
						End of Borehole	6.45		42.61

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	SG/TH
6.45	0.10	Windowless Sampler	SG/TH

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			07/05/21	08:00
6.45	3.00	WET	07/05/21	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
5.00					Slow seepage.

Remarks

AGS

Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml vial, 2 x 258ml amber glass jars and 1 x plastic jar.
Backfill details from base of hole: bentonite seal up to 0.50m, arisings up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Figure **1 of 1**
22/06/2021

geotechnics

BOREHOLE RECORD - Windowless Sampler

Project **PORT STREET, MANCHESTER**

Engineer **WSP UK LIMITED**

Borehole **WS07**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**

National Grid Coordinates **384861.1** E **398453.6** N

Ground Level **47.58** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		47.58
0.10	ES					MADE GROUND: Black tarmacadam.	0.10		47.48
0.30	ES					MADE GROUND: Dark brownish grey slightly clayey sandy angular to subrounded fine to coarse gravel of mudstone, sandstone and brick with fragments of metal and timber. Sand includes ash.			
0.60	ES								
1.00- 1.80	B						1.00		46.58
1.00	ES					MADE GROUND: Firm dark grey slightly sandy slightly gravelly clay. Gravel is angular to subrounded fine to coarse of mudstone, sandstone and brick. Sand includes ash.			
1.20- 1.65	D	1.20			S9		1.20		46.38
						Firm to stiff brown sandy CLAY.			
1.90	D								
2.00- 2.80	B								
2.00- 2.45	D	2.00			S13				
2.00	ES								
2.90	D								
3.00- 3.80	B								
3.00- 3.45	D	3.00			S14				
3.90	D								
4.00- 4.80	B								
4.00- 4.45	D	3.00			S11				
4.90	D								
5.00- 5.80	B								
5.00- 5.45	D	3.00			S13				
5.90	D								
6.00- 6.45	D	3.00			S14				
						End of Borehole	6.45		41.13

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	SG/TH
6.45	0.10	Windowless Sampler	SG/TH

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			06/05/21	08:00
6.45	3.00	DRY	06/05/21	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml vial, 2 x 258ml amber glass jars and 1 x plastic jar.
Backfill details from base of hole: bentonite seal up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Figure **1 of 1**
22/06/2021

geotechnics

BOREHOLE RECORD – Windowless Sampler

Project **PORT STREET, MANCHESTER**

Engineer **WSP UK LIMITED**

Borehole **WS08**
Project No **PN214228**

Client **MANCHESTER (PORT STREET) LIMITED**

National Grid Coordinates **384858.0** E **398436.7** N

Ground Level **47.71** m OD

Scale 1:50

Sampling			Properties			Strata			
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		47.71
0.10	ES					MADE GROUND: Grey concrete.	0.05		47.66
0.30	ES					MADE GROUND: Dark reddish brown slightly clayey sandy angular to subrounded fine to coarse gravel of mudstone, sandstone, brick and concrete with fragments of metal and timber. Low cobble content.			
0.50	B								
0.60	ES								
1.00	ES						0.90		46.81
1.20- 1.65	D	1.20			S10	MADE GROUND: Grey slightly sandy angular to subrounded fine to coarse gravel of mudstone, sandstone and brick with fragments of timber.			
1.50	B					Firm to stiff brown sandy CLAY.	1.30		46.41
1.90	D								
2.00- 2.45	D	2.00			S13				
2.00	ES								
2.50	B								
2.90	D								
3.00- 3.45	D	3.00			S14				
3.50	B								
3.90	D								
4.00- 4.45	D	3.00			S15				
4.50	B								
4.90	D								
5.00- 5.45	D	3.00			S13				
5.60	B								
5.90	D								
6.00- 6.45	D	3.00			S18				
						End of Borehole	6.45		41.26

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	SG/TH	G.L.			06/05/21	08:00						None encountered.
6.45	0.10	Windowless Sampler	SG/TH	6.45	3.00	DRY	06/05/21	18:00						

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml vial, 2 x 258ml amber glass jars and 1 x plastic jar.
Backfill details from base of hole: bentonite seal up to 0.05m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Figure **1 of 1**
22/06/2021

geotechnics

Fieldwork Results - *SPT Results Summary*

Project PORT STREET, MANCHESTER **Project No** PN214228

Client MANCHESTER (PORT STREET) LIMITED

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive 0-75 (mm)	Seating Drive 75-150 (mm)	Test Drive 0-75 (mm)	Test Drive 75-150 (mm)	Test Drive 150-225 (mm)	Test Drive 225-300 (mm)	SPT 'N' Value	Uncorrected SPT 'N'
WS01	1.20	46.35	S	-	1	2	-	1	-	-	1	*
WS01	2.00	45.55	S	-	1	-	-	-	-	-	1/450	*
WS01	3.00	44.55	S	-	2	3	2	4	3	3	12	*
WS01	4.00	43.55	S	-	3	4	4	3	4	4	15	*
WS01	5.00	42.55	S	-	4	5	4	4	3	4	15	*
WS01	6.00	41.55	S	-	4	5	5	5	5	5	20	*

Uncorrected SPT 'N' — 10 20 30 40 50

Driller	Steve Green
Hammer No.	DART185
Energy Ratio, Er (%)	70.00
Calibration Date	30/10/2020

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

Fieldwork Results - *SPT Results Summary*

Project PORT STREET, MANCHESTER **Project No** PN214228

Client MANCHESTER (PORT STREET) LIMITED

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' 10 20 30 40 50
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		
WS02	1.20	49.10	S	-	1	-	5	1	6	2	14	*
WS02	2.00	48.30	S	-	1	1	1	2	3	4	10	*
WS02	3.00	47.30	S	-	2	3	2	3	3	3	11	*

Driller	Steve Green
Hammer No.	DART185
Energy Ratio, Er (%)	70.00
Calibration Date	30/10/2020

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

Fieldwork Results - *SPT Results Summary*

Project PORT STREET, MANCHESTER **Project No** PN214228

Client MANCHESTER (PORT STREET) LIMITED

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' 10 20 30 40 50
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		
WS03	1.20	46.31	S	-	1	-	1	1	-	1	3	*
WS03	2.00	45.51	S	-	-	-	-	-	-	-	0/450	*
WS03	3.00	44.51	S	-	1	2	1	2	2	2	7	*
WS03	4.00	43.51	S	-	3	4	3	3	4	3	13	*
WS03	5.00	42.51	S	-	4	3	4	4	4	4	16	*
WS03	6.00	41.51	S	-	3	3	4	5	4	5	18	*

Driller	Steve Green
Hammer No.	DART185
Energy Ratio, Er (%)	70.00
Calibration Date	30/10/2020

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

Fieldwork Results - SPT Results Summary

Project PORT STREET, MANCHESTER **Project No** PN214228

Client MANCHESTER (PORT STREET) LIMITED

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' 10 20 30 40 50
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		
WS04	1.20	46.53	S	-	1	2	2	1	1	2	6	*
WS04	2.00	45.73	S	-	3	3	4	3	4	4	15	*
WS04	3.00	44.73	S	-	3	3	3	5	4	5	17	*
WS04	4.00	43.73	S	-	3	3	3	3	4	4	14	*
WS04	5.00	42.73	S	-	3	3	3	3	3	3	12	*
WS04	6.00	41.73	S	-	3	5	5	4	5	5	19	*

Driller	Steve Green
Hammer No.	DART185
Energy Ratio, Er (%)	70.00
Calibration Date	30/10/2020

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

Fieldwork Results - *SPT Results Summary*

Project PORT STREET, MANCHESTER **Project No** PN214228

Client MANCHESTER (PORT STREET) LIMITED

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' 10 20 30 40 50
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		
WS06	1.20	47.86	S	-	1	-	1	1	-	1	3	*
WS06	2.00	47.06	S	-	1	1	1	2	2	2	7	*
WS06	3.00	46.06	S	-	2	3	3	4	4	4	15	*
WS06	4.00	45.06	S	-	3	4	4	5	4	5	18	*
WS06	5.00	44.06	S	-	2	2	2	2	3	4	11	*
WS06	6.00	43.06	S	-	2	3	4	4	3	4	15	*

Driller	Steve Green
Hammer No.	DART185
Energy Ratio, Er (%)	70.00
Calibration Date	30/10/2020

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

Fieldwork Results - *SPT Results Summary*

Project PORT STREET, MANCHESTER **Project No** PN214228

Client MANCHESTER (PORT STREET) LIMITED

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' 10 20 30 40 50
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		
WS07	1.20	46.38	S	-	1	1	1	2	3	3	9	*
WS07	2.00	45.58	S	-	2	3	3	3	4	3	13	*
WS07	3.00	44.58	S	-	3	4	3	3	4	4	14	*
WS07	4.00	43.58	S	-	2	2	3	2	3	3	11	*
WS07	5.00	42.58	S	-	3	2	3	3	3	4	13	*
WS07	6.00	41.58	S	-	3	4	3	3	4	4	14	*

Driller	Steve Green
Hammer No.	DART185
Energy Ratio, Er (%)	70.00
Calibration Date	30/10/2020

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

Fieldwork Results - *SPT Results Summary*

Project PORT STREET, MANCHESTER **Project No** PN214228

Client MANCHESTER (PORT STREET) LIMITED

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' 10 20 30 40 50
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		
WS08	1.20	46.51	S	-	1	2	1	3	3	3	10	*
WS08	2.00	45.71	S	-	2	3	2	3	4	4	13	*
WS08	3.00	44.71	S	-	3	3	3	3	4	4	14	*
WS08	4.00	43.71	S	-	3	3	4	3	4	4	15	*
WS08	5.00	42.71	S	-	3	4	4	3	3	3	13	*
WS08	6.00	41.71	S	-	3	5	4	5	4	5	18	*

Driller	Steve Green
Hammer No.	DART185
Energy Ratio, Er (%)	70.00
Calibration Date	30/10/2020

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

James Fisher Testing Services

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

James Fisher Testing Services Ltd
40A Hardwick Grange
Ruby House
Woolston
Warrington
WA1 4RF

SPT Hammer Ref:	DART185
Test Date:	30/10/2020
Report Date:	03/11/2020
File Name:	DART185.spt
Test Operator:	BM

Instrumented Rod Data

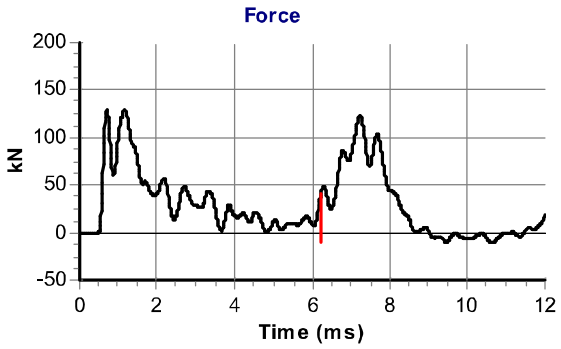
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.5
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	11855
Accelerometer No.2:	6457

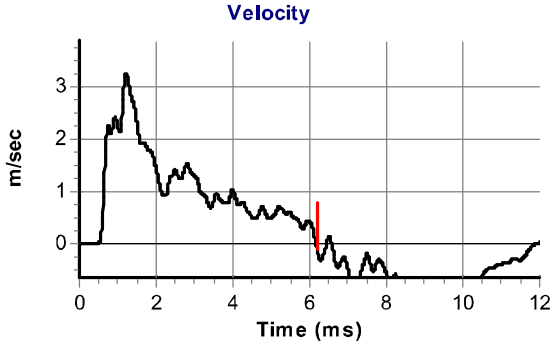
SPT Hammer Information

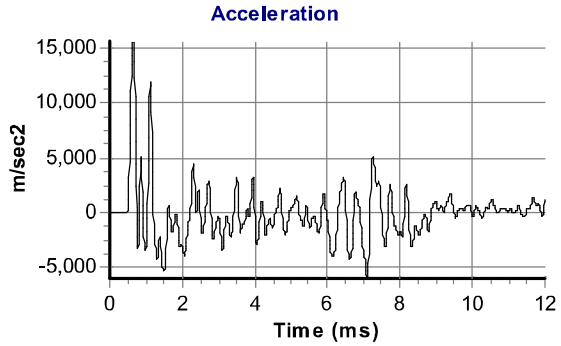
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

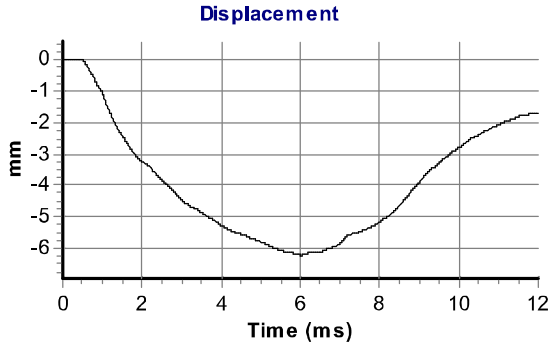
Comments / Location

Client: Macklin Geotech Ltd
Location: JFTS Laboratory
Type: SPT - Drop Hammer









Calculations

Area of Rod A (mm2):	970
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	332

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

Signed: Iain Revenhorst
Title: Senior Technician

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APPENDIX 5

Monitoring Results

FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Project No **PN214228**

Borehole **BH01**

Client **MANCHESTER (PORT STREET) LIMITED**

Sheet No. **1 (1 of 3)**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**5.00m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**1.00 - 5.00m**	Ground Level	**49.72 m OD**
Date Installed	**17 May 2021**		

Date	Time	Depth to Water (m bgl)	Methane (Peak) CH4 (% VOL)	Methane (Steady) CH4 (% VOL)	Carbon Dioxide (Peak) (% VOL)	Carbon Dioxide (Steady) (% VOL)	Oxygen (Peak) (% VOL)	Oxygen (Steady) (% VOL)	Remarks
26-May-2021		**4.75**	**0.0**	**0.0**	**0.5**	**0.5**	**21.3**	**21.3**	
11-Jun-2021		**4.47**	**0.0**	**0.0**	**0.7**	**0.7**	**21.4**	**21.4**	
28-Jun-2021		**DRY**	**0.0**	**0.0**	**1.2**	**1.1**	**21.0**	**20.4**	
7-Jul-2021		**3.45**	**0.0**	**0.0**	**0.9**	**0.9**	**21.3**	**20.2**	
20-Jul-2021		**3.26**	**0.0**	**0.0**	**1.1**	**1.1**	**21.0**	**19.8**	
9-Aug-2021		**2.94**	**0.1**	**0.1**	**0.7**	**0.7**	**20.6**	**20.1**	

Remarks

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FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Project No **PN214228**

Borehole **BH01**

Client **MANCHESTER (PORT STREET) LIMITED**

Sheet No. **1 (2 of 3)**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**5.00m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**1.00 - 5.00m**	Ground Level	**49.72 m OD**
Date Installed	**17 May 2021**		

Date	Time	Nitrogen (Peak) N2 (% VOL)	Nitrogen (Steady) N2 (% VOL)	Carbon Monoxide (Peak) (ppm)	Carbon Monoxide (Steady) (ppm)	Barometric Pressure (mbar)	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	Remarks
26-May-2021		**80.1**	**78.9**	**0**	**0**		**0.2**	**0.2**	
11-Jun-2021		**77.9**	**77.9**	**0**	**0**	**1012**	**0.0**	**0.0**	
28-Jun-2021		**78**	**78**	**0**	**0**	**1013**	**0.0**	**0.0**	
7-Jul-2021		**78**	**78**	**0**	**0**	**1003**	**0.0**	**0.0**	
20-Jul-2021		**79**	**79**	**0**	**0**	**1015**	**0.0**	**0.0**	
9-Aug-2021		**79**	**79**	**0**	**0**	**1005**	**0.0**	**0.0**	

Remarks

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FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Project No **PN214228**
Borehole **BH01**
Sheet No. **1 (3 of 3)**

Client **MANCHESTER (PORT STREET) LIMITED**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**5.00m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**1.00 - 5.00m**	Ground Level	**49.72 m OD**
Date Installed	**17 May 2021**		

Date	Time	Wind ()	Cloud ()	Rain ()	Equipment Used ()	Monitored by ()	Remarks
26-May-2021		**Light**	**Overcast**	**Dry**	**GFM436 Gas A**	**BT**	
11-Jun-2021		**Light**	**Overcast**	**Dry**	**GA5000**	**JD**	
28-Jun-2021		**Light**	**Cloudy**	**Moderate**	**GA5000**	**JA**	
7-Jul-2021		**Light**	**Overcast**	**Heavy**	**GA5000**	**JA**	
20-Jul-2021		**Light**	**None**	**Dry**	**GA5000**	**JA**	
9-Aug-2021		**Light**	**Cloudy**	**Dry**	**GA5000**	**JA**	

Remarks

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FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Project No **PN214228**

Borehole **BH02**

Client **MANCHESTER (PORT STREET) LIMITED**

Sheet No. **1 (1 of 3)**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**16.00m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**10.00 - 16.00m**	Ground Level	**49.07 m OD**
Date Installed	**18 May 2021**		

Date	Time	Depth to Water (m bgl)	Methane (Peak) CH4 (% VOL)	Methane (Steady) CH4 (% VOL)	Carbon Dioxide (Peak) (% VOL)	Carbon Dioxide (Steady) (% VOL)	Oxygen (Peak) (% VOL)	Oxygen (Steady) (% VOL)	Remarks
26-May-2021			**0.1**	**0.0**	**0.6**	**0.6**	**21.1**	**17.3**	
11-Jun-2021			**0.0**	**0.0**	**6.0**	**6.0**	**0.7**	**0.7**	
28-Jun-2021			**0.0**	**0.0**	**4.4**	**4.4**	**21.6**	**7.7**	

Remarks **BH02 (50mm) at 16.00m - Couldn't monitor water level due to bung being stuck in the standpipe. Potential damage caused by vehicles driving over the position; on 07/07/2021 the borehole was flooded, no gas readings could be taken. From 20/07/2021, installation has been damaged, no further monitoring.**

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FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Project No **PN214228**

Borehole **BH02**

Client **MANCHESTER (PORT STREET) LIMITED**

Sheet No. **1 (2 of 3)**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**16.00m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**10.00 - 16.00m**	Ground Level	**49.07 m OD**
Date Installed	**18 May 2021**		

Date	Time	Nitrogen (Peak) N2 (% VOL)	Nitrogen (Steady) N2 (% VOL)	Carbon Monoxide (Peak) (ppm)	Carbon Monoxide (Steady) (ppm)	Barometric Pressure (mbar)	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	Remarks
26-May-2021		**82.1**	**82.1**	**28**	**27**		**0.1**	**0.1**	
11-Jun-2021		**93.0**	**93.3**	**5**	**5**	**1012**	**0.0**	**0.0**	
28-Jun-2021		**87**	**87**	**0**	**0**	**1012**	**0.0**	**0.0**	

Remarks **BH02 (50mm) at 16.00m - Couldn't monitor water level due to bung being stuck in the standpipe. Potential damage caused by vehicles driving over the position; on 07/07/2021 the borehole was flooded, no gas readings could be taken. From 20/07/2021, installation has been damaged, no further monitoring.**

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FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Client **MANCHESTER (PORT STREET) LIMITED**

Project No **PN214228**

Borehole **BH02**

Sheet No. **1 (3 of 3)**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**16.00m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**10.00 - 16.00m**	Ground Level	**49.07 m OD**
Date Installed	**18 May 2021**		

Date	Time	Wind ()	Cloud ()	Rain ()	Equipment Used ()	Monitored by ()	Remarks
26-May-2021		**Light**	**Overcast**	**Dry**	**GFM436 Gas A**	**BT**	
11-Jun-2021		**Moderate**	**Overcast**	**Dry**	**GA5000**	**JD**	
28-Jun-2021		**Light**	**Cloudy**	**Moderate**	**GA5000**	**JA**	

Remarks **BH02 (50mm) at 16.00m - Couldn't monitor water level due to bung being stuck in the standpipe. Potential damage caused by vehicles driving over the position; on 07/07/2021 the borehole was flooded, no gas readings could be taken. From 20/07/2021, installation has been damaged, no further monitoring.**

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FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Project No **PN214228**

Borehole **BH03**

Client **MANCHESTER (PORT STREET) LIMITED**

Sheet No. **1 (1 of 3)**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**1.40m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**0.50 - 1.40m**	Ground Level	**47.52 m OD**
Date Installed	**13 May 2021**		

Date	Time	Depth to Water (m bgl)	Methane (Peak) CH4 (% VOL)	Methane (Steady) CH4 (% VOL)	Carbon Dioxide (Peak) (% VOL)	Carbon Dioxide (Steady) (% VOL)	Oxygen (Peak) (% VOL)	Oxygen (Steady) (% VOL)	Remarks
26-May-2021		**0.80**	**0.0**	**0.0**	**0.5**	**0.5**	**21.0**	**20.1**	
11-Jun-2021		**0.90**	**0.0**	**0.0**	**2.5**	**2.5**	**15.0**	**15.0**	
28-Jun-2021		**DRY**	**0.0**	**0.0**	**2.0**	**2.0**	**21.5**	**14.7**	
7-Jul-2021		**0.78**	**0.0**	**0.0**	**2.9**	**2.9**	**21.1**	**9.2**	
20-Jul-2021		**0.94**	**0.0**	**0.0**	**1.8**	**1.8**	**21.0**	**14.8**	
9-Aug-2021		**0.80**	**0.0**	**0.0**	**3.0**	**3.0**	**20.7**	**14.2**	

Remarks

geotechnics

FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Project No **PN214228**

Borehole **BH03**

Client **MANCHESTER (PORT STREET) LIMITED**

Sheet No. **1 (2 of 3)**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**1.40m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**0.50 - 1.40m**	Ground Level	**47.52 m OD**
Date Installed	**13 May 2021**		

Date	Time	Nitrogen (Peak) N2 (% VOL)	Nitrogen (Steady) N2 (% VOL)	Carbon Monoxide (Peak) (ppm)	Carbon Monoxide (Steady) (ppm)	Barometric Pressure (mbar)	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	Remarks
26-May-2021		**80.1**	**79.4**	**0**	**0**		**0.1**	**0.1**	
11-Jun-2021		**82.5**	**82.5**	**0**	**0**	**1012**	**0.0**	**0.0**	
28-Jun-2021		**78**	**78**	**0**	**0**	**1013**	**0.0**	**0.0**	
7-Jul-2021		**87**	**87**	**0**	**0**	**1004**	**0.0**	**0.0**	
20-Jul-2021		**82**	**82**	**0**	**0**	**1015**	**0.0**	**0.0**	
9-Aug-2021		**82**	**82**	**0**	**0**	**1005**	**0.0**	**0.0**	

Remarks

geotechnics

FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Project No **PN214228**

Borehole **BH03**

Client **MANCHESTER (PORT STREET) LIMITED**

Sheet No. **1 (3 of 3)**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**1.40m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**0.50 - 1.40m**	Ground Level	**47.52 m OD**
Date Installed	**13 May 2021**		

Date	Time	Wind ()	Cloud ()	Rain ()	Equipment Used ()	Monitored by ()	Remarks
26-May-2021		**Light**	**Overcast**	**Dry**	**GFM436 Gas A**	**BT**	
11-Jun-2021		**Moderate**	**Overcast**	**Dry**	**GA5000**	**JD**	
28-Jun-2021		**Light**	**Cloudy**	**Moderate**	**GA5000**	**JA**	
7-Jul-2021		**Light**	**Overcast**	**Heavy**	**GA5000**	**JA**	
20-Jul-2021		**Light**	**None**	**Dry**	**GA5000**	**JA**	
9-Aug-2021		**Light**	**Cloudy**	**Dry**	**GA5000**	**JA**	

Remarks

geotechnics

FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Project No **PN214228**

Borehole **BH04**

Client **MANCHESTER (PORT STREET) LIMITED**

Sheet No. **1 (1 of 3)**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**10.00m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**2.00 - 10.00m**	Ground Level	**47.43 m OD**
Date Installed	**11 May 2021**		

Date	Time	Depth to Water (m bgl)	Methane (Peak) CH4 (% VOL)	Methane (Steady) CH4 (% VOL)	Carbon Dioxide (Peak) (% VOL)	Carbon Dioxide (Steady) (% VOL)	Oxygen (Peak) (% VOL)	Oxygen (Steady) (% VOL)	Remarks
26-May-2021		**2.24**	**0.1**	**0.0**	**0.2**	**0.2**	**21.0**	**20.9**	
11-Jun-2021		**2.69**	**0.0**	**0.0**	**0.1**	**0.1**	**21.6**	**21.6**	
28-Jun-2021		**4.10**	**0.1**	**0.0**	**2.7**	**2.7**	**21.3**	**18.5**	
7-Jul-2021		**3.32**	**0.0**	**0.0**	**4.8**	**4.8**	**21.2**	**13.4**	
20-Jul-2021		**5.13**	**0.1**	**0.0**	**3.1**	**3.1**	**20.8**	**19.1**	
9-Aug-2021		**3.20**	**0.2**	**0.2**	**0.9**	**0.9**	**20.8**	**18.6**	

Remarks

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FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Project No **PN214228**

Borehole **BH04**

Client **MANCHESTER (PORT STREET) LIMITED**

Sheet No. **1 (2 of 3)**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**10.00m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**2.00 - 10.00m**	Ground Level	**47.43 m OD**
Date Installed	**11 May 2021**		

Date	Time	Nitrogen (Peak) N2 (% VOL)	Nitrogen (Steady) N2 (% VOL)	Carbon Monoxide (Peak) (ppm)	Carbon Monoxide (Steady) (ppm)	Barometric Pressure (mbar)	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	Remarks
26-May-2021		**79.0**	**78.9**	**0**	**0**		**0.4**	**0.1**	
11-Jun-2021		**78.3**	**78.3**	**0**	**0**	**1012**	**0.0**	**0.0**	
28-Jun-2021		**78**	**78**	**1**	**1**	**1013**	**-3.0**	**-3.0**	
7-Jul-2021		**81**	**81**	**0**	**0**	**1004**	**0.1**	**0.0**	
20-Jul-2021		**77**	**77**	**0**	**0**	**1015**	**0.0**	**0.0**	
9-Aug-2021		**80**	**80**	**0**	**0**	**1005**	**-3.3**	**-3.3**	

Remarks

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FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Project No **PN214228**

Borehole **BH04**

Client **MANCHESTER (PORT STREET) LIMITED**

Sheet No. **1 (3 of 3)**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**10.00m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**2.00 - 10.00m**	Ground Level	**47.43 m OD**
Date Installed	**11 May 2021**		

Date	Time	Wind ()	Cloud ()	Rain ()	Equipment Used ()	Monitored by ()	Remarks
26-May-2021		**Light**	**Overcast**	**Dry**	**GFM436 Gas A**	**BT**	
11-Jun-2021		**Moderate**	**Overcast**	**Dry**	**GA5000**	**JD**	
28-Jun-2021		**Light**	**Cloudy**	**Moderate**	**GA5000**	**JA**	
7-Jul-2021		**Light**	**Overcast**	**Heavy**	**GA5000**	**JA**	
20-Jul-2021		**Light**	**None**	**Dry**	**GA5000**	**JA**	
9-Aug-2021		**Light**	**Cloudy**	**Moderate**	**GA5000**	**JA**	

Remarks

FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Client **MANCHESTER (PORT STREET) LIMITED**

Project No **PN214228**

Borehole **WS01**

Sheet No. **1 (1 of 3)**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**2.80m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**0.40 - 2.80m**	Ground Level	**47.55 m OD**
Date Installed	**5 May 2021**		

Date	Time	Depth to Water (m bgl)	Methane (Peak) CH4 (% VOL)	Methane (Steady) CH4 (% VOL)	Carbon Dioxide (Peak) (% VOL)	Carbon Dioxide (Steady) (% VOL)	Oxygen (Peak) (% VOL)	Oxygen (Steady) (% VOL)	Remarks
11-Jun-2021		**0.27**	**0.1**	**0.1**	**0.2**	**0.2**	**20.1**	**20.1**	
28-Jun-2021		**0.20**	**13.3**	**13.3**	**2.3**	**2.3**	**21.1**	**19.3**	

Remarks **WS01(50mm) at 2.80m - Gas readings were not taken on 26/05/2021, 07/07/2021 and 09/08/2021, as the well was flooded.**

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FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Project No **PN214228**

Borehole **WS01**

Client **MANCHESTER (PORT STREET) LIMITED**

Sheet No. **1 (2 of 3)**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**2.80m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**0.40 - 2.80m**	Ground Level	**47.55 m OD**
Date Installed	**5 May 2021**		

Date	Time	Nitrogen (Peak) N2 (% VOL)	Nitrogen (Steady) N2 (% VOL)	Carbon Monoxide (Peak) (ppm)	Carbon Monoxide (Steady) (ppm)	Barometric Pressure (mbar)	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	Remarks
11-Jun-2021		**79.6**	**79.6**	**2**	**0**	**1012**	**0.1**	**0.1**	
28-Jun-2021		**65**	**65**	**0**	**0**	**1013**	**4.9**	**4.9**	

Remarks **WS01(50mm) at 2.80m - Gas readings were not taken on 26/05/2021, 07/07/2021 and 09/08/2021, as the well was flooded.**

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Form 003/1

FIELDWORK - *Insitu Gas Monitoring - Instrument Record*

Project **PORT STREET, MANCHESTER**

Client **MANCHESTER (PORT STREET) LIMITED**

Project No **PN214228**

Borehole **WS01**

Sheet No. **1 (3 of 3)**

Installation Details

Installation Type	**Standpipe**	Diameter	**50mm**
Depth to Base	**2.80m**	Cover Type	**Flush lockable protective cover**
Filter Zone	**0.40 - 2.80m**	Ground Level	**47.55 m OD**
Date Installed	**5 May 2021**		

Date	Time	Wind ()	Cloud ()	Rain ()	Equipment Used ()	Monitored by ()	Remarks
11-Jun-2021		**Moderate**	**Overcast**	**Dry**	**GA5000**	**JD**	
28-Jun-2021		**Light**	**Cloudy**	**Moderate**	**GA5000**	**JA**	

Remarks **WS01(50mm) at 2.80m - Gas readings were not taken on 26/05/2021, 07/07/2021 and 09/08/2021, as the well was flooded.**

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FIELDWORK – *Water Level Monitoring*

Project PORT STREET, MANCHESTER

Project No PN214228

Client MANCHESTER (PORT STREET) LIMITED

Sheet No 1

Borehole		BH01		BH02		BH03		BH04		WS01			
Instrument (dia. mm)		S (50mm)		S (50mm)		S (50mm)		S (50mm)		S (50mm)			
Depth to Base (m)		5.00		16.00 (Note 1)		1.40		10.00		2.80 (Note 2)			
Filter Zone (m)		1.00-5.00		10.00-16.00		0.50-1.40		2.00-10.00		0.40-2.80			
Level		49.72 m OD		49.07 m OD		47.52 m OD		47.43 m OD		47.55 m OD			
Date	Time	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level
26 May 2021		4.75	*44.97*			0.80	*46.72*	2.24	*45.19*				
11 Jun 2021		4.47	*45.25*			0.90	*46.62*	2.69	*44.74*	0.27	*47.28*		
28 Jun 2021		DRY				DRY		4.10	*43.33*	0.20	*47.35*		
7 Jul 2021		3.45	*46.27*			0.78	*46.74*	3.32	*44.11*				
20 Jul 2021		3.26	*46.46*			0.94	*46.58*	5.13	*42.30*				
9 Aug 2021		2.94	*46.78*			0.80	*46.72*	3.20	*44.23*				

Remarks

Note 1 - BH02 (50mm) at 16.00m - Couldn't monitor water level due to bung being stuck in the standpipe. Potential damage caused by vehicles driving over the position; on 07/07/2021 the borehole was flooded, no gas readings could be taken. From 20/07/2021, installation has been damaged, no further monitoring.

Note 2 - WS01(50mm) at 2.80m - Gas readings were not taken on 26/05/2021, 07/07/2021 and 09/08/2021, as the well was flooded.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

GEOTECHNICS
geotechnical and geoenvironmental specialists

APPENDIX 6

Laboratory Test Results - Geotechnical (Soil)

LABORATORY REPORT

4043

Contract Number: PSL21/4047

Report Date:	14 June 2021
Client's Reference:	PN214228
Client Name:	Geotechnics Chester The Geotechnical Centre Unit 1 Borders Industrial Park River Lane, Saltney Chester CH4 8RJ
For the attention of:	**Connor Southall**
Contract Title:	Port Street, Manchester
Date Received:	18/5/2021
Date Commenced:	18/5/2021
Date Completed:	11/6/2021
Notes:	**Opinions and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins (Director)	R Berriman (Quality Manager)	S Royle (Laboratory Manager)
L Knight (Assistant Laboratory Manager)	S Eyre (Senior Technician)	T Watkins (Senior Technician)

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rberriman@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BH03		UT	3.00	3.45	Stiff brown slightly gravelly sandy CLAY.
BH03		D	3.50		Brown slightly gravelly very sandy CLAY.
BH03		UT	8.00	8.45	Very stiff brown slightly gravelly very sandy CLAY.
BH03		D	9.50	9.95	Brown slightly gravelly very sandy CLAY.
BH03		D	10.50		Brown slightly gravelly sandy CLAY.
BH03		D	13.50		Brown slightly gravelly very sandy CLAY.
BH03		B	17.00	17.45	Brown very gravelly very sandy CLAY.
BH03		D	22.70		Brown gravelly SAND.
BH04		UT	1.20	1.65	Brown slightly gravelly sandy CLAY.
BH04		D	2.00	2.45	Brown sandy CLAY.
BH04		UT	3.00	3.45	Firm brown slightly gravelly sandy CLAY.
BH04		D	3.80	3.90	Brown slightly gravelly slightly sandy CLAY.
BH04		D	4.80	4.90	Brown slightly gravelly slightly sandy CLAY.
BH04		UT	5.00	5.45	Firm brown slightly gravelly sandy CLAY.
BH04		D	6.00	6.10	Brown slightly gravelly very sandy CLAY.
BH04		D	8.45	8.55	Brown slightly gravelly very sandy CLAY.
BH04		D	10.50	10.60	Brown slightly gravelly very sandy CLAY.
BH04		UT	12.50	12.95	Brown slightly gravelly very sandy CLAY.
BH04		B	13.50	13.79	Brown sandy slightly clayey GRAVEL with many cobbles.

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BH04		B	18.00	18.29	Brown very gravelly very clayey SAND.
BH04		B	21.00	21.26	Brown very sandy clayey GRAVEL with many cobbles.
BH01		UT	3.00	3.45	Brown slightly gravelly sandy CLAY.
BH01		D	4.00	4.45	Brown slightly gravelly sandy CLAY.
BH01		UT	5.00	5.45	Stiff brown slightly gravelly sandy CLAY.
BH01		D	6.50	6.95	Brown slightly gravelly sandy CLAY.
BH01		UT	8.00	8.45	Firm brown slightly gravelly sandy CLAY.
BH01		D	9.50	9.95	Brown slightly gravelly sandy CLAY.
BH01		D	13.00	13.45	Brown slightly gravelly sandy CLAY.
BH01		D	16.90		Brown gravelly very sandy CLAY.
BH01		B	20.50	20.95	Brown very sandy clayey GRAVEL.
BH02		UT	3.00		Brown slightly gravelly sandy CLAY.
BH02		D	3.80	3.90	Brown slightly gravelly sandy CLAY.
BH02		D	5.45	5.55	Brown slightly gravelly slightly silty CLAY.
BH02		UT	8.00	8.45	Very stiff brown slightly gravelly very sandy CLAY.
BH02		D	9.50	9.95	Brown slightly gravelly sandy CLAY.
BH02		UT	11.00	11.45	Very stiff brown slightly gravelly very sandy CLAY.
BH02		UT	14.00	14.45	Very stiff brown slightly gravelly very sandy CLAY.
BH02		D	15.00	15.10	Brown slightly gravelly sandy CLAY.

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BH02		D	18.50	18.77	Brown slightly gravelly very sandy CLAY.
BH02		B	23.00	23.16	Brown very gravelly slightly silty SAND with many cobbles.

UKAS TESTING
4043

Professional Soils Laboratory

Port Street, Manchester

Contract No:
PSL21/4047
Client Ref:
PN214228

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
BH03		D	3.50		19			33	16	17	96	Low Plasticity CL
BH03		UT	8.00	8.45	15			35	17	18	98	Intermediate Plasticity CI
BH03		D	9.50	9.95	16							
BH03		D	10.50		17			36	17	19	98	Intermediate Plasticity CI
BH03		D	13.50		16			26	15	11	87	Low Plasticity CL
BH03		D	22.70		10				NP			
BH04		UT	1.20	1.65	34			45	21	24	92	Intermediate Plasticity CI
BH04		D	2.00	2.45	19							
BH04		UT	3.00	3.45	20			41	19	22	98	Intermediate Plasticity CI
BH04		D	3.80	3.90	30							
BH04		D	4.80	4.90	24			34	16	18	97	Low Plasticity CL
BH04		D	6.00	6.10	11							
BH04		D	8.45	8.55	15							
BH04		D	10.50	10.60	16							
BH04		UT	12.50	12.95	10			27	15	12	97	Low Plasticity CL
BH01		UT	3.00	3.45	18			47	22	25	98	Intermediate Plasticity CI
BH01		D	4.00	4.45	18							
BH01		UT	5.00	5.45	18			48	22	26	97	Intermediate Plasticity CI
BH01		D	6.50	6.95	28							

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

UKAS TESTING 4043

PSL Professional Soils Laboratory

Port Street, Manchester

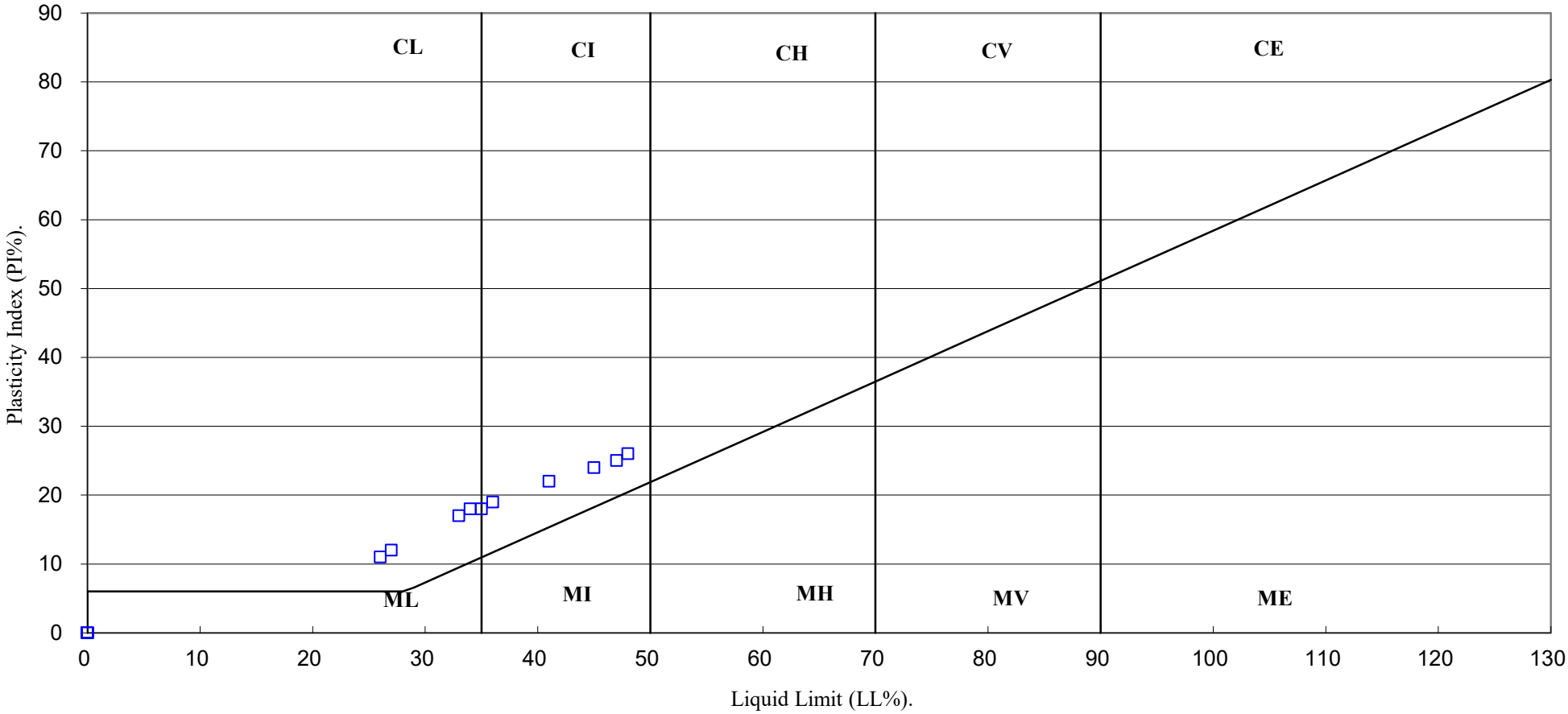
Contract No:

PSL21/4482

Client Ref:

PN214228

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	Port Street, Manchester	Contract No: PSL21/4482
			Client Ref: PN214228

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
BH01		UT	8.00	8.45	24			41	19	22	98	Intermediate Plasticity CI
BH01		D	9.50	9.95	14							
BH01		D	13.00	13.45	14			34	17	17	97	Low Plasticity CL
BH01		D	16.90		14			26	15	11	69	Low Plasticity CL
BH02		D	3.80	3.90	22			39	19	20	92	Intermediate Plasticity CI
BH02		D	5.45	5.55	25							
BH02		UT	8.00	8.45	14			35	17	18	98	Intermediate Plasticity CI
BH02		D	9.50	9.95	15							
BH02		UT	11.00	11.45	15			34	16	18	98	Low Plasticity CL
BH02		UT	14.00	14.45	11			30	15	15	98	Low Plasticity CL
BH02		D	15.00	15.10	11							

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

UKAS TESTING 4043

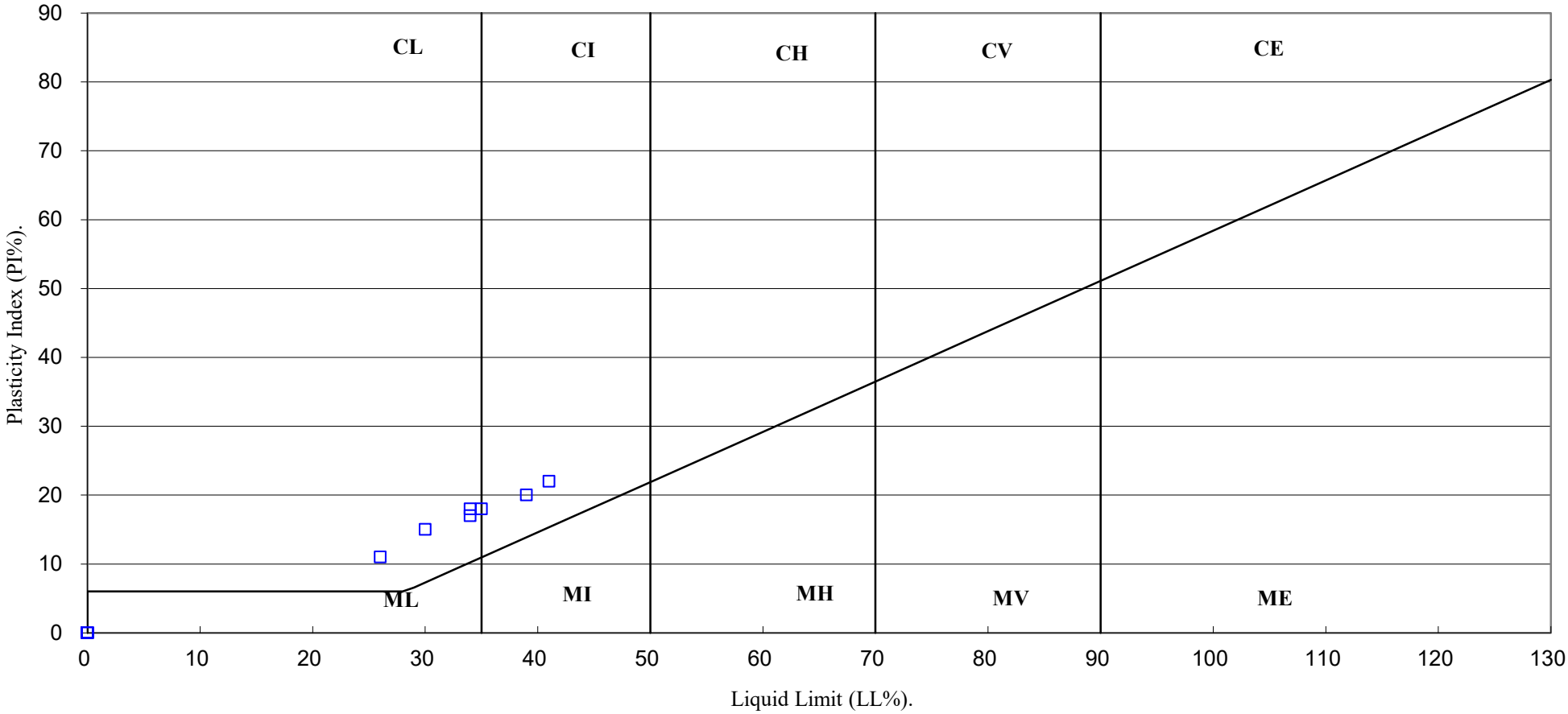
PSL Professional Soils Laboratory

Port Street, Manchester

Contract No: PSL21/4482

Client Ref: PN214228

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



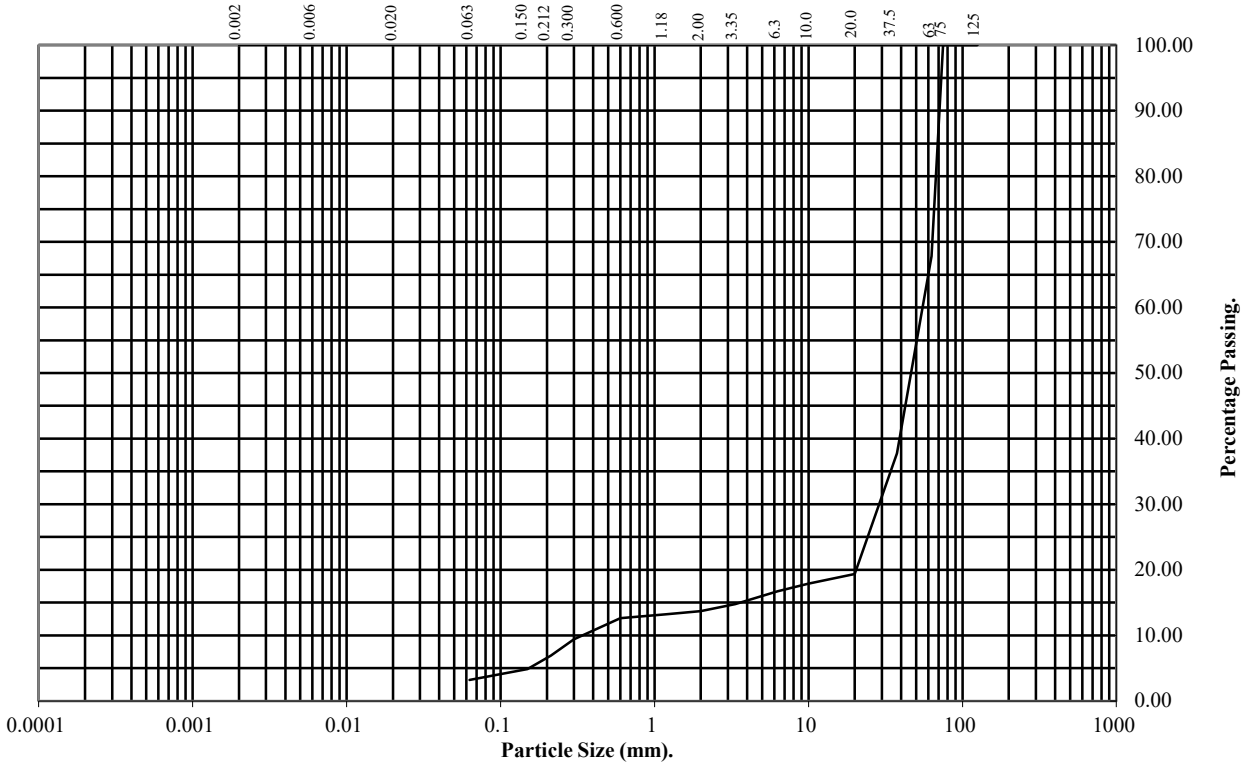
UKAS TESTING 4043	PSL Professional Soils Laboratory	Port Street, Manchester	Contract No: PSL21/4482
			Client Ref: PN214228

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**BH04**	**Top Depth (m):**	**13.50**
Sample Number:		**Base Depth(m):**	**13.79**
Sample Type:	**B**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	68
37.5	38
20	19
10	18
6.3	17
3.35	15
2	14
1.18	13
0.6	13
0.3	9
0.212	7
0.15	5
0.063	3

Soil Fraction	Total Percentage
Cobbles	32
Gravel	54
Sand	11
Silt/Clay	3

Remarks:

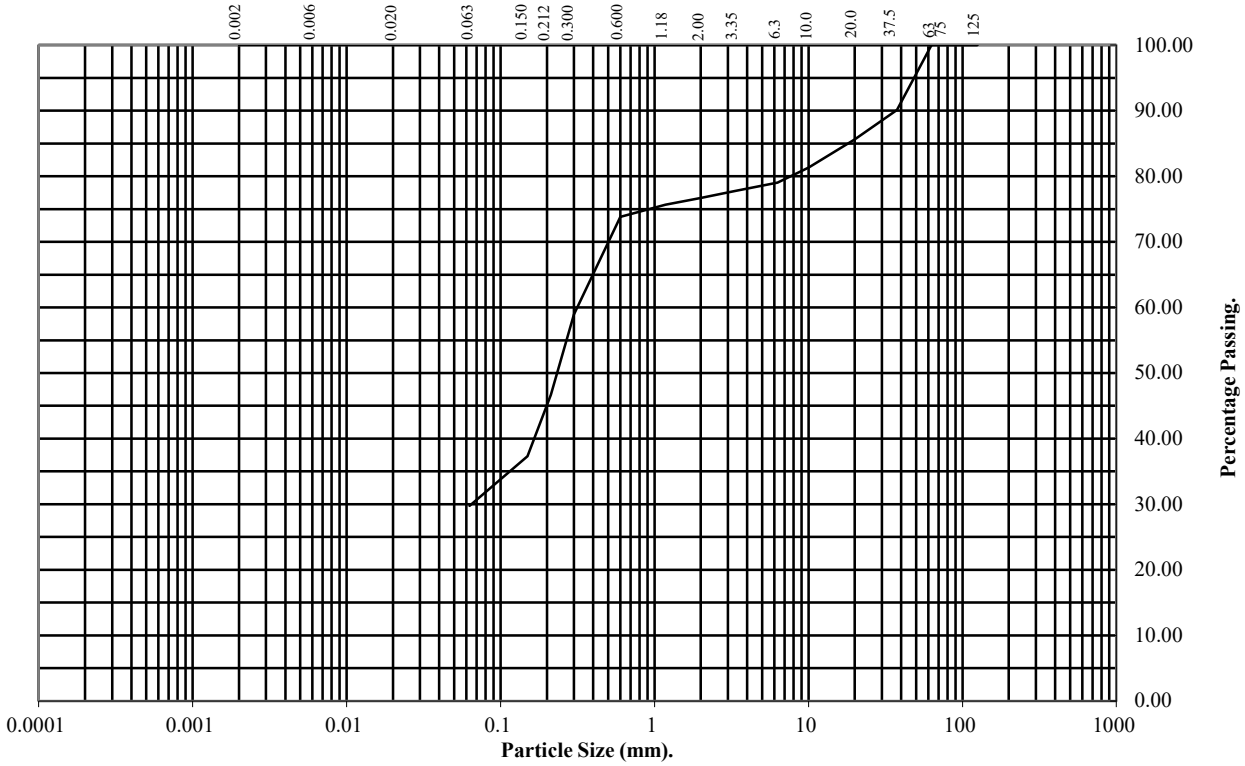
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**BH04**	**Top Depth (m):**	**18.00**
Sample Number:		**Base Depth(m):**	**18.29**
Sample Type:	**B**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	90
20	86
10	81
6.3	79
3.35	78
2	77
1.18	76
0.6	74
0.3	59
0.212	47
0.15	37
0.063	30

Soil Fraction	Total Percentage
Cobbles	0
Gravel	23
Sand	47
Silt/Clay	30

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

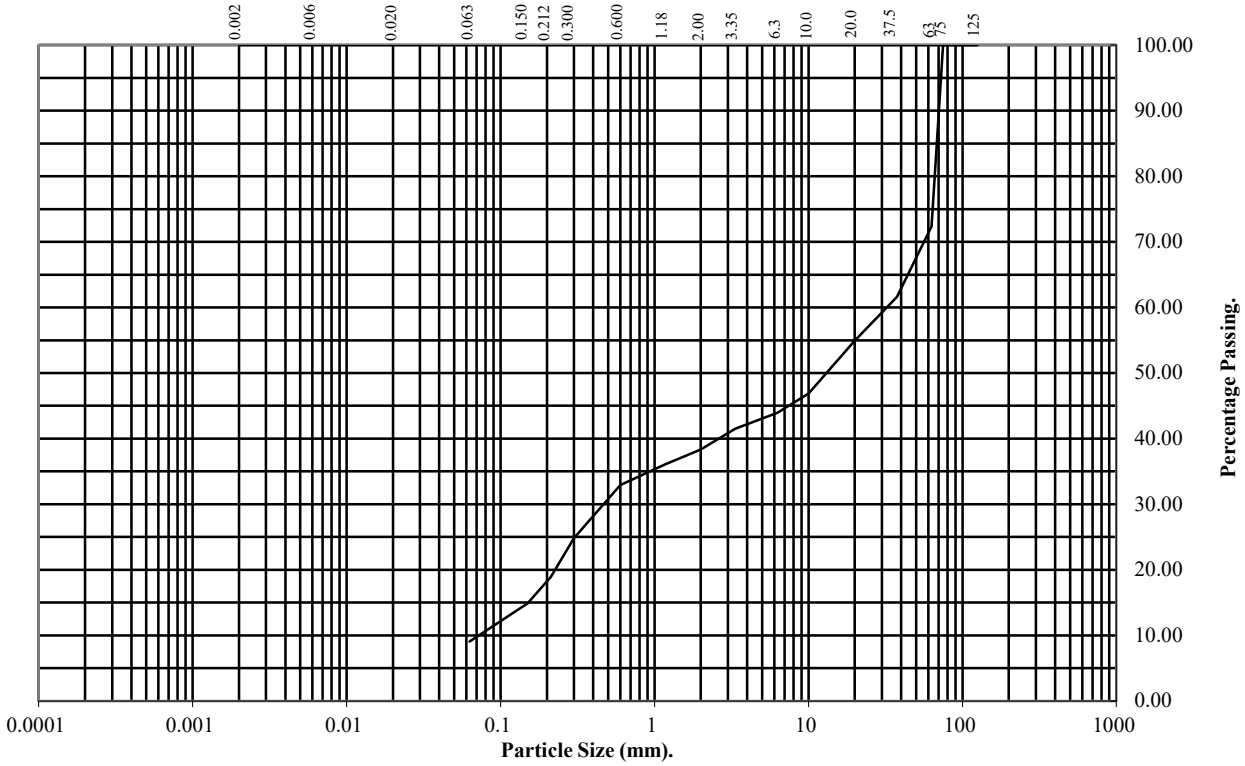
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: BH04 **Top Depth (m):** 21.00

Sample Number: **Base Depth(m):** 21.06

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	72
37.5	62
20	55
10	47
6.3	44
3.35	42
2	38
1.18	36
0.6	33
0.3	25
0.212	19
0.15	15
0.063	9

Soil Fraction	Total Percentage
Cobbles	28
Gravel	34
Sand	29
Silt/Clay	9

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

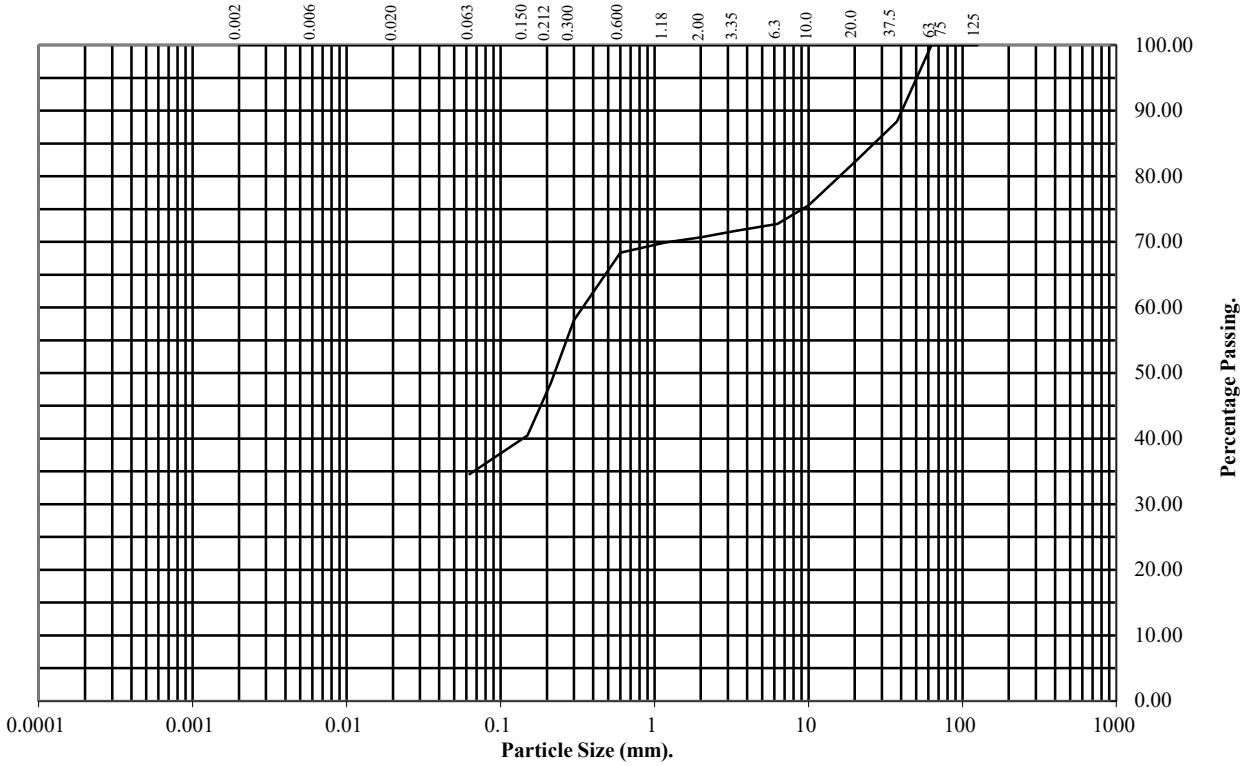
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **BH03** **Top Depth (m):** **17.00**

Sample Number: **Base Depth(m):** **17.45**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	88
20	82
10	76
6.3	73
3.35	72
2	71
1.18	70
0.6	68
0.3	58
0.212	48
0.15	40
0.063	35

Soil Fraction	Total Percentage
Cobbles	0
Gravel	29
Sand	36
Silt/Clay	35

Remarks:

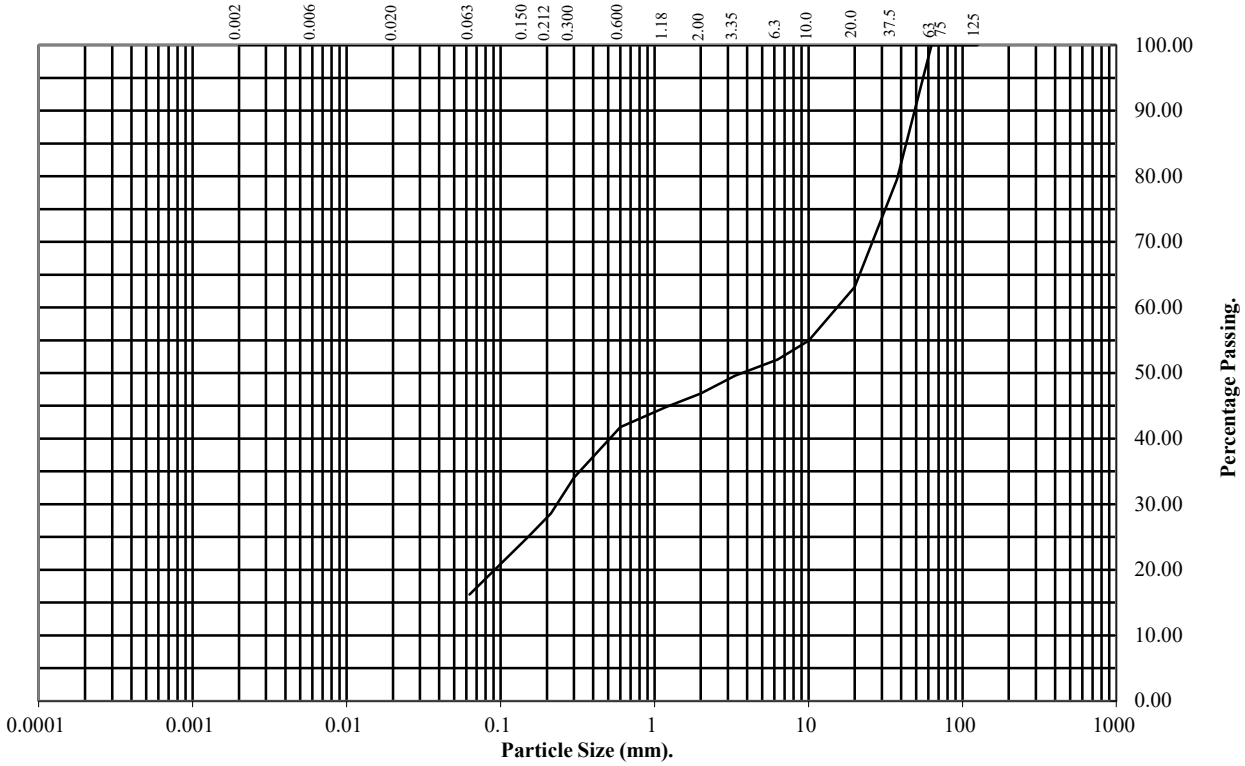
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**BH01**	**Top Depth (m):**	**20.50**
Sample Number:		**Base Depth(m):**	**20.95**
Sample Type:	**B**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	80
20	63
10	55
6.3	52
3.35	50
2	47
1.18	45
0.6	42
0.3	34
0.212	29
0.15	25
0.063	16

Soil Fraction	Total Percentage
Cobbles	0
Gravel	53
Sand	31
Silt/Clay	16

Remarks:

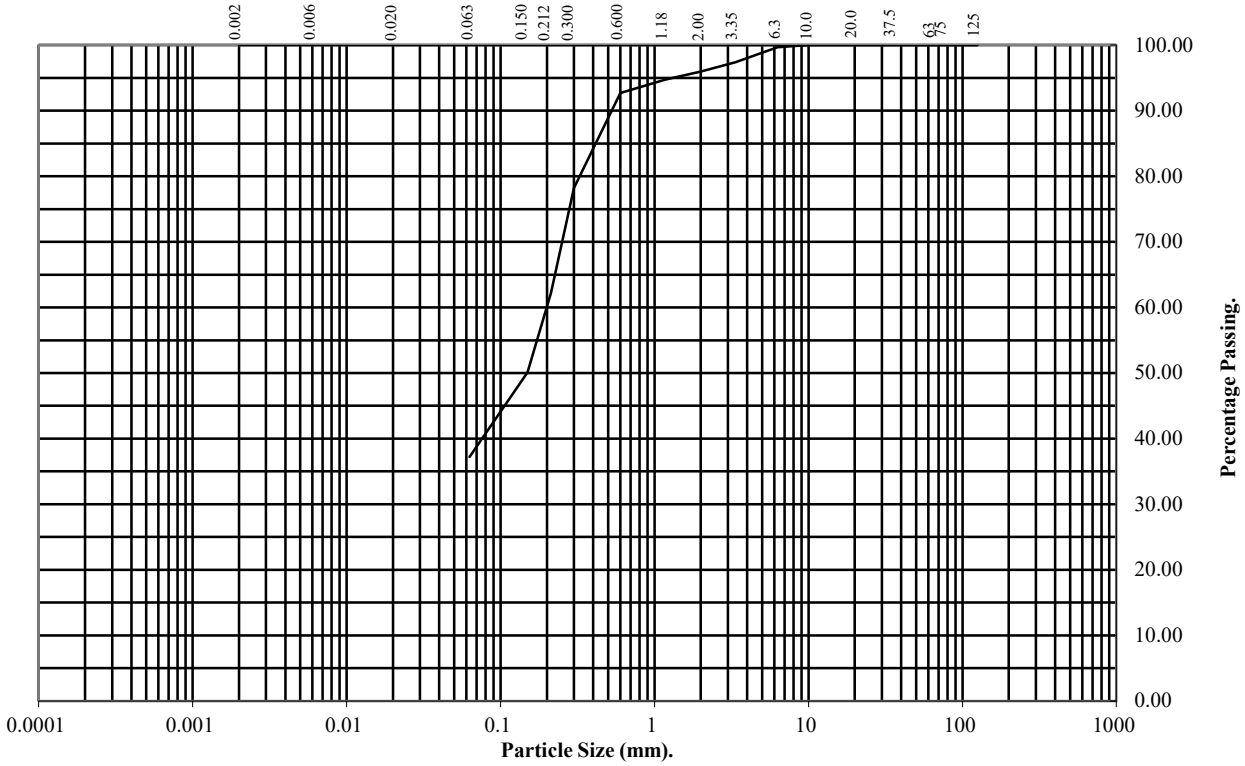
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**BH02**	**Top Depth (m):**	**18.50**
Sample Number:		**Base Depth(m):**	**18.77**
Sample Type:	**D**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	97
2	96
1.18	95
0.6	93
0.3	78
0.212	62
0.15	50
0.063	37

Soil Fraction	Total Percentage
Cobbles	0
Gravel	4
Sand	59
Silt/Clay	37

Remarks:

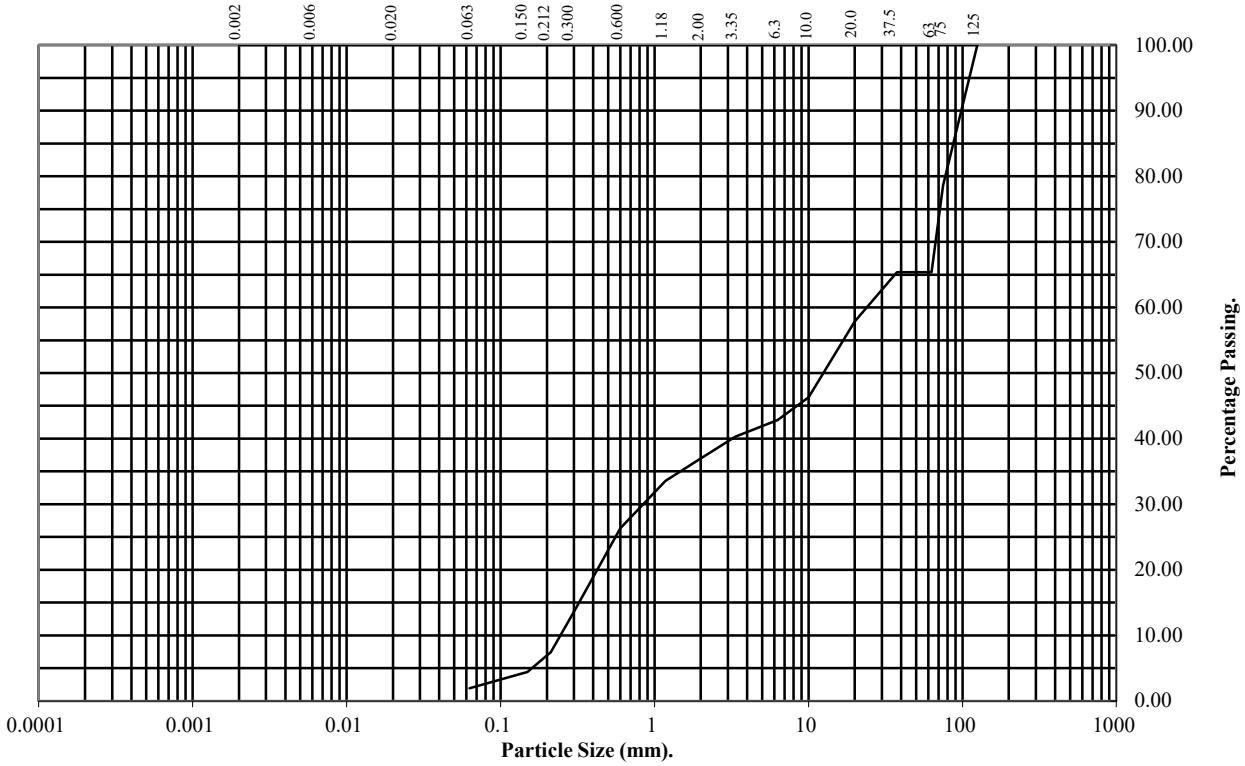
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**BH02**	**Top Depth (m):**	**23.00**
Sample Number:		**Base Depth(m):**	**23.16**
Sample Type:	**B**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	79
63	65
37.5	65
20	58
10	46
6.3	43
3.35	40
2	37
1.18	34
0.6	26
0.3	14
0.212	7
0.15	4
0.063	2

Soil Fraction	Total Percentage
Cobbles	35
Gravel	28
Sand	35
Silt/Clay	2

Remarks:

See Summary of Soil Descriptions

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

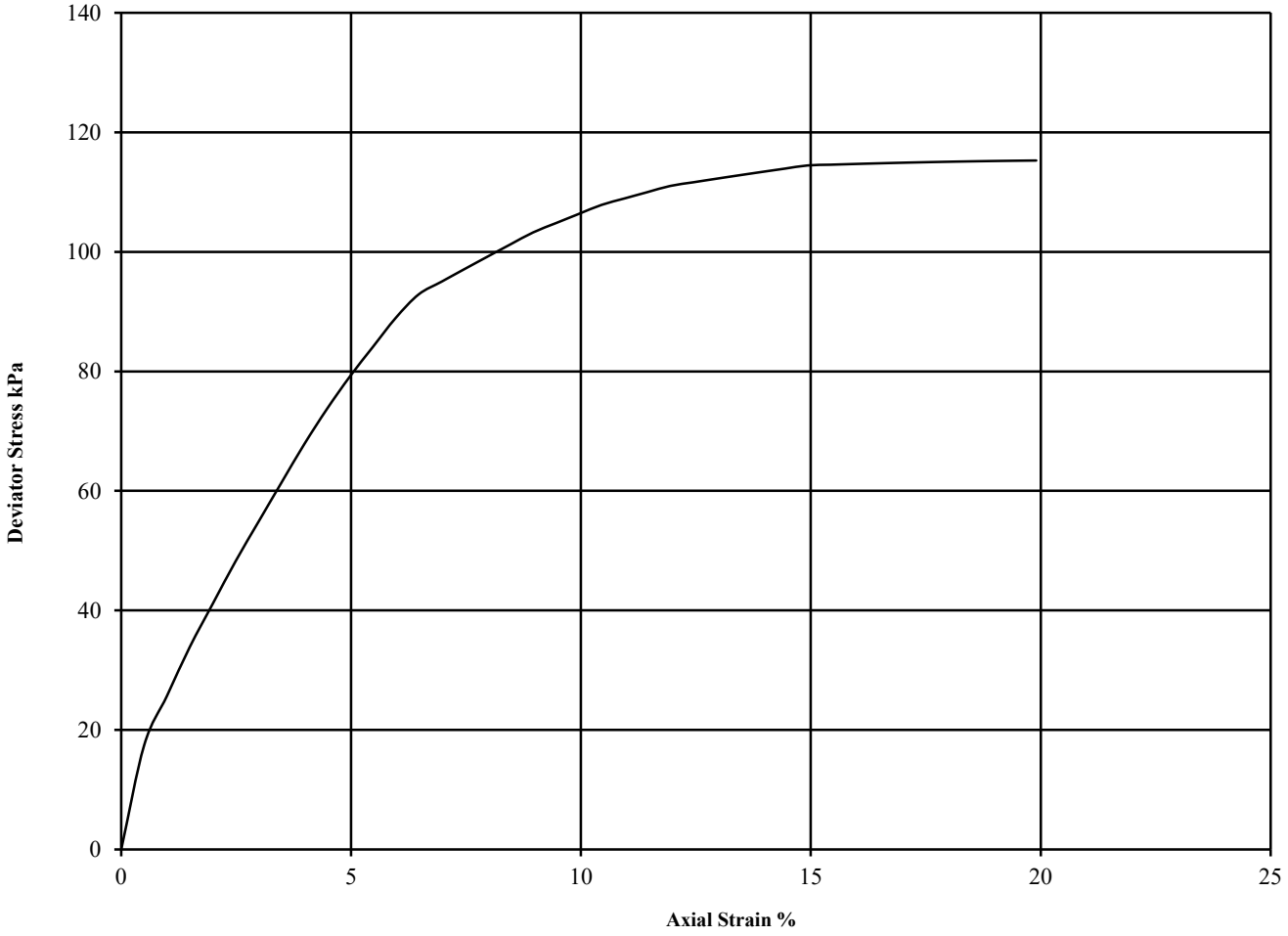
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **BH04** **Top Depth (m):** **3.00**

Sample Number: **Base Depth (m):** **3.45**

Sample Type **UT**



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.33
1	20	2.08	1.74	60	115	58	19.9	Plastic	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Port Street, Manchester

Contract No:
PSL21/4047
Client Ref:
PN214228

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

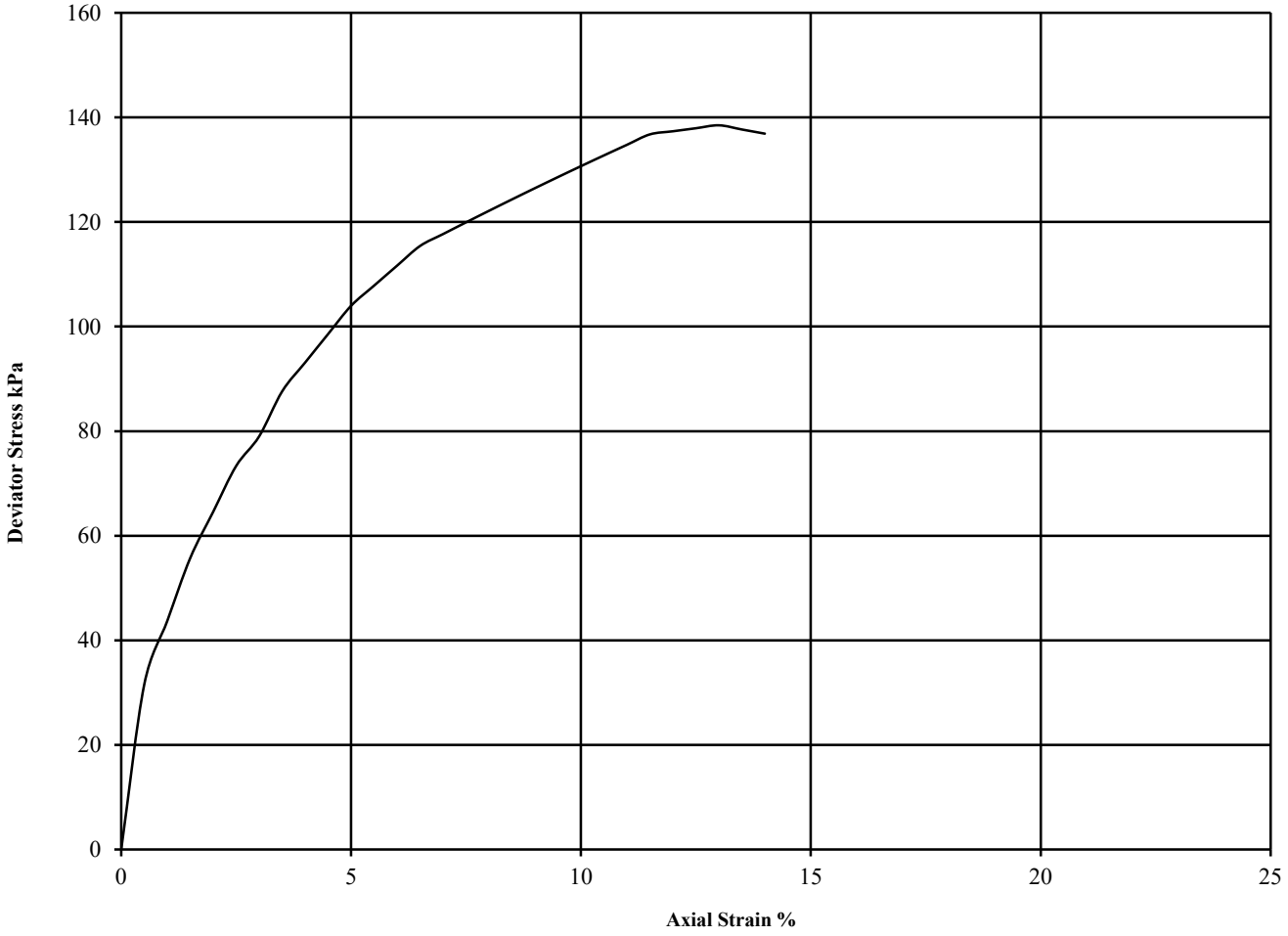
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **BH04** **Top Depth (m):** **5.00**

Sample Number: **Base Depth (m):** **5.45**

Sample Type **UT**



Diameter (mm):		38	Height (mm):		76	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.81
1	15	2.02	1.75	100	138	69	13.0	Plastic	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Port Street, Manchester

Contract No:
PSL21/4047
Client Ref:
PN214228

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

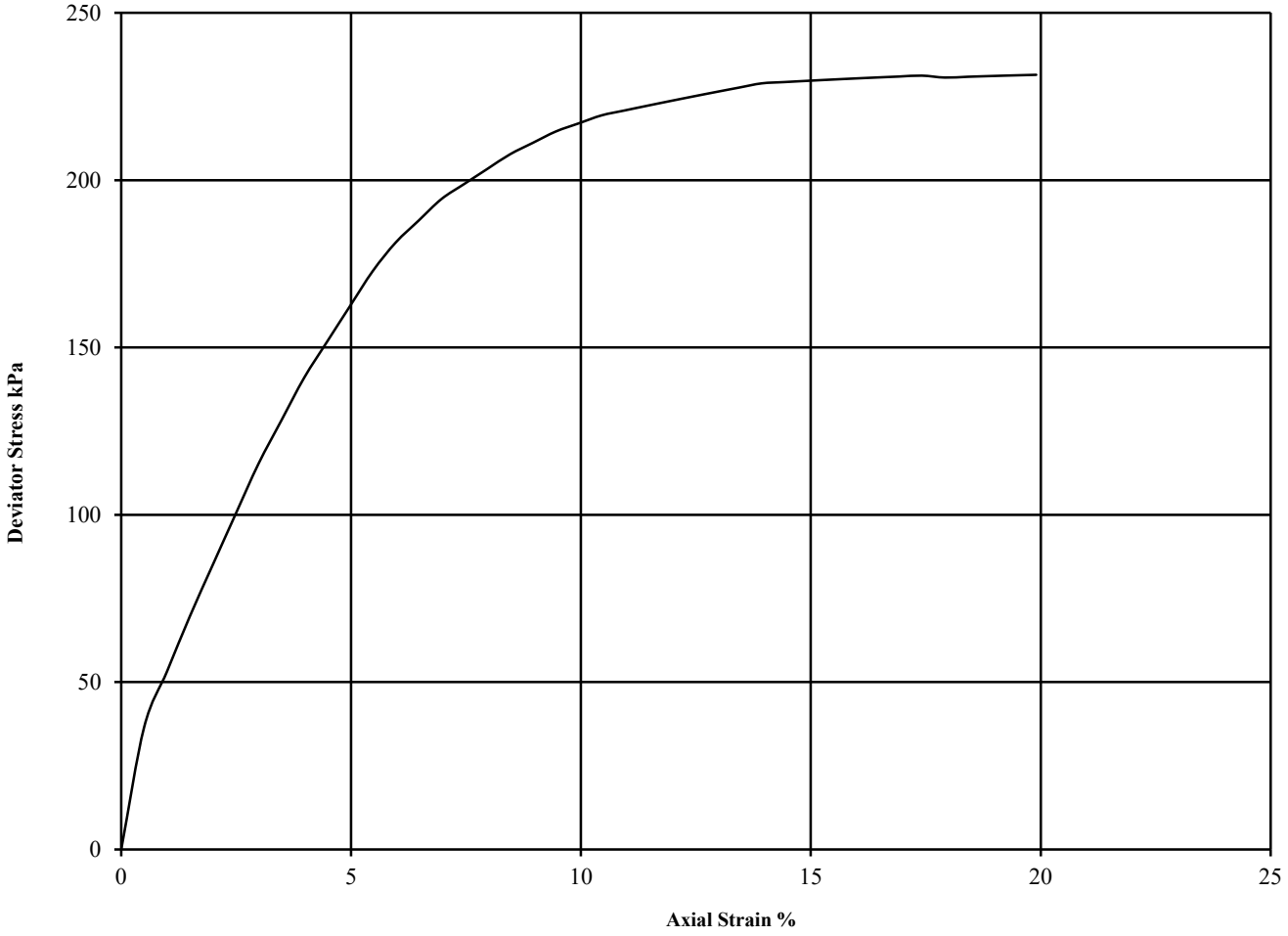
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH03 **Top Depth (m):** 3.00

Sample Number: **Base Depth (m):** 3.45

Sample Type U



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.33
1	18	2.08	1.76	60	231	116	19.9	Plastic	See summary of soil descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	**Port Street, Manchester**	**Contract No:** PSL21/4047 **Client Ref:** PN214228

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

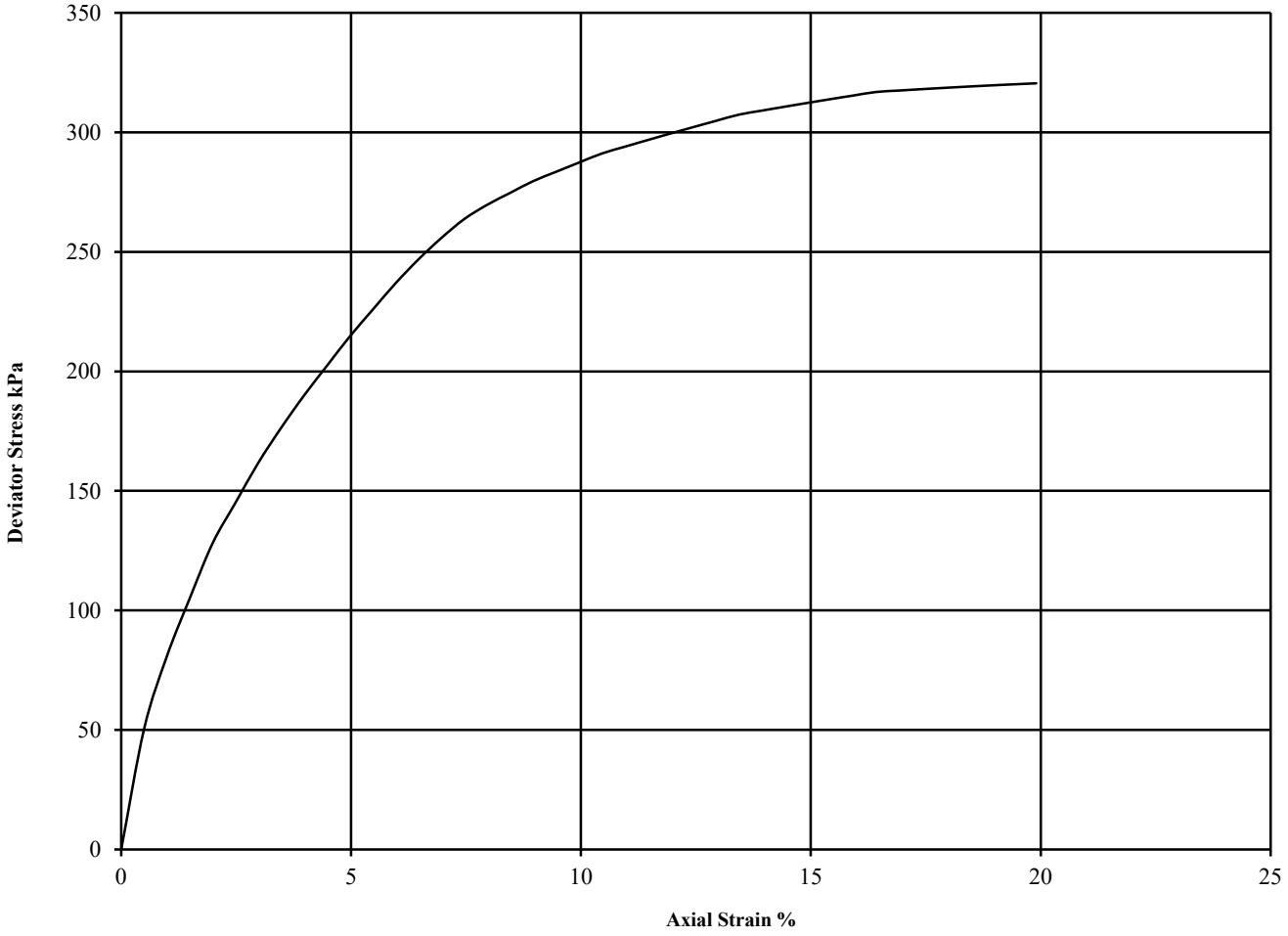
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH03 **Top Depth (m):** 8.00

Sample Number: **Base Depth (m):** 8.45

Sample Type U



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.33
1	15	2.11	1.84	160	321	160	19.9	Plastic	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Port Street, Manchester

Contract No:
PSL21/4047
Client Ref:
PN214228

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

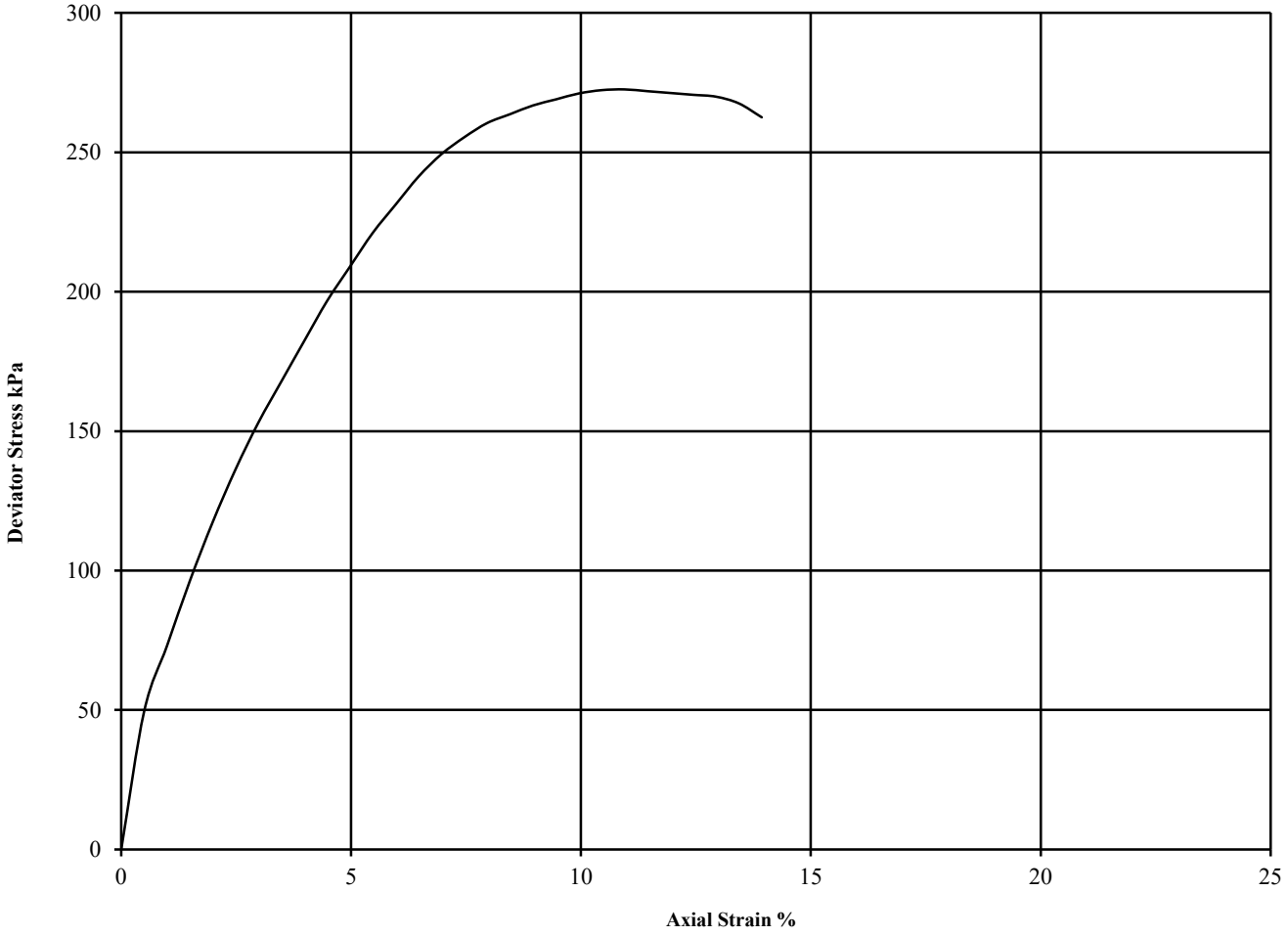
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **BH01** **Top Depth (m):** **5.00**

Sample Number: **Base Depth (m):** **5.45**

Sample Type **UT**



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.35
1	18	2.05	1.74	100	273	136	10.9	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Port Street, Manchester

Contract No:
PSL21/4047
Client Ref:
PN214228

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

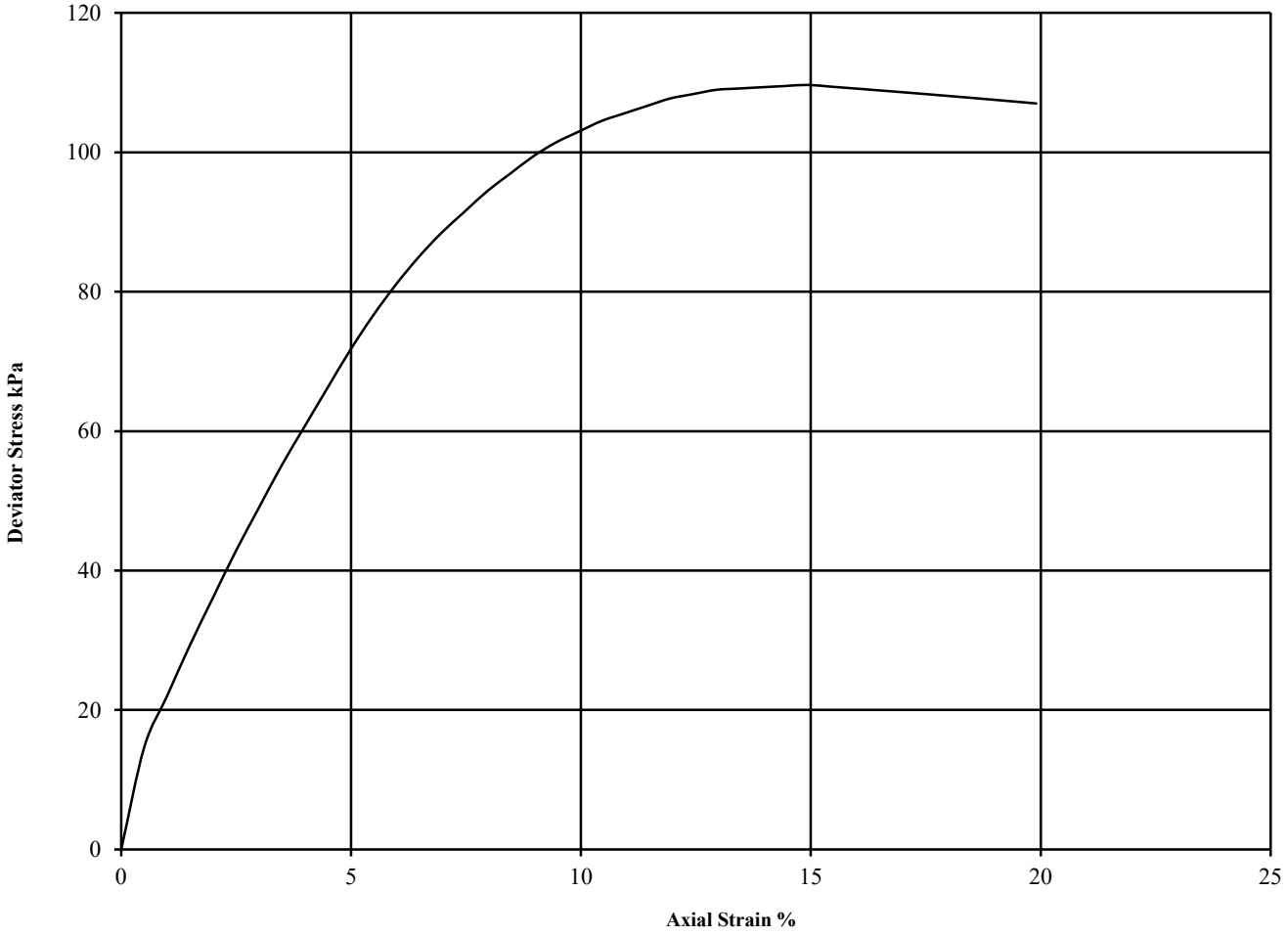
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **BH01** **Top Depth (m):** **8.00**

Sample Number: **Base Depth (m):** **8.45**

Sample Type **UT**



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.34
1	24	2.07	1.66	160	110	55	14.9	Plastic	See summary of soil descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	**Port Street, Manchester**	**Contract No:** PSL21/4047 **Client Ref:** PN214228

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

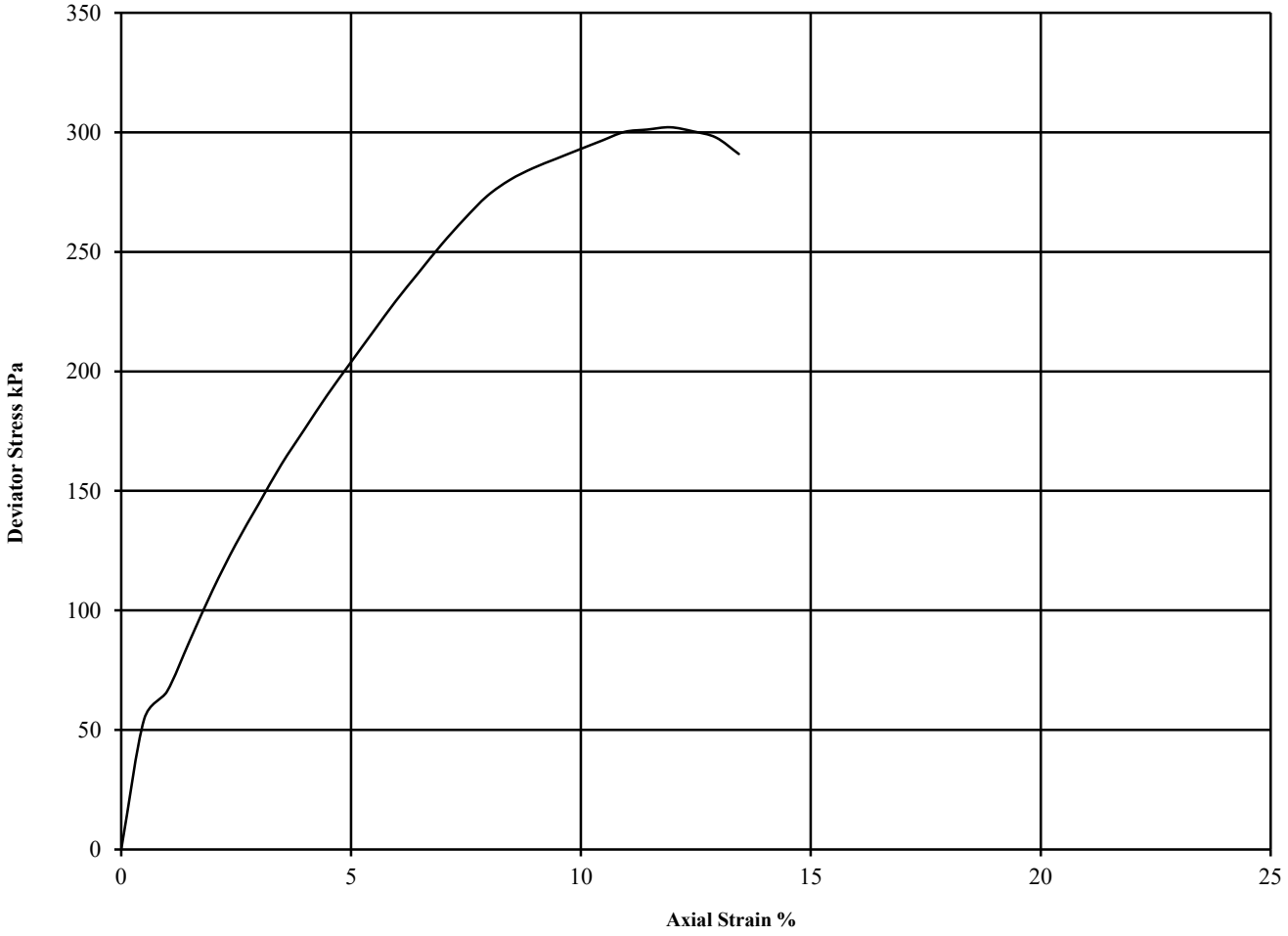
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **BH02** **Top Depth (m):** **8.00**

Sample Number: **Base Depth (m):** **8.45**

Sample Type **UT**



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.35
1	14	2.11	1.86	160	302	151	11.9	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Port Street, Manchester

Contract No:
PSL21/4047
Client Ref:
PN214228

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

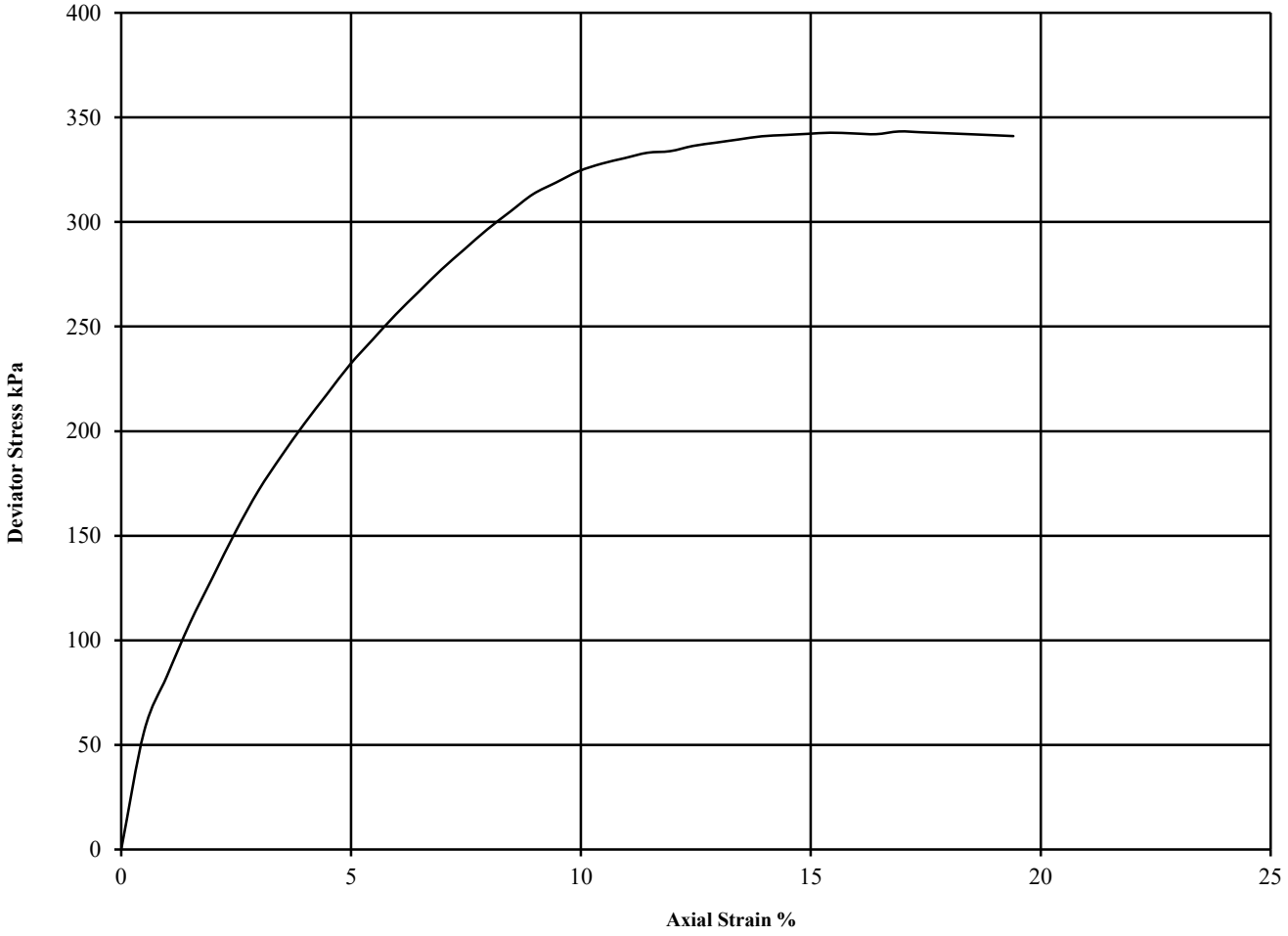
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH02 **Top Depth (m):** 11.00

Sample Number: **Base Depth (m):** 11.45

Sample Type UT



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.34
1	15	2.17	1.88	220	343	172	16.9	Plastic	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Port Street, Manchester

Contract No:
PSL21/4047
Client Ref:
PN214228

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

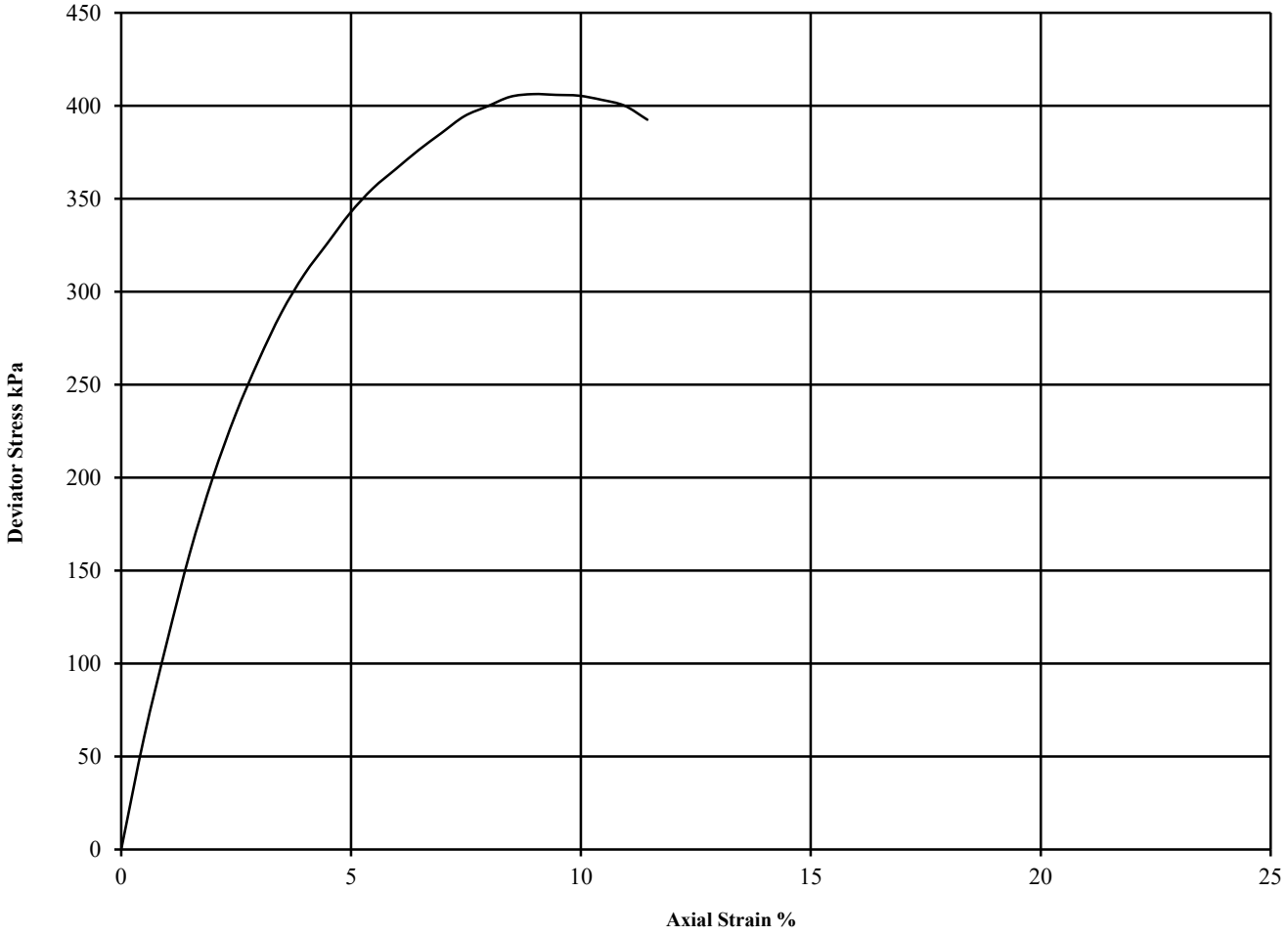
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH02 **Top Depth (m):** 14.00

Sample Number: **Base Depth (m):** 14.45

Sample Type UT



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.35
1	11	2.25	2.03	280	406	203	9.0	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Port Street, Manchester

Contract No: PSL21/4047

Client Ref: PN214228

ONE DIMENSIONAL CONSOLIDATION TEST

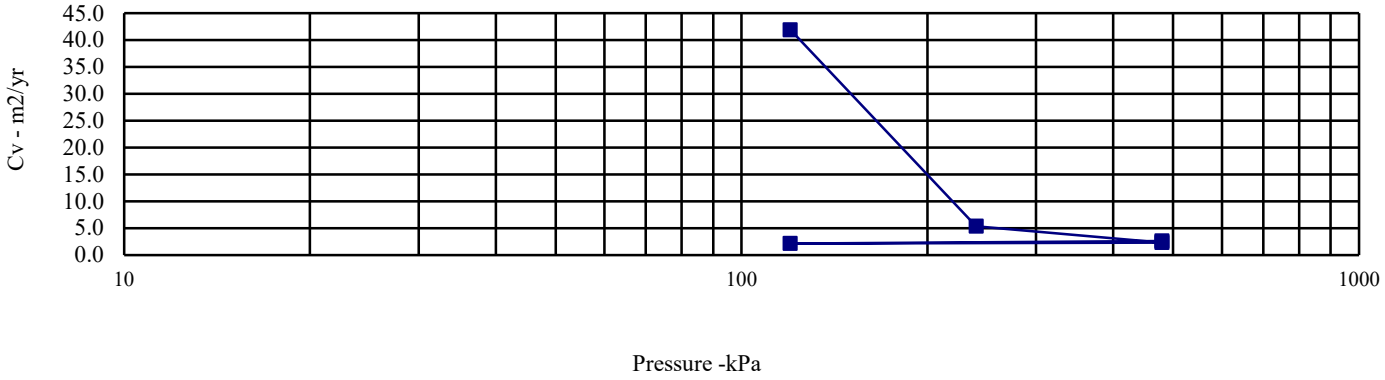
BS 1377: Part 5: 1990: Clause 3

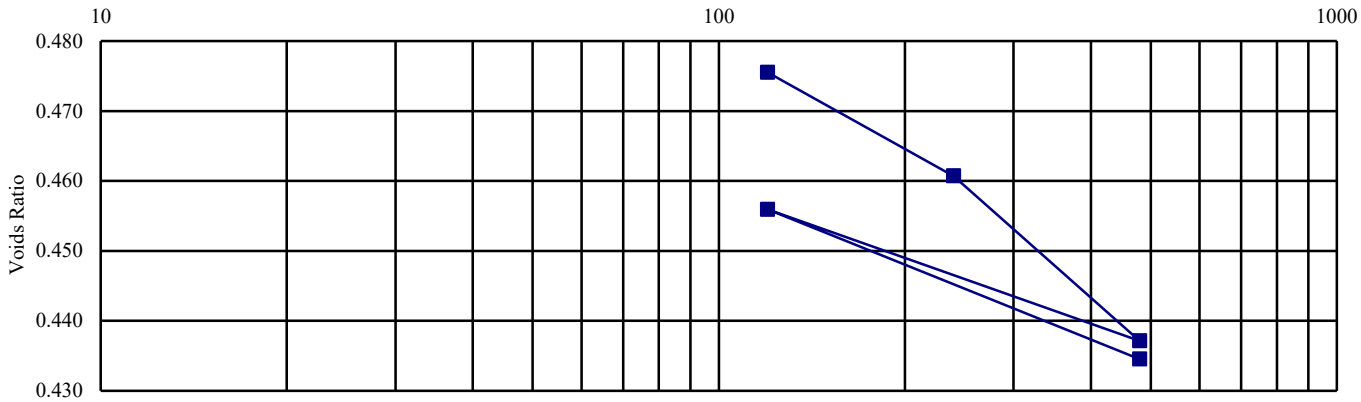
Hole Number: **BH01** **Top Depth (m):** **3.00**

Sample Number: **Base Depth (m) :**

Sample Type: **U**

Initial Conditions		Pressure Range kPa		Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	18						
Bulk Density (Mg/m3):	2.10	0	120	0.108	41.880	Method used to	
Dry Density (Mg/m3):	1.77	120	240	0.084	5.338	determine CV:	T90
Voids Ratio:	0.495	240	480	0.067	2.305	Nominal temperature	
Degree of saturation:	99.1	480	120	0.036	2.106	during test ' C:	20
Height (mm):	20.1	120	480	0.041	2.589	Remarks:	
Diameter (mm)	75.01					See summary of soil descriptions	
Particle Density (Mg/m3): Assumed	2.65						





UKAS TESTING 4043	PSL Professional Soils Laboratory	'Port Street, Manchester	Contract No: PSL21/4047
			Client Ref: PN214228

ONE DIMENSIONAL CONSOLIDATION TEST

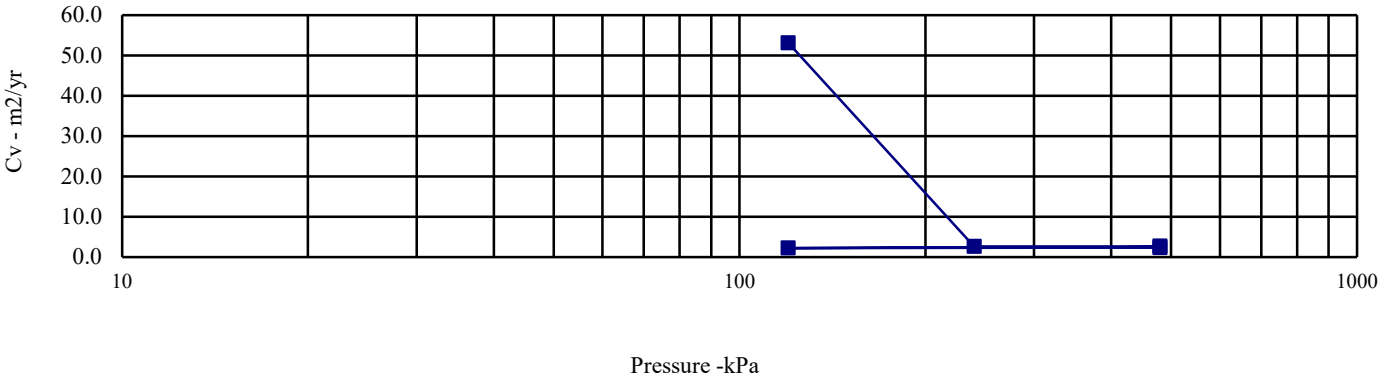
BS 1377: Part 5: 1990: Clause 3

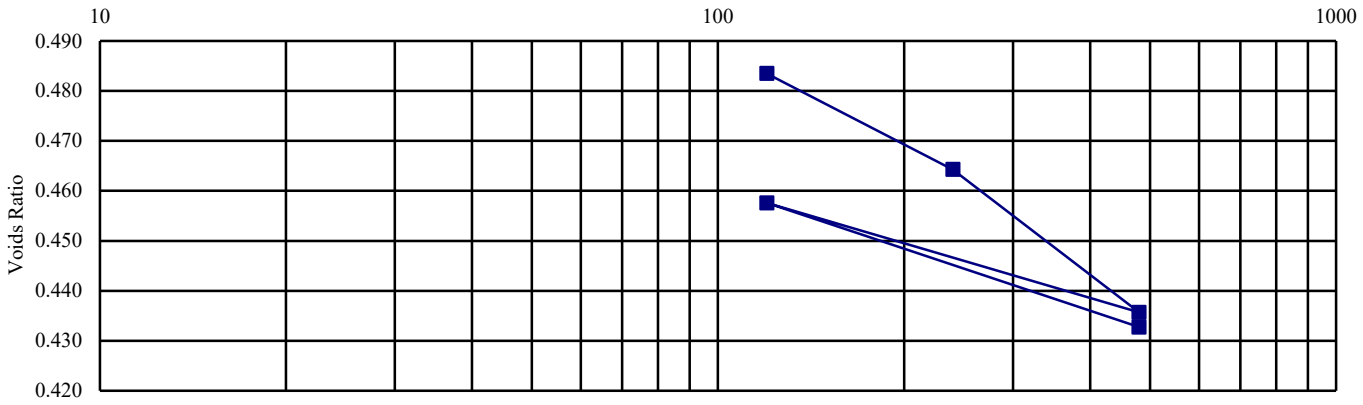
Hole Number: **BH02** **Top Depth (m):** **3.00**

Sample Number: **Base Depth (m) :**

Sample Type: **U**

Initial Conditions		Pressure Range kPa		Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	20						
Bulk Density (Mg/m3):	2.09	0	120	0.200	53.077	Method used to	
Dry Density (Mg/m3):	1.74	120	240	0.108	2.615	determine CV:	T90
Voids Ratio:	0.520	240	480	0.081	2.328	Nominal temperature	
Degree of saturation:	100.1	480	120	0.042	2.223	during test ' C:	20
Height (mm):	20.03	120	480	0.047	2.647	Remarks:	
Diameter (mm)	75.11					See summary of soil descriptions	
Particle Density (Mg/m3): Assumed	2.65						





UKAS TESTING 4043	PSL Professional Soils Laboratory	**Port Street, Manchester**	**Contract No:** PSL21/4047 **Client Ref:** PN214228

PSL
Professional Soils Laboratory

TEST AMENDMENT NOTICE

(Please tick boxes as appropriate)

From: Jay Stringer

To: Conor Southall

Date: 9 / 6 /2021

Laboratory Ref: PSL21/1404Y

Contract Number:

Location: Port Street, Manchester

☑ BH 04 o TP Sample Number

Depth (m): 12.50

Sample Type: ☑ U o B o D o W o P o C
Test/s:

Q.U.T

The above sample cannot be tested for the following reasons:

- ☐ The Sample has not been received
- ☐ There is insufficient material for BS1377: 1990 testing
  Maximum Grain Size (Minimum 10%): o Fine o Medium o Coarse
  Sample Mass (kg): .....
  Required Mass (kg): .....
- ☐ The Sample has been previously tested.
- ☐ The Sample has been misplaced in the Laboratory.
- ☑ The Sample is unsuitable for testing because: Sample highly disturbed collapsed on extrusion

Please advise action required:

- ☐ Perform original test on the following alternative Sample:
  o BH o TP Sample Number: Depth (m):
  Sample Type: o U o B o D o W o P o C
- ☐ Combine original Sample with the following sample:
  o BH o TP Sample Number: Depth (m):
  Sample Type: o U o B o D o W o P o C
- ☐ Perform the following alternative test/s on the original Sample
- ☐ Perform non-standard test on material available
- ☐ Take no further action.

Signed ..... Date .....
(Project Engineer)

PSL
Professional Soils Laboratory

TEST AMENDMENT NOTICE

(Please tick boxes as appropriate)

From: Jay Stringer
To: Conor Southall

Date: 8 / 6 /2021
Laboratory Ref: PSL21/4047

Contract Number:
Location: Park Street, Manchester

✓ BH 04 o TP Sample Number
Depth (m): 1.20

Sample Type: ✓ U o B o D o W o P o C
Test/s:

Q.U.T

The above sample cannot be tested for the following reasons:

- ☐ The Sample has not been received
- ☐ There is insufficient material for BS1377: 1990 testing
  Maximum Grain Size (Minimum 10%): o Fine o Medium o Coarse
  Sample Mass (kg): .....
  Required Mass (kg): .....
- ☐ The Sample has been previously tested.
- ☐ The Sample has been misplaced in the Laboratory.
- ☑ The Sample is unsuitable for testing because: Sample is Waterlogged

Please advise action required:

- ☐ Perform original test on the following alternative Sample:
  o BH o TP Sample Number: Depth (m):
  Sample Type: o U o B o D o W o P o C
- ☐ Combine original Sample with the following sample:
  o BH o TP Sample Number: Depth (m):
  Sample Type: o U o B o D o W o P o C
- ☐ Perform the following alternative test/s on the original Sample
- ☐ Perform non-standard test on material available
- ☐ Take no further action.

Signed ..... Date .....
(Project Engineer)

CAB

PSL
Professional Soils Laboratory

TEST AMENDMENT NOTICE

(Southall Geotechnics Co-op

(Please tick boxes as appropriate)

From: Jay Stringer

To: Conor Southall

Date: 8 / 6 /2021

Laboratory Ref: PSL21 14047

Contract Number:

Location: Park Street, Manchester

✓ BH03 o TP Sample Number

Depth (m): 11.00

Sample Type: ✓ U o B o D o W o P o C

Test/s:

Q.U.T

The above sample cannot be tested for the following reasons: ✓

- ❑ The Sample has not been received
- ❑ There is insufficient material for BS1377: 1990 testing
  Maximum Grain Size (Minimum 10%): o Fine o Medium o Coarse
  Sample Mass (kg): .....
  Required Mass (kg): .....
- ❑ The Sample has been previously tested.
- ❑ The Sample has been misplaced in the Laboratory.
- ✓ The Sample is unsuitable for testing because: Collapsed on extrusion due to brittle nature of specimen (Sandy)

Please advise action required:

- ❑ Perform original test on the following alternative Sample:
  o BH o TP Sample Number: Depth (m):
  Sample Type: o U o B o D o W o P o C
- ❑ Combine original Sample with the following sample:
  o BH o TP Sample Number: Depth (m):
  Sample Type: o U o B o D o W o P o C
- ❑ Perform the following alternative test/s on the original Sample
- ❑ Perform non-standard test on material available
- ❑ Take no further action.

CG/6

Signed ..... Date .....
(Project Engineer)

2531

ANALYTICAL TEST REPORT

Contract no: 97012

Contract name: Port Street, Manchester

Client reference: PSL21/4047

Clients name: Professional Soils Laboratory

Clients address: 5/7 Hexthorpe Road
Doncaster
DN4 0AR

Samples received: 07 June 2021

Analysis started: 07 June 2021

Analysis completed: 14 June 2021

Report issued: 14 June 2021

Notes:
Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

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

Approved by:
Rachael Burton
Customer Support Squad Leader

Chemtech Environmental Limited

SOILS

Lab number			97012-1	97012-2	97012-3	97012-4	97012-5	97012-6
Sample id			BH01	BH01	BH01	BH01	BH02	BH03
Depth (m)			1.80	7.30	16.90	19.80	18.50-18.77	0.90
Date sampled			11/05/2021	11/05/2021	-	12/05/2021	-	04/05/2021
Test	**Method**	**Units**						
pH	CE004 [U]	units	7.9	8.3	8.2	8.3	8.7	8.2
Sulphate (2:1 water soluble)	CE061	mg/l SO_4	1927	220	90	128	52	84

Chemtech Environmental Limited

SOILS

Lab number			97012-7	97012-8	97012-9	97012-10
Sample id			BH03	BH03	BH04	BH04
Depth (m)			2.00-2.45	22.70	0.60-1.00	8.45-8.55
Date sampled			04/05/2021	-	04/05/2021	-
Test	**Method**	**Units**				
pH	CE004 [U]	units	8.1	8.7	7.4	8.3
Sulphate (2:1 water soluble)	CE061	mg/l SO_4	32	34	349	74

Chemtech Environmental Limited

METHOD DETAILS

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

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

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

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
97012-1	BH01	1.80	Y	All (EHT)
97012-2	BH01	7.30	Y	All (EHT)
97012-3	BH01	16.90	Y	All (NSD)
97012-4	BH01	19.80	Y	All (EHT)
97012-5	BH02	18.50-18.77	Y	All (EHT)
97012-6	BH03	0.90	Y	All (EHT)
97012-7	BH03	2.00-2.45	Y	All (EHT)
97012-8	BH03	22.70	Y	All (NSD)
97012-9	BH04	0.60-1.00	Y	All (EHT)
97012-10	BH04	8.45-8.55	Y	All (NSD)

APPENDIX 7

Laboratory Test Results - Geotechnical (Rock)

LABORATORY REPORT

4043

Contract Number: PSL21/4503

Report Date: 17 June 2021

Client's Reference: PN214228

Client Name: Geotechnics Chester
The Geotechnical Centre
Unit 1 Borders Industrial Park
River Lane, Saltney
Chester
CH4 8RJ

For the attention of: Connor Southall

Contract Title: Port Street, Manchester

Date Received: 3/6/2021
Date Commenced: 3/6/2021
Date Completed: 16/6/2021

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins (Director)
R Berriman (Quality Manager)
S Royle (Laboratory Manager)
L Knight (Assistant Laboratory Manager)
S Eyre (Senior Technician)
T Watkins (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

DETERMINATION OF UNCONFINED COMPRESSIVE STRENGTH

ISRM Suggested Methods, pp 111 –116, 1981.

Hole Number	Sample Number	Sample Type	Top Depth (m)	Base Depth (m)	Sample Diameter (mm)	Sample Length (mm)	Height Ratio	Initial Mass (g)	Bulk Density (Mg/m)	Moisture Content (%)	Dry Density (Mg/m)	Load Failure (kN)	UCS (MPa)	Failure Mode	Date Tested	Remarks
BH01		C	26.70	26.91	86	171	2.0	2074	2.09	3.9	2.01	39.8	6.9	Brittle	15/06/21	
BH01		C	38.28	38.70	86	173	2.0	2279	2.27	5.4	2.15	48.9	8.4	Brittle	15/06/21	
BH04		C	28.15	28.50	86	172	2.0	2150	2.15	3.3	2.08	40.7	7.0	Brittle	15/06/21	
BH04		C	29.50	29.77	86	172	2.0	2188	2.19	4.4	2.10	50.2	8.6	Brittle	15/06/21	
BH04		C	34.50	34.95	86	171	2.0	2186	2.20	5.9	2.08	40.7	7.0	Brittle	15/06/21	
BH04		C	35.89	36.12	86	172	2.0	2185	2.19	3.9	2.10	36.9	6.4	Brittle	15/06/21	
BH04		C	31.12	31.33	86	172	2.0	2200	2.20	5.7	2.08	41.8	7.2	Brittle	15/06/21	
BH04		C	32.69	33.23	86	171	2.0	2190	2.20	3.6	2.13	38.4	6.6	Brittle	15/06/21	

PSL Professional Soils Laboratory

Port Street, Manchester

Contract No:
PSL21/4503
Client Ref:
PN214228

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH01	32.70		A	Perp	86	41	3526	4489.44	67.00	-	0.77	0.17	1.141	0.20	Valid	
BH01	33.87		A	Perp	86	40	3440	4379.94	66.18	-	0.57	0.13	1.134	0.15	Valid	
BH01	25.40		A	Perp	86	30	2580	3284.96	57.31	-	0.28	0.09	1.063	0.09	Valid	
BH01	26.63		A	Perp	86	38	3268	4160.95	64.51	-	0.58	0.14	1.121	0.16	Valid	
BH01	29.11		A	Perp	86	41	3526	4489.44	67.00	-	0.92	0.20	1.141	0.23	Valid	
BH01	40.00		A	Perp	85	34	2890	3679.66	60.66	-	0.33	0.09	1.091	0.10	Valid	
BH04	25.33		A	Perp	85	36	3060	3896.11	62.42	-	0.92	0.24	1.105	0.26	Valid	
BH04	26.45		A	Perp	85	25	2125	2705.63	52.02	-	0.26	0.10	1.018	0.10	Valid	
BH04	28.10		A	Perp	86	23	1978	2518.47	50.18	-	0.56	0.22	1.002	0.22	Valid	
BH04	30.06		A	Perp	86	34	2924	3722.95	61.02	-	0.76	0.20	1.094	0.22	Valid	
BH04	34.42		A	Perp	86	44	3784	4817.94	69.41	-	0.77	0.16	1.159	0.19	Valid	
BH04	31.42		A	Perp	86	33	2838	3613.45	60.11	-	1.06	0.29	1.086	0.32	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL Professional Soils Laboratory

Port Street, Manchester

Contract No:

PSL21/4503

Client Ref:

PN214228

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH01	32.70		D	Par	-	86	7396	86.00	-	0.78	0.105	1.276	0.13	Valid	
BH01	33.87		D	Par	-	86	7396	86.00	-	0.09	0.012	1.276	0.02	Valid	
BH01	25.40		D	Par	-	86	7396	86.00	-	0.31	0.042	1.276	0.05	Valid	
BH01	26.63		D	Par	-	86	7396	86.00	-	0.29	0.039	1.276	0.05	Valid	
BH01	29.11		D	Par	-	86	7396	86.00	-	0.91	0.123	1.276	0.16	Valid	
BH01	40.00		D	Par	-	85	7225	85.00	-	0.16	0.022	1.270	0.03	Valid	
BH04	25.33		D	Par	-	85	7225	85.00	-	0.55	0.076	1.270	0.10	Valid	
BH04	26.45		D	Par	-	85	7225	85.00	-	0.38	0.053	1.270	0.07	Valid	
BH04	28.10		D	Par	-	86	7396	86.00	-	0.86	0.116	1.276	0.15	Valid	
BH04	30.06		D	Par	-	86	7396	86.00	-	0.74	0.100	1.276	0.13	Valid	
BH04	34.42		D	Par	-	86	7396	86.00	-	0.42	0.057	1.276	0.07	Valid	
BH04	31.42		D	Par	-	86	7396	86.00	-	0.93	0.126	1.276	0.16	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

UKAS TESTING 4043

PSL Professional Soils Laboratory

Port Street, Manchester

Contract No:

PSL21/4503

Client Ref:

PN214228

APPENDIX 8

Laboratory Test Results - Contamination (Soil)

Certificate of Analysis

Certificate Number	21-10197-1	*Issued:*	01-Jun-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-10197-1

Client Reference PN214228

Order No ON29687

Contract Title Port Street, Manchester

Description 12 Soil samples.

Date Received 14-May-21

Date Started 14-May-21

Date Completed 01-Jun-21

Test Procedures Identified by prefix DETSn (details on request).

Notes This report supersedes 21-10197, extra testing added.
Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 21-10197-1
Client Ref PN214228
Contract Title Port Street, Manchester

	Lab No	1847053	1847054	1847055	1847056	1847057	1847058
	.Sample ID	BH04	BH03	WS01	WS01	WS01	WS03
	Depth	0.60	0.30	0.30	0.50	2.00	0.60
	Other ID						
	Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampling Date	04/05/2021	04/05/2021	05/05/2021	05/05/2021	05/05/2021	05/05/2021
	Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Asbestos Quantification	DETSC 1102	0.001	%				0.001		
Metals									
Antimony	DETSC 2301*	1	mg/kg	1.1	1.4	2.2	6.9	3.1	1.2
Arsenic	DETSC 2301#	0.2	mg/kg	13	15	30	76	50	9.0
Beryllium	DETSC 2301#	0.2	mg/kg	0.9	1.1	1.5	2.4	1.9	0.8
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	1.2	< 0.2	0.3	1.3	1.0	0.7
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	0.3	0.6	5.4	2.3	0.6
Chromium III	DETSC 2301*	0.15	mg/kg	19	11	22	50	37	22
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	39	52	160	520	370	36
Lead	DETSC 2301#	0.3	mg/kg	75	99	82	750	1100	35
Manganese	DETSC 2301#	20	mg/kg	240	350	680	400	370	540
Mercury	DETSC 2325#	0.05	mg/kg	0.14	0.35	0.15	4.0	2.6	0.09
Molybdenum	DETSC 2301#	0.4	mg/kg	1.6	2.1	3.0	4.0	2.4	1.1
Nickel	DETSC 2301#	1	mg/kg	20	17	27	45	58	28
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	0.9	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	43	76	150	2100	550	190
Inorganics									
Loss on Ignition (Fines)	DETSC 5022	0.01	%	7.1	8.8	2.1	4.7	8.1	2.1
pH	DETSC 2008#		pH	7.4	8.2	8.3	7.5	6.9	8.2
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	510	10	6.8
Organic matter	DETSC 2002#	0.1	%	3.5	1.7	1.4	12	7.5	1.3
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	110	14	37	15	68	70
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	20	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	160	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	180	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	33	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	88	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	180	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	300	< 10	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	480	< 10	< 10

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 21-10197-1
Client Ref PN214228
Contract Title Port Street, Manchester

			Lab No	1847053	1847054	1847055	1847056	1847057	1847058
			.Sample ID	BH04	BH03	WS01	WS01	WS01	WS03
			Depth	0.60	0.30	0.30	0.50	2.00	0.60
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	04/05/2021	04/05/2021	05/05/2021	05/05/2021	05/05/2021	05/05/2021
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAHs									
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	7.3	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	1.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	0.1	< 0.1	16	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	0.1	< 0.1	16	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	1.0	< 0.1	55	0.5	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	0.2	< 0.1	14	0.2	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	1.6	< 0.1	40	0.7	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	1.5	< 0.1	33	0.5	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	0.7	< 0.1	12	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	0.7	< 0.1	14	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	0.6	< 0.1	8.7	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	0.4	< 0.1	4.6	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	0.6	< 0.1	9.5	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	0.6	< 0.1	5.9	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	0.4	< 0.1	1.3	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	1.0	< 0.1	6.2	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	9.5	< 1.6	240	1.9	< 1.6
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	0.3	2.2	0.6	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 21-10197-1
Client Ref PN214228
Contract Title Port Street, Manchester

			Lab No	1847059	1847060	1847061	1847062	1847063	1847064
			.Sample ID	WS03	WS04	WS07	WS08	WS02	WS06
			Depth	2.00	0.30	2.00	0.60	1.00	1.00
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	05/05/2021	05/05/2021	06/05/2021	06/05/2021	07/05/2021	07/05/2021
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0.001	%				0.020		
Metals									
Antimony	DETSC 2301*	1	mg/kg	1.4	4.3	< 1.0	2.9	1.9	4.8
Arsenic	DETSC 2301#	0.2	mg/kg	9.1	17	7.3	17	10	31
Beryllium	DETSC 2301#	0.2	mg/kg	1.2	0.9	0.7	0.6	0.6	1.0
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.2	< 0.2	< 0.2	1.4	0.8	0.4
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	1.3	0.1	0.7	0.4	4.0
Chromium III	DETSC 2301*	0.15	mg/kg	33	21	20	32	15	21
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	34	76	25	160	54	110
Lead	DETSC 2301#	0.3	mg/kg	25	220	9.7	150	150	620
Manganese	DETSC 2301#	20	mg/kg	630	380	550	310	350	410
Mercury	DETSC 2325#	0.05	mg/kg	0.05	0.18	< 0.05	0.25	0.22	1.0
Molybdenum	DETSC 2301#	0.4	mg/kg	0.7	2.7	0.5	1.7	1.1	3.5
Nickel	DETSC 2301#	1	mg/kg	38	28	25	22	13	27
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	74	170	46	340	120	520
Inorganics									
Loss on Ignition (Fines)	DETSC 5022	0.01	%	2.0	3.7	2.0	4.8	3.0	3.6
pH	DETSC 2008#		pH	8.4	8.4	8.4	9.8	9.9	8.4
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.6	0.8	0.2	3.3	0.5	6.0
Organic matter	DETSC 2002#	0.1	%	1.2	1.9	0.8	5.5	1.1	2.1
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	360	< 10	46	250	33	120
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	580	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	1800	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	2000	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	2800	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	7300	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	1400	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	2100	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	3900	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	7300	< 10	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	15000	< 10	< 10

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Summary of Chemical Analysis
Soil Samples

Our Ref 21-10197-1
Client Ref PN214228
Contract Title Port Street, Manchester

			Lab No	1847059	1847060	1847061	1847062	1847063	1847064
			.Sample ID	WS03	WS04	WS07	WS08	WS02	WS06
			Depth	2.00	0.30	2.00	0.60	1.00	1.00
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	05/05/2021	05/05/2021	06/05/2021	06/05/2021	07/05/2021	07/05/2021
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAHs									
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 1.0	< 0.1	0.4
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 1.0	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 1.0	< 0.1	0.5
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 1.0	0.1	0.5
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	0.2	< 0.1	< 1.0	0.9	4.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 1.0	0.3	0.8
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	0.5	< 0.1	< 1.0	2.0	5.3
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	0.5	< 0.1	< 1.0	2.1	5.7
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	0.3	< 0.1	< 1.0	1.1	2.3
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	0.3	< 0.1	< 1.0	1.2	2.7
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	0.4	< 0.1	< 1.0	1.0	2.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	0.2	< 0.1	< 1.0	0.6	1.0
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	0.3	< 0.1	< 1.0	1.2	2.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	0.4	< 0.1	< 1.0	0.9	1.5
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	0.5	< 0.1	< 1.0	0.4	0.4
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	0.9	< 0.1	< 1.0	2.0	2.2
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	4.6	< 1.6	< 16.0	14	32
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 21-10197-1
Client Ref PN214228
Contract Title Port Street, Manchester

Lab No	1847056
.Sample ID	WS01
Depth	0.50
Other ID	
Sample Type	SOIL
Sampling Date	05/05/2021
Sampling Time	n/s

Test	Method	LOD	Units	
VOCs				
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	0.02

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 21-10197-1
Client Ref PN214228
Contract Title Port Street, Manchester

Lab No	1847056
.Sample ID	WS01
Depth	0.50
Other ID	
Sample Type	SOIL
Sampling Date	05/05/2021
Sampling Time	n/s

Test	Method	LOD	Units	
sec-butylbenzene	DETSC 3431	0.01	mg/kg	0.02
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01
SVOCs				
Phenol	DETSC 3433	0.1	mg/kg	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	0.2
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	1.3
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	2.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 21-10197-1
Client Ref PN214228
Contract Title Port Street, Manchester

Lab No	1847056
.Sample ID	WS01
Depth	0.50
Other ID	
Sample Type	SOIL
Sampling Date	05/05/2021
Sampling Time	n/s

Test	Method	LOD	Units	
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1
Di-n-octylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	2.1

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 21-10197-1
Client Ref PN214228
Contract Title Port Street, Manchester

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1847053	BH04 0.60	SOIL	NAD	none	Emma Stacey
1847054	BH03 0.30	SOIL	NAD	none	Emma Stacey
1847055	WS01 0.30	SOIL	NAD	none	Emma Stacey
1847056	WS01 0.50	SOIL	Chrysotile	Chrysotile present as fibre bundles.	Emma Stacey
1847057	WS01 2.00	SOIL	NAD	none	Emma Stacey
1847058	WS03 0.60	SOIL	NAD	none	Emma Stacey
1847059	WS03 2.00	SOIL	NAD	none	Emma Stacey
1847060	WS04 0.30	SOIL	NAD	none	Emma Stacey
1847061	WS07 2.00	SOIL	NAD	none	Emma Stacey
1847062	WS08 0.60	SOIL	Amosite Chrysotile	Amosite and Chrysotile present as fibre bundles.	Emma Stacey
1847063	WS02 1.00	SOIL	NAD	none	Emma Stacey
1847064	WS06 1.00	SOIL	NAD	none	Emma Stacey

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Summary of Asbestos Quantification Analysis
Soil Samples

Our Ref 21-10197-1
Client Ref PN214228
Contract Title Port Street, Manchester

		Lab No	1847056	1847062
		.Sample ID	WS01	WS08
		Depth	0.50	0.60
		Other ID		
		Sample Type	SOIL	SOIL
		Sampling Date	05/05/2021	06/05/2021
		Sampling Time		
Test	**Method**	**Units**		
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**0.001**	**0.020**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	0.001	0.020
Quantification by PCOM (c)	DETSC 1102	Mass %	na	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na	na
Breakdown of Gravimetric Analysis (a)				
Mass of Sample		g	714.09	891.37
ACMs present*		type		
Mass of ACM in sample		g		
% ACM by mass		%		
% asbestos in ACM		%		
% asbestos in sample		%		
Breakdown of Detailed Gravimetric Analysis (b)				
% Amphibole bundles in sample		Mass %	na	0.017
% Chrysotile bundles in sample		Mass %	0.001	0.003
Breakdown of PCOM Analysis (c)				
% Amphibole fibres in sample		Mass %	na	na
% Chrysotile fibres in sample		Mass %	na	na
Breakdown of Potentially Respirable Fibre Analysis (d)				
Amphibole fibres		Fibres/g	na	na
Chrysotile fibres		Fibres/g	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
denotes deviating sample

Information in Support of the Analytical Results

Our Ref 21-10197-1
Client Ref PN214228
Contract Port Street, Manchester

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1847053	BH04 0.60 SOIL	04/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1847054	BH03 0.30 SOIL	04/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1847055	WS01 0.30 SOIL	05/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1847056	WS01 0.50 SOIL	05/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1847057	WS01 2.00 SOIL	05/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1847058	WS03 0.60 SOIL	05/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1847059	WS03 2.00 SOIL	05/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1847060	WS04 0.30 SOIL	05/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1847061	WS07 2.00 SOIL	06/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1847062	WS08 0.60 SOIL	06/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1847063	WS02 1.00 SOIL	07/05/21	GJ 250ml, GJ 60ml, PT 1L		
1847064	WS06 1.00 SOIL	07/05/21	GJ 250ml, GJ 60ml, PT 1L		

Lab No	Sample ID	Comments
1847053	BH04 0.60 SOIL	Insufficient sample 84g (<1kg) received for LOI fines analysis
1847054	BH03 0.30 SOIL	Insufficient sample 80g (<1kg) received for LOI fines analysis
1847055	WS01 0.30 SOIL	Insufficient sample 490g (<1kg) received for LOI fines analysis
1847056	WS01 0.50 SOIL	Insufficient sample 266g (<1kg) received for LOI fines analysis
1847057	WS01 2.00 SOIL	Insufficient sample 371g (<1kg) received for LOI fines analysis
1847058	WS03 0.60 SOIL	Insufficient sample 407g (<1kg) received for LOI fines analysis
1847059	WS03 2.00 SOIL	Insufficient sample 424g (<1kg) received for LOI fines analysis
1847060	WS04 0.30 SOIL	Insufficient sample 403g (<1kg) received for LOI fines analysis
1847061	WS07 2.00 SOIL	Insufficient sample 315g (<1kg) received for LOI fines analysis
1847062	WS08 0.60 SOIL	Insufficient sample 338g (<1kg) received for LOI fines analysis
1847063	WS02 1.00 SOIL	Insufficient sample 87g (<1kg) received for LOI fines analysis
1847064	WS06 1.00 SOIL	Insufficient sample 92g (<1kg) received for LOI fines analysis

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

Certificate of Analysis

Certificate Number	21-10790	*Issued:*	28-May-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference	21-10790
Client Reference	PN214228
Order No	(not supplied)
Contract Title	Port Street, Manchester
Description	4 Soil samples.
Date Received	21-May-21
Date Started	21-May-21
Date Completed	28-May-21
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 21-10790
Client Ref PN214228
Contract Title Port Street, Manchester

			Lab No	1850829	1850830	1850831	1850832
			.Sample ID	BH02	BH02	BH01	BH01
			Depth	0.50	3.00	1.00	2.00
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	10/05/2021	10/05/2021	11/05/2021	11/05/2021
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Metals							
Antimony	DETSC 2301*	1	mg/kg	2.6	1.1	5.3	22
Arsenic	DETSC 2301#	0.2	mg/kg	67	9.4	11	13
Beryllium	DETSC 2301#	0.2	mg/kg	1.6	0.8	0.4	0.7
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.6	0.7	1.2	3.3
Cadmium	DETSC 2301#	0.1	mg/kg	0.5	0.2	0.3	1.5
Chromium III	DETSC 2301*	0.15	mg/kg	18	22	12	17
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	46	25	53	51
Lead	DETSC 2301#	0.3	mg/kg	230	16	530	1000
Manganese	DETSC 2301#	20	mg/kg	400	510	230	340
Mercury	DETSC 2325#	0.05	mg/kg	0.83	< 0.05	0.46	1.2
Molybdenum	DETSC 2301#	0.4	mg/kg	2.6	0.8	1.5	2.1
Nickel	DETSC 2301#	1	mg/kg	30	28	14	15
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	75	51	130	240
Inorganics							
Loss on Ignition (Fines)	DETSC 5022	0.01	%	2.4	3.3	2.5	3.8
pH	DETSC 2008#		pH	8.7	8.5	8.3	8.4
Cyanide, Total	DETSC 2130#	0.1	mg/kg	3.4	0.2	0.2	6.6
Organic matter	DETSC 2002#	0.1	%	1.0	1.3	1.7	3.8
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	2000	64	1800	2200
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	120	< 3.4	< 3.4	35
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	120	< 10	< 10	35
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	27	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	270	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	300	< 10	< 10	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	420	< 10	< 10	35
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 21-10790
Client Ref PN214228
Contract Title Port Street, Manchester

			Lab No	1850829	1850830	1850831	1850832
			.Sample ID	BH02	BH02	BH01	BH01
			Depth	0.50	3.00	1.00	2.00
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	10/05/2021	10/05/2021	11/05/2021	11/05/2021
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
PAHs							
Naphthalene	DETSC 3301	0.1	mg/kg	2.3	0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	0.3	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	4.0	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	4.8	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	22	< 0.1	0.5	0.2
Anthracene	DETSC 3301	0.1	mg/kg	5.7	< 0.1	0.2	0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	20	0.2	0.7	0.4
Pyrene	DETSC 3301	0.1	mg/kg	20	0.1	0.6	0.4
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	8.4	< 0.1	0.4	0.2
Chrysene	DETSC 3301	0.1	mg/kg	9.5	< 0.1	0.4	0.2
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	6.2	< 0.1	0.4	0.4
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	3.6	< 0.1	0.3	0.3
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	7.9	< 0.1	0.3	0.2
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	5.1	< 0.1	0.4	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	1.1	< 0.1	0.4	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	4.6	< 0.1	0.8	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	130	< 1.6	5.4	2.5
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	0.5

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 21-10790
Client Ref PN214228
Contract Title Port Street, Manchester

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1850829	BH02 0.50	SOIL	NAD	none	Emma Stacey
1850830	BH02 3.00	SOIL	NAD	none	Emma Stacey
1850831	BH01 1.00	SOIL	NAD	none	Emma Stacey
1850832	BH01 2.00	SOIL	NAD	none	Emma Stacey

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 21-10790
Client Ref PN214228
Contract Port Street, Manchester

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1850829	BH02 0.50 SOIL	10/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1850830	BH02 3.00 SOIL	10/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1850831	BH01 1.00 SOIL	11/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1850832	BH01 2.00 SOIL	11/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	

Lab No	Sample ID	Comments
1850829	BH02 0.50 SOIL	Insufficient sample 104g (<1kg) received for LOI fines analysis
1850830	BH02 3.00 SOIL	Insufficient sample 128g (<1kg) received for LOI fines analysis
1850831	BH01 1.00 SOIL	Insufficient sample 87g (<1kg) received for LOI fines analysis
1850832	BH01 2.00 SOIL	Insufficient sample 79g (<1kg) received for LOI fines analysis

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

APPENDIX 9

Laboratory Test Results - Contamination (Groundwater)

Certificate of Analysis

Certificate Number	21-11315	*Issued:*	07-Jun-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference	21-11315
Client Reference	PN214228
Order No	(not supplied)
Contract Title	Port Street, Manchester
Description	2 Water samples.
Date Received	28-May-21
Date Started	28-May-21
Date Completed	07-Jun-21
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Water Samples

Our Ref 21-11315
Client Ref PN214228
Contract Title Port Street, Manchester

			Lab No	1854320	1854321
			.Sample ID	BH04	BH03
			Depth		
			Other ID		
			Sample Type	WATER	WATER
			Sampling Date	25/05/2021	25/05/2021
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Metals					
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.6	1.1
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	0.10
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	7.4
Copper, Dissolved	DETSC 2306	0.4	ug/l	0.6	2.6
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.19	1.1
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	0.03
Nickel, Dissolved	DETSC 2306	0.5	ug/l	1.9	2.9
Selenium, Dissolved	DETSC 2306	0.25	ug/l	8.0	20
Zinc, Dissolved	DETSC 2306	1.3	ug/l	4.0	2.3
Inorganics					
pH	DETSC 2008		pH	7.1	7.6
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40
Sulphate as SO4	DETSC 2055	0.1	mg/l	51	110
Sulphide	DETSC 2208	10	ug/l	280	130
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	20
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	14
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	35
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	ug/l	< 10	35
Benzene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Toluene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Ethylbenzene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Xylene	DETSC 3322	1	ug/l	< 1.0	< 1.0
PAHs					
Naphthalene	DETSC 3304	0.05	ug/l	< 0.05	< 0.05
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Water Samples

Our Ref 21-11315
Client Ref PN214228
Contract Title Port Street, Manchester

			Lab No	1854320	1854321
			.Sample ID	BH04	BH03
			Depth		
			Other ID		
			Sample Type	WATER	WATER
			Sampling Date	25/05/2021	25/05/2021
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Phenanthrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Anthracene	DETSC 3304	0.01	ug/l	0.02	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.02	< 0.01
Pyrene	DETSC 3304	0.01	ug/l	0.01	< 0.01
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	0.01	< 0.01
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	< 0.20
Phenols					
Phenol - Monohydric	DETSC 2130	100	ug/l	< 100	< 100

Key: * -not accredited. n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 21-11315
Client Ref PN214228
Contract Port Street, Manchester

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1854320	BH04 WATER	25/05/21	GB 1L, PB 1L	pH/Cond/TDS (1 days)	
1854321	BH03 WATER	25/05/21	GB 1L, GV	pH/Cond/TDS (1 days)	

Key: G-Glass P-Plastic B-Bottle V-Vial

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Disposal

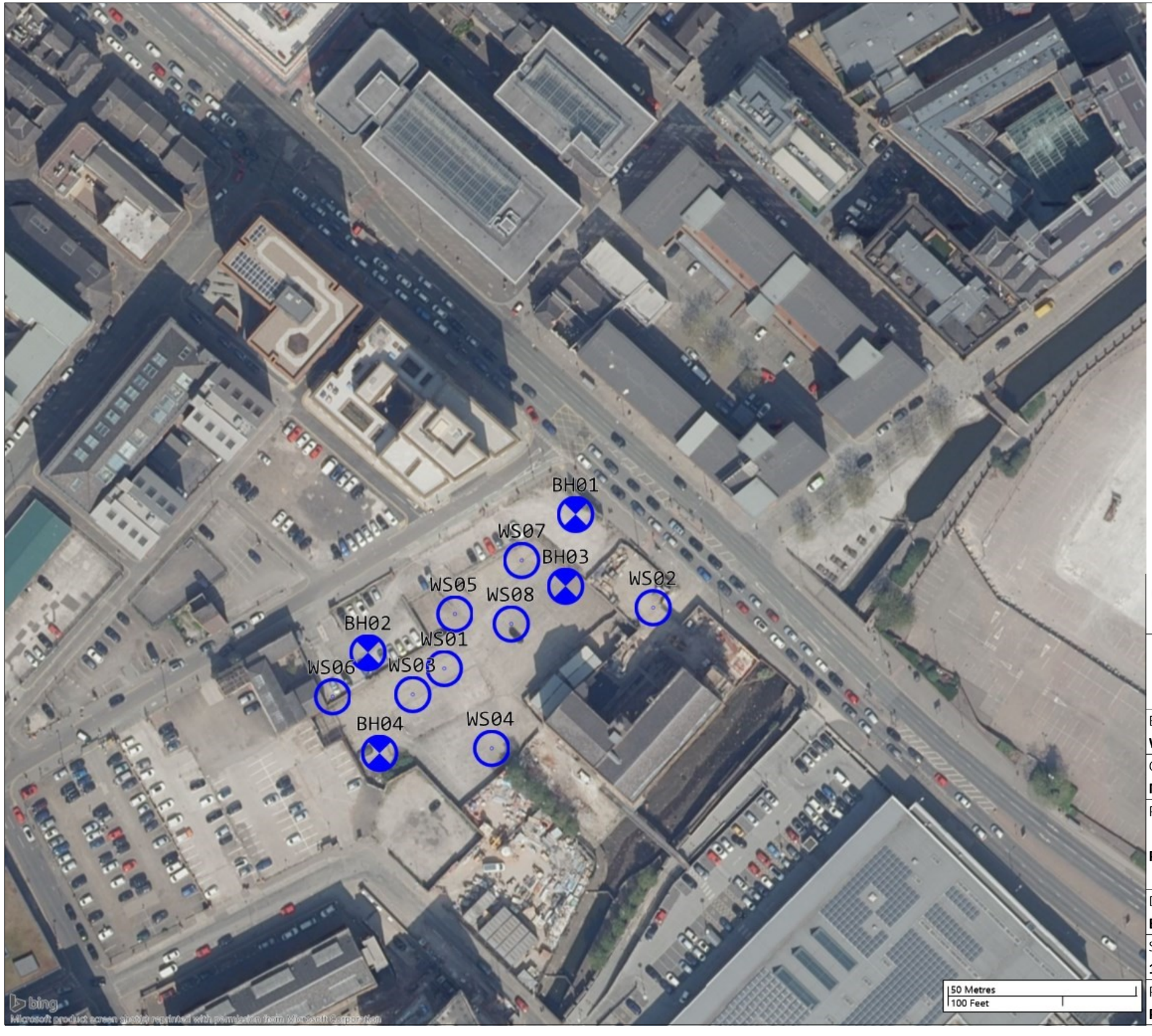
From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

APPENDIX 10

Exploratory Hole Location Plan



Key

- Locations By Type - CP+RC
- Locations By Type - WLS

GEOTECHNICS
geotechnical and geoenvironmental specialists

Phone:
Fax:
Email:
www.geotechnics.co.uk

Engineer:
WSP UK Limited

Client:
Manchester (Port Street) Limited

Project:
Port Street, Manchester

Drawing Title:
Exploratory Hole Location Plan

Scale:	Date:
1:1000 at A3	**22/06/2021**
Project No.:	File Name:
PN214228	

APPENDIX 11

Investigation Techniques and General Notes

INVESTIGATION TECHNIQUES

INTRODUCTION

The following brief review of Ground Investigation techniques, generally used as part of most Site Investigations in the UK, summarises their methodology, advantages and limitations. Detailed descriptions of the techniques are available and can be provided on request. This review should be read in conjunction with the accompanying General Notes.

TRIAL PITS

The trial pit is amongst the simplest yet most effective means of identifying shallow ground conditions on a site. Its advantages include simplicity, speed, potential accuracy and cost-effectiveness. The trial pit is most commonly formed using a back-acting excavator which can typically determine ground conditions to some 4 metres below ground level. Hand excavation is often used to locate, expose and detail existing foundations, features or services. In general, it is difficult to extend pits significantly below the water table in predominantly granular soils, where flows can cause instability. Unless otherwise stated, the trial pits will not have been provided with temporary side support during their construction. Under such circumstances, entrance into the pit is not permitted and hence observations will have been made from the ground surface and samples taken from the excavator bucket.

Where access for personnel is required to allow close observation of the exposed strata, the taking of samples and the carrying out of in situ tests, the sides of the trial pits (Observation Pits in BS 5930:2015) will be made safe using temporary supports or the sides battered back to a stable angle. Some limited access to such Trial Pits (Observation Pits) at depths less than 1m may be allowed in stable conditions or where the sides are benched or battered back to a safe angle.

Trends in strata type, level and thickness can be determined, shear surfaces identified and the behaviour of plant, excavation sides and excavated materials can be related to the construction process. They are particularly valuable in land slip investigations. Some types of in situ test can be undertaken in such pits and large disturbed or block samples obtained.

CABLE PERCUSSION BORING

The light Cable Percussion technique of soft ground boring, typically at a diameter of 150mm, is a well-established simple and flexible method of boring vertical holes and generally allows data to be obtained in respect of strata conditions other than rock. A tubular cutter (for cohesive soils) or shell with a flap valve (for granular soils) is repeatedly lifted and dropped using a winch and rope operating from an "A" frame. Soil which enters these tools is regularly removed and either sampled for subsequent examination or test, or laid to one side for later removal off site and licensed disposal or, if permitted by the Client, use as backfill. Steel casing will have been used to prevent collapse of the borehole sides where necessary. A degree of disturbance of soil and mixing of layers is inevitable and the presence of very thin layers of different soils within a particular stratum may not be identified. Changes in strata type can only be detected on recognition of a change in soil samples at the surface, after the interface has been passed. For the foregoing reasons, depth measurements should not be considered to be more accurate than 0.10 metre. The technique can determine ground conditions to depths in excess of 30 metres under suitable circumstances and usually causes less surface disturbance than trial pitting.

In cohesive soils cylindrical samples are retrieved by driving or pushing in 100mm nominal diameter tubes. In soft soils, piston sampling or vane testing may be undertaken. In granular soils and often in cohesive materials, in situ Standard Penetration Tests (SPT's) are performed. The SPT records the number of standard blows required to drive a 50mm diameter open or cone ended probe for 300mm after an initial 150mm penetration. A modified method of recording is used in denser strata. Small disturbed samples are obtained throughout.

ROTARY DRILLING

Rotary Drilling to produce cores by rotating an annular diamond-impregnated tube or barrel into the ground is the technique most appropriate to the forming of site investigation boreholes through rock or other hard strata. It has the advantage of being able to be used vertically or at an angle. Core diameters of less than 100mm are most common for site investigation purposes. Core is normally retrieved in plastic lining tubes. A flushing fluid such as air, water or foam is used to cool the bit and carry cuttings to the surface. Depths in excess of 60 metres can be achieved under suitable circumstances using rotary techniques, with minimal surface disturbance.

Examination of cores allows detailed rock description and generally enables angled discontinuity surfaces to be observed. However, vertical holes do not necessarily reveal the presence of vertical or near-vertical fissures or joint discontinuities. The core type and/or techniques used will depend on the ground conditions. Where open hole rotary drilling is employed, descriptions of strata result from examination at the surface of small particles ejected from the borehole in the flushing medium. In consequence, no indication of fissuring, bedding, consistency or degree of weathering can be obtained.

DYNAMIC SAMPLING

This technique involves the driving of an open-ended tube into the ground and retrieval of the soil which enters the tube. It was previously called window or windowless sampling. The term "window sample" arose from the original device which had a "window" or slot cut into the side of the tube through which samples were taken. This was superseded by the use of a thin-walled plastic liner to retrieve the soil sample from within a sampler (windowless sampling) which has a solid wall. Line diameters range from 36 to 86mm. Such samples can be used for qualitative logging, selection of samples for classification and chemical analysis and for obtaining a rudimentary assessment of strength.

Driving devices can be hand-held or machine mounted and the drive tubes are typically in 1m lengths. Depending on the type of rig used, the hole formed can be cased to prevent collapse of the borehole sides. Where the type of rig does not allow the insertion of casing, the success of this technique can be limited when soils and groundwater conditions are such that the sides of the hole collapse on withdrawal of the sampler. Obstructions within the ground, the density of the material or its strength can also limit the depth and rate of penetration of this light-weight investigation technique. Nevertheless, it is a valuable tool where access is constrained such as within buildings or on embankments. Depths of up to 10m can be achieved in suitable circumstances depending on the rig type but depths of 5m to 6m are more common.

EXPLORATORY HOLE RECORDS

The data obtained by these techniques are generally presented on Trial Pit, Borehole, Drillhole or Dynamic Sample Records. The descriptions of strata result from information gathered from a number of sources which may include published geological data, preliminary field observations and descriptions, in situ test results, laboratory test results and specimen descriptions. A key to the symbols and abbreviations used accompanies the records. The descriptions on the exploratory hole records accommodate but may not necessarily be identical to those on any preliminary records or the laboratory summaries.

The records show ground conditions at the exploratory hole locations. The degree to which they can be used to represent conditions between or beyond such holes, however, is a matter for geological interpretation rather than factual reporting and the associated uncertainties must be recognised.

DYNAMIC PROBING

This technique typically measures the number of blows of a standard weight falling over a standard height to advance a cone-ended rod over sequential standard distances (typically 100mm). Some devices measure the penetration of the probe per standard blow. It is essentially a profiling tool and is best used in conjunction with other investigation techniques where site-specific correlation can be used to delineate the distribution of soft or loose soils or the upper horizon of a dense or strong layer such as rock.

Both machine-driven and hand-driven equipment is available, the selection depending upon access restrictions and the depth of penetration required. It is particularly useful where access for larger equipment is not available, disturbance is to be minimised or where there are cost constraints. No samples are recovered and some techniques leave a sacrificial cone head in the ground. As with other lightweight techniques, progress is limited in strong or dense soils. The results are presented both numerically and graphically. Depths of up to 10m are commonly achieved in suitable circumstances.

The hand-driven DCP probing device has been calibrated by the Highways Agency to provide a profile of CBR values over a range of depths.

INSTRUMENTATION

The most common form of instrument used in site investigation is either the standpipe or else the standpipe piezometer which can be installed in investigation holes. They are used to facilitate monitoring of groundwater levels and water sampling over a period of time following site work. Normally a standpipe would be formed using rigid plastic tubing which has been perforated or slotted over much of its length whilst a standpipe piezometer would have a filter tip which would be placed at a selected level and the hole sealed above and sometimes below to isolate the zone of interest. Groundwater levels are determined using an electronic "dip meter" to measure the depth to the water surface from ground level. Piezometers can also be used to measure permeability. They are simple and inexpensive instruments for long term monitoring but response times can limit their use in tidal areas and access to the ground surface at each instrument is necessary. Remote reading requires more sophisticated hydraulic, electronic or pneumatic equipment.

Settlement can be monitored using surface or buried target plates whilst lateral movement over a range of depths is monitored using slip indicator or inclinometer equipment.

GENERAL NOTES

1. *The report is prepared for the exclusive use of the Client named in the document and copyright subsists with Geotechnics Limited. Prior written permission must be obtained to reproduce all or part of the report. It is prepared on the understanding that its contents are only disclosed to parties directly involved in the current investigation, preparation and development of the site.*

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3. *The report and/or opinion is prepared for the specific purpose stated in the document and in relation to the nature and extent of proposals made available to Geotechnics Limited at that time. Re-consideration will be necessary should those details change. The recommendations should not be used for other schemes on or adjacent to the site without further reference to Geotechnics Limited.*

4. *The assessment of the significance of the factual data, where called for, is provided to assist the Client and their Engineer and/or Advisers in the preparation of their designs.*

5. *The report is based on the ground conditions encountered in the exploratory holes together with the results of field and laboratory testing in the context of the proposed development. The data from any commissioned desk study and site reconnaissance are also drawn upon. There may be special conditions appertaining to the site, however, which are not revealed by the investigation and which may not be taken into account in the report.*

6. *Methods of construction and/or design other than those proposed by the designers or referred to in the report may require consideration during the evolution of the proposals and further assessment of the geotechnical and any geoenvironmental data would be required to provide discussion and evaluations appropriate to these methods.*

7. *The accuracy of results reported depends upon the technique of measurement, investigation and test used and these values should not be regarded necessarily as characteristics of the strata as a whole (see accompanying notes on Investigation Techniques). Where such measurements are critical, the technique of investigation will need to be reviewed and supplementary investigation undertaken in accordance with the advice of the Company where necessary.*

8. *The samples selected for laboratory test are prepared and tested in accordance with the relevant Clauses and Parts of BS EN ISO 17892 and BS 1377 Parts 1 to 8, where appropriate, in Geotechnics Limited's UKAS accredited Laboratory, where possible. A list of tests is given.*

9. *Tests requiring the use of another laboratory having UKAS accreditation where possible are identified.*

10. *Any unavoidable variations from specified procedures are identified in the report.*

11. *Specimens are cut vertically, where this is relevant and can be identified, unless otherwise stated*

12. *All the data required by the test procedures are recorded on individual test sheets but the results in the report are presented in summary form to aid understanding and assimilation for design purposes. Where all details are required, these can be made available.*

13. *Whilst the report may express an opinion on possible configurations of strata between or beyond exploratory holes, or on the possible presence of features based on either visual, verbal, written, cartographical, photographic or published evidence, this is for guidance only and no liability can be accepted for its accuracy.*

14. *The Code of Practice for Ground Investigations – BS 5930:2015 calls for man-made soils to be described as Anthropogenic Ground with soils placed in an un-controlled manner classified as Made Ground and soils placed in a controlled manner as Fill. In view of the difficulty in always accurately determining the origin of man-made soils in exploratory holes, Geotechnics Limited classify such materials as Made Ground. Where soils can be clearly identified as being placed in a controlled manner then further classification of the soils as Fill has been added to the Exploratory Hole Records.*

15. *Classification of man-made soils is based on the inspection of retrieved samples or exposed excavations. Where it is obvious that foreign matter such as paper, plastic or metal is present, classification is clear. Frequently, however, for man-made soils that arise from the adjacent ground or from the backfilling of excavations, their visual characteristics can closely resemble those of undisturbed ground. Other evidence such as site history, exploratory hole location or other tests may need to be drawn upon to provide clarification. For these reasons, classification of soils on the exploratory hole records as either Made Ground or naturally occurring strata, the boundary between them and any interpretation that this gives rise to should be regarded as provisional and subject to re-evaluation in the light of further data.*

16. *The classification of materials as Topsoil is generally based on visual description and should not be interpreted to mean that the material so described complies with the criteria for Topsoil used in BS 3882:2015. Specific testing would be necessary where such a definition is a requirement.*

17. *Ground conditions should be monitored during the construction of the works and the report should be re-evaluated in the light of these data by the supervising geotechnical engineers.*

18. *Any comments on groundwater conditions are based on observations made at the time of the investigation, unless specifically stated otherwise. It should be noted, however, that the observations are subject to the method and speed of boring, drilling or excavation and that groundwater levels will vary due to seasonal or other effects.*

19. *Any bearing capacities for conventional spread foundations which are given in the report and interpreted from the investigation are for bases at a minimum depth of 1m below finished ground level in naturally occurring strata and at broadly similar levels throughout individual structures, unless otherwise stated. Typically they are based on serviceability criteria taking account of an assessment of the shear strength and/or density data obtained by the investigation. The foundations should be designed in accordance with the good practice embodied in BS 8004:2015 - Foundations, supplemented for housing by NHBC Standards. Foundation design is an iterative process and bearing pressures may need adjustment or other measures may need to be taken in the context of final layouts and levels prior to finalisation of proposals.*

20. *Unless specifically stated, the investigation does not take account of the possible effects of mineral extraction or of gases from fill or natural sources within, below or outside the site.*

21. *The costs or economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, will depend on very many factors in addition to geotechnical or geoenvironmental considerations and hence their evaluation is outside the scope of the report.*

Appendix E

DERIVATION OF GAC

Confidential

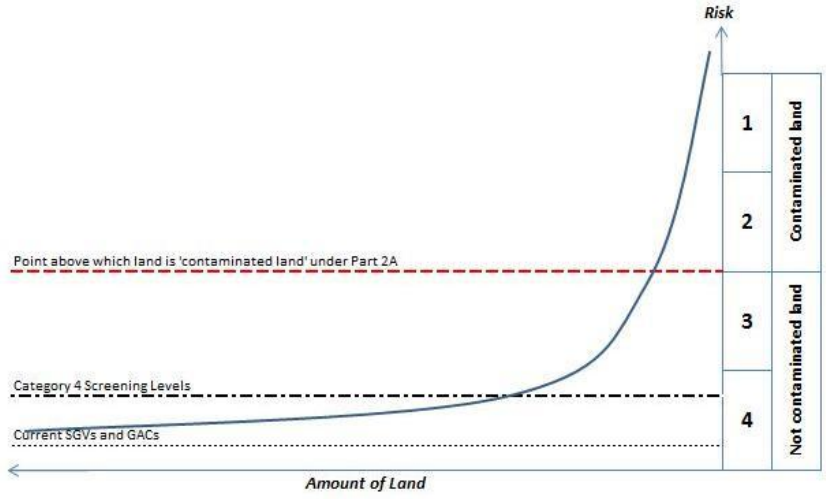
METHODOLOGY FOR THE DERIVATION OF GENERIC QUANTITATIVE ASSESSMENT CRITERIA TO EVALUATE RISKS TO HUMAN HEALTH FROM SOIL & GROUNDWATER CONTAMINATION

UK APPROACH

In the UK, the potential risks to human health from contamination in the ground are usually evaluated through a generic quantitative risk assessment (GQRA) approach. This allows generic and conservative exposure assumptions to be readily applied to risk assessments, and can be a useful tool for rapidly screening data and to identify those contaminants or scenarios that could benefit from further investigation and/or site-specific detailed quantitative risk assessment (DQRA). Current industry good practice is to use the approach presented in the Environment Agency (EA) publications SR2[1] and SR3[2]. This approach allows the derivation of Generic Assessment Criteria (GACs), primarily for chronic exposure.

In April 2012, the Department of Environment, Food and Rural Affairs (Defra) published updated statutory guidance[3] which introduced a four category approach to determining whether land in England and Wales is contaminated or not on the grounds of significant possibility of significant harm (SPOSH). **Figure 1** presents a graphical representation of the categories.

Figure 1: Four Categories for Determining if Land Represent a SPOSH



Cases classified as Category 1 are considered to be SPOSH based on actual evidence or an unacceptably high probability of harm existing. Category 4 cases are those where there is no risk, or a low risk of SPOSH.

[1] Environment Agency '*Human Health Toxicological Assessment of Contaminants in Soil',* Report SC050021/SR2. January 2009.
[2] Environment Agency '*Updated Technical Background to the CLEA Model*,' Report SC050021/SR3. January 2009.
[3] Defra '*Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance'.* April 2012.

GACs represent a minimal risk level, well within Category 4. A 2014 publication by Contaminated Land: Applicatons in Real Environments (CL:AIRE),SP1010[4] and endorsed by Defra[5] provided an approach to determine Category 4 Screening Levels (C4SLs) which are higher than the GACs whilst being "more pragmatic but still strongly precautionary". It also provided C4SLs for six contaminants of concern. Although the C4SLs were designed to support Part 2A assessments to determine 'contaminated land' they are specifically mentioned, along with reference to the Part 2A statutory guidance, by the Department for Communities and Local Government (DCLG) for use in a planning context[6].

An updated version the Contaminated Land Exposure Assessment (CLEA) Workbook (v1.071) was released by the EA in September 2015 to take into account the publication of SP1010. The updates comprised: additional toxicity data for the six chemicals for which C4SLs were derived; two new public open space land use scenarios; updated exposure parameters; options to run the model using C4SL exposure assumptions; and increased functionality. There were no changes to algorithms, so it is still possible to replicate the withdrawn SGVs using the input parameters held within v1.071.

It should be noted that the four category approach has not been adopted in Scotland under Part 2A or the planning regime. The Part 2A statutory guidance applicable in Scotland (Paper SE/2006/44 dated May 2006) does not reflect the changes introduced by Defra in April 2012 which allow for the use of C4SLs within Part 2A risk assessments. Additionally, it is considered that the principal of 'minimal risk' should still apply under planning in Scotland, based on current guidance.

WSP APPROACH

Following the withdrawal of the SGVs, and in the absence of an industry-wide, accepted set of GACs it is down to individual practitioners to derive their own soil assessment criteria. WSP has used the approach provided within SR2, SR3, SP1010, CLEA Workbook v1.071 and SR4[7] to produce a set of minimal risk GACs. The chemical-specific data within two key publications were considered during their production: CL:AIRE 2010[8] and LQM 2015[9]. Both documents provide comprehensive sets of GACs for different contaminants of concern.

The LQM Suitable For Use Levels (S4ULs) have selected exposure parameters consistent with the C4SL exposure scenarios. This approach was rejected by WSP as not representing minimal risk. However, the LQM S4UL document was critically reviewed and the approach and chemical input parameters were utilised where considered to be appropriate.

An industry-led C4SL Working Group is in the process of deriving a larger set of C4SLs in the near future, for approximately 20 contaminants. This will include a critical review of the chemical input data for all selected substances, and may therefore lead to further amendments to the chemical input data used in the WSP in-house screening values. It is considered likely that the contaminant list will

[4] CL:AIRE *'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination'* SP1010, Final Project Report (Revision 2). September 2014.
[5] Defra 'SP1010: *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document'*. December 2014.
[6] DCLG Planning Practice Guidance '*Land Affected by Contamination'*, particularly Paragraphs 001 and 007. Ref IDs: 33-001-20140306 & 33-007-20140612.
[7] Environment Agency '*CLEA Software (Version 1.05) Handbook (and Software)',* Report SC050021/SR4. September 2009.
[8] CL:AIRE 'The EIC/AGS/CL:AIRE *Soil Generic Assessment Criteria for Human Health Risk Assessment'.* ISBN 978-1-05046-20-1. January 2010.
[9] Nathanail et al '*The LQM/CIEH S4ULs for Human Health Risk Assessment'*, Land Quality Press, ISBN 978-0-9931084-0-2. 2015.

crossover with the 2009 EIC/AGS/CL:AIRE GACs. As such, this document was not critically reviewed by WSP.

WSP's current approach to the assessment of risks to human health is to continue to evaluate minimal risk through the use of in-house derived GACs, and to use the published C4SLs as a secondary tier of assessment until such time as additional C4SLs are published and/or in-house values are derived.

EXPOSURE MODELS

LAND USES

WSP has largely adopted the exposure assumptions of the generic land use scenarios included within SR3, with two additional public open space scenarios included from within SP1010 and two bespoke exposure scenarios (highways):

- Residential with homegrown produce consumption;
- Residential without homegrown produce consumption;
- Allotments;
- Commercial;
- Public open space near residential housing (POS_{resi});
- Public park (POS_{park});
- Highways (surface soils); and
- Highways (subsurface soils).

Exceptions are described in the following Sections.

SOIL PROPERTIES

SR3 assumes a sandy loam soil with a pH of 7 and a Soil Organic Matter (SOM) content of 6% for its generic land uses, based on the geographical spread of topsoils in the UK. WSP has adopted these default values. In addition, GACs based on an SOM of 1% and 2.5% have been derived, based on common experience of the nature of Made Ground and lack of topsoil on many brownfield sites.

RECEPTOR CHARACTERISTICS AND BEHAVIOURS

SP1010 provides some updated exposure parameters for long-term inhalation rates[10] and the consumption rates for homegrown produce[11] compared to those provided in SR3. This data was used to derived WSP's GACs.

The changes in inhalation rates do not apply to the allotment generic land use scenario, as these are based on the breathing rates for short-term exposure of light to moderate intensity activity which were derived from a study that was not updated in USEPA 2011, so the SR3 rates were retained.

[10] USEPA, National Centre for Environmental Assessment '*Exposure Factors Handbook: 2011 Edition*' EPA/600/R-09/052F. September 2011.
[11] National Diet and Nutrition Survey 2008/2009 to 2010/2011.

HIGHWAYS EXPOSURE SCENARIOS

Human health GAC for a Highways exposure scenario have been derived. The site area is defined by publicly accessible land adjacent to highways, comprising both hard and soft landscaped areas. Exposure is considered to be largely transitory.

There are no publicly available GAC for this exposure scenario. Consequently, WSP have derived GAC for the following exposure scenarios:

- à Highways (surface soils); and
- à Highways (sub-surface soils).

Surface soils GAC are for soil at ground level and within 300mm of the surface. Conversely, subsurface GAC are for soils at a depth exceeding 0.3m bgl. These GAC are not to be used as import criteria.

The critical receptor is a young female child, CLEA age classes 4-9. This is consistent with the critical receptor for the POS(resi) exposure scenario, and considered to be appropriate for a child potentially playing outside without direct adult supervision.

For all GAC, a sandy loam soil and a soil organic matter content of 1% is assumed. There is no building on site.

Exposure scenarios for surface and subsurface soils are detailed below. These are considered to be conservative estimates, due to the mostly transitory use of publically accessible lands adjacent to highways.

HIGHWAYS GAC (SURFACE SOILS)

The relevant exposure pathways include direct soil and dust ingestion, dermal contact (outdoors) and the inhalation of outdoor dust and vapour.

The exposure frequency is 170 days per annum, and the occupancy period outdoors is 1 hour per day (as per the POS (resi) exposure scenario). The soil and dust ingestion rate has been set at 50 mg/day, consistent with a POS(park) exposure scenario.

HIGHWAYS GAC (SUBSURFACE SOILS)

The single relevant exposure pathway is the inhalation of outdoor vapour. Direct exposure pathways are not viable due to the depth of the soils below ground level.

The exposure frequency is 170 days per annum, and the occupancy period outdoors is 1 hour per day (as per the POS (resi) exposure scenario). The soil and dust ingestion rate has been set to zero, as direct exposure pathways to soils at this depth are not viable.

CHEMICAL DATA

PHYSICO-CHEMICAL PARAMETERS

Physico-chemical properties for the contaminants for which GACs have been derived have been obtained following critical review of the following hierarchy of data sources:

1. Environment Agency/Defra SGV reports where available;
2. Environment Agency '*Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values*', Report SC050021/SR7, November 2008; and
3. Published fate and transport reviews within Nathanail et. al 2015 and CL:AIRE 2010.

Where appropriate, and where sufficient data is available, values were adjusted to reflect a UK soil temperature of 10ºC (e.g. K_{aw}).

TOXICOLOGICAL DATA

Toxicological data for the derivation of minimal risk Health Criteria Values (HCV) for each contaminant was selected with due regard to the approach presented in SR2. Where appropriate, the following hierarchy of data sources was used:

1. UK toxicity reviews published by authoritative bodies including:
   - EA;
   - Public Health England (PHE);
   - Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT); and
   - Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (COC).
2. Authoritative European sources such as European Food Standards Agency (EFSA)
3. International organisations including:
   - World Health Organisation (WHO); and
   - Joint FAO/WHO Expert Committee on Food Additives (JECFA).
4. Authoritative country-specific sources including:
   - United States Environmental Protection Agency (USEPA);
   - US Agency for Toxic Substances and Disease Registry (ATSDR);
   - US Integrated Risk Information System (IRIS); and
   - Netherlands National Institute for Public Health and the Environment (RIVM).

Factors such as the applicability of the data to human health (e.g. epidemiological vs. animal studies), the quality of the data, the level of uncertainty in the results and the age of the data were also taken into account in the final selection. Details for specific substances are available on request.

MEAN DAILY INTAKES

Estimations of background exposure for each threshold substance have been updated. In line with the SR2 approach, the exposure from non-threshold substances in the soil does not take into account exposure from other sources, and as such GACs were derived without consideration of the Mean Daily Intake (MDI) for those substances.

The data published by the EA in its series of TOX reports between 2002 and 2009 was evaluated to determine whether the values were considered to remain valid today. Values from these current UK published sources were not amended unless they were considered to be significantly different so that the GACs remained as comparable as possible with the revoked SGVs.

ORAL MEAN DAILY INTAKES

Oral MDI were generally estimated as the sum of exposure via the ingestion of food and drinking water using the default adult physiological parameters presented in Table 3.3 of SR2.

Data on the exposure of substances from food ingestion was generally obtained from UK Total Diet Studies (TDS) published by the Food Standards Agency (FSA) and its predecessor the Ministry of Agriculture, Fisheries and Food (MAFF) and from studies commissioned by COT. Where no UK-specific data was available, MDI were derived from the European Food Safety Authority (EFSA), Health Canada and US sources. This was a rare occurrence, and in these instances, the data was evaluated to determine its applicability to the UK.

Data on the concentrations of substances in tap water was obtained from a variety of sources. UK data was used where available, with preference given to Drinking Water Inspectorate (DWI) 2014 data from water company tap water testing (LOD, 1st and 99th percentile data is available). Where the substance was not included in tap water testing, other UK sources of information were considered including:

- à DWI data from water company tap water testing from previous years;
- à COT; and
- à FSA.

Where UK data was not available, a number of other data sources were considered, largely WHO International Programme on Chemical Safety (IPCS) Concise International Chemical Assessment Documents (CICADs) and background documents for the development of Guidelines for Drinking Water Quality, using professional judgement on the relevance of the data to the UK. The final decision on the MDI from drinking water was made using professional judgement on the balance of relevance and probability, taking into account the detection limit where not detected, Koc and solubility, reduction in use of the substance, banned substances, tight controls (e.g. on explosives) and with due consideration to the SR2 instruction that “if no data or information in background exposure are available, background exposure should be assumed to be negligible and the MDI set to zero….”.

Data from other countries was generally not used because it was considered that the hydrogeology of these countries along with industrial practices were unlikely to be reflective of the UK.

INHALATION MEAN DAILY INTAKES

Inhalation MDIs were based on estimates of average daily exposure by the inhalation pathway and calculated using the default adult physiological parameters presented in Table 3.3 of SR2.

The inhalation MDIs were generally estimated using background exposure data from the UK, derived from Defra's UK-AIR: Air Information Resource[12], which provides ambient air quality data from a number of sites forming a UK-wide monitoring network. The MDIs for heavy metals were based on rolling annual average metal mass concentration data from Defra's UK Heavy Metals Monitoring Network from the period October 2009 to September 2010[13].

Information for some substances was obtained from UK sources including Environment Agency TOX reports and data from the UK Expert Panel on Air Quality Standards (EPAQS). Where recent UK data was not available, data was sourced from the International Programme on Chemical Safety (IPCS), the World Health Organisation (WHO), the Agency for Toxic Substances and Diseases Registry (ATSDR), Health Canada, and various other peer-reviewed sources summarised by LQM/CIEH[14].

For other substances, where no data or information on background exposure was available, background exposure was assumed to be negligible and the MDI set at 0.5*TDI in accordance with guidance in SR2.

PLANT UPTAKE

Soil to plant concentration factors are available in CLEA v1.071 for arsenic, cadmium, hexavalent chromium, lead, mercury, nickel and selenium. For all remaining inorganic chemicals, concentration factors were obtained using the PRISM model. Substance-specific correction factors have been selected in accordance with the guidance established within SR3. This is consistent to the approach utilised in the derivation of the LQM S4UL and the EIC/AGS/CL:AIRE GAC.

Where there is a lack of appropriate data to enable the derivation of specific soil to plant concentrations factors for organic chemicals, plant uptake was modelled within CLEA v1.071 using the generic equations recommended within SR3, as follows:

- Green Vegetables – Ryan et al. (1988);
- Root Vegetables – Trapp (2002);
- Tuber Vegetables – Trapp et al. (2007); and
- Tree Fruit – Trapp et al. (2003).

There are no suitable models available for modelling uptake for herbaceous fruit or shrub fruit. Exposure is considered negligible.

[12] Crown 2016 copyright Defra via uk-air.defra.gov.uk, licenced under the Open Government Licence (OGL).
[13] Defra, 2013 Spreadsheet of historic data for multiple years for the Metals network. Available online at: http://uk-air.defra.gov.uk/data/metals-data. [Accessed 13/03/2016].
[14] LQM/CIEH, 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment.

SOIL SATURATION LIMITS

GACs are not limited to their theoretical soil saturation within CLEA, although where either the aqueous or the vapour-based saturation is exceeded, this is highlighted within the Workbook (compared with the lower of the two values). This affects pathways which depend on partitioning calculations so in reality this only affects the vapour pathways and is relevant to organic substances and other substances, such as elemental mercury, that have a significant volatile component. However, the Workbook highlights saturation for direct contact pathways to indicate to the user where further qualitative consideration of free phase contamination at the surface may be required.

Where the lower of the two saturation limits is exceeded and the vapour pathway is the only exposure route being considered, the chronic risks to human health are likely to be negligible. Further evaluation could be undertaken using an alternative model suitable for evaluating non-aqueous phase liquids (NAPLs), such as the Johnson & Ettinger (J&E) approach described in USEPA 2003. However, WSP considers that if NAPLs are suspected, given the known limitations and over-simplifications of J&E, soil vapour monitoring is a more accurate way of assessing potential risks.

Where the lower saturation limit is exceeded for the vapour pathway and a number of exposure routes are being considered, then the contribution from the NAPL via vapour inhalation to the overall exposure can be evaluated using the procedure provided in SR4. WSP would evaluate this as part of a DQRA process or through soil vapour monitoring on-site to determine site-specific soil vapour concentrations.

CHEMICAL SPECIFIC ASSUMPTIONS

CYANIDES

Cyanide has high acute toxicity, and short term exposure is an important consideration when assessing the risks from soils contaminated with cyanide. The primary risk to human receptors from free cyanide in soils is an acute risk.

There is no current UK guidance available for calculating acute risks from free cyanide. Consequently, GAC for acute exposure were derived using the algorithms presented in MADEP 1992[15] and assuming a one-off ingestion of 10g of soil (this conservative value has been taken as an upper bound estimate for a one-off soil ingestion rate amongst children). Receptor body weights have been selected according to the critical receptor for each exposure scenario. The lowest of the chronic and acute GAC for each land use scenario were adopted by WSP.

LEAD

The SGV for lead was withdrawn by the EA in 2009, and in 2011 the EA withdrew their published TOX report in light of new scientific evidence. The C4SL for lead was derived using the latest scientific evidence from a large human dataset. As such, no chemical-specific margin was applied in the derivation of the C4SL for lead. It may be possible for WSP to derive a GAC for lead using the same dataset and applying a chemical-specific margin, but the value is likely to be lower than UK natural background concentrations. Therefore, WSP has adopted the toxicological data used to derive the C4SLs in deriving the GAC for lead until such time as alternative GACs are published by an authoritative body. The relative bioavailability was set at 100% in line with the approach taken for other GACs, whereas the C4SL assumes 60% for soil and 64% for airborne dust. Thus, the WSP GAC are lower than the C4SLs.

[15] MADEP '*Background Documentation for the Development of an "Available Cyanide" Benchmark Concentration'* 1992. http://www.mass.gov/dep/toxics/cn_soil.htm

POLYCYCLIC AROMATIC HYDROCARBONS

WSP's approach to the assessment of polycyclic aromatic hydrocarbons (PAHs) uses the surrogate marker approach. BaP was used as a surrogate marker for all genotoxic PAHs in line with the Health Protection Agency 2010[16] recommendations and SP1010. This assumes that the PAH profile of the data is similar to that of the coal tars used in the Culp *et al* oral carcinogenicity study from which the toxicity data for BaP was produced. In reality, this profile has been shown by HPA to be applicable on the majority of contaminated sites based on assessment of sites across the country.

The alternative is the Toxic Equivalency Factor (TEF) approach which uses a reference compound and assigns TEFs for other compounds based on estimates of potency. Key uncertainties with this approach include the assumption that all compounds have the same toxic mechanism of action within the body and that no compounds with a greater potency than the reference compound are present. It is considered by the HPA that the TEF approach is likely to under predict the true carcinogenicity of PAHs and therefore favours the surrogate marker approach.

For these reasons, WSP considers that the adoption of BaP as a surrogate marker for genotoxic PAHs, as opposed to the TEF approach, is reasonable. In rare cases where the PAH profile may differ from the wide definitions of the Culp *et al* study the user should discuss their project with an experienced risk assessor. In addition, WSP has derived a GAC for naphthalene, which is commonly a risk driver due to its high volatility, relative to other PAH compounds.

TRIMETHYLBENZENES

The GAC for trimethylbenzenes can be used for the assessment of any individual isomer (1,2,3-trimethylbenzene, 1,2,4-trimethylbenzene or 1,3,5-trimethylbenzene), or a mixture of the three isomers.

CHEMICAL GROUPS

For a number of chemical groups, the available toxicity data is for combinations of chemicals. Given that the physico-chemical parameters may differ between the chemicals, the GACs for the chemicals within the groups have been calculated and then the lowest GAC selected to represent the entire group. This was the approach taken by the EA for m-, o- and p-xylenes, and has also been adopted by WSP for:

- 2-chlorophenol, 2,4-dichlorophenol, 2,4,6-trichlorophenol and 2,3,4,6-tetrachlorophenol;
- 2-, 3- and 4-methylphenol (total cresols);
- aldrin and dieldrin; and
- α- and β-endosulphan.

[16] HPA Contaminated Land Information Sheet '*Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)* 2010

EXPOSURE TO VAPOURS

INHALATION OF MEASURED VAPOURS

WSP has derived a set of soil vapour GACs (GAC_{sv}) that allow for the assessment of measured site soil vapour concentrations, using J&E, in order to establish potential risks via indoor inhalation of vapours. This methodology enables a more robust assessment of exposure via the inhalation of soil vapours indoors than using CLEA-derived soil GAC, as it is based upon measured soil vapour concentrations beneath the site. It also allows for the assessment of vapours from all source terms (i.e. groundwater, soil or NAPL). Outdoor inhalation was not included. WSP considers that the indoor inhalation pathway is the significantly dominant risk-driver.

The generic land use scenarios within CLEA (residential and commercial) that were used to derive the soil GAC were used to define the receptor and building characteristics for the soil vapour GAC. Only residential and commercial generic land use scenarios include the indoor inhalation of vapours pathway.

The GAC_{sv} were derived for three different soil types; sand, sandy loam and clay, reflecting the importance of this parameter within the J&E model. A depth to contamination of 0.85 m below the base of the building foundation was assumed (i.e. 1 m below ground level). This differs from the depth assumed for the soil GAC (0.5 m bgl), but was selected by WSP as a reasonable worst case scenario.

It is acknowledged that the J&E commonly over-predicts indoor vapour concentrations. In particular, it will significantly over-predict vapour concentrations for suspended floor slabs, which many new builds are constructed with, it does not take into account lateral migration and assumes an infinite source of contamination at steady state conditions. In addition, it is common for soil gas/vapour wells to be installed with at least 1 m of plain riser at the surface and this equates to a total depth of 0.85 m below the building foundation plus a 0.15 m thick foundation, and so is more representative of the depth that samples will be taken from.

The TDSIs and IDs for each substance were converted from $\mu gkg^{-1}_{bw}day^{-1}$ to μgm^{-3} using the standard conversions quoted in Table 3.3 of SR2, thereby replacing the need to model C_{air} in the equation:

$$C_{air} = \alpha . C_{vap} . 1{,}000{,}000 cm^3 m^{-3}$$

Where:

C_{air} is the concentration of vapours within the building, mg^{-3}
α is the steady state attenuation coefficient between soil and indoor air, dimensionless
C_{vap} is the soil vapour concentration, $mgcm^{-3}$

The target concentrations within indoor air for each substance (C_{air}) are a function of receptor inhalation rates and occupancy periods, as defined by the site conceptual exposure model (assuming standard CLEA occupancy periods and receptors).

The attenuation factor was calculated using J&E (Equation 10.4 in SR3) and the resulting C_{vap} is equivalent to the GAC_{sv} for the modelled exposure scenario.

Where reported soil vapour concentrations exceed the relevant saturated vapour concentration, free product may occur, and the user should discuss their project with an experienced risk assessor.

INHALATION OF GROUNDWATER-DERIVED VAPOURS

WSP has derived a set of groundwater GACs (GAC_{gw}) to evaluate the potential risks through the indoor inhalation of groundwater-derived vapours by first applying the approach described above for the derivation of the WSP GAC_{sv} to determine the acceptable concentration in soil vapour directly above the water table.

The depth to groundwater was assumed to be 1 m bgl (i.e. 0.85 m below the base of the building foundation). This depth was considered to be more representative of commonly encountered groundwater conditions than the 0.5 m below the base of the building foundation (i.e. 0.65 m bgl) that is used by CLEA for an unsaturated source present in the overlying soil.

The GAC_{gw} was then back-calculated from the GAC_{sv} using the air-water partition coefficient (K_{aw}) for each substance.

The WSP Groundwater Vapour GAC are protective against a dissolved phase contaminant source only. If the presence of NAPL is suspected, the risks from this source will need to be assessed. Where reported groundwater concentrations exceed the relevant solubility limit, free product may occur, and the user should discuss their project with an experienced risk assessor.

Appendix F

SOIL AND GROUNDWATER SCREENING RESULTS

CONFIDENTIAL

Summary of Chemical Analysis

Exceeds GAC

					Lab No		1850831	1850832	1850829	1850830	1847054	1847053	1847055	1847056	1847057	1847063	1847058	1847059
					.Sample ID		BH01	BH01	BH02	BH02	BH03	BH04	WS01	WS01	WS01	WS02A	WS03	WS03
					Depth		1.00	2.00	0.50	3.00	0.30	0.60	0.30	0.50	2.00	1.00	0.60	2.00
					Strata		MG	Nat	MG	Nat	MG	MG	MG	MG	MG	MG	MG	MG
					Other ID													
					Sample Type	GAC - Residential	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Sampling Date	without Plant	11/05/2021	11/05/2021	10/05/2021	10/05/2021	04/05/2021	04/05/2021	05/05/2021	05/05/2021	05/05/2021	07/05/2021	05/05/2021	05/05/2021
					Sampling Time	Uptake - 1% SOM	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units															
Metals																		
Antimony	DETSC 2301*	1	mg/kg	643	5.3	22	2.6	1.1	1.4	1.1	2.2	6.9	3.1	1.9	1.2	1.4	
Arsenic	DETSC 2301#	0.2	mg/kg	35	11	13	67	9.4	15	13	30	76	50	10	9.0	9.1	
Beryllium	DETSC 2301#	0.2	mg/kg	-	0.4	0.7	1.6	0.8	1.1	0.9	1.5	2.4	1.9	0.6	0.8	1.2	
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	10500	1.2	3.3	0.6	0.7	< 0.2	1.2	0.3	1.3	1.0	0.8	0.7	0.2	
Cadmium	DETSC 2301#	0.1	mg/kg	87	0.3	1.5	0.5	0.2	0.3	0.2	0.6	5.4	2.3	0.4	0.6	0.2	
Chromium III	DETSC 2301*	0.15	mg/kg	1590	12	17	18	22	11	19	22	50	37	15	22	33	
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	4.50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Copper	DETSC 2301#	0.2	mg/kg	7520	53	51	46	25	52	39	160	520	370	54	36	34	
Lead	DETSC 2301#	0.3	mg/kg	188	530	1000	230	16	99	75	82	750	1100	150	35	25	
Manganese	DETSC 2301#	20	mg/kg	1820	230	340	400	510	350	240	680	400	370	350	540	630	
Mercury	DETSC 2325#	0.05	mg/kg	56	0.46	1.2	0.83	< 0.05	0.35	0.14	0.15	4.0	2.6	0.22	0.09	0.05	
Molybdenum	DETSC 2301#	0.4	mg/kg	673	1.5	2.1	2.6	0.8	2.1	1.6	3.0	4.0	2.4	1.1	1.1	0.7	
Nickel	DETSC 2301#	1	mg/kg	181	14	15	30	28	17	20	27	45	58	13	28	38	
Selenium	DETSC 2301#	0.5	mg/kg	430	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.9	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	
Zinc	DETSC 2301#	1	mg/kg	40400	130	240	75	51	76	43	150	2100	550	120	190	74	
Inorganics																		
Loss on Ignition (Fines)	DETSC 5022	0.01	%		2.5	3.8	2.4	3.3	8.8	7.1	2.1	4.7	8.1	3.0	2.1	2.0	
pH	DETSC 2008#		pH		8.3	8.4	8.7	8.5	8.2	7.4	8.3	7.5	6.9	9.9	8.2	8.4	
Cyanide, Total	DETSC 2130#	0.1	mg/kg	15	0.2	6.6	3.4	0.2	< 0.1	< 0.1	< 0.1	510	10	0.5	6.8	0.6	
Organic matter	DETSC 2002#	0.1	%		1.7	3.8	1.0	1.3	1.7	3.5	1.4	12	7.5	1.1	1.3	1.2	
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l		1800	2200	2000	64	14	110	37	15	68	33	70	360	
Petroleum Hydrocarbons																		
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	161	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	529	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	154	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	754	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	3490	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	89100	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	20	< 1.5	< 1.5	< 1.5	< 1.5	
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	89100	< 3.4	35	120	< 3.4	< 3.4	< 3.4	< 3.4	160	< 3.4	< 3.4	< 3.4	< 3.4	
Aliphatic C5-C35	DETSC 3072*	10	mg/kg		< 10	35	120	< 10	< 10	< 10	< 10	180	< 10	< 10	< 10	< 10	
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	1360	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	3640	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	265	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	1090	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	1730	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	33	< 0.5	< 0.5	< 0.5	< 0.5	
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	1340	< 0.6	< 0.6	27	< 0.6	< 0.6	< 0.6	< 0.6	88	< 0.6	< 0.6	< 0.6	< 0.6	
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	1340	< 1.4	< 1.4	270	< 1.4	< 1.4	< 1.4	< 1.4	180	< 1.4	< 1.4	< 1.4	< 1.4	
Aromatic C5-C35	DETSC 3072*	10	mg/kg		< 10	< 10	300	< 10	< 10	< 10	< 10	300	< 10	< 10	< 10	< 10	
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	-	< 10	35	420	< 10	< 10	< 10	< 10	480	< 10	< 10	< 10	< 10	
Benzene	DETSC 3321#	0.01	mg/kg	1.4	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Ethylbenzene	DETSC 3321#	0.01	mg/kg	435	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Toluene	DETSC 3321#	0.01	mg/kg	3700	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Xylene	DETSC 3321#	0.01	mg/kg	424	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
MTBE	DETSC 3321	0.01	mg/kg		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
PAHs																		
Naphthalene	DETSC 3301	0.1	mg/kg	13	< 0.1	< 0.1	2.3	0.1	< 0.1	< 0.1	< 0.1	7.3	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthylene	DETSC 3301	0.1	mg/kg		< 0.1	< 0.1	0.3	< 0.1	< 0.1	< 0.1	< 0.1	1.1	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthene	DETSC 3301	0.1	mg/kg		< 0.1	< 0.1	4.0	< 0.1	0.1	< 0.1	< 0.1	16	< 0.1	< 0.1	< 0.1	< 0.1	
Fluorene	DETSC 3301	0.1	mg/kg		< 0.1	< 0.1	4.8	< 0.1	0.1	< 0.1	< 0.1	16	< 0.1	0.1	< 0.1	< 0.1	
Phenanthrene	DETSC 3301	0.1	mg/kg		0.5	0.2	22	< 0.1	1.0	< 0.1	< 0.1	55	0.5	0.9	< 0.1	< 0.1	
Anthracene	DETSC 3301	0.1	mg/kg		0.2	0.1	5.7	< 0.1	0.2	< 0.1	< 0.1	14	0.2	0.3	< 0.1	< 0.1	
Fluoranthene	DETSC 3301	0.1	mg/kg		0.7	0.4	20	0.2	1.6	< 0.1	< 0.1	40	0.7	2.0	< 0.1	< 0.1	
Pyrene	DETSC 3301	0.1	mg/kg		0.6	0.4	20	0.1	1.5	< 0.1	< 0.1	33	0.5	2.1	< 0.1	< 0.1	
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg		0.4	0.2	8.4	< 0.1	0.7	< 0.1	< 0.1	12	< 0.1	1.1	< 0.1	< 0.1	
Chrysene	DETSC 3301	0.1	mg/kg		0.4	0.2	9.5	< 0.1	0.7	< 0.1	< 0.1	14	< 0.1	1.2	< 0.1	< 0.1	
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg		0.4	0.4	6.2	< 0.1	0.6	< 0.1	< 0.1	8.7	< 0.1	1.0	< 0.1	< 0.1	
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg		0.3	0.3	3.6	< 0.1	0.4	< 0.1	< 0.1	4.6	< 0.1	0.6	< 0.1	< 0.1	
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	1.7	0.3	0.2	7.9	< 0.1	0.6	< 0.1	< 0.1	9.5	< 0.1	1.2	< 0.1	< 0.1	
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg		0.4	< 0.1	5.1	< 0.1	0.6	< 0.1	< 0.1	5.9	< 0.1	0.9	< 0.1	< 0.1	
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg		0.4	< 0.1	1.1	< 0.1	0.4	< 0.1	< 0.1	1.3	< 0.1	0.4	< 0.1	< 0.1	
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg		0.8	< 0.1	4.6	< 0.1	1.0	< 0.1	< 0.1	6.2	< 0.1	2.0	< 0.1	< 0.1	
PAH Total	DETSC 3301	1.6	mg/kg		5.4	2.5	130	< 1.6	9.5	< 1.6	< 1.6	240	1.9	14	< 1.6	< 1.6	
Phenols																		
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	280	< 0.3	0.5	< 0.3	< 0.3	< 0.3	< 0.3	0.3	2.2	0.6	< 0.3	< 0.3	< 0.3	

Summary of Chemical Analysis

			Lab No	1847060	1847064	1847061	1847062
			.Sample ID	WS04	WS06	WS07	WS08
			Depth	0.30	1.00	2.00	0.60
			Strata	MG	MG	MG	MG
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	05/05/2021	07/05/2021	06/05/2021	06/05/2021
			Sampling Time	n/s	n/s	n/s	n/s
Test	Method	LOD	Units				
Metals							
Antimony	DETSC 2301*	1	mg/kg	4.3	4.8	< 1.0	2.9
Arsenic	DETSC 2301#	0.2	mg/kg	17	31	7.3	17
Beryllium	DETSC 2301#	0.2	mg/kg	0.9	1.0	0.7	0.6
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2	0.4	< 0.2	1.4
Cadmium	DETSC 2301#	0.1	mg/kg	1.3	4.0	0.1	0.7
Chromium III	DETSC 2301*	0.15	mg/kg	21	21	20	32
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	76	110	25	160
Lead	DETSC 2301#	0.3	mg/kg	220	620	9.7	150
Manganese	DETSC 2301#	20	mg/kg	380	410	550	310
Mercury	DETSC 2325#	0.05	mg/kg	0.18	1.0	< 0.05	0.25
Molybdenum	DETSC 2301#	0.4	mg/kg	2.7	3.5	0.5	1.7
Nickel	DETSC 2301#	1	mg/kg	28	27	25	22
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	170	520	46	340
Inorganics							
Loss on Ignition (Fines)	DETSC 5022	0.01	%	3.7	3.6	2.0	4.8
pH	DETSC 2008#		pH	8.4	8.4	8.4	9.8
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.8	6.0	0.2	3.3
Organic matter	DETSC 2002#	0.1	%	1.9	2.1	0.8	5.5
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	< 10	120	46	250
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	580
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	1800
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	2000
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	2800
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	7300
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	1400
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	2100
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	3900
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	7300
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	15000
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
PAHs							
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	0.4	< 0.1	< 1.0
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 1.0
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	0.5	< 0.1	< 1.0
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	0.5	< 0.1	< 1.0
Phenanthrene	DETSC 3301	0.1	mg/kg	0.2	4.1	< 0.1	< 1.0
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	0.8	< 0.1	< 1.0
Fluoranthene	DETSC 3301	0.1	mg/kg	0.5	5.3	< 0.1	< 1.0
Pyrene	DETSC 3301	0.1	mg/kg	0.5	5.7	< 0.1	< 1.0
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	0.3	2.3	< 0.1	< 1.0
Chrysene	DETSC 3301	0.1	mg/kg	0.3	2.7	< 0.1	< 1.0
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	0.4	2.1	< 0.1	< 1.0
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	0.2	1.0	< 0.1	< 1.0
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	0.3	2.1	< 0.1	< 1.0
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	0.4	1.5	< 0.1	< 1.0
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	0.5	0.4	< 0.1	< 1.0
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	0.9	2.2	< 0.1	< 1.0
PAH Total	DETSC 3301	1.6	mg/kg	4.6	32	< 1.6	< 16.0
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	0.3

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Groundwater Screening Results - GROUNDWATER

Analyte	Unit	LOD	Reference	GAC	BH03	BH04	
Metals							
Arsenic	µg/l	0.16	UK DWS	10	1.1	1.6	
Cadmium	µg/l	0.03	UK DWS	5	0.1	<0.03	
Chromium	µg/l	0.25	UK DWS	50	7.4	<0.25	
Copper	µg/l	0.4	UK DWS	2,000	2.6	0.6	
Lead	µg/l	0.09	UK DWS	10	1.1	0.19	
Mercury	µg/l	0.01	UK DWS	1	0.03	<0.01	
Nickel	µg/l	0.5	UK DWS	20	2.9	1.9	
Selenium	µg/l	0.25	UK DWS	10	**20**	0.8	
Zinc	µg/l	1.3		-	2.3	4	
Inorganics							
pH	pH Units	n/a	UK DWS	6.5 - 10.0	7.6	7.1	
Cyanide, total	µg/l	40	UK DWS	50	<40	<40	
Sulphate as SO_4	mg/l	0.1	UK DWS	250	110	51	
Sulphide	µg/l	10		-	130	280	
Aliphatics and Aromatics							
Aliphatic >C5 - C6	µg/l	0.1	WHO 2008	15,000	<0.1	<0.1	
Aliphatic >C6 - C8	µg/l	0.1	WHO 2008	15,000	<0.1	<0.1	
Aliphatic >C8 - C10	µg/l	0.1	WHO 2008	300	<0.1	<0.1	
Aliphatic >C10 - C12	µg/l	1	WHO 2008	300	<1.0	<1.0	
Aliphatic >C12 - C16	µg/l	1	WHO 2008	300	<1.0	<1.0	
Aliphatic >C16 - C21	µg/l	1		-	20	<1.0	
Aliphatic >C21 - C35	µg/l	1		-	14	<1.0	
Aliphatic (C5 - C35)	µg/l	10		-	35	<1.0	
Aromatic >C5 - C7	µg/l	0.1		-	<0.1	<0.1	
Aromatic >C7 - C8	µg/l	0.1		-	<0.1	<0.1	
Aromatic >C8 - C10	µg/l	0.1		-	<0.1	<0.1	
Aromatic >C10 - C12	µg/l	1	WHO 2008	90	<1.0	<1.0	
Aromatic >C12 - C16	µg/l	1	WHO 2008	90	<1.0	<1.0	
Aromatic >C16 - C21	µg/l	1	WHO 2008	90	<1.0	<1.0	
Aromatic >C21 - C35	µg/l	1	WHO 2008	90	<1.0	<1.0	
Aromatic (C5 - C35)	µg/l	10		-	<10	<10	
Benzene	µg/l	1	UK DWS	1	<1.0	<1.0	
Toluene	µg/l	1	WHO 2017	700	<1.0	<1.0	
Ethylbenzene	µg/l	1	WHO 2017	300	<1.0	<1.0	
Xylene	µg/l	1	WHO 2017	500	<1.0	<1.0	

Groundwater Screening Results - GROUNDWATER

PAH							
Naphthalene	µg/l	0.05		-	<0.05	<0.05	
Acenaphthylene	µg/l	0.01		-	<0.01	<0.01	
Acenaphthene	µg/l	0.01		-	<0.01		0.01
Fluorene	µg/l	0.01		-	<0.01	<0.01	
Phenanthrene	µg/l	0.01		-	<0.01	<0.01	
Anthracene	µg/l	0.01		-	<0.01		0.02
Fluoranthene	µg/l	0.01		-	<0.01		0.02
Pyrene	µg/l	0.01		-	<0.01		0.01
Benzo(a)anthracene	µg/l	0.01		-	<0.01	<0.01	
Chrysene	µg/l	0.01		-	<0.01	<0.01	
Benzo(b)fluoranthene	µg/l	0.01	UK DWS	see PAH4	<0.01	<0.01	
Benzo(k)fluoranthene	µg/l	0.01	UK DWS	see PAH4	<0.01	<0.01	
Benzo(a)pyrene	µg/l	0.01	UK DWS	0.01	<0.01	<0.01	
Indeno(1,2,3-cd)pyrene	µg/l	0.01	UK DWS	see PAH4	<0.01	<0.01	
Dibenz(a,h)anthracene	µg/l	0.01		-	<0.01	<0.01	
Benzo(ghi)perylene	µg/l	0.01	UK DWS	see PAH4	<0.01		0.01
PAH Total (EPA 16)	µg/l	0.2		-	<0.2	<0.2	
PAH4 (Sum of benzo(b)fluoranthene, benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene and benzo(ghi)perylene)	µg/l	0.04	UK DWS	0.1	<0.04		0.01
Phenols							
Phenol, monohydric	µg/l	100		-	<100	<100	

Key

Result > Assessment Criterion

LOD > Assessment Criterion

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Groundwater Screening Results - SURFACE WATER

Analyte	Unit	LOD	Reference	GAC	BH03	BH04	
Metals							
Arsenic	µg/l	0.16	EQS 2015	50	1.1		1.6
Cadmium	µg/l	0.03	EQS 2015 (based on assumed water hardness of 100-200 mgCaCO3/l in receiving water body)	0.15	0.1	<0.03	
Chromium	µg/l	0.25	EQS 2015	4.7	**7.4**	<0.25	
Copper	µg/l	0.4	EQS 2015, bioavailable	1	**2.6**		0.6
Lead	µg/l	0.09	EQS 2015, bioavailable	1.2	1.1		0.19
Mercury	µg/l	0.01	EQS 2015, MAC	0.07	0.03	<0.01	
Nickel	µg/l	0.5	EQS 2015, bioavailable	4	2.9		1.9
Selenium	µg/l	0.25		-	20		0.8
Zinc	µg/l	1.3	EQS 2015, bioavailable	10.9	2.3		4
Inorganics							
pH	pH Units	n/a	EQS 2015	6.0 - 9.0	7.6		7.1
Cyanide, total	µg/l	40	EQS 2015	1	**<40**	**<40**	
Sulphate as SO_4	mg/l	0.1		-	110		51
Sulphide	µg/l	10		-	130		280
Aliphatics and Aromatics							
Aliphatic >C5 - C6	µg/l	0.1		-	<0.1	<0.1	
Aliphatic >C6 - C8	µg/l	0.1		-	<0.1	<0.1	
Aliphatic >C8 - C10	µg/l	0.1		-	<0.1	<0.1	
Aliphatic >C10 - C12	µg/l	1		-	<1.0	<1.0	
Aliphatic >C12 - C16	µg/l	1		-	<1.0	<1.0	
Aliphatic >C16 - C21	µg/l	1		-	20	<1.0	
Aliphatic >C21 - C35	µg/l	1		-	14	<1.0	
Aliphatic (C5 - C35)	µg/l	10		-	35	<1.0	
Aromatic >C5 - C7	µg/l	0.1	CL:AIRE 2017	10	<0.1	<0.1	
Aromatic >C7 - C8	µg/l	0.1	CL:AIRE 2017	74	<0.1	<0.1	
Aromatic >C8 - C10	µg/l	0.1	CL:AIRE 2017	20	<0.1	<0.1	
Aromatic >C10 - C12	µg/l	1	CL:AIRE 2017	2	<1.0	<1.0	
Aromatic >C12 - C16	µg/l	1	CL:AIRE 2017	2	<1.0	<1.0	
Aromatic >C16 - C21	µg/l	1	CL:AIRE 2017	0.1	**<1.0**	**<1.0**	
Aromatic >C21 - C35	µg/l	1	CL:AIRE 2017	0.00017	**<1.0**	**<1.0**	
Aromatic (C5 - C35)	µg/l	10		-	<10	<10	
Benzene	µg/l	1	EQS 2015	10	<1.0	<1.0	
Toluene	µg/l	1	EQS 2015	74	<1.0	<1.0	
Ethylbenzene	µg/l	1	EQS 2015	20	<1.0	<1.0	
Xylene	µg/l	1	CL:AIRE 2017	30	<1.0	<1.0	

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Groundwater Screening Results - SURFACE WATER

PAH							
Naphthalene	µg/l	0.05	EQS 2015	2	<0.05	<0.05	
Acenaphthylene	µg/l	0.01		-	<0.01	<0.01	
Acenaphthene	µg/l	0.01		-	<0.01		0.01
Fluorene	µg/l	0.01		-	<0.01	<0.01	
Phenanthrene	µg/l	0.01		-	<0.01	<0.01	
Anthracene	µg/l	0.01	EQS 2015	0.1	<0.01		0.02
Fluoranthene	µg/l	0.01	EQS 2015	0.0063	**<0.01**		**0.02**
Pyrene	µg/l	0.01		-	<0.01		0.01
Benzo(a)anthracene	µg/l	0.01		-	<0.01	<0.01	
Chrysene	µg/l	0.01		-	<0.01	<0.01	
Benzo(b)fluoranthene	µg/l	0.01		-	<0.01	<0.01	
Benzo(k)fluoranthene	µg/l	0.01		-	<0.01	<0.01	
Benzo(a)pyrene	µg/l	0.01	EQS 2015	0.00017	**<0.01**	**<0.01**	
Indeno(1,2,3-cd)pyrene	µg/l	0.01		-	<0.01	<0.01	
Dibenz(a,h)anthracene	µg/l	0.01		-	<0.01	<0.01	
Benzo(ghi)perylene	µg/l	0.01		-	<0.01		0.01
PAH Total (EPA 16)	µg/l	0.2		-	<0.2	<0.2	
Phenols							
Phenol, monohydric	µg/l	100	EQS 2015	7.7	**<100**	**<100**	

Key

Result > Assessment Criterion

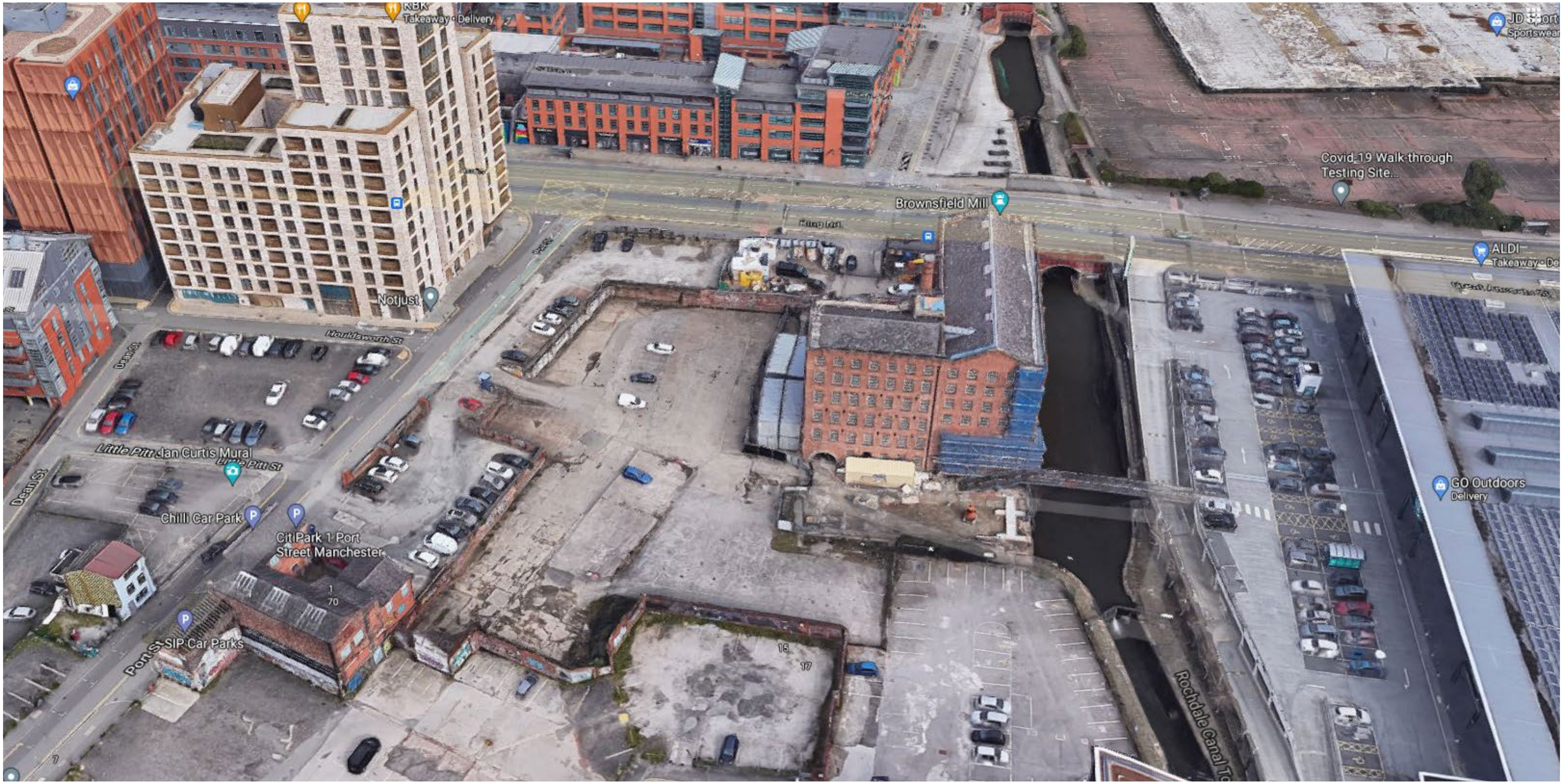
LOD > Assessment Criterion

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Manchester
M15 4RP

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Appendix 6 – TVIA Viewpoints



September 2021 / RF21-894-WB04 02

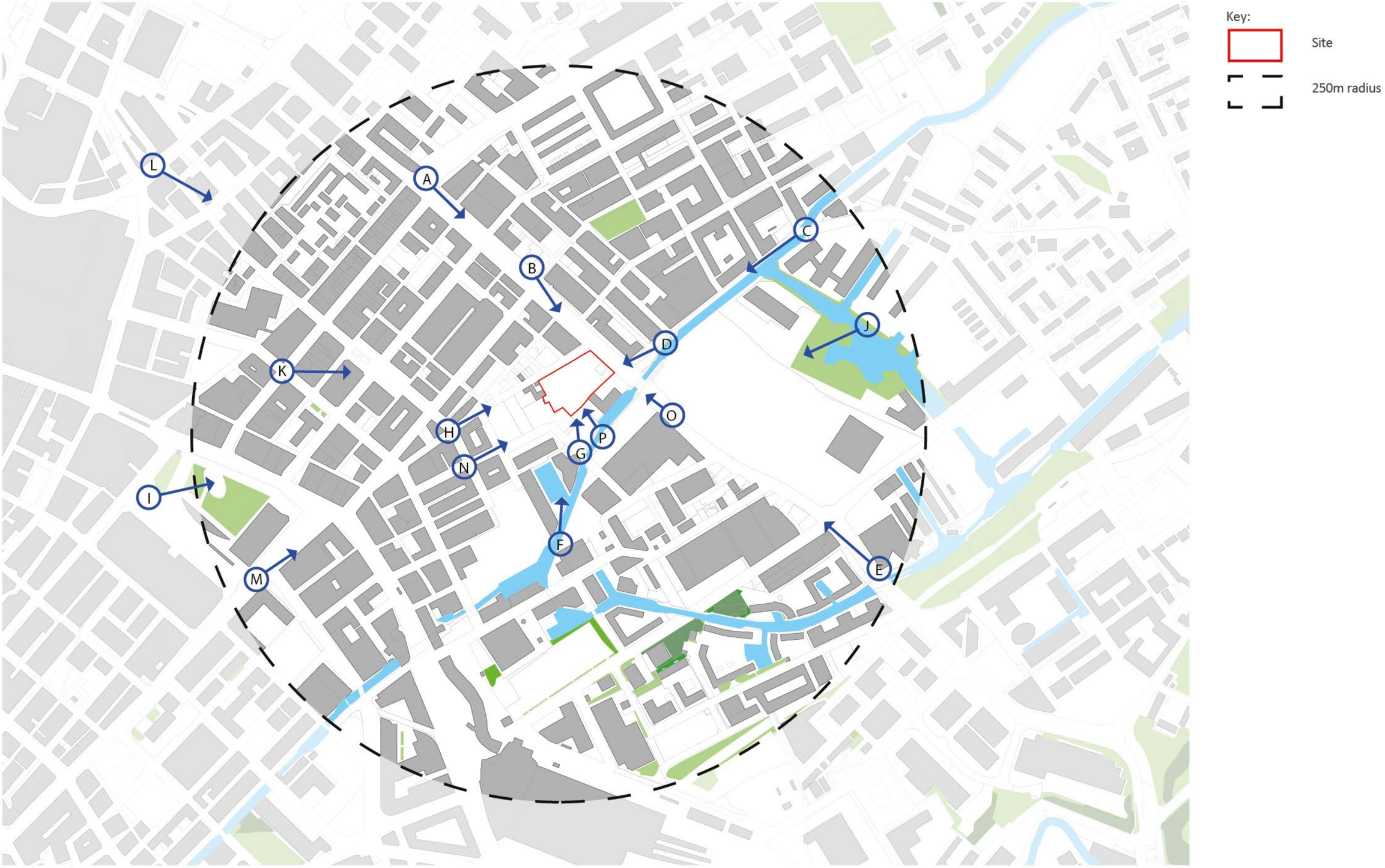
Port Street, Manchester

Townscape & Heritage Viewpoint Locations

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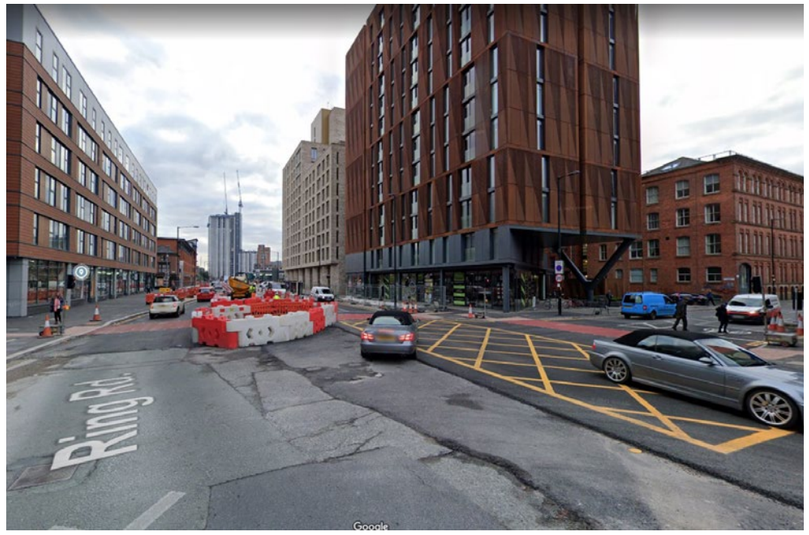
Proposed View Points





A Townscape Reference - TVA 1
Heritage Reference- LR1

Render



B Townscape Reference - TVA 2
Heritage Reference- SR5

Render



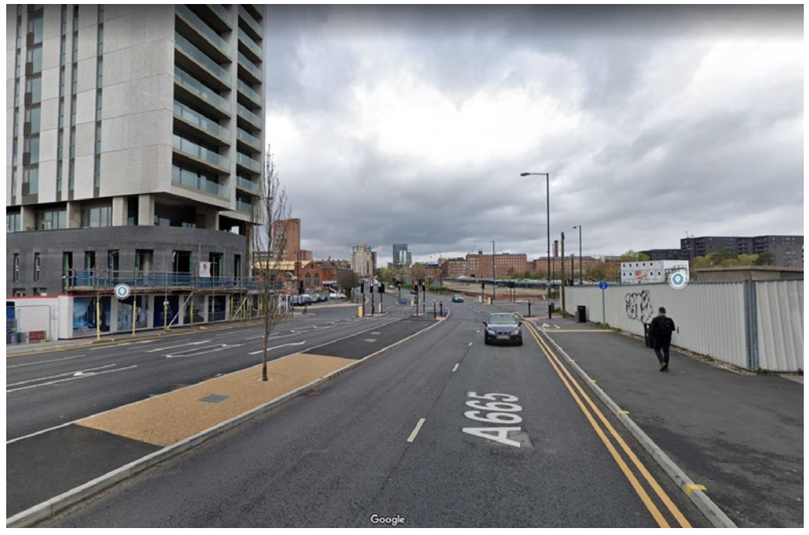
C Townscape Reference - TVA 3
Heritage Reference- LR3

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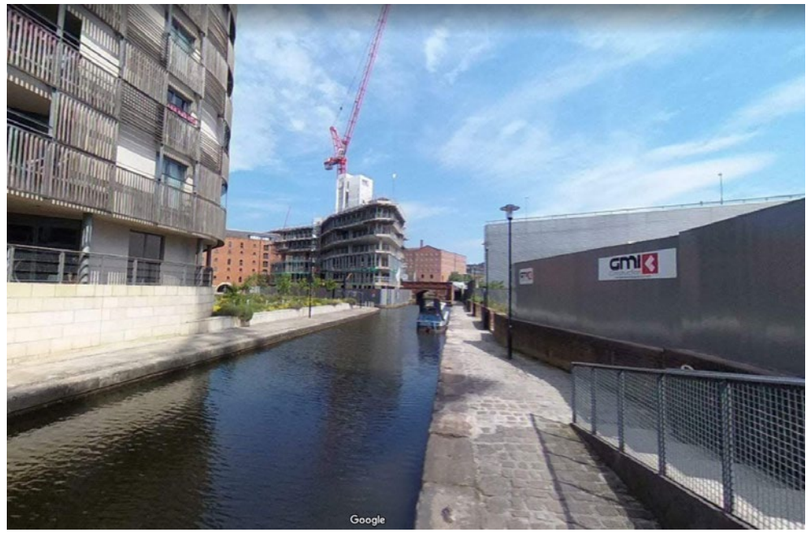
D Townscape Reference - TVA 4
Heritage Reference- SR1

Render



E Townscape Reference - TVA 5
Heritage Reference- LR2

Render



F Townscape Reference - TVA 6 (to be taken from footbridge)
Heritage Reference- SR3

Wireline



G Townscape Reference - TVA 7

Heritage Reference- SR2

Render



H Townscape Reference - TVA 8

Heritage Reference- SR6

Render



I Townscape Reference - TVA 9

Heritage Reference- LR5

Render



J Townscape Reference - TVA 10

Heritage Reference- N/A

Render



K Townscape Reference - TVA 11

Heritage Reference- N/A

Wireline



L Townscape Reference - TVA 12

Heritage Reference- N/A

Wireline



M

Townscape Reference - N/A

Heritage Reference- SR4

Render



N

Townscape Reference - N/A

Heritage Reference- SR7

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O

Townscape Reference - N/A

Heritage Reference- LR6

Render



P

Townscape Reference - TVA 13

Heritage Reference- SR8

Render

Proposed View Points- TVA

	Location	TVA Ref	Reason for selection - TVA	Heritage Ref	Reason for selection - Heritage
A	Junction of Great Ancoats Street and Oldham Road looking south east towards the site.	TVA 1	Distant view representative of a key commuter route and pedestrian route from the north west and within the context of a listed building	LR1	Long range view along Great Ancoats Street which includes the southern boundary of the Ancoats Conservation Area.
B	Great Ancoats Street at junction with Blossom Street, looking south east towards the site.	TVA 2	Representative of a sequential view along a key commuter route as the development becomes more visible	SR5	Short range view along Great Ancoats Street, and part of the kinetic view experienced moving south-east towards the Site. The view includes the southern boundary of the Great Ancoats Conservation Area.
C	Redhill Street at the junction with the Rochdale Canal	TVA 3	Convergence of key pedestrian and commuter routes and representative of north eastern views along the canal and within the Ancoats conservation area	LR3	Long range view looking south-west along Redhill Street towards the Site; the view is within the Ancoats Conservation Area and includes a range of Grade II* and Grade II Listed Buildings.
D	Public space beside Redhill Street/ Great Ancoats Street junction looking south west towards the site	TVA 4	Representative of a short distance view from a public open space and beside listed canal lock and within the Ancoats conservation area	SR1	Kinetic view from View C (LR3) which includes the Ancoats Conservation Area and Listed Buildings, particularly the Grade II* Brownsfield Mill.
E	Great Ancoats Street approaching the Junction of Old Mill Street	TVA 5	Distant view representative of a key commuter route and pedestrian route from the south east	LR2	Long range view looking towards the Site in the context of the Ancoats Conservation Area and setting of the Grade II* Brownsfield Mill.
F	Pedestrian Footbridge at Piccadilly Basin at the end of Brewer Street looking North	TVA 6	Representative of a mid distance view from a key public footpath as it crosses the canal.	SR3	Short range view looking towards the Site illustrating the historic canal setting of the Grade II* Former Rochdale Canal Warehouse and Grade II* Brownsfield Mill.
G	Tariff Street bridge looking north towards the site.	TVA 7	Representative of a residential view and short distance view from surrounding footpath and road network from the south. Also captures Brownsfield Mill in the view	SR2	Short range view from street level of the historic canal setting to the Grade II* Brownsfield Mill.
H	Port Street/ Hilton Street junction looking north east towards the site.	TVA 8	Representative view from within Stephenson Sq conservation area capturing the context of sensitive listed buildings	SR6	Representative view from within Stephenson Sq conservation area capturing the context of sensitive listed buildings
I	West side of Piccadilly gardens looking east towards the site.	TVA 9	Representative view from a key city public open space capturing a wider context including listed monuments and buildings	LR5	Representative view from a key city public open space capturing a wider context including listed monuments and buildings
J	Public footpath along northern edge of Islington Marina	TVA 10	Representative of views from both a key public open space and a residential aspects	N/A	

K	Junction of Oldham Street and Dale Street	TVA 11	Representative of a view from the heart of the Northern Qtr, on the edge of both Smithfield and Stevenson Square conservation areas and in the context of listed buildings	N/A	
L	Shudehill Metrolink and Bus Station	TVA 12	Representative of views from a key transport hub, gate-way point into the Northern Qtr and on the edge of the Smithfield conservation area	N/A	
M	Footpath along the southern side of the Rochdale canal beside the lock at Tarrif Street	N/A		SR4	Representative view from within Stephenson Sq conserva-tion area capturing the context of sensitive listed buildings
N	Tariff Street at junction with Hilton Street looking north east towards the site.	N/A		SR7	Kinetic view from View E (LR2) to include the immediate setting of the Gradell* Brownsfield Mill and Ancoats Conservation Area in relation to the Site.
O	Opposite Urban Exchange on north side of the Ring Road looking north-west towards the site.	N/A		LR6	Kinetic view from View F (SR3) illustrating the immediate canal side setting of the Grade II* Brownsfield Mill.
P	Portland Street adjacent to junction with Aytoun Street looking north east towards the site.	TVA 13	Representative of a short distant view from a key pedestri-an route with clear sight of the listed Brownsfield Mill and the context of listed canal lock.	SR8	Kinetic view from View F (SR3) illustrating the immediate canal side setting of the Grade II* Brownsfield Mill.

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