



**BROWNFIELD
SOLUTIONS LTD**

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

DOMIS CONSTRUCTION LTD

Fusion, Manchester

Remediation Validation Report

NS/C5511/12505

October 2023

PROJECT QUALITY CONTROL DATA SHEET

Site Name:	Fusion, Manchester		
Document Name:	Remediation Validation Report		
Reference:	NS/C5511/12505		
Status:	-	06/10/2023	Interim.

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DRAWINGS

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20269-011	T-07	General Arrangement – Ground Floor
DSM-SDL-ZZ-FX-DR-ST-0091	P03	General Arrangement Foundation Sections
DSM-SDL-ZZ-FX-DR-ST-0092	P03	General Arrangement Foundation Sections
C5511/01	-	Site Location Plan
C5511/02	-	Exploratory Hole Location Plan
C5511/03	-	Hotspot Location Plan
C5511/07	-	Tank Validation Sample Location Plan

APPENDICES

Appendix	Title
Appendix A	Photographic Volume –Tank Excavation
Appendix B	Chemical Testing Results
Appendix C	PID Calibration Certificates

1.0 INTRODUCTION

1.1 Context

This Remediation Validation Report has been produced by Brownfield Solutions Limited (BSL) on behalf of Domis Construction Ltd for a site off Deansgate, Manchester.

As of October 2023, remedial works are ongoing, and this report will be updated upon satisfactory completion of the remediation.

1.2 Objectives

The objective of the validation works is to provide evidence demonstrating implementation of appropriate remediation measures. The remedial works were carried out in order to make the site suitable for the proposed residential end use, as per the Remedial Strategy produced by TEC, reference 2006023.004.01B, dated September 2023, which is understood to have been accepted by the Local Planning Authority (Manchester City Council).

1.3 Proposed Development

The proposed development is understood to comprise a 534No. purpose build student accommodation units within a 28-storey building as shown on the 'General Arrangement Plan' ref. 20269-2009, dated 5th April 2023, provided to BSL by the client. No areas of communal recreation or open space are proposed at ground floor level, as shown on the General Arrangement – Ground Floor Plan (ref. 20269-011 T-07).

1.4 Previous Reports and Correspondence

The following reports and correspondence with regulators are applicable to the site and should be read in conjunction with this validation report:

- Opus, Phase I (Desk Study) Investigation Report (ref. J-W0501.02, issued November 2015).
- WSP, Phase I Preliminary Risk Assessment Report (ref. 11742(1), issued 2021).
- Structural Soils Ltd, Factual Report on Ground Investigation (ref. 764121, issued December 2016).
- Buro Happold Engineering, Design Note BCG091 (ref. 035799, dated June 2017).
- TEC, Ground Investigation Report (ref. 2006023.001.01A, issued August 2023).
- TEC, Foundation Works Risk Assessment (ref. 2006023.002.01, issued July 2023).
- TEC, Remediation Strategy & Verification Plan (ref. 2006023.004.01B, issued September 2023).
- Email/Telephone correspondence between Laura Miller <laura.miller@manchester.gov.uk>, dated 3rd October 2023.

It is assumed that the Local Planning Authority will have provided the above reports to the appropriate statutory consultees and the recommendations therein have been accepted.

1.5 Limitations

This report has been carried out based on information obtained from a number of areas, BSL have assumed that this information is correct.

There may be other conditions prevailing on the site which are outside the scope of work and have not been highlighted by this report and therefore not been taken into account by this report. Responsibility cannot be accepted for such site conditions not revealed by the assessment.

This report has been prepared for the sole use and reliance of the Client, Domis Construction. No other third parties may rely upon or reproduce the contents of this report without the written permission of Brownfield Solutions Ltd (BSL). If any unauthorised third party comes into possession of this report, they rely on it at their own risk and BSL do not owe them any Duty of Care.

This report has been based on the proposed planning layouts provided. Any subsequent change to the planning layout may have an impact on the validity of recommendations made within this report. Furthermore, new information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.

The site plans enclosed in this report should not be scaled off. Any site boundary line depicted on plans does not imply legal ownership of land.

Any recommendations made in this report should be confirmed with the Regulatory Authorities to ensure compliance.

2.0 PREVIOUS REPORTS

2.1 Opus (2015) / WSP (2021)

A summary of the relevant points from the Phase I Preliminary Risk Assessment Reports completed by Opus / WSP (ref. J-W0501.02 / 11742(1)) are presented below:

Phase I Risk Assessment Summary	
Site History	The earliest available historical mapping (1851) indicated the site formed part of the wider 'The Old Warehouse' wharf development to the north. The western part of the site was occupied by several buildings, with an additional smaller building to the north and notably a 'pump' in the eastern corner. This layout was reportedly changed by 1893, with the site appearing distinctly separate from adjacent works areas, and featuring two buildings, parallel with the north-eastern boundary. The WSP 2021 report suggested that the retaining structure along the north-eastern perimeter was likely constructed prior to 1893. Minor alterations to the site layout reportedly occurred in 1948 and 1951 when buildings were removed and replaced by a garage in 1960, interpreted by WSP to include a canopy/forecourt to the west and a building to the east which was likely a shop. No notable changes to the site layout were reported until mapping dating to 2010 which suggested the site was vacant. Imagery from Google Earth Pro shows that the contemporary concrete slab was likely associated with construction activities on a nearby site.
Surrounding Area History	A number of potentially significant current and historic land uses were reported within 500m of the site, including numerous industrial or engineering sites, two petrol/fuel sites (both of which listed as obsolete), sixty-five historical garages or vehicle repair sites and ten historical tanks.
Published Geology	The geology for the site was reported to comprise sands and gravels of the superficial Glaciofluvial Deposits, underlain by sandstone bedrock of the Chester Formation.
Hydrogeology	The Glaciofluvial Deposits are designated by the Environment Agency as a Secondary A Aquifer, whilst the Chester Formation is designated as a Principal Aquifer. Whilst the site is not located within a Source Protection Zone, there are eight groundwater abstractions recorded within 1km of the site, the nearest of which is reported approximately 575m to the north.
Hydrology	The nearest surface water feature was identified as the River Medlock located approximately 50m east of the site, which supplies the Castlefield Canal Basin 50m to the north. It is reported that the eastern half of the site lies within an Environment Agency Zone 2 flood zone.
Potential Environmental Constraints	There were no historical landfill sites recorded within 250m of the site, nor any records of historical mining or historical cavities within 1km.
Radon	The site is not located within a Radon Affected Area and therefore, no radon protective measures are reported to be required within new properties on site.
UXO	As part of the WSP report in 2021 a review of the Manchester Bomb Record was undertaken which suggested numerous damaged or demolished buildings as a result of historical bombing, with one recorded incidence of 'high explosives' located just northwest of the site. Online Zetica Bomb Risk Maps shows the site to be in a moderate risk area for the potential presence of unexploded bombs.

2.2 Structural Soils (2016) / Buro Happold Engineering (2017)

A summary of the relevant points from the Factual Report on Ground Investigation / Design Note completed by Structural Soils / Buro Happold Engineering (ref. 764121 / 035799) are presented below:

Historic Ground Investigation Reports	
Observed Geology	The encountered ground conditions across the site were generally reported to comprise made ground to depths of between 0.80m to in excess of 2.20m bgl, recorded as reinforced concrete underlain by brick fill, silty sandy gravel or silty gravelly sand. The gravel component typically comprised brick and sandstone.

Historic Ground Investigation Reports	
	The made ground was recorded to be underlain by gravelly sand with gravel of sandstone to depths of between 1.80m to 2.90m bgl, beneath which very weak to weak thinly to moderately bedded medium to coarse sandstone was observed to a maximum depth of 20.00m bgl and was considered representative of the Sherwood Sandstone Group.
Groundwater	Groundwater was struck in BH02 at 15.20m bgl, with resting levels recorded as 6.90m bgl after a period of 20 minutes. During subsequent monitoring works, groundwater was reported at depths ranging from 6.25m and 9.06m bgl.
Contamination – Soils	Limited visual and olfactory evidence of contamination was recorded during the ground investigation works and noted to include localised pockets of ash within the made ground, a strong hydrocarbon odour and staining between 0.60m and 1.90m bgl in made ground and underlying sandstone in TP04 and similarly in TP05 between 0.90m and 1.80m bgl. Elevated Photo-Ionisation Detector (PID) readings were recorded to a maximum of 1,700ppm at 1.40m bgl in TP04 and 2,100ppm at 1.60m bgl in TP05. Laboratory analysis of samples recorded localised exceedances of the relevant residential without plant uptake land use thresholds with respect to lead (TP04 0.70-0.90m bgl), naphthalene (TP04 1.80-1.90m bgl, and TP05 1.60-1.80m bgl), petroleum hydrocarbons (TP05 1.60-1.80m bgl) and 1,2,4- trimethylbenzene (TP05 1.60-1.80m bgl).
Contamination – Groundwater	Laboratory analysis of 3No. groundwater samples recovered from BH02, recorded exceedances of UK Drinking Water Standards for total aliphatic/aromatic TPH compounds and benzene, with additional exceedances of Environmental Quality Standards (EQS- Freshwater, AA) for cyanide, chromium, copper, lead, nickel, naphthalene and aromatic EC10-EC12 TPH compounds.
Ground Gas	4No. rounds of ground gas monitoring were undertaken by Structural Soils, within two installed boreholes screening the made ground. Results of the ground gas monitoring indicated the site would likely be classified as Characteristic Situation 1, with no further monitoring required, nor any gas protection measures considered necessary.
Land Contamination Recommendations and Further Works	Based on the localised hydrocarbon impact on subsurface soils identified by Structural Soils, Buro Happold reported that the visually impacted soils should be removed to a maximum depth of 2.00m bgl or a vapour resistant gas barrier should be installed in the proposed development. Additionally, whilst hardstanding is proposed across the majority of the site, Buro Happold recommended that a minimum build-up of clean material of 600mm installed along with a geotextile membrane in any areas of soft landscaping.

2.3 TEC (2023) – Ground Investigation Report

A summary of the relevant points from the Ground Investigation Report completed by TEC (reference 2006023.001.01A, used issued September 2023) is presented below:

Ground Investigation Report Summary	
Ground Penetrating Radar Findings	A GPR survey was undertaken by Groundscan prior to the commencement of works.. The survey identified a number of anomalies considered to be associated with the former PFS in the south / southwest of the site, including 4No. possible underground storage tanks, possible fuel line and possible former pump island. Anecdotal evidence from a local resident corroborates this layout and suggests that a forecourt building was present along the north-eastern perimeter and that the remaining brick wall on site was likely part of this structure.
Observed Geology	Made ground was encountered across the site to a maximum depth of 4.00mbgl and typically comprised reinforced concrete underlain by gravelly sand or clayey gravel, with gravel of brick, concrete, asphalt and limestone. The Chester formation was encountered beneath the made ground in all locations and typically comprised medium dense reddish brown slightly clayey fine to medium sand to depths between 1.00 and 7.00m bgl, underlain by moderately strong to strong reddish brown fine to medium sandstone to a maximum depth of 25.00m bgl.

Ground Investigation Report Summary	
Groundwater	While it was not possible to determine groundwater levels during drilling works due to the addition of water to aid with construction of the borehole, groundwater levels during the initial monitoring visit conducted immediately post drilling show groundwater levels resting at approximately 2.50 to 3.30m bgl. However, during subsequent monitoring visits standing groundwater levels were noted to be at approximately 7.00m bgl.
Contamination - Soils	Hydrocarbon odours and black staining were recorded within reworked natural materials and the upper part of the Chester Formation in BH102, whilst made ground materials sampled from BH101 were noted to have a weak petrol odour with Volatile Organic Carbon (VOC) concentrations recorded with a PID of a maximum of 305ppm at 1.50m bgl. Laboratory analysis of made ground recorded marginal exceedances at a single location (TP102) when screened against Public Open Space (resi) screening criteria for PAH compounds for residential site end use without homegrown produce. No contaminants of potential concern were identified within the natural ground.
Contamination - Groundwater	Leachable CoPCs (heavy metals and total phenol) were identified within sampled made ground/natural Chester Formation. In addition, PAH, total phenol, benzene and Aromatic TPH EC5-EC7 were identified within the groundwater at the site in excess of the UK Drinking Water Standards.
Ground Gas	No credible source of ground gas was identified within the assessment undertaken by WSP, Structural Soils and TEC; and the confirmatory gas monitoring undertaken by both Structural Soils and TEC confirms the site would be classified as Characteristic Situation 1. No ground gas protection of further assessment is deemed to be required.

3.0 SUMMARY OF RISK ASSESSMENTS

3.1 General

The previous site investigations have confirmed the following:

- Localised exceedances of lead (TP04 1.60-1.80m bgl), naphthalene (TP04 1.80-1.90m bgl, and TP05 1.60-1.80m bgl), petroleum hydrocarbons (TP05 1.60-1.80m bgl) and 1,2,4 trimethylbenzene (TP05 1.60-1.80m bgl).
- Made ground exceedances for PAH compounds in TP102.
- Exceedances of UK Drinking Water Standards for total aliphatic/aromatic TPH compounds and benzene within BH02.
- Exceedances of Environmental Quality Standards for cyanide, chromium, copper, lead, nickel, naphthalene and aromatic EC10-EC12 TPH compound within BH02.
- Presence of decommissioned tanks and interceptors.
- Ground gas monitoring indicated the site to be classified as Characteristic Situation 1.
- The presence of Volatile Organic Compounds (VOCs) presenting a risk via vapour migration into confined spaces.
- Elevated Photo-Ionisation Detector (PID) readings were recorded to a maximum of 1,700ppm at 1.40m bgl in TP04 and 2,100ppm at 1.60m bgl in TP05.

3.2 On Site Tanks

The GPR survey undertaken as part of the TEC intrusive works identifies the potential presence of 4No. underground storage tanks, a potential fuel line and a potential former pump island. Appropriate decommissioning and removal of these features are to be undertaken by an appropriately qualified party and a watching brief will be undertaken by an appropriately experienced geo-environmental consultant for the duration of the works.

3.3 Human Health Risks

Hydrocarbon odours were recorded in four exploratory hole locations, generally localised to the northwest corner of the site, and with a second localised area in the east of the site. Details of where hydrocarbon odours and staining were observed are summarised below:

Location	Observation	Strata	Depth (m bgl)
BH101	Weak petrol odour	Made ground	1.00-3.00
BH101	Weak petrol odour	Made ground	3.00 – 3.80
BH102	Slight hydrocarbon odour & small amount of visual staining	Made ground	0.80 -1.00
BH102	Slight hydrocarbon odour & small amount of visual staining	Reworked natural (sandy gravelly clay)	1.00-1.50
TP04	Strong hydrocarbon odour	Made ground	0.67 – 0.95
TP04	Hydrocarbon odour and staining	SILT	0.95 – 1.17
TP04	Strong hydrocarbon odour and staining	SAND (weathered bedrock)	1.17 – 1.90
TP05	Strong hydrocarbon odour and staining	Made ground	0.90 – 1.10
TP05	Strong hydrocarbon odour	SAND (weathered bedrock)	1.10 – 1.80
TP05	Strong hydrocarbon odour	SANDSTONE	1.80

A photo-ionisation detector (PID) was utilised alongside the identification of visual / olfactory evidence of contamination with a number of locations / strata demonstrating levels of volatile contamination above 50ppm as detailed below:

Location	Observation	Depth (m bgl)	PID (ppm)
BH101	Weak hydrocarbon odour	1.50 – 1.80	305
BH101	Weak petrol odour	3.00 – 3.80	81.50
TP04	Strong hydrocarbon odour	0.70 – 0.90	495
TP04	Hydrocarbon odour and staining	0.95 – 1.17	1,650
TP04	Strong hydrocarbon odour and staining	1.40 – 1.50	1,700
TP04	Strong hydrocarbon odour and staining	1.80 – 1.90	1,400
TP05	Strong hydrocarbon odour and staining	0.90 – 1.10	600
TP05	Strong hydrocarbon odour	1.60 – 1.80	2,100

NB: PID readings in bold are considered to represent the contamination observed.

On-site PID testing of samples returned high values in localised areas, the highest PID was encountered in TP05 between 1.60m and 1.80m bgl at a recorded level of 2,100ppm.

Structural Soils 2017 (report ref. 764121/035799) laboratory analysis of samples recorded localised exceedances of the relevant residential without plant uptake land use thresholds with respect to lead (TP04 0.70-0.90m bgl), naphthalene (TP04 1.80-1.90m bgl, and TP05 1.60-1.80m bgl), petroleum hydrocarbons (TP05 1.60-1.80m bgl) and 1,2,4- trimethylbenzene (TP05 1.60-1.80).

TEC 2023 (report ref. 2006023.001.01A) laboratory analysis of made ground recorded marginal exceedances at a single location (TP102) when screened against Public Open Space (resi) screening criteria for PAH compounds for residential site end use without homegrown produce. No contaminants of potential concern were identified within the natural ground.

It should be noted that all locations with elevated PID readings (>50 ppm) were in close proximity to the 4No. tanks on site. The above PID readings and the exceedances within TP04 and TP05, as well as groundwater contamination in BH102 were utilised to generate an indicative Hotspot Location Plan (ref. C5511/03) for targeting remediation and validation of the hydrocarbon impacted site soils.

3.4 Ground Gas and Vapours

No credible source of ground gas has been identified within the assessment by WSP, Structural Soils and TEC; and the confirmatory gas monitoring undertaken by both Structural Soils and TEC confirms the site would be classified as Characteristic Situation 1. No ground gas protection of further assessment is deemed to be required.

Whilst volatile contamination has been identified during the site investigation and during the BH102 at 67.7ppm during one of the three supplementary monitoring visits attention should be drawn to the Conceptual Site Model for the developed site. To date, hydrocarbon impacted soils have been encountered up to depths of 3.80m bgl or ~26.50m AOD (BH101) and it is proposed to reduce the site down to levels between 23.35 and 24.95m AOD which allows for an additional 1.50m below the contamination in this area of the site to be excavated as part of the reduced level dig. That being said, the greater PID readings were encountered at depths shallower than 2.00m bgl which would allow for ~4m of additional material to be excavated below the base of the contamination.

Across the site as a whole, it is proposed to reduce levels by circa 6.00m to accommodate the basement and raft foundation for the building. The site wide reduction in levels will, in some areas, result in the removal of circa 4.00m of sandstone bedrock. Given this, it is highly likely that the development of the site will remove all the hydrocarbon impacted soils at the site, thus removing the source, and mitigate the risk from vapours.

Any residual contamination which remains following the site wide reduction in levels will be mitigated by the formation of the raft foundation which consists of 2.50m to 3.00m thick concrete. Given the

considerable thickness of concrete this will break the pathway between residually contaminated site soils / bedrock and the end-user.

The above is demonstrated on the General Arrangement Foundation Sections for the site (ref. DSM-SDL-ZZ-FX-DR-ST-0091 P03 and DSM-SDL-ZZ-FX-DR-ST-0092 P03).

3.5 Risks to Controlled Waters

The groundwater monitoring regime and remediation requirements are currently under review with the Environment Agency. Groundwater monitoring throughout the construction of the project is being undertaken by TEC as appointed by Shear Design Ltd on behalf of Fusion Manchester Devco Ltd and will be reported by TEC within a separate supporting Verification Report.

3.6 Summary

A summary of the findings of the previous investigations and assessments where a risk is present (i.e. an unacceptable source-pathway-receptor linkage) which requires mitigation is presented in the table below.

Source	Receptor
<- Poses an unacceptable risk to ->	
VOCs, hydrocarbons	Water Pipe / Human Health and Controlled waters
Existing or redundant fuel storage and dispensing infrastructure, inspection pit	Human Health, Controlled Waters

4.0 REMEDIATION STRATEGY

4.1 Outline

Based on the site investigations undertaken at the site and the contaminant sources identified within the CSM, the following key items associated with the site soils require remediating:

- Petroleum Hydrocarbon Point Sources – Four underground storage tanks (USTs) have been identified on site. Any associated drainage or fuel lines represent potential point sources.
- General Made Ground – Pervasive contamination in the form of PAHs has been identified within the made ground, presenting a risk to human health (site end users).

4.2 Site Remediation Requirements.

Following an options appraisal in the Remedial Strategy completed by TEC in September 2023 (report reference 2006023.004.01B). Full details are available within the Remedial Strategy, with the key requirements summarised in the table below.

Source	Contaminants of Concern	Remediation Method	Further Details / Remedial Requirements
1 – Hydrocarbon point Sources (USTs, interceptor, inspection pits, associated drainage)	Petroleum Hydrocarbons	Source Removal – Excavation of hydrocarbon point sources	Once tanks are precisely located and it has been confirmed that the tanks have been appropriately decommissioned, the tanks/cradles and any hydrocarbon impacted soils and perched groundwater will be excavated and removed until “clean” faces and base are encountered, with chemical testing undertaken to confirm this. The sum of TPH CWG banding per validation sample should not exceed 1000mg/kg for the protection of controlled waters (considered to be highly conservative in this case).
2 – Hydrocarbon impacted made ground and natural soils / bedrock	Petroleum Hydrocarbons & VOCs	Source Removal – Excavation of hydrocarbon point sources	Hydrocarbon impacted soils will be excavated and removed until “clean” faces and base are encountered, with chemical testing undertaken to confirm this. The sum of TPH CWG banding per validation sample should not exceed 1000mg/kg for the protection of controlled waters (considered to be highly conservative in this case).

In addition to the specific remedial requirements listed in the tables above which are intended to mitigate the risks from known sources, it was recommended that a watching brief be maintained during the groundworks and construction for any evidence of contamination and BSL consulted for advice.

With reference to the remedial requirements, “clean” soils, validation samples taken from the resultant excavations will be screened on site with a Photo-Ionisation Detector (PID) and values should not exceed 50ppm, to assist with delineation. TPH CWG testing should be undertaken on all validation samples and the sum of petroleum hydrocarbon bands should not exceed 1000mg/kg which is considered to be suitably protective of controlled waters.

5.0 SITE REMEDIATION AND VALIDATION

5.1 General

The remediation process was undertaken over several stages and site visits were undertaken between the dates of 7th September 2023 and 25th September 2023.

A summary of the site works undertaken in accordance with the Remedial Strategy (report reference 2006023.004.01B) is detailed below

5.2 Source 1: Hydrocarbon Point Sources

Prior to BSL attendance on site O'gara, the earthworks contractor, lifted the concrete slabs in the area of the suspected tanks on the site to confirm the number of tanks and their contents. It was confirmed that 6No. (~2m x ~3m ≈ 9,000-10,000L) tanks were present and each was noted to have been decommissioned with sand / cement and therefore there was no requirement to pump /de-gas their contents prior to commencing their removal. It was noted that the tanks were enclosed within a brick bund on all four sides.

BSL attended the site to verify the removal of hydrocarbon point sources over a series of supervisory visits between 6th September 2023 and 25th September 2023. Prior to commencement, the four corners of the brick bund were surveyed, and these are demonstrated on the Hotspot Location Plan ref. C5511/03. The brick bund had dimensions of 16.0m x 3.5m.

Sampling and chemical testing were to be undertaken at a minimum frequency of one test per 10m of linear sidewall with a minimum of four tests (i.e. one per side) and one test per 50m² on the base, as governed by BSL standard practice. Based on this, two samples were to be taken from the longer walls and two from the base of the excavation, totalling 8 samples for the validation of the entire tank bund.

7th September - UST (Excavation 1)

BSL were not requested to attend site during the removal of the UST. However, photographic records were provided by the groundworks contractor are provided in Appendix A.

According to the groundworks contractor, two metal tanks were encountered in the south area of the site during break-up of the concrete. The tanks did not contain any liquid products but was filled with what appeared to be concrete. No cradle or other concrete support was present surrounding the tank but the tanks were surrounded by sand.

Following confirmation that the tank did not contain any hydrocarbons, the two tanks were lifted out of the excavation and placed on an area of concrete hardstanding.

The soils immediately surrounding the tanks were excavated and placed on impermeable hardstanding ground in the north of the site for offsite disposal. The material was tested (SP01) and the results are presented in Appendix B within analytical report number 23-55896.

BSL then attended site on 7th September 2023 to undertake verification of the removal of known hydrocarbon point source in the form of UST's in the south of the site. In order to allow the inspection of the resultant excavation for the UST, the original excavation was kept open and made secure with heras fencing.

When the contents of the bund in this area had been excavated, a 300mm thick concrete slab was observed across part of the excavation with the eastern most tank (thought to be diesel) placed directly over bedrock. The excavation extended to bedrock at 3.80m bgl where the sandstone was noted to be

visually impacted. The excavation was advanced through the assistance of a breaker to 4.20m bgl where the base was noted to be “clean” with no significant areas with hydrocarbon odours and staining remaining, a sample was taken of the bedrock at the base of the excavation.

Once a clean base was determined the eastern and eastern half of the southern wall were punched in to allow the surrounding soils to be examined. Following this soils from two of the three sides of the tank excavation were sampled and scheduled for TPH-CWG analysis at a UKAS accredited laboratory. All samples were screened onsite with a Photo-Ionisation Detector (PID).

A summary of the sample information, chemical testing and results is presented in the table below:

Sample Reference	Sample depth (m bgl)	VOCs by PID (ppm)	Chemical Testing Scheduled	Total TPH Concentration (mg/kg)
TKVAL1 (base)	4.20	0	TPH-CWG	<10
TKVAL2 (side wall)	2.50	0	TPH-CWG	<10
TKVAL3 (side wall)	2.50	0	TPH-CWG	<10

The PID measurements of the validation samples did not exceed 50ppm, which is the acceptable limit specified by BSL.

All samples taken within the tank excavation did not exceed the remedial target concentration of 1000mg/kg for TPH concentrations and therefore demonstrate the successful removal of impacted soils from the southern and eastern extent of the tank bund in this area of the site.

The chemical testing results are presented in Appendix B within analytical report number 23-55896. PID calibration certificates are presented in Appendix C.

A photographic volume from the tank excavation is presented in Appendix A.

Northern Wall

Following the excavation of this area of the site, it was determined that chasing out the northern side of the tank bund to clean sides would not be feasible at this stage given the size of the site, the depth of the excavation and the logistics of excavator, soil and wagon movement during the process. The excavation of the northern side will therefore be combined with the hotspot removal for the areas demarked on the Hotspot Location Plan (ref. C5511/03) which is to be undertaken at a later date during the reduced level dig.

12-13th September 2023 –USTs (Excavation 1 Extension)

The excavation undertaken on 7th September under BSL supervision was extended during the removal of four additional UST's.

When the contents of the bund in this area had been excavated, bedrock was observed at ~2.30m bgl where the sandstone was noted to be visually impacted. The excavation was advanced through the assistance of a breaker to 2.50m bgl where the base was noted to be “clean” with no significant areas with hydrocarbon odours and staining remaining, a sample was taken of the bedrock at the base of the excavation.

Further sampling was undertaken on soils and rock from the sides and base and samples were scheduled for TPH-CWG analysis at a UKAS accredited laboratory. All samples were screened onsite with a Photo-Ionisation Detector (PID). The locations of the additional samples are indicated on the Hotspot Location Plan, Drawing No. C5511/03.

A summary of the sample information, chemical testing and results is presented in the table below:

Sample Reference	Sample depth (m bgl)	VOCs by PID (ppm)	Chemical Testing Scheduled	TPH Concentration (mg/kg)
TKVAL4 (base)	2.50	8.2	TPH-CWG	<10
TKVAL5 (side wall)	2.00	0.2	TPH-CWG	13
TKVAL6 (side wall)	0.90	6	-	-
TKVAL7 (side wall)	1.00	0	TPH-CWG	<10

The PID measurements of the validation samples did not exceed 50ppm, which is the acceptable limit specified by BSL.

All samples taken within the tank excavation did not exceed the remedial target concentration of 1000mg/kg for TPH concentrations and therefore demonstrate the successful removal of impacted soils from the southern and western extent of the tank bund in this area of the site.

The chemical testing results are presented in Appendix B within analytical report number 23-56397. PID calibration certificates are presented in Appendix C.

A photographic volume from the tank excavation is presented in Appendix A.

Northern Wall

As detailed above, the northernmost extent of the excavation remains unvalidated. The wall along the eastern extent of the northern face was removed for inspection during BSL's attendance which demonstrated some hydrocarbon-impacted strata at circa 1.00m, and up to 2.85m bgl in the area which was most visually impacted.

The area with the most significant staining was considered to be associated with the second tank from the east (Tank 2), in proximity to BH103 and aligned with the TP05 where the greatest PID readings were encountered. It is understood this may have been a petrol tank. Once the contiguous pile wall has been installed, in line with the Foundation Works Risk Assessment (ref. 2006023.002.01) the hotspot will be removed in its entirety before the site levels are reduced under a watching brief.

A 300mm diameter pipe was encountered behind the brick bund and when broken was not noted to contain any visual or olfactory evidence of contamination.

A photographic volume from the tank excavation is presented in Appendix A.

6.0 CONCLUSIONS

6.1 General

The remedial works described within this report were carried out between the dates of 7th September 2023 and 13th September 2023 under the supervision of experienced BSL geo-environmental engineers.

6.2 Hydrocarbon Point Source Excavations

A total of six ~9,000-10,000 litre underground storage tanks (USTs) have been encountered on site.

BSL carried out soil sampling from three sides and the base of the resultant excavations. The soil samples were scheduled for appropriate chemical testing; the sampling frequency and scheduling of chemical testing (TPH CWG). None of the samples exceeded the Remediation Target value of 1,000mg/kg and 50ppm. In general, all of the samples were either below detection or marginally above, and it is therefore considered these areas have been successfully remediated.

In summary, based on the above remediation and validation works, the eastern, western and southern walls as well as the base of the tank bund have all been successfully remediated and validated.

6.3 Further Works

As detailed above, the following works associated with the impacted site soils require remediation at the site:

-
- Validation of the northern tank bund wall down to clean sides;
 - The above point to coincide with removal of the hydrocarbon hotspot (drawing ref. C5511/03);
 - Watching brief maintained over reduced level dig with photographic evidence of clean base/formation level prior to placement of lower level piling mat and commencement of piling.
 - Documented information pertaining to waste/tank removal from the site with associated WTNs.
-

The above will be reported in an updated revision of this Remediation Validation Report.

DRAWINGS

APPENDIX A

Photographic Volume –Tank Excavation

CASTLE WHARF

DEANSGATE QUAY

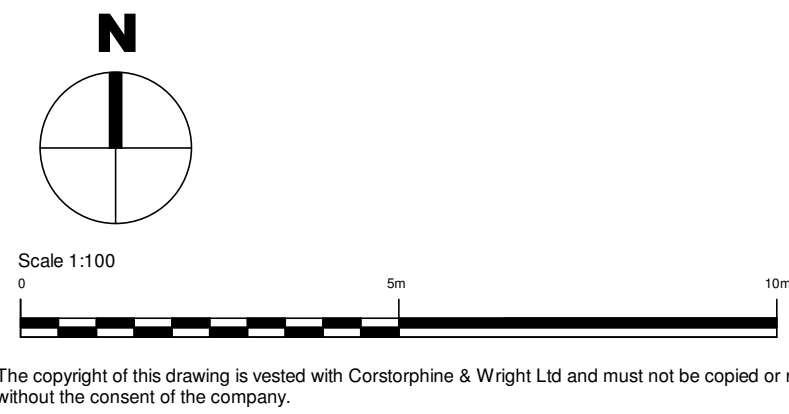
BRIDGEWATER VIADUCT

CAR PARK

LAYBY

DEANSGATE SOUTH

OWEN STREET



T-07	Updated to suit VE Contractor Proposals.	22/09/23	BH	CMc
T-06	Updated to suit Design Team comments.	24/05/23	BH	CMc
T-05	Drawings updated to suit comments from the Design & Client Team following the introduction of the new stair.	06/04/23	BH	CMc
T-04	Coordinated with Interior Design Team.	04/11/22	BH	CMc
T-03	Stage 4 Issue.	23/09/2022	BH	CMc
T-02	Drawings updated to suit Design Team comments ahead of Stage 3+ Issue.	20/09/22	BH	CMc
T-01	TENDER	05/08/2022	SW	CMc
T-00	TENDER	08/07/2022	SW	CMc
Rev.	Description	Date	Drawn	Chk.

KEY

— Site Boundary

NOTES:

The copyright of this drawing is vested with Corstorphine + Wright Ltd and must not be copied or reproduced without the consent of the company.

Figured dimensions only to be taken from this drawing. DO NOT SCALE.

All contractors must visit the site and be responsible for checking all setting out dimensions and notifying the Architect of any discrepancies prior to any manufacture or construction work.

Drawings to be read in conjunction with the following Consultant information:

- Structural Engineer
- M&E Engineer
- Fire Engineer
- Interior Designer

Client:
Domis Construction
Project:
Deansgate South, Manchester

Drawing Title
General Arrangement - Plan - 00 -
Ground Floor

Drawing Status
TENDER

Corstorphine & Wright

Warwick Studio
Brook Hall, Brook Street, Warwick, CV34 4BL
01926 858 444
corstorphine-wright.com

Drawing No.
20269-2011

Drawn
SW

Checked
CMc

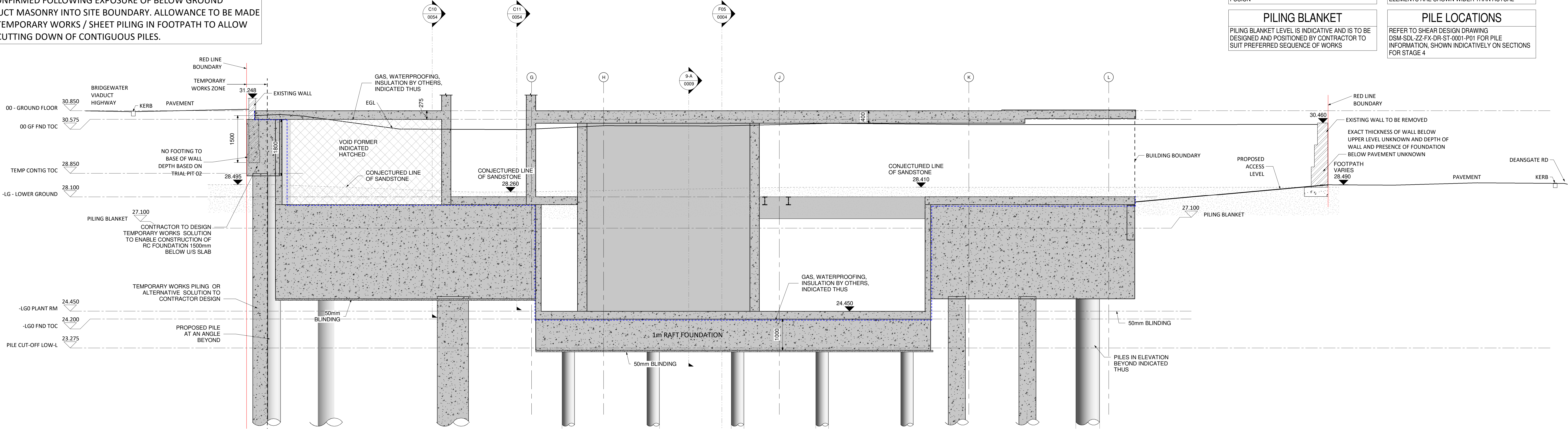
Paper Size
A1

Scale
1 : 100

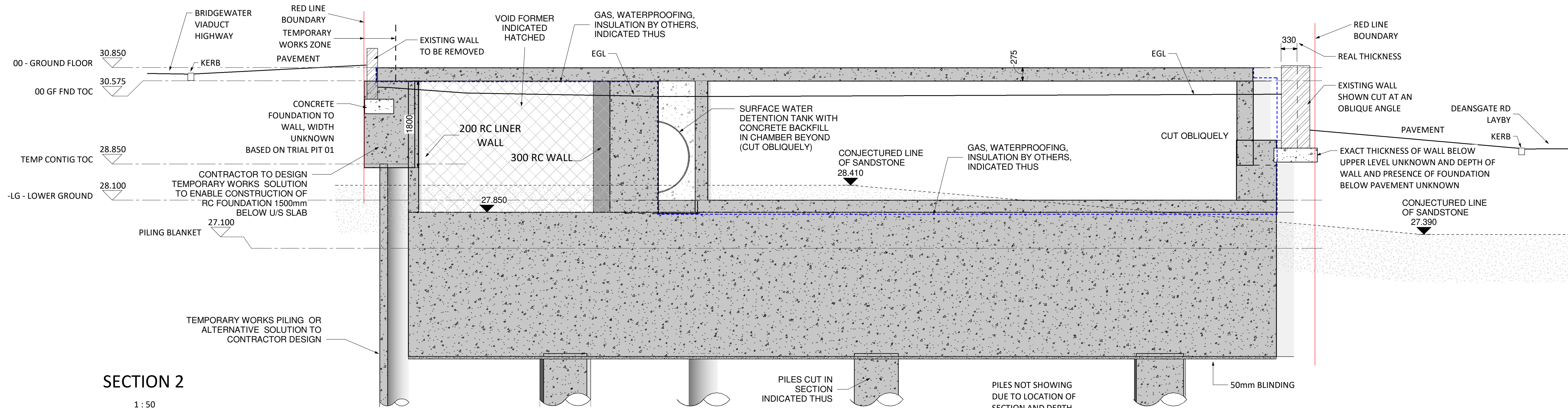
Revision
T-07

Date
20/06/22

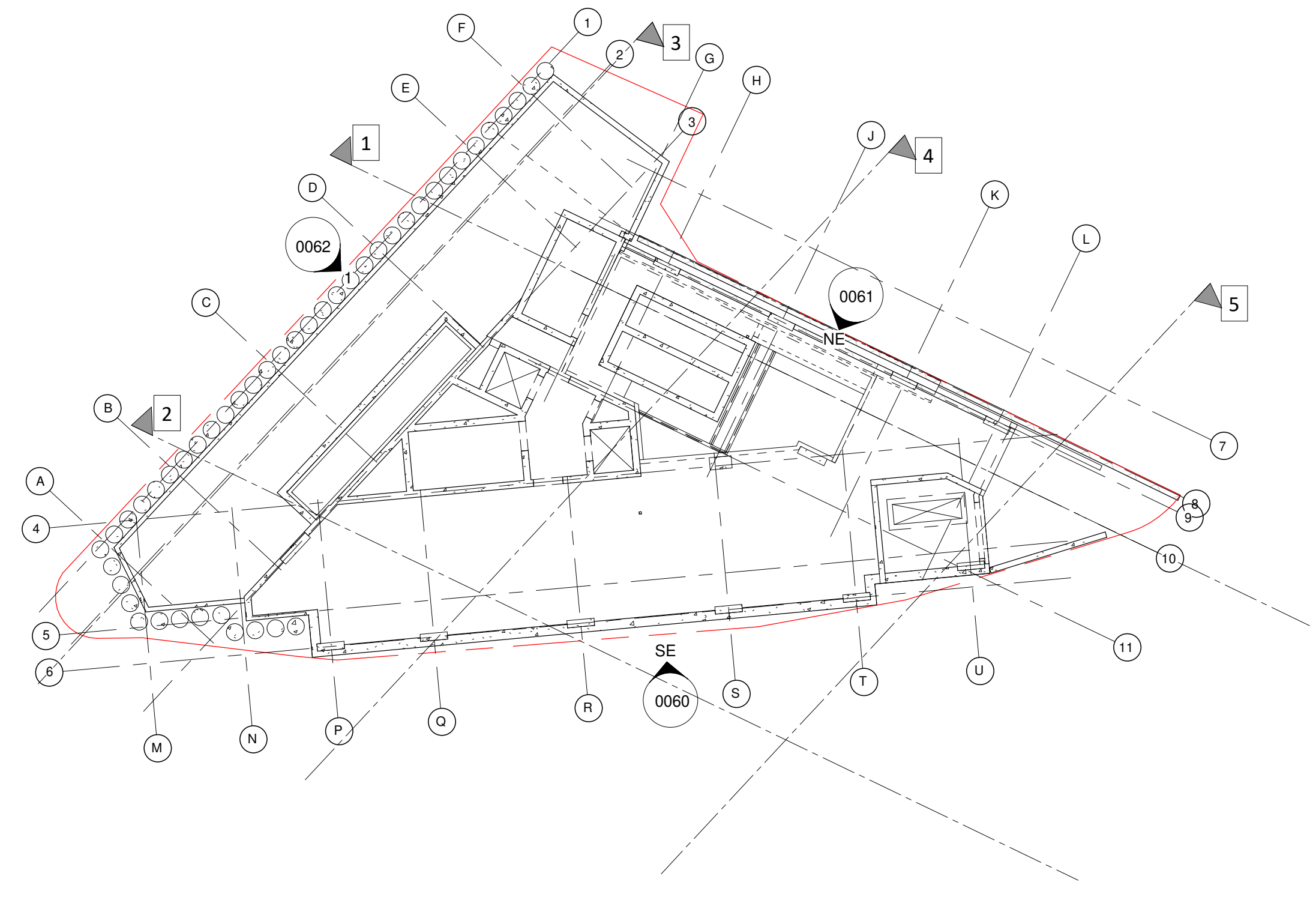
EXTENT OF CONTIGUOUS PILED WALL AND TEMPORARY WORKS TO BE CONFIRMED FOLLOWING EXPOSURE OF BELOW GROUND VIADUCT MASONRY INTO SITE BOUNDARY. ALLOWANCE TO BE MADE FOR TEMPORARY WORKS / SHEET PILING IN FOOTPATH TO ALLOW FOR CUTTING DOWN OF CONTIGUOUS PILES.



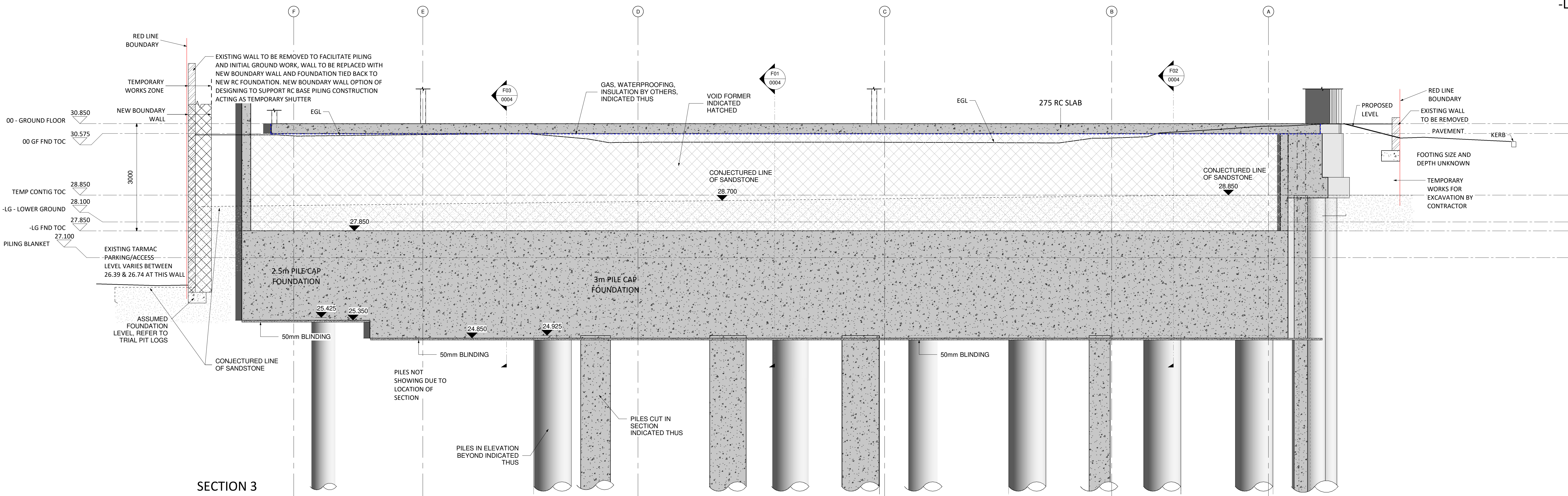
SECTION 1
1 : 50



SECTION 2
1 : 50



-LG - LOWER GROUND - KEYPLAN
1 : 200



SECTION 3
1 : 50

NOTE! DPM
DPM/DPC AND TANKING DETAILS BY OTHERS

RED LINE BOUNDARY
RED LINE BOUNDARY SHOWN HAS BEEN TAKEN FROM CWA DRAWINGS AND IS INDICATIVE, TBC BY FUSION

SECTION CUTTING
SECTIONS HAVE CUT THE STRUCTURE AT AN OBLIQUE ANGLE IN SOME INSTANCES AND ELEMENTS ARE SHOWN WIDER THAN ACTUAL

PILING BLANKET
PILING BLANKET LEVEL IS INDICATIVE AND IS TO BE DESIGNED AND POSITIONED BY CONTRACTOR TO SUIT PREFERRED SEQUENCE OF WORKS

PILE LOCATIONS
REFER TO SHEAR DESIGN DRAWING DSM-SDL-ZZ-FX-DR-ST-0001-P01 FOR PILE INFORMATION, SHOWN INDICATIVELY ON SECTIONS FOR STAGE 4

NOTES

- GENERAL**
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
 - ALL LEVELS RELATE TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
 - DO NOT SCALE FROM THIS DRAWING. USE FIGURED DIMENSIONS ONLY.
 - ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY TO THE ENGINEER.
 - THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
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THIS DRAWING MUST BE READ IN CONJUNCTION WITH SHEAR DESIGN DRAWING DSM-SDL-ST-0080 FOR ALL NOTES

P03	26.05.23	STAGE 4 ISSUE	AK	BGH
P02	21.10.22	STAGE 4 ISSUE	DF	BGH
P01	26.08.22	STAGE 3+ ISSUE	AK	BGH
REV	DATE	DESCRIPTION	BY	CHK

Revision Schedule

CLIENT: FUSION MANCHESTER DEVCO LIMITED

PROJECT: DEANSGATE SOUTH DEANSGATE MANCHESTER

TITLE: GENERAL ARRANGEMENT FOUNDATION SECTIONS 1

SHEAR design
Consulting Civil and Structural Engineers

7 Ashtree Court - Woody Close - Cardiff Gate Business Park - Cardiff - CF23 8RW

Tel: 029 2054 7000 - Fax: 029 2054 7001 - www.shear-design.com

Enquiries@shear-design.com

DRAWN: AK, CHECKED: BH, DATE: 27/06/22, SCALE: As indicated@A0

STATUS: STAGE 4

SHEAR DESIGN REF: 20047, DRAWING NUMBER: DSM-SDL-ZZ-FX-DR-ST-0091, REVISION: P03, STATUS: S1

NOTE! DPM
DPM/DPC AND TANKING DETAILS BY OTHERS

RED LINE BOUNDARY
RED LINE BOUNDARY SHOWN HAS BEEN TAKEN FROM CWA DRAWINGS AND IS INDICATIVE, TBC BY FUSION

PILING BLANKET
PILING BLANKET LEVEL IS INDICATIVE AND IS TO BE DESIGNED AND POSITIONED BY CONTRACTOR TO SUIT PREFERRED SEQUENCE OF WORKS

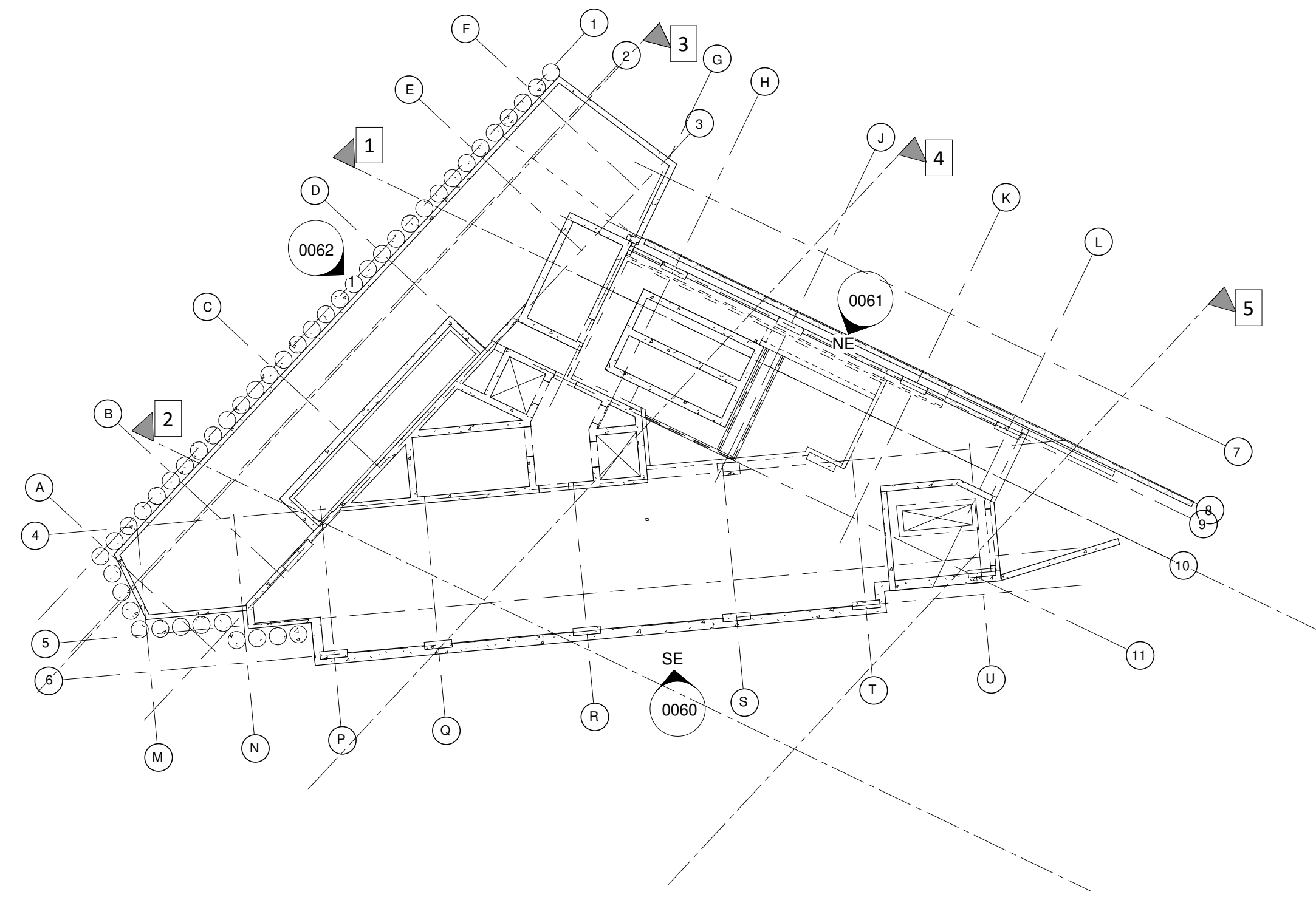
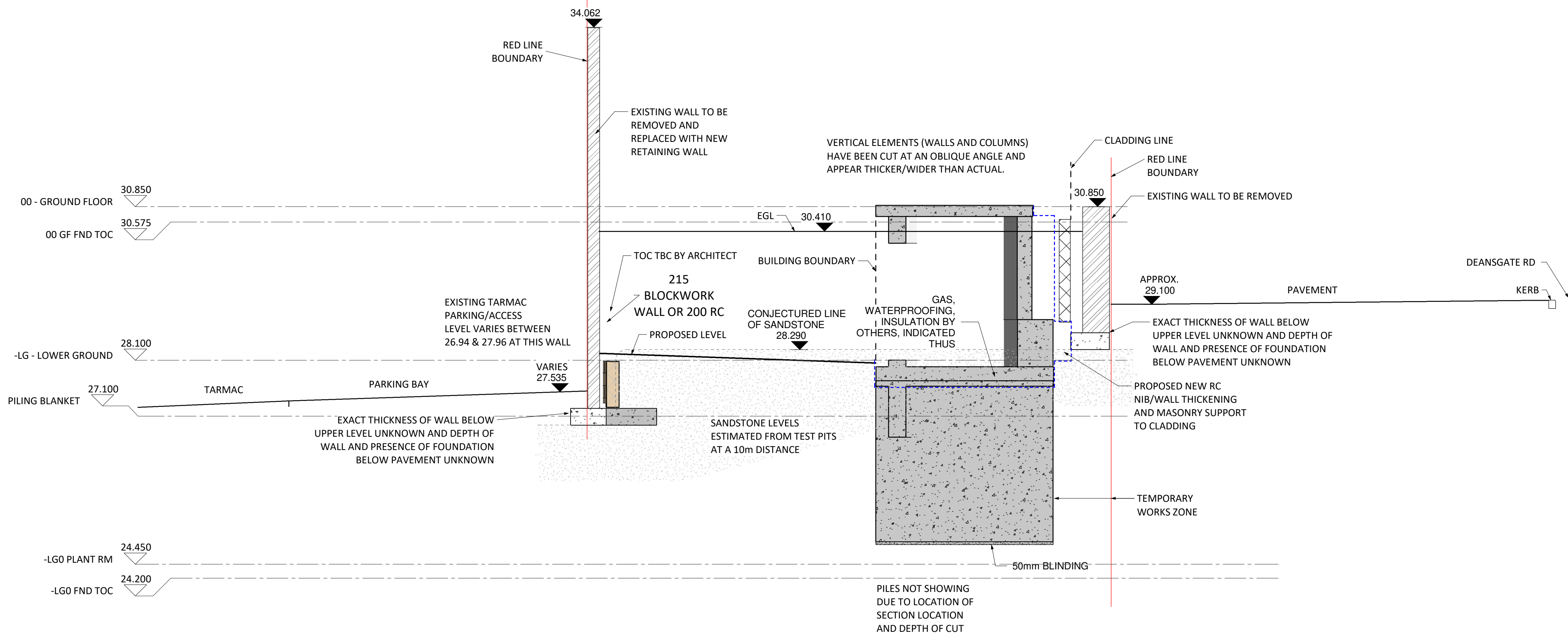
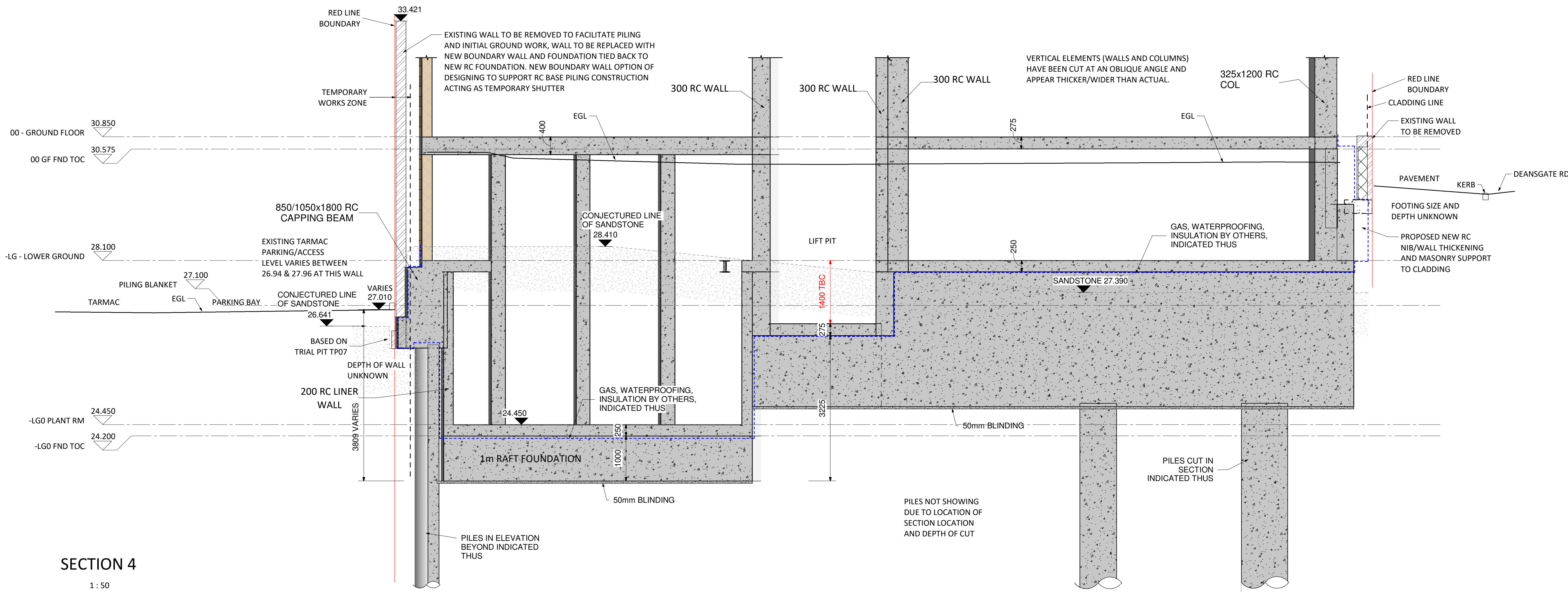
SECTION CUTTING
SECTIONS HAVE CUT THE STRUCTURE AT AN OBLIQUE ANGLE IN SOME INSTANCES AND ELEMENTS ARE SHOWN WIDER THAN ACTUAL

PILE LOCATIONS
REFER TO SHEAR DESIGN DRAWING DSM-SDL-ZZ-FX-DR-ST-0001-P01 FOR PILE INFORMATION, SHOWN INDICATIVELY ON SECTIONS FOR STAGE 4

NOTES

- GENERAL
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 - ALL LEVELS RELATE TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
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DRAWING
DSM-SDL-ST-0080 FOR ALL
NOTES



PO3	26.05.23	STAGE 4 ISSUE	AK	BGH
PO2	21.10.22	STAGE 4 ISSUE	DF	BGH
PO1	26.08.22	STAGE 3+ ISSUE	AK	BGH
REV	DATE	DESCRIPTION	BY	CHK

Revision Schedule

CLIENT:	FUSION MANCHESTER DEVCO LIMITED
PROJECT:	DEANSGATE SOUTH DEANSGATE MANCHESTER
TITLE:	GENERAL ARRANGEMENT FOUNDATION SECTIONS 2

SHEAR design
Consulting Civil and Structural Engineers

7 Ashtree Court - Woody's Close - Cardiff Gate Business Park - Cardiff - CF23 8RW
Tel: 029 2054 7000 - Fax: 029 2054 7001 - www.shear-design.com
Enquiries@shear-design.com

DRAWN:	AK	CHECKED:	BH	DATE:	27/06/22	SCALE:	As indicated@A0
STATUS:	STAGE 4						
SHEAR DESIGN REF:	20047	DRAWING NUMBER:	DSM-SDL-ZZ-FX-DR-ST-0092	REVISION:	PO3		
				STATUS:	S1		



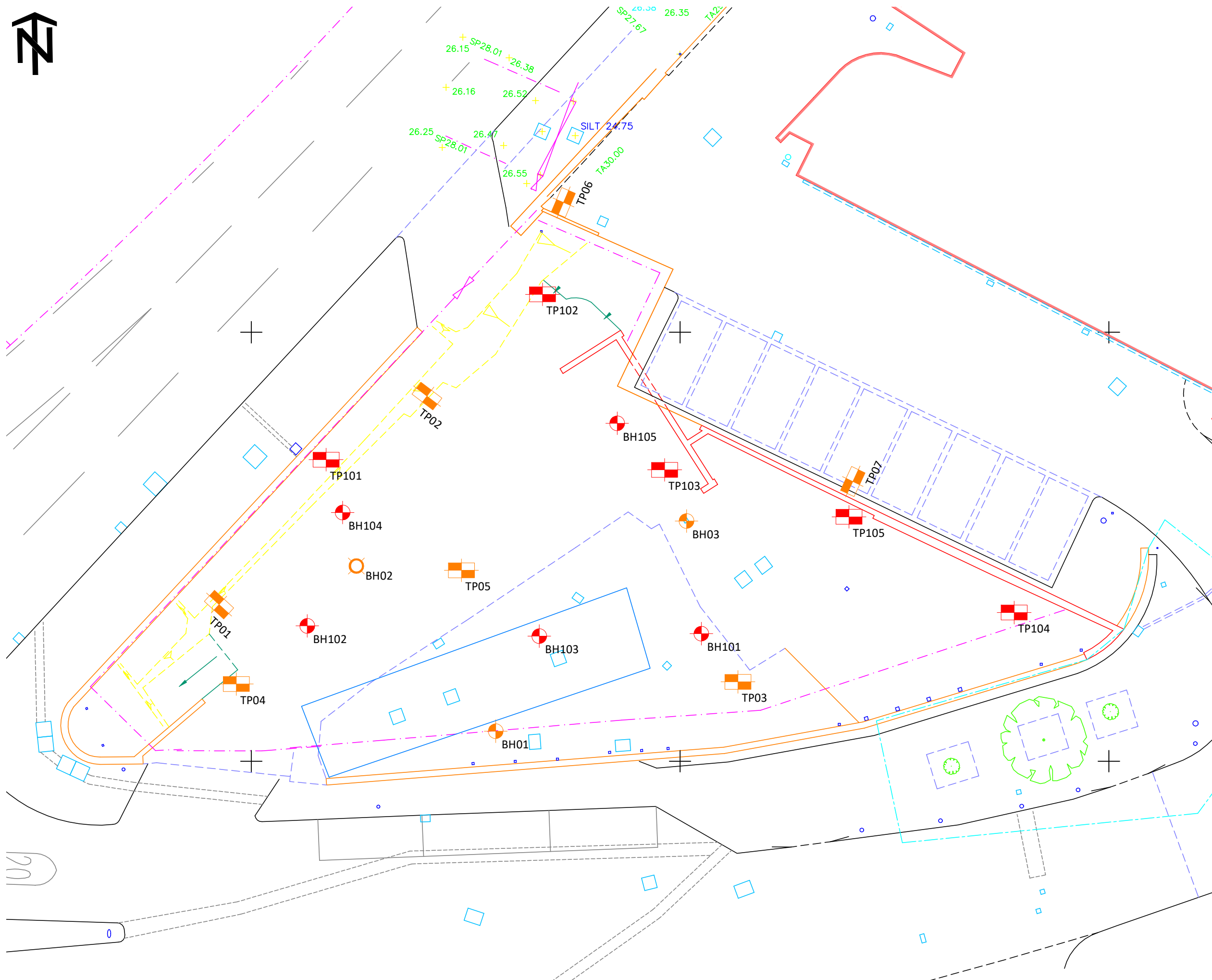
SITE LOCATION

NEAREST POSTCODE: M3 4LB

SITE ENTRANCE WHAT3WORDS:
///SHELF.TAKES.VIEWS



REV	DATE	DESCRIPTION	BY	CKD
 BROWNFIELD SOLUTIONS LTD CEO ENVIRONMENTAL ENGINEERING EXCELLENCE				
CLIENT DOMIS CONSTRUCTION LTD				
PROJECT TITLE FUSION, MANCHESTER				
DRAWING TITLE SITE LOCATION PLAN				
DRAWING No. C5511/01	REVISION -	SCALE NTS	DATE 03/10/23	
DRAWN BY SD		CHECKED BY NS		



KEY	
	APPROXIMATE SITE BOUNDARY

TEC (2022)	
	SONIC DRILLING BOREHOLE
	TRIAL PIT

STRUCTURAL SOILS (2017)	
	TRIAL PIT
	WINDOW SAMPLE BOREHOLE
	ROTARY CORED BOREHOLE

- NOTES
1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
 2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS REPORTS. THIS DRAWING IS COPYRIGHT OF BSL.
 3. DRAWING NOT FOR CONSTRUCTION PURPOSES.

REV	DATE	DESCRIPTION	BY	CKD

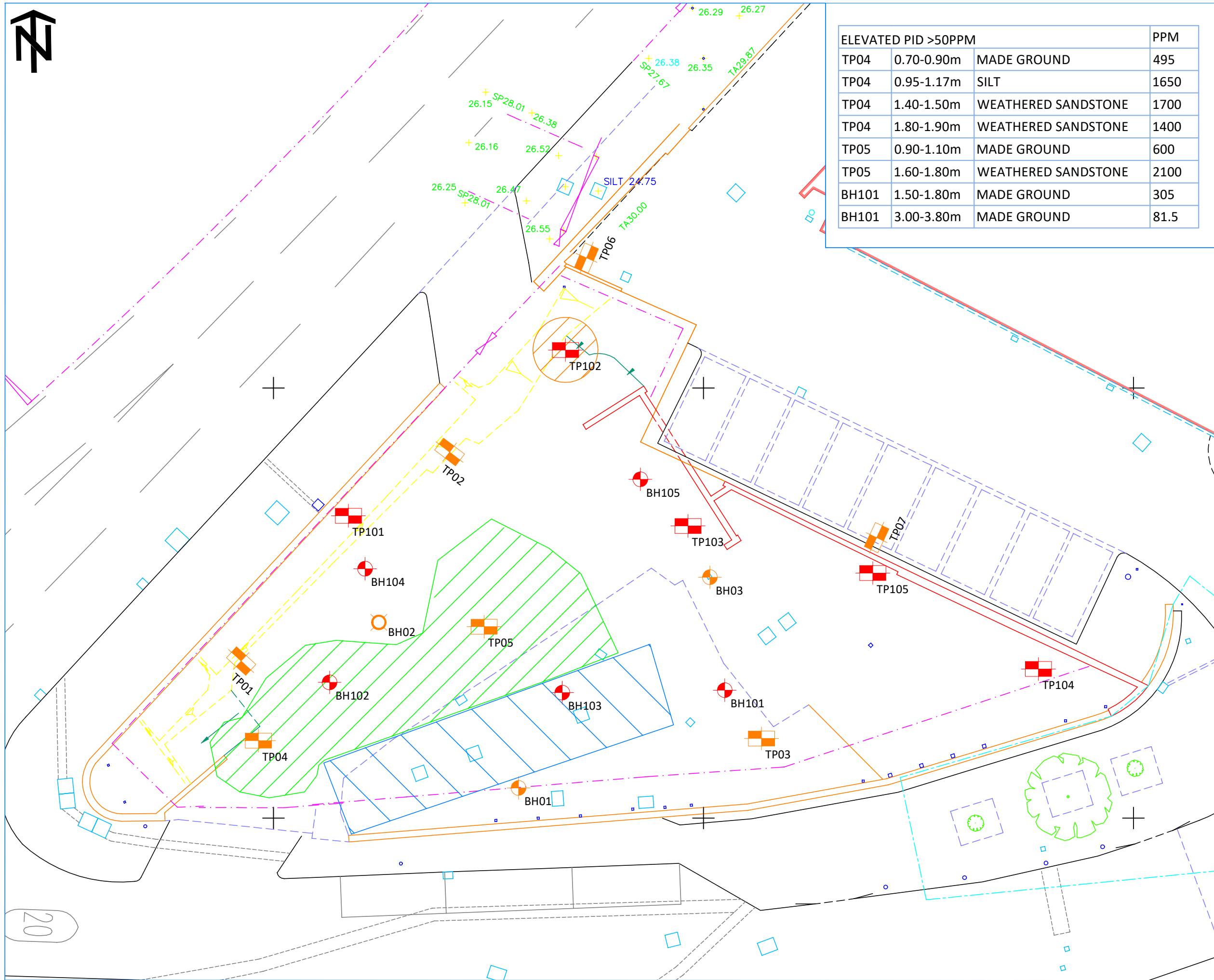


CLIENT
DOMIS CONSTRUCTION LTD

PROJECT TITLE
FUSION, MANCHESTER

DRAWING TITLE
EXPLORATORY HOLE LOCATION PLAN

DRAWING No.	REVISION	SCALE	DATE
C5511/02	-	NTS	11/09/23
DRAWN BY CM		CHECKED BY XXX	



ELEVATED PID >50PPM			PPM
TP04	0.70-0.90m	MADE GROUND	495
TP04	0.95-1.17m	SILT	1650
TP04	1.40-1.50m	WEATHERED SANDSTONE	1700
TP04	1.80-1.90m	WEATHERED SANDSTONE	1400
TP05	0.90-1.10m	MADE GROUND	600
TP05	1.60-1.80m	WEATHERED SANDSTONE	2100
BH101	1.50-1.80m	MADE GROUND	305
BH101	3.00-3.80m	MADE GROUND	81.5

KEY	
	APPROXIMATE SITE BOUNDARY
	ELEVATED PAH
	TPH >1000mg/kg
	HYDROCARBON ODOURS IN LOGS
	TANK BRICK BUND EXTENTS
TEC (2022)	
	SONIC DRILLING BOREHOLE
	TRIAL PIT
STRUCTURAL SOILS (2017)	
	TRIAL PIT
	WINDOW SAMPLE BOREHOLE
	ROTARY CORED BOREHOLE

NOTES

- ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
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- DRAWING NOT FOR CONSTRUCTION PURPOSES.

REV	DATE	DESCRIPTION	BY	CKD

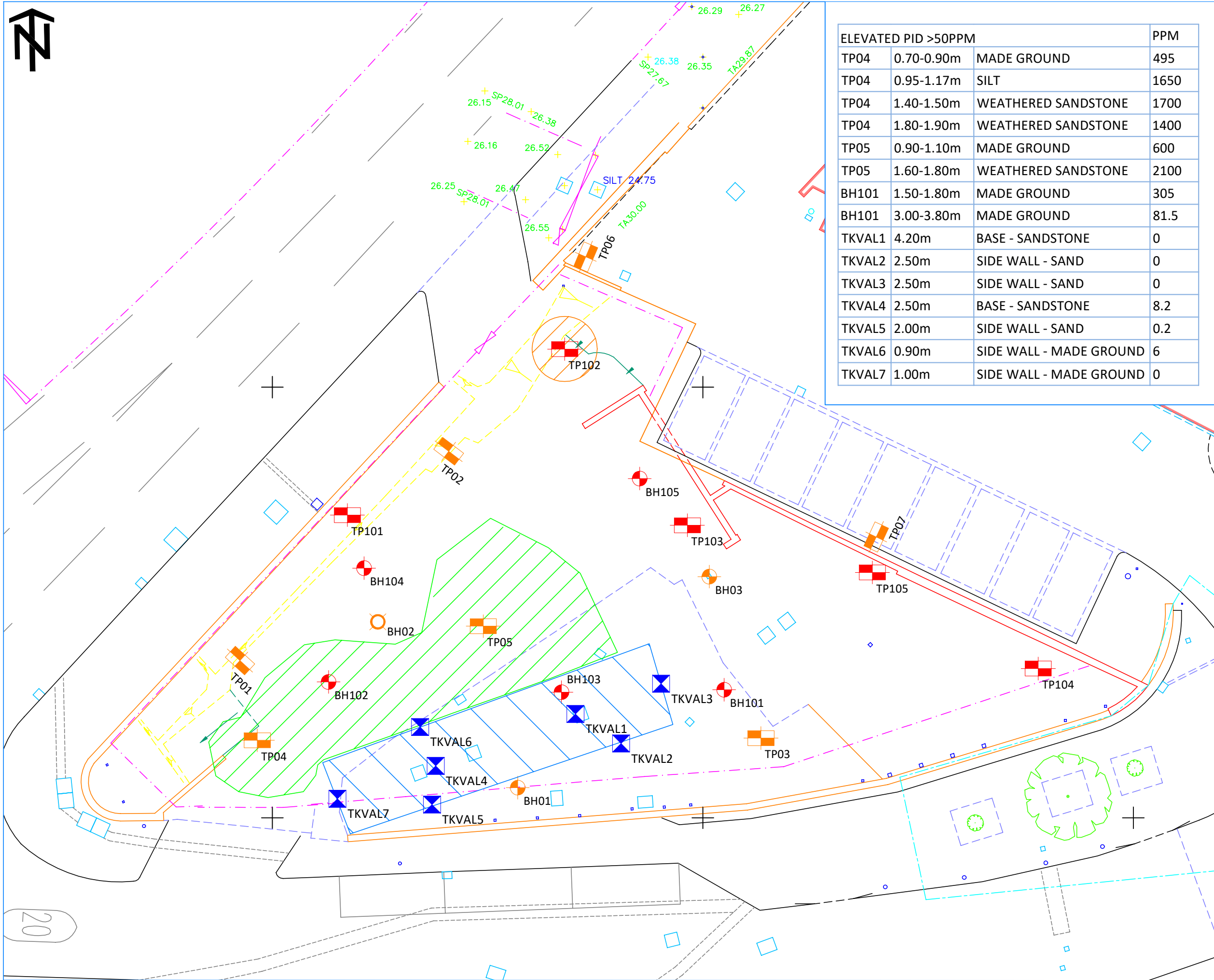


CLIENT
DOMIS CONSTRUCTION LTD

PROJECT TITLE
FUSION, MANCHESTER

DRAWING TITLE
HOTSPOT LOCATION PLAN

DRAWING No.	REVISION	SCALE	DATE
C5511/03	-	NTS	06/10/23
DRAWN BY MB		CHECKED BY NS	



KEY	
	APPROXIMATE SITE BOUNDARY
	ELEVATED PAH
	TPH >1000mg/kg
	HYDROCARBON ODOURS IN LOGS
	TANK BRICK BUND EXTENTS
	TKVALX TANK VALIDATION SAMPLE
TEC (2022)	
	BHXX SONIC DRILLING BOREHOLE
	TP105 TRIAL PIT
STRUCTURAL SOILS (2017)	
	TPXX TRIAL PIT
	WSXX WINDOW SAMPLE BOREHOLE
	RCXX ROTARY CORED BOREHOLE

- NOTES
- ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
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REV	DATE	DESCRIPTION	BY	CKD



**BROWNFIELD
SOLUTIONS LTD**

CLIENT

DOMIS CONSTRUCTION LTD

PROJECT TITLE

FUSION, MANCHESTER

DRAWING TITLE

VALIDATION SAMPLE LOCATION
PLAN

DRAWING No.	REVISION	SCALE	DATE
C5511/07	-	NTS	06/10/23

DRAWN BY	CHECKED BY
MB	NS

APPENDIX B

Chemical Test Results

**Nicola Swallow**

Brownfield Solutions Ltd
William Smith House
173 - 183 Witton Street
Northwich
Cheshire
CW9 5LP

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404**f:** 01923 237404**e:** reception@i2analytical.com**e:** n.swallow@brownfield-solutions.co.uk

Analytical Report Number : 23-55896

Project / Site name:	Fusion, Manchester	Samples received on:	12/09/2023
Your job number:	C5511	Samples instructed on/ Analysis started on:	12/09/2023
Your order number:	4564	Analysis completed by:	18/09/2023
Report Issue Number:	1	Report issued on:	18/09/2023
Samples Analysed:	4 soil samples		

Signed:

Joanna Szwagrak
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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

Analytical Report Number: 23-55896
Project / Site name: Fusion, Manchester
Your Order No: 4564

Lab Sample Number				2807897	2807898	2807899	2807900
Sample Reference				TKVAL1	TKVAL2	TKVAL3	SP01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				4.20	2.50	2.50	None Supplied
Date Sampled				07/09/2023	07/09/2023	07/09/2023	07/09/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	10	9.5	10	8.3
Total mass of sample received	kg	0.001	NONE	0.8	0.7	0.7	0.9

Asbestos in Soil	Type	N/A	ISO 17025	-	-	-	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	N/A	N/A	N/A	JBH

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-	-	-	10.3
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	-	220
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	-	0.112
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	112
Organic Matter (automated)	%	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Anthracene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Pyrene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Chrysene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	-	-	-	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	-	-	-	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	-	-	-	< 0.80
-----------------------------	-------	-----	-----------	---	---	---	--------

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	2.8
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	-	-	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	-	-	-	< 1.2
Chromium (III)	mg/kg	1	NONE	-	-	-	4.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	4.2
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	5
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	10
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	-	-	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	4.7
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	19

Analytical Report Number: 23-55896
Project / Site name: Fusion, Manchester
Your Order No: 4564

Lab Sample Number	2807897	2807898	2807899	2807900
Sample Reference	TKVAL1	TKVAL2	TKVAL3	SP01
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	4.20	2.50	2.50	None Supplied
Date Sampled	07/09/2023	07/09/2023	07/09/2023	07/09/2023
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	

Monoaromatics & Oxygenates

Total BTEX & MTBE	mg/kg	0.007	NONE	< 0.007	< 0.007	< 0.007	< 0.007
-------------------	-------	-------	------	---------	---------	---------	---------

Monoaromatics & Oxygenates

Benzene	mg/kg	0.005	MCERTS	< 0.005	< 0.005	< 0.005	< 0.005
Toluene	mg/kg	0.005	MCERTS	< 0.005	< 0.005	< 0.005	< 0.005
Ethylbenzene	mg/kg	0.005	MCERTS	< 0.005	< 0.005	< 0.005	< 0.005
p & m-xylene	mg/kg	0.005	MCERTS	< 0.005	< 0.005	< 0.005	< 0.005
o-xylene	mg/kg	0.005	MCERTS	< 0.005	< 0.005	< 0.005	< 0.005
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	0.005	NONE	< 0.005	< 0.005	< 0.005	< 0.005

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	18
TPH-CWG - Aliphatic >EC16 - EC35 _{EH_CU_1D_AL}	mg/kg	10	MCERTS	< 10	< 10	< 10	18
TPH-CWG - Aliphatic >EC35 - EC40 _{EH_CU_1D_AL}	mg/kg	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (EC5 - EC35) _{EH_CU+HS_1D_AL}	mg/kg	10	NONE	< 10	< 10	< 10	19

TPH-CWG - Aromatic >EC5 - EC7 _{HS_1D_AR}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC7 - EC8 _{HS_1D_AR}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC8 - EC10 _{HS_1D_AR}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC10 - EC12 _{EH_CU_1D_AR}	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 _{EH_CU_1D_AR}	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC35 - EC40 _{EH_CU_1D_AR}	mg/kg	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35) _{EH_CU+HS_1D_AR}	mg/kg	10	NONE	< 10	< 10	< 10	< 10
TPH Total C5 - C40 _{EH_CU+HS_1D_TOTAL}	mg/kg	10	NONE	< 10	< 10	< 10	23

TPH (C5 - C10) _{HS_1D_TOTAL}	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C10 - C16) _{EH_CU_1D_TOTAL}	mg/kg	10	NONE	< 10	< 10	< 10	< 10
TPH (C16 - C40) _{EH_CU_1D_TOTAL}	mg/kg	10	NONE	< 10	< 10	< 10	23

VOCs

Chloromethane	µg/kg	5	ISO 17025	-	-	-	< 5.0
Chloroethane	µg/kg	5	NONE	-	-	-	< 5.0
Bromomethane	µg/kg	5	ISO 17025	-	-	-	< 5.0
Vinyl Chloride	µg/kg	5	NONE	-	-	-	< 5.0
Trichlorofluoromethane	µg/kg	5	NONE	-	-	-	< 5.0
1,1-dichloroethene	µg/kg	5	NONE	-	-	-	< 5.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	5	NONE	-	-	-	< 5.0
Trans 1,2-dichloroethylene	µg/kg	5	NONE	-	-	-	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	-	-	< 5.0
1,1-dichloroethane	µg/kg	5	ISO 17025	-	-	-	< 5.0
2,2-Dichloropropane	µg/kg	5	ISO 17025	-	-	-	< 5.0
Chloroform	µg/kg	5	NONE	-	-	-	< 5.0
1,1,1-Trichloroethane	µg/kg	5	ISO 17025	-	-	-	< 5.0

Analytical Report Number: 23-55896
Project / Site name: Fusion, Manchester
Your Order No: 4564

Lab Sample Number				2807897	2807898	2807899	2807900
Sample Reference				TKVAL1	TKVAL2	TKVAL3	SP01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				4.20	2.50	2.50	None Supplied
Date Sampled				07/09/2023	07/09/2023	07/09/2023	07/09/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
1,2-dichloroethane	µg/kg	5	ISO 17025	-	-	-	< 5.0
1,1-Dichloropropene	µg/kg	5	ISO 17025	-	-	-	< 5.0
Cis-1,2-dichloroethene	µg/kg	5	ISO 17025	-	-	-	< 5.0
Benzene	µg/kg	5	MCERTS	-	-	-	< 5.0
Carbontetrachloride	µg/kg	5	NONE	-	-	-	< 5.0
1,2-dichloropropane	µg/kg	5	ISO 17025	-	-	-	< 5.0
Trichloroethene	µg/kg	5	ISO 17025	-	-	-	< 5.0
Dibromomethane	µg/kg	5	ISO 17025	-	-	-	< 5.0
Bromodichloromethane	µg/kg	5	ISO 17025	-	-	-	< 5.0
Cis-1,3-dichloropropene	µg/kg	5	ISO 17025	-	-	-	< 5.0
Trans-1,3-dichloropropene	µg/kg	5	ISO 17025	-	-	-	< 5.0
Toluene	µg/kg	5	MCERTS	-	-	-	< 5.0
1,1,2-Trichloroethane	µg/kg	5	ISO 17025	-	-	-	< 5.0
1,3-Dichloropropane	µg/kg	5	ISO 17025	-	-	-	< 5.0
Dibromochloromethane	µg/kg	5	ISO 17025	-	-	-	< 5.0
Tetrachloroethene	µg/kg	5	NONE	-	-	-	< 5.0
1,2-Dibromoethane	µg/kg	5	ISO 17025	-	-	-	< 5.0
Chlorobenzene	µg/kg	5	ISO 17025	-	-	-	< 5.0
1,1,1,2-Tetrachloroethane	µg/kg	5	ISO 17025	-	-	-	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	-	-	-	< 5.0
p & m-xylene	µg/kg	5	MCERTS	-	-	-	< 5.0
Styrene	µg/kg	5	ISO 17025	-	-	-	< 5.0
Bromoform	µg/kg	5	NONE	-	-	-	< 5.0
o-xylene	µg/kg	5	MCERTS	-	-	-	< 5.0
Isopropylbenzene	µg/kg	5	ISO 17025	-	-	-	< 5.0
1,1,2,2-Tetrachloroethane	µg/kg	5	ISO 17025	-	-	-	< 5.0
Bromobenzene	µg/kg	5	NONE	-	-	-	< 5.0
N-Propylbenzene	µg/kg	5	ISO 17025	-	-	-	< 5.0
2-Chlorotoluene	µg/kg	5	ISO 17025	-	-	-	< 5.0
4-Chlorotoluene	µg/kg	5	ISO 17025	-	-	-	< 5.0
1,3,5-Trimethylbenzene	µg/kg	5	ISO 17025	-	-	-	< 5.0
Tert-Butylbenzene	µg/kg	5	ISO 17025	-	-	-	< 5.0
1,2,4-Trimethylbenzene	µg/kg	5	ISO 17025	-	-	-	< 5.0
Sec-Butylbenzene	µg/kg	5	ISO 17025	-	-	-	< 5.0
1,3-dichlorobenzene	µg/kg	5	ISO 17025	-	-	-	< 5.0
P-Isopropyltoluene	µg/kg	5	ISO 17025	-	-	-	< 5.0
1,4-dichlorobenzene	µg/kg	5	ISO 17025	-	-	-	< 5.0
1,2-dichlorobenzene	µg/kg	5	ISO 17025	-	-	-	< 5.0
Butylbenzene	µg/kg	5	NONE	-	-	-	< 5.0
1,2-Dibromo-3-chloropropane	µg/kg	5	ISO 17025	-	-	-	< 5.0
1,2,4-Trichlorobenzene	µg/kg	5	ISO 17025	-	-	-	< 5.0
Hexachlorobutadiene	µg/kg	5	NONE	-	-	-	< 5.0
1,2,3-Trichlorobenzene	µg/kg	5	ISO 17025	-	-	-	< 5.0
Sum of the above VOCs	µg/kg	5	NONE	-	-	-	< 5.0

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

Analytical Report Number : 23-55896

Project / Site name: Fusion, Manchester

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2807897	TKVAL1	None Supplied	4.2	Brown sand.
2807898	TKVAL2	None Supplied	2.5	Brown sand.
2807899	TKVAL3	None Supplied	2.5	Brown sand.
2807900	SP01	None Supplied	None Supplied	Brown sand.

Analytical Report Number : 23-55896
Project / Site name: Fusion, Manchester

Water matrix abbreviations:

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards. Refer to CoA for analyte specific accreditation.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID. Refer to CoA for band specific accreditation.	In-house method with silica gel split/clean up.	L088/76-PL	D	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260. Refer to CoA for analyte specific accreditation	L073B-PL	W	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Analytical Report Number : 23-55896
Project / Site name: Fusion, Manchester

Water matrix abbreviations:

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 23-56397

Project / Site name:	Fusion, Manchester	Samples received on:	14/09/2023
Your job number:	C5511	Samples instructed on/ Analysis started on:	14/09/2023
Your order number:	C5511-154-NS	Analysis completed by:	20/09/2023
Report Issue Number:	1	Report issued on:	20/09/2023
Samples Analysed:	3 soil samples		

Signed:



Joanna Szwagrak
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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

Analytical Report Number: 23-56397
Project / Site name: Fusion, Manchester
Your Order No: C5511-154-NS

Lab Sample Number				2810670	2810671	2810672
Sample Reference				TKVAL4	TKVAL5	TKVAL7
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				2.50	2.00	1.00
Date Sampled				12/09/2023	12/09/2023	12/09/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	10	8.3
Total mass of sample received	kg	0.001	NONE	0.8	0.7	0.9

General Inorganics

Organic Matter (automated)	%	0.1	MCERTS	0.2	0.4	0.2
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Monoaromatics & Oxygenates

Total BTEX & MTBE	mg/kg	0.007	NONE	< 0.007	< 0.007	< 0.007
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Monoaromatics & Oxygenates

Benzene	mg/kg	0.005	MCERTS	< 0.005	< 0.005	< 0.005
Toluene	mg/kg	0.005	MCERTS	< 0.005	< 0.005	< 0.005
Ethylbenzene	mg/kg	0.005	MCERTS	< 0.005	< 0.005	< 0.005
p & m-xylene	mg/kg	0.005	MCERTS	< 0.005	< 0.005	< 0.005##
o-xylene	mg/kg	0.005	MCERTS	< 0.005	< 0.005	< 0.005
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	0.005	NONE	< 0.005	< 0.005	< 0.005

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC16 - EC35 _{EH_CU_1D_AL}	mg/kg	10	MCERTS	< 10	< 10	< 10
TPH-CWG - Aliphatic >EC35 - EC40 _{EH_CU_1D_AL}	mg/kg	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic (EC5 - EC35) _{EH_CU+HS_1D_AL}	mg/kg	10	NONE	< 10	< 10	< 10

TPH-CWG - Aromatic >EC5 - EC7 _{HS_1D_AR}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC7 - EC8 _{HS_1D_AR}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC8 - EC10 _{HS_1D_AR}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC10 - EC12 _{EH_CU_1D_AR}	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 _{EH_CU_1D_AR}	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	< 10	< 10	< 10
TPH-CWG - Aromatic >EC35 - EC40 _{EH_CU_1D_AR}	mg/kg	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35) _{EH_CU+HS_1D_AR}	mg/kg	10	NONE	< 10	< 10	< 10
TPH Total C5 - C40 _{EH_CU+HS_1D_TOTAL}	mg/kg	10	NONE	< 10	13	< 10

TPH (C5 - C10) _{HS_1D_TOTAL}	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0
TPH (C10 - C16) _{EH_CU_1D_TOTAL}	mg/kg	10	NONE	< 10	< 10	< 10
TPH (C16 - C40) _{EH_CU_1D_TOTAL}	mg/kg	10	NONE	< 10	13	< 10

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

Analytical Report Number : 23-56397

Project / Site name: Fusion, Manchester

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2810670	TKVAL4	None Supplied	2.5	Brown sand with gravel.
2810671	TKVAL5	None Supplied	2	Brown sand with gravel.
2810672	TKVAL7	None Supplied	1	Brown sand with gravel.

Analytical Report Number : 23-56397
Project / Site name: Fusion, Manchester

Water matrix abbreviations:

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID. Refer to CoA for band specific accreditation.	In-house method with silica gel split/clean up.	L088/76-PL	D	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260. Refer to CoA for analyte specific accreditation	L073B-PL	W	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
-	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

- Quality control parameter has a high recovery (outside of limit); however the associated result is below the reporting limit, other checks applied prior to reporting the data have been accepted. The result should be considered as being deviating and may be compromised.

APPENDIX C

PID Calibration Certificates

CERTIFICATE OF CALIBRATION



ESS

Safety, Survey, Test & Measurement

CUSTOMER	BROWNFIELD SOLUTIONS LTD
JOB/CERTIFICATE NO:	21004530
MAKE/MODEL	IONSCIENCE PHOCHECK TIGER PID
SERIAL NO:	T-119478

VISUAL INSPECTION	OK
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OPERATIONAL	OK
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	CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4	CHANNEL 5	CHANNEL 6
SENSOR TYPE:	ISOBUTYLENE					
GAS CYL NO:	WO272326					
CAL GAS USED:	ISOBUTYLENE					
HIGH ALARM:	100PPM					
LOW ALARM:	50PPM					
DATE OF SERVICE:	24/07/2023					
CAL DUE DATE:	24/01/2024					

THE INSTRUMENT DETAILED ABOVE HAS BEEN TESTED & CALIBRATED AGAINST THE MANUFACTURERS SPECIFICATION USING EQUIPMENT TRACEABLE TO THE MANUFACTURERS STANDARDS AND IN ACCORDANCE WITH ISO 9001:2021. EVERY PRECAUTION HAS BEEN TAKEN TO ENSURE THAT THE EQUIPMENT SPECIFIED HAS BEEN INSPECTED IN FULL AND IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS. IT IS THE OWNERS RESPONSIBILITY TO ENSURE IT FUNCTIONS CORRECTLY BEFORE EACH USE. ESS VP WILL NOT ACCEPT LIABILITY FOR ANY DAMAGE OR LOSS THAT OCCURS AS A RESULT OF IMPROPER CHECKS AND/OR USE OF EQUIPMENT.

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