Project Taverna



Metrolink Construction Management Plan

This Metrolink Construction Management Plan (CMP) has been developed to demonstrate how we will deliver Project Taverna to satisfy the requirements of City Football Group, Transport for Greater Manchester (TfGM), and Manchester City Council. It will examine our project delivery in detail to explain how we will satisfy the relevant conditions of planning permission reference 145358/FO/2026.

The key requirements of the Metrolink condition 9 are:

- Prior to the commencement of the development, a Metrolink Specific Construction Management Plan (CMP) with detailed method statements of construction and risk assessments, shall be submitted for approval in writing by the City Council, as Local Planning Authority.
- The approved Metrolink CMP shall include agreed safe methods of working adjacent to the operational tramway and shall be adhered to throughout the construction period.
- The approved Metrolink Specific CMP shall be implemented as part of the development and remain in place until construction is complete.

Construction Management Plan for the works

Project Particulars

The project

The project consists of the design and construction of a new events facility on the old Collar Site off Alan Turing Way. The building is to be rectangular in plan, approximately 70m x 25m and three storeys in height. It will be a steel framed structure with rainscreen cladding façade treatment and flat / low pitch roof concealed behind a parapet. Following specialist fit-out the building will come into service as a specialist banqueting and events venue

Externally, hard surfacing will provide pedestrian and maintenance access to the building perimeter, along with soft landscape planting. The portion of the site to the immediate north of the building, up to the southern boundary of the Metrolink line, remains undeveloped as part of this scheme, but will be utilised for the site welfare set-up and materials / waste management.

The Client

City Football Group

Etihad Campus,
North Gate,
400 Ashton New Rd
Manchester
M11 4TQ
[redacted]

The Principal Contractor

John Turner Construction Group Ltd

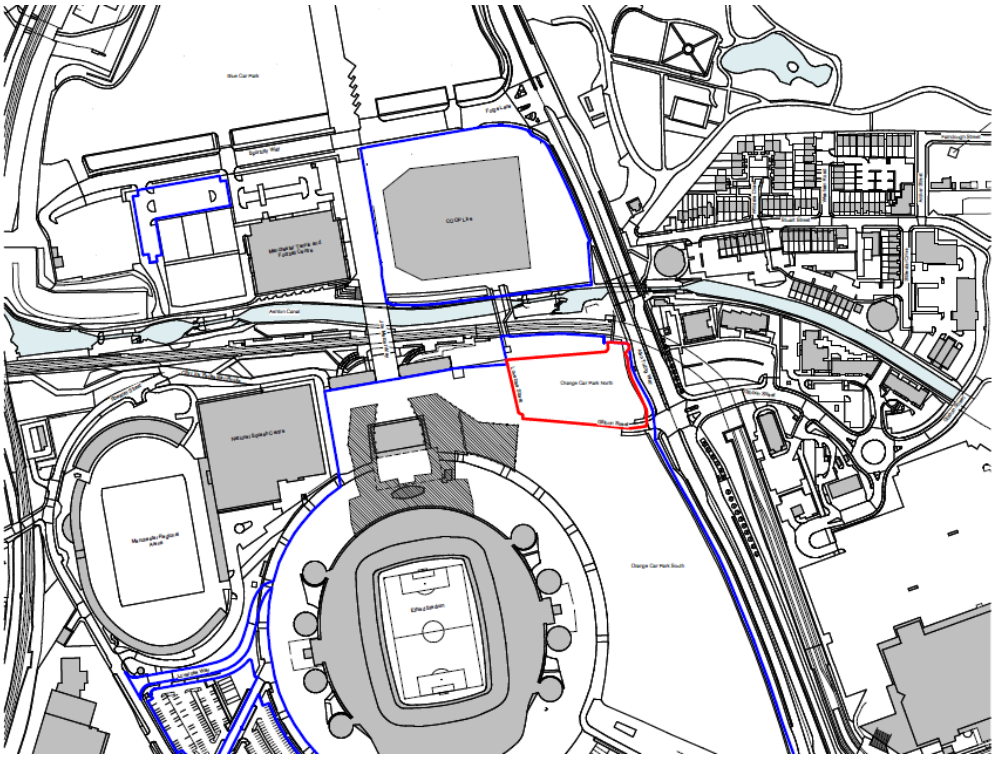
2 Preston Road
Grimsargh
Preston
PR2 5SD
Head Office Contact [redacted]

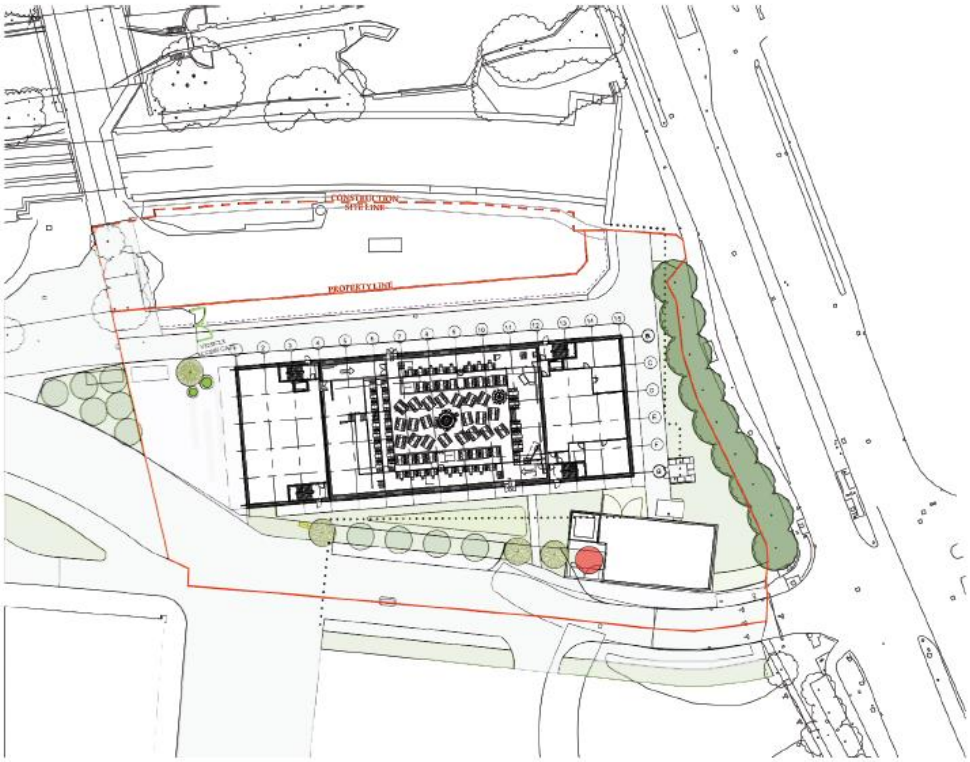
Emergency Contact
Pat Murphy
[redacted]

Project Manager / Responsible Person Contact
[redacted]

Site location

The new entertainment venue development is located within the plot of land off Alan Turing Way, M11 3FF, highlighted red below. It forms part of the wider Etihad Campus and is referred to as the old Collar Site.





Construction Programme

The proposed programme period is to be developed but is anticipated to be in the region of **14 months,** starting in the autumn of 2026 and completing toward the end 2027.

Proposed hours of working and delivery times

Working hours:

Monday to Friday, 07:30 to 18.00.

Saturday, 08:30 to 14:00

Out of hours work, should it be required, will only by implemented following the consultation and agreement of MCC.

Emergency Contact

Our emergency contact details are as follows:

[redacted]

Project Manager / Responsible Person Contact

[redacted]

Contact details for Pat, Paul and other key members of the site team will be clearly displayed at the site boundary via notice boards and Considerate Constructors Scheme signage.

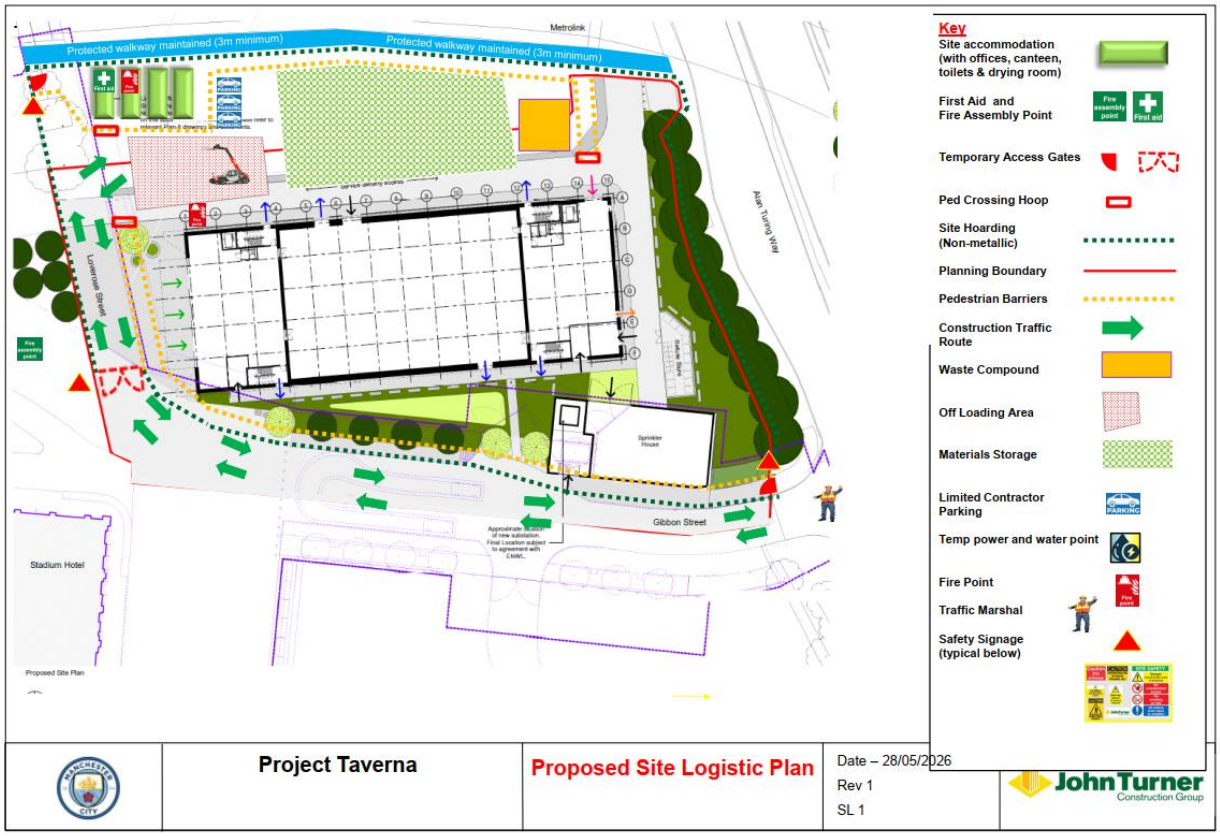
Reference Material

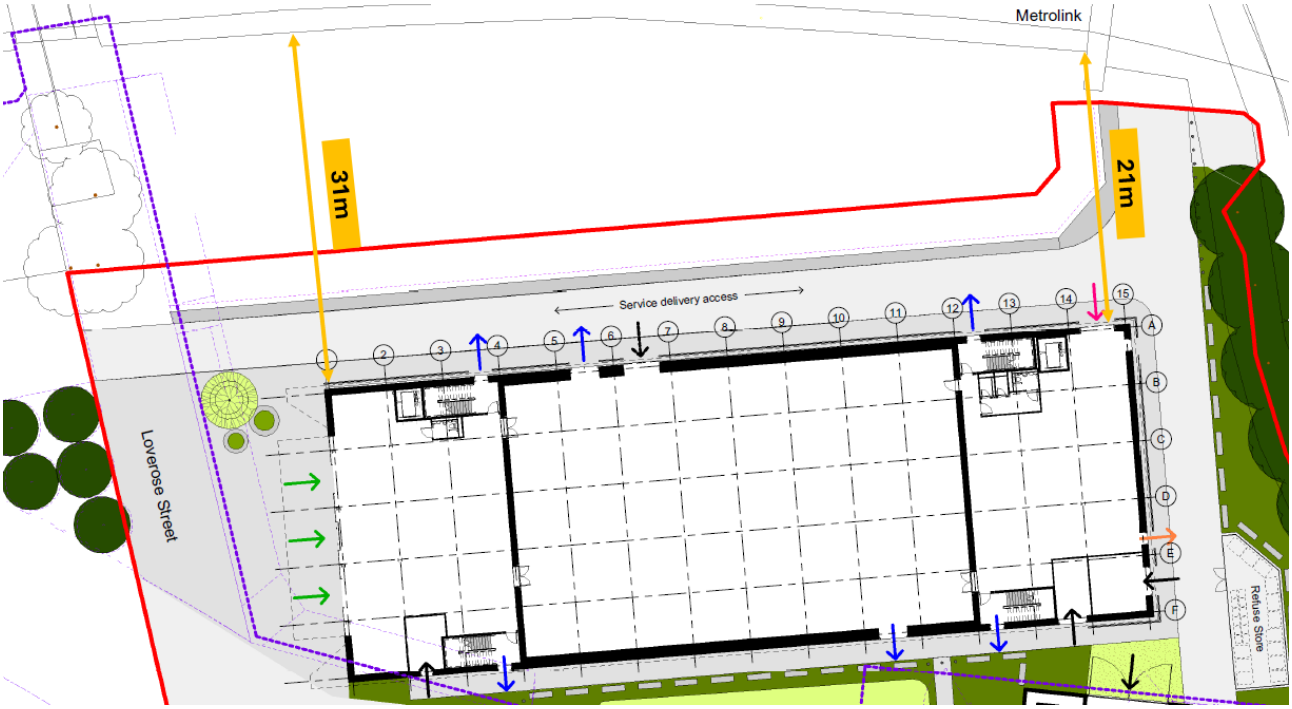
The following documents have been referred to in preparation of this CMP (see Appendix 1):

- Working Safely Near Metrolink January 2024 Version 1
- As-built drawings relating to existing infrastructure:
    - ASH19 Final Health And Safety File 040201
    - ASH19 Draft H&S file
    - ASH19 Alan Turning Way underpass AIP west end 2001
    - ASH19 Alan Turning Way underpass AIP east end 2001
    - ASH19 Alan Turning Way as-built drawings 2001
    - ASH18 Forge Lane bridge as-built drawings
    - ASH18 Forge Lane bridge AIP 2002
    - 67313-C-00-06-F
    - 060500 01 drg Structure locations ASH18,10a&b,19,19a&b
    - 040604 4[1].3 Ret Wall And Tunnel Design Calcs
    - 040201 as built drg list
    - 020000 rpt ASH 18 Forge Lane Bridge GAs

Site Layout

The extract below illustrates the proposed site layout. A plan has been included beneath, which shows the separation distances of building and compound set-up from the Metrolink retaining wall.





Construction methodology

The construction methods to be deployed are conventional, and comprise the following key elements:

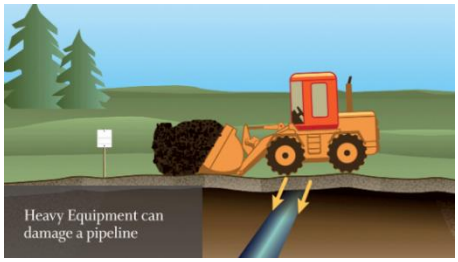
- Reduction of the site and stoning up of a working platform
- CFA Piling and subsequent concreting of foundations
- Below ground drainage and utilities work
- Erection of steel frame
- Casting of the ground floor slab
- Envelope works – cladding and roofing
- Intermediate composite deck flooring
- Internal fit-out
- External hard and soft landscaping

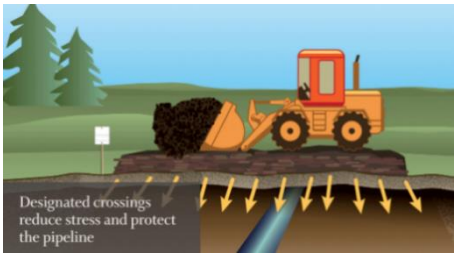
Whilst the site red line boundary sits close to the Metrolink line, it is important to note that the construction works themselves are located some distance to the south and separated from the tram infrastructure by a strip of undeveloped ground which we are proposing to utilise only as a site compound to service the works. The extract below shows the distances from each end of the new building to the outer face of the Metrolink embankment retaining wall, which is 21m at the tightest point:

Site preparation and piling works

The site area for the extension to form the new events venue will be thoroughly surveyed for existing buried services by our qualified, competent site engineer using a cable avoidance tool and generator. We will use existing utility services drawings to locate existing services. A Permit to Dig will be issued with RAMS and trial holes will be excavated by hand to positively locate known services. An existing OOC LV cable will be spiked by ENWL prior to and excavation commencing.

Hard surfaces will be removed by means of hand-held mechanical plant using water dust suppression diamond cutters and hydraulic breakers. The invert levels of all the existing drains will be confirmed. All wayleaves and easements will be clearly marked out and signed across the site. The easement to the Cadent gas main will be marked out with red coloured timber pegs, demarcation barriers and safety signs. Crossing points will be clearly signed and depending on the depth of the gas pipe, we will surcharge any crossing points to reduce the stress on the pipe.





A 3m exclusion zone from the outer face of the Metrolink retaining wall parapet will be established. This is to maintain a clear pedestrian walkway between Co-op Live and Alan Turning Way. Our perimeter hoarding line will be set outside this easement to ensure no works are undertaken within it – the zone therefore falls outside our site boundary.

Site cabins will be established inside this line. The hoarding is to be free-standing counter-weighted type with the elevation along the Metrolink infrastructure being of non-metallic construction. The hoarding zone is approximately 1.35m wide to account for the ballast to the inner face. Cabins will then be located approximately 2m inside the site, so that the minimum distance from cabin elevation to retaining wall outer face is over **6m**.

The building is to be piled, using the low-vibration CFA method. Collapse radius drawings will be produced for the piling rig to prove the rig cannot topple within the Metrolink infrastructure zone. The building footprint is 21m away from the Metrolink wall at the tightest point and the rig will be contained within the building footprint.

Control of dust and surface water run-off will be considered. The works will be carried out in accordance with BRE best practice guidance. The following measures will be introduced to control dust generation:

Roads and stockpiles will be regularly dampened down with water using a dust suppression water bowser.

Vehicles used to transport soil or fill materials will be enclosed or covered with a tarpaulin. Access roads will be regularly cleaned and a vehicular wash down area will be provided to minimise any dust being tracked off-site.

Vehicle movements will be kept to a minimum and speed limits restricted to 5mph. Plant and equipment will be located as far away as possible from site boundary.

Any complaints about dust will be investigated at the earliest opportunity so that action can be taken to remedy the situation as soon as possible.

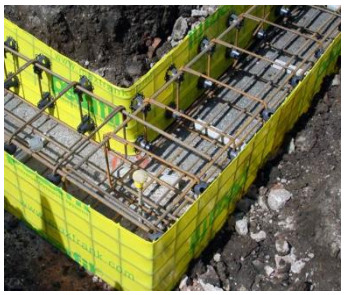
A programme of dust monitoring will be undertaken during the works, to include wind speed and direction.

Water run-off will be controlled stripping the site vegetation and topsoil in sequence so we only expose areas that can be stoned over on the same day and this will reduce the amount of silty water during rainy periods.

By using sand bags and/or temporary spoil bunds along the site boundary they help restrict any water run- off from the site and allow the rain water to disperse natural back into the ground. Ground water from excavations will be pumped into silt traps and discharged into the drainage system with the approval of UU rather than discharged across the site.

Substructure works

After the CFA piling, further CBR testing will be undertaken on the stoned formation to allow the correct size of mobile concrete pump and mobile crane pads to be designed and also to confirm the ground bearing capacity is sufficient for MEWPs and hiab off-loading vehicles.



Foundations, pile caps and ground beams will be constructed using reinforcement and permanent shuttering. They will be excavated using a 13T, 360-degree excavator and the concrete will be placed by a concrete pump into suitably prepared, clean and blinded foundation areas. Should there be a requirement to pump ground water from the excavations then silt traps will be used and permission to discharge to the main drains obtained from the relevant statutory authority. Under slab drainage and ducts will be installed after the foundations are complete.

During the site strip, substructure works and periodically throughout the works a road brush will be in attendance to ensure roads are regularly cleaned to avoid the build-up of mud or debris on it.

On the site, we will have a designated area where vehicles will have their wheels cleaned before leaving site. A site operative with a jet wash will clean the wheels of the vehicles and any spoil will be removed to a skip and taken away from the site.

The foul and surface water drainage connections will then be constructed, commencing from the existing connection manholes and working inwards towards the new surface water attenuation tank and the new building. The attenuation tank is located close to the new building and is approximately 2m deep - we proposed to batter back the side of the excavation rather than create vibration by driving sheet piles in.

Superstructure works

Materials and plant will be distributed with an all-terrain telescopic forklift truck from the compound to the site areas under the supervision of a traffic marshal.

Frame erection and the lifting of packs of roof sheets, plant etc., will be via mobile telescopic crane. Any such crane lifts will be arranged on a “contract lift” basis with provision of full lifting plans, suitably qualified lift management personnel and operating under a permit to work system. All lifts will be planned and approved by a qualified crane coordinator and appointed person. A crane collapse radius drawing will be produced and positions marked out on site to ensure the safety of the public, and to the Metrolink infrastructure.

Acknowledging the proximity of the site to the tram line to the north, crane rigging positions will be developed with the engagement of Metrolink. Lift radii will be calculated so as not to present risk to the tram lines. For example, main frame erection will utilise rigging positions from within the building footprint to maintain a greater degree of separation distance from the tram infrastructure to the north and there will be no oversailing of the tram lines at any time.

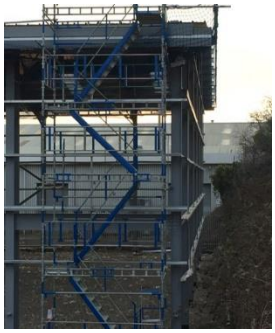
Lift plans will detail the collapse radius and should any lifting be required that places this radius within proximity of the Metrolink infrastructure, the crane will be derated to **80% capacity** for the duration of the lift.

The above measures have been proposed in accordance with the Transport for Greater Manchester document “Working Safely near Metrolink” Version 1 (January 2024), and liaison with the TfGM and Keolis teams during the pre-construction phase.

Packs of metal decking and the internal staircase will be installed as the steel frame is constructed. The subcontractor will erect the frame progressively and line/level it in the correct programmed sequence. Delivery of the frame will be to suit our construction programme and to the delivery times detailed in the Employer's Requirements/Planning Conditions.

All the materials and cranes will be located within the fenced off area of the site. This means that there are no interface issues with MCFC staff or the public.

Roof and walls construction



The roofing materials will be supplied and installed by a specialist subcontractor. As roofing is a high-risk activity it will be given particular attention from procurement to installation. Scaffolding edge protection will be provided by a specialist scaffolding company and installed off MEWPs. A full netting system will be installed to the roof level to allow the roofing materials to be installed safely.



Installation proposals will be covered in a detailed risk assessment and method statement which will be reviewed and agreed by John Turner Construction in advance of the commencement of the works.

The installation of the roofing materials will comprise the use of a 50T mobile crane for loading out and material handling. Access to the roof will be via Haki staircases, as shown to the right.

The vertical wall cladding, glazed curtain walling and PPC aluminium windows will be installed off scissor lifts, working around the building in sequence until the building is weathertight.

Ground floor and upper floors

The metal decking and edge trims will be placed by hand and the shear stud welding will be completed followed by the reinforced mesh panels. These will be lifted into position using a forklift.

The floors and roof slab will be concreted using laser controlled equipment by a specialist concrete subcontractor. The slabs will be floated off to achieve the required floor finish.

Concrete wagons will washout into preparatory concrete skips or skips lined with polythene to ensure no concrete is washed out onto the ground or trailed across the site and onto the local road network. The skips will then be taken away by our recycling company.

Windows and curtain walling

Following completion of the floor slabs, installation of curtain walling and glazing will be started. This will further aid in weatherproofing the interior areas. The curtain walling material handling will be by forklift.

MEWPs will be used externally and alloy towers will be used for access internally. The alloy towers will only be erected by certificated and competent personnel.

Internal finishes

Once the external envelopes are watertight the internal fit-out works can commence. First fix items and preloading of second fix items will be undertaken in the sequence detailed on the programme. Second and final fix items will be completed on a similar basis.

MEP installations will follow the same sequence, although early priority will be given to the completion of the plant room and to the walls/ceilings to the main service routes in order that the

services to key areas can be fully installed. The MEP and internal finishes will be installed from mobile access towers and in the case of the main performance hall space, MEWPs will be used due to the heights involved.

External works

The external works to the perimeter of the new events building, will commence to suit the general constraints of the construction of the building, whilst taking due consideration of the access requirements of the internal fit-out subcontractors. The external works will be set out by our site engineer.

The external works will be constructed using a 13T excavator, 6T dumper, and Bomag twin roller and specialist subcontractors. The tarmac will be installed using a proprietary paving machine fed by 8 wheeler asphalt vehicles.

Risks to Infrastructure

Proximity of major construction works within 50m of the tram line means that there could be risk to Metrolink's infrastructure. The key risks can be summarized as follows:

- Damage to the retaining structure and tracks through excessive ground movement and/or vibration
- Damage to the retaining structure through excessive surcharge loading of materials
- Damage to infrastructure and risk to the public through the uncontrolled collapse of construction plant, primarily mobile craneage.

Mitigating Measures

The following key mitigation measures will be employed to ensure the ongoing protection of the Metrolink infrastructure during the lifetime of the construction project:

Boundary Monitoring

A dedicated scheme of boundary vibration and movement monitoring has been proposed. This will be agreed with Metrolink and submitted to discharge planning condition 10. The scheme is appended to this document (note: to follow). The monitoring regime will be delivered by Switch Infrastructure and is founded on the following principles:

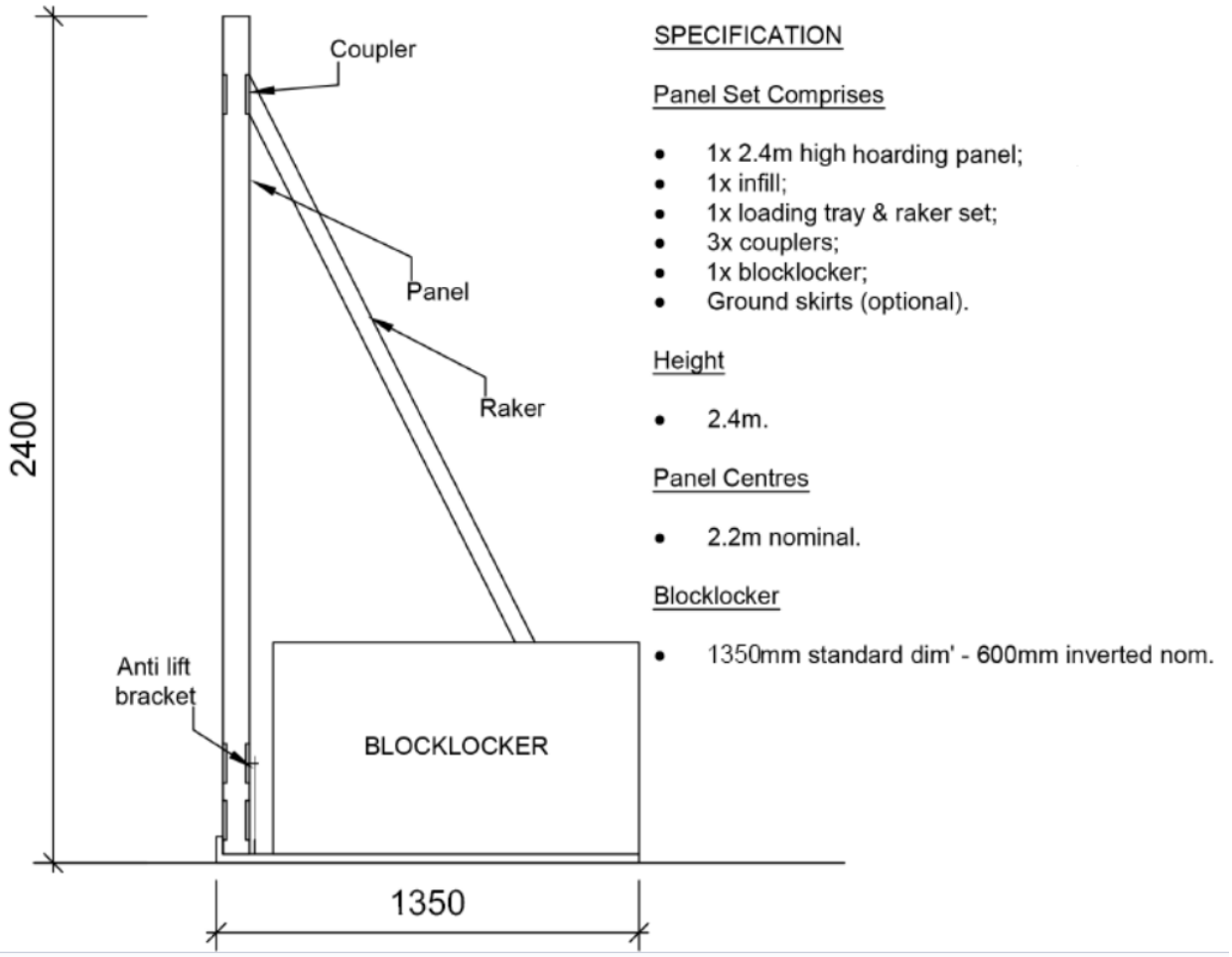
- Position monitoring of the track, and position and vibration monitoring of the retaining wall
- Baseline readings established prior to the commencement of CFA piling works
- During the works, readings to be taken at 2 hourly intervals. Piling is anticipated to take around 3 weeks to complete
- Follow up readings to be taken daily for the two weeks following completion of the piling (may be extended depending upon the monitoring results).

Should the scheme of monitoring identify any exceedances beyond Metrolink's permitted limits, then work on site will cease and alternative working methods will be established and implemented.

Site-side Loading of the Retaining Wall

A 3m exclusion zone from the outer face of the Metrolink retaining wall parapet will be established. This is to maintain a clear pedestrian walkway between Co-op Live and Alan Turning Way. Our perimeter hoarding line will be set outside this easement to ensure no works are undertaken within it – the zone remains outside our site boundary at all times.

The hoarding zone itself occupies a width of 1.35m due to the counterweighting required for the ‘no dig’ hoarding solution proposed:



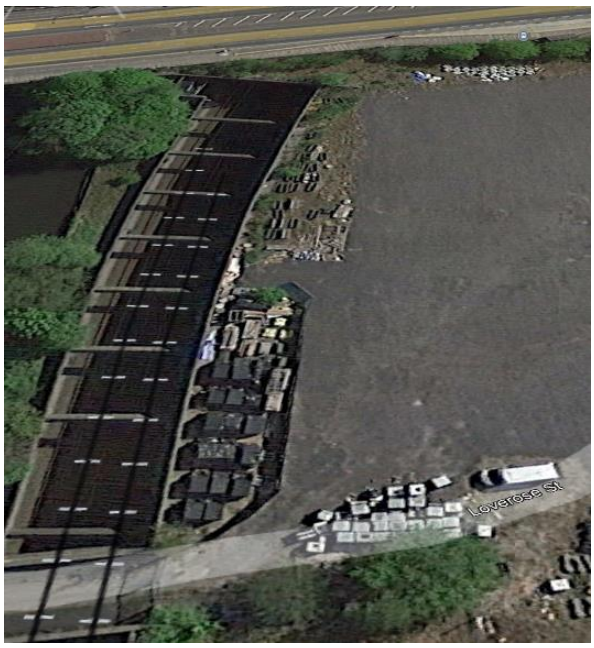
Inside the above line, site cabins will be offset by 2m, so that the minimum distance between cabins and the wall face is just over 6m. Elsewhere on the site, the materials storage area is separated by a similar distance. The sections below illustrate the proposed arrangement:

In terms of the loadings imposed by our site cabins and material storage proposals, our structural engineer has interrogated the as-built information for the contiguous pile retaining wall which forms the southern boundary of the Metrolink infrastructure. The loading allowances identified in the design pack, only refer to dead load and water pressure loads in the design of the retaining walls and props. There is no mention of superimposed live loadings or otherwise, so we have relied upon the precedent images below to demonstrate that the area has previously been used for similar purposes:

2018



2020



2022

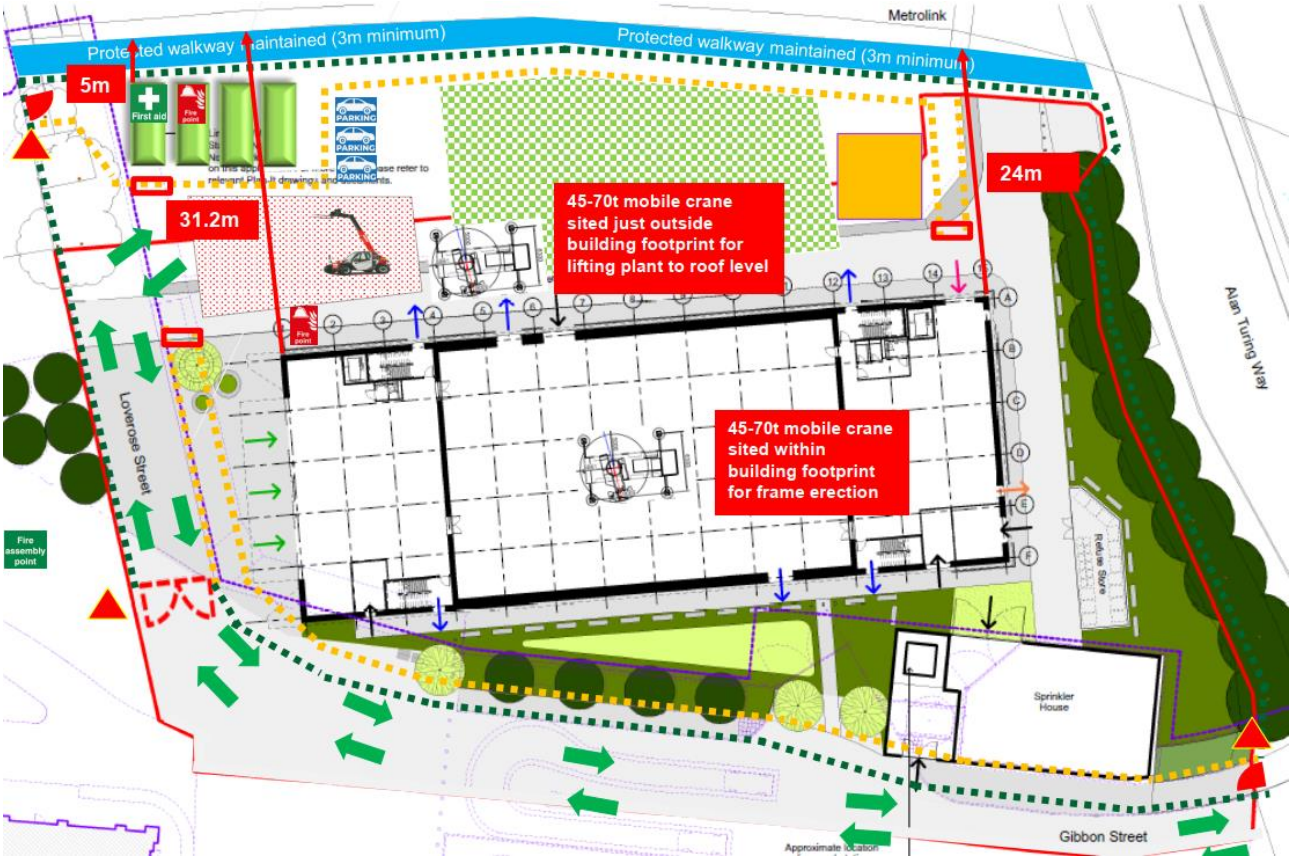


We have appended the Phase 2 SI we have carried out for the Taverna site. This may prove useful in regard to confirmation of groundwater levels on the site. It is possible that the earth and water

pressure values taken in the retaining wall as-built calculations were more relevant to the north side where the Ashton Canal is being retained. The Taverna site does not feature a permanent body of water and hence it may be the case that that water pressure allowances are overestimated in the context of the southern boundary wall.

Craneage

There will be no tower cranes required for this project. All lifting work will be by mobile crane of rating between 40T and 70T. Proposed rigging locations are shown below:



Detailed lift plans will be prepared for every lifting operation. These will be issued on a contract lift basis by a competent crane hire company such as Baldwins or Ainscough. The plans will illustrate how either:

a) the maximum collapse radius from rigging position will fall no closer than 4m from the outer face of the Metrolink retaining wall parapet, or
b) the crane will be derated to 80% of its maximum lift capacity

Asset Protection Agreement

As Asset Protection Agreement (APA) will be arranged between MCFC/John Turner Construction, and TfGM/Metrolink. The conditions therein will be adhered to throughout the duration of the project.

Appendix 1

Reference Documents



23-0624_Working_S
afely_Near_Metrolin



4490-03 MCFC
Project Taverna - Ph



As Builts Files.zip

A1

10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR

UNAUTHORISED REPRODUCTION INFRINGES CROWN COPYRIGHT AND MAY LEAD TO PROSECUTION OR CIVIL PROCEEDINGS.

BASED UPON THE 1991 ORDNANCE SURVEY 1:2500 MAP WITH THE PERMISSION OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE, © CROWN COPYRIGHT. Ove Arup & Partners, Licence No:AL54921S

NOTES

1. THE TOPOGRAPHICAL SURVEY IS REPRODUCED FROM MALCOM HUGHES SURVEY.
2. PILE LOCATIONS ARE INDICATIVE ONLY.
3. LIMIT OF DEVIATION CO-ORDINATES FROM MALCOLM HUGHES TOPOGRAPHICAL SURVEY AND BRINCKERHOFF INFORMATION.

KEY

- DIAPHRAGM WALL
- CONTIGUOUS BORED PILE WALL
- PROPPED DIAPHRAGM WALL
- PROPPED CONTIGUOUS BORED PILE WALL
- EARTHWORKS SLOPES

Rev.	Date	By	Description
–	17/05/01	DLP	FIRST ISSUE
A	25/05/01	DW	PILE ARRANGEMENT REVIEWED
B	29/05/01	DW	PILE ARRANGEMENT REVISED & METROLINK BOUNDARY, CO ORDINATES ADDED
C	19/07/01	DW	PROP BEAM LOCATIONS AMENDED
D	23/07/01	DW	TUNNEL LINE BRIDGE REDUCED TO 2m WIDTH, NOTE ADDED, PROPOSED GIBSON ST. LAYOUT & EARTHWORKS SLOPES ADDED
E	03/08/01	DW	FINAL ARRANGEMENT AMENDED, SEWERS & ADJ PROPERTY DIVERSION ADDED

Drawing Status: FOR APPROVAL

KEYPLAN

Job Title: METROLINK PHASE 3 ADVANCED WORKS

Drawing Title: GENERAL ARRANGEMENT CH 975 TO 1400 SHEET 1 OF 2

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www.arup.com

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Scales 1:500 | Originator DW | Checked | Approved | Date JUNE 01

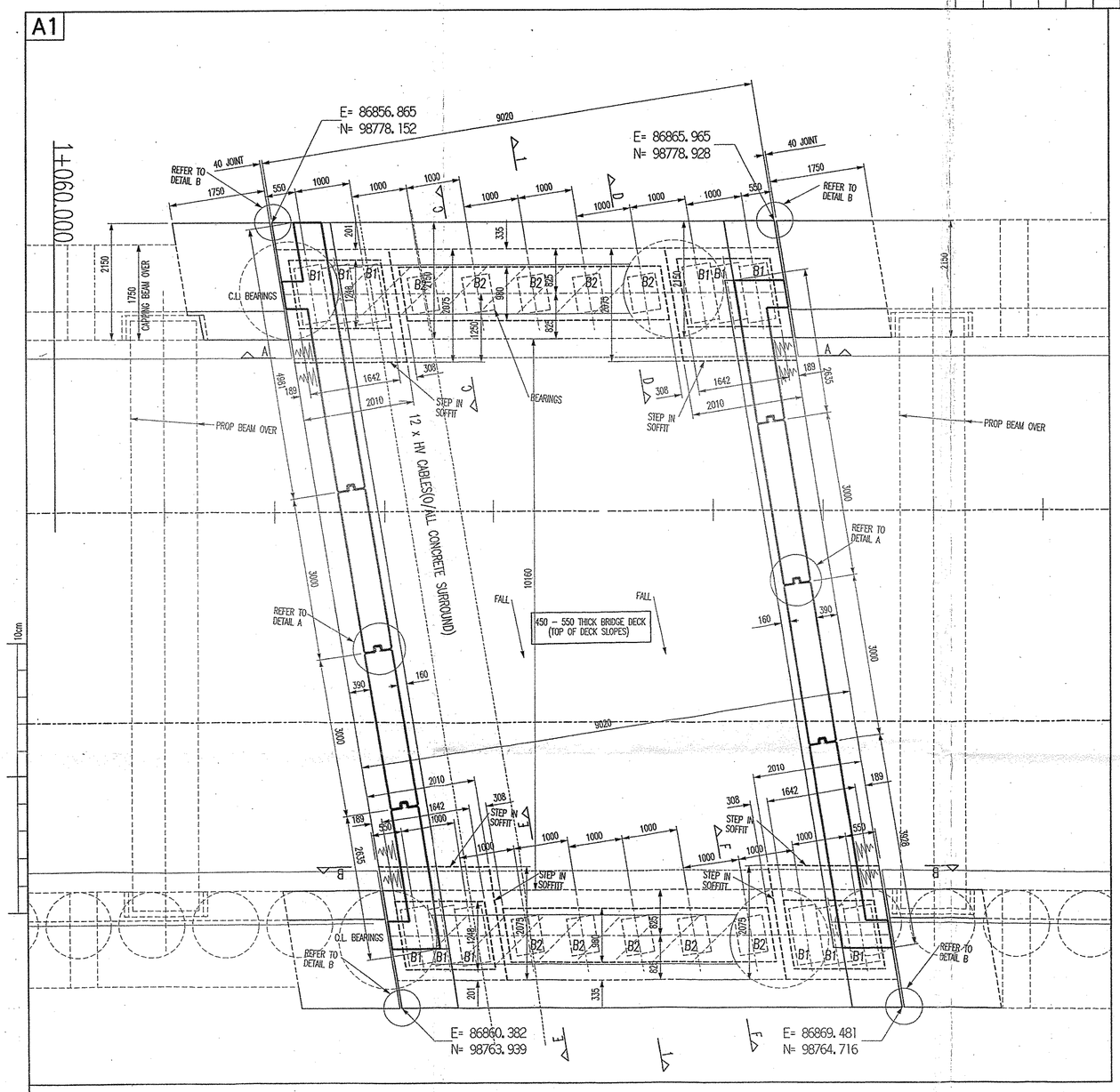
Job No. 67313 | Drawing No. C-00-06 | Rev. E

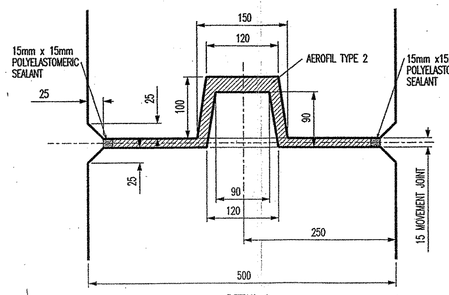
CDM NOTE; FUTURE PHASE 3 CONCESSIONAIRE WILL BE REQUIRED TO CONSTRUCT BELOW TRACK SUPPORT 'UNDER SLAB' UTILISING TEMPORARY WORKS PROPPING MEASURES BETWEEN CHAINAGE 975 AND 985

SEE DRAWING No. C-00-07

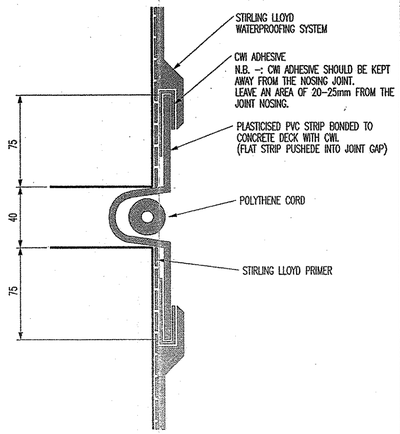
A1

10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR

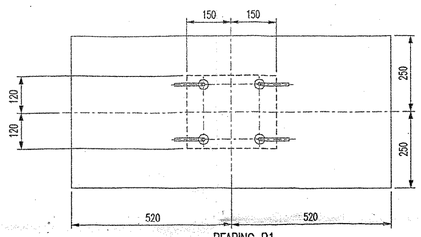




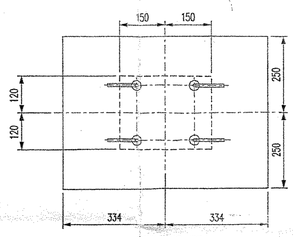
DETAIL A
(SCALE 1:5)



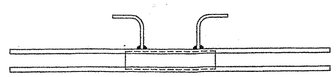
DETAIL B
(SCALE N.T.S.)



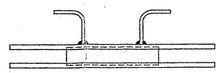
BEARING B1
(SCALE 1:5)



BEARING B2
(SCALE 1:5)



SECTION 1–1
(SCALE 1:5)



SECTION 2–2
(SCALE 1:5)

BEARING PLATE TABLE

BEARING REFERENCE	BEARING (mm) LENGTH x BREADTH x THICKNESS	TOP AND BOTTOM PLATES (mm) LENGTH x BREADTH x THICKNESS	PLAN/SECTION
B1	300 x 240 x 53	1040 x 500 x 15 (WITH RECESS)	BEARING B1/SECTION 1–1
B2	300 x 240 x 53	668 x 500 x 15 (WITH RECESS)	BEARING B2/SECTION 2–2

NOTES:–

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S–16–006/14.
2. FOR SECTIONS REFER TO DRAWING NUMBER S–17–016.
3. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
4. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313–00/009.
5. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
6. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C50
   PRECAST..... C50

Rev.	Date	By	Description
C1	25/02/02	EC	ISSUED FOR CONSTRUCTION

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
GENERAL ARRANGEMENT
FORGE LANE CROSSING

ARUP
www.arup.com
8th Floor, St. James's Buildings, Oxford Street, Manchester. M1 6EL.
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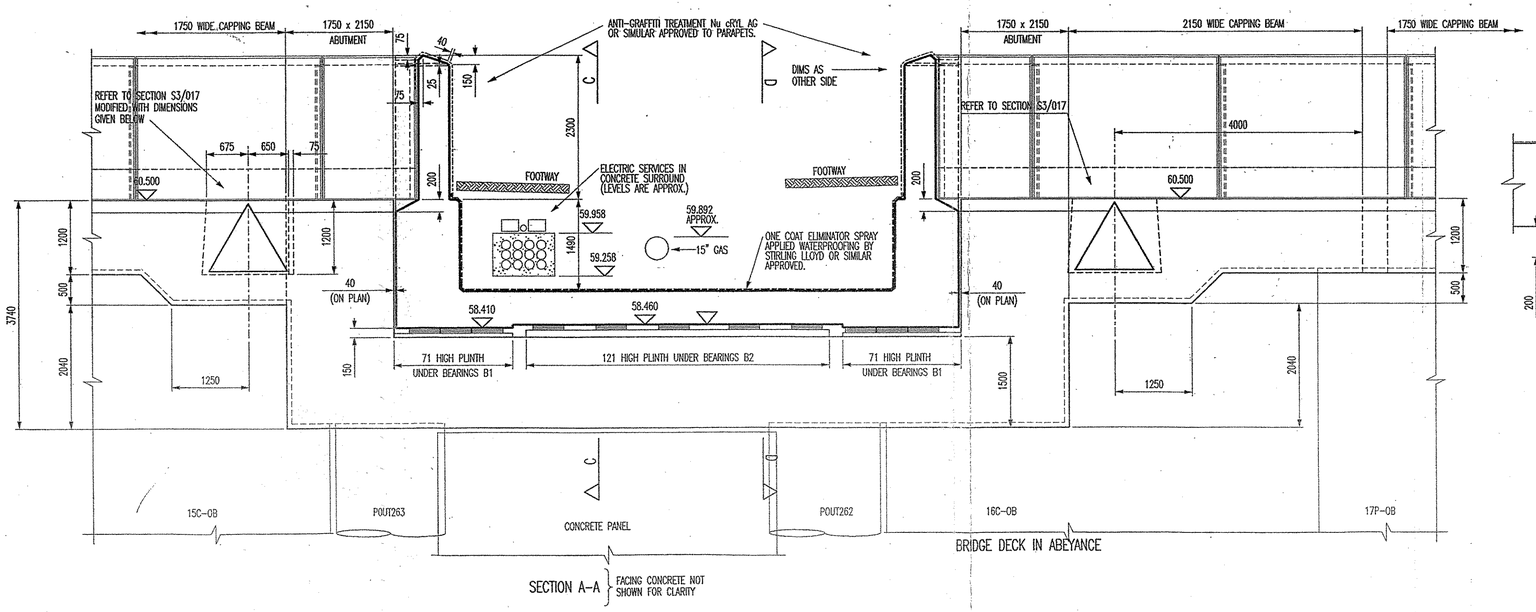
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Scales 1:50 Originator EC
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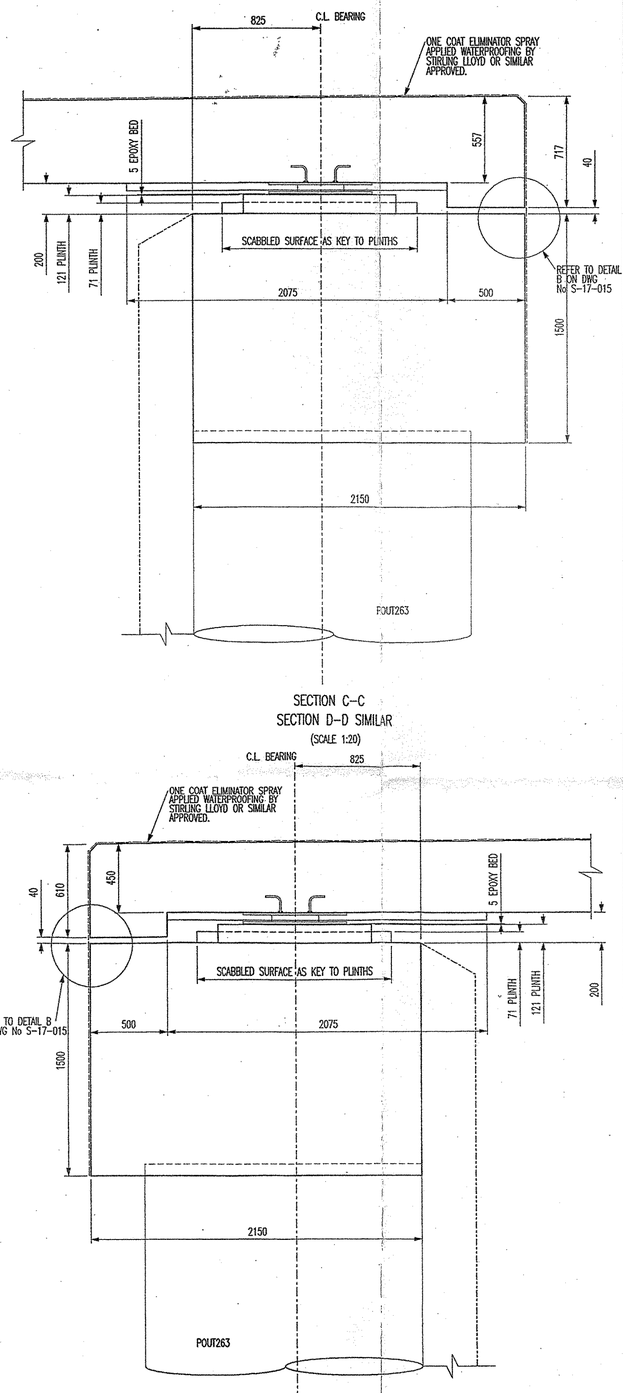
Job No. 67313 Drawing No. S–17–015 Rev. C1

A1

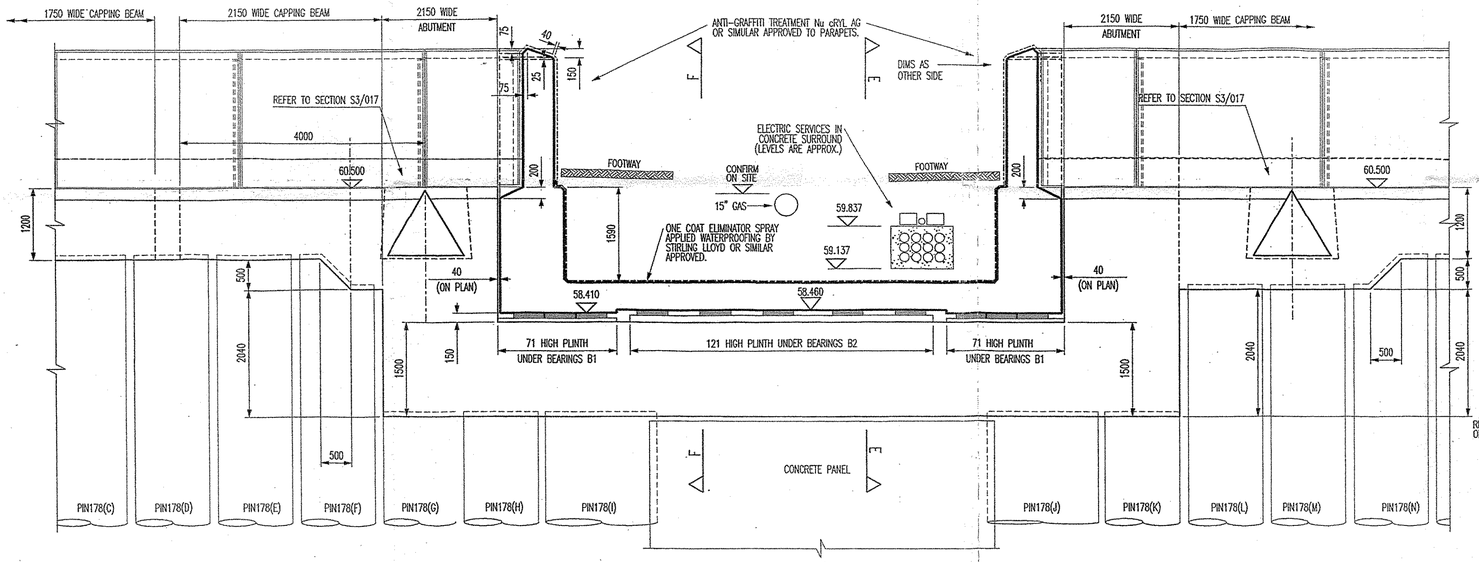
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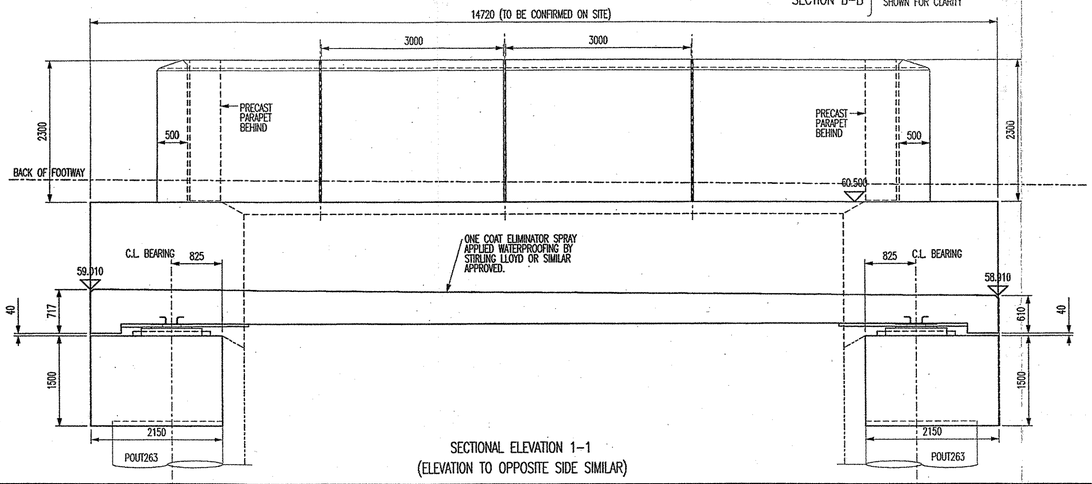
SECTION A–A { FACING CONCRETE NOT SHOWN FOR CLARITY



SECTION C–C
SECTION D–D SIMILAR
(SCALE 1:20)



SECTION B–B { FACING CONCRETE NOT SHOWN FOR CLARITY



SECTIONAL ELEVATION 1–1
(ELEVATION TO OPPOSITE SIDE SIMILAR)

SECTION E–E
SECTION F–F SIMILAR
(SCALE 1:20)

NOTES:–
1. FOR NOTES REFER TO DRAWING NUMBER S-17-015.

Rev.	Date	By	Description
C3	21/02/02	EC	BRIDGE DECK FINISHED
C2	28/01/02	EC	SECTIONS ADDED AND BEAM UNDER DECK LOWERED
C1	07-12-01	EC	REDRAWN AS FORGE LANE CROSSING

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
SECTIONS
FORGE LANE CROSSING

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Job No. 67313 | Drawing No. S-17-016 | Rev. C3

Document Reference	Title	Revision/Issue	Originator
QA Records			
16511	Amec Quality Assurance Records		Amec
Drawings			
67313-C-00-01	Scope of Advanced Work & Alignment Sheet 1 of 4	-	Arup
C-00-02	Scope of Advanced Work & Alignment Sheet 2 of 4		Arup
C-00-03	Scope of Advanced Work & Alignment Sheet 3 of 4	-	Arup
C-00-04	Scope of Advanced Work & Alignment Sheet 4 of 4		Arup
C-00-05	Location Plan	-	Arup
C-00-06	General Arrangement CH975 to 1400, Sheet 1 of 2	ASB/G	Amec
C-00-07	General Arrangement CH975 to 1400, Sheet 2 of 2	ASB/F	Amec
C-00-08	Turnback Option 1	-	Arup
C-00-09	Turnback Option 2	-	Arup
C-00-10	Turnback Option 3	-	Arup
C-00-11	Turnback Option 4		Arup
C-00-12	Location Plan – Showing Mineworkings	A	Arup
C-00-13	Metrolink Corridor & Proposed Sportcity Development Interaction, Sheet 1 of 3	-	Arup
C-00-14	Metrolink Corridor & Proposed Sportcity Development Interaction, Sheet 2 of 3	-	Arup
C-00-15	Metrolink Corridor & Proposed Sportcity Development Interaction, Sheet 3 of 3	-	Arup
C-00-16	Parapet Location CH 975 to 1400, Sheet 1 of 2	ASB/C	Amec
C-00-17	Parapet Location CH 1400 to 1525, Sheet 2 of 2	ASB/B	Amec
C-01-01	Traffic Management Phase 1	-	Arup
C-01-02	Traffic Management Phase 2	-	Arup
C-05-01	Sectionmarks for Services	-	Arup
C-05-02	Section Through Forge Lane Showing Existing Services	-	Arup
C-05-03	Section Through Alan Turing Way Showing Existing Services	-	Arup
C-05-04	Section Through Gibbon Street Showing Existing Services	-	Arup
C-05-05	Gibbon Street Proposed Structure Cross-Section Showing MP Gas Main	-	Arup
C-05-06	Scheme Drainage	C3	Arup
C-05-07	Proposed Drainage Abandonments &	-	Arup

Document Reference	Title	Revision/Issue	Originator
	Connection		
C-05-08	Track Drainage Manhole Schedule and Details	C3	Arup
C-05-09	PC Concrete Manhole >3m Cover Details	C1	Arup
C-06-01	Shaft Locations	-	Arup
C-06-02	Proposed Mine Seam Treatment & Location of Stuart street Tunnel	A	Arup
C-06-03	Typical Detail (Mineworkings & Mineshafts)	-	Arup
C-07-01	Permanent Way Alignment & Longitudinal Profile Outbound Track, Sheet 1 of 3	-	Arup
C-07-02	Permanent Way Alignment & Longitudinal Profile Outbound Track, Sheet 2 of 3	-	Arup
C-07-03	Permanent Way Alignment & Longitudinal Profile Outbound Track, Sheet 3 of 3	-	Arup
C-07-04	Cross Sections Sheet 1 of 2	C	Arup
C-07-05	Cross Sections Sheet 2 of 2	A	Arup
C-07-06	Cross Sections @ 20m Intervals Along Outbound Track (1310-1490) Sheet 1 of 3 (Indicative)	-	Arup
C-07-07	Cross Sections @ 20m Intervals Along Outbound Track (1310-1490) Sheet 2 of 3 (Indicative)	-	Arup
67313-C-07-08	Cross Sections @ 20m Intervals Along Outbound Track (1310-1490) Sheet 3 of 3 (Indicative)	A	Arup
C-07-09	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 2, Sheet 1 of 3	B	Arup
C-07-10	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 2, Sheet 2 of 3	C	Arup
C-07-11	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 2, Sheet 3 of 3	C	Arup
C-07-12	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 1, Sheet 1 of 3	-	Arup
C-07-13	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 1, Sheet 2 of 3	-	Arup
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C-07-15	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 1 of 5 (Indicative)	A	Arup
C-07-16	Cross Section @ 20m Intervals Along	-	Arup

Document Reference	Title	Revision/Issue	Originator
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C-07-17	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 3 of 5 (Indicative)	-	Arup
C-07-18	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 4 of 5 (Indicative)	-	Arup
C-07-19	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 5 of 5 (Indicative)	-	Arup
C-07-20	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 1 of 5 (Indicative)	-	Arup
C-07-21	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 2 of 5 (Indicative)	-	Arup
C-07-22	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 3 of 5 (Indicative)	-	Arup
C-07-23	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 4 of 5 (Indicative)	-	Arup
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C-07-26	Tunnel Cross Sections Chainages 1160 to 1310 (Indicative), Sheet 2 of 4	-	Arup
C-07-27	Tunnel Cross Sections Chainages 1160 to 1310 (Indicative), Sheet 3 of 4	-	Arup
C-07-28	Tunnel Cross Sections Chainages 1160 to 1310 (Indicative), Sheet 4 of 4	-	Arup
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C-07-30	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 2, Sheet 5 of 5	B	Arup
C-07-33	Earthworks Longsections Along Outbound Track	-	Arup
C-09-01	Proposed Forge Lane Bridge	A	Arup
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S-16-007	Retaining Wall Setting Out Outbound CH. 1040-1100, Sheet 2 of 9	ASB/5	Amec
S-16-008	Retaining Wall Setting Out Outbound CH. 1100-1160, Sheet 3 of 9	ASB/5	Amec
S-16-009	Retaining Wall Setting Out Outbound CH. 1160-1220, Sheet 4 of 9	ASB/8	Amec
S-16-010	Retaining Wall Setting Out Outbound	ASB/9	Amec

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S-16-011	Retaining Wall Setting Out Outbound CH. 1280-1340, Sheet 6 of 9	ASB/6	Amec
S-16-012	Retaining Wall Setting Out Outbound CH. 1340-1400, Sheet 7 of 9	ASB/5	Amec
S-16-013	Retaining Wall Setting Out Outbound CH. 1400-1460, Sheet 8 of 9	ASB/5	Amec
S-16-014	Retaining Wall Setting Out Outbound CH. 1460-1525, Sheet 9 of 9	ASB/5	Amec
S-16-020	Pile Wall Elevation Outbound CH. 950-1530	-	Arup
S-16-021	Pile Wall Elevation Inbound CH. 950-1530	-	Arup
S-16-022	Tunnel Entrance Wing Walls Replacement Piles	-	Arup
S-17-001	Location of Forge Bridge Lane	A	Arup
S-17-002	Typical Tunnel & Bridge Deck Section	-	Arup
S-17-003	Pile Capping Beam & Prop Typical Detail	-	Arup
S-17-004	Brick Cladding Details	-	Arup
S-17-005	Forge Lane Bridge Section	-	Arup
S-17-006	General Arrangement Outbound CH. 980-1040, Sheet 1 of 9	ASB/5	Amec
S-17-007	General Arrangement Outbound CH. 1040-1100, Sheet 2 of 9	ASB/5	Amec
S-17-008	General Arrangement Outbound CH. 1100-1160, Sheet 3 of 0	ASB/9	Amec
S-17-009	General Arrangement Outbound CH. 1160-1220, Sheet 4 of 9	ASB/7	Amec
S-17-010	General Arrangement Outbound CH. 1220-1280, Sheet 5 of 9	ASB/6	Amec
S-17-011	General Arrangement Outbound CH. 1280-1340, Sheet 6 of 9	ASB/5	Amec
S-17-012	General Arrangement Outbound CH. 1340-1400, Sheet 7 of 9	ASB/5	Amec
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S-17-016	General Arrangement Gibbon Street Crossing	ASB/6	Amec
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S-17-020	General Sections, Sheet 4 of 5	ASB/5	Amec
S-17-021	General Sections, Sheet 5 of 5	ASB	Amec
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S-17-026	Base Slab Outbound CH. 1062-1085 Sheet 2 of 4	ASB/2	Amec

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S-17-027	Base Slab Outbound CH. 1208-1238 Sheet 3 of 4	ASB/3	Amec
S-17-028	Base Slab Outbound CH. 1415-1440 Sheet 4 of 4	ASB/2	Amec
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67313-S-17-050	PC Prop Details	ASB/4	Amec
S-17-060	Outbound Parapet Elevations Ch 1310.00 – 1525.00	ASB/6	Amec
S-17-061	Inbound Parapet Elevations Ch 1310.00 – 1525.00	ASB/6	Amec
S-17-062	Parapet Types, Sheet 1	ASB/8	Amec
S-17-063	Parapet Types, Sheet 2	ASB/8	Amec
S-17-064	Parapet Layout & Details at Fire Access	ASB/5	Amec
S-17-065	Outbound Parapet Elevations CH 980 to CH1161	ASB/4	Amec
S-17-066	Inbound Parapet Elevation CH1040 to Ch 1162	ASB/6	Amec
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S-17-068	Parapet Layout and Details at Parapet Returns	C4	Arup
S-17-069	Parapet Types Sheet 3	ASC/4	Amec
S-17-100	Outbound Elevation Sheet 1 of 2	ASB/2	Amec
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S-17-102	Inbound Elevation Sheet 1 of 2	ASB/2	Amec
S-17-103	Inbound Elevation Sheet 2 of 2	ASB/2	Amec
S-17-104	Tunnel Entrance Portal Plan & Elevation Outbound Chainage 1160	ASB/3	Amec
S-17-105	Tunnel Entrance Portal Plan & Elevation Outbound Chainage 1310	ASB/2	Amec
S-17-110	Facing Concrete Typical Elevation Inbound CH. 1058m – 1160m	C1	Amec
S-17-111	Facing Concrete Typical Elevation (Piles) Outbound CH. 1310m – 1525m	ASB/2	Amec
S-17-112	Facing Concrete Typical Elevation (diaphragm) Outbound CH. 1058m – 1170m	C1	Arup
S-17-113	Facing Concrete Typical Elevation Panels	ASB/2	Amec
S-17-120	Sprayed Concrete Wall Facing Details	G	Arup
S-17-121	Fire Access Stair Foundation General Arrangement	O	Arup
S-29-001	Reinforcement Key Plan Capping Beams Ch. 1 + 310 to Ch. 1 + 525	C9	Arup
S-29-002	Reinforcement Details Capping Beam Ch. 1 + 310 to Ch. 1 + 420 sheet 1 incl. Sched.	C3	Arup
S-29-003	Reinforcement Details Capping Beam Ch. 1 + 310 to Ch. 1 + 420 sheet 2 incl. Sched.	C3	Arup
S-29-004	Reinforcement Details Capping Beam	C3	Arup

Document Reference	Title	Revision/Issue	Originator
	Ch. 1 + 310 to Ch. 1 + 420 sheet 3 incl. Sched.		
S-29-005	Reinforcement Details Capping Beam Ch. 1 + 310 to Ch. 1 + 420 sheet 4 incl. Sched.	C2	Arup
S-29-006	Reinforcement Details Capping Beam Ch. 1 + 420 to Ch. 1 + 525 sheet 4 incl. Sched.	C4	Arup
S-29-007	Reinforcement Details Capping Beam Ch. 1 + 420 to Ch. 1 + 525 sheet 4 incl. Sched.	C2	Arup
S-29-008	Reinforcement Details Foundation Beams Ch. 1 + 440 to Ch. 1 + 525 incl. Sched.	C2	Arup
S-29-009	Reinforcement Details Capping Beam Ch. 1 + 420 to Ch. 1 + 525 sheet 4 incl. Sched.	C2	Arup
S-29-010	Contiguous Bored Pile Wall Ch. 1 + 162 to works 6 sewer crossing RC details to 1200 dia piles.	C1	Arup
S-29-011	Reinforcement Details Tunnel Slab Ch. 1162 – 1254 sheet 1	C1	Arup
S-29-012	Reinforcement Details Tunnel Slab Ch. 1162 – 1254 sheet 2	C2	Arup
S-29-013	Reinforcement Details Tunnel Slab Ch. 1162 – 1254 sheet 3	C2	Arup
S-29-014	Reinforcement Details Tunnel Slab Ch. 1162 – 1254 sheet 4	C1	Arup
S-29-015	Reinforcement Details Tunnel Slab Ch. 1254 - 1310 sheet 2	C2	Arup
S-29-016	Reinforcement Details Tunnel Slab Ch. 1254 - 1310 sheet 2	C2	Arup
S-29-018	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 16	C1	Arup
S-29-019	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 15	C1	Arup
S-29-020	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 1	C2	Arup
S-29-021	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 2	C3	Arup
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S-29-024	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 5	C3	Arup
S-29-025	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 6	C3	Arup
S-29-026	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 7	C1	Arup
S-29-027	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 8	C1	Arup

Document Reference	Title	Revision/Issue	Originator
S-29-028	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 9	C2	Arup
S-29-029	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 10	C2	Arup
S-29-030	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 11	C1	Arup
S-29-031	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 12	C1	Arup
S-29-032	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 13	C1	Arup
S-29-033	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 14	C1	Arup
S-29-034	Reinforcement Details Capping Beam ch. 1420 – 1525	C1	Arup
S-29-035	Reinforcement Details Base Prop Slabs Sheet 1	C1	Arup
S-29-036	Reinforcement Details Base Prop Slabs Sheet 2	C2	Arup
S-29-040	Reinforcement Details Forge Lane Bridge Deck Sheet 1	C2	Arup
S-29-041	Reinforcement Details Forge Lane Bridge Deck Sheet 2	C1	Arup
S-29-042	Reinforcement Details Forge Lane Bridge Deck Sheet 3	C1	Arup
S-29-045	Reinforcement Details Infill Panels Sheet 1	C1	Arup
S-29-046	Reinforcement Details Infill Panels Sheet 2	C2	Arup
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S-29-048	Reinforcement Details Infill Panels Sheet 4	C2	Arup
S-29-050	Panel 13 Replacement	C1	Arup
S-29-070	Contig Bored Pile Wall Ch 1162 to Works 6 Sewer Crossing RC Details to 1200 dia Piles	C2	Arup
S-29-071	Contig Bored Pile Wall Works 6 Sewer Reinforcement Details	C1	Arup
S-29-080	Reinforcement Details Slabs S1 and S2	O	Arup
G-SK-00	Typical Details (Minworkings and Mineshafts)	O	Arup
A2/144728/001	Proposed Gibbon Street Sewers Diversion General Layout		Amec/Donegan
A1/144728/002	Plan & Long Section Shaft 1 – Work 6 Sewer		Amec/Donegan
A1/144728/003	Shaft 1		Amec/Donegan
16511/001	Buried Obstructions Sheet 1 of 9		Amec
16511/002	Buried Obstructions Sheet 2 of 9		Amec
16511/003	Buried Obstructions Sheet 3 of 9		Amec
16511/004	Buried Obstructions Sheet 4 of 9		Amec

Document Reference	Title	Revision/Issue	Originator
16511/005	Buried Obstructions Sheet 5 of 9		Amec
16511/006	Buried Obstructions Sheet 6 of 9		Amec
16511/007	Buried Obstructions Sheet 7 of 9		Amec
16511/008	Buried Obstructions Sheet 8 of 9		Amec
16511/009	Buried Obstructions Sheet 1 of 9		Amec
18116/001	Reinforcement Details For Contiguous Pilled Wall, Chainage 1254 to 1415, Sheet 1 of 3	F	Amec
18116/002	Reinforcement Details For Contiguous Pilled Wall, Chainage 1415 to 1525, Sheet 2 of 3	E	Amec
18116/003	Reinforcement Details For Contiguous Pilled Wall, Chainage 975 to 1085, Sheet 3 of 3	E	Amec
18116/004	Reinforcement Details for Alan Turing Way Service Crossings	C3	Amec
18116/005	Reinforcement Details for Forge Lane Service Crossings	C4	Amec
Sketch Sheet 17	-	-	Amec
18116/201	Diaphragm Wall Reinforcement Primary Panel Type 1 Chainage 0+975 to 1+028	C1	Amec
18116/202	Diaphragm Wall Reinforcement Closing Panel Type 1 Chainage 0+975 to 1+028	C1	Amec
18116/203	Diaphragm Wall Reinforcement Primary Panel Type 2 Chainage 1+040 to 1+045	C1	Amec
18116/204	Diaphragm Wall Reinforcement Closing Panel Type 2 Chainage 1+033 to 1+052	C1	Amec
18116/205	Diaphragm Wall Reinforcement Primary Panel Type 3 Chainage 1+028 to 1+034	C1	Amec
18116/206	Diaphragm Wall Reinforcement Closing Panel Type 3 Chainage 1+072 to 1+138	C1	Amec
18116/207	Diaphragm Wall Reinforcement Primary Panel Type 4 Chainage 1+080 to 1+132	C1	Amec
18116/210	Diaphragm Wall Reinforcement Closing Panel Type 5B Chainage 1+138 to 1+164	C1	Amec
18116/211	Diaphragm Wall Reinforcement Closing Panel Type 5C Chainage 1+140 to 1+159	C1	Amec
18116/213	Diaphragm Wall Reinforcement Primary Panel Type 4A Chainage 1+052 to 1+057	C1	Amec
18116/214	Diaphragm Wall Reinforcement Closing Panel Type 4B Chainage 1+028 to 1+057	C1	Amec
18116/215	Reinforcement Details For 1m Thick Diaphragm Wall Panel 34P-OB	E	Amec
18116/217	RC Columns to Temporary Road Bridge	C1	Amec
18116/218	RC Columns to Temporary Foot Bridge	C1	Amec
18116/219	Reinforcement Details For 1m Thick Diaphragm Wall Panel 33P-OB	B	Amec
18116/223	Diaphragm Wall Reinforcement Closing	C1	Amec

Document Reference	Title	Revision/Issue	Originator
	Panel Type 32C-OB		
18116/224	Reinforcement Details For 1m Thick Diaphragm Wall Panel 31P-OB	C1	Amec
18116/225	Diaphragm Wall Reinforcement Closing Panel Type 30C-OB	C1	Amec
18116/226	Reinforcement Details For 1m Thick Diaphragm Wall Panel 29P-OB	C1	Amec
18116/227	Diaphragm Wall Reinforcement Closing Panel Type 4 Panel 16C-OB 30C-OB	C1	Amec
18116/228	Diaphragm Wall Reinforcement Closing Panel Type 4 Panel 15C-OB 30C-OB	C1	Amec
CSK/070	Capping Beam Test Point Location Plan	-	Arup
CSK/071	Elevation 1-1 as Ch. 1 + 415m	-	Arup
CSK/072	Detail 1 at Ch. 1 + 415m	-	Arup
CSK/073	Section Through Capping Beam at Ch. 1 + 310m	-	Arup
CSK/074	Detail 2 at Ch. 1 + 310	-	Arup
CSK/075	Detail 3 – Cable Connection to Rebar	-	Arup

AMEC Capital Projects

Metrolink Phase III Advanced Works

Calculation Plan

DRAFT 4

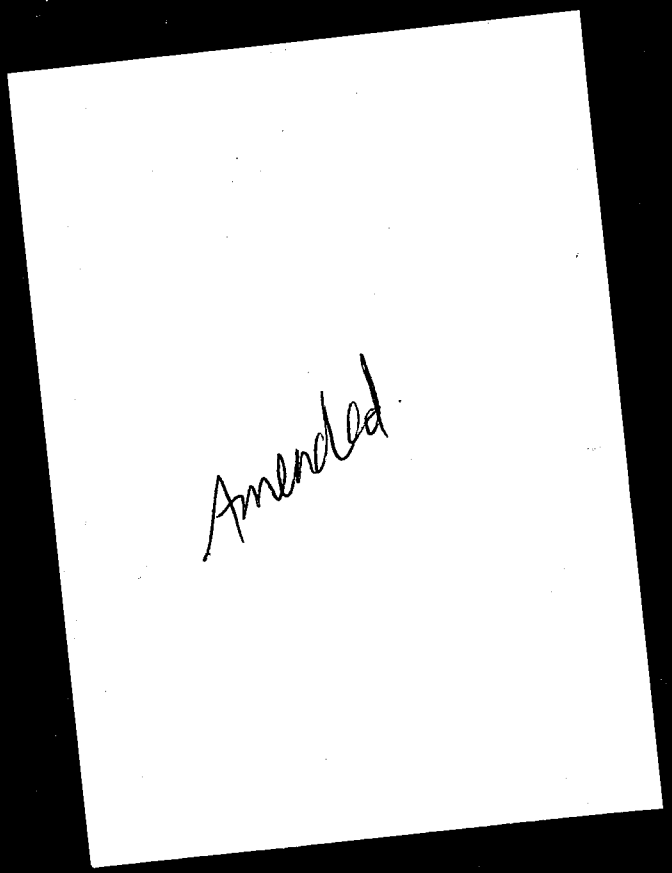
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AMEC Capital Projects

Metrolink Phase III Advanced Works

Calculation Plan

DRAFT 4



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Metrolink Phase III Advanced Works

Calculation Plan

DRAFT 4

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Metrolink Phase III Advanced Works

Calculation Plan

January 2004

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Job number 67313

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Document Verification

Job title	Metrolink Phase III Advanced Works		Job number 67313
Document title	Calculation Plan		File reference 4-05-06
Document ref	REP/S001		

Revision	Date				
Draft 1	July 2001	Filename	0014Report JAT REP-S001 Calculation plan Draft 1.doc		
		Description	First draft		
			Prepared by	Checked by	Approved by
		Name	Victoria Edmondson	Darren Paine	Mike Robinson
		Signature			
Draft 2	July 2002	Filename	0014Report JAT REP-S001 Calculation plan Draft 2.doc		
		Description	Second Draft		
			Prepared by	Checked by	Approved by
		Name	Victoria Edmondson	Darren Paine	Mike Robinson
		Signature			
Draft 3	January 2003	Filename	0016Report JAT REP-S001 Calculation Plan Draft 3.doc		
		Description	Third Draft		
			Prepared by	Checked by	Approved by
		Name	Kathryn Orrell / Victoria Edmondson	Darren Paine	Mike Robinson
		Signature			
Draft 4	21/01/04	Filename	0017Report JAT REP-S001 Calculation Plan Draft 3.doc		
		Description	Amendments to Section 2.4 Design Life Amended Section 3.1 Amendments to Table 4.1		
			Prepared by	Checked by	Approved by
		Name	James Theobalds	Simon Small	Darren Paine
		Signature	[redacted]		

Issue Document Verification with Document ✓

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QA Rev 9.3, 17 November 2003

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Configuration of Axles and Trailer for the 328 Tonne Abnormal Vehicle

1. INTRODUCTION

1.1 Purpose of the plan

This document defines the design criteria for the Metrolink Phase III Advanced Works civil-structures. It commences with a description of the project's structural elements, and then proceeds to outline the governing design standards, the analysis methodology, principle design parameters, and the design loads.

The document has been compiled to: -

I. Instruct the engineer completing the calculation.
II. Inform those checking the design calculations.
III. Provide information to temporary-works and other interface designers.
IV. Ultimately form part of the Health and Safety File.
V. Inform the Metrolink Phase III Concessionaire.

It is intended, that the document be read in conjunction with the following reports: -

I. 'Metrolink Phase III, Preparatory (Advanced) Works Alan Turing Way Stage 1 – Design and Construction Brief", - a comprehensive brief containing further project and site information.
II. 'Metrolink Phase III Advanced Works – Specification for Structural Works (Not to be used for piling works', - DTP 'Specification for Highway Works' appendices. The DTP 'Specification for Highway Works' forms the specification for the civil/structural works.
III. 'Metrolink Phase III Advanced Works, Alan Turing Way Service Tunnel AIP' – Approval in principal submission for 93m of cut and cover tunnel under Alan Turing Way.
IV. 'Metrolink Phase III Advanced Works, Gibbon Street Service Tunnel AIP' – Approval in principal submission for 56m of cut and cover tunnel under Gibbon Street.
V. 'Metrolink Phase III Advanced Works, Forge Lane Bridge AIP' – Approval in principle submission for Forge Lane Bridge.

1.2 Scope of the Plan

This document outlines the structural design of the following civil-structural elements:-

- Capping beams.
- Parapets.
- Tunnel roof slab.
- Forge Lane Bridge.
- Base prop slabs.
- Triangular Prop beams.
- Infill panels.

- Contiguous pile and diaphragm panel wall facings.
- Emergency Staircase Foundation.

The design of the contiguous piles and diaphragm walls is not outlined in this document. The contiguous piles and diaphragm walls are Geotechnical elements and shall be design separately.

2. DESCRIPTION OF THE STRUCTURAL WORKS

The principle structural elements encompassed within the scope of the Metrolink Phase Three Advanced Works, are shown schematically on the civil general arrangement drawings 67313/C-00-06 to 07 attached as Appendix A to this document. For detailed structural layouts reference should be made to the structural general arrangement drawings listed in Appendix B. A description of the works at each location is summarised below.

2.1 Forge Lane Bridge

Forge Lane Bridge is a new overbridge located at outbound Chainage 1070m. The bridge carries a reduced width Forge Lane, and crosses the Metrolink cutting at an angle of approximately 9 degrees. The bridge comprises a single 12.5 x 9.1x 0.45m deep in-situ reinforced concrete deck with upstand edge beams and parapets.

The bridge is simply supported on two 2150mm wide x 1500mm deep abutment beams. Theses beams are a locally widened section of the capping beam which props the retaining walls of the Metrolink Corridor from Outbound chainage 1062m to 1161m. The capping beam drops beneath the new Forge Lane Bridge to form a 9.2m x 2.25m deep recessed abutment into which the bridge sits. Forge Lane Bridge is independent of the propped capping beam/retaining wall and does not act as a prop to the embedded retaining walls.

The bridge deck rests directly on 11 elastomeric bearings at each support. These elastomeric bearings provide lateral restraint, and resist braking loads. The bearings have been sized to accommodate all movement, including anticipated movement of the propped pile wall beneath the bridge.

2.2 Tunnel Roof Slab

A 149m service tunnel extends between outbound Metrolink chainages 1161m to 1310m. The service tunnel roof comprises a single span continuous insitu reinforced concrete slab. The roof slab spans transversely between the diaphragm walls and contiguous piles which form its supports. At service crossing locations the tunnel spans onto beams that consecutively span onto large pile or diaphragm wall return supports located outside of service zones. Between chainages 1161 to 1225m the tunnel roof slab is 1.45m thick, reducing to 1m thick between chainage 1225 to 1310m. A full movement joint is located at chainage 1254m. The tunnel portals are protected with P6 parapets, and the tunnel contiguous pile walls will be lined with sprayed concrete.

The new tunnel will be constructed from existing ground level downwards in a 'cut and cover' operation. Following piling works, excavation will be completed to tunnel roof slab formation level. The tunnel roof slab will then be cast on 1000 gauge Visqueen above a 50mm concrete blinding. The concrete blinding and 1000 gauge Visqueen will form the separation layer from the earthworks beneath. Following the Commonwealth Games the earthworks beneath the tunnel roof slab will be excavated to form the tunnel.

2.3 Capping Beams, Props and Parapets

A reinforced in-situ concrete capping beam is to be constructed along the top of all diaphragm and contiguous piled walls outside of the tunnel. Between outbound chainages 1058 to 1161m and 1310 to 1420m the capping beam is 1750 x 1200mm deep, in all other locations the capping beam is 1250 x 1200mm deep. Precast concrete, high containment P6 parapets are connected to the capping beam to deflect vehicles away from the Metrolink corridor.

The capping beam between chainages 1058 to 1161m and 1310 to 1420m acts as a horizontally spanning beam between prop locations. The props are triangular precast concrete beams, spanning the track at capping beam level at approximately 10m centres. Between chainage 985 to 1058m, 1208 to 1238m, and 1415 to 1440m the retaining walls are propped by a 500mm thick in-situ concrete base slab. This slab is constructed between the inbound and outbound wall 700mm below track level.

2.4 Wall Facings

The contiguous piles walls between outbound chainages 1300 to 1525m are to be lined with a nominal 350mm thick in-situ concrete facing. The facing is to have a ribbed pattern finish and will hang in tension from the capping beams with fixings at intervals in the retaining walls. The actual thickness of the facing will vary by approximately 75mm due to pile and diaphragm wall construction tolerances.
The contiguous pile and diaphragm piled walls between outbound chainages 975 and 1310m and inbound chainages 975 and 1316 will be lined with sprayed concrete nominally 110mm thick.

2.5 Infill Panels

Infill panels are located where the bottom levels of contiguous pile and diaphragm retaining walls, would otherwise clash with the statutory services traversing the Metrolink corridor. In all locations except for the Work 6 Sewer, the infill panels are formed from a series of independent concrete beams spanning (with vertical clearance to the services) horizontally between large piles or return diaphragms. The beams are connected to adjacent large piles and diaphragm wall returns by means of couplers. The panels are cast in-situ in a maximum of 2.2m deep with an interlocking 150 deep by half the width of the panel shear key used to transfer load between each panel segment. The thickness of the panels varies with location between 650 and 1000mm thick.

At the specific location of the Work 6 Sewer only 1200 piles with raised toe levels have been used to form the retaining wall above the sewer. The piles cantilever and are propped at the top onto a downstand from the tunnel roof slab. The pile are not directly connected to the tunnel roof slab, and thereby do not carry vertical load.

2.6 Emergency Staircase Foundation

Two galvanised steel staircases and gates are provided for Fire Brigade emergency access adjacent to both tunnel portals. The staircases will be supported directly from a reinforced concrete base slab.
The east side staircase access is located adjacent to the east tunnel portal at Ch 1310, and will be positioned within a recess formed by contiguous bored pile retaining walls, the recess is 6.62m x 5.18m, with a vertical rise of 8.8m

The west side staircase access is located adjacent to the west tunnel portal at Ch 1160 and will be positioned with a recess formed by diaphragm walling panels, the recess is 6.4m x 5.35m, with a vertical rise of 8.3m.
The foundation slabs are to be 300mm thick, with a thickening to the trackside, to allow for future excavations, to a depth of 1200mm. The slab is to be ground bearing with an allowable ground bearing of 150 kN/m^2.

3. PRINCIPLE DESIGN PARAMATERS

3.1 Codes

Design is to be completed with full reference to British Standards, and the Department of Transport, Design Manual for Roads and Bridges. Structural elements are to be designed for a 120-year design life, with the exception of the facing to the contiguous piles and diaphragm which is has a reduced design life of 30 years.

The main structural design codes are as follows: -

BS 5400-4: 1990 Steel concrete and composite bridges – Part 4: Code of practice for design of concrete bridges.

BD 24/92 The design of Concrete Highway Bridges and Structures – Use of BS 5400: Part 4 1990 (and Interim Advice Note 1A.5 dated July 1996).

BD 28/87 Early Thermal Cracking of Concrete.

BA 24/87 Early Thermal Cracking of Concrete.

BD 37/01 Loads for Highway Bridges.

BD 52/93 The Design of Highway Bridge Parapets.

BA 57/95 Design for Durability.

BD 57/95 Design for Durability

BD 42/00 Design of Embedded Retaining Wall and Bridge Abutments.

BD 31/87 Buried Concrete Box Type Structures.

3.2 Specifications

The Department of Transport Publications 'Specification for Highway Works' forms the specification for the civil structural elements.

3.3 Structural Software

The following structural software will be utilised: -

- OASYS GSA General Structural Analysis.
- OASYS ADC Analysis and Design of Concrete.

3.4 Fire Ratings

All concrete structural elements shall be designed to provide a 3 hour fire resistance.

3.5 Materials

Reinforced Concrete Resisting	Grades	Sulphate Resisting
Capping beams	C40	Class 2
Parapets	C40	Class 2
Tunnel Roof Slab	C40	Class 2
Forge Lane Bridge	C50	Class 2
Base Prop Slabs	C40	Class 2
Triangular Prop Beams	C40	Class 2
Infill Panels	C40	Class 2
Emergency Staircase	C40	Class 2
Foundation		
Wall Facings	C40	Class 2
	50% Replacement Mix	
Reinforcement	460N/mm^2 (To BS 4449)	

3.6 Movements

All structural elements will be designed to ensure that deflections and movements do not adversely affect clearances, or the drainage of any structure. Provision in the design will be made for the predicted settlement of diaphragm walls and contiguous piles. Expansion and contraction joints will be introduced to accommodate thermal structural movements following the guidance in 'BS5400: 1990 Part 4 - Code of practice for design of concrete bridges', 'BD 37/01: Loads for Highway Bridges' and ' BD 31/87 Buried Concrete Box Type Structures'.

3.7 Durability

All element will have the appropriate cover and crack widths for severe exposure conditions as outlined in 'BS5400:1990 Part 4 – Code of practice for the design of concrete bridges' and 'BD 57/95: Design for Durability'

4. DESIGN LOAD CASES

The design load cases for the main structural elements are tabulated in table 4.1 below. Design is to be completed to the Ultimate Limit State with loads factored and combined in accordance with 'Department of Transport, Highway and Traffic Standard BD 37/01, Loads for Highway Bridges'.

Table 4.1

Element	Location	Unfactored Design Loads	
Forge Lane Bridge Deck	*Outbound Chainage 1070m*	*Dead*	Self weight = 12 kN/m
		Super Imposed Dead	2m of fill and highway surface finishes = 40 kN/m
		Live	HA = 63.6 kN/m of notional lane width. KEL = 120kN per notional lane width. Loads due to vehicle collision with integral P6 parapets - local and global affects (refer to clause 6.7 'BD 37/01Loads for Highway Bridges'). Secondary live loads – accidental skidding and longitudinal loads (refer to clause 6.10 and 6.11 'BD 37/01 Loads for Highway Bridges'). Wind – 6kN/m² of pressure on vertical projecting areas of the bridge. Bridge to be checked for 30 units HB, applied independently in a central 3.6m wide notional lane on the bridge deck.
Tunnel Roof Slab	One *(Outbound Chainages 1161 to 1225m applied beneath Alan Turing Way).*	*Dead*	Self weight = 34.8 kN/m
		Super Imposed Dead	2.5m of fill and highway surface finishes = 50kN/m
		Live	HA = 63.6 kN/m of notional lane width KEL= 120kN per notional lane width HB = 45 units Abnormal load 328 tonnes on a 1001 trailer (configuration of the axles and trailer are shown on the drawing attached as Appendix C).
	Two *(Outbound Chainages 1225 to 1250 applied beneath proposed development).*	*Dead*	Self weight = 24kN/m
		Super Imposed Dead	2m of fill and highway surface finishes = 40kN/m
		Live	HA = 63.6 kN/m of notional lane width KEL = 120kN per notional lane width HB = 30 units
	Three *(Outbound Chainages 1250 to 1310 applied beneath Gibbon Street)*	*Dead*	Self weight = 24 kN/m
		Super Imposed Dead	3.2m of fill and highway surface finishes = 64kN/m
		Live	HA = 63.6 kN/m of notional lane width KEL= 120kN per notional lane width HB = 37.5 units

Table 4.1 (continued)

Element	Location	Unfactored Design Loads	
Inbound and Outbound Wall Facings	One *(Outbound Chainage 1058 to 1220m and 1300 to 1525m)*	*Dead*	Self Weight = 105kN/m for in situ wall facing, 2.6kN/m² for spray concrete
		Water Pressure	Inbound wall facings chainage 1058 to 1160 m are designed for 8.5m of water pressure. Remaining locations are design for 5m of water pressure. Water levels are as advised by Geotechnics. Checks have resulted in the incorporation of drainage membranes to limit the water behind the wall, where the facing has been designed for a static head of 5m.
Prop Beam	One *(Approximately 10m intervals between Outbound Chainage 1310 to 1440m and 1056 to 1161m)*	*Dead*	Self Weight = 15kN/m
		Earth and Water Pressure	Axial prop load generated from earth and water pressure force uniformly distributed along capping beams. Maximum working prop load = 3666kN
Pile Capping Beam (Note: All capping beams have been design to resist an unfactored bending moment of 762kNm and shear of 360kN introduced by a 4m differential excavation during construction. Check was completed assuming full water pressure and a unit weight of soil of 19kN/m³).	One *(Propped Capping Beams Outbound Chainage 1310 to 1440m)*	*Earth and Water Pressure*	Earth and water pressure forces uniformly distributed along top of cantilevered piles. Working top prop loads from Geotechnics are as follows: - ▪ Outbound Chainage 1310 to 1370 = 230kN/m. ▪ Outbound Chainage 1370 to 1440 = 210kN/m. ▪ Outbound Chainage 1400 to 1420 = 135kN/m
	Two *(Propped Capping Beams Outbound Chainage 1058 to 1161m)*	*Earth and Water Pressure*	Earth and water pressure forces uniformly distributed along the top of the cantilever piles and diaphragm walls. Working top prop loads from Geotechnics are as follows: - ▪ Outbound Chainage 1058 to 1161 = 322kN/m
	Three *(Unpropped Capping Beam Outbound Chainage 1420 to 1525m, and Outbound Chainage 976 to 1058m)*	*N/A*	Design reinforcement governed by early thermal shrinkage requirements.
Parapets	One *(Outbound Chainage 965 to 1161m, and 1310 to 1525m)*	*Impact*	Designed as high containment P6 parapets, impact loading in accordance with 'BD52/93 The Design of Highway Bridge Parapets'.

Table 4.1 (continued)

Element	Location	Unfactored Design Loads	
Infill Panels	*At transverse service crossing along the Metrolink Corridor*	*Water and earth pressure*	Designed for full height water and earth pressure. The unit weight of earth = 19kN/m^3.
		Live	20kN surcharge applied at the rear of the panel.
		Super Imposed Dead	Where applicable vertical loads transferred from structures above panel (refer to design calculations for further details).
Base Prop Slab	*Outbound Chainage 985m to 1058m, 1208 to 1238m and 1415 to 1440m*	*Water and earth pressure*	Earth and water pressure forces uniformly distributed along the cantilever piles and diaphragm walls. Working base prop loads from Geotechnics = 605kN/m
		Live	75 Tonne tram, distributed over 6 notional wheels.
Emergency Staircase Foundations	*East Side Chainage 1310m West Side Chainage 1160m*	*Staircase loading*	
		Live	50 kN per column (4 No. columns)
		Dead	15 kN per column (4 No. columns)

5. MODELLING AND ANALYSIS

5.1 Forge Lane Bridge

The bridge superstructure has been modelled as a 12.5m x 8m grillage in GSA, with elements defined with the equivalent section stiffnesses. A first order elastic analysis of this model was completed to generate forces and displacements.

5.2 Capping Beams and Props

The capping beam has been modelled as a 2D dimensionally representative continuous beam in GSA. The props at appropriate centres have been modelled as springs with equivalent axial stiffness. A horizontal earth pressure load generated from worst credible soil parameters has been applied along the whole length of the beam. A first order elastic analysis has been completed to generate forces and displacements.

5.3 Tunnel Roof Slab

The analysis of the slab is based on a 1m wide typical section of the 12.5m span. The model assumes that the slab is simply supported on the contiguous and diaphragm walls. HA and HB live loading is applied across the full 1m section. Where applicable the 1m strip has been checked for the Abnormal load.

5.4 Emergency Staircase Foundations

Pad foundations have been modelled using Spreadsheets devised by the Reinforced Concrete Council, these have been based on BS 8110, and therefore safety factors have been amended to correspond with BS 5400. The spreadsheets were used to obtain moments. Checks were then performed with Arup spreadsheets designed to check reinforcement to BS 5400. Additional spreadsheets were used to check this against early thermal cracking, in accordance with BD 28/87 and BA 24/87

6. DESIGN CHECKING AND REVIEW PROCEDURE

6.1 General Design Checking

Scheme design calculations and element sizes are checked within the design team by more detailed calculations during final design. An engineer within the team who is not the originator of the calculations checks the final design.

6.2 Checking Requirements for Technical Approval Authority

The tunnel roof slab and Forge Lane Bridge are classified as Category 2 structures in accordance with 'BA 23/89 Part 1 Technical approval of Highway structures on motorways and trunk roads part 1 – General procedures'. In compliance with 'BD 2/89 Part 1 Technical approval of highway structures on motorways and other trunk roads - Part 1 - General Procedures ' both these structures will be checked within Arup by a checking team independent of the Design Team.

6.3 Project Reviews

Project reviews are completed at key stages. The reviews form part of the design checking process and are held to: -:

- Ensure that the design complies with the clients brief.
- Present and seek comments on the design from engineers independent of the design team.
- Ensure consistency of the design within Arup.
- Assess health and safety hazards associated with the design.
- Ensure code compliance and good practice.

APPENDIX A

Civil General Arrangement Drawings

A1

10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR

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59.1m +

STUART STREET

Cycle Lane

ALAN TURING WAY

+ 61.8m

HIGH LEVEL PROP BEAMS (SPANNING BETWEEN PILED WALLS)

EX FORGE LANE

FB Lock

ASHTON CANAL

Overflow

(NEW) FIRE ACCESS STAIRCASE

FB Lock Lock Overflow Weir

ASHTON CANAL

El Sub Sta

LIMIT OF ADVANCED CONSTRUCTION WORKS

ASHTON CANAL

OUTBOUND

INBOUND

"TUNNEL" PORTAL (NORTH)

EXISTING WORKS 6 SEWER

"TUNNEL"

(NEW) FORGE LANE BRIDGE

60.6m +

El Sub Sta (Demolished)

DIVERTED GIBBON STREET SEWER

El Sub Sta (Demolished)

+ 57.4m

FUTURE METROLINK STADIUM STOP (INBOUND TO MANCHESTER CENTRE)

MOVEMENT JOINT IN ROOF SLAB

FLOW

BM 62.88m

GIBBON STREET

ALAN TURING WAY

"TUNNEL" PORTAL (SOUTH)

(NEW) FIRE ACCESS STAIRCASE

Cycle Lane

OUTBOUND

HIGH LEVEL PROP BEAMS (SPANNING BETWEEN PILED WALLS)

CDM NOTE; FUTURE PHASE 3 CONCESSIONAIRE WILL BE REQUIRED TO CONSTRUCT BELOW TRACK SUPPORT 'UNDER SLAB' UTILISING TEMPORARY WORKS PROPPING MEASURES BETWEEN CHAINAGE 975 AND 985

60.7m +

BM 61.30m

CUTLINE

SEE DRAWING No. C-00-07

ALAN TURING WAY

NOTES

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2. PILE LOCATIONS ARE INDICATIVE ONLY.
3. LIMIT OF DEVIATION CO-ORDINATES FROM MALCOLM HUGHES TOPOGRAPHICAL SURVEY AND BRINCKERHOFF INFORMATION.

KEY

- DIAPHRAGM WALL
- CONTIGUOUS BORED PILE WALL
- PROPPED DIAPHRAGM WALL
- PROPPED CONTIGUOUS BORED PILE WALL
- EARTHWORKS SLOPES
- BASE SLAB (PROP)

Rev.	Date	By	Description
F	12/07/02	EC	FULL UPDATE
E	06/09/01	DW	PROP ARRANGEMENT AMENDED. SEWER 6 AND PROPOSED DIVERSION ADDED
D	23/07/01	DW	FORGE LANE BRIDGE REDUCED TO 7m WIDTH. NOTE ADDED. PROPOSED GIBBON ST. LAYOUT & EARTHWORKS SLOPES ADDED
C	19/07/01	DW	PROP BEAM LOCATIONS AMENDED
B	29/06/01	DW	PILE CLASSIFICATION ADDED & METROLINK BOUNDARY CO ORDINATES ADDED
A	26/06/01	DW	PILE ARRANGEMENT REVIEWED
–	17/05/01	DLP	FIRST ISSUE

Drawing Status: FOR APPROVAL

KEYPLAN

Job Title: METROLINK PHASE 3 ADVANCED WORKS

Drawing Title: GENERAL ARRANGEMENT CH 975 TO 1400 SHEET 1 OF 2

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Job No. 67313 | Drawing No. C-00-06 | Rev. F

A1

10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR

OUTLINE SEE DRAWING No. C-00-06

HIGH LEVEL PROP BEAMS (SPANNING BETWEEN PILED WALLS)

NON-PILED RETAINING WALL (INCLUDING FOUNDATIONS)

LIMIT OF ADVANCED CONSTRUCTION WORKS

ALAN TURING WAY

CORBETT STREET

ASHTON NEW ROAD

TURNBACK SIDING

OUTBOUND

INBOUND

Cycle Lane

Works

Ward Bdy

CR

GRASS / SCRUB

CONC / TARMAC / COBBLES

TARMAC

TILES / CONC

L Twr

El Sub Sta

BH

TRIAL PIT

C/BOX

IC/EL

MH

HOARDING

BUSHES / SMALL TREES

17000E 17050E 17100E 17150E 17200E 17250E 17300E

28600N 28550N 28500N 28450N 28400N 28350N

61.8m

62.4m

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KEY

ⵔⵔⵔⵔⵔ – CONTIGUOUS BORED PILE WALL

– PROPPED CONTIGUOUS BORED PILE WALL

BASE SLAB (PROP)

Rev.	Date	By	Description
E	12/07/02	EC	FULL UPDATE
D	05/06/01	DW	PROP ARRANGEMENT AMENDED
C	23/03/01	DW	CONTIGUOUS PILE WALL STOPPED AT CH 1445 ON INBOUND TRACKSIDE ONLY. CONCRETE PLINTH LOCATION ADDED
B	19/03/01	DW	PROP BOM LOCATIONS AMENDED
A	02/02/01	DW	ADVANCED WORKS EXTENDED TO CH 1525. CO-ORDINATES ADDED
–	17/05/01	DLP	FIRST ISSUE

Drawing Status: FOR APPROVAL

KEYPLAN

Job Title: METROLINK PHASE 3 ADVANCED WORKS

Drawing Title: GENERAL ARRANGEMENT CH 1400 TO 1525 SHEET 2 OF 2

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APPENDIX B

Structural General Arrangement Drawings List

B1. STRUCTURAL GENERAL ARRANGEMENT DRAWINGS

S-17-001	Location of Forge Bridge Lane
S-17-002	Typical Tunnel & Bridge Deck Section
S-17-003	Pile Capping Beam & Prop Typical Detail
S-17-004	Brick Cladding Details
S-17-005	Forge Lane Bridge Section
S-17-006	General Arrangement Outbound CH. 980-1040, Sheet 1 of 9
S-17-007	General Arrangement Outbound CH. 1040-1100, Sheet 2 of 9
S-17-008	General Arrangement Outbound CH. 1100-1160, Sheet 3 of 0
S-17-009	General Arrangement Outbound CH. 1160-1220, Sheet 4 of 9
S-17-010	General Arrangement Outbound CH. 1220-1280, Sheet 5 of 9
S-17-011	General Arrangement Outbound CH. 1280-1340, Sheet 6 of 9
S-17-012	General Arrangement Outbound CH. 1340-1400, Sheet 7 of 9
S-17-013	General Arrangement Outbound CH. 1400-1460, Sheet 8 of 9
S-17-014	General Arrangement Outbound CH. 1460-1525, Sheet 9 of 9
S-17-015	General Arrangement Bridge
S-17-016	General Arrangement Gibbon Street Crossing
S-17-017	General Sections, Sheet 1 of 5
S-17-018	General Sections, Sheet 2 of 5
S-17-019	General Sections, Sheet 3 of 5
S-17-020	General Sections, Sheet 4 of 5
S-17-021	General Sections, Sheet 5 of 5
S-17-025	Base Slab Outbound CH. 980-1040 Sheet 1 of 4
S-17-026	Base Slab Outbound CH. 1062-1085 Sheet 2 of 4
S-17-027	Base Slab Outbound CH. 1208-1238 Sheet 3 of 4
S-17-028	Base Slab Outbound CH. 1415-1440 Sheet 4 of 4
S-17-040	Foundations Outbound CH. 1440-1525
S-17-050	PC Prop Details
S-17-060	Outbound Parapet Elevations Ch 1310.00 – 1525.00
S-17-061	Inbound Parapet Elevations Ch 1310.00 – 1525.00
S-17-062	Parapet Types, Sheet 1
S-17-063	Parapet Types, Sheet 2
S-17-064	Parapet Layout & Details at Fire Access
S-17-065	Outbound Parapet Elevations CH 980 to CH1161
S-17-066	Inbound Parapet Elevation CH1040 to Ch 1162
S-17-067	Parapet Layout and Details at Fire Access
S-17-068	Parapet Layout and Details at Parapet Returns
S-17-069	Parapet Types Sheet 3

S-17-100	Outbound Elevation Sheet 1 of 2
S-17-101	Outbound Elevation Sheet 2 of 2
S-17-102	Inbound Elevation Sheet 1 of 2
S-17-103	Inbound Elevation Sheet 2 of 2
S-17-104	Tunnel Entrance Portal Plan & Elevation Outbound Chainage 1160
S-17-105	Tunnel Entrance Portal Plan & Elevation Outbound Chainage 1310
S-17-121	Fire Access Stair Foundation G.A.

APPENDIX C

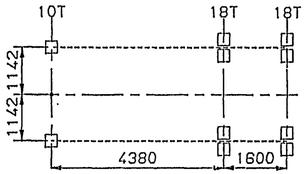
Configuration of Axles and Trailer for the 328 Tonne Abnormal Vehicle

ABNORMAL VEHICLE W1001

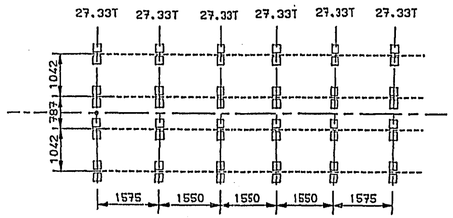
328T GROSS TRAILER
2NO. 46T GROSS TRACTOR UNITS

SCALE 1:100

DIRECTION OF TRAVEL

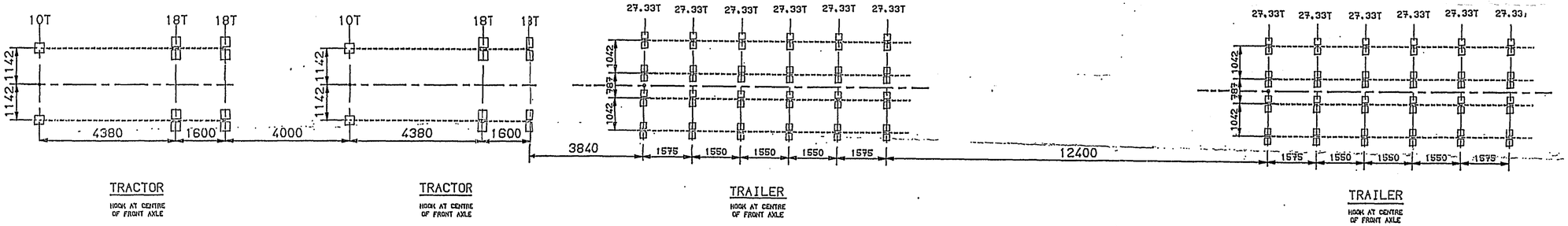


TRACTOR
HOOK AT CENTRE OF FRONT AXLE



TRAILER
HOOK AT CENTRE OF FRONT AXLE

OVERALL LENGTH OF THE COMBINATION FROM CLINE OF FIRST TO CLINE OF LAST AXLE = 47810



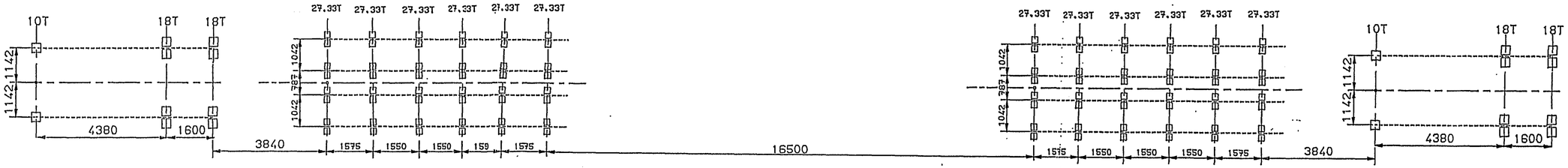
TRACTOR
HOOK AT CENTRE OF FRONT AXLE

TRACTOR
HOOK AT CENTRE OF FRONT AXLE

TRAILER
HOOK AT CENTRE OF FRONT AXLE

TRAILER
HOOK AT CENTRE OF FRONT AXLE

OVERALL LENGTH OF THE COMBINATION FROM CLINE OF FIRST TO CLINE OF LAST AXLE = 51710



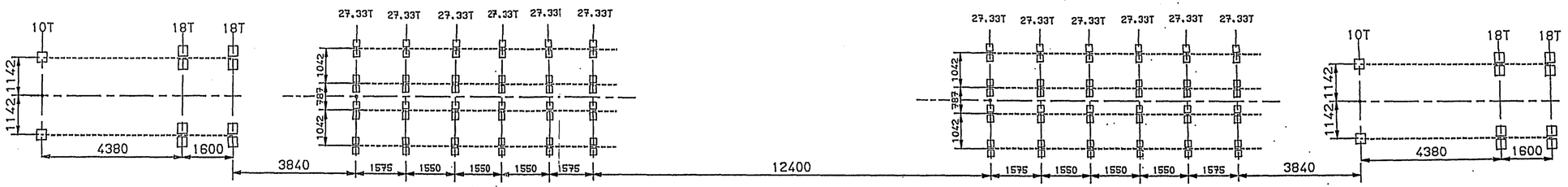
TRACTOR
HOOK AT CENTRE OF FRONT AXLE

TRAILER
HOOK AT CENTRE OF FRONT AXLE

TRAILER
HOOK AT CENTRE OF FRONT AXLE

TRACTOR
HOOK AT CENTRE OF FRONT AXLE

OVERALL LENGTH OF THE COMBINATION FROM CLINE OF FIRST TO CLINE OF LAST AXLE = 47640



TRACTOR
HOOK AT CENTRE OF FRONT AXLE

TRAILER
HOOK AT CENTRE OF FRONT AXLE

TRAILER
HOOK AT CENTRE OF FRONT AXLE

TRACTOR
HOOK AT CENTRE OF FRONT AXLE

ARUP

Job No. 67313
Scheme METROLINK PHASE 3 - ADVANCED WORKS ATW
Title CONFIGURATION OF AXLES AND TRAILER FOR 328 TONNE ABNORMAL VEHICLE
Scale NTS
Date 21/6/02
Checked
Approved
Ref FIGURE C1

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A1

10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR

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KEY

- DIAPHRAGM WALL
- CONTIGUOUS BORED PILE WALL
- PROPPED DIAPHRAGM WALL
- PROPPED CONTIGUOUS BORED PILE WALL
- EARTHWORKS SLOPES
- BASE SLAB (PROP)

59.1m

STUART STREET

EX FORGE LANE

ALAN TURING WAY

Cycle Lane

HIGH LEVEL PROP BEAMS (SPANNING BETWEEN PILED WALLS)

FB Lock

Overflow

ASHTON CANAL

(NEW) FIRE ACCESS STAIRCASE

ASH18b

LIMIT OF ADVANCED CONSTRUCTION WORKS

OUTBOUND

INBOUND

"TUNNEL" PORTAL (NORTH)

(NEW) FORGE LANE BRIDGE

ASH18a

60.6m

ASH18

El Sub Sta (Demolished)

57.4m

FUTURE METROLINK STADIUM STOP (INBOUND TO MANCHESTER CENTRE)

CDM NOTE; FUTURE PHASE 3 CONCESSIONAIRE WILL BE REQUIRED TO CONSTRUCT BELOW TRACK SUPPORT 'UNDER SLAB' UTILISING TEMPORARY WORKS PROPPING MEASURES BETWEEN CHAINAGE 975 AND 985

60.7m

BM 61.30m

61.8m

El Sub Sta

FB Lock Lock Overflow Weir

ASHTON CANAL

Posts

EXISTING WORKS 6 SEWER

ASH19

"TUNNEL"

DIVERTED GIBBON STREET SEWER

El Sub Sta (Demolished)

FLOW

BM 62.86m

MOVEMENT JOINT IN ROOF SLAB

GIBBON STREET

"TUNNEL" PORTAL (SOUTH)

ASH19b

(NEW) FIRE ACCESS STAIRCASE

ASH19a

HIGH LEVEL PROP BEAMS (SPANNING BETWEEN PILED WALLS)

CUTLINE

SEE DRAWING No. C-00-07

Note - Extent of Structures shown is indicative only and should be confirmed on site

Rev.	Date	By	Description
F	12/07/02	EC	FULL UPDATE
E	06/09/01	DW	PROP ARRANGEMENT AMENDED. SEWER 6 AND PROPOSED DIVERSION ADDED
D	23/07/01	DW	FORGE LANE BRIDGE REDUCED TO 7m WIDTH. NOTE ADDED. PROPOSED GIBBON ST. LAYOUT & EARTHWORKS SLOPES ADDED
C	19/07/01	DW	PROP BEAM LOCATIONS AMENDED
B	29/06/01	LW	PILE CLASSIFICATION JOURNEYED & METROLINK BOUNDARY CO-ORDINATES ADDED
A	26/06/01	DW	PILE ARRANGEMENT REVIEWED
–	17/05/01	DLP	FIRST ISSUE

Drawing Status: FOR APPROVAL

KEYPLAN

Job Title: METROLINK PHASE 3 ADVANCED WORKS

Drawing Title: Structure Locations ASH18,18a&b, 19, 19a&b

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Scales 1:500 | Originator DW | Checked | Approved | Date JUNE 01

Job No.	Drawing No.	Rev.
67313	C-00-06	F

A1

10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR

OUTLINE SEE DRAWING No. 1-00-06

HIGH LEVEL PROP BEAMS (SPANNING BETWEEN PILED WALLS)

ASH19b

ASH19a

NON-PILED RETAINING WALL (INCLUDING FOUNDATIONS)

LIMIT OF ADVANCED CONSTRUCTION WORKS

ALAN TURING WAY

TURNBACK SIDING

OUTBOUND

INBOUND

Cycle Lane

CORBETT STREET

ASHTON NEW ROAD

Note - Extent of Structures shown is indicative only and should be confirmed on site

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KEY

– CONTIGUOUS BORED PILE WALL

– PROPPED CONTIGUOUS BORED PILE WALL

BASE SLAB (PROP)

Rev.	Date	By	Description
E	12/02/01	EC	FULL UPDATE
D	09/02/01	DW	PROP ARRANGEMENT AMENDED
C	23/01/01	DW	CONTIGUOUS PILE WALL STOPPED AT CH 1415 ON INBOUND TRACKSIDE ONLY. CONCRETE PLINTH LOCATION ADDED
B	19/01/01	DW	PROP BEAM LOCATIONS AMENDED
A	10/01/01	DW	ADVANCED WORKS EXTENDED TO CH 1525. CO-ORDINATES ADDED
–	17/05/01	DLP	FIRST ISSUE.

Drawing Status: FOR APPROVAL

KEYPLAN

Job Title: METROLINK PHASE 3 ADVANCED WORKS

Drawing Title: Structure Locations ASH19a&b

357

A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR

59.1m +

STUART STREET

EX FORGE LANE

Cycle Lane

ALAN TURING WAY

+ 61.8m

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HIGH LEVEL PROP BEAMS (SPANNING BETWEEN PILED WALLS)

FB Lock Overflow

ASHTON CANAL

LIMIT OF ADVANCED CONSTRUCTION WORKS

OUTBOUND

INBOUND

(NEW) FIRE ACCESS STAIRCASE

EXISTING WORKS 6 SEWER

"TUNNEL" PORTAL (NORTH)

(NEW) FORGE LANE BRIDGE

60.6m +

"TUNNEL"

DIVERTED GIBBON STREET SEWER

El Sub Sta (Demolished)

El Sub Sta

FB Lock Lock Overflow Weir

ASHTON CANAL

Posts

FLOW

MOVEMENT JOINT IN ROOF SLAB

BM 62.88m

GIBBON STREET

ALAN TURING WAY

(NEW) FIRE ACCESS STAIRCASE

"TUNNEL" PORTAL (SOUTH)

Cycle Lane

HIGH LEVEL PROP BEAMS (SPANNING BETWEEN PILED WALLS)

CUTLINE

SEE DRAWING No. C-00-07

10cm

El Sub Sta (Demolished)

+ 57.4m

FUTURE METROLINK STADIUM STOP (INBOUND TO MANCHESTER CENTRE)

60.7m +

BM 61.30m

CDM NOTE; FUTURE PHASE 3 CONCESSIONAIRE WILL BE REQUIRED TO CONSTRUCT BELOW TRACK SUPPORT 'UNDER SLAB' UTILISING TEMPORARY WORKS PROPPING MEASURES BETWEEN CHAINAGE 975 AND 985

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- ∿∿∿ - CONTIGUOUS BORED PILE WALL
- PROPPED DIAPHRAGM WALL
- PROPPED CONTIGUOUS BORED PILE WALL
- EARTHWORKS SLOPES
- BASE SLAB (PROP)

Rev.	Date	By	Description
F	12/07/02	EC	FULL ISSUE
E	05/04/01	DW	PROP ARRANGEMENT AMENDED, SEWER 6 AND PROPOSED SEWERS ADDED
D	23/03/01	DW	FORGE LANE BRIDGE REDUCED TO 3m WIDE, NOTE ADDED, PROPOSED GIBBON ST. LAYOUT & EARTHWORKS SLOPES ADDED
C	26/02/01	DW	PROP BEAMS INCORRECTLY ADDED
B	26/02/01	DW	PILE ARRANGEMENT REVISED & RETAINING BOUNDARY CO-ORDINATES ADDED
A	30/01/01	DW	PILE ARRANGEMENT REVISED
-	12/01/01	DLP	FIRST ISSUE

Drawing Status: FOR APPROVAL

KEYPLAN

Job Title: METROLINK PHASE 3 ADVANCED WORKS

Drawing Title: GENERAL ARRANGEMENT CH 975 TO 1400 SHEET 1 OF 2

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Scales: 1:500 Originator: DW Checked: Approved: Date: JUNE 01

Job No. 67313 Drawing No. C-00-06 Rev. F

...\Drawings\Civil\C-00-06.dgn 23/01/2003 09:48:46

GMPTE Metrolink

Metrolink Phase III - Advanced Works

Forge Lane Bridge AIP

March 2002

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Document Verification

Job title	Metrolink Phase III - Advanced Works	Job number 67313
Document title	Forge Lane Bridge AIP	File reference 4-06
Document ref	67313 - SPC/S005	

Revision	Date				
Draft 1	21/03/02	Filename			
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			Prepared by	Checked by	Approved by
		Name	V Edmondson	~~D Paine~~ R. Humphreys	M J Robinson
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
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Issue Document Verification with Document ✓

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APPENDICES

APPENDIX A
Technical Approval Schedule

APPENDIX B
Analysis Model and Associated Loading

TABLES

Table 1 – Soil Parameters

1. NAME OF SCHEME

Metrolink Phase III Advanced Works – A Metrolink corridor extending from the Commonwealth Stadium, Manchester to Ashton New Road, Manchester (refer to drawing number C.00.006 Rev E and C00.007 Rev D for route layout). Forge Lane Bridge is a new overbridge located at outbound Chainage 1070m. The Bridge carries Forge Lane where it crosses the Metrolink cutting.

(Advanced Works shall form an element of the future Phase III Extension of Metrolink to Ashton-under-Lyne).

1.1 Type of Highway

Forge Lane, a single lane unadopted highway, is carried above the structure. Demountable bollards are located at the approaches to the new Forge Lane Bridge, refer to drawing number C/09/01 Rev A. These bollards can be removed, to temporarily increase Forge Lane to two lanes when access by a wide vehicle is required. The existing Forge Lane highway, to the north and south of the new Metrolink bridge, is two lane (unadopted). Two lanes reduce to a single lane across the new bridge structure.

A twin track electrified Metrolink passes under the structure.

1.2 Permitted Traffic Speed (for a bridge give over and/or under).

A traffic speed restriction will be enforced on the highway above the structure. The speed restriction to be applied is to be determined by others.

The permitted speed on the Metrolink line is anticipated to be 30mph. The new Inbound Stadium Stop will be located to the west of the new Forge Lane Bridge structure.

2. NAME OF STRUCTURE

New Forge Lane Bridge outbound Chainage 1070m – Forge Lane (OS grid ref, SJ386398).

2.1 Obstacles Crossed

Manchester Metrolink under/Forge Lane unadopted highway above.

3. PROPOSED STRUCTURE

3.1 Description of Structure

Single span insitu reinforced concrete deck with upstand edge beams and parapets.

3.2 Structural Type

New Forge Lane Bridge is formed from reinforced insitu concrete construction. A 120 year design life is required for the structure. In-situ concrete was chosen for its durability, economy and low maintenance requirements. Situated directly above the Metrolink electrified lines, concrete was preferred for its lower conductivity in comparison to a steel solution. The close proximity of services immediately above the new bridge deck, also lead to a concrete solution.

3.3 Foundation Type

The foundations consist of traditional 1800mm diameter contiguous bored piles. These piles transmit all loads through end bearing and skin friction to the underlying ground strata.

3.4 Span Arrangements

New Forge Lane Bridge spans longitudinally across the Metrolink corridor at an approximate angle of 9 . The bridge has a clear span of 12.5m between the two abutment beams that form its support. The bridge soffit is 9.1m wide.

The stiffness of the 2100mm deep x 1000mm wide bridge edge beams in comparison to the typically 450mm deep deck, means that part of the deck also spans transversely onto the edge beams. Hence, the spanning action of Forge Lane Bridge is comparable to a two-way spanning slab.

3.5 Articulation Arrangements

Forge Lane Bridge is simply supported on two 2150mm wide x 1500mm deep abutment beams. The beams are a locally widened section of a continuous typically 1750mm x 1200mm deep capping beam spanning from Metrolink Outbound chainage 1062m to 1161m (refer to drawing number S-17-007 rev C4, S-17-008 rev C4 and S-17-009 rev C6). This capping beam ties the contiguous piles and diaphragm retaining structures forming the Metrolink cutting walls together, enabling them to be propped at the top at approximately 10m centres. The capping beam drops beneath new Forge Lane Bridge to form a 9.2m x 2.25m deep recessed abutment into which the bridge sits. Forge Lane Bridge is independent of the propped capping beam/retaining wall and does not act as a prop to the embedded retaining walls.

The bridge deck rests on 11 elastomeric bearings at each support. These elastomeric bearings provide lateral restraint, resisting braking loads. The bearings have been sized to accommodate all movement, including anticipated movement of the propped pile wall beneath the bridge.

3.6 Parapet Type

Forge Lane Bridge has integral insitu concrete P6 classification parapets.

3.7 Proposed Arrangements for Inspection and Maintenance

Inspection and maintenance of the New Forge Lane Bridge will be undertaken when Metrolink is not operating, between the OHLE outages. Access will need to be arranged in conjunction with the Operator and GMPTE. Access can be made to the east of the bridge by a fire escape located in a recess at outbound Chainage 1161. Alternatively, future access can be obtained to the west of the bridge down the Metrolink route via the new Stadium station stop. These parapets have an integrally formed coping detail.

3.8 Materials and Finishes

Reinforced Concrete:	All structural elements will be constructed from Grade C50 mixed and placed in accordance with the 'Manual of Contract Documents for Highway Works Volume 1. Specification for Highway Works Series 1700: Structural Concrete'. For details of reinforcement refer to drawing number S/29/40 rev C2 and S/29/41 to 42 rev C1.
Waterproofing:	Spray applied to the top of the deck in accordance with the 'Manual of Contract Documents for Highway Works Volume 1: Specification for Highway Works Series 2000: Waterproofing for Concrete Structure'. The top of Forge Lane Bridge has a longitudinal fall of 1 in 150 to allow water to drain off the structure.
Movement and Construction Joints:	No movement joints are required in the deck and edge beam of new Forge Lane Bridge. Movement joints are required in the parapets as shown on the drawings. Construction joints are to be located by the Contractor and agreed with the Structural Engineer prior to commencing any works.
Finishes:	The soffit of Forge Lane Bridge will have a minimum class F3 finish. The parapets and exposed surfaces of the edge beam will also have a F3 finish. The parapets will be treated with an anti-graffiti coating as indicated on the drawings. (Wherever possible the minimum class F3 finish will be enhanced to class F4).

4. DESIGN / ASSESSMENT CRITERIA

4.1 Live Loading/Headroom

4.1.1 HA Loading

HA UDL 63.6 kN/m of notional lane width. KEL of 120 kN/motional lane width.

4.1.2 HB Loading

The bridge has been checked for 30 units HB loading, applied independently of HA loading in a 3.6m lane down the centre line of the deck. (This has been discussed previously with MEDC, in their capacity as TAA for this structure).

4.1.3 Footway or Footbridge Live Loading

Not applicable.

4.1.4 Provision for exceptional abnormal loads

Not applicable.

4.1.5 Any Special loading not covered above

(i) Horizontal collision loads from Metrolink carriage applied to contiguous bored piles in derailment case.

(ii) 2.0m depth of surcharge from fill above the bridge deck.

4.1.6 Department heavy or high load route requirements and arrangements being made to preserve the route

Not applicable.

4.1.7 Minimum Headroom Provided

The clearance from rail level to the soffit of new Forge Lane Bridge is 5.236m.

4.1.8 Authorities Consulted and Requirement

1) Her Majesty's Railway Inspectorate (HMRI)

The track alignments, clearances and impact loads have been designed in consultation with the HMRI. HMRI have reviewed the design and confirmed (by letter) they have no objection to the Metrolink proposals, all in accordance with the Railways and Other Transport Systems (Approval of Works Plant and Equipment) Regulations 1994.

2) Manchester City Council – Highways

In provisional discussions the Highways Department at Manchester City Council indicated that they preferred spray applied waterproofing products. The Department's experience was that spray applied waterproofing products were more robust, and had a longer life before requiring maintenance than waterproof lining.

3) Manchester 2002

Manchester City Council Operational Services are being consulted on issues relating to traffic management, access, earthworks, site delineation and security during construction.

4) Manchester City Council – Planning

Planning approval for prop beams, parapets and other structural has now been obtained. Specific, planning approvals for parapet finishes at new Forge Lane Bridge is being sought by GMPTE Metrolink.

MCC Planning/M2002 are also fully aware of the reduction of the highway to single lane, only, across the new Forge Lane Bridge.

5) Statutory Utilities

Statutory utilities have been consulted with regard to minimum clearances, necessary diversions or temporary works.

Additional authorities consulted concerning this Advanced Works Project are as follows: -

- Greater Manchester County Fire Service
- British Waterways (twice)
- Environmental Agency
- Manchester Environment and Development Consultancy (MEDC); Agent for Sewerage for United Utilities.
- Greater Manchester Police
- Transco
- Manchester City Council –Special Projects Group (City of Manchester Stadium)
- Norweb
- United Utilities (North West Water)
- The Coal Authority (via GMPTE)
- Wardell Armstrong (consultants), relating to mineworking treatments
- Manchester City Council – Environmental Health
- British Telecom

4.2 List of Relevant Design Standards

Refer to Appendix A.

4.3 Proposed Departures from Documents given in 4.2

Non proposed.

4.4 Proposed methods of dealing with aspects not covered by Documents given in 4.2

No proposal.

5. STRUCTURAL ANALYSIS

5.1 Methods of analysis proposed for superstructure, substructure and foundations

5.1.1 Superstructure

5.1.1.1 Model

The superstructure of Forge Lane Bridge is comprised of a typically 450mm deck, 2100 deep x 1000mm edge beam and integral P6 parapets; forming a 'U' section in cross-sections.

The bridge superstructure has been modelled as a 12.5m x 8m grillage, with elements defined with the equivalent section stiffnesses. A first order elastic analysis of this model was completed to generate forces and displacements.

5.1.1.2 Loading

LIVE: -

HA loading (calculated for a 1m strip of deck) has been applied across the whole bridge deck.

An independent check has been made for a 10m long 30 unit HB vehicle, positioned centrally in a 3.6m wide lane on the deck, to give the most adverse loading.

COMBINATION: -

The following load combinations have been considered:

Combination One: a) Dead, superimposed dead (fill), HA alone

b) Dead, superimposed dead (fill), MB alone

Combination Two: a) Dead, superimposed dead (fill) HA alone, wind

b) Dead, superimposed dead (fill) HB alone, fill.

NOTE: As the bridge is at normal height above ground; has a span of less than 20m and is approximately 10m wide, a wind pressure of 6kN/m^2 has been considered on the parapets and edge beam.

Combination Four:

a) Combination Four loading has been applied. Specifically the global affects of a vehicle collision with the high containment parapets have been considered on the edge beam

b) In addition, accidental skidding, longitudinal loads and local affects of vehicle collision have been considered in separate combination four load cases.

The affects of temperature have been considered in the specification of the bearings, and provision made for early thermal shrinkage and shrinkage in sizing of reinforcement

Parapets have been designed separately in accordance with the guidance for P6 insitu concrete parapets in 'BD52/93 The Design of Highway Bridge Parapets'.

5.1.2 Substructure and Foundations

The 2150mm wide by 1500mm deep abutment beam forms the substructure for Forge Lane Bridge. This abutment beam is a locally widened section of a continuous typically 1750 x 1250mm deep capping beam spanning from Outbound Chainage 1062 to 1161. This capping beam ties the contiguous piles and diaphragm retaining walls together enabling them to be propped at the top at approximately 10m centres.

The capping beam has been modelled as a 2D dimensionally representative continuous beam. The props at appropriate centres have been modelled as springs with equivalent axial stiffness. A horizontal earth pressure load generated from worst credible soil parameters has been applied along the whole length of the beam.

The resultant load from Forge Lane Bridge has been applied as a vertical point load beneath the bearing points of the edge beam.

The 1800 diameter contiguous bored piles form the foundations of the bridge. The contiguous bored pile design takes account of the construction sequence adopted and is analysed using the computer programme "Wallap". This will carry out two separate types of analysis.

(i) Limit equilibrium in order to determine the factor of safety according to the strength factor method for each construction stage considered.

(ii) Bending Moment and displacement analysis by modelling the stage by stage development of forces and wall movements as construction proceeds. The wall and soil are modelled as a beam and springs.

The limit equilibrium calculations are carried out using both the moderately conservative and worst credible soil parameters for both the temporary and permanent excavation levels to ensure that the appropriate factor of safety as indicated within CIRIA 104 Table 5 are adhered to. In addition to the 1200mm temporary excavation an unplanned excavation of 500mm is also considered in combination with the worst credible soil parameters to ensure that wall stability is maintained. The design adopts the deepest wall toe level required to fulfil all of the aforementioned criteria.

5.2 Description and diagram of idealised structure to be used for analysis

Refer to Appendix B.

5.3 Assumptions intended for calculation of structural element stiffness

The equivalent stiffness of Forge Lane Bridge Deck, edge beams; deck and parapet have been determined from section sizes. A long term concrete modulus has been applied to these elements (14kN/mm^2). Because the roof slab is in compression it has been assumed that a short-term concrete modulus applies to this element (28kN/mm^2). WALLAP analysis for the contiguous pile supports has looked at the effects of both short and long term concrete modulii.

5.4 Earth Pressure Coefficients (ka, ko or kp) to be used in the design of earth retaining elements

Earth pressures have been derived from an assessment of the available data and are shown in Table 1.

TABLE OF SOIL PARAMETERS

STRATA	DESIGN APPROACH	phi'	C'	ko	ka (kac)	kp (kpc)	E' kN/m²	dE'/dz kN/m²m
Made ground	Worst credible	26	0	0.560	0.337	3.442	5000	0
	Moderately conservative	28	0	0.530	0.309	3.868	5000	0
								c
Glacial Till – 1	Worst credible	28	0	1.0	0.309	3.868	33000	0
					(1.300)	(5.395)		
	Moderately conservative	31	0	1.0	0.271	4.653	54000	0
					(1.213)	(6.080)		
Glacial Till – 2	Worst credible	28	2	1.0	0.309	3.868	33000	9000
					(1.300)	(5.395)		
	Moderately conservative	31	2	1.0	0.271	4.653	54000	15000
					(1.213)	(6.080)		
Coal Measures – 1	Worst credible	28	0	1.0	0.309	3.868	150000	0
					(1.300)	(5.395)		
	Moderately conservative	28	2	1.0	0.309	3.868	150000	0
					(1.300)	(5.395)		
Coal Measures – 2	Worst credible	28	5	1.0	0.309	3.868	250000	0
					(1.300)	(5.395)		
at 1.5m pen	Moderately conservative	28	10	1.0	0.309	3.868	250000	0
					(1.300)	(5.395)		

6. GROUND CONDITIONS

6.1 The recommendations of interpretative soils report to be used in the design are generally accepted with a revision to the parameters as defined in Table 1.

6.2 Ground Conditions

Made Ground	60.5 to 58.8mAOD
Glacial Till	58.8 to 46.8mAOD
Weathered Coal Measures	46.8 to 44.3mAOD
Coal Measures	below 44.3mAOD

The abutments, the ultimate support for Forge Lane bridge are supported by 4 no. 1.8m diameter piles with a toe level of 42mAOD (approximately 2.5m embedded into the underlying Coal Measures). Each of these 4 no. piles has been designed for a vertical load of 3400kN ULS) and 1800kN (SLS). The anticipated settlement of these piles under an SLS loading of 1800kN is <5mm. Total and differential settlements of 5mm is allowed for in the design of the structure.

6.3 The embedded retaining walls beneath Forge Lane Abutment Beam are anticipated to experience a maximum horizontal deflection in the order of 10mm. This is based upon the calculated values from the Wallap analysis, previous experience and empirical methods.

6.4 Sulphate and pH tests have been undertaken on soil and groundwater samples from across the site. The results from these tests when compared against the recommendations provided in BRE Digest 363[12] generally indicate conditions for Class 2 concrete

6.5 Mine Workings

The following seams subcrop in the vicinity of the proposed works: -

- Bradford 4 Foot Seam
- Bradford ¾ Seam

It is intended to grout these seams to a depth of 10 x seam thickness below rockhead. The plan extent is defined as a plane commencing from a point at ground level 5m beyond the edge of structures extending at 30 degrees from the vertical to intersect the seam to be grouted.

In addition to mine workings, 3 shafts were proven to be within the vicinity of the works. These have now been backfilled and capped.

7. CATEGORY OF STRUCTURE

7.1 Proposed Category of Structure

Category II

7.2 If Category III, name of proposed Independent Checkers

Not required.

7.3 Erection proposals or temporary works for which the contractor will be required to arrange an independent check listing the parts of the structure affected.

The Contractor is, it is understood, currently seeking separate comment/approvals from MEDC with specific regard to the interaction of Temporary Works for Utilities Support at the new Forge Lane Bridge structure, insofar as this may impact upon the existing Forge Lane Bridge structure across the (adjacent) Ashton Canal.

8. DRAWINGS AND DOCUMENTS

8.1 List of drawings (including numbers) and documents accompanying this submission

1. Drawing Number 67313 C-00-006 Rev E General Arrangement CH 975 to 1400 Sheet 1 of 2.
2. Drawing Number 67313 C-00-007 Rev D General Arrangement CH 975 to 1400 Sheet 1 of 2.
3. Drawing Number 67313 S/29/040 Rev C2 Reinforcement Details Forge Lane Bridge Deck, Sheet 1.
4. Drawing Number 67313 S/29/041 Rev C1 Reinforcement Details Forge Lane Bridge Deck, Sheet 2.
5. Drawing Number 67313 S/29/042 Rev C1 Reinforcement Details Forge Lane Bridge Deck, Sheet 3.
6. Drawing Number 67313 S/17/015 Rev C1 General Arrangement Forge Lane Crossing.
7. Drawing Number 67313 S-17-016 Rev C3 Sections Forge Lane Crossing.
8. Drawing Number 67313 C/09/01 Rev A Proposed Forge Lane Bridge.
9. Drawing Number 67313 S/17/007 Rev C4 General Arrangement Outbound CH 1040 to 1100, Sheet 2 of 9.
10. Drawing Number S/17/008 Rev C4 General Arrangement Outbound Chainage 1100 to 1160, Sheet 3 of 9.
11. Drawing Number S/17/009 Rev C6 General Arrangement Outbound Chainage 1160 to 1220, Sheet 4 of 9.

9. THE ABOVE ~~DESIGN~~ AND CONSTRUCTION PROPOSALS ARE SUBMITTED FOR REVIEW.

Signed
Name DARREN PAINE
TEAM LEADER DESIGNER
Engineering Qualifications B.ENG. MICE
Name of Organisation ARUP
Date 23.6.02

10. THE ABOVE DESIGN AND CONSTRUCTION PROPOSALS ARE SUBMITTED FOR REVIEW.

Signed
In the Capacity of ENGINEERING DESIGN MANAGER
Name ALAN CAWYN BROOKES
~~CONSULTANT~~ CONTRACTOR
Name of Organisation AMEC CAPITAL PROJECTS LTD.
Date 21 JUNE 2002.

11. THE ABOVE DESIGN AND CONSTRUCTION PROPOSALS ARE SUBMITTED FOR REVIEW.

Signed
TAA Manchester City Council

Name J.E. MULLEN

Date 7.6.02

The above Acceptance in Principle means that the Technical Appraisal Authority has appraised and is satisfied that the proposed contains a concept for the structure, which is acceptable for tendering purposes.

Annex 2/8 to Part 3 of Schedule 1
Technical Approval Schedule "TAS" (February 2000)

Schedule of Design Documents relating to Highway Bridges and Structures

STANDARD	Tick if required
1. BRITISH STANDARDS	
~~BS 5268: Part 2: Structural Use of Timber~~	
BS 5400 - Steel Concrete and Composite Bridges:	
Part 1: 1988 -General Statement (see BD 15 - DMRB 1.3.2)	✓
Part 2: 1978 - Specification for Loads (implemented by BD 37 – DMRB 1.3)	✓
~~Part 3: 1982 - CP for Design of Steel Bridges (see BD 13 - DMRB 1.3)~~	
Part 4: 1990 - CP for Design of Concrete Bridges (see BD 24 – DMRB 1.3.1)	✓
~~Part 5: 1979 - CP for Design of Composite Bridges (see BD 16 - DMRB 1.3)~~	
Part 9: 1983 - Bridge Bearings (see BD 20 - DMRB 2.3.1)	✓
~~Part 10: 1980 - CP for Fatigue (see BD 9 - DMRB 1.3)~~	
~~BS 5628: Code of Practice for Use of Masonry~~ ~~Part 1: 1992 - Structural Use of Unreinforced Masonry~~	
BS 5930: 1981- Code of Practice for Site Investigations	✓
BS 6031: 1981- Code of Practice for Earthworks	✓
~~BS 6651: 1992 - Code of Practice for Protection of Structures Against Lightning~~	
~~BS 6779: Part 1: 1992 Specification for Vehicle Containment Parapets of Metal Construction (see BD 52 - DMRB 2.3.3)~~	
~~BS 7668 1994 - Specification for weldable structural steel hot finished structural hollow sections in weather resistant steels.~~	
~~BS 7818 1995 - Pedestrian Restraint Systems in Metal~~	
~~BS 8004: 1986 - Foundations (see BD 32 - DMRB 2.1)~~	
~~BS8006: 1985 - Code of Practice for Strengthened /Reinforced Soils and Other Fills (see BD 70 - DMRB 2.1.5)~~	
~~BS 8118: Structural Use of Aluminium~~	

STANDARD	Tick if required
~~BS EN 40.1 Lighting Columns: Part 1: 1992 Definitions and Terms~~ ~~BS 5649: Part 2: 1978 Dimensions and Tolerances~~ ~~EN 40: Part 2~~ ~~BS 5649: Part 3: 1982 Specification for Materials and Welding Requirements~~ ~~BS 5649: Part 4: 1982 Recommendations for Surface Protection of Metal Lighting Columns~~ ~~EN 40: Part 4~~ ~~BS 5649: Part 5: 1982 Specification for Base Compartments and Cableways~~ ~~EN 40: Part 5~~ ~~BS 5649: Part 6: 1982 Specification for Design Loads~~ ~~EN 40: Part 6~~ ~~BS 5649: Part 7: 1985 Method for Verification of Structural Design by Calculation~~ ~~BS 5649: Part 8: 1982 Method for Verification of Structural Design by Testing~~ ~~EN 40: Part 8~~ ~~BS 5649: Part 9: 1982 Specification of Special Requirements for Reinforced and Prestressed Concrete Lighting Columns~~ ~~EN 40: Part 9~~	
~~BS EN 10025: 1993 Hot Rolled Products of Non-alloy Structural Steels Technical Delivery Conditions (2nd edition)~~	
~~BS EN 10113: Part 1 1993 Hot Rolled Products in Weldable Fine Grain Structural Steels Part 1. General Delivery Conditions.~~	
~~BS EN 10113: Part 2 1993 Hot Rolled Products in Weldable Fine Grain Structural Steels Part 2. Delivery Conditions for Normalised Rolled Steels.~~	
~~BS EN 10113: Part 3 1993 Hot Rolled Products in Weldable Fine Grain Structural Steels Part 3. Delivery Conditions for Thermomechanical Rolled Steels~~	
~~BS EN 10155: 1993 Structural Steels with Improved Atmospheric Corrosion Resistance. Technical Delivery Conditions.~~	
~~BS EN 10210: Part 1:1994 Hot finished structural hollow sections of non alloy and fine grain structural steels~~ ~~Part 1 Technical delivering conditions~~	
2. BRITISH STANDARD CODES OF PRACTICE	
~~CP 2 Earth Retaining Structures (see BD 30 DMRB 2.1)~~	
~~CP 2004 Foundations~~	

3.	**DOT PUBLICATIONS**	
Specification for Highway Works and Notes for Guidance (1998 Volumes 1 and 2)		✓
Highway Construction Details 1998 Consolidated Edition (incorporating 1993,1994,1998 amendments Volume 3)		✓
~~Simplified Tables of External Loads on Buried Pipelines (1986)~~		
4.	**MISCELLANEOUS**	
~~Circular Roads No. 61/72 Routes for Heavy and High Abnormal Loads.~~		
~~BE 1/74~~	~~The Independent Checking of Erection Proposals and Temporary Works Details for Major Highway Structures on Trunk Roads and Motorways (and Amendment List No. 1 dated 17/4/78) (DMRB 1.2.2).~~	
~~BE 8/75~~	~~Painting of Concrete Highway Structures (DMRB 2.4)~~	
~~BE 7/77~~	~~Departmental Standard (Interim) Motorway Sign/Signal Gantries (DMRB 2.2)~~	
~~BE 13~~	~~Fatigue Risk in Bailey Bridges (DMRB 3.4)~~	
~~IM 5~~	~~Formation of Continuity Joints in Bridge Decks (DMRB 2.2)~~	
~~HA 40/89~~	~~Determination of Pipe and Bedding Combinations for Drainage Works~~	
~~HA 65/94~~	~~Design Guide for Environmental Barriers~~	
~~HA 66/95~~	~~Environmental Barriers -- Technical Requirements~~	
~~HA 68/94~~	~~Design Methods for the Reinforcement of Highway Slopes by Reinforced Soil and Soil Nailing Techniques~~	
~~HA 78/96~~	~~Design of Outfalls for Surface Water Channels~~	
5.	**STANDARDS AND ADVICE NOTES**	
IA 25	Measures to Minimise The Risk Of Sulphate Attack (Including Thaumasite) (DMRB 2.1)	✓
~~TD 9/93~~	~~Highway Link Design~~	
~~TD 19/85~~	~~Safety Fences and Barriers (and Amendment No. 1) (and Interim Advice Note IA 26)~~	
~~TD 27/96~~	~~Cross Sections and Headrooms~~	
~~TD 32/93~~	~~Wire Rope Safety Fence~~	
~~TD 36/93~~	~~Subways for Pedestrians and Pedal Cyclists. Layout and Dimensions~~	
~~BD 2/79~~	~~Technical Approval of Highway Structures on Motorway and Other Trunk Roads Part IV: Procedures for Lighting Columns~~	
~~BD 2/89~~	~~Technical Approval of Highway Structures on Motorway and Other Trunk Roads Part I: General Procedures~~	

BD 2/89	Technical Approval of Highway Structures on Motorways and Other Trunk Roads Part III: Procedures for Service Tunnels.	✓
BA 32/89	Technical Approval of Highway Structures on Motorway and Other Trunk Roads Part I: General Procedures	✓
~~BD 7/81~~	~~Weathering Steel for Highway Structures~~	
~~BD 9/81~~	~~Implementation of BS 5400 Part 10: 1980, CP for Fatigue~~	
~~BA 9/81~~	~~The Use of BS 5400 Part 10: 1980, CP for Fatigue (and Amendment No.1)~~	
BD 10/97	Design of Highway Structures in Areas of Mining Subsidence	✓
~~BD 12/95~~	~~Design of Corrugated Steel Buried Structures with Span not Exceeding 8m, Including Circular Arches~~	
~~BD 13/90~~	~~Design of Steel Bridges - Use of BS 5400: Part 3: 1982~~	
~~BA 19/85~~	~~The Use of BS 5400: Part 3: 1982~~	
BD 15/92	General Principles for the Design and Construction of Bridges - Use of BS 5400: Part 1: 1988	✓
~~BD 16/82~~	~~Design of Composite Bridges Use of BS 5400: Part 5: 1979 (and Amendment No. 1)~~	
BD 20/92	Bridge Bearings - Use of BD 5400: Part 9: 1983	✓
~~BD 21/97~~	~~The Assessment of Highway Bridges and Structures (and Amendment No. 1)~~	
~~BA 16/97~~	~~The Assessment of Highway Bridges and Structures (and Amendment No. 1)~~	
BD 24/92	The Design of Concrete Highway Bridges and Structures - Use of BS5400: Part 4: 1990 (and Interim Advice Note IA.5 dated July 1996)	✓
~~BD 26/99~~	~~Design of Lighting Columns~~	
~~BD 27/86~~	~~Materials for the Repair of Concrete Highway Structures~~	
BD 28/87	Early Thermal Cracking of Concrete (and Amendment No.1)	✓
BA 24/87	Early Thermal Cracking of Concrete (and Amendment No.1)	✓
~~BD 29/87~~	~~Design Criteria for Footbridges~~	
~~BD 30/87~~	~~Backfilled Retaining Walls and Bridge Abutments~~	
~~BD 31/87~~	~~Buried Concrete Box Type Structures~~	
~~BD 32/88~~	~~Piled Foundations~~	
~~BA 25/88~~	~~Piled Foundations~~	

BD 33/94	Expansion Joints for Use in Highway Bridge Decks	✓
BA 26/94	Expansion Joints for Use in Highway Bridge Decks	✓
~~BD 34/90~~	~~Technical Requirements for the Assessment and Strengthening Programme for Highway Structures. Stage 1 - Older Short Span Bridges and Retaining Walls.~~	
~~BA 34/90~~	~~Technical Requirements for the Assessment and Strengthening Programme for Highway Structures. Stage 1 - Older Short Span Bridges and Retaining Walls.~~	
~~BD 35/99~~	~~Quality Assurance Scheme for Paints and Similar Protective Coatings~~	
~~BA 27/99~~	~~Quality Assurance Scheme for Paints and Similar Protective Coatings~~	
BD 36/92	Evaluation of Maintenance Costs in Comparing Alternative Designs for Highway Structures	
BA 28/92	Evaluation of Maintenance Costs in Comparing Alternative Designs for Highway Structures	✓
BD 37/88	Loads for Highway Bridges	✓
~~BD 41/97~~	~~Reinforced Clay Brickwork Retaining Walls of Pocket Type and Grouted Cavity Type Construction.~~	
BD 42/94	Design of Embedded Retaining Walls & Bridge Abutments (Unpropped or propped at the Top)	✓
BD 43/90	Criteria and Material for the Impregnation of Concrete Highway Structures	✓
BA 33/90	Impregnation of Concrete Highway Structures (and Addendum May 1990)	✓
~~BD 44/95~~	~~The Assessment of Concrete Highway Bridges and Structures~~	
~~BA 44/96~~	~~The Assessment of Concrete Highway Bridges and Structures~~	
~~BD 45/93~~	~~Identification Marking of Highway Structures~~	
~~BD 46/92~~	~~Technical Requirements for the Assessment and Strengthening Programme for Highway Structures. Stage 2 - Modern Short Span Bridges~~	
BD 47/99	Waterproofing and Surfacing of Concrete Bridge Decks	✓
BA 47/99	Waterproofing and Surfacing of Concrete Bridge Decks	✓
~~BD 48/93~~	~~The Assessment and Strengthening of Highway Bridge Supports~~	
~~BD 49/93~~	~~Design Rules for Aerodynamic Effects on Bridges~~	
~~BD 50/92~~	~~Technical Requirements for the Assessment and Strengthening Programme for Highway Structures. Stage 3 - Long Span Bridges~~	
~~BD 51/98~~	~~Design Criteria for Portal and Cantilever Sign/Signal Gantries~~	
BD 52/93	The Design of Highway Bridge Parapets	✓

~~BD 53/95~~	~~Inspection and Records for Road Service Tunnels~~	
~~BD 54/93~~	~~Post-tensioned Concrete Bridges. Prioritisation of Special Inspections~~	
~~BA 50/93~~	~~Post-tensioned Concrete Bridges. Planning, Organisation and Methods for Carrying Out Special Inspections.~~	
~~BD 56/96~~	~~The Assessment of Steel Highway Bridges and Structures~~	
~~BA 56/96~~	~~The Assessment of Steel Highway Bridges and Structures~~	
BD 57/95	Design for Durability	✓
BA 57/95	Design for Durability	✓
~~BD 58/94~~	~~The Design of Concrete Highway Bridges and Structures with External and Unbonded Prestressing~~	
~~BA 58/94~~	~~The Design of Concrete Highway Bridges and Structures with External and Unbonded Prestressing~~	
BD 60/94	The Design of Highway Bridges for Vehicle Collision Loads	✓
~~BD 61/96~~	~~The Assessment of Composite Highway Bridges and Structures~~	
~~BA 61/96~~	~~The Assessment of Composite Highway Bridges and Structures~~	
BD 62/94	As Built, Operational and Maintenance Records for Highway Structures	✓
~~BD 63/94~~	~~Inspection of Highway Structures~~	
~~BA 63/94~~	~~Inspection of Highway Structures~~	
~~BD 65/97~~	~~Design Criteria for Collision Protection Beams~~	
~~BD 67/96~~	~~Enclosure of Bridges~~	
~~BA 67/96~~	~~Enclosure of Bridges~~	
~~BD 68/97~~	~~Crib Retaining Walls~~	
~~BA 68/97~~	~~Crib Retaining Walls~~	
~~BD 70/97~~	~~Strengthened/ Reinforced Soils and Other Fills for Retaining Walls and Bridge Abutments. (Use of BS 8006: 1995)~~	
BD 74/00	Foundations	✓
~~BD 78/99~~	~~Design of Road Service Tunnels~~	
~~BA 30/94~~	~~Strengthening of Concrete Highway Structures Using Externally Bonded Plates.~~	
~~BA 35/90~~	~~The Inspection and Repair of Concrete Highway Structures~~	
~~BA 36/90~~	~~The Use of Permanent Formwork~~	
~~BA 37/92~~	~~Priority Ranking of Existing Parapets~~	

~~BA 38/93~~	~~Assessment of the Fatigue Life of Corroded or Damaged Reinforcing Bars~~	
~~BA 39/93~~	~~Assessment of Reinforced Concrete Half joints~~	
BA 40/93	Tack Welding of Reinforcing Bars	✓
~~BA 41/98~~	~~The Design and Appearance of Bridges~~	
~~BA 42/96~~	~~The Design of Integral Bridges~~	
~~BA 43/94~~	~~Strengthening, Repair and Monitoring of Post tensioned Concrete Bridge Decks~~	
~~BA 48/93~~	~~Pedestrian Protection at Head Walls, Wing Walls and Retaining Walls~~	
~~BA 51/95~~	~~The Assessment of Concrete Structures Affected by Steel Corrosion~~	
~~BA 52/94~~	~~The Assessment of Concrete Structures Affected by Alkali Silica Reaction~~	
~~BA 53/94~~	~~Bracing Systems and the use of U Frames in Steel Highway Bridges~~	
~~BA 54/94~~	~~Load Testing for Bridge Assessment~~	
~~BA 55/94~~	~~The Assessment of Bridge Substructures and Foundations, Retaining Walls and Buried Structures~~	
~~BA 59/94~~	~~Design of Highway Bridges for Hydraulic Action~~	
~~BA 79/98~~	~~The Management of Sub Standard Highways Structures~~	
~~BA 80/99~~	~~Use of Rock Bolts~~	

APPENDIX B

Analysis Model and Associated Loading

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	1 of	

Job Title METROLINK PHASE IIC ADVANCED WORKS FORGE LANE

Member/Location

Drg. Ref.

Made by WE Date 11-12-01 Chd.

RIF	TEXT	OUTPUTS

Provide reinforcement detail for Forge lane superstructure.

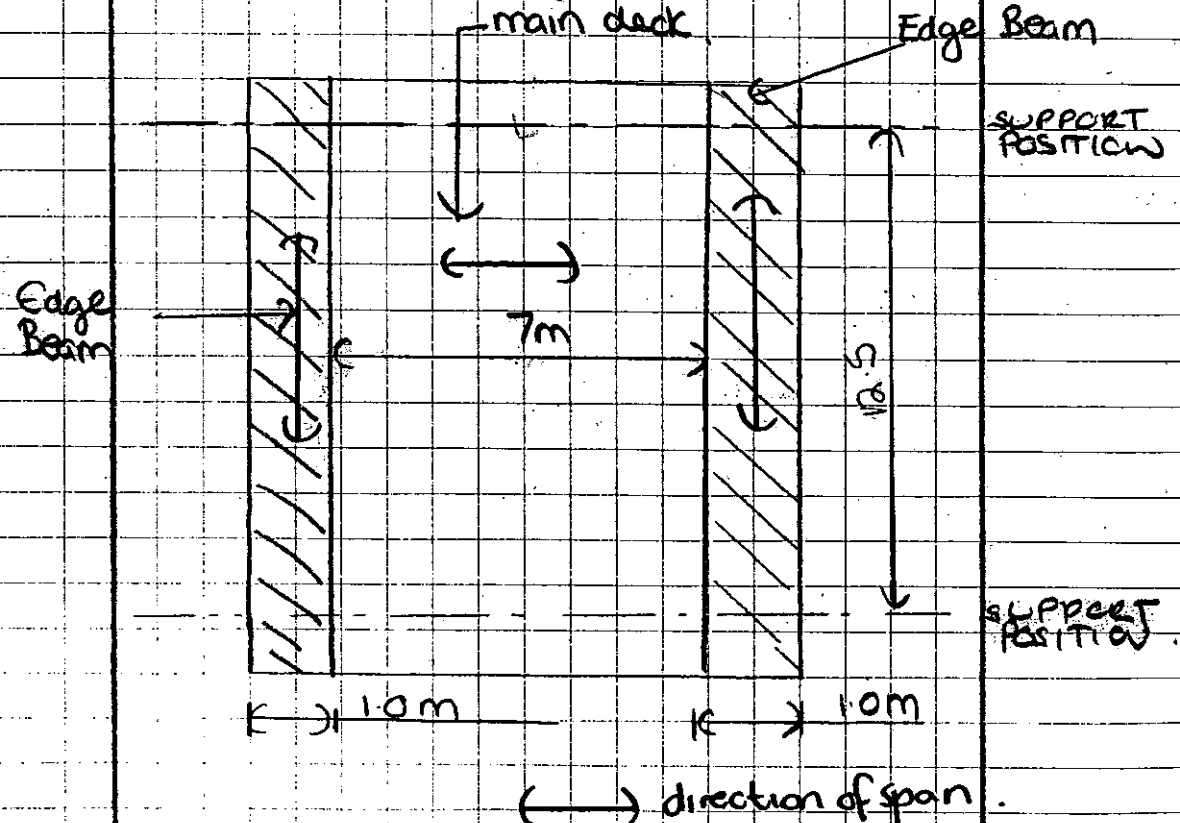
Design Forge lane Bridge in accordance with BS 5400 Part 4 1990 and BD37/01 "Loads for Highway Bridges"

LOADS

Forge lane Bridge is to be designed for HA loading only.

The cross-section of the deck is shown on S-17-016 rv C1 attached.

Forge lane bridge spans as shown below



AP20

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	2 of	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS FORGE LANE

Drg. Ref.

Made by LOE Date 11-12-01 Chd:

REF	TEXT	OUTPUTS
	LOADS	
	DEAD = 0.5m concrete deck ← Now reduced to 450 thick.	
	= 12 kN/m	12 kN/m.
	SUPERIMPOSED DEAD = 40 kN/m ← 2m of fill	40 kN/m.
	LIVE = HA only. Loaded length = width of tunnel roof slab	
	= 12.5m.	
	∴ Table 13 HA = 636 kN/m.	
3.2.9.3	Carriageway width 8.5m (refer to S-17-001 RWA attacted). number of notional lanes = 2. 2.512 = 1.25m. however notional lane shall not be taken less than 2.5m ∴ notional lane = 2.5m	
	HA = 636/2.5 = 25.44 kN/m.	
6.2.2	KEL per notional lane = 120 kN. = 120/2.5 = 48 kN/m	
6.4.1	The KEL and HA load needs to be multiplied by the appropriate lane factor.	
Table 14	T_{600} = 0.274 bL = 0.274 × 2.5 = 0.685	
	HA = 25.44 × 0.685 = 17.5 kN/m	17.5 kN/m
	KEL = 48 × 0.685 = 33 kN/m	33 kN/m.
6	The bridge in the temporary condition is to take construction traffic across its full width ∴ the whole deck is designed to take HA loading	

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	3 of	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS · FORGE LANE

Drg. Ref.

Made by UK Date 08-01-02 Chd.

REF	TEXT	OUTPUTS
5.3	WIND	
	Bridge span less than 20m, width approximately 10m and at normal height above ground	
	∴ check for a 6 kN/m² pressure on vertical projecting area of the bridge.	← Seems high
5.4	TEMPERATURE - effective bridge temperatures cause loading in superstructure due to:-	
	i) temperature restraint. ii) frictional bearing restraint iii) temperature difference.	
5.42	Fig 7 minimum shade air temperature = -16°C.	
	Fig 8 maximum shade air temperature = 35°C,	
	return period = 1 in 120 years.	
5.43	Minimum and maximum effective bridge temperature.	
	From Figure 9 have a Group 4 structure.	
	∴ From table 10 minimum effective bridge temp = -10°C.	
	From table 11 maximum effective bridge temp = 35°C.	

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	4 of	

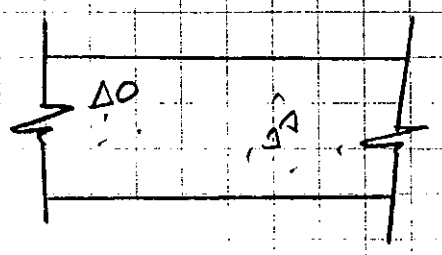
Member/Location

Job Title METROLINK PHASE III
ADVANCED WORKS FORGE LANE

Drg. Ref.

Made by WE Date 11-12-01 Chd.

REF	TEXT	OUTPUTS
	Adjust accordingly to Table 12. There will be at least 200mm of surfacing on the deck.	
	∴ Minimum effective bridge temp = −10 + 1 = −9	−9°C.
	∴ Maximum effective bridge temp = 35 − 2 = 33°C	33°C.
5.4.5	Temperature Difference.	
	Appendix C Table 24. ← deck is 0.5m thick 0.6m will give slightly more conservative temperature figures.	
	0.6 thick surface thickness = 200mm.	
	Positive Temperature Difference.	
	T_1 = 7.2	
	T_2 = 1.5	
	T_3 = 1.5	
	Reserve. Temperature Differences.	
	T_1 3.6	
	T_2 0.6	
	T_3 1.9	
	T_4 4.0.	



h=0.8m

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	5 of	

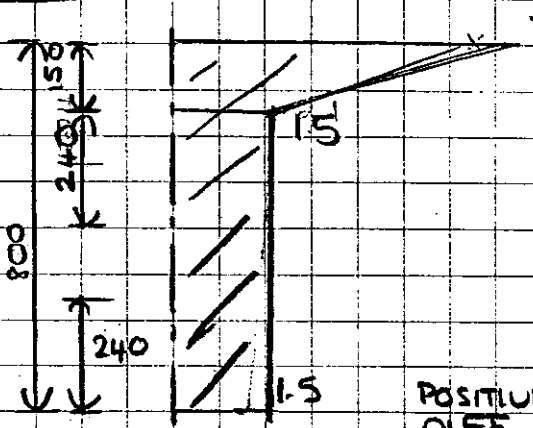
Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS FORGE LANE

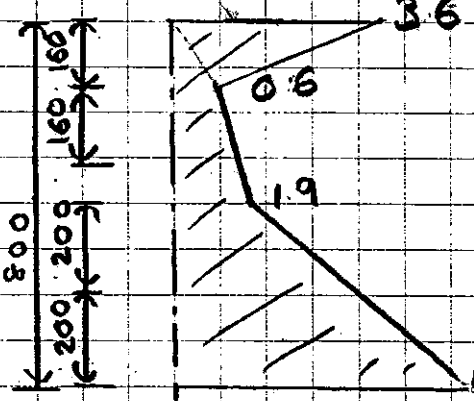
Drg. Ref.

Made by WE Date 11-12-01 Chd.

REF | TEXT | OUTPUTS



POSITIVE TEMP DIFF.



REVERSE TEMP DIFF.

5.4.5.2. Max positive temp diff coexist with effective bridge temp above 15°C

5.4.4. Effective bridge temp is the temp at time the structure is restrained

Bridge to be constructed in April in Manchester.
From the National Metrological office.
The minimum temp April in Manchester (1961-90) = 4.3°C.
The maximum temp April in Manchester (1961-90) = 11.6°C.

take mean as effective temperature at the time of constructn.

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	6 of	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS FORGE LANE.

Drg. Ref.

Made by WE Date 12-12-01 Chd.

REF	TEXT	OUTPUTS
	$= \frac{11.6 + 4.3}{2} = 7.95 = 8°C.$	
	At 8°C. coexst of effective bridge + max positive temp diff not applicable.	
	Maximum reversed temp diff shall coexist with effective bridge temp up to 2°C below max for group 4.	
	Max reseverse temp diff = 4.6 − 2.0 = 2.0°C.	
	8°C. the coexistance of effective bridge + ravered temp diff is not applicable.	
5.4.7	Nominal Range of movement.	
	effective bridge temp = 8°C.	
	Expansion up to max effective bridge temp. = 33 − 8 = 25°C	
5.4.6	$\alpha = 12 \times 10^{-6} / °C$	
	$\Delta e = 12 \times 10^{-6} \times 25 = 3 \times 10^{-4}$	
	$\Delta e = \frac{L_1 - L_2}{L_1} = 3 \times 10^{-4}$	
	$L_1 = 12500.$	
	$\therefore L_1 - L_2 = 3 \times 10^{-4} \times 12500 = 3.75mm.$	

AP20

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	7 of	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS FORGE LANE.

Drg. Ref.

Made by WE Date 12.12-01 Chd.

REF	TEXT	OUTPUTS
	Max movement = 3.75 mm due to expansion.	
	Contraction down to minimum effective bridge temp.	
	9 + 8 = 17°C.	
5.4.6	$\alpha = 12 \times 10^{-6}/°C$.	
	$\Delta e = 12 \times 10^{-6} \times 17$	
	$= 2.04 \times 10^{-4}$.	
	$\Delta e = \frac{L_1 - L_2}{L_1} = 2.04 \times 10^{-4}$	
	$L_1 - L_2 = 2.04 \times 10^{-4} \times 12500$	
	$= 2.55$ mm.	
	Max movement = 2.55 mm due to contraction	
	DESIGN MOVEMENT	
5.4.8.1	Expansion and contraction will not cause damage a structural collapse above the serviceability range ∴ design for movement @ SLS only.	
	SLS factor = 1.0	
	∴ Design movement	
	Contraction = 2.55 mm	Contraction 2.55
	Expansion = 3.75 mm.	Expansion = 3.75

XP20

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	8of	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS FORGE LANE

Drg. Ref.

Made by WE Date 08-01-02. Chd.

REF	TEXT	OUTPUTS.
6.7	LOADS DUE TO VEHICLE COLISION WITH PARAPETS — Have high containment LOCAL EFFECTS parapet Ultimate design moment of resistance + ultimate design shear resistance of a 4.5m length of parapet should be applied uniformly over 4.5m length of supporting element. In addition as have high containment an additional single vertical load of 175 kN shall be applied unifomally over a length of 3m at the top of the front face of the parapet. ultimate design moment of resistance + ultimate design shear resistance are in accordance with BD52/93 'The Design of Highway Bridge Parapets' ASSUME PARAPETS ON FORGE LANE BRIDGE WILL BE INSITU REINFORCE CONCRETE TABLE 4 : minimum ultimate moment of resistance at base of wall = 165 kN m/m (consider worst case of end section) * - bending in the vertical plane.	vertical load 175kN

AP20

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
87313	11 of	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS FORGE LANE.

Drg. Ref.

Made by WE Date 09-01-02 Chd.

REF | TEXT | OUTPUTS

SLS

DEAD = 1.0×1.0 = 1.0.

SUPERIMPOSED DEAD (OTHER LOADS) = 1.0×1.0 = 1.0

HA ALONE = 1.2×1.0 = 1.2

WIND = 1.0×1.0 = 1.0.

OUTPUTS

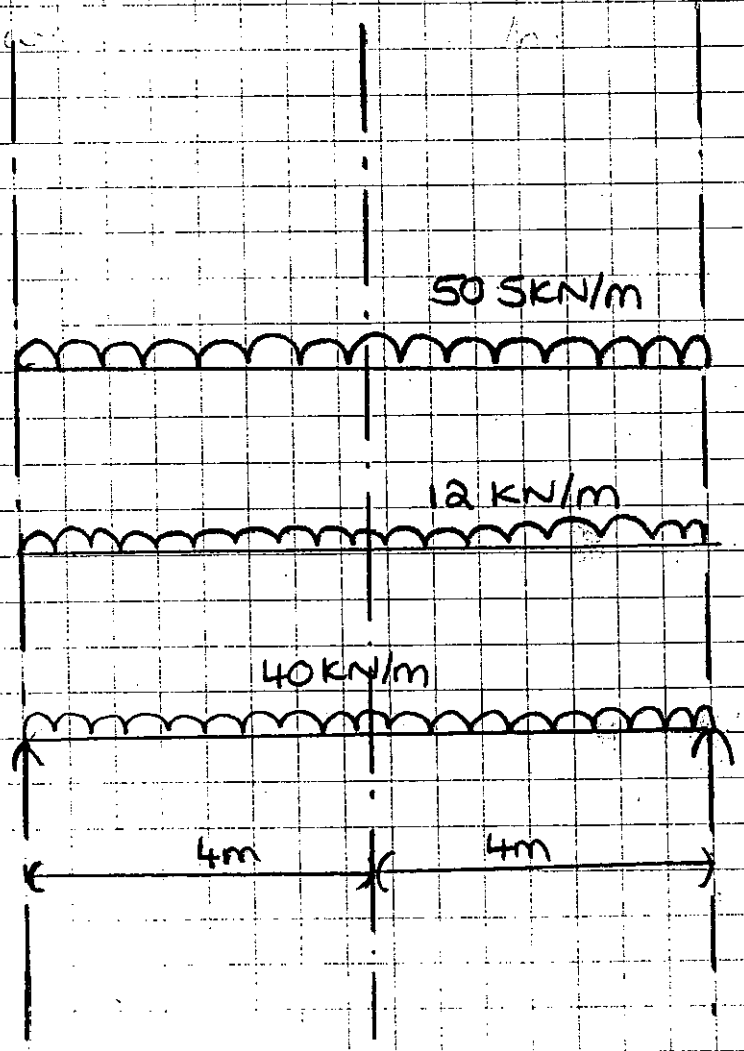
DEAD = 1.0

SUPERIMPOSED DEAD = 1.0.

HA ALONE

WIND = 1.0

LOADS APPLIED TO ONE METRE STRIP ACROSS WIDTH OF CARRIAGEWAY ON FORGE LANE BRIDGE (UNFACTORED)



HA+KEL ✓

DEAD ✓

SUPERIMPOSED DEAD - FILL ✓

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67813	14 of	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS FORGE LANE

Drg. Ref.

Made by Date Chd.

REF	TEXT	OUTPUTS
	10. PARAPET LOCAL EFFECTS ADDITIONAL SINGLE VERTICAL LOAD ULS (APPLIED END SPAN). ✓	
	11. PARAPET LOCAL EFFECTS ADDITIONAL SINGLE VERTICAL LOAD SLS (APPLIED MID SPAN) ✓	
	SLS FACTOR TABLE 1 = 1.15 58.5 × 1.15 = 67.3	
	12. PARAPET LOCAL EFFECTS ADDITIONAL SINGLE VERTICAL LOAD SLS (APPLIED END SPAN) ✓	
	13. PARAPET LOCAL EFFECT BENDING ✓ in vertical plane mid span right hand side of deck ULS (TABLE ONE FACTOR = 1.4 × 172.2 = 241.08 KNm/m)	
	14. As above but left hand side of deck. ✓	
	15. PARAPET LOCAL EFFECT ✓ BENDING IN VERTICAL PLANE, MIDSPAN, RIGHTHAND SIDE OF DECK. (SLS)	
	(TABLE ONE FACTOR SLS = 1.15 × 172.2 = 198.03 KNm/m)	
	16. As above but left hand ✓ side of deck.	
	17. PARAPET LOCAL EFFECT BENDING IN VERTICAL PLANE, END SPAN RIGHTHAND SIDE OF DECK @ ULS ✓	

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
6733	15 of	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS FOREHAND.

Drg. Ref.

Made by WE Date 10-01-02 Chd.

REF	TEXT	OUPUTS
	18. AS PER 17 BUT LEFT HAND SIDE OF DECK. ✓	
	19. PARAPET LOCAL EFFECTS BENDING IN VERTICAL PLANE, ENDSPAN RIGHTHAND SIDE OF DECK (SLS) ✓	
	20 AS ABOVE BUT LEFT HAND SIDE OF DECK ✓	
	21 PARAPET LOCAL EFFECTS BENDING IN HORIZONTAL PLANE, MIDSPAN RIGHTHAND SIDE OF DECK (ULS) ✓	
	(TABLE ONE FACTR = 1.4 62.5 × 1.4 = 87.5KNM)	
	22 AS 21 BUT LEFT HANDSIDE OF DECK ✓	
	23 PARAPET LOCAL EFFECTS BENDING IN HORIZONTAL PLANE, MIDSPAN RIGHTHAND SIDE OF DECK (SLS) ✓	
	(TABLE ONE FACTR 1.15 62.5 × 1.15 = 71.88)	
	24 AS 23 BUT LEFT HAND SIDE OF DECK. ✓	
	25 PARAPET LOCAL EFFECTS BENDING IN HORIZONTAL PLANE, ENDSPAN RIGHT HAND SIDE OF DECK (ULS) ✓	
	26 AS 25 BUT LEFT HAND SIDE OF DECK. ✓	

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	16 of	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS FORE GANE

Drg. Ref.

Made by WE Date 10-01-02 Chd. TP

REF	TEXT	OUTPUTS
	27. PARAPET LOCAL EFFECTS BENDING IN HORIZONTAL PLANE, END SPAN RIGHT HAND SIDE OF DECK (SLS) ✓	
	28 AS 27 BUT LEFT HAND SIDE OF DECK. ✓	
	29 HORIZONTAL TRANSVERSE SHEAR. MIDSPAN RIGHTHAND SIDE OF DECK ULS ✓	
	AS ABOVE	
	TABLE 1.4 × LOAD FACTOR = 1.4	
	220 × 1.4 = 308 KN/m	
	30 AS ABOVE BUT LEFT HAND SIDE ✓	
	31 HORIZONTAL TRANSVERSE SHEAR LOAD ✓ MID SPAN RIGHTHAND SIDE OF DECK SLS	
	TABLE 1 = LOAD FACTOR = 1.15.	
	220 × 1.15 = 253 KN/m	
	32 AS ABOVE + LEFT HAND SIDE ✓ OF THE BEAM	
	33 HORIZONTAL TRANSVERSE SHEAR LOAD END SPAN RIGHT HAND SIDE OF DECK ULS. ✓	
	34 AS ABOVE BUT LEFT HAND SIDE OF THE DECK. ✓	
	35 HORIZONTAL TRANSVERSE SHEAR LOAD END SPAN RIGHT HAND SIDE OF DECK SLS. ✓	
	36. AS ABOVE BUT LEFT HAND SDE	

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	17 of	

Member/Location

Job Title METROLINK PHASE III ADLANDS WORKS FORGE LANE

Drg. Ref.

Made by WE Date 16-01-02 Chd.

REF	TEXT	OUTPUTS

GLOBAL EFFECTS

The loads are applied over a length of 3m measured along the line of the parapet

37 PARAPET GLOBAL EFFECTS, SINGLE HORIZONTAL TRANSVERSE LOAD MID SPAN RIGHT HAND SIDE OF DECK ULS.

LOAD FACTOR TABLE 1 = 1.4.

BRIDGE STRUCTURE CONSIDERED TO BE LIGHT AS IT ONLY HAS A SHORT SPAN

500/3 × 1.4 = 233 KN/m ✓

38 AS ABOVE BUT LEFT HAND SIDE OF DECK ✓

39 PARAPET GLOBAL EFFECTS, SINGLE HORIZONTAL TRANSVERSE LOAD MID SPAN RIGHT HAND SIDE OF DECK ULS ✓

LOAD FACTOR TABLE 1 = 1.0
(AGAIN BRIDGE STRUCTURE IS CONSIDERED TO BE LIGHT)

500/3 × 1.0 = 167 KN/m

40 AS ABOVE BUT LEFT HAND SIDE ✓

41 PARAPET GLOBAL EFFECTS, SINGLE HORIZONTAL TRANSVERSE LOAD END SPAN RIGHT HAND SIDE OF DECK ULS ✓

42 AS ABOVE BUT LEFT HAND SIDE OF DECK. ✓

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	18 of	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS FORGE LANE

Drg. Ref.

Made by WE Date 16-01-02 Chd.

REF	TEXT	OUTPUTS

43 PARAPET GLOBAL EFFECTS SINGLE HORIZONTAL TRANSVERSE LOAD END SPAN RIGHT HAND SIDE OF DECK SLS.

44 AS ABOVE BUT LEFT HAND SIDE OF DECK. ✓

45. PARAPET GLOBAL EFFECTS SINGE VERTICAL LOAD MIDSPAN OF DECK ULS ✓

BRIDGE STRUCTURE CONSIDERED TO BE LIGHT AS IT ONLY HAS A SHORT SPAN. LOAD FACTOR TABLE 1=1.4

175/3 = 58.33 x 1.4 = 82 KN/m

46 PARAPET GLOBAL EFFECTS SINGLE VERTICAL LOAD MIDSPAN OF DECK = SLS

175/3 = 58.33 KN/m ✓

47 PARAPET GLOBAL EFFECTS SINGLE VERTICAL LOAD END SPAN OF DECK ULS ✓

48 PARAPET GLOBAL EFFECTS SINGLE VERTICAL LOAD END SPAN OF DECK SLS. ✓

LOCAL AFFECTS CONTINUED.

AS 6.7.1 states that the single vertical 175KN load which is applied over 3m, is to be applied

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313.	19 of	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS FOREGLANE.

Drg. Ref.

Made by LDE Date 16-01-02. Chd.

REF	TEXT	OUTPUTS
	"at the top of the front face of the parapet." Need to include a ecx moment for eccentricity. 175/3 x 0.5 = 29.16 kNm/m FACTOR TABLE 1 ULS = 1.4. 40.83 kNm/m FACTOR TABLE 1 SLS = 1.15 33.54 kNm/m	
49	PARAPET LOCAL EFFECTS ECCENTRICITY FROM 175 kN ADDITIONAL LOAD RIGHT HAND SIDE OF BRIDGE, MID SPAN - ULS ✓	
50	AS ABOVE BUT LEFT HAND SIDE OF THE BRIDGE ✓	
51	PARAPET LOCAL EFFECTS ECCENTRICITY ✓ FROM 175kN ADDITIONAL LOAD RIGHT HAND SIDE OF BRIDGE MID SPAN - SLS	
52	AS ABOVE BUT LEFT HAND SIDE OF BRIDGE ✓	
53	PARAPET LOCAL EFFECTS ECCENTRICITY FROM 175kN ADDITIONAL LOAD RIGHT HAND SIDE OF BRIDGE ✓ END SPAN - ULS.	
54	AS ABOVE BUT LEFT HAND SIDE OF BRIDGE. ✓	

P20

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	20 of.	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS FORGE LANE

Drg. Ref.

Made by JJG Date 18-01-02 Chd.

REF	TEXT	OUTPUTS

55 PARAPET LOCAL EFFECTS ECCENTRICITY FROM 175 KN ADDITIONAL LOAD RIGHT HAND SIDE OF BRIDGE END SPAN SLS

56. AS ABOVE PUT LEFT HAND SIDE OF BRIDGE.

LOAD COMBINATIONS

3 = 57 + 8 + 9 + 13 + 14 + 21 + 22 + 29 + 30 + 49 + 50

(DEAD + FILL + LOCAL EFFECTS PARAPET MIDSPAN ULS)

4. 58 + 7 + 11 + 15 + 16 + 23 + 24 + 31 + 32 + 51 + 52

(DEAD + FILL + LOCAL EFFECTS PARAPETS MID SPAN SLS)

5. 57 + 6 + 10 + 17 + 18 + 25 + 26 + 33 + 34 + 53 + 54

(DEAD + FILL + LOCAL EFFECTS PARAPETS END SPAN ULS)

6. 58 + 7 + 12 + 19 + 20 + 27 + 28 + 35 + 36 + 55 + 56.

- (DEAD + FILL + LOCAL EFFECTS PARAPET END SPAN SLS)

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	20a	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS. FORGE LANE

Drg. Ref.

Made by UJE Date 12-02-02 Chd.

REF	TEXT	OUTPUTS
57	: Dead bridge deck 0·5m thick + fill (ULS)	
58	: Dead bridge deck 0·5m thick + fill (SLS)	
59	. HB Loading 10m vehicle positioned end span (ULS)	
60	HB Loading 10m vehicle positioned. end span (SLS).	
61	HB loading 10m vehicle positioned centrally (ULS)	
62	HB loading 10m vehicle positioned centrally (SLS)	

AP20

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	21 of	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS FORGE LANE.

Drg. Ref.

Made by WE Date 17-01-02 Chd.

REF	TEXT	OUTPUTS
7.	2 + 8 + 37 + 38 + 45 (DEAD + FILL + LIVE + GLOBAL PARAPET MIDSPAN ULS)	
8.	1 + 7 + 39 + 40 + 46 (DEAD + FILL + LIVE + GLOBAL PARAPET MID SPAN SLS)	
9	2 + 8 + 41 + 42 + 47 (DEAD + FILL + LIVE + GLOBAL PARAPETS END SPAN ULS)	
10	1 + 7 + 43 + 44 + 48. (DEAD + FILL + LIVE + GLOBAL PARAPETS END SPAN SLS)	
11	57 + 8 (DEAD + FILL ULS)	
12	58 + 7 (DEAD + FILL SLS)	
13 & 14	not used	
15	57 + 8 + 5 + 6 + 59 (Dead + Fill + Wind + 61B endspan ULS)	
16	58 + 7 + 3 + 4 + 60 (Dead + Fill + Wind + HB endspan SLS)	

ARUP | Calculation sheet

Job No.	Sheet No.	Rev.
67313	22 of	

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS FORGE LANE

Drg. Ref.

Made by UJE Date 12-02-02 Chd.

REF	TEXT	OUTPUTS

17. 57 + 8 + 5 + 6 + 61

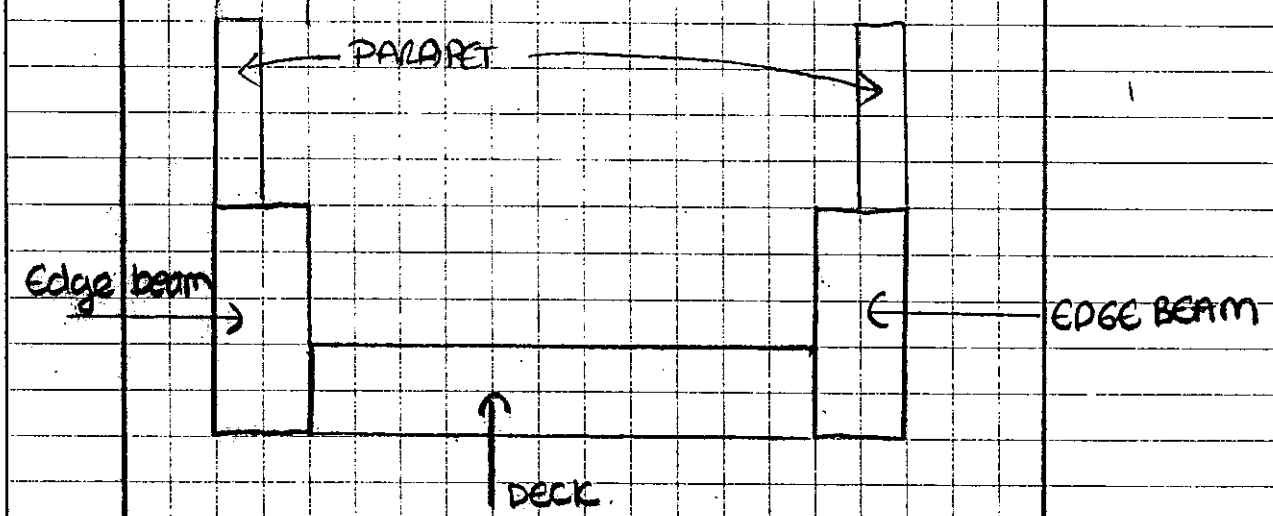
(Dead + Fill + wind + HB mid span ULS)

18. 58 + 7 + 3 + 4 + 60

(Dead + Fill + wind + HB midspan SLS)

CALCULATE REINFORCEMENT REQUIREMENTS

BRIDGE IS SPLIT INTO THE FOLLOWING PRINCIPLE ELEMENTS



DECK

Deck = 450mm thick
Concrete = Grade C50
cover = 75mm bottom 40mm top.

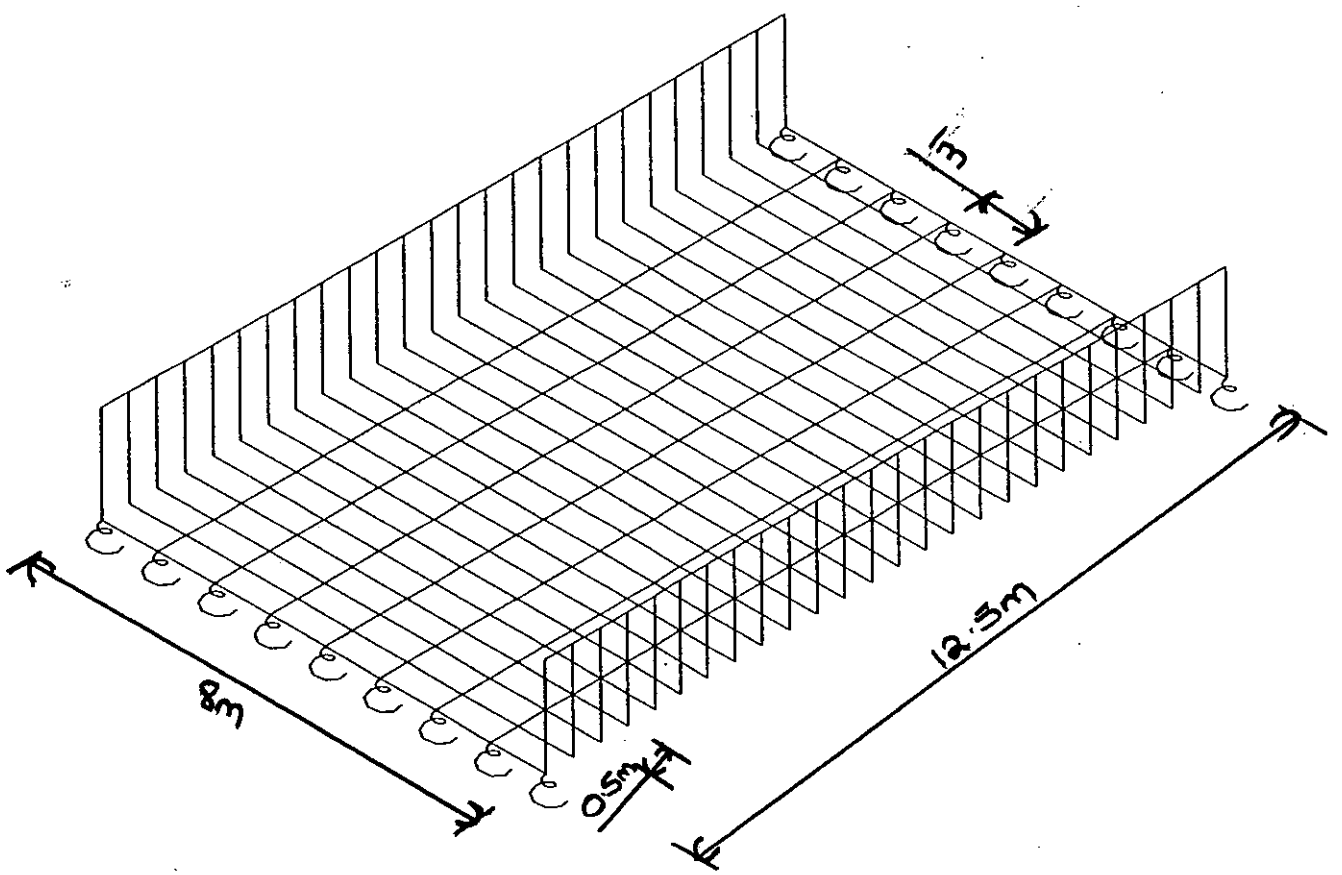
ARUP

Metrolink Phase III - Advanced Works
Forge Lane Bridge Approximate Chainage 1076
Metrolink Phase III - Forge Lane Bridge

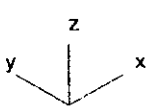
Job No.	Sheet No.	Rev.
67313		
Drg. Ref.		
Made by: vje	Date: 28-Feb-2002	Data: ForgeLane1d.gwb

Checked

Scale: 1:98.55
Isometric Scale: 1:120.7

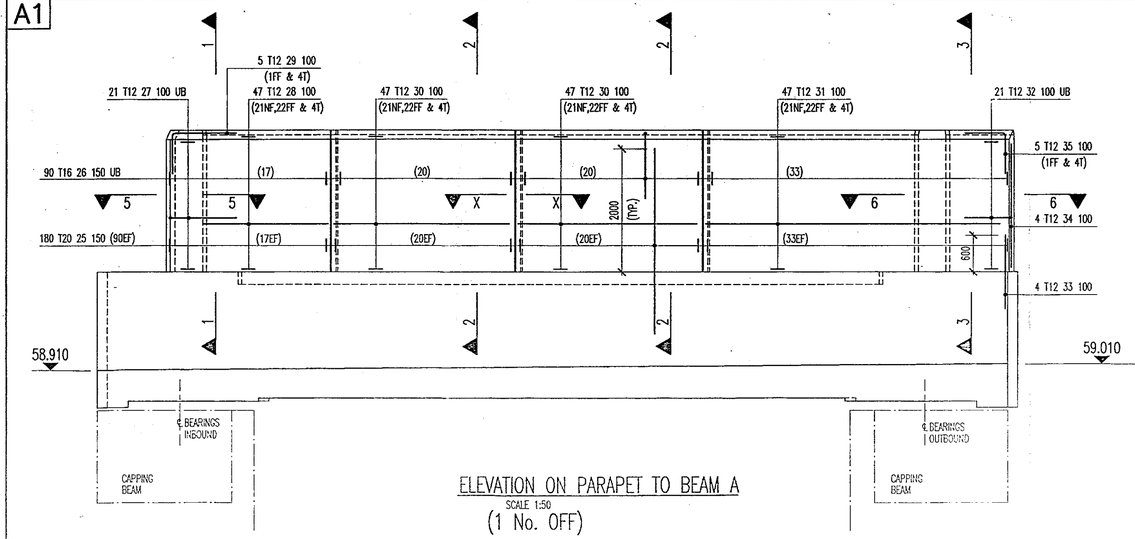


FORGE LANE BRIDGE
GRILLAGE.

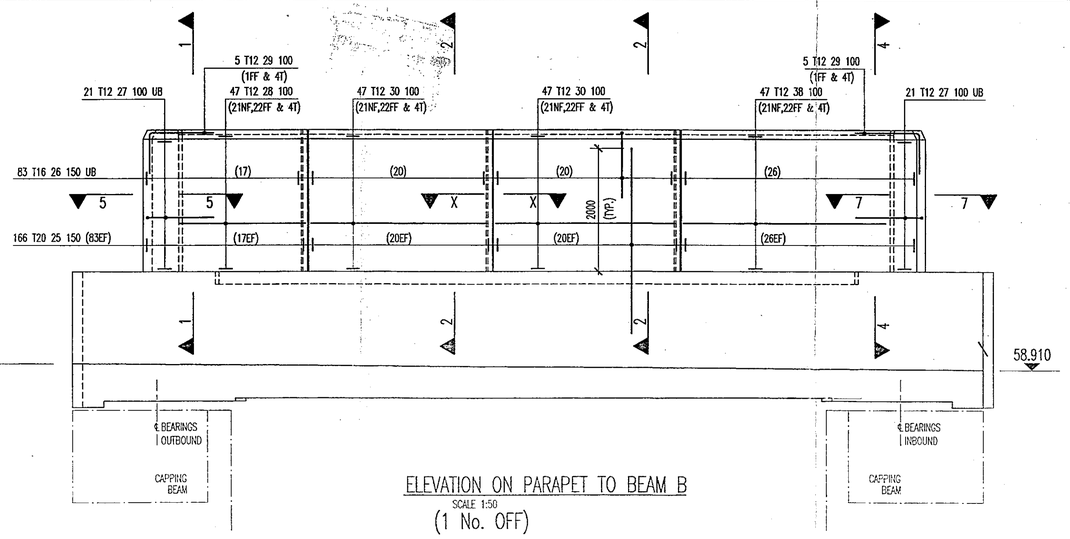


A1

10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR



ELEVATION ON PARAPET TO BEAM A
SCALE 1:50
(1 No. OFF)



ELEVATION ON PARAPET TO BEAM B
SCALE 1:50
(1 No. OFF)

NOTES :-

1 CONCRETE TO BE GRADE C50 AT 28 DAYS .

2 MAXIMUM AGGREGATE SIZE TO BE :- 20mm

3 REINFORCEMENT LISTED ON BENDING SCHEDULE PAGES :- 01 TO 03.

4 FOR LAYOUT DETAILS SEE DRAWING NUMBERS :- S/17/015

5 AP ALTERNATELY PLACED
AR ALTERNATELY REVERSED
AS ALTERNATELY STAGGERED
EF EACH FACE
NF NEAR FACE
FF FAR FACE
T TOP
B BOTTOM
UB U BAR
LLT LONG LEG TOP
LLB LONG LEG BOTTOM

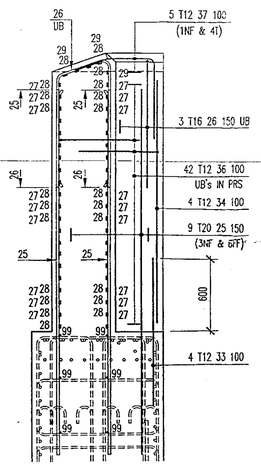
6 COVER :- UNLESS NOTED OTHERWISE COVER TO BE :- 40mm TOP & SIDES

7 FOR LOCATION OF BRIDGE REFER TO KEY PLAN DRG No. S/29/001.

8 ALL CHAINAGE REFERENCES ARE MADE TO THE METROLINK OUTBOUND CHAINAGES.

MINIMUM LAP LENGTHS

T10 – 400	T25 – 775
T12 – 450	T32 – 950
T16 – 550	T40 – 1150
T20 – 650	

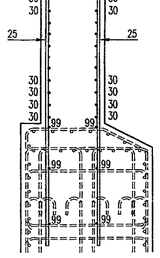


FOR SECTION 4–4 BAR Mk 28 READS AS 38

FOR DETAILS OF BEAM REINF'T SHOWN DOTTED SEE DRG No. S/29/041.

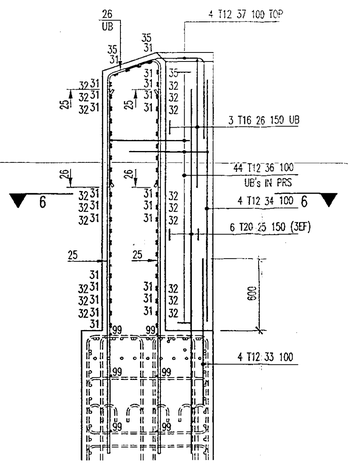
SECTION 1–1
SCALE 1:25

SECTION 4–4 SIMILAR BUT HANDED U.N.O.



FOR DETAILS OF BEAM REINF'T SHOWN DOTTED SEE DRG No. S/29/041.

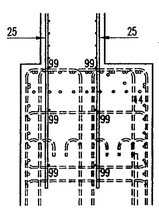
SECTION 2–2
SCALE 1:25



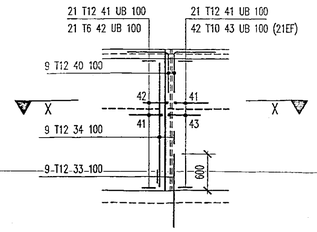
FOR DETAILS OF BEAM REINF'T SHOWN DOTTED SEE DRG No. S/29/041.

SECTION 3–3
SCALE 1:25

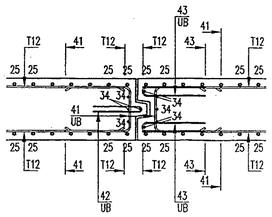
18 T12 99 – SUPPLIED TO SITE IN 6 METRE LENGTHS. BARS TO BE CUT & LAPPED ON SITE TO SUIT (450mm LAP) REINF'T PLACED AS SHOWN ON SECTIONS



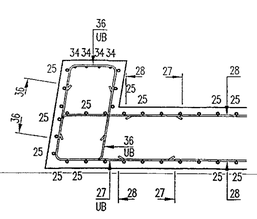
TYPICAL TIE DETAILS TO PARAPET STARTER BARS
SCALE 1:25



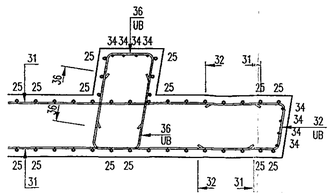
TYPICAL DETAIL AT MOVEMENT JOINT
SCALE 1:50
(6 No. OFF)



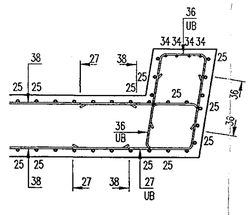
SECTION X–X
(TYPICAL SECTION THRO' JOINT)



SECTION 5–5
SCALE 1:25



SECTION 6–6
SCALE 1:25



SECTION 7–7

Rev.	Date	By	Description
C1	03/02	DMC	ISSUE FOR CONSTRUCTION

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3.
ADVANCED WORKS

Drawing Title
REINFORCEMENT DETAILS
FORGE LANE BRIDGE DECK
SHEET 3

ARUP
Bergius House
11–12 Claremont Terrace – Glasgow G3 7XR
Tel +44 (0)141 3328534 Fax +44 (0)141 3323737
www.arup.com

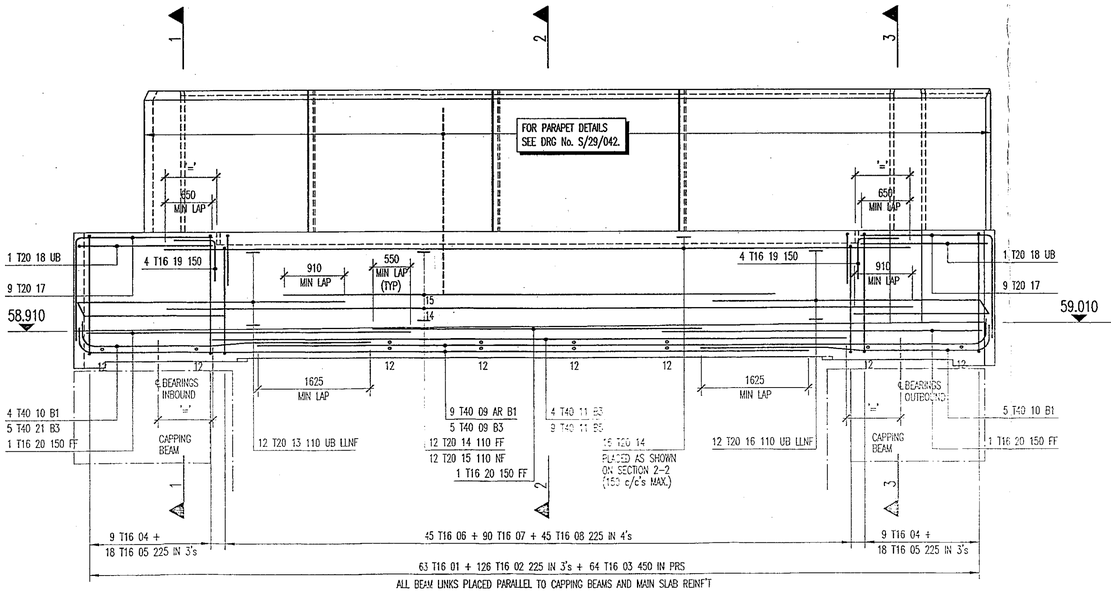
©

Scales 1:50 Originator DMC
Checked J.McD. Approved Date 07/03/02

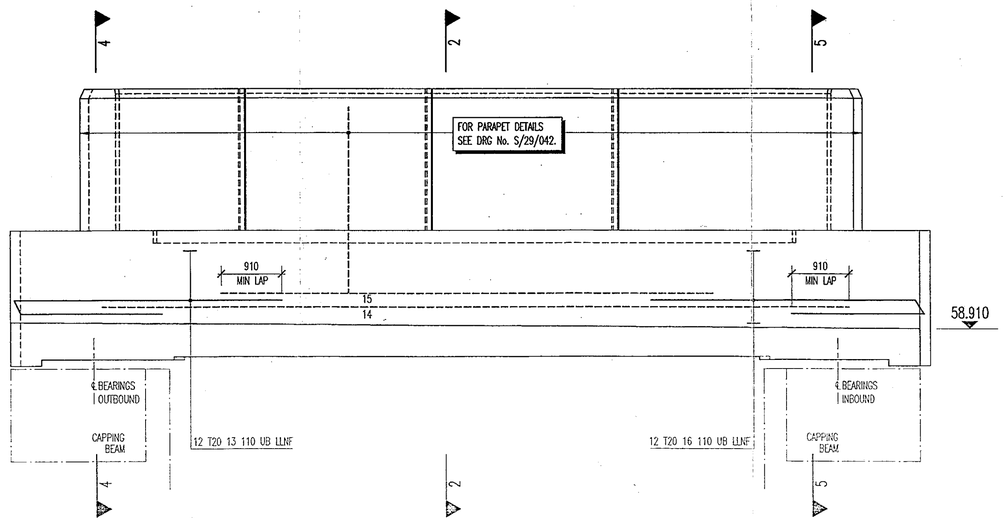
Job No. 67313 Drawing No. S/29/042 Rev. C

A1

10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR



ELEVATION ON BEAM A
SCALE 1:50
(1 No. OFF)



ELEVATION ON BEAM B
SCALE 1:50
(1 No. OFF)
(REINF'T SIMILAR TO BEAM A BUT HANDED UNLESS SHOWN OTHERWISE)

NOTES :–

1 CONCRETE TO BE GRADE C50 AT 28 DAYS .

2 MAXIMUM AGGREGATE SIZE TO BE :– 20mm

3 REINFORCEMENT LISTED ON BENDING SCHEDULE PAGES :– 01 TO 02.

4 FOR LAYOUT DETAILS SEE DRAWING NUMBERS :– S/17/015

AP	ALTERNATELY PLACED	T	TOP
AR	ALTERNATELY REVERSED	B	BOTTOM
AS	ALTERNATELY STAGGERED	UB	U BAR
EF	EACH FACE	LLT	LONG LEG TOP
NF	NEAR FACE	LLB	LONG LEG BOTTOM
FF	FAR FACE		

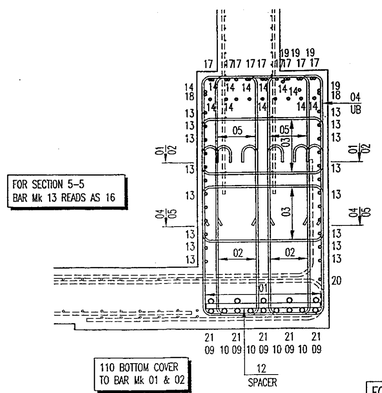
6 COVER :– UNLESS NOTED OTHERWISE COVER TO BE :– 50mm BOTTOM & 40mm TOP & SIDES

7 FOR LOCATION OF BRIDGE REFER TO KEY PLAN DRG No. S/29/001.

8 ALL CHAINAGE REFERENCES ARE MADE TO THE METROLINK OUTBOUND CHAINAGES.

MINIMUM LAP LENGTHS

T10 – 400	T25 – 775
T12 – 450	T32 – 950
T16 – 550	T40 – 1150
T20 – 650	

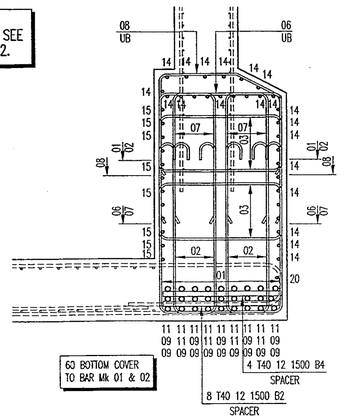


SECTION 1–1
SCALE 1:25

FOR DETAILS OF PARAPET REINF'T SEE DRG No. S/29/042.

FOR DETAILS OF SLAB REINF'T SEE DRG No. S/29/040.

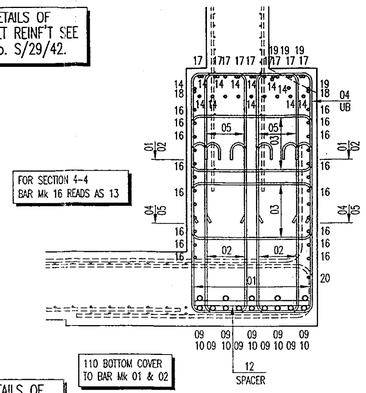
SECTION 5–5 SIMILAR U.N.O.



SECTION 2–2
SCALE 1:25

FOR DETAILS OF PARAPET REINF'T SEE DRG No. S/29/042.

FOR DETAILS OF SLAB REINF'T SEE DRG No. S/29/040.



SECTION 3–3
SCALE 1:25

SECTION 4–4 SIMILAR U.N.O.

Rev.	Date	By	Description
C1	03/02	DMC	ISSUE FOR CONSTRUCTION

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3.
ADVANCED WORKS

Drawing Title
REINFORCEMENT DETAILS
FORGE LANE BRIDGE DECK
SHEET 2

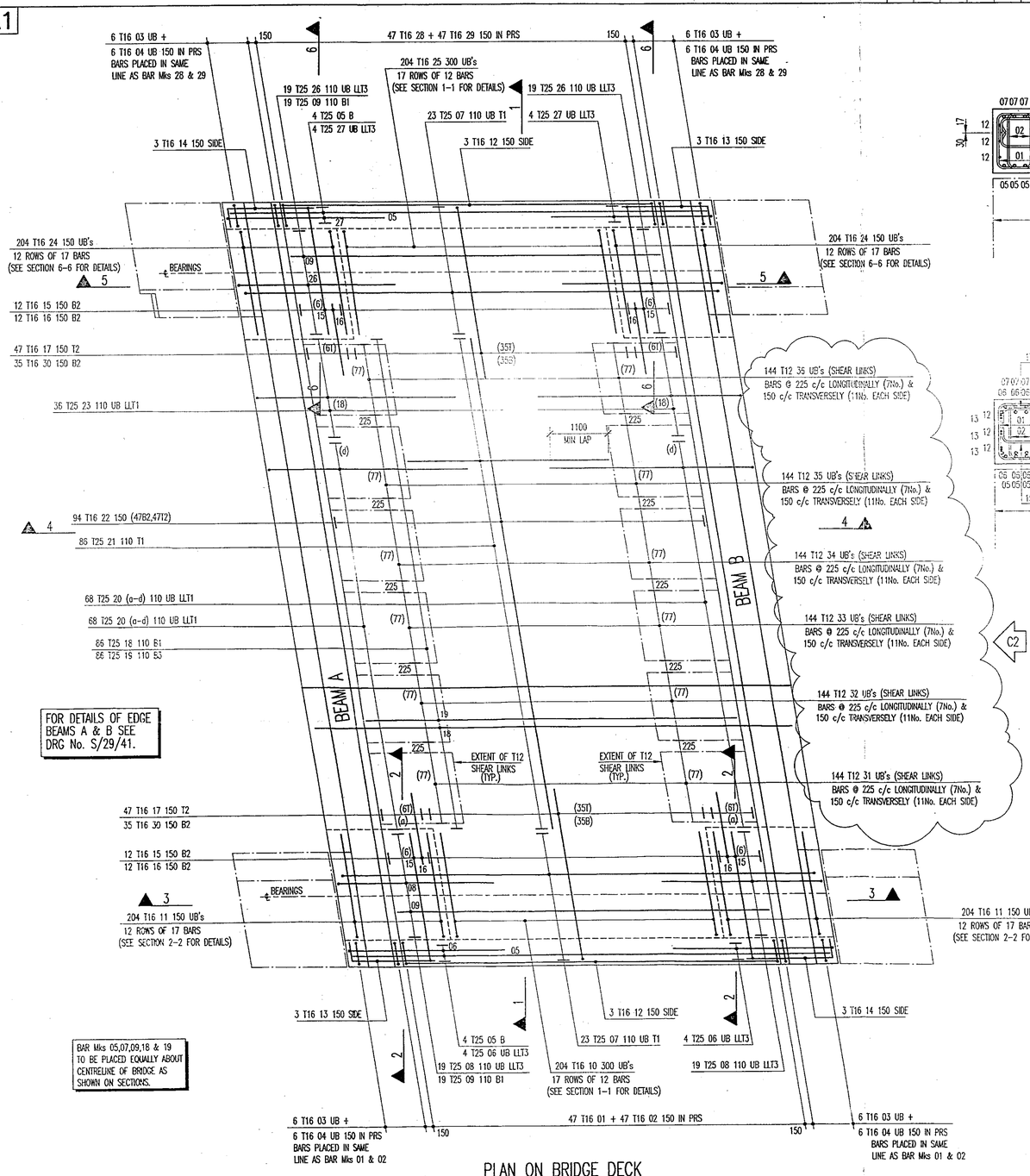
ARUP
Berglus House
11–12 Claremont Terrace – Glasgow G3 7XR
Tel +44 (0)141 3328534 Fax +44 (0)141 3323737
www.arup.com

Scales 1:50 | Originator DMC
Checked J.McD. | Approved | Date 05/03/02
Job No. 67313 | Drawing No. S/29/041 | Rev. C1

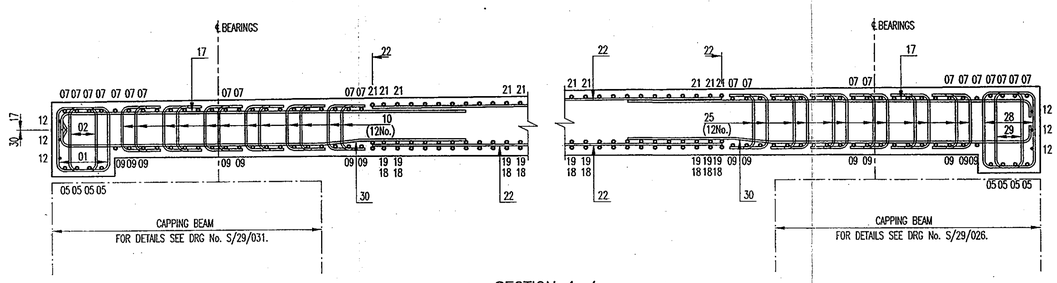
A1

10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR

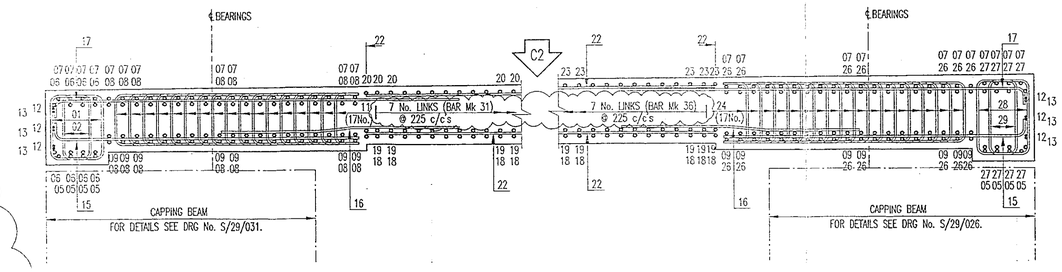
10cm



PLAN ON BRIDGE DECK
SCALE 1:50
(1 No. OFF)

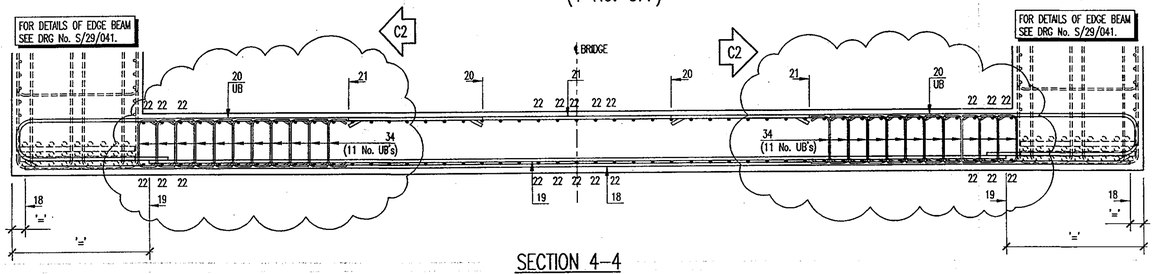


SECTION 1–1
SCALE 1:25

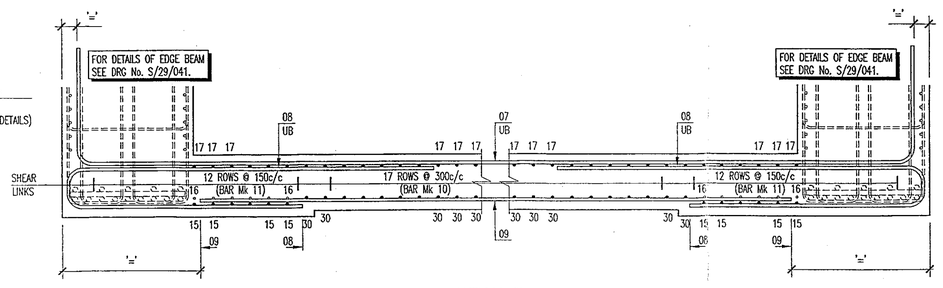


SECTION 2–2
SCALE 1:25

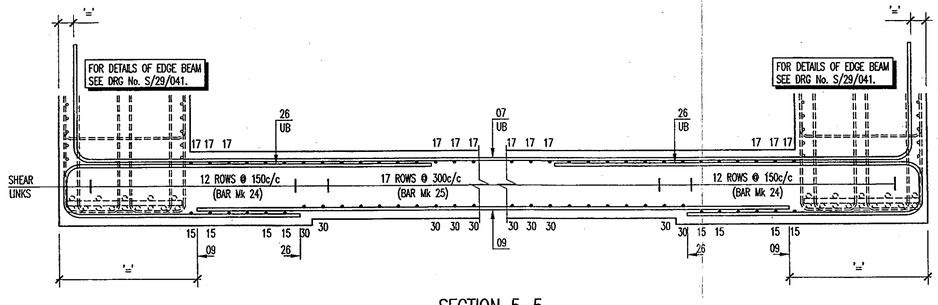
SECTION 6–6
SCALE 1:25



SECTION 4–4
SCALE 1:25



SECTION 3–3
SCALE 1:25



SECTION 5–5
SCALE 1:25

NOTES :-

1 CONCRETE TO BE GRADE C50 AT 28 DAYS .

2 MAXIMUM AGGREGATE SIZE TO BE :- 20mm

3 REINFORCEMENT LISTED ON BENDING SCHEDULE PAGES :- 01 TO 02.

4 FOR LAYOUT DETAILS SEE DRAWING NUMBERS :- S/17/015

5 AP ALTERNATELY PLACED
AR ALTERNATELY REVERSED
AS ALTERNATELY STAGGERED
EF EACH FACE
NF NEAR FACE
FF FAR FACE
T TOP
B BOTTOM
UB U BAR
LLT LONG LEG TOP
LLB LONG LEG BOTTOM

6 COVER :- UNLESS NOTED OTHERWISE COVER TO BE :- 50mm BOTTOM & 40mm TOP & SIDES

7 FOR LOCATION OF BRIDGE REFER TO KEY PLAN DRG No. S/29/001.

8 ALL CHAINAGE REFERENCES ARE MADE TO THE METROLINK OUTBOUND CHAINAGES.

MINIMUM LAP LENGTHS

T10 – 400	T25 – 775
T12 – 450	T32 – 950
T16 – 550	T40 – 1150
T20 – 650	

Rev.	Date	By	Description
C2	05/02	DMC	ADDITIONAL REINF'T ADDED
C1	05/02	DMC	ISSUE FOR CONSTRUCTION

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3.
ADVANCED WORKS

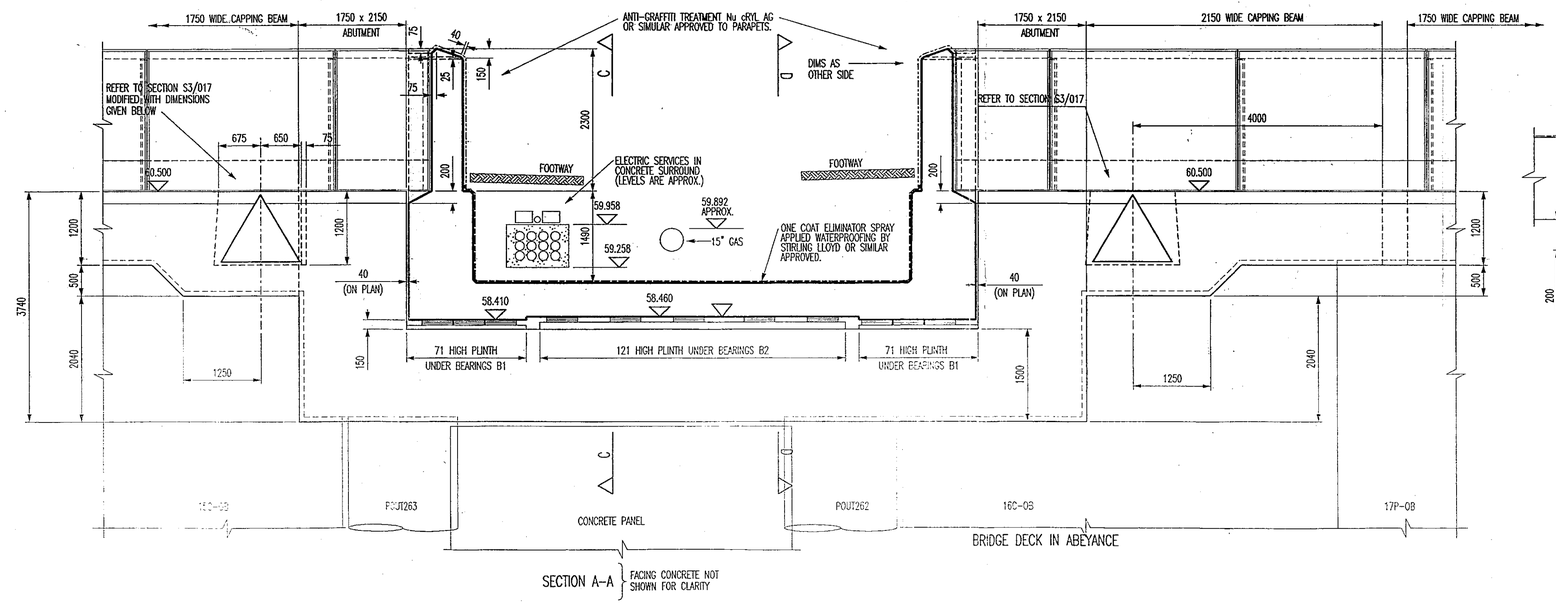
Drawing Title
REINFORCEMENT DETAILS
FORGE LANE BRIDGE DECK
SHEET 1

ARUP
Bergius House
11–12 Claremont Terrace – Glasgow G3 7XR
Tel +44 (0)141 3328534 Fax +44 (0)141 3323
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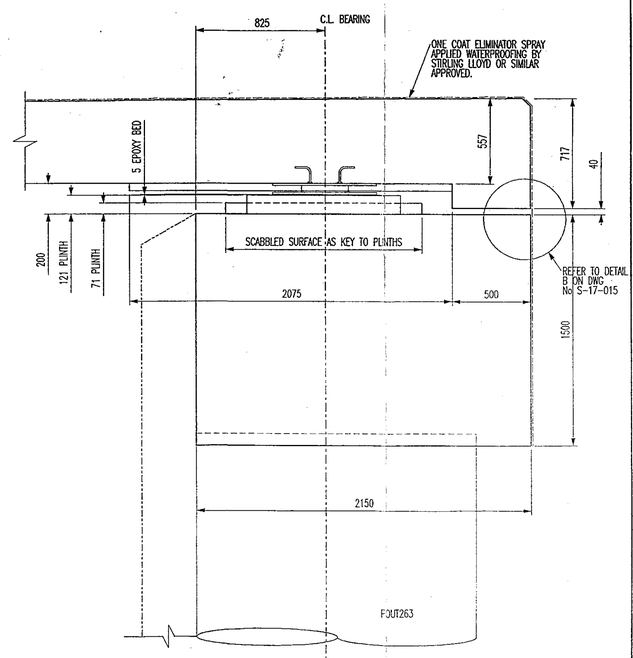
Scales 1:50 Originator DMC
Checked J.McD. Approved Date 05/03/02
Job No. 67313 Drawing No. S/29/040 Rev. C

A1

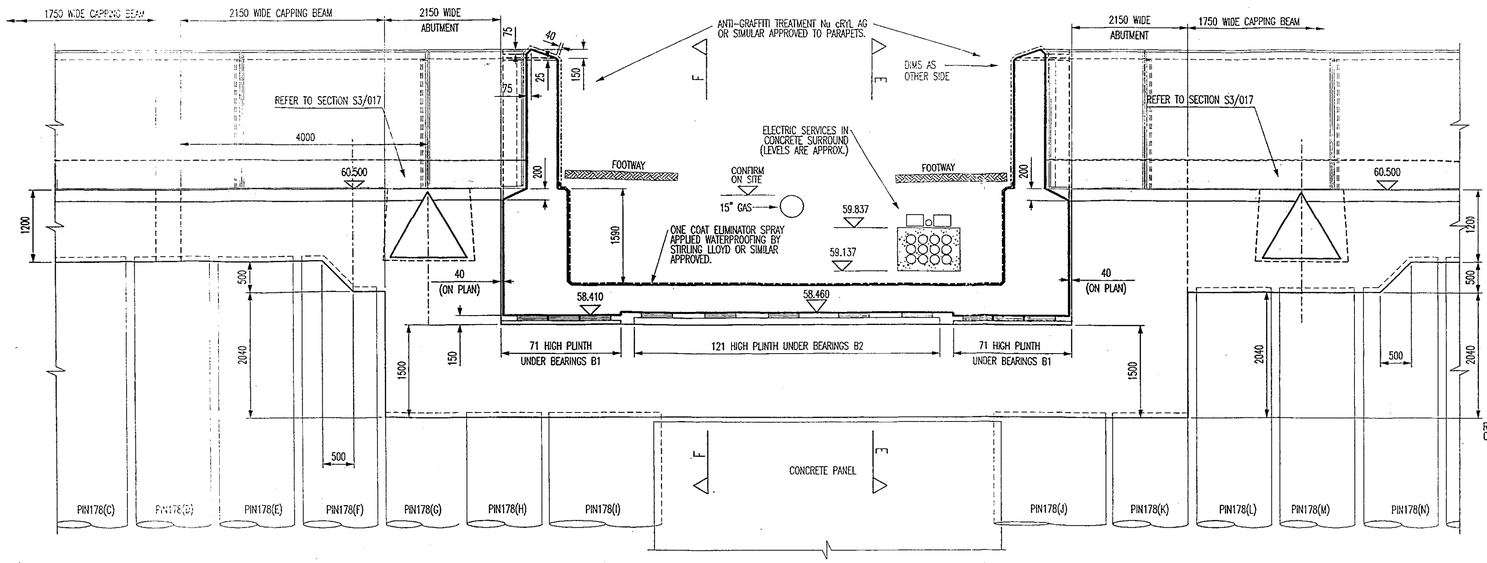
10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR



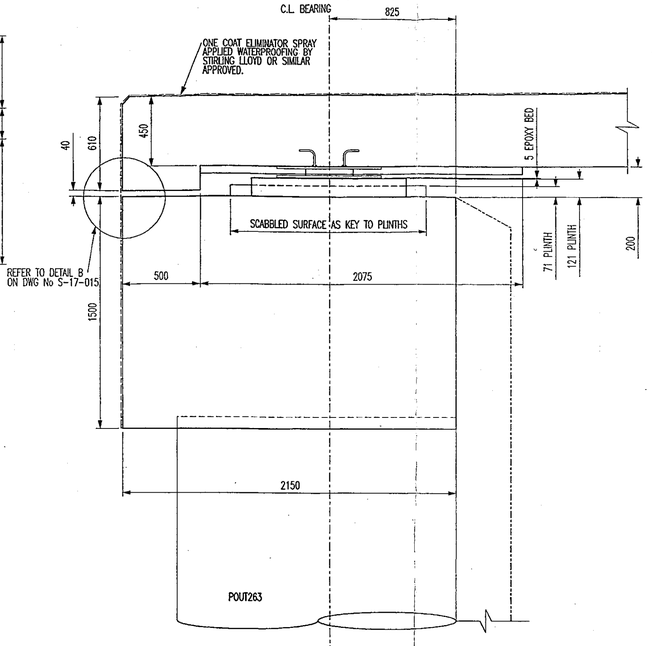
SECTION A–A } FACING CONCRETE NOT SHOWN FOR CLARITY



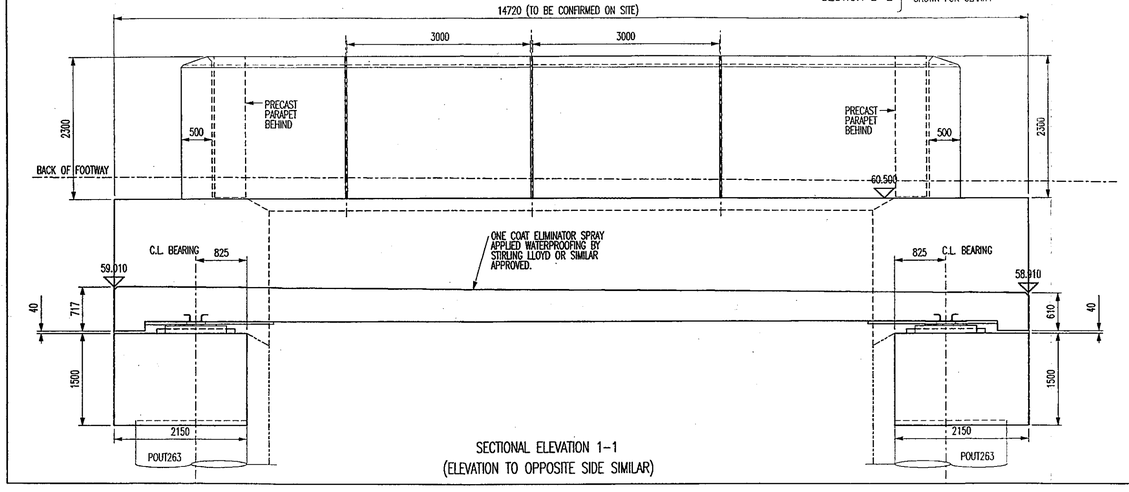
SECTION C–C
SECTION D–D SIMILAR
(SCALE 1:20)



SECTION B–B } FACING CONCRETE NOT SHOWN FOR CLARITY



SECTION E–E
SECTION F–F SIMILAR
(SCALE 1:20)



SECTIONAL ELEVATION 1–1
(ELEVATION TO OPPOSITE SIDE SIMILAR)

NOTES:–
1. FOR NOTES REFER TO DRAWING NUMBER S-17-015.

Rev.	Date	By	Description
C3	21/12/02	EC	BRIDGE DECK FINALISED
C2	26/11/02	EC	SECTIONS AMENDED AND BEAM UNDER DECK LOWERED
C1	07-12-01	EC	REVISION AS FORGE LANE CROSSING

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
SECTIONS
FORGE LANE CROSSING

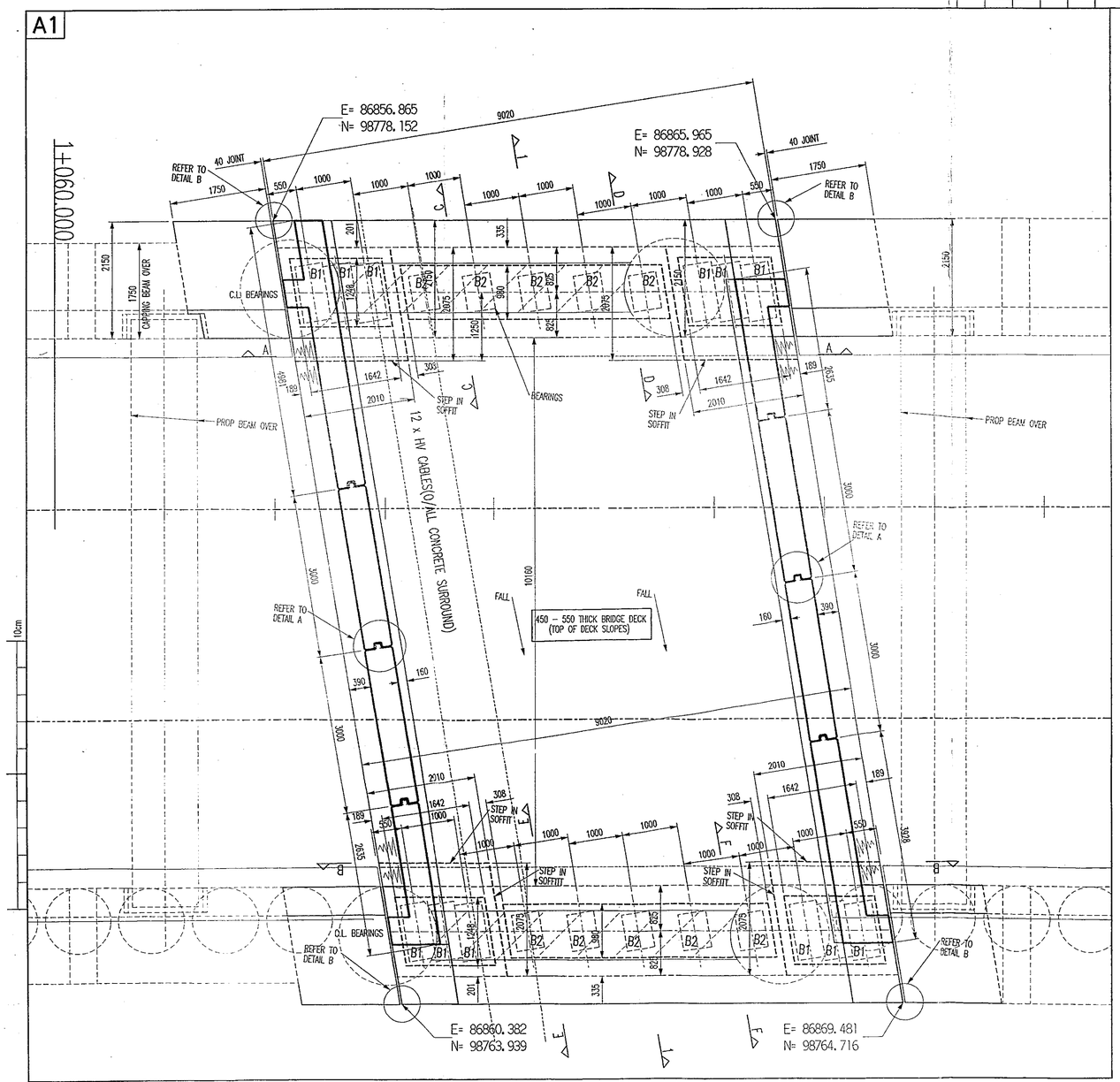
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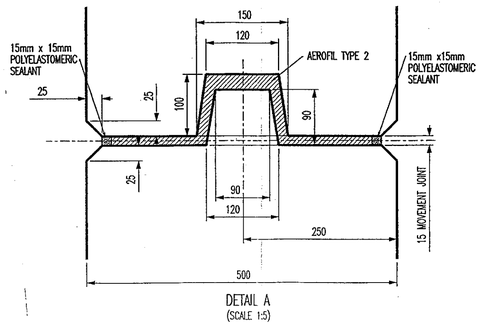
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Scales 1:50 Originator EC
Checked Approved Date 07-12-01
Job No. 67313 Drawing No. S-17-016 Rev. C3

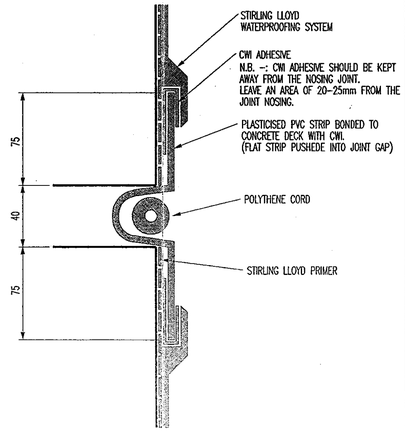
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10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR

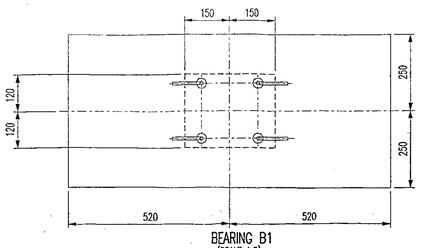




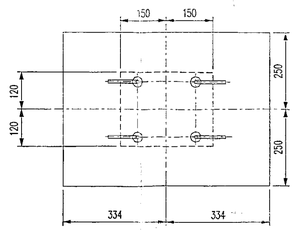
DETAIL A
(SCALE 1:5)



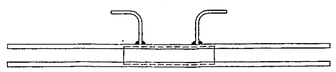
DETAIL B
(SCALE N.T.S.)



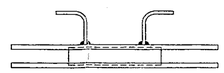
BEARING B1
(SCALE 1:5)



BEARING B2
(SCALE 1:5)



SECTION 1–1
(SCALE 1:5)



SECTION 2–2
(SCALE 1:5)

BEARING PLATE TABLE

BEARING REFERENCE	BEARING (mm) LENGTH x BREADTH x THICKNESS	TOP AND BOTTOM PLATES (mm) LENGTH x BREADTH x THICKNESS	PLAN/SECTION
B1	300 x 240 x 53	1040 x 500 x 15 (WITH RECESS)	BEARING B1/SECTION 1–1
B2	300 x 240 x 53	668 x 500 x 15 (WITH RECESS)	BEARING B2/SECTION 2–2

NOTES:–

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S–16–006/14.
2. FOR SECTIONS REFER TO DRAWING NUMBER S–17–016.
3. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/D01 AND SPECIFICATION.
4. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313–00/009.
5. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
6. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C50
   PRECAST..... C50

Rev.	Date	By	Description
C1	25/02/02	EC	ISSUED FOR CONSTRUCTION

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
GENERAL ARRANGEMENT
FORGE LANE CROSSING

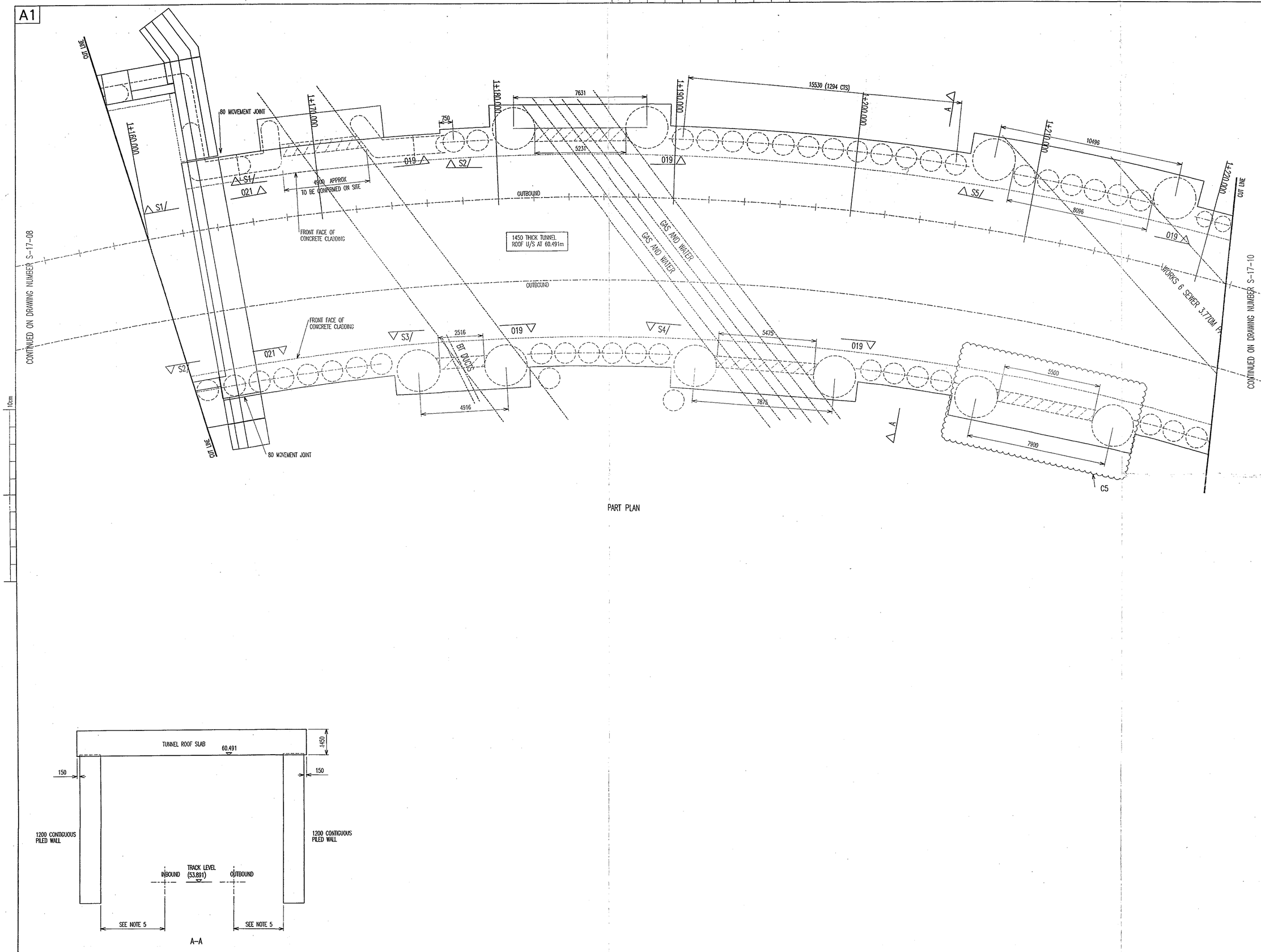
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Scales 1:50 Originator EC
Checked Approved Date 04/12/01
Job No. 67313 Drawing No. S–17–015 Rev. C1

A1

10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR



PART PLAN

A–A

NOTES:–

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S-16-006/14.
2. FOR LEVELS TABLE, SECTIONS AND DETAILS REFER TO DRAWING NUMBER S-17-017/020.
3. HIGH LEVEL PROP SETTING OUT PRINCIPLES :-

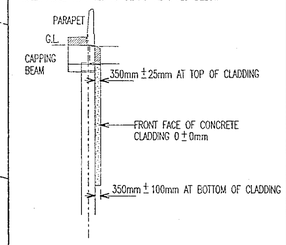
   THE TRIANGULAR HIGH LEVEL PROP BEAMS ARE TO BE SET OUT IN THE FOLLOWING MANNER.

   A LINE FROM THE INTERSECTION OF THE OUTBOUND RAILTRACK AND THE OUTBOUND CHAINAGE TO BE PERPENDICULAR TO THE INBOUND RAILTRACK. THIS LINE THEN EXTENDS FROM BOTH TRACKS TO THE CENTRE LINE OF THE PILES OR DIAPHRAGM WALLS.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/D01 AND SPECIFICATION.
5. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009.
6. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
7. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C40
   PRECAST..... C40

TOLERANCES:–

TOLERANCES TO PILES TO BE AS INDICATED BELOW



Rev.	Date	By	Description
C5	25/02/02	EC	PILES REMOVED – WALL PANEL ADDED
C4	05/02/02	EC	SECTION MARKS RENUMBERED AND CLIP LINES AMENDED PANEL SPANS AMENDED AND PILES REPLACED DIAPHRAGMS
C3	28/11/01	EC	REVISED AS NOTED
C2	24/10/01	EC	NOTES AMENDED AND AS NOTED
C1	09/01	DW	ISSUED FOR CONSTRUCTION

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
GENERAL ARRANGEMENT
OUTBOUND CH. 1160–1220
SHEET 4 OF 9

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Oxford Street, Manchester, M1 6EL
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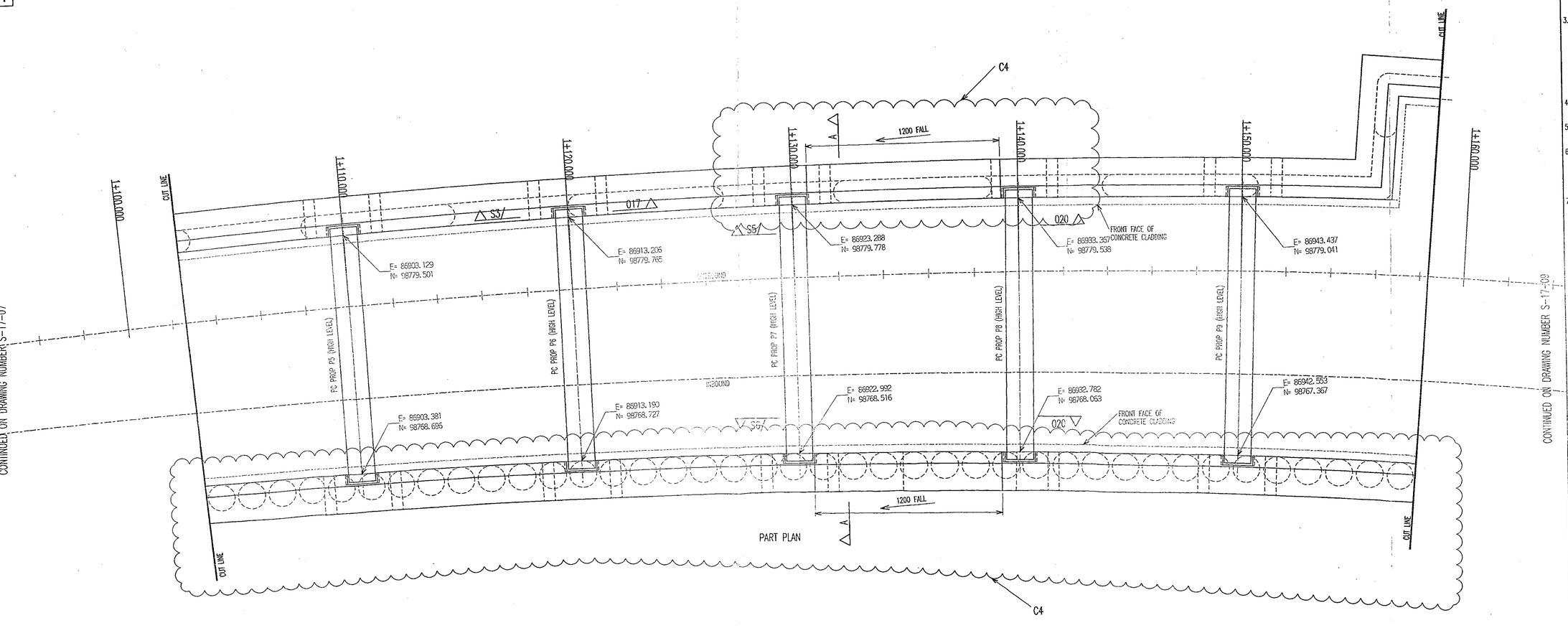
©

Scales	1:100, U.N.O.	Originator	DW
Checked	EC.	Approved	Date SEP 01

Job No.	Drawing No.	Rev.
67313	S-17-009	C5

A1

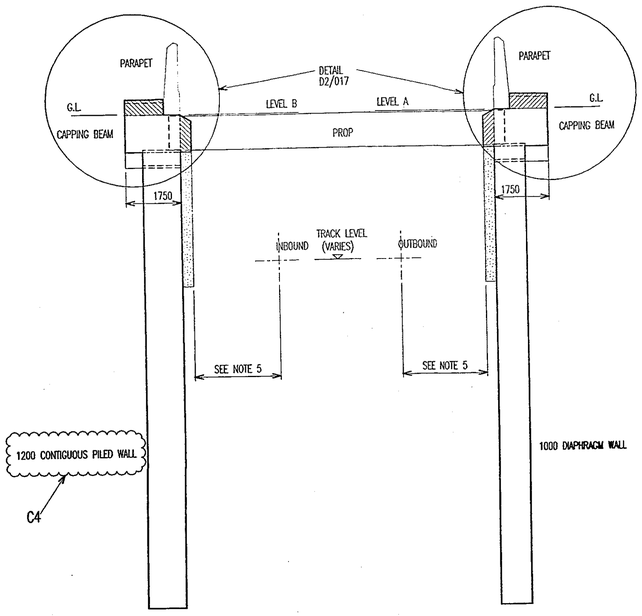
10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR



CONTINUED ON DRAWING NUMBER S-17-07

CONTINUED ON DRAWING NUMBER S-17-09

PART PLAN



SECTION A-A

NOTES:-

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S-16-006/14.
2. FOR LEVELS TABLE, SECTIONS AND DETAILS REFER TO DRAWING NUMBER S-17-017/020.
3. HIGH LEVEL PROP SETTING OUT PRINCIPLES :-

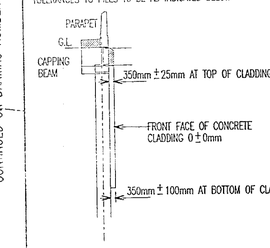
   THE TRIANGULAR HIGH LEVEL PROP BEAMS ARE TO BE SET OUT IN THE FOLLOWING MANNER.

   A LINE FROM THE INTERSECTION OF THE OUTBOUND RAILTRACK AND THE OUTBOUND CHAINAGE TO BE PERPENDICULAR TO THE INBOUND RAILTRACK. THIS LINE THEN EXTENDS FROM BOTH TRACKS TO THE CENTRE LINE OF THE PILES OR DIAPHRAGM WALLS.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/D01 AND SPECIFICATION.
5. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009.
6. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
7. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C40
   PRECAST..... C40

TOLERANCES:-

TOLERANCES TO PILES TO BE AS INDICATED BELOW



Rev.	Date	By	Description
C4	12/03/02	EC	AS NOTED AND CUT LINES AMENDED
C3	24/10/01	EC	PROP BEAM SETTING OUT COORDINATES ADDED AND AS NOTED
C1	02/09/01	EC	CONSTRUCTION ISSUE

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
GENERAL ARRANGEMENT
OUTBOUND CH. 1100-1160
SHEET 3 OF 9

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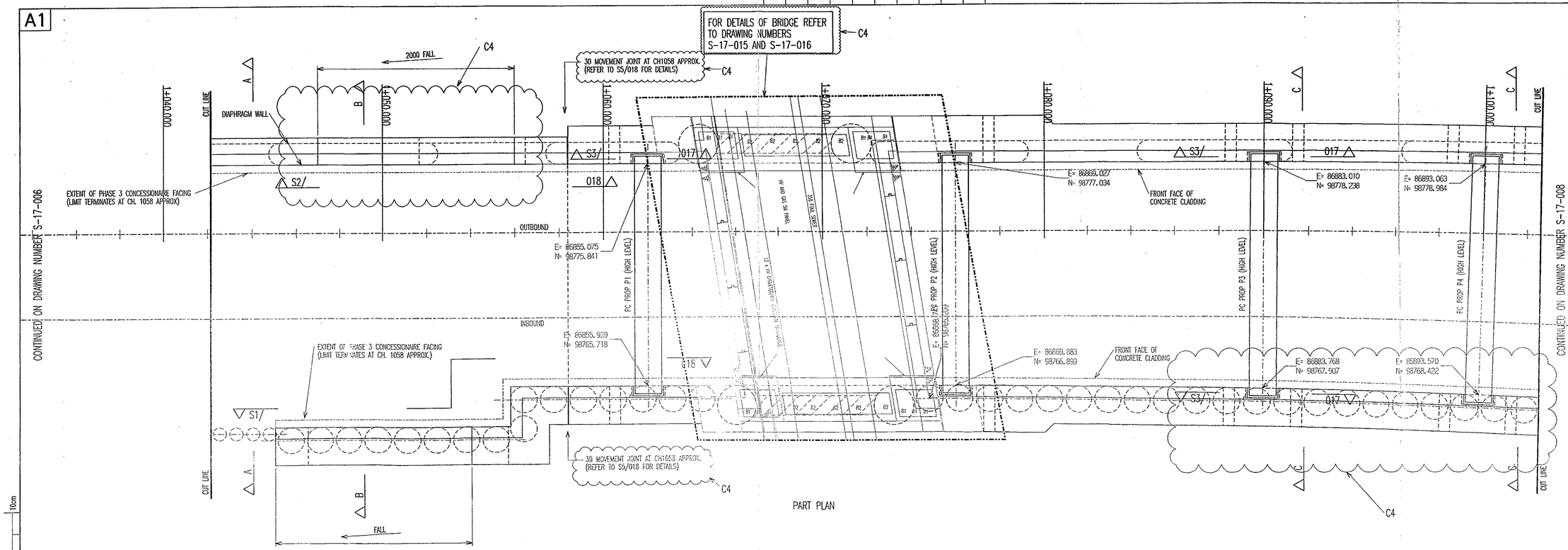
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Scales 1:100 U.N.O. Originator DW
Checked Approved Date AUG 01

Job No. 67313 | Drawing No. S-17-008 | Rev. C4

A1

10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR



PART PLAN

NOTES:–

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S-16-006/14.
2. FOR LEVELS TABLE, SECTIONS AND DETAILS REFER TO DRAWING NUMBER S-17-017/020.
3. HIGH LEVEL PROP SETTING OUT PRINCIPLES :-

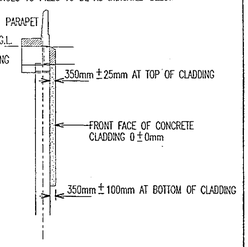
   THE TRIANGULAR HIGH LEVEL PROP BEAMS ARE TO BE SET OUT IN THE FOLLOWING MANNER.

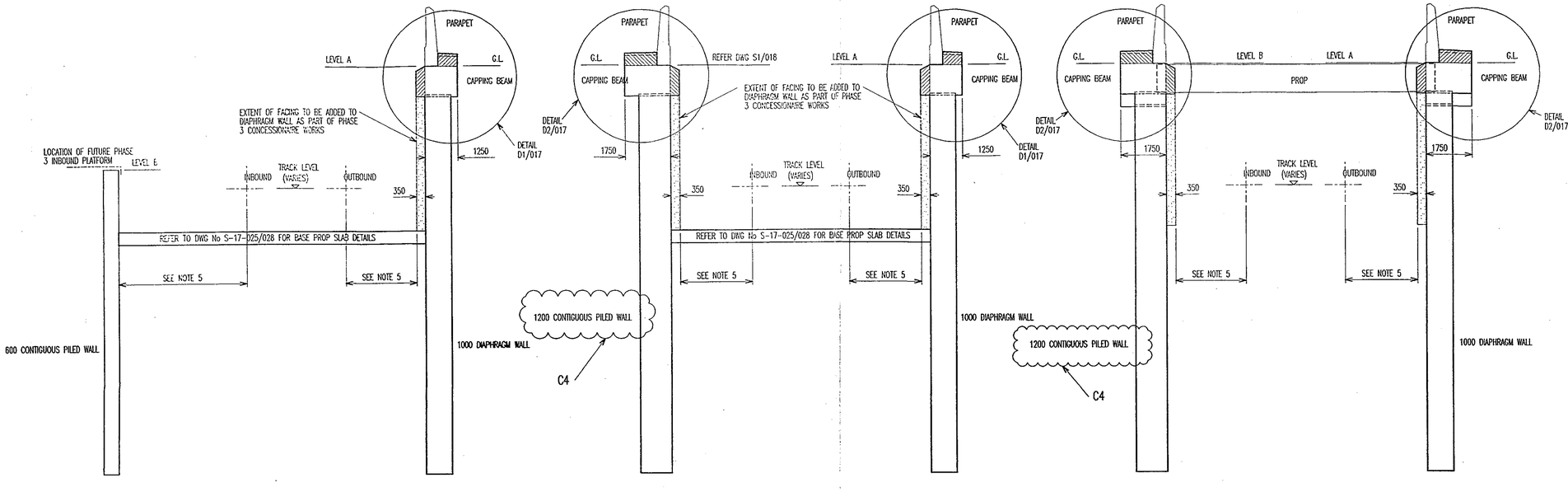
   A LINE FROM THE INTERSECTION OF THE OUTBOUND RAILTRACK AND THE OUTBOUND CHAINAGE TO BE PERPENDICULAR TO THE INBOUND RAILTRACK. THIS LINE THEN EXTENDS FROM BOTH TRACKS TO THE CENTRE LINE OF THE PILES OR DIAPHRAGM WALLS.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
5. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009
6. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
7. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C40
   PRECAST..... C40

TOLERANCES:–

TOLERANCES TO PILES TO BE AS INDICATED BELOW





SECTION A–A

SECTION B–B

SECTION C–C

Rev.	Date	By	Description
C4	12/03/02	EC	AS NOTED
C3	28/11/01	EC	PROP BEAM SETTING OUT COORDINATES ADDED AND AS NOTED
C2	24/10/01	EC	NOTES AMENDED AND AS NOTED
C1	03/05/01	EC	CONSTRUCTION ISSUE

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
GENERAL ARRANGEMENT
OUTBOUND CH. 1040–1100
SHEET 2 OF 9

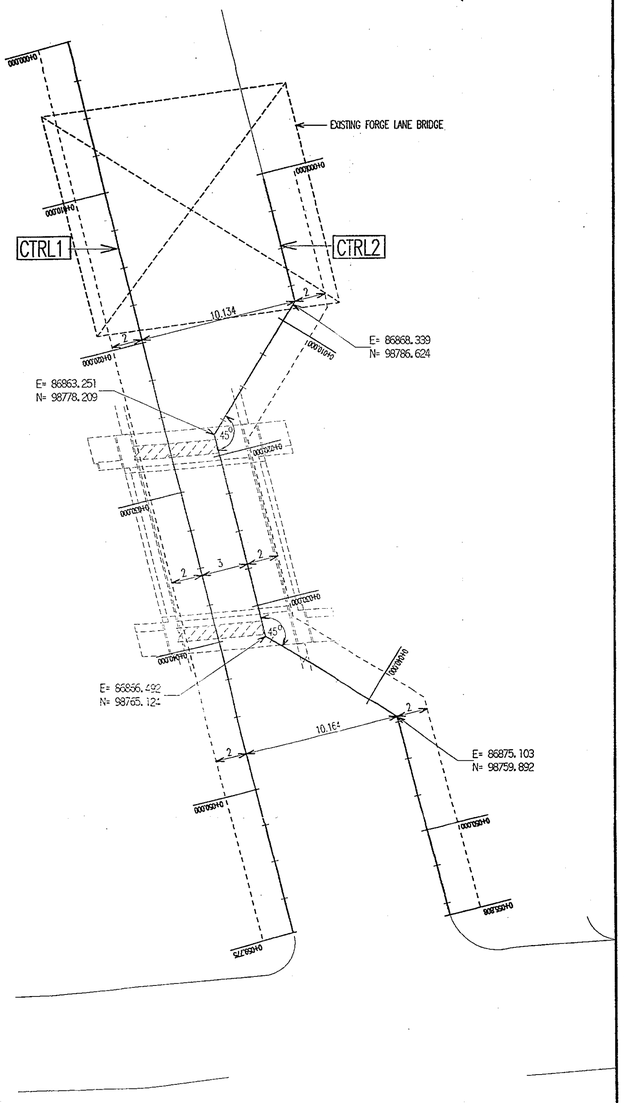
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Scales 1:100 U.N.O. Originator DW
Checked Approved Date SEP 01

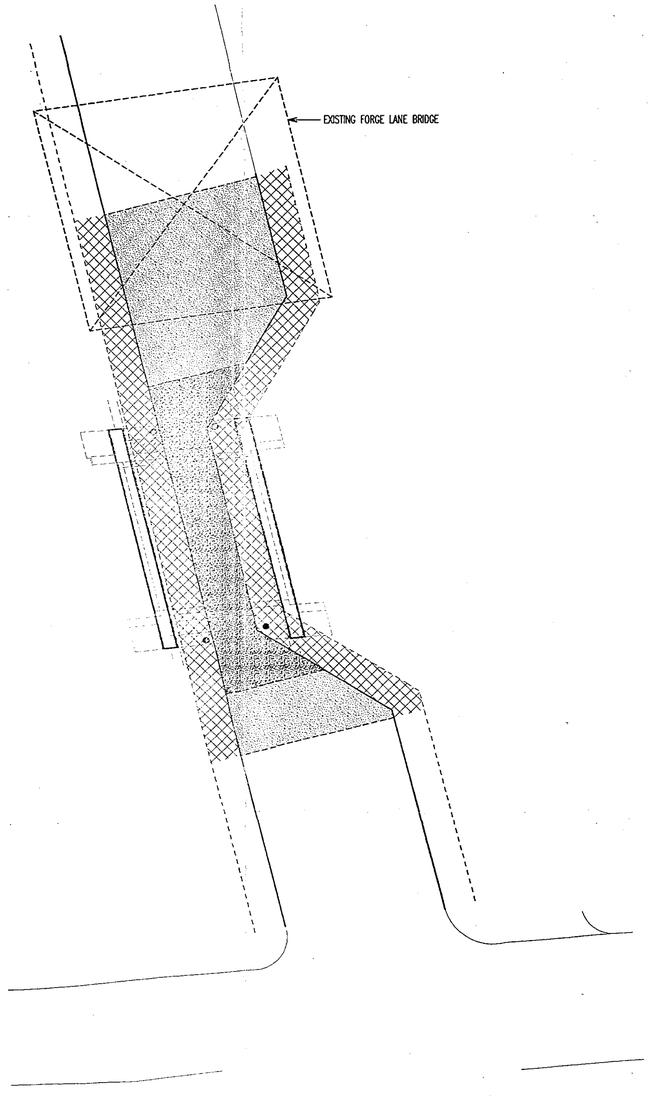
Job No. 67313 | Drawing No. S-17-007 | Rev. C4

A1

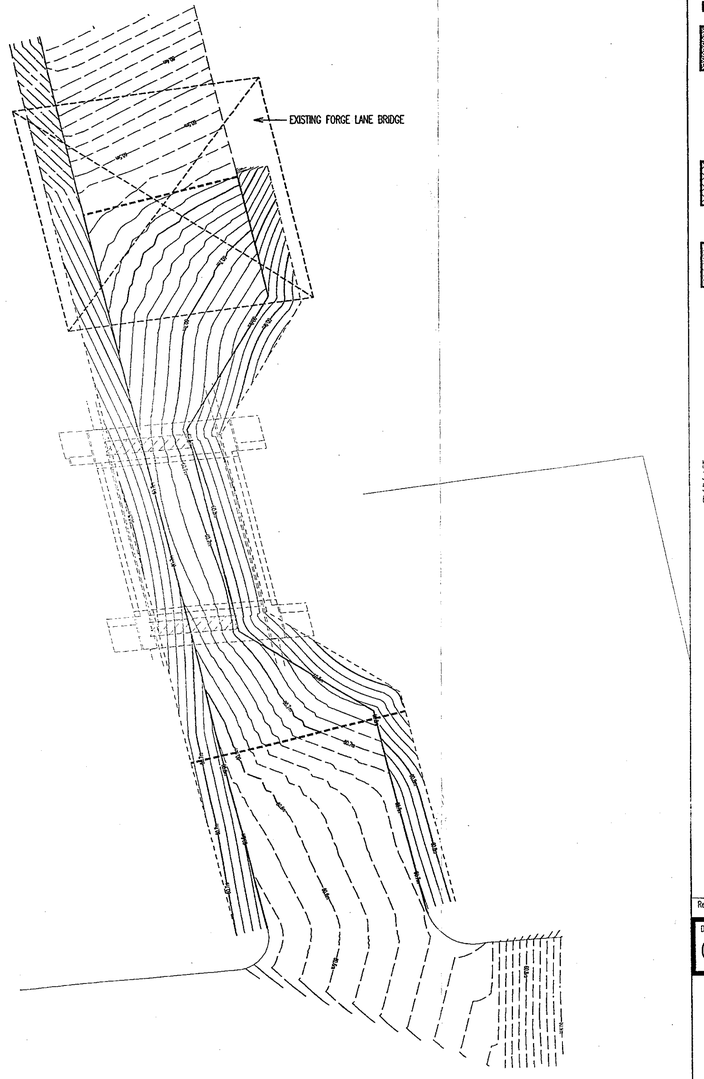
10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR



GENERAL ARRANGEMENT



PAVEMENT LAYOUT



PROPOSED CONTOURS

KEY

CARRIAGEWAY CONSTRUCTION TYPE 1:–
FULL DEPTH CONSTRUCTION
35mm SMA WEARING COURSE TO CL 942
55mm HRA BASE COURSE TO CL 905
200mm DBM ROADBASE TO CL 903
150mm TYPE 1 SUB–BASE TO CL 803
350mm 6F1 CAPPING LAYER TO TABLE 6.1
NOTE FOR 350mm CAPPING LAYER CBR OF SUBFORMATION IS TO BE MINIMUM 3%

FOOTWAY CONSTRUCTION:–
20mm DBM WEARING COURSE
60mm DBM BASE COURSE
100mm SUB–BASE

NEW SURFACING, PLANE–OFF EXISTING CARRIAGEWAY PAVEMENT MINIMUM
50mm TO AREAS INDICATED AND LAY
45mm HRA WEARING COURSE ON HRA WEARING COURSE REGULATING COURSE

REMOUNTABLE BOLLARDS (LESS THEN 300mm DIA)

PROPOSED NEW GULLIES

NOTE:– IF NECESSARY IN NARROW WIDENINGS
35mm SMA WEARING COURSE
55mm HRA BASECOURSE TO CL 905
600mm CONCRETE CLASS ST4 TO CL 1030

CTRL1

STATION	EASTING	NORTHING	ELEVATION
0+000.000	86853.8883	98803.5921	60.2806
0+001.000	86854.1332	98802.6226	60.2960
0+002.000	86854.3691	98801.6509	60.3207
0+003.000	86854.6050	98800.6791	60.3453
0+004.000	86854.8409	98799.7073	60.3700
0+005.000	86855.0768	98798.7355	60.3946
0+006.000	86855.3127	98797.7638	60.4193
0+007.000	86855.5486	98796.7920	60.4439
0+008.000	86855.7845	98795.8202	60.4686
0+009.000	86856.0204	98794.8484	60.4932
0+010.000	86856.2568	98793.8768	60.5165
0+011.000	86856.4985	98792.9064	60.5240
0+012.000	86856.7402	98791.9361	60.5315
0+013.000	86856.9819	98790.9657	60.5390
0+014.000	86857.2235	98789.9953	60.5465
0+015.000	86857.4652	98789.0250	60.5540
0+016.000	86857.7069	98788.0546	60.5615
0+017.000	86857.9486	98787.0843	60.5690
0+018.000	86858.1903	98786.1139	60.5765
0+019.000	86858.4319	98785.1436	60.5839
0+020.000	86858.6736	98784.1732	60.5914
0+021.000	86858.9153	98783.2029	60.5989
0+022.000	86859.1570	98782.2325	60.6064
0+023.000	86859.3987	98781.2622	60.6139
0+024.000	86859.6404	98780.2918	60.6214
0+025.000	86859.8820	98779.3214	60.6289
0+026.000	86860.1237	98778.3511	60.6364
0+027.000	86860.3654	98777.3807	60.6413
0+028.000	86860.6071	98776.4104	60.6460
0+029.000	86860.8488	98775.4400	60.6497
0+030.000	86861.0905	98774.4697	60.6524

CTRL1 CONT'D

STATION	EASTING	NORTHING	ELEVATION
0+031.000	86861.3321	98773.4993	60.6542
0+032.000	86861.5738	98772.5290	60.6549
0+033.000	86861.8155	98771.5586	60.6546
0+034.000	86862.0572	98770.5882	60.6533
0+035.000	86862.2989	98769.6179	60.6510
0+036.000	86862.5406	98768.6475	60.6477
0+037.000	86862.7822	98767.6772	60.6435
0+038.000	86863.0239	98766.7068	60.6382
0+039.000	86863.2656	98765.7365	60.6319
0+040.000	86863.5073	98764.7661	60.6248
0+041.000	86863.7490	98763.7958	60.6176
0+042.000	86863.9788	98762.8226	60.6104
0+043.000	86864.2023	98761.8479	60.6032
0+044.000	86864.4258	98760.8732	60.5960
0+045.000	86864.6493	98759.8985	60.5889
0+046.000	86864.8728	98758.9237	60.5817
0+047.000	86865.1121	98757.9529	60.5788
0+048.000	86865.3563	98756.9831	60.5772
0+049.000	86865.6005	98756.0134	60.5755
0+050.000	86865.8447	98755.0437	60.5739
0+051.000	86866.0889	98754.0739	60.5723
0+052.000	86866.3331	98753.1042	60.5707
0+053.000	86866.5743	98752.1338	60.5684
0+054.000	86866.8133	98751.1627	60.5657
0+055.000	86867.0523	98750.1917	60.5629
0+056.000	86867.2912	98749.2207	60.5602
0+057.000	86867.5302	98748.2497	60.5574
0+058.000	86867.7692	98747.2786	60.5546
0+059.000	86868.0081	98746.3076	60.5519
0+059.775	86868.1974	98745.5562	60.5500

CTRL2

STATION	EASTING	NORTHING	ELEVATION
0+000.358	86866.4959	98794.7523	60.5740
0+001.000	86866.6501	98794.1290	60.5960
0+002.000	86866.8901	98793.1583	60.6303
0+003.000	86867.1302	98792.1875	60.6646
0+004.000	86867.3702	98791.2167	60.6968
0+005.000	86867.6103	98790.2460	60.7244
0+006.000	86867.8503	98789.2752	60.7474
0+007.000	86868.0904	98788.3045	60.7658
0+008.000	86868.3304	98787.3337	60.7797
0+009.000	86868.2138	98786.4171	60.7890
0+010.000	86867.6964	98785.5614	60.7937
0+011.000	86867.1789	98784.7057	60.7939
0+012.000	86866.6615	98783.8499	60.7895
0+013.000	86866.1441	98782.9942	60.7805
0+014.000	86865.6267	98782.1385	60.7690
0+015.000	86865.1093	98781.2827	60.7578
0+016.000	86864.5918	98780.4270	60.7478
0+017.000	86864.0744	98779.5713	60.7390
0+018.000	86863.5570	98778.7155	60.7315
0+019.000	86863.3489	98777.8129	60.7252
0+020.000	86863.5893	98776.8422	60.7201
0+021.000	86863.8298	98775.8716	60.7163
0+022.000	86864.0702	98774.9009	60.7137
0+023.000	86864.3107	98773.9303	60.7121
0+024.000	86864.5512	98772.9596	60.7105
0+025.000	86864.7916	98771.9889	60.7089
0+026.000	86865.0321	98771.0183	60.7074
0+027.000	86865.2725	98770.0476	60.7058

CTRL2 CONT'D

STATION	EASTING	NORTHING	ELEVATION
0+028.000	86865.5130	98769.0769	60.7042
0+029.000	86865.7534	98768.1063	60.7032
0+030.000	86865.9939	98767.1356	60.7039
0+031.000	86866.2343	98766.1650	60.7064
0+032.000	86866.4748	98765.1943	60.7106
0+033.000	86867.2768	98764.6368	60.7165
0+034.000	86868.1319	98764.1184	60.7241
0+035.000	86868.9870	98763.5999	60.7335
0+036.000	86869.8421	98763.0815	60.7445
0+037.000	86870.6973	98762.5630	60.7562
0+038.000	86871.5524	98762.0446	60.7643
0+039.000	86872.4075	98761.5261	60.7682
0+040.000	86873.2626	98761.0077	60.7678
0+041.000	86874.1177	98760.4892	60.7633
0+042.000	86874.9728	98759.9708	60.7546
0+043.000	86875.3116	98759.0702	60.7418
0+044.000	86876.5574	98758.1009	60.7247
0+045.000	86875.8033	98757.1316	60.7039
0+046.000	86876.0492	98756.1623	60.6849
0+047.000	86876.2951	98755.1930	60.6729
0+048.000	86876.5410	98754.2237	60.6681
0+049.000	86876.7869	98753.2544	60.6682
0+050.000	86877.0328	98752.2851	60.6685
0+051.000	86877.2787	98751.3158	60.6688
0+052.000	86877.5246	98750.3465	60.6681
0+053.000	86877.7704	98749.3772	60.6664
0+054.000	86878.0163	98748.4079	60.6647
0+055.000	86878.2622	98747.4386	60.6630
0+055.808	86878.4608	98746.6558	60.6617

Rev.	Date	By	Description

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS

Drawing Title
PROPOSED FORGE LANE BRIDGE

ARUP
www.arup.com
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Scales 1:200 Originator AJS
Checked Approved Date 20/02/02

Job No. 67313 | Drawing No. C/09/01 | Rev. A

A1

10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR

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NOTES

1. THE TOPOGRAPHICAL SURVEY IS REPRODUCED FROM MALCOM HUGHES SURVEY.
2. PILE LOCATIONS ARE INDICATIVE ONLY.
3. LIMIT OF DEVIATION CO-ORDINATES FROM MALCOLM HUGHES TOPOGRAPHICAL SURVEY AND BRINCKERHOFF INFORMATION.

KEY

- DIAPHRAGM WALL
- CONTIGUOUS BORED PILE WALL
- PROPPED DIAPHRAGM WALL
- PROPPED CONTIGUOUS BORED PILE WALL
- EARTHWORKS SLOPES

STUART STREET

ALAN TURING WAY

Cycle Lane

Lock

Overflow Weir

El Sub Sta

LOW LEVEL (DISCRETE) STRUCTURAL PROPS OR BASE SLAB TO BE CONSTRUCTED (BELOW FUTURE PHASE 3 TRACK CONSTRUCTION)

EXISTING BRICK WALL TO BE REMOVED AS PART OF ADVANCED WORKS

DIAPHRAGM WALL

OUTBOUND

INBOUND

TUNNEL PORTAL

ACCESS AND EGRESS RAMP TO CENTRAL PLATFORM APPROX GRADE 1 IN 15

FIRE BRIGADE ACCESS

EXISTING WORKS & SEWER (AS DEPICTED)/INTERPRETED FROM MEDC DATA)

850mm WIDE CENTRAL PLATFORM FOR EMERGENCY USE ONLY { FOR PHASE 3 CONCESSIONAIRE ASSESSMENT, REVIEW & INSTALLATION

FUTURE RETAIL SITE DEVELOPMENT

PROPOSED GIBSON STREET SEWER DIVERSION

E= 87059.760
N= 98717.703

NEW FORGE LANE ROAD/PEDESTRIAN OVER-RAIL-STRUCTURE TO BE CONSTRUCTED. EXISTING SERVICES TO BE ACCOMMODATED

PHILIPS PARK ROAD

ROUGH GROUND

TARMAC

HARDCORE

PROPPED CONTIGUOUS BORED PILE WALL

NEW RETAIL DEVELOPMENT SITE (WORKS COMMENCED JULY 2001)

ACCESS AND EGRESS RAMP TO CENTRAL PLATFORM APPROX GRADE 1 IN 15

McGoyle Lane

GRASS / SCRUB

E= 87084.703
N= 98546.766

E= 87091.903
N= 98626.939

E= 87097.804
N= 98612.815

BM 61.30m

CUTLINE

SEE DRAWING No. C-00-07

CDM NOTE; FUTURE PHASE 3 CONCESSIONAIRE WILL BE REQUIRED TO CONSTRUCT BELOW TRACK SUPPORT 'UNDER SLAB' UTILISING TEMPORARY WORKS PROPPING MEASURES BETWEEN CHAINAGE 975 AND 985

Rev.	Date	By	Description
F	05/09/01	DW	NEW ALIGNMENT AMENDED, CENTRE & ADJ PROPPED SLABDOWN ADDED
D	23/07/01	DW	FORGE LANE BRIDGE REDUCED TO 7m WIDTH, NOTE ADDED. PROPOSED GIBSON ST. LAYOUT & EARTHWORKS SLOPES ADDED
C	18/07/01	DW	PROP BEAM LOCATIONS AMENDED
B	25/06/01	DW	PILE ARRANGEMENT REVIEWED & METROLINK BOUNDARY, CO ORDINATES ADDED
A	26/06/01	DW	PILE ARRANGEMENT REVIEWED
–	17/05/01	DLP	FIRST ISSUE

Drawing Status
FOR APPROVAL

KEYPLAN

Job Title
METROLINK PHASE 3
ADVANCED WORKS

Drawing Title
GENERAL ARRANGEMENT
CH 975 TO 1400
SHEET 1 OF 2

ARUP
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Tel +44 (0161) 2282331 Fax +44 (0161) 2361057

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Scales 1:500 | Originator DW
Checked | Approved | Date JUNE 01

Job No. 67313 | Drawing No. C-00-06 | Rev. E

A1

10cm – SCALE WITH CAUTION AS DISTORTION CAN OCCUR

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NOTES

1. THE TOPOGRAPHICAL SURVEY IS REPRODUCED FROM MALCOM HUGHES SURVEY.
2. PILE LOCATIONS ARE INDICATIVE ONLY.
3. LIMIT OF DEVIATION CO-ORDINATES FROM MALCOLM HUGHES TOPOGRAPHICAL SURVEY AND BRINCKERHOFF INFORMATION.

KEY

– DIAPHRAGM WALL

– CONTIGUOUS BORED PILE WALL

– PROPPED DIAPHRAGM WALL

– PROPPED CONTIGUOUS BORED PILE WALL

OUTLINE SEE DRAWING No. C-00-06

PROPPED CONTIGUOUS BORED PILE WALL

CANTILEVER CONTIGUOUS BORED PILE WALL

LOW LEVEL (DISCRETE) STRUCTURAL PROPS OR BASE SLAB TO BE CONSTRUCTED (BELOW FUTURE PHASE 3 TRACK CONSTRUCTION)

MASS CONCRETE PLINTH (2800mm DEEP, 1500mm WIDE)

NEW DRAIN CROSSING (CONSTRUCTED BY OTHERS) FROM DRAWING C-07-11

E= 87097.804
N= 98612.815

E= 87152.802
N= 98457.423

NEW RETAIL DEVELOPMENT SITE (WORKS COMMENCED JULY 2001)

ALAN TURING WAY

CORBETT STREET

ASHTON NEW ROAD

OUTBOUND

INBOUND

TURNBACK SIDING

Cycle Lane

Works

Ward Bdy

El Sub Sta

Rev.	Date	By	Description
D	05/02/01	DW	PROP ARRANGEMENT AMENDED
C	23/01/01	DW	CONTIGUOUS PILE WALL STOPPED AT CH 1445 ON INBOUND TRACKSIDE ONLY, CONCRETE PLINTH LOCATION ADDED
B	19/01/01	DW	PROP BEAM LOCATIONS AMENDED
A	02/01/01	DW	ADVANCED WORKS EXTENDED TO CH 1525. CO-ORDINATES ADDED
–	17/05/01	DLP	FIRST ISSUE

Drawing Status: FOR APPROVAL

KEYPLAN

Job Title: METROLINK PHASE 3 ADVANCED WORKS

Drawing Title: GENERAL ARRANGEMENT CH 1400 TO 1525 SHEET 2 OF 2

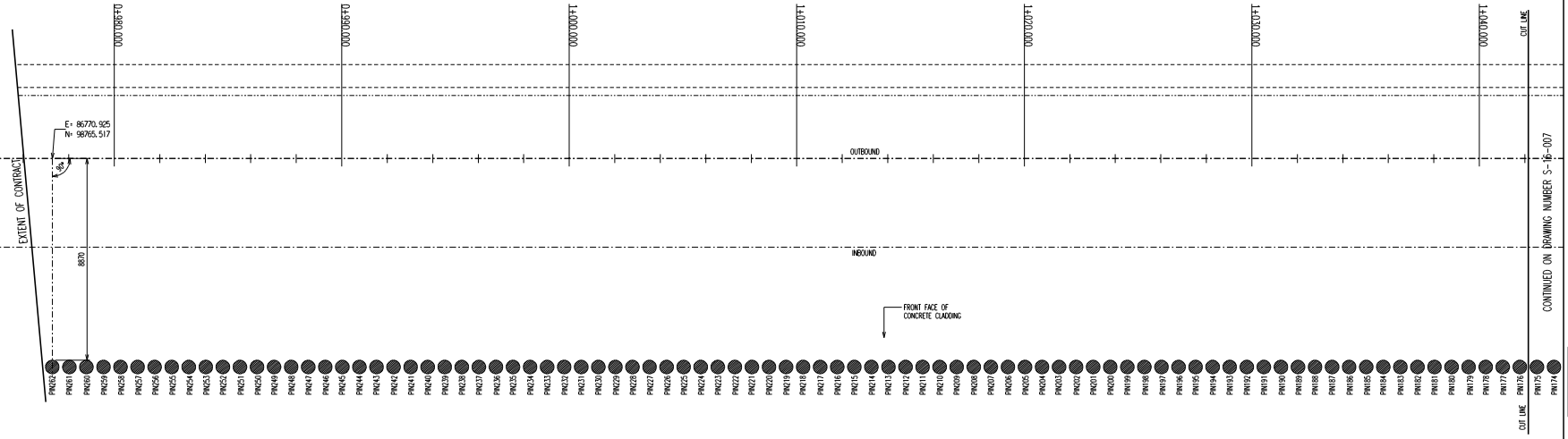
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Checked Approved Date MAY 01
Job No. 67313 Drawing No. C-00-07 Rev. D

A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



PART PLAN

10cm

NOTES:-

1. FOR CAPPING BEAM SETTING OUT REFER TO DRG No.s S-17-006/014.
2. FOR BASE PROP SLAB REFER TO DRG No.s S-17-020/028.
3. ALL PILES ARE TO BE INSTALLED USING PROPRIETARY GUIDE WALL TECHNIQUES CONSTRAINING INSTALLATION TOLERANCES AS SHOWN BELOW.

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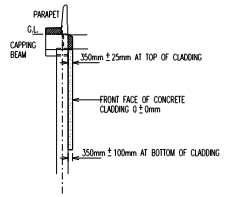
PILE SETTING OUT SYMBOLOGY

PIN154 - STANDARD PILE

PIN182 - CRITICAL PILE

TOLERANCES:-

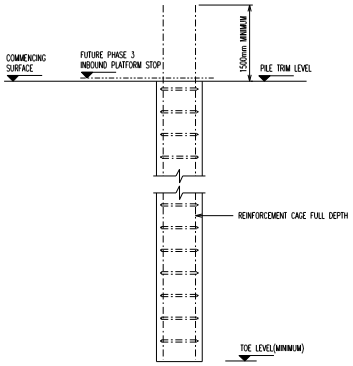
TOLERANCES TO PILES TO BE AS INDICATED BELOW



PILE DIMENSIONS (mm)

PILE SIZE	PILE CENTRES	MINIMUM PILE REINFORCEMENT ANCHORAGE INTO CAPPING BEAM
900	1050	900
750	900	850
600	750	750

PILE REF	PILE DIA (mm)	ESTIMATED TOE LEVEL (A.O.D)	PILE TRIM LEVEL (A.O.D)
PIN262 - PIN176	600	43.000	54.000



TYPICAL PILE
N.T.S

Rev.	Date	By	Description
C1	14/09/01	DW	CONSTRUCTION ISSUE

Drawing Status: CONSTRUCTION

Job Title: METROLINK PHASE 3 ADVANCED WORKS

Drawing Title: RETAINING WALL SETTING OUT OUTBOUND CH. 980-1040 SHEET 1 OF 9

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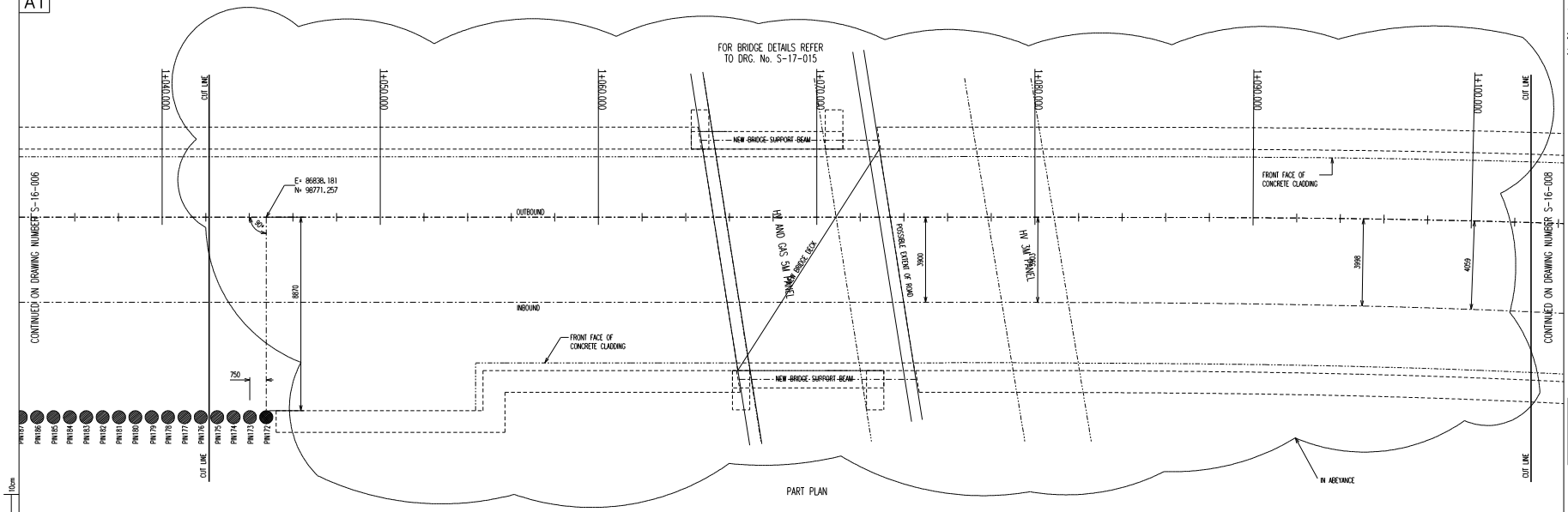
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Scales 1:100 | Originator DLP | Checked | Approved | Date 14/09/01

Job No. 67313 | Drawing No. S-16-006 | Rev. C1

A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



PART PLAN

NOTES:-

1. FOR CAPPING BEAM SETTING OUT REFER TO DRG No.s S-17-006/014.
2. FOR BASE PROPSLAB REFER TO DRG No.s S-17-020/028.
3. ALL PILES ARE TO BE INSTALLED USING PROPRIETARY GUIDE WALL TECHNIQUES CONSTRAINING INSTALLATION TOLERANCES AS SHOWN BELOW.

KEY:-

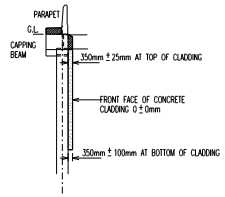
PILE SETTING OUT SYMBOLOGY

PIN154 - STANDARD PILE

PIN182 - CRITICAL PILE

TOLERANCES:-

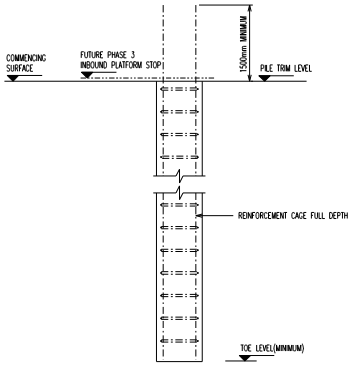
TOLERANCES TO PILES TO BE AS INDICATED BELOW



PILE DIMENSIONS (mm)

PILE SIZE	PILE CENTRES	MINIMUM PILE REINFORCEMENT ANCHORAGE INTO CAPPING BEAM
900	1050	900
750	900	850
600	750	750

PILE REF	PILE DIA (mm)	ESTIMATED TOE LEVEL (A.O.D)	PILE TRIM LEVEL (A.O.D)
PIN175 - PIN172	600	43.000	54.000



TYPICAL PILE

N.T.S

Rev.	Date	By	Description
C1	12/09/01	DW	CONSTRUCTION ISSUE

Drawing Status: CONSTRUCTION

Job Title: METROLINK PHASE 3 ADVANCED WORKS

Drawing Title: PILING SETTING OUT OUTBOUND CH. 1040-1100 SHEET 2 OF 9

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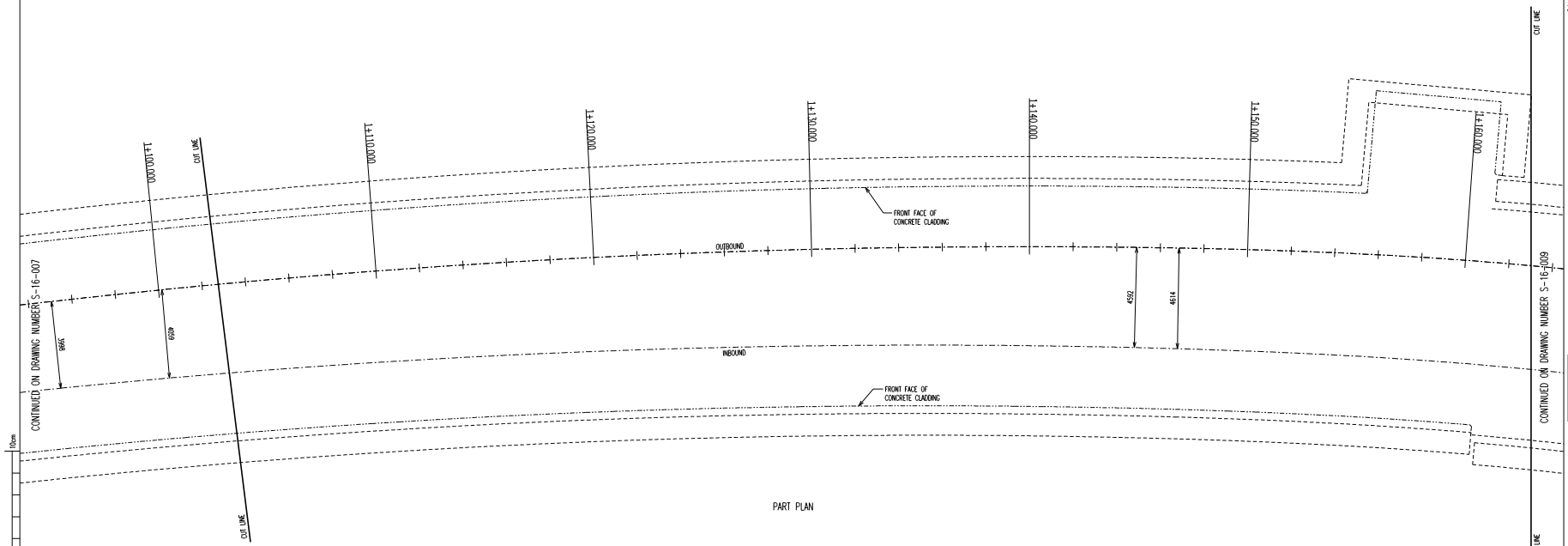
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Job No. 67313 | Drawing No. S-16-007 | Rev. C1

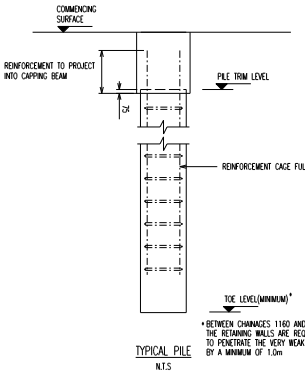
A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



PART PLAN

10cm



* BETWEEN CHAINAGES 1160 AND 1310 THE RETAINING WALLS ARE REQUIRED TO PENETRATE THE VERY WEAK MUDSTONE BY A MINIMUM OF 1.0m

TYPICAL PILE
N.T.S

NOTES:-

1. FOR CAPPING BEAM SETTING OUT REFER TO DRG No.s S-17-006/014.
2. FOR BASE PROPSLAB REFER TO DRG No.s S-17-020/028.
3. ALL PILES ARE TO BE INSTALLED USING PROPRIETARY GUIDE WALL TECHNIQUES CONSTRAINING INSTALLATION TOLERANCES AS SHOWN BELOW.

KEY:-

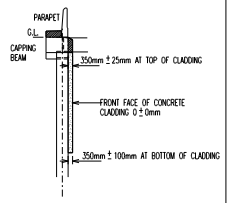
PILE SETTING OUT SYMBOLOGY

PIN154 - STANDARD PILE

PIN182 - CRITICAL PILE

TOLERANCES:-

TOLERANCES TO PILES TO BE AS INDICATED BELOW



PILE DIMENSIONS

PILE SIZE	PILE CENTRES
900	1050
750	900
600	750

Rev.	Date	By	Description
C1	14/09/01	DW	CONSTRUCTION ISSUE

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS

Drawing Title
PILING SETTING OUT
OUTBOUND CH. 1100-1160
SHEET 3 OF 9

ARUP
8th Floor, St. James's Buildings,
Oxford Street, Manchester, M1 6EL
Tel +44 (0161) 2282331 Fax +44 (0161) 2361057
www.arup.com

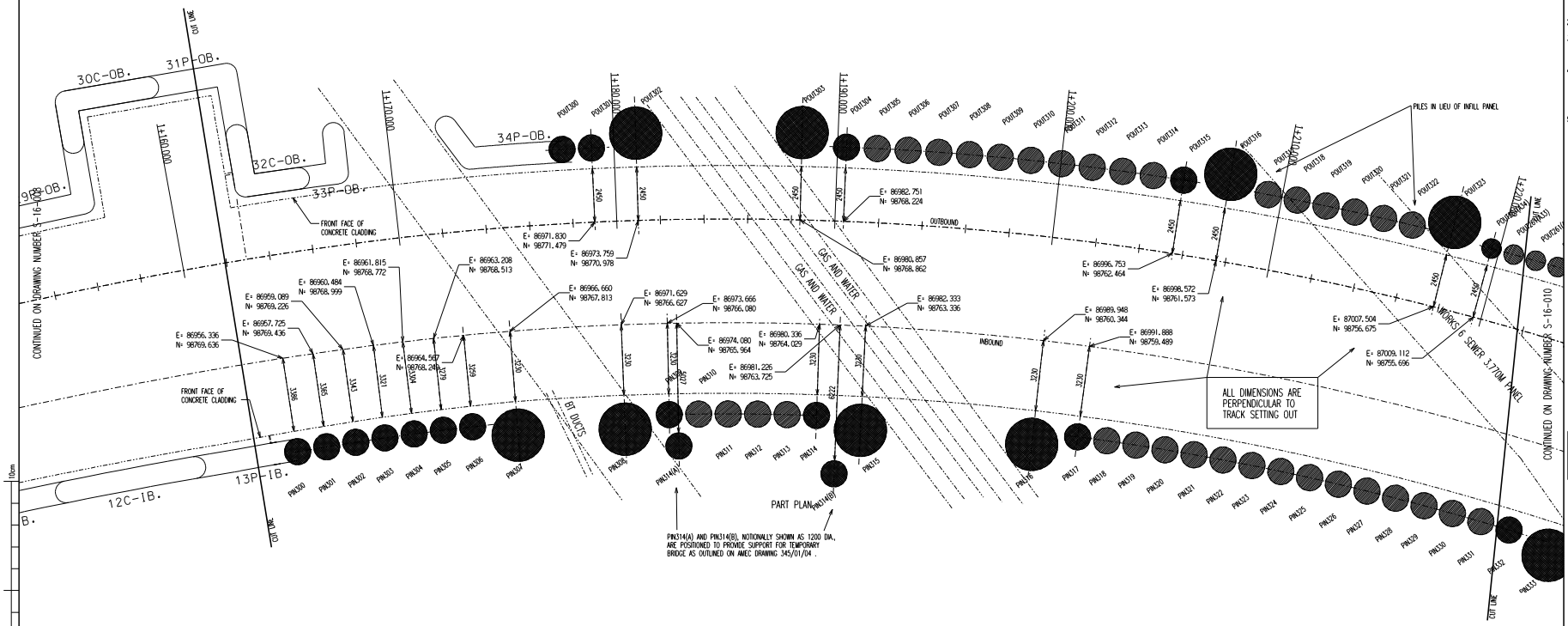
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Scales 1:100 | Originator DW | Checked | Approved | Date 14/09/01

Job No. 67313 | Drawing No. S-16-008 | Rev. C1

A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



NOTES:-

1. FOR CAPPING BEAM SETTING OUT REFER TO DRG No.s S-17-006/014.
2. FOR BASE PROP SLAB REFER TO DRG No.s S-17-025/028.
3. ALL PILES AND DIAPHRAGMS TO BE INSTALLED USING PROPRIETARY GUIDE WALL TECHNIQUES CONSTRAINING INSTALLATION TOLERANCES AS SHOWN BELOW.
4. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
5. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009.

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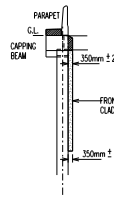
PILE SETTING OUT SYMBOLOGY

PIN154 - STANDARD PILE

PIN182 - CRITICAL PILE

TOLERANCES:-

TOLERANCES TO PILES AND DIAPHRAGMS TO BE AS INDICATED BELOW



SPECIAL NOTE

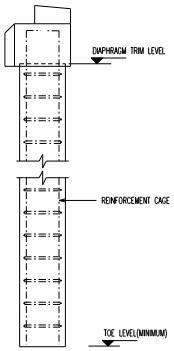
FOR SETTING OUT PURPOSES THE COORDINATES ON THIS DRAWING SHOULD BE ADJUSTED BY -70000E AND -70000N IN ORDER TO BE COMPATIBLE WITH METROLINK LOCAL COORDINATE SYSTEM AS PROVIDED BY PARSONS BRINKERHOFF DRAWINGS NUMBERS 74016/A1/6290/001-008 (REV A) INC.

Rev.	Date	By	Description
C4	21/01/02	EC	PILES REPLACE DIAPHRAGM WALLS
C3	11/12/01	EC	DIAPHRAGM WALL ADDED, NOTES AMENDED
C2	09/10/01	EC	NOTES AMENDED, SETTING OUT ADDED AND AS NOTED
C1	14/09/01	DW	CONSTRUCTION ISSUE

Drawing Status

CONSTRUCTION

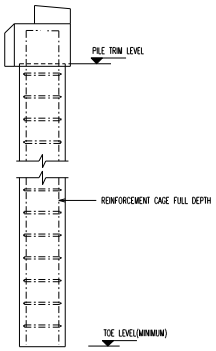
DIAPHRAGM REF	DIAPHRAGM THICKNESS (mm)	MINIMUM TOE LEVEL (A.O.D)	DIAPHRAGM TRIM LEVEL (A.O.D)
31P-OB	FOR DETAILS OF DIAPHRAGM		
32C-OB	WALLS REFER TO AMEC FABRICATION		
33P-OB	AND ARUP SERIES 17 DRAWINGS		
34P-OB			



TYPICAL DIAPHRAGM
N.T.S

C4

PILE REF	PILE DIA (mm)	MINIMUM TOE LEVEL (A.O.D)	PILE TRIM LEVEL (A.O.D)
POUT300-POUT301	1200	42.000	60.566
POUT302-POUT303	2400	39.000	-
POUT304-POUT315	1200	42.000	60.566
POUT316	2400	39.000	-
POUT317-POUT322	1200	45.000	-
POUT323	2400	39.000	-
POUT261(A34)	900	42.000	60.566
POUT261(A33)	900	42.000	60.566
PIN300-PIN306	1200	42.000	60.566
POUT307-PIN308	2400	39.000	-
PIN309-PIN314	1200	42.000	60.566
PIN314(A)	AMEC DESIGN	-	-
PIN314(B)	AMEC DESIGN	-	-
POUT315-PIN316	2400	39.000	-
PIN317-PIN331	1200	45.000	60.450



TYPICAL PILE
N.T.S

WALL DIMENSIONS (mm)	MINIMUM PILE REINFORCEMENT ANCHORAGE INTO CAPPING BEAM					
WALL SIZE (mm)	BAR DIAMETER (mm)					
	16	20	25	32	40	50
600 DIA.	492	540	600	684	780	900
750 DIA.	560	615	675	759	855	975
900 DIA.	560	690	750	834	930	1050
1000 DIA.	560	700	800	884	980	1100
1200 DIA.	560	700	875	984	1080	1200
1800 DIA.	560	700	875	1120	1380	1500
1000 DIAPHRAGM	560	700	875	1120	1380	1500

THE ABOVE VALUES SHOULD BE USED IN ALL CASES EXCEPT WHERE THE MINIMUM ANCHORAGE IS GOVERNED BY THE "DEPTH OF CAPPING BEAM-100mm", IN THIS CASE THE BARS SHOULD BE TRIMMED WITH 100mm COVER TO THE TOP OF THE CAPPING BEAM.

Job Title

METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title

RETAINING WALL SETTING OUT
OUTBOUND CH. 1160 - 1220
SHEET 4 OF 9

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Oxford Street, Manchester, M1 6EL
Tel +44 (0)161 2282331 Fax +44 (0)161 2361057
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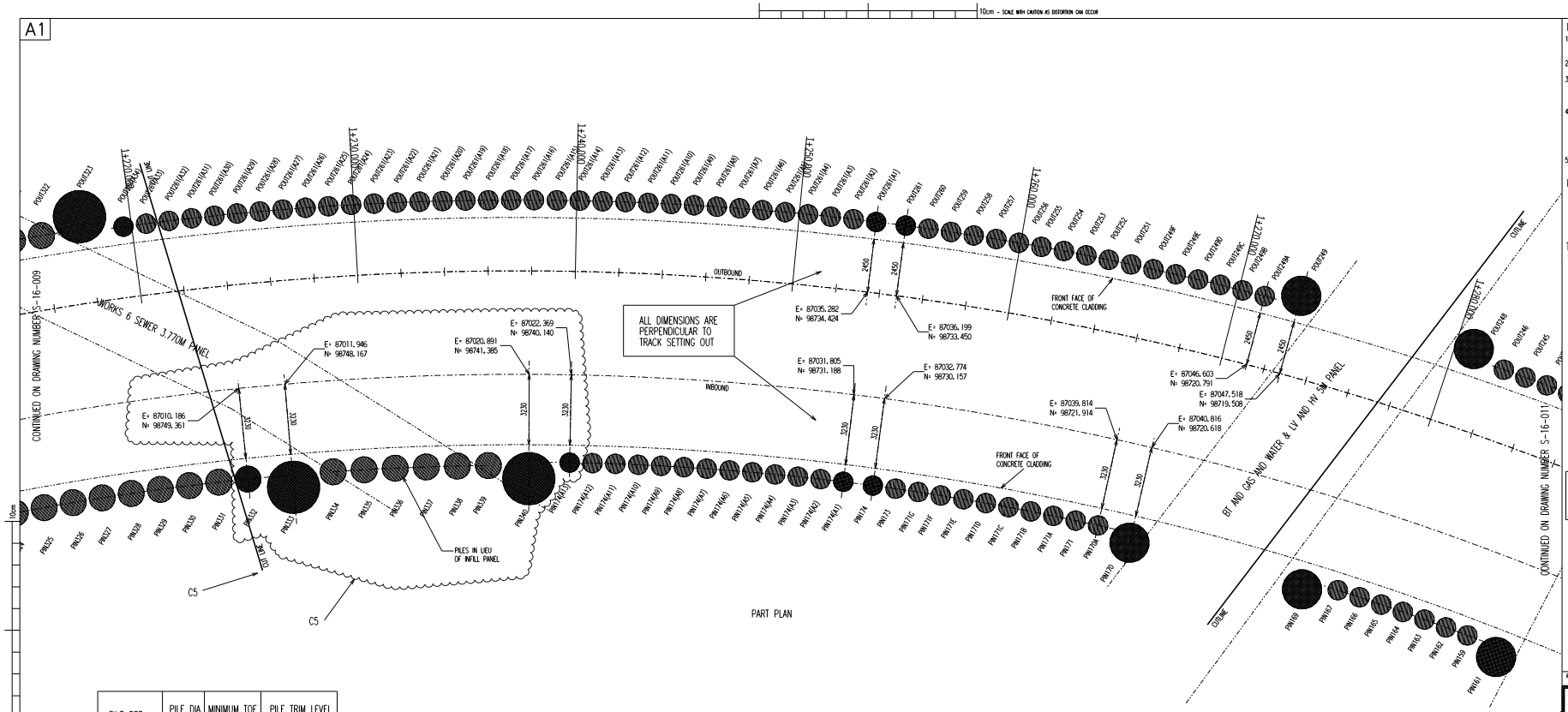
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Scales	1:100	Originator	DW
Checked		Approved	Date 14/09/01

Job No.	Drawing No.	Rev.
67313	S-16-009	C4

A1

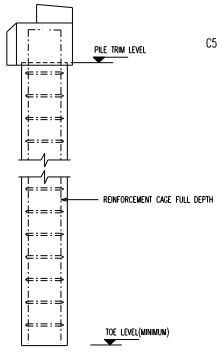
10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



PART PLAN

PILE REF	PILE DIA (mm)	MINIMUM TOE LEVEL (A.O.D)	PILE TRIM LEVEL (A.O.D)
POUT261(A32) - POUT261(A1)	900	42.000	60.566
POUT261 - POUT251	900	44.500	58.575
POUT249F	900	44.500	58.575
POUT249E	900	44.500	58.575
POUT249D	900	44.500	58.575
POUT249C	900	44.500	58.575
POUT249B	900	44.500	58.575
POUT249A	900	44.500	58.575
POUT249	1800		
PIN174(A13)- PIN174(A1)	900	42.000	60.566
PIN174 - PIN173	900	44.500	58.575
PIN171G	900	44.500	58.575
PIN171F	900	44.500	58.575
PIN171E	900	44.500	58.575
PIN171D	900	44.500	58.575
PIN171C	900	44.500	58.575
PIN171B	900	44.500	58.575
PIN171A	900	44.500	58.575
PIN171	900	44.500	58.575
PIN170A	900	44.500	58.575
PIN170	1800		

C5



TYPICAL PILE
N.T.S

C5

PILE REF	PILE DIA (mm)	MINIMUM TOE LEVEL (A.O.D)	PILE TRIM LEVEL (A.O.D)
PIN332	1200	45.000	60.450
PIN333	2400	39.000	-
PIN334-PIN339	1200	45.000	-
PIN340	2400	39.000	-

NOTES:-

1. FOR CAPPING BEAM SETTING OUT REFER TO DRG No.s S-17-006/014.
2. FOR BASE PROP SLAB REFER TO DRG No.s S-17-025/028.
3. ALL PILES AND DIAPHRAGMS TO BE INSTALLED USING PROPRIETARY GUIDE WALL TECHNIQUES CONSTRAINING INSTALLATION TOLERANCES AS SHOWN BELOW.
4. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
5. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009.

KEY:-

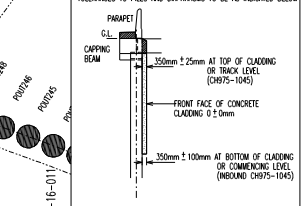
PILE SETTING OUT SYMBOLOGY

PIN154 - STANDARD PILE

PIN182 - CRITICAL PILE

TOLERANCES:-

TOLERANCES TO PILES AND DIAPHRAGMS TO BE AS INDICATED BELOW



SPECIAL NOTE

FOR SETTING OUT PURPOSES THE COORDINATES ON THIS DRAWING SHOULD BE ADJUSTED BY -70000E AND -70000N IN ORDER TO BE COMPATIBLE WITH METROLINK LOCAL COORDINATE SYSTEM AS PROVIDED BY PARSONS BRINKERHOFF DRAWINGS NUMBERS 74016/A1/6290/001-008 (REV A) INC.

Rev.	Date	By	Description
C5	21/11/02	EC	PILES REPLACE DIAPHRAGM WALLS
C4	22/10/02	EC	ADDITIONAL PILES REPLACING DIAPHRAGM, NOTES AMENDED AND AS NOTED
C3	22/11/01	EC	PIN172, PIN173, AND PIN174(A1) AND PIN174 ADDED PIN172 AND PIN250 DELETED AND AS NOTED
C2	08/10/01	EC	PILES PIN250-PIN256 REMOVED PILES PIN175-PIN178 REMOVED, NOTES AMENDED AND AS NOTED
C1	14/09/01	DW	CONSTRUCTION ISSUE

Drawing Status

CONSTRUCTION

WALL DIMENSIONS (mm)	MINIMUM PILE REINFORCEMENT ANCHORAGE INTO CAPPING BEAM					
	BAR DIAMETER (mm)					
WALL SIZE (mm)	16	20	25	32	40	50
600 DIA.	492	540	600	684	780	900
750 DIA.	560	615	675	759	855	975
900 DIA.	560	690	750	834	930	1050
1000 DIA.	560	700	800	884	980	1100
1200 DIA.	560	700	875	984	1080	1200
1800 DIA.	560	700	875	1120	1380	1500
1000 DIAPHRAGM	560	700	875	1120	1380	1500

THE ABOVE VALUES SHOULD BE USED IN ALL CASES EXCEPT WHERE THE MINIMUM ANCHORAGE IS GOVERNED BY THE "DEPTH OF CAPPING BEAM-100mm". IN THIS CASE THE BARS SHOULD BE TRIMMED WITH 100mm COVER TO THE TOP OF THE CAPPING BEAM.

Job Title

METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title

RETAINING WALL SETTING OUT
OUTBOUND CH. 1220-1280
SHEET 5 OF 9

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8th Floor, St. James's Buildings, Oxford Street, Manchester, M1 6EL
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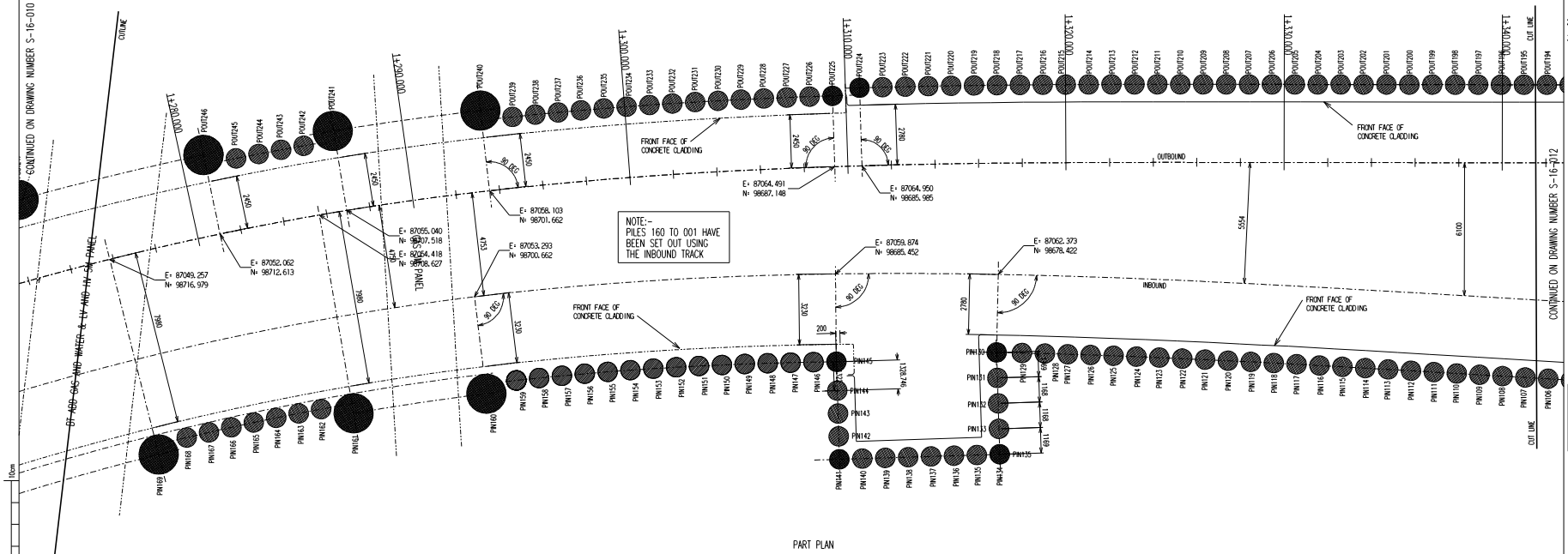
Scales 1:100 Originator DW

Checked Approved Date 14/09/01

Job No. 67313 Drawing No. S-16-010 Rev. C5

A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



PART PLAN

NOTES:-

1. FOR CAPPING BEAM SETTING OUT REFER TO DRG No.s S-17-006/014.
2. FOR BASE PROPSLAB REFER TO DRG No.s S-17-020/028.
3. ALL PILES ARE TO BE INSTALLED USING PROPRIETARY GUIDE WALL TECHNIQUES CONSTRAINING INSTALLATION TOLERANCES AS SHOWN BELOW.

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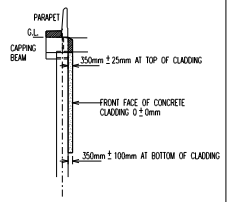
PILE SETTING OUT SYMBOLOGY

PIN154 - STANDARD PILE

PIN182 - CRITICAL PILE

TOLERANCES:-

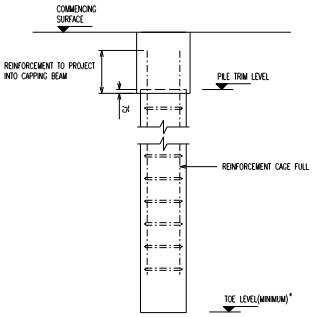
TOLERANCES TO PILES TO BE AS INDICATED BELOW



PILE DIMENSIONS

PILE SIZE	PILE CENTRES
900	1050
750	900
600	750

PILE REF	PILE DIA (mm)	ESTIMATED TOE LEVEL (A.O.D)	TRIM LEVEL (A.O.D)
POUT246	1800	-	-
POUT245-POUT242	900	45.000	58.575
POUT241-POUT240	1800	-	-
POUT239-POUT225	900	45.000	58.575
POUT224-POUT195	900	45.000	61.075
PIN169	1800	-	-
PIN168 - PIN162	900	45.000	58.575
PIN161 - PIN160	1800	-	-
PIN159-PIN141	900	45.000	58.575
PIN140-PIN107	900	45.000	61.075



TYPICAL PILE
N.T.S

Rev.	Date	By	Description
C1	14/09/01	DW	CONSTRUCTION ISSUE

Drawing Status: CONSTRUCTION

Job Title: METROLINK PHASE 3 ADVANCED WORKS

Drawing Title: PILE SETTING OUT OUTBOUND CH. 1280 - 1340 SHEET 6 OF 9

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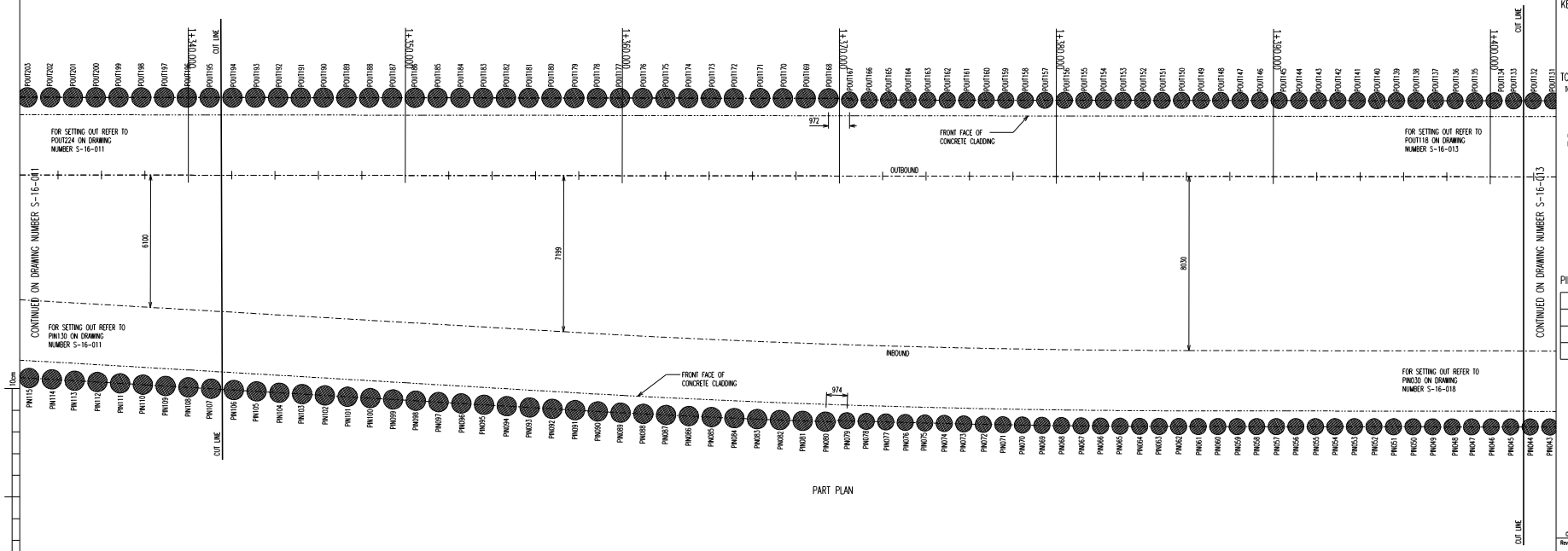
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Scales 1:100 | Originator DW | Checked | Approved | Date 14/09/01

Job No. 67313 | Drawing No. S-16-011 | Rev. C1

A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



PART PLAN

NOTES:-

1. FOR CAPPING BEAM SETTING OUT REFER TO DRG No.s S-17-006/014.
2. FOR BASE PROPSLAB REFER TO DRG No.s S-17-020/028.
3. ALL PILES ARE TO BE INSTALLED USING PROPRIETARY GUIDE WALL TECHNIQUES CONSTRAINING INSTALLATION TOLERANCES AS SHOWN BELOW.

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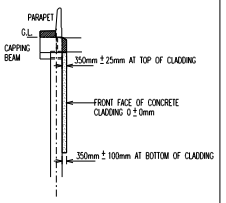
PILE SETTING OUT SYMBOLOGY

PIN154 - STANDARD PILE

PIN182 - CRITICAL PILE

TOLERANCES:-

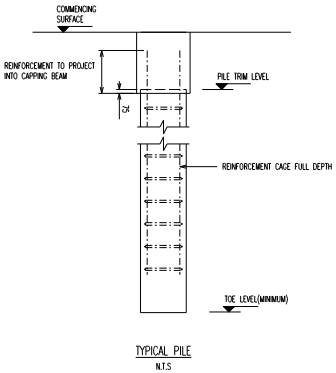
TOLERANCES TO PILES TO BE AS INDICATED BELOW



PILE DIMENSIONS

PILE SIZE	PILE CENTRES
900	1050
750	900
600	750

PILE REF	PILE DIA (mm)	ESTIMATED TOE LEVEL (A.O.D)	PILE TRIM LEVEL (A.O.D)
POUT194 - POUT168	900	45.000	61.075
POUT167 - POUT134	750/900	46.800/46.000	61.075
POUT133	750	48.500	61.075
PIN106 - PIN080	900	45.000	61.075
PIN079 - PIN046	750/900	46.800/46.000	61.075
PIN045	750	48.500	61.075



TYPICAL PILE

N.T.S

Rev.	Date	By	Description
C1	01/09/01	EC	CONSTRUCTION ISSUE

Drawing Status

CONSTRUCTION

Job Title

METROLINK PHASE 3
ADVANCED WORKS

Drawing Title

PILING SETTING OUT
OUTBOUND CH. 1340-1400
SHEET 7 OF 9

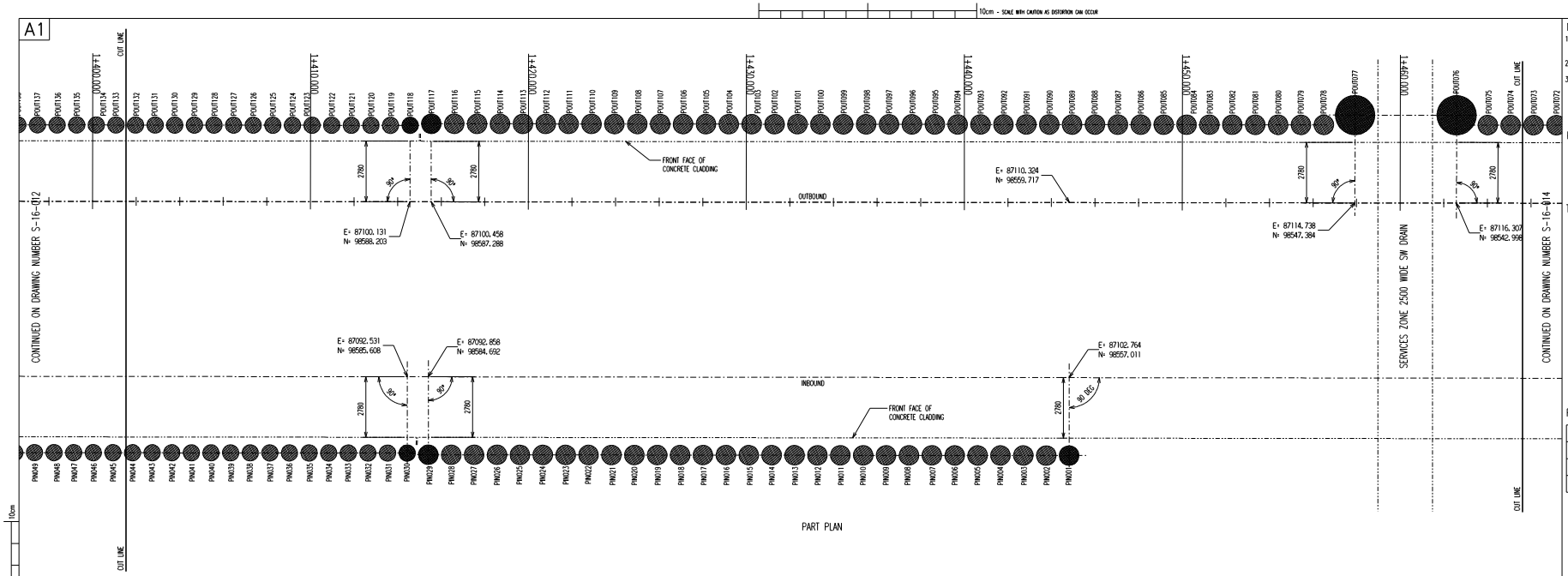
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Checked Approved Date 14/09/01

Job No. 67313 Drawing No. S-16-012 Rev. C1



PART PLAN

10cm

NOTES:-

1. FOR CAPPING BEAM SETTING OUT REFER TO DRG No.s S-17-006/014.
2. FOR BASE PROPSLAB REFER TO DRG No.s S-17-020/028.
3. ALL PILES ARE TO BE INSTALLED USING PROPRIETARY GUIDE WALL TECHNIQUES CONSTRAINING INSTALLATION TOLERANCES AS SHOWN BELOW.

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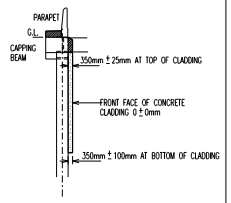
PILE SETTING OUT SYMBOLOGY

PIN154 - STANDARD PILE

PIN182 - CRITICAL PILE

TOLERANCES:-

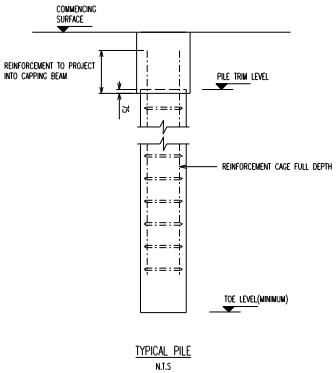
TOLERANCES TO PILES TO BE AS INDICATED BELOW



PILE DIMENSIONS

PILE SIZE	PILE CENTRES
900	1050
750	900
600	750

PILE REF	PILE DIA (mm)	ESTIMATED TOE LEVEL (A.O.D)	PILE TRIM LEVEL (A.O.D)
POUT132 - POUT118	750	48.500	61.075
POUT117 - POUT094	900	48.500	61.075
POUT093 - POUT078	900	48.500	VARIES
POUT077 - POUT076	1800	-	-
POUT075 - POUT074	900	48.500	VARIES
PIN044 - PIN030	750	48.500	61.075
PIN029 - PIN006	900	48.500	61.075
PIN005 - PIN001	900	48.500	VARIES



TYPICAL PILE

N.T.S

Rev.	Date	By	Description
C1	14/09/01	EC	CONSTRUCTION ISSUE

Drawing Status

CONSTRUCTION

Job Title

METROLINK PHASE 3
ADVANCED WORKS

Drawing Title

PILING SETTING OUT
OUTBOUND CH. 1400-1460
SHEET 8 OF 9

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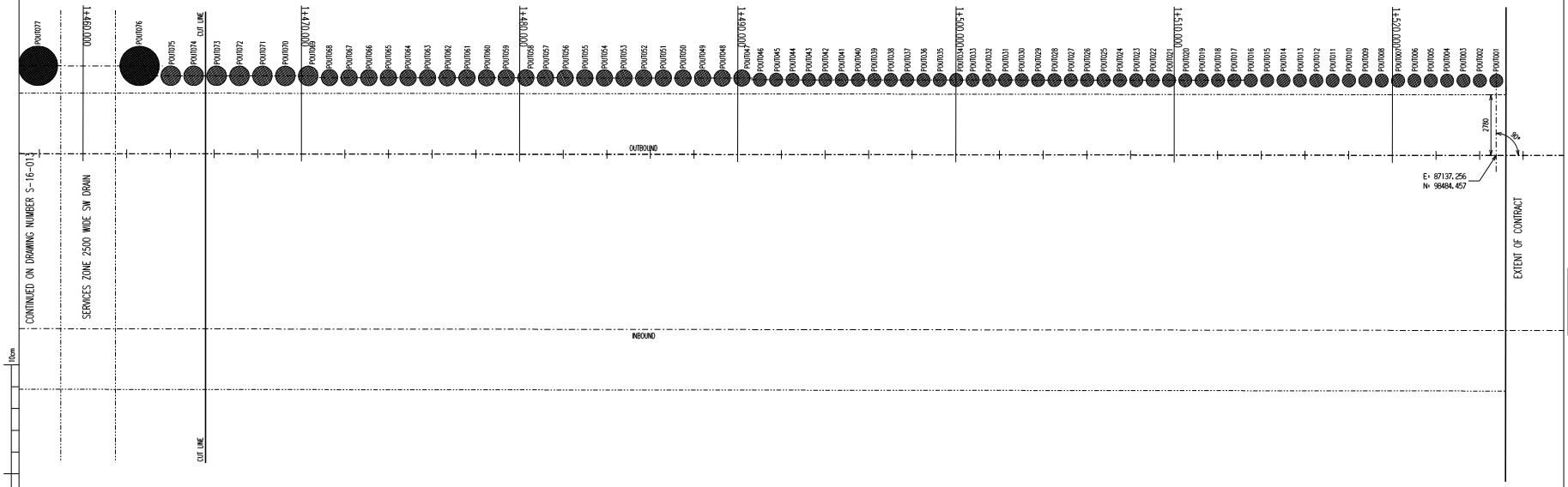
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Checked Approved Date 14/09/01

Job No. 67313 Drawing No. S-16-013 Rev. C1

A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



NOTES:-

1. FOR CAPPING BEAM SETTING OUT REFER TO DRG No.s S-17-006/014.
2. FOR BASE PROPSLAB REFER TO DRG No.s S-17-020/028.
3. ALL PILES ARE TO BE INSTALLED USING PROPRIETARY GUIDE WALL TECHNIQUES CONSTRAINING INSTALLATION TOLERANCES AS SHOWN BELOW.

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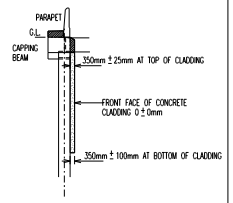
PILE SETTING OUT SYMBOLOGY

PIN154 - STANDARD PILE

PIN182 - CRITICAL PILE

TOLERANCES:-

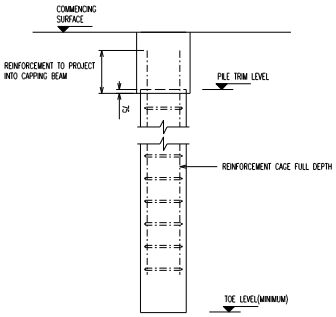
TOLERANCES TO PILES TO BE AS INDICATED BELOW



PILE DIMENSIONS

PILE SIZE	PILE CENTRES
900	1050
750	900
600	750

PILE REF	PILE DIA (mm)	ESTIMATED TOE LEVEL (A.O.D)	PILE TRIM LEVEL (A.O.D)
POUT073 - POUT069	900	48.500	VARIES
POUT068 - POUT047	750	49.100	VARIES
POUT046 - POUT001	600	51.800	VARIES



TYPICAL PILE
N.T.S

Rev.	Date	By	Description
C1	14/09/01	EC	CONSTRUCTION ISSUE

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS

Drawing Title
PILING SETTING OUT
OUTBOUND CH. 1460-1525
SHEET 9 OF 9

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Oxford Street, Manchester, M1 6EJ
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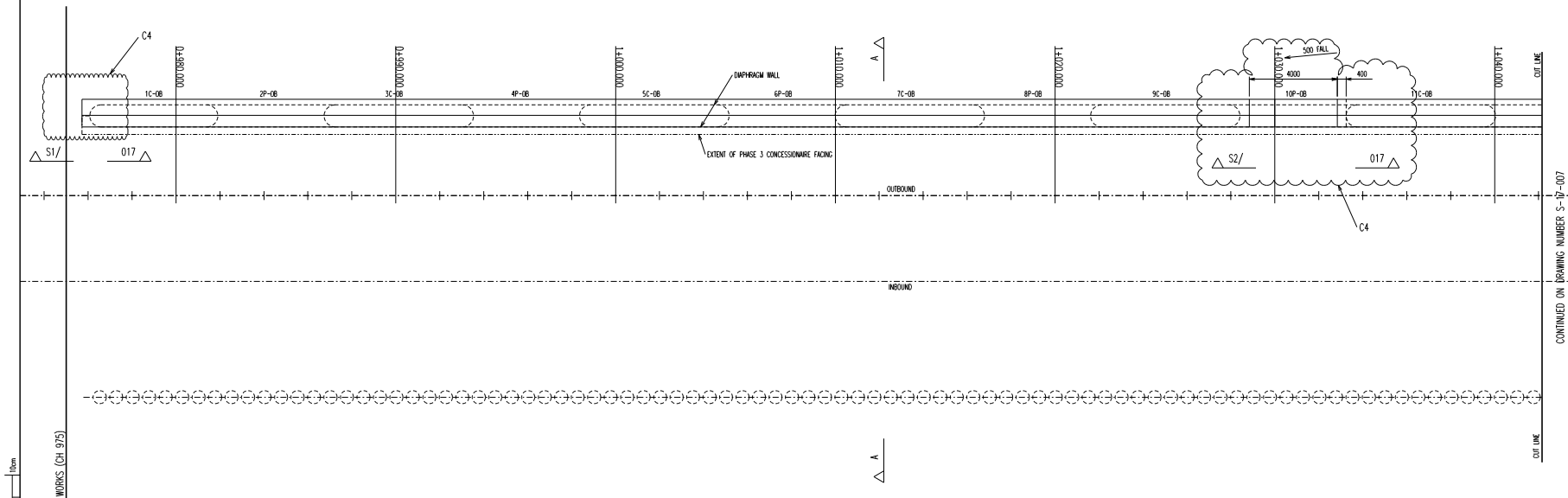
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Scales 1:100 Originator DW
Checked Approved Date 14/09/01

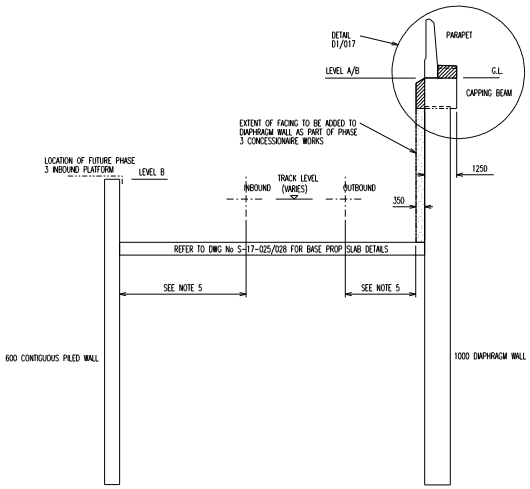
Job No. 67313 Drawing No. S-16-014 Rev. C1

A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



PART PLAN



SECTION A-A

NOTES:-

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S-16-006/14.
2. FOR LEVELS TABLE, SECTIONS AND DETAILS REFER TO DRAWING NUMBER S-17-017/020.
3. HIGH LEVEL PROP SETTING OUT PRINCIPLES :-

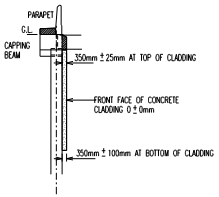
   THE TRIANGULAR HIGH LEVEL PROP BEAMS ARE TO BE SET OUT IN THE FOLLOWING MANNER.

   A LINE FROM THE INTERSECTION OF THE OUTBOUND RAILTRACK AND THE OUTBOUND CHAINAGE TO BE PERPENDICULAR TO THE INBOUND RAILTRACK. THIS LINE THEN EXTENDS FROM BOTH TRACKS TO THE CENTRE LINE OF THE PILES OR DIAPHRAGM WALLS.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
5. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009.
6. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
7. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C40
   PRECAST..... C40

TOLERANCES:-

TOLERANCES TO PILES TO BE AS INDICATED BELOW



Rev.	Date	By	Description
C4	12/03/02	EC	AS NOTED
C3	26/11/01	EC	REVISED AS NOTED
C2	24/10/01	EC	NOTES AMENDED AND AS NOTED
C1	03/09/01	EC	CONSTRUCTION ISSUE

Drawing Status: CONSTRUCTION

Job Title: METROLINK PHASE 3 ADVANCED WORKS (ALAN TURING WAY)

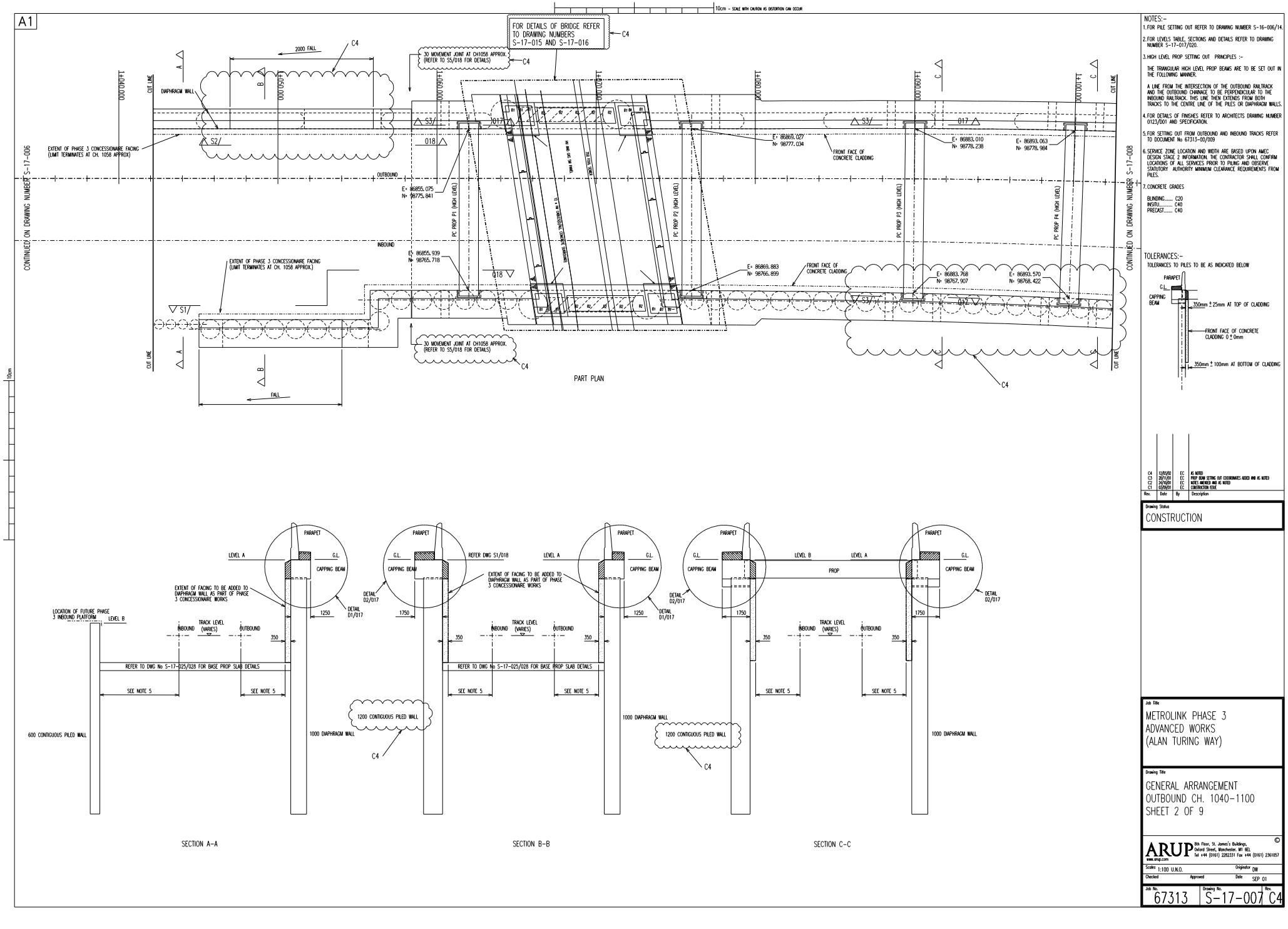
Drawing Title: GENERAL ARRANGEMENT OUTBOUND CH. 980-1040 SHEET 1 OF 9

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Scales: 1:100 U.N.O. | Originator: DW | Checked | Approved | Date: SEP 01

Job No. 67313 | Drawing No. S-17-006 | Rev. C4



PART PLAN

SECTION A-A SECTION B-B SECTION C-C

NOTES:-

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S-16-006/14.
2. FOR LEVELS TABLE, SECTIONS AND DETAILS REFER TO DRAWING NUMBER S-17-017/020.
3. HIGH LEVEL PROP SETTING OUT PRINCIPLES :-

   THE TRIANGULAR HIGH LEVEL PROP BEAMS ARE TO BE SET OUT IN THE FOLLOWING MANNER.

   A LINE FROM THE INTERSECTION OF THE OUTBOUND RAILTRACK AND THE OUTBOUND CHAINAGE TO BE PERPENDICULAR TO THE INBOUND RAILTRACK. THIS LINE THEN EXTENDS FROM BOTH TRACKS TO THE CENTRE LINE OF THE PILES OR DIAPHRAGM WALLS.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
5. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009
6. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
7. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C40
   PRECAST..... C40

TOLERANCES:-

TOLERANCES TO PILES TO BE AS INDICATED BELOW

Rev.	Date	By	Description
C4	12/03/02	EC	AS NOTED
C3	26/11/01	EC	PROP BEAM SETTING OUT COORDINATES ADDED AND AS NOTED
C2	24/10/01	EC	NOTES AMENDED AND AS NOTED
C1	03/09/01	EC	CONSTRUCTION ISSUE

Drawing Status: CONSTRUCTION

Job Title: METROLINK PHASE 3 ADVANCED WORKS (ALAN TURING WAY)

Drawing Title: GENERAL ARRANGEMENT OUTBOUND CH. 1040-1100 SHEET 2 OF 9

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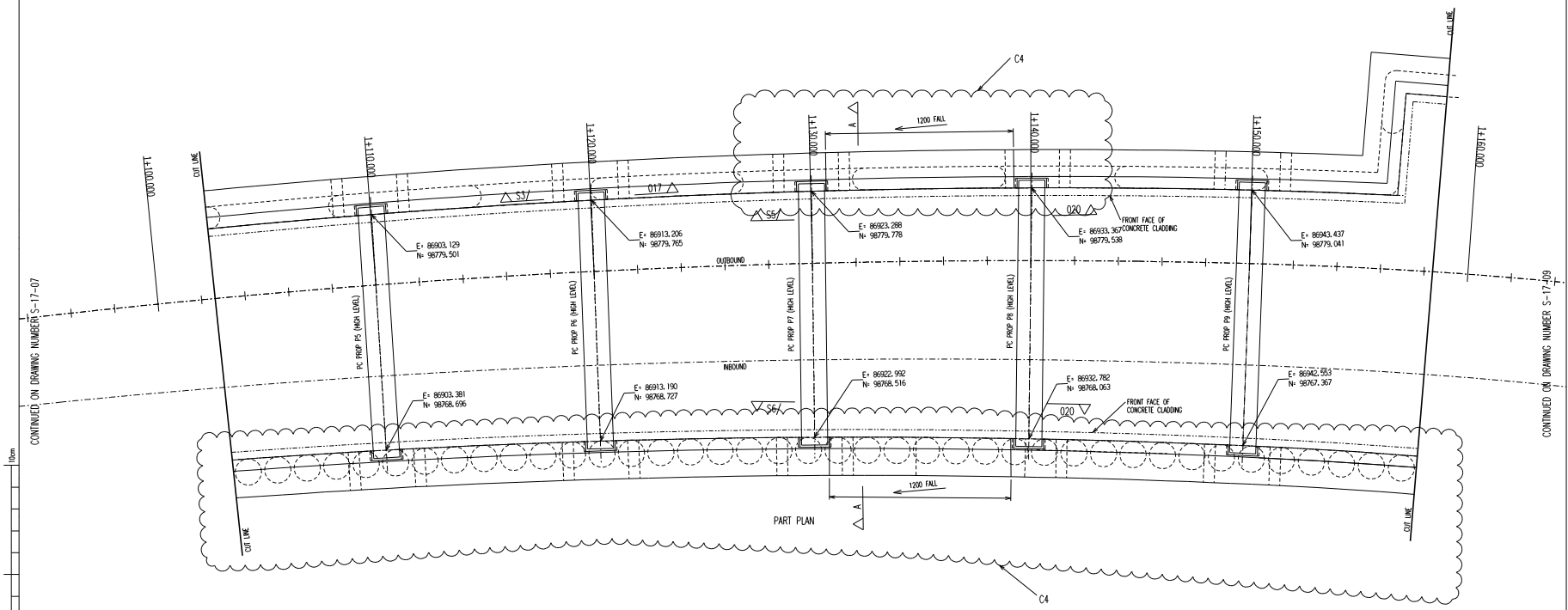
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Scales	Originator
1:100 U.N.O.	DW
Checked	Approved
	Date: SEP 01

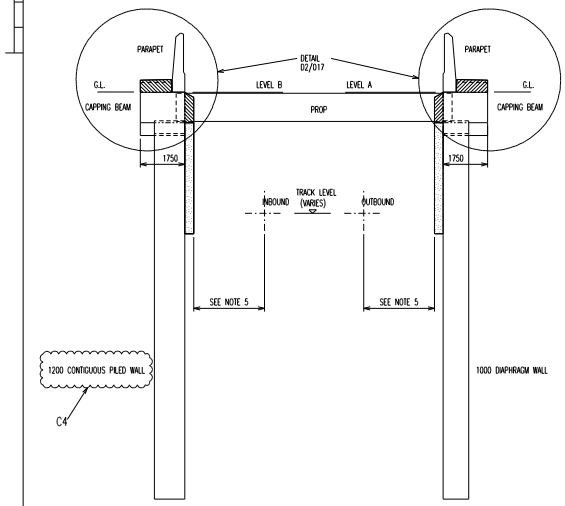
Job No.	Drawing No.	Rev.
67313	S-17-007	C4

A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



PART PLAN



SECTION A-A

NOTES:-

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S-16-006/14.
2. FOR LEVELS TABLE, SECTIONS AND DETAILS REFER TO DRAWING NUMBER S-17-017/020.
3. HIGH LEVEL PROP SETTING OUT PRINCIPLES :-

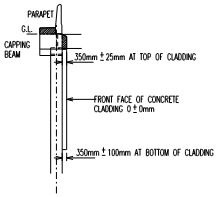
   THE TRIANGULAR HIGH LEVEL PROP BEAMS ARE TO BE SET OUT IN THE FOLLOWING MANNER.

   A LINE FROM THE INTERSECTION OF THE OUTBOUND RAILTRACK AND THE OUTBOUND CHAINAGE TO BE PERPENDICULAR TO THE INBOUND RAILTRACK. THIS LINE THEN EXTENDS FROM BOTH TRACKS TO THE CENTRE LINE OF THE PILES OR DIAPHRAGM WALLS.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
5. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009.
6. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
7. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C40
   PRECAST..... C40

TOLERANCES:-

TOLERANCES TO PILES TO BE AS INDICATED BELOW



Rev.	Date	By	Description
C4	12/03/02	EC	AS NOTED AND CUT LINES AMENDED
C3	24/10/01	EC	PROP BEAM SETTING OUT COORDINATES ADDED AND AS NOTED
C1	03/09/01	EC	CONSTRUCTION ISSUE

Drawing Status: CONSTRUCTION

Job Title: METROLINK PHASE 3 ADVANCED WORKS (ALAN TURING WAY)

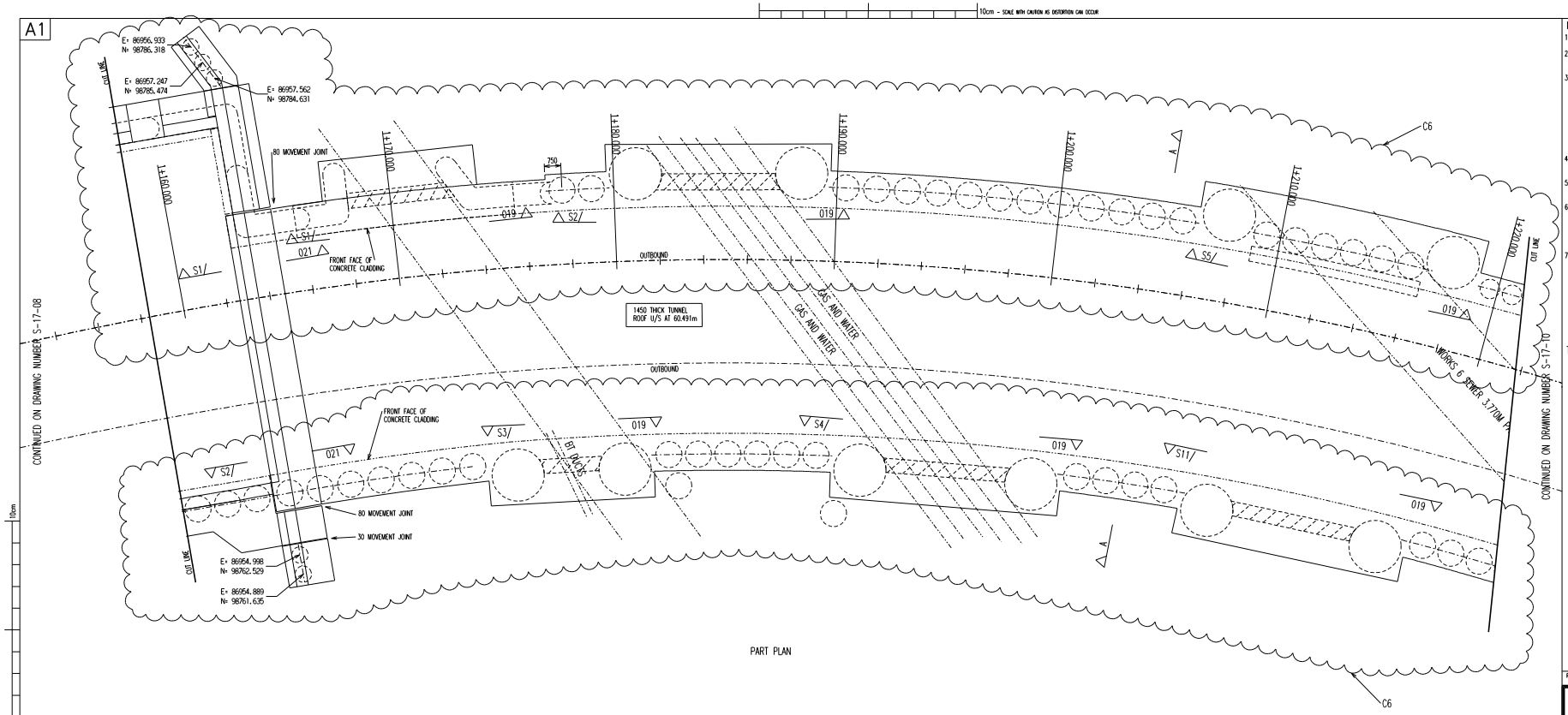
Drawing Title: GENERAL ARRANGEMENT OUTBOUND CH. 1100-1160 SHEET 3 OF 9

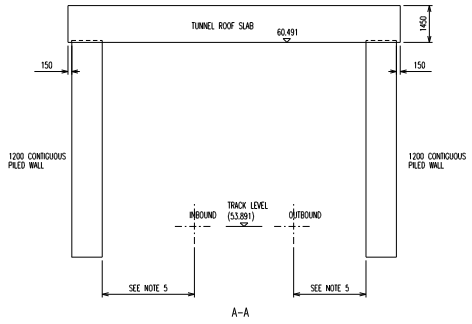
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Checked		Approved	
Date	AUG 01		

Job No.	Drawing No.	Rev.
67313	S-17-008	C4





A-A

NOTES:-

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S-16-006/14.
2. FOR LEVELS TABLE, SECTIONS AND DETAILS REFER TO DRAWING NUMBER S-17-017/020.
3. HIGH LEVEL PROP SETTING OUT PRINCIPLES :-

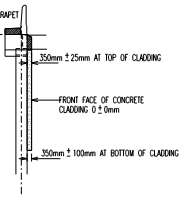
   THE TRIANGULAR HIGH LEVEL PROP BEAMS ARE TO BE SET OUT IN THE FOLLOWING MANNER.

   A LINE FROM THE INTERSECTION OF THE OUTBOUND RAILTRACK AND THE OUTBOUND CHAINAGE TO BE PERPENDICULAR TO THE INBOUND RAILTRACK. THIS LINE THEN EXTENDS FROM BOTH TRACKS TO THE CENTRE LINE OF THE PILES OR DIAPHRAGM WALLS.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
5. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009.
6. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
7. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C40
   PRECAST..... C40

TOLERANCES:-

TOLERANCES TO PILES TO BE AS INDICATED BELOW



Rev.	Date	By	Description
C6	12/03/02	EC	AS NOTED AND CUT LINES AMENDED
C5	25/02/02	EC	PILES REMOVED - WALL PANEL ADDED
C4	06/09/01	EC	SECTION MARKS REMUMBERED AND CUT LINES AMENDED PANEL SPANS AMENDED AND PILES REPLACING DIAPHRAGM
C3	29/11/01	EC	REVISED AS NOTED
C2	24/10/01	EC	NOTES AMENDED AND AS NOTED
C1	19/9/01	DW	ISSUED FOR CONSTRUCTION

Drawing Status: CONSTRUCTION

Job Title: METROLINK PHASE 3 ADVANCED WORKS (ALAN TURING WAY)

Drawing Title: GENERAL ARRANGEMENT OUTBOUND CH. 1160-1220 SHEET 4 OF 9

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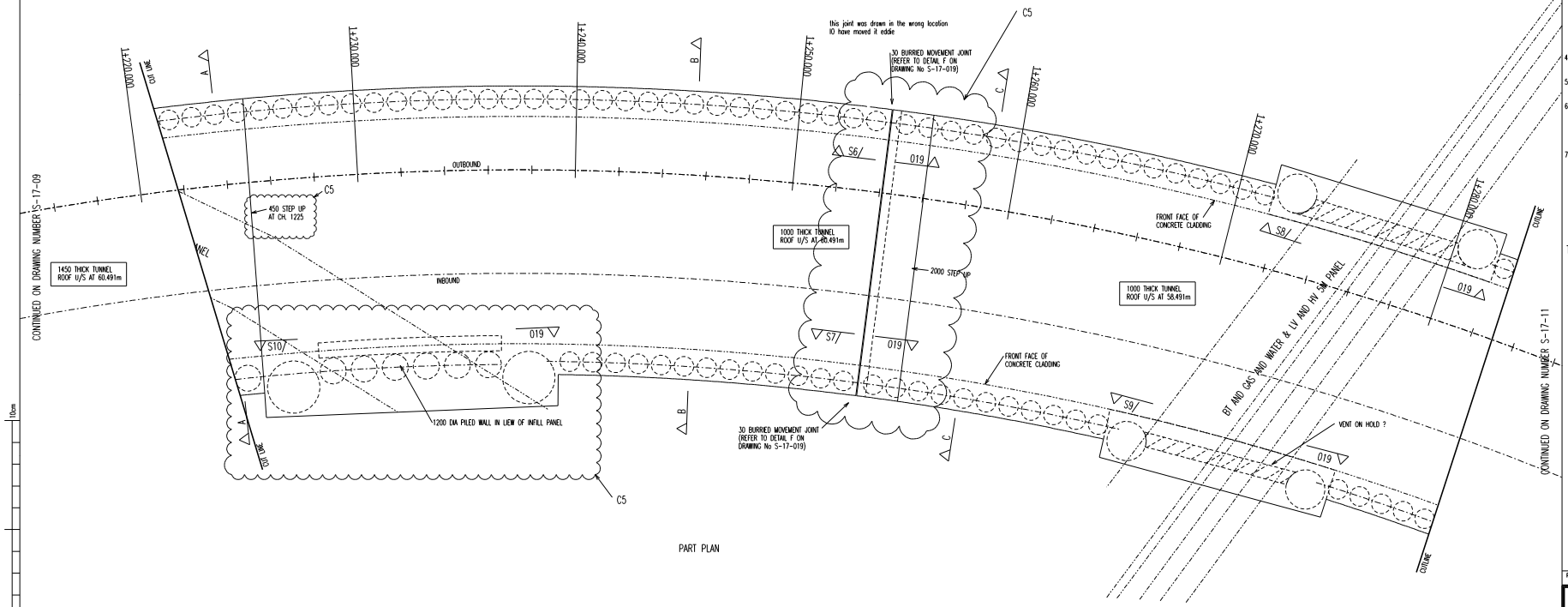
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Scales	1:100, U.N.O.	Originator	DW
Checked		Approved	Date SEP 01

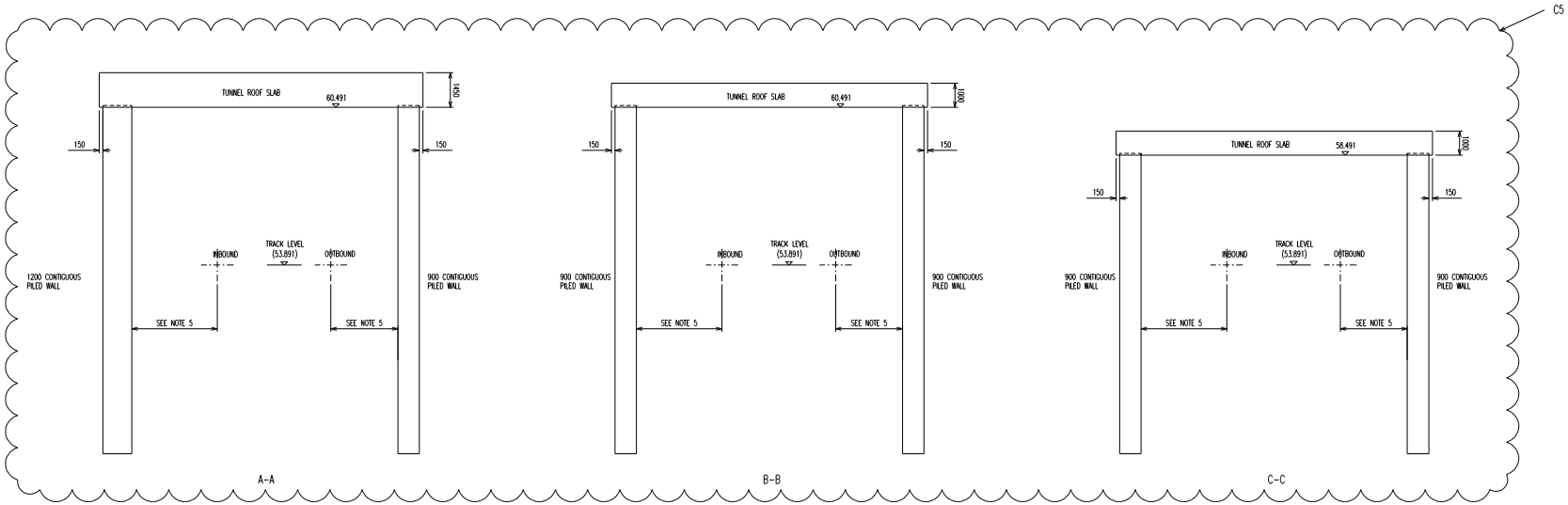
Job No.	Drawing No.	Rev.
67313	S-17-009	C6

A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



PART PLAN



NOTES:-

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S-16-006/14.
2. FOR LEVELS TABLE, SECTIONS AND DETAILS REFER TO DRAWING NUMBER S-17-017/020.
3. HIGH LEVEL PROP SETTING OUT PRINCIPLES :-

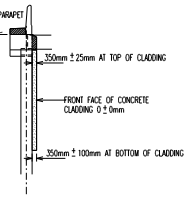
   THE TRIANGULAR HIGH LEVEL PROP BEAMS ARE TO BE SET OUT IN THE FOLLOWING MANNER.

   A LINE FROM THE INTERSECTION OF THE OUTBOUND RAILTRACK AND THE OUTBOUND CHAINAGE TO BE PERPENDICULAR TO THE INBOUND RAILTRACK. THIS LINE THEN EXTENDS FROM BOTH TRACKS TO THE CENTRE LINE OF THE PILES OR DIAPHRAGM WALLS.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
5. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009.
6. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
7. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C40
   PRECAST..... C40

TOLERANCES:-

TOLERANCES TO PILES TO BE AS INDICATED BELOW



Rev.	Date	By	Description
C5	12/03/02	EC	AS NOTED AND CUT LINES AMENDED
C4	11/12/01	EC	ADDITIONAL PILES REPLACING DIAPHRAGM AS NOTED
C3	26/11/01	EC	SECTION B-B REVISED AND DIAPHRAGM NOTED
C2	24/10/01	EC	NOTES AMENDED AND AS NOTED
C1	19/9/01	DW	ISSUED FOR CONSTRUCTION

Drawing Status: CONSTRUCTION

Job Title: METROLINK PHASE 3 ADVANCED WORKS (ALAN TURING WAY)

Drawing Title: GENERAL ARRANGEMENT OUTBOUND CH. 1220-1280 SHEET 5 OF 9

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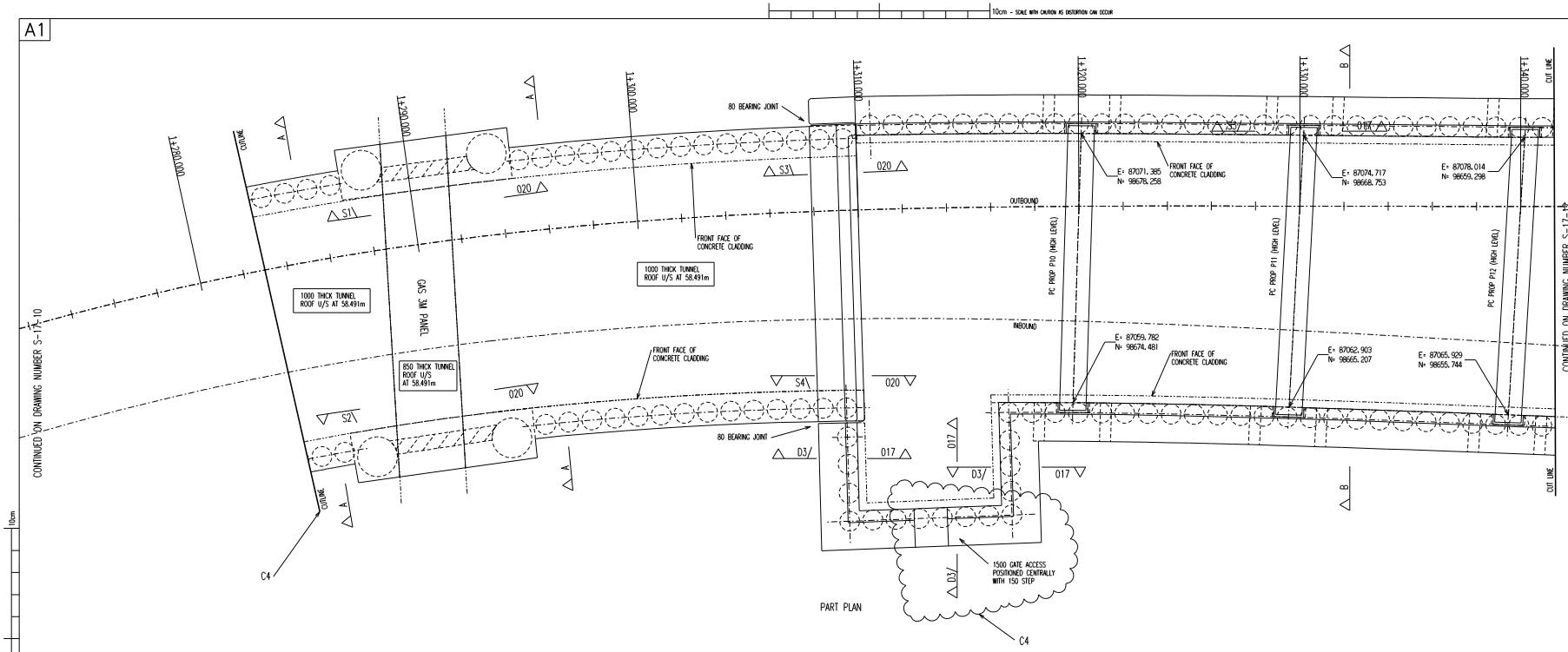
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Scales	1:100	Originator	DW
Checked	Approved	Date	SEP 01

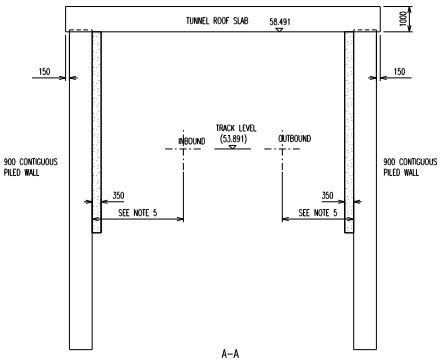
Job No.	Drawing No.	Rev.
67313	S-17-010	C5

A1

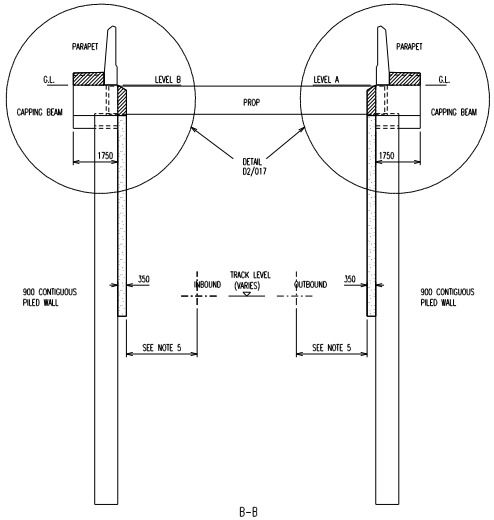
10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



PART PLAN



A–A



B–B

NOTES:-

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S-16-006/14.
2. FOR LEVELS TABLE, SECTIONS AND DETAILS REFER TO DRAWING NUMBER S-17-017/020.
3. HIGH LEVEL PROP SETTING OUT PRINCIPLES :-

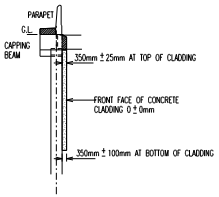
   THE TRIANGULAR HIGH LEVEL PROP BEAMS ARE TO BE SET OUT IN THE FOLLOWING MANNER.

   A LINE FROM THE INTERSECTION OF THE OUTBOUND RAILTRACK AND THE OUTBOUND CHAINAGE TO BE PERPENDICULAR TO THE INBOUND RAILTRACK. THIS LINE THEN EXTENDS FROM BOTH TRACKS TO THE CENTRE LINE OF THE PILES OR DIAPHRAGM WALLS.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
5. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009.
6. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
7. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C40
   PRECAST..... C40

TOLERANCES:-

TOLERANCES TO PILES TO BE AS INDICATED BELOW



Rev.	Date	By	Description
C4	12/03/02	EC	AS NOTED AND CUT LINES AMENDED
C3	26/11/01	EC	PROP BEAM SETTING OUT COORDINATES ADDED AND AS NOTED
C2	24/10/01	EC	NOTES AMENDED AND AS NOTED
C1	03/09/01	EC	CONSTRUCTION ISSUE

Drawing Status

CONSTRUCTION

Job Title

METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title

GENERAL ARRANGEMENT
OUTBOUND CH. 1280-1340
SHEET 6 OF 9

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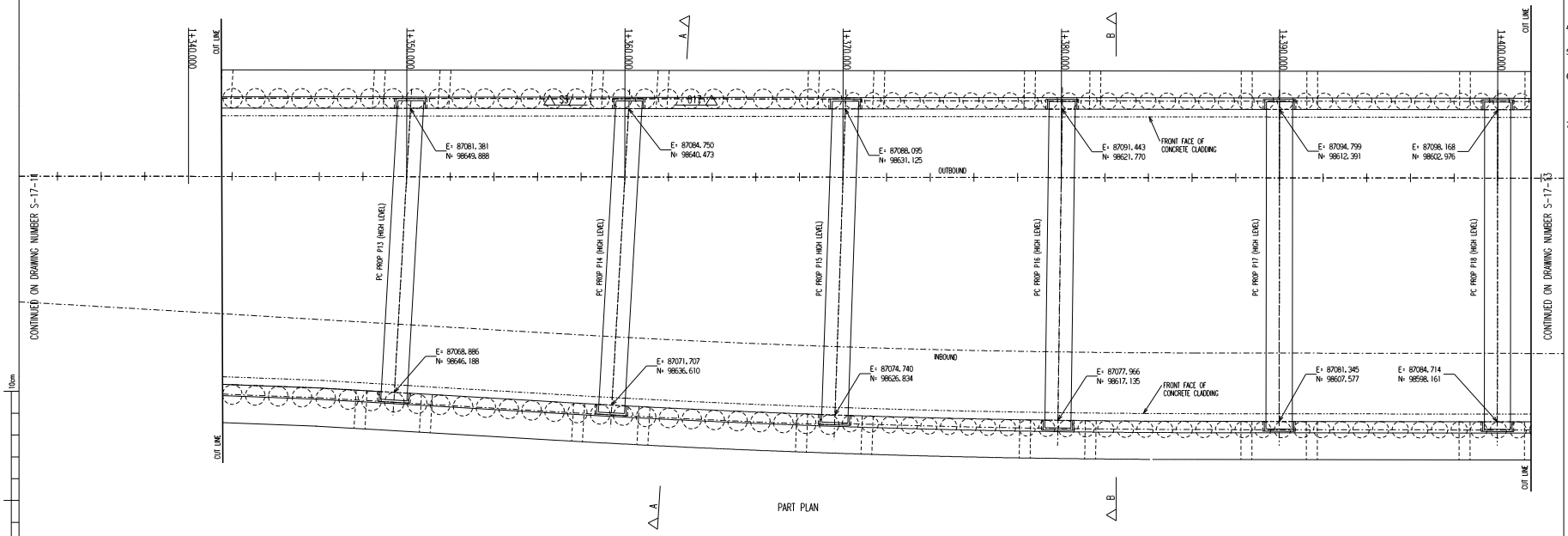
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Scales		Originator	
1:100 U.N.O.		EC	
Checked	Approved	Date	
		SEP 01	

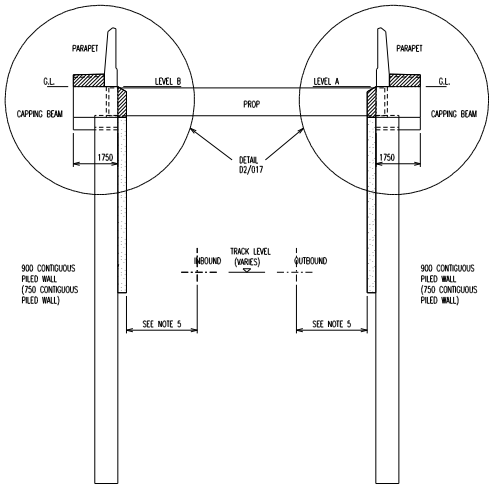
Job No.	Drawing No.	Rev.
67313	S-17-011	C4

A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



PART PLAN



SECTION A-A
(SECTION B-B)

NOTES:-

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S-16-006/14.
2. FOR LEVELS TABLE, SECTIONS AND DETAILS REFER TO DRAWING NUMBER S-17-017/020.
3. HIGH LEVEL PROP SETTING OUT PRINCIPLES :-

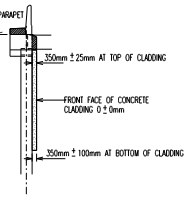
   THE TRIANGULAR HIGH LEVEL PROP BEAMS ARE TO BE SET OUT IN THE FOLLOWING MANNER.

   A LINE FROM THE INTERSECTION OF THE OUTBOUND RAILTRACK AND THE OUTBOUND CHAINAGE TO BE PERPENDICULAR TO THE INBOUND RAILTRACK. THIS LINE THEN EXTENDS FROM BOTH TRACKS TO THE CENTRE LINE OF THE PILES OR DIAPHRAGM WALLS.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
5. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009.
6. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
7. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C40
   PRECAST..... C40

TOLERANCES:-

TOLERANCES TO PILES TO BE AS INDICATED BELOW



Rev.	Date	By	Description
C4	12/03/02	EC	CUT LINES AMENDED
C3	26/11/01	EC	PROP BEAM SETING OUT COORDINATES ADDED
C2	30/10/01	EC	NOTES AMENDED AND AS NOTED
C1	12/09/01	DW	ISSUED FOR CONSTRUCTION

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

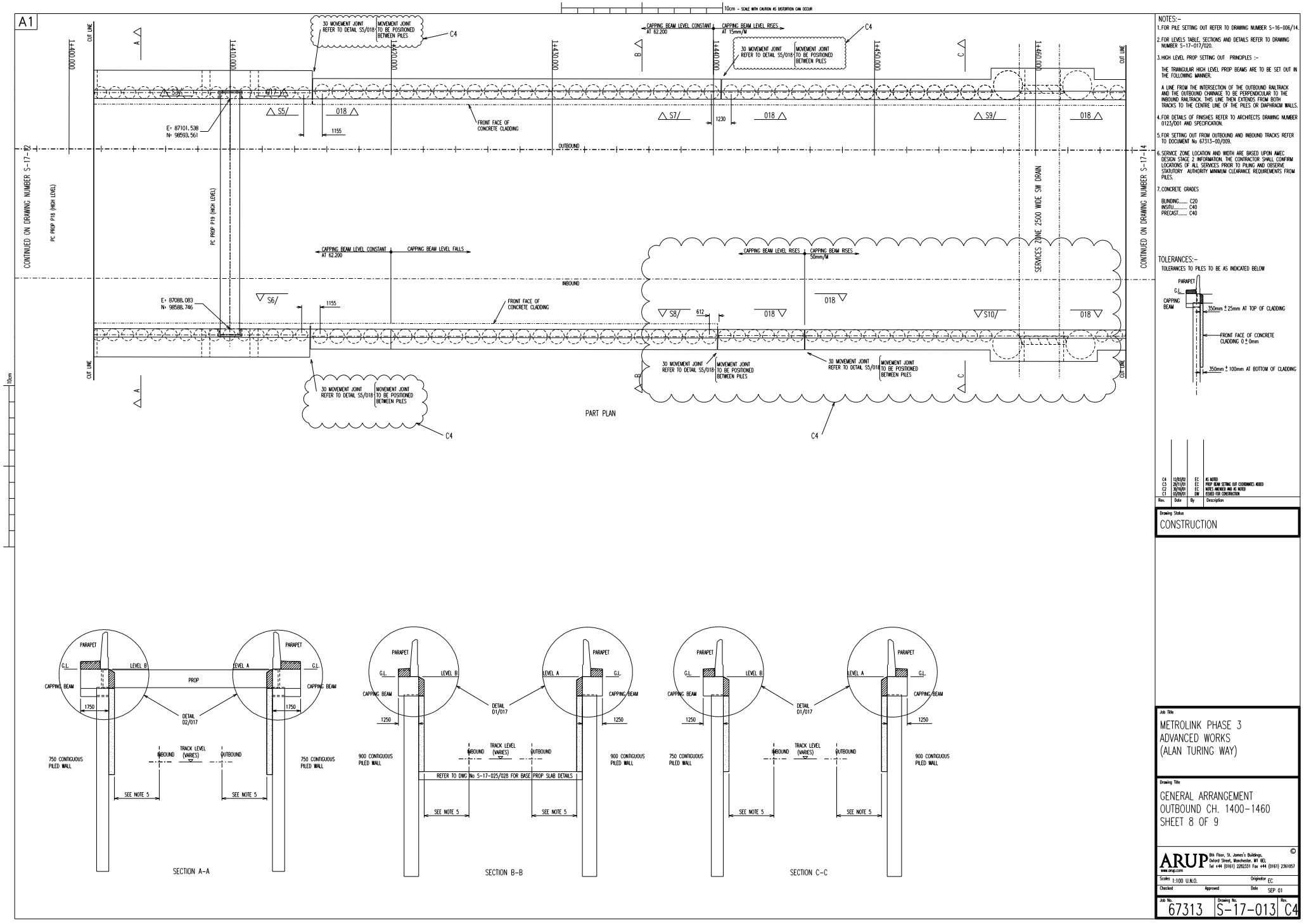
Drawing Title
GENERAL ARRANGEMENT
OUTBOUND CH. 1340-1400
SHEET 7 OF 9

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Scales	1:100 U.N.O.	Originator	DW
Checked		Approved	Date SEP 01

Job No.	Drawing No.	Rev.
67313	S-17-012	C4



NOTES:-

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S-16-006/14.
2. FOR LEVELS TABLE, SECTIONS AND DETAILS REFER TO DRAWING NUMBER S-17-017/020.
3. HIGH LEVEL PROP SETTING OUT PRINCIPLES :-

   THE TRIANGULAR HIGH LEVEL PROP BEAMS ARE TO BE SET OUT IN THE FOLLOWING MANNER.

   A LINE FROM THE INTERSECTION OF THE OUTBOUND RAILTRACK AND THE OUTBOUND CHAINAGE TO BE PERPENDICULAR TO THE INBOUND RAILTRACK. THIS LINE THEN EXTENDS FROM BOTH TRACKS TO THE CENTRE LINE OF THE PILES OR DIAPHRAGM WALLS.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
5. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009.
6. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
7. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C40
   PRECAST..... C40

TOLERANCES:-

TOLERANCES TO PILES TO BE AS INDICATED BELOW

Rev.	Date	By	Description
C4	12/03/02	EC	AS NOTED
C3	26/11/01	EC	PROP BEAM SETTING OUT COORDINATES ADDED
C2	30/10/01	EC	NOTES AMENDED AND AS NOTED
C1	03/09/01	SW	ISSUED FOR CONSTRUCTION

Drawing Status: CONSTRUCTION

Job Title: METROLINK PHASE 3 ADVANCED WORKS (ALAN TURING WAY)

Drawing Title: GENERAL ARRANGEMENT OUTBOUND CH. 1400-1460 SHEET 8 OF 9

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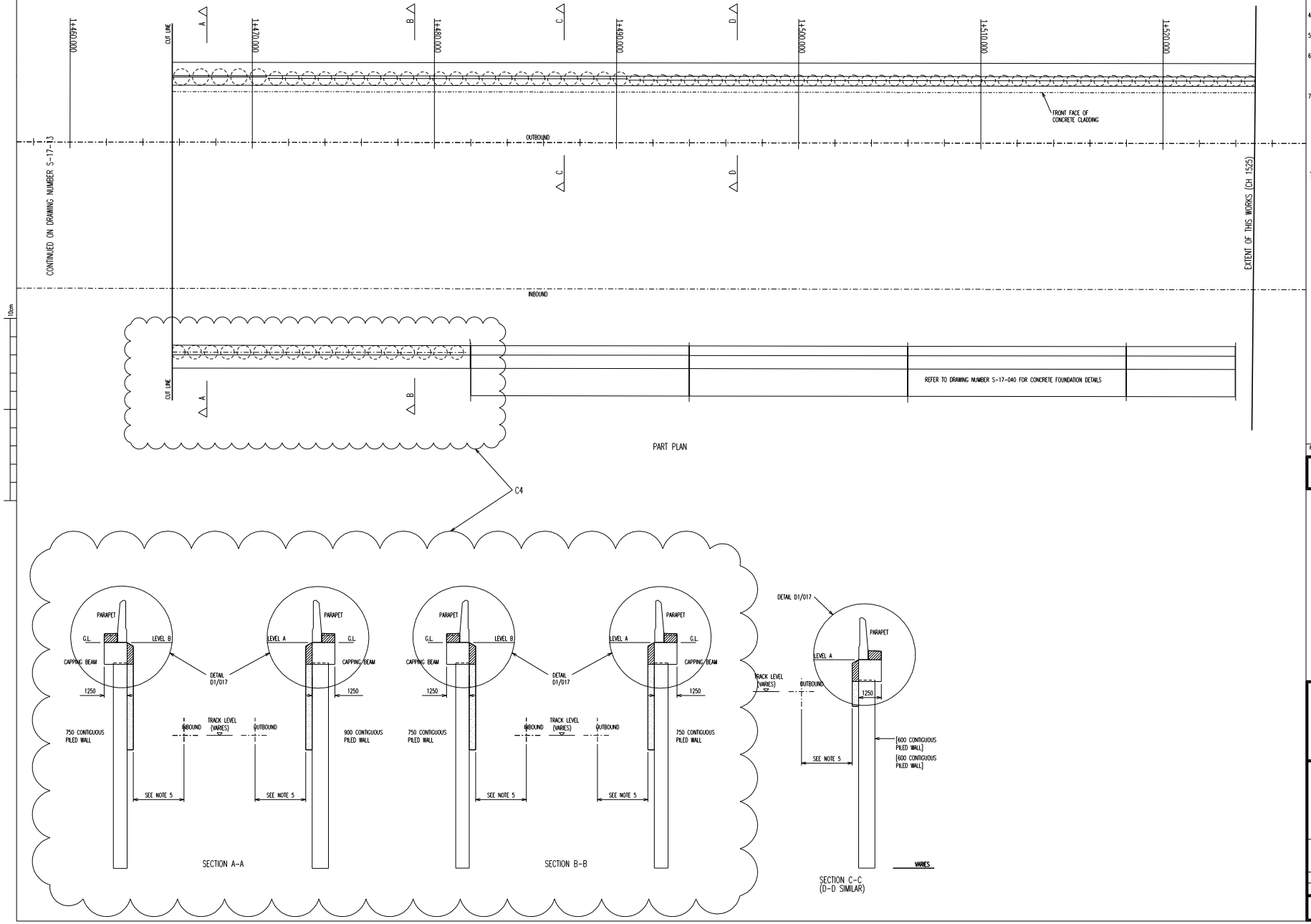
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Scales	1:100 U.N.O.	Originator	EC
Checked	Approved	Date	SEP 01

Job No.	Drawing No.	Rev.
67313	S-17-013	C4

A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



NOTES:-

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S-16-006/14.
2. FOR LEVELS TABLE, SECTIONS AND DETAILS REFER TO DRAWING NUMBER S-17-017/020.
3. HIGH LEVEL PROP SETTING OUT PRINCIPLES :-

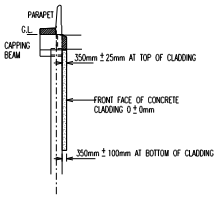
   THE TRIANGULAR HIGH LEVEL PROP BEAMS ARE TO BE SET OUT IN THE FOLLOWING MANNER.

   A LINE FROM THE INTERSECTION OF THE OUTBOUND RAILTRACK AND THE OUTBOUND CHAINAGE TO BE PERPENDICULAR TO THE INBOUND RAILTRACK. THIS LINE THEN EXTENDS FROM BOTH TRACKS TO THE CENTRE LINE OF THE PILES OR DIAPHRAGM WALLS.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
5. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009.
6. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
7. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C40
   PRECAST..... C40

TOLERANCES:-

TOLERANCES TO PILES TO BE AS INDICATED BELOW



Rev.	Date	By	Description
C4	12/03/02	EC	AS NOTED
C3	26/11/01	EC	SECTION MAIN SW/013 REMOVED
C2	30/10/01	EC	NOTES AMENDED AND AS NOTED
C1	12/09/01	DW	CONSTRUCTION ISSUE

Drawing Status: CONSTRUCTION

Job Title: METROLINK PHASE 3 ADVANCED WORKS (ALAN TURING WAY)

Drawing Title: GENERAL ARRANGEMENT OUTBOUND CH. 1460-1525 SHEET 9 OF 9

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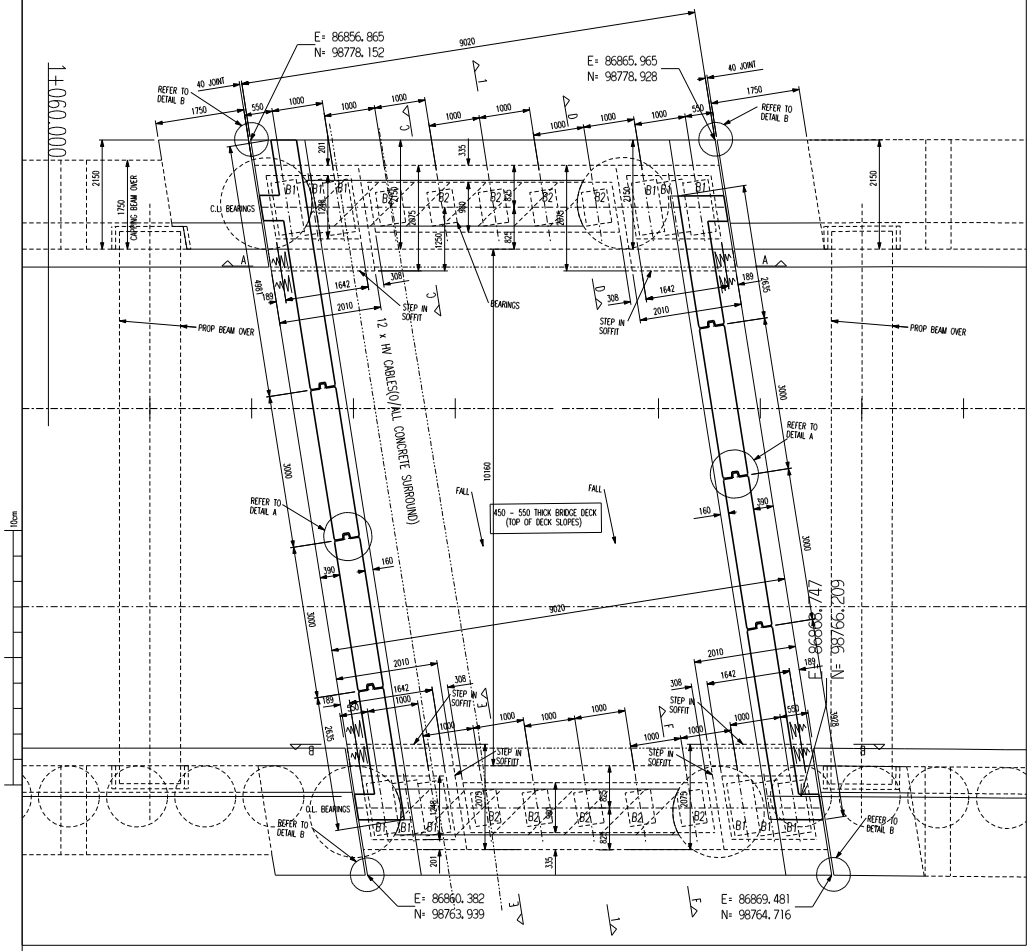
©

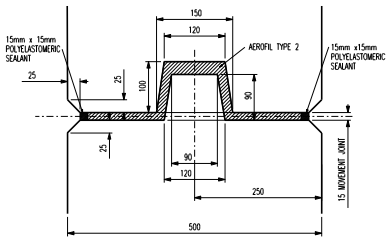
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Checked	Approved	Date	10/08/01

Job No.	Drawing No.	Rev.
67313	S-17-014	C4

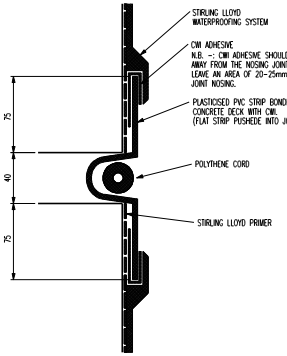
A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR

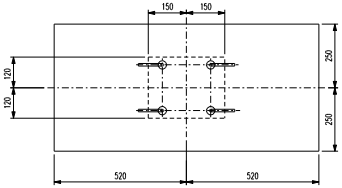




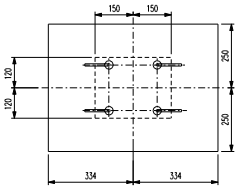
DETAIL A
(SCALE 1:5)



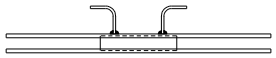
DETAIL B
(SCALE N.T.S.)



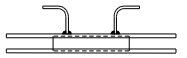
BEARING B1
(SCALE 1:5)



BEARING B2
(SCALE 1:5)



SECTION 1-1
(SCALE 1:5)



SECTION 2-2
(SCALE 1:5)

NOTES:-

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S-16-006/14.
2. FOR SECTIONS REFER TO DRAWING NUMBER S-17-016.
3. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
4. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO DOCUMENT No 67313-00/009.
5. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.
6. CONCRETE GRADES

BLINDING..... C20
INSITU..... C50
PRECAST..... C50

BEARING PLATE TABLE

BEARING REFERENCE	BEARING (mm) LENGTH x BREADTH x THICKNESS	TOP AND BOTTOM PLATES (mm) LENGTH x BREADTH x THICKNESS	PLAN/SECTION
B1	300 x 240 x 53	1040 x 500 x 15 (WITH RECESS)	BEARING B1/SECTION 1-1
B2	300 x 240 x 53	668 x 500 x 15 (WITH RECESS)	BEARING B2/SECTION 2-2

Rev.	Date	By	Description
C1	21/01/02	EC	ISSUED FOR CONSTRUCTION

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
GENERAL ARRANGEMENT
FORGE LANE CROSSING

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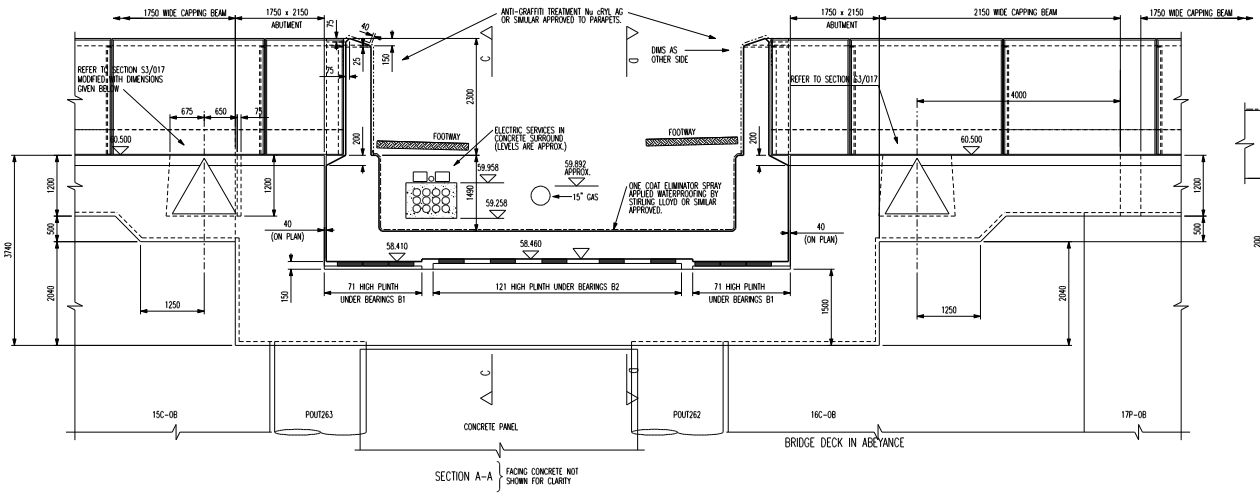
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Scales	1:50	Originator	EC
Checked		Approved	Date 04/12/01

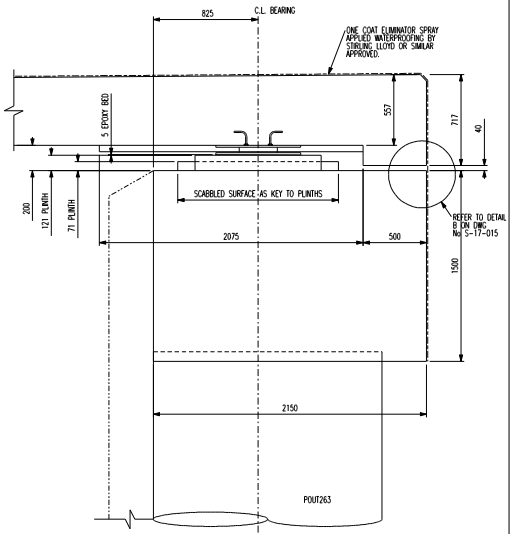
Job No.	Drawing No.	Rev.
67313	S-17-015	C1

A1

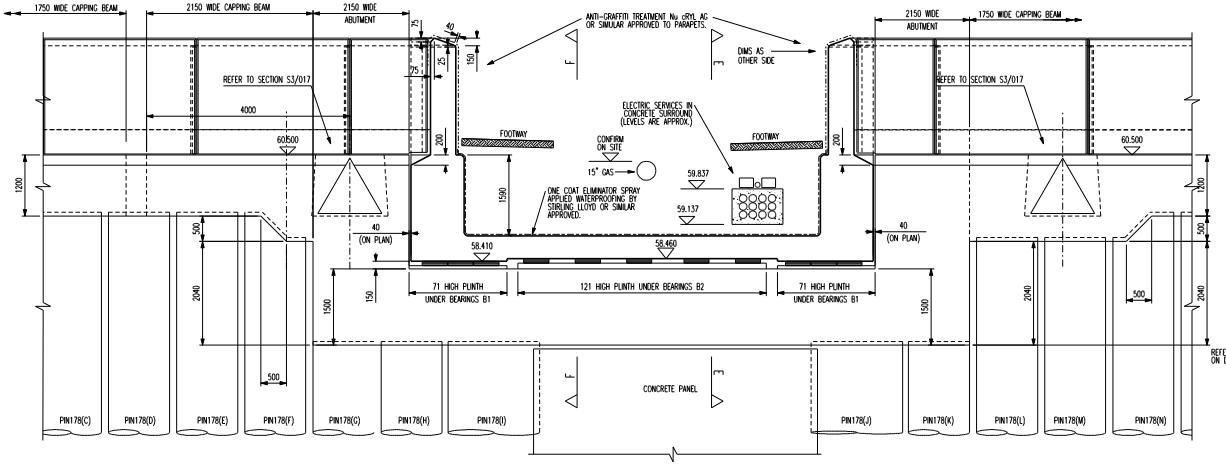
10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



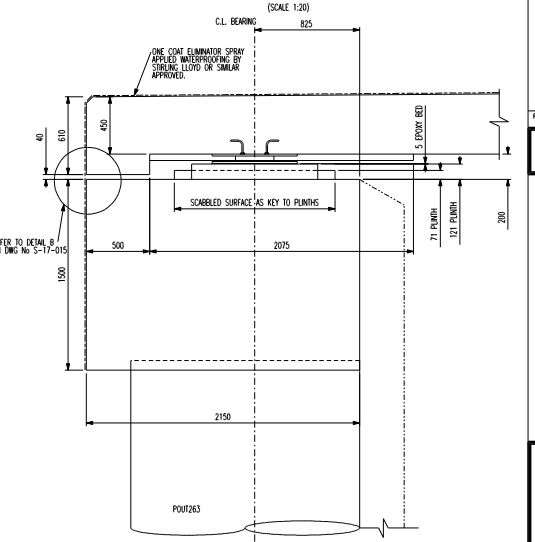
SECTION A-A FACING CONCRETE NOT SHOWN FOR CLARITY



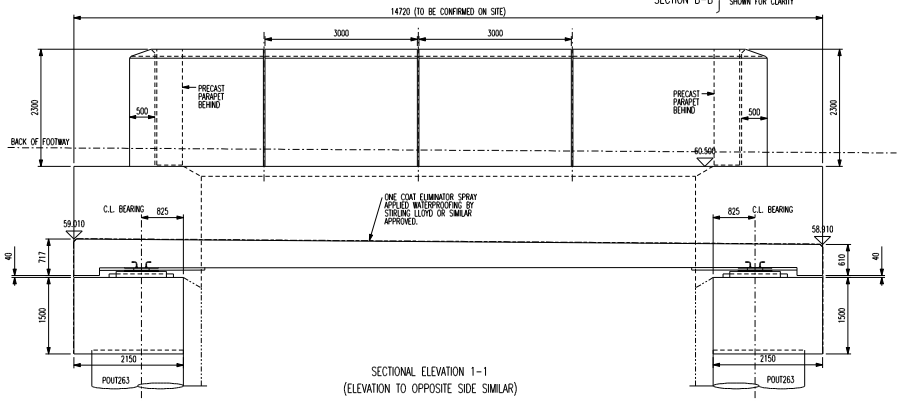
SECTION C-C
SECTION D-D SIMILAR
(SCALE 1:20)



SECTION B-B FACING CONCRETE NOT SHOWN FOR CLARITY



SECTION E-E
SECTION F-F SIMILAR
(SCALE 1:20)



SECTIONAL ELEVATION 1-1
(ELEVATION TO OPPOSITE SIDE SIMILAR)

NOTES:-
1. FOR NOTES REFER TO DRAWING NUMBER S-17-015.

Rev.	Date	By	Description
C3	21/02/02	EC	BRIDGE DECK RAISED
C2	20/01/02	EC	SECTIONS AMENDED AND BEAM UNDER DECK LOWERED
C1	07-12-01	EC	REDRAWN AS FORGE LANE CROSSING

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
SECTIONS
FORGE LANE CROSSING

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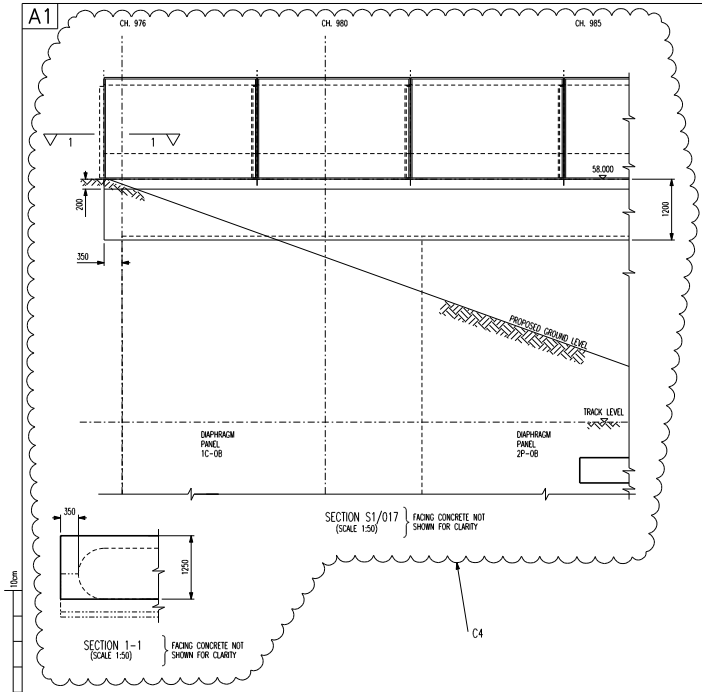
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Scales	1:50	Originator	EC
Checked		Approved	Date 07-12-01

Job No.	Drawing No.	Rev.
67313	S-17-016	C3

A1

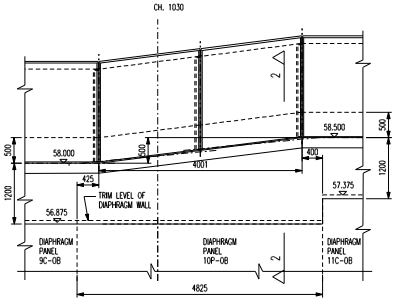
10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



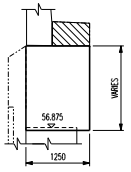
SECTION S1/017 (SCALE 1:50) } FACING CONCRETE NOT SHOWN FOR CLARITY

SECTION 1-1 (SCALE 1:50) } FACING CONCRETE NOT SHOWN FOR CLARITY

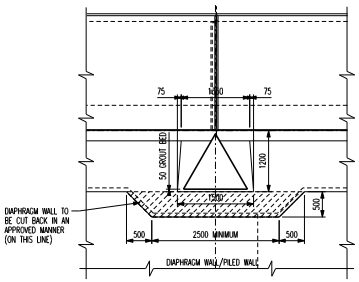
C4



SECTION S2/017 (SCALE 1:50) } FACING CONCRETE NOT SHOWN FOR CLARITY



SECTION 2-2 (SCALE 1:50)



SECTION S3/017 (SCALE 1:50) } FACING CONCRETE NOT SHOWN FOR CLARITY

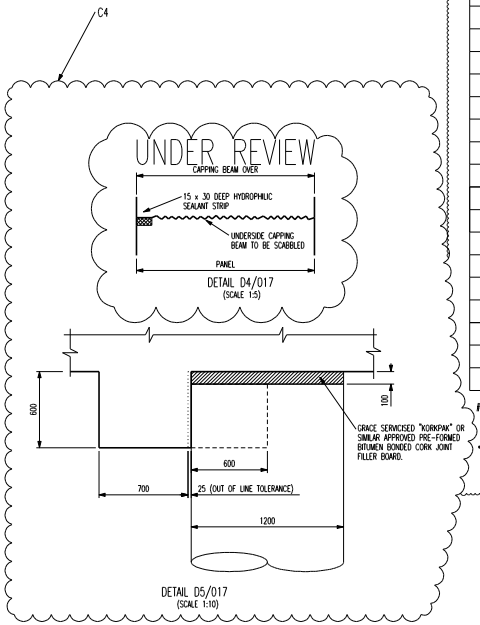
LEVEL TABLE (OUTBOUND AND INBOUND)

CHAINAGE (OUTBOUND)	PROPOSED CAPPING BEAM LEVELS LEVEL A (OUTBOUND)	LEVEL B (INBOUND)
975	58.000	54.000
980	58.000	54.000
990	58.000	54.000
1000	58.000	54.000
1010	58.000	54.000
1020	58.000	54.000
1030	58.000*	54.000
1040	58.500*	54.000
1045	58.500*	54.000/56.500*
1050	*	*
1056	60.500*	60.500*
1060	60.500	60.500
1070	60.500	60.500
1080	60.500	60.500
1090	60.500	60.500
1100	60.500	60.500
1110	60.500	60.500
1120	60.500	60.500
1130	60.500*	60.500*
1140	61.700*	61.700*
1150	61.700	61.700
1160	61.700	61.700
1310	62.200	62.200
1320	62.200	62.200
1330	62.200	62.200
1340	62.200	62.200
1350	62.200	62.200
1360	62.200	62.200
1370	62.200	62.200
1380	62.200	62.200
1390	62.200	62.200
1400	62.200	62.200
1410	62.200	62.200
1420	62.200	62.200
1430	62.200	SEE DETAIL S16/018
1440	62.200	SEE DETAIL S16/018
1445	62.275	SEE DETAIL S16/018
1450	62.350	#
1460	62.500	#
1470	62.650	#
1480	62.800	#
1490	62.950	#
1500	63.100	#
1510	63.250	#
1520	63.400	#
1524	63.460	#
1525	63.475	NOT APPLICABLE

REFER TO DRAWING NUMBER S-17-040 FOR LEVELS (GENERAL ARRANGEMENT "NON PILED" RETAINING WALL CH.1441 TO 1525)

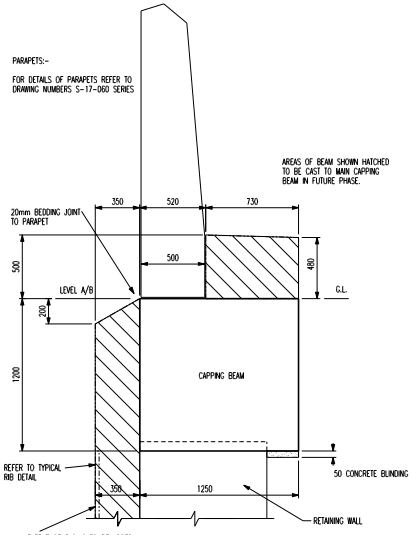
* CAPPING BEAMS SLOPES BETWEEN APPROXIMATE CHAINAGE LOCATIONS THUS NOTED (NOT NECESSARILY AT THESE CHAINAGE)

C4

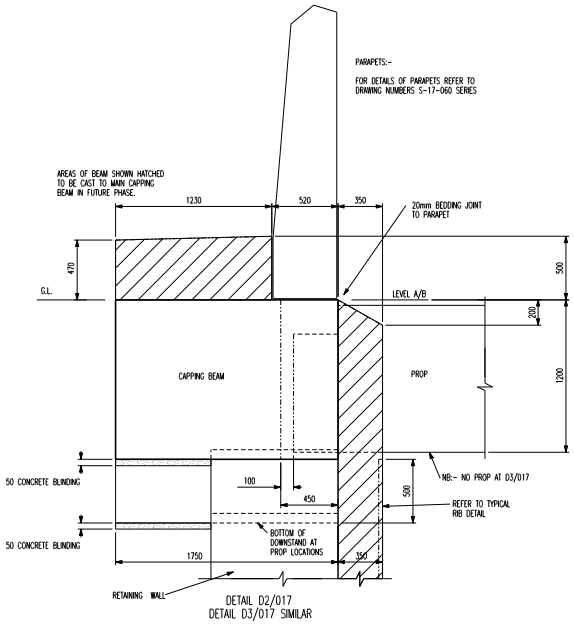


DETAIL D4/017 (SCALE 1:5)

DETAIL D5/017 (SCALE 1:10)



DETAIL D1/017 (SCALE 1:20)



DETAIL D2/017
DETAIL D3/017 SIMILAR
(SCALE 1:20)

NOTES:-

1. FOR PC PROP DETAILS REFER TO DRG No. S-17-050
2. FOR PC PARAPETS REFER TO DRG Nos. S-17-060 SERIES.
3. FOR WATERPROOFING SYSTEM REFER TO STRUCTURAL ENGINEERS CONCRETE SPECIFICATION.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
5. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.

ALL CHAMFERS 50mm x 50mm UNLESS NOTED

Rev.	Date	By	Description
C4	12/03/02	EC	AS NOTED
C3	14/11/01	EC	DETAILS UPDATED
C2	29/10/01	EC	DETAILS CANCELLED
C1	25/10/01	EC	CONSTRUCTION ISSUE

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
GENERAL SECTIONS
SHEET 1 OF 5

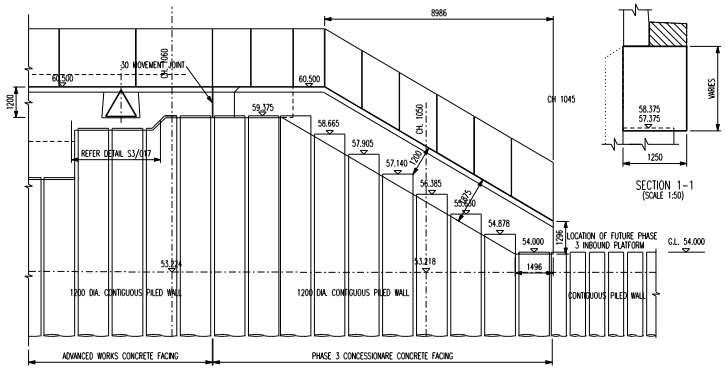
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Scales	AS NOTED	Originator	EC
Checked	Approved	Date	25/10/01
Job No. 67313	Drawing No. S-17-017	Rev. C4	

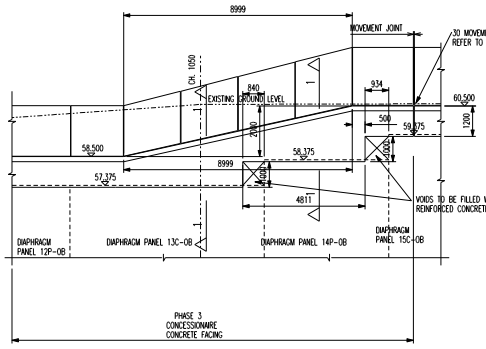
A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR

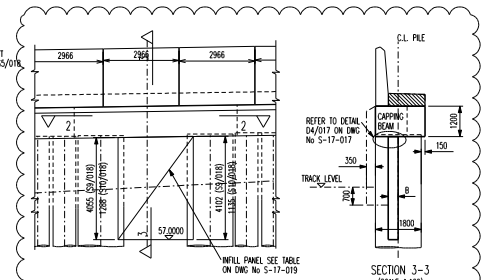


SECTION S1/018 (SCALE 1:100) } FACING CONCRETE NOT SHOWN FOR CLARITY

SECTION 1-1 (SCALE 1:50)



SECTION S2/018 (SCALE 1:100) } FACING CONCRETE NOT SHOWN FOR CLARITY

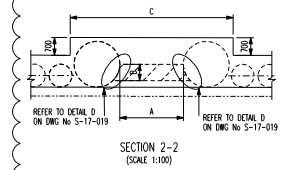


S9/018 (S10/018 SIMILAR) (SCALE 1:100) } FACING CONCRETE NOT SHOWN FOR CLARITY

SECTION 3-3 (SCALE 1:100)

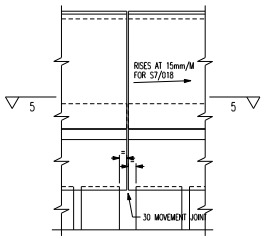
TABLE FOR SECTIONS 2-2 & 3-3

PANEL REF.	DIMENSIONS (mm)		
	A	B	C
S9/018	(2502)	650	(6404)
S10/018	(2751)	650	(6647)

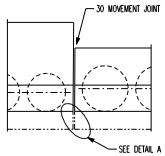


SECTION 2-2 (SCALE 1:100)

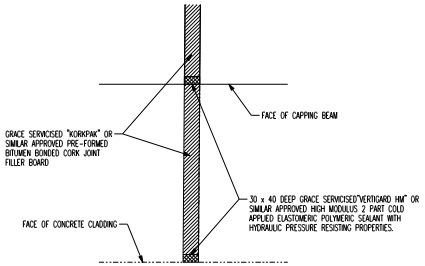
C3



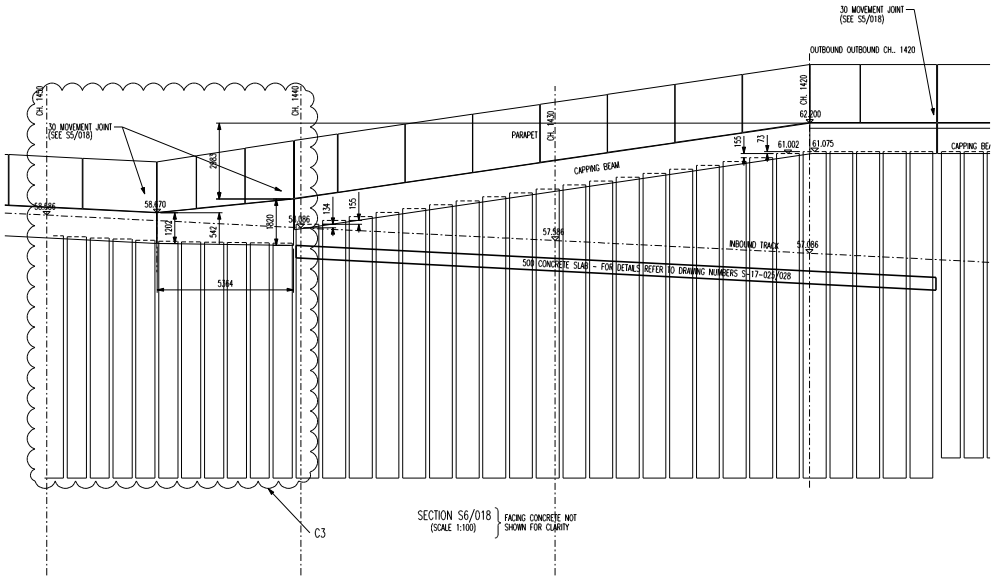
SECTION S5/018 (SECTION S7/018 SIMILAR) (SECTION S8/018 SIMILAR) (SCALE 1:50) } FACING CONCRETE NOT SHOWN FOR CLARITY



SECTION 5-5 (SCALE 1:50)



DETAIL A (SCALE 1:5)



C3

SECTION S6/018 (SCALE 1:100) } FACING CONCRETE NOT SHOWN FOR CLARITY

NOTES:-

1. FOR PC PROP DETAILS REFER TO DRG No. S-17-050
2. FOR PC PARAPETS REFER TO DRG NoS. S-17-060 SERIES.
3. FOR WATERPROOFING SYSTEM REFER TO STRUCTURAL ENGINEERS CONCRETE SPECIFICATION.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
5. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.

ALL CHAMFERS 50mm x 50mm UNLESS NOTED

ALL DIMENSIONS BRACKETTED SHOWN THUS (2500) ARE TO BE CONFIRMED ON SITE.

Rev.	Date	By	Description
C3	15/10/02	EC	AS NOTED + GENERAL UPDATE
C2	16/11/01	EC	BEAMS UPDATED
C1	29/09/01	EC	CONSTRUCTION ISSUE

Drawing Status: CONSTRUCTION

Job Title: METROLINK PHASE 3 ADVANCED WORKS (ALAN TURING WAY)

Drawing Title: GENERAL SECTIONS SHEET 2 OF 5

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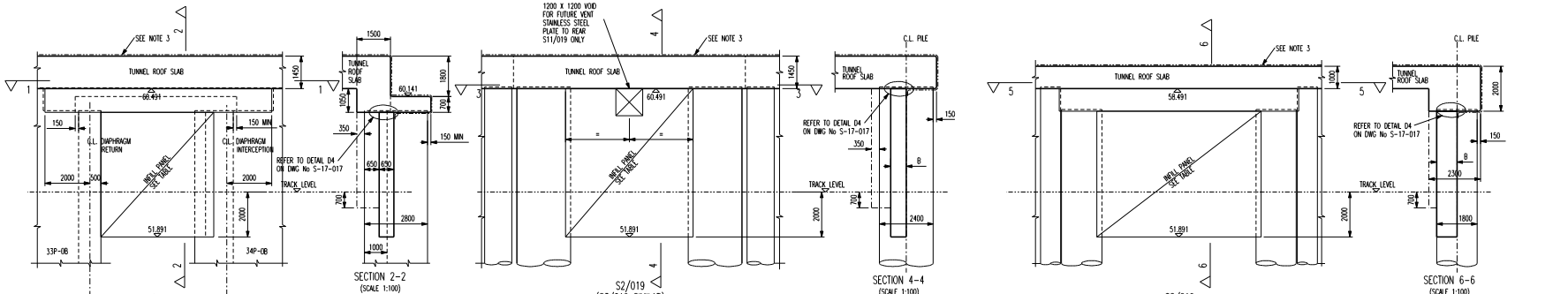
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Scales: AS NOTED | Originator: EC | Checked | Approved | Date: 29/10/01

Job No. 67313 | Drawing No. S-17-018 | Rev. C3

A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR

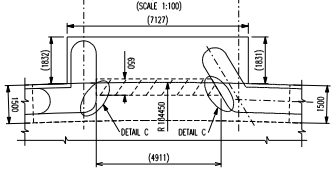


SECTION 2-2
(SCALE 1:100)

SECTION 4-4
(SCALE 1:100)

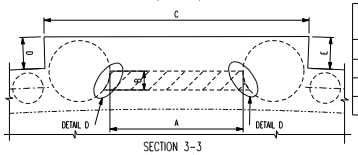
SECTION 6-6
(SCALE 1:100)

S1/019
(SCALE 1:100)



SECTION 1-1
(SCALE 1:100)

S2/019
(S3/019 SIMILAR)
(S4/019 SIMILAR)
(S11/019 SIMILAR)
(SCALE 1:100)



SECTION 3-3
(SCALE 1:100)

TABLE FOR SECTIONS 3-3 & 4-4

PANEL REF.	DIMENSIONS (mm)				
	A	B	C	D	E
S2/019	(5231)	700	(10422)	1245	1245
S3/019	(2516)	650	(7536)	1177	1145
S4/019	(5475)	700	(10464)	1150	1150
S11/019	(5500)	700	(10600)	1149	1149

S8/019
(S9/019 SIMILAR)
(SCALE 1:100)

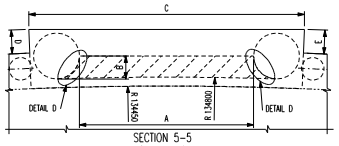
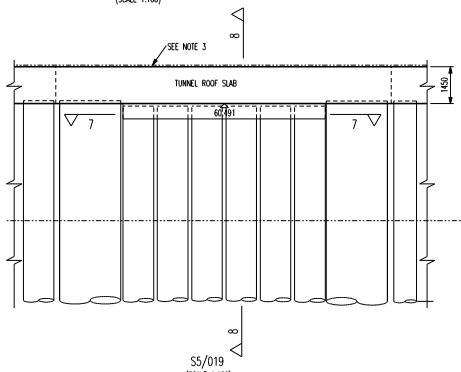


TABLE FOR SECTIONS 5-5 & 6-6

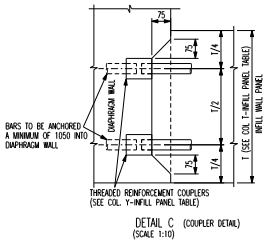
PANEL REF.	DIMENSIONS (mm)				
	A	B	C	D	E
S8/019	6800	900	10837	938	938
S9/019	6540	900	10517	860	860

SECTION 5-5
(SCALE 1:100)



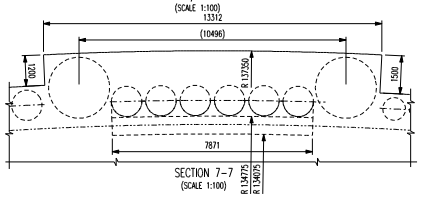
SECTION 8-8
(SCALE 1:100)

SECTION 10-10
(SCALE 1:100)



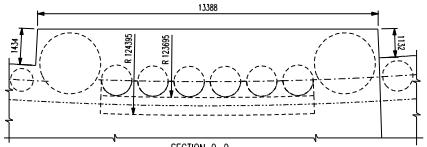
DETAIL C (COUPLER DETAIL)
(SCALE 1:10)

S5/019
(SCALE 1:100)

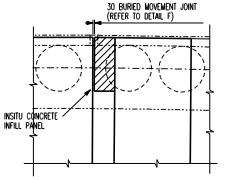


SECTION 7-7
(SCALE 1:100)

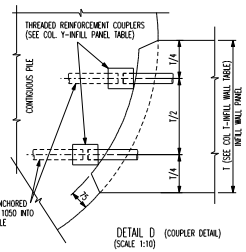
S10/019
(SCALE 1:100)



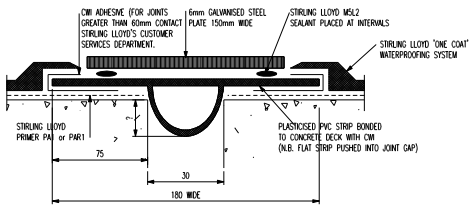
SECTION 9-9
(SCALE 1:100)



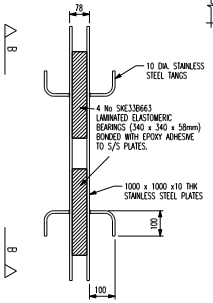
SECTION 11-11
(SCALE 1:50)



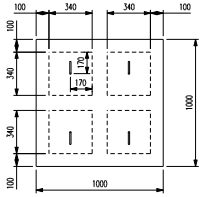
DETAIL D (COUPLER DETAIL)
(SCALE 1:10)



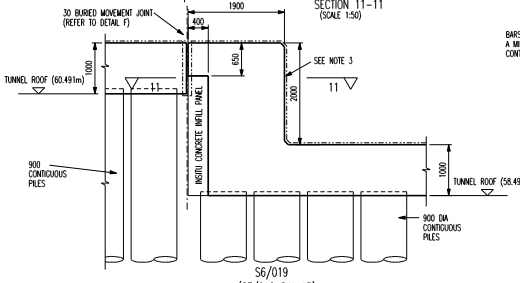
DETAIL F (BURIED MOVEMENT JOINT)
(N.T.S.)



DETAIL A
(SCALE 1:10)



ELEVATION B-B
(SCALE 1:20)



S6/019
(S7/019 SIMILAR)
(SCALE 1:50)

INFILL PANEL TABLE

PANEL SPAN (W mm)	PANEL THICKNESS (T mm)	COUPLER SIZE* (Y mm)	VERTICAL COUPLER SPACING (Z mm)
>or= 5000	650	40	300
5500	700	40	300
6000	750	40	300
7000	900	40	300
8000	1100	40	300

* ALL COUPLERS TO BE ANCHORED INTO DIAPHRAGM WALL /PILE WITH A BAR THE SAME SIZE AS THE COUPLER.

NOTES:-

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2. FOR PC PARAPETS REFER TO DRG Nos. S-17-060 SERIES.
3. FOR WATERPROOFING SYSTEM REFER TO STRUCTURAL ENGINEERS CONCRETE SPECIFICATION.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
5. SERVICE ZONE LOCATION AND WIDTH ARE BASED UPON AMEC DESIGN STAGE 2 INFORMATION. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF ALL SERVICES PRIOR TO PILING AND OBSERVE STATUTORY AUTHORITY MINIMUM CLEARANCE REQUIREMENTS FROM PILES.

ALL CHAMFERS 50mm x 50mm UNLESS NOTED

ALL DIMENSIONS BRACKETTED SHOWN THUS (2500) ARE TO BE CONFIRMED ON SITE.

Rev.	Date	By	Description
C3	16/11/01	EC	SECTIONS UPDATED
C2	26/09/01	EC	ADDITIONAL DETAILS ADDED AND NOTES AMENDED
C1			CONSTRUCTION ISSUE

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
GENERAL SECTIONS
SHEET 3 OF 5

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8th Floor, St. James's Buildings, Oxford Street, Manchester, M1 6EL
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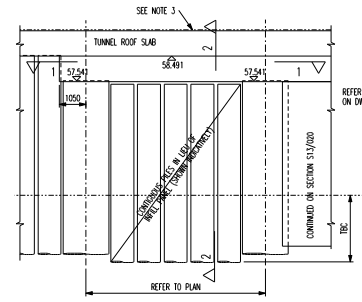
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Scales AS NOTED | Originator EC
Checked | Approved | Date | DATE

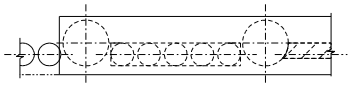
Job No. 67313 | Drawing No. S-17-019 | Rev. C3

A1

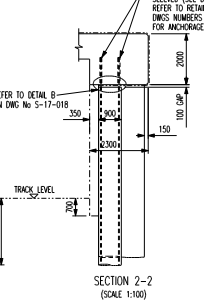
10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



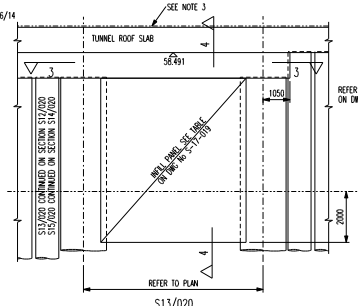
S12/020
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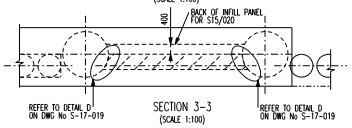
SECTION 1-1
(SCALE 1:100)



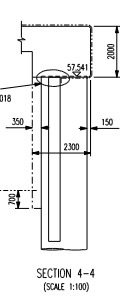
SECTION 2-2
(SCALE 1:100)



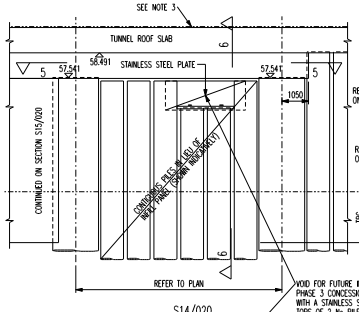
S13/020
(S15/020 SIMILAR BUT HANDED)
(SCALE 1:100)



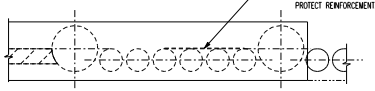
SECTION 3-3
(SCALE 1:100)



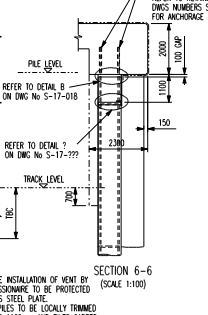
SECTION 4-4
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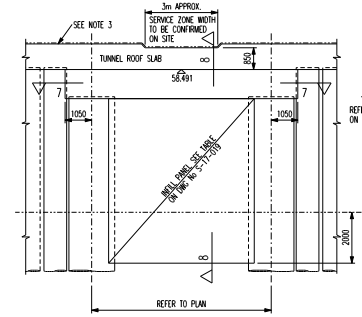
S14/020
(SCALE 1:100)



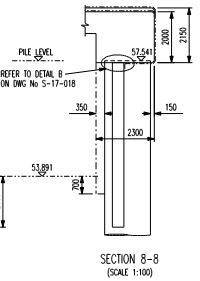
SECTION 5-5
(SCALE 1:100)



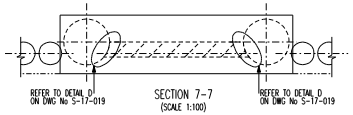
SECTION 6-6
(SCALE 1:100)



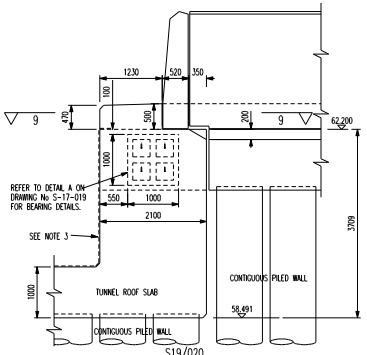
S17/020
(S18/020 SIMILAR)
(SCALE 1:100)



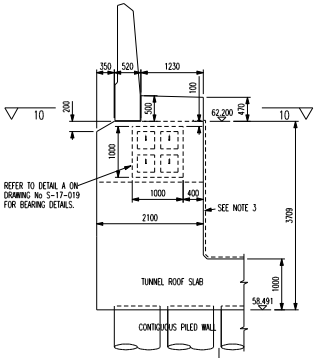
SECTION 8-8
(SCALE 1:100)



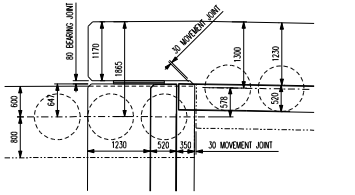
SECTION 7-7
(SCALE 1:100)



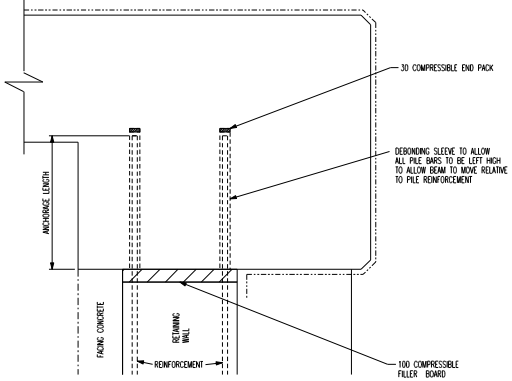
S19/020
(SCALE 1:50)



S20/020
(SCALE 1:50)



SECTION 9-9
(SCALE 1:50)



DETAIL A
(SCALE 1:20)

NOTES:-

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ALL CHAMFERS 50mm x 50mm UNLESS NOTED

Rev.	Date	By	Description
C2	21/11-01 26/11/09	EC EC	SECOND UPDATED CONSTRUCTION ISSUE
C1			

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
GENERAL SECTIONS
SHEET 4 OF 5

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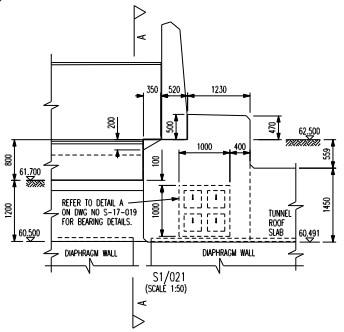
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Scales	AS NOTED	Originator	EC
Checked		Approved	
Date	DATE		

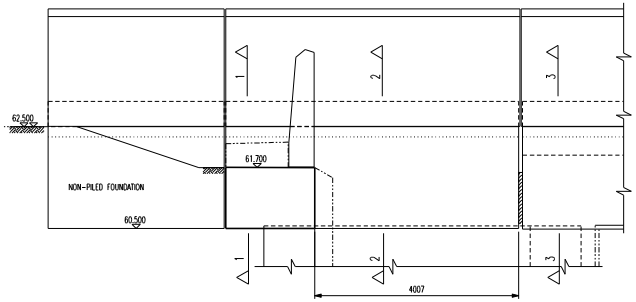
Job No.	Drawing No.	Rev.
67313	S-17-020	C2

A1

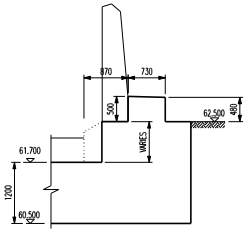
10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



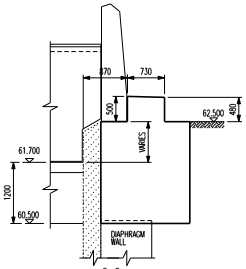
S1/021
(SCALE 1:50)



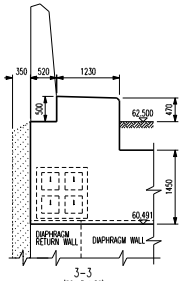
ELEVATION A-A
(SCALE 1:50)



1-1
(SCALE 1:50)



2-2
(SCALE 1:50)

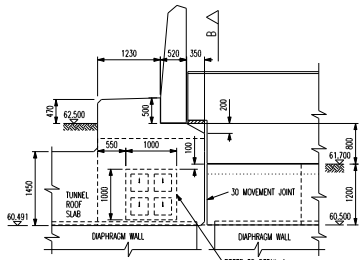


3-3
(SCALE 1:50)

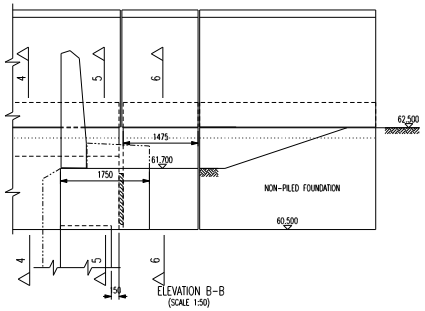
ALL CHAMFERS 50mm x 50mm UNLESS NOTED

NOTES:-

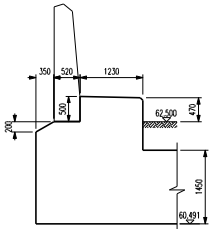
1. FOR PC PROP DETAILS REFER TO DRG No. S-17-050
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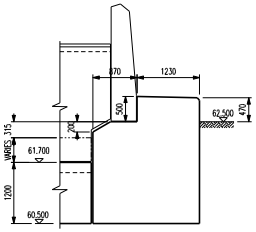
S2/021
(SCALE 1:50)



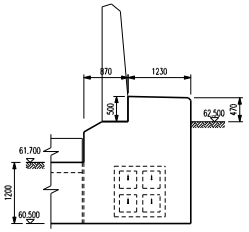
ELEVATION B-B
(SCALE 1:50)



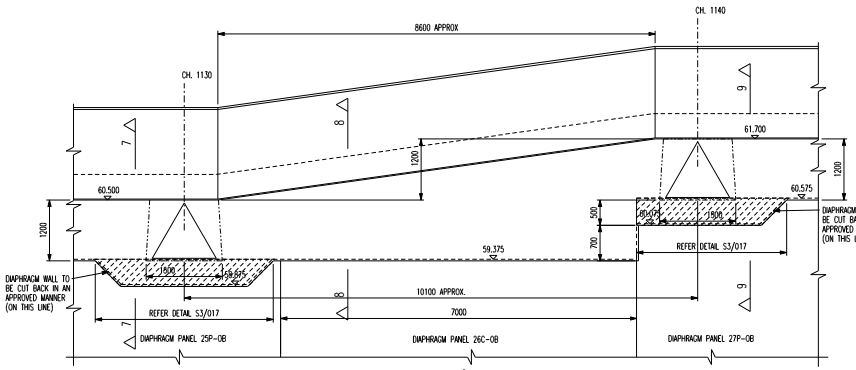
4-4
(SCALE 1:50)



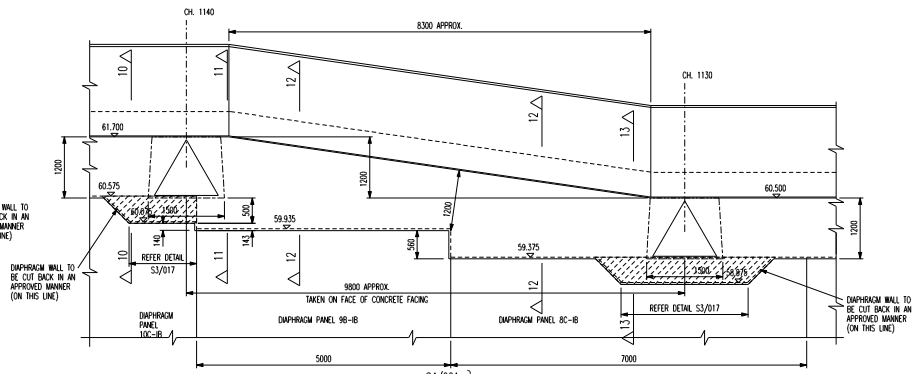
5-5
(SCALE 1:50)



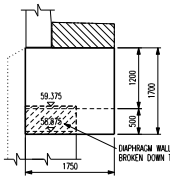
6-6
(SCALE 1:50)



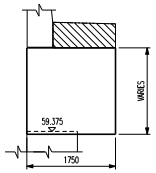
S3/021
(SCALE 1:50)
FACING CONCRETE NOT SHOWN FOR CLARITY



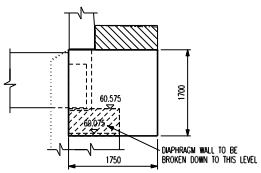
S4/021
(SCALE 1:50)
FACING CONCRETE NOT SHOWN FOR CLARITY



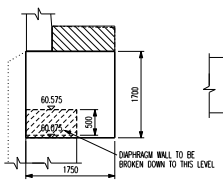
SECTION 7-7
(SCALE 1:20)



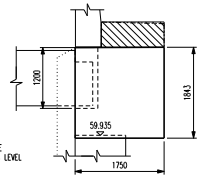
SECTION 8-8
(SCALE 1:20)



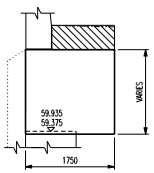
SECTION 9-9
(SCALE 1:20)



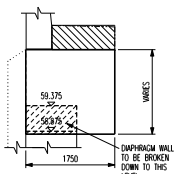
SECTION 10-10
(SCALE 1:20)



SECTION 11-11
(SCALE 1:20)



SECTION 12-12
(SCALE 1:20)



SECTION 13-13
(SCALE 1:20)

Rev.	Date	By	Description

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
GENERAL SECTIONS
SHEET 5 OF 5

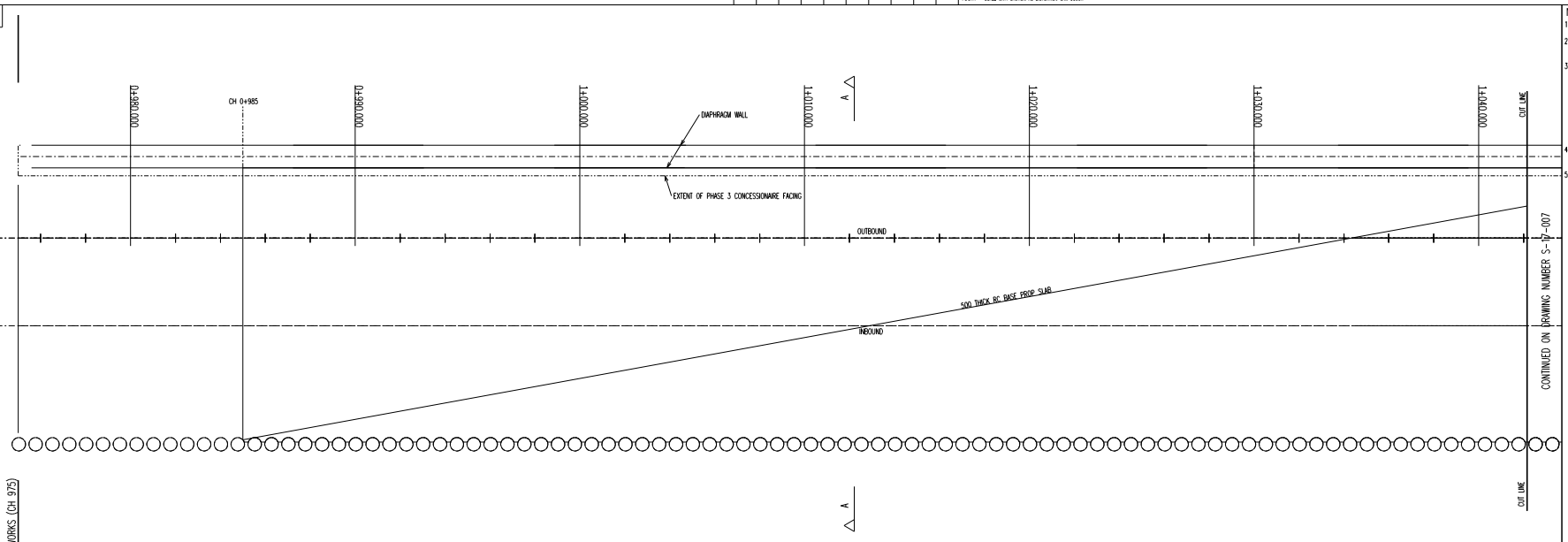
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Scales	AS NOTED	Originator	EC
Checked	Approved	Date	12/11/01
Job No. 67313	Drawing No. S-17-021	Rev.	

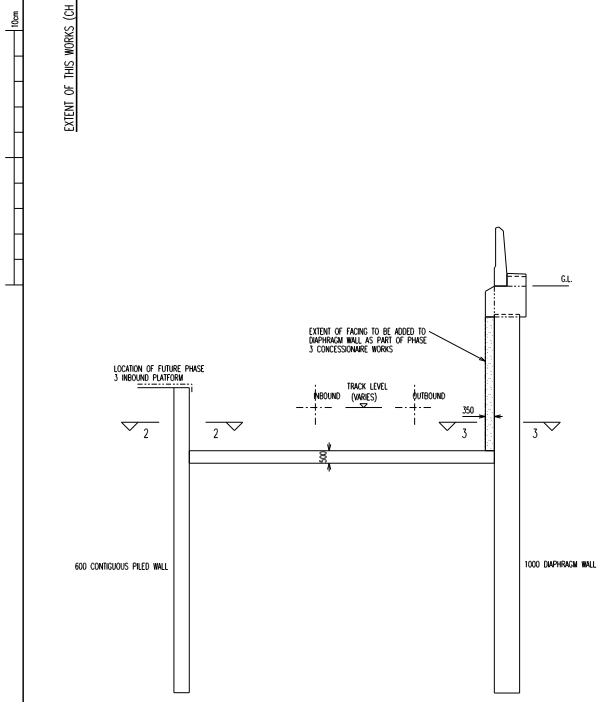
A1

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR

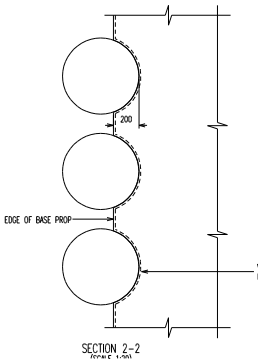


PART PLAN

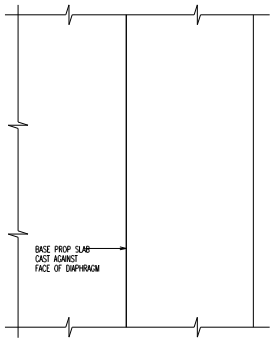
EXTENT OF THIS WORKS (CH 975)



SECTION A-A



SECTION 2-2



SECTION 3-3
(SCALE 1:20)

NOTES:-

1. FOR PILE SETTING OUT REFER TO DRAWING NUMBER S-16-011.
2. FOR LEVELS TABLE, SECTIONS AND DETAILS REFER TO DRAWING NUMBER S-17-017
3. HIGH LEVEL PROP SETTING OUT PRINCIPLES :-

   THE TRIANGULAR HIGH LEVEL PROP BEAMS ARE TO BE SET OUT IN THE FOLLOWING MANNER.

   A LINE FROM THE INTERSECTION OF THE OUTBOUND RAIL TRACK AND THE OUTBOUND CHAINAGE TO BE PERPENDICULAR TO THE INBOUND RAIL TRACK. THIS LINE THEN EXTENDS FROM BOTH TRACKS TO THE CENTRE LINE OF THE PILES OR DIAPHRAGM WALLS.
4. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/D01 AND SPECIFICATION.
5. CONCRETE GRADES

   BLINDING..... C20
   INSITU..... C40
   PRECAST..... C40

Rev.	Date	By	Description

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
BASE SLAB
OUTBOUND CH. 980-1040
SHEET 1 OF 4

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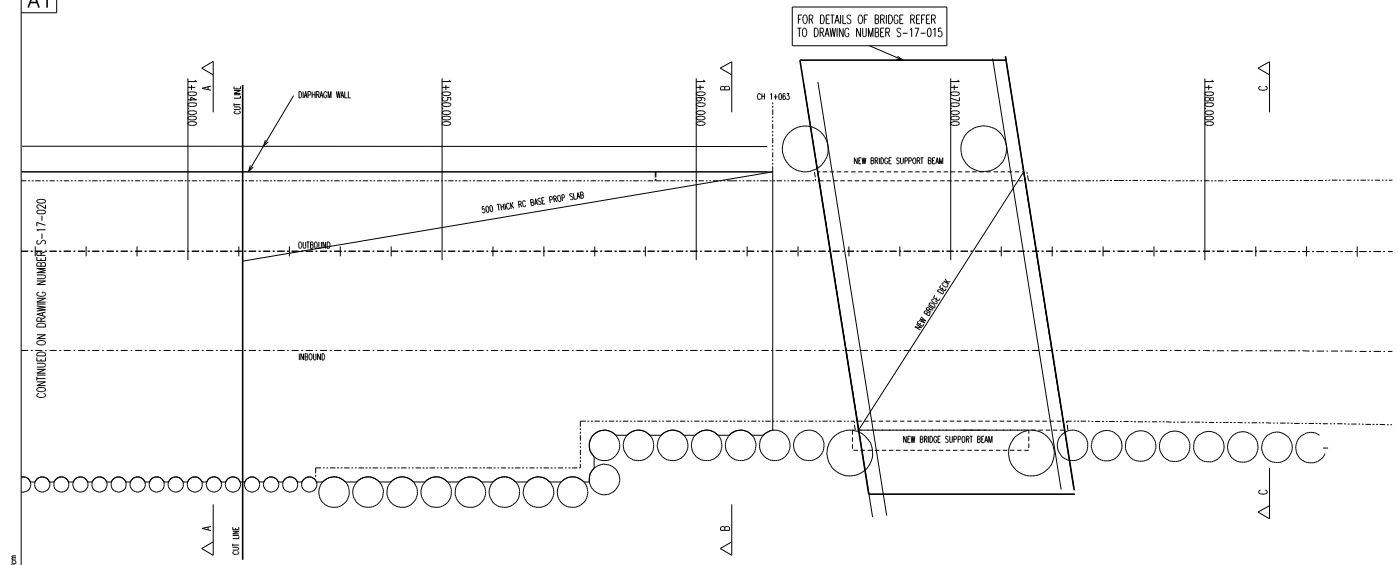
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Scales	1:100 U.N.O.	Originator	EC
Checked	Approved	Date	DATE

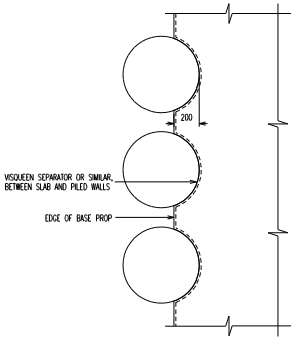
Job No.	Drawing No.	Rev.
67313	S-17-025	

A1

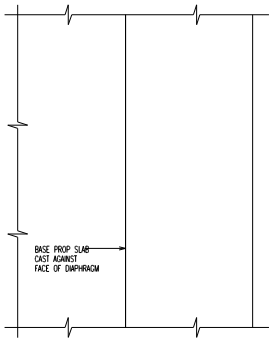
10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



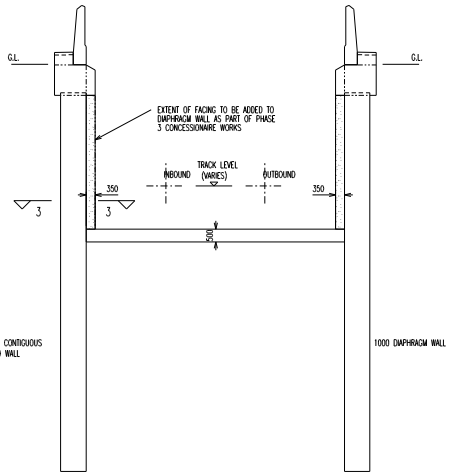
PART PLAN



SECTION 2-2
(SCALE 1:20)



SECTION 3-3
(SCALE 1:20)



SECTION B-B

NOTES:-
1. FOR NOTES REFER TO DRAWING NUMBER S-17-020.

Rev.	Date	By	Description

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
BASE SLAB
OUTBOUND CH. 1062-1085
SHEET 2 OF 4

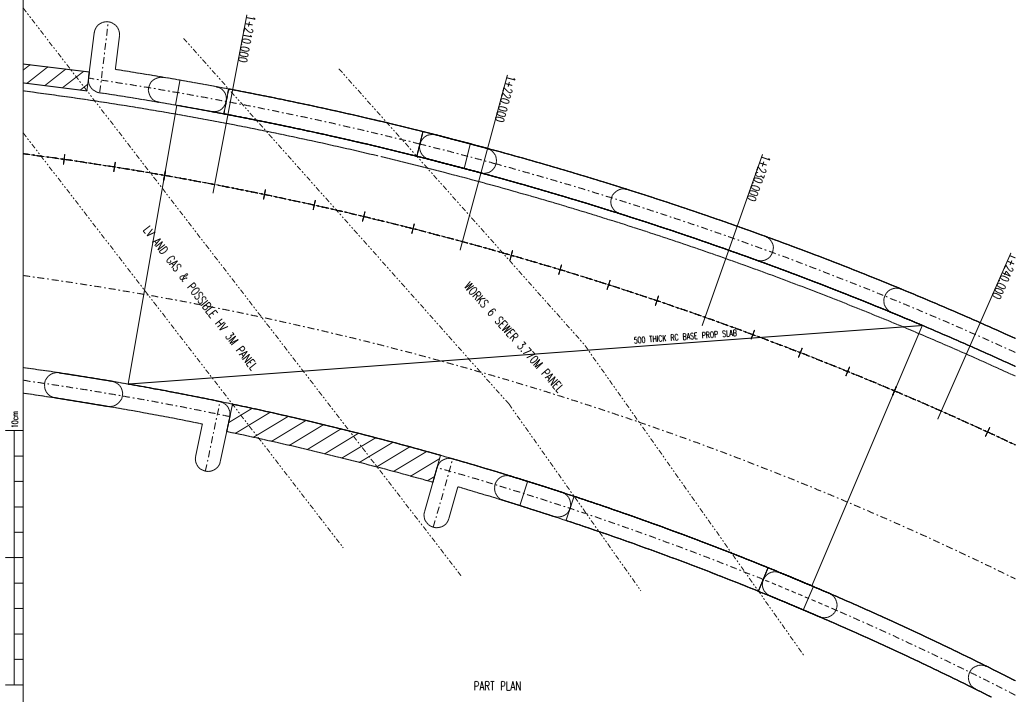
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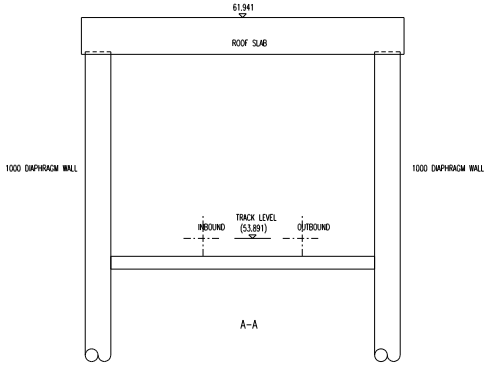
Scales	1:100 U.N.O.	Originator	EC
Checked	Approved	Date	DATE
Job No. 67313	Drawing No. S-17-026	Rev.	

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR

A1



PART PLAN



A-A

NOTES:-

1. FOR GENERAL NOTES REFER TO DRAWING NUMBER S-17-020

Rev.	Date	By	Description

Drawing Status

CONSTRUCTION

Job Title

METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title

BASE SLAB
OUTBOUND CH. 1208-1238
SHEET 3 OF 4

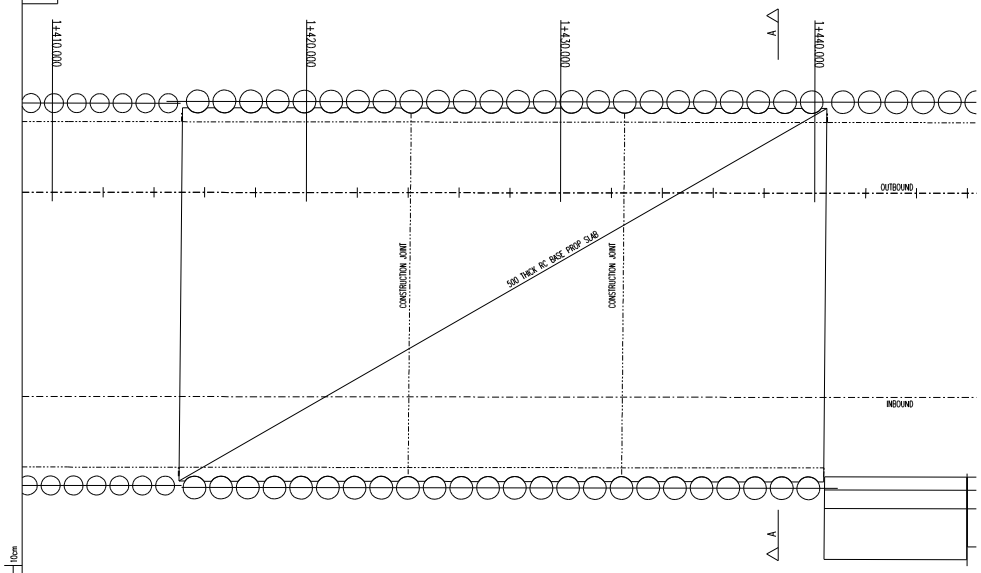
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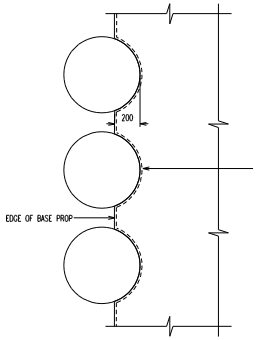
Scales	1:00 U.N.O.	Originator	EC
Checked	Approved	Date	DATE
Job No. 67313	Drawing No. S-17-027	Rev.	

A1

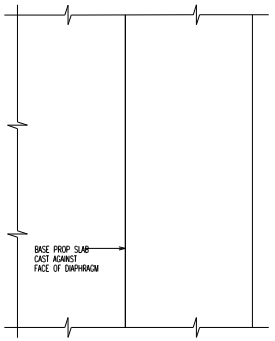
10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



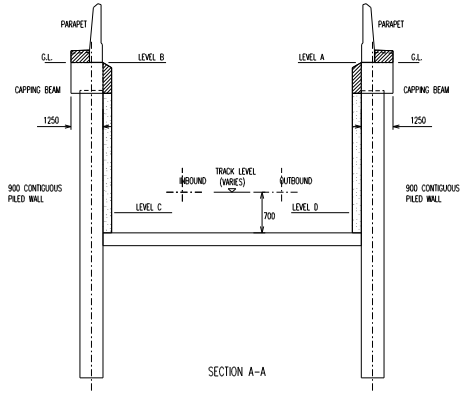
PART PLAN



SECTION 2-2
(SCALE 1:20)



SECTION 3-3
(SCALE 1:20)



SECTION A-A

NOTES:-
1. FOR GENERAL NOTES REFER TO DWG NUMBERS S-16-006/014.

Rev.	Date	By	Description

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
PROPPING SLAB
OUTBOUND CH. 1415-1440
SHEET 4 OF 4

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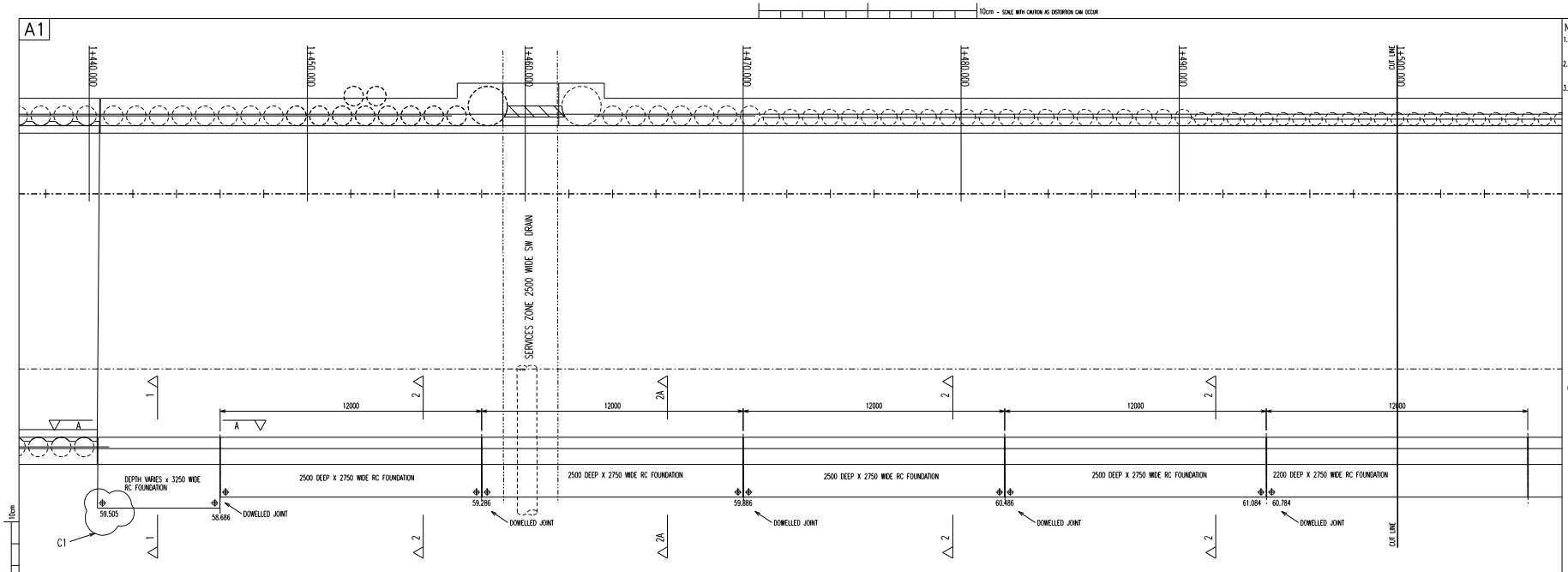
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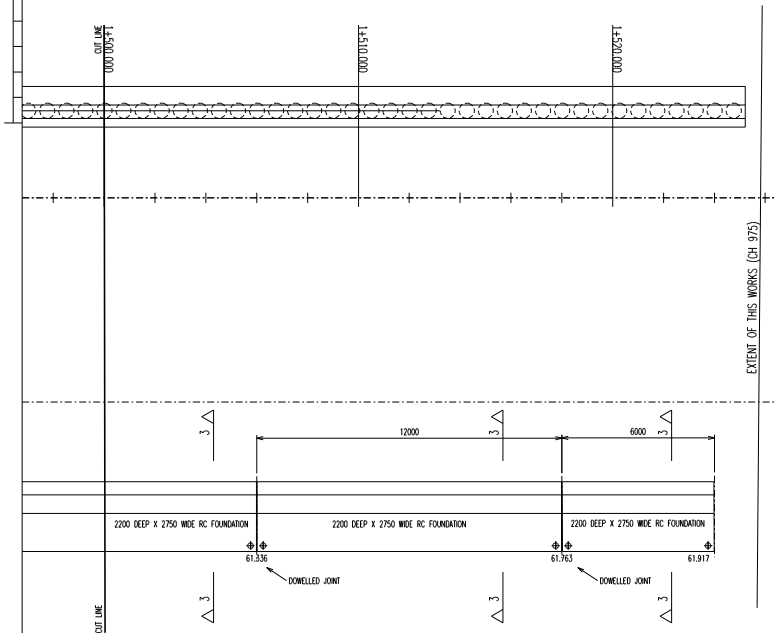
Scales	1:100 U.N.O.	Originator	EC
Checked	Approved	Date	SEP 01

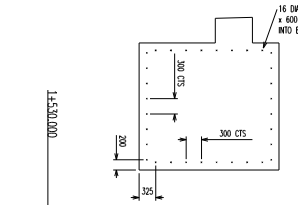
Job No.	Drawing No.	Rev.
67313	S-17-028	

A1

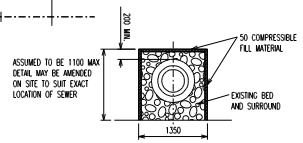
10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



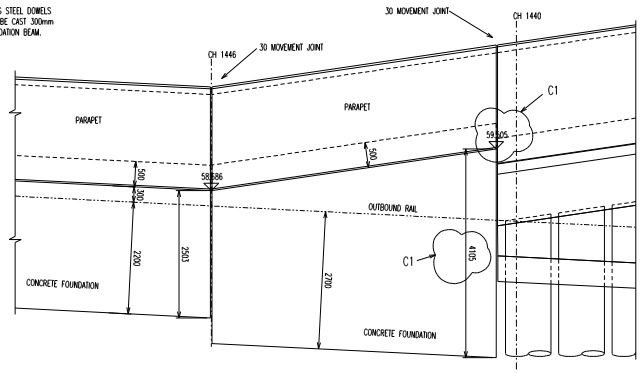




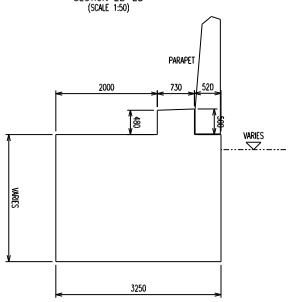
TYPICAL DOWEL ARRANGEMENT AT JOINT IN FOUNDATION BEAMS
(SCALE 1:50)



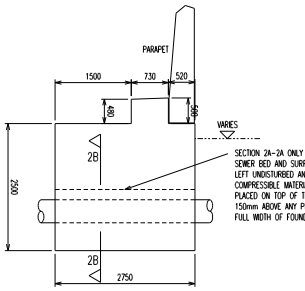
SECTION 2B-2B
(SCALE 1:50)



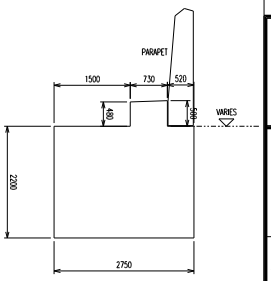
SECTION A-A
(SCALE 1:50)



SECTION 1-1
(SCALE 1:50)



SECTION 2-2
SECTION 2A-2A SIMILAR
(SCALE 1:50)



SECTION 3-3
(SCALE 1:50)

NOTES:-

1. FOR DETAILS OF FINISHES REFER TO ARCHITECTS DRAWING NUMBER 0123/001 AND SPECIFICATION.
2. FOR SETTING OUT FROM OUTBOUND AND INBOUND TRACKS REFER TO INFORMATION SHEETS ???????
3. CONCRETE GRADES

BLINDING..... C20
INSITU..... C40
PRECAST..... C40

◆ DENOTES LEVELS TO TOP OF CONCRETE FOUNDATIONS.
60.784

N.B. NOT ISSUED AS C1 REVISION TO DATE 06/12/01

Rev.	Date	By	Description
C1	DAE	EC	AS NOTED

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

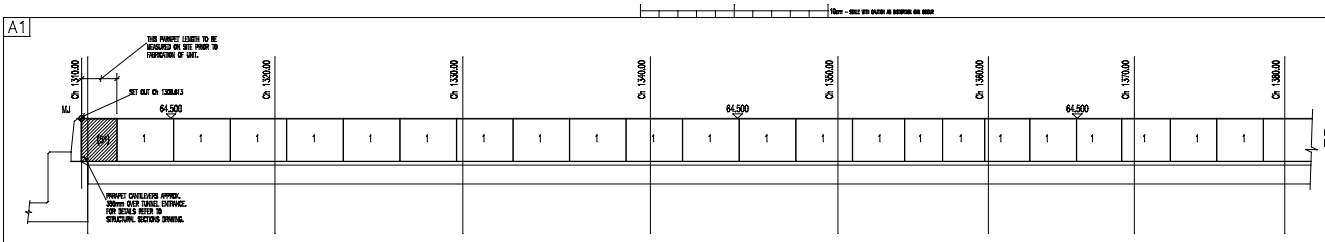
Drawing Title
FOUNDATIONS
OUTBOUND CH. 1440-1525

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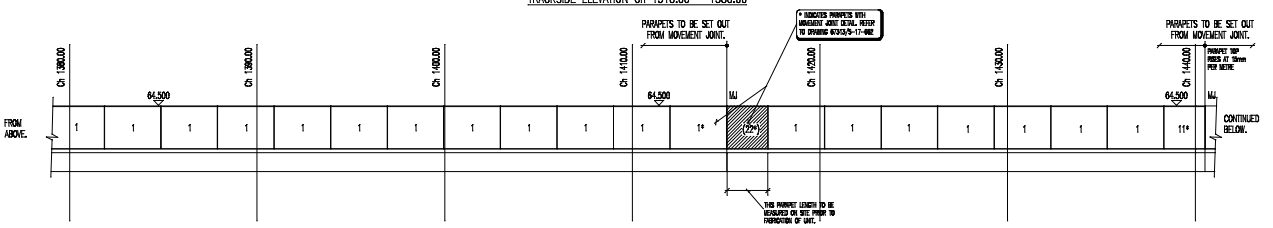
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Scales	1:100 U.N.O.	Originator	EC
Checked	Approved	Date	18/10/01
Job No.	Drawing No.	Rev.	
67313	S-17-040	C1	

A1

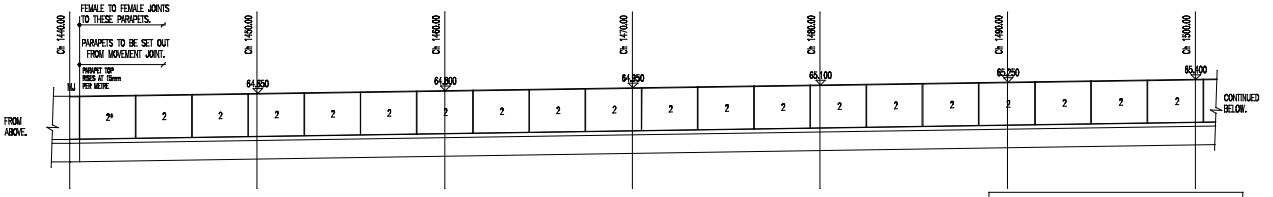


TRACKSIDE ELEVATION Ch 1310.00 – 1380.00



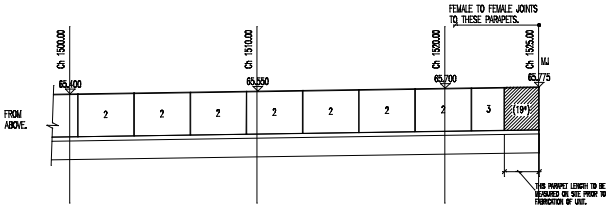
REFER TO DWG No S-17-062 FOR SHEAR KEY AT SPLAYS

TRACKSIDE ELEVATION Ch 1380.00 – 1440.00

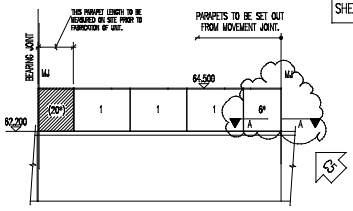


TRACKSIDE ELEVATION Ch 1440.00 – 1500.00

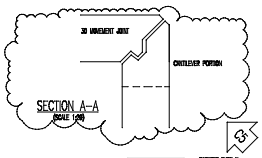
PARAPET PANELS BETWEEN CHAINAGES 1440 AND 1525 ARE TO HAVE FEMALE TO FEMALE JOINTS. THESE JOINTS TO BE SEALED USING PROPRIETARY SHEAR KEY SOCK ANCHOR SYSTEM (TO BE AGREED)

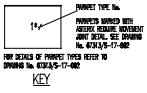


TRACKSIDE ELEVATION Ch 1500.00 – 1525.00



TRACKSIDE PARAPET ELEVATION AT TUNNEL ENTRANCE (CHAINAGE 1310)





NOTES.

1. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE CONTRACT STRUCTURAL SPECIFICATIONS.
2. SPECIAL FINISH SHALL BE OF EXPOSED AGGREGATE TYPE (AS PRODUCED UPON TRIAL PANEL)
3. ANTI-GRAFFITI TREATMENT (Ie Cyl AS OR SIMILAR APPROVED) SHALL BE PROVIDED TO ALL EXPOSED SURFACES OF PARAPETS, BUT NOT TO SURFACES TO BE CONCRETED STRUCTURALLY TO CAPPING BEAM.
4. C.V. BUDVAN TO PROVIDE FULL REINFORCEMENT DETAILS FOR LIFTING AND INSTALLATION OF PARAPET UNITS.
5. PARAPET TOLERANCE SHALL BE AS PER STRUCTURAL SPECIFICATION.
6. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT STRUCTURAL ENGINEERS DRAWINGS.
7. C.V. BUDVAN TO SUBMIT FOR APPROVAL ALL RE DIMENSIONS PRIOR TO POURING OF UNITS
8. SHEAR KEY NOT SHOWN ON PANELS FOR CLARITY.
9. PARAPETS NUMBERED IN PARENTHESIS ARE TO BE MEASURED ON SITE PRIOR TO FABRICATION OF UNITS.

Rev.	Date	By	Description
C5	24/04/02	EC	AS NOTED
C4	24/04/02	EC	AS NOTED
C3	24/04/02	EC	AS NOTED
C2	20/11/01	AJ	NOTE ADDED TO PARAPET ADJACENT TUNNEL OPENINGS. TUNNEL ENTRANCE PARAPET AMENDED FROM 2 TO 6.

Drawing Status
CONSTRUCTION

Job Title
METROLINK ADVANCED WORKS

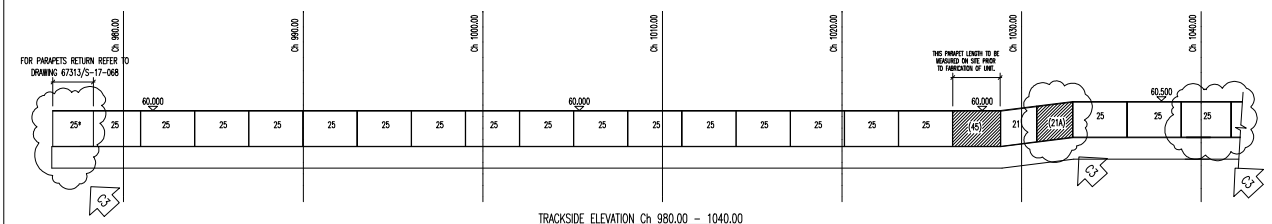
Drawing Title
METROLINK PHASE 3
ADVANCED WORKS
OUTBOUND PARAPET ELEVATIONS
Ch 1310.00 – 1525.00

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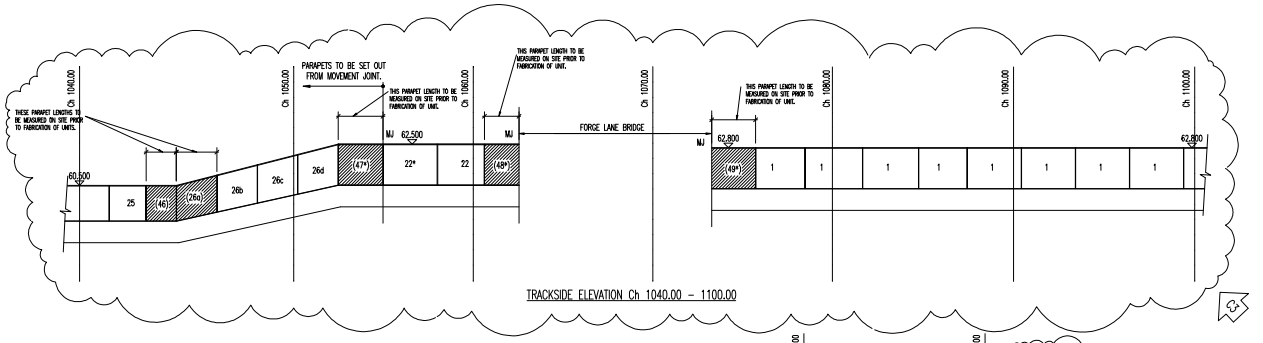
Drawn	Engineer
M.C.S.	A.J.
Checked	Approved
	Date 26/03/02

Job No. 67313
Drawing No. S-17-060
Rev. C5

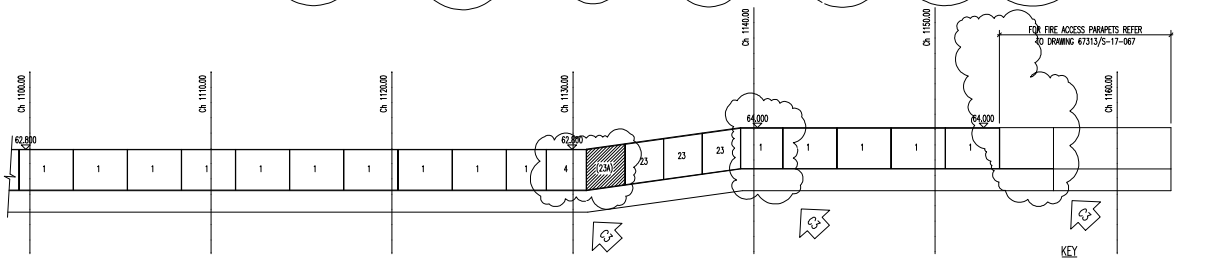
A1



TRACKSIDE ELEVATION Ch 980.00 – 1040.00



TRACKSIDE ELEVATION Ch 1040.00 – 1100.00



TRACKSIDE ELEVATION Ch 1100.00 – 1160.00

KEY

1* PARAPET TYPE No.
PARAPETS MARKED WITH ASTERISK REQUIRE MOVEMENT JOINT DETAIL. SEE DRAWING No. 67313/S-17-062

FOR DETAILS OF PARAPET TYPES REFER TO DRAWING No. 67313/S-17-062

NOTES.

1. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE CONTRACT STRUCTURAL SPECIFICATIONS.
2. SPECIAL FINISH SHALL BE OF EXPOSED AGGREGATE TYPE (AS PRODUCED UPON TRIAL PANEL)
3. ANTI-GRAFFITI TREATMENT (Nu Cyn AG OR SIMILAR APPROVED) SHALL BE PROVIDED TO ALL EXPOSED SURFACES OF PARAPETS, BUT NOT TO SURFACES TO BE CONNECTED STRUCTURALLY TO CAPPING BEAM.
4. C.N. BUCHAN TO PROVIDE FULL REINFORCEMENT DETAILS FOR LIFTING AND INSTALLATION OF PARAPET UNITS.
5. PARAPET TOLERANCE SHALL BE AS PER STRUCTURAL SPECIFICATION.
6. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT STRUCTURAL ENGINEERS DRAWINGS.
7. C.N. BUCHAN TO SUBMIT FOR APPROVAL ALL RC DRAWINGS PRIOR TO POURING OF UNITS
8. SHEAR KEY NOT SHOWN ON PANELS FOR CLARITY.
9. PARAPETS NUMBERED IN PARENTHESIS ARE TO BE MEASURED ON SITE PRIOR TO FABRICATION OF UNITS.

Rev.	Date	By	Description
C3	14/11/11	EC	AS NOTED
C2	24/11/11	AJ	NOTE 6 ADDED.

Drawing Status
CONSTRUCTION

Job Title
METROLINK ADVANCED WORKS

Drawing Title
METROLINK PHASE 3
ADVANCED WORKS
OUTBOUND PARAPET ELEVATIONS
Ch 976.00 – 1157.00

ARUP
Ove Arup & Partners Ltd
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Fitzroy Street, Manchester, M1 4EE,
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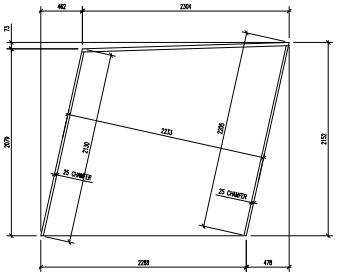
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Scale 1:100 Originator AJ
Checked Approved Date 15/02/02

Job No. 67313 Drawing No. S-17-065 Rev. C3

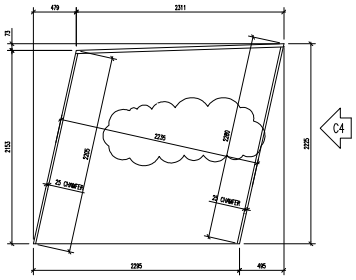
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A1



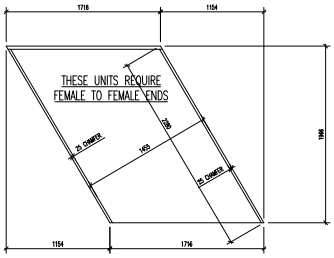
PARAPET TYPE 26c

PARAPET ON A SLOPE
ALL DIMENSIONS TO BE CONFIRMED ON SITE FOLLOWING CONSTRUCTION OF CAPPING BEAM SLOPE.



PARAPET TYPE 26d

PARAPET ON A SLOPE
ALL DIMENSIONS TO BE CONFIRMED ON SITE FOLLOWING CONSTRUCTION OF CAPPING BEAM SLOPE.



PARAPET TYPE 27

PARAPET ON A SLOPE
ALL DIMENSIONS TO BE CONFIRMED ON SITE FOLLOWING CONSTRUCTION OF CAPPING BEAM SLOPE.

NOTES.

1. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE CONTRACT STRUCTURAL SPECIFICATIONS.

2. SPECIAL FINISH SHALL BE OF EXPOSED AGGREGATE TYPE (AS PRODUCED UPON TRIAL PANEL)

3. ANTI-GRAFFITI TREATMENT (Re Cryl AS OR SIMILAR APPROVED) SHALL BE PROVIDED TO ALL EXPOSED SURFACES OF PARAPETS, BUT NOT TO SURFACES TO BE CONNECTED STRUCTURALLY TO CAPPING BEAM.

4. C.V. BUCHAN TO PROVIDE FULL REINFORCEMENT DETAILS FOR LIFTING AND INSTALLATION OF PARAPET UNITS.

5. PARAPET TOLERANCE SHALL BE AS PER STRUCTURAL SPECIFICATION.

6. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT STRUCTURAL ENGINEERS DRAWINGS.

7. C.V. BUCHAN TO SUBMIT FOR APPROVAL ALL RC DRAWINGS PRIOR TO POURING OF UNITS

8. SHEAR KEY NOT SHOWN ON PANELS FOR CLARITY.

Rev.	Date	By	Description
C4	01/04/22	EC	AS NOTED
C3	11/03/22	EC	AS NOTED + 3B REMOVED
C2	31/01/22	AJ	PARAPET TYPE 3B ADDED

Drawing Status
CONSTRUCTION

Job Title
METROLINK ADVANCED WORKS

Drawing Title
METROLINK PHASE 3
ADVANCED WORKS
PARAPET TYPES
SHEET 3

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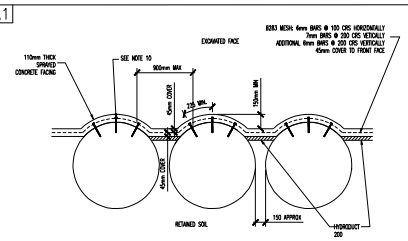
Scales	Originator
1:20	AJ
Checked	Approved
	Date 27/03/22

Job No.	Drawing No.	Rev.
67313	S-17-069	C4

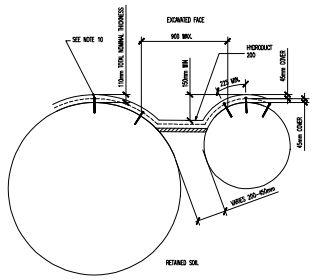
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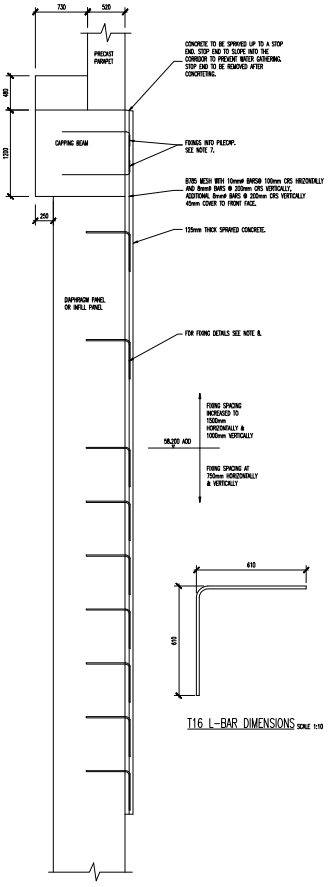
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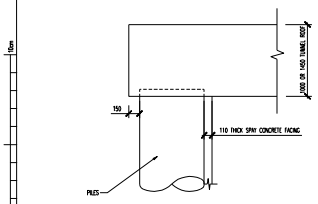
DETAIL 1 (TYPICAL) – 900mm DIA PILES SCALE 1:25
SPRAY CONCRETE FACING DETAIL TO BE SIMILAR FOR OTHER DIA PILES



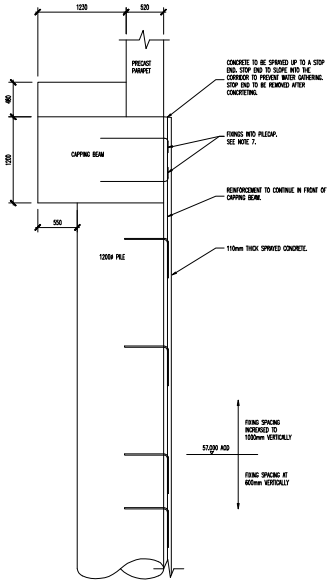
DETAIL 2 (TYPICAL) ADJACENT 2400mm AND 1200mm DIAMETER PILES SCALE 1:25
SPRAY CONCRETE FACING DETAIL TO BE SIMILAR FOR OTHER DIAMETER PILES



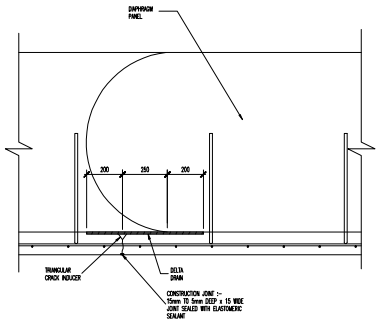
DETAIL 5 SCALE 1:25



DETAIL 3 – TOP OF SPRAYED FACING INSIDE TUNNEL SCALE 1:25



DETAIL 4 – TOP OF SPRAYED FACING OUTSIDE TUNNEL SCALE 1:25



CONSTRUCTION JOINT DETAIL 1:10

T16 L-BAR DIMENSIONS SCALE 1:10

NOTES

1. SPRAYED CONCRETE TO BE ACCORDANCE WITH THE SPECIFICATION.
2. ALL DIMENSIONS ARE IN mm.
3. FOR EXTENT OF CONCRETE SEE DRAWINGS Nos. S-17-007 TO S-17-011.
4. MOVEMENT JOINTS IN SPRAYED CONCRETE FACING TO BE AT LOCATIONS INDICATED ON DRAWINGS Nos. S-17-007 TO S-17-011 AND OUTBOUND CHAINAGE 1+200.00 & 1+215.00, INBOUND CHAINAGE 1+220.00 & 1+234.00. (WORK 6 SEWER)
5. CONSTRUCTION JOINTS TO BE PROVIDED AT EVERY DIAPHRAM PANEL JOINT IN ACCORDANCE WITH DETAIL 6.
6. A MINIMUM OF TWO SHEETS OF MESHING MAY BE LAPPED AT ANY POINT. MINIMUM LAP LENGTHS TO BE :
   - 6mm – 300mm
   - 7mm – 325mm
   - 8mm – 350mm
   - 10mm – 425mm
7. THE EXISTING T16 FIXINGS INTO THE PILECAP ARE TO BE CURTAILED 25mm FROM THE EXISTING FACE. THE EXISTING T12 BARS ARE TO BE AMENDED TO SUCH THAT THEY HAVE 40mm COVER TO THE FRONT FACE.
8. T16 L-BARS TO BE FIXED ALONG DIAPHRAGM AND INFILL PANELS AT 750 VERTICAL CENTRES AND 750 HORIZONTAL CENTRES. L-BARS TO BE RESIN ANCHORED USING HILTI HIT HY150 RESIN (OR EQUIVALENT) IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS. 555 LONG x 20 DIAMETER HOLE DRILLED INTO PILE. 58.2M THE SPACING OF THE FIXINGS MAY BE INCREASED TO 1500mm HORIZONTALLY AND 1000 VERTICALLY.
9. HYDRODUCT 200 IS NOT REQUIRED BETWEEN THE INBOUND CONTOURING BORED PILES BETWEEN CH1559 AND 1720.
10. 3 No T16 L-BARS PER PILE AT 600mm CENTRES VERTICALLY L-BARS TO BE RESIN ANCHORED USING HILTI HIT HY150 RESIN (OR EQUIVALENT) IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS.
    555 LONG x 20 DIAMETER HOLE DRILLED INTO PILE. ABOVE 512M THE VERTICAL SPACING OF THE FIXINGS MAY BE INCREASED TO 1000mm.
11. REINFORCEMENT NOT TO BE LAPPED AT CONSTRUCTION JOINTS.

Rev.	Date	By	Description
G	03/01/02	LST	ADDITIONAL NOTE 10 ADDED & DIAPHRAM WIDTH CORRECTED
F	19/12/01	LST	FIXING SPACING REVISED
E	29/11/01	LST	CHAINAGE CORRECTED & DIAPHRAM PANEL ADDED
D	19/11/01	LST	CHAINAGE PILE NOS. ADDED REVISED NOTE 8 & 10 ADDED
C	08/11/01	LST	DIAPHRAM PANEL FIXINGS ADDED
B	06/11/01	LST	NOTE 7 ADDED & FIXING DETAILS ADDED
A	18/10/01	LST	FIRST ISSUE

Drawing Status: PRELIMINARY

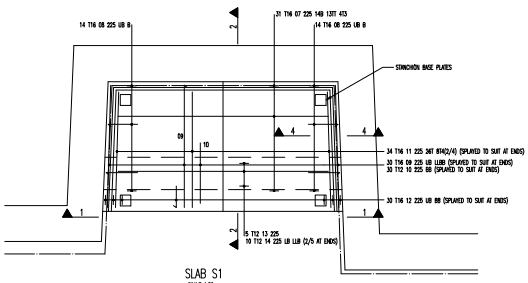
Job Title: METROLINK PHASE 3 ADVANCED WORKS (ALAN TURING WAY)

Drawing Title: SPRAYED CONCRETE FACING DETAILS

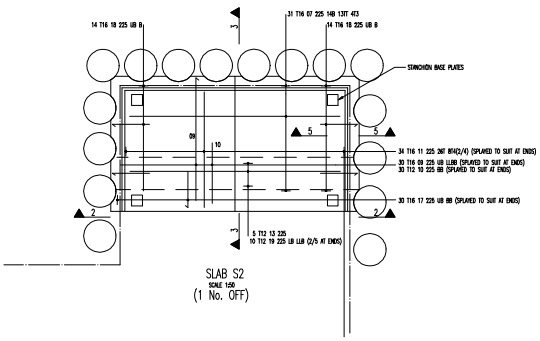
ARUP
The Pierhead, 23 Mount Stuart Square, Cardiff Bay, Cardiff, CF10 5EE
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Scales	Originator
AS SHOWN	CM
Checked	Approved
LST	MJC
Date	31/10/02
Job No.	Drawing No.	Rev.
67313	S-17-120	G

A1



SLAB S1
SCALE 1:50
(1 No. OFF)



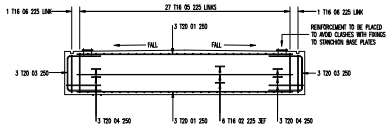
SLAB S2
SCALE 1:50
(1 No. OFF)

NOTES :-

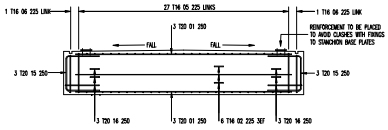
1 CONCRETE TO BE GRADE C40 AT 28 DAYS .
2 MAXIMUM AGGREGATE SIZE TO BE :- 20mm
3 REINFORCEMENT LISTED ON BENDING SCHEDULE PAGES :- 1-2
4 FOR LAYOUT DETAILS SEE DRAWING NUMBERS :- 5/17/121
5 AP ALTERNATELY PLACED
AR ALTERNATELY REVERSED
AS ALTERNATELY STAGGERED
EF EACH FACE
NF NEAR FACE
FF FAR FACE
T TOP
B BOTTOM
UB U BAR
LLT LONG LEG TOP
LLB LONG LEG BOTTOM
6 COVER :- UNLESS NOTED OTHERWISE COVER TO BE :- 50mm

MINIMUM LAP LENGTHS

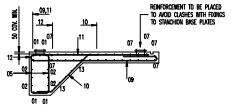
T10 – 400	T25 – 775
T12 – 450	T32 – 950
T16 – 550	T40 – 1150
T20 – 650	



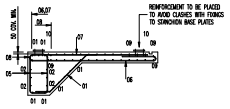
ELEVATION 1–1 (BEAM B1)
SCALE 1:50
(1 No. OFF)



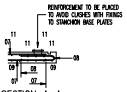
ELEVATION 2–2 (BEAM B2)
SCALE 1:50
(1 No. OFF)



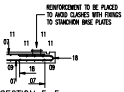
SECTION 2–2
SCALE 1:50



SECTION 3–3
SCALE 1:50



SECTION 4–4
SCALE 1:50



SECTION 5–5
SCALE 1:50

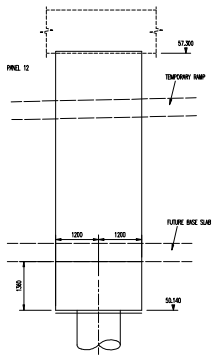
Rev. Date By Description

Drawing Status
CONSTRUCTION

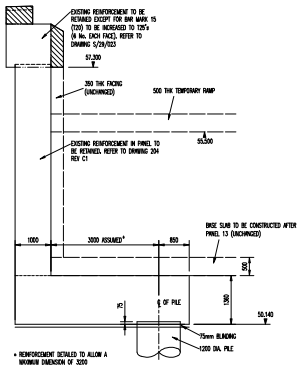
Job Title
METROLINK PHASE 3.
ADVANCED WORKS

Drawing Title
REINFORCEMENT DETAILS
SLABS S1 AND S2

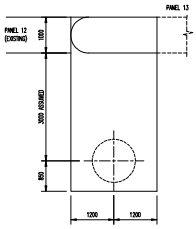
ARUP
Scale AS NOTED
Designed EC
Checked JMcD. Approved Date 24/12/02
Job No. 67313
Drawing No. S/29/032
Rev.



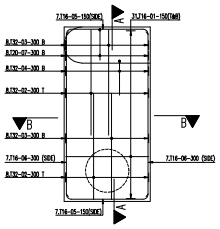
ELEVATION OF PANEL
SCALE 1:50



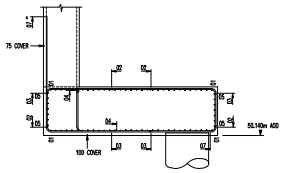
SIDE ELEVATION ON PANEL
SCALE 1:20



PLAN ON PANEL
SCALE 1:50

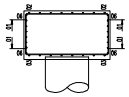


BASE REINFORCEMENT
SCALE 1:50



* BAR MAY NEED COUPLER FOR CONSTRUCTABILITY

SECTION A-A
SCALE 1:20



SECTION B-B
SCALE 1:20

Member	Bar mark	Type of bar shape	No. of identical bars	No. of bars in member	Total No.	Length (mm)	Total length (m)	A* mm	B* mm	C* mm	D* mm	E* mm
PANEL 6000	01	T20	1	21	21	3300	69	200	2500	600		
	02	T20	1	10	10	3300	37	1100	1500			
	03	T20	1	10	10	3300	37	1100	1500			
	04	T20	1	10	10	1000	37	200	600			
	05	T20	1	14	14	3400	55	200	2500	600		
	06	T20	1	14	14	4000	56					
	07	T20	1	6	6	3300	37	4700	5070			

This schedule complies with the requirements of BS 8666
* Specified to multiples of 5mm

NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. ALL REINFORCEMENT BARS ARE TO BE GRADE 460 TYPE 2 DEFORMED.
3. ALL REINFORCEMENT BARS ARE TO BE CUT AND BENT IN ACCORDANCE WITH BS 4466:1989.

BAR DIA.(mm)	16	20	32
BAR LAP(mm)	680	850	875

4. CONCRETE GRADE IS TO BE C40.
5. NOMINAL COVER TO BE 75mm UNLESS STATED OTHERWISE.
6. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH AMEC BAR SCHEDULE REF:18116-204-01.
7. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH AMEC DRAWING No.'s:18116-101 & 18116-102.
8. ALL PANELS ARE TO INCLUDE "STRAY CURRENT PROVISION". THIS COMPRISES OF WELDING THREE NUMBER SETS OF LINKS (BM 101, 102) TO MAKE THEM CONTINUOUS, THEN EQUALLY SPACED ALONG EACH CAGE, AND THESE LINKS WELDED TO EACH LONGITUDINAL BAR.
WHERE THE LONGITUDINAL REINFORCEMENT INCLUDES LAPPED BARS A MINIMUM OF ONE BAR IS TO BE WELDED AT LAP POSITION FROM EACH CAGE TO PROVIDE ELECTRICAL CONTINUITY.
9. IT HAS BEEN ASSUMED THAT SUPPORT TO THE EXISTING GROUND BEHIND THE WALL STEM WILL BE PROVIDED BY TEMPORARY WORKS. IT HAS BEEN ASSUMED THAT THE EXISTING SHEET PILES WILL BE PROPPED OFF THE ADJACENT PANELS AS PART OF THESE WORKS. THE WALL WILL NOT SUPPORT SOIL LOADING UNTIL COMPLETE AND THE 7DAY CONCRETE STRENGTH HAS BEEN ACHIEVED.
10. THE STEM OF THE WALL SHOULD BE CONSTRUCTED TOP DOWN LEAVING A MINIMUM OF A LAP LENGTH OF THE EXISTING REINFORCEMENT EXPOSED BELOW THE REPLACEMENT CONCRETE.
11. THE EXISTING REINFORCEMENT SHOULD BE CHECKED FOR SIZE AND CONTENT DURING EXCAVATION, ANY DAMAGED OR MISSING REINFORCEMENT SHOULD BE REPLACED.

Issue	Date	By	Chkd	Appd

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Client

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
PANEL 13
REPLACEMENT

Scale at A1 1:50
Plot ID
Drawing Status

Job No.	Drawing No.	Issue
67313	S-13-050	

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A1

10cm - SCALE WITH CAUTION AS ORIGINAL ON A1/A3

Bar Schedule Ref : A

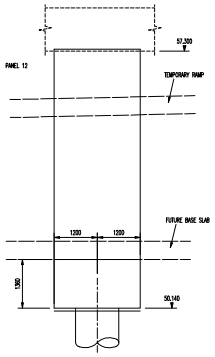
Date prepared 03/05/22 **Date revised**

Prepared by M TYRRELL **Checked by**

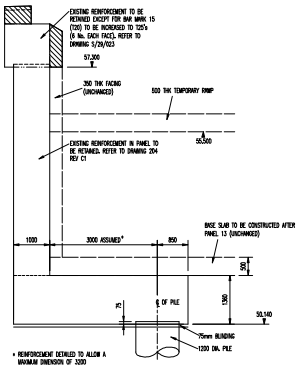
Member	Bar mark	Type and size	No. of members	No. of bars in each	Total no.	Length of each bar* mm	Shape Code	A* mm	B* mm	C* mm	D* mm	E/A* mm
PANEL BASE	01	T16	1	31	31	3960	36	950	2360	950		
	02	T32	1	16	16	3960	37	1100	3125			
	03	T32	1	16	16	3960	37	1100	2925			
	04	T32	1	16	16	1525	37	500	500			
	05	T16	1	14	14	3460	36	950	2360	950		
	06	T16	1	14	14	4900	20					
	07	T20	1	8	8	7625	37	4700	3175			

This schedule complies with the requirments of BS 4466

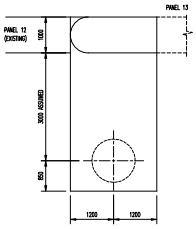
*Specified in multiples of 5mm ^ Specified in multiples of 25mm



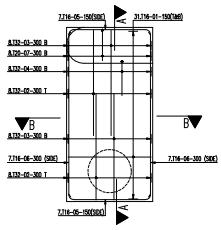
ELEVATION OF PANEL
SCALE 1:50



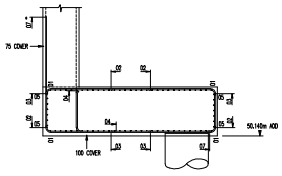
SIDE ELEVATION ON PANEL
SCALE 1:20



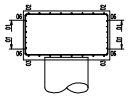
PLAN ON PANEL
SCALE 1:50



BASE REINFORCEMENT
SCALE 1:50



SECTION A-A
SCALE 1:20



SECTION B-B
SCALE 1:20

NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. ALL REINFORCEMENT BARS ARE TO BE GRADE 460 TYPE 2 DEFORMED.
3. ALL REINFORCEMENT BARS ARE TO BE CUT AND BENT IN ACCORDANCE WITH BS 8666:2005.

BAR DIA.(mm)	16	20	32
BAR LAP(mm)	480	650	975

4. CONCRETE GRADE IS TO BE C40.
5. NOMINAL COVER TO BE 75mm UNLESS STATED OTHERWISE.
6. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH BAR SCHEDULE REF: 18116-204-01.
7. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH DRAWING No.'s: 18116-101 & 18116-102.
8. ALL PANELS ARE TO INCLUDE "STRAY CURRENT PROVISION", THIS COMPRISES OF WELDING THREE NUMBER SETS OF LINKS (BM 101, 102) TO MAKE THEM CONTINUOUS, THEN EQUALLY SPACED ALONG EACH CASE, AND THESE LINKS WELDED TO EACH LONGITUDINAL BAR.
WHERE THE LONGITUDINAL REINFORCEMENT INCLUDES LAPPED BARS A MINIMUM OF ONE BAR IS TO BE WELDED AT LAP POSITION FROM EACH CASE TO PROVIDE ELECTRICAL CONTINUITY.
9. IT HAS BEEN ASSUMED THAT SUPPORT TO THE EXISTING GROUND BEHIND THE WALL STEM WILL BE PROVIDED BY TEMPORARY WORKS, IT HAS BEEN ASSUMED THAT THE EXISTING SHEET PILES WILL BE PROPPED OFF THE ADJACENT PANELS AS PART OF THESE WORKS, THE WALL WILL NOT SUPPORT SOIL LOADING UNTIL COMPLETE AND THE 7DAY CONCRETE STRENGTH HAS BEEN ACHIEVED.
10. THE SIDE OF THE WALL SHOULD BE CONSTRUCTED TOP DOWN LEAVING A MINIMUM OF A LAP LENGTH OF THE EXISTING REINFORCEMENT EXPOSED BELOW THE REPLACEMENT CONCRETE.
11. THE EXISTING REINFORCEMENT SHOULD BE CHECKED FOR SIZE AND COVERAT DURING EXCAVATION. ANY DAMAGED OR MISSING REINFORCEMENT SHOULD BE REPLACED.

Rev.	Date	By	Description
C1	04/05/22	EC	CONSTRUCTION ISSUE

Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3
ADVANCED WORKS
(ALAN TURING WAY)

Drawing Title
PANEL 13
REPLACEMENT

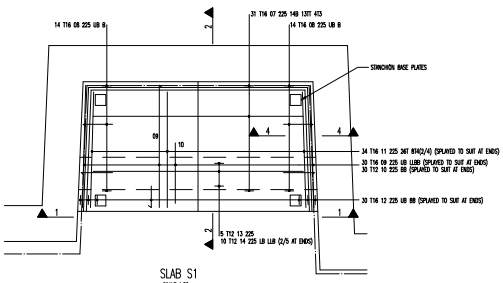
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Scales: AS NOTED Originator MT
Checked YZ Approved AJA Date 09/05/22

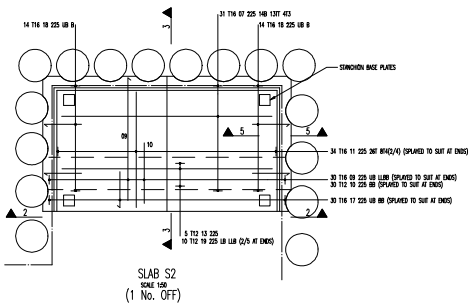
Job No. 67313 Drawing No. S-29-050 Rev. C1

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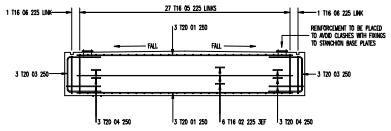
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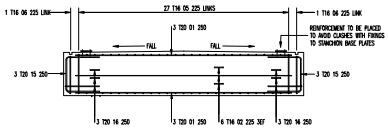
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(1 No. OFF)



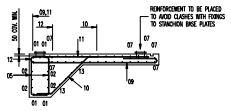
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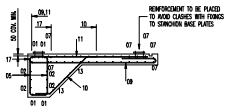
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SCALE 1:50
(1 No. OFF)



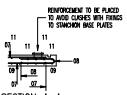
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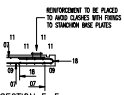
SECTION 2–2
SCALE 1:50



SECTION 3–3
SCALE 1:50



SECTION 4–4
SCALE 1:50



SECTION 5–5
SCALE 1:50

NOTES :-
1 CONCRETE TO BE AIR ENTRAINED GRADE C40 AT 28 DAYS, WITH A MEAN TOTAL AIR CONTENT BY VOLUME OF FRESH CONCRETE = 5.0%.
2 MAXIMUM AGGREGATE SIZE TO BE :- 20mm
3 REINFORCEMENT LISTED ON BENDING SCHEDULE PAGES :- 1-2
4 FOR LAYOUT DETAILS SEE DRAWING NUMBERS :- S-17-121
5 AP ALTERNATELY PLACED
AR ALTERNATELY REVERSED
AS ALTERNATELY STAGGERED
EF EACH FACE
NF NEAR FACE
FF FAR FACE
T TOP
B BOTTOM
UB U BAR
LLT LONG LEG TOP
LLB LONG LEG BOTTOM
6 COVER :- UNLESS NOTED OTHERWISE COVER TO BE :- 50mm

MINIMUM LAP LENGTHS

T10 – 400	T25 – 775
T12 – 450	T32 – 950
T16 – 550	T40 – 1150
T20 – 650	

Rev.	Date	By	Description

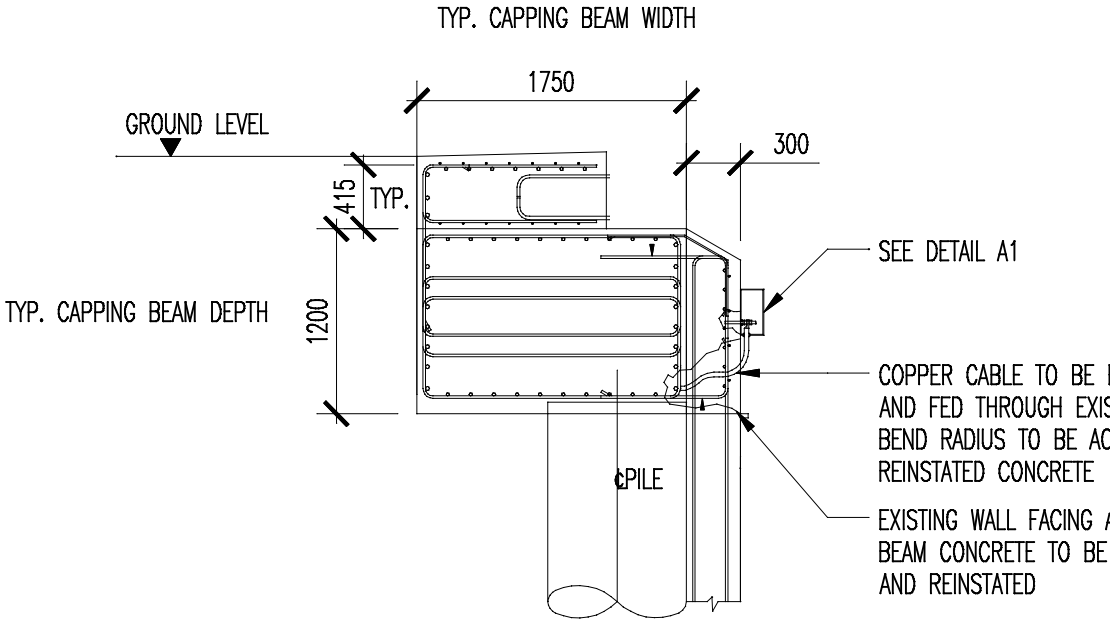
Drawing Status
CONSTRUCTION

Job Title
METROLINK PHASE 3.
ADVANCED WORKS

Drawing Title
REINFORCEMENT DETAILS
SLABS S1 AND S2

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Scale AS NOTED	Originator EC
Checked	Approved
	Date 24/12/02
Job No. 67313	Drawing No. S-29-080
	Rev.



SECTION 1/1 (THROUGH CAPPING BEAM)

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Client

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PROJECTS

Job Title

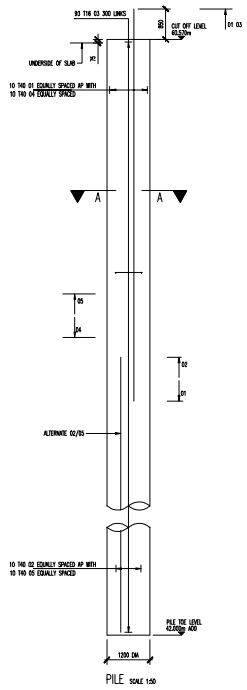
METROLINK ADVANCED
WORKS

Drawing Title

SECTION THROUG
CAPPING BEAM AT
CH 1 + 310M

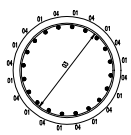
10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR

A1



PILE SCALE 1:50

NOTE:- BAR MARK 01 LAPS ONTO BAR MARK 02
BAR MARK 04 LAPS ONTO BAR MARK 05



SECTION A–A SCALE 1:20

ARUP

Job No.	Drawing No.	Page No.	Rev.
67313	S-29-010	1	

Revision: A B C
Originator/Date: EC/01/02
Chd. by/Date: LT/01/02

MANCHESTER METROLINK
CON DA 1160 33 1056
PILE REINFORCEMENT

Location	Bar mark	Type and size	Number of groups	Number in each	Total number	Length of each bar	Shape code	All bending dimensions are in accordance with BS4466 A mm	B mm	C mm	D mm	E/R mm	Rev
PILE TYPE 1	01	T40	1	10	10	12000	25						
	02	T40	1	10	10	8575	20						
	03	T16	1	93	93	3825	99	1040	(550)				
	04	T40	1	10	10	10000	20						
	05	T40	1	10	10	10650	20						



R=Ribbed reinforcement to BS4449
T=Type 2 High yield reinforcement to BS4449 or BS4482
X=General abbreviations for other than R and T

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FOR GENERAL ARRANGEMENT REFER TO S-16, AND S-17 SERIES DRAWINGS
3. CONCRETE GRADE TO BE 40/20.
4. NOMINAL COVER TO REINFORCEMENT TO BE 75mm UNLESS OTHERWISE STATED.
5. REINFORCEMENT LISTED ON BAR BENDING SCHEDULE No S-29-010 SHT 1 (ON DRG)
6. REINFORCEMENT TYPES
   R – MILD STEEL TO BS 4449
   T – HIGH YIELD STEEL, TYPE 2 DEFORMED, TO BS 4449, BS 4461
7. REINFORCEMENT TO BE IN ACCORDANCE WITH BS 4466/1989.
8. STEEL REINFORCEMENT DETAILS EXCLUDE ALL SUPPORTING STEEL AND SPACERS U.N.O.
9. STANDARD LAPS TO BE ADOPTED UNLESS SHOWN OTHERWISE.

BAR DIA/mm	8	10	12	16	20	25	32	40
BAR LAP/mm	350	400	450	550	650	775	975	1215

WHERE BARS OF DIFFERENT DIAMETERS ARE LAPPED, THE LAP LENGTH SHALL BE BASED ON THE SMALLER BAR.

10. REINFORCEMENT NOTATION TO BE UTILISED ON DRAWINGS IS AS SHOWN IN THE FOLLOWING EXAMPLE:

50 T20 01 150 FF
NO OF BARS — BAR TYPE — BAR DIA. — BAR LOCATION — BAR SPACING — BAR MARK

11. ABBREVIATIONS
   NF – NEAR FACE
   FF – FAR FACE
   EF – EACH FACE
   T – TOP
   T1 – TOP BAR OUTERMOST LAYER
   T2 – TOP BAR SECOND LAYER
   T3 – TOP BAR INNERMOST LAYER
   B – BOTTOM
   B1 – BOTTOM BAR OUTERMOST LAYER
   B2 – BOTTOM BAR SECOND LAYER
   B3 – BOTTOM BAR INNERMOST LAYER
   AP – ALTERNATELY PLACED BARS
   ARR– ALTERNATE BARS REVERSED
   STG– ALTERNATELY STAGGERED BARS
   ARS– ALTERNATE BARS STAGGERED
   U.N.O.– UNLESS NOTED OTHERWISE

Rev.	Date	By	Description
C1	21/01/02	EC	ISSUED FOR CONSTRUCTION

Drawing Status: CONSTRUCTION

Job Title: METROLINK PHASE 3 ADVANCED WORKS (ALAN TURING WAY)

Drawing Title: CONTIGUOUS BORED PILE WALL CHAINAGE 1162 TO WORKS 6 SEWER CROSSING RC DETAILS TO 1200 DIA. PILES

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Drawn: SG SHOWN | Originator:
Checked: | Approved: | Date: 21/01/02

Job No. 67313 | Drawing No. S-29-010 | Rev. C1

J:\67313\PJT3-CIV\Drawing\Structural\AutoCad\Pile\Reinforcement\pl29010.dwg 5 Aug 2003 10:47 by TRAVIS JH

GMPTE Metrolink

Metrolink Phase III - Advanced Works Gibbon Street

Service Tunnel AIP

July 2001

GMPTE Metrolink

Metrolink Phase III - Advanced Works Gibbon Street

Service Tunnel AIP

October 2001

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Document Verification

Job title	Metrolink Phase III - Advanced Works Gibbon Street	Job number	67313
Document title	Service Tunnel	File reference	
Document ref			

Revision	Date				
Draft 1	10/10/01	Filename			
		Description	First draft		
			Prepared by	Checked by	Approved by
		Name	V Edmondson	D E Paine	M J Robinson
		Signature	[redacted]		
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
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		Signature			
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			Prepared by	Checked by	Approved by
		Name			
		Signature			

Issue Document Verification with Document ✓

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APPENDICES

APPENDIX A
Technical Approval Schedule

APPENDIX B
Analysis Model and Associated Loading

APPENDIX B
Analysis Model and Associated Loading

TABLES

Table 1 – Soil Parameters

1. NAME OF SCHEME

Metrolink Phase III Advanced Works – A Metrolink corridor extending from the Commonwealth Stadium, Manchester to Ashton New Road, Manchester (refer to drawing number C.00.006 Rev C and C00.007 Rev D for route layout)

1.1 Type of Highway

Gibbon Street a two lane single adopted highway is carried above the structure.

A twin track electrified Metrolink line passes under the structure.

1.2 Permitted Traffic Speed (for a bridge give over and/or under).

The permitted traffic speed on the highway above the structure is 30mph.

The permitted traffic speed on the Metrolink line is 30mph.

2. NAME OF STRUCTURE

Metrolink Service Tunnel Outbound Chainages 1255m to 1310m – Gibbon Street (OS Grid Ref. SJ 386398)

2.1 Obstacles Crossed

Manchester Metrolink under/Gibbon Street adopted highway above.

3. PROPOSED STRUCTURE

3.1 Description of Structure

The proposed structure is a cut and cover service tunnel. The total overall length of the service tunnel is 149m. Approval in Principle is sought for a 45m end section between outbound chainages 1265m and 1310m. This section passes beneath Gibbon Street an adopted highway, and is separated from the remainder of the service tunnel by a full movement joint.

900mm diameter contiguous bored piles form the service tunnel walls between outbound chainages 1265m to 1310m. The spacings between the contiguous bored piles will be drained with vertical perforated pipes between each pile. Each of these will be able to be visually inspected within the height of the tunnel and rodded out if necessary. Gaps will be left in any facing unit to allow visually inspect to be completed. The service tunnel roof is a continuous insitu reinforced concrete slab. The minimum clearance to the roof slab is 4.6m from the rail, while the overall width is 13.73m outside face to outside face of the walls.

3.2 Structural Type

All elements of the cut and cover service tunnel are formed from reinforced insitu concrete construction.

A 120 year design life is required for the service tunnel structure. In-situ concrete was chosen for its durability, economy, low maintenance requirements, along with its suitability for forming a monolithic service tunnel structure from the piles and roof slab.

3.3 Foundation Type

The contiguous bored piles forming the walls of the service tunnel, transmit all loads through end bearing and skin friction to the underlying glacial till. The roof slab acts as a prop, providing horizontal restraint to the top of the piles.

3.4 Span Arrangements

The service tunnel roof comprises a single span continuous reinforced concrete slab. The roof slab spans transversely between the contiguous bored pile walls which form its supports.

3.5 Articulation Arrangements

The service tunnel roof slab is simply supported on the contiguous bored pile walls.

3.6 Parapet Type

P6 classification parapets are to be provided at service tunnel portals where vertical drops to the Metrolink track exist. A service tunnel portal is located at outbound chainage 1310m, approximately 19m south of Gibbon Street back of footway.

3.7 Proposed Arrangements for Inspection and Maintenance

Prior to use of the service tunnel by Metrolink, access to the interim faces of the service tunnel can be gained via an access door at either blocked off end of the tunnel.

After the Metrolink line is live, access will need to be arranged in conjunction with the Operator and GMPTE. Access can be made by fire escapes located in a recess at either end of the tunnel, refer to drawing C-00-07 Rev B and C-00-06 Rev C.

3.8 Materials and Finishes

Reinforced Concrete:	Structural elements will be constructed from Grade C40 mixed and placed in accordance with the 'Manual of Contract Documents for Highway Works Volume 1. Specification for Highway Works Series 1700 : Structural Concrete'.
Waterproofing:	Waterproofing measure shall be incorporated to protect the structure from the effects of a ground and surface water. Waterproofing materials will be specified and installed in accordance with the 'Manual of Contract Documents for Highway Works Volume 1 : Specification for Highway Works Series 2000 : Waterproofing for Concrete Structure'. To limit the requirements for maintenance, a proprietary spray application waterproofing material is favoured.
Movement and Construction Joints:	The location of movement joints is shown on the drawings.

4. DESIGN / ASSESSMENT CRITERIA

4.1 Live Loading/Headroom

4.1.1 HA Loading

HA UDL 57.3 kN/m of notional lane width. KEL of 120 kN.

4.1.2 HB Loading

HB = 37.5 units

4.1.3 Footway or Footbridge Live Loading

Not applicable.

4.1.4 Provision for exceptional abnormal loads

Not applicable.

4.1.5 Any Special loading not covered above

(i) Horizontal collision loads from Metrolink carriage applied to contiguous bored piles in derailment case.

(ii) 3.2m depth of surcharge from fill above service tunnel.

4.1.6 Department heavy or high load route requirements and arrangements being made to preserve the route

Not applicable.

4.1.7 Minimum Headroom Provided

4.6m above underside of rail.

4.1.8 Authorities Consulted and Requirement

1) Her Majesty's Railway Inspectorate (HMRI)

The track alignments, clearances and impact loads have been designed in consultation with the HMRI. HMRI have reviewed the design and indicated that they are prepared to sign a letter of No objection in accordance with the Railways and Other Transport Systems (Approval of Works Plant and Equipment) Regulations 1994.

2) Manchester City Council – Highways

In provisional discussions the Highways Department at Manchester City Council indicated that they favoured spray-on waterproofing products. The Department's experience was that spray-on waterproofing products were more robust, and had a longer life before requiring maintenance than waterproof lining.

3) Manchester City Council – Operational Services

Manchester City Council Operational Services are being consulted on issues relating to traffic management, access, earthworks, site delineation and security during construction.

4) Manchester City Council – Planning

Outline planning approval of the prop beams, parapets and other structural elements is being progressed.

5) Greater Manchester County Fire Service

Discussion have been held with Greater Manchester County Fire Service, concerning the provisions to be made within the service tunnel for fighting fire.

6) Statutory Utilities

Statutory utilities are being consulted with regard to necessary diversions or temporary works.

Additional authorities consulted concerning the service tunnel are as follows:-

- British Waterways (twice)
- Environmental Agency
- Manchester Environment and Development Consultancy (MEDC); Agent for Sewerage for United Utilities.
- Greater Manchester Police
- Transco
- Manchester City Council –Special Projects Group (City of Manchester Stadium)
- Norweb
- United Utilities (North West Water)
- The Coal Authority (via GMPTE)
- Wardell Armstrong (consultants), relating to mineworking treatments
- Manchester City Council – Environmental Health
- British Telecom

4.2 List of Relevant Design Standards

Refer to Appendix A.

4.3 Proposed Departures from Documents given in 4.2

Non proposed.

4.4 Proposed methods of dealing with aspects not covered by Documents given in 4.2

No proposal.

5. STRUCTURAL ANALYSIS

5.1 Methods of analysis proposed for superstructure, substructure and foundations

5.1.1 Superstructure

The superstructure of the service tunnel is considered to be the tunnel roof slab. The analysis of the slab is based on a 1m section of the 14m span. HA live loading is applied across the full 1m section. HB wheel loads are dispersed at a spread to depth ratio of 1 horizontally to 2 vertically through the overlying 3m of fill following the guidance in BS 37/88 Loads for Highway Bridges (refer to Appendix B: Analysis Model and Associated Loading for details).

5.1.1.1 Substructure and Foundations

The contiguous bored piles from the substructure and foundations of the tunnel. The contiguous bored pile design takes account of the construction sequence adopted and is analysed using the computer programme "Wallap". This will carry out two separate types of analysis.

(i) Limit equilibrium in order to determine the factor of safety according to the strength factor method for each construction stage considered.

(ii) Bending Moment and displacement analysis by modelling the stage by stage development of forces and wall movements as construction proceeds. The wall and soil are modelled as a beam and springs.

The limit equilibrium calculations are carried out using both the moderately conservative and worst credible soil parameters for both the temporary and permanent excavation levels to ensure that the appropriate factor of safety as indicated within CIRIA 104 Table 5 are adhered to. In addition to the 1200mm temporary excavation an unplanned excavation of 500mm is also considered in combination with the worst credible soil parameters to ensure that wall stability is maintained. The design adopts the deepest wall toe level required to fulfil all of the aforementioned criteria.

5.2 Description and diagram of idealised structure to be used for analysis

Refer to Appendix B.

5.3 Assumptions intended for calculation of structural element stiffness

The tunnel roof slab is simply supported and has a continuous section size and thereby has a continuous stiffness. Because the roof slab is in compression it has been assumed that an short term concrete modulus applies to this element (28kN/mm²). WALLAP analysis has looked at the effects of both short and long term concrete modulii.

5.4 Earth Pressure Coefficients (ka, ko or kp) to be used in the design of earth retaining elements

Earth pressures have been derived from an assessment of the available data and are shown in Table 1.

TABLE OF SOIL PARAMETERS

STRATA	DESIGN APPROACH	phi'	C'	ko	ka (kac)	kp (kpc)	E' kN/m²	dE'/dz kN/m²m
Made ground	Worst credible	26	0	0.560	0.337	3.442	5000	0
	Moderately conservative	28	0	0.530	0.309	3.868	5000	0
								c
Glacial Till – 1	Worst credible	28	0	1.0	0.309 (1.300)	3.868 (5.395)	33000	0
	Moderately conservative	31	0	1.0	0.271 (1.213)	4.653 (6.080)	54000	0
Glacial Till – 2	Worst credible	28	2	1.0	0.309 (1.300)	3.868 (5.395)	33000	9000
	Moderately conservative	31	2	1.0	0.271 (1.213)	4.653 (6.080)	54000	15000
Coal Measures – 1	Worst credible	28	0	1.0	0.309 (1.300)	3.868 (5.395)	150000	0
	Moderately conservative	28	2	1.0	0.309 (1.300)	3.868 (5.395)	150000	0
Coal Measures – 2	Worst credible	28	5	1.0	0.309 (1.300)	3.868 (5.395)	250000	0
at 1.5m pen	Moderately conservative	28	10	1.0	0.309 (1.300)	3.868 (5.395)	250000	0

6. GROUND CONDITIONS

6.1 The recommendations of interpretative soils report to be used in the design are generally accepted with a revision to the parameters as defined in Table 1.

6.2 The tunnel roof is supported on a load bearing contiguous bored pile wall, with all piles being socketted into the Coal Measures bedrock.

6.3 Total and differential settlements of 25mm and 1 in 500 are allowed for in the design of the structure.

6.4 The embedded retaining walls are anticipated to experience a maximum deflection in the order of 25mm. This is based upon the calculated values from the Wallap analysis, previous experience and empirical methods.

6.5 Sulphate and pH tests have been undertaken on soil and groundwater samples from across the site. The results from these tests when compared against the recommendations provided in BRE Digest 363[12] generally indicate conditions for Class 2 concrete

6.6 Mine Workings

The following seams subcrop in the vicinity of the proposed works:-

- Bradford 4 Foot Seam
- Bradford ¾ Seam

It is intended to grout these seams to a depth of 10 x seam thickness below rockhead. The plan extent is defined as a plane commencing from a point at ground level 5m beyond the edge of structures extending at 30 degrees from the vertical to intersect the seam to be grouted.

In addition to mine workings, 3 shafts were proven to be within the vicinity of the works. it is intended that these be backfilled and capped prior to commencement of the embedded retaining walls.

7. CATEGORY OF STRUCTURE

7.1 Proposed Category of Structure

Category II

7.2 If Category III, name of proposed Independent Checkers

Not required.

7.3 Erection proposals or temporary works for which the contractor will be required to arrange an independent check listing the parts of the structure affected.

Not required.

8. DRAWINGS AND DOCUMENTS

8.1 List of drawings (including numbers) and documents accompanying this submission

1. Drawing Number 67313 C-00-006 Rev C General Arrangement CH 975 to 1400 Sheet 1 of 2.
2. Drawing Number 67313 C-00-007 Rev B General Arrangement CH 975 to 1400 Sheet 1 of 2.
3. Drawing Number 67313 S-17-016 Rev - General Arrangement Gibbon Street.
4. Drawing Number 67313 S-17-002 Rev C Typical Tunnel and Bridge Deck Section.
5. Drawing Number 67313 CSK/046 Rev - Pile Capping Beam, Prop and Parapet Typical Outline Detail.

9. THE ABOVE DESIGN AND CONSTRUCTION PROPOSALS ARE SUBMITTED FOR REVIEW.

Signed [redacted]
Name DARREN PAINE
TEAM LEADER DESIGNER
Engineering Qualifications B.ENG (HONS) MICE
Name of Organisation ARUP
Date 15th MAY 2002.

10. THE ABOVE DESIGN AND CONSTRUCTION PROPOSALS ARE SUBMITTED FOR REVIEW.

Signed [redacted]
In the Capacity of ENGINEERING DESIGN MANAGER
Name ALAN BROOKES
~~TENDERER~~ CONTRACTOR
Name of Organisation AMEC CAPITAL PROJECTS LTD
Date 13 MAY 2002

11. THE ABOVE DESIGN AND CONSTRUCTION PROPOSALS ARE SUBMITTED FOR REVIEW.

Signed [redacted]
TAA Manchester City Council
Name S.E. MULLEN
Date 6.11.01
The above Acceptance in Principle means that the Technical Appraisal Authority has appraised and is satisfied that the proposed contains a concept for the structure, which is acceptable for tendering purposes.

APPENDIX A

Technical Approval Schedule

Annex 2/8 to Part 3 of Schedule 1
Technical Approval Schedule "TAS" (February 2000)

Schedule of Design Documents relating to Highway Bridges and Structures

STANDARD	Tick if required
1. BRITISH STANDARDS	
~~BS 5268: Part 2: Structural Use of Timber~~	
BS 5400 - Steel Concrete and Composite Bridges:	
Part 1 : 1988 -General Statement (see BD 15 - DMRB 1.3.2)	✓
Part 2 : 1978 - Specification for Loads (implemented by BD 37 – DMRB 1.3)	✓
~~Part 3 : 1982 - CP for Design of Steel Bridges (see BD 13 - DMRB 1.3)~~	
Part 4 : 1990 - CP for Design of Concrete Bridges (see BD 24 – DMRB 1.3.1)	✓
~~Part 5 : 1979 - CP for Design of Composite Bridges (see BD 16 - DMRB 1.3)~~	
~~Part 9 : 1983 - Bridge Bearings (see BD 20 - DMRB 2.3.1)~~	
~~Part 10: 1980 - CP for Fatigue (see BD 9 - DMRB 1.3)~~	
BS 5628: Code of Practice for Use of Masonry Part 1: 1992- Structural Use of Unreinforced Masonry	✓
BS 5930: 1981- Code of Practice for Site Investigations	✓
BS 6031: 1981- Code of Practice for Earthworks	✓
~~BS 6651: 1992 - Code of Practice for Protection of Structures Against Lightning~~	
BS 6779: Part 1: 1992-Specification for Vehicle Containment Parapets of Metal Construction (see BD 52 - DMRB 2.3.3)	✓
~~BS 7668 1994 - Specification for weldable structural steel hot finished structural hollow sections in weather resistant steels.~~	
~~BS 7818 1995 - Pedestrian Restraint Systems in Metal~~	
~~BS 8004: 1986 - Foundations (see BD 32 - DMRB 2.1)~~	
~~BS8006: 1985 - Code of Practice for Strengthened /Reinforced Soils and Other Fills (see BD 70 - DMRB 2.1.5)~~	
~~BS 8118: Structural Use of Aluminium~~	

STANDARD	Tick if required
~~BS EN 40.1 Lighting Columns: Part 1: 1992 Definitions and Terms~~ ~~BS 5649: Part 2: 1978 Dimensions and Tolerances~~ ~~EN 40: Part 2~~ ~~BS 5649: Part 3: 1982 Specification for Materials and Welding Requirements~~ ~~BS 5649: Part 4: 1982 Recommendations for Surface Protection of Metal Lighting Columns~~ ~~EN 40: Part 4~~ ~~BS 5649: Part 5: 1982 Specification for Base Compartments and Cableways~~ ~~EN 40: Part 5~~ ~~BS 5649: Part 6: 1982 Specification for Design Loads~~ ~~EN 40: Part 6~~ ~~BS 5649: Part 7: 1985 Method for Verification of Structural Design by Calculation~~ ~~BS 5649: Part 8: 1982 Method for Verification of Structural Design by Testing~~ ~~EN 40: Part 8~~ ~~BS 5649: Part 9: 1982 Specification of Special Requirements for Reinforced and Prestressed Concrete Lighting Columns~~ ~~EN 40: Part 9~~	
~~BS EN 10025: 1993 Hot Rolled Products of Non alloy Structural Steels Technical Delivery Conditions (2nd edition)~~	
~~BS EN 10113: Part 1 1993 Hot Rolled Products in Weldable Fine Grain Structural Steels Part 1. General Delivery Conditions.~~	
~~BS EN 10113: Part 2 1993 Hot Rolled Products in Weldable Fine Grain Structural Steels Part 2. Delivery Conditions for Normalised Rolled Steels.~~	
~~BS EN 10113: Part 3 1993 Hot Rolled Products in Weldable Fine Grain Structural Steels Part 3. Delivery Conditions for Thermomechanical Rolled Steels~~	
~~BS EN 10155: 1993 Structural Steels with Improved Atmospheric Corrosion Resistance. Technical Delivery Conditions.~~	
~~BS EN 10210: Part 1:1994 Hot finished structural hollow sections of non alloy and fine grain structural steels~~ ~~Part 1 Technical delivering conditions~~	
2. BRITISH STANDARD CODES OF PRACTICE	
~~CP 2 Earth Retaining Structures (see BD 30 DMRB 2.1)~~	
~~CP 2004 Foundations~~	

3. DOT PUBLICATIONS		
Specification for Highway Works and Notes for Guidance (1998 Volumes 1 and 2)		✓
Highway Construction Details 1998 Consolidated Edition (incorporating 1993,1994,1998 amendments Volume 3)		✓
~~Simplified Tables of External Loads on Buried Pipelines (1986)~~		
4. MISCELLANEOUS		
Circular Roads No. 61/72 – Routes for Heavy and High Abnormal Loads.		✓
BE 1/74	The Independent Checking of Erection Proposals and Temporary Works Details for Major Highway Structures on Trunk Roads and Motorways (and Amendment List No. 1 dated 17/4/78) (DMRB 1.2.2).	✓
BE 8/75	Painting of Concrete Highway Structures (DMRB 2.4)	✓
~~BE 7/77~~	~~Departmental Standard (Interim) Motorway Sign/Signal Gantries (DMRB 2.2)~~	
~~BE 13~~	~~Fatigue Risk in Bailey Bridges (DMRB 3.4)~~	
~~IM 5~~	~~Formation of Continuity Joints in Bridge Decks (DMRB 2.2)~~	
~~HA 40/89~~	~~Determination of Pipe and Bedding Combinations for Drainage Works~~	
~~HA 65/94~~	~~Design Guide for Environmental Barriers~~	
~~HA 66/95~~	~~Environmental Barriers Technical Requirements~~	
~~HA 68/94~~	~~Design Methods for the Reinforcement of Highway Slopes by Reinforced Soil and Soil Nailing Techniques~~	
~~HA 78/96~~	~~Design of Outfalls for Surface Water Channels~~	
5. STANDARDS AND ADVICE NOTES		
IA 25	Measures to Minimise The Risk Of Sulphate Attack (Including Thaumasite) (DMRB 2.1)	✓
~~TD 9/93~~	~~Highway Link Design~~	
~~TD 19/85~~	~~Safety Fences and Barriers (and Amendment No. 1) (and Interim Advice Note IA 26)~~	
~~TD 27/96~~	~~Cross Sections and Headrooms~~	
~~TD 32/93~~	~~Wire Rope Safety Fence~~	
~~TD 36/93~~	~~Subways for Pedestrians and Pedal Cyclists. Layout and Dimensions~~	
~~BD 2/79~~	~~Technical Approval of Highway Structures on Motorway and Other Trunk Roads Part IV: Procedures for Lighting Columns~~	
BD 2/89	Technical Approval of Highway Structures on Motorway and Other Trunk Roads Part I: General Procedures	✓

BD 2/89	Technical Approval of Highway Structures on Motorways and Other Trunk Roads Part III: Procedures for Service Tunnels.	✓
BA 32/89	Technical Approval of Highway Structures on Motorway and Other Trunk Roads Part I: General Procedures	✓
~~BD 7/81~~	~~Weathering Steel for Highway Structures~~	
~~BD 9/81~~	~~Implementation of BS 5400 Part 10: 1980, CP for Fatigue~~	
~~BA 9/81~~	~~The Use of BS 5400 Part 10: 1980, CP for Fatigue (and Amendment No.1)~~	
BD 10/97	Design of Highway Structures in Areas of Mining Subsidence	✓
~~BD 12/95~~	~~Design of Corrugated Steel Buried Structures with Span not Exceeding 8m, Including Circular Arches~~	
BD 13/90	Design of Steel Bridges - Use of BS 5400: Part 3: 1982	✓
BA 19/85	The Use of BS 5400: Part 3: 1982	✓
BD 15/92	General Principles for the Design and Construction of Bridges - Use of BS 5400: Part 1: 1988	✓
~~BD 16/82~~	~~Design of Composite Bridges Use of BS 5400: Part 5: 1979 (and Amendment No. 1)~~	
~~BD 20/92~~	~~Bridge Bearings - Use of BD 5400: Part 9: 1983~~	
~~BD 21/97~~	~~The Assessment of Highway Bridges and Structures (and Amendment No. 1)~~	
~~BA 16/97~~	~~The Assessment of Highway Bridges and Structures (and Amendment No.1)~~	
BD 24/92	The Design of Concrete Highway Bridges and Structures - Use of BS5400: Part 4: 1990 (and Interim Advice Note IA.5 dated July 1996)	✓
~~BD 26/99~~	~~Design of Lighting Columns~~	
~~BD 27/86~~	~~Materials for the Repair of Concrete Highway Structures~~	
BD 28/87	Early Thermal Cracking of Concrete (and Amendment No.1)	✓
BA 24/87	Early Thermal Cracking of Concrete (and Amendment No.1)	✓
~~BD 29/87~~	~~Design Criteria for Footbridges~~	
~~BD 30/87~~	~~Backfilled Retaining Walls and Bridge Abutments~~	
~~BD 31/87~~	~~Buried Concrete Box Type Structures~~	
~~BD 32/88~~	~~Piled Foundations~~	
~~BA 25/88~~	~~Piled Foundations~~	

BD 33/94	Expansion Joints for Use in Highway Bridge Decks	✓
BA 26/94	Expansion Joints for Use in Highway Bridge Decks	✓
~~BD 34/90~~	~~Technical Requirements for the Assessment and Strengthening Programme for Highway Structures. Stage 1 - Older Short Span Bridges and Retaining Walls.~~	
~~BA 34/90~~	~~Technical Requirements for the Assessment and Strengthening Programme for Highway Structures. Stage 1 - Older Short Span Bridges and Retaining Walls.~~	
~~BD 35/99~~	~~Quality Assurance Scheme for Paints and Similar Protective Coatings~~	
~~BA 27/99~~	~~Quality Assurance Scheme for Paints and Similar Protective Coatings~~	
BD 36/92	Evaluation of Maintenance Costs in Comparing Alternative Designs for Highway Structures	
BA 28/92	Evaluation of Maintenance Costs in Comparing Alternative Designs for Highway Structures	✓
BD 37/88	Loads for Highway Bridges	✓
~~BD 41/97~~	~~Reinforced Clay Brickwork Retaining Walls of Pocket Type and Grouted Cavity Type Construction.~~	
~~BD 42/94~~	~~Design of Embedded Retaining Walls & Bridge Abutments (Unpropped or propped at the Top)~~	
BD 43/90	Criteria and Material for the Impregnation of Concrete Highway Structures	✓
BA 33/90	Impregnation of Concrete Highway Structures (and Addendum May 1990)	✓
~~BD 44/95~~	~~The Assessment of Concrete Highway Bridges and Structures~~	
~~BA 44/96~~	~~The Assessment of Concrete Highway Bridges and Structures~~	
~~BD 45/93~~	~~Identification Marking of Highway Structures~~	
~~BD 46/92~~	~~Technical Requirements for the Assessment and Strengthening Programme for Highway Structures. Stage 2 - Modern Short Span Bridges~~	
BD 47/99	Waterproofing and Surfacing of Concrete Bridge Decks	✓
BA 47/99	Waterproofing and Surfacing of Concrete Bridge Decks	✓
BD 48/93	The Assessment and Strengthening of Highway Bridge Supports	✓
~~BD 49/93~~	~~Design Rules for Aerodynamic Effects on Bridges~~	
~~BD 50/92~~	~~Technical Requirements for the Assessment and Strengthening Programme for Highway Structures. Stage 3 - Long Span Bridges~~	
~~BD 51/98~~	~~Design Criteria for Portal and Cantilever Sign/Signal Gantries~~	
BD 52/93	The Design of Highway Bridge Parapets	✓

~~BD 53/95~~	~~Inspection and Records for Road Service Tunnels~~	
~~BD 54/93~~	~~Post-tensioned Concrete Bridges. Prioritisation of Special Inspections~~	
~~BA 50/93~~	~~Post-tensioned Concrete Bridges. Planning, Organisation and Methods for Carrying Out Special Inspections.~~	
~~BD 56/96~~	~~The Assessment of Steel Highway Bridges and Structures~~	
~~BA 56/96~~	~~The Assessment of Steel Highway Bridges and Structures~~	
BD 57/95	Design for Durability	✓
BA 57/95	Design for Durability	✓
~~BD 58/94~~	~~The Design of Concrete Highway Bridges and Structures with External and Unbonded Prestressing~~	
~~BA 58/94~~	~~The Design of Concrete Highway Bridges and Structures with External and Unbonded Prestressing~~	
BD 60/94	The Design of Highway Bridges for Vehicle Collision Loads	✓
~~BD 61/96~~	~~The Assessment of Composite Highway Bridges and Structures~~	
~~BA 61/96~~	~~The Assessment of Composite Highway Bridges and Structures~~	
BD 62/94	As Built, Operational and Maintenance Records for Highway Structures	✓
~~BD 63/94~~	~~Inspection of Highway Structures~~	
~~BA 63/94~~	~~Inspection of Highway Structures~~	
~~BD 65/97~~	~~Design Criteria for Collision Protection Beams~~	
~~BD 67/96~~	~~Enclosure of Bridges~~	
~~BA 67/96~~	~~Enclosure of Bridges~~	
~~BD 68/97~~	~~Crib Retaining Walls~~	
~~BA 68/97~~	~~Crib Retaining Walls~~	
~~BD 70/97~~	~~Strengthened/ Reinforced Soils and Other Fills for Retaining Walls and Bridge Abutments. (Use of BS 8006: 1995)~~	
BD 74/00	Foundations	✓
BD 78/99	Design of Road Service Tunnels	✓
~~BA 30/94~~	~~Strengthening of Concrete Highway Structures Using Externally Bonded Plates.~~	
~~BA 35/90~~	~~The Inspection and Repair of Concrete Highway Structures~~	
~~BA 36/90~~	~~The Use of Permanent Formwork~~	
~~BA 37/92~~	~~Priority Ranking of Existing Parapets~~	

~~BA 38/93~~	~~Assessment of the Fatigue Life of Corroded or Damaged Reinforcing Bars~~	
BA 39/93	Assessment of Reinforced Concrete Half-joints	✓
BA 40/93	Tack Welding of Reinforcing Bars	✓
~~BA 41/98~~	~~The Design and Appearance of Bridges~~	
~~BA 42/96~~	~~The Design of Integral Bridges~~	
~~BA 43/94~~	~~Strengthening, Repair and Monitoring of Post-tensioned Concrete Bridge Decks~~	
~~BA 48/93~~	~~Pedestrian Protection at Head Walls, Wing Walls and Retaining Walls~~	
~~BA 51/95~~	~~The Assessment of Concrete Structures Affected by Steel Corrosion~~	
~~BA 52/94~~	~~The Assessment of Concrete Structures Affected by Alkali Silica Reaction~~	
~~BA 53/94~~	~~Bracing Systems and the use of U Frames in Steel Highway Bridges~~	
~~BA 54/94~~	~~Load Testing for Bridge Assessment~~	
~~BA 55/94~~	~~The Assessment of Bridge Substructures and Foundations, Retaining Walls and Buried Structures~~	
~~BA 59/94~~	~~Design of Highway Bridges for Hydraulic Action~~	
~~BA 79/98~~	~~The Management of Sub Standard Highways Structures~~	
~~BA 80/99~~	~~Use of Rock Bolts~~	

APPENDIX B

Analysis Model and Associated Loading

ARUP

Job No. 5738	Sheet No. 1 of 2	Rev.
Member/Location		
Job Title METROLINK PHASE III ADVANCED WORKS GIBBON STREET CHAINAGE 1250 to 1310m	Drg. Ref.	
	Made by DJE Date 17-09-01 Chd.	

REF	TEXT	OUTPUTS

Analysis of one metre strip of tunnel roof slab between chainage 1250 to 1310 to determine tunnel roof slab requirements

LOADS

All loads are factored and compiled in accordance with BD 37/88 'Loads for Highway Bridges'

UNFACTORED LOADS - from Forge Lane Bridge and Tunnel Section Calculation date 26-06-01.

DEAD = 24 KN/m

SUPERIMPOSED DEAD (FROM FILL) = 64 KN/m

LIVE

HA

Loaded length = width of tunnel roof = 12.5m

Table 13. ∴ HA = 63.6 KN/m of notional lane.

carriageway width = 7m, 5m to 7.5m
number of notional lanes = 2

∴ notional lane width = 3.5m.

HA = 63.6/3.5 = 18.2 KN/m

Also have a KEL of 120 KN per notional lane width

∴ = 34.3 KN/m

Both the KEL and HA loading need to be multiplied by the appropriate factor

Table 14: Being conservative assume consider a metre strip of the full tunnel

Job No. 6[illegible]	Sheet No. 2 of	Rev.
Member/Location		
Drg. Ref.		
Made by YE	Date 17-09-01	Chd.

AV [illegible] WORKS SIBBOL STREET CHAINAGE 250 to 300m

REF | TEXT | OUTPUTS

∴ lane factor = 0.274 bL

bL = notional lane width

= 0.274 × 3.5 = 0.959

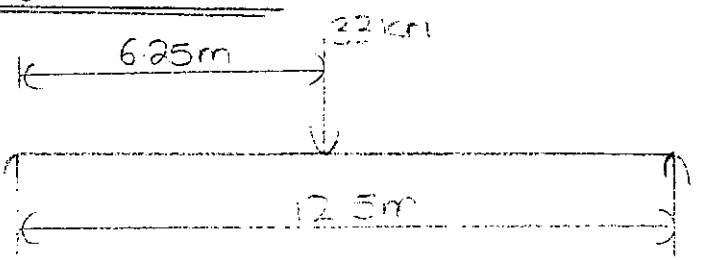
∴ HA = 17.5 kN/m
KEL = 33 kN

HA = 17.5 kN/m
KEL ~~HA~~ = 33 kN

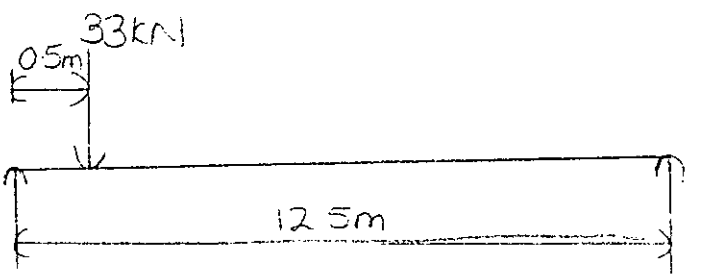
Need to position KEL to give the most severe shear and bending moment.

∴ KEL arrangement that follows have been analysed

KEL LOAD CASE ONE



KEL LOAD CASE TWO



HB HB = 37.5 units

1 unit = 10kN per axle, 4 wheels per axle = 37.5 × 10 / 4 = 93.75kN per wheel

HB applied above [illegible] carriageway can disperse at a spread to depth ratio of [illegible] horizontally to [illegible]

[illegible] depth of fill above Gibbon Street = 1.25m

Job No. [illegible] Sheet No. [illegible] Rev

Member/Location

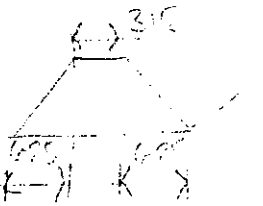
Drg. Ref.

Made by [illegible] Date [illegible] Chd.

WORK PACKAGE PHASE III
ADVANCED WORKS FOR
STREET CHAINAGE 1250m TO
1310m.

REF | TEXT | OUTPUTS

It is assumed that HB wheels disperse through a vertical depth of 1.25m in all directions



6.3.2 Wheel contact area = $\frac{93750}{1.1}$

= 312.25 × 312.25.

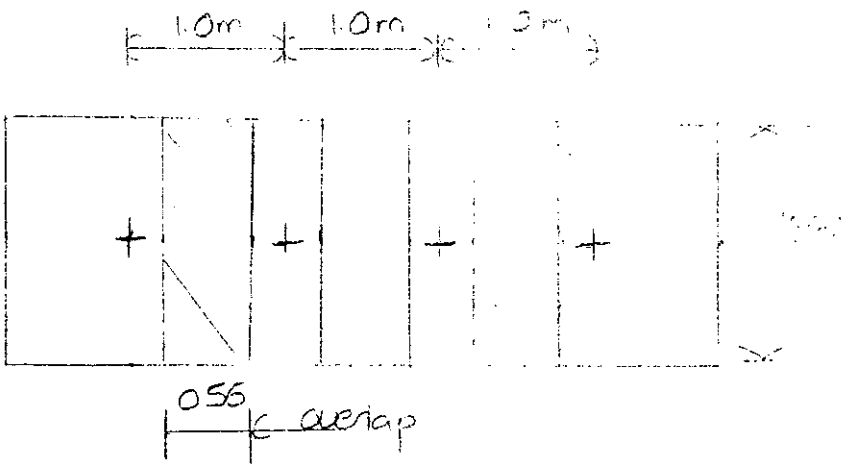
∴ overall square area of dispersal
= (0.31225 + 1.25) × (0.31225 + 1.25)

= 1.56 × 1.56 = 2.43m² ✓

HB is equivalent to 93.75/2.44

= 38.42 kN/m² ✓

However spacing of wheels means that area of dispersed load within a 1m strip will overlap as shown



HB loading in one metre strip is equivalent to (1.56 × 38 + 2) + (1.56 × 0.56 × 38 + 2)

= 59.932 + 33.[illegible]

= 92.[illegible] kN

HB = 93.5 kN

To be conservative as [illegible] the HB [illegible] maximum [illegible] the normal HE [illegible]

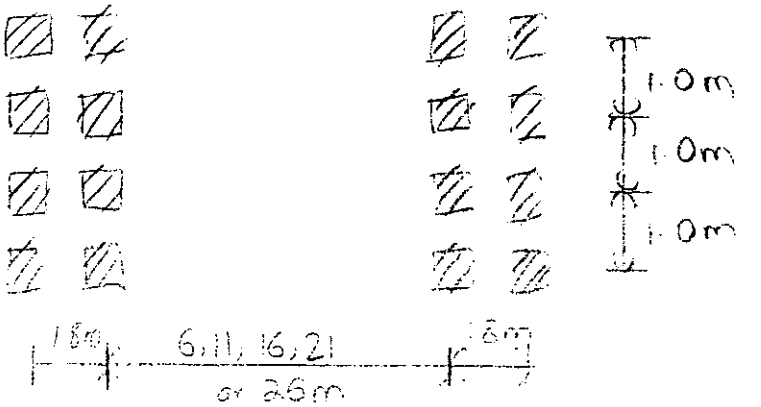
Job No.	Sheet No.	Rev.
Member/Location		
Drg. Ref.		
Made by	Date	Chd.

RUN

TEXT

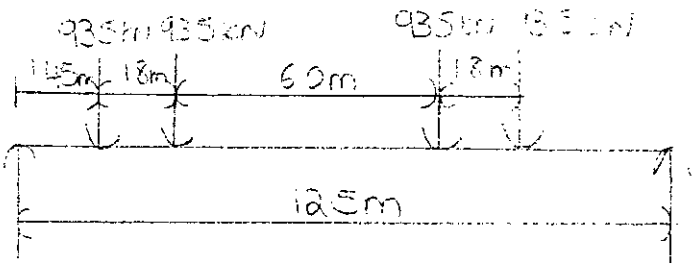
OUTPUTS

Standard dimensions for the HB vehicle are as follows

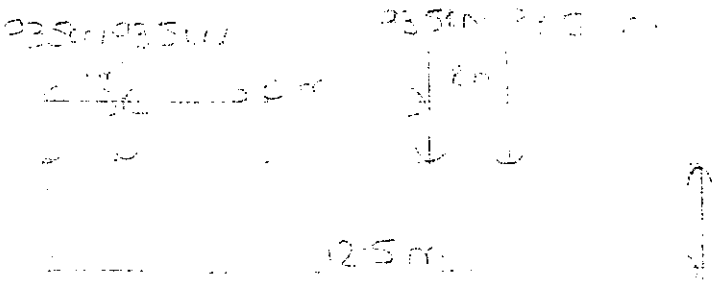


The tunnel roof slab is 13.3m wide overall and therefore can only fit a 10m long notional HB vehicle. The analysis assumes that 2 wheels on one axle of the HB vehicle can load the slab at one time. For analysis purposes the wheels may be transported to cause the most severe shear forces and bending moments. Three arrangements of the HB vehicle should be analysed.

HB LOAD CASE ONE



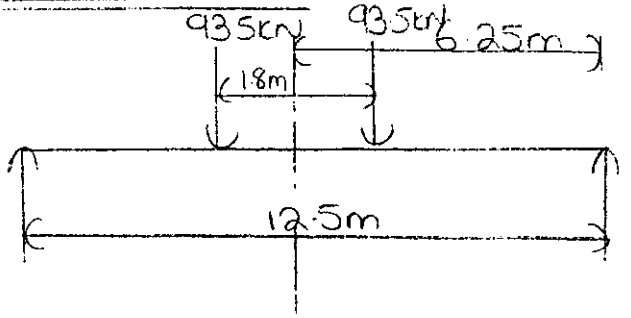
HB LOAD CASE TWO



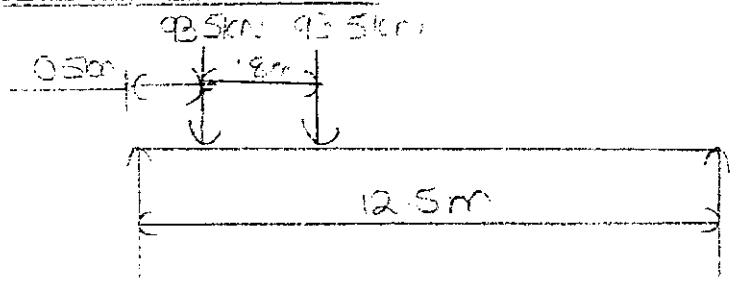
	Job No.	Sheet No. 5 Rev
	Member Location	
	Drg. Ref.	
	Made by F Date 7-09-01 Chd.	

REF TEXT OUTPUT

HB LOADCASE THREE



HB LOADCASE FOUR



6.5.1 Pedestrian loading is ignored in the arch units. The design is being completed on a one meter section subject to full HA, HB, loading and surcharge from fill. The resulting rebar from the 1m section will be placed in the pedestrian zone, and is considered more than sufficient to support traffic or pedestrians

6.6 Accidential wheel loading not applicable (see paragraph above for reason)

6.8 Collision loads radius of curvature greater than 1000m therefore does not apply

6.9 Longitudinal loads — BS 5400 Part 2 concrete box type structure states that provision for longitudinal loads should be made unless [illegible] load need not be considered for the transverse and longitudinal direction [illegible]

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GMPTE Metrolink

Metrolink Phase III - Advanced Works Alan Turing Way

Service Tunnel AIP

October 2001

GMPTE Metrolink

Metrolink Phase III - Advanced Works Alan Turing Way

Service Tunnel AIP

October 2001

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Job number 67313

ARUP

Document Verification

Job title	Metrolink Phase III - Advanced Works Alan Turing Way	Job number
		67313
Document title	Service Tunnel	File reference
Document ref		

Revision	Date				
Draft 1	04/10/01	Description	First draft		
			Prepared by	Checked by	Approved by
		Name	V Edmondson	D E Paine	M J Robinson
		Signature			
Rev 1	05/10/01	Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name	V Edmondson	D E Paine	M J Robinson
		Signature		[redacted]	
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			

Issue Document Verification with Document ✓

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QA Rev 1/00 1 October 2000

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APPENDICES

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Technical Approval Schedule

APPENDIX B
Analysis Model and Associated Loading

APPENDIX B
Analysis Model and Associated Loading

TABLES

Table 1 – Soil Parameters

1. NAME OF SCHEME

Metrolink Phase III Advanced Works – A Metrolink corridor extending from the Commonwealth Stadium, Manchester to Ashton New Road, Manchester (refer to drawing number C.00.006 and C00.007 for route layout)

1.1 Type of Highway

Alan Turing Way a dual lane adopted highway with designated cycle lanes is carried above the structure. Alan Turing Way has an abnormal load route designation.

1.2 Permitted Traffic Speed (for a bridge give over and/or under).

The permitted traffic speed on the highway above the structure is 30mph.

The permitted traffic speed on the Metrolink line is 30mph.

2. NAME OF STRUCTURE

Metrolink Service Tunnel Outbound Chainages 1161m to ~~1254~~ Sket m – Alan Turing Way (OS Grid Ref. SJ 386398)

2.1 Obstacles Crossed

Manchester Metrolink under/Alan Turing Way adopted highway above.

3. PROPOSED STRUCTURE

3.1 Description of Structure

The proposed structure is a cut and cover service tunnel. The total overall length of the service tunnel is 149m. Approval in Principle is sought for a 93m end section between outbound chainages 1161m and 1254m. This section passes beneath Alan Turing Way an adopted highway, and is separated from the remainder of the service tunnel by a full movement joint.

1000mm thick diaphragm panels from the service tunnel walls between outbound chainage 1161m to 1254m. The service tunnel roof is a continuous insitu reinforced concrete slab. The minimum clearance to the roof slab is 6.6m from the rail, while the overall width is 13m outside face to outside face of the walls.

From a possible range of piling options, diaphragm panels were assessed as representing the most watertight construction solution, within the vicinity of the canal. the panels were designed to resist the critical condition of the canal in flood, and are intended to be impervious as defined by Grade 1 of Table 2.1 of CIRIA Report 139 (1995).

The design and construction of the diaphragm panels will take full account of water seepage issues, to ensure that no water flows are evident upon completion of the diaphragm piled structure. Where such flows are encountered these shall be sealed by pressure grouting to the rear of the walls. Dampness of the walls where running water is not evident, will be considered acceptable.

3.2 Structural Type

All elements of the cut and cover service tunnel are formed from reinforced insitu concrete construction.

A 120 year design life is required for the service tunnel structure. In-situ concrete was chosen for its durability, economy, low maintenance requirements, along with its suitability for forming a monolithic service tunnel structure from the piles and roof slab.

3.3 Foundation Type

The diaphragm panels forming the walls of the service tunnel, transmit all loads through end bearing and skin friction to the underlying glacial till and bedrock. The roof slab acts as a prop, providing horizontal restraint to the top of the piles.

3.4 Span Arrangements

The service tunnel roof comprises a single span continuous reinforced concrete slab. The roof slab spans transversely between the diaphragm panels walls which form its supports.

3.5 Articulation Arrangements

The service tunnel roof slab is simply supported on the diaphragm panels walls.

3.6 Parapet Type

P6 classification parapets are to be provided at service tunnel portals where vertical drops to the Metrolink track exist. A service tunnel portal is located at outbound chainage 1161m, approximately 8m west of Alan Turing Way back of footway.

3.7 Proposed Arrangements for Inspection and Maintenance

Prior to use of the service tunnel by Metrolink, access to the interim faces of the service tunnel can be gained via an access door at either blocked off end of the tunnel.

After the Metrolink line is live, access will need to be arranged in conjunction with the future Operator and GMPTE. Access can be made by fire escapes located in a recess at either end of the tunnel, refer to drawing C-00-07 and C-00-06.

3.8 Materials and Finishes

Reinforced Concrete:	Structural elements will be constructed from Grade C40, mixed and placed in accordance with the 'Manual of Contract Documents for Highway Works Volume 1. Specification for Highway Works Series 1700 : Structural Concrete'.
Waterproofing:	Waterproofing measures shall be incorporated to protect the structure from the effects of a ground and surface water. Waterproofing materials will be specified and installed in accordance with the 'Manual of Contract Documents for Highway Works Volume 1 : Specification for Highway Works Series 2000 : Waterproofing for Concrete Structure'. To limit the requirements for maintenance, a proprietary spray application waterproofing material is favoured.
Movement and Construction Joints:	The location of movement and designed construction joint are shown on drawings attached in Appendix C.

S-17-009	General Arrangement Outbound CH 1160 – CH1220 Sheet 4 of 9
S-17-010	General Arrangement Outbound CH 1220 – CH1280 Sheet 5 of 9

Bearings: Bearing details are shown on the following drawings:

S-17-009	General Arrangement Outbound CH1160-CH1220 Sheet 4 of 9
S-17-010	General Arrangement Outbound CH1220-CH1280 Sheet 5 of 9

4. DESIGN / ASSESSMENT CRITERIA

4.1 Live Loading/Headroom

4.1.1 HA Loading

HA UDL 63.6 kN/m of notional lane width. KEL of 120 kN.

4.1.2 HB Loading

HB = 45 units

4.1.3 Footway or Footbridge Live Loading

Not applicable.

4.1.4 Provision for exceptional abnormal loads

328 tonnes on a 1001 trailer together with associated tractor. For configuration of the axles refer to the drawing of the "Abnormal Vehicle W1001" attached as Appendix C.

4.1.5 Any Special loading not covered above

(i) Horizontal collision loads from Metrolink carriage applied to contiguous bored piles in derailment case.

(ii) 2.5m depth of surcharge from fill above service tunnel.

4.1.6 Department heavy or high load route requirements and arrangements being made to preserve the route

Alan Turing Way is an abnormal load route.

4.1.7 Minimum Headroom Provided

6.6m above underside of rail.

4.1.8 Authorities Consulted and Requirement

1) Her Majesty's Railway Inspectorate (HMRI)

The track alignments, clearances and impact loads have been designed in consultation with the HMRI. HMRI have reviewed the design and indicated that they are prepared to sign a letter of No objection in accordance with the Railways and Other Transport Systems (Approval of Works Plant and Equipment) Regulations 1994.

2) Manchester City Council – Highways

In provisional discussions the Highways Department at Manchester City Council indicated that they favoured spray-on waterproofing products. The Department's experience was that spray-on waterproofing products were more robust, and had a longer life before requiring maintenance than waterproof lining.

3) Manchester City Council – Operational Services

Manchester City Council Operational Services are being consulted on issues relating to traffic management, access, earthworks, site delineation and security during construction.

4) Manchester City Council – Planning

Outline planning approval of the prop beams, parapets and other structural elements is being progressed.

5) Greater Manchester County Fire Service

Discussion have been held with Greater Manchester County Fire Service, concerning the provisions to be made within the service tunnel for fighting fire.

6) Statutory Utilities

Statutory utilities are being consulted with regard to necessary diversions or temporary works.

Additional authorities consulted concerning the service tunnel are as follows:-

- British Waterways (twice)
- Environmental Agency
- Manchester Environment and Development Consultancy (MEDC); Agent for Sewerage for United Utilities.
- Greater Manchester Police
- Transco
- Manchester City Council –Special Projects Group (City of Manchester Stadium)
- Norweb
- United Utilities (North West Water)
- The Coal Authority (via GMPTE)
- Wardell Armstrong (consultants), relating to mineworking treatments
- Manchester City Council – Environmental Health
- British Telecom

4.2 List of Relevant Design Standards

Refer to Appendix A.

4.3 Proposed Departures from Documents given in 4.2

Not applicable.

4.4 Proposed methods of dealing with aspects not covered by Documents given in 4.2

No proposal.

5. STRUCTURAL ANALYSIS

5.1 Methods of analysis proposed for superstructure, substructure and foundations

5.1.1 Superstructure

The superstructure of the service tunnel is considered to be the tunnel roof slab. The analysis of the slab is based on a 1m wide typical section of the 12.5m span. HA live loading is applied across the full 1m section. HB wheel loads are dispersed at a spread to depth ratio of 1 horizontally to 2 vertically through the overlying 3m of fill following the guidance in BS 37/88 Loads for Highway Bridges (refer to Appendix B: Analysis Model and Associated Loading for details). The 1m strip was checked for the Abnormal load.

5.1.1.1 Substructure and Foundations

The diaphragm walls form the substructure and foundations of the tunnel. The contiguous bored pile design takes account of the construction sequence adopted and is analysed using the computer programme "Wallap". This will carry out two separate types of analysis.

(i) Limit equilibrium in order to determine the factor of safety according to the strength factor method for each construction stage considered.

(ii) Bending Moment and displacement analysis by modelling the stage by stage development of forces and wall movements as construction proceeds. The wall and soil are modelled as a beam and springs.

The limit equilibrium calculations are carried out using both the moderately conservative and worst credible soil parameters for both the temporary and permanent excavation levels to ensure that the appropriate factor of safety as indicated within CIRIA 104 Table 5 are adhered to. In addition to the 1200mm temporary excavation an unplanned excavation of 500mm is also considered in combination with the worst credible soil parameters to ensure that wall stability is maintained. The design adopts the deepest wall toe level required to fulfil all of the aforementioned criteria.

5.2 Description and diagram of idealised structure to be used for analysis

Refer to Appendix B.

5.3 Assumptions intended for calculation of structural element stiffness

The tunnel roof slab is simply supported and has a continuous section size and thereby has a continuous stiffness. Because the roof slab is in compression it has been assumed that an short term concrete modulus applies to this element (28kN/mm^2). WALLAP analysis has looked at the effects of both short and long term concrete modulii.

5.4 Earth Pressure Coefficients (ka, ko or kp) to be used in the design of earth retaining elements

Earth pressures have been derived from an assessment of the available data and are shown in Table 1.

TABLE OF SOIL PARAMETERS

STRATA	DESIGN APPROACH	phi'	C'	ko	ka (kac)	kp (kpc)	E' kN/m²	dE'/dz kN/m²m
Made ground	Worst credible	26	0	0.560	0.337	3.442	5000	0
	Moderately conservative	28	0	0.530	0.309	3.868	5000	0
								c
Glacial Till – 1	Worst credible	28	0	1.0	0.309 (1.300)	3.868 (5.395)	33000	0
	Moderately conservative	31	0	1.0	0.271 (1.213)	4.653 (6.080)	54000	0
Glacial Till – 2	Worst credible	28	2	1.0	0.309 (1.300)	3.868 (5.395)	33000	9000
	Moderately conservative	31	2	1.0	0.271 (1.213)	4.653 (6.080)	54000	15000
Coal Measures – 1	Worst credible	28	0	1.0	0.309 (1.300)	3.868 (5.395)	150000	0
	Moderately conservative	28	2	1.0	0.309 (1.300)	3.868 (5.395)	150000	0
Coal Measures – 2	Worst credible	28	5	1.0	0.309 (1.300)	3.868 (5.395)	250000	0
at 1.5m pen	Moderately conservative	28	10	1.0	0.309 (1.300)	3.868 (5.395)	250000	0

6. GROUND CONDITIONS

6.1 The recommendations of interpretative soils report to be used in the design are generally accepted with a revision to the parameters as defined in Table 1.

6.2 The tunnel roof is supported on a load bearing diaphragm wall, with all panels being socketted into the Coal Measures bedrock.

6.3 Total and differential settlements of 25mm and 1 in 500 are allowed for in the design of the structure.

6.4 The embedded retaining walls are anticipated to experience a maximum deflection in the order of 25mm. This is based upon the calculated values from the Wallap analysis, previous experience and empirical methods.

6.5 Sulphate and pH tests have been undertaken on soil and groundwater samples from across the site. The results from these tests when compared against the recommendations provided in BRE Digest 363[12] generally indicate conditions for Class 2 concrete

6.6 Mine Workings

The following seams subcrop in the vicinity of the proposed works:-

- Bradford 4 Foot Seam
- Bradford ¾ Seam

It is intended to grout these seams to a depth of 10 x seam thickness below rockhead. The plan extent is defined as a plane commencing from a point at ground level 5m beyond the edge of structures extending at 30 degrees from the vertical to intersect the seam to be grouted.

In addition to mine workings, 3 shafts were proven to be within the vicinity of the works. it is intended that these be backfilled and capped prior to commencement of the embedded retaining walls.

7. CATEGORY OF STRUCTURE

7.1 Proposed Category of Structure

Category II

7.2 If Category III, name of proposed Independent Checkers

Not required.

7.3 Erection proposals or temporary works for which the contractor will be required to arrange an independent check listing the parts of the structure affected.

Not required.

8. DRAWINGS AND DOCUMENTS

8.1 List of drawings (including numbers) and documents accompanying this submission

1. General Arrangement Outbound CH1100-1160, Sheet 3 of 9 Drawing No. S-17-008 C1
2. General Arrangement Outbound CH1160-1220, Sheet 4 of 9 Drawing No. S-17-009 C1
3. General Arrangement Outbound CH1220-1280, Sheet 5 of 9 Drawing No. S-17-010 C1
4. Propping Slab Outbound CH1040-1100 Sheet 2 of 9 Drawing No.S-17-021 Not Issued
5. Propping Slab Outbound CH1100-1160 Sheet 3 of 9 Drawing No.S-17-022 Not Issued
6. Propping Slab Outbound CH1160-1220 Sheet 4 of 9 Drawing No.S-17-023 Not Issued
7. Propping Slab Outbound CH1220-1280 Sheet 5 of 9 Drawing No.S-17-024 Not Issued
8. S-17-017 - General Section Sheet 1 of 3
9. S-17-018 - General Section Sheet 2 of 3
10. S-17-019 - General Section Sheet 3 of 3
11. Drawing Number 67313 C-00-006 Rev C General Arrangement CH 975 to 1400 Sheet 1 of 2.
12. Drawing Number 67313 C-00-007 Rev B General Arrangement CH 975 to 1400 Sheet 1 of 2.
13. Drawing Number 67313 S-17-016 Rev - General Arrangement Gibbon Street.
14. Drawing Number 67313 S-17-002 Rev C Typical Tunnel and Bridge Deck Section.
15. Drawing Number 67313 CSK/046 Rev - Pile Capping Beam, Prop and Parapet Typical Outline Detail.

9. THE ABOVE DESIGN AND CONSTRUCTION PROPOSALS ARE SUB

Signe
Name D DARREN PAINE
TEAM LEADER DESIGNER
Engineering Qualifications B.ENG (HONS) MICE
Name of Organisation ARUP
Date 15th MAY 2002

10. THE ABOVE DESIGN AND CONSTRUCTION PROPOSALS ARE SUBMITTED FOR REVIEW.

Signed
In the Capacity of ENGINEERING DESIGN MANAGER
Name ALAN BROOKES
~~TENDERER~~ CONTRACTOR.
Name of Organisation AMEC CAPITAL PROJECTS LTD
Date 13 MAY 2002

11. THE ABOVE DESIGN AND CONSTRUCTION PROPOSALS ARE SUBMITTED FOR REVIEW.

Signed
TAA [redacted]NCIL
Name J.E.MULLEN
Date 8.11.01

The above Acceptance in Principle means that the Technical Appraisal Authority has appraised and is satisfied that the proposed contains a concept for the structure, which is acceptable for tendering purposes.

APPENDIX A

Technical Approval Schedule

Annex 2/8 to Part 3 of Schedule 1
Technical Approval Schedule "TAS" (February 2000)

Schedule of Design Documents relating to Highway Bridges and Structures

STANDARD	Tick if required
1. BRITISH STANDARDS	
~~BS 5268: Part 2: Structural Use of Timber~~	
BS 5400 - Steel Concrete and Composite Bridges: Part 1 : 1988 -General Statement (see BD 15 - DMRB 1.3.2) Part 2 : 1978 - Specification for Loads (implemented by BD 37 – DMRB 1.3) ~~Part 3 : 1982 - CP for Design of Steel Bridges (see BD 13 - DMRB 1.3)~~ Part 4 : 1990 - CP for Design of Concrete Bridges (see BD 24 – DMRB 1.3.1) ~~Part 5 : 1979 - CP for Design of Composite Bridges (see BD 16 - DMRB 1.3)~~ ~~Part 9 : 1983 - Bridge Bearings (see BD 20 - DMRB 2.3.1)~~ ~~Part 10: 1980 - CP for Fatigue (see BD 9 - DMRB 1.3)~~	✓ ✓ ✓
BS 5628: Code of Practice for Use of Masonry Part 1: 1992- Structural Use of Unreinforced Masonry	✓
BS 5930: 1981- Code of Practice for Site Investigations	✓
BS 6031: 1981- Code of Practice for Earthworks	✓
~~BS 6651: 1992 - Code of Practice for Protection of Structures Against Lightning~~	
BS 6779: Part 1: 1992-Specification for Vehicle Containment Parapets of Metal Construction (see BD 52 - DMRB 2.3.3)	✓
~~BS 7668 1994 - Specification for weldable structural steel hot finished structural hollow sections in weather resistant steels.~~	
~~BS 7818 1995 - Pedestrian Restraint Systems in Metal~~	
~~BS 8004: 1986 - Foundations (see BD 32 - DMRB 2.1)~~	
~~BS8006: 1985 - Code of Practice for Strengthened /Reinforced Soils and Other Fills (see BD 70 - DMRB 2.1.5)~~	
~~BS 8118: Structural Use of Aluminium~~	

STANDARD	Tick if required
~~BS EN 40.1 Lighting Columns: Part 1: 1992 Definitions and Terms~~ ~~BS 5649: Part 2: 1978 Dimensions and Tolerances~~ ~~EN 40: Part 2~~ ~~BS 5649: Part 3: 1982 Specification for Materials and Welding Requirements~~ ~~BS 5649: Part 4: 1982 Recommendations for Surface Protection of Metal Lighting Columns~~ ~~EN 40: Part 4~~ ~~BS 5649: Part 5: 1982 Specification for Base Compartments and Cableways~~ ~~EN 40: Part 5~~ ~~BS 5649: Part 6: 1982 Specification for Design Loads~~ ~~EN 40: Part 6~~ ~~BS 5649: Part 7: 1985 Method for Verification of Structural Design by Calculation~~ ~~BS 5649: Part 8: 1982 Method for Verification of Structural Design by Testing~~ ~~EN 40: Part 8~~ ~~BS 5649: Part 9: 1982 Specification of Special Requirements for Reinforced and Prestressed Concrete Lighting Columns~~ ~~EN 40: Part 9~~	
~~BS EN 10025: 1993 Hot Rolled Products of Non-alloy Structural Steels Technical Delivery Conditions (2nd edition)~~	
~~BS EN 10113: Part 1 1993 Hot Rolled Products in Weldable Fine Grain Structural Steels Part 1. General Delivery Conditions.~~	
~~BS EN 10113: Part 2 1993 Hot Rolled Products in Weldable Fine Grain Structural Steels Part 2. Delivery Conditions for Normalised Rolled Steels.~~	
~~BS EN 10113: Part 3 1993 Hot Rolled Products in Weldable Fine Grain Structural Steels Part 3. Delivery Conditions for Thermomechanical Rolled Steels~~	
~~BS EN 10155: 1993 Structural Steels with Improved Atmospheric Corrosion Resistance. Technical Delivery Conditions.~~	
~~BS EN 10210: Part 1:1994 Hot finished structural hollow sections of non-alloy and fine grain structural steels~~ ~~Part 1 Technical delivering conditions~~	
2. BRITISH STANDARD CODES OF PRACTICE	
~~CP 2 Earth Retaining Structures (see BD 30 DMRB 2.1)~~	
~~CP 2004 Foundations~~	

3.	**DOT PUBLICATIONS**	
Specification for Highway Works and Notes for Guidance (1998 Volumes 1 and 2)		✓
Highway Construction Details 1998 Consolidated Edition (incorporating 1993,1994,1998 amendments Volume 3)		✓
~~Simplified Tables of External Loads on Buried Pipelines (1986)~~		
4.	**MISCELLANEOUS**	
Circular Roads No. 61/72 – Routes for Heavy and High Abnormal Loads.		✓
BE 1/74	The Independent Checking of Erection Proposals and Temporary Works Details for Major Highway Structures on Trunk Roads and Motorways (and Amendment List No. 1 dated 17/4/78) (DMRB 1.2.2).	✓
BE 8/75	Painting of Concrete Highway Structures (DMRB 2.4)	✓
~~BE 7/77~~	~~Departmental Standard (Interim) Motorway Sign/Signal Gantries (DMRB 2.2)~~	
~~BE 13~~	~~Fatigue Risk in Bailey Bridges (DMRB 3.4)~~	
~~IM 5~~	~~Formation of Continuity Joints in Bridge Decks (DMRB 2.2)~~	
~~HA 40/89~~	~~Determination of Pipe and Bedding Combinations for Drainage Works~~	
~~HA 65/94~~	~~Design Guide for Environmental Barriers~~	
~~HA 66/95~~	~~Environmental Barriers – Technical Requirements~~	
~~HA 68/94~~	~~Design Methods for the Reinforcement of Highway Slopes by Reinforced Soil and Soil Nailing Techniques~~	
~~HA 78/96~~	~~Design of Outfalls for Surface Water Channels~~	
5.	**STANDARDS AND ADVICE NOTES**	
IA 25	Measures to Minimise The Risk Of Sulphate Attack (Including Thaumasite) (DMRB 2.1)	✓
~~TD 9/93~~	~~Highway Link Design~~	
~~TD 19/85~~	~~Safety Fences and Barriers (and Amendment No. 1) (and Interim Advice Note IA 26)~~	
~~TD 27/96~~	~~Cross Sections and Headrooms~~	
~~TD 32/93~~	~~Wire Rope Safety Fence~~	
~~TD 36/93~~	~~Subways for Pedestrians and Pedal Cyclists. Layout and Dimensions~~	
~~BD 2/79~~	~~Technical Approval of Highway Structures on Motorway and Other Trunk Roads Part IV: Procedures for Lighting Columns~~	
BD 2/89	Technical Approval of Highway Structures on Motorway and Other Trunk Roads Part I: General Procedures	✓

BD 2/89	Technical Approval of Highway Structures on Motorways and Other Trunk Roads Part III: Procedures for Service Tunnels.	✓
BA 32/89	Technical Approval of Highway Structures on Motorway and Other Trunk Roads Part I: General Procedures	✓
~~BD 7/81~~	~~Weathering Steel for Highway Structures~~	
~~BD 9/81~~	~~Implementation of BS 5400 Part 10: 1980, CP for Fatigue~~	
~~BA 9/81~~	~~The Use of BS 5400 Part 10: 1980, CP for Fatigue (and Amendment No.1)~~	
BD 10/97	Design of Highway Structures in Areas of Mining Subsidence	✓
~~BD 12/95~~	~~Design of Corrugated Steel Buried Structures with Span not Exceeding 8m, Including Circular Arches~~	
BD 13/90	Design of Steel Bridges - Use of BS 5400: Part 3: 1982	✓
BA 19/85	The Use of BS 5400: Part 3: 1982	✓
BD 15/92	General Principles for the Design and Construction of Bridges - Use of BS 5400: Part 1: 1988	✓
~~BD 16/82~~	~~Design of Composite Bridges Use of BS 5400: Part 5: 1979 (and Amendment No. 1)~~	
~~BD 20/92~~	~~Bridge Bearings Use of BD 5400: Part 9: 1983~~	
~~BD 21/97~~	~~The Assessment of Highway Bridges and Structures (and Amendment No. 1)~~	
~~BA 16/97~~	~~The Assessment of Highway Bridges and Structures (and Amendment No. 1)~~	
BD 24/92	The Design of Concrete Highway Bridges and Structures - Use of BS5400: Part 4: 1990 (and Interim Advice Note IA.5 dated July 1996)	✓
~~BD 26/99~~	~~Design of Lighting Columns~~	
~~BD 27/86~~	~~Materials for the Repair of Concrete Highway Structures~~	
BD 28/87	Early Thermal Cracking of Concrete (and Amendment No.1)	✓
BA 24/87	Early Thermal Cracking of Concrete (and Amendment No.1)	✓
~~BD 29/87~~	~~Design Criteria for Footbridges.~~	
~~BD 30/87~~	~~Backfilled Retaining Walls and Bridge Abutments~~	
~~BD 31/87~~	~~Buried Concrete Box Type Structures~~	

BD 33/94	Expansion Joints for Use in Highway Bridge Decks	✓
BA 26/94	Expansion Joints for Use in Highway Bridge Decks	✓
~~BD 34/90~~	~~Technical Requirements for the Assessment and Strengthening Programme for Highway Structures. Stage 1 - Older Short Span Bridges and Retaining Walls.~~	
~~BA 34/90~~	~~Technical Requirements for the Assessment and Strengthening Programme for Highway Structures. Stage 1 - Older Short Span Bridges and Retaining Walls.~~	
~~BD 35/99~~	~~Quality Assurance Scheme for Paints and Similar Protective Coatings~~	
~~BA 27/99~~	~~Quality Assurance Scheme for Paints and Similar Protective Coatings~~	
BD 36/92	Evaluation of Maintenance Costs in Comparing Alternative Designs for Highway Structures	
BA 28/92	Evaluation of Maintenance Costs in Comparing Alternative Designs for Highway Structures	✓
BD 37/88	Loads for Highway Bridges	✓
~~BD 41/97~~	~~Reinforced Clay Brickwork Retaining Walls of Pocket Type and Grouted Cavity Type Construction.~~	
~~BD 42/94~~	~~Design of Embedded Retaining Walls & Bridge Abutments (Unpropped or propped at the Top)~~	
BD 43/90	Criteria and Material for the Impregnation of Concrete Highway Structures	✓
BA 33/90	Impregnation of Concrete Highway Structures (and Addendum May 1990)	✓
~~BD 44/95~~	~~The Assessment of Concrete Highway Bridges and Structures~~	
~~BA 44/96~~	~~The Assessment of Concrete Highway Bridges and Structures~~	
~~BD 45/93~~	~~Identification Marking of Highway Structures~~	
~~BD 46/92~~	~~Technical Requirements for the Assessment and Strengthening Programme for Highway Structures. Stage 2 - Modern Short Span Bridges~~	
BD 47/99	Waterproofing and Surfacing of Concrete Bridge Decks	✓
BA 47/99	Waterproofing and Surfacing of Concrete Bridge Decks	✓
BD 48/93	The Assessment and Strengthening of Highway Bridge Supports	✓
~~BD 49/93~~	~~Design Rules for Aerodynamic Effects on Bridges~~	
~~BD 50/92~~	~~Technical Requirements for the Assessment and Strengthening Programme for Highway Structures. Stage 3 - Long Span Bridges~~	
~~BD 51/98~~	~~Design Criteria for Portal and Cantilever Sign/Signal Gantries~~	
BD 52/93	The Design of Highway Bridge Parapets	✓

~~BD 53/95~~	~~Inspection and Records for Road Service Tunnels~~	
~~BD 54/93~~	~~Post-tensioned Concrete Bridges. Prioritisation of Special Inspections~~	
~~BA 50/93~~	~~Post-tensioned Concrete Bridges. Planning, Organisation and Methods for Carrying Out Special Inspections.~~	
~~BD 56/96~~	~~The Assessment of Steel Highway Bridges and Structures~~	
~~BA 56/96~~	~~The Assessment of Steel Highway Bridges and Structures~~	
BD 57/95	Design for Durability	✓
BA 57/95	Design for Durability	✓
~~BD 58/94~~	~~The Design of Concrete Highway Bridges and Structures with External and Unbonded Prestressing~~	
~~BA 58/94~~	~~The Design of Concrete Highway Bridges and Structures with External and Unbonded Prestressing~~	
BD 60/94	The Design of Highway Bridges for Vehicle Collision Loads	✓
~~BD 61/96~~	~~The Assessment of Composite Highway Bridges and Structures~~	
~~BA 61/96~~	~~The Assessment of Composite Highway Bridges and Structures~~	
BD 62/94	As Built, Operational and Maintenance Records for Highway Structures	✓
~~BD 63/94~~	~~Inspection of Highway Structures~~	
~~BA 63/94~~	~~Inspection of Highway Structures~~	
~~BD 65/97~~	~~Design Criteria for Collision Protection Beams~~	
~~BD 67/96~~	~~Enclosure of Bridges~~	
~~BA 67/96~~	~~Enclosure of Bridges~~	
~~BD 68/97~~	~~Crib Retaining Walls~~	
~~BA 68/97~~	~~Crib Retaining Walls~~	
~~BD 70/97~~	~~Strengthened/ Reinforced Soils and Other Fills for Retaining Walls and Bridge Abutments. (Use of BS 8006: 1995)~~	
BD 74/00	Foundations	✓
BD 78/99	Design of Road Service Tunnels	✓
~~BA 30/94~~	~~Strengthening of Concrete Highway Structures Using Externally Bonded Plates.~~	
~~BA 35/90~~	~~The Inspection and Repair of Concrete Highway Structures~~	
~~BA 36/90~~	~~The Use of Permanent Formwork~~	
~~BA 37/92~~	~~Priority Ranking of Existing Parapets~~	

~~BA 38/93~~	~~Assessment of the Fatigue Life of Corroded or Damaged Reinforcing Bars~~	
BA 39/93	Assessment of Reinforced Concrete Half-joints	✓
BA 40/93	Tack Welding of Reinforcing Bars	✓
~~BA 41/98~~	~~The Design and Appearance of Bridges~~	
~~BA 42/96~~	~~The Design of Integral Bridges~~	
~~BA 43/94~~	~~Strengthening, Repair and Monitoring of Post tensioned Concrete Bridge Decks~~	
~~BA 48/93~~	~~Pedestrian Protection at Head Walls, Wing Walls and Retaining Walls~~	
~~BA 51/95~~	~~The Assessment of Concrete Structures Affected by Steel Corrosion~~	
~~BA 52/94~~	~~The Assessment of Concrete Structures Affected by Alkali Silica Reaction~~	
~~BA 53/94~~	~~Bracing Systems and the use of U Frames in Steel Highway Bridges~~	
~~BA 54/94~~	~~Load Testing for Bridge Assessment~~	
~~BA 55/94~~	~~The Assessment of Bridge Substructures and Foundations, Retaining Walls and Buried Structures~~	
~~BA 59/94~~	~~Design of Highway Bridges for Hydraulic Action~~	
~~BA 79/98~~	~~The Management of Sub Standard Highways Structures~~	
~~BA 80/99~~	~~Use of Rock Bolts~~	

APPENDIX B

Analysis Model and Associated Loading

ARUP	Job No. 67313	Sheet No. 1 of 31	Rev.
	Member/Location		
Job Title METROLINK PHASE III ADVANCED WORKS ALAN TURING WAY. CHAINAGE 1160 to 1225 m	Drg. Ref. SKETCH 67313/SK220801/1		
	Made by UJE	Date 15-09-01	Chd.

REF	TEXT	OUTPUTS
	Analysis of one metre strip of tunnel roof slab between chainages 1160 to 1225m to determine tunnel roof slab reinforcement requirements.	
	LOADS.	
	ALL loads are factored and compiled in accordance with BD 37/88 'Loads for Highway Bridges'.	
	UNFACTORED LOADS – from Forge Lane Bridge and Tunnel Section Calculations date 26-06-01.	
	DEAD.	
	deck is considered to be 1.45 deep. CSA section considered = 1 x 1.45	
	γ weight concrete = 24 kN/m3	
	∴ Dead = 1 x 1.45 x 24 = 34.8 kN/m	Dead = 34.8kN/m
	SUPERIMPOSED DEAD LOAD = 50 kN/m from fill	Superimposed dead = 50 kN/m
	LIVE	
	HA	
	Loaded length = width of tunnel roof = 12.5m	
Table 13	HA = 63.6 kN/m of notional lane.	
	Carriageway width = 1/2 of central verge to the edge of the footway.	
	left hand = 9m right hand = 13.5m	
	base design on wider section of the road.	

ARUP

Job No. 67313 | Sheet No. 2 of 31 | Rev.

Member/Location

Job Title METROLINK PHASE III ADVANCED WORKS ALAN TURING WAY CHAINAGE 1160 to 1225m

Drg. Ref. SKETCH 67313/SK2208 01/1

Made by WE | Date 15-09-01 | Chd. TC

REF	TEXT	OUTPUTS

10.95m to 14.60m number of notional lanes = 4

∴ notional lane width = $\frac{13.5}{4}$ = 3.375m

∴ HA = $\frac{63.6}{3.375}$ = 18.84 kN/m

ALSO have a KEL of 120 kN per notional lane width

ie 120/3.375 = 35.6 kN

6.4.1 Both the KEL and HA loading need to be multiplied by the appropriate lane factor

Table 14 Being conservative assume considering a metre strip in the first lane.

∴ lane factor

= 0.274 bL bL = notional lane width

= 0.274 × 3.375

= 0.925

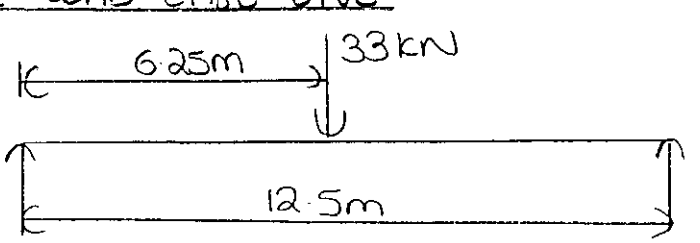
∴ HA = 17.5 kN/m
KEL = 33kN

HA = 17.5 kN/m
KEL = 33 kN

Need to position KEL to give the most severe shear and bending moment.

∴ KEL Arrangements that follow have been analysed.

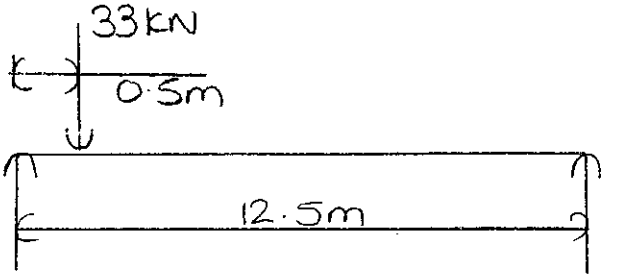
KEL LOAD CASE ONE



ARUP	Job No. 6313	Sheet No. 3 of 3	Rev.
	Member/Location		
Job Title A14 JUNCTION 31 ADVANCED WORKS ALAN TURING WAY CHAINAGE 1160 to 1225m	Drg. Ref. SKETCH 6313/SK22-08-01		
	Made by [illegible]	Date 15-09-01	Chd.

REF	TEXT	OUTPUTS

ICEL LOAD CASE TWO



HB HB = 45 units

1 unit = 10kN per axle, 4 wheels.
per axle = $\frac{45 \times 10}{4}$ = 112.5kN

6.3.3 HB applied above fill, therefore can disperse at a spread to depth ratio of 1 horizontally to 2 vertically.
Minimum depth of fill above Alan Turing Way = 1.651m say 1.5m

It is assumed that HB wheels disperse through a vertical depth of 1.5m in all directions.

6.3.2 wheel contact area = $\sqrt{\frac{112500}{1.1}}$

= 320 x 320mm.

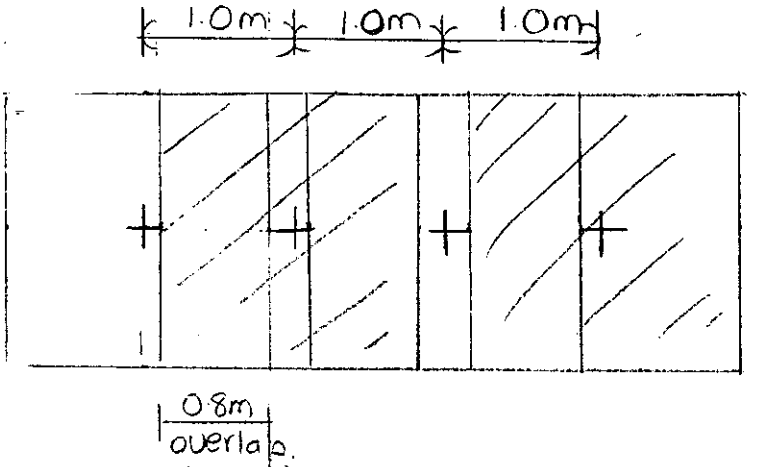
∴ overall square area of dispersal
= (0.32 + 1.5) x (0.32 + 1.5)

= 1.82 x 1.82 = 3.31 m²

∴ HB is equivalent to 112.5/3.31 = 34kN/m²

However spacing of wheels means that area of dispersed load within a 1m strip will overlap as shown.

REF | TEXT | OUTPUTS



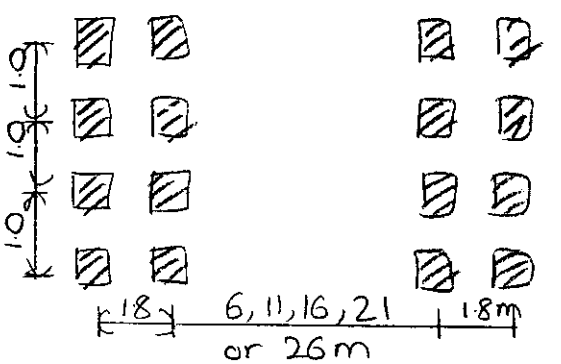
∴ HB loading in a one metre strip is equivalent to $(1.82 \times 34) + (1.82 \times 0.8 \times 34)$

↑ to allow for overlap.

$$HB = 61.88 + 49.504 = 111.4\ kN$$

To be conservative assume that the HB acts as a phantom load at the normal HB standard axle spacings.

Standard dimensions for the HB vehicle are as follows.

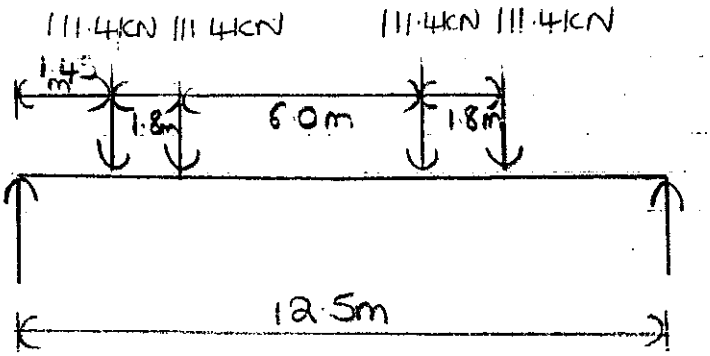


The tunnel roof slab is 12.5m wide overall and therefore can only fit a 10m long notional HB vehicle. The analysis assumes that 2 wheels or 4 wheels of the HB vehicle can load the slab at one time. For analysis purposes the wheels have been positioned to give the most severe shear forces and bending moments. The wheel arrangements that follow have been analysed.

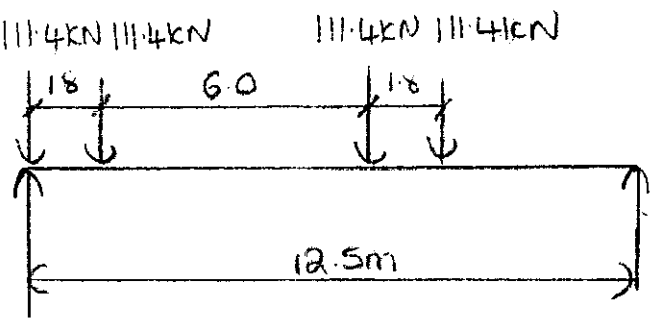
ARUP	Job No. 67313	Sheet No. 5 of [illegible]	Rev.
	Member/Location		
Job Title METROLINK PHASE III ADVANCED WORKS ALAN TURING WALK CHAINAGE 1160 to 1225m	Drg. Ref. SKETCH 67313/SK 22 08 01/1		
	Made by WE	Date 22-08-01	Chd.

REF | TEXT | OUTPUTS

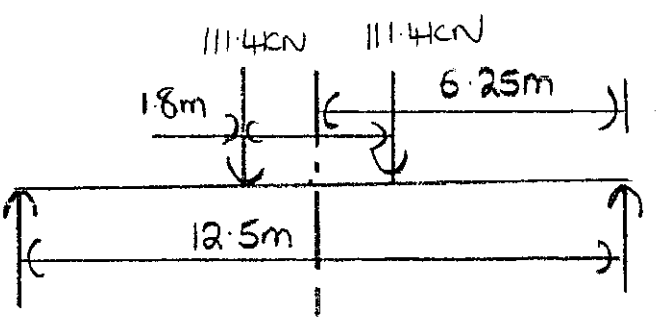
HB LOADCASE ONE



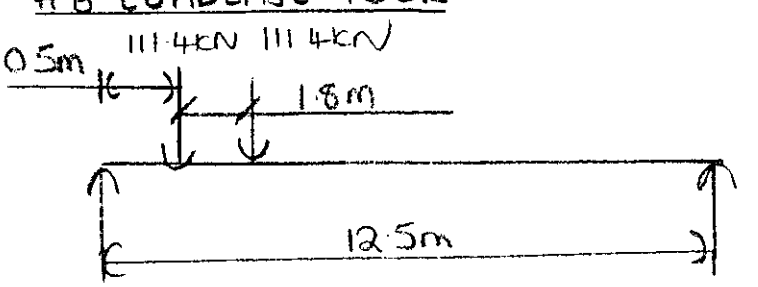
HB LOADCASE TWO



HB LOADCASE THREE



HB LOADCASE FOUR



REF | TEXT | OUTPUTS

ABNORMAL LOAD.

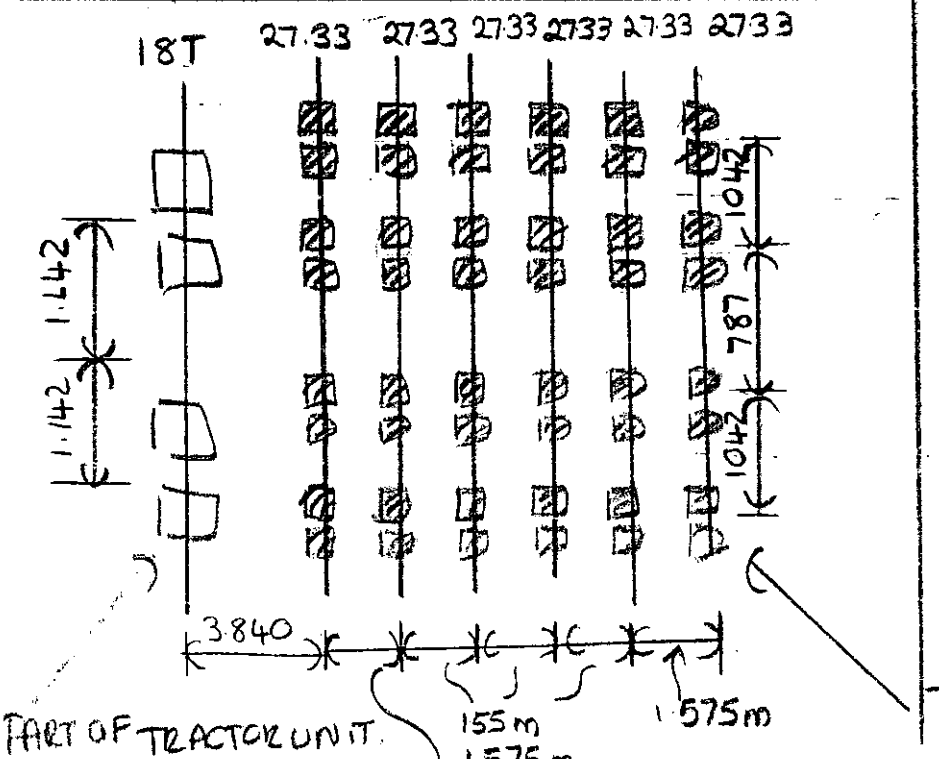
UNDER INSTRUCTION FROM MANCHESTER CITY COUNCIL HIGHWAY SECTION THE TUNNEL IS TO BE DESIGN TO CARRY A 328 tonne on a 100t trailer together with associated tractor

The configuration of the axles of the tractor and trailer is shown on the attached drawing sketch 67313/SK220801/1

AS THE BRIDGE DECK IS ONLY 12.5m LONG IT IS ONLY POSSIBLE FOR PART OF THE VEHICLE TO SIT ON THE ROOF SLAB.

THE ANALYSIS ASSUMES THAT THE HEAVIEST SECTION OF THE VEHICLE IS POSITIONED ON THE BRIDGE. (AS SHOWN BELOW)

ABNORMAL LOADING CONFIGURATION



REF	TEXT	OUTPUTS

one wheel load on trailer = $\frac{27.38 \times 10}{8}$

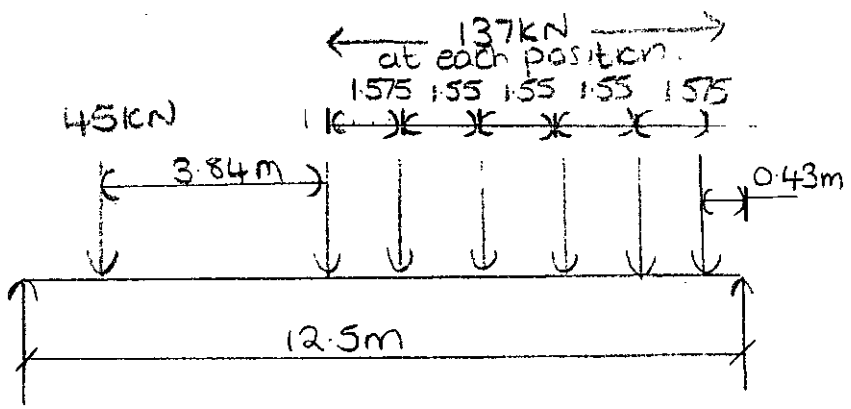
= 34.16 kN

one wheel load on tractor = $\frac{18 \times 10}{4}$

= 45 kN

In the worst case, it is possible for four wheels of the trailer and one wheel of the tractor to be positioned within the metre strip,

4 × 34.16 = 136.64 kN say 137kN



6.5.1 Pedestrian loading is ignored in the analysis. The design is being completed based on a one metre section subject to full HA, HB, Abnormal loading and surcharge from full. The resulting rebar from the 1m section will be placed in the pedestrian zone, and is considered more than sufficient to support traffic on foot.

6.6 Accidental wheel loading not applicable see paragraph above for reason.

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GMPTE Metrolink/ Amec Developments Limited

Metrolink Phase 3 : Advanced Works - Alan Turing Way

Health & Safety File

draft

DRAFT 1

GMPTE Metrolink/ Amec Developments Limited

Metrolink Phase 3 : Advanced Works - Alan Turing Way

Health & Safety File

Interim to June 2002

June 2002

draft

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Job number 67313-04

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Date 18 June 2002

Document number	Document type	Issued to	Date
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Details of non-conformance

Draft Report not approved for issue.

CDM Reports 13, 26, 27 and 28 not included.

Purpose of issue

Interim issue at request of GMPTE.

Any other actions required ?

Project Engineer Simon Small

cc: Project Manager

Signed

Date 18/6/02

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QA Rev 1/01 1 November 2001

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Document Verification

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draft

1. INTRODUCTION TO THIS FILE

1.1 Description of the Health & Safety File

This Health and Safety File has been prepared under the requirements of Regulation 14(d)-(f) of the Construction (Design and Management) Regulations 1994, as amended, in particular Regulation 14(d), Appendix 4 of the Approved Code of Practice and Arup standards. The purpose of the File is to provide a record of specific information concerning this site and the construction of the Metrolink Phase 3 Advanced Works at Alan Turing Way, which focuses on the health and safety of workers and those that may be affected by future construction, commissioning or it's subsequent demolition. The information it contains will alert those who are responsible for future development on the premises to any significant health and safety risks that need to be dealt with during subsequent maintenance, repair or development and construction work.

This File should also be made available to those responsible for undertaking any intended works. The File will also provide information for future pre-tender Health and Safety Plans and will undergo development to take into account the subsequent construction work.

The Planning Supervisor has taken all reasonable measures to ensure the delivery of the contents of this file.

The Regulations do not specifically require designers to keep a record of the design decisions they made and how they took account of health and safety when they made their decisions. However, designers may need to assure the planning supervisor that health and safety was given adequate regard among the other design considerations. Where quality assurance schemes are already in use to track other design decision-making processes, they may provide a suitable framework for controlling and monitoring the CDM decision-making process.

1.2 Use of this Health and Safety File

The purpose of this Health and Safety File is to act as a reference document (or set of records) to provide information to assist persons undertaking future construction, maintenance, repair, alteration or demolition work on the project.

CDM Regulation 12(1) states that:

Every client shall take such steps as is reasonable for a person in his position to take to ensure that the information in any health and safety file which has been delivered to him is kept available for inspection by any person who may need information in the file for the purpose of complying with the requirements and prohibitions imposed on him by or under the relevant statutory provisions.

The information that this File contains is that which has been collated as a result of the works identified in sections 2.0 and 3.0.

This document is to be stored and made available by GMPTE Metrolink.

2. PROJECT PARTICULARS

2.1 Project Team and Directory

The following were the principle contacts for the project

Clients:	Amec Developments Limited Anchorage 1 Anchorage Quay Salford Quays Manchester M5 2YJ Tel: 0161 888 1627 Contact Mr M Payton Greater Manchester Passenger Transport Executive 6th Floor Magnum House 9 Portland Street Piccadilly Manchester M60 1HX Tel: 0161 242 6253 Contact Mr C Humphreys/ Mr C Howarth
Planning Supervisor:	Ove Arup & Partners International Ltd 8th Floor St James' Buildings Oxford Street Manchester M1 6EL Tel: 0161 228 2331 Contact Mr S Small
Principal Contractor:	Amec Capital Projects Limited Leonard Fairclough House Church Street Adlington Chorley PR7 4LB Tel: 01257 484 400 Contacts Mr A Brookes/ Mr S Clarkson (Construction Manager)
Designer:	Ove Arup & Partners International Ltd 8th Floor St James' Buildings Oxford Street Manchester M1 6EL Tel: 0161 228 2331 Contact Mr R Milburn / Mr M Kay

draft

2.2 Site Location

The Advanced Works are located adjacent to Alan Turing Way in the Bradford area of Manchester, to the north and east of the new City of Manchester Stadium (See Figure 1). The site extends from a point west of Forge Lane and then continues eastwards below the approach to the existing Forge Lane Bridge, towards and under Alan Turing Way through a proposed tunnel and then south below Gibbon Street before emerging and continuing parallel to Alan Turing Way.

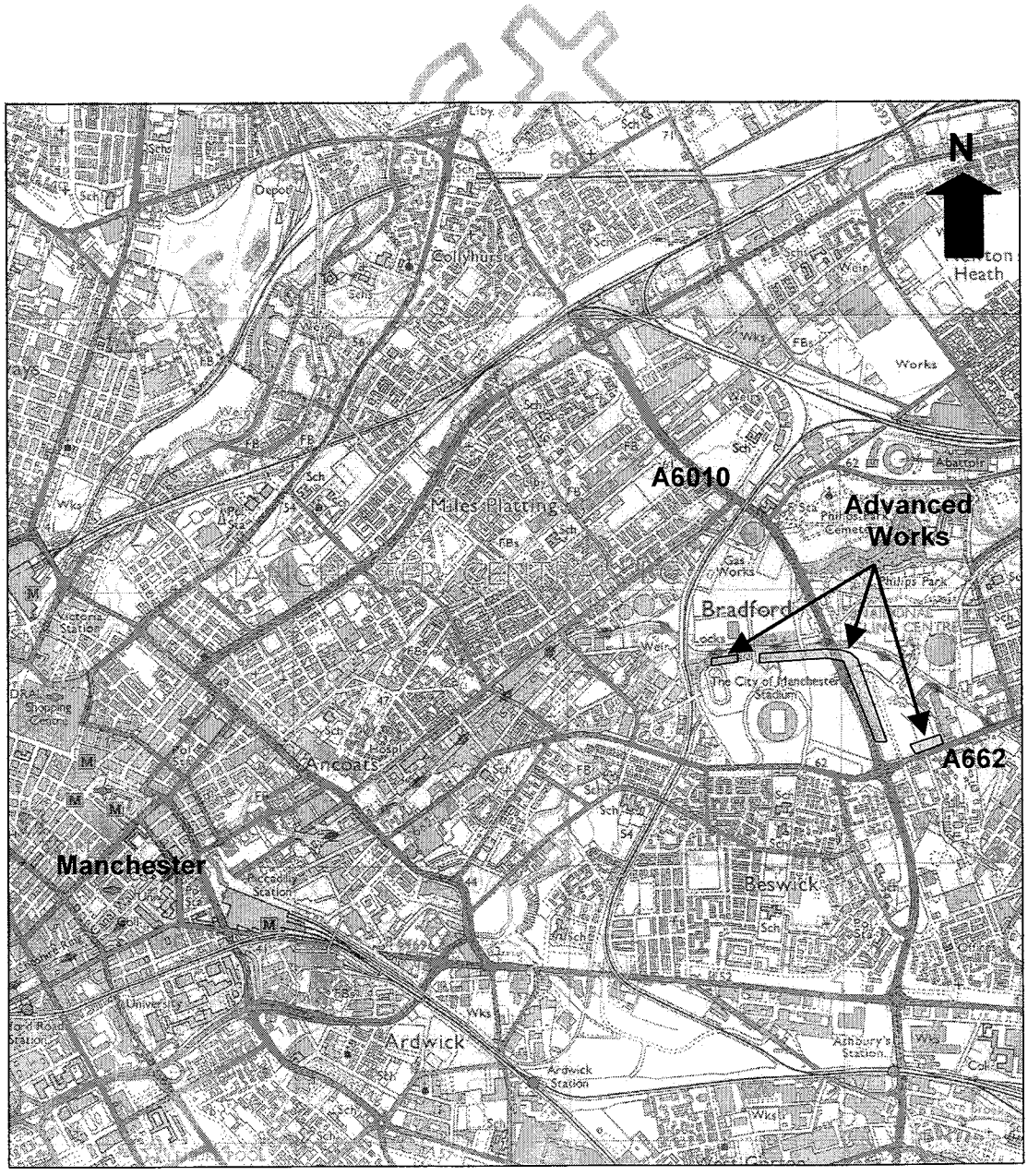


Figure 1 – Site Location

2.3 Site History

Metrolink Phase 3 – Advanced Works (Alan Turing Way) site forms part of a larger area in the Bradford district of East Manchester that is under going significant redevelopment centred on the new City of Manchester Stadium (to become Manchester City FC's home football ground) and the commercial development known as SportCity.

2.3.1 Historical Uses

Historically the area along the Advanced Works route have seen various industrial uses and features including:-

- Philips Park Printing Works
- Bradford Iron Works
- Townly Iron Works
- Bradford Colliery (only workings under route)
- Residential Areas near Gibbon Street
- Cotton Mills (African Mills, Park Mills)
- Chemical Works

Information on the historical uses of the site and interpretive reporting on site investigations along the route can be found in the following report.

Manchester Metrolink Phase 3
Piccadilly to Eastlands
Interpretative Report on Ground Investigation
First Issue dated 31/01/01
by Parson Brinckerhoff (PB Kennedy & Donkin)

2.3.2 Site Investigations

Site investigations have been carried out for the Advanced Works area and for adjacent developments. The most useful and relevant information is available in the reports below:-

- Northern Foundations, Phase 1 and 2 for Manchester City Council. c1992.
- Wardell Armstrong, Alan Turing Way Mining Investigation . c1993.
- Norwest Holst, Stadium Site Investigation. c1999.
- Soil Mechanics, Sportcity Investigation, 2000.
- Kennedy and Donkin, Metrolink Site Investigation for GMPTE, 2000. (As in 2.3.1)
- Arup Investigation for GMPTE, 2001.
- Soil Mechanics Report 101189/F dated May 2002.

2.4 Contamination Considerations

Based up on the historical uses of the site some contamination was anticipated. Generally contamination within the soils at the site was considered to be low. Contamination within the groundwater has been identified but no special protection measures have been used during the construction of the works. Details of ground and water contamination are given in the reports under 2.3.2.

3. BRIEF DESCRIPTION OF THE WORK CARRIED OUT

In this document Metrolink Phase 3 – Advanced Works (Alan Turing Way) will be abbreviated to the 'Advanced Works'.

3.1 Overview

3.1.1 The Metrolink Phase 3 Project

The six mile Ashton-under-Lyne Metrolink extension will run from Manchester Piccadilly Station through Eastlands, past the new City of Manchester Stadium (to become Manchester City FC's home football ground). The extension will be completed after the Games are held in July 2002.

The Advanced Works alongside the stadium have been carried out to minimise the complexity, difficulty and cost (and hence risks to health and safety) of the extension works that would be aggravated by the re-development currently underway on adjacent land. The re-development projects are all due to complete before the Games. Following the Games there will be further development in the areas north, south and to the east of the Advanced Works.

3.1.2 Advanced Works

The Advanced Works was limited to the design and construction of a tunnel under Alan Turing Way and Gibbon Street with approach cuttings between retaining walls.

The tunnel portion was constructed top-down by excavating below a roof slab cast on the ground. No permanent way, overhead traction power supplies or signalling infrastructure was installed under the Advanced Works.

At this interim stage the works have progressed to a point where the walls, roof slabs, props and parapets have been completed and excavation is underway. It is intended to halt the works while the Commonwealth games take place and resume completion of the excavation and wall facing after the games.

3.2 Tunnel and Tunnel Approach Structures

The Advanced Works tunnel is approximately 149m long from tunnel portal to tunnel portal with approach sections that are each approximately 180m long (west) and 210m long (east/South).

Tunnel and approach walls are mainly constructed from a combination of large diameter bored piles (0.7m, 0.9m and 1.2m) and diaphragm wall panels. A full description of the structure is given in the Arup Calculation Plan 67313/REP/S001 dated June 2002 and the Arup Retaining Wall Calculation Plan 67313/REP/S002 dated June 2002.

3.2.1 Tunnel Section - General

The tunnel is formed mainly by propped cantilever retaining walls which are propped by the roof slab. There is no prop at the tunnel invert level as a general rule. The roof slab is continuous with the top of the walls in most locations.

3.2.2 Tunnel Section – Unusual Aspects

The 67313-S-17-006 to 027 series of GA drawings should be referred to for locations of unusual structural features.

3.2.2.1 Service Crossings

Where the tunnel route crosses shallow services that were not diverted the wall structure is not a propped cantilever wall. Piles have been installed with clearance to the services and in fill panels (generally cast in 2m depth panels top down) have been installed which span horizontally between the piles.

These infill panel locations may not be obvious after wall facings have been installed.

3.2.2.2 Works 6 Sewer Crossing

The piles above the Works 6 Sewer have a higher toe level than other wall areas to avoid a clash with the Sewer. The piled wall has a tunnel base slab prop in this location. Vertical load on the Sewer is minimised by not connecting the tunnel roof slab to the top of the piles and the use of a compressible filler to ensure no load transfer. The short piles require a prop at roof slab level in addition to the base slab level prop. Accordingly the roof slab in this area has a projection down into the tunnel, below top of pile level, which effectively allows the roof slab to act as a prop to the wall piles (Detail S5/019 and S10/019 on 67313-S-017-019).

3.2.3 Tunnel Approaches – General

The tunnel approaches (cuttings) are formed by a combination of:-

- Propped cantilever walls with discrete high level props at 10m centres approximately;
- Propped cantilever walls with invert level slab props; and
- Cantilever retaining walls.

P6 parapets are provided to all sections of the tunnel approaches.

3.2.4 Tunnel Approaches – Unusual Aspects

3.2.4.1 Stadium Station Stop

At the western end of the tunnel west approach provision for the future Stadium station stop has resulted in retaining walls of differing heights. The north wall (Outbound) retaining the Ashton Canal is taller than the south wall (Inbound).

The south wall is required to provide the reaction to the invert level slab which props the north wall.

3.2.4.2 New Forge Lane Bridge

A new bridge has been provided over the tunnel western approach at Forge Lane. It is a pedestrian bridge with provision for some maintenance vehicle access, details of load capacity can be found in the Arup Calculation Plan REP/S001 dated June 2002.

The new bridge deck sits on top of the approach retaining walls but it does not act as a prop to the walls. Hence the bridge deck could be removed with no adverse impact on the walls. If the bridge was removed the parapet would have to be made continuous.

The ownership of the bridge is being discussed.

A deep sewer runs under the line of Forge Lane, accordingly there are no piles over the sewer and infill panels have been provided (as 3.2.2.1).

In early reports and early design stages an invert slab prop under the New Forge Lane Bridge was considered, eventually this was not required.

3.2.4.3 Diaphragm Wall Panel 13

A non-conformance with the specification has resulted in the need to strengthen Panel 13 of the diaphragm wall. A pile was constructed in front of the panel and a base slab constructed monolithically from the pile to the upper part of Panel 13 to create an 'L' shaped wall. Accordingly this part of the structure does not behave in the same way as the rest of the diaphragm panels. Details are shown on Drawing No. 67313-S-29-050.

3.2.4.4 Non Conforming Piles

Where a pile did not conform with the specification a replacement pile has been installed behind the wall. The capping beam (on approaches) or roof slab (tunnel) has been widened to include the additional pile.

Issues of provision for maintenance access and land ownership need to be considered carefully in these locations.

3.2.4.5 Gravity Retaining Walls

Part of the west wall (inbound) to the east/south tunnel approach is a gravity retaining wall with no piles. (see drawing 67313-S-17-040 and Calculation Plan 67313/REP/S003).

3.3 Treatment of Mineworkings

The area of the Advanced Works tunnel and approaches have been treated to stabilise old mineworkings. Areas under Alan Turing Way had been treated previously by works under taken by the Highway Authority.

Areas of stabilisation can be found in the following documents:-

- Drilitec Northern Report entitled "Metrolink Phase 3 Ground Stabilisation Grouting Report"
- The Specification for the Stabilisation Works can be found in Arup Specification "Metrolink Phase 3 – Preparatory (Advanced) Works – Alan Turing Way Grouting Specification dated July 2001 Ref. GEO/002.

The treatment areas include sections to the west of the Stadium Footbridge and to the south of the new Asda Wal Mart store on the A662 (Ashton New Road).

The desk study for mineworkings identified five possible mine shafts (F,G,H,I and J) in the area of influence of the Advanced Works.

During investigation and treatment only 3 of these shafts were found (F,G and I) in the zone of influence of the Advanced Works. Mine shafts H and J were never proved or located within the zone of influence (see Drilltec/IMC drawings 255/E SHAFT A3). Shafts F,G and I will be capped.

In addition to being unable to locate and cap mine shafts H & J an unexpected mine shaft, known as the "suspected" or "unrecorded mineshaft in Area 4", was identified north of Gibbon Street (see Drilitec/IMC drawing 255/E SHAFT A3). The unrecorded mine shaft will be capped.

3.4 Sewer Diversion Works

The Advanced Works Tunnel interrupted the line of a sewer running east to west in Gibbon Street which discharged to the deep sewer under Forge Lane. The invert level of the tunnel was below the invert of the Gibbon Street sewer.

A sewer diversion has been constructed by a pipe jack process to a level below the invert of the Advanced Works Tunnel.

This new diversion sewer has a direct connection to the deep Works 6 Sewer just to the west of the tunnel wall near the junction of Gibbon Street and Alan Turing Way.

The new sewer diversion will be adopted by United Utilities.

The new diversion sewer accepts discharges from existing developments and planned developments to the east of the Advanced Works tunnel at Alan Turing Way.

Details of the diversion can be found in the Amec/Donegan marked up versions of the following documents:-

- Drawing A2/144728/001
- Drawing A1/144728/002
- Drawing A1/144728/003

3.5 Utilities and Drainage

3.5.1 Utility and Drainage Diversions

Various utilities and drainage have been diverted or relocated as part of the Advanced Works. These are mainly at Forge Lane, Alan Turing Way and Gibbon Street. Up-to-date utility searches should be obtained for any future work in these areas. Details of the diversions carried out under the Advanced Works Contract are given in the following Amec documents:-

- Drawing 16511/001 to 16511/009

The Works 6 Sewer and the Norweb Cable tunnel (Quixhall Street Tunnel) are of particular note in the area of the Advanced Works. The Stuart Street Tunnel has been grouted up beneath the Advanced Works route.

Some plans make reference to the Main North Cross Cut Tunnel, this is an extremely deep interconnecting tunnel between old coal mines which had no impact on the Advanced Works design.

3.5.2 New Drainage

The tunnel and approaches have new drainage pipes located in the middle of the tunnel/approach invert. Two parallel pipes are provided to allow some redundancy after consideration of the access restrictions to the pipe locations. These central pipes accept discharges from wall drainage and future filter drains at track bed level.

3.5.3 Wall Drainage

Drainage provision behind and in the wall are complicated to describe. There are sections of wall where no drainage has been provided and water pressure designed for. There are sections where wall drainage is essential to reduce water pressure on wall facings. In these locations spare drain capacity has been incorporated. At certain locations a land drain has been provided at the back of the wall to control the level of a perched water table. This land drain will require maintenance.

3.6 Confirmation of design to meet the Disability Discrimination Act and associated access standards for people with disabilities

It should be noted that the Advanced Works are to be incorporated into the overall Metrolink Phase 3 works and as such a full assessment of the requirements for access should be carried out by the Concessionaire. In respect of emergency evacuation from the tunnel cross-section space for a de-trainment walkway has been allowed. The width of the walkway has been increased from a standard 700mm to 900mm to allow for wheelchair use.

draft

4. RESIDUAL HAZARDS AND HOW THEY HAVE BEEN DEALT WITH:

4.1 Surveys and information concerning asbestos

The site investigations did not indicate the presence of asbestos in the area of the Advanced Works. During construction of the Advanced Works within limits of detection, no asbestos was uncovered.

4.2 Surveys and information concerning contaminated land

The site investigations (see 2.3.2) indicated various levels of contamination. During construction of the Advanced Works there were no unexpected contaminants or contaminants that required special measures. Future excavation works should proceed after consideration of the test results and appropriate measures identified.

Although not hazardous to health it is worth noting that stands of Japanese Knotweed were present on the site and adjacent sites which required special identification and removal measures.

4.3 Surveys and information concerning water bearing strata

Site investigations have identified ground water level prior to construction. Other than pile drilling records no ground water levels have been recorded.

There is no requirement to monitor groundwater levels post construction provided that drainage provisions remain functional.

4.4 Surveys and information concerning buried services

As built records of the buried services affected by the Advanced Works have been provided by Amec. (see 3.5).

Although it is to be adopted by United Utilities the Gibbon Street Sewer Diversion has a connection to the Works 6 Sewer which forms a constriction to the diversion. The possibility for blockages from debris collection and the limited access to unblock the diversion has been considered by United Utilities.

4.5 Other Hazards identified by the design team and any other parties

(CDM reports listed below can be found in Appendix A)

4.5.1 Buried Obstructions

Remnants of temporary works structures such as sheet piles, bored pile temporary bridge foundations and other obstructions have been recorded by Amec on drawings (see 3.5).

4.5.2 Allowable Surcharge Loading

CDM report 3 highlights the need to obtain engineering advice before surcharge loads are placed behind the retaining walls.

4.5.3 Migration of Mineworkings Gas

CDM report 6 identified the possibility of gas migration into the works due to disturbance and creation of possible pathways. Whilst gas monitoring during construction of the Advanced Works did not detect any gas occupiers of the Advanced Works should consider gas monitoring and assessment of any continual risk.

4.5.4 Condition Monitoring

Hazards associated with degradation of adjacent structures have been managed by undertaking condition surveys. Future construction work activities should be aware of the following condition surveys by Michael Pooler Associates for Amec:-

1) Engineering Report 7513 – Sept 2002
2) Engineering Report 7513/9 – Ashton Canal Lock- 11/02/02
3) Engineering Report 7513/8A – Vibration monitoring lock keepers cottage – 05/02/02
4) Condition Survey/Structural Assessment – Ashton Canal – 26/07/01
5) Ashton Canal monitoring – Sept 2001 to Apr. 2002
6) Ashton Canal monitoring – Oct 2001 to Nov 2002
7) Ashton Canal monitoring – Sept 2001 to Jan 2002

4.5.5 Mine Workings and Shafts

Within the are local to the Advanced Works there is a possibility of encountering the mineshafts not identified and capped during the Advanced works contract. This risk will change with the reduction of GMPTE land ownership area. GMPTE should ensure that risks are communicated to new landowners when areas of the Advanced Works site are disposed or transferred.

4.5.6 Damage to or Loss of Prop

The loss of a prop by accident has been considered and a scenario developed for temporary stability of the approach walls and prop replacement. This is contained in the latter attachment to CDM Report 13.

4.5.7 Wall Facing

Maintenance of the concrete wall facing (which will include replacement of joint sealant) should be rare but it may involve working at height.

4.5.8 Parapet Joint Sealant

The replacement of joint sealant on the track-side of the parapet will involve working at height near overhead line electrification equipment.

4.5.9 Mis-use of Advanced Works by Phase 3 Concessionaire

There is a hazard that the Advanced Works are misused if insufficient information is passed on to the concessionaire. GMPTE have prepared a package of handover information for concessionaire tenderers and will handover as built records, O&M manuals and reports to the concessionaire.

4.5.10 Replacement of MHTD001

If MHTD001 required replacement by excavation temporary propping of the walls should be considered.

4.5.11 Permanent Prop to 1200mm Piles at Works 6 Sewer

CDM report 28 identifies the requirement to consider the importance of the down-stand prop to the roof slab.

4.5.12 Metrolink Corridor Drainage Beneath Base Slab Props

CDM report 26 identifies considerations for maintaining or replacing the Metrolink corridor drainage beneath base slab props. There is as need to consider maintaining stability of the wall.

4.5.13 Forge Lane Bridge Bearings

The maintenance, inspection or replacement of the Forge Lane Bridge bearings has to be carried out from the track side. CDM report 27 identifies the considerations for safe access.

draft

5. HAZARDS ASSOCIATED WITH MATERIALS USED

5.1 Hazardous substances

The only substances which may require consideration of COSHH aspects during replacement are :-

- Bridge deck water proofing systems
- Forge Lane bridge bearing epoxy mortar

5.2 Lead paint and special coatings which should not be burnt off

No paints have been used in the works which should not be burnt off.

draft

6. THE NATURE, LOCATION AND MARKINGS OF SIGNIFICANT SERVICES, INCLUDING FIRE-FIGHTING SERVICES

6.1 Significant services

Other than drainage there are no services provided in the tunnel or approaches. Modifications to existing utilities and services are described in Section 3.5.

6.2 Fire Fighting Services

Two fire fighting hydrants have been provided under the contract near each tunnel portal in agreement with the Fire Service. They are shown on drawings listed in Section 3.5.

draft

7. RELEVANT INFORMATION, DRAWINGS AND REPORTS

The following documents are currently are issued as at Construction Status. The list will be revised when As-Built packages have been confirmed.

Document Reference	Title	Originator
Reports		
67313/REP/S001	Calculation Plan	Arup
67313/REP/S002	Retaining Wall Calculation Plan	Arup
67313/REP/S003	Gravity Retaining Wall Calculation Plan	Arup
67313/REP/S004	Stage 1 – Design and Construction Brief	Arup
67313/REP/S005	Fire Safety Assessment	Arup
67313/REP/S006	Submission For Letter Of No Objection (Ch850 to Ch1550)	Arup
67313/REP/S007	Submission No 2 For Letter Of No Objection. Parapets / Prop Beams and Discrete (Below Rail) Slabs (Ch 975 to 1525)	Arup
Specifications		
67313/SPEC/C001	Specification For Civil Works	Arup
67313/SPEC/G001	Grouting Specification	Arup
67313/SPEC/S002	Specification For Structural Concrete	Arup
Approval In Principal		
67313/AIP/001	Gibbon Street - Bridge Specification	Arup
67313/AIP/002	Alan Turing Way - Service Tunnel AIP	Arup
67313/AIP/003	Forge Lane Bridge	Arup
Condition Surveys		
7513	Engineering Report – Sept 2002	Amec/Michael Pooler Assoc'tes
7513/9	Engineering Report– Ashton Canal Lock- 11/02/02	Amec/Michael Pooler Assoc'tes
7513/8A	Engineering Report– Vibration monitoring lock keepers cottage – 05/02/02	Amec/Michael Pooler Assoc'tes
-	Condition Survey/Structural Assessment – Ashton Canal – 26/07/01	Amec/Michael Pooler Assoc'tes
-	Ashton Canal monitoring – Sept 2001 to Apr. 2002	Amec/Michael Pooler Assoc'tes
-	Ashton Canal monitoring – Oct 2001 to Nov 2002	Amec/Michael Pooler Assoc'tes
-	Ashton Canal monitoring – Sept 2001 to Jan 2002	Amec/Michael Pooler Assoc'tes
QA Records		
16511	Amec Quality Assurance Records	Amec

Document Reference	Title	Originator
Drawings		
67313-C-00-01	Scope of Advanced Work & Alignment Sheet 1 of 4	Arup
C-00-02	Scope of Advanced Work & Alignment Sheet 2 of 4	Arup
C-00-03	Scope of Advanced Work & Alignment Sheet 3 of 4	Arup
C-00-04	Scope of Advanced Work & Alignment Sheet 4 of 4	Arup
C-00-05	Location Plan	Arup
C-00-06	General Arrangement CH975 to 1400, Sheet 1 of 2	Arup
C-00-07	General Arrangement CH975 to 1400, Sheet 2 of 2	Arup
C-00-08	Turnback Option 1	Arup
C-00-09	Turnback Option 2	Arup
C-00-10	Turnback Option 3	Arup
C-00-11	Turnback Option 4	Arup
C-00-12	Location Plan – Showing Mineworkings	Arup
C-00-13	Metrolink Corridor & Proposed Sportcity Development Interaction, Sheet 1 of 3	Arup
C-00-14	Metrolink Corridor & Proposed Sportcity Development Interaction, Sheet 2 of 3	Arup
C-00-15	Metrolink Corridor & Proposed Sportcity Development Interaction, Sheet 3 of 3	Arup
C-00-16	Parapet Location CH 975 to 1400, Sheet 1 of 2	Arup
C-00-17	Parapet Location CH 1400 to 1525, Sheet 2 of 2	Arup
C-01-01	Traffic Management Phase 1	Arup
C-01-02	Traffic Management Phase 2	Arup
C-05-01	Sectionmarks for Services	Arup
C-05-02	Section Through Forge Lane Showing Existing Services	Arup
C-05-03	Section Through Alan Turing Way Showing Existing Services	Arup
C-05-04	Section Through Gibbon Street Showing Existing Services	Arup
C-05-05	Gibbon Street Proposed Structure Cross-Section Showing MP Gas Main	Arup
C-05-06	Scheme Drainage	Arup
C-05-07	Proposed Drainage Abandonments & Connection	Arup
C-05-08	Track Drainage Manhole Schedule and Details	Arup
C-06-01	Shaft Locations	Arup
C-06-02	Proposed Mine Seam Treatment & Location of Stuart street Tunnel	Arup
C-06-03	Typical Detail (Mineworkings & Mineshafts)	Arup
C-07-01	Permanent Way Alignment & Longitudinal Profile Outbound Track, Sheet 1 of 3	Arup
C-07-02	Permanent Way Alignment & Longitudinal Profile Outbound Track, Sheet 2 of 3	Arup
C-07-03	Permanent Way Alignment & Longitudinal Profile Outbound Track, Sheet 3 of 3	Arup
C-07-04	Cross Sections Sheet 1 of 2	Arup
C-07-05	Cross Sections Sheet 2 of 2	Arup
C-07-06	Cross Sections @ 20m Intervals Along Outbound Track (1310-1490) Sheet 1 of 3 (Indicative)	Arup
C-07-07	Cross Sections @ 20m Intervals Along Outbound Track (1310-1490) Sheet 2 of 3 (Indicative)	Arup

Document Reference	Title	Originator
67313-C-07-08	Cross Sections @ 20m Intervals Along Outbound Track (1310-1490) Sheet 3 of 3 (Indicative)	Arup
C-07-09	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 2, Sheet 1 of 3	Arup
C-07-10	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 2, Sheet 2 of 3	Arup
C-07-11	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 2, Sheet 3 of 3	Arup
C-07-12	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 1, Sheet 1 of 3	Arup
C-07-13	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 1, Sheet 2 of 3	Arup
C-07-14	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 1, Sheet 3 of 3	Arup
C-07-15	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 1 of 5 (Indicative)	Arup
C-07-16	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 2 of 5 (Indicative)	Arup
C-07-17	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 3 of 5 (Indicative)	Arup
C-07-18	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 4 of 5 (Indicative)	Arup
C-07-19	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 5 of 5 (Indicative)	Arup
C-07-20	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 1 of 5 (Indicative)	Arup
C-07-21	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 2 of 5 (Indicative)	Arup
C-07-22	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 3 of 5 (Indicative)	Arup
C-07-23	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 4 of 5 (Indicative)	Arup
C-07-24	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 5 of 5 (Indicative)	Arup
C-07-25	Tunnel Cross Sections Chainages 1160 to 1310 (Indicative), Sheet 1 of 4	Arup
C-07-26	Tunnel Cross Sections Chainages 1160 to 1310 (Indicative), Sheet 2 of 4	Arup
C-07-27	Tunnel Cross Sections Chainages 1160 to 1310 (Indicative), Sheet 3 of 4	Arup
C-07-28	Tunnel Cross Sections Chainages 1160 to 1310 (Indicative), Sheet 4 of 4	Arup
C-07-29	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 2, Sheet 4 of 5	Arup
C-07-30	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 2, Sheet 5 of 5	Arup
C-07-33	Earthworks Longsections Along Outbound Track	Arup
C-09-01	Proposed Forge Lane Bridge	Arup
S-16-006	Retaining Wall Setting Out Outbound CH. 980-1040, Sheet 1 of 9	Arup
S-16-007	Retaining Wall Setting Out Outbound CH. 1040-1100, Sheet 2 of 9	Arup

Document Reference	Title	Originator
67313-S-16-008	Retaining Wall Setting Out Outbound CH. 1100-1160, Sheet 3 of 9	Arup
S-16-009	Retaining Wall Setting Out Outbound CH. 1160-1220, Sheet 4 of 9	Arup
S-16-010	Retaining Wall Setting Out Outbound CH. 1220-1280, Sheet 5 of 9	Arup
S-16-011	Retaining Wall Setting Out Outbound CH. 1280-1340, Sheet 6 of 9	Arup
S-16-012	Retaining Wall Setting Out Outbound CH. 1340-1400, Sheet 7 of 9	Arup
S-16-013	Retaining Wall Setting Out Outbound CH. 1400-1460, Sheet 8 of 9	Arup
S-16-014	Retaining Wall Setting Out Outbound CH. 1460-1525, Sheet 9 of 9	Arup
S-16-020	Pile Wall Elevation Outbound CH. 950-1530	Arup
S-16-021	Pile Wall Elevation Inbound CH. 950-1530	Arup
S-16-022	Tunnel Entrance Wing Walls Replacement Piles	Arup
S-17-001	Location of Forge Bridge Lane	Arup
S-17-002	Typical Tunnel & Bridge Deck Section	Arup
S-17-003	Pile Capping Beam & Prop Typical Detail	Arup
S-17-004	Brick Cladding Details	Arup
S-17-005	Forge Lane Bridge Section	Arup
S-17-006	General Arrangement Outbound CH. 980-1040, Sheet 1 of 9	Arup
S-17-007	General Arrangement Outbound CH. 1040-1100, Sheet 2 of 9	Arup
S-17-008	General Arrangement Outbound CH. 1100-1160, Sheet 3 of 0	Arup
S-17-009	General Arrangement Outbound CH. 1160-1220, Sheet 4 of 9	Arup
S-17-010	General Arrangement Outbound CH. 1220-1280, Sheet 5 of 9	Arup
S-17-011	General Arrangement Outbound CH. 1280-1340, Sheet 6 of 9	Arup
S-17-012	General Arrangement Outbound CH. 1340-1400, Sheet 7 of 9	Arup
S-17-013	General Arrangement Outbound CH. 1400-1460, Sheet 8 of 9	Arup
S-17-014	General Arrangement Outbound CH. 1460-1525, Sheet 9 of 9	Arup
S-17-015	General Arrangement Bridge	Arup
S-17-016	General Arrangement Gibbon Street Crossing	Arup
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S-17-018	General Sections, Sheet 2 of 5	Arup
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S-17-020	General Sections, Sheet 4 of 5	Arup
S-17-021	General Sections, Sheet 5 of 5	Arup
S-17-025	Base Slab Outbound CH. 980-1040 Sheet 1 of 4	Arup
S-17-026	Base Slab Outbound CH. 1062-1085 Sheet 2 of 4	Arup
S-17-027	Base Slab Outbound CH. 1208-1238 Sheet 3 of 4	Arup
S-17-028	Base Slab Outbound CH. 1415-1440 Sheet 4 of 4	Arup
S-17-040	Foundations Outbound CH. 1440-1525	Arup

Document Reference	Title	Originator
67313-S-17-050	PC Prop Details	Arup
S-17-060	Outbound Parapet Elevations Ch 1310.00 – 1525.00	Arup
S-17-061	Inbound Parapet Elevations Ch 1310.00 – 1525.00	Arup
S-17-062	Parapet Types, Sheet 1	Arup
S-17-063	Parapet Types, Sheet 2	Arup
S-17-064	Parapet Layout & Details at Fire Access	Arup
S-17-065	Outbound Parapet Elevations CH 980 to CH1161	Arup
S-17-066	Inbound Parapet Elevation CH1040 to Ch 1162	Arup
S-17-067	Parapet Layout and Details at Fire Access	Arup
S-17-068	Parapet Layout and Details at Parapet Returns	Arup
S-17-069	Parapet Types Sheet 3	Arup
S-17-100	Outbound Elevation Sheet 1 of 2	Arup
S-17-101	Outbound Elevation Sheet 2 of 2	Arup
S-17-102	Inbound Elevation Sheet 1 of 2	Arup
S-17-103	Inbound Elevation Sheet 2 of 2	Arup
S-17-104	Tunnel Entrance Portal Plan & Elevation Outbound Chainage 1160	Arup
S-17-105	Tunnel Entrance Portal Plan & Elevation Outbound Chainage 1310	Arup
S-17-110	Facing Concrete Typical Elevation Inbound CH. 1058m – 1160m	Arup
S-17-111	Facing Concrete Typical Elevation (Piles) Outbound CH. 1310m – 1525m	Arup
S-17-112	Facing Concrete Typical Elevation (diaphragm) Outbound CH. 1058m – 1170m	Arup
A2/144728/001	Proposed Gibbon Street Sewers Diversion General Layout	Amec/Donegan
A1/144728/002	Plan & Long Section Shaft 1 – Work 6 Sewer	Amec/Donegan
A1/144728/003	Shaft 1	Amec/Donegan
16511/001	Buried Obstructions Sheet 1 of 9	Amec
16511/002	Buried Obstructions Sheet 2 of 9	Amec
16511/003	Buried Obstructions Sheet 3 of 9	Amec
16511/004	Buried Obstructions Sheet 4 of 9	Amec
16511/005	Buried Obstructions Sheet 5 of 9	Amec
16511/006	Buried Obstructions Sheet 6 of 9	Amec
16511/007	Buried Obstructions Sheet 7 of 9	Amec
16511/008	Buried Obstructions Sheet 8 of 9	Amec
16511/009	Buried Obstructions Sheet 1 of 9	Amec

Appendix A CDM Reports

draft

ARUP

CDM Report

Project	Job number
Metrolink Phase 3 – Advance Works (ATW)	67313

Design stage	CDM Report Ref
FEASIBILITY CONCEPT SCHEME DETAILED DESIGN √ OTHER	3

Topic

Allowable limits on proximity of plant to walls and allowable surcharge loading.

Comments/Associated hazards

If construction plant loadings exceed design loadings, the retaining walls and roof slabs could fail/move with the potential to cause damage, disrupt working, induce objects to fall from height into excavation and more importantly, to cause plant/equipment to become unstable and topple over.
The wall will be subject to changing excavation levels and differing plant loadings whilst unpropped and propped.

Were / Are there any design alternatives with less serious or fewer hazards, to eliminate or reduce risks ?

Were / Are the risks arising from a hazard dependent on alternative methods, locations, or timing ?

If required, record the decision making, and associated risk assessment (eg: Form F41.3 or F41.4)

Assumptions and implications

Assumption is that temporary loads will not exceed design loads listed in the Arup Calculation Plan.
Overloading of wall leading to loss of support and plant instability.
The allowable loading prior to prop installation will be different to the allowable loading after prop installation. The allowable loading will vary with excavated depth in front of the wall.

Residual risks that a competent contractor and/or designer needs to be told about

Abnormal plant loads to be submitted to the ~~engineer~~ CONTRACTOR for checking against design.

Date [redacted] Made [redacted] C [redacted]

Verified by [redacted] (Arup Project Manager) Date 23/8/07

Copied to [redacted] (Planning Supervisor) Date 20/8/07

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ARUP

CDM Report

Project	Job number
Metrolink Phase 3 – Advance Works (ATW)	67313

Design stage	CDM Report Ref
FEASIBILITY CONCEPT SCHEME DETAILED DESIGN OTHER	6

Topic

Migration of gases from collapsed mineworkings into Works.

Comments/Associated hazards

Possible explosion.
Asphyxiation.
There is a view that piling and diaphragm walling works may provide a pathway for gas migration into the Works.

Were / Are there any design alternatives with less serious or fewer hazards, to eliminate or reduce risks ?

Were / Are the risks arising from a hazard dependent on alternative methods, locations, or timing ?

If required, record the decision making, and associated risk assessment (eg: Form F41.3 or F41.4)

Assumptions and implications

The mineworking treatment (grouting) will help to reduce gas pathways and reduce the risk of mineworking gas migration.

If tunnel portals closed off monitoring of gases should be undertaken.

Residual risks that a competent contractor and/or designer needs to be told about

Gas monitoring should be employed to determine if gas is migrating.
Tunnel sections may require forced ventilation or other control measure to limit risk of explosion (OLE could be source of ignition) and asphyxiation during installation/testing/commissioning.
Build up of gases if the tunnel portals are blocked off during the period of Advance Works demobilisation for Games and period between Advance works completion and occupation by Phase 3 concessionaire.

Date	[redacted]	[redacted]

Verified by Mark Kay (Arup Project Manager) Date 23/8/01

Copied to [redacted] (Planning Supervisor) Date 20/8/01

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CDM Report

Project	Job number
Metrolink Phase 3 – Advance Works (ATW)	67313

Design stage	CDM Report Ref
FEASIBILITY CONCEPT SCHEME DETAILED DESIGN √ OTHER	13

Topic

Damage to permanent props during construction. (Leading to extra load transfer onto adjacent structure, with possibility that structure is then beyond servicability and/or limit states).

Comments/Associated hazards

Failure of wall, collapse of excavation, earth falling onto works. Prop falling onto workers during damage/impact event.
Loss of support to plants equipment at top of wall – toppling.
Complicated operation of trying to reinstall a prop after loss.
It is not economically possible to design the walls without top props (i.e. freestanding). Base props are possible, but they would necessitate the use of temporary high level props and additional hazards.

Were / Are there any design alternatives with less serious or fewer hazards, to eliminate or reduce risks ?

Were / Are the risks arising from a hazard dependent on alternative methods, locations, or timing ?

If required, record the decision making, and associated risk assessment (eg: Form F41.3 or F41.4)

Assumptions and implications

The robustness of the structure in the permanent works has been examined. The loss of a prop will cause the capping beam to deflect excessively, transferring load onto adjacent piles causing piles to deflect excessively. Progressive collapse is not expected.
This philosophy will hold true for the construction case, although it must be recognised that the risk of prop damage is higher during construction.

Residual risks that a competent contractor and/or designer needs to be told about

Potential loss of support to top of wall.
Difficult replacement activities.

Date	Made b	Chec
[redacted]	[redacted]	[redacted]

Verified by [redacted] (Arup Project Manager) Date 23/8/01

Copied to (Planning Supervisor) Date 20/8/01

NOTE; Procedure for Prop replacement, during future Operation and Maintence, requires derivation by DESIGNER/CONTRACTOR

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GMPTE Metrolink/ Amec Developments Limited

Metrolink Phase 3 : Advanced Works - Alan Turing Way

Health & Safety File

ISSUE 4

GMPTE Metrolink/ Amec Developments Limited

Metrolink Phase 3 : Advanced Works - Alan Turing Way

Health & Safety File

Interim to June 2002

February 2004

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Job number 67313-04

Job title	Metrolink Phase 3 : Advanced Works - Alan Turing Way		Job number 67313-04
Document title	Health & Safety File		File reference
Document ref	REP/PS002		

Revision	Date				
Draft 1	19/06/02	Filename	0001Report hsf.doc		
		Description	First draft		
			Prepared by	Checked by	Approved by
		Name	Simon Small	Mike Wilton	Roger Milburn
		Signature			
Issue	19/06/02	Filename	0001Report hsf.doc		
		Description	First Issue as interim.		
			Prepared by	Checked by	Approved by
		Name	Simon Small	Mike Wilton	Roger Milburn
		Signature			
Issue 1	11/06/03	Filename	0004Report H&S FILE ISSUE 1.doc		
		Description	Drawing and report references updated to reflect as built design		
			Prepared by	Checked by	Approved by
		Name	Simon Small	Mike Wilton	Roger Milburn
		Signature			
Issue 2	14/08/03	Filename	0005Report H&S FILE Issue 2.doc		
		Description	Cl.3.1.2 para 3 amended Cl 3.1.3 added Cl 3.3 para 5 amended, Document Summary updated to include pile and diaphragm wall reinforcement drawings ,		
			Prepared by	Checked by	Approved by
		Name	Simon Small	Mike Wilton	Roger Milburn
		Signature			

Issue Document Verification with Document ☑

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QA Rev 1/01 1 November 2001

Job title	Metrolink Phase 3 : Advanced Works - Alan Turing Way		Job number 67313-04
Document title	Health & Safety File		File reference
Document ref	REP/PS002		

Revision	Date				
Issue 3	05/01/04	Filename	0006Report H&S File Issue 3.doc		
		Description	Amec Engineering Report 7513.A Ashton Canal – Alan Turing Way and Engineering Report No 7513/8.A Lock Keepers Cottage Ashton Canal references updated in section 7.		
			Prepared by	Checked by	Approved by
		Name	Simon Small	Mike Wilton	Roger Milburn
		Signature			
Issue 4	18/02/04	Filename	0007Report H&S File Issue 4.doc		
		Description	Amendment to Section 4.5.4 – reference to final Michael Pooler Report. Amendment to Section 7 – Calculation plan updated to Draft 4.		
			Prepared by	Checked by	Approved by
		Name	James Theobalds	Simon Small	Mike Wilton/ Roger Milburn
		Signature	[redacted]		
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			

Issue Document Verification with Document ☑

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QA Rev 9.3, 17 November 2003

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1. INTRODUCTION TO THIS FILE

1.1 Description of the Health & Safety File

This Health and Safety File has been prepared under the requirements of Regulation 14(d)-(f) of the Construction (Design and Management) Regulations 1994, as amended, in particular Regulation 14(d), Appendix 4 of the Approved Code of Practice and Arup standards. The purpose of the File is to provide a record of specific information concerning this site and the construction of the Metrolink Phase 3 Advanced Works at Alan Turing Way, which focuses on the health and safety of workers and those that may be affected by future construction, commissioning or it's subsequent demolition. The information it contains will alert those who are responsible for future development on the premises to any significant health and safety risks that need to be dealt with during subsequent maintenance, repair or development and construction work.

This File should also be made available to those responsible for undertaking any intended works. The File will also provide information for future pre-tender Health and Safety Plans and will undergo development to take into account the subsequent construction work.

The Planning Supervisor has taken all reasonable measures to ensure the delivery of the contents of this file.

1.2 Use of this Health and Safety File

The purpose of this Health and Safety File is to act as a reference document (or set of records) to provide information to assist persons undertaking future construction, maintenance, repair, alteration or demolition work on the project.

CDM Regulation 12(1) states that:

Every client shall take such steps as is reasonable for a person in his position to take to ensure that the information in any health and safety file which has been delivered to him is kept available for inspection by any person who may need information in the file for the purpose of complying with the requirements and prohibitions imposed on him by or under the relevant statutory provisions.

The information that this File contains is that which has been collated as a result of the works identified in sections 2.0 and 3.0.

This document is to be stored and made available by GMPTE Metrolink.

2. PROJECT PARTICULARS

2.1 Project Team and Directory

The following were the principle contacts for the project

Clients:	Amec Developments Limited Anchorage 1 Anchorage Quay Salford Quays Manchester M5 2YJ Tel: 0161 877 3400 Contact Mr M Payton Greater Manchester Passenger Transport Executive 6th Floor Magnum House 9 Portland Street Piccadilly Manchester M60 1HX Tel: 0161 242 6000 Contact Mr C Humphreys/ Mr C Howarth
Planning Supervisor:	Ove Arup & Partners International Ltd 8th Floor St James' Buildings Oxford Street Manchester M1 6EL Tel: 0161 228 2331 Contact Mr S Small
Principal Contractor:	Amec Capital Projects Limited Leonard Fairclough House Church Street Adlington Chorley PR7 4LB Tel: 01257 484 400 Contacts Mr A Brookes/ Mr S Clarkson (Construction Manager)
Designer:	Ove Arup & Partners International Ltd 8th Floor St James' Buildings Oxford Street Manchester M1 6EL Tel: 0161 228 2331 Contact Mr R Milburn / Mr M Kay

2.2 Site Location

The Advanced Works are located adjacent to Alan Turing Way in the Bradford area of Manchester, to the north and east of the new City of Manchester Stadium (See Figure 1). The site extends from a point west of Forge Lane and then continues eastwards below the approach to the existing Forge Lane Bridge, towards and under Alan Turing Way through a proposed tunnel and then south below Gibbon Street before emerging and continuing parallel to Alan Turing Way.

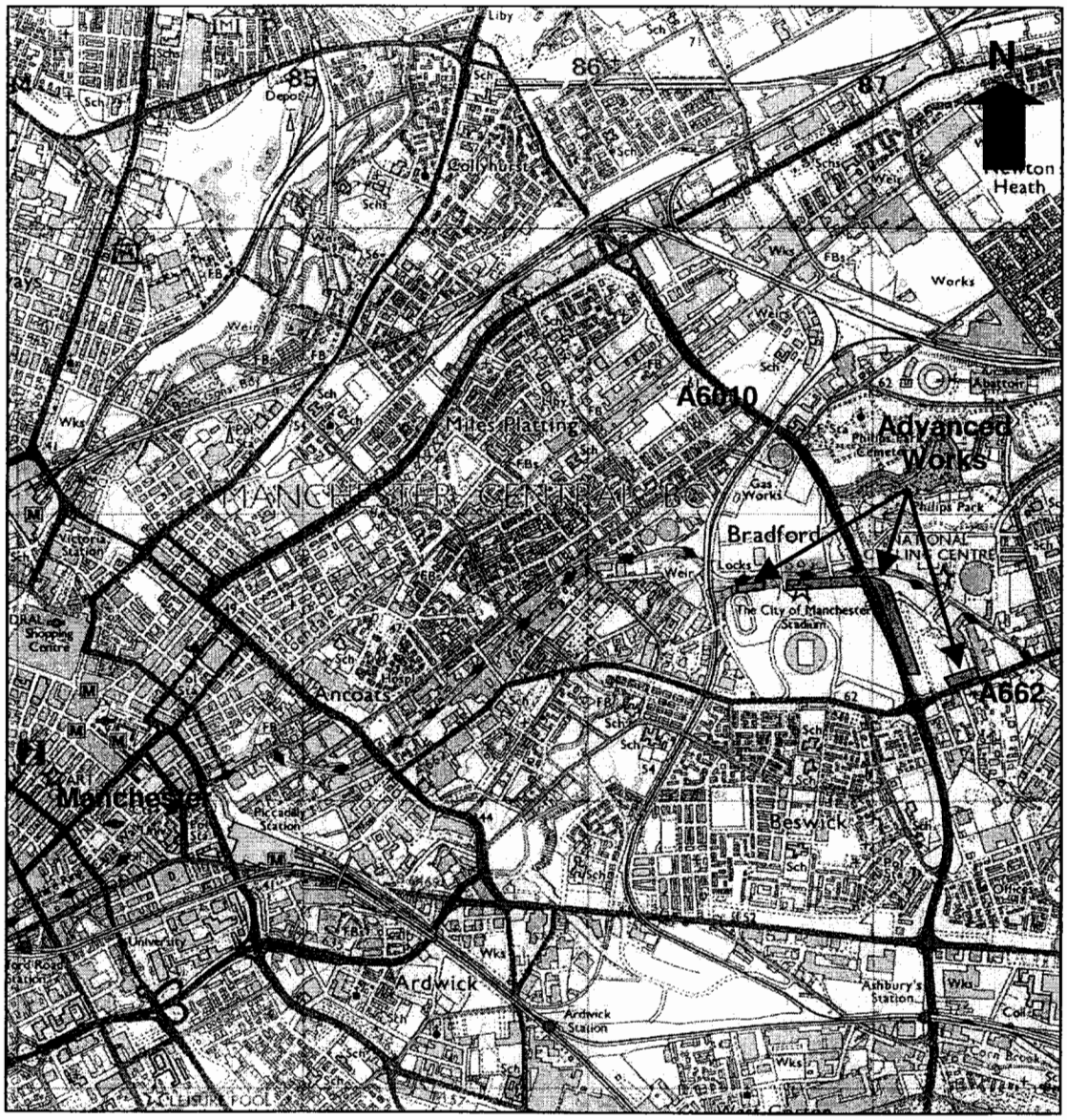


Figure 1 – Site Location

2.3 Site History

The Metrolink Phase 3 – Advanced Works (Alan Turing Way) site forms part of a larger area in the Bradford district of East Manchester, termed SportCity, that is under going significant redevelopment centred on the new City of Manchester Stadium and the commercial development known as SportCity. The stadium will be home to the Commonwealth Games in 2002 and will be converted in 2002/2003 to become the home of Manchester City FC.

2.3.1 Historical Uses

Historically the area along the Advanced Works route have seen various industrial uses and features including:-

- Philips Park Printing Works
- Bradford Iron Works
- Townly Iron Works
- Bradford Colliery (only workings under route)
- Residential Areas near Gibbon Street
- Cotton Mills (African Mills, Park Mills)
- Chemical Works

Information on the historical uses of the site and interpretive reporting on site investigations along the route can be found in the following report.

Manchester Metrolink Phase 3 - Piccadilly to Eastlands
Interpretative Report on Ground Investigation
First Issue dated 31/01/01 by Parson Brinckerhoff (PB Kennedy & Donkin)

2.3.2 Site Investigations

Site investigations have been carried out for the Advanced Works area and for adjacent developments. The most useful and relevant information is available in the reports below:-

- Northern Foundations, Phase 1 and 2 for Manchester City Council. c1992.
- Wardell Armstrong, Alan Turing Way Mining Investigation . c1993.
- Norwest Holst, Stadium Site Investigation. c1999.
- Soil Mechanics, Sportcity Investigation, 2000.
- Kennedy and Donkin, Metrolink Site Investigation for GMPTE, 2000. (As in 2.3.1)
- Arup Investigation for GMPTE, 2001.
- Soil Mechanics Report 101189/F dated May 2002.

2.4 Contamination Considerations

Based up on the historical uses of the site some contamination was anticipated. Generally contamination within the soils at the site was considered to be low. Contamination within the groundwater has been identified but no special protection measures have been used during the construction of the works. Details of ground and water contamination are given in the reports under 2.3.2.

3. BRIEF DESCRIPTION OF THE WORK CARRIED OUT

In this document Metrolink Phase 3 – Advanced Works (Alan Turing Way) will be abbreviated to the 'Advanced Works'.

3.1 Overview

3.1.1 The Metrolink Phase 3 Project

The six mile Ashton-under-Lyne Metrolink extension will run from Manchester Piccadilly Station through SportCity to Ashton. The extension will be completed some time after the Games are held in July 2002.

The Advanced Works alongside the stadium have been carried out to minimise the complexity, difficulty and cost (and hence risks to health and safety) of the extension works that would be aggravated by the re-development currently underway on adjacent land. Many of the re-development projects will be complete before the Games, but following the Games there will be further development in the areas north, south and to the east of the Advanced Works.

3.1.2 Advanced Works

The Advanced Works was limited to the design and construction of a tunnel under Alan Turing Way and Gibbon Street with approach cuttings between retaining walls.

The tunnel portion was constructed top-down by excavating below a roof slab cast on the ground. No permanent way, overhead traction power supplies or signalling infrastructure was installed under the Advanced Works.

The alignment design that the tunnel and approaches are related to has been carried out and submitted for HMRI approval. The assumptions and risks are identified in Arup reports 67313/REP/S006 and S007.

3.1.3 Structures General

Many parts of the structure are integral and support each other. No increase or decrease in level of fill to any structure or part there of should be made, without reference to the intended design as shown in the appropriate calculation plans and drawings.

3.2 Tunnel and Tunnel Approach Structures

The Advanced Works tunnel is approximately 149m long from tunnel portal to tunnel portal with approach sections that are each approximately 180m long (west) and 210m long (east/South).

Tunnel and approach walls are mainly constructed from a combination of large diameter bored piles (0.7m, 0.9m and 1.2m) and diaphragm wall panels. A full description of the structure is given in the Arup Calculation Plan 67313/REP/S001 dated June 2002 and the Arup Retaining Wall Calculation Plan 67313/REP/S002 dated June 2002.

3.2.1 Tunnel Section - General

The tunnel is formed mainly by propped cantilever retaining walls which are propped by the roof slab. There is no prop at the tunnel invert level as a general rule. The roof slab is continuous with the top of the walls in most locations.

3.2.2 Tunnel Section – Unusual Aspects

The 67313-S-17-006 to 027 series of GA drawings should be referred to for locations of unusual structural features.

3.2.2.1 Service Crossings

Where the tunnel route crosses shallow services that were not diverted the wall structure is not a propped cantilever wall. Piles have been installed with clearance to the services and in fill panels (generally cast in 2m depth panels top down) have been installed which span horizontally between the piles.

These infill panel locations may not be obvious after wall facings have been installed.

The new Gibbon Street Sewer Diversion is crossed using an in fill panel.

3.2.2.2 Works 6 Sewer Crossing

The piles above the Works 6 Sewer have a higher toe level than other wall areas to avoid a clash with the Sewer. The piled wall has a tunnel base slab prop in this location. Vertical load on the Sewer is minimised by not connecting the tunnel roof slab to the top of the piles and the use of a compressible filler to ensure no load transfer. The short piles require a prop at roof slab level in addition to the base slab level prop. Accordingly the roof slab in this area has a projection down into the tunnel, below top of pile level, which effectively allows the roof slab to act as a prop to the wall piles (Detail S5/019 and S10/019 on 67313-S-017-019).

3.2.3 Tunnel Approaches – General

The tunnel approaches (cuttings) are formed by a combination of:-

- Propped cantilever walls with discrete high level props at 10m centres approximately;
- Propped cantilever walls with invert level slab props; and
- Cantilever retaining walls.

P6 parapets are provided to all sections of the tunnel approaches.

3.2.4 Tunnel Approaches – Unusual Aspects

3.2.4.1 Stadium Station Stop

At the western end of the tunnel west approach provision for the future Stadium station stop has resulted in retaining walls of differing heights. The north wall (Outbound) retaining the Ashton Canal is taller than the south wall (Inbound).

The south wall is required to provide the reaction to the invert level slab which props the north wall. Any future excavation behind the south wall should consider the reduction in its capacity to resist the prop load and possible overstressing of the south wall piles.

The section of high level south wall between the low level piles at the Stadium Stop and Forge Lane Bridge has been designed to resist a maximum retained height as shown on the drawings (i.e. not the full height of the piles).

3.2.4.2 New Forge Lane Bridge

A new bridge has been provided over the tunnel western approach at Forge Lane. It is a pedestrian bridge with provision for some maintenance vehicle access,

details of load capacity can be found in the Arup Calculation Plan REP/S001 dated June 2002.

The new bridge deck sits on top of the approach retaining walls but it does not act as a prop to the walls. Hence the bridge deck could be removed with no adverse impact on the walls. If the bridge was removed the parapet would have to be made continuous.

The ownership of the bridge is being discussed.

A deep sewer runs under the line of Forge Lane, accordingly there are no piles over the sewer and infill panels have been provided (as 3.2.2.1).

In early reports and early design stages an invert slab prop under the New Forge Lane Bridge was considered, eventually this was not required.

3.2.4.3 Diaphragm Wall Panel 13

A non-conformance with the specification has resulted in the need to strengthen Panel 13 of the diaphragm wall. A pile was constructed in front of the panel and a base slab constructed monolithically from the pile to the upper part of Panel 13 to create an 'L' shaped wall. Accordingly this part of the structure does not behave in the same way as the rest of the diaphragm panels. Details are shown on Drawing No. 67313-S-29-050.

3.2.4.4 Non Conforming Piles

Where a pile did not conform with the specification a replacement pile has been installed behind the wall. The capping beam (on approaches) or roof slab (tunnel) has been widened to include the additional pile.

Issues of provision for maintenance access and land ownership need to be considered carefully in these locations.

3.2.4.5 Gravity Retaining Walls

Part of the west wall (inbound) to the east/south tunnel approach is a gravity retaining wall with no piles. (see drawing 67313-S-17-040 and Calculation Plan 67313/REP/S003).

3.3 Treatment of Shallow Mineworkings

The area of the Advanced Works tunnel and approaches have been treated to stabilise old shallow mineworkings. Areas under Alan Turing Way had been treated previously by works under taken by the Highway Authority.

Areas of stabilisation can be found in the following documents:-

- Drilitec Northern Report entitled "Metrolink Phase 3 Ground Stabilisation Grouting Report"
- The Specification for the Stabilisation Works can be found in Arup Specification "Metrolink Phase 3 – Preparatory (Advanced) Works – Alan Turing Way Grouting Specification dated July 2001 Ref. GEO/002.

The treatment areas include sections to the west of the Stadium Footbridge and to the south of the new Asda Wal Mart store on the A662 (Ashton New Road).

The desk study for mineworkings identified five possible mine shafts (F,G,H,I and J) in the area of influence of the Advanced Works.

During investigation and treatment only 3 of these shafts were found (F,G and I) in the zone of influence of the Advanced Works. Mine shafts H and J were never proved or located within the zone of influence (see Drilltec/IMC drawings 255/E SHAFT A3). Shafts F,G and I have been capped.

In addition to being unable to locate and cap mine shafts H & J an unexpected mine shaft, known as the "suspected" or "unrecorded mineshaft in Area 4", was identified north of Gibbon Street (see Drilitec/IMC drawing 255/E SHAFT A3). The unrecorded mine shaft has been capped.

The Stuart Street Tunnel (coal conveyor tunnel) has been grouted up beneath the Advanced Works route.

Some plans make reference to the Main North Cross Cut Tunnel, this is an extremely deep interconnecting tunnel between old coal mines which had no impact on the Advanced Works design.

3.4 Sewer Diversion Works

The Advanced Works Tunnel interrupted the line of a sewer running east to west in Gibbon Street which discharged to the deep sewer under Forge Lane. The invert level of the tunnel was below the invert of the Gibbon Street sewer.

A sewer diversion has been constructed by a pipe jack process to a level below the invert of the Advanced Works Tunnel.

This new diversion sewer has a direct connection to the deep Works 6 Sewer just to the west of the tunnel wall near the junction of Gibbon Street and Alan Turing Way.

The new sewer diversion will be adopted by United Utilities.

The new diversion sewer accepts discharges from existing developments and planned developments to the east of the Advanced Works tunnel at Alan Turing Way.

Details of the diversion can be found in the Amec/Donegan marked up versions of the following documents:-

- Drawing A2/144728/001
- Drawing A1/144728/002
- Drawing A1/144728/003

3.5 Utilities and Drainage

3.5.1 Utility and Drainage Diversions

Various utilities and drainage have been diverted or relocated as part of the Advanced Works. These are mainly at Forge Lane, Alan Turing Way and Gibbon Street. Up-to-date utility searches should be obtained for any future work in these areas. Details of the diversions carried out under the Advanced Works Contract are given in the following Amec documents:-

- Drawing 16511/001 to 16511/009

The Works 6 Sewer and the United Utilities (formerly Norweb) Cable tunnel (Quixhall Street Cable Tunnel – *Note : United Utilities often refer to this as the Stuart Street Tunnel which should not be confused with the old coal conveyor tunnel known locally as the Stuart Street Tunnel*) are of particular note in the area of the Advanced Works.

3.5.2 New Drainage

The tunnel and approaches have new drainage pipes located in the middle of the tunnel/approach invert. Two parallel pipes are provided to allow some redundancy after consideration of the access restrictions to the pipe locations. These central pipes accept discharges from wall drainage and future filter drains at track bed level.

3.5.3 Wall Drainage

Drainage provision behind and in the wall are complicated to describe. There are sections of wall where no drainage has been provided and water pressure designed for. There are sections where wall drainage is essential to reduce water pressure on wall facings. In these locations spare drain capacity has been incorporated to compensate for maintenance.

At certain locations a land drain has been provided at the back of the wall to control the level of a perched water table. This land drain will require maintenance.

3.6 Confirmation of design to meet the Disability Discrimination Act and associated access standards for people with disabilities

It should be noted that the Advanced Works are to be incorporated into the overall Metrolink Phase 3 works and as such a full assessment of the requirements for access should be carried out by the Concessionaire. In respect of emergency evacuation from the tunnel cross-section space for a de-trainment walkway has been allowed. The width of the walkway has been increased from a standard 700mm to 900mm to allow for wheelchair use.

4. RESIDUAL HAZARDS AND HOW THEY HAVE BEEN DEALT WITH:

4.1 Surveys and information concerning asbestos

The site investigations did not indicate the presence of asbestos in the area of the Advanced Works. During construction of the Advanced Works within limits of detection, no asbestos was uncovered.

4.2 Surveys and information concerning contaminated land

The site investigations (see 2.3.2) indicated various levels of contamination. During construction of the Advanced Works there were no unexpected contaminants. Future excavation works should proceed after consideration of the test results and appropriate measures identified.

Although not hazardous to health it is worth noting that stands of Japanese Knotweed were present on the site and adjacent sites which required special identification and removal measures.

4.3 Surveys and information concerning water bearing strata

Site investigations have identified ground water level prior to construction. Other than pile drilling records no ground water levels have been recorded.

There is no requirement to monitor groundwater levels post construction provided that drainage provisions remain functional.

4.4 Surveys and information concerning buried services

As built records of the buried services affected by the Advanced Works have been provided by Amec. (see 3.5).

Although it is to be adopted by United Utilities the Gibbon Street Sewer Diversion has a connection to the Works 6 Sewer which forms a constriction to the diversion. The possibility for blockages from debris collection and the limited access to unblock the diversion has been considered by United Utilities.

4.5 Other Hazards identified by the design team and any other parties

(CDM reports listed below can be found in Appendix A)

4.5.1 Buried Obstructions

Remnants of temporary works structures such as sheet piles, bored pile temporary bridge foundations and other obstructions have been recorded by Amec on drawings (see 3.5).

4.5.2 Allowable Surcharge Loading

CDM report 3 highlights the need to obtain engineering advice before surcharge loads are placed behind the retaining walls.

4.5.3 Migration of Mineworkings Gas

CDM report 6 identified the possibility of gas migration into the works due to disturbance and creation of possible pathways. Whilst gas monitoring during construction of the Advanced Works did not detect any gas GMPTE should consider gas monitoring and assessment of any continual risk.

4.5.4 Condition Monitoring

Hazards associated with degradation of adjacent structures have been managed by undertaking condition surveys. Future construction work activities should be aware of the following condition surveys by Michael Pooler Associates for Amec:-

1) Engineering Report 7513 – Sept 2002
2) Engineering Report 7513/9 – Ashton Canal Lock- 11/02/02
3) Engineering Report 7513/8A – Vibration monitoring lock keepers cottage – 05/02/02
4) Condition Survey/Structural Assessment – Ashton Canal – 26/07/01
5) Ashton Canal monitoring – Sept 2001 to Apr. 2002
6) Ashton Canal monitoring – Oct 2001 to Nov 2002
7) Ashton Canal monitoring – Sept 2001 to Jan 2002
8) Ashton Canal – Alan Turing Way October 2003

4.5.5 Mine Workings and Shafts

Within the area local to the Advanced Works there is a possibility of encountering the mineshafts not identified and capped during the Advanced works contract. This risk will change with the reduction of GMPTE land ownership area. GMPTE should ensure that risks are communicated to new landowners when areas of the Advanced Works site are disposed or transferred.

4.5.6 Damage to or Loss of Prop

The loss of a prop by accident has been considered and a scenario developed for temporary stability of the approach walls and prop replacement. This is contained in the latter attachment to CDM Report 13.

4.5.7 Wall Facing

Maintenance of the concrete wall facing (which will include replacement of joint sealant) should be rare but it may involve working at height.

4.5.8 Parapet Joint Sealant

The replacement of joint sealant on the track-side of the parapet will involve working at height near overhead line electrification equipment.

4.5.9 Mis-use of Advanced Works by Phase 3 Concessionaire

There is a hazard that the Advanced Works are misused if insufficient information is passed on to the concessionaire. GMPTE have prepared a package of handover information for concessionaire tenderers and will handover as built records, O&M manuals and reports to the concessionaire.

4.5.10 Replacement of Manhole MHTD001

If MHTD001 required replacement by excavation temporary propping of the walls should be considered.

4.5.11 Permanent Prop to 1200mm Piles at Works 6 Sewer

CDM report 28 identifies the requirement to consider the importance of the down-stand prop to the roof slab.

4.5.12 Metrolink Corridor Drainage Beneath Base Slab Props

CDM report 26 identifies considerations for maintaining or replacing the Metrolink corridor drainage beneath base slab props. There is as need to consider maintaining stability of the wall.

4.5.13 Forge Lane Bridge Bearings

The maintenance, inspection or replacement of the Forge Lane Bridge bearings has to be carried out from the track side. CDM report 27 identifies the considerations for safe access.

5. HAZARDS ASSOCIATED WITH MATERIALS USED

5.1 Hazardous substances

The only substances which may require consideration of COSHH aspects during replacement are :-

- Bridge deck water proofing systems
- Forge Lane bridge bearing epoxy mortar

5.2 Lead paint and special coatings which should not be burnt off

No paints have been used in the works which should not be burnt off.

6. THE NATURE, LOCATION AND MARKINGS OF SIGNIFICANT SERVICES, INCLUDING FIRE-FIGHTING SERVICES

6.1 Significant services

Other than drainage there are no services provided in the tunnel or approaches. Modifications to existing utilities and services are described in Section 3.5.

6.2 Fire Fighting Services

Two fire fighting hydrants have been provided under the contract near each tunnel portal in agreement with the Fire Service. They are shown on drawings listed in Section 3.5.

7. RELEVANT INFORMATION, DRAWINGS AND REPORTS

The following documents are currently are issued as at Construction Status. The list will be revised when As-Built packages have been confirmed.

Document Reference	Title	Revision/Issue	Originator
Reports			
67313/REP/S001	Calculation Plan	Draft 4	Arup
67313/REP/S002	Retaining Wall Calculation Plan		Arup
67313/REP/G001	Gravity Retaining Wall Calculation Plan	Issue 1	Arup
67313/REP/C001	Stage 1 – Design and Construction Brief	Draft 1	Arup
67313/REP/G001	Fire Safety Assessment	Draft 1	Arup
67313/REP/C002	Submission For Letter Of No Objection (Ch850 to Ch1550)	Issue 1	Arup
67313/REP/C003	Submission No 2 For Letter Of No Objection. Parapets / Prop Beams and Discrete (Below Rail) Slabs (Ch 975 to 1525)	Issue	Arup
Specifications			
67313/SPEC/G001	Grouting Specification	Issue	Arup
67313/SPEC/S002	Specification For Structural Concrete	Draft 1	Arup
	Sprayed Concrete Specification	B	
Approval In Principal			
67313/AIP/001	Gibbon Street - Bridge Specification	Draft 1	Arup
67313/AIP/002	Alan Turing Way - Service Tunnel AIP	Rev 1	Arup
67313/AIP/003	Forge Lane Bridge	Draft 1	Arup
Condition Surveys			
7513.A	Engineering Report – Ashton Canal – Alan Turing Way Oct 2003		Amec/Michael Pooler Assoc'tes
7513/9	Engineering Report– Ashton Canal Lock- 11/02/02		Amec/Michael Pooler Assoc'tes
7513/8.A	Engineering Report– Vibration monitoring lock keepers cottage – 19/08/03		Amec/Michael Pooler Assoc'tes
-	Condition Survey/Structural Assessment – Ashton Canal – 26/07/01		Amec/Michael Pooler Assoc'tes
-	Ashton Canal monitoring – Sept 2001 to Apr. 2002		Amec/Michael Pooler Assoc'tes
-	Ashton Canal monitoring – Oct 2001 to Nov 2002		Amec/Michael Pooler Assoc'tes
-	Ashton Canal monitoring – Sept 2001 to Jan 2002		Amec/Michael Pooler Assoc'tes

Document Reference	Title	Revision/Issue	Originator
QA Records			
16511	Amec Quality Assurance Records		Amec
Drawings			
67313-C-00-01	Scope of Advanced Work & Alignment Sheet 1 of 4	-	Arup
C-00-02	Scope of Advanced Work & Alignment Sheet 2 of 4		Arup
C-00-03	Scope of Advanced Work & Alignment Sheet 3 of 4	-	Arup
C-00-04	Scope of Advanced Work & Alignment Sheet 4 of 4		Arup
C-00-05	Location Plan	-	Arup
C-00-06	General Arrangement CH975 to 1400, Sheet 1 of 2	ASB/G	Amec
C-00-07	General Arrangement CH975 to 1400, Sheet 2 of 2	ASB/F	Amec
C-00-08	Turnback Option 1	-	Arup
C-00-09	Turnback Option 2	-	Arup
C-00-10	Turnback Option 3	-	Arup
C-00-11	Turnback Option 4		Arup
C-00-12	Location Plan – Showing Mineworkings	A	Arup
C-00-13	Metrolink Corridor & Proposed Sportcity Development Interaction, Sheet 1 of 3	-	Arup
C-00-14	Metrolink Corridor & Proposed Sportcity Development Interaction, Sheet 2 of 3	-	Arup
C-00-15	Metrolink Corridor & Proposed Sportcity Development Interaction, Sheet 3 of 3	-	Arup
C-00-16	Parapet Location CH 975 to 1400, Sheet 1 of 2	ASB/C	Amec
C-00-17	Parapet Location CH 1400 to 1525, Sheet 2 of 2	ASB/B	Amec
C-01-01	Traffic Management Phase 1	-	Arup
C-01-02	Traffic Management Phase 2	-	Arup
C-05-01	Sectionmarks for Services	-	Arup
C-05-02	Section Through Forge Lane Showing Existing Services	-	Arup
C-05-03	Section Through Alan Turing Way Showing Existing Services	-	Arup
C-05-04	Section Through Gibbon Street Showing Existing Services	-	Arup
C-05-05	Gibbon Street Proposed Structure Cross-Section Showing MP Gas Main	-	Arup
C-05-06	Scheme Drainage	C3	Arup
C-05-07	Proposed Drainage Abandonments &	-	Arup

Document Reference	Title	Revision/Issue	Originator
	Connection		
C-05-08	Track Drainage Manhole Schedule and Details	C3	Arup
C-05-09	PC Concrete Manhole >3m Cover Details	C1	Arup
C-06-01	Shaft Locations	-	Arup
C-06-02	Proposed Mine Seam Treatment & Location of Stuart street Tunnel	A	Arup
C-06-03	Typical Detail (Mineworkings & Mineshafts)	-	Arup
C-07-01	Permanent Way Alignment & Longitudinal Profile Outbound Track, Sheet 1 of 3	-	Arup
C-07-02	Permanent Way Alignment & Longitudinal Profile Outbound Track, Sheet 2 of 3	-	Arup
C-07-03	Permanent Way Alignment & Longitudinal Profile Outbound Track, Sheet 3 of 3	-	Arup
C-07-04	Cross Sections Sheet 1 of 2	C	Arup
C-07-05	Cross Sections Sheet 2 of 2	A	Arup
C-07-06	Cross Sections @ 20m Intervals Along Outbound Track (1310-1490) Sheet 1 of 3 (Indicative)	-	Arup
C-07-07	Cross Sections @ 20m Intervals Along Outbound Track (1310-1490) Sheet 2 of 3 (Indicative)	-	Arup
67313-C-07-08	Cross Sections @ 20m Intervals Along Outbound Track (1310-1490) Sheet 3 of 3 (Indicative)	A	Arup
C-07-09	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 2, Sheet 1 of 3	B	Arup
C-07-10	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 2, Sheet 2 of 3	C	Arup
C-07-11	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 2, Sheet 3 of 3	C	Arup
C-07-12	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 1, Sheet 1 of 3	-	Arup
C-07-13	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 1, Sheet 2 of 3	-	Arup
C-07-14	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 1, Sheet 3 of 3	-	Arup
C-07-15	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 1 of 5 (Indicative)	A	Arup
C-07-16	Cross Section @ 20m Intervals Along	-	Arup

Document Reference	Title	Revision/Issue	Originator
	Outbound Track (1500-1740), Sheet 2 of 5 (Indicative)		
C-07-17	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 3 of 5 (Indicative)	-	Arup
C-07-18	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 4 of 5 (Indicative)	-	Arup
C-07-19	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 5 of 5 (Indicative)	-	Arup
C-07-20	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 1 of 5 (Indicative)	-	Arup
C-07-21	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 2 of 5 (Indicative)	-	Arup
C-07-22	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 3 of 5 (Indicative)	-	Arup
C-07-23	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 4 of 5 (Indicative)	-	Arup
C-07-24	Cross Section @ 20m Intervals Along Outbound Track (1500-1740), Sheet 5 of 5 (Indicative)	-	Arup
C-07-25	Tunnel Cross Sections Chainages 1160 to 1310 (Indicative), Sheet 1 of 4	-	Arup
C-07-26	Tunnel Cross Sections Chainages 1160 to 1310 (Indicative), Sheet 2 of 4	-	Arup
C-07-27	Tunnel Cross Sections Chainages 1160 to 1310 (Indicative), Sheet 3 of 4	-	Arup
C-07-28	Tunnel Cross Sections Chainages 1160 to 1310 (Indicative), Sheet 4 of 4	-	Arup
C-07-29	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 2, Sheet 4 of 5	B	Arup
C-07-30	Permanent Way Alignment & Longitudinal Profile Outbound Track – Option 2, Sheet 5 of 5	B	Arup
C-07-33	Earthworks Longsections Along Outbound Track	-	Arup
C-09-01	Proposed Forge Lane Bridge	A	Arup
S-16-006	Retaining Wall Setting Out Outbound CH. 980-1040, Sheet 1 of 9	ASB/5	Amec
S-16-007	Retaining Wall Setting Out Outbound CH. 1040-1100, Sheet 2 of 9	ASB/5	Amec
S-16-008	Retaining Wall Setting Out Outbound CH. 1100-1160, Sheet 3 of 9	ASB/5	Amec
S-16-009	Retaining Wall Setting Out Outbound CH. 1160-1220, Sheet 4 of 9	ASB/8	Amec
S-16-010	Retaining Wall Setting Out Outbound	ASB/9	Amec

Document Reference	Title	Revision/Issue	Originator
	CH. 1220-1280, Sheet 5 of 9		
S-16-011	Retaining Wall Setting Out Outbound CH. 1280-1340, Sheet 6 of 9	ASB/6	Amec
S-16-012	Retaining Wall Setting Out Outbound CH. 1340-1400, Sheet 7 of 9	ASB/5	Amec
S-16-013	Retaining Wall Setting Out Outbound CH. 1400-1460, Sheet 8 of 9	ASB/5	Amec
S-16-014	Retaining Wall Setting Out Outbound CH. 1460-1525, Sheet 9 of 9	ASB/5	Amec
S-16-020	Pile Wall Elevation Outbound CH. 950-1530	-	Arup
S-16-021	Pile Wall Elevation Inbound CH. 950-1530	-	Arup
S-16-022	Tunnel Entrance Wing Walls Replacement Piles	-	Arup
S-17-001	Location of Forge Bridge Lane	A	Arup
S-17-002	Typical Tunnel & Bridge Deck Section	-	Arup
S-17-003	Pile Capping Beam & Prop Typical Detail	-	Arup
S-17-004	Brick Cladding Details	-	Arup
S-17-005	Forge Lane Bridge Section	-	Arup
S-17-006	General Arrangement Outbound CH. 980-1040, Sheet 1 of 9	ASB/5	Amec
S-17-007	General Arrangement Outbound CH. 1040-1100, Sheet 2 of 9	ASB/5	Amec
S-17-008	General Arrangement Outbound CH. 1100-1160, Sheet 3 of 0	ASB/9	Amec
S-17-009	General Arrangement Outbound CH. 1160-1220, Sheet 4 of 9	ASB/7	Amec
S-17-010	General Arrangement Outbound CH. 1220-1280, Sheet 5 of 9	ASB/6	Amec
S-17-011	General Arrangement Outbound CH. 1280-1340, Sheet 6 of 9	ASB/5	Amec
S-17-012	General Arrangement Outbound CH. 1340-1400, Sheet 7 of 9	ASB/5	Amec
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S-17-014	General Arrangement Outbound CH. 1460-1525, Sheet 9 of 9	ASB/5	Amec
S-17-015	General Arrangement Bridge	ASB/3	Amec
S-17-016	General Arrangement Gibbon Street Crossing	ASB/6	Amec
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S-17-018	General Sections, Sheet 2 of 5	ASB/6	Amec
S-17-019	General Sections, Sheet 3 of 5	ASB/6	Amec
S-17-020	General Sections, Sheet 4 of 5	ASB/5	Amec
S-17-021	General Sections, Sheet 5 of 5	ASB	Amec
S-17-025	Base Slab Outbound CH. 980-1040 Sheet 1 of 4	ASB/2	Amec
S-17-026	Base Slab Outbound CH. 1062-1085 Sheet 2 of 4	ASB/2	Amec

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S-17-027	Base Slab Outbound CH. 1208-1238 Sheet 3 of 4	ASB/3	Amec
S-17-028	Base Slab Outbound CH. 1415-1440 Sheet 4 of 4	ASB/2	Amec
S-17-040	Foundations Outbound CH. 1440-1525	ASB/2	Amec
67313-S-17-050	PC Prop Details	ASB/4	Amec
S-17-060	Outbound Parapet Elevations Ch 1310.00 – 1525.00	ASB/6	Amec
S-17-061	Inbound Parapet Elevations Ch 1310.00 – 1525.00	ASB/6	Amec
S-17-062	Parapet Types, Sheet 1	ASB/8	Amec
S-17-063	Parapet Types, Sheet 2	ASB/8	Amec
S-17-064	Parapet Layout & Details at Fire Access	ASB/5	Amec
S-17-065	Outbound Parapet Elevations CH 980 to CH1161	ASB/4	Amec
S-17-066	Inbound Parapet Elevation CH1040 to Ch 1162	ASB/6	Amec
S-17-067	Parapet Layout and Details at Fire Access	ASB/5	Amec
S-17-068	Parapet Layout and Details at Parapet Returns	C4	Arup
S-17-069	Parapet Types Sheet 3	ASC/4	Amec
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S-17-101	Outbound Elevation Sheet 2 of 2	ASB/2	Amec
S-17-102	Inbound Elevation Sheet 1 of 2	ASB/2	Amec
S-17-103	Inbound Elevation Sheet 2 of 2	ASB/2	Amec
S-17-104	Tunnel Entrance Portal Plan & Elevation Outbound Chainage 1160	ASB/3	Amec
S-17-105	Tunnel Entrance Portal Plan & Elevation Outbound Chainage 1310	ASB/2	Amec
S-17-110	Facing Concrete Typical Elevation Inbound CH. 1058m – 1160m	C1	Amec
S-17-111	Facing Concrete Typical Elevation (Piles) Outbound CH. 1310m – 1525m	ASB/2	Amec
S-17-112	Facing Concrete Typical Elevation (diaphragm) Outbound CH. 1058m – 1170m	C1	Arup
S-17-113	Facing Concrete Typical Elevation Panels	ASB/2	Amec
S-17-120	Sprayed Concrete Wall Facing Details	G	Arup
S-17-121	Fire Access Stair Foundation General Arrangement	O	Arup
S-29-001	Reinforcement Key Plan Capping Beams Ch. 1 + 310 to Ch. 1 + 525	C9	Arup
S-29-002	Reinforcement Details Capping Beam Ch. 1 + 310 to Ch. 1 + 420 sheet 1 incl. Sched.	C3	Arup
S-29-003	Reinforcement Details Capping Beam Ch. 1 + 310 to Ch. 1 + 420 sheet 2 incl. Sched.	C3	Arup
S-29-004	Reinforcement Details Capping Beam	C3	Arup

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	Ch. 1 + 310 to Ch. 1 + 420 sheet 3 incl. Sched.		
S-29-005	Reinforcement Details Capping Beam Ch. 1 + 310 to Ch. 1 + 420 sheet 4 incl. Sched.	C2	Arup
S-29-006	Reinforcement Details Capping Beam Ch. 1 + 420 to Ch. 1 + 525 sheet 4 incl. Sched.	C4	Arup
S-29-007	Reinforcement Details Capping Beam Ch. 1 + 420 to Ch. 1 + 525 sheet 4 incl. Sched.	C2	Arup
S-29-008	Reinforcement Details Foundation Beams Ch. 1 + 440 to Ch. 1 + 525 incl. Sched.	C2	Arup
S-29-009	Reinforcement Details Capping Beam Ch. 1 + 420 to Ch. 1 + 525 sheet 4 incl. Sched.	C2	Arup
S-29-010	Contiguous Bored Pile Wall Ch. 1 + 162 to works 6 sewer crossing RC details to 1200 dia piles.	C1	Arup
S-29-011	Reinforcement Details Tunnel Slab Ch. 1162 – 1254 sheet 1	C1	Arup
S-29-012	Reinforcement Details Tunnel Slab Ch. 1162 – 1254 sheet 2	C2	Arup
S-29-013	Reinforcement Details Tunnel Slab Ch. 1162 – 1254 sheet 3	C2	Arup
S-29-014	Reinforcement Details Tunnel Slab Ch. 1162 – 1254 sheet 4	C1	Arup
S-29-015	Reinforcement Details Tunnel Slab Ch. 1254 - 1310 sheet 2	C2	Arup
S-29-016	Reinforcement Details Tunnel Slab Ch. 1254 - 1310 sheet 2	C2	Arup
S-29-018	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 16	C1	Arup
S-29-019	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 15	C1	Arup
S-29-020	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 1	C2	Arup
S-29-021	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 2	C3	Arup
S-29-022	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 3	C2	Arup
S-29-023	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 4	C2	Arup
S-29-024	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 5	C3	Arup
S-29-025	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 6	C3	Arup
S-29-026	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 7	C1	Arup
S-29-027	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 8	C1	Arup

Document Reference	Title	Revision/Issue	Originator
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S-29-029	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 10	C2	Arup
S-29-030	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 11	C1	Arup
S-29-031	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 12	C1	Arup
S-29-032	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 13	C1	Arup
S-29-033	Reinforcement Details Capping Beam Ch. 975 - 1162 sheet 14	C1	Arup
S-29-034	Reinforcement Details Capping Beam ch. 1420 – 1525	C1	Arup
S-29-035	Reinforcement Details Base Prop Slabs Sheet 1	C1	Arup
S-29-036	Reinforcement Details Base Prop Slabs Sheet 2	C2	Arup
S-29-040	Reinforcement Details Forge Lane Bridge Deck Sheet 1	C2	Arup
S-29-041	Reinforcement Details Forge Lane Bridge Deck Sheet 2	C1	Arup
S-29-042	Reinforcement Details Forge Lane Bridge Deck Sheet 3	C1	Arup
S-29-045	Reinforcement Details Infill Panels Sheet 1	C1	Arup
S-29-046	Reinforcement Details Infill Panels Sheet 2	C2	Arup
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S-29-048	Reinforcement Details Infill Panels Sheet 4	C2	Arup
S-29-050	Panel 13 Replacement	C1	Arup
S-29-070	Contig Bored Pile Wall Ch 1162 to Works 6 Sewer Crossing RC Details to 1200 dia Piles	C2	Arup
S-29-071	Contig Bored Pile Wall Works 6 Sewer Reinforcement Details	C1	Arup
S-29-080	Reinforcement Details Slabs S1 and S2	O	Arup
G-SK-00	Typical Details (Minworkings and Mineshafts)	O	Arup
A2/144728/001	Proposed Gibbon Street Sewers Diversion General Layout		Amec/Donegan
A1/144728/002	Plan & Long Section Shaft 1 – Work 6 Sewer		Amec/Donegan
A1/144728/003	Shaft 1		Amec/Donegan
16511/001	Buried Obstructions Sheet 1 of 9		Amec
16511/002	Buried Obstructions Sheet 2 of 9		Amec
16511/003	Buried Obstructions Sheet 3 of 9		Amec
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16511/005	Buried Obstructions Sheet 5 of 9		Amec
16511/006	Buried Obstructions Sheet 6 of 9		Amec
16511/007	Buried Obstructions Sheet 7 of 9		Amec
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18116/001	Reinforcement Details For Contiguous Pilled Wall, Chainage 1254 to 1415, Sheet 1 of 3	F	Amec
18116/002	Reinforcement Details For Contiguous Pilled Wall, Chainage 1415 to 1525, Sheet 2 of 3	E	Amec
18116/003	Reinforcement Details For Contiguous Pilled Wall, Chainage 975 to 1085, Sheet 3 of 3	E	Amec
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18116/005	Reinforcement Details for Forge Lane Service Crossings	C4	Amec
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18116/201	Diaphragm Wall Reinforcement Primary Panel Type 1 Chainage 0+975 to 1+028	C1	Amec
18116/202	Diaphragm Wall Reinforcement Closing Panel Type 1 Chainage 0+975 to 1+028	C1	Amec
18116/203	Diaphragm Wall Reinforcement Primary Panel Type 2 Chainage 1+040 to 1+045	C1	Amec
18116/204	Diaphragm Wall Reinforcement Closing Panel Type 2 Chainage 1+033 to 1+052	C1	Amec
18116/205	Diaphragm Wall Reinforcement Primary Panel Type 3 Chainage 1+028 to 1+034	C1	Amec
18116/206	Diaphragm Wall Reinforcement Closing Panel Type 3 Chainage 1+072 to 1+138	C1	Amec
18116/207	Diaphragm Wall Reinforcement Primary Panel Type 4 Chainage 1+080 to 1+132	C1	Amec
18116/210	Diaphragm Wall Reinforcement Closing Panel Type 5B Chainage 1+138 to 1+164	C1	Amec
18116/211	Diaphragm Wall Reinforcement Closing Panel Type 5C Chainage 1+140 to 1+159	C1	Amec
18116/213	Diaphragm Wall Reinforcement Primary Panel Type 4A Chainage 1+052 to 1+057	C1	Amec
18116/214	Diaphragm Wall Reinforcement Closing Panel Type 4B Chainage 1+028 to 1+057	C1	Amec
18116/215	Reinforcement Details For 1m Thick Diaphragm Wall Panel 34P-OB	E	Amec
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18116/218	RC Columns to Temporary Foot Bridge	C1	Amec
18116/219	Reinforcement Details For 1m Thick Diaphragm Wall Panel 33P-OB	B	Amec
18116/223	Diaphragm Wall Reinforcement Closing	C1	Amec

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	Panel Type 32C-OB		
18116/224	Reinforcement Details For 1m Thick Diaphragm Wall Panel 31P-OB	C1	Amec
18116/225	Diaphragm Wall Reinforcement Closing Panel Type 30C-OB	C1	Amec
18116/226	Reinforcement Details For 1m Thick Diaphragm Wall Panel 29P-OB	C1	Amec
18116/227	Diaphragm Wall Reinforcement Closing Panel Type 4 Panel 16C-OB 30C-OB	C1	Amec
18116/228	Diaphragm Wall Reinforcement Closing Panel Type 4 Panel 15C-OB 30C-OB	C1	Amec
CSK/070	Capping Beam Test Point Location Plan	-	Arup
CSK/071	Elevation 1-1 as Ch. 1 + 415m	-	Arup
CSK/072	Detail 1 at Ch. 1 + 415m	-	Arup
CSK/073	Section Through Capping Beam at Ch. 1 + 310m	-	Arup
CSK/074	Detail 2 at Ch. 1 + 310	-	Arup
CSK/075	Detail 3 – Cable Connection to Rebar	-	Arup

Appendix A CDM Reports

ARUP

CDM Report

Project Metrolink Phase 3 – Advance Works (ATW)	Job number 67313
Design stage FEASIBILITY CONCEPT SCHEME DETAILED DESIGN ✓ OTHER	CDM Report Ref 3

Topic

Allowable limits on proximity of plant to walls and allowable surcharge loading.

Comments/Associated hazards

If construction plant loadings exceed design loadings, the retaining walls and roof slabs could fail/move with the potential to cause damage, disrupt working, induce objects to fall from height into excavation and more importantly, to cause plant/equipment to become unstable and topple over.
The wall will be subject to changing excavation levels and differing plant loadings whilst unpropped and propped.

Were / Are there any design alternatives with less serious or fewer hazards, to eliminate or reduce risks ?

Were / Are the risks arising from a hazard dependent on alternative methods, locations, or timing ?

If required, record the decision making, and associated risk assessment (eg: Form F41.3 or F41.4)

Assumptions and implications

Assumption is that temporary loads will not exceed design loads listed in the Arup Calculation Plan.
Overloading of wall leading to loss of support and plant instability.
The allowable loading prior to prop installation will be different to the allowable loading after prop installation. The allowable loading will vary with excavated depth in front of the wall.

Residual risks that a competent contractor and/or designer needs to be told about

Abnormal plant loads to be submitted to the ~~engineer~~ CONTRACTOR for checking against design.

Date [redacted] Made [redacted] Ch [redacted]

Verified by [redacted] (Arup Project Manager) Date 23/8/01

Copied to [redacted] (Planning Supervisor) Date 20/8/01

ARUP

CDM Report

Project Metrolink Phase 3 – Advance Works (ATW)	Job number 67313
Design stage FEASIBILITY CONCEPT SCHEME DETAILED DESIGN ✓ OTHER	CDM Report Ref 13

Topic

Damage to permanent props during construction. (Leading to extra load transfer onto adjacent structure, with possibility that structure is then beyond servicability and/or limit states).

Comments/Associated hazards

Failure of wall, collapse of excavation, earth falling onto works. Prop falling onto workers during damage/impact event.
Loss of support to plants equipment at top of wall – toppling.
Complicated operation of trying to reinstall a prop after loss.
It is not economically possible to design the walls without top props (i.e. freestanding). Base props are possible, but they would necessitate the use of temporary high level props and additional hazards.

Were / Are there any design alternatives with less serious or fewer hazards, to eliminate or reduce risks ?

Were / Are the risks arising from a hazard dependent on alternative methods, locations, or timing ?

If required, record the decision making, and associated risk assessment (eg: Form F41.3 or F41.4)

Assumptions and implications

The robustness of the structure in the permanent works has been examined. The loss of a prop will cause the capping beam to deflect excessively, transferring load onto adjacent piles causing piles to deflect excessively. Progressive collapse is not expected.
This philosophy will hold true for the construction case, although it must be recognised that the risk of prop damage is higher during construction.

Residual risks that a competent contractor and/or designer needs to be told about

Potential loss of support to top of wall.
Difficult replacement activities.

[redacted]

[redacted]

[redacted]

ARUP

CDM Report

Project Metrolink Phase 3 – Advance Works (ATW)	Job number 67313
Design stage FEASIBILITY CONCEPT SCHEME DETAILED DESIGN ☑ OTHER	CDM Report Ref 13 (A) Revised 31/5/02 Page 1 of 3

Topic

Damage to permanent props during construction. (Leading to extra load transfer onto adjacent structure, with possibility that structure is then beyond servicability and/or limit states).

Comments/Associated hazards

Failure of wall, collapse of excavation, earth falling onto works. Prop falling onto workers during damage/impact event.
Loss of support to plants equipment at top of wall – toppling.
Complicated operation of trying to reinstall a prop after loss.
It is not economically possible to design the walls without top props (i.e. freestanding). Base props are possible, but they would necessitate the use of temporary high level props and additional hazards.

Were / Are there any design alternatives with less serious or fewer hazards, to eliminate or reduce risks ?

Were / Are the risks arising from a hazard dependent on alternative methods, locations, or timing ?

If required, record the decision making, and associated risk assessment (eg. . Form F41.3 or F41.4)

Assumptions and implications

The robustness of the structure in the permanent works has been examined. The loss of a prop will cause the capping beam to deflect excessively, transferring load onto adjacent piles causing piles to deflect excessively. Progressive collapse is not expected.
This philosophy will hold true for the construction case, although it must be recognised that the risk of prop damage is higher during construction.

Residual risks that a competent contractor and/or designer needs to be told about

Potential loss of support to top of wall.
Difficult replacement activities.
Refer to Arup letter to AMEC CAPITAL PROJECTS dated 15/03/02 (copy enclosed)

Date 31/05/02	Made by MRK	Checked by

Verifie [redacted] (Arup Project Manager) Date 31/05/02

Coplec (Planning Supervisor) Date 5/6/02

CDM Report 13 (cont'd) Page 2 of 3

Our ref 67313
File ref 7-01-01
Date 15 March 2002

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Mr S Clarkson
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MANCHESTER
M11 4BD.

Dear Mr Clarkson

Metrolink Phase 3 - Advanced Works ; Alan Turing Way.
Accidental Collapse of Piled Walls arising from the loss of (Overhead) Precast r.c. Prop Beam(s).

Whilst not expressly outlined within the Project Brief, I have considered it necessary to ensure that a review and assessment of the accidental collapse of Piled Walls has been completed as part of this Advanced Works Project.
(Overhead) Prop beams are being utilised in a fundamental manner in order to provide active support to installed Piled Walls.
Accidental collapse of these Piled Walls could occur from the future impact of operational Metrolink vehicles in the corridor between walls, and below the overhead Precast reinforced concrete prop beams (which are spaced at intervals of not less than ten metres). Such impact may result in the deflection of one tram up onto the top of another tram, and in the process result in the removal of one prop beam – albeit that it is likely that the statistical probability of such an event occurring is very small.

On the basis that only one Prop beam is removed, it is considered that this will not trigger the subsequent collapse of Piled Walls (forming the below ground Metrolink corridor), on the strict proviso that a Temporary (Replacement) Prop is installed as soon as possible after any such accident/incident, AND WITHIN A PERIOD NOT GREATER THAN TWENTY FOUR HOURS.
Temporary (Replacement) Prop Beam(s) will be required to act at a Working Load of 550kN/m over a maximum length of some 14 metres (near to the New Forge Lane Bridge).

Should a major accident/incident result in the removal of more than one, permanent, Prop Beam it remains unlikely that the Piled Walls forming the Metrolink corridor will collapse instantaneously.
However, whilst it has not been assessed, it is considered likely that such an accident/incident will have detrimental effects upon the Piled Walls within a period LESS than twenty four hours after the accident/incident, and, hence the provision of Temporary (Replacement) Prop Beams as soon as possible shall be imperative.

The potential for catastrophic events, including terrorism, resulting in the removal of several Prop Beams has not been considered to be within the scope of the Project Development Brief

I hope this information is adequate for the purpose of all parties, and confirm that such information will be included within the Project Health and Safety File.

../2

Ove Arup & Partners International Ltd
Registered in England Number 952468
13 Fitzroy Street London W1T 4BQ

CDM Report 13 (cont'd) pg 3 of 3

Yours sincerely

Mark Kay
Project Manager

cc Mr C Haworth / Mr C Humphreys
GMPTE Metrolink
6 th Floor
9 Portland Street
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M60 1HX.

Mr A Brookes
Amec Capital Projects
Leonard Fairclough House
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Mr P Gallagher
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c/0 Amec Site Offices
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Mr A Turner / Mr A Armstrong
ARUP Campus

ARUP

CDM Report

Project Metrolink Phase III Advanced Works (ATW)	Job number 67313
Design stage FEASIBILITY CONCEPT SCHEME DETAILED DESIGN ✓ OTHER	CDM Report Ref 0026

Topic

Replacement of Metrolink Corridor drainage beneath base prop slabs.

Comments/Associated hazards

Excessive wall movement/failure of contiguous piled/diaphragm panel walls due to loss of support. Potential coincidental ingress of water into corridor, where walls are propped with a base slab in the vicinity of the canal.

Were / Are there any design alternatives with less serious or fewer hazards, to eliminate or reduce risks ?

Were / Are the risks arising from a hazard dependent on alternative methods, locations, or timing ?

If required, record the decision making, and associated risk assessment (eg: Form F41.3 or F41.4)

Assumptions and implications

Fifty percent extra drainage capacity has been provided beneath all base prop slabs, by the provision of two pipes to minimise maintenance requirement.

Residual risks that a competent contractor and/or designer needs to be told about

Temporary props must be installed to maintain stability of contiguous pile/diaphragm walls, before undertaking any break out of base slabs to repace drainage.

Date	Made by	[redacted]
1st February 2002	VJE	

Verified by [redacted] (Arup Project Manager) Date 5/6/02

Copied to [redacted] (Planning Supervisor) Date 5/6/02.

ARUP

CDM Report

Project Metrolink Phase III Advanced Works (ATW)	Job number 67313
Design stage FEASIBILITY CONCEPT SCHEME DETAILED DESIGN ✓ OTHER	CDM Report Ref 0027

Topic

Forge Lane Bridge Bearings.

Comments/Associated hazards

Forge Lane Bridge Bearings may require maintenance/replacement during the 120 year design life of the structure.

HAZARDS
- Working near operating Trams
- Electrocution from overhead Electricity Lines.

Were / Are there any design alternatives with less serious or fewer hazards, to eliminate or reduce risks ?

Were / Are the risks arising from a hazard dependent on alternative methods, locations, or timing ?

If required, record the decision making, and associated risk assessment (eg: Form F41.3 or F41.4)

Assumptions and implications

Maintenance of Forge Lane Bridge bearings to be undertaken when the Metrolink is not operational. Elastomeric bridge bearings have been specified, because of their recognised reduced maintenance requirements. All bearings sit on concrete plinths, which can be 'pecked-out' to allow bearing replacement. A 200mm gap between the bridge soffit and abutment has to be left to allow jacking of the deck if necessary in the future.

Residual risks that a competent contractor and/or designer needs to be told about

None.
Electrocution or impact with tram if bearing replacement is not carried out during power shutdown and possessions.

Date	Made by	Checked by
1st February 200	[redacted]JE	

Verified by [redacted] (Arup Project Manager) Date 30/05/02.

Copied to (Planning Supervisor) Date 5/6/02

ARUP

CDM Report

Project Metrolink Phase III Advanced Works (ATW)	Job number 67313
Design stage FEASIBILITY CONCEPT SCHEME DETAILED DESIGN ✓ OTHER	CDM Report Ref 0028

Topic

Provision of permanent prop to 1200 piles forming infill at the work 6 sewer.

Comments/Associated hazards

1200 piles work 6 sewer will bear onto a permanent downstand from the tunnel roof slab.

Potential for excessive movement of piles and facing if prop is lost and if excavation is completed before concrete gains full strength.

Were / Are there any design alternatives with less serious or fewer hazards, to eliminate or reduce risks ?

Were / Are the risks arising from a hazard dependent on alternative methods, locations, or timing ?

If required, record the decision making, and associated risk assessment (eg: Form F41.3 or F41.4)

Assumptions and Implications

Permanent prop will be cast with tunnel roof slab, and thereby be in place prior to excavation and loading of piles. Potential loss of prop could be as a result of future maintenance.

Residual risks that a competent contractor and/or designer needs to be told about

Contractor not to excavate tunnel until concrete has reached 28 day strength.

Communicate structural importance of prop to Phase III concessionaire.

Date	Made by	Checked by
1st February 2002	VJE	

Verified by [redacted] (Arup Project Manager) Date 31/05/02

Copied to (Planning Supervisor) Date 5/6/02

Working safely near Metrolink

January 2024
Version 1



Transport for
Greater Manchester

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Introduction

This document has been produced to provide information to aid the understanding of what and who Metrolink are and what may be expected of you when working or developing near Metrolink.

Metrolink is the light rapid transit or tram network in Greater Manchester that is owned by Transport for Greater Manchester (TfGM) but is operated and maintained by Keolis Amey Metrolink (KAM).

While TfGM remains the asset owner of all Metrolink infrastructure, KAM looks after the network on a day-to-day basis and will need to be engaged when works are planned near lines, stops and depots.

Metrolink operates either in a street running environment or in segregated sections and the requirements and authorisations required for undertaking construction and/or maintenance works will differ depending on which situation applies.

In street running sections you will need to consider the Electrical Hazard Zone and the Metrolink Exclusion Zone around overhead line poles shown in Diagrams **M1** and **M3** respectively.

Where Metrolink operates in segregated sections the Metrolink Exclusion Zone, that also includes the Electrical Hazard Zone, will apply. This is shown in Diagram **M2**.

In addition to the overhead power lines and the trams moving around the network Metrolink has other infrastructure which can be seen above ground, but there is also equipment that is below ground and cannot be seen.

This includes drainage infrastructure and chambers and ducts carrying power and telecommunications. All of these elements need to be considered when developing or working near Metrolink

Common construction scenarios start on page 11. If you have further enquiries please get in touch using the contact details on page 28.

Metrolink Electrical Hazard Zone

The Metrolink tram network is powered by overhead power lines (OLE). These operate at 750 volts (DC) and are generally over 5 metres (around 18 feet) above the tracks.

These do not pose a danger to pedestrians and motorists at ground level or to those living and working in the vicinity of the tramway.

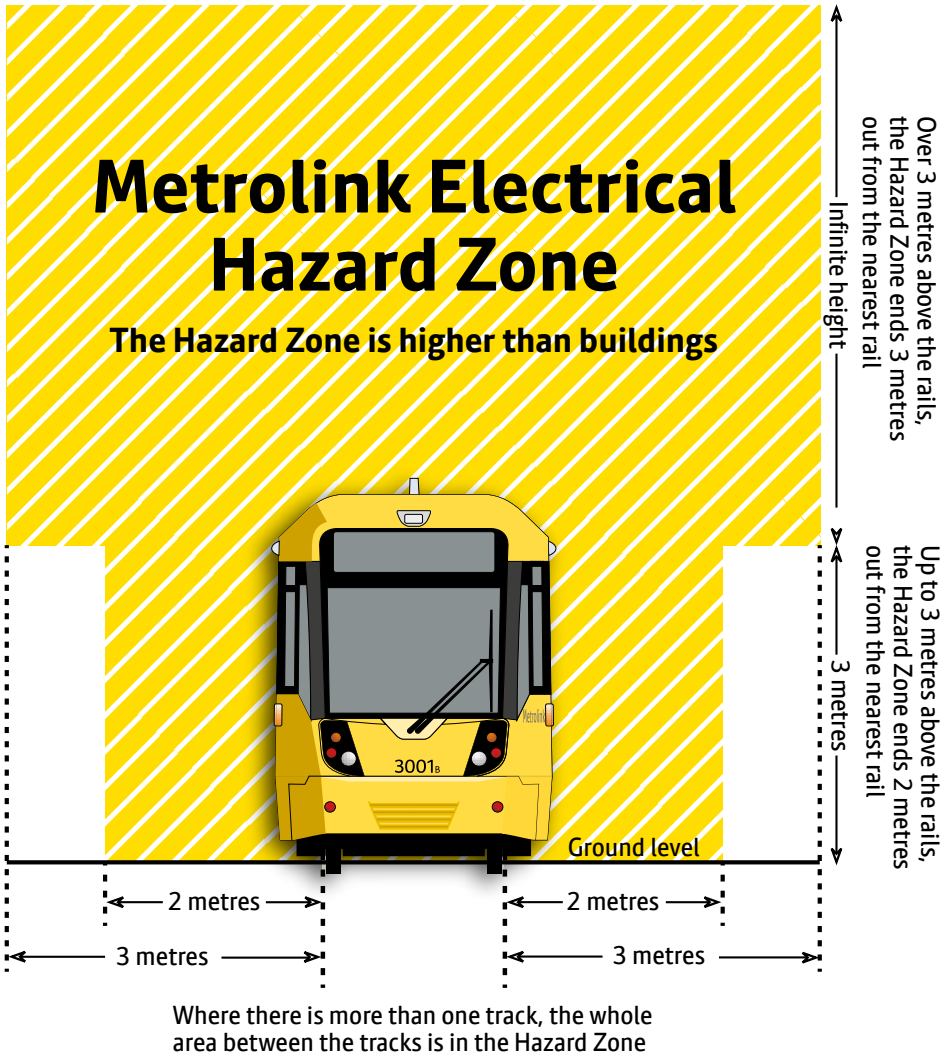
However, when working in the vicinity the potential hazards associated with working close to the overhead power lines needs to be taken seriously. We want you to stay safe near Metrolink.

The Metrolink Electrical Hazard Zone, as shown in Diagram **M1** on the next page, applies generally to street running sections.

No person shall enter this zone to undertake works or carry or operate any equipment that has potential to enter the zone without authorisation from Metrolink.

Diagram M1 – Metrolink Electrical Hazard Zone

Usually applicable in street running sections



Where there is more than one track, the whole area between the tracks is in the Hazard Zone

Metrolink Exclusion Zone

In addition to the Electrical Hazard Zone there are other areas that you must not work within unless you have authorisation, in combination these are defined as exclusion zones.

Street running

When trams are operating within a street environment the Metrolink Exclusion Zone includes the Electrical Hazard Zone as shown in Diagram **M1** in addition to the individual exclusion zones around overhead line equipment, as shown in Diagram **M2**. Note: the same 3 metre clearance applies to cables fixed to buildings.

Segregated

Where trams are not operating within a street environment the Metrolink Exclusion Zone is the area between the operational boundaries. This includes the Electrical Hazard Zone as shown in Diagram **M3**.

You must not enter the Metrolink Exclusion Zone to undertake works, or carry or operate any equipment that has potential to enter the Exclusion Zone, without authorisation from Metrolink.

Diagram M2 – Metrolink Exclusion Zone around overhead line poles

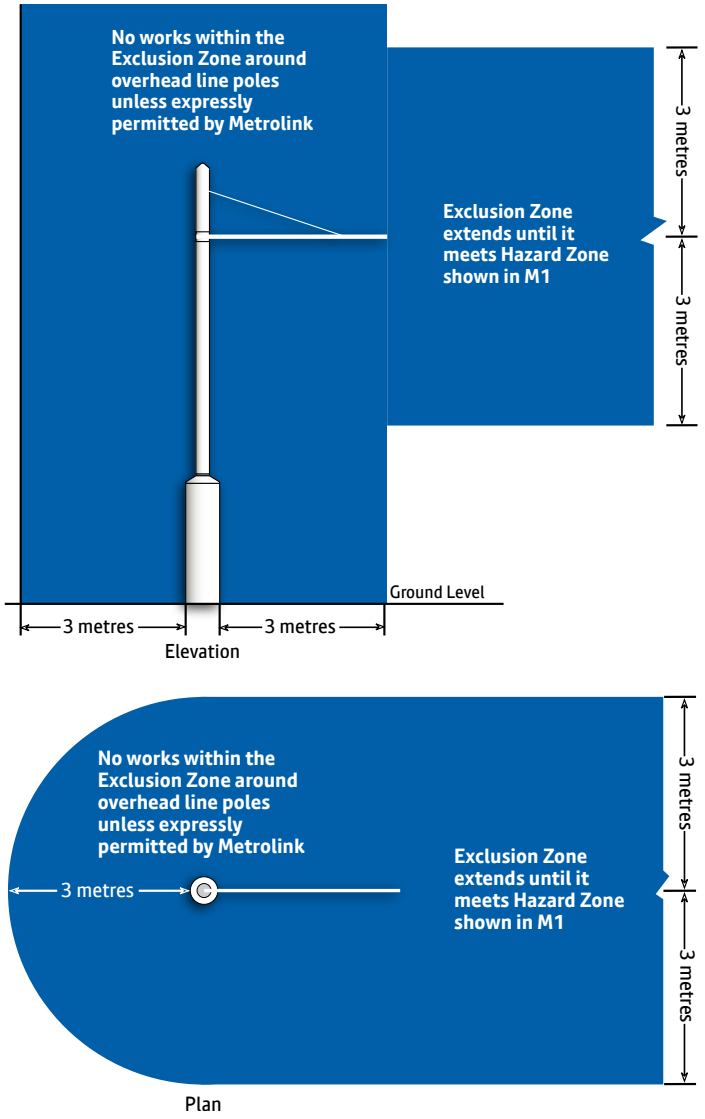
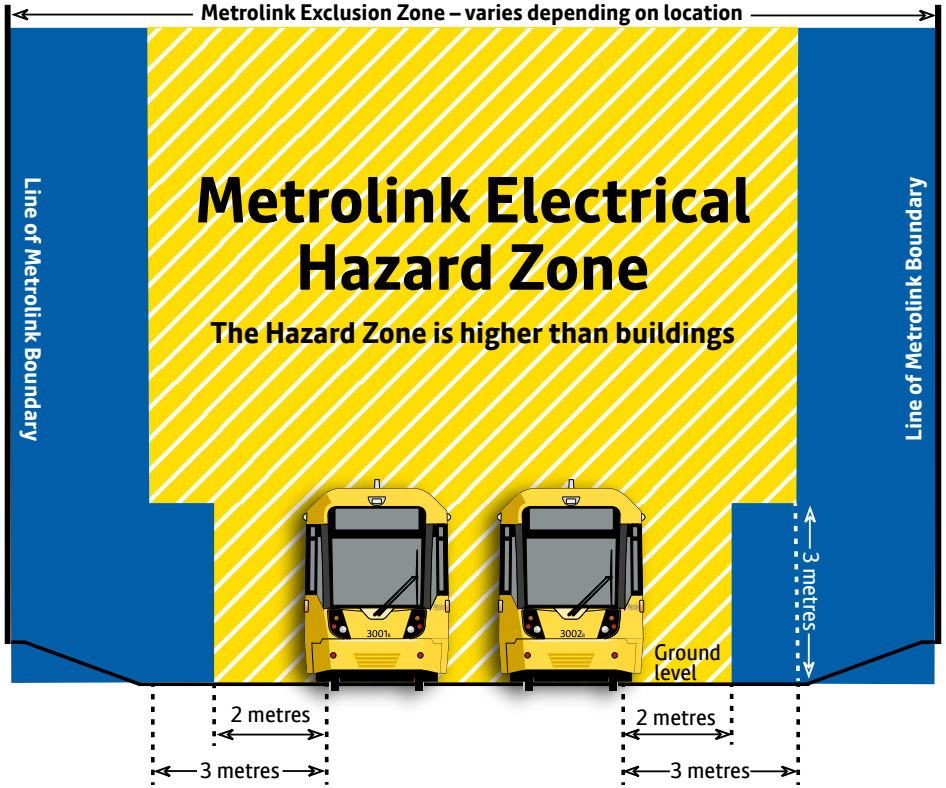


Diagram M3 – Metrolink Exclusion Zone

Area between Metrolink land boundaries and includes the Hazard Zone. Usually most applicable in segregated sections.



Common construction scenarios

Scaffolding near Metrolink

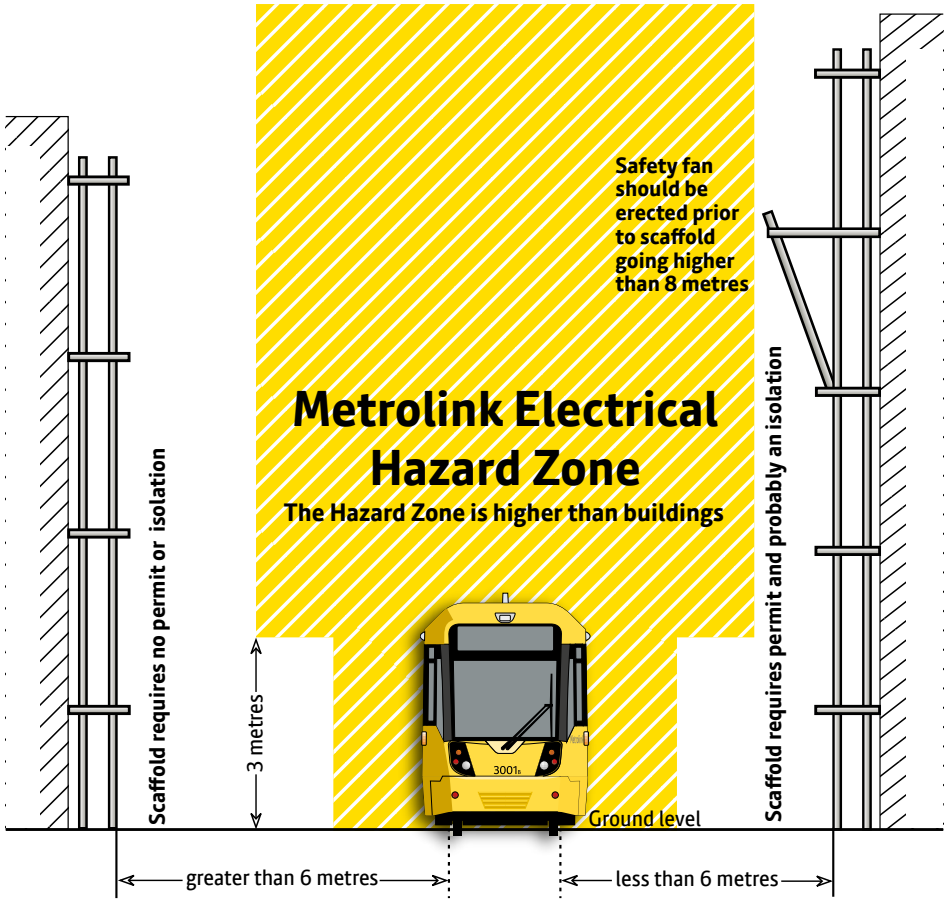
You can erect scaffolding without permission if it is at a distance of greater than 4 metres from the Metrolink Electrical Hazard Zone, i.e. 6 metres from nearest rail or 7 metres horizontally from the OLE.

However, if you are closer than this you will need to apply for a permit and will need to speak with Metrolink about undertaking the work safely.

Each situation is different but for guidance:

- It is likely that an isolation of the overhead power lines will be required. A typical night time isolation period is between 1.30am – 4.30am (actual working time period is approximately between 2am – 4am). You will be advised if there are planned isolations that you could utilise.
- Scaffolding in close proximity to Metrolink will need a fan included at a height of 8 metres prior to erecting scaffold above this height.
- Earthing of the scaffold and the installation of a Voltage Limiting Device may be required.
- A copy of the scaffold design and an independent design certificate will be required.
- If sheeting of the scaffold is proposed the details of the fixings will be required.

Diagram M4 – Scaffolding adjacent to Metrolink



Excavating near Metrolink

You can excavate adjacent to Metrolink without prior authorisation providing:

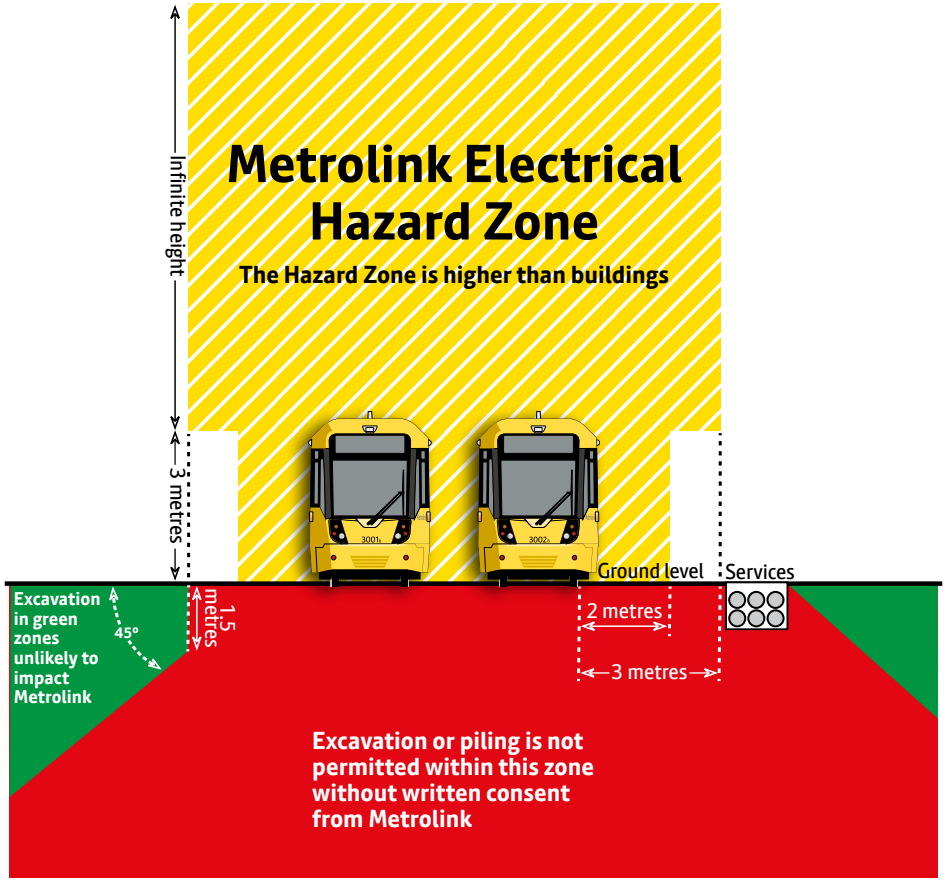
- No excavations or piling works enter the red zone, shown in Diagram **M5**.
- There is no risk of the equipment being used entering the Metrolink hazard zone, shown in Diagram **M5**.
- The topple/collapse radius of any excavator or piling rig does not extend into the Metrolink hazard zone; shown in Diagram **M5**.

You **must not** excavate within 3 metres of any overhead line equipment pole or adjacent to any Metrolink structures without prior approval.

The foundations of structures are not always obvious and often extend further than you think.

Under track crossings will be assessed on a case by case basis and will require authorisation.

Diagram M5 – Excavation and piling constraints



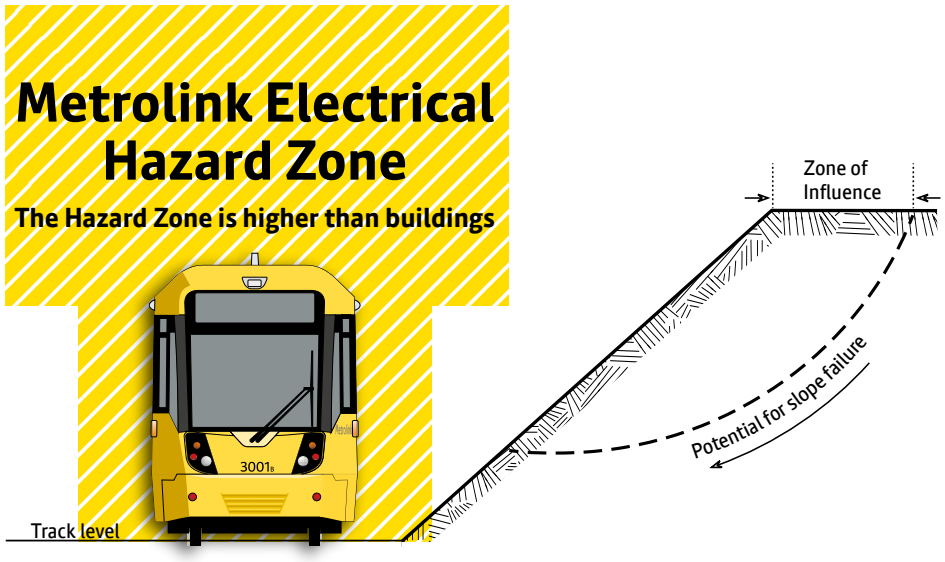
Working near Metrolink embankments or cuttings

You can only work/excavate adjacent to the top of a cutting slope, shown in Diagram **M6**, or at the bottom of an embankment, shown in Diagram **M7**, once you have demonstrated that your works will not adversely affect the stability of the slope.

Each situation is different but for guidance:

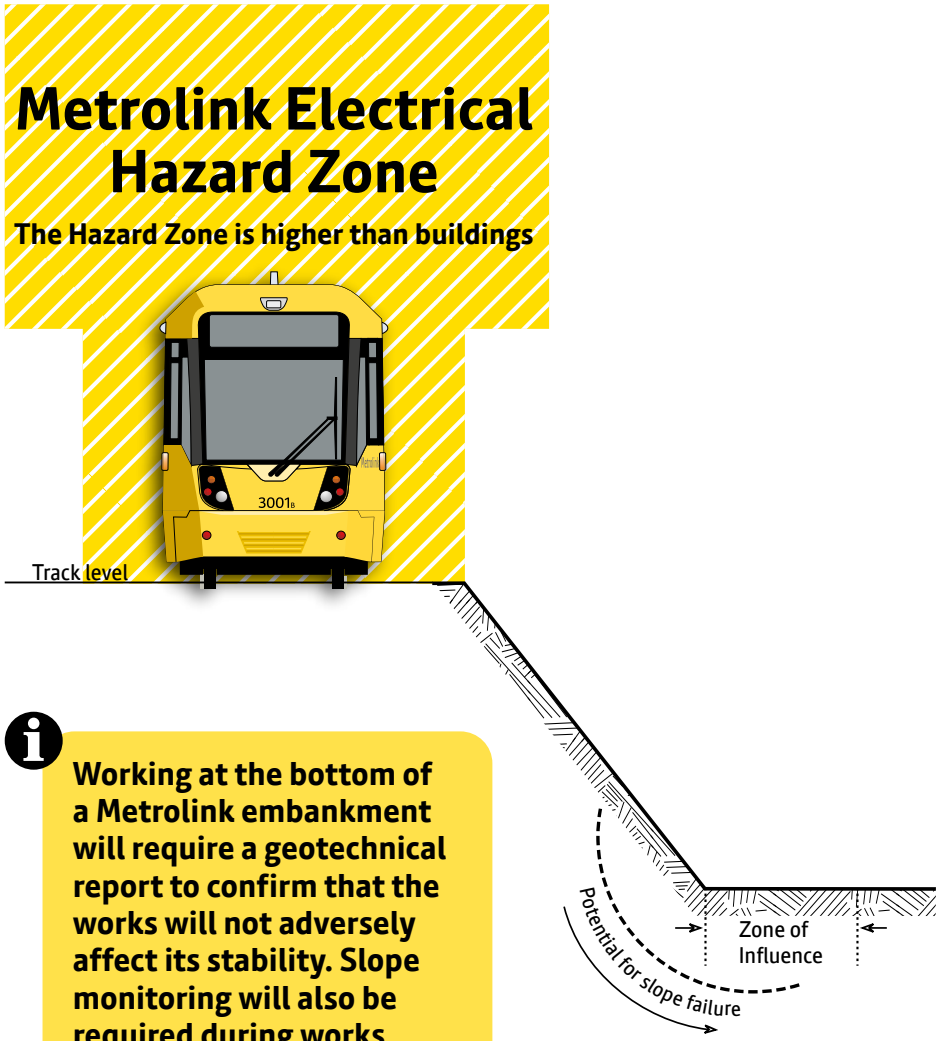
- A geotechnical assessment will need to be undertaken and we may request that slope monitoring and possibly track monitoring is carried out during the works.
- You must demonstrate that there will be no surface water discharge onto a Metrolink cutting slope as this could affect the stability of the slope.
- It is likely that temporary and/or permanent support systems will be required when working at the base of a Metrolink embankment. A design for this will need to be produced.

Diagram M6 – Working at the top of a Metrolink cutting slope



Working at the top of a cutting slope will require a geotechnical report to confirm that the works will not adversely affect its stability. Slope monitoring will also be required during works.

Diagram M7 – Working at the bottom of a Metrolink embankment



Working at the bottom of a Metrolink embankment will require a geotechnical report to confirm that the works will not adversely affect its stability. Slope monitoring will also be required during works.

New developments next to Metrolink

Advice for developers

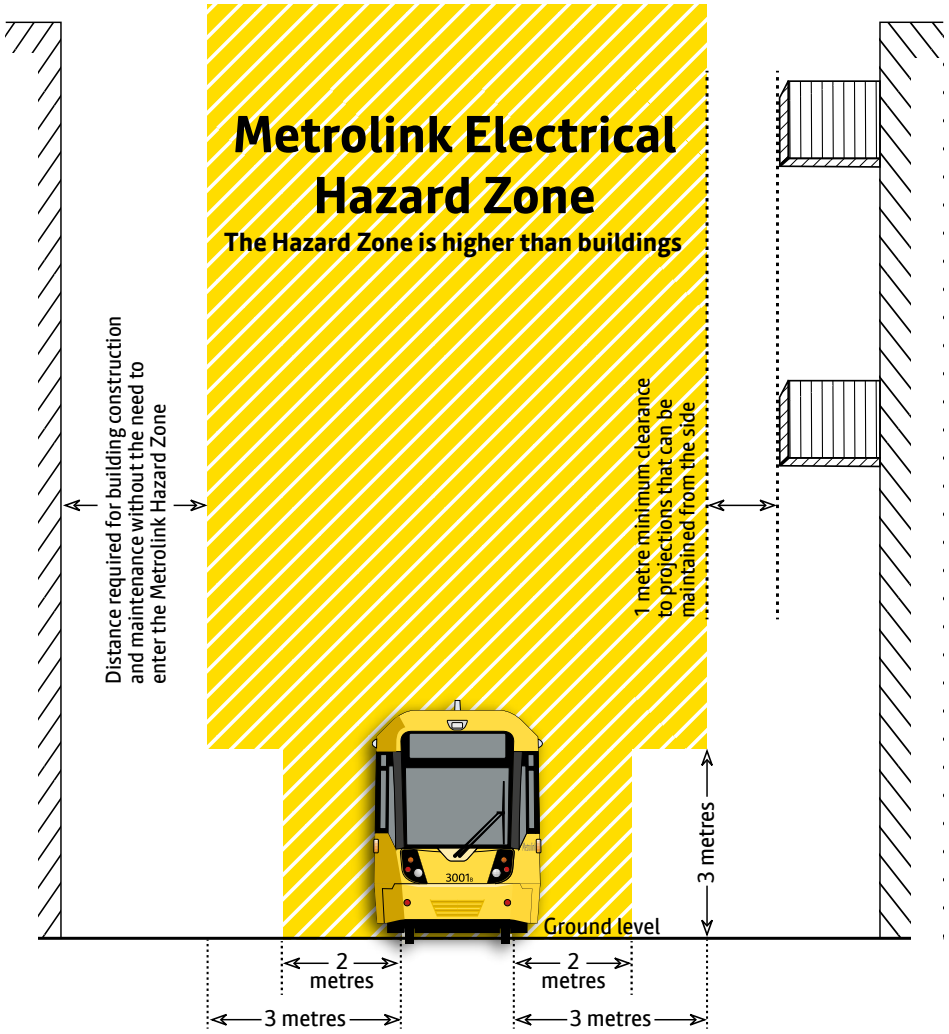
Your development must not enter the Hazard Zone. It should be designed so that it can be built and maintained without the need for any personnel or equipment to enter the Electrical Hazard Zone.

The only exception to a development extending into the Electrical Hazard Zone would be if it fully bridged Metrolink.

Any work in the Electrical Hazard Zone will require isolations and/or disruptive possessions. These incur charges and will need to be planned in. It should be noted that these could be cancelled at short notice if urgent maintenance work on the Metrolink network needs to be undertaken.

The design must also consider and accommodate the needs for the ongoing maintenance and replacement of Metrolink's own infrastructure.

Diagram M8 – Proposed development adjacent to Metrolink



Using a crane on a site next to Metrolink

- The use of a crane adjacent to Metrolink is permissible, but the crane must **not** over-sail the tramway. The only exception is when in free-slew during hours of non-operation.
- A plan showing the slew restriction will be required to demonstrate that it will **not** oversail Metrolink infrastructure or the hazard zone.
- If the crane is working within its collapse radius of Metrolink then the crane must only be utilised to 80% of its load capacity.

Minor works within the hazard or exclusion zone without a possession

It may be possible, with the permission of KAM, to undertake minor works in the Electrical Hazard Zone or Exclusion Zones.

Any such applications will need to be reviewed on a case-by-case basis but will likely require the use of a Person In Charge and a Lookout that would be charged out on an hourly basis.

Erecting hoarding in a street where Metrolink operates

Hoarding can be erected within the footway where Metrolink runs in the adjacent carriageway providing the hoarding arrangements:

- If less than 6 metres from the nearest rail, the hoarding should be made of non-conductive material. Alternatively, if metallic hoardings are proposed they will require non-metallic panels to be inserted every 15 metres or they may need to be bonded to the track or earthed; earthing calculations will be required.
- Leave a minimum of 1.8 metre footway to ensure that pedestrians are not forced to walk into the tram swept path envelope. If this cannot be provided then Metrolink must be contacted to discuss options. (If the footway is extremely busy then a width greater than 1.8 metres might be required).
- Can be erected without any equipment entering the hazard zone. If this is not possible then you must contact Metrolink and agree methods of working.
- Do not provide a person with the potential to get closer to the OLE than they would have been at ground level.

Installing ducting below Metrolink

- Ducting below the track is possible, however, this would need to be reviewed on a case-by-case basis. The depth of crossing will vary depending on the location and the intended use of the crossing.
- We expect that all track crossings will cross at 90 degrees to the track and we will require proposed construction methods and materials to be submitted for consideration.
- You are advised to contact Metrolink as soon as possible to discuss the proposals.

Abseiling adjacent to Metrolink

- You can usually abseil adjacent to Metrolink providing you have sufficient distance to undertake the task without personnel or equipment encroaching into the hazard zone or pedestrians being diverted into the hazard zone.

If in doubt please ask.

Authorisation

What needs authorisation?

Authorisation from Metrolink will be needed for any of the following activities:

- Any work where part of the work site, tools, materials, machines, suspended loads or persons could enter the Metrolink Electrical Hazard Zone or Exclusion Zones shown in Diagrams **M1**, **M2** and **M3**.
- Erecting scaffolding within 6 metres of the nearest rail. Refer to Diagram **M4**.
- Any work, including scaffolding or hoarding, which could force pedestrians into the path of a tram.
- Using a crane adjacent to Metrolink.
- Erecting hoarding adjacent to Metrolink.
- Piling or excavating within the zone shaded in red in Diagram **M5**.
- To enter the Metrolink Exclusion Zone on segregated sections.
- Undertaking any excavations at the base of a Metrolink embankment or at the top of a Metrolink cutting slope, within 3 metres of any overhead line pole, or adjacent to any Metrolink structure. Refer to Diagrams **M3**, **M6** and **M7**.

You must never undertake any of the following without an electrical isolation being in place:

- Power wash anything adjacent to Metrolink such that water could come in to contact with the power cables.
- Enter the Electrical Hazard Zone with any materials or equipment.
- Erect scaffolding within 6 metres of the nearest rail.

These lists are only a guide, they are not exhaustive and will be work dependent. Please contact Metrolink using the details on page 28 if you have any queries.

Please remember safety is paramount.

If in doubt please ask.

How to get authorisation

In order to obtain authorisation to work near the tramway you must submit a Metrolink Work Request Form, saying where and when you want to work, and describing the work to be done.

Work Request Forms can be obtained on our website at:

tfgm.com/tram-safety

or by emailing us at: eplanner@metrolink.co.uk

Once you have agreed a safe method of working with the Metrolink Operator and obtained your authorisation to work. You must do the work in the agreed way. Failure to do so will mean the work will be suspended.

Completed Work Request Forms for minor works must be returned **at least 3 weeks** before you intend to start work. Major works will require more notice and will be dependent on the nature of the works. Early liaison is therefore advised.

For major works, in addition to demonstrating a suitable level of insurance, it is likely that you will be required to enter into an Asset Protection Agreement.

If you have prepared a method statement, you should send it with your Work Request Form. Also include any information that you have submitted to the Highway Authority under the New Roads and Street Works Act.

We may need to telephone you or meet with you to find out more about the work. If no precautions are necessary, we will tell you in writing.

If you need to take precautions in order to work safely, we will tell you about them in writing. We will try to find ways in which your work can be done safely during normal working hours. However, some activities may need to take place at night when trams are not running and when power to the overhead lines can be isolated.

There is a fee for isolating the OLE, which must be paid in advance, prior to it being programmed in. If there is an opportunity for you to work during isolations that are already planned in we will advise you accordingly.

If you need to carry out work urgently to protect people or property, you must, for your own safety, still contact us at the address shown and obtain agreement to carry out the work before you start. We will come to the site if necessary but may charge you to cover the costs for this.

Unauthorised work can be dangerous and is against the law.

Accessing the Metrolink Electrical Hazard or Exclusion Zones

Overnight electrical isolation

- A minimum of six weeks notice is required for the application.
- You will usually be notified within a week of receipt of your application if the proposal is acceptable.
- If the associated Risk Assessments and Method Statements (RAMS) for your works are not too complex these can often be submitted around two weeks before the isolation. However, this is dependent on the nature of the works and staff availability so submitting early is recommended.
- A cost is payable to secure an isolation and this will be required in advance of the isolation being planned in.

It should be noted that the time for working can often be as little as two hours between 2am – 4am.

Disruptive possession and the power isolated

(i.e. tram operations being suspended)

- Disruptive possessions are only granted where absolutely necessary and where the works cannot feasibly or safely be carried out using overnight isolations.
- A minimum of 13 weeks notice is required for a disruptive possession to be considered.
- There are some periods when planned events require that there are no service disruptions, consequently, you will need to be flexible with when the works requiring a disruptive possession are undertaken.
- Disruptive possessions incur substantial costs for bus replacement services.
- There may be the opportunity to utilise existing possessions that have already been scheduled in by the operator for maintenance purposes and these will be offered where possible.

Please note: If Metrolink needs to undertake emergency repairs, it may be necessary to cancel planned isolations or possessions at short notice.

We will give no recompense for any such cancellations, but we will provide a replacement date as soon as it is possible.

Emergencies during work

If work obstructs the track unexpectedly, if anyone or anything comes into contact with the overhead wires, or if tramway equipment is damaged, please inform the Metrolink control room immediately.

Emergency contact

The control room can be contacted **at any time** by:

- Using the emergency help point at any tram stop.
- By telephoning **0161 203 5619** (emergencies only).
- Contacting a Metrolink representative.
- You can also contact the emergency services (if needed) using **999.**

You must tell the control room that there is an emergency. The controller will ask you for details of the emergency. Please answer the questions as quickly as possible.

Questions the control room will ask in an emergency:

- **Who** are you and where are you?
- **What** has happened?
- Is anyone or anything touching the overhead lines?
- Is the track obstructed?
- Which emergency services are needed (if any)?

Please ensure you follow any instructions given by the controller.

If an approaching tram must be stopped, signal to the driver by holding both arms above your head.

You should stand where the driver can see you, but not in the path of the tram.

For more information on safe working procedures contact:

Engineering Planner
Metrolink House
Queens Road
Manchester
M8 ORY

0161 205 2000

eplanner@metrolink.co.uk

Or visit: **tfgm.com/tram-safety**

Transport for
Greater Manchester

MCFC Project Taverna

Phase 2 Geo-Environmental Investigation Report

For: Manchester City Football Club

Job Number:	**4490**
Report Reference:	**4490-03**
Issue Status / Revision:	**1st issue**
Date:	**May 2026**
Written By:	**Luke Griffith** BSc (Hons), FGS
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Previous Revisions and Date:	-

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1.0 INTRODUCTION

This Phase 2 Geo-Environmental Investigation Report has been prepared at the request of Manchester City Football Club. Instructions to proceed were received in March 2026.

This report pertains to a c. 0.63 Ha site located to the east of the Etihad Stadium, Etihad Campus, Manchester, c. 3km northeast of Manchester City Centre, at the approximate post code M11 3FF. The Ordnance Survey Grid Reference for the centre of the site is 386925E, 398736N.

The site is currently partially used as a site compound for the Etihad Stadium north stand extension, operated by Sisk. The site is bound by a Metrolink cutting to the north with Ashton Canal and the Co-op Live Arena beyond to the North, Alan Turing Way to the east, Gibbon Street to the south and the Sisk site compound to the west. Access to the site is via Gibbon Street off Alan Turing Way. An aerial photo of the site is included below, and a site location plan is contained in Appendix 2.



Figure 1: Aerial image of the site dated March 2025. The approximate site boundary is highlighted in magenta.

This Phase 2 Geo-Environmental Investigation Report is to be used for submission to the Local Authority as part of a planning application. It is the client's intention to develop the site into an immersive events space.

A proposed development plan is contained in Appendix 2 with an extract below as Figure 2.

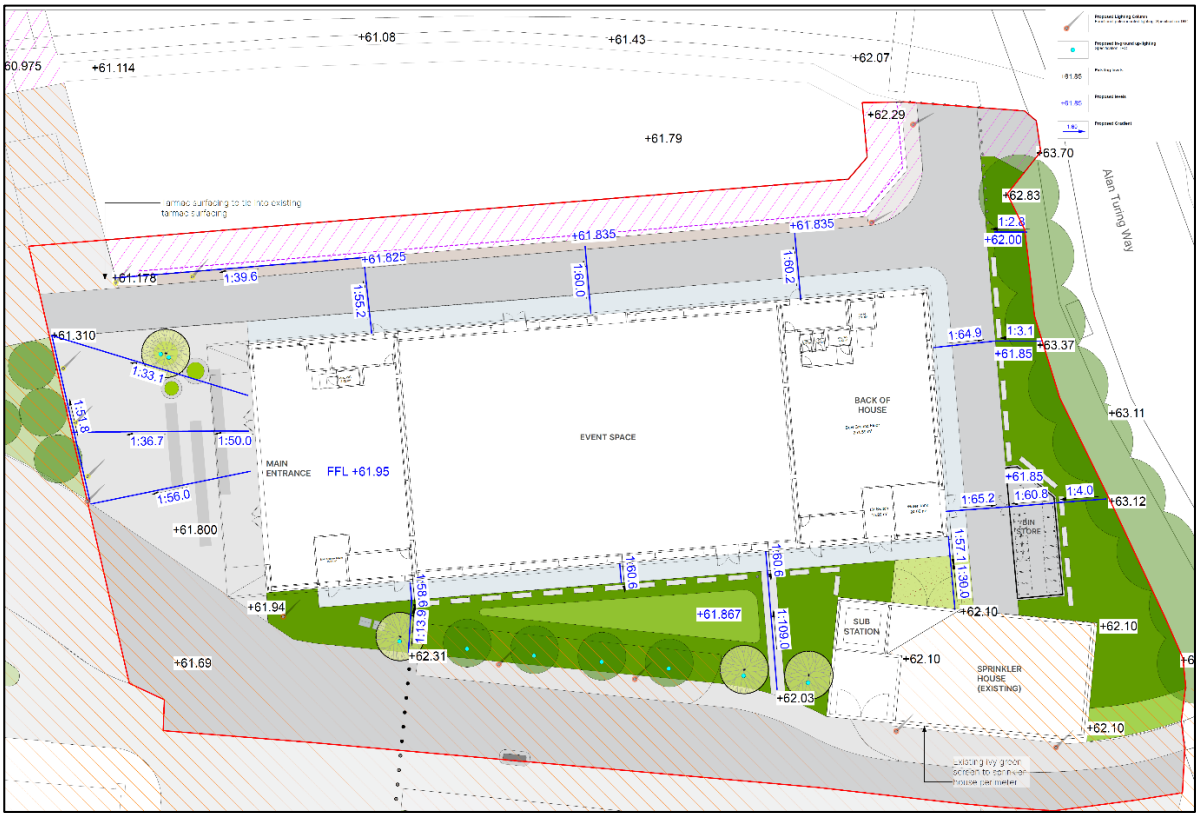


Figure 2: Extract of the proposed development plan

1.1 Brief

The brief was to carry out a Phase 2 geo-environmental ground investigation for the site based upon the findings of the IGE Consulting *Phase 1 Geo-Environmental Report* (4490-01, January 2026) and the proposed development outlined in Section 1.0. This report uses findings and recommendations from the following reports and documents:

- **IGE Consulting** *Phase 1 Geo-Environmental Report* (4490-01, dated January 2026);
- **IGE Consulting** *Coal Mining Risk Assessment Report* (4490-02, dated March 2026); and
- **Planit I.E.** *Landscape General Arrangement* (3679.3-PLA-XX-XX-DR-L-0001, dated March 2026).

The investigation was to include the following tasks:

a) Undertake / install appropriate exploratory holes and collect representative samples from exploratory holes and arrange appropriate chemical testing in accordance with the latest legal framework, record olfactory and / or visual evidence of contamination during intrusive works and undertake on site in-situ and laboratory geotechnical testing;

b) Refine conceptual models to accommodate the findings of the ground investigation works in terms of the risk to human health, ground gas, controlled waters and the wider environment;

c) Identify the risks and evaluate whether a Phase 3 numerical risk assessment and / or a Remedial Strategy, is required;

d) Undertake an assessment of the ground conditions to provide outline recommendations for the proposed foundations; and

e) Undertake ground gas and groundwater depth monitoring including 6 No. visits over 3 months.

A report was to be provided to summarise the findings and recommendations.

2.0 SCOPE OF INVESTIGATION WORK

This Phase 2 Geo-Environmental Investigation has been designed based on the findings of the IGE Consulting *Phase 1 Geo-Environmental Report* (4490-01, January 2026) and the client's requirements in relation to the proposed development outlined in Section 1.0.

The ground investigation works were undertaken between 30th March and 2nd April 2026 and comprised 2 No. cable percussion boreholes, 8 No. dynamic sampling boreholes, 12 No. mechanically excavated trial pits and 16 No. California Bearing Ratio (CBR) determinations via plate load tests. Subsequent laboratory testing was undertaken between 2nd April and 22nd April 2026.

Drilling of dynamic sample boreholes was carried out by RP Drilling Ltd, drilling of cable percussion boreholes was carried out by DMW Drilling Ltd and the CBR determinations via plate load testing were undertaken by TD Construction Testing Ltd.

Testing of soil samples for environmental purposes was carried out by i2 Analytical in accordance with the Environment Agency's MCERTS (Monitoring Certification) quality assurance accreditation scheme. Testing of soil samples for geotechnical purposes was carried out by Murray Rix (Northern) Ltd, which is a UKAS accredited laboratory. These organisations were appointed directly by IGE Consulting to carry out these contracting works.

The locations of the exploratory holes were topographically surveyed (X-Y-Z axis) with an accuracy of 20mm.

The ground investigation was undertaken in general accordance with:

- BS 5930 (2015) + A1 (2020) Code of Practice for Ground Investigation;
- BS EN ISO 17892 Geotechnical Investigation and Testing - Laboratory Testing of Soil;
- BS 10175 (2026) Investigation of Potentially Contaminated Sites – Code of Practice;

- BS EN 1997-2 (2007) Eurocode 7 – Geotechnical Design – Ground Investigation and Testing;
- BS 8485 (2015) + A1 (2019) Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings;
- BS 8576 (2013) Guidance on Investigations for Ground Gas – Permanent gases and Volatile Organic Compounds; and
- Land Contamination Risk Management (2025).

Further details pertaining to the ground investigation works are outlined in the following sections.

The limitations of the investigation work and report are included in Appendix 1.

The exploratory holes were undertaken in order to achieve the following:

- to establish the thickness, extent and characteristics of any possible Made Ground and underlying natural superficial deposits;
- to establish bedrock depth across the site;
- to undertake in-situ geotechnical testing within these deposits;
- to target and delineate the historical infilled canal running through the site and any visual or olfactory evidence of contamination associated with it;
- to obtain samples from these deposits for classification and laboratory testing;
- to allow for the installation of ground gas and groundwater monitoring wells.

The exploratory hole location plan is included in Appendix 2 with an extract below as Figure 3:

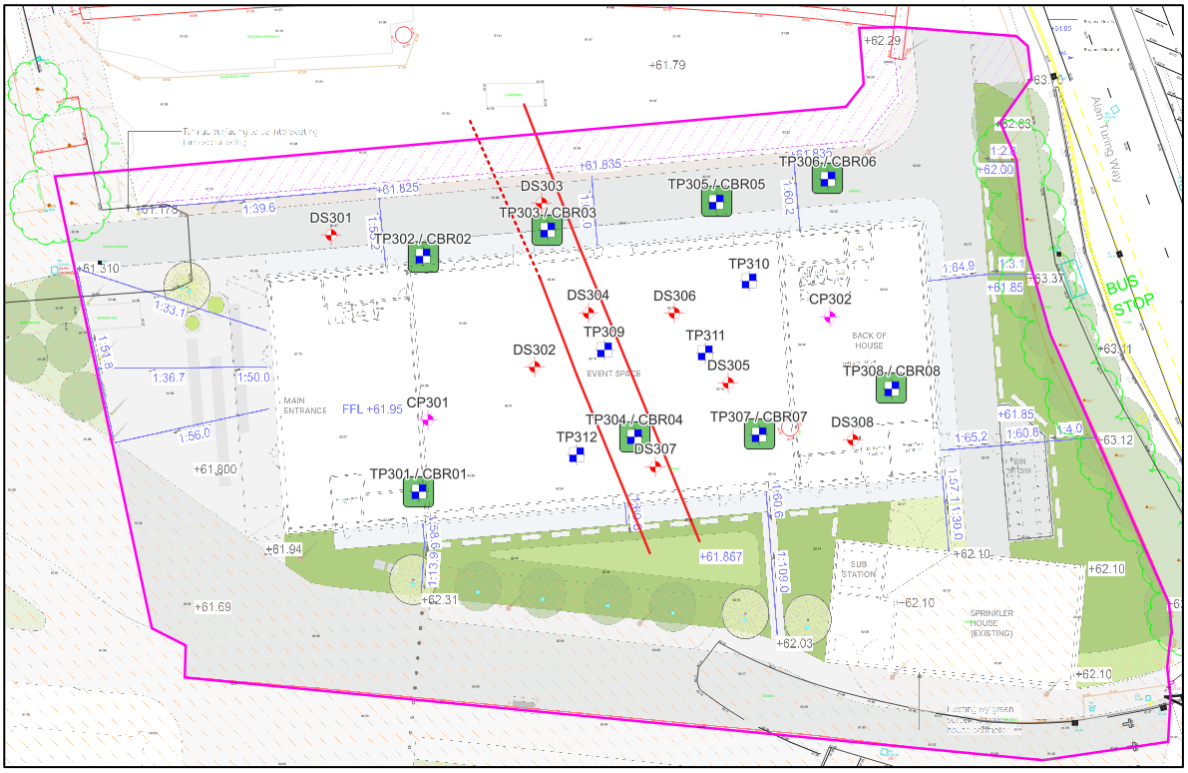


Figure 3: Extract of the exploratory hole location plan

2.1 Trial Pits

12 No. trial pits (TP301 to TP312, inclusive) were mechanically excavated to depths of between 2.40m and 5.10m bgl (59.71m and 57.01m AOD) using a LiuGong 913 FCR (13T) tracked excavator. TP303, TP304 and TP309 were positioned targeting the historical infilled canal and were extended to determine the lateral extents of this feature. The remaining trial pits were placed spatially across the site and according to access constraints to gain a representative view of the ground conditions.

The locations of the trial pits are shown on the exploratory hole location plan in Appendix 2 and trial pit exploratory hole logs and photographs are contained in Appendix 3.

2.2 Dynamic Sampling Boreholes

8 No. dynamic sampling boreholes (DS301 to DS308, inclusive) were constructed spatially across the site to depths of between 0.90m bgl and 3.38m bgl (61.20m and 58.68m AOD).

DS303, DS304 and DS307 were positioned targeting the historical infilled canal whilst the remaining boreholes were placed spatially to gain a representative view of ground conditions and install gas and groundwater depth monitoring wells.

The locations of the dynamic sampling boreholes are shown on the exploratory hole location plan in Appendix 2 and the dynamic sampling borehole logs are contained in Appendix 4.

2.3 Cable Percussion Boreholes

2 No. cable percussion boreholes (CP301 and CP302) were constructed using both 200mm and 150mm casing and tools. CP301 was undertaken to a depth of 16.91m bgl (45.19m AOD) whilst CP302 was undertaken to a depth of 16.83m bgl (45.22m AOD). The boreholes were positioned at the most accessible western and eastern extremes of the site to gain a representative view of ground conditions, establish bedrock depth and install gas and groundwater depth monitoring wells.

The locations of the cable percussion boreholes are shown on the exploratory hole location plan in Appendix 2, and the borehole logs are contained in Appendix 5.

2.4 Site Testing and Sampling

The following site tests and sampling were carried out:

a) Retrieval of environmental samples and bulk disturbed samples from trial pits, cable percussion boreholes and dynamic sampling sleeves for the purposes of chemical and geotechnical laboratory testing and classification;

b) Retrieval of undisturbed 100mm (U100) samples from cable percussion boreholes for geotechnical laboratory testing;

c) Where possible, in-situ and ex-situ shear strength testing was undertaken within fine grained material (clay) from the trial pits and from the dynamic sampling borehole sleeve samples using a 19mm hand shear vane in accordance with BS1377-9;

d) Standard Penetration Tests (SPTs) were undertaken at regular 1.00m intervals between 1.00m and 3.00m bgl within the dynamic sampling boreholes and at

regular 1.00m intervals between 1.00m and 7.00m and at 1.50m intervals below 7.00m in cable percussion boreholes; and

e) California Bearing Ratio determinations were completed in-situ via plate load tests at locations CBR01 to CBR08.

2.5 Laboratory Testing

2.5.1 Chemical Laboratory Testing

18 No. soil samples obtained during exploratory hole construction were sent to i2 Analytical laboratories for chemical testing. These samples were placed into sterile sealed containers to facilitate MCERTS chemical laboratory testing of potential contaminants. Chemical testing suites are outlined below and were based upon the findings of the Phase 1 Geo-Environmental Report.

Asbestos ID, sulphate, pH, nitrate, total and free cyanide, arsenic, barium, beryllium, boron, cadmium, chromium, chromium (hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc, Total Petroleum Hydrocarbon screen, Speciated Total Petroleum Hydrocarbons (TPH-CWG), Monochromatics and Oxygenates (MTBE and BTEX), Speciated Polyaromatic Hydrocarbons, Total Phenols (monohydric) and Volatile Organic Compounds.

2.5.2 Geotechnical Laboratory Testing

The following geotechnical laboratory tests were carried out on selected samples obtained from across the site:

a) Determination of moisture content in accordance with BS EN ISO 17892-1:2014+A1:2022;

b) Determination of liquid limit and plastic limit in accordance with BS EN ISO 17892-12:2018+A2;

c) Determination of particle size distribution (PSD) by dry / wet sieving and sedimentation analysis by pipette method in accordance with BS EN ISO 17892-4:2016;

d) Determination of undrained shear strength in triaxial compression in accordance with BS EN ISO 17892-8:2018;

e) Determination of California Bearing Ratio in accordance with BS1377:9 Clause 4.1 and IAN 73/06 Rev 1 (2009); and

f) BRE Special Digest suite for aggressive ground conditions.

2.6 Previous Earthworks

As presented and discussed in the IGE Consulting Phase 1 Geo-Environmental Report, the site has a considerable industrial history and has been subjected to multiple stages of earthworks and remediation prior to the IGE Consulting ground investigation works. During earthworks, contaminated ground is understood to have been ‘turned over’ and replaced to an engineering specification. According to the remediation reports, the works also involved the removal of contaminated material from within the infilled canal and replacement with geotechnically suitable material.

Given the presence of underground coal workings associated with the former Bradford Colliery, as discussed in the Phase 1 and Coal Mining Risk Assessment reports, the eastern site section has been subject to treatment by drilling and grouting during earthworks. The remaining site section is understood to have remained untreated during this stage of earthworks. The details of previous works undertaken on site are included in the IGE Consulting Phase 1 Geo-Environmental Report (4490-01, dated January 2026) and the IGE Consulting Coal Mining Risk Assessment (4490-02A, dated March 2026).

3.0 FINDINGS

3.1 Ground Conditions

The site currently consists of a gravel surfaced car park in the eastern section and a site compound in the western site section separated by an asphalt road, predominantly utilised for pedestrian access. The site topography is consistent at c. 62.00m AOD with a gentle slope to the west. Figure 4, below, shows elevations across the site based on LIDAR data:

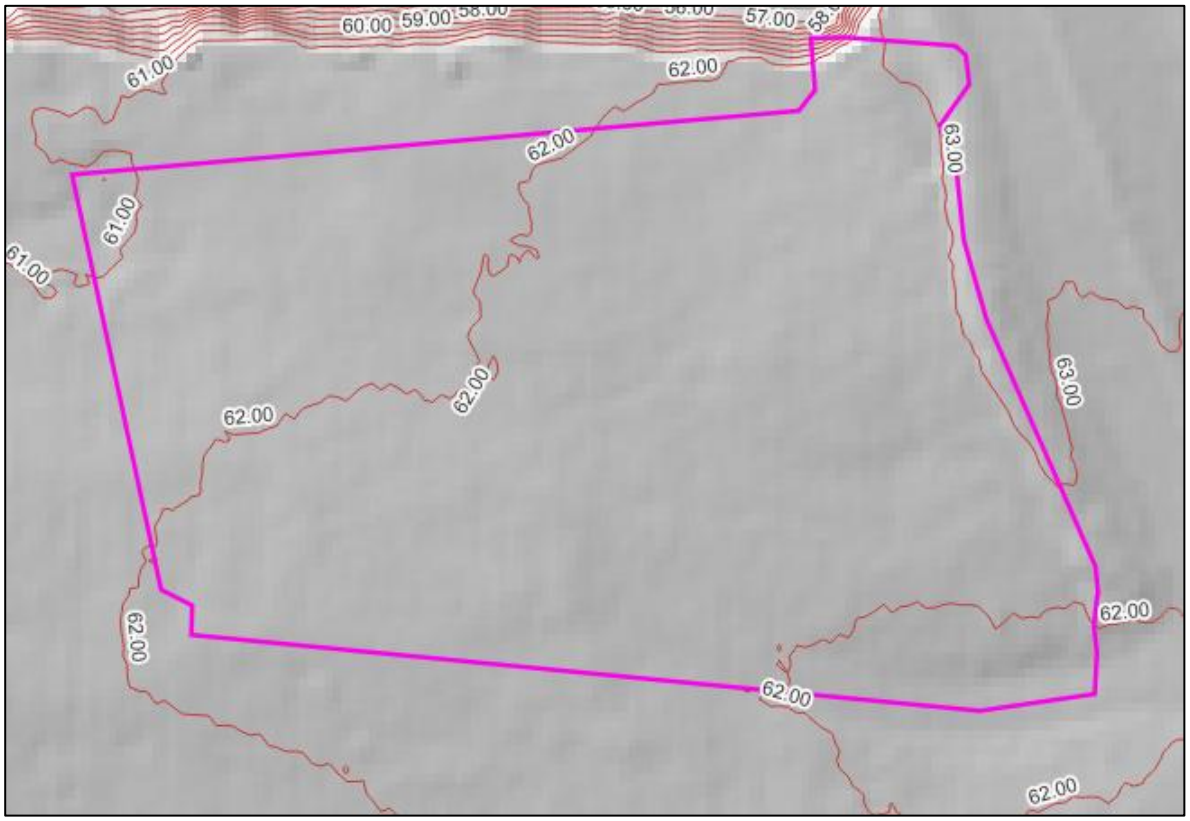


Figure 4: Site location plan showing current site elevations based on LIDAR data

The typical ground conditions encountered across the site are as follows:

- **Made Ground** comprising asphalt (in the road only) to a depth of 0.10m to 0.15m bgl (62.00m to 61.72m AOD), underlain by:
- **Made Ground** comprising dark greyish brown, very gravelly, slightly clayey to clayey fine to coarse SAND to a depth of 2.30m to at least 3.10m (59.73m to 59.03m AOD), underlain by:

- **Glacial Till** comprising stiff to very stiff, light brown, slightly gravelly, slightly sandy CLAY to depths of between 15.00m to 15.80m bgl (47.05m to 46.30m AOD), underlain by:
- **Pennine Upper Coal Measures** comprising weathered MUDSTONE. During cable percussion drilling, this material was recovered as very stiff, grey, slightly gravelly CLAY to a depth of at least 16.91m bgl (45.19m AOD).

Images of the typical Made ground, Glacial Till and Pennine Upper Coal Measures deposits are shown below:



Figure 5: Typical Made Ground encountered in TP301 (left), typical Glacial Till encountered in TP305 (centre) and Pennine Upper Coal Measures in CP302 (right).

3.1.1 Notable Exceptions

The following notable exceptions to the aforementioned typical ground conditions were recorded:

- **Made Ground** comprising stiff, light brown, slightly gravelly, slightly sandy CLAY was encountered in CP302 only from 3.00m to 4.00m bgl (59.05m to 58.05m AOD).
- **Made Ground** comprising soft, black, slightly sandy, gravelly CLAY and dark grey, very sandy, silty GRAVEL with a mild to strong hydrocarbon odour and sheen was encountered within TP303, TP304 and TP309 from 2.60m and 4.40m bgl (59.52m and 57.72m AOD).

3.2 Visual and Olfactory Contamination Findings

During the intrusive investigation works, the soils were examined carefully for both visual and olfactory evidence of contamination.

3.2.1 Infilled Canal

Trial pits TP303, TP304, TP309 and TP312 were undertaken within the extents of the historical infilled canal in order to identify and delineate this feature. During this delineation exercise, a mild to strong hydrocarbon odour and sheen was noted in the Made Ground deposits between 2.60m and 4.40m bgl (59.52m and 57.72m AOD).

Any evidence of hydrocarbon impact and in-situ Photo Ionisation Detector (PID) test results are summarised below:

Location	Depth (m bgl)	Evidence	PID
TP303	1.20	Mild hydrocarbon odour	0.20 ppm at 1.20m bgl
	2.90	Slight hydrocarbon sheen	2.10 ppm at 2.90m bgl
	3.00 – 4.20	Mild hydrocarbon odour and sheen	1.20 ppm at 3.20m bgl 2.30 ppm at 4.20m bgl
TP304	2.70	Mild hydrocarbon odour	2.60 ppm at 2.70m bgl
	4.00 – 4.40	Mild hydrocarbon odour and sheen	12.00 ppm at 4.10m bgl
TP309	2.30	Slight hydrocarbon odour	-
	2.70 – 4.00	Strong hydrocarbon odour and sheen	24.30 ppm at 2.90m bgl 64.00 ppm at 3.60m bgl
TP312	2.40	Slight hydrocarbon odour	-

Figure 6, below, shows the locations of the trial pits in relation to the infilled canal based on the 1893 historical OS map.

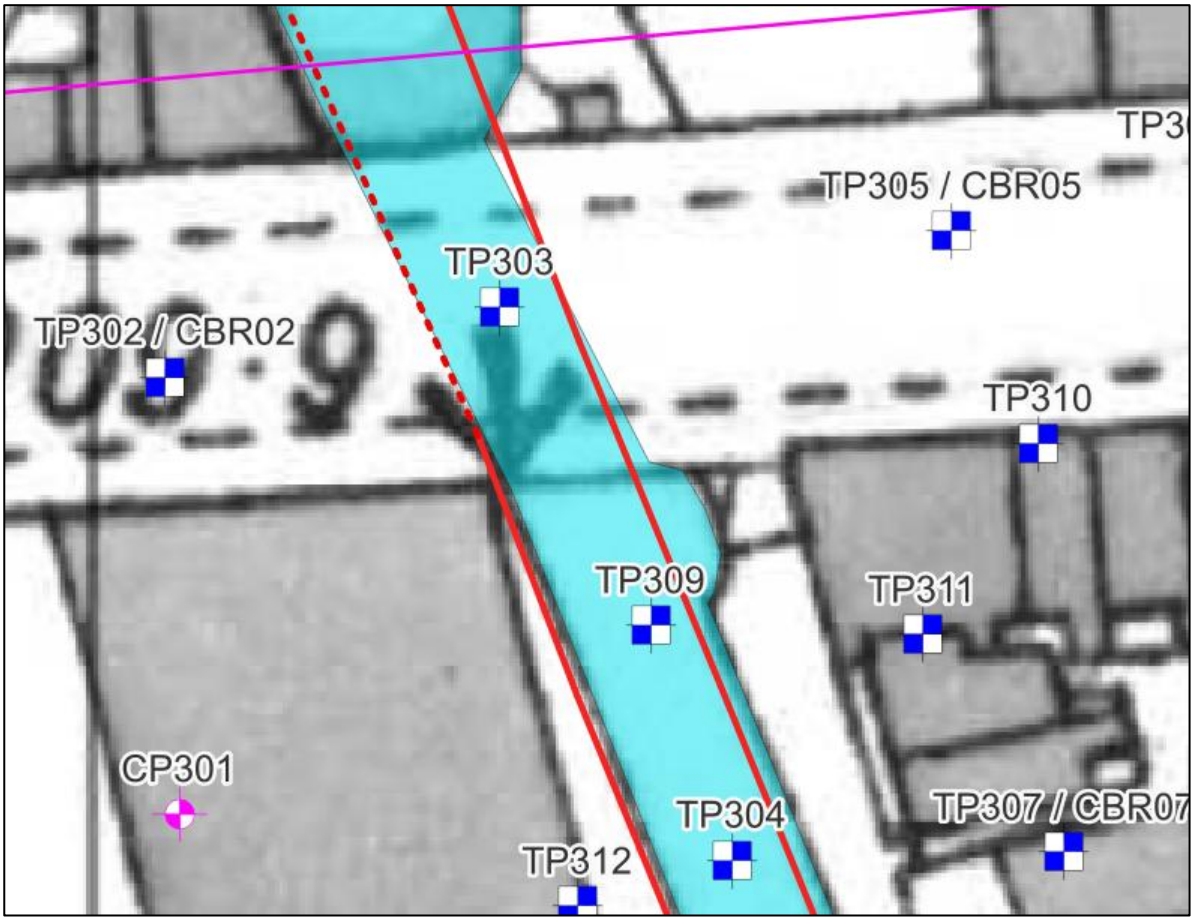


Figure 6: Locations of exploratory holes targeting the historical infilled canal overlain onto the 1893 historical OS map. The location of the canal on the historical map is shown in blue. Extents measured during ground investigation are shown with red lines and inferred extents are shown with a dashed red line.

Evidence of TPH impact was noted to be the strongest in TP309 and significantly weaker in TP304 and TP303. Representative samples were taken from these deposits and sent for chemical laboratory testing to confirm contaminant concentrations. Chemical testing results are included in Appendix 8 and summarised in Section 3.7. Photographs of the recovered material in which strong odours and sheens were recorded are included below as Figure 7:



Figure 7: Photographs of Made Ground where strong hydrocarbon odours and sheens were recorded (TP303, left and TP309, right)

Evidence of TPH impact recorded during the ground investigation and the PID test results are included on the trial pit logs in Appendix 3.

3.3 Water Strikes

No water strikes were recorded within the underlying natural strata. Perched water strikes were recorded within Made Ground deposits and are summarised below:

Exploratory Hole	Depth (m bgl) *(m AOD)*	Comments
TP310	0.70 *(61.42)*	-
TP305	0.80 *(61.25)*	-
CP302	0.80 *(61.25)*	Water level 0.50m bgl (61.55m AOD) after 5 minutes
TP309	2.30 *(59.81)*	-
TP304	2.30 *(59.82)*	-
TP303	3.10 *(58.85)*	-

Water strikes are detailed on the exploratory hole logs contained in Appendices 3 to 5.

3.4 Conceptual Ground Model

The findings of the Phase 2 ground investigation works have been used to create a conceptual ground model of the site. The model illustrates the typical ground conditions outlined in Section 3.1 as well as the deeper Made Ground encountered in the infilled canal. An extract of the conceptual ground model is included below as Figure 8 and presented in Appendix 2:

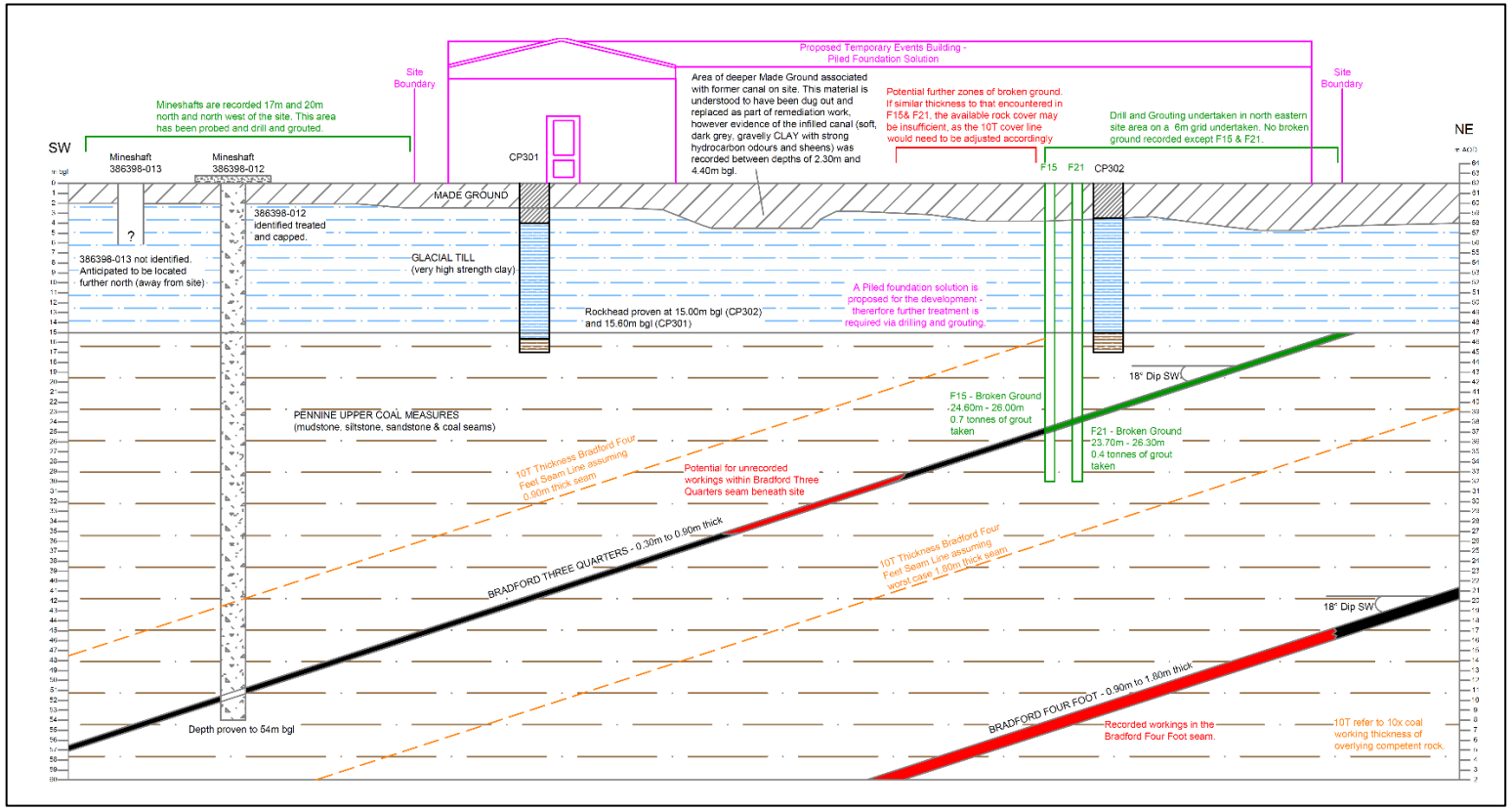


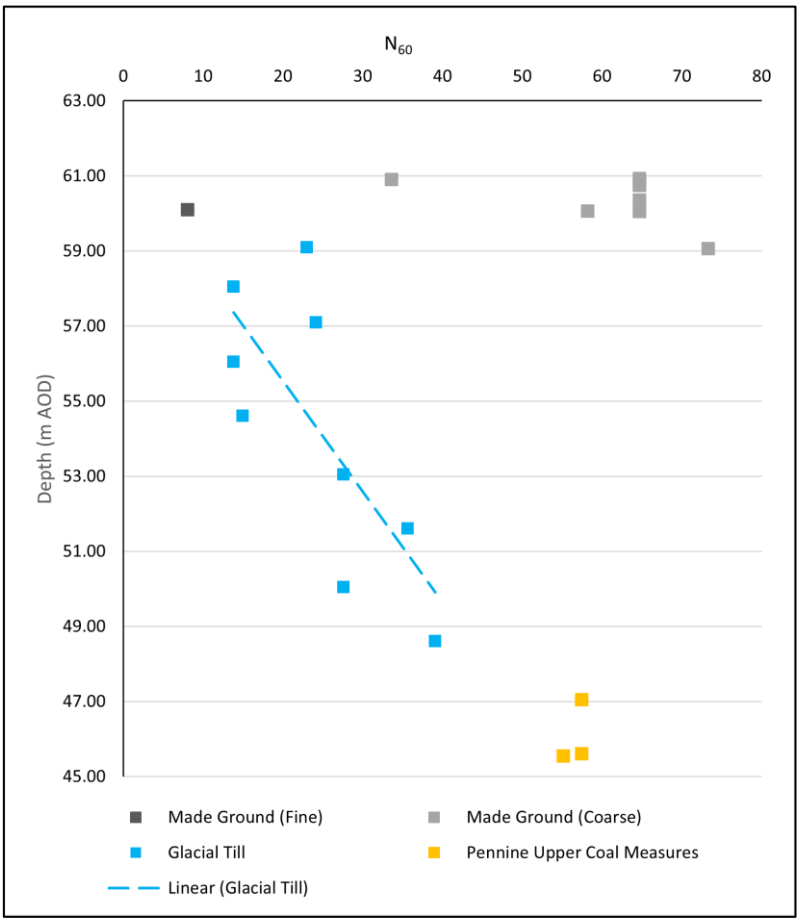
Figure 8: Extract of the conceptual ground model for the site.

3.5 Geotechnical Site Testing

The results of the geotechnical testing undertaken during the ground investigation are summarised below.

3.5.1 Standard Penetration Tests

Standard penetration tests (SPTs) were undertaken at regular 1.00m intervals during the construction of the cable percussion and dynamic sampling boreholes. The following scatter graph outlines the corrected N_{60} (energy ratio of 69) derived from the standard penetration tests undertaken during the ground investigation works.

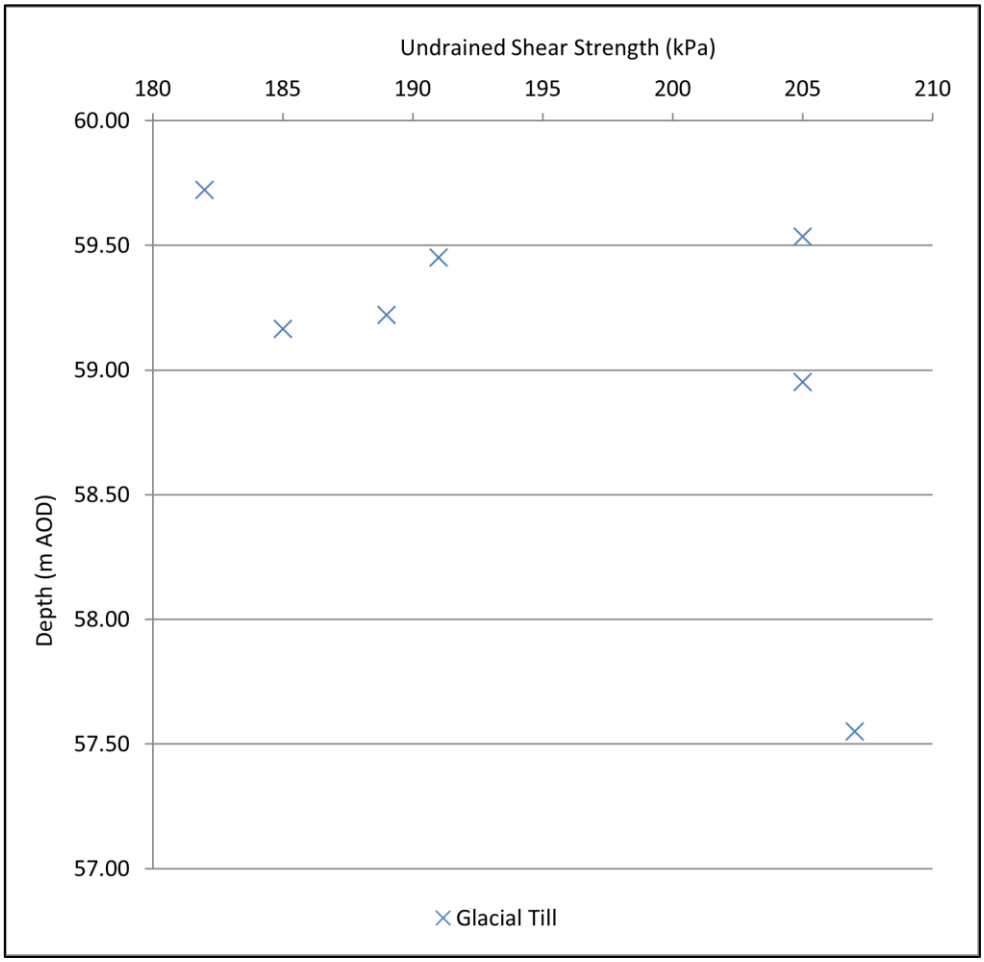


The scatter graph shows that there was a positive correlation between increasing corrected N_{60} with depth within Glacial Till deposits. SPTs undertaken within Made Ground and Pennine Upper Coal Measures mostly resulted in refusals.

SPT results are included on the dynamic sample and cable percussion borehole logs presented in Appendices 4 and 5 respectively.

3.5.2 Hand Shear Vane (19mm) Tests

Where possible, ex-situ undrained shear strength testing was undertaken on samples of fine-grained material (clay) within trial pits and dynamic sampling boreholes using a 19mm hand shear vane in accordance with BS1377-9. It should be noted that undertaking hand shear vane tests below 2m bgl within dynamic sample boreholes is considered inappropriate; the increased sampling disturbance at depth can produce unrepresentative results.



Given the depth of Made Ground encountered across the site and the general recovery of fine Glacial Till deposits as fine gravel to cobble sized pieces, only 7 No. undrained shear strength tests were conducted via hand shear vane during the ground investigation. A correlation between undrained shear strength and depth could not be established with the available data although results were recorded between 185 kPa and results in excess of 205 kPa (average 195). The Glacial Till on

site can therefore be classified as a very high strength clay. Hand shear vane test results are included on the trial pit logs, contained within Appendix 3.

3.5.3 California Bearing Ratio (CBR) Tests

16 No. California Bearing Ratio determinations via plate load testing were undertaken across the site in proposed external areas. 2 No. tests were undertaken at each location, the first at 0.50m bgl and the second at 1.00m bgl using a 300mm plate. Given the thickness of Made Ground on site (2.40m to 4.00m bgl), all tests were carried out within Made Ground deposits. The test results are summarised in the table below, and presented in Appendix 6:

Test	Test depth (m bgl)	Modulus of Subgrade Reaction (k) (kN/m^2/mm)	Equivalent CBR (%)
CBR04	0.50	82.1	20
CBR08	0.50	99.6	28
CBR03	0.50	109.1	33
CBR01	0.50	159	63
CBR05	0.50	162.4	65
CBR02	0.50	183.3	81
CBR06	0.50	184.6	82
CBR07	0.50	196.7	91
CBR06	1.00	87.9	23
CBR01	1.00	122.1	40
CBR03	1.00	226.8	>100
CBR08	1.00	242	>100
CBR04	1.00	252	>100
CBR02	1.00	371	>100
CBR05	1.00	371	>100
CBR07	1.00	371	>100

Orange = Results impacted by surface or perched water ingress into pit during test.

3.6 Geotechnical Laboratory Testing

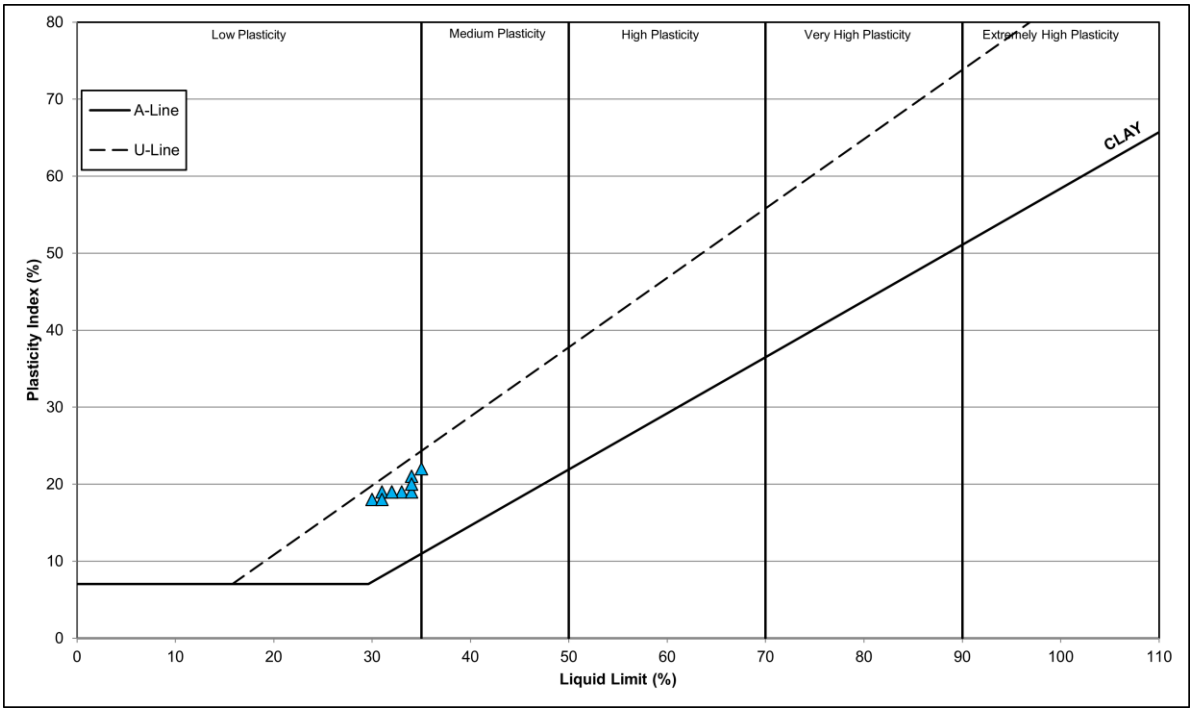
The results of the geotechnical laboratory tests undertaken during the ground investigation are summarised below. The full geotechnical laboratory test results are included in Appendix 7.

3.6.1 Atterberg Limit Tests

Atterberg limit tests were undertaken on 10 No. samples from natural Glacial Till deposits. The results of the Atterberg testing are as follows:

Sample	Sample Depth (m bgl)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	Passing through 425 micron (%)	Modified Plasticity Index
TP310	2.40	23.5	34	14	20	88	18
TP305	2.60	19.5	32	13	19	81	15
TP302	2.70	15.7	35	13	22	69	15
CP301	4.00	12.1	34	13	21	86	18
TP309	4.20	21.3	34	15	19	79	15
TP305	4.50	16.7	33	14	19	74	14
CP302	7.00	12.8	31	12	19	90	17
CP301	9.00	12.2	32	13	19	91	17
CP301	12.00	10.3	30	12	18	82	15
CP302	13.50	12.9	31	13	18	87	16
Average		**16**	**33**	**13**	**19**	**-**	**-**

Green = low volume change potential



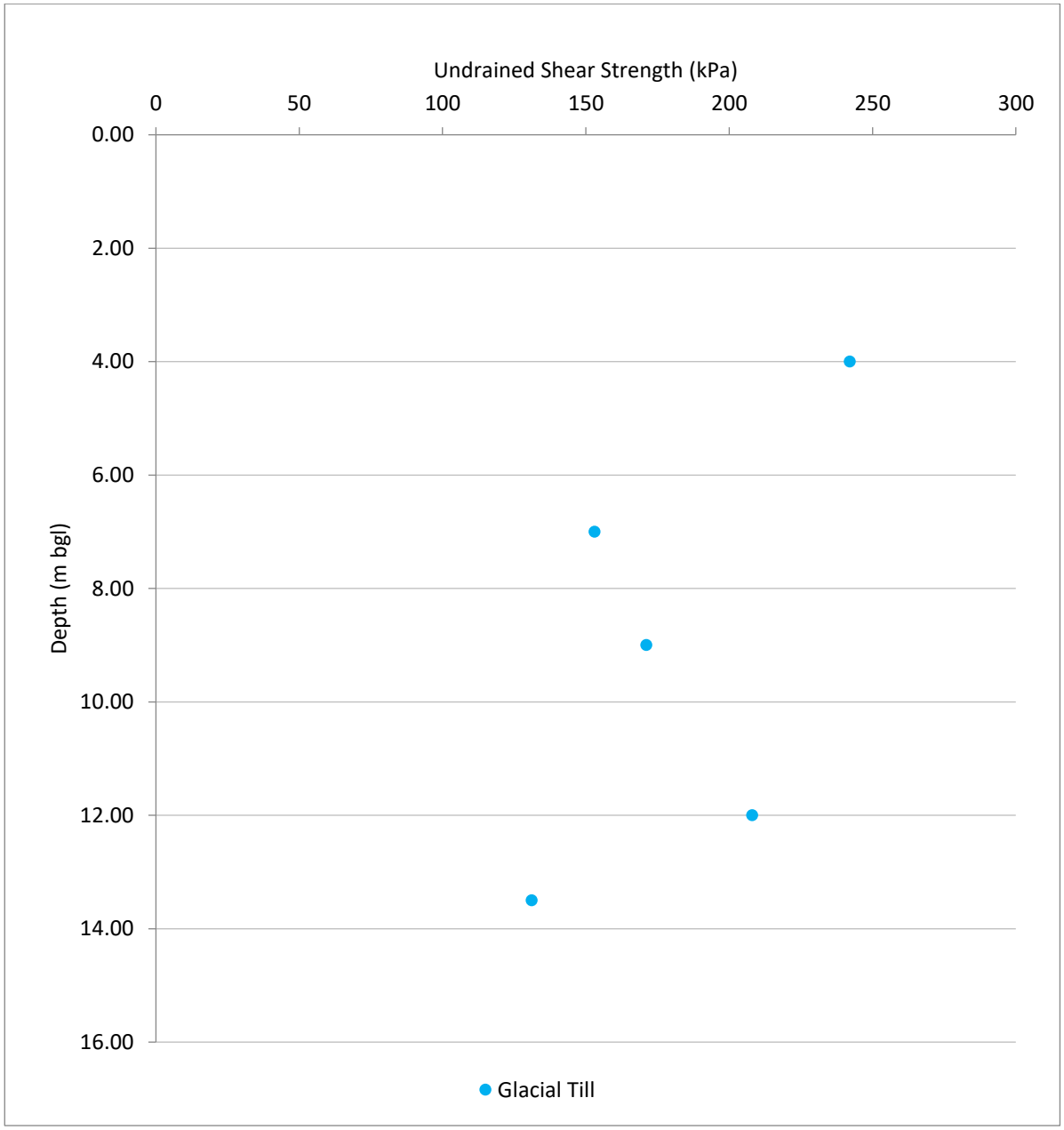
The Atterberg Limit tests indicate that the Glacial Till deposits are generally of low plasticity with the exception of 1 No. sample (TP302 at 2.70m bgl) which is medium plasticity in-line with BS14688 Part 2. The Glacial Till is of low volume change potential as indicated by all Atterberg limit tests.

3.6.2 Quick Undrained Triaxial Testing

5 No. samples of Glacial Till were analysed for undrained shear strength in triaxial compression. The results are summarised below, organised by increasing undrained shear strength:

Exploratory Hole	Depth (m bgl)	Moisture content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Undrained Shear Strength (kPa)	Mode of failure	Strength
CP302	13.50	12.90	2.17	1.92	131	Bulging	High
CP302	7.00	12.80	2.21	1.96	153	Bulging	Very High
CP301	9.00	12.20	2.25	2.01	171	Plastic	
CP301	12.00	10.30	2.24	2.03	208	Plastic	
CP301	4.00	12.10	2.26	2.02	242	Complex Shear	

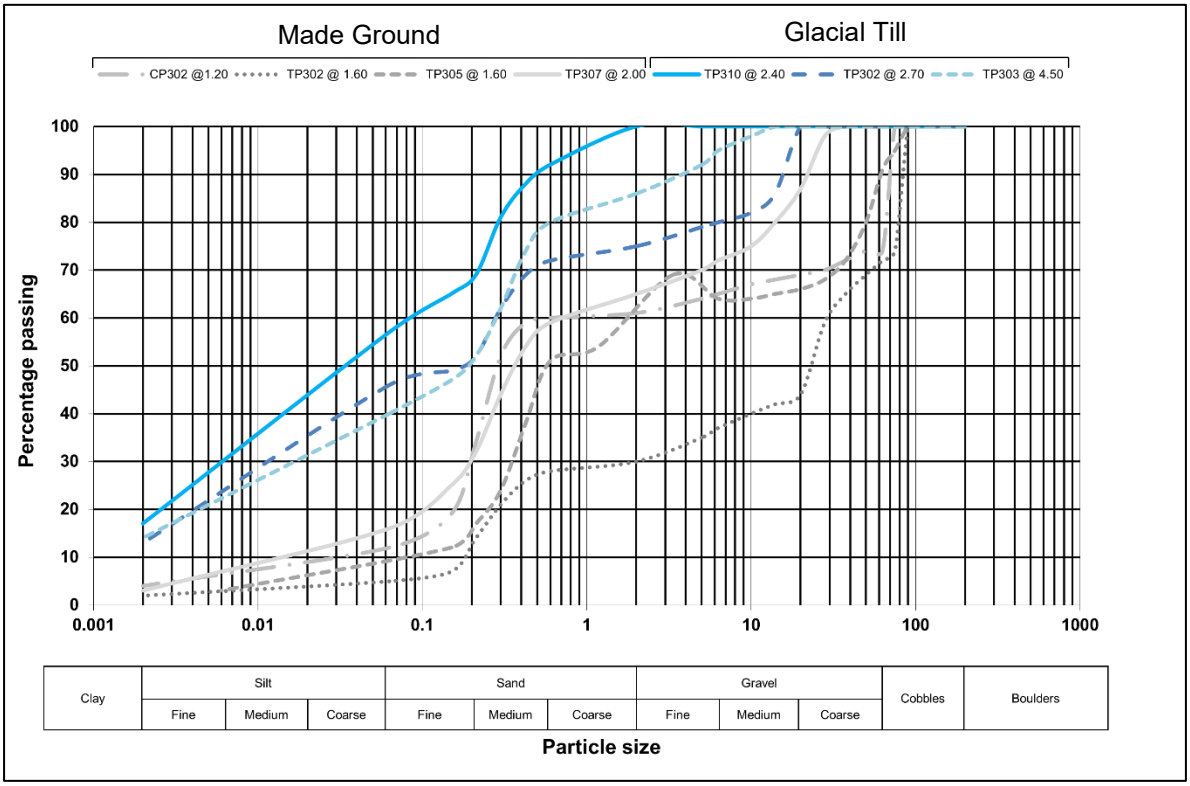
The triaxial testing indicates that the Glacial Till is of very high strength aside from 1 No. test (CP302 at 13.50m bgl) recorded as high strength. The below graph illustrates the undrained shear strength plotted against increasing depth:



3.6.3 Particle Size Distribution (PSD) Testing

6 No. particle size distribution (PSD) tests with sedimentation were undertaken on samples of Glacial Till. The results are summarised below:

Sample	Sample Depth (m bgl)	Formation	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Cobble (%)
CP302	1.20	Made Ground	4	8	**49**	13	26
TP302	1.60		2	3	25	**39**	31
TP305	1.60		3	9	**57**	22	9
TP307	2.00		3	13	**49**	35	0
TP310	2.40	Glacial Till	**17**	40	43	0	0
TP302	2.70		**13**	33	29	25	0
TP303	4.50		**14**	26	46	14	0



The PSD test results indicate that the Glacial Till is typically a slightly gravelly, slightly sandy to sandy clay. The tests indicate that the Made Ground is a very sandy, slightly clayey gravel or a gravelly to very gravelly, slightly clayey sand with medium to high cobble content. Given the assessed behaviour observed in the field, fine soils encountered on site have been classified as a clay as opposed to a silt, despite the relatively high proportion of silt recorded in the laboratory testing.

3.6.4 BRE Special Digest Suite Testing

In accordance with BRE Special Digest 1: Concrete in Aggressive Ground (2005), the site has been classified as brownfield with mobile groundwater. BRE SD1 testing suites were undertaken on 3 No. samples of Made Ground and 3 No. samples of Glacial Till in order to determine the Design Sulfate (DS) levels and the Aggressive Chemical Environment for Concrete (ACEC), with the findings summarised below:

Sample	Depth (m bgl)	Strata	DS Class	ACEC Class
TP303	1.20	Made Ground	2	AC-2
TP304	2.70		3	AC-3
DS307	1.50		3	AC-3
TP309	4.20	Glacial Till	1	AC-1
TP302	2.70		1	AC-1
TP303	4.50		1	AC-1

3.7 Environmental Laboratory Test Results

The findings of the chemical test results, summarised below, will be assessed against generic assessment criteria (GAC) for the purposes of screening allowable concentrations in comparison to the measured site concentrations. The GAC are defined based on the critical receptors identified at the site, detailed in the Phase 1 Investigation. Receptors are considered in relation to:

- Human health receptors (e.g. end-users, construction workers and the general public) via measured solid concentrations, and;
- Additional receptors which may be relevant e.g. flora/fauna, water, buried concrete.

The GAC adopted for assessment of soils in relation to Human Health are based on published LQM/CIEH S4ULs (2015) for those compounds for which published criteria are available for varying scenarios (residential, commercial, allotment, public open space). In the absence of LQM/CIEH S4ULs (2015) the following GAC defining documents are adopted - CL:AIRE Soil GAC for Human Health Assessment (2010) and Category 4 Screening Levels (C4SLs) (2014).

The primary risk to human receptors from free cyanide in soils is an acute risk (i.e. a single dose could have a lethal effect as opposed to adverse effects from cumulative intake (chronic effect)). There is no current UK guidance available for calculating acute risks from free cyanide, therefore an in-house methodology has been used to derive an acute GAC of 60 mg/kg for all exposure scenarios. The value is given for

Free or Easily Liberatable Cyanide but should be used to assess Total Cyanide in the absence of cyanide speciation. In cases where the Total Cyanide exceeds the GAC then analysis for Free or Easily Liberatable Cyanide should be completed.

Appendix 9 contains the full screening tables for 14 No. samples of Made Ground and 4 No. samples of Glacial Till. Any exceedances of GACs are indicated below. Given the commercial end use but the inclusion of public open space (POS) in the proposed development, all results have been assessed against the relevant GACs for a **Public Open Space - Park** scenario based on a measured organic matter content of **2.5%**.

3.7.1 Asbestos

An asbestos screen was performed on 12 No. samples of Made Ground; asbestos was recorded in 9 No. of the samples. The asbestos screening results are summarised below and are included in the chemical testing results in Appendix 8. A JIWG Decision Support Tool has been used to establish a CAR2012 Work Category for the site. The Decision Support Tool is included with the screening tables in Appendix 9. It should be noted that the laboratory detection limit for asbestos quantification is 0.001%.

Sample	Depth (m bgl)	Total Asbestos (%)	Asbestos Type	Asbestos Containing Material (ACM) Detected
TP303	1.20	<0.001	Amosite and Chrysotile	Loose Fibres
TP309	2.90	0.002	Amosite and Chrysotile	Loose Fibres, Loose Fibrous Debris
TP304	2.70	0.006	Amosite and Chrysotile	Sheeting / Board Debris, Loose Fibres
TP301	0.30	0.001	Amosite and Chrysotile	Loose Fibres, Loose Fibrous Debris
DS302	1.00	<0.001	Chrysotile	Loose Fibres
TP302	0.60	<0.001	Chrysotile	
DS307	1.50	0.003	Amosite and Chrysotile	Bitumen, Loose Fibres
DS306	0.40	<0.001	Amosite	Loose Fibres
DS304	0.50	<0.001	Amosite	Loose Fibres
TP303	2.90	<0.001	Chrysotile	Asbestos Cement

TP304	4.10	<0.001	Amosite and Chrysotile	Loose Fibres
TP306	1.20	<0.001	Amosite and Chrysotile	Loose Fibres, Loose Fibrous Debris

3.7.2 Polycyclic aromatic hydrocarbons (PAHs)

Of the sixteen PAH compounds, 5 No. exceedances of the POS - Park GAC were noted. The sample taken at 3.60m bgl in TP309 was taken from within the infilled canal. The exceedances are summarised in the table below:

Determinand	Location	Depth of Sample (m bgl)	Result (mg/kg)	GAC (mg/kg)
Benzo(b)fluoranthene	TP309	3.60	16.00	15.00
benzo(a)pyrene	DS306	0.40	14.00	12.00
	TP309	3.60	18.00	
dibenz(a,h)anthracene	DS306	0.40	1.60	1.30
	TP309	3.60	1.70	

3.7.3 Metals and metalloids

No exceedances of any metals or metalloids were recorded in any of the samples submitted for laboratory analysis.

3.7.4 Total Petroleum Hydrocarbons (TPH)

There were no TPH compounds recorded in excess of the Public Open Space – Park GAC in any of the samples tested across the site.

3.7.5 Monoaromatics and Oxygenates

14 No. samples of Made Ground were tested for the presence of BTEX (benzene, toluene, ethyl benzene and xylenes) and methyl tert-butyl ether (MTBE). Concentrations of BTEX compounds above laboratory detection limits were noted in 7 No. samples, however no exceedances for the Public Open Space – Park GAC were recorded in any of the samples tested.

3.7.6 Volatile Organic Compounds (VOCs)

3 No samples taken from the infilled canal area were tested for the presence of VOCs (not including contaminants previously discussed in this section). Although selected VOCs were recorded at concentrations above the laboratory detection limit within these samples, the VOCs in question (1,1,2,2 Tetrachlorethane, n-Propylbenzene, 1,3,5– Trimethylbenzene, 1,2,4– Trimethylbenzene and p-Isopropyltoluene) are considered low risk and do not have an associated general assessment criteria (GAC) value.

3.8 Ground Gas Monitoring

The following dynamic sampling and cable percussion boreholes were installed with a standpipe to allow for monitoring of ground gas concentrations and any underlying groundwater which may be present:

Exploratory Hole	Response Zone Stratum	Response Zone Depth m bgl *(m AOD)*	
		Top of Response Zone	Base of Response Zone
DS302	**Made Ground** comprising very gravelly clayey fine to coarse SAND	0.50 *(61.62)*	1.00 *(61.12)*
CP301		1.00 *(61.10)*	3.00 *(59.10)*
CP302	**Glacial Till** comprising slightly gravelly slightly sandy CLAY	5.00 *(57.05)*	8.00 *(54.05)*

The monitoring wells are constructed of 51mm diameter HDPE plain pipe to the depth of the response zone. The response zones comprise slotted pipe surrounded by a gravel annulus which are sealed above and below with hydrated bentonite seals. The monitoring wells are topped with a flush lockable cover.

4 No. visits out of a scheduled programme of 6 visits have been completed; the results have been summarised below:

Gas Monitoring Well	Steady O_2 Concentration (%)	Peak CO_2 Concentration (%)	Peak CH_4 Concentration (%)	Peak H_2S Concentration (ppm)	Atmospheric Pressure (mbar)	Steady Gas Flow (l/hr)
DS302	18.7 – 19.2	0.1	0.1	1	1004 – 1022	0.1
CP301	19.0 – 19.8	0.1	0.1 – 0.2	1	1003 – 1023	0.1
CP302	3.3 – 14.1	0.2 – 1.0	0.1	1	1004 – 1022	0.1

Ground gas monitoring was undertaken utilising a GFM 4300 gas analyser. Grey = Result below instrument detection limit

The ground gas monitoring results and calibration certificate are included in Appendix 10.

3.9 Groundwater Depth Monitoring

The above wells were also installed for the purposes of groundwater depth monitoring. Groundwater monitoring is ongoing, however, after 4 No. visits the following range of results has been recorded:

Groundwater Monitoring Well	Response Zone (m bgl)	Water Level (m bgl)
DS302	0.50 – 1.00	0.25 – 0.75
CP301	1.00 – 3.00	1.53 – 1.80
CP302	5.00 – 8.00	7.21 – 7.69

The groundwater depth monitoring results are included with the gas monitoring results in Appendix 10.

4.0 ENVIRONMENTAL CONCLUSIONS

4.1 Assessment of Environmental Results

Soil sample analyses have assessed the presence of contaminants on a spatial basis, and the concentrations at which they occur across the site.

PAH exceedances for the *'POS - Park'* land use scenario were recorded for 2 No. samples of Made Ground sent for laboratory chemical testing. Asbestos was detected in 12 No. samples of Made Ground in the form of chrysotile and amosite loose fibres, sheeting, board debris and asbestos cement.

Visual and olfactory evidence of TPH impact was recorded in the infilled canal as detailed in §3.2. Strong hydrocarbon odours and sheens were recorded in exploratory holes undertaken within the extents of the infilled canal between depths of 2.40m and 4.40m bgl. Speciated TPH analysis within these deposits recorded no GAC exceedances for the ('*POS – Park')* land use scenario.

The original conceptual models produced in the IGE Consulting *Phase 1 Geo-Environmental Investigation Report* have been revised / updated using the findings from the geo-environmental ground investigation.

4.2 Conceptual Model for Human Health Risk

The possible sources of contamination identified within the Phase 1 report include:

- On-site Made Ground;
- On-site historical industrial land use;
- On-site historical infilled canal; and
- Off-site historical industrial land use.

The human health receptors identified within the Phase 1 report include:

- End users (POS – Park land use scenario);
- Construction workers; and

- The general public and adjacent site users.

The human health pathways identified within the Phase 1 report include:

- Ingestion of dust and soil;
- Dermal contact with dust and soil;
- Inhalation (dust);
- Inhalation (vapours); and
- Inhalation and oral backgrounds.

Made Ground was identified across the site to a depth of between 2.30m and 4.00m bgl and was noted to be consistent in composition aside from the material encountered within the area of the infilled canal. GAC exceedances were recorded for the POS – Park land use scenario for PAHs in 2 No. samples of Made Ground when screened against the relevant S4ULs. Although the concentration of benzo(a)pyrene recorded acceptable concentrations when screened against C4SL criteria, a PAH profiling tool was used to determine whether benzo(a)pyrene could be used as a surrogate marker. The profiling determined that due to the variance from the Culp et al results, benzo(a)pyrene cannot be used as a surrogate marker for PAH concentrations on site.

The most severe contaminant pathway with regards to human health risk is ingestion of dust and soil, particularly given there is currently no hardstanding or soft landscaping breaking the pathway between the contaminative source and the receptor. However, a c. 950m^2 area of soft landscaping is included in the proposed development in the southern and eastern site sections; this area is to comprise 300mm topsoil overlying 400mm subsoil. This material will need to be imported onto site and thus chemically tested at source and on site, thus producing a clean cover system breaking a key contaminative pathway. The remaining external areas will be overlain by asphalt within the proposed development further reducing contaminative pathways. Details of the clean cover system requirements, testing frequencies and further discussion are presented in §4.6.

However, a c. 400m^2 external area is to remain in the existing condition according to the proposed development plan. Given that the pathways will not be broken within this area and that is unclear whether this area will be open to public following development, the risk is elevated within this region.

As discussed in § 3.7.1, Asbestos in the form of chrysotile and amosite is present within the Made Ground deposits at concentrations of up to 0.006% (sheeting / board debris). A JIWG Decision Support Tool has been used to confirm the classification of any groundworks carried out within the Made Ground, although the assessment has classified the work as non-licensed work, there is an uncertainty as to the level of degradation of intact ACMs caused by the work and whether any exposure limit will be exceeded. However, the risk assessment has been completed conservatively, assuming significant degradation and 'full time occupational exposure' to account for this. Given the work will take place outside and will utilise dust suppression and appropriate PPE and RPE, it is not deemed necessary to class the work as notifiable at this stage.

4.2.1 Human Health Conclusions

Based on the above revised conceptual site models, the site is considered to pose a **low risk** to human health of site users, the general public and construction workers.

A clean cover system should be installed in areas of soft landscaping as detailed in §4.6.

The JIWG Decision Support Tool indicates that any groundworks within the asbestos-impacted soil will be classed as non-licensed work in-line with CAR2012 involving the use of localised and basic personal decontamination facilities, localised dust suppression and the use of EN149 type FFP3 face masks. Groundworkers should be trained in non-licensed work and empowered to stop works if necessary. Any potential increase in risk to construction workers associated with acute interaction with soils can be mitigated with the aforementioned health and safety procedures and PPE / RPE.

4.3 Conceptual Model for Ground Gas Risk

For the purposes of this ground gas risk assessment, the proposed development has been considered to be a Type C building in accordance with BS 8485 (2015) + A1 (2019) – *commercial building with central building management control of any alterations to the building, its uses and maintenance (including gas protection measures). Small to large rooms with active ventilation or good passive ventilation.*

Potential ground gas sources identified within the Phase 1 report include:

- On-site Made Ground;
- On-site historical shafts and workings; and
- On-site coal seam and potential workings.

Potential ground gas pathways identified within the Phase 1 report include:

- Migration through fractures and fissures in bedrock;
- Preferential migration along foundations and service ducts;
- Migration within groundwater;
- Ingress through cavity walls and floors; and
- Inhalation.

Potential ground gas receptors identified within the Phase 1 report include:

- End users;
- Construction workers; and
- The general public and adjacent site users.

Made Ground was recorded in all exploratory holes undertaken on site to a maximum depth of 4.00m bgl. The Made Ground was noted to contain no putrescible or organic rich material during the investigation works although strong hydrocarbon odours were recorded between depths of 2.40m and 4.40m bgl in trial pits undertaken within the infilled canal presenting a potential risk from Volatile Organic Compounds (VOCs).

However, Photo Ionization Detector (PID) tests undertaken on samples of this material recorded a maximum result of 64.00 ppm and subsequent spot PID tests undertaken during ground gas monitoring visits have recorded a maximum value of 5.20 ppm.

No significant ground gas concentrations were recorded during the ground gas monitoring visits undertaken to date, although reduced oxygen was recorded in CP302. It is inferred that this is likely due to the presence of rootlets within Glacial Till deposits in which the monitoring well was placed. Made Ground on site can therefore be discounted as a significant ground gas source.

Mine gas from underlying coal seams and workings is considered separately below, in-line with best practice guidance.

4.3.1 Mine Gas Risk Assessment

Shallow coal workings were identified as a potential ground gas source in the Phase 1 Geo-Environmental Report. Following the completion of the IGE Consulting Coal Mining Risk Assessment (Ref: 4490-02A), and the intrusive ground investigation, the conceptual site model with respect to mine gas emissions has been updated below:

No evidence of shallow coal seams or shallow coal workings were identified during the ground investigation given that the cable percussion boreholes were not progressed to significant depths within bedrock. During drilling and grouting works undertaken previously in the eastern site section, the Bradford Three Quarter coal seam was encountered at depths of 16.60m to 29.60m bgl and was noted to be mostly intact aside from broken ground combined with flush loss in 2 No. boreholes at depths of 24.60m to 26.30m bgl. Therefore, there is a potential for broken ground / shallow workings further west on site. The shallowest recorded workings on site are at a depth of c. 47.00m bgl as indicated by the Coal Mining Consultants Report and abandonment plans obtained for the IGE Consulting Coal Mining Risk Assessment.

During the previous drilling and grouting works, the presence of 2 No. mine shafts north of the site were investigated by probing with 1 No. shaft found to be present

and appropriately treated and the other not identified after 150 probe holes undertaken in a spiral pattern out from the recorded centre of the shaft.

Therefore, based on the above findings, without any further consideration the site is deemed to be at moderate risk based on the CL:AIRE Good Practice for Risk Assessment of Coal Mine Gas Emissions (October 2021) Figure 13.1: Decision Support Tool For Mine Gas Risk Assessment, therefore, a detailed mine gas risk assessment is recommended and has been undertaken below.

Based on the ground investigation undertaken, including the trial pits, dynamic sample boreholes and cable percussion boreholes, fine Glacial Till is present on-site to a depth of between 15.00m and 15.40m bgl. Therefore, generally across the site there is at least 11.00m of fine Glacial Till underlying the Made Ground. The presence of a significant thickness of cohesive Glacial Till will significantly reduce if not negate the vertical migration of ground gas from the underlying suspected workings at c. 47.00m bgl.

Additionally, mudstone was recorded at rockhead which will also significantly reduce the possibility of vertical migration of mine gas. No faults, including underground faults, are recorded on site or in close proximity to the site, therefore migration along faults and fissures is also not considered a feasible pathway.

Therefore, no significant vertical migration pathways have been identified on site. However, numerous mine shafts are recorded off site to the north and northeast. 2 No. shafts (Ref: 386398-012 and 386398-013) are located c. 17m and 20m north of the site, respectively, based on the MRA recorded location. Mine entry 386398-012 has been identified and treated by grouting and capped whilst mine entry 386398-013 has been subject to a comprehensive probing investigation involving 150 probe holes. The investigation did not locate the mine entry but concluded that it lies further to the north than recorded on the MRA drawings.

Mine entries are considered significant pathways for mine gas migration as they may provide direct conduits for mine gas migration. Where mine shafts have been grouted or backfilled with concrete and capped, the likelihood of migration of mine gas is

reduced given the low permeability of the backfill material. However, as it is unknown if the mine shafts adjacent to the site have been backfilled, mine gas migration up the mine shafts may occur.

Although the mine shafts are located off-site, given their proximity to the site, the risk of mine gas migrating from the shafts onto the site cannot be discounted. Migration from shaft ref: 386398-012 is unlikely given the previous investigation and treatment; migration from 386398-013 is unlikely given the low probability that lateral migration will occur at depth due to the low permeability Glacial Till and mudstone which will reduce diffuse gas migration. Although some granular bands may be present within the Glacial Till, they are not anticipated to be continuous or present at consistent depths and are often water bearing, therefore lateral migration of mine gas from the shaft along granular bands is also deemed unlikely. However, where unsaturated granular Made Ground is present near the surface, or where service trenches are present leading from the vicinity of the shaft onto the site, lateral mine gas migration may occur.

However, abandoned mine gas emissions are characterised by a high rate of emissions immediately following closure of the mine, with the emission rate falling to much lower rates over a period of c. 10 years. Therefore, as the last recorded workings beneath the site are more than 130 years ago in 1891 as recorded by the MRA, it is envisaged that the desorption of methane from the coal workings will be very low at present. This is also likely to be true for the oxidation of coal and the generation of carbon dioxide, as the longer the duration since the coal was exposed to the atmosphere (i.e., during mining), the lower the risk. Weathered / oxidised coal also consumes oxygen at a rate much lower than freshly mined coal, therefore the risk of oxygen deficient air being emitted is also considered to be low. Therefore, although pathways may be present along shallow granular deposits from the off-site mine entry, given the anticipated very low concentrations of mine gas which will be diluted and dispersed, the accumulation of significant concentrations of mine gas within proposed structures is deemed unlikely.

The mine entries located more than 50m from the site have not been considered in this risk assessment given the relatively low risk associated with mine shafts located more than 50m from the site given their distance.

Given the ground conditions encountered on site and the anticipated load of the proposed development, the structure will utilise a piled foundation solution. The piles are unlikely to be driven into the bedrock given the presence of Glacial Till to c. 15.00m bgl. Additionally, ground gas migration along piled foundations is not considered a feasible pathway as the piles are in intimate contact with the surrounding soil. A considerable thickness of cohesive Glacial Till will be present beneath the foundations, consequently, additional pathways will not be created by the construction of piled foundations.

The installation of possible soakaways, attenuation tanks and deep drainage in the proposed development is unknown at this stage. However, if any of the aforementioned features are installed, an increase in the mine gas risk is not anticipated as a significant thickness of Glacial Till will negate the possibility of vertical migration and accumulation within service trenches or drainage features.

It should also be noted that given the relatively shallow depth of investigation, none of the exploratory holes are deemed to be potential pathways to the future developments as they were backfilled with arisings or bentonite upon completion. Nonetheless, it is recommended that prior to development, the ground gas monitoring wells are appropriately decommissioned.

Based on the above conceptual site model, given the lack of feasible pathways of mine gas migration, the risk posed by mine gas remains moderate.

4.3.2 Carbon Monoxide

A peak and steady carbon monoxide concentration of 27 ppm was recorded in CP302 during the first monitoring visit which correlated with oxygen depletion at the time of monitoring.

Carbon monoxide is an odourless, colourless and tasteless gas produced by incomplete combustion of fossil fuels such as coal, wood, gas or oil. The ‘Workplace

Exposure Limits' safety level as specified by the Health and Safety Executive is 35mg/m^3 or 30ppm for long term exposure (8-hour period) which is greater than the recorded concentration in CP302. The source of the carbon monoxide is anticipated to be due to the presence of significant quantities of coal within the fine Glacial Till deposits. Given the level of carbon monoxide recorded and the proposed development, carbon monoxide is deemed to pose a low risk.

4.3.3 Gas Screening Value

The results of the 4 No. ground gas monitoring visits have been assessed in accordance with BS 8485 (2015) + A1 (2019). The characteristic Gas Screening Value (GSV) is calculated by dividing the maximum methane or carbon dioxide concentration by 100 and multiplying by the maximum steady flow rate recorded at the same monitoring point (the instrument detection limit of 0.1 l/hr is utilised when below detection limit flow rates are recorded). If required, the worst case GSV can be calculated by dividing the maximum carbon dioxide and methane concentration by 100 and multiplying by the maximum steady flow rate on site.

Ground gas monitoring has recorded a maximum peak carbon dioxide concentration of 1.0% v/v. No methane concentrations or steady flow rates above detection limits were recorded.

As no steady flow rates were recorded on site, the GSV and the worst case GSV for carbon dioxide at the site can be calculated as (1.0/100)*0.1= 0.001l/hr.

4.3.4 Ground Gas Conclusions

Based on the ground gas monitoring undertaken and based on a traditional assessment utilising a gas screening value, the site falls in-line with Characteristic Situation 1. However, based on the mine gas risk assessment undertaken in Section 4.3.1, there is a moderate risk of mine gas as sources and possible pathways have been recorded. Consequently, the site is designated as a **Characteristic Situation (CS3).** Based on the proposed development being a Type C building in accordance with BS8485 (2015) + A1 (2019), ground gas protection measures will be required to mitigate the ground gas risk, achieving a minimum of **3.0 points.** Details of suitable ground gas protection measures to achieve the required points are outlined in §4.6.3.

4.3.5 Radon

The Indicative Atlas of Radon in England and Wales produced by the Health Protection Agency and British Geological Survey indicates that the site lies within a lower probability area, less than 1% of homes are above the action level. Consequently, no radon protection measures are necessary in the construction of new dwellings or extensions.

4.4 Conceptual Model for Controlled Waters Risk

The possible sources of contamination identified within the Phase 1 report include:

- On-site Made Ground;
- On-site historical industrial land use (1848 – 1992); and
- On-site historical infilled canal (1848 – 1992).

The controlled water receptors identified within the Phase 1 report include:

- Groundwater contained within the underlying Secondary Undifferentiated Aquifer and Secondary A Aquifer; and
- Surface water – off site Ashton Canal (15m north).

The controlled waters pathways identified within the Phase 1 report include:

- Vertical migration through coarse Made Ground and coarse soils;
- Lateral migration along low permeability natural soils & pooling at relative low points;
- Vertical migration along future foundations and pooling at base;
- Migration through porous bedrock; and
- Overland flow.

Made Ground was encountered consistently to depths of between 2.30m and 4.40m bgl on site. Strong hydrocarbon sheens and odours were recorded during exploratory hole construction within the historical infilled canal with tar recorded during the

construction of TP309. No further visual or olfactory evidence of contamination was noted in the Made Ground or Glacial Till deposits elsewhere across the site. Chemical testing undertaken has recorded elevated PAH concentrations within Made Ground deposits and elevated VOC concentrations in Made Ground encountered in the historical infilled canal.

No natural groundwater strikes were recorded during the investigation, and the groundwater monitoring visits undertaken to date have recorded water levels between (0.25m – 7.69m bgl) inferred to be due to the monitoring wells acting as a sump for perched water within Made Ground deposits. Both PAHs and VOCs are relatively insoluble and thus immobile in groundwater further reducing the risk to controlled waters. Furthermore, given the presence of c. 12.00m fine Glacial Till deposits underlying the Made Ground, lateral migration will be a preferential pathway as opposed to vertical migration and given the slight downward sloping topography to the south, and lateral migration will be away from the Ashton Canal north of the site.

Consideration has been given to the possibility of piled foundations creating a contaminant linkage to controlled waters. The primary pathways in this case include the sinking of contaminants directly at the base of the pile, migration down the sides and through the centre of the piles and piles directly causing turbidity in underlying aquifers. Given the relatively low concentrations of contaminants and low mobility of elevated contaminants (PAHs), the sinking of contaminants at the base of the pile is unlikely to cause a significant impact to controlled waters. The pile will cause densification of the surrounding soil along the length of the pile, thus ‘closing up’ the soil and preventing the migration of contaminants along the edges. Finally, the lack of natural groundwater encountered across the site during the ground investigation reduces the risk further and negates the risk of causing turbidity in underlying aquifers.

Consequently, the risk to controlled waters is deemed **low** as no contaminative linkages have been negated. No further assessment or remedial measures are considered necessary.

4.4.1 Controlled Waters Conclusions

The risk to controlled waters is deemed **low** due to a lack of significant contaminative sources and no contaminative linkages having been identified. No further assessment or remedial measures are considered necessary.

4.5 Conceptual Model for Building Materials & Services

In accordance with BRE Special Digest 1: Concrete in Aggressive Ground (2005), the site has been classified as brownfield with mobile groundwater, the Made Ground soils have been classified as Design Sulfate level DS-3 and subsequently within the Aggressive Chemical Environment for Concrete (ACEC) classification of AC-3. Therefore, all concrete to be used on site should be designed to meet the requirements of DS-3, AC-3.

The chemical laboratory testing results are contained within Appendix 8.

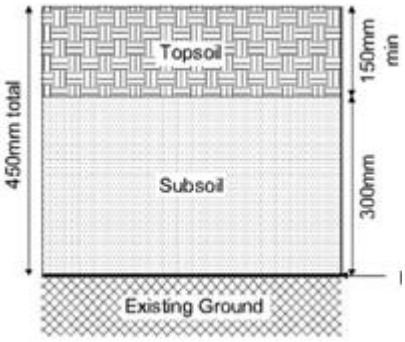
4.6 Outline Remedial Strategy

As discussed in §4.2.1, due to the human health GAC exceedances for the POS - Park scenario recorded within the on-site Made Ground and the confirmed presence of asbestos, remedial measures are required for the proposed development. A clean cover system will be required in proposed areas of soft landscaping in order to break the contaminative linkages. Details of the required clean cover system are included below. Ground gas protection measures achieving a minimum of 3.0 points are also required for the proposed development.

4.6.1 Clean Cover System

Made Ground is present depths exceeding 450mm below finalised external levels across the site. Therefore, in accordance with Manchester City Council Planning and Contaminated Land Technical Guidance (dated February 2021), the following procedure is proposed for use in areas of soft landscaping:

1. Excavate to 450mm bgl in soft landscaping areas;
2. A 450mm clean cover system is recommended to be added to the proposed soft landscaping. This is to consist of:
   - No less than 150mm suitable topsoil, underlain by;
   - 300mm suitable subsoil to a total (topsoil + subsoil) depth of 450mm, underlain by;
- A high vis geotextile marker;
- Validate in line with the below strategy.



4.6.2 Clean Cover System Validation

Once the 450mm clean cover system is installed to break contaminative linkages, validation requirements include:

- Details of the source of the cover material;
- Chemical test results to demonstrate that the soil is free from contamination and 'suitable for use' in-line with the below chemical testing suites and rates;
- Waste transfer notes to provide evidence of source;
- Confirmation of cover depth by either measurement tape or topographical survey with photographs consisting of three pits in the proposed soft landscaping area.

No topsoil is present on site, therefore all topsoil will need to be imported, and this must be validated as detailed below to ensure its suitability for use (i.e., no glass or plastic is to be included and meets chemical testing acceptability criteria). The Glacial Till deposits are deemed chemically suitable for re-use subject to further testing during earthworks.

Imported topsoil and subsoil is required to be tested at source prior to import to confirm suitability. All topsoil and subsoil, whether site-won or imported is required to be tested at the following frequency:

Source	Material End Use	Sampling Frequency[1]	Testing Suites[3] (see below)
Greenfield Source:	Topsoil	1 per 200m^3	A, B, C, D, F
	Subsoil	1 per 200m^3	A, B, C, D, F
Brownfield Source:	Topsoil	1 per 50m^3	A, B, C, D, F, H
	Subsoil	1 per 100m^3	A, B, C, D, F
	General Fill[2]	1 per 1000m^3	A, B, C, E, G

1) Minimum 3 samples regardless of volume.
2) 'General Fill' is material used primarily to raise levels, specifically not within areas of public open space, or soft landscaping, e.g. 6F2.
3) In addition to the standard suites given, the laboratory testing suite should include any additional contaminants of concern based on the source of the samples.

Testing Suites:

A. Asbestos ID, Asbestos quantification.
B. pH, total and free cyanide, soluble sulfate, organic matter.
C. Arsenic, Beryllium, Boron, Cadmium, Chromium (III and VI) Copper, Lead, Inorganic Mercury, Nickel, Selenium, Vanadium, Zinc.
D. Speciated PAHs: Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(ghi)perylene.
E. Total (non-speciated) PAHs.
F. Speciated Total Petroleum Hydrocarbons (TPH): Aliphatic >EC5 - EC6, >EC6 - EC8, >EC8 - EC10, >EC10 - EC12, >EC12 - EC16, >EC16 - EC21, >EC21 - EC35, and > EC35 - EC44, and Aromatic >EC5 - EC7, >EC7 - EC8, >EC8 - EC10, >EC10 - EC12, >EC12 - EC16, >EC16 - EC21, >EC21 - EC35, > EC35 - EC44.
G. Total Petroleum Hydrocarbons (TPH): TPH EC6 – EC40.
H. BTEX: Benzene, Toluene, Ethylbenzene, p- & m-xylene, o-xylene. Methyl tertiary butyl ether (MTBE).

Once tested, the results are to be compared against the following Acceptability Criteria:

Suite	Determinand (mg/kg unless stated)	Acceptability Criteria for:			
		Private Gardens	Public Open Space (residential)	Soft Landscaping or Public Open Space (Park)	General Fill
A	Asbestos (%)	ND	ND	ND	<0.001 – 0.01%
B	pH	>6 - <8(3)	>6 - <8(3)	>6 - <8(3)	>5 - <10(3)
	Total Cyanide	0.5(3)	0.5(3)	0.5(3)	0.5(3)
	Free Cyanide	0.5(3)	0.5(3)	0.5(3)	0.5(3)
	Soluble Sulfate (mg/l)	500(3)	500(3)	500(3)	500(3)
C	Arsenic	37	79	170	640
	Beryllium	1.7	2.2	63	12
	Boron	290	21000	46000	240000
	Cadmium	11	120	560	190
	Chromium (III)	910	1500	33000	8600
	Chromium (VI)	6	7.7	220	33
	Copper	2400	12000	44000	68000
	Lead	200(1)	630(1)	1300	2330(1)
	Inorganic Mercury	40	120	240	1100
	Nickel	130	230	800	980
	Selenium	250	1100	1800	12000
	Vanadium	410	2000	5000	9000
	Zinc	3700	81000	170000	730000
D	Naphthalene	2.3	4900	1200	
	Acenaphthylene	170	15000	29000	
	Acenaphthene	210	15000	29000	

	Fluorene	170	9900	20000	
	Phenanthrene	95	3100	6200	
	Anthracene	2400	74000	150000	
	Fluoranthene	280	3100	6300	
	Pyrene	620	7400	15000	
	Benzo(a)anthracene	7.2	29	49	
	Chrysene	15	57	93	
	Benzo(b)fluoranthene	2.6	7.1	13	
	Benzo(k)fluoranthene	77	190	370	
	Benzo(a)pyrene	2.2	5.7	11	
	Indeno(1,2,3-cd)pyrene	27	82	150	
	Dibenz(a,h)anthracene	0.24	0.57	1.1	
	Benzo(ghi)perylene	320	640	1400	
E	Total PAHs				1000[4]
F	TPH-CWG - Aliphatic >EC5 - EC6	42	570000	95000	
	TPH-CWG - Aliphatic >EC6 - EC8	100	600000	150000	
	TPH-CWG - Aliphatic >EC8 - EC10	27	13000	14000	
	TPH-CWG - Aliphatic >EC10 - EC12	130	13000	21000	
	TPH-CWG - Aliphatic >EC12 - EC16	1100	13000	25000	
	TPH-CWG - Aliphatic >EC16 - EC21	65000	250000	450000	
	TPH-CWG - Aliphatic >EC21 - EC35				
	TPH-CWG - Aliphatic > EC35 - EC44	65000	250000	450000	
	TPH-CWG - Aromatic >EC5 - EC7	70	56000	76000	
	TPH-CWG - Aromatic >EC7 - EC8	130	56000	87000	
	TPH-CWG - Aromatic >EC8 - EC10	34	5000	7200	
	TPH-CWG - Aromatic >EC10 - EC12	74	5000	9200	
	TPH-CWG - Aromatic >EC12 - EC16	140	5100	10000	
	TPH-CWG - Aromatic >EC16 - EC21	260	3800	7600	
	TPH-CWG - Aromatic >EC21 - EC35	1100	3800	7800	
	TPH-CWG - Aromatic > EC35 - EC44	1100	3800	7800	
G	TPH > EC6 - EC40				5000[4]
H	Benzene	0.087	72	90	
	Toluene	130	56000	87000*	
	Ethylbenzene	47	24000	17000*	
	p & m-xylene	56	41000	17000*&**	
	o-xylene	60	41000	17000*	
	MTBE (Methyl Tertiary Butyl Ether)	LOD[3]	LOD[3]	LOD[3]	

LQM/CIEH S4ULs for Human Health Risk Assessment (3rd edition, 2015) used unless stated:

1) *Category 4 Screening Levels (March 2014)*
2) *CL:AIRE Soil GAC for Human Health Assessment (January 2010)*
3) *In-house screening criteria used as no GAC methodology currently exists*
4) *Hazardous waste thresholds. This limit only applies to imported material, not to in-situ soil.*

Assumed 1% SOM (most conservative) for those values dependent upon SOM.
ND = Not Detected
LOD = Limit of Detection
**Exceeds vapour saturation limit*
***Exceeds solubility saturation limit*

The above acceptability criteria for PAHs for imported topsoil and subsoil are based on the published LQM/CIEH S4ULs (2015) for each individual PAH and not based on the Category 4 Screening Level using benzo(a)pyrene as a surrogate marker. This is as the source of the imported material is unknown therefore using the surrogate

marker approach may not be suitable as the distribution of PAHs in the imported material may not be similar to those in the Culp et al. (1998)[1] study. Once chemical testing had been undertaken on imported soil and the distribution of PAHs compared to the distribution in the Culp et al. (1998) study, it may be suitable to use the surrogate marker approach / C4SL.

4.6.3 Ground Gas Protection Measures

As stated in § 4.2.2, ground gas protection measures achieving a minimum of 3.0 points are required for the proposed development. Based on no basement and the unknown suspended floor slab design, 2 No. examples of how the required 3.0 points can be achieved are given below:

		BS:8485 (2015) + A1 (2019) Scores	Floor Slab Design Options			
			Pre-cast Beam and Block Suspended Slab		Cast In-situ Suspended Slab	
			Design Choice	Score	Design Choice	Score
Floor Slab	Precast suspended segmental subfloor	0	✔	0		
	Cast in-situ ground bearing floor slab (with only nominal mesh reinforcement)	0.5				
	Cast in-situ monolithic reinforced ground bearing raft or reinforced cast in-situ suspended floor slab with minimal penetrations	1 or 1.5*			✔	1.5
Ventilation	Pressure relief pathway	0.5				
	Passive sub-floor dispersal layer	1.5 or 2.5**	✔	2.5		
	Active dispersal layer	1.5 to 2.5				
	Active positive pressurisation	1.5 to 2.5				
Membrane	**Ground gas resistant membrane*** **	**2**	✔	**2**	✔	**2**
Total Points Achieved			4.5		3.5	

* To achieve a score of 1.5 the raft or suspended floor slab should be well reinforced to control cracking and have minimal penetrations cast in.
** 2.5 points = very good performance. 1.5 points = good performance.
*** To achieve the 2 points the gas membrane must meet all criteria set out in BS:8485 (2015) + A1 (2019) Table 7.

[1] Culp et al. (1998), *A comparison of the tumors induced by coal tar and benzo[a]pyrene in a 2-year bioassay*, **Carcinogenesis,** vol.19, no.1, pp.117–124.

4.6.4 Ground Gas Protection Measures Validation

The installers will be required to be trained and experienced in the installation of ground gas resistant membranes. In line with CIRIA 735 (2014), an independent verifier will verify the installation of the gas protection measures for the proposed development, utilising a visual inspection method, including pick testing. This will be undertaken following the laying of the gas membrane, but prior to laying insulation and finishes. The independent verifier should:

- Identify that the correct membrane has been used, including sealing / jointing tape and pre-formed components e.g. tophats, corners;
- Inspect the general condition of the membrane for rips, tears and punctures;
- Check that all jointing has been carried out to the manufacturer's specification;
- Check that the membrane has been installed correctly across cavities, including correct jointing in these areas;
- Check that top hats have been correctly installed around service entries, including jubilee clip around pipe and correct lapping and jointing to membrane at base;
- Check that vents have been installed around the perimeter of the building in sufficient number and in the correct locations, including inspecting the condition i.e. not blocked or otherwise restricted;
- Check the presence of a ventilation layer, including measuring that this is of a sufficient depth and the void has not been filled or otherwise compromised. Check that internal sleeper walls are also vented to provide adequate flow-through within the void so that none of the walls are blocking off unvented sections within the void; and
- Take photographs to provide evidence of the above.

4.6.5 Validation Procedure and Report

The following plan details the required actions to demonstrate the successful installation of ground gas protection on the site. In accordance with BS8485+A1 (2019), the verification shall include, as a minimum, the following:

- Objectives of the verification;
- A brief overview of the site conditions and summary of the ground gas regime;
- A description of the installation, including gas-resistant membrane manufacturer and type used (including sealing / jointing tape and pre-formed components e.g. top hats, corners). The manufacturer specification / datasheet shall be included;
- Installer and verifier and credentials of such organisations, i.e. level of competency of installer – NVQ Level 2 or general groundworker;
- Detailed description of any deviations from the specification provided in this report, with explanation and justification of such deviations;
- As-built construction drawings and product specifications of components used:
- A description of the verification approach – in this case visual inspection, including pick testing;
- Verification evidence – in this case photographic evidence;
- Any record of relevant communications with regulatory bodies; and
- Verification conclusions, including any future monitoring or management requirements (anticipated none in this case due to passive approach), and limitations of the measures installed.

When the above has been completed and prior to use, this information will be compiled in a validation / completion report which will be submitted to and approved in writing by the local planning authority.

4.6.6 Asbestos and Dust Management

As discussed in §3.7.1, Asbestos in the form of amosite loose fibres, loose fibrous debris, sheeting / board debris, bitumen and asbestos cement (<0.001% to 0.006%) was recorded in the Made Ground. Consequently, based on the findings of the chemical laboratory test results, a risk assessment has been undertaken for the made ground using the *JIWG Decision Support Tool for the Categorisation of Work Activities Involving Asbestos in Soil or Construction & Demolition Materials in accordance with CAR 2012* (FINAL Version 2.1, March 2017).

The risk assessment for the Made Ground has been undertaken based on the worst-case scenario; 0.006% amosite and chrysotile sheeting / board debris.

Whilst some uncertainty remains regarding the level of degradation caused by the work and the exposure levels during the work, the JIWG risk assessment has been completed conservatively to account for this. The JIWG risk assessment concludes that any groundworks proposed on site involving the Made Ground will be classified as Non-Licensed Work. According to the above risk assessment, localised mechanical dust suppression and localised and enhanced personal decontamination facilities will be required during groundworks. An EN149 type FFP3 disposable mask must be worn by all construction workers involved in the proposed groundworks. It would be prudent to obtain guidance from a specialist asbestos contractor prior to selecting a removal / remediation method for on-site asbestos.

5.0 GEOTECHNICAL CONCLUSIONS

5.1 Geotechnical Assessment of Ground Conditions

It is the client's intention to develop the site into an immersive events space. The intrusive investigation works have revealed that the ground conditions at the site generally comprise Made Ground underlain by Glacial Till underlain by Pennine Upper Coal Measures.

The principal strata identified are outlined in further detail below.

5.1.1 Made Ground

Made Ground was recorded in all exploratory holes and generally comprised dark grey, very gravelly to gravelly, slightly clayey, fine to coarse sand with medium to high cobble content or dark grey, very sandy, slightly clayey, very angular to subrounded, fine to coarse gravel with medium to high cobble content.

Due to an extensive industrial history on site and the subsequent earthworks undertaken post-demolition, the Made Ground was found to be heavily compacted particularly at depths exceeding 1.00m bgl. The compaction of the Made Ground caused difficulty when excavating or drilling through the deposits with all dynamic sample boreholes terminating short of the target depth due to SPT refusals. Trial pit excavations terminated short of the target depth due to hard digging at TP301, TP307 and TP311 and thus did not reach the base of the Made Ground deposits.

16 No. California bearing ratio (CBR) tests were undertaken within Made Ground deposits at positions CBR01 to CBR08 at depths of 0.50m bgl and 1.00m bgl at each position. CBR values of between 20% and in excess of 100% and *k* values of between 82.10 and 371 kN/m^2/mm were recorded in the testing. Higher values were recorded in tests undertaken at 1.00m bgl with select results recording lower value as a result of surface water ingress into the pit during the test.

12 No. Standard Penetration Tests (SPTs) were undertaken within Made Ground deposits, all of which recording refusals apart from DS307 at 2.00m bgl, CP301 at

1.20m bgl and CP301 at 2.00m bgl recording N-values of 45, 26 and 7 respectively. Given the inherent heterogeneity of Made Ground, the SPT N-values should not be taken as characteristic or representative.

5.1.2 Glacial Till

Glacial Till deposits were encountered underlying the Made Ground and were noted to be consistent across the site, comprising stiff to very stiff, light brown, slightly gravelly, slightly sandy to sandy clay.

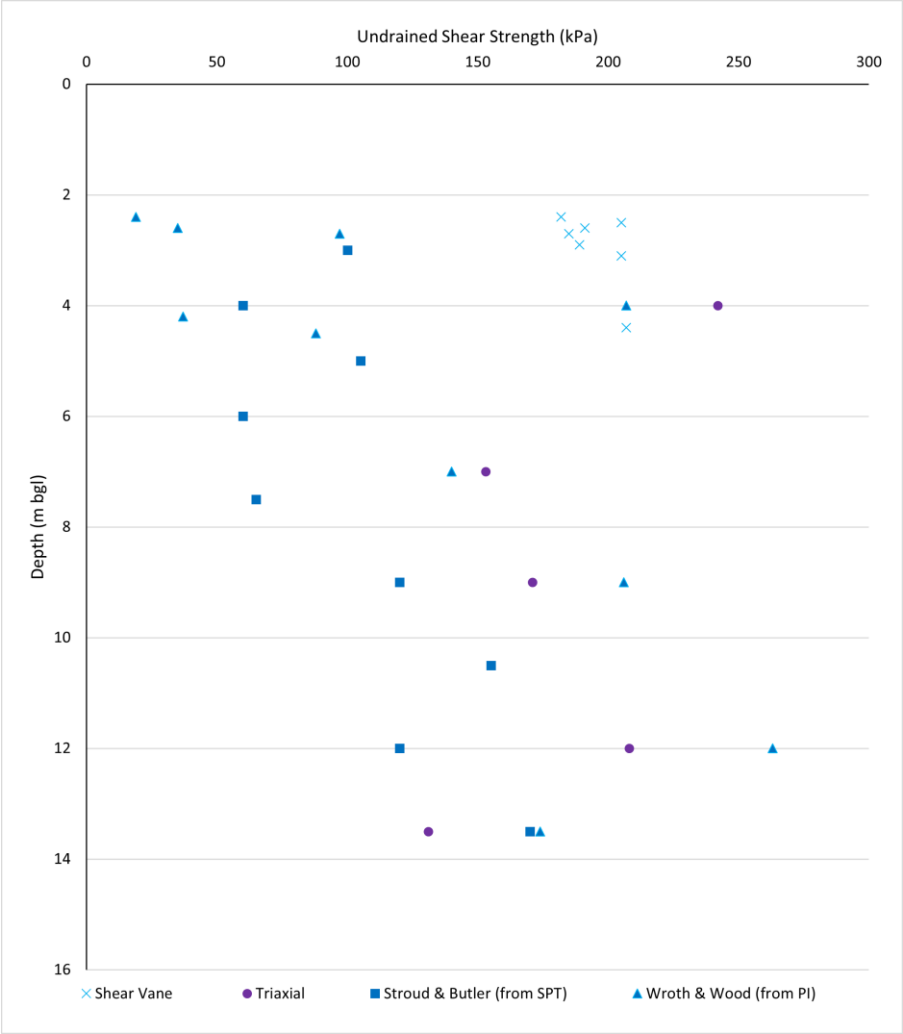
7 No. hand shear vane tests were undertaken within the Glacial Till which recorded undrained shear strengths of between 189kPa and >207kPa (average 195kPa). Given the low number of hand shear vane tests undertaken, a clear correlation between shear strength and depth could not be established.

5 No. undisturbed samples were submitted for quick undrained triaxial testing to determine the in-situ undrained shear strength, with results recorded between 131 and 242 kPa, indicative of a generally very high strength material at depth.

9 No. SPTs were undertaken in this stratum recording N-values of between 12 and 50 (average 20) and corrected N_{60} of between 9 and 34 (average 21) which increased linearly with depth.

10 No. Atterberg tests were undertaken on samples of shallow Glacial Till (2.40m – 13.50m bgl), which indicated that the Glacial Till deposits are clays of low to medium plasticity and low volume change potential.

The correlations between uncorrected N-values and undrained shear strength proposed by *Stroud & Butler* and between undrained shear strength and plasticity indices proposed by *Wroth & Wood* have been used to augment the dataset of undrained shear strength. The direct measurements (hand shear vane and triaxial) are presented alongside the empirical estimations, below. The undrained shear strength of the Glacial Till generally increases with depth, with no direct measurements below 100kPa.



5.1.3 Pennine Upper Coal Measures

Pennine Upper Coal Measures were encountered in CP301 and CP302 at depths of 15.40m and 15.00m bgl respectively encountered as weathered mudstone. Recovered as: Very stiff, slightly gravelly clay. Weathered mudstone was proven to a depth of at least 16.91m bgl (45.19m AOD). 3 No. SPTs were undertaken within the Pennine Upper Coal Measures resulting in 2 No. refusals (N-value = 50) and 1 No. result of 48.

5.2 Groundwater

No groundwater strikes were recorded within natural strata during the ground investigation works, however perched water was encountered within the Made Ground deposits at depths of between 0.70m and 3.10m bgl. Groundwater depth monitoring wells were installed during the ground investigation to monitor any longer

term fluctuations in groundwater levels. During the groundwater monitoring visits undertaken to date, water levels between 0.25m and 7.69m bgl have been recorded, inferred to be due to the wells acting as sumps for perched water overlying impermeable Glacial Till deposits. Groundwater control may be required for excavations on site, though simple techniques including sump pumping are likely to be sufficient for the perched water. Excavation support in accordance with guidance contained in CIRIA R97 should be utilised for any deep excavations on site and health and safety best practice should be adhered to at all times.

5.3 Foundations

Based on proposed levels, anticipated loads and the ground conditions encountered on site, shallow foundations are not deemed suitable for the proposed development. Although a raft foundation solution has been considered and would theoretically be feasible, it is understood that a piled foundation solution is the preferred methodology for the development. Given the presence of very high strength clays across the site from depths of c. 2.40m to 15.00m bgl, a piled foundation solution utilising skin friction is likely to be the most cost-effective foundation solution.

In consideration of the Made Ground deposits, a specialist piling contractor has been consulted in order to select the most feasible piling method for the development. Driven piles are unlikely to be feasible for the development due to the high compaction of the Made Ground deposits; instead, replacement piling methods such as continuous flight auger (CFA) piling utilising pile diameters greater than 450mm are considered suitable for the proposed development.

It is recommended that a temporary working platform is undertaken in line with BRE470 with appropriate in-situ testing to validate the installation. The movement/tracking of the piling rig onto and across site should be considered within the design. It is recommended that suitable plate incremental tests to appropriate pressures are undertaken following completion of the temporary working platform to ensure they have been installed appropriately.

All concrete on site, including that used for piles, should be designed to meet the requirements of DS-3, AC-3.

An assessment of the impact of existing services upon the proposed foundations should be made before selecting a final foundation solution.

Whilst it is not proposed to progress any piles into the underlying bedrock, given the possibility of broken ground and unrecorded shallow workings beneath the site, remediation of the historical coal mining is recommended. This should comprise drilling and grouting, following on from previous remedial works. This will likely involve drilling to 35.00m bgl and grouting to the surface based on a 6x6m primary grid in areas where the broken ground is encountered. The treatment area should extend as far west as required according to the depth of the Bradford Three-Quarter coal seam; due to the southwest dip of the seam, treatment may cease once the coal seam is not encountered within 35.00m bgl. The full details of the scheme will be provided in a drilling and grouting specification report, which should be provided to piling specialists prior to selecting a final solution.

5.4 Earthworks and External Areas

5.4.1 Highways and External areas

Given the consistent nature of the Made Ground deposits as noted visually and recorded in the CBR tests, it is envisaged that the entire site is underlain by well-compacted coarse Made Ground, therefore the hard-surfaced external works including the access road and pavements may be constructed directly on Made deposits across the site.

5.4.2 Earthworks

A full earthworks programme should be designed and completed for the works once finalised levels are known.

5.4.3 Stockpile Management

During the course of the development there will also be areas of stockpiled soils intended for re-use within the proposed development or for disposal off site. These will have been subjected to off-site testing and approved for use on site. It is imperative that the stockpiles are well managed to avoid inadvertent mixing or

depositing of surplus or deleterious materials that would compromise the continued use. We would recommend that the site management reviews the proposed positions for placement of stockpiles and places either fencing or warning signs to ensure compliance.

5.4.4 Export of Materials

Any soils to be removed from site must be classified in accordance with WM3 under the definition of waste and chemically tested to determine their destination, i.e. reuse or landfill. Waste ticket records must also be retained as proof of the export of materials from site.

6.0 RECOMMENDATIONS

- Following any variation in a finalised proposed development detailed design including earthworks design, proposed levels and arboricultural survey (tree survey) it is recommended that the above conclusions are re-appraised to determine the suitability;
- The conclusions of this report should be agreed with relevant regulatory authorities prior to the commencement of works;
- Further work involving drilling and grouting is required to achieve adequate competent rock thickness above shallow workings, the specification of which will be detailed in a separate report;
- Given the presence of asbestos in the Made Ground deposits, any groundworks on site will be classed as non-licensed work, requiring control measures discussed in § 4.6.6;
- A clean cover system, detailed in § 4.6.1, is deemed necessary in the area of soft landscaping proposed in the southern site section in order to break contaminative linkages;
- Ground gas protection measures are deemed necessary given that sources and potential pathways for ground gas have been identified on site. Ground gas protection measures achieving a minimum of **3.0** points are required;
- If any hereto unidentified visual or olfactory evidence of contamination is encountered during earthworks or construction work, then the Local Authority Environmental Health Officer and Environment Agency should be contacted immediately to determine appropriate mitigation measures;
- It is recommended that the presence and associated constraints of all site services are established prior to significant intrusive works beginning.

APPENDIX 1

LIMITATIONS OF REPORT AND INVESTIGATION WORKS

LIMITATIONS OF REPORT

This consultancy report was compiled and carried out by IGE Consulting Limited ('IGE') for the client, as defined in the main report (the 'client'), on the basis of a defined programme and scope of works and the terms of a contract between IGE and the client. IGE undertook this with all reasonable skill and care, taking into account the limits of the scope of works required by the client, the prevailing site conditions, the time scale involved and the resources, including financial and manpower resources, agreed between IGE and the client. IGE cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outwith the agreed scope of works.

Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices. This report may not be relied upon, or transferred to, by any other party without the written agreement of its author. If a third party relies on this report, it does so wholly at its own and sole risk and IGE disclaims any liability to such parties.

It is IGE's understanding that this report is to be used for the purpose described in the 'Brief' section of this report. That purpose was a significant factor in determining the scope and the services to be provided. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without IGE's review and advice shall be at the client's sole and own risk.

The information contained in this report is protected by disclosure under Part 3 of the Environmental Information Regulations 2004 pursuant to the provisions of Regulation 12(5) without the consent in writing of a Director of IGE.

This report is a function of the date it was written and should be read in light of any subsequent changes in legislation, statutory requirements and industry practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of IGE. In the absence of such written advice of IGE, reliance on the report in the future shall be at the client's own and sole risk. Should IGE be requested to review the report in the future, IGE shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between IGE and the client.

The observations and conclusions described in this report are based solely upon the scope of works agreed between the client and IGE. IGE has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report. IGE is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the agreed scope of works. For the avoidance of doubt, this report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species (e.g. Japanese Knotweed). It is recommended that the client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the identification of asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace full and proper surveys.

LIMITATIONS OF INVESTIGATION WORK

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations, the potential exists for ground conditions to be encountered which are different to those considered in this report. The explored extent of the site area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried

out for a limited number of parameters, based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Exploratory Holes

Where exploratory holes have been carried out as part of this investigation, the spacing has been determined to provide a reasonable indication of the general ground conditions across the site, but the number has ultimately been limited by commercial constraints. The findings of the exploratory holes relate specifically to the exploratory hole locations and are no absolute guarantee of the ground conditions between such locations. Due allowance should be made for the possibility of variation in conditions between exploratory hole locations.

Extent of Contamination Testing

The extent of contaminated land testing carried out on samples obtained from the site has been determined in accordance with the latest legal guidance issued by the government to provide, with reasonable certainty, the probable general levels of contamination present on site that could pose a significant hazard to human health or waters. The extent of site investigation works including chemical testing has also been limited by reasonable commercial constraints. Although extensive testing of samples has been carried out, the volume of samples taken for testing are a minute fraction of the total volume of soils and groundwater present on site. Therefore, there is a residual risk that undetected pockets of contamination may be present on site, situated between testing locations.

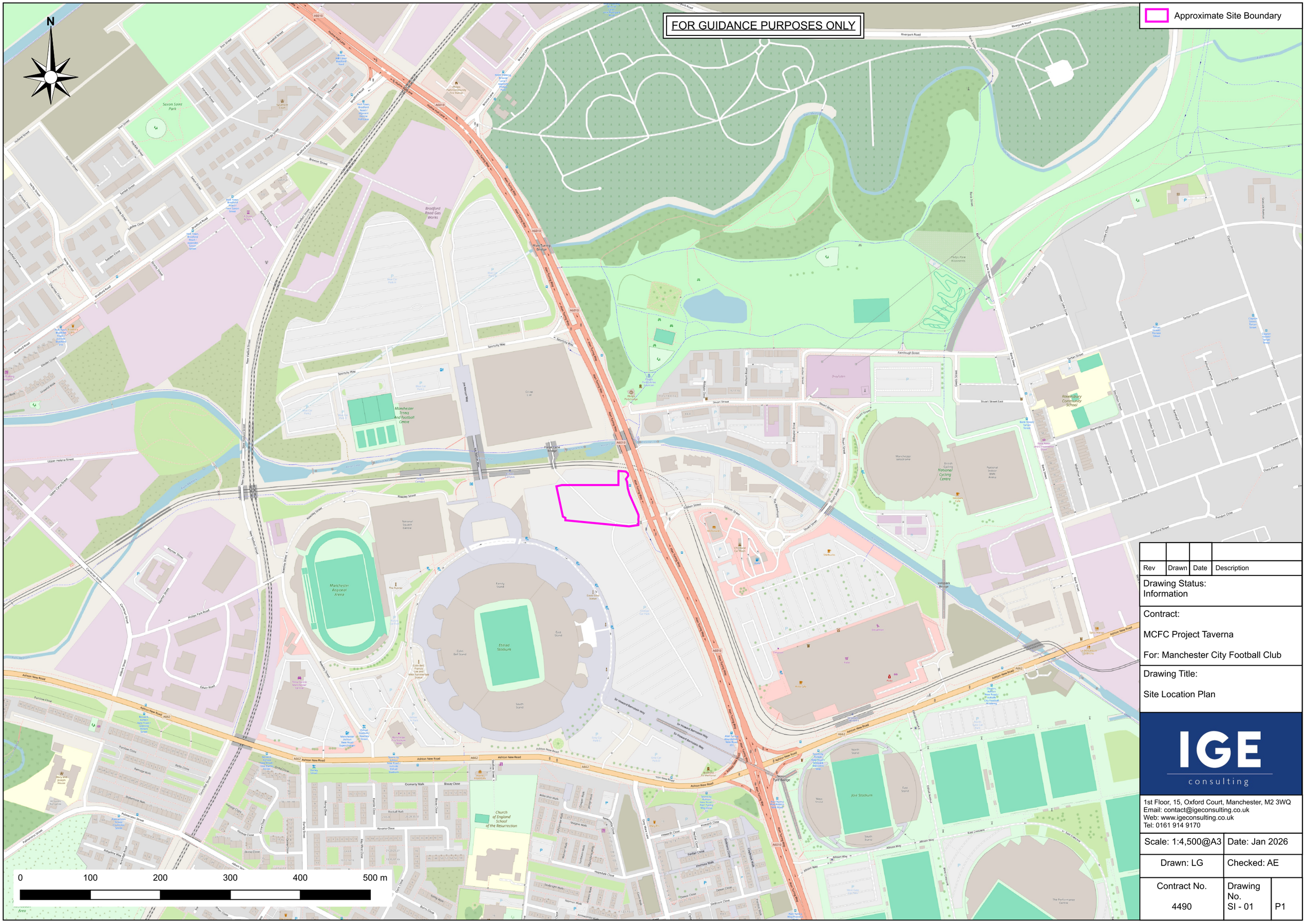
When investigating or developing potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and temporally. The absence of certain ground, ground gas, contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

Extent of Geo-Environmental Studies

This report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species e.g. Japanese Knotweed. It is recommended that the Client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the identification asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace a full and proper survey. If an Unexploded Ordnance (UXO) report has been obtained within the report, it has been so on the basis of Health and Safety concerns and no assessment has been made other than transcribing the recommendations of the sub-contractor contained within the report. In terms of a potential contaminative source, unless ordnance has been manufactured / stored on site, UXOs will only be determined as a contaminative source following a positive identification on site.

APPENDIX 2

FIGURES AND DRAWINGS



Rev	Drawn	Date	Description

Drawing Status:
Information

Contract:

MCFC Project Taverna

For: Manchester City Football Club

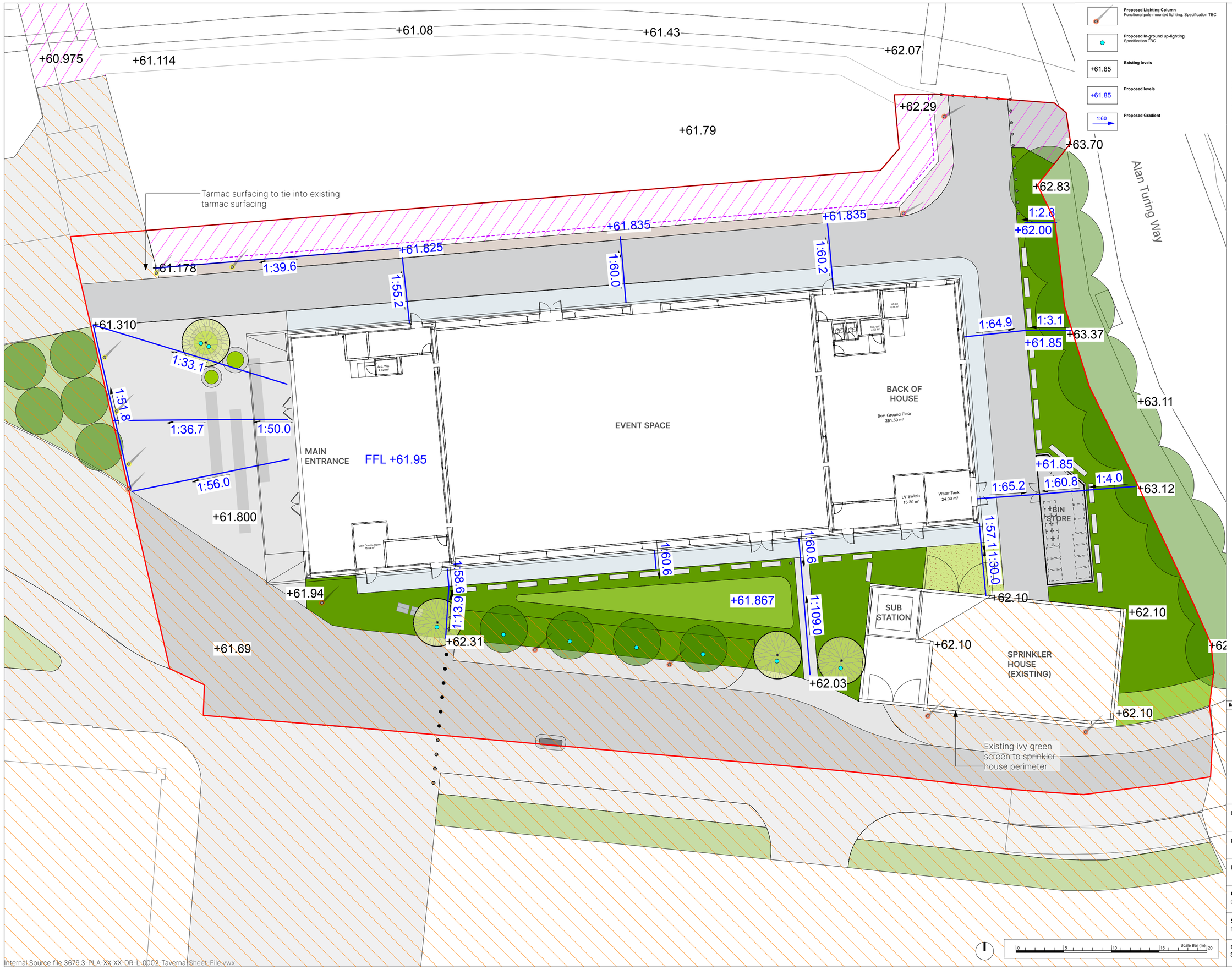
Drawing Title:

Site Location Plan

IGE consulting

1st Floor, 15, Oxford Court, Manchester, M2 3WQ
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

Scale: 1:4,500@A3	Date: Jan 2026	
Drawn: LG	Checked: AE	
Contract No. 4490	Drawing No. SI - 01	P1



Proposed Lighting Column
Functional pole mounted lighting. Specification TBC

Proposed In-ground up-lighting
Specification TBC

Existing levels
+61.85

Proposed levels
+61.85

Proposed Gradient
1:60

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NOTES:
1. Do not scale from this drawing.
2. Always work to noted dimensions.
3. All dimensions are in millimetres unless otherwise stated.
4. All setting out, levels and dimensions to be agreed on site.
5. The dimensions of all materials must be checked on site before being laid out.
6. This drawing must be read with the relevant specification clauses and detail drawings.
7. Order of construction and setting out to be agreed on site.

Key

Ornamental Planting
Mixed shrub, herbaceous perennial and ornamental grass planting (plant species to tie into existing North Stand works)
Notes: 300mm topsoil oveer 400mm subsoil

Rain Garden Planting
Rain garden suitable planting mix
Notes: 300mm topsoil oveer 400mm subsoil

Climbers
Tensile wire system with climbing plants to soften and screen the new substation enclosure. Twining climber species - final extent to be coordinated with substation ventilation requirements

Proposed Street tree
Semi-mature tree
20-25cm girth
Notes: 300mm topsoil over 600mm subsoil

Existing Tree

Surface Type 1
Insitu concrete with large format precast concrete banding to arrival plaza

Surface Type 2
Concrete block paving to footpath around the perimiter of the building. Specification to be in keeping with the North Stand development

Surface Type 3
Tarmac to access road to match existing surfacing on North Stand development.

Surface Type 4
Filter Drain along northern edge of access road to form part of the drainage strategy

Surface Type 5
Reinforced grass to sprinkler house access point

Large pre cast concrete planters
Placed in the arrival plaza, the raised concrete planters help soften the entrance facade and allow people to perch on the planter edge

Fixed Bollard
To form HVM line. Specification TBC

Fixed Concrete Block
Fixed concrete block with gabion cladding / artwork to improve appearance. To form HVM line. Specification TBC

Timber Post and rail fence
1.2m high to the northern edge of the access road
Product TBC

Bin Store
Steel frame with timber uprights and lockable gates.
Product TBC

Proposed Lighting Column
Column mounted projectors. Specification TBC

Area to Remain as Existing

Emerging Context Under North Stand Public Realm Works

Revision	Date	Description	Drawn	Apprvd.
P05	02/03/26	Incorporating Architects Comments	CB	SC
P04	27/02/26	Planning	CB	SPL
P03	30/01/26	Review and comment	CB	SPL
P02	28/01/26	For Review and Comment	CB	SPL
P01	22/01/226	For Review and Comment	CB	SPL

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Client Manchester City Football Club

Project Project Taverna

Drg Title Landscape General Arrangement

Created on	Created by	Approved by
09-01-26	CB	SPL

Scale	Size	Workstage
1:250	A2	Planning

Drg No. 3679.3-PLA-XX-XX-DR-L-0001
Suitability S2
Revision P05

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FOR GUIDANCE PURPOSES ONLY

N

Tarmac surfacing to tie into existing tarmac surfacing

Approximate Site Boundary

IGE Ground Investigation (April 2026)

- Trial Pits
- CBR Tests and Trial Pits
- Dynamic Sample Boreholes
- Cable Percussion Logs

Site Features

- +61.79 Existing Levels (m AOD)
- +61.835 Proposed Levels (m AOD)
- Infilled Canal Edges (Measured)
- Infilled Canal Edges (Inferred)

DS301 DS302 DS303 DS304 DS306 DS307 DS308

TP301 / CBR01 TP302 / CBR02 TP303 / CBR03 TP304 / CBR04 TP305 / CBR05 TP306 / CBR06 TP307 / CBR07 TP308 / CBR08 TP309 TP310 TP311 TP312

CP301 CP302

+61.178 +61.310 +61.800 +61.94 +61.69 +61.825 +61.835 +61.867 +62.29 +62.83 +62.00 +63.70 +63.37 +61.85 +63.11 +63.12 +62.31 +62.03 +62.10

1:39.6 1:55.2 1:1.0 1:60.2 1:64.9 1:3.1 1:33.1 1:51.8 1:36.7 1:50.0 1:56.0 1:58.9 1:13.9 1:60.8 1:60.6 1:109.0 1:65.2 1:60.8 1:4.0 1:57.1 1:30.0 1:2.8

FFL +61.95

MAIN ENTRANCE

EVENT SPACE

BACK OF HOUSE

BUS STOP

SUB STATION

SPRINKLER HOUSE (EXISTING)

BIN STORE

Existing ivy green screen to sprinkler house perimeter

0 10 20 30 40 50 m

Rev	Drawn	Date	Description

Drawing Status: Information

Contract:

MCFC Project Taverna

For: Manchester City Football Club

Drawing Title:

Exploratory Hole Location Plan

IGE consulting

1st Floor, 15, Oxford Court, Manchester, M2 3WQ
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

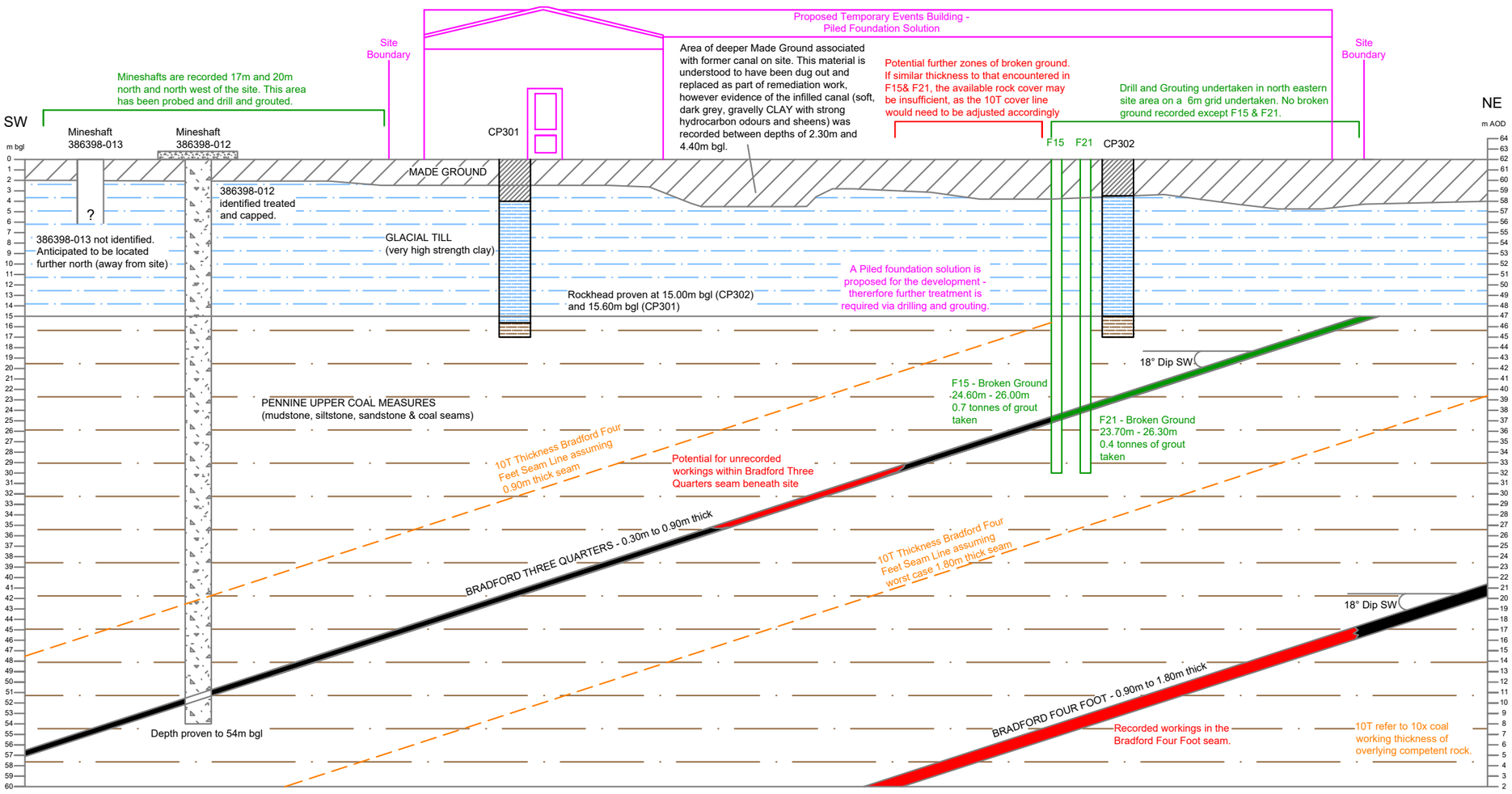
Scale: 1:300@A3	Date: April 2026
Drawn: LG	Checked: AE

Contract No.	Drawing No.	
4490	SI - 07	P1

Notes

1 This drawings is indicative and not to scale.

2 This drawing is to be read in conjunction with all relevant Architects and Service Engineers drawings.



Rev	Drawn	Date	Description
A	LG	MAY 2026	Updated following intrusive ground investigation

Drawing Status
INFORMATION

Contract
MCFC PROJECT TAVERNA

FOR: MANCHESTER CITY FOOTBALL CLUB

Drawing Title
REVISED GROUND MODEL

IGE consulting

1st Floor, 15, Oxford Court, Manchester, M2 3WQ
email: contact@igeconsulting.co.uk
web: www.igeconsulting.co.uk

Scale	Date	
NTS	April 2026	
Drawn	**Checked**	
AL	AE	
Contract No.	**Drawing No.**	
4490	SI - 05	P1

Notes

1 This drawings is indicative and not to scale.

2 This drawing is to be read in conjunction with all relevant Architects and Service Engineers drawings.

SOURCES

PATHWAYS

RECEPTORS

Sources
1. On site Made Ground
2. On site Historical Industrial Land Use
3. On site Historical Infilled Canal Arm
4. Off site Historical Industrial Land Use

Secondary Sources
5. Pooling beneath current and / or future foundations
6. Pooling in relative low points above low permeability deposits
7. Pooling within granular lenses within low permeability deposits

Ground Gas Sources
1. On site Made Ground
2. On site Historical Underground workings

Pathways To Human Health
A. Ingestion of dust and soil
B. Dermal contact with dust and soil
C. Inhalation (dust)
D. Inhalation (vapours)
E. Inhalation and oral backgrounds

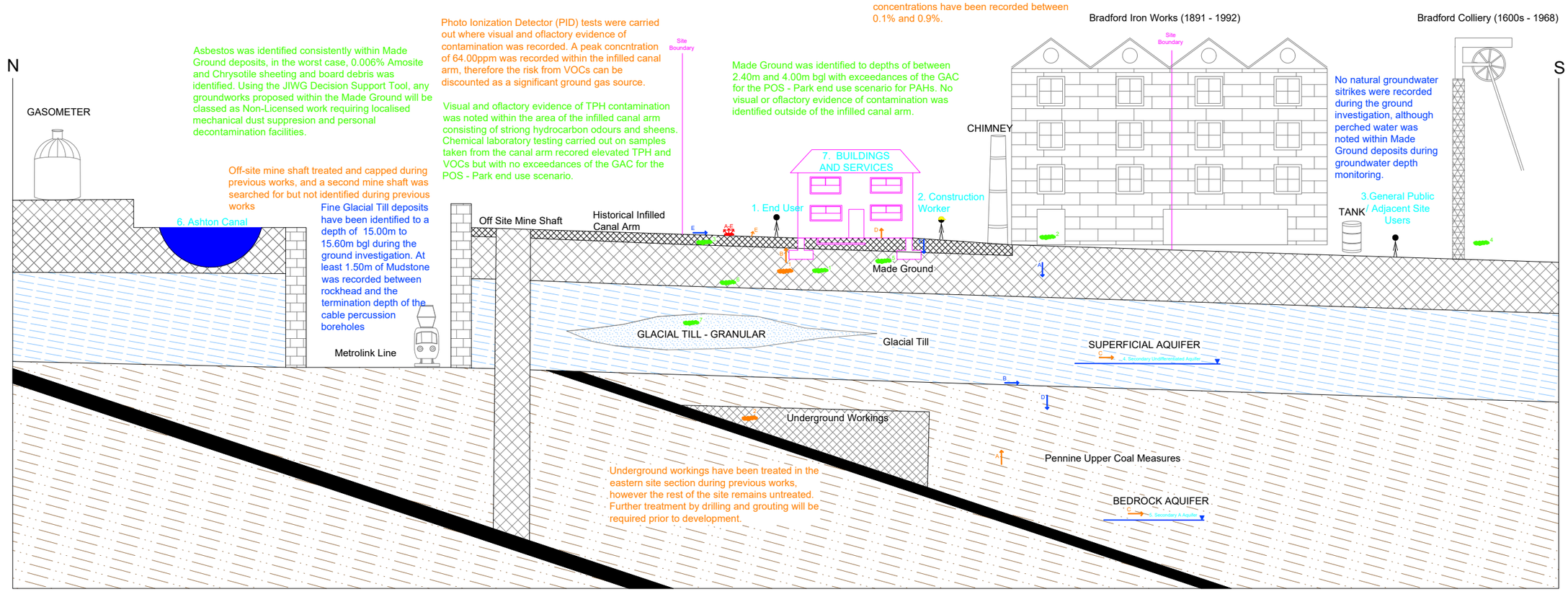
Pathways To Controlled Waters
A. Vertical migration athrough coarse Made Ground and coarse soils.
B. Lateral migration along low permeability natural soils & pooling at relative low points.
C. Vertical migration along future foundations and pooling at base.
D. Migration through porous bedrock
E. Overland flow

Ground Gas Pathways
A. Migration through fractures and fissures in bedrock
B. Preferential migration along foundations and service ducts
C. Migration within groundwater
D. Ingress through cavity walls and floors
E. Inhalation

Receptors
1. End user
2. Construction workers
3. General public / adjacent site users
4. Secondary Undifferentiated aquifer in superficial deposits
5. Secondary A aquifer aquifer in bedrock
6. Surface water - Off-site Ashton Canal
7. Buildings and services

Ground gas monitoring has recorded no steady flows or methane concentrations above instrument detection limits. Peak Carbon Dioxide concentrations have been recorded between 0.1% and 0.9%.

A single peak Carbon Monoxide concentration of 27ppm was recored at CP02 during the 1st ground gas monitoring visit. The 'Workplace Expsoure Limits' safety level as specified by the HSE is 30ppm for long term exposure which is greater than then recorded concentration in CP302.



Rev	Drawn	Date	Description
A	LG	MAY 2026	Revised following intrusive ground investigation

Drawing Status
INFORMATION

Contract
MCFC PROJECT TAVERNA

FOR: MANCHESTER CITY FOOTBALL CLUB

Drawing Title
REVISED CONCEPTUAL SITE MODEL

IGE consulting

1st Floor, 15, Oxford Court, Manchester, M2 3WQ
email: contact@igeconsulting.co.uk
web: www.igeconsulting.co.uk

Scale	Date
NTS	Feb 2026
Drawn LG	**Checked** AE

Contract No.	Drawing No.	
4490	SI-05	P1

APPENDIX 3

TRIAL PIT LOGS AND PHOTOGRAPHS

Trial Pit

TP301

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386902.40	398711.71	62.38	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-30	2026-03-30

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
						(0.15)		Asphalt [MADE GROUND]
					62.23	0.15		
		0.30	ES, B			(0.30)		Dark grey very sandy slightly clayey very angular to subrounded fine to coarse GRAVEL of red brick, concrete, ceramic, metal, limestone and sandstone with medium cobble content. Cobbles are very angular of concrete [MADE GROUND]
					61.93	0.45		
		0.70	ES					*Orange geotextile across pit (0.40m)* *Brick obstruction in northern most 0.40m of pit (0.40 - 0.60m)*
								Dark grey very gravelly clayey fine to coarse SAND with medium cobble content. Gravel is very angular to subangular fine to coarse of red brick, concrete and sandstone. Cobbles are very angular of red brick and concrete [MADE GROUND]
						(2.55)		
		1.80	ES, B					
		2.70	ES, B					
					59.38	3.00		*End of Trial Pit at 3.00m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated due to hard digging. No water strike

Method, Plant, Stability, Dimensions
0.00 - 3.00m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 165°
L = 3.30m
W = 1.20m

Logger
LG

Checked By: LM

Trial Pit

TP301

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386902.40	398711.71	62.38	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-03-30	2026-03-30

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor







Remarks
Terminated due to hard digging. No water strike

Method, Plant, Stability, Dimensions
0.00 - 3.00m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 165°
L = 3.30m
W = 1.20m

Logger
LG

Checked By: LM

Trial Pit

TP302

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386902.83	398736.62	61.87	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-30	2026-03-30

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
					61.72	(0.15) 0.15		Asphalt [MADE GROUND]
		0.60	ES, B					Dark grey very sandy slightly clayey very angular to subrounded fine to coarse GRAVEL of red brick, concrete, metal, plastic and clinker with medium cobble content. Cobbles are very angular to rounded of red brick and concrete [MADE GROUND] *Orange geotextile across pit (0.40m)*
		1.60	ES, B			(2.35)		
		2.70 2.70	HV ES, B	185 (kPa)	59.37	2.50		Stiff yellowish brown mottled light grey slightly gravelly slightly sandy CLAY. Gravel is subrounded to rounded fine to coarse of mudstone and sandstone [GLACIAL TILL]
					58.67	(0.70) 3.20		*End of Trial Pit at 3.20m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated at target depth. No water strike

Method, Plant, Stability, Dimensions
0.00 - 3.20m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 130°
L = 3.80m
W = 1.20m

Logger
LG

Checked By: LM

Trial Pit

TP302

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386902.83	398736.62	61.87	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-03-30	2026-03-30

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor







Remarks
Terminated at target depth. No water strike

Method, Plant, Stability, Dimensions
0.00 - 3.20m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 130°
L = 3.80m
W = 1.20m

Logger
LG

Checked By: LM

Trial Pit

TP303

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386916.11	398739.39	61.95	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-04-01	2026-04-01

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
		0.30	ES, B					Dark greyish brown very sandy slightly clayey very angular to rounded fine to coarse GRAVEL of red brick, concrete, ceramic, metal, plastic, limestone, sandstone and mudstone with medium cobble content. Cobbles are very angular to subrounded of red brick and concrete [MADE GROUND]
								Orange geotextile across pit (0.35m)
								150mm plastic orange pipe orientated east to west across pit (0.45m)
		1.20	PID	0.20 (ppmv)				*Becoming dark bluish grey with a mild hydrocarbon odour and occasional coarse gravel sized pockets of firm light brown slightly gravelly slightly sandy CLAY (1.10m)*
		1.20	ES			(3.00)		
		2.10	ES					
		2.90	PID	2.10 (ppmv)				*Slight hydrocarbon sheen (2.80m)*
		2.90	ES		58.95	3.00		
	▽	3.20	PID	1.20 (ppmv)				Dark grey very gravelly clayey fine to coarse SAND with a mild hydrocarbon odour and sheen. Gravel is very angular to angular fine to coarse of red brick, concrete and glass [MADE GROUND]
						(1.20)		*No hydrocarbon odour from 3.50m bgl (3.50m)*
		4.20	PID	2.30 (ppmv)	57.75	4.20		Stiff light brown mottled light grey slightly gravelly sandy CLAY. Gravel is subrounded to rounded fine to medium of mudstone [GLACIAL TILL]
		4.30	ES					
		4.40	HV	207 (kPa)		(0.40)		
		4.50	ES, B					*Pit extended for delineation (4.20m)*
					57.35	4.60		*End of Trial Pit at 4.60m*

Remarks
Terminated at target depth. Moderate water ingress from north and south faces of pit at 3.10m bgl

Method, Plant, Stability, Dimensions
0.00 - 4.60m TP LiuGong 913FCR (13T)
Slight spalling from 0.00m to 1.00m in all faces of pit
Orientation: 90°
L = 6.50m
W = 1.20m

Logger
LG

Checked By: LM

Trial Pit

TP303
PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386916.11	398739.39	61.95	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-04-01	2026-04-01

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor









Remarks
Terminated at target depth. Moderate water ingress from north and south faces of pit at 3.10m bgl

Method, Plant, Stability, Dimensions
0.00 - 4.60m TP LiuGong 913FCR (13T)
Slight spalling from 0.00m to 1.00m in all faces of pit
Orientation: 90°
L = 6.50m
W = 1.20m

Logger
LG

Checked By: LM

Trial Pit

TP304

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386925.30	398717.45	62.12	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-04-01	2026-04-01

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
								Dark brown very gravelly clayey fine to coarse SAND with medium cobble content and frequent cobble sized pockets of very stiff grey slightly gravelly slightly sandy CLAY. Gravel is very angular to rounded fine to coarse of red brick, concrete, clinker, plastic, metal, ceramic, limestone and sandstone. Cobbles are angular to subrounded of red brick and concrete [MADE GROUND]
		0.70	ES					
								Becoming dark bluish grey (1.30m)
		1.80	ES					
						(4.00)		
	▽							
		2.70	ES					*Mild hydrocarbon odour from 2.60m bgl (2.60m)*
		3.30	B					
					58.12	4.00		
		4.10	PID	12.00 (ppmv)				Soft dark grey slightly sandy gravelly CLAY with a mild hydrocarbon odour and sheen. Gravel is very angular to subangular fine to coarse of red brick, ceramic and glass [MADE GROUND]
		4.10	ES			(0.40)		
					57.72	4.40		Stiff light brown slightly gravelly slightly sandy CLAY. Gravel is subrounded to rounded fine to medium of mudstone [GLACIAL TILL]
		4.60	ES			(0.40)		
					57.32	4.80		*End of Trial Pit at 4.80m*

Remarks
Terminated at target depth. Moderate water ingress from north and south faces of pit at 2.30m bgl

Method, Plant, Stability, Dimensions
0.00 - 4.80m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 90°
L = 6.00m
W = 1.20m

Logger
LG

Checked By: LM

Trial Pit

TP304

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386925.30	398717.45	62.12	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-04-01	2026-04-01

Client
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Consultant
IGE Consulting

Contractor







Remarks
Terminated at target depth. Moderate water ingress from north and south faces of pit at 2.30m bgl

Method, Plant, Stability, Dimensions
0.00 - 4.80m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 90°
L = 6.00m
W = 1.20m

Logger
LG

Checked By: LM

Trial Pit

TP305

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386934.01	398742.41	62.05	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-04-02	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
		0.50	ES			(2.40)		Dark brown very gravelly slightly clayey fine to coarse SAND with medium cobble content. Gravel is very angular to subrounded fine to coarse of red brick, concrete, glass, ceramic, plastic, metal, limestone and sandstone. Cobbles are very angular to angular of red brick and concrete [MADE GROUND] *Orange geotextile across pit (0.40m)*
		1.60	ES, B					
		2.60	HV	191 (kPa)	59.65	2.40		
		2.60	ES, B					Stiff light brown slightly gravelly slightly sandy CLAY. Gravel is subrounded to well rounded fine to medium of mudstone [GLACIAL TILL]
		3.10	HV	>205 (kPa)		(1.00)		*Becoming very stiff (3.00m)*
					58.65	3.40		*End of Trial Pit at 3.40m*

Remarks
Terminated at target depth. Moderate water ingress from east and west faces of pit at 0.80m bgl

Method, Plant, Stability, Dimensions
0.00 - 3.40m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 175°
L = 3.00m
W = 1.20m

Logger
LG

Checked By: LM

Trial Pit

TP305

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386934.01	398742.41	62.05	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-04-02	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor







Remarks
Terminated at target depth. Moderate water ingress from east and west faces of pit at 0.80m bgl

Method, Plant, Stability, Dimensions
0.00 - 3.40m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 175°
L = 3.00m
W = 1.20m

Logger
LG

Checked By: LM

Trial Pit

TP306

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386945.81	398744.81	62.03	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-04-02	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
		0.30	ES			(0.90)		Dark brown very sandy clayey very angular to rounded fine to coarse GRAVEL of red brick, concrete, metal, plastic, glass, ceramic and sandstone with medium cobble content. Cobbles are very angular to angular of red brick and concrete [MADE GROUND] *200mm plastic pipe orientated north to south across pit (0.50m)*
		1.20	ES, B		61.13	0.90		Dark brown very gravelly clayey fine to coarse SAND with medium cobble content and occasional cobble sized pockets of stiff dark grey slightly gravelly sandy CLAY. Gravel is very angular to subrounded fine to coarse of red brick, concrete, wood, metal, plastic, ceramic, limestone and sandstone. Cobbles are very angular to rounded of red brick and concrete [MADE GROUND]
		2.50 2.50	HV ES, B	>205 (kPa)	59.73	(1.40) 2.30		Stiff locally very stiff light brown mottled bluish grey slightly gravelly slightly sandy CLAY with occasional rootlets along bluish grey mottling. Gravel is subrounded to well rounded fine to medium of mudstone, sandstone and coal [GLACIAL TILL]
					59.13	(0.60) 2.90		*End of Trial Pit at 2.90m*

Remarks
Terminated at target depth. No water strike

Method, Plant, Stability, Dimensions
0.00 - 2.90m TP LiuGong 913FCR (13T)
Slight spalling from 0.00m to 0.90m in east and west faces of pit
Orientation: 165°
L = 3.00m
W = 0.60m

Logger
LG

Checked By: LM

Trial Pit

TP306

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386945.81	398744.81	62.03	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-04-02	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor







Remarks
Terminated at target depth. No water strike

Method, Plant, Stability, Dimensions **Logger**

0.00 - 2.90m TP LiuGong 913FCR (13T) LG
Slight spalling from 0.00m to 0.90m in east and west faces of pit
Orientation: 165°

L = 3.00m

W = 0.60m

Checked By: LM

Trial Pit

TP307

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386938.50	398717.76	62.13	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-04-02	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
		0.40	ES, B			(0.70)		Dark brown very sandy clayey very angular to rounded fine to coarse GRAVEL of red brick, concrete, ceramic, limestone and sandstone. Cobbles are very angular to angular of red brick [MADE GROUND]
								Orange geotextile across pit (0.50m)
					61.43	0.70		Dark brown very gravelly slightly clayey fine to coarse SAND with medium cobble content and occasional cobble sized pockets of very stiff brown slightly gravelly slightly sandy CLAY. Gravel is very angular to subangular fine to coarse of red brick, concrete, limestone and sandstone. Cobbles are very angular to subangular of red brick and concrete [MADE GROUND]
		0.90	ES, B					
		2.00	B			(2.40)		
		3.00	ES, B					
					59.03	3.10		*End of Trial Pit at 3.10m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated due to hard digging. No water strike

Method, Plant, Stability, Dimensions
0.00 - 3.10m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 355°
L = 4.00m
W = 0.60m

Logger
LG

Checked By: LM

Trial Pit

TP307

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386938.50	398717.76	62.13	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-04-02	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor







Remarks
Terminated due to hard digging. No water strike

Method, Plant, Stability, Dimensions
0.00 - 3.10m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 355°
L = 4.00m
W = 0.60m

Logger
LG

Checked By: LM

Trial Pit

TP308

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386952.59	398722.62	62.02	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-04-02	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
						(0.30)		Beige sandy silty angular to subrounded fine to coarse GRAVEL of limestone [MADE GROUND]
					61.72	0.30		
		0.60	ES					Dark brown gravelly very clayey fine to coarse SAND with medium cobble content and occasional cobble sized pockets of very stiff brown slightly gravelly slightly sandy CLAY. Gravel is very angular to subrounded fine to coarse of red brick, concrete, limestone and sandstone. Cobbles are very angular to angular of red brick and concrete [MADE GROUND]
						(2.30)		
		1.70	ES, B					
					59.42	2.60		
		2.70	ES			(0.20)		Stiff light brown slightly gravelly slightly sandy CLAY. Gravel is subrounded to well rounded fine to medium of mudstone [GLACIAL TILL]
					59.22	2.80		*End of Trial Pit at 2.80m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated at target depth. No water strike

Method, Plant, Stability, Dimensions
0.00 - 2.80m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 265°
L = 2.80m
W = 0.60m

Logger
LG

Checked By: LM

Trial Pit

TP308

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386952.59	398722.62	62.02	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-04-02	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor







Remarks
Terminated at target depth. No water strike

Method, Plant, Stability, Dimensions
0.00 - 2.80m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 265°
L = 2.80m
W = 0.60m

Logger
LG

Checked By: LM

Trial Pit

TP309

Sheet 1 of 2

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386922.09	398726.76	62.11	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-04-01	2026-04-01

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
					62.01	(0.10) 0.10		Dark grey very sandy slightly silty very angular to angular fine to coarse GRAVEL of sandstone [MADE GROUND]
		0.50	ES			(1.60)		Dark brown very sandy clayey very angular to rounded fine to coarse GRAVEL of red brick, concrete, metal, plastic, wood, clinker, limestone, sandstone and mudstone with medium cobble content. Cobbles are very angular to subrounded of red brick and concrete [MADE GROUND]
					60.41	1.70		
		1.90	B			(0.50)		Dark brown gravelly very clayey fine to coarse SAND with medium cobble content. Gravel is very angular to subangular fine to coarse of red brick and clinker. Cobbles are very angular of red brick [MADE GROUND]
	▽				59.91	2.20		
		2.40	ES			(0.50)		Dark grey very sandy silty very angular to subrounded fine to coarse GRAVEL of red brick, concrete, clinker and sandstone with low cobble content and a strong hydrocarbon odour and sheen. Cobbles are very angular of red brick [MADE GROUND] *Slight hydrocarbon odour from 2.30m bgl (2.30m)*
					59.41	2.70		
		2.90 2.90	PID ES	24.30 (ppmv)		(1.30)		Soft black slightly sandy gravelly CLAY with a strong hydrocarbon odour and sheen. Gravel is very angular to angular fine to coarse of red brick, glass, metal, plastic and ceramic [MADE GROUND]
		3.60 3.60	PID ES	64.00 (ppmv)				
					58.11	4.00		
		4.20	ES			(1.10)		Very stiff light brown mottled light grey slightly gravelly slightly sandy CLAY. Gravel is subrounded to rounded fine to medium of mudstone [GLACIAL TILL]
								Continued on next page

Remarks
Terminated at target depth. Moderate water ingress from north and south faces of pit at 3.10m bgl

Method, Plant, Stability, Dimensions
0.00 - 5.10m TP LiuGong 913FCR (13T)
Slight spalling from 0.00m to 0.90m in north and south faces of pit
Orientation: 65°
L = 6.50m
W = 1.20m

Logger
LG

Checked By: LM

Trial Pit

TP309

Sheet 2 of 2

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386922.09	398726.76	62.11	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-04-01	2026-04-01

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
					57.01	5.10		As previous page.
								End of Trial Pit at 5.10m

5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
10.0

Remarks
Terminated at target depth. Moderate water ingress from north and south faces of pit at 3.10m bgl

Method, Plant, Stability, Dimensions

0.00 - 5.10m TP LiuGong 913FCR (13T)
Slight spalling from 0.00m to 0.90m in north and south faces of pit
Orientation: 65°
L = 6.50m
W = 1.20m

Logger
LG

Checked By: LM

Trial Pit

TP309

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386922.09	398726.76	62.11	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-04-01	2026-04-01

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor







Remarks
Terminated at target depth. Moderate water ingress from north and south faces of pit at 3.10m bgl

Method, Plant, Stability, Dimensions **Logger**

0.00 - 5.10m TP LiuGong 913FCR (13T) LG
Slight spalling from 0.00m to 0.90m in north and south faces of pit
Orientation: 65°

L = 6.50m

W = 1.20m

Checked By: LM

Trial Pit

TP310

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386937.46	398733.98	62.12	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-04-02	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
		0.40	ES			(2.20)		Dark brown very gravelly clayey fine to coarse SAND with medium cobble content. Gravel is very angular to subrounded fine to coarse of red brick, concrete, metal, plastic, glass, limestone and sandstone. Cobbles are very angular to subrounded of red brick and concrete [MADE GROUND]
	▽	1.50	ES, B					
		2.40	HV	182 (kPa)	59.92	2.20		Stiff light brown mottled light grey slightly gravelly sandy CLAY. Gravel is subangular to well rounded fine to medium of mudstone, sandstone and coal [GLACIAL TILL]
		2.40	ES, B			(0.80)		
		2.90	HV	189 (kPa)				
					59.12	3.00		*End of Trial Pit at 3.00m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated at target depth. Moderate water ingress from east face of pit at 0.70m bgl

Method, Plant, Stability, Dimensions
0.00 - 3.00m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 15°
L = 3.00m
W = 0.60m

Logger
LG

Checked By: LM

Trial Pit

TP310
PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386937.46	398733.98	62.12	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-04-02	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor







Remarks
Terminated at target depth. Moderate water ingress from east face of pit at 0.70m bgl

Method, Plant, Stability, Dimensions
0.00 - 3.00m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 15°
L = 3.00m
W = 0.60m

Logger
LG

Checked By: LM

Trial Pit

TP311

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386932.87	398726.39	62.11	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-04-02	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
		0.30	ES, B					Dark brown very gravelly slightly clayey fine to coarse SAND with medium cobble content. Gravel is very angular to subrounded fine to coarse of red brick, concrete, metal, plastic, clinker and limestone. Cobbles are very angular to subrounded of red brick and concrete [MADE GROUND]
								Orange geotextile across pit (0.40m)
								Becoming clayey with occasional cobble sized pieces of very stiff slightly gravelly slightly sandy CLAY (1.00m)
		1.30	ES			(2.40)		
								Becoming gravelly (1.50m)
		2.30	ES, B					
					59.71	2.40		*End of Trial Pit at 2.40m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated due to hard digging. No water strike

Method, Plant, Stability, Dimensions
0.00 - 2.40m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 265°
L = 2.40m
W = 0.60m

Logger
LG

Checked By: LM

Trial Pit

TP311

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386932.87	398726.39	62.11	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-04-02	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor







Remarks
Terminated due to hard digging. No water strike

Method, Plant, Stability, Dimensions
0.00 - 2.40m TP LiuGong 913FCR (13T)
Stable during excavation
Orientation: 265°
L = 2.40m
W = 0.60m

Logger
LG

Checked By: LM

Trial Pit

TP312

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386919.19	398715.61	62.02	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-04-02	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
						(2.60)		Dark brown very gravelly clayey fine to coarse SAND with medium cobble content. Gravel is very angular to subrounded fine to coarse of red brick, concrete, clinker, metal, plastic and limestone. Cobbles are very angular to rounded of red brick and metal [MADE GROUND]
		2.40	ES					*Slight hydrocarbon odour from 2.40m bgl (2.40m)*
					59.42	2.60		
		2.80	ES			(0.40)		Stiff light brown slightly gravelly slightly sandy CLAY. Gravel is subrounded fine to medium of mudstone [GLACIAL TILL]
					59.02	3.00		*End of Trial Pit at 3.00m*

0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0

Remarks
Terminated at target depth. No water strike

Method, Plant, Stability, Dimensions
0.00 - 3.00m TP LiuGong 913FCR (13T)
Occasional moderate collapses in east face of pit
Orientation: 10°
L = 3.00m
W = 0.60m

Logger
LG

Checked By: LM

Trial Pit

TP312

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	386919.19	398715.61	62.02	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-04-02	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor







Remarks
Terminated at target depth. No water strike

Method, Plant, Stability, Dimensions
0.00 - 3.00m TP LiuGong 913FCR (13T)
Occasional moderate collapses in east face of pit
Orientation: 10°
L = 3.00m
W = 0.60m

Logger
LG

Checked By: LM

APPENDIX 4

DYNAMIC SAMPLE LOGS AND PHOTOGRAPHS

Dynamic Sampler

DS301

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386893.12	398738.85	61.55	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-30	2026-03-30

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
					61.40	(0.15) 0.15		Asphalt [MADE GROUND]
					61.30	(0.10) 0.25		Beige sandy silty angular to subangular fine to coarse GRAVEL of limestone [MADE GROUND]
		0.40	ES					Dark grey gravelly very clayey fine to coarse SAND with medium cobble content. Gravel is very angular to subangular fine to coarse of red brick. Cobbles are very angular of red brick [MADE GROUND]
		1.20	SPT(C)	N=50 for 200mm (4,14/18,16,16 for 50mm)		(1.30)		
					60.00	1.55		*End of Borehole at 1.55m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; borehole is dry, base at 1.30m bgl

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 1.55m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS301

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386893.12	398738.85	61.55	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-30	2026-03-30

Client	Consultant	Contractor
Manchester City Football Club	IGE Consulting	

SPT - Details

Top Depth (m) (Type)	Casing Depth (m)	Water Depth (m)	Hammer Serial No.	Energy Ratio (%)	Results
1.20 (C)		Dry	RP05	69	N=50 for 200mm (4,14/18,16,16 for 50mm)

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		

Remarks

Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; borehole is dry, base at 1.30m bgl

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 1.55m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS301
PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386893.12	398738.85	61.55	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-03-30	2026-03-30

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor



Remarks
Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; borehole is dry, base at 1.30m bgl

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 1.55m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS302

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386914.70	398724.86	62.12	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-30	2026-03-30

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
					62.02	(0.10) 0.10		Asphalt [MADE GROUND]
						(0.20)		Beige sandy silty angular to subangular fine to coarse GRAVEL of limestone [MADE GROUND]
					61.82	0.30		Dark grey very gravelly clayey fine to coarse SAND with low cobble content. Gravel is very angular to subrounded fine to coarse of red brick, concrete, ceramic, plastic, metal, limestone and sandstone. Cobbles are very angular of red brick [MADE GROUND]
						(1.16)		*Becoming gravelly and very clayey (0.90m)*
		1.00	ES					
		1.20	SPT(C)	N=50 for 135mm (9,16/27,23 for 60mm)				
					60.66	1.46		*End of Borehole at 1.46m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; water at 1.35m bgl, base at 1.37m bgl

Method, Plant, Stability, Dimensions

			Logger
0.00 - 0.80m	IP	Insulated Hand Tools	LG
0.80 - 1.46m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS302

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386914.70	398724.86	62.12	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-30	2026-03-30

Client	Consultant	Contractor
Manchester City Football Club	IGE Consulting	

SPT - Details

Top Depth (m) (Type)	Casing Depth (m)	Water Depth (m)	Hammer Serial No.	Energy Ratio (%)	Results
1.20 (C)		Dry	RP05	69	N=50 for 135mm (9,16/27,23 for 60mm)

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		

Depth Related Remarks

Top Depth (m)	Base Depth (m)	Remarks
0.80	1.20	87mm - 100% recovoery

Remarks

Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; water at 1.35m bgl, base at 1.37m bgl

Method, Plant, Stability, Dimensions			Logger
0.00 - 0.80m	IP	Insulated Hand Tools	LG
0.80 - 1.46m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS302
PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386914.70	398724.86	62.12	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-03-30	2026-03-30

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor



Remarks
Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; water at 1.35m bgl, base at 1.37m bgl

Method, Plant, Stability, Dimensions

			Logger
0.00 - 0.80m	IP	Insulated Hand Tools	LG
0.80 - 1.46m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS303

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386915.48	398742.23	61.94	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-30	2026-03-30

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
						(1.61)		Dark grey very gravelly clayey fine to coarse SAND with medium cobble content. Gravel is very angular to subrounded fine to coarse of red brick, concrete, ceramic, plastic, metal, limestone and sandstone. Cobbles are very angular of red brick [MADE GROUND]
		1.20	SPT(C)	N=50 for 255mm (1,0/12,10,19,9 for 30mm)				
					60.33	1.61		*End of Borehole at 1.61m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; water at 1.12m bgl, base at 1.21m bgl

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 1.61m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS303

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386915.48	398742.23	61.94	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-30	2026-03-30

Client	Consultant	Contractor
Manchester City Football Club	IGE Consulting	

SPT - Details

Top Depth (m) (Type)	Casing Depth (m)	Water Depth (m)	Hammer Serial No.	Energy Ratio (%)	Results
1.20 (C)		Dry	RP05	69	N=50 for 255mm (1,0/12,10,19,9 for 30mm)

Remarks

Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; water at 1.12m bgl, base at 1.21m bgl

Method, Plant, Stability, Dimensions			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 1.61m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS303
PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386915.48	398742.23	61.94	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-03-30	2026-03-30

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor



Remarks
Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; water at 1.12m bgl, base at 1.21m bgl

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 1.61m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS304

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386920.41	398730.67	62.05	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-30	2026-03-30

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
						(1.41)		Dark grey very gravelly clayey fine to coarse SAND with medium cobble content. Gravel is very angular to subrounded fine to coarse of red brick, concrete, ceramic, plastic, metal, limestone and sandstone. Cobbles are very angular of red brick [MADE GROUND]
		1.20	SPT(C)	N=50 for 115mm (19,6/31,19 for 40mm)				
					60.64	1.41		*End of Borehole at 1.41m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; borehole is dry, base at 1.16m bgl

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 1.41m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS304

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386920.41	398730.67	62.05	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-30	2026-03-30

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

SPT - Details

Top Depth (m) (Type)	Casing Depth (m)	Water Depth (m)	Hammer Serial No.	Energy Ratio (%)	Results
1.20 (C)		Dry	RP05	69	N=50 for 115mm (19,6/31,19 for 40mm)

Remarks
Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; borehole is dry, base at 1.16m bgl

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 1.41m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS304
PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386920.41	398730.67	62.05	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-30	2026-03-30

Client	Consultant	Contractor
Manchester City Football Club	IGE Consulting	



Remarks
Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; borehole is dry, base at 1.16m bgl

Method, Plant, Stability, Dimensions			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 1.41m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS305

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386935.30	398723.22	62.10	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-31	2026-03-31

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
						(0.90)		Light greyish brown very gravelly clayey fine to coarse SAND with medium cobble content. Gravel is very angular to subrounded fine to coarse of red brick, concrete, ceramic, plastic, metal, limestone and sandstone. Cobbles are very angular of red brick [MADE GROUND]
					61.20	0.90		*End of Borehole at 0.90m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated due to an obstruction. No water strike

Method, Plant, Stability, Dimensions
0.00 - 0.90m IP Insulated Hand Tools

Logger
LG

Checked By: LM

Dynamic Sampler

DS305
PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386935.30	398723.22	62.10	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-03-31	2026-03-31

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor



Remarks
Terminated due to an obstruction. No water strike

Method, Plant, Stability, Dimensions
0.00 - 0.90m IP Insulated Hand Tools

Logger
LG

Checked By: LM

Dynamic Sampler

DS306

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386929.59	398730.59	62.02	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-31	2026-03-31

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
		0.40	ES			(1.47)		Dark greyish brown very gravelly clayey fine to coarse SAND with medium cobble content. Gravel is very angular to subrounded fine to coarse of red brick, concrete, ceramic, plastic, metal, limestone and sandstone. Cobbles are very angular of red brick [MADE GROUND]
		1.20	SPT(C)	N=50 for 150mm (17,8/21,29)				
					60.55	1.47		*End of Borehole at 1.47m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; borehole is dry, base at 0.90m bgl

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 1.47m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS306

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386929.59	398730.59	62.02	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-31	2026-03-31

Client	Consultant	Contractor
Manchester City Football Club	IGE Consulting	

SPT - Details

Top Depth (m) (Type)	Casing Depth (m)	Water Depth (m)	Hammer Serial No.	Energy Ratio (%)	Results
1.20 (C)		Dry	RP05	69	N=50 for 150mm (17,8/21,29)

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		

Remarks

Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; borehole is dry, base at 0.90m bgl

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 1.47m	DS	Global Geo	LG

Checked By: LM

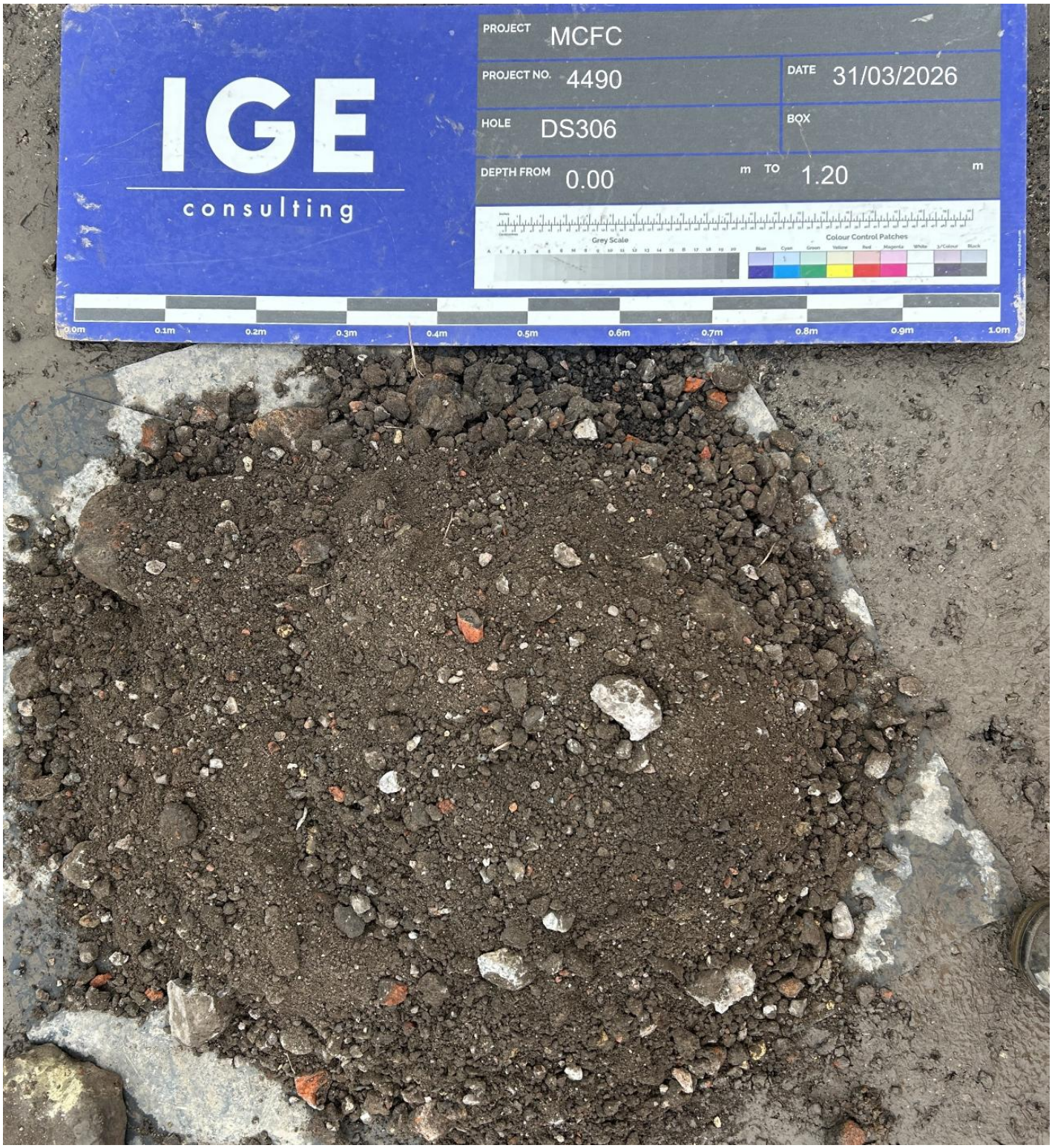
Dynamic Sampler

DS306
PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386929.59	398730.59	62.02	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-31	2026-03-31

Client	Consultant	Contractor
Manchester City Football Club	IGE Consulting	



Remarks
Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; borehole is dry, base at 0.90m bgl

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 1.47m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS307

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386927.53	398714.35	62.06	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-31	2026-03-31

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
		0.50	ES			(1.80)		Dark greyish brown very gravelly clayey fine to coarse SAND with medium cobble content. Gravel is very angular to subrounded fine to coarse of red brick, concrete, ceramic, plastic, metal, limestone and sandstone. Cobbles are very angular of red brick [MADE GROUND]
		1.50	ES					
		2.00	SPT(C)	N=45 (7,5/8,8,17,12)	60.26	1.80		Very stiff dark greyish brown slightly sandy gravelly CLAY with medium cobble content. Gravel is subangular to subrounded fine to coarse of red brick, concrete and limestone. Cobbles are very angular of red brick [MADE GROUND]
		2.50	ES			(1.58)		
		3.00	SPT(C)	N=50 for 230mm (9,8/7,18,22,3 for 5mm)				
					58.68	3.38		*End of Borehole at 3.38m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; borehole is dry, base at 1.65m bgl

Method, Plant, Stability, Dimensions			Logger
0.00 - 2.00m	IP	LiuGong 913FCR (13T)	LG
2.00 - 3.38m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS307

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386927.53	398714.35	62.06	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-31	2026-03-31

Client	Consultant	Contractor
Manchester City Football Club	IGE Consulting	

SPT - Details

Top Depth (m) (Type)	Casing Depth (m)	Water Depth (m)	Hammer Serial No.	Energy Ratio (%)	Results
2.00 (C)		Dry	RP05	69	N=45 (7,5/8,8,17,12)
3.00 (C)		Dry	RP05	69	N=50 for 230mm (9,8/7,18,22,3 for 5mm)

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		
	ES		
	ES		

Depth Related Remarks

Top Depth (m)	Base Depth (m)	Remarks
2.00	3.00	67mm - 100% recovery

Remarks

Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; borehole is dry, base at 1.65m bgl

Method, Plant, Stability, Dimensions

			Logger
0.00 - 2.00m	IP	LiuGong 913FCR (13T)	LG
2.00 - 3.38m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS307
PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386927.53	398714.35	62.06	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-03-31	2026-03-31

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor



Remarks
Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; borehole is dry, base at 1.65m bgl

Method, Plant, Stability, Dimensions			Logger
0.00 - 2.00m	IP	LiuGong 913FCR (13T)	LG
2.00 - 3.38m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS307
PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386927.53	398714.35	62.06	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-31	2026-03-31

Client	Consultant	Contractor
Manchester City Football Club	IGE Consulting	



Remarks
Terminated due to an SPT refusal. No water strike. Borehole dipped upon completion; borehole is dry, base at 1.65m bgl

Method, Plant, Stability, Dimensions			Logger
0.00 - 2.00m	IP	LiuGong 913FCR (13T)	LG
2.00 - 3.38m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS308

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386948.44	398717.19	62.07	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-31	2026-03-31

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
						(2.19)		Dark greyish brown very gravelly clayey fine to coarse SAND with medium cobble content. Gravel is very angular to subrounded fine to coarse of red brick, concrete, ceramic, plastic, metal, limestone and sandstone. Cobbles are very angular of red brick [MADE GROUND]
		2.00	SPT(C)	N=50 for 105mm (21,4/37,13 for 30mm)				
					59.88	2.19		*End of Borehole at 2.19m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated due to an SPT refusal. No water strike

Method, Plant, Stability, Dimensions

			Logger
0.00 - 2.00m	IP	LiuGong 913FCR (13T)	LG
2.00 - 2.19m	DS	Global Geo	LG

Checked By: LM

Dynamic Sampler

DS308

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
DS	386948.44	398717.19	62.07	1:25

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-31	2026-03-31

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

SPT - Details

Top Depth (m) (Type)	Casing Depth (m)	Water Depth (m)	Hammer Serial No.	Energy Ratio (%)	Results
2.00 (C)		Dry	RP05	69	N=50 for 105mm (21,4/37,13 for 30mm)

Remarks
Terminated due to an SPT refusal. No water strike

Method, Plant, Stability, Dimensions

			Logger
0.00 - 2.00m	IP	LiuGong 913FCR (13T)	LG
2.00 - 2.19m	DS	Global Geo	LG

Checked By: LM

APPENDIX 5

CABLE PERCUSSION BOREHOLE LOGS

Borehole Log

CP301

Sheet 1 of 2

Hole Type	Easting	Northing	Ground Level (m)	Scale
IP+CP	386903.39	398719.27	62.10	1:50

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-04-01	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
		0.00-0.50	B		62.00	(0.10) 0.10		Asphalt [MADE GROUND]
		0.50-1.00	B			(1.90)		Dark brown very gravelly clayey fine to coarse SAND. Gravel is very angular to subrounded fine to coarse of red brick, ceramic, limestone and sandstone [MADE GROUND]
		1.20 1.20-1.65	SPT D	N=26 (1,2/1,3,7,15)				
		2.00 2.00-2.45	SPT D, B	N=7 (1,1/2,1,2,2)	60.10	2.00 (1.00)		Stiff brown slightly gravelly sandy CLAY. Gravel is very angular to subrounded fine to coarse of red brick, concrete, ceramic, limestone and sandstone [MADE GROUND]
		3.00 3.00-3.45	SPT D, B	N=20 (2,3/3,5,6,6)	59.10	3.00		Very stiff light brown mottled light grey slightly gravelly slightly sandy CLAY. Gravel is subangular to well rounded fine to medium of mudstone, sandstone and coal [GLACIAL TILL]
		4.00-4.45	U100	Blows: 30, Recovery: 100%				
		5.00 5.00-5.45	SPT D, B	N=21 (3,3/4,4,6,7)				
		6.00-6.45	U100	Blows: 31, Recovery: 100%		(12.80)		
		7.50 7.50-7.95	SPT D, B	N=13 (2,2/3,3,3,4)				
		9.00-9.45	U100	Blows: 25, Recovery: 100%				

Continued on next page

Remarks
Terminated at target depth. No water strike

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 16.91m	CP	Dando 2000	LG

Checked By: LM

Created using Pebble Geo

Borehole Log

CP301

Hole Type	Easting	Northing	Ground Level (m)	Scale
IP+CP	386903.39	398719.27	62.10	1:50

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-04-01	2026-04-02

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
								As previous page.
		10.50 10.50-10.95	SPT D, B	N=31 (5,6/7,7,8,9)				
		12.00-12.45	U100	Blows: 37, Recovery: 100%				
		13.50 13.50-13.95	SPT D, B	N=34 (6,6/7,8,9,10)				
		15.00-15.45	U100	Blows: 50, Recovery: 90%				
		16.00-16.50	B		46.30	15.80		Weathered MUDSTONE. Recovered as: Very stiff grey slightly gravelly CLAY. Gravel is very angular to subrounded fine to coarse [PENNINE UPPER COAL MEASURES]
		16.50	SPT	N=50 for 275mm (12,13/13,14,13,10 for 50mm)		(1.11)		
		16.50-16.91	D		45.19	16.91		*End of Borehole at 16.91m*

Remarks
Terminated at target depth. No water strike

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 16.91m	CP	Dando 2000	LG

Checked By: LM

Borehole Log

CP301

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
IP+CP	386903.39	398719.27	62.10	1:50

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-04-01	2026-04-02

Client	Consultant	Contractor
Manchester City Football Club	IGE Consulting	

Hole Diameter

Base Depth (m)	Hole Diameter (mm)	Remarks
3.00	200	
16.91	150	

Casing Diameter

Base Depth (m)	Casing Diameter (mm)	Remarks
3.00	200	
9.00	150	

Drilling Progress

Depth (m)	Casing Depth (m)	Water Level (m)	Date and Time	Remarks
0.00	0.00	Dry	2026-04-01T10:00	Start of borehole
0.00	0.00	Dry	2026-04-02T09:00	End of borehole
16.91	9.00	Dry	2026-04-01T16:30	End of shift
16.91	9.00	Dry	2026-04-02T08:00	Start of shift

SPT - Details

Top Depth (m) (Type)	Casing Depth (m)	Water Depth (m)	Hammer Serial No.	Energy Ratio (%)	Results
1.20 (S)	1.20	Dry	AR3734	69	N=26 (1,2/1,3,7,15)
2.00 (S)	2.00	Dry	AR3734	69	N=7 (1,1/2,1,2,2)
3.00 (S)	3.00	Dry	AR3734	69	N=20 (2,3/3,5,6,6)
5.00 (S)	5.00	Dry	AR3734	69	N=21 (3,3/4,4,6,7)
7.50 (S)	7.50	Dry	AR3734	69	N=13 (2,2/3,3,3,4)
10.50 (S)	9.00	Dry	AR3734	69	N=31 (5,6/7,7,8,9)
13.50 (S)	9.00	Dry	AR3734	69	N=34 (6,6/7,8,9,10)
16.50 (S)	9.00	Dry	AR3734	69	N=50 for 275mm (12,13/13,14,13,10 for 50mm)

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	B		
	B		
	D		
	D		
	B		
	D		
	B		
	U100		
	D		
	B		
	U100		
	D		
	B		
	U100		
	D		
	B		
	U100		
	D		
	B		
	U100		
	B		
	D		

Remarks
Terminated at target depth. No water strike

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 16.91m	CP	Dando 2000	LG

Checked By: LM

Borehole Log

CP302

Sheet 1 of 2

Hole Type	Easting	Northing	Ground Level (m)	Scale
IP+CP	386946.09	398730.23	62.05	1:50
Project Name		**Project No.**	**Start Date**	**End Date**
MCFC		4490	2026-03-31	2026-04-01

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
		0.00-0.50	B					Dark greyish brown gravelly slightly clayey fine to coarse SAND with medium cobble content. Gravel is very angular to subrounded fine to coarse of red brick, concrete, metal, clinker, limestone and sandstone [MADE GROUND]
		0.50-1.00	B					*Becoming grey very silty no longer clayey (0.50m)*
		1.20	SPT	N=50 for 255mm (9,12/13,15,15,7 for 30mm)				
		1.20-1.65	D, B			(3.00)		
		2.00	SPT	N=50 for 145mm (15,10/25,25 for 70mm)				
		2.00-2.45	D, B					
		3.00-3.45	U100	Blows: 26, Recovery: 80%	59.05	3.00		
						(1.00)		Stiff brown slightly gravelly slightly sandy CLAY. Gravel is very angular to well rounded fine to coarse of red brick and mudstone [MADE GROUND]
		4.00	SPT	N=12 (1,2/3,3,3,3)	58.05	4.00		
		4.00-4.45	D, B					Stiff greyish brown slightly gravelly slightly sandy CLAY. Gravel is subrounded to rounded fine to coarse of mudstone and sandstone [GLACIAL TILL]
		5.00-5.45	U100	Blows: 22, Recovery: 100%				
		6.00	SPT	N=12 (2,2/3,3,3,3)				
		6.00-6.45	D, B					
						(11.00)		
		7.50-7.95	U100	Blows: 29, Recovery: 100%				
		9.00	SPT	N=24 (3,4/5,6,6,7)				
		9.00-9.45	D, B					

Continued on next page

Remarks
Terminated at target depth

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 16.83m	CP	Dando 2000	LG

Checked By: LM

Borehole Log

CP302

Sheet 2 of 2

Hole Type	Easting	Northing	Ground Level (m)	Scale
IP+CP	386946.09	398730.23	62.05	1:50

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-31	2026-04-01

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
		10.50-10.95	U100	Blows: 34, Recovery: 100%				
		12.00	SPT	N=24 (3,4/4,6,7,7)				*Becoming very stiff (12.00m)*
		12.00-12.45	D, B					
		13.50-13.95	U100	Blows: 18, Recovery: 100%				
		15.00	SPT	N=50 for 295mm (12,10/12,13,13,12 for 70mm)	47.05	15.00		Weathered MUDSTONE. Recovered as: Very stiff grey slightly gravelly CLAY. Gravel is very angular to angular fine to coarse [PENNINE UPPER COAL MEASURES]
		15.00-15.45	D, B					
						(1.83)		
		16.50	SPT	N=50 for 180mm (10,15/16,24,8 for 30mm)				
		16.50-16.83	D		45.22	16.83		*End of Borehole at 16.83m*

Remarks
Terminated at target depth

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 16.83m	CP	Dando 2000	LG

Checked By: LM

Borehole Log

CP302

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
IP+CP	386946.09	398730.23	62.05	1:50

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-31	2026-04-01

Client	Consultant	Contractor
Manchester City Football Club	IGE Consulting	

Hole Diameter

Base Depth (m)	Hole Diameter (mm)	Remarks
3.00	200	
16.83	150	

Casing Diameter

Base Depth (m)	Casing Diameter (mm)	Remarks
3.00	200	
10.50	150	

Water Strike - General

Struck (m)	Seal Depth (m)	Casing Depth (m)	Date and Time	Remarks
0.80	1.50		2026-03-31	

Water Strike - Details

Struck (m)	Rose To (m)	Time (mins)	Remarks
0.80	0.50	5	

Drilling Progress

Depth (m)	Casing Depth (m)	Water Level (m)	Date and Time	Remarks
0.00	0.00	Dry	2026-03-31T09:00	Start of borehole
0.00	0.00	Dry	2026-03-31T09:00	End of borehole
16.83	10.50	Dry	2026-03-31T16:30	End of shift
16.83	10.50	Dry	2026-03-31T07:30	Start of shift

SPT - Details

Top Depth (m) (Type)	Casing Depth (m)	Water Depth (m)	Hammer Serial No.	Energy Ratio (%)	Results
1.20 (S)	1.20	1.00	AR3734	69	N=50 for 255mm (9,12/13,15,15,7 for 30mm)
2.00 (S)	2.00	Dry	AR3734	69	N=50 for 145mm (15,10/25,25 for 70mm)
4.00 (S)	3.00	Dry	AR3734	69	N=12 (1,2/3,3,3,3)
6.00 (S)	6.00	Dry	AR3734	69	N=12 (2,2/3,3,3,3)
9.00 (S)	9.00	Dry	AR3734	69	N=24 (3,4/5,6,6,7)
12.00 (S)	10.50	Dry	AR3734	69	N=24 (3,4/4,6,7,7)
15.00 (S)	10.50	Dry	AR3734	69	N=50 for 295mm (12,10/12,13,13,12 for 70mm)
16.50 (S)	10.50	Dry	AR3734	69	N=50 for 180mm (10,15/16,24,8 for 30mm)

Continued on next page

Remarks
Terminated at target depth

Method, Plant, Stability, Dimensions			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 16.83m	CP	Dando 2000	LG

Checked By: LM

Borehole Log

CP302

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
IP+CP	386946.09	398730.23	62.05	1:50

Project Name	Project No.	Start Date	End Date
MCFC	4490	2026-03-31	2026-04-01

Client
Manchester City Football Club

Consultant
IGE Consulting

Contractor

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	B		
	B		
	D		
	B		
	D		
	B		
	U100		
	D		
	B		
	U100		
	D		
	B		
	U100		
	D		
	B		
	U100		
	D		
	B		
	U100		
	D		
	B		
	D		

Remarks
Terminated at target depth

Method, Plant, Stability, Dimensions

			Logger
0.00 - 1.20m	IP	Insulated Hand Tools	LG
1.20 - 16.83m	CP	Dando 2000	LG

Checked By: LM

APPENDIX 6

CALIFORNIA BEARING RATIO TEST RESULTS

TD Construction Testing Ltd
Gerard Hall
40 Lord Street
St Helens
Merseyside
WA10 2SD

T: 01744 734769
E: enquiries@tdconstructiontesting.co.uk

UKAS TESTING
8011

CONSTRUCTION TESTING

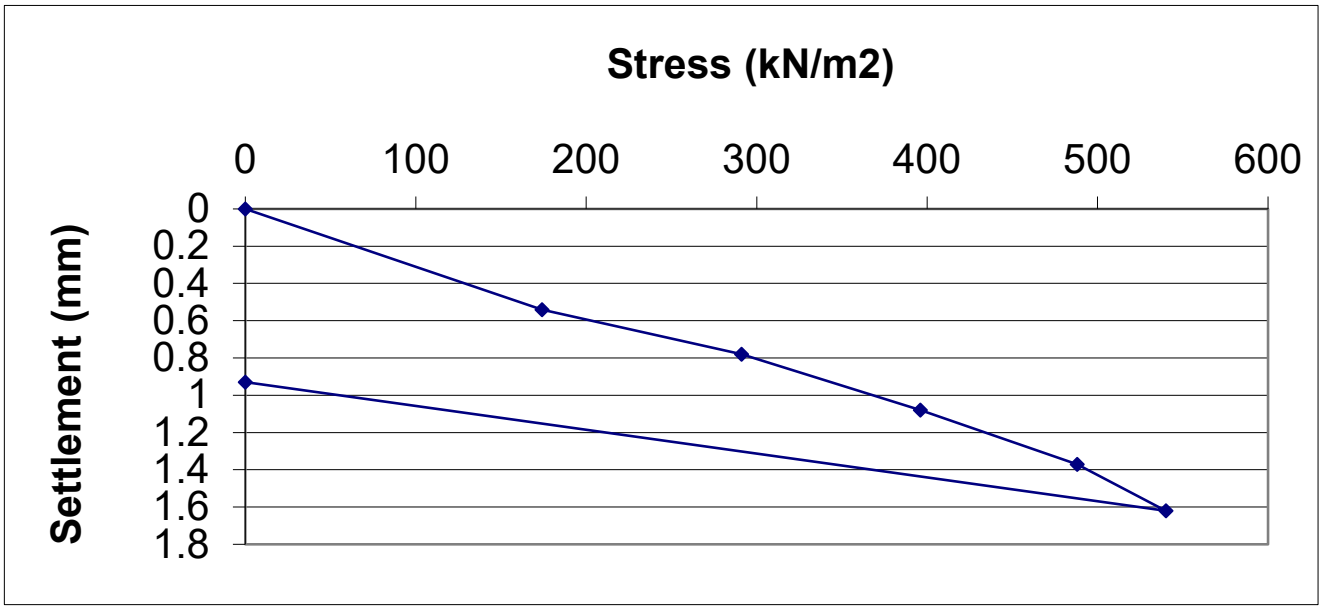
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-01	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	6F5		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	1		
Location*:	CBR 1		
Test Level:	-0.5 BGL		
Plate Size mm:	300		
Date Tested:	30/03/2026		
Weather Conditions:	Overcast, Windy, Showers		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:			

Test Report No.: TD26-I-04-A-01

Stress (kN/m^2)	Settlement (mm)
0	0
174	0.54
291	0.78
396	1.08
488	1.37
540	1.62
0	0.93



K Value (kN/m^2/mm)	159
Estimated CBR value	63%

Comments/Deviations:

This report shall not be reproduced except in full without approval of the laboratory.

Results relate only to the location tested.

* Information supplied by client.

Signe [redacted]

A. Hayes (Site Section Manager)

TD Construction Testing Ltd
Gerard Hall
40 Lord Street
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CONSTRUCTION TESTING

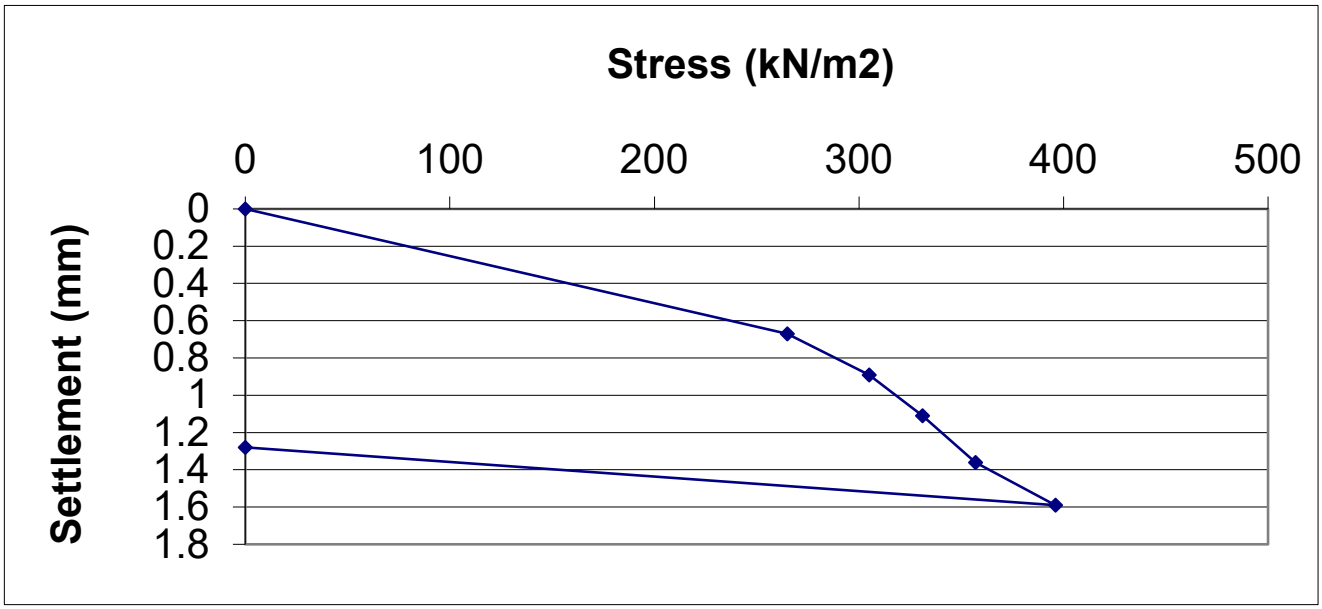
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-02	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Crushed Brick / Brown Stony Clay		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	2		
Location*:	CBR 1		
Test Level:	-1.0 BGL		
Plate Size mm:	300		
Date Tested:	30/03/2026		
Weather Conditions:	Raining, Overcast, Windy		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:			

Test Report No.: TD26-I-04-A-02

Stress (kN/m^2)	Settlement (mm)
0	0
265	0.67
305	0.89
331	1.11
357	1.36
396	1.59
0	1.28



K Value (kN/m^2/mm)	122.1
Estimated CBR value	40%

Comments/Deviations:

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Results relate only to the location tested.

* Information supplied by client.

Signe [redacted]	A. Hayes (Site Section Manager)

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UKAS TESTING
8011

CONSTRUCTION TESTING

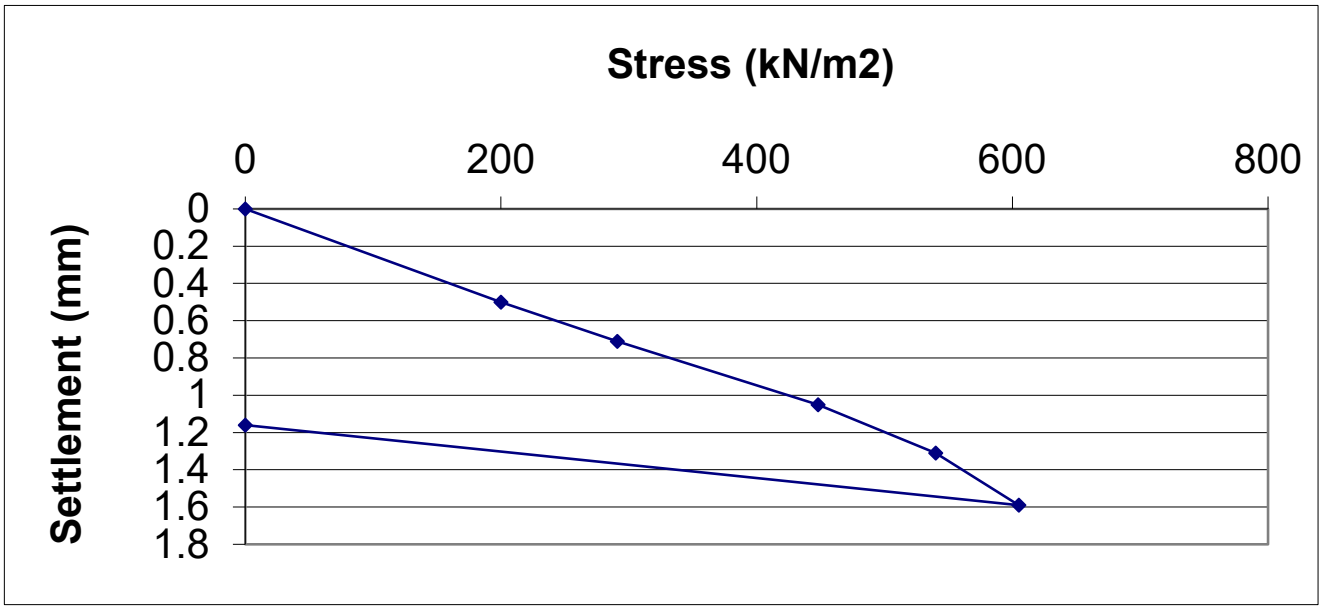
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-03	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Stony Brown Clay		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	3		
Location*:	CBR 2		
Test Level:	-0.5 BGL		
Plate Size mm:	300		
Date Tested:	30/03/2026		
Weather Conditions:	Raining, Windy		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:			

Test Report No.: TD26-I-04-A-03

Stress (kN/m^2)	Settlement (mm)
0	0
200	0.5
291	0.71
448	1.05
540	1.31
605	1.59
0	1.16



K Value (kN/m^2/mm)	183.3
Estimated CBR value	81%

Comments/Deviations:

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Results relate only to the location tested.

* Information supplied client.

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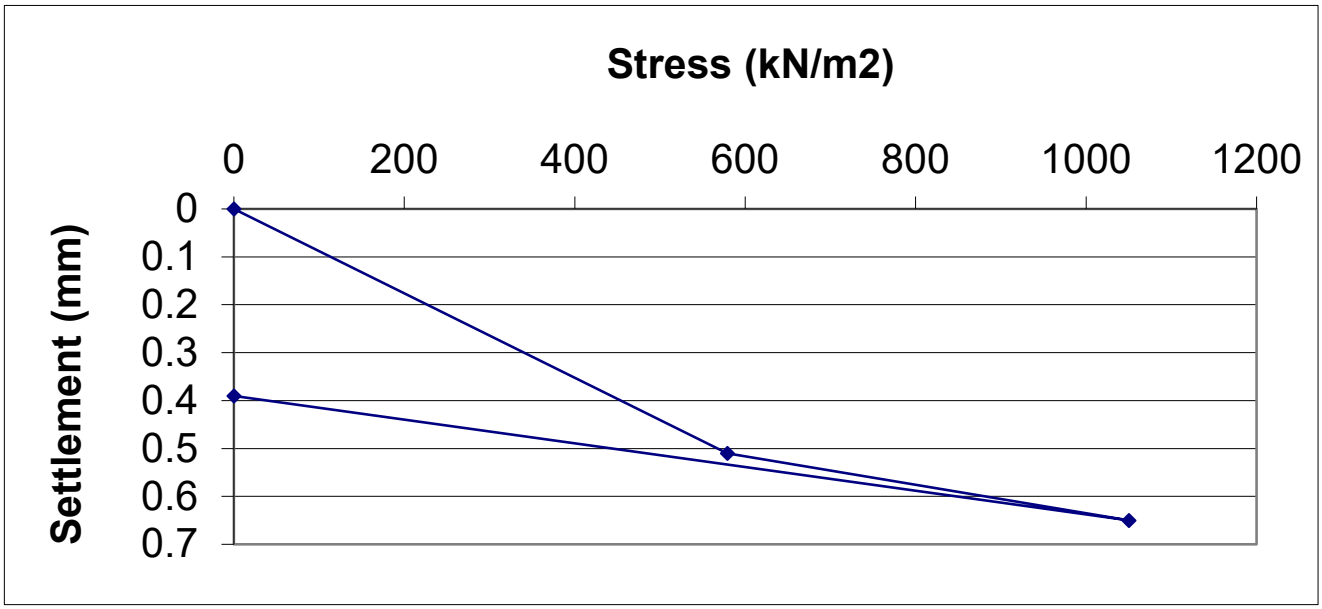
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-04	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Crushed Rock / Brick and Brown Clay		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	4		
Location*:	CBR 2		
Test Level:	-1.0 BGL		
Plate Size mm:	300		
Date Tested:	30/03/2026		
Weather Conditions:	Raining, Windy		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:	Test ended @1050kN/m2 due to reaching maximum capacity of the Jack		

Test Report No.: TD26-I-04-A-04

Stress (kN/m^2)	Settlement (mm)
0	0
579	0.51
1050	0.65
0	0.39



K Value (kN/m^2/mm)	371
Estimated CBR value	Exceeds 100%

Comments/Deviations:

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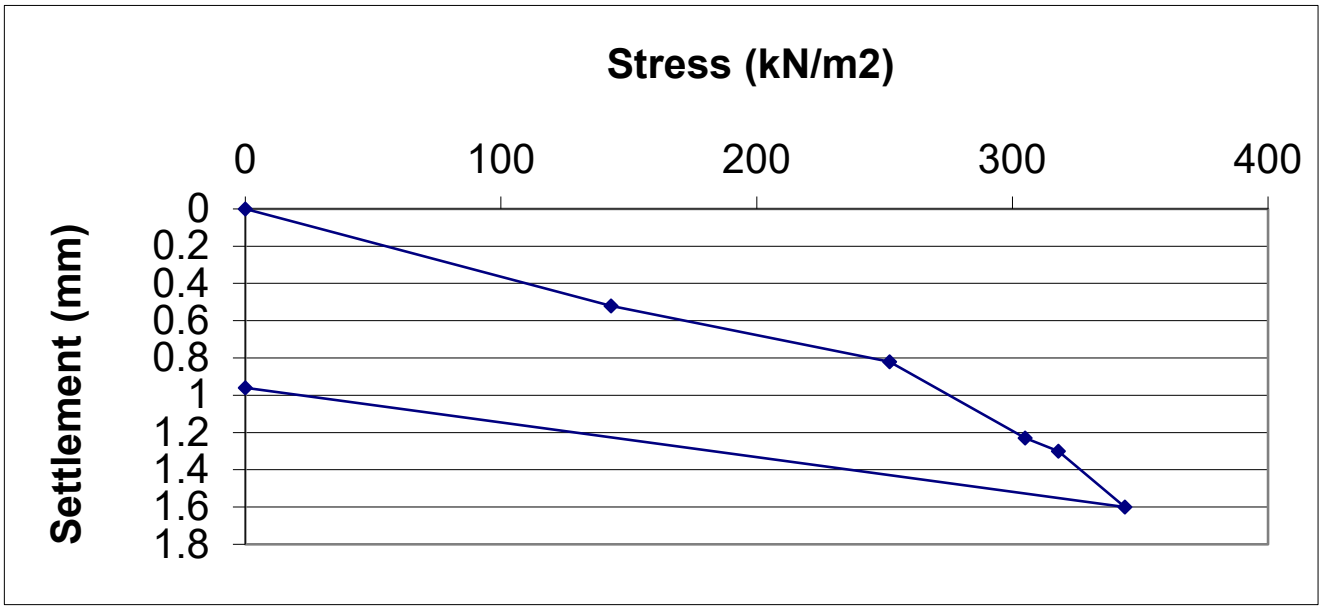
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-05	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Stony Gravel Brown Clay		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	5		
Location*:	CBR 3		
Test Level:	-0.5 BGL		
Plate Size mm:	300		
Date Tested:	30/03/2026		
Weather Conditions:	Raining, Windy		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:			

Test Report No.: TD26-I-04-A-05

Stress (kN/m^2)	Settlement (mm)
0	0
143	0.52
252	0.82
305	1.23
318	1.30
344	1.60
0	0.96



K Value (kN/m^2/mm)	109.1
Estimated CBR value	33%

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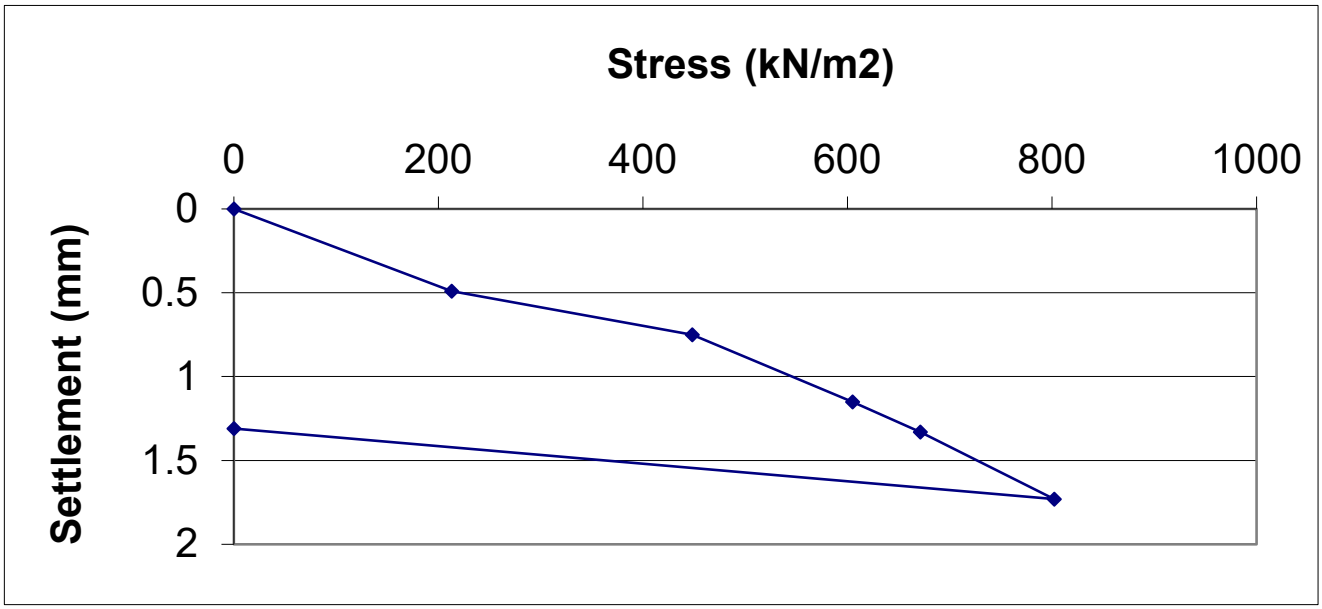
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-06	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Crushed Brick / Concrete Gravely Clay		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	6		
Location*:	CBR 3		
Test Level:	-1.0 BGL		
Plate Size mm:	300		
Date Tested:	30/03/2026		
Weather Conditions:	Windy, Showers		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:			

Test Report No.: TD26-I-04-A-06

Stress (kN/m^2)	Settlement (mm)
0	0
213	0.49
448	0.75
605	1.15
671	1.33
802	1.73
0	1.31



K Value (kN/m^2/mm)	226.8
Estimated CBR value	Exceeds 100%

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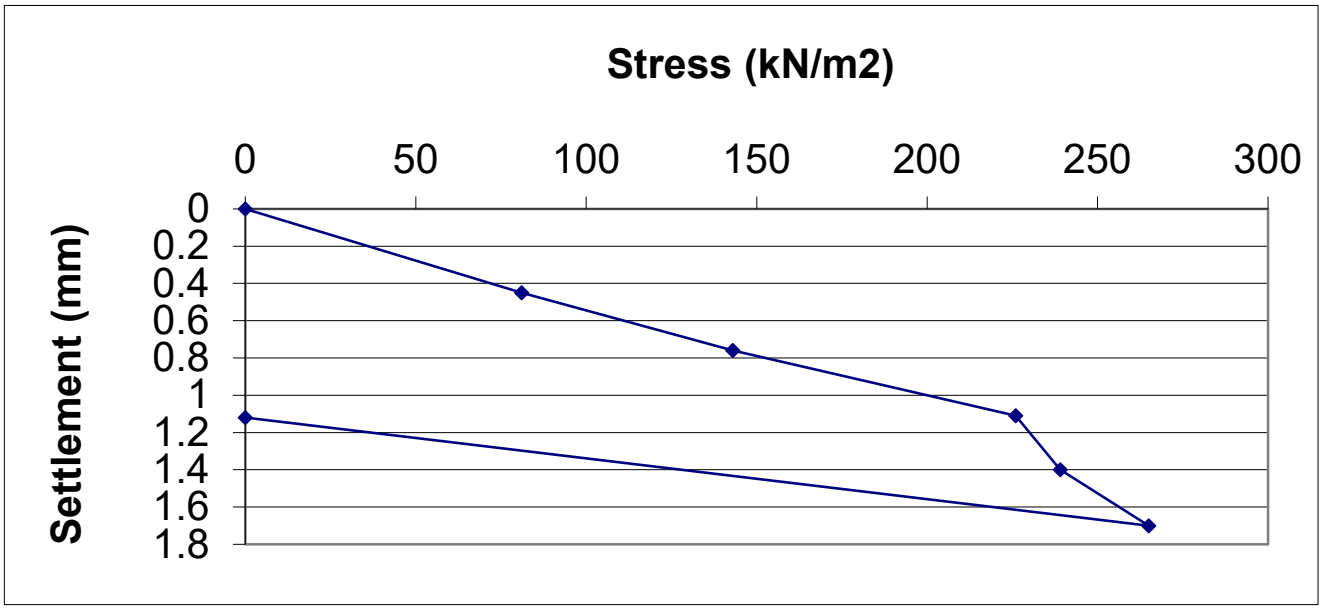
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-07	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Stoney Gravely Clay		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	1		
Location*:	CBR 4		
Test Level:	-0.5 BGL		
Plate Size mm:	300		
Date Tested:	31/03/2026		
Weather Conditions:	Overcast, Showers		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:			

Test Report No.: TD26-I-04-A-07

Stress (kN/m^2)	Settlement (mm)
0	0
81	0.45
143	0.76
226	1.11
239	1.40
265	1.70
0	1.12



K Value (kN/m^2/mm)	82.1
Estimated CBR value	20%

Comments/Deviations:

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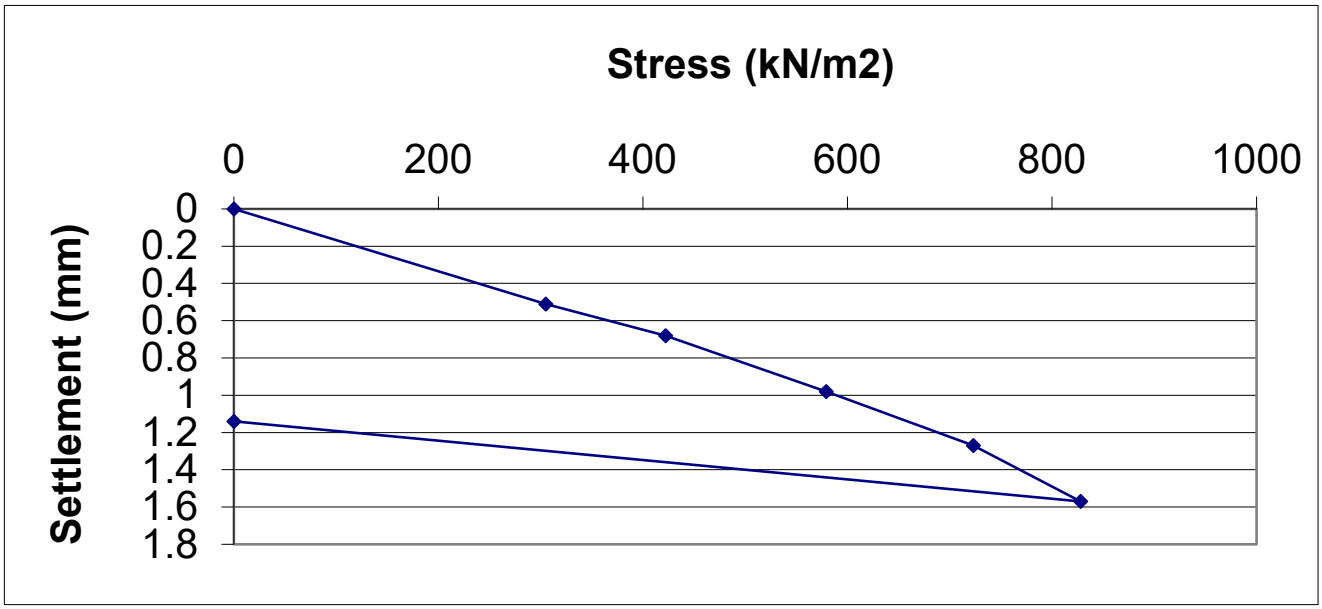
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-09	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Crushed Stone and Stony Clay		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	2		
Location*:	CBR 4		
Test Level:	-1.0 BGL		
Plate Size mm:	300		
Date Tested:	31/03/2026		
Weather Conditions:	Overcast		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:			

Test Report No.: TD26-I-04-A-09

Stress (kN/m^2)	Settlement (mm)
0	0
305	0.51
422	0.68
579	0.98
723	1.27
828	1.57
0	1.14



K Value (kN/m^2/mm)	252
Estimated CBR value	Exceeds 100%

Comments/Deviations:

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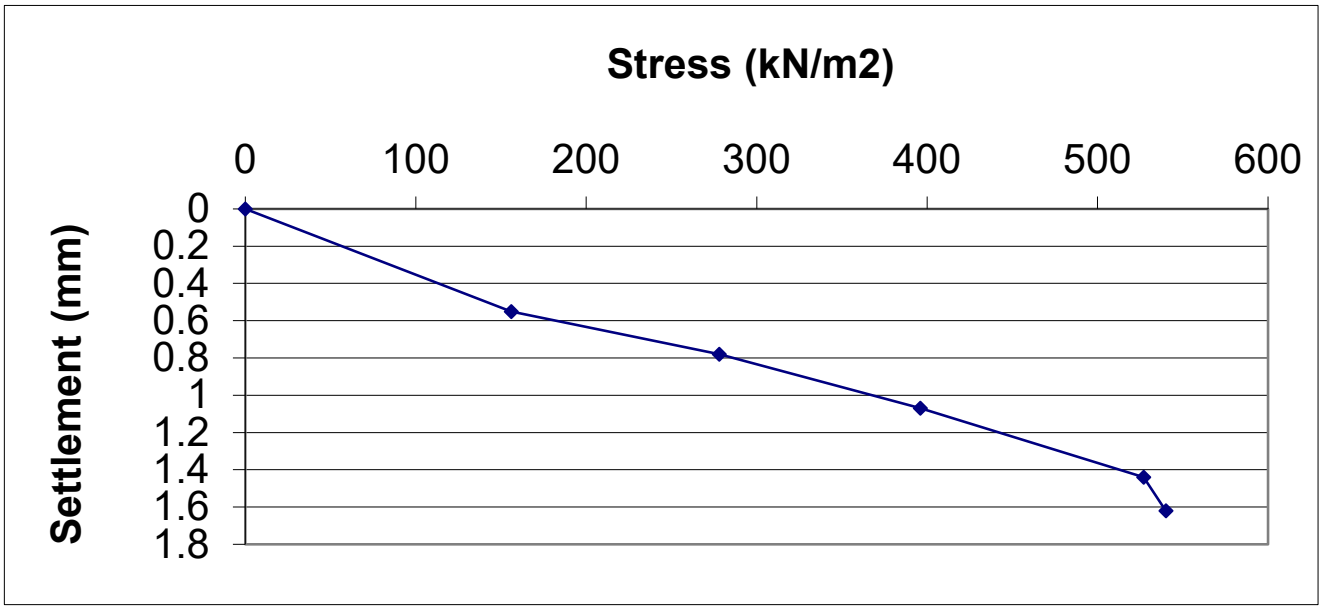
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-10	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Crushed Rock/ Brick		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	3		
Location*:	CBR 5		
Test Level:	-0.5 BGL		
Plate Size mm:	300		
Date Tested:	31/03/2026		
Weather Conditions:	Overcast		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:	No rebound recorded due to side wall rock hitting datum bar		

Test Report No.: TD26-I-04-A-10

Stress (kN/m^2)	Settlement (mm)
0	0
156	0.55
278	0.78
396	1.07
527	1.44
540	1.62



K Value (kN/m^2/mm)	162.4
Estimated CBR value	65%

Comments/Deviations:

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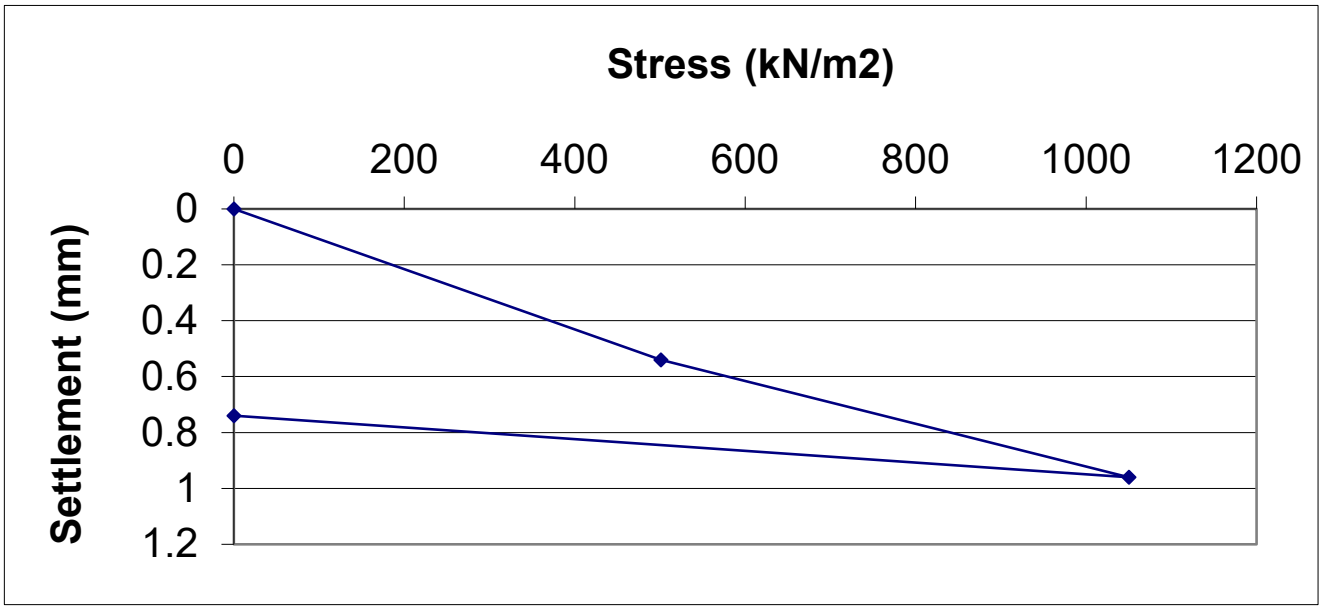
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-08	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Crushed Stony Gravely Clay		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	4		
Location*:	CBR 5		
Test Level:	-1.0 BGL		
Plate Size mm:	300		
Date Tested:	31/03/2026		
Weather Conditions:	Overcast		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:	Test ended @1050kN/m2 due to reaching maximum capacity of the jack		

Test Report No.: TD26-I-04-A-08

Stress (kN/m^2)	Settlement (mm)
0	0
501	0.54
1050	0.96
0	0.74



K Value (kN/m^2/mm)	371
Estimated CBR value	Exceeds 100%

Comments/Deviations:

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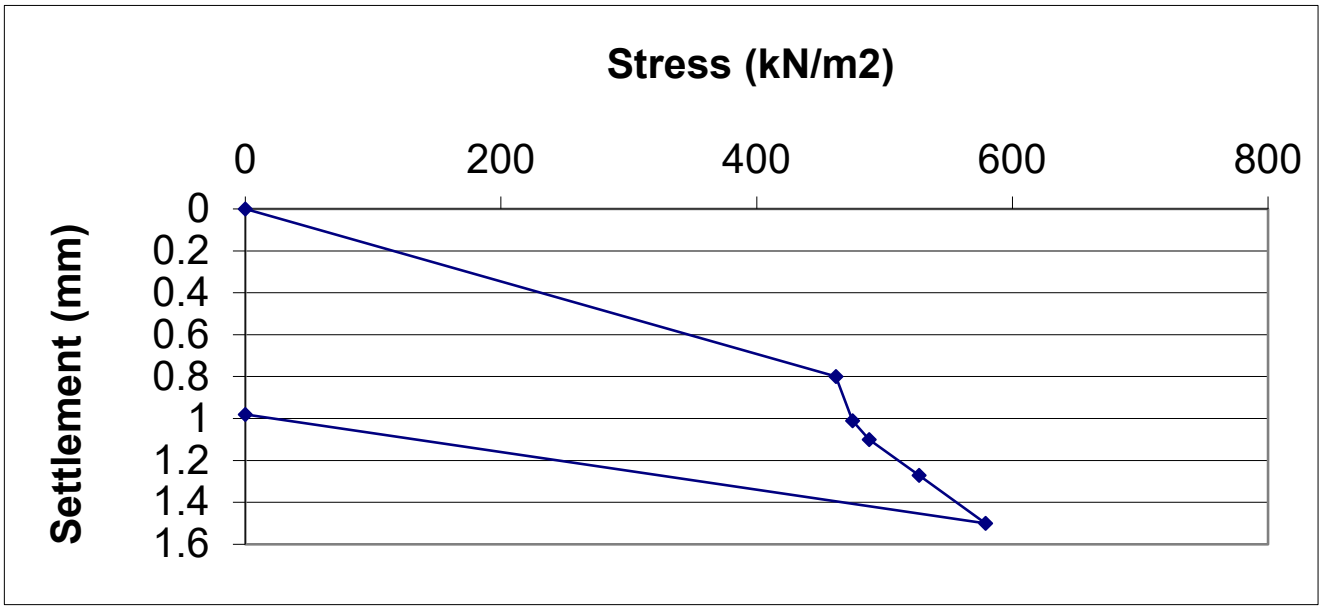
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-11	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Stony Gravely Clay		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	5		
Location*:	CBR 6		
Test Level:	-0.5 BGL		
Plate Size mm:	300		
Date Tested:	31/03/2026		
Weather Conditions:	Overcast		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:			

Test Report No.: TD26-I-04-A-11

Stress (kN/m^2)	Settlement (mm)
0	0
462	0.8
475	1.01
488	1.10
527	1.27
579	1.50
0	0.98



K Value (kN/m^2/mm)	184.6
Estimated CBR value	82%

Comments/Deviations:

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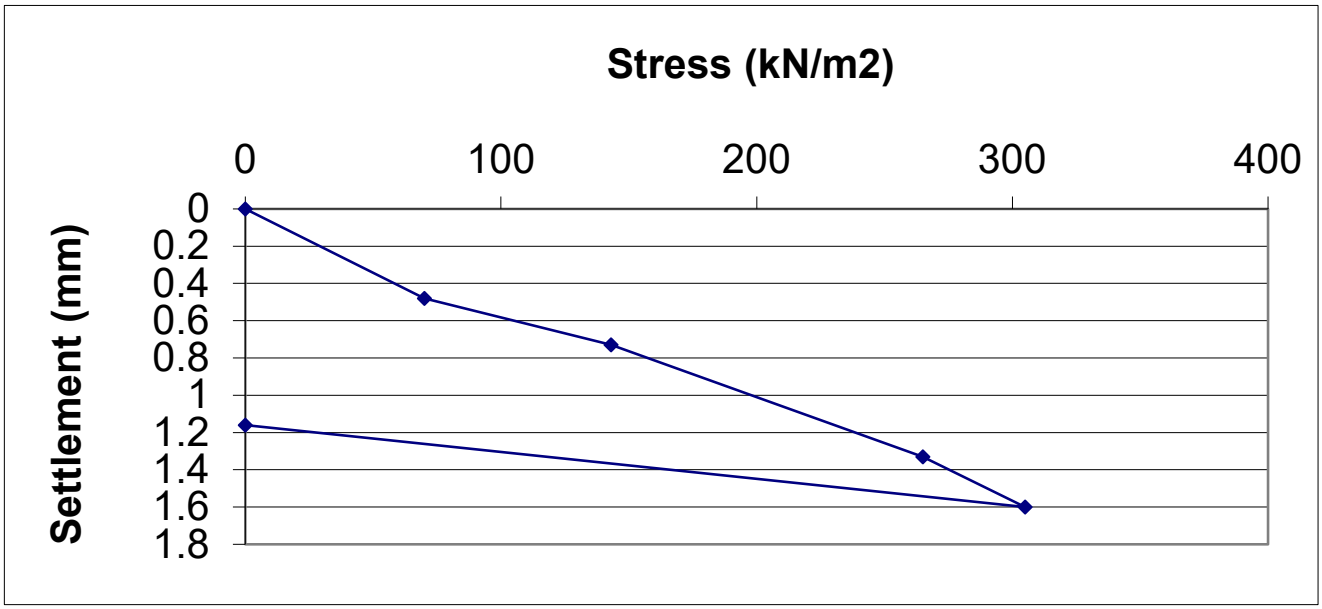
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-12	Report Date:	02/04/2026.
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Brick / Gravel		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	6		
Location*:	CBR 6		
Test Level:	-1.0 BGL		
Plate Size mm:	300		
Date Tested:	31/03/2026		
Weather Conditions:	Overcast		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:			

Test Report No.: TD26-I-04-A-12

Stress (kN/m^2)	Settlement (mm)
0	0
70	0.48
143	0.73
265	1.33
305	1.60
0	1.16



K Value (kN/m^2/mm)	87.9
Estimated CBR value	23%

Comments/Deviations:

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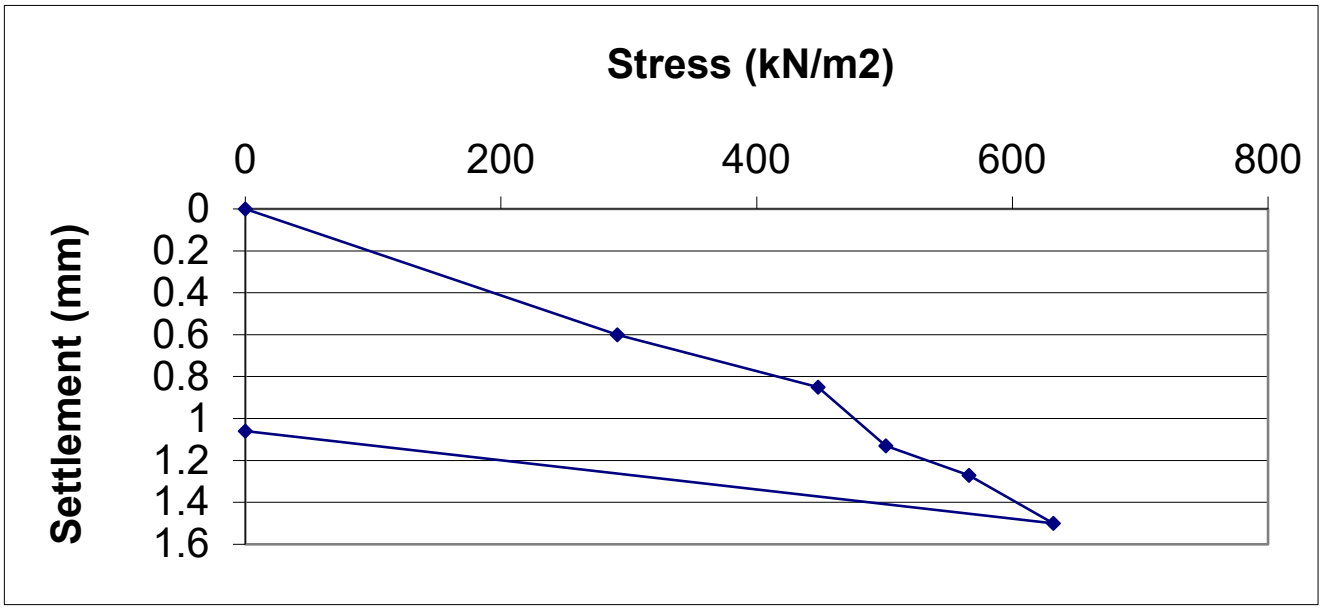
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-13	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Brick and Gravel		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	7		
Location*:	CBR 7		
Test Level:	-0.5 BGL		
Plate Size mm:	300		
Date Tested:	31/03/2026		
Weather Conditions:	Overcast		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:			

Test Report No.: TD26-I-04-A-13

Stress (kN/m^2)	Settlement (mm)
0	0
291	0.6
448	0.85
501	1.13
566	1.27
632	1.50
0	1.06



K Value (kN/m^2/mm)	196.7
Estimated CBR value	91%

Comments/Deviations:

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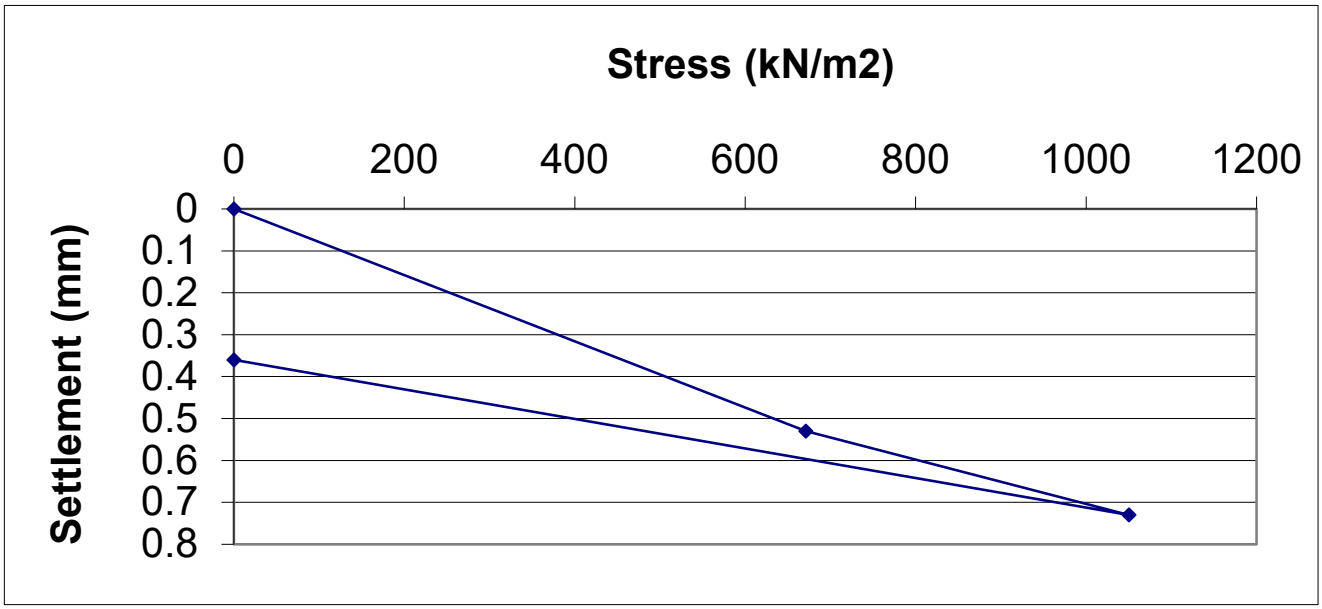
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-14	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Crushed Stone and Gravely Clay		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	8		
Location*:	CBR 7		
Test Level:	-1.0 BGL		
Plate Size mm:	300		
Date Tested:	31/03/2026		
Weather Conditions:	Overcast		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:	Test ended @1050kN/,2 due to reaching maximum capacity of the Jack		

Test Report No.: TD26-I-04-A-14

Stress (kN/m^2)	Settlement (mm)
0	0
671	0.53
1050	0.73
0	0.36



K Value (kN/m^2/mm)	371
Estimated CBR value	Exceeds 100%

Comments/Deviations:

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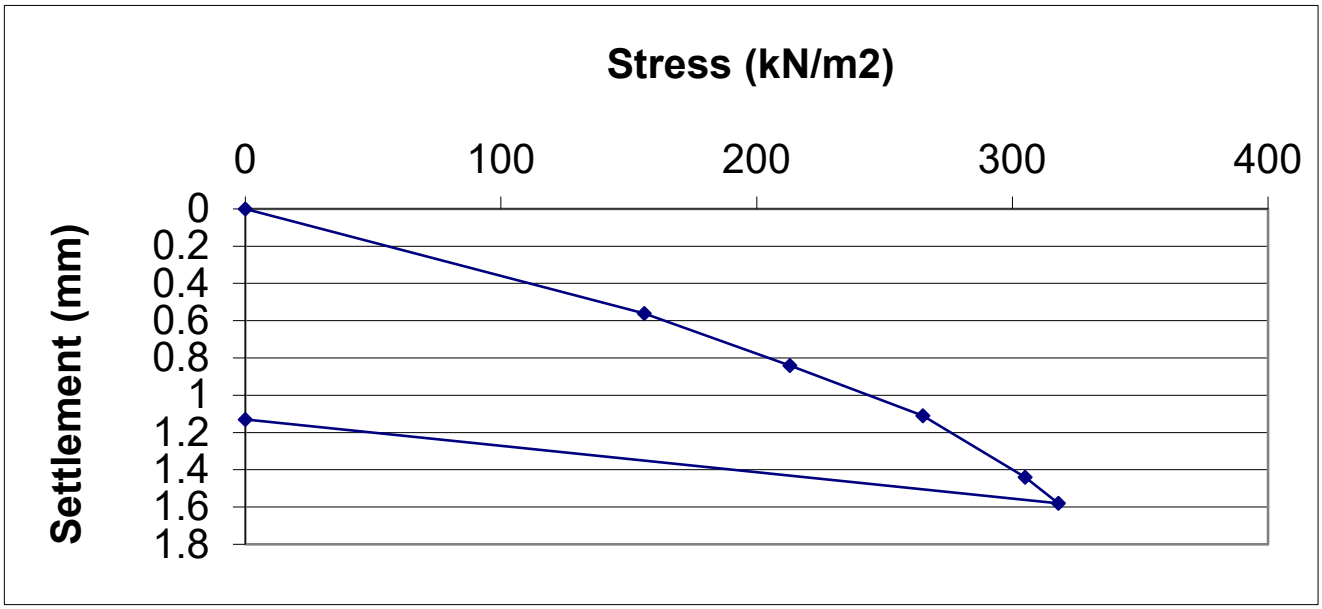
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-15	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Brown Stony Clay		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	9		
Location*:	CBR 8		
Test Level:	-0.5 BGL		
Plate Size mm:	300		
Date Tested:	31/03/2026		
Weather Conditions:	Overcast		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:			

Test Report No.: TD26-I-04-A-15

Stress (kN/m^2)	Settlement (mm)
0	0
156	0.56
213	0.84
265	1.11
305	1.44
318	1.58
0	1.13



K Value (kN/m^2/mm)	99.6
Estimated CBR value	28%

Comments/Deviations:

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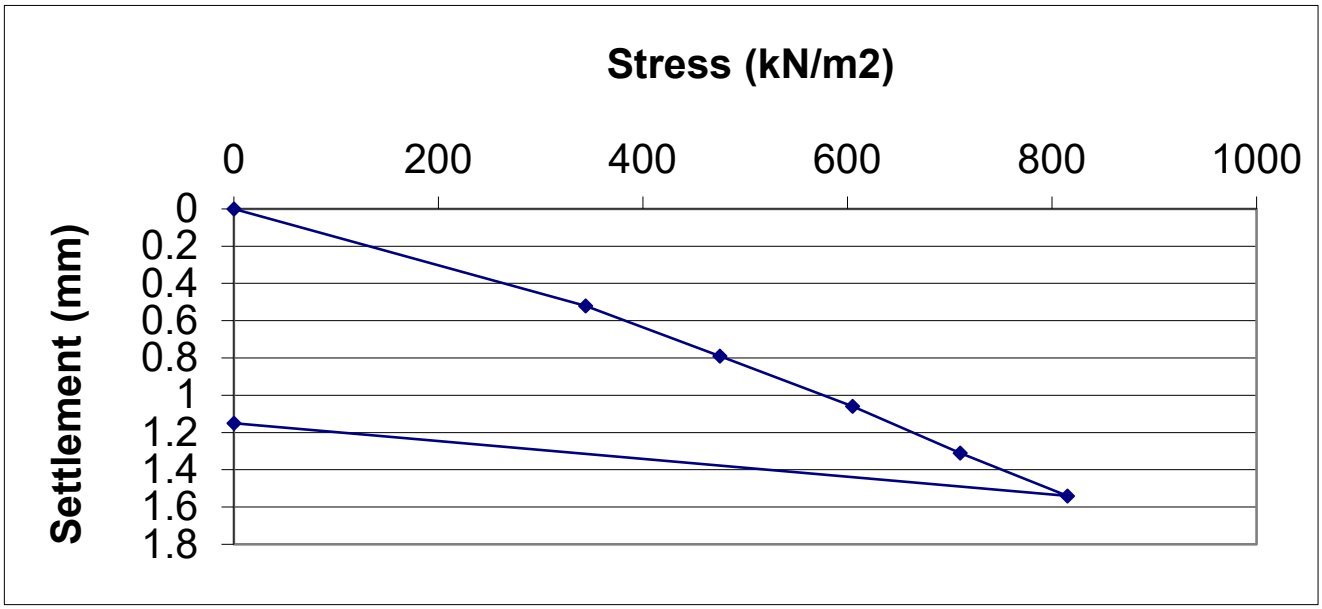
TEST REPORT

Plate Loading Test

Test Report No.:	TD26-I-04-A-16	Report Date:	02/04/2026
Client:	IGE Consulting		
Address:	Bartle House, Oxford Court, Manchester, M2 3WQ		
Contact:	Luke Griffith		
Site:	Etihad Campus, Manchester		
Test Requested:	**Plate Loading Test to obtain Approximate CBR value**		
Test Method:	Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1 (2009)		
Material*:	Crushed Brick Stony Clay		
Supplier/Source*:	Client / Site Won		
Moisture Content %:	N/R		
Test Number:	10		
Location*:	CBR 8		
Test Level:	-1.0 BGL		
Plate Size mm:	300		
Date Tested:	31/03/2026		
Weather Conditions:	Overcast		
Tested By:	Ste Dodd		
Kentledge Type:	Excavator		
Comments:			

Test Report No.: TD26-I-04-A-16

Stress (kN/m^2)	Settlement (mm)
0	0
344	0.52
475	0.79
605	1.06
710	1.31
815	1.54
0	1.15



K Value (kN/m^2/mm)	242
Estimated CBR value	Exceeds 100%

Comments/Deviations:

This report shall not be reproduced except in full without approval of the laboratory.

Results relate only to the location tested.

* Information supplied by client.

Sign [redacted] A. Hayes (Site Section Manager)

APPENDIX 7

GEOTECHNICAL LABORATORY TEST RESULTS

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client IGE Consulting Ltd

Address Office 16
Bartle House
Oxford Court
Manchester
M2 3WQ

Contract MCFC

Job Number MRN 26041/26
Date of Issue 22 April 2026
Page 1 of 23

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.

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

6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.

M U R R A Y R I X

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892-4:2016

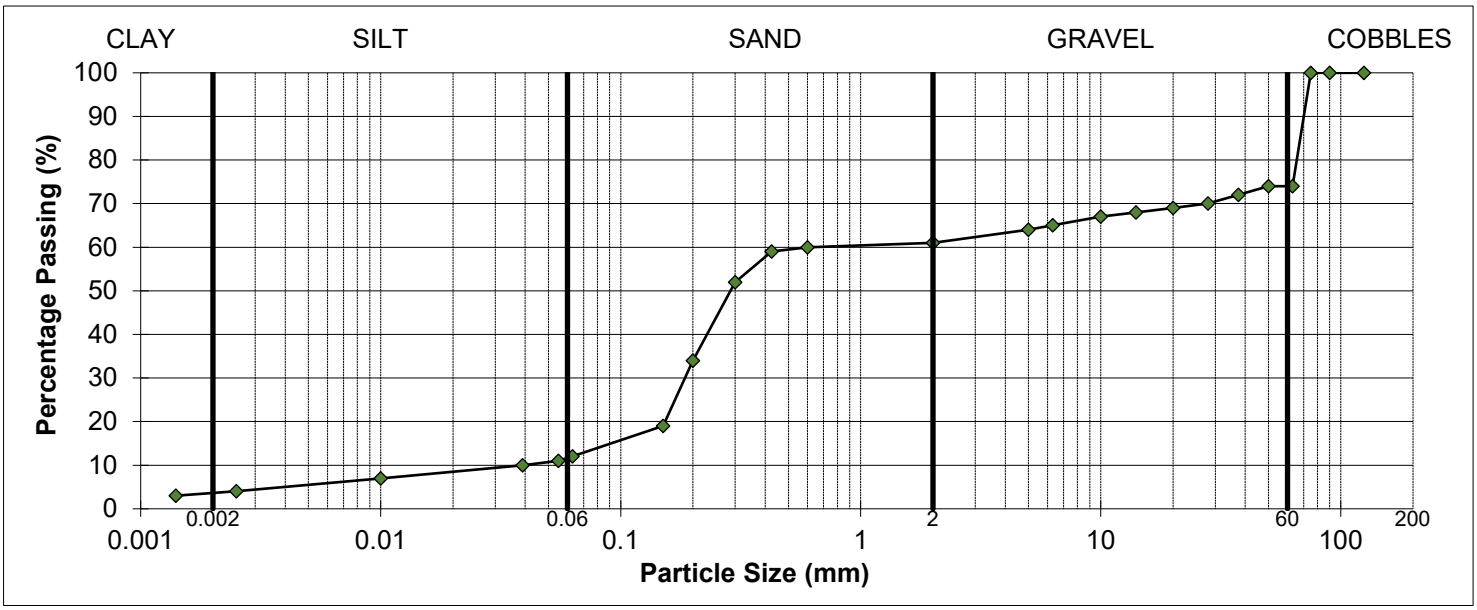
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	CP02 1.2-1.65m	DATE SAMPLED	01-Apr-26
LAB SAMPLE No	6073206	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown clayey very gravelly SAND		
ADVISED SOURCE	Site Investigation Sample	AS RECEIVED WATER CONTENT (%)	17.9

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2	61	
90	100		0.6	60	
75	100		0.425	59	
63	74		0.3	52	
50	74		0.2	34	
37.5	72		0.15	19	
28	70		0.063	12	
20	69		0.055	11	
14	68		0.039	10	
10	67		0.01	7	
6.3	65		0.0025	4	
5	64		0.0014	3	



SOIL FRACTIONS			
GRAVEL	13%	SILT	8%
SAND	49%	CLAY	4%

REMARKS

SIGNED [redacted]

NAME C.P. Davies BA (Hons) (Director / Head of Laboratory) DATE 22-Apr-26

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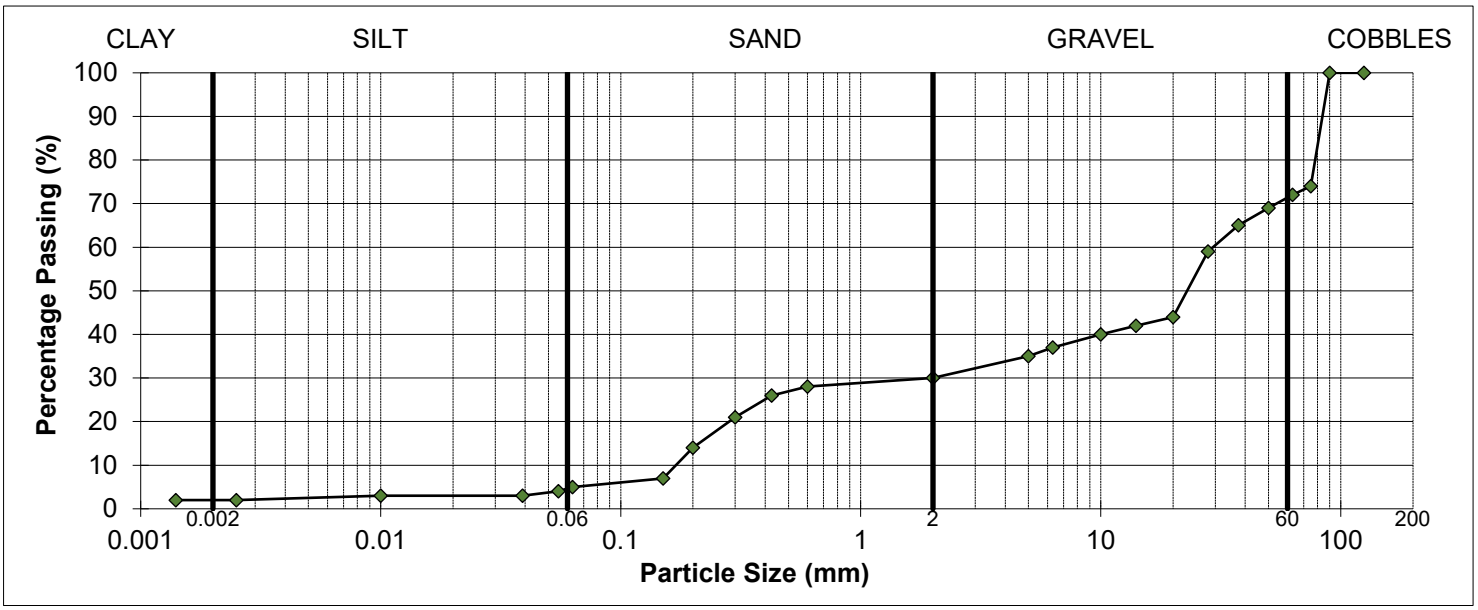
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	TP302 1.6m	DATE SAMPLED	01-Apr-26
LAB SAMPLE No	6073207	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown clayey very sandy GRAVEL		
ADVISED SOURCE	Site Investigation Sample	AS RECEIVED WATER CONTENT (%)	18.3

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2	30	
90	100		0.6	28	
75	74		0.425	26	
63	72		0.3	21	
50	69		0.2	14	
37.5	65		0.15	7	
28	59		0.063	5	
20	44		0.055	4	
14	42		0.039	3	
10	40		0.01	3	
6.3	37		0.0025	2	
5	35		0.0014	2	



SOIL FRACTIONS			
GRAVEL	42%	SILT	3%
SAND	25%	CLAY	2%

REMARKS

SIGNED [redacted]

NAME G.P. Davies BA (Hons) (Director / Head of Laboratory)

DATE 22-Apr-26

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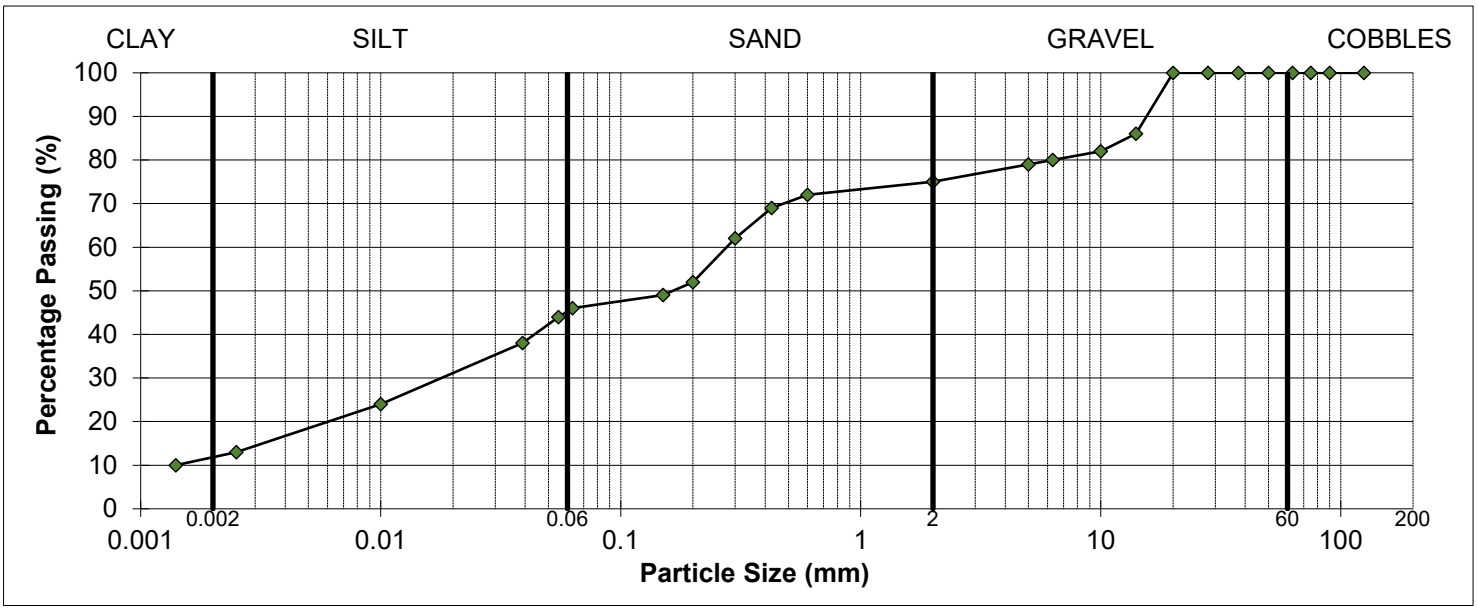
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	TP302 2.7m	DATE SAMPLED	01-Apr-26
LAB SAMPLE No	6073208	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	AS RECEIVED WATER CONTENT (%)	15.7

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2	75	
90	100		0.6	72	
75	100		0.425	69	
63	100		0.3	62	
50	100		0.2	52	
37.5	100		0.15	49	
28	100		0.063	46	
20	100		0.055	44	
14	86		0.039	38	
10	82		0.01	24	
6.3	80		0.0025	13	
5	79		0.0014	10	



SOIL FRACTIONS			
GRAVEL	25%	SILT	34%
SAND	29%	CLAY	12%

REMARKS

SIGNED [redacted]

NAME C.P. Davies BA (Hons) DATE 22-Apr-26
(Director / Head of Laboratory)

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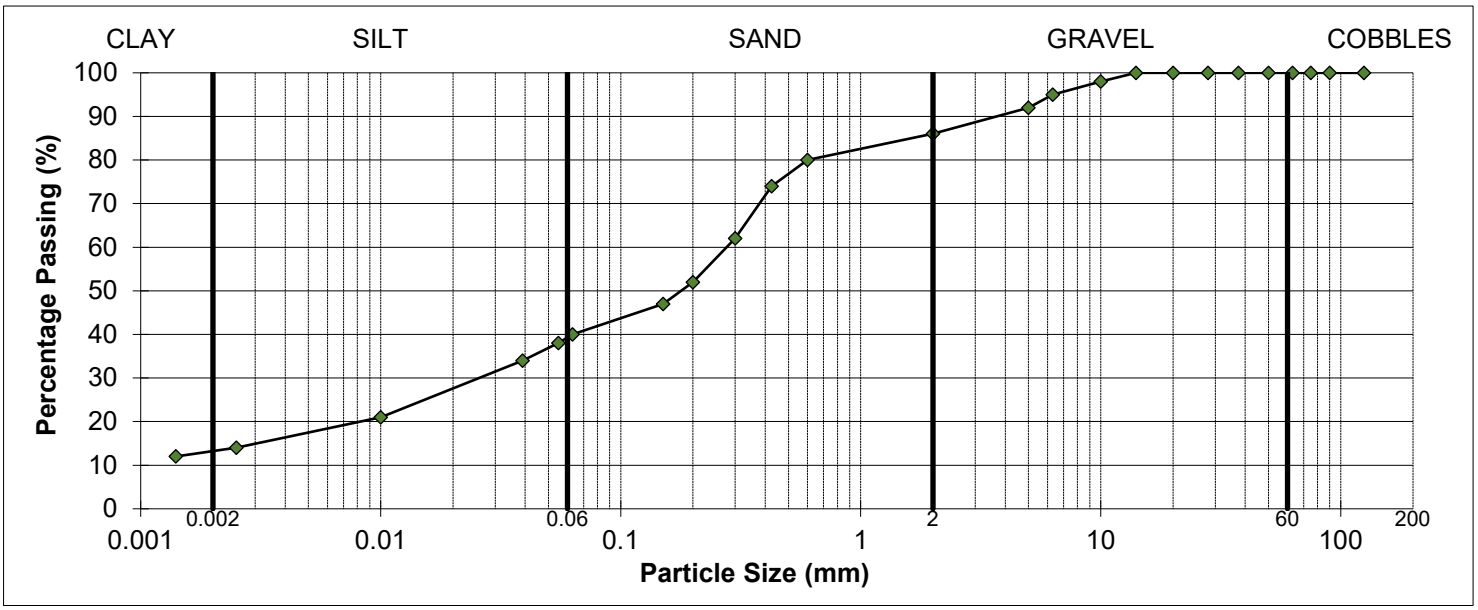
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	TP303 4.5m	DATE SAMPLED	01-Apr-26
LAB SAMPLE No	6073209	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	AS RECEIVED WATER CONTENT (%)	16.7

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2	86	
90	100		0.6	80	
75	100		0.425	74	
63	100		0.3	62	
50	100		0.2	52	
37.5	100		0.15	47	
28	100		0.063	40	
20	100		0.055	38	
14	100		0.039	34	
10	98		0.01	21	
6.3	95		0.0025	14	
5	92		0.0014	12	



SOIL FRACTIONS			
GRAVEL	14%	SILT	27%
SAND	46%	CLAY	13%

REMARKS

SIGNED [redacted]

NAME C.P. Davies BA (Hons) (Director / Head of Laboratory) DATE 22-Apr-26

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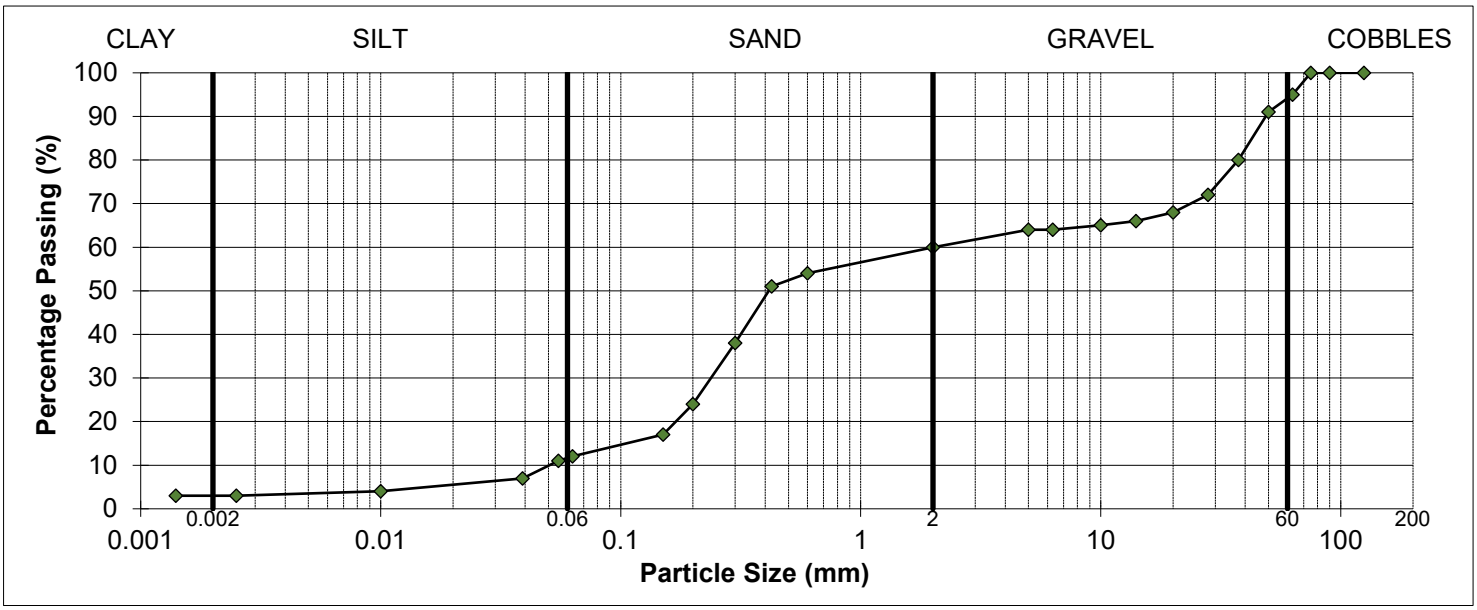
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	TP305 1.6m	DATE SAMPLED	01-Apr-26
LAB SAMPLE No	6073210	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown clayey very gravelly SAND		
ADVISED SOURCE	Site Investigation Sample	AS RECEIVED WATER CONTENT (%)	17.1

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2	60	
90	100		0.6	54	
75	100		0.425	51	
63	95		0.3	38	
50	91		0.2	24	
37.5	80		0.15	17	
28	72		0.063	12	
20	68		0.055	11	
14	66		0.039	7	
10	65		0.01	4	
6.3	64		0.0025	3	
5	64		0.0014	3	



SOIL FRACTIONS			
GRAVEL	35%	SILT	9%
SAND	48%	CLAY	3%

REMARKS

SIGNED [redacted]

NAME C.P. Davies BA (Hons) (Director / Head of Laboratory)

DATE 22-Apr-26

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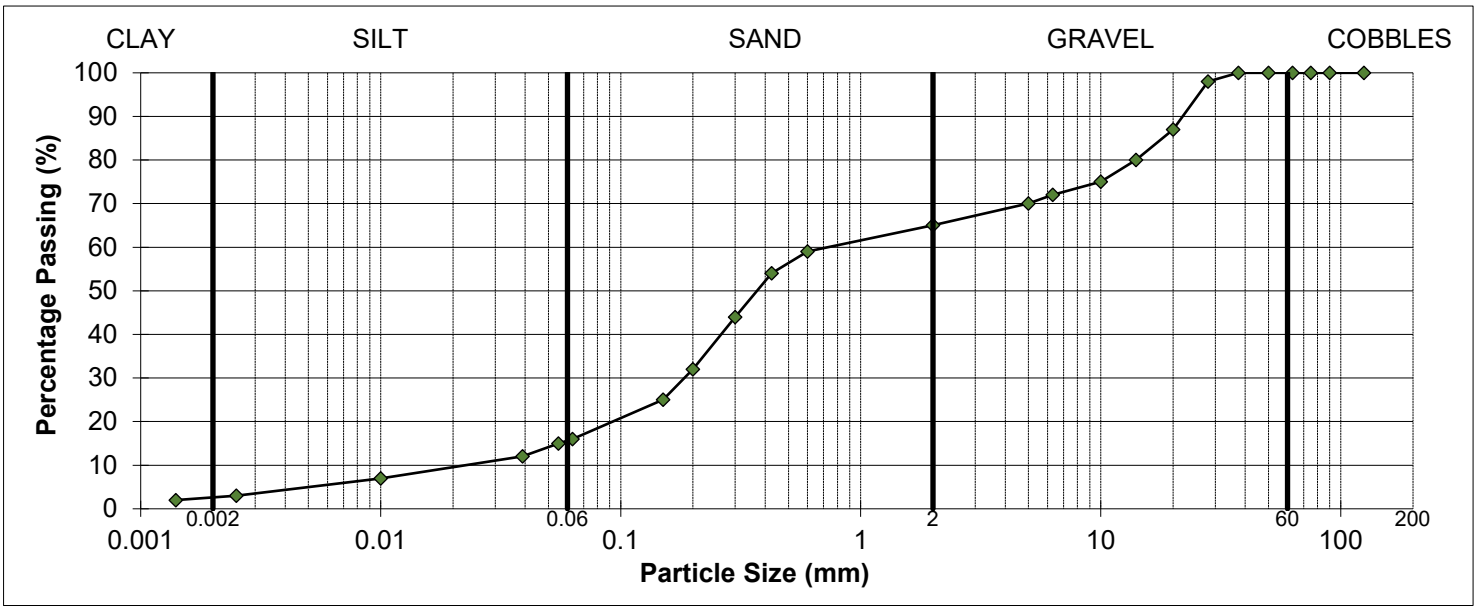
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	TP307 2.0m	DATE SAMPLED	01-Apr-26
LAB SAMPLE No	6073212	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown clayey very gravelly SAND		
ADVISED SOURCE	Site Investigation Sample	AS RECEIVED WATER CONTENT (%)	20.2

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2	65	
90	100		0.6	59	
75	100		0.425	54	
63	100		0.3	44	
50	100		0.2	32	
37.5	100		0.15	25	
28	98		0.063	16	
20	87		0.055	15	
14	80		0.039	12	
10	75		0.01	7	
6.3	72		0.0025	3	
5	70		0.0014	2	



SOIL FRACTIONS			
GRAVEL	35%	SILT	13%
SAND	49%	CLAY	3%

REMARKS

SIGNED [redacted]

NAME C.P. Davies BA (Hons) (Director / Head of Laboratory)

DATE 22-Apr-26

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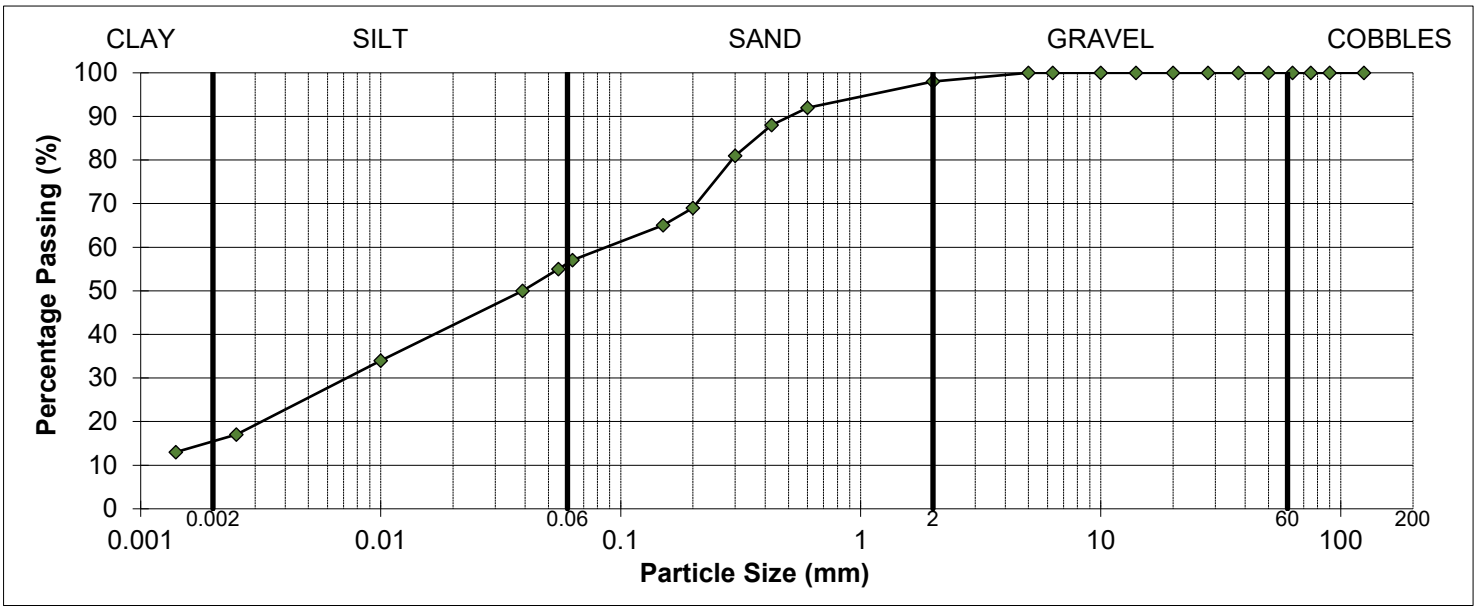
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	TP310 2.4m	DATE SAMPLED	01-Apr-26
LAB SAMPLE No	6073214	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	AS RECEIVED WATER CONTENT (%)	23.5

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2	98	
90	100		0.6	92	
75	100		0.425	88	
63	100		0.3	81	
50	100		0.2	69	
37.5	100		0.15	65	
28	100		0.063	57	
20	100		0.055	55	
14	100		0.039	50	
10	100		0.01	34	
6.3	100		0.0025	17	
5	100		0.0014	13	



SOIL FRACTIONS			
GRAVEL	2%	SILT	42%
SAND	41%	CLAY	15%

REMARKS

SIGNED [redacted]

NAME G.P. Davies BA (Hons) (Director / Head of Laboratory) DATE 22-Apr-26

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.3 (30° FALL CONE) 1 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

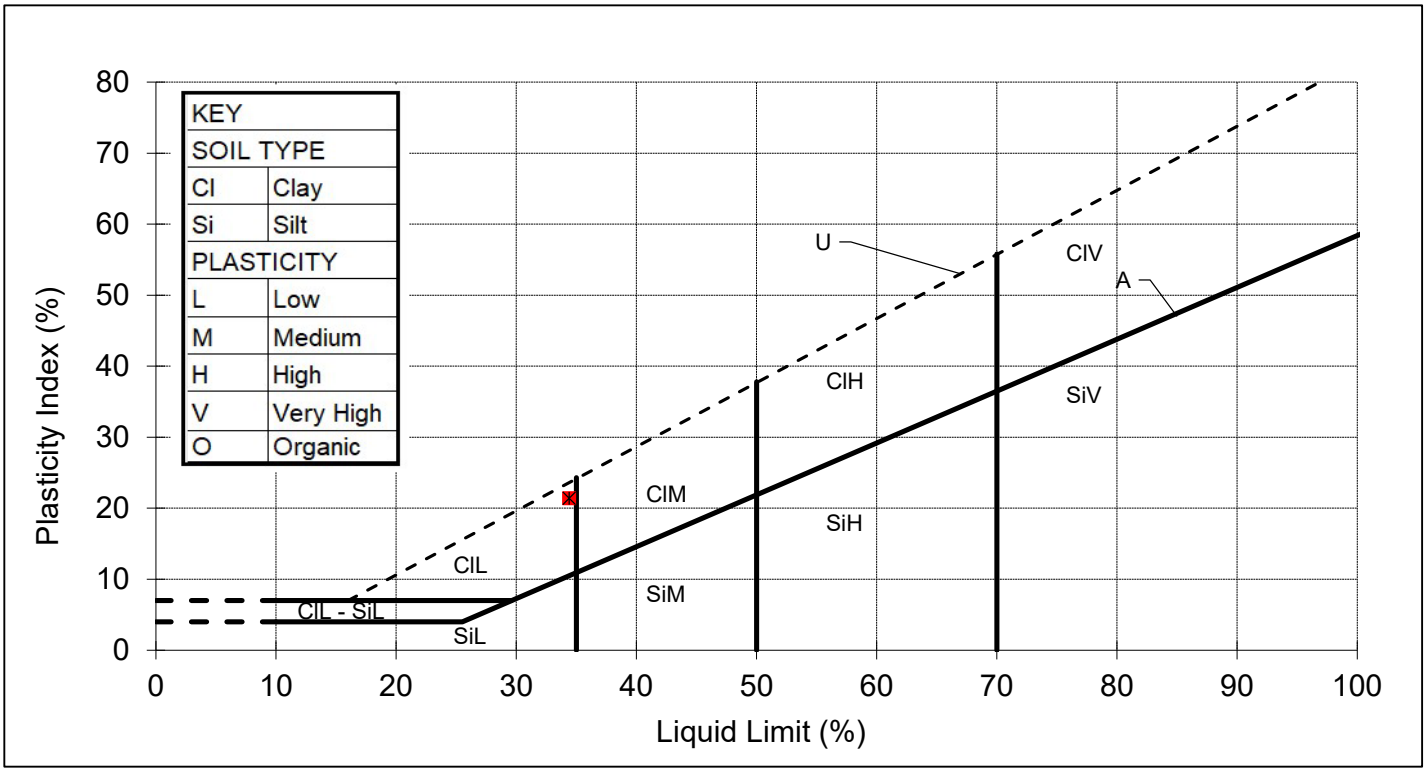
CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	CP301 4.0-4.45m	DATE SAMPLED	01-Apr-26
SAMPLE No.	6073201	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
PRE TREATMENT	As received	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	19.5	34.2	1.008	
Determination 2 (avg)	19.5	34.1		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
12.1	34	13	21	86



REMARKS

SIGNED [redacted]

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 22-Apr-26

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WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

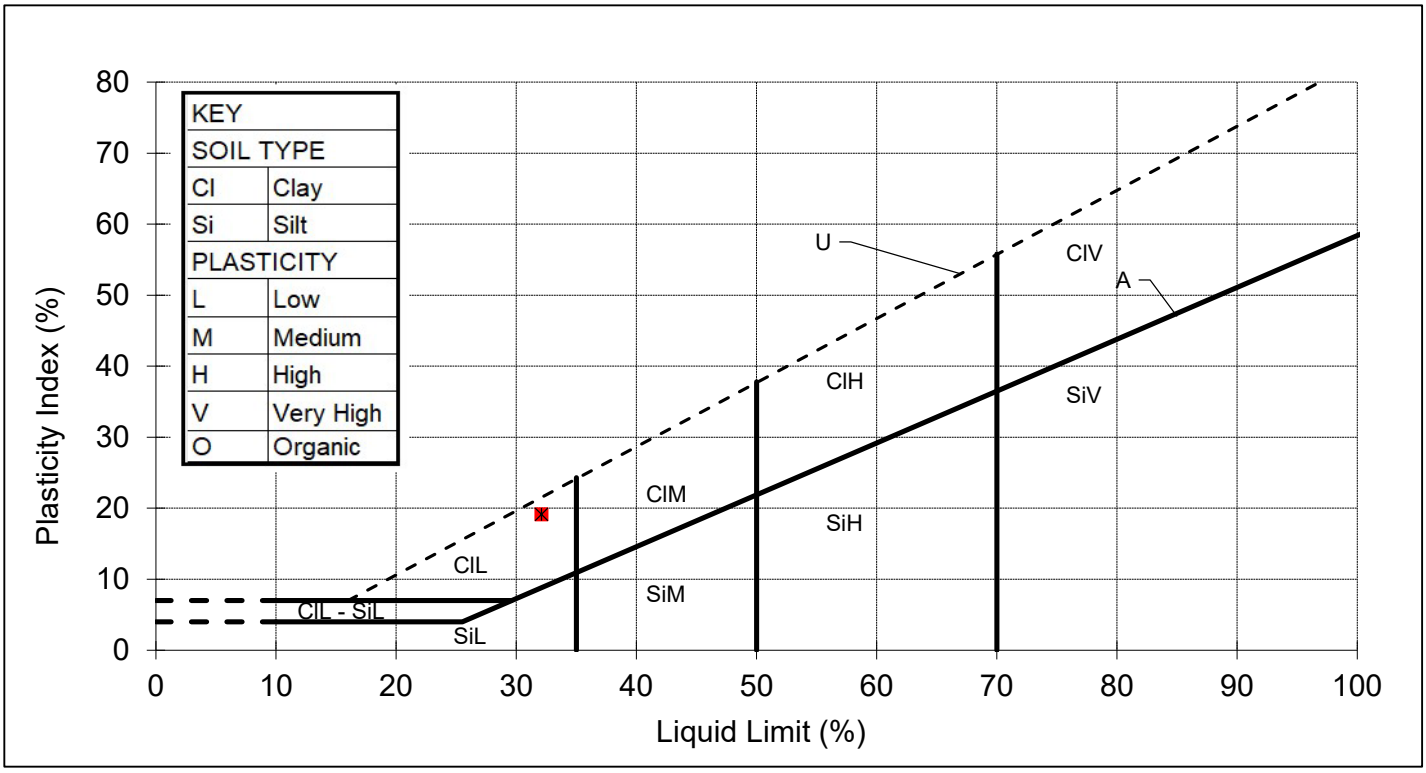
CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	CP301 9.0-9.45m	DATE SAMPLED	01-Apr-26
SAMPLE No.	6073202	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
PRE TREATMENT	As received	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	20.0	32.2	1.000	
Determination 2 (avg)	20.0	32.0		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
12.2	32	13	19	91



REMARKS

SIGNED [redacted]

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 22-Apr-26

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WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

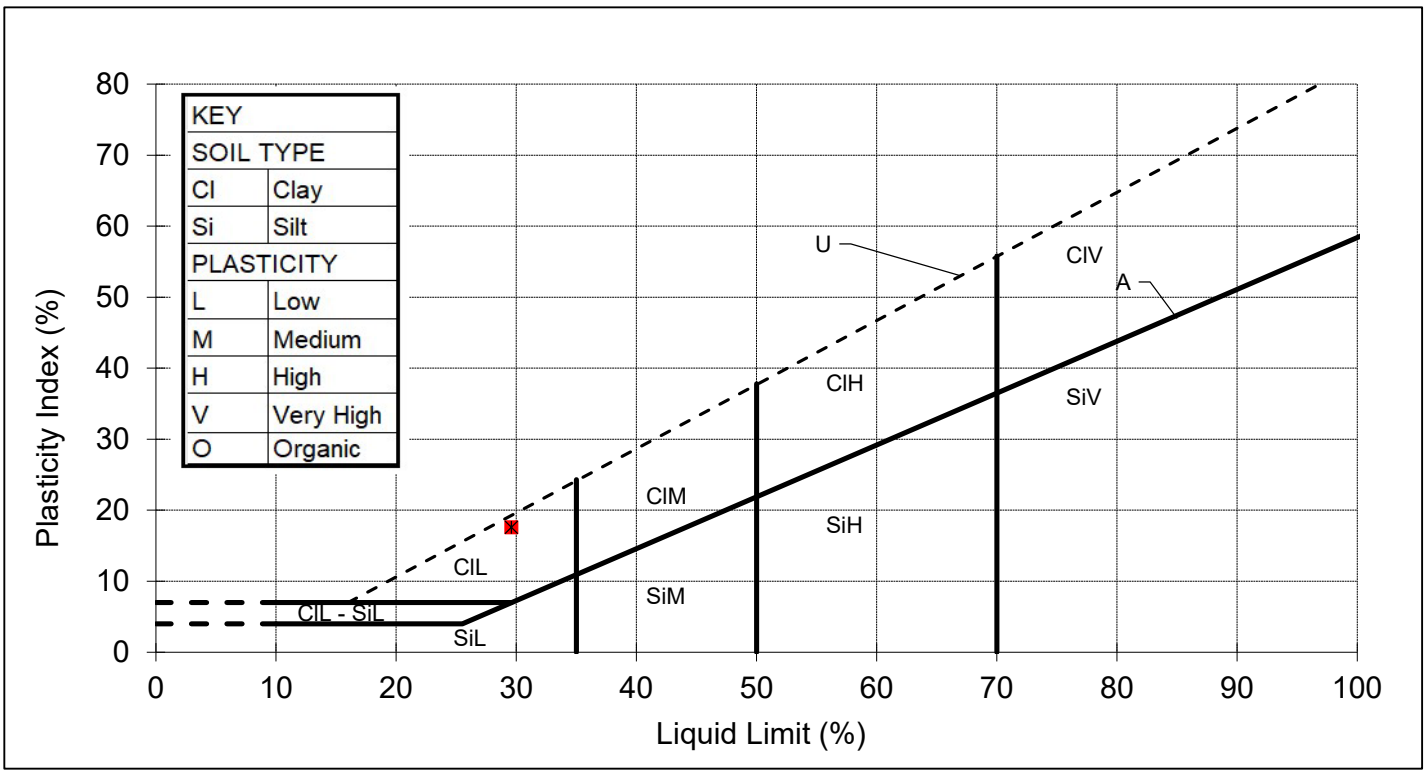
CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	CP301 12.0-12.45m	DATE SAMPLED	01-Apr-26
SAMPLE No.	6073203	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
PRE TREATMENT	As received	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	20.1	29.6	1.002	
Determination 2 (avg)	19.7	29.5		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
10.3	30	12	18	82



REMARKS

SIGNED [redacted]

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 22-Apr-26

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TEL 0161 475 0870

UKAS TESTING 1580

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PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

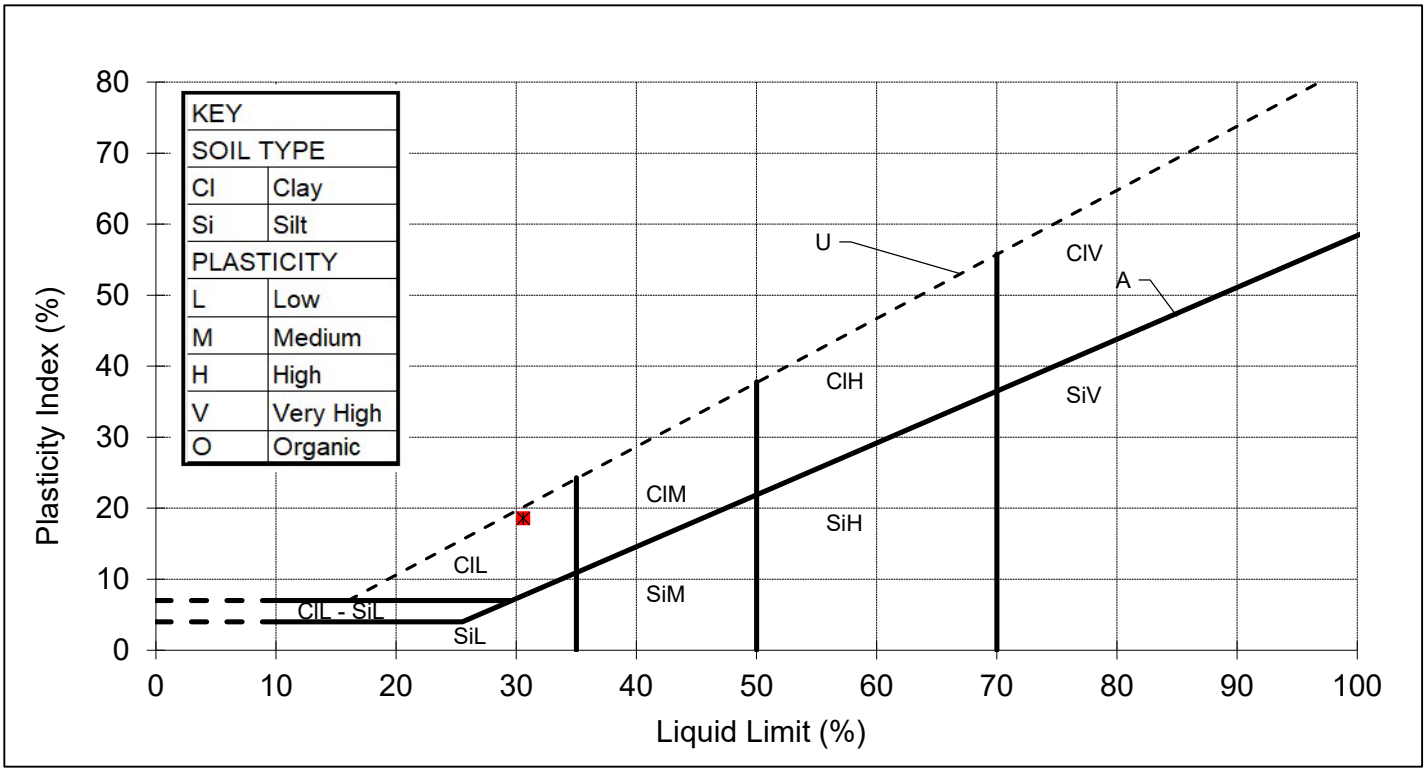
CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	CP302 7.0-7.45m	DATE SAMPLED	01-Apr-26
SAMPLE No.	6073204	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
PRE TREATMENT	As received	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	18.5	29.9	1.023	
Determination 2 (avg)	18.5	29.9		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
12.8	31	12	19	90



REMARKS

SIGNED [redacted]

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 22-Apr-26

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TEL 0161 475 0870

UKAS TESTING 1580

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PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

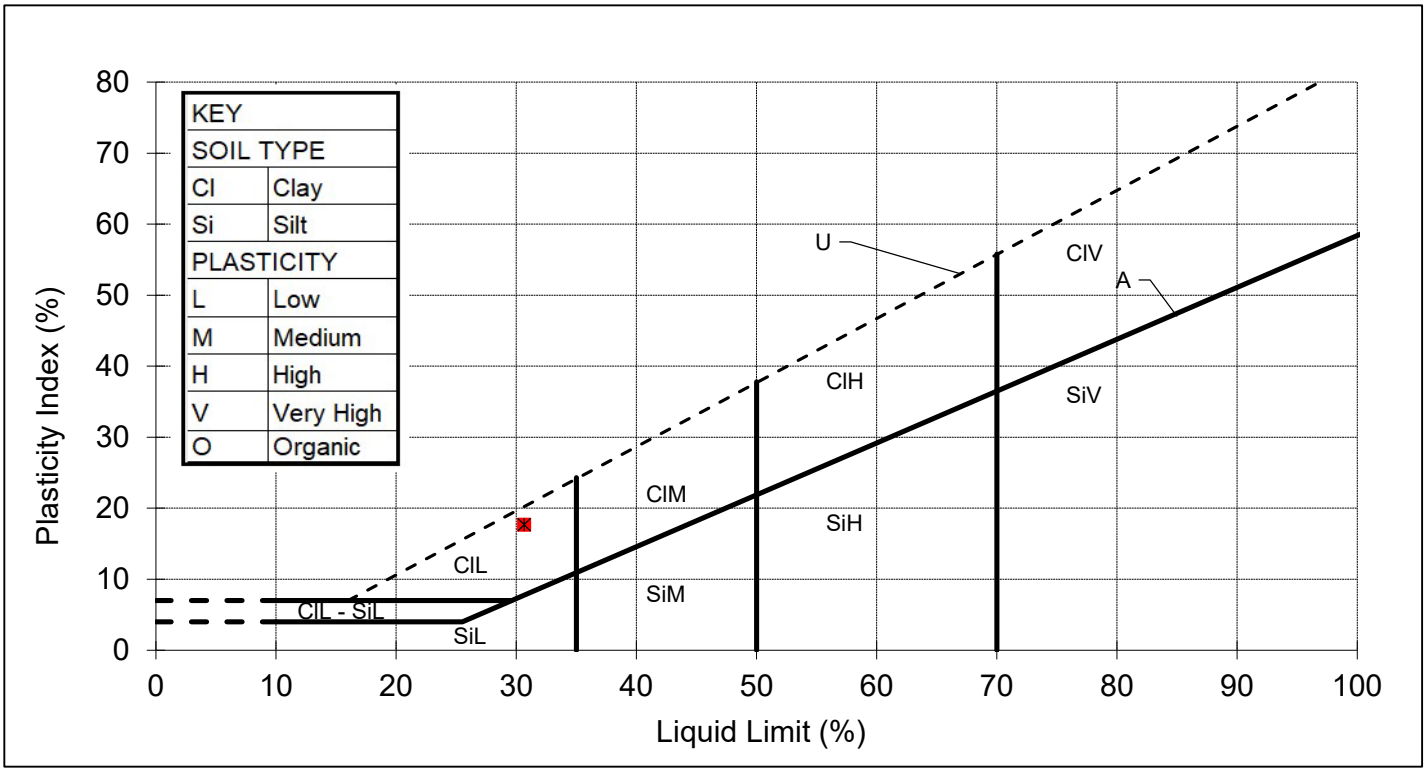
CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	CP302 13.5-13.95m	DATE SAMPLED	01-Apr-26
SAMPLE No.	6073205	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
PRE TREATMENT	As received	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	21.1	31.1	0.983	
Determination 2 (avg)	21.1	31.3		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
12.9	31	13	18	87



REMARKS

SIGNED [redacted]

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 22-Apr-26

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.3 (30° FALL CONE) 1 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

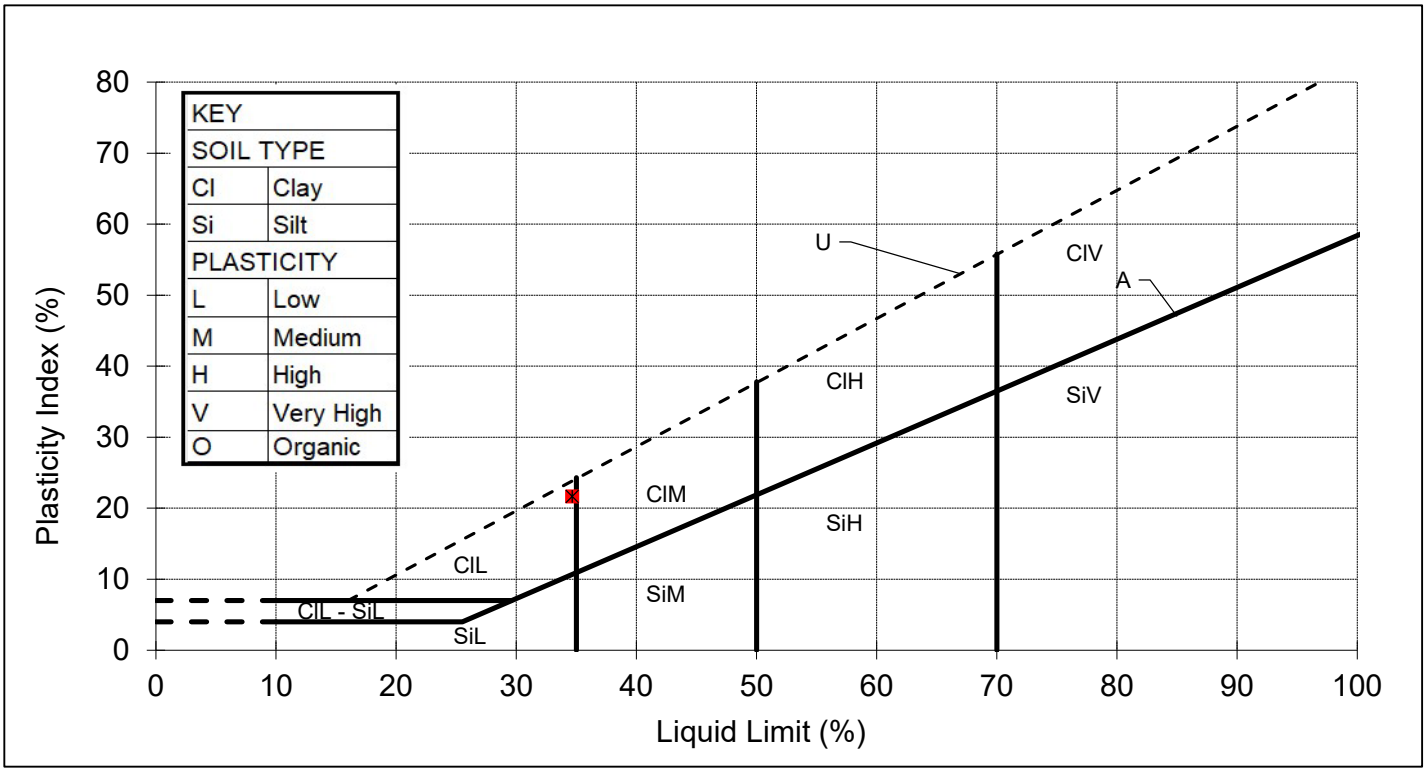
CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	TP302 2.7m	DATE SAMPLED	01-Apr-26
SAMPLE No.	6073208	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
PRE TREATMENT	As received	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	19.2	34.2	1.012	
Determination 2 (avg)	19.2	34.3		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
15.7	35	13	22	69



REMARKS

SIGNED [redacted]

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 22-Apr-26

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.3 (30° FALL CONE) 1 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

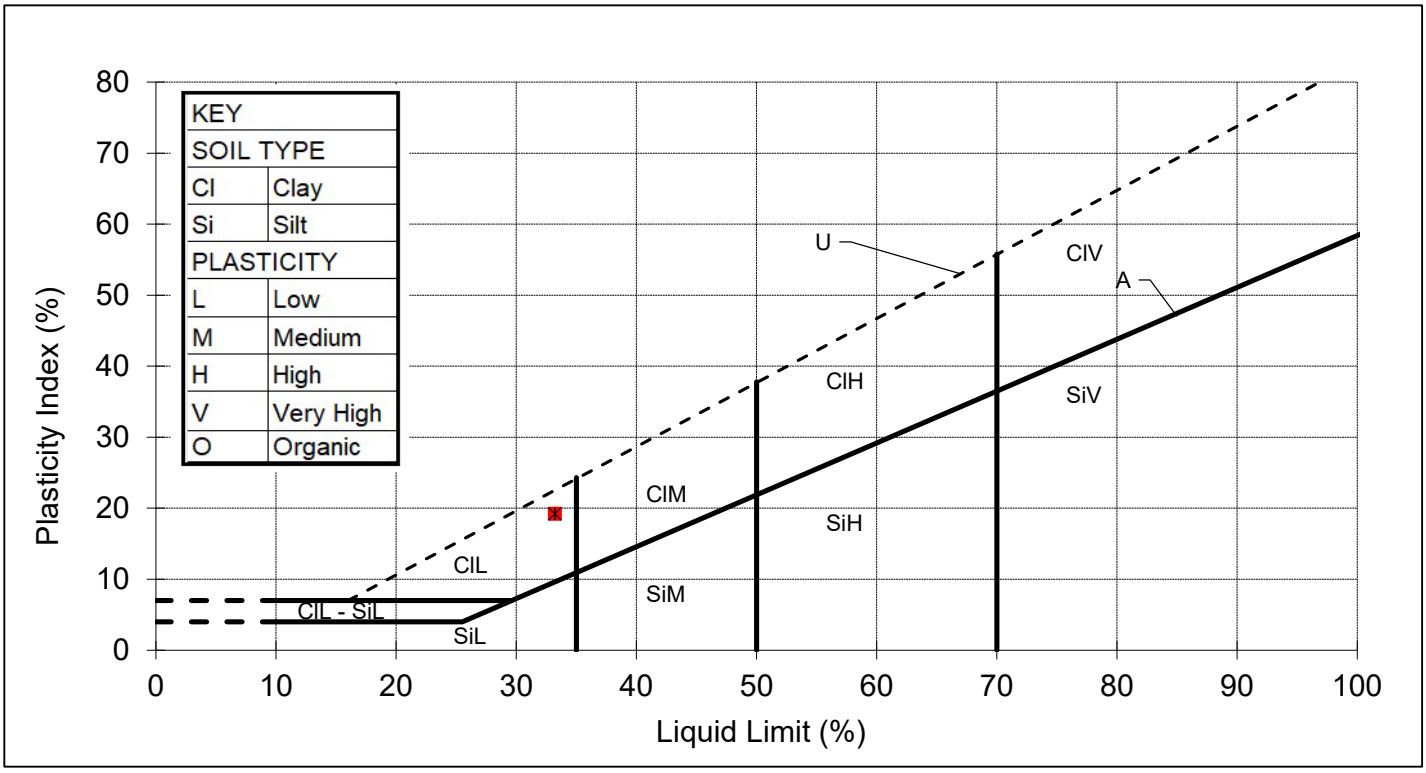
CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	TP303 4.5m	DATE SAMPLED	01-Apr-26
SAMPLE No.	6073209	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
PRE TREATMENT	As received	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	19.9	33.2	1.002	
Determination 2 (avg)	19.9	33.1		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
16.7	33	14	19	74



REMARKS

SIGNED [redacted]

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 22-Apr-26

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

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PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

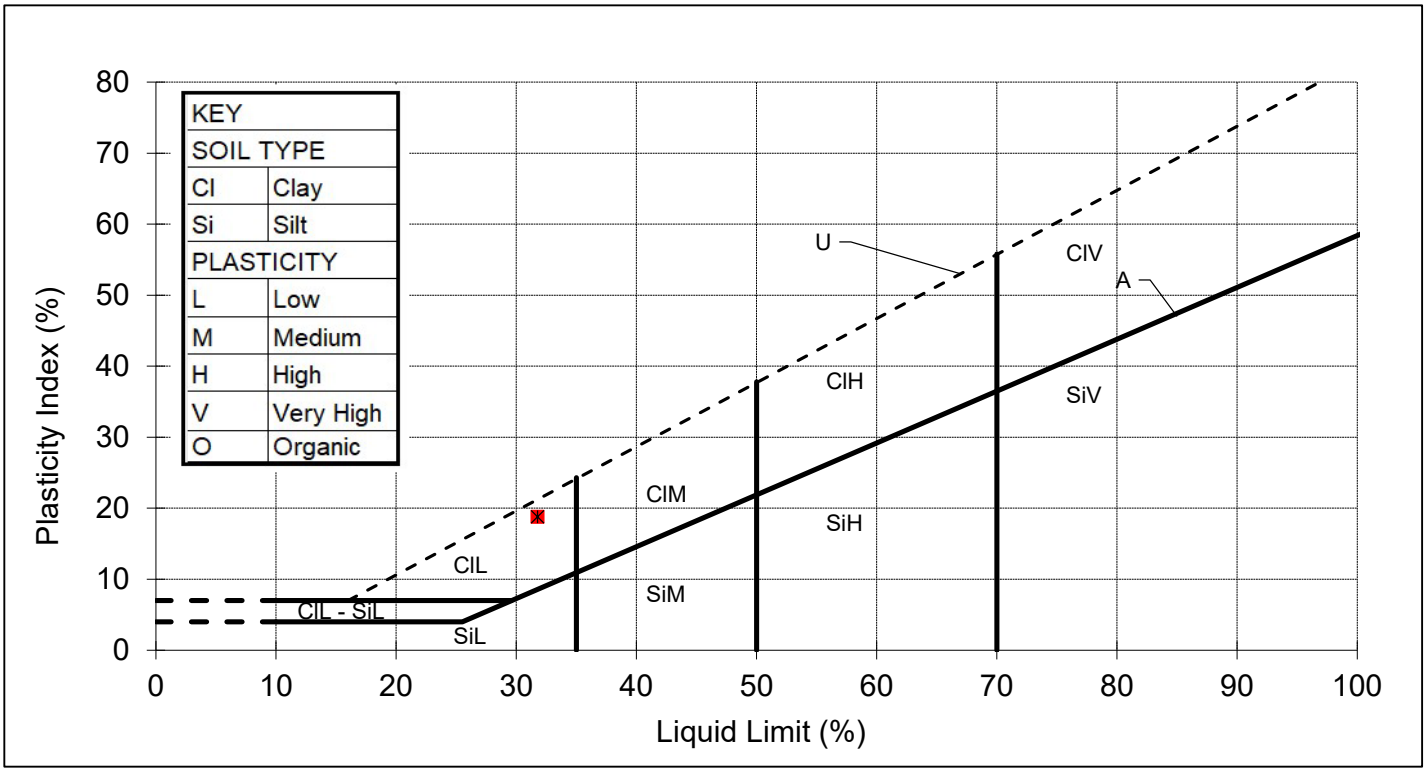
CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	TP305 2.6m	DATE SAMPLED	01-Apr-26
SAMPLE No.	6073211	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
PRE TREATMENT	As received	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	20.8	32.2	0.988	
Determination 2 (avg)	20.7	32.1		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
19.5	32	13	19	81



REMARKS

SIGNED [redacted]

NAME O.P. Davies BA (Hons)
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DATE 22-Apr-26

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TEST CERTIFICATE

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PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

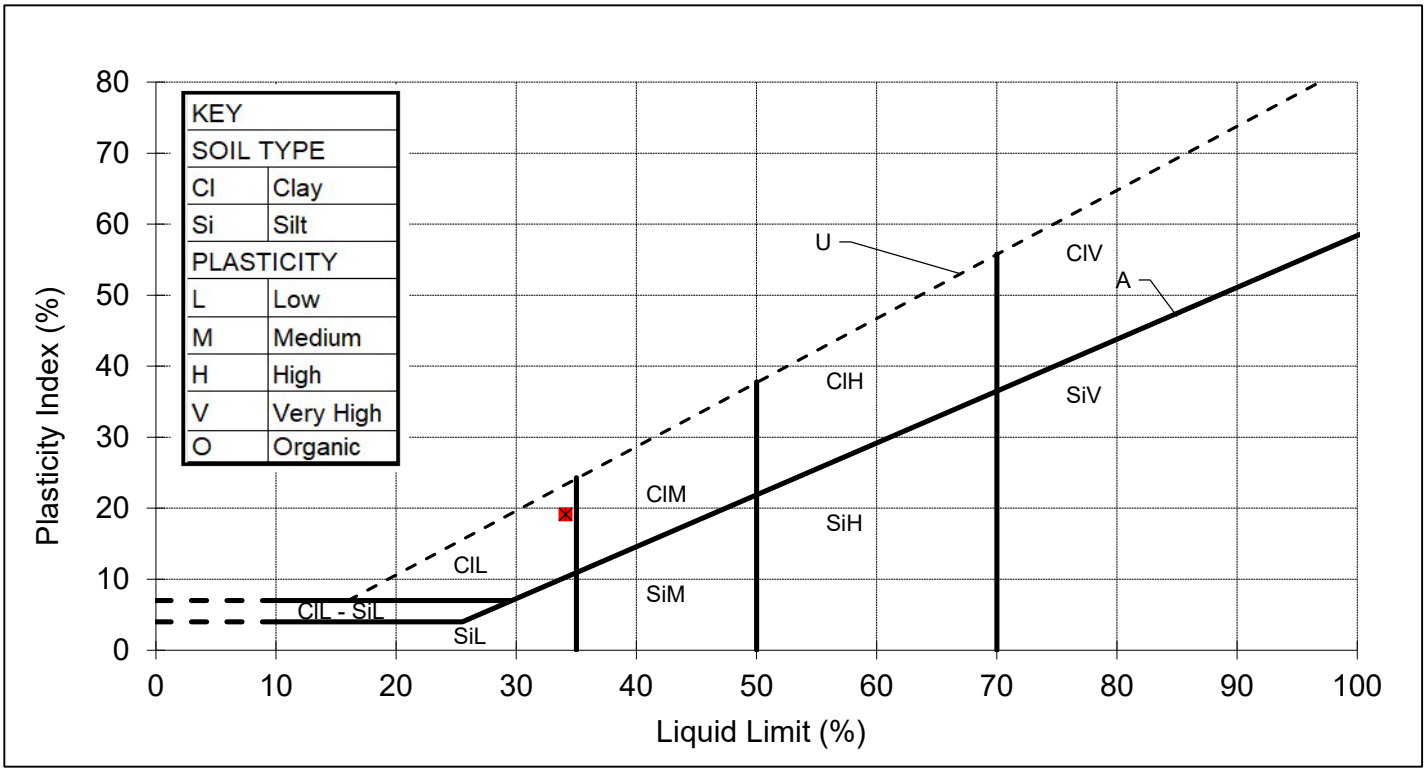
CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	TP309 4.2m	DATE SAMPLED	01-Apr-26
SAMPLE No.	6073213	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
PRE TREATMENT	As received	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	22.1	35.1	0.972	
Determination 2 (avg)	21.8	35.1		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
21.3	34	15	19	79



REMARKS

SIGNED [redacted]

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 22-Apr-26

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.3 (30° FALL CONE) 1 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

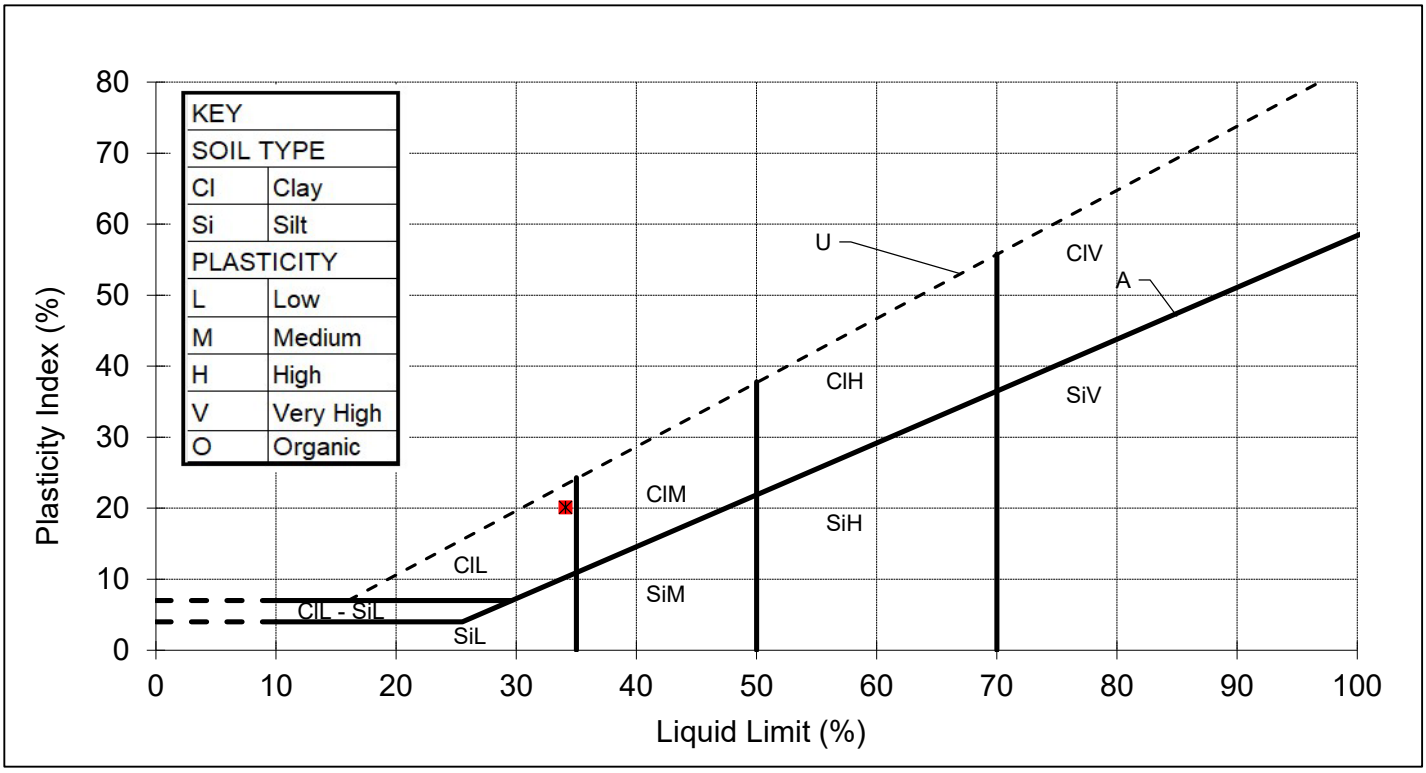
CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	TP310 2.4m	DATE SAMPLED	01-Apr-26
SAMPLE No.	6073214	DATE RECEIVED	08-Apr-26
DATE TESTED	14-Apr-26	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
PRE TREATMENT	As received	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	17.2	32.8	1.038	
Determination 2 (avg)	17.5	32.9		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
23.5	34	14	20	88



REMARKS

SIGNED [redacted]

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 22-Apr-26

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DUKINFIELD, CHESHIRE SK16 4QX
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UKAS TESTING 1580

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

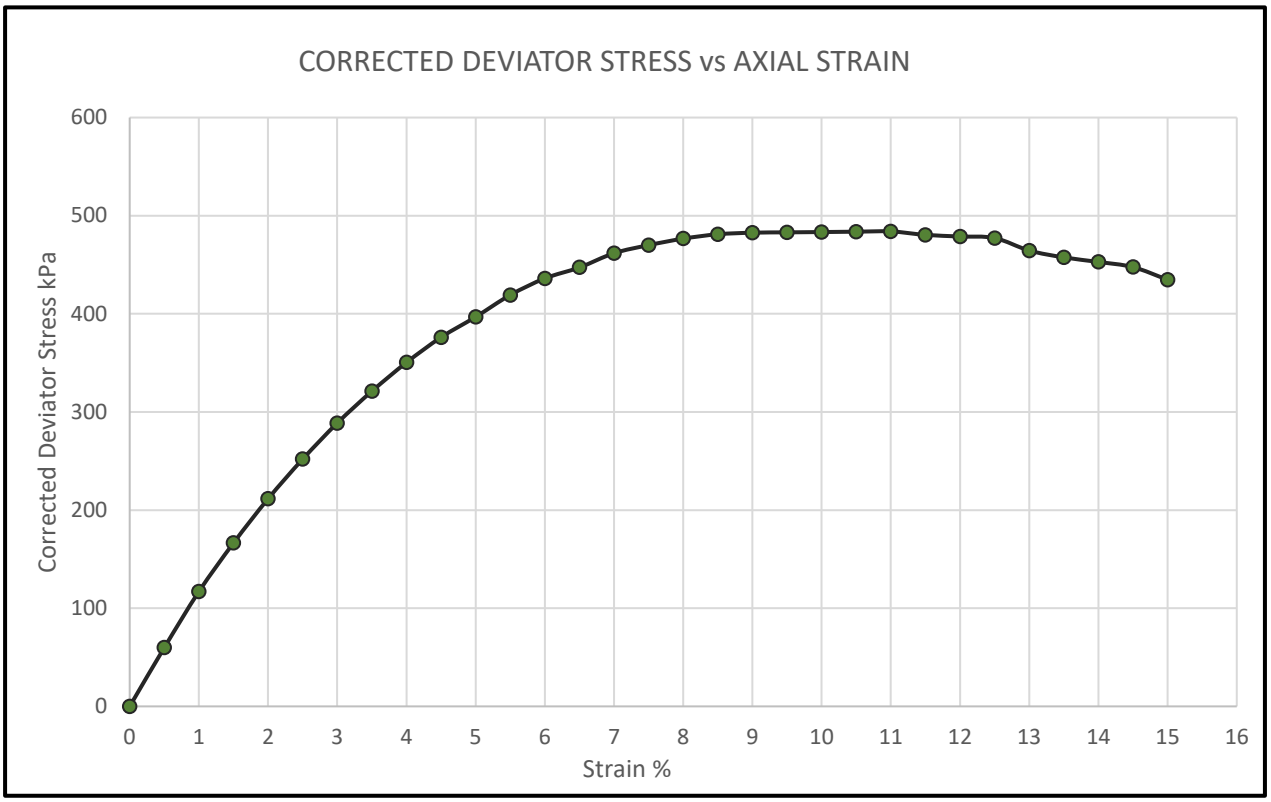
BS EN ISO 17892-8:2018

CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	CP301 4.0-4.45m	**DATE SAMPLED**	01-Apr-26
LAB SAMPLE No.	6073201	**DATE RECEIVED**	08-Apr-26
DATE TESTED	14-Apr-26	**SAMPLED BY**	Client
MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample		

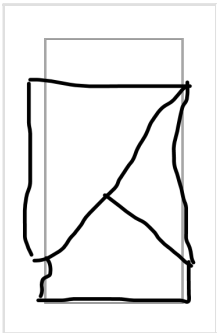
INITIAL CONDITIONS

Specimen Location	Sample Length (mm)	450	Specimen depth from top of Sample (mm)	55
	Sample Orientation	Vertical	Specimen Condition	Undisturbed
	Specimen Length (mm)	203	Specimen Water Content (%)	12.1
	Specimen Diameter (mm)	102	Specimen Bulk Density (Mg/m3)	2.26
	Membrane Thickness (mm)	0.4	Specimen Dry Density (Mg/m3)	2.02
	Membrane Correction	3.40		



TEST TYPE
SINGLE STAGE

SKETCH OF SPECIMEN AT FAILURE



COMPLEX_SHEAR

Cell Pressure (kPa)	Failure Strain (%)	Rate of Strain (%/min)	Corrected Deviator Stress (kPa)	Shear Strength Cu (kPa)
80	11.0	2.0	484	242

Remarks/Abnormalities

Name O.P. Davies BA (Hons)
(Director / Head of Laboratory)

Signed [redacted]

Date 22 April 2026

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

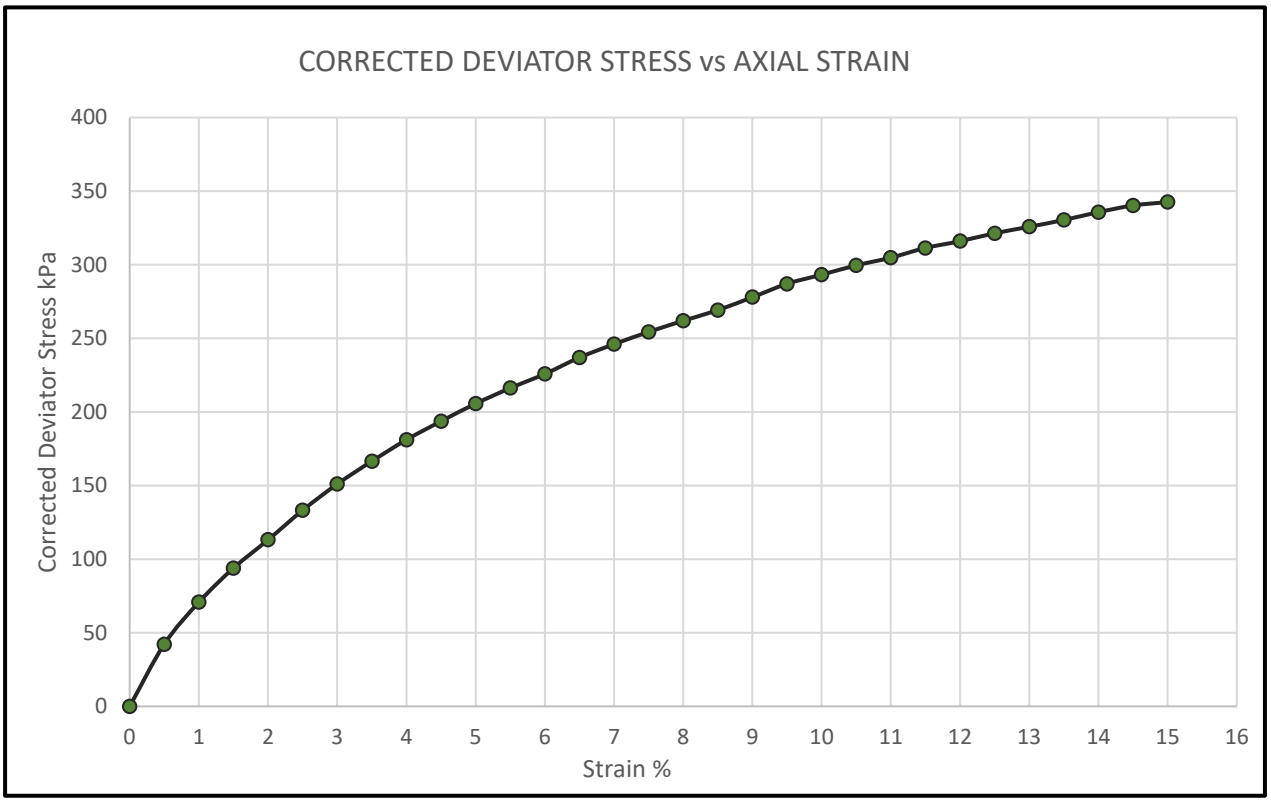
BS EN ISO 17892-8:2018

CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	CP301 9.0-9.45m	**DATE SAMPLED**	01-Apr-26
LAB SAMPLE No.	6073202	**DATE RECEIVED**	08-Apr-26
DATE TESTED	14-Apr-26	**SAMPLED BY**	Client
MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample		

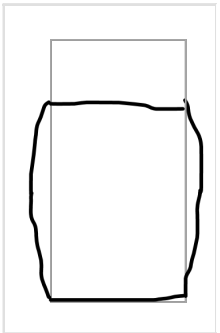
INITIAL CONDITIONS

Specimen Location	Sample Length (mm)	450	Specimen depth from top of Sample (mm)	61
	Sample Orientation	Vertical	Specimen Condition	Undisturbed
	Specimen Length (mm)	203	Specimen Water Content (%)	12.2
	Specimen Diameter (mm)	103	Specimen Bulk Density (Mg/m3)	2.25
	Membrane Thickness (mm)	0.4	Specimen Dry Density (Mg/m3)	2.01
	Membrane Correction	3.40		



TEST TYPE
SINGLE STAGE

SKETCH OF SPECIMEN AT FAILURE



PLASTIC

Cell Pressure (kPa)	Failure Strain (%)	Rate of Strain (%/min)	Corrected Deviator Stress (kPa)	Shear Strength Cu (kPa)
180	15.0	2.0	343	171

Remarks/Abnormalities

Name O.P. Davies BA (Hons)
(Director / Head of Laboratory)

Signed [redacted]

Date 22 April 2026

MURRAY RIX

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

BS EN ISO 17892-8:2018

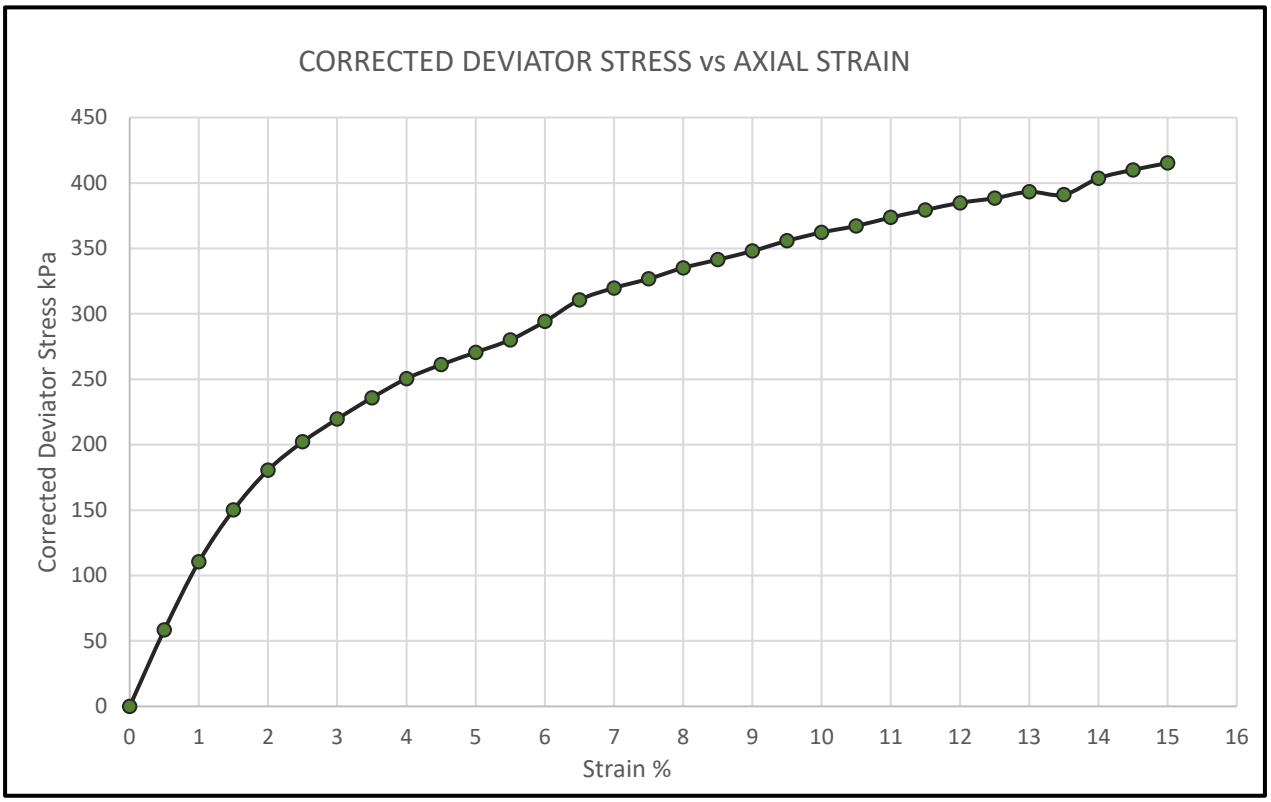
CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	CP301 12.0-12.45m	**DATE SAMPLED**	01-Apr-26
LAB SAMPLE No.	6073203	**DATE RECEIVED**	08-Apr-26
DATE TESTED	14-Apr-26	**SAMPLED BY**	Client
MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample		

INITIAL CONDITIONS

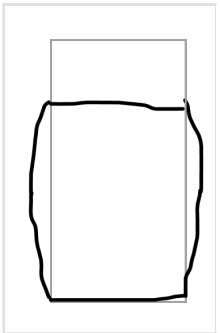
Specimen Location 

Sample Length (mm)	450	Specimen depth from top of Sample (mm)	34
Sample Orientation	Vertical	Specimen Condition	Undisturbed
Specimen Length (mm)	202	Specimen Water Content (%)	10.3
Specimen Diameter (mm)	102	Specimen Bulk Density (Mg/m3)	2.24
Membrane Thickness (mm)	0.4	Specimen Dry Density (Mg/m3)	2.03
Membrane Correction	3.40		



TEST TYPE
SINGLE STAGE

SKETCH OF SPECIMEN AT FAILURE



PLASTIC

Cell Pressure (kPa)	Failure Strain (%)	Rate of Strain (%/min)	Corrected Deviator Stress (kPa)	Shear Strength Cu (kPa)
240	15.0	2.0	415	208

Remarks/Abnormalities

Name O.P. Davies BA (Hons)
(Director / Head of Laboratory)

Signed [redacted]

Date 22 April 2026

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

BS EN ISO 17892-8:2018

CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

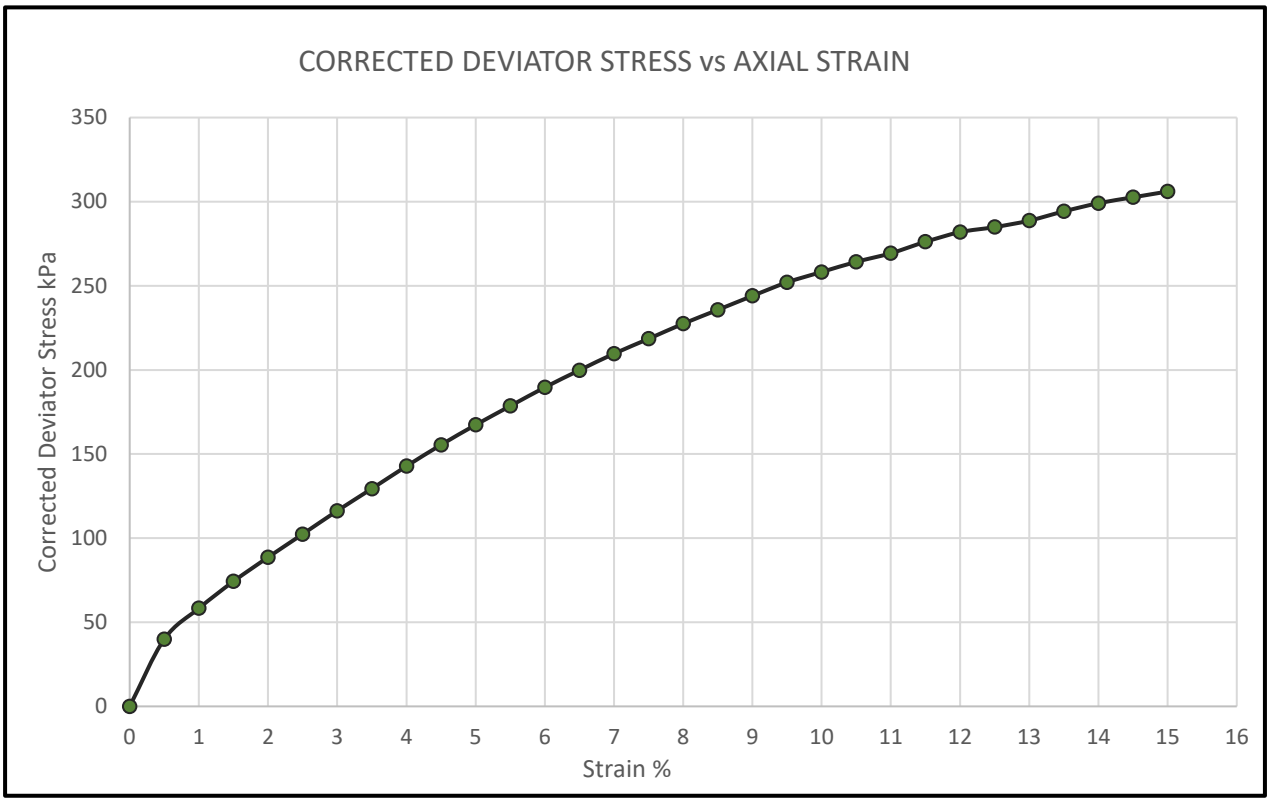
SAMPLE LABEL	CP302 7.0-7.45m	**DATE SAMPLED**	01-Apr-26
LAB SAMPLE No.	6073204	**DATE RECEIVED**	08-Apr-26
DATE TESTED	14-Apr-26	**SAMPLED BY**	Client
MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample		

INITIAL CONDITIONS

Specimen Location

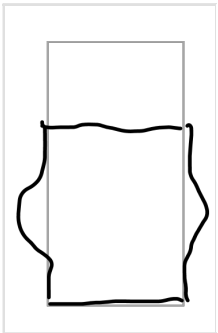


Sample Length (mm)	450	Specimen depth from top of Sample (mm)	96
Sample Orientation	Vertical	Specimen Condition	Undisturbed
Specimen Length (mm)	202	Specimen Water Content (%)	12.8
Specimen Diameter (mm)	102	Specimen Bulk Density (Mg/m3)	2.21
Membrane Thickness (mm)	0.4	Specimen Dry Density (Mg/m3)	1.96
Membrane Correction	3.40		



TEST TYPE
SINGLE STAGE

SKETCH OF SPECIMEN AT FAILURE



BULGING

Cell Pressure (kPa)	Failure Strain (%)	Rate of Strain (%/min)	Corrected Deviator Stress (kPa)	Shear Strength Cu (kPa)
140	15.0	2.0	306	153

Remarks/Abnormalities

Name O.P. Davies BA (Hons)
(Director / Head of Laboratory)

Signed [redacted]

Date 22 April 2026

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

BS EN ISO 17892-8:2018

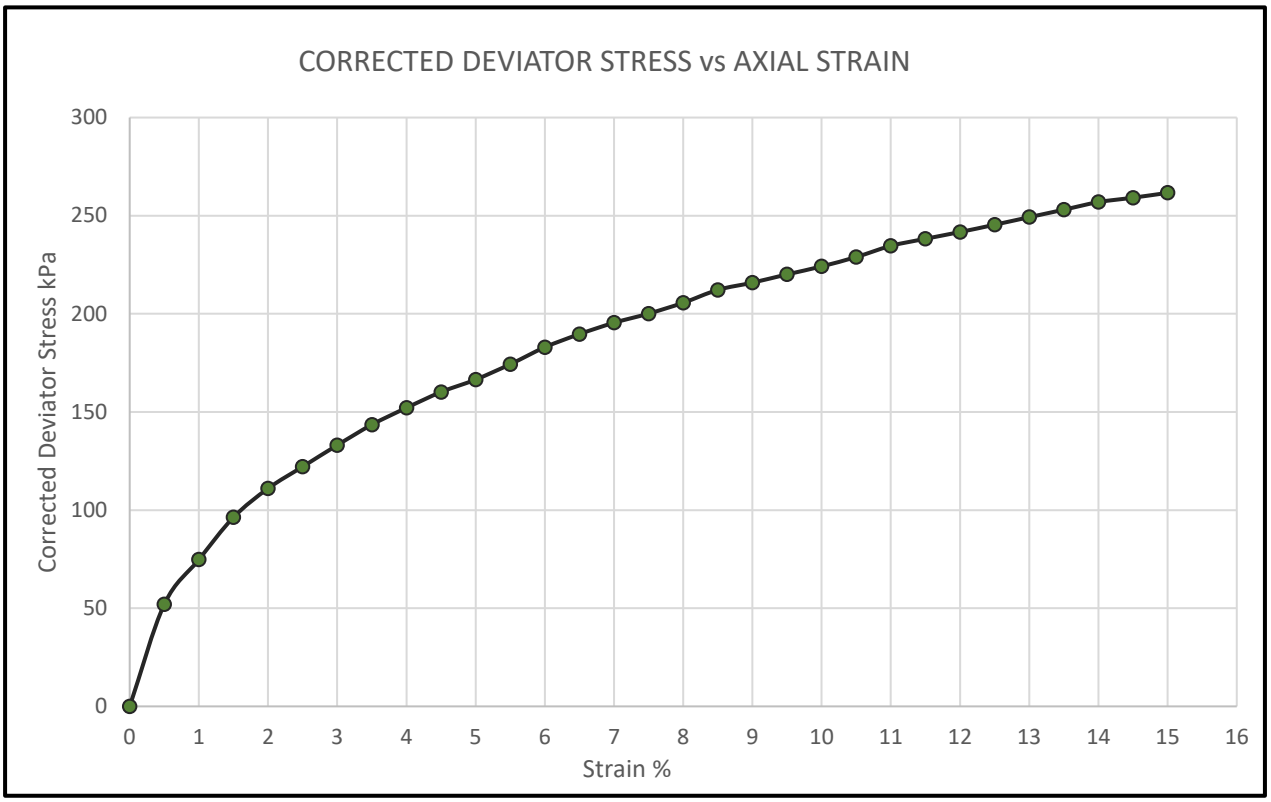
CLIENT	IGE Consulting Ltd
SITE	MCFC
JOB NUMBER	MRN 26041/26

SAMPLE LABEL	CP302 13.5-13.95m	**DATE SAMPLED**	01-Apr-26
LAB SAMPLE No.	6073205	**DATE RECEIVED**	08-Apr-26
DATE TESTED	14-Apr-26	**SAMPLED BY**	Client
MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample		

INITIAL CONDITIONS

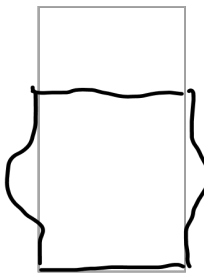
Specimen Location

Sample Length (mm)	450	Specimen depth from top of Sample (mm)	62
Sample Orientation	Vertical	Specimen Condition	Undisturbed
Specimen Length (mm)	203	Specimen Water Content (%)	12.9
Specimen Diameter (mm)	102	Specimen Bulk Density (Mg/m3)	2.17
Membrane Thickness (mm)	0.4	Specimen Dry Density (Mg/m3)	1.92
Membrane Correction	3.40		



TEST TYPE
SINGLE STAGE

SKETCH OF SPECIMEN AT FAILURE



BULGING

Cell Pressure (kPa)	Failure Strain (%)	Rate of Strain (%/min)	Corrected Deviator Stress (kPa)	Shear Strength Cu (kPa)
270	15.0	2.0	262	131

Remarks/Abnormalities

Name O.P. Davies BA (Hons)
(Director / Head of Laboratory)

Signed [redacted]

Date 22 April 2026

APPENDIX 8

CHEMICAL LABORATORY TEST RESULTS

IGE Consulting
Office 11
Bartle House
Oxford Court
Manchester
M2 3WQ

t: [redacted]

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

t: 01923 225404
f: 01923 237404
e: info-i2analytical@normecgroup.com

Analytical Report Number : 26-017499

Project / Site name:	MCFC Entertainment	**Samples received on:**	02/04/2026
Your job number:	4490	**Samples instructed on/ Analysis started on:**	07/04/2026
Your order number:		**Analysis completed by:**	15/04/2026
Report Issue Number:	1	**Report issued on:**	15/04/2026
Samples Analysed:	12 soil samples		

[redacted]

Signed:

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

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

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

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

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting
air	- once the analysis is complete

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

Retention period for records and reports is minimum 6 years from the date of issue of the final report.
Some records may be kept for longer according to other legal/best practice requirements.

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.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 26-017499
Project / Site name: MCFC Entertainment

Lab Sample Number				879892	879893	879894	879895	879896
Sample Reference				TP303	TP303	TP309	TP304	TP301
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				1.20	4.50	2.90	2.70	0.30
Date Sampled				02/04/2026	02/04/2026	02/04/2026	02/04/2026	02/04/2026
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
Mass of stone >10mm	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	38.7
Moisture Content	%	0.01	NONE	14	13	21	12	7.3
Total mass of sample received	kg	0.1	NONE	0.6	0.4	0.8	0.6	0.8
Whole Sample Crushed	N/A	N/A	NONE	-	-	-	-	-

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Detected	-	Detected	Detected	Detected
Asbestos Analyst ID	N/A	N/A	N/A	KMC	-	KMC	KMC	KMC
Analysis completed	N/A	N/A	N/A	15/04/2026	-	15/04/2026	15/04/2026	15/04/2026
Actinolite detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	Not-detected	Not-detected
Amosite detected	Type	N/A	ISO 17025	Detected	-	Detected	Detected	Detected
Anthophyllite detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	Not-detected	Not-detected
Chrysotile detected	Type	N/A	ISO 17025	Detected	-	Detected	Detected	Detected
Crocidolite detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	Not-detected	Not-detected
Tremolite detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	Not-detected	Not-detected
Asbestos % by hand picking/weighing	%	0.001	ISO 17025	< 0.001	-	0.002	0.006	0.001
Asbestos Containing Material Types Detected (ACM)	Type	N/A	ISO 17025	Loose Fibres	-	Loose Fibres, Loose Fibrous Debris	Sheeting/Board Debris, Loose Fibres	Loose Fibres, Loose Fibrous Debris

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	9.6	7.7	9.5	9.5	11.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	1.7	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO_4	%	0.005	MCERTS	0.232	0.022	-	0.283	-
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1100	59	840	1200	480
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	540	29.6	419	585	239
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	24	13	-	53	-
Total Sulphur	mg/kg	50	MCERTS	1100	1900	-	1700	-
Total Sulphur	%	0.005	MCERTS	0.106	0.186	-	0.174	-
Ammoniacal Nitrogen as NH_4^+	mg/kg	0.5	MCERTS	8.3	1.8	-	11	-
Ammonium as NH_4^+ (10:1 leachate equivalent)	mg/l	0.05	MCERTS	0.55	0.12	-	0.73	-
Organic Matter (automated)	%	0.1	MCERTS	3.3	1.3	2.8	3.5	2.9
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.9	0.8	1.6	2	1.7
Nitrate as NO_3 (Water Soluble) (2:1)	mg/kg	0.9	NONE	< 0.90	< 0.90	-	< 0.90	-
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	0.9	N/A	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90

Analytical Report Number: 26-017499
Project / Site name: MCFC Entertainment

Lab Sample Number				879892	879893	879894	879895	879896
Sample Reference				TP303	TP303	TP309	TP304	TP301
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				1.20	4.50	2.90	2.70	0.30
Date Sampled				02/04/2026	02/04/2026	02/04/2026	02/04/2026	02/04/2026
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	1.6	< 0.05	4.5	2.6	1.4
Acenaphthylene	mg/kg	0.05	MCERTS	0.12	< 0.05	0.54	0.25	0.22
Acenaphthene	mg/kg	0.05	MCERTS	1.3	< 0.05	4	1.5	0.7
Fluorene	mg/kg	0.05	MCERTS	1.1	< 0.05	2.8	1.2	0.41
Phenanthrene	mg/kg	0.05	MCERTS	7.1	0.14	12	7.6	6.3
Anthracene	mg/kg	0.05	MCERTS	1.8	< 0.05	3.3	1.8	1.4
Fluoranthene	mg/kg	0.05	MCERTS	9.5	0.1	11	8.9	7.8
Pyrene	mg/kg	0.05	MCERTS	8.9	0.09	12	8.7	7.7
Benzo(a)anthracene	mg/kg	0.05	MCERTS	4.5	0.07	6.3	4.5	3.8
Chrysene	mg/kg	0.05	MCERTS	4.5	0.07	5.6	4.1	3.8
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	5.4	0.09	5.5	4.9	4.4
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	2.1	< 0.05	2.2	2	1.7
Benzo(a)pyrene	mg/kg	0.05	MCERTS	4.7	< 0.05	5.7	4.4	4
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	2.2	< 0.05	2.2	2	1.8
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.44	< 0.05	0.5	0.42	0.36
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2.5	< 0.05	2.5	2.4	2.1
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	57.7	< 0.80 ##	80.8	57.2	47.8
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	20	8.9	24	22	12
Barium (aqua regia extractable)	mg/kg	1	MCERTS	210	150	240	720	200
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.3	1.1	1.4	1.2	0.88
Boron (water soluble)	mg/kg	0.2	MCERTS	3.2	0.8	3.9	3.6	4.1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.8	< 0.2	0.8	0.9	0.7
Chromium (hexavalent) Low Level	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	35	27	68	67	38
Copper (aqua regia extractable)	mg/kg	1	MCERTS	69	26	110	94	63
Lead (aqua regia extractable)	mg/kg	1	MCERTS	160	12	190	180	93
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	36	33	34	33	29
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	1.4	1.2	1.3
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	44	29	42	46	31
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	350	63	290	360	220
Magnesium (leachate equivalent)	mg/l	2.5	NONE	3.4	6.2	-	3.1	-
Magnesium (water soluble)	mg/kg	5	NONE	6.8	12	-	6.2	-

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Analytical Report Number: 26-017499
Project / Site name: MCFC Entertainment

Lab Sample Number				879892	879893	879894	879895	879896
Sample Reference				TP303	TP303	TP309	TP304	TP301
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				1.20	4.50	2.90	2.70	0.30
Date Sampled				02/04/2026	02/04/2026	02/04/2026	02/04/2026	02/04/2026
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
Petroleum Hydrocarbons								
TPHCWG - Aliphatic >EC5 - EC6 $_{HS_1D_AL}$	mg/kg	0.01	MCERTS	< 0.010	-	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC6 - EC8 $_{HS_1D_AL}$	mg/kg	0.01	MCERTS	< 0.010	-	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC8 - EC10 $_{HS_1D_AL}$	mg/kg	0.01	MCERTS	< 0.010	-	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC10 - EC12 $_{EH_CU_1D_AL}$	mg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 $_{EH_CU_1D_AL}$	mg/kg	2	MCERTS	6	-	5.9	5.5	13
TPHCWG - Aliphatic >EC16 - EC21 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	19	-	20	19	46
TPHCWG - Aliphatic >EC21 - EC35 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	110	-	130	120	280
TPHCWG - Aliphatic >EC35 - EC44 $_{EH_CU_1D_AL}$	mg/kg	8.4	NONE	60	-	46	66	110
TPHCWG - Aliphatic >EC5 - EC35 $_{EH_CU+HS_1D_AL}$	mg/kg	10	NONE	140	-	160	150	340
TPHCWG - Aliphatic >EC5 - EC44 $_{EH_CU+HS_1D_AL}$	mg/kg	10	NONE	200	-	200	210	450
TPHCWG - Aromatic >EC5 - EC7 $_{HS_1D_AR}$	mg/kg	0.01	MCERTS	< 0.010	-	0.016	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 $_{HS_1D_AR}$	mg/kg	0.01	MCERTS	< 0.010	-	0.012	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 $_{HS_1D_AR}$	mg/kg	0.02	MCERTS	< 0.020	-	0.044	< 0.020	< 0.020
TPHCWG - Aromatic >EC10 - EC12 $_{EH_CU_1D_AR}$	mg/kg	1	MCERTS	1	-	1.1	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 $_{EH_CU_1D_AR}$	mg/kg	2	MCERTS	12	-	18	5.1	7.7
TPHCWG - Aromatic >EC16 - EC21 $_{EH_CU_1D_AR}$	mg/kg	10	MCERTS	51	-	59	31	48
TPHCWG - Aromatic >EC21 - EC35 $_{EH_CU_1D_AR}$	mg/kg	10	MCERTS	120	-	150	140	220
TPHCWG - Aromatic >EC35 - EC44 $_{EH_CU_1D_AR}$	mg/kg	8.4	NONE	55	-	58	72	110
TPHCWG - Aromatic >EC5 - EC35 $_{EH_CU+HS_1D_AR}$	mg/kg	10	NONE	180	-	220	180	270
TPHCWG - Aromatic >EC5 - EC44 $_{EH_CU+HS_1D_AR}$	mg/kg	10	NONE	240	-	280	250	380
TPH Total >EC6 - EC40 $_{EH_CU+HS_1D_TOTAL}$	mg/kg	10	NONE	-	< 10	-	-	-
Petroleum Range Organics (EC6 - EC10) $_{HS_1D_TOTAL}$	mg/kg	1	ISO 17025	-	< 1.0	-	-	-
TPH (EC10 - EC40) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	-	< 10	-	-	-
VOCs								
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	< 5.0	-	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	-	15	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	-	10	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	-	12	< 5.0	< 5.0
p & m-Xylene	µg/kg	8	MCERTS	< 8.0	-	12	< 8.0	< 8.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	-	8.5	< 5.0	< 5.0

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

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Analytical Report Number: 26-017499
Project / Site name: MCFC Entertainment

Lab Sample Number				879897	879898	879899	879900	879901
Sample Reference				DS302	TP309	TP302	TP302	DS307
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				1.00	4.20	0.60	2.70	1.50
Date Sampled				02/04/2026	02/04/2026	02/04/2026	02/04/2026	02/04/2026
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
Mass of stone >10mm	%	0.1	NONE	60.5	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	12	17	12	13	11
Total mass of sample received	kg	0.1	NONE	0.6	0.4	0.7	0.6	0.6
Whole Sample Crushed	N/A	N/A	NONE	Crushed	-	-	-	-
Asbestos								
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Detected	-	Detected	-	Detected
Asbestos Analyst ID	N/A	N/A	N/A	KMC	-	KMC	-	KMC
Analysis completed	N/A	N/A	N/A	15/04/2026	-	15/04/2026	-	15/04/2026
Actinolite detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
Amosite detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Detected
Anthophyllite detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
Chrysotile detected	Type	N/A	ISO 17025	Detected	-	Detected	-	Detected
Crocidolite detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
Tremolite detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
Asbestos % by hand picking/weighing	%	0.001	ISO 17025	< 0.001	-	< 0.001	-	0.003
Asbestos Containing Material Types Detected (ACM)	Type	N/A	ISO 17025	Loose Fibres	-	Loose Fibres	-	Bitumen, Loose Fibres
General Inorganics								
pH (L099)	pH Units	N/A	MCERTS	10.3	7.8	10.5	8.1	9.4
Total Cyanide	mg/kg	1	MCERTS	3.9	< 1.0	1.1	< 1.0	1.3
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO_4	%	0.005	MCERTS	-	0.025	-	0.019	0.373
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1400	110	780	86	1800
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	702	54	389	43.2	914
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	13	-	15	110
Total Sulphur	mg/kg	50	MCERTS	-	140	-	1800	5100
Total Sulphur	%	0.005	MCERTS	-	0.014	-	0.184	0.509
Ammoniacal Nitrogen as NH_4^+	mg/kg	0.5	MCERTS	-	12	-	4.3	19
Ammonium as NH_4^+ (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	0.76	-	0.29	1.29
Organic Matter (automated)	%	0.1	MCERTS	3.9	1.7	2.5	1.3	3.9
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.3	1	1.5	0.8	2.3
Nitrate as NO_3 (Water Soluble) (2:1)	mg/kg	0.9	NONE	-	< 0.90	-	< 0.90	< 0.90
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	0.9	N/A	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90

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Analytical Report Number: 26-017499
Project / Site name: MCFC Entertainment

Lab Sample Number				879897	879898	879899	879900	879901
Sample Reference				DS302	TP309	TP302	TP302	DS307
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				1.00	4.20	0.60	2.70	1.50
Date Sampled				02/04/2026	02/04/2026	02/04/2026	02/04/2026	02/04/2026
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	2	0.1	1.9	0.1	2.3
Acenaphthylene	mg/kg	0.05	MCERTS	0.32	< 0.05	0.16	< 0.05	0.28
Acenaphthene	mg/kg	0.05	MCERTS	1.8	< 0.05	1.1	0.12	1.6
Fluorene	mg/kg	0.05	MCERTS	1.8	< 0.05	0.94	0.11	1.2
Phenanthrene	mg/kg	0.05	MCERTS	11	0.2	5.9	0.68	7.3
Anthracene	mg/kg	0.05	MCERTS	2.9	< 0.05	1.5	0.24	3.3
Fluoranthene	mg/kg	0.05	MCERTS	13	0.17	7.4	1.1	8.7
Pyrene	mg/kg	0.05	MCERTS	13	0.18	7.2	1.1	9
Benzo(a)anthracene	mg/kg	0.05	MCERTS	6.6	0.12	3.7	0.56	4.3
Chrysene	mg/kg	0.05	MCERTS	6.5	0.13	3.8	0.57	4.5
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	7.6	0.13	4.4	0.5	5
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	2.7	< 0.05	1.7	0.23	2.3
Benzo(a)pyrene	mg/kg	0.05	MCERTS	6.8	0.1	3.9	0.41	4.9
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	3	0.05	1.8	0.19	2.3
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.63	< 0.05	0.34	< 0.05	0.57
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	3.4	0.06	2	0.23	2.7
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	83.3	1.24	47.5	6.15	60.3
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	16	8	15	7.6	24
Barium (aqua regia extractable)	mg/kg	1	MCERTS	180	170	180	120	250
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.2	1.4	0.97	1	1.3
Boron (water soluble)	mg/kg	0.2	MCERTS	2.7	0.4	2.9	0.3	4.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	< 0.2	0.7	< 0.2	1
Chromium (hexavalent) Low Level	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	33	29	25	74
Copper (aqua regia extractable)	mg/kg	1	MCERTS	200	31	65	26	160
Lead (aqua regia extractable)	mg/kg	1	MCERTS	110	14	130	14	210
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.4	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	27	40	23	32	60
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	37	34	40	28	41
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	190	73	270	58	390
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	6.7	-	5.6	3.6
Magnesium (water soluble)	mg/kg	5	NONE	-	13	-	11	7.2

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Analytical Report Number: 26-017499
Project / Site name: MCFC Entertainment

Lab Sample Number				879897	879898	879899	879900	879901
Sample Reference				DS302	TP309	TP302	TP302	DS307
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				1.00	4.20	0.60	2.70	1.50
Date Sampled				02/04/2026	02/04/2026	02/04/2026	02/04/2026	02/04/2026
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
Petroleum Hydrocarbons								
TPHCWG - Aliphatic >EC5 - EC6 $_{HS_1D_AL}$	mg/kg	0.01	MCERTS	< 0.010	-	< 0.010	-	< 0.010
TPHCWG - Aliphatic >EC6 - EC8 $_{HS_1D_AL}$	mg/kg	0.01	MCERTS	< 0.010	-	< 0.010	-	< 0.010
TPHCWG - Aliphatic >EC8 - EC10 $_{HS_1D_AL}$	mg/kg	0.01	MCERTS	< 0.010	-	< 0.010	-	< 0.010
TPHCWG - Aliphatic >EC10 - EC12 $_{EH_CU_1D_AL}$	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 $_{EH_CU_1D_AL}$	mg/kg	2	MCERTS	22	-	2.3	-	5.1
TPHCWG - Aliphatic >EC16 - EC21 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	43	-	12	-	28
TPHCWG - Aliphatic >EC21 - EC35 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	130	-	94	-	390
TPHCWG - Aliphatic >EC35 - EC44 $_{EH_CU_1D_AL}$	mg/kg	8.4	NONE	66	-	39	-	240
TPHCWG - Aliphatic >EC5 - EC35 $_{EH_CU+HS_1D_AL}$	mg/kg	10	NONE	200	-	110	-	420
TPHCWG - Aliphatic >EC5 - EC44 $_{EH_CU+HS_1D_AL}$	mg/kg	10	NONE	260	-	150	-	660
TPHCWG - Aromatic >EC5 - EC7 $_{HS_1D_AR}$	mg/kg	0.01	MCERTS	0.018	-	< 0.010	-	0.012
TPHCWG - Aromatic >EC7 - EC8 $_{HS_1D_AR}$	mg/kg	0.01	MCERTS	< 0.010	-	< 0.010	-	< 0.010
TPHCWG - Aromatic >EC8 - EC10 $_{HS_1D_AR}$	mg/kg	0.02	MCERTS	0.023	-	< 0.020	-	0.025
TPHCWG - Aromatic >EC10 - EC12 $_{EH_CU_1D_AR}$	mg/kg	1	MCERTS	2.4	-	< 1.0	-	< 1.0
TPHCWG - Aromatic >EC12 - EC16 $_{EH_CU_1D_AR}$	mg/kg	2	MCERTS	22	-	5.1	-	8.8
TPHCWG - Aromatic >EC16 - EC21 $_{EH_CU_1D_AR}$	mg/kg	10	MCERTS	96	-	34	-	54
TPHCWG - Aromatic >EC21 - EC35 $_{EH_CU_1D_AR}$	mg/kg	10	MCERTS	230	-	140	-	260
TPHCWG - Aromatic >EC35 - EC44 $_{EH_CU_1D_AR}$	mg/kg	8.4	NONE	92	-	68	-	200
TPHCWG - Aromatic >EC5 - EC35 $_{EH_CU+HS_1D_AR}$	mg/kg	10	NONE	350	-	180	-	330
TPHCWG - Aromatic >EC5 - EC44 $_{EH_CU+HS_1D_AR}$	mg/kg	10	NONE	440	-	240	-	530
TPH Total >EC6 - EC40 $_{EH_CU+HS_1D_TOTAL}$	mg/kg	10	NONE	-	< 10	-	< 10	-
Petroleum Range Organics (EC6 - EC10) $_{HS_1D_TOTAL}$	mg/kg	1	ISO 17025	-	< 1.0	-	< 1.0	-
TPH (EC10 - EC40) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	-	< 10	-	< 10	-
VOCs								
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
Benzene	µg/kg	5	MCERTS	17	-	< 5.0	-	12
Toluene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	5.8
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	7.5
p & m-Xylene	µg/kg	8	MCERTS	9.5	-	< 8.0	-	< 8.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0

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

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Analytical Report Number: 26-017499
Project / Site name: MCFC Entertainment

Lab Sample Number				879902	879903
Sample Reference				DS306	DS304
Sample Number				None Supplied	None Supplied
Water Matrix				N/A	N/A
Depth (m)				0.40	0.50
Date Sampled				02/04/2026	02/04/2026
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status		
Mass of stone >10mm	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	9.3	7.8
Total mass of sample received	kg	0.1	NONE	0.7	0.7
Whole Sample Crushed	N/A	N/A	NONE	-	-

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Detected	Detected
Asbestos Analyst ID	N/A	N/A	N/A	PKU	PKU
Analysis completed	N/A	N/A	N/A	15/04/2026	15/04/2026
Actinolite detected	Type	N/A	ISO 17025	Not-detected	Not-detected
Amosite detected	Type	N/A	ISO 17025	Detected	Detected
Anthophyllite detected	Type	N/A	ISO 17025	Not-detected	Not-detected
Chrysotile detected	Type	N/A	ISO 17025	Not-detected	Not-detected
Crocidolite detected	Type	N/A	ISO 17025	Not-detected	Not-detected
Tremolite detected	Type	N/A	ISO 17025	Not-detected	Not-detected
Asbestos % by hand picking/weighing	%	0.001	ISO 17025	< 0.001	< 0.001
Asbestos Containing Material Types Detected (ACM)	Type	N/A	ISO 17025	Loose Fibres	Loose Fibres

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	10.1	10.3
Total Cyanide	mg/kg	1	MCERTS	1.4	1.5
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Total Sulphate as SO_4	%	0.005	MCERTS	-	-
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1100	880
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	532	438
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-
Total Sulphur	mg/kg	50	MCERTS	-	-
Total Sulphur	%	0.005	MCERTS	-	-
Ammoniacal Nitrogen as NH_4^+	mg/kg	0.5	MCERTS	-	-
Ammonium as NH_4^+ (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	-
Organic Matter (automated)	%	0.1	MCERTS	5	3.2
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.9	1.9
Nitrate as NO_3 (Water Soluble) (2:1)	mg/kg	0.9	NONE	-	-
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	0.9	N/A	< 0.90	< 0.90

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Analytical Report Number: 26-017499
Project / Site name: MCFC Entertainment

Lab Sample Number				879902	879903
Sample Reference				DS306	DS304
Sample Number				None Supplied	None Supplied
Water Matrix				N/A	N/A
Depth (m)				0.40	0.50
Date Sampled				02/04/2026	02/04/2026
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status		
Speciated PAHs					
Naphthalene	mg/kg	0.05	MCERTS	8.6	3.4
Acenaphthylene	mg/kg	0.05	MCERTS	0.45	0.37
Acenaphthene	mg/kg	0.05	MCERTS	6.4	2.8
Fluorene	mg/kg	0.05	MCERTS	5.8	2.5
Phenanthrene	mg/kg	0.05	MCERTS	32	16
Anthracene	mg/kg	0.05	MCERTS	8.8	4.3
Fluoranthene	mg/kg	0.05	MCERTS	31	16
Pyrene	mg/kg	0.05	MCERTS	29	16
Benzo(a)anthracene	mg/kg	0.05	MCERTS	15	8
Chrysene	mg/kg	0.05	MCERTS	14	7.4
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	14	7.3
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	7.7	4.1
Benzo(a)pyrene	mg/kg	0.05	MCERTS	14	7.6
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	6.4	3.3
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	1.6	1
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	7.4	4
Total PAH					
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	200	104
Heavy Metals / Metalloids					
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	20	14
Barium (aqua regia extractable)	mg/kg	1	MCERTS	220	150
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.2	0.81
Boron (water soluble)	mg/kg	0.2	MCERTS	1.5	2.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.8	0.9
Chromium (hexavalent) Low Level	mg/kg	1.2	NONE	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	33	22
Copper (aqua regia extractable)	mg/kg	1	MCERTS	74	49
Lead (aqua regia extractable)	mg/kg	1	MCERTS	160	210
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	32	21
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.1	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	70	41
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	310	210
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-
Magnesium (water soluble)	mg/kg	5	NONE	-	-

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Analytical Report Number: 26-017499
Project / Site name: MCFC Entertainment

Lab Sample Number				879902	879903
Sample Reference				DS306	DS304
Sample Number				None Supplied	None Supplied
Water Matrix				N/A	N/A
Depth (m)				0.40	0.50
Date Sampled				02/04/2026	02/04/2026
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status		
Petroleum Hydrocarbons					
TPHCWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.01	MCERTS	< 0.010	< 0.010
TPHCWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.01	MCERTS	< 0.010	< 0.010
TPHCWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.01	MCERTS	< 0.010	< 0.010
TPHCWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	2.5	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	18	12
TPHCWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	41	23
TPHCWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	200	120
TPHCWG - Aliphatic >EC35 - EC44 EH_CU_1D_AL	mg/kg	8.4	NONE	88	52
TPHCWG - Aliphatic >EC5 - EC35 EH_CU+HS_1D_AL	mg/kg	10	NONE	260	160
TPHCWG - Aliphatic >EC5 - EC44 EH_CU+HS_1D_AL	mg/kg	10	NONE	350	210
TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	MCERTS	0.012	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	MCERTS	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.02	MCERTS	0.032	< 0.020
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	4.2	1.1
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	33	18
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	140	83
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	480	210
TPHCWG - Aromatic >EC35 - EC44 EH_CU_1D_AR	mg/kg	8.4	NONE	240	97
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	660	310
TPHCWG - Aromatic >EC5 - EC44 EH_CU+HS_1D_AR	mg/kg	10	NONE	900	400
TPH Total >EC6 - EC40 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	-	-
Petroleum Range Organics (EC6 - EC10) HS_1D_TOTAL	mg/kg	1	ISO 17025	-	-
TPH (EC10 - EC40) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	-	-
VOCs					
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	11	7.3
Toluene	µg/kg	5	MCERTS	6.8	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0
p & m-Xylene	µg/kg	8	MCERTS	12	< 8.0
o-Xylene	µg/kg	5	MCERTS	9.4	< 5.0

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

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Analytical Report Number: **26-017499**
Project / Site name: **MCFC Entertainment**
Your Order No:

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample	Analysis completed	Analyst ID
879892	TP303	1.2	204	Loose Fibres	**Amosite & Chrysotile**	< 0.001	**< 0.001**	15/04/2026	KMC
879894	TP309	2.9	208	Loose Fibres, Loose Fibrous Debris	**Amosite & Chrysotile**	0.002	**0.002**	15/04/2026	KMC
879895	TP304	2.7	218	Sheeting/Board Debris, Loose Fibres	**Amosite & Chrysotile**	0.006	**0.006**	15/04/2026	KMC
879896	TP301	0.3	204	Loose Fibres, Loose Fibrous Debris	**Amosite & Chrysotile**	0.001	**0.001**	15/04/2026	KMC
879897	DS302	1	197	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**	15/04/2026	KMC
879899	TP302	0.6	207	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**	15/04/2026	KMC
879901	DS307	1.5	225	Bitumen, Loose Fibres	**Amosite & Chrysotile**	0.003	**0.003**	15/04/2026	KMC
879902	DS306	0.4	229	Loose Fibres	**Amosite**	< 0.001	**< 0.001**	15/04/2026	PKU
879903	DS304	0.5	230	Loose Fibres	**Amosite**	< 0.001	**< 0.001**	15/04/2026	PKU

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

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Analytical Report Number : 26-017499
Project / Site name: MCFC Entertainment

* 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 *
879892	TP303	None Supplied	1.2	Brown clay and sand with gravel
879893	TP303	None Supplied	4.5	Brown clay with vegetation
879894	TP309	None Supplied	2.9	Brown clay and sand with gravel and vegetation
879895	TP304	None Supplied	2.7	Brown sand with gravel and vegetation
879896	TP301	None Supplied	0.3	Brown clay and sand with gravel and stones
879897	DS302	None Supplied	1	Brown clay and sand with gravel and stones
879898	TP309	None Supplied	4.2	Brown clay
879899	TP302	None Supplied	0.6	Brown clay and sand with gravel
879900	TP302	None Supplied	2.7	Brown clay
879901	DS307	None Supplied	1.5	Brown clay and sand with gravel and vegetation
879902	DS306	None Supplied	0.4	Brown sand with gravel and vegetation
879903	DS304	None Supplied	0.5	Brown clay and sand with gravel and brick

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Analytical Report Number : 26-017499
Project / Site name: MCFC Entertainment

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references	HSE Report No: 83/1996, HSG 248 (2021), HSG 264 (2012) & SCA Blue Book (draft)	A006B	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content (Wet Weight)	Moisture content (% wet weight), determined gravimetrically (up to 30°C)	In-house-procedure based on BS EN 12880:2000	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES	In-house method based on TRL 447	L038B	D	NONE
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES	In-house method	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID in soil	Determination of total petroleum hydrocarbons in soil by GC-FID with carbon banding aliphatic and aromatic	In-house method	L076B	D	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil (Summed Bands)	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic (Summed Bands).	Calculation	L076B/L088-PL	D/W	NONE

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Analytical Report Number : 26-017499
Project / Site name: MCFC Entertainment

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Hexavalent chromium in soil (low 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
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser	In-house method	L082B	D	MCERTS
Ammonium as NH4 in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by HS-GC/MS in soil	Determination of total petroleum hydrocarbons in soil by HS-GC/MS with carbon banding aliphatic and aromatic	In-house method	L088-PL	W	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
Water Soluble Nitrate (2:1) as NO3 in soil	Determination of nitrate as NO3 in soil by discrete method	In-house method by discrete analyzer based on TON as N, Total Oxidized Nitrogen (Vanadium Chloride reduction), Thermo Fisher Scientific, MANUAL 2015-0	L082B	W	NONE
Soil Descriptions	Textural classification	In-house method	L019B	W	NONE
Total petroleum hydrocarbons by GC-FID in soil	Determination of total petroleum hydrocarbons in soil by GC-FID	In-house method	L076B	D	MCERTS
Total petroleum hydrocarbons by GC-FID/GC-MS HS in soil (Summed Bands)	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS (Summed Bands).	Calculation	L076B/L088-PL	D/W	NONE
Total petroleum hydrocarbons by HS-GC-MS in soil	Determination of total petroleum hydrocarbons in soil by HS-GC-MS	In-house method	L129-PL	W	ISO 17025
Whole Sample Crushed	Either: Client specific preparation instructions - sample(s) crushed whole prior to analysis OR Sample unsuitable for standard preparation and therefore crushed whole prior to analysis	In house method, applicable to dry samples only	L019B	D	NONE

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

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

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Analytical Report Number : 26-017499
Project / Site name: MCFC Entertainment

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status

##- 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.

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Analytical Report Number : 26-018094

Project / Site name:	MCFC	**Samples received on:**	07/04/2026
Your job number:	4490	**Samples instructed on/ Analysis started on:**	08/04/2026
Your order number:	4490 LG	**Analysis completed by:**	16/04/2026
Report Issue Number:	1	**Report issued on:**	17/04/2026
Samples Analysed:	6 soil samples		

[redacted]

Signed:

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

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

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

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

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting
air	- once the analysis is complete

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

Retention period for records and reports is minimum 6 years from the date of issue of the final report.
Some records may be kept for longer according to other legal/best practice requirements.

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

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Analytical Report Number: 26-018094
Project / Site name: MCFC
Your Order No: 4490 LG

Lab Sample Number				882999	883000	883001	883002	883003
Sample Reference				TP303	TP309	TP304	TP305	TP306
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				2.90	3.60	4.10	2.60	1.20
Date Sampled				01/04/2026	01/04/2026	01/04/2026	02/04/2026	02/04/2026
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
Mass of stone >10mm	%	0.1	NONE	3.9	0.1	2.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	15	23	23	13	13
Total mass of sample received	kg	0.1	NONE	0.9	0.8	1	1	1

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Detected	Not-detected	Detected	-	Detected
Asbestos Analyst ID	N/A	N/A	N/A	KJK	KJK	KJK	-	KJK
Analysis completed	N/A	N/A	N/A	14/04/2026	14/04/2026	14/04/2026	-	14/04/2026
Actinolite detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
Amosite detected	Type	N/A	ISO 17025	Not-detected	-	Detected	-	Detected
Anthophyllite detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
Chrysotile detected	Type	N/A	ISO 17025	Detected	-	Detected	-	Detected
Crocidolite detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
Tremolite detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
Asbestos % by hand picking/weighing	%	0.001	ISO 17025	< 0.001	-	< 0.001	-	< 0.001
Asbestos Containing Material Types Detected (ACM)	Type	N/A	ISO 17025	Asbestos Cement	-	Loose Fibres	-	Loose Fibres, Loose Fibrous Debris

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	9.2	8.7	9.1	8.5	9.9
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	1.1	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1900	900	2000	320	1100
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	933	452	1020	158	530
Organic Matter (automated)	%	0.1	MCERTS	4.2	3.7	3.3	1.6	3
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.4	2.1	1.9	0.9	1.8
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	0.9	N/A	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-

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

Analytical Report Number: 26-018094
Project / Site name: MCFC
Your Order No: 4490 LG

Lab Sample Number				882999	883000	883001	883002	883003
Sample Reference				TP303	TP309	TP304	TP305	TP306
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				2.90	3.60	4.10	2.60	1.20
Date Sampled				01/04/2026	01/04/2026	01/04/2026	02/04/2026	02/04/2026
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	3.8	32	3.7	0.06	2.7
Acenaphthylene	mg/kg	0.05	MCERTS	0.28	5.3	0.42	< 0.05	0.41
Acenaphthene	mg/kg	0.05	MCERTS	2.7	29	2.2	< 0.05	2
Fluorene	mg/kg	0.05	MCERTS	2.2	22	1.8	< 0.05	2
Phenanthrene	mg/kg	0.05	MCERTS	12	73	9.4	0.09	13
Anthracene	mg/kg	0.05	MCERTS	3.1	21	2.5	< 0.05	3.5
Fluoranthene	mg/kg	0.05	MCERTS	15	37	9.2	0.1	16
Pyrene	mg/kg	0.05	MCERTS	14	53	9.6	0.09	16
Benzo(a)anthracene	mg/kg	0.05	MCERTS	6.2	23	4.7	0.07	7.8
Chrysene	mg/kg	0.05	MCERTS	5.8	21	4.4	0.06	7.1
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	7.3	16	5	< 0.05	8.6
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	2.5	5.4	1.6	< 0.05	2.9
Benzo(a)pyrene	mg/kg	0.05	MCERTS	6	18	4.4	< 0.05	7.2
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	3	5.4	1.9	< 0.05	3.3
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.7	1.7	0.49	< 0.05	0.75
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	3.4	6.2	2.2	< 0.05	3.7
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	88	370	63.5	< 0.80	97.3
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	24	32	19	4.9	18
Barium (aqua regia extractable)	mg/kg	1	MCERTS	200	340	230	100	190
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.3	1.3	1.3	1.1	1.1
Boron (water soluble)	mg/kg	0.2	MCERTS	4.3	2.4	7.1	0.8	1.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.1	0.6	0.8	< 0.2	0.8
Chromium (hexavalent) Low Level	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	34	50	55	30	28
Copper (aqua regia extractable)	mg/kg	1	MCERTS	79	86	81	27	66
Lead (aqua regia extractable)	mg/kg	1	MCERTS	200	130	150	12	150
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	34	40	36	32	29
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	1.3
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	49	37	43	28	41
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	390	290	400	61	260
Petroleum Hydrocarbons								
TPHCWG - Aliphatic >EC5 - EC6 $_{HS_1D_AL}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010	-	< 0.010
TPHCWG - Aliphatic >EC6 - EC8 $_{HS_1D_AL}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010	-	< 0.010
TPHCWG - Aliphatic >EC8 - EC10 $_{HS_1D_AL}$	mg/kg	0.01	MCERTS	< 0.010	0.02	< 0.010	-	< 0.010
TPHCWG - Aliphatic >EC10 - EC12 $_{EH_CU_1D_AL}$	mg/kg	1	MCERTS	1.3	8.4	1.4	-	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 $_{EH_CU_1D_AL}$	mg/kg	2	MCERTS	11	29	5.3	-	3.4
TPHCWG - Aliphatic >EC16 - EC21 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	30	53	20	-	10
TPHCWG - Aliphatic >EC21 - EC35 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	230	330	98	-	71
TPHCWG - Aliphatic >EC35 - EC44 $_{EH_CU_1D_AL}$	mg/kg	8.4	NONE	130	130	57	-	35
TPHCWG - Aliphatic >EC5 - EC35 $_{EH_CU+HS_1D_AL}$	mg/kg	10	NONE	270	420	130	-	85
TPHCWG - Aliphatic >EC5 - EC44 $_{EH_CU+HS_1D_AL}$	mg/kg	10	NONE	400	550	180	-	120
TPHCWG - Aromatic >EC5 - EC7 $_{HS_1D_AR}$	mg/kg	0.01	MCERTS	< 0.010	0.017	0.013	-	< 0.010

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Analytical Report Number: 26-018094
Project / Site name: MCFC
Your Order No: 4490 LG

Lab Sample Number				882999	883000	883001	883002	883003
Sample Reference				TP303	TP309	TP304	TP305	TP306
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				2.90	3.60	4.10	2.60	1.20
Date Sampled				01/04/2026	01/04/2026	01/04/2026	02/04/2026	02/04/2026
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	MCERTS	< 0.010	0.011	0.012	-	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.02	MCERTS	< 0.020	0.43	0.082	-	< 0.020
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	3.3	14	< 1.0	-	1.2
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	18	110	6	-	6.7
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	73	210	29	-	28
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	300	280	81	-	87
TPHCWG - Aromatic >EC35 - EC44 EH_CU_1D_AR	mg/kg	8.4	NONE	200	82	51	-	39
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	400	620	120	-	120
TPHCWG - Aromatic >EC5 - EC44 EH_CU+HS_1D_AR	mg/kg	10	NONE	600	700	170	-	160
TPH Total >EC6 - EC40 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	-	-	-	< 10	-
Petroleum Range Organics (EC6 - EC10) HS_1D_TOTAL	mg/kg	1	ISO 17025	-	-	-	< 1.0	-
TPH (EC10 - EC40) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	-	-	-	< 10	-

VOCs

Chloromethane	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Chloroethane	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Bromomethane	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Vinyl Chloride	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	-	-
Trichlorofluoromethane	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
1,1-Dichloroethene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Trans 1,2-dichloroethylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	< 5.0
1,1-Dichloroethane	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
2,2-Dichloropropane	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	-	-
Chloroform	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
1,1,1-Trichloroethane	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
1,2-Dichloroethane	µg/kg	7	MCERTS	< 7.0	< 7.0	< 7.0	-	-
1,1-Dichloropropene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Cis-1,2-dichloroethene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Benzene	µg/kg	5	MCERTS	< 5.0	15	12	-	< 5.0
Carbontetrachloride	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
1,2-Dichloropropane	µg/kg	6	MCERTS	< 6.0	< 6.0	< 6.0	-	-
Trichloroethene	µg/kg	10	MCERTS	< 10	< 10	< 10	-	-
Dibromomethane	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Bromodichloromethane	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Cis-1,3-dichloropropene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Trans-1,3-dichloropropene	µg/kg	10	MCERTS	< 10	< 10	< 10	-	-
Toluene	µg/kg	5	MCERTS	< 5.0	8.5	12	-	< 5.0
1,1,2-Trichloroethane	µg/kg	6	MCERTS	< 6.0	< 6.0	< 6.0	-	-
1,3-Dichloropropane	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Dibromochloromethane	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Tetrachloroethene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
1,2-Dibromoethane	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Chlorobenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-

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Analytical Report Number: 26-018094
Project / Site name: MCFC
Your Order No: 4490 LG

Lab Sample Number				882999	883000	883001	883002	883003
Sample Reference				TP303	TP309	TP304	TP305	TP306
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				2.90	3.60	4.10	2.60	1.20
Date Sampled				01/04/2026	01/04/2026	01/04/2026	02/04/2026	02/04/2026
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
1,1,1,2-Tetrachloroethane	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	190	25	-	< 5.0
p & m-Xylene	µg/kg	8	MCERTS	< 8.0	36	20	-	< 8.0
Styrene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Bromoform	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
o-Xylene	µg/kg	5	MCERTS	< 5.0	85	17	-	< 5.0
Isopropylbenzene	µg/kg	5	MCERTS	< 5.0	59	< 5.0	-	-
1,1,2,2-Tetrachloroethane	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	-	-
Bromobenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
n-Propylbenzene	µg/kg	5	MCERTS	< 5.0	15	< 5.0	-	-
2-Chlorotoluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
4-Chlorotoluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
1,3,5-Trimethylbenzene	µg/kg	5	MCERTS	< 5.0	70	< 5.0	-	-
tert-Butylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
1,2,4-Trimethylbenzene	µg/kg	5	MCERTS	< 5.0	450	32	-	-
sec-Butylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
1,3-Dichlorobenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
p-Isopropyltoluene	µg/kg	5	MCERTS	< 5.0	43	< 5.0	-	-
1,4-Dichlorobenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
1,2-Dichlorobenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Butylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
1,2-Dibromo-3-chloropropane	µg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	-	-
1,2,4-Trichlorobenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
Hexachlorobutadiene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-
1,2,3-Trichlorobenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	-

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

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Analytical Report Number: 26-018094
Project / Site name: MCFC
Your Order No: 4490 LG

Lab Sample Number				883004
Sample Reference				TP308
Sample Number				None Supplied
Water Matrix				N/A
Depth (m)				1.70
Date Sampled				02/04/2026
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
Mass of stone >10mm	%	0.1	NONE	2.2
Moisture Content	%	0.01	NONE	14
Total mass of sample received	kg	0.1	NONE	0.9

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	KJK
Analysis completed	N/A	N/A	N/A	14/04/2026
Actinolite detected	Type	N/A	ISO 17025	-
Amosite detected	Type	N/A	ISO 17025	-
Anthophyllite detected	Type	N/A	ISO 17025	-
Chrysotile detected	Type	N/A	ISO 17025	-
Crocidolite detected	Type	N/A	ISO 17025	-
Tremolite detected	Type	N/A	ISO 17025	-
Asbestos % by hand picking/weighing	%	0.001	ISO 17025	-
Asbestos Containing Material Types Detected (ACM)	Type	N/A	ISO 17025	-

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	10.1
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1300
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	630
Organic Matter (automated)	%	0.1	MCERTS	2.2
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.3
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	0.9	N/A	< 0.90

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-

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Analytical Report Number: 26-018094
Project / Site name: MCFC
Your Order No: 4490 LG

Lab Sample Number				883004
Sample Reference				TP308
Sample Number				None Supplied
Water Matrix				N/A
Depth (m)				1.70
Date Sampled				02/04/2026
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
Speciated PAHs				
Naphthalene	mg/kg	0.05	MCERTS	1.4
Acenaphthylene	mg/kg	0.05	MCERTS	0.26
Acenaphthene	mg/kg	0.05	MCERTS	1
Fluorene	mg/kg	0.05	MCERTS	1
Phenanthrene	mg/kg	0.05	MCERTS	6.5
Anthracene	mg/kg	0.05	MCERTS	1.9
Fluoranthene	mg/kg	0.05	MCERTS	7.1
Pyrene	mg/kg	0.05	MCERTS	6.9
Benzo(a)anthracene	mg/kg	0.05	MCERTS	3.3
Chrysene	mg/kg	0.05	MCERTS	3.1
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	3
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	1.4
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.9
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.3
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.39
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.7
Total PAH				
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	43.3
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	23
Barium (aqua regia extractable)	mg/kg	1	MCERTS	220
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.2
Boron (water soluble)	mg/kg	0.2	MCERTS	3.1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.7
Chromium (hexavalent) Low Level	mg/kg	1.2	NONE	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	35
Copper (aqua regia extractable)	mg/kg	1	MCERTS	82
Lead (aqua regia extractable)	mg/kg	1	MCERTS	160
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	39
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	48
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	300
Petroleum Hydrocarbons				
TPHCWG - Aliphatic >EC5 - EC6 $_{HS_1D_AL}$	mg/kg	0.01	MCERTS	< 0.010
TPHCWG - Aliphatic >EC6 - EC8 $_{HS_1D_AL}$	mg/kg	0.01	MCERTS	< 0.010
TPHCWG - Aliphatic >EC8 - EC10 $_{HS_1D_AL}$	mg/kg	0.01	MCERTS	< 0.010
TPHCWG - Aliphatic >EC10 - EC12 $_{EH_CU_1D_AL}$	mg/kg	1	MCERTS	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 $_{EH_CU_1D_AL}$	mg/kg	2	MCERTS	< 2.0
TPHCWG - Aliphatic >EC16 - EC21 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	< 8.0
TPHCWG - Aliphatic >EC21 - EC35 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	100
TPHCWG - Aliphatic >EC35 - EC44 $_{EH_CU_1D_AL}$	mg/kg	8.4	NONE	49
TPHCWG - Aliphatic >EC5 - EC35 $_{EH_CU+HS_1D_AL}$	mg/kg	10	NONE	100
TPHCWG - Aliphatic >EC5 - EC44 $_{EH_CU+HS_1D_AL}$	mg/kg	10	NONE	150
TPHCWG - Aromatic >EC5 - EC7 $_{HS_1D_AR}$	mg/kg	0.01	MCERTS	< 0.010

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

Analytical Report Number: 26-018094
Project / Site name: MCFC
Your Order No: 4490 LG

Lab Sample Number				883004
Sample Reference				TP308
Sample Number				None Supplied
Water Matrix				N/A
Depth (m)				1.70
Date Sampled				02/04/2026
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	MCERTS	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.02	MCERTS	< 0.020
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	3.8
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	33
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	120
TPHCWG - Aromatic >EC35 - EC44 EH_CU_1D_AR	mg/kg	8.4	NONE	61
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	160
TPHCWG - Aromatic >EC5 - EC44 EH_CU+HS_1D_AR	mg/kg	10	NONE	220
TPH Total >EC6 - EC40 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	-
Petroleum Range Organics (EC6 - EC10) HS_1D_TOTAL	mg/kg	1	ISO 17025	-
TPH (EC10 - EC40) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	-

VOCs

Chloromethane	µg/kg	5	MCERTS	-
Chloroethane	µg/kg	5	MCERTS	-
Bromomethane	µg/kg	5	MCERTS	-
Vinyl Chloride	µg/kg	5	NONE	-
Trichlorofluoromethane	µg/kg	5	MCERTS	-
1,1-Dichloroethene	µg/kg	5	MCERTS	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	5	MCERTS	-
Trans 1,2-dichloroethylene	µg/kg	5	MCERTS	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	< 5.0
1,1-Dichloroethane	µg/kg	5	MCERTS	-
2,2-Dichloropropane	µg/kg	5	NONE	-
Chloroform	µg/kg	5	MCERTS	-
1,1,1-Trichloroethane	µg/kg	5	MCERTS	-
1,2-Dichloroethane	µg/kg	7	MCERTS	-
1,1-Dichloropropene	µg/kg	5	MCERTS	-
Cis-1,2-dichloroethene	µg/kg	5	MCERTS	-
Benzene	µg/kg	5	MCERTS	< 5.0
Carbontetrachloride	µg/kg	5	MCERTS	-
1,2-Dichloropropane	µg/kg	6	MCERTS	-
Trichloroethene	µg/kg	10	MCERTS	-
Dibromomethane	µg/kg	5	MCERTS	-
Bromodichloromethane	µg/kg	5	MCERTS	-
Cis-1,3-dichloropropene	µg/kg	5	MCERTS	-
Trans-1,3-dichloropropene	µg/kg	10	MCERTS	-
Toluene	µg/kg	5	MCERTS	< 5.0
1,1,2-Trichloroethane	µg/kg	6	MCERTS	-
1,3-Dichloropropane	µg/kg	5	MCERTS	-
Dibromochloromethane	µg/kg	5	MCERTS	-
Tetrachloroethene	µg/kg	5	MCERTS	-
1,2-Dibromoethane	µg/kg	5	MCERTS	-
Chlorobenzene	µg/kg	5	MCERTS	-

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Analytical Report Number: 26-018094
Project / Site name: MCFC
Your Order No: 4490 LG

Lab Sample Number				883004
Sample Reference				TP308
Sample Number				None Supplied
Water Matrix				N/A
Depth (m)				1.70
Date Sampled				02/04/2026
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status	
1,1,1,2-Tetrachloroethane	µg/kg	5	MCERTS	-
Ethylbenzene	µg/kg	5	MCERTS	< 5.0
p & m-Xylene	µg/kg	8	MCERTS	< 8.0
Styrene	µg/kg	5	MCERTS	-
Bromoform	µg/kg	5	MCERTS	-
o-Xylene	µg/kg	5	MCERTS	< 5.0
Isopropylbenzene	µg/kg	5	MCERTS	-
1,1,2,2-Tetrachloroethane	µg/kg	5	NONE	-
Bromobenzene	µg/kg	5	MCERTS	-
n-Propylbenzene	µg/kg	5	MCERTS	-
2-Chlorotoluene	µg/kg	5	MCERTS	-
4-Chlorotoluene	µg/kg	5	MCERTS	-
1,3,5-Trimethylbenzene	µg/kg	5	MCERTS	-
tert-Butylbenzene	µg/kg	5	MCERTS	-
1,2,4-Trimethylbenzene	µg/kg	5	MCERTS	-
sec-Butylbenzene	µg/kg	5	MCERTS	-
1,3-Dichlorobenzene	µg/kg	5	MCERTS	-
p-Isopropyltoluene	µg/kg	5	MCERTS	-
1,4-Dichlorobenzene	µg/kg	5	MCERTS	-
1,2-Dichlorobenzene	µg/kg	5	MCERTS	-
Butylbenzene	µg/kg	5	MCERTS	-
1,2-Dibromo-3-chloropropane	µg/kg	8	MCERTS	-
1,2,4-Trichlorobenzene	µg/kg	5	MCERTS	-
Hexachlorobutadiene	µg/kg	5	MCERTS	-
1,2,3-Trichlorobenzene	µg/kg	5	MCERTS	-

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

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UKAS TESTING
4041

Normec i2 Analytical

Analytical Report Number: **26-018094**
Project / Site name: **MCFC**
Your Order No: **4490 LG**

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample	Analysis completed	Analyst ID
882999	TP303	2.9	220	Asbestos Cement	**Chrysotile**	< 0.001	**< 0.001**	14/04/2026	KJK
883001	TP304	4.1	205	Loose Fibres	**Amosite & Chrysotile**	< 0.001	**< 0.001**	14/04/2026	KJK
883003	TP306	1.2	225	Loose Fibres, Loose Fibrous Debris	**Amosite & Chrysotile**	< 0.001	**< 0.001**	14/04/2026	KJK

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

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Analytical Report Number : 26-018094
Project / Site name: MCFC

* 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 *
882999	TP303	None Supplied	2.9	Brown loam and clay with vegetation and stones
883000	TP309	None Supplied	3.6	Brown clay and loam with stones
883001	TP304	None Supplied	4.1	Brown clay and loam with stones
883002	TP305	None Supplied	2.6	Brown clay and loam with gravel
883003	TP306	None Supplied	1.2	Brown loam and clay with gravel
883004	TP308	None Supplied	1.7	Brown loam and sand with stones

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Analytical Report Number : 26-018094
Project / Site name: MCFC

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references	HSE Report No: 83/1996, HSG 248 (2021), HSG 264 (2012) & SCA Blue Book (draft)	A006B	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content (Wet Weight)	Moisture content (% wet weight), determined gravimetrically (up to 30°C)	In-house-procedure based on BS EN 12880:2000	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID in soil	Determination of total petroleum hydrocarbons in soil by GC-FID with carbon banding aliphatic and aromatic	In-house method	L076B	D	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil (Summed Bands)	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic (Summed Bands).	Calculation	L076B/L088-PL	D/W	NONE
Hexavalent chromium in soil (low 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
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS

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Analytical Report Number : 26-018094
Project / Site name: MCFC

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Total petroleum hydrocarbons with carbon banding by HS-GC/MS in soil	Determination of total petroleum hydrocarbons in soil by HS-GC/MS with carbon banding aliphatic and aromatic	In-house method	L088-PL	W	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
Water Soluble Nitrate (2:1) as NO3 in soil	Determination of nitrate as NO3 in soil by discrete method	In-house method by discrete analyzer based on TON as N, Total Oxidized Nitrogen (Vanadium Chloride reduction), Thermo Fisher Scientific, MANUAL 2015-0	L082B	W	N/A
Soil Descriptions	Textural classification	In-house method	L019B	W	NONE
Total petroleum hydrocarbons by GC-FID in soil	Determination of total petroleum hydrocarbons in soil by GC-FID	In-house method	L076B	D	MCERTS
Total petroleum hydrocarbons by GC-FID/GC-MS HS in soil (Summed Bands)	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS (Summed Bands).	Calculation	L076B/L088-PL	D/W	NONE
Total petroleum hydrocarbons by HS-GC-MS in soil	Determination of total petroleum hydrocarbons in soil by HS-GC-MS	In-house method	L129-PL	W	ISO 17025

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

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

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APPENDIX 9

CHEMICAL LABORATORY SCREENING TABLES

IGE consulting

Project: MCFC

Job No: 4490

Lab Sample Number			879892.00	879894.00	879895.00	879896.00	879897.00	879899.00	879901.00	879902.00	879903.00	883003.00	883004.00	882999.00	883000.00	883001.00	879898.00	879900.00	883002.00	879893.00	Statistical Analysis					GAC - S4UL unless stated				C4SL		
Sample Reference			TP303	TP309	TP304	TP301	DS302	TP302	DS307	DS306	DS304	TP306	TP308	TP303	TP309	TP304	TP309	TP302	TP305	TP303						Statistical Results						
Stratum			Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground (Infilled Canal)	Made Ground (Infilled Canal)	Made Ground (Infilled Canal)	Glacial Till	Glacial Till	Glacial Till	Glacial Till												
Depth (m)			1.20	2.90	2.70	0.30	1.00	0.60	1.50	0.40	0.50	1.20	1.70	2.90	3.60	4.10	4.20	2.70	2.60	4.50												
Date Sampled			02/04/2026	02/04/2026	02/04/2026	02/04/2026	02/04/2026	02/04/2026	02/04/2026	02/04/2026	02/04/2026	02/04/2026	02/04/2026	01/04/2026	01/04/2026	01/04/2026	02/04/2026	02/04/2026	02/04/2026	02/04/2026												
Analytical Parameter (Soil Analysis)	**Units**	**LoD**																			Count	Standard Deviation	Minimum	Maximum	Mean	Maximum	**2.5% Public Open Space - Park**	Pass/Fail	Exceedances	**2.5% Public Open Space - Park**	Pass/Fail	Exceedances
Stone Content	%	0.1	0.10	0.10	0.10	38.70	60.50	0.10	0.10	0.10	0.10	0.10	2.20	3.90	0.10	2.10	0.10	0.10	0.10	13.00	18	16.32	0.1	60.5	6.0	60.5						
Moisture Content	%	0.01	14.00	21.00	12.00	7.30	12.00	12.00	11.00	9.30	7.80	13.00	14.00	15.00	23.00	23.00	17.00	13.00	13.00	13.00	18	4.55	7.30	23.00	13.91	23.00						
Total mass of sample received	kg	0.1	0.60	0.80	0.60	0.80	0.60	0.70	0.60	0.70	0.70	1.00	0.90	0.90	0.80	1.00	0.40	0.60	1.00	0.40	18	0.19	0.400	1.000	0.728	1.000						
Asbestos in Soil Screen	Type	N/A	Amosite and Chrysotile	Amosite and Chrysotile	Amosite and Chrysotile	Amosite and Chrysotile	Chrysotile	Chrysotile	Amosite and Chrysotile	Amosite	Amosite	Amosite and Chrysotile	Not-detected	Chrysotile	Not-detected	Amosite and Chrysotile	-	-	-	-	14	-	-	-	-							
Asbestos Containing Material (ACM) Detected	Type	N/A	Loose Fibres	Loose Fibres, Loose Fibrous Debris	Sheeting / Board Debris, Loose Fibres	Loose Fibres, Loose Fibrous Debris	Loose Fibres	Loose Fibres	Bitumen, Loose Fibres	Loose Fibres	Loose Fibres	Loose Fibres, Loose Fibrous Debris	-	Asbestos Cement	-	Loose Fibres	-	-	-	-	12	-			-							
Asbestos Quantification Total	%	0.001	0.001	0.002	0.006	0.001	0.001	0.001	0.003	0.001	0.001	0.001	-	0.001	-	0.001	-	-	-	-	12	0.00	0.00	0.01	0.00							
General Inorganics																																
pH - Automated	pH Units	N/A	9.60	9.50	9.50	11.20	10.30	10.50	9.40	10.10	10.30	9.90	10.10	9.20	8.70	9.10	7.80	8.10	8.50	7.70	18	0.97	7.70	11.20	9.42							
Total Cyanide	mg/kg	1	1.00	1.00	1.70	1.00	3.90	1.10	1.30	1.40	1.50	1.00	1.00	1.00	1.00	1.10	1.00	1.00	1.00	1.00	18	0.69	1.00	3.90	1.28	3.90	**60**	Pass	0			
Free Cyanide	mg/kg	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	18	0.00	1.00	1.00	1.00	1.00	**60**	Pass	0			
Total Sulphate as SO4	%	0.005	0.23	-	0.28	-	-	-	0.37	-	-	-	-	-	-	-	0.03	0.02	-	0.02	6	0.157	0.019	0.373	0.159							
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.50	1100.00	840.00	1200.00	480.00	1400.00	780.00	1800.00	1100.00	880.00	1100.00	1300.00	1900.00	900.00	2000.00	110.00	86.00	320.00	59.00	18	598.58	59.00	2000.00	964.17							
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	540.00	419.00	585.00	238.00	702.00	389.00	914.00	532.00	438.00	530.00	630.00	933.00	452.00	1020.00	54.00	43.20	158.00	29.60	18	299.82	29.60	1020.00	478.21							
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	24.00	-	53.00	-	-	-	110.00	-	-	-	-	-	-	13.00	13.00	15.00	-	13.00	6	38.4	13.0	110.0	38.0							
Total Sulphur	%	0.005	0.11	-	0.17	-	-	-	0.51	-	-	-	-	-	-	-	0.01	0.18	-	0.19	6	0.167	0.014	0.509	0.196							
Ammoniacal Nitrogen as NH4	mg/kg	0.5	8.30	-	11.00	-	-	-	19.00	-	-	-	-	-	-	-	12.00	4.30	-	1.80	6	6.11	1.80	19.00	9.40							
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	0.55	-	0.73	-	-	-	1.29	-	-	-	-	-	-	-	0.76	0.29	-	0.12	6	0.41	0.12	1.29	0.62							
Organic Matter (automated)	%	0.1	3.30	2.80	3.50	2.90	3.90	2.50	3.90	5.00	3.20	3.00	2.20	4.20	3.70	3.30	1.70	1.30	1.60	1.30	18	1.04	1.30	5.00	2.96							
Total Organic Carbon (automated)	%	0.100	1.90	1.60	2.00	1.70	2.30	1.50	2.30	2.90	1.90	1.80	1.30	2.40	2.10	1.90	1.00	0.80	0.90	0.80	18.00	0.593	0.800	2.90	1.73							
Water Soluble Nitrate (2:1) as NO3	mg/kg	0.9	0.90	-	0.90	-	-	-	0.90	-	-	-	-	-	-	-	0.90	0.90	-	0.90	6	0.00	0.90	0.90	0.90							
Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)	mg/l	0.9	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	18	0.00	0.90	0.90	0.90							
Speciated PAHs																																
Naphthalene	mg/kg	0.05	1.60	4.50	2.60	1.40	2.00	1.90	2.30	8.60	3.40	2.70	1.40	3.80	32.00	3.70	0.10	0.10	0.06	0.05	18	7.28	0.05	32.00	4.01	32.00	**1900**	Pass	0	**1200.00**	Pass	0
Acenaphthylene	mg/kg	0.05	0.12	0.54	0.25	0.22	0.32	0.16	0.28	0.45	0.37	0.41	0.26	0.28	5.30	0.42	0.05	0.05	0.05	0.05	18	1.20	0.05	5.30	0.53	5.30	**30000**	Pass	0			
Acenaphthene	mg/kg	0.05	1.30	4.00	1.50	0.70	1.80	1.10	1.60	6.40	2.80	2.00	1.00	2.70	29.00	2.20	0.05	0.12	0.05	0.05	18	6.62	0.05	29.00	3.24	29.00	**30000**	Pass	0			
Fluorene	mg/kg	0.05	1.10	2.80	1.20	0.41	1.80	0.94	1.20	5.80	2.50	2.00	1.00	2.20	22.00	1.80	0.05	0.11	0.05	0.05	18	5.03	0.05	22.00	2.61	22.00	**20000**	Pass	0			
Phenanthrene	mg/kg	0.05	7.10	12.00	7.60	6.30	11.00	5.90	7.30	32.00	16.00	13.00	6.50	12.00	73.00	9.40	0.20	0.68	0.09	0.14	18	16.91	0.09	73.00	12.23	73.00	**6200**	Pass	0			
Anthracene	mg/kg	0.05	1.80	3.30	1.80	1.40	2.90	1.50	3.30	8.80	4.30	3.50	1.90	3.10	21.00	2.50	0.05	0.24	0.05	0.05	18	4.85	0.05	21.00	3.42	21.00	**150000**	Pass	0			
Fluoranthene	mg/kg	0.05	9.50	11.00	8.90	7.80	13.00	7.40	8.70	31.00	16.00	16.00	7.10	15.00	37.00	9.20	0.17	1.10	0.10	0.10	18	9.86	0.10	37.00	11.06	37.00	**6300**	Pass	0			
Pyrene	mg/kg	0.05	8.90	12.00	8.70	7.00	13.00	7.20	9.00	29.00	16.00	16.00	6.90	14.00	53.00	9.60	0.18	1.10	0.09	0.09	18	12.49	0.09	53.00	11.80	53.00	**15000**	Pass	0			
Benzo(a)anthracene	mg/kg	0.05	4.50	6.30	4.50	3.80	6.60	3.70	4.30	15.00	8.00	7.80	3.30	6.20	23.00	4.70	0.12	0.56	0.07	0.07	18	5.62	0.07	23.00	5.70	23.00	**56.00**	Pass	0			
Chrysene	mg/kg	0.05	4.50	5.60	4.10	3.80	6.50	3.80	4.50	14.00	7.40	7.10	3.10	5.80	21.00	4.40	0.13	0.57	0.06	0.07	18	5.14	0.06	21.00	5.36	21.00	**110**	Pass	0			
Benzo(b)fluoranthene	mg/kg	0.05	5.40	5.50	4.90	4.40	7.60	4.40	5.00	14.00	8.60	7.30	3.60	6.60	16.00	5.00	0.13	0.50	0.05	0.09	18	4.37	0.05	16.00	5.51	16.00	**15.00**	Fail	1			
Benzo(k)fluoranthene	mg/kg	0.05	2.10	2.20	2.00	1.70	2.70	1.70	2.30	7.70	4.10	2.90	1.40	2.50	5.40	1.60	0.05	0.23	0.05	0.05	18	1.94	0.05	7.70	2.26	7.70	**410**	Pass	0			
Benzo(a)pyrene	mg/kg	0.05	4.70	5.70	4.40	4.00	6.80	3.90	4.90	14.00	7.60	7.20	2.90	6.00	14.00	4.40	0.10	0.41	0.05	0.05	18	4.64	0.05	18.00	5.28	18.00	**12.00**	Fail	2	**21.00**	Pass	0
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	2.20	2.20	2.00	1.80	3.00	1.80	2.30	3.30	3.30	3.30	1.50	3.00	5.40	2.00	0.05	0.19	0.05	0.05	18	1.73	0.05	6.40	2.24	6.40	**170**	Pass	0			
Dibenz(a,h)anthracene	mg/kg	0.05	0.44	0.50	0.42	0.36	0.63	0.34	0.57	1.60	1.00	0.75	0.39	0.70	1.70	0.49	0.05	0.05	0.05	0.05	18	0.48	0.05	1.70	0.56	1.70	**1.30**	Fail	2			
Benzo(ghi)perylene	mg/kg	0.05	2.50	2.50	2.40	2.10	3.40	2.00	2.70	7.40	4.00	3.70	1.70	3.40	6.20	2.20	0.06	0.23	0.05	0.05	18	1.99	0.05	7.40	2.59	7.40	**1800**	Pass	0			
Total PAH																																
Speciated Total EPA-16 PAHs	mg/kg	0.8	57.70	80.80	57.20	47.80	83.30	47.50	60.30	200.00	104.00	97.30	43.30	88.00	370.00	63.50	1.24	6.15	0.80	0.80	18	87.02	0.80	370.00	78.32							
Heavy Metals / Metalloids																																
Arsenic (aqua regia extractable)	mg/kg	1	20.00	24.00	22.00	12.00	16.00	15.00	24.00	20.00	14.00	18.00	23.00	24.00	32.00	19.00	8.00	7.60	4.90	8.90	18	7.17	4.90	32.00	17.36	32.00	**170**	Pass	0			
Barium (aqua regia extractable)	mg/kg	1	210.00	240.00	720.00	200.00	180.00	180.00	250.00	220.00	150.00	190.00	220.00	200.00	340.00	230.00	170.00	120.00	100.00	150.00	18	134.35	100.00	720.00	226.11	720.00	-	Pass	0			
Boron (water soluble)	mg/kg	0.2	3.20	3.90	3.60	4.10	2.70	2.90	4.90	1.50	2.20	1.40	3.10	4.30	2.40	7.10	0.40	0.30	0.80	0.80	18	1.77	0.30	7.10	2.76	7.10	**46000**	Pass	0			
Cadmium (aqua regia extractable)	mg/kg	0.2	0.80	0.80	0.90	0.70	0.70	0.70	1.00	0.80	0.90	0.80	0.70	1.10	1.00	0.60	0.20	0.20	0.20	0.20	18	0.29	0.20	1.10	0.66	1.10	**560**	Pass	0	**880.00**	Pass	0
Chromium (hexavalent)	mg/kg	1.2	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	18	0.00	1.20	1.20	1.20	1.20	**220**	Pass	0	**250.00**	Pass	0
Chromium (aqua regia extractable)	mg/kg	1	35.00	68.00	67.00	38.00	25.00	29.00	74.00	33.00	22.00	28.00	35.00	34.00	50.00	55.00	33.00	25.00	30.00	27.00	18	16.24	22.00	74.00	39.33	74.00	**33000**	Pass	0			
Copper (aqua regia extractable)	mg/kg	1	69.00	110.00	94.00	63.00	200.00	65.00	160.00	74.00	49.00	66.00	82.00	79.00	86.00	81.00	31.00	25.00	27.00	26.00	18	45.15	25.00	200.00	77.11	200.00	**44000**	Pass	0			
Lead (aqua regia extractable)	mg/kg	1	160.00	190.00	180.00	93.00	110.00	130.00	210.00	160.00	210.00	150.00	160.00	200.00	130.00	150.00	14.00	14.00	12.00	12.00	18	70.15	12.00	210.00	126.94	210.00	**1300**	Pass	0	**1300.00**	Pass	0
Mercury (aqua regia extractable)	mg/kg	0.3	0.30	0.30	0.30	0.30	0.40	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	18	0.02	0.30	0.40	0.31	0.40	**240**	Pass	0			
Nickel (aqua regia extractable)	mg/kg	1	36.00	34.00	33.00	29.00	27.00	23.00	60.00	32.00	21.00	29.00	39.00	34.00	40.00	36.00	40.00	32.00	32.00	33.00	18	8.34	21.00	60.00	33.89	60.00	**880**	Pass	0			
Selenium (aqua regia extractable)	mg/kg	1	1.00	1.40	1.20	1.30	1.00	1.00	1.00	1.10	1.00	1.30	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	18	0.13	1.00	1.40	1.07	1.40	**1800**	Pass	0			
Vanadium (aqua regia extractable)	mg/kg	1	44.00	42.00	46.00	31.00	37.00	40.00	41.00	70.00	41.00	41.00	48.00	49.00	37.00	43.00	34.00	28.00	28.00	29.00	18	9.86	28.00	70.00	40.50	70.00	**5000**	Pass	0			
Zinc (aqua regia extractable)	mg/kg	1	350.00	290.00	360.00	220.00	190.00	270.00	390.00	310.00	210.00	260.00	300.00	390.00	290.00	400.00	73.00	58.00	61.00	63.00	18	118.46	58.00	400.00	249.17	400.00	**170000**	Pass	0			
Magnesium (water soluble)	mg/kg	5	6.80	-	6.20	-	-	-	7.20	-	-	-	-	-	-	-	13.00	11.00	-	12.00	6	2.97	6.20	13.00	9.37							
Magnesium (leachate equivalent)	mg/l	2.5	3.40	-	3.10	-	-	-	3.60	-	-	-	-	-	-	-	6.70	5.60	-	6.20	6	1.58	3.10	6.70	4.77							
Monoaromatics & Oxygenates																																
Benzene	µg/kg	5	5.00	15.00	5.00	5.00	17.00	5.00	12.00	11.00	7.30	5.00	5.00	5.00	15.00	12.00	-	-	-	-	14	4.58	5	17	8.88	17	**100000**	Pass	0	**170000.00**	Pass	0
Toluene	µg/kg	5	5.00	10.00	5.00	5.00	5.00	5.00	5.00	6.80	5.00	5.00	5.00	5.00	8.50	12.00	-	-	-	-	14	2.27	5	12	6.29	12	**95000000**	Pass	0			
Ethylbenzene	µg/kg	5	5.00	12.00	5.00	5.00	5.00	5.00	7.50	5.00	5.00	5.00	5.00	5.00	190.00	25.00	-	-	-	-	14	49.14	5	190	20.32	190	**22000000**	Pass	0			
p & m-xylene	µg/kg	8	8.00	12.00	8.00	8.00	9.50	8.00	8.00	12.00	8.00	8.00	8.00	8.00	36.00	20.00	-	-	-	-	14	7.78	8	36	11.54	36	**23000000**	Pass	0			
o-xylene	µg/kg	5	5.00	8.50	5.00	5.00	5.00	5.00	5.00	9.40	5.00	5.00	5.00	5.00	85.00	17.00	-	-	-	-	14	21.24	5	85	12.14	85	**24000000**	Pass	0			
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	-	-	-	-	14	0.00	5	5	5.00							
Petroleum Hydrocarbons																																
Petroleum Range Organics (C6 - C10)	mg/kg	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	1.00	1.00	1.00	4	0.00	1.00	1.00	1.00							
TPH C10 - C40	mg/kg	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.00	10.00	10.00	10.00	4	0.00	10.00	10.00	10.00							
TPH C6 - C40	mg/kg	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.00	10.00	10.00	10.00	4	0.00	10.00	10.00	10.00							
TPH-CWG - Aliphatic >EC5 - EC6	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	0.01	0.01	0.01	-	-	-	-	14	0.000	0.010	0.010	0.010	0.010	**130000**	Pass	0			
TPH-CWG - Aliphatic >EC6 - EC8	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	0.01	0.01	0.01	-	-	-	-	14	0.000	0.010	0.010	0.010	0.010	**220000**	Pass	0			
TPH-CWG - Aliphatic >EC8 - EC10	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	0.01	0.01	0.01	-	-	-	-	14	0.003	0.010	0.020	0.011	0.020	**18000**	Pass	0			
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.50	1.00	1.00	1.00	1.30	8.40	1.40	-	-	-	-	14	1.97	1.00	8.40	1.69	8.40	**23000**	Pass	0			
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	6.00	5.90	5.50	13.00	22.00	2.30	5.10	18.00	12.00	3.40	2.00	11.00	29.00	5.30	14.00	8.08	2.00	29.00	18	10.04	2.00	29.00	10.04	29.00	**28000**	Pass	0			
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	19.00	20.00	19.00	46.00	43.00	12.00	28.00	41.00	23.00	10.00	8.00	30.00	53.00	20.00	-	-	-	-	14	14.18	8.00	53.00	26.57	53.00	-					
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	110.00	130.00	120.00	280.00	130.00	94.00	390.00	200.00	120.00	71.00	100.00	230.00	330.00	98.00	-	-	-	-	14	99.24	71.00	390.00	171.64	390.00	**480000**	Pass	0			
TPH-CWG - Aliphatic >EC35 - EC44	mg/kg	8.4	60.00	46.00	66.00	110.00	66.00	39.00	240.00	88.00	52.00	35.00	49.00	130.00	130.00	57.00	-	-	-	-	14	55.00	35.00	240.00	83.43	240.00	**480000**	Pass	0			
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	140.00	160.00	150.00	340.00	200.00	110.00	420.00	260.00	160.00	85.00	100.00	270.00	420.00	130.00	-	-	-	-	14	113.99	85.00	420.00	210.36							
TPH-CWG - Aliphatic (EC5 - EC44)	mg/kg	10	200.00	200.00	210.00	450.00	260.00	150.00	660.00	350.00	210.00	120.00	150.00	400.00	550.00	180.00	-	-	-	-	14	165.44	120.00	660.00	292.14							
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	-	-	-	-	14	0.003	0.010	0.018	0.012	0.018	**84000**	Pass	0			
TPH-CWG - Aromatic >EC7 - EC8	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	0.01	0.01	0.01	-	-	-	-	14	0.001	0.010	0.012	0.010	0.012	**95000**	Pass	0			
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.02	0.02	0.04	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.43	0.08	-	-	-	-	14	0.109	0.020	0.430	0.057	0.430	**8500**	Pass	0			
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	1.00	1.10	1.00	1.00	2.40	1.00	1.00	4.20	1.10	1.20	1.00	3.30	14.00	1.60	-	-	-	-	14	3.48	1.00	14.00	2.45	14.00	**9700**	Pass	0			
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	12.00	18.00	5.10	7.70	22.00	5.10	8.80	33.00	18.00	6.70	3.80	18.00	110.00	6.00	-	-	-	-	14	27.32	3.80	110.00	19.59	110.00	**10000**	Pass	0			
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	51.00	59.00	31.00	48.00	96.00	34.00	54.00	140.00	83.00	28.00	33.00	73.00	210.00	29.00	-	-	-	-	14	51.29	28.00	210.00	69.21	210.00	**7700**	Pass	0			
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	120.00	150.00	140.00	220.00	230.00	140.00	260.00	480.00	210.00	87.00	120.00	300.00	280.00	81.00	-	-	-	-	14	107.13	81.00	480.00	201.29	480.00	**7800**	Pass	0			
TPH-CWG - Aromatic >EC35 - EC44	mg/kg	8.4	55.00	58.00	72.00	110.00	92.00	68.00	200.00	240.00	97.00	39.00	61.00	200.00	82.00	51.00	-	-	-	-	14	64.03	39.00	240.00	101.79	240.00	**7800**	Pass	0			
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	180.00	220.00	180.00	270.00	350.00	180.00	330.00	660.00	310.00	120.00	160.00	400.00	620.00	120.00	-	-	-	-	14	170.90	120.00	660.00	292.86							
TPH-CWG - Aromatic (EC5 - EC44)	mg/kg	10	240.00	280.00	250.00	380.00	440.00	240.00	530.00	900.00	460.00	160.00	220.00	600.00	700.00	170.00	-	-	-	-	14	220.02	160.00	900.00	393.57							
VOCs - All below detection limit except the following:																																
Chloromethane	µg/kg	5	-	-	-	-	-	-	-	-	-	-	-	5.00	5.00	5.00	-	-	-	-	3	0.00	5.00	5.00	5.00		-					
Chloroethane	µg/kg	5	-	-	-	-	-	-	-	-	-	-	-	5.00	5.00	5.00	-	-	-	-	3	0.00	5.00	5.00	5.00		-					
Bromomethane	µg/kg	5	-	-	-	-	-	-	-	-	-	-	-	5.00	5.00	5.00	-	-	-	-	3	0.00	5.00	5.00	5.00		-					
Vinyl Chloride	µg/kg	5	-	-	-	-	-	-	-	-	-	-	-	5.00	5.00	5.00	-	-	-	-	3	0.00	5.00	5.00	5.00	5.00	**5000**	Pass	0			
Trichlorofluoromethane	µg/kg	5	-	-	-	-	-	-	-	-	-	-	-	5.00	5.00	5.00	-	-	-	-	3	0.00	5.00	5.00	5.00		-					
1,1-Dichloroethene	µg/kg	5	-	-	-	-	-	-	-	-	-	-	-	5.00	5.00	5.00	-	-	-	-	3	0.00	5.00	5.00	5.00		-					
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/kg	5	-	-	-	-	-	-	-	-	-	-	-	5.00	5.00	5.00	-	-	-	-	3	0.00	5.00	5.00	5.00		-					
Cis-1,2-dichloroethene	µg/kg	5	-	-	-	-	-	-	-	-	-	-	-	5.00	5.00	5.00	-	-	-	-	3	0

JIWG

Joint Industry Working Group

Asbestos in Soil and Construction & Demolition Materials

Project Reference	4490
Site Name	MCFC
Client	Manchester City Football Club
Run by	LG
Date	16-Apr-26
Scenario details	

Decision Support Tool for CAR2012 Work Categories

Stage 1

Hazard Factors

		Score
Select ACM type (run model for each type to generate 'Worst Case' output)	Unspecified fibrous board	2
Extent of degradation of ACMs at outset of work	Degraded (Significant degradation in ACM; material has lost its basic integrity)	3
Friability and degree of bonding by matrix (ACM matrix, not ground materials)	Friable ACM or ACM with fibres not firmly linked in a matrix	2
Distribution of Visible Asbestos Across Affected Area	No visible ACMs/fibre bundles	0
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Very Low quantities - <0.001 to 0.01 %wt/wt	1
Sub-total		**8**

Note: the asbestos licensing regime is unaffected by the type of asbestos fibre present in ACMs

Hazard ranking **Low**

No warranty, expressed or implied, or reliance, is provided in relation to the use of this tool.
It is contingent on users to satisfy themselves that the output from the tool is relevant and appropriate to the assessment being made.

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Stage 2

Exposure Factors

		Score
Anticipated airborne fibre concentration - Control Limit or SALI?	<0.01 fibres/ml	1
Anticipated duration of exposure to asbestos	> 2 hours in a 7 day period and Up to 10 hours in a day (e.g. full time occupational exposure)	4
Activity type and effect on deterioration of ACMs during work	Not low intensity, significant deterioration expected	4
Best description of primary host material matrix (soil/made ground)	Made Ground - Recycled Aggregate, Track Ballast	4
Respirable fibre index for ACM - RIVM report 711701034 (2003)	Low	2
Sub-total		**15**
Exposure ranking		Medium
Combined hazard and exposure ranking	**23**	Medium

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Stage 3

Risk Assessment Outputs

Probable Licensing Status	Non-Licensed Work
RPE*	EN149 type FFP3 disposable
Dust Suppression**	Manual/localised dust suppression
Hygiene/Decontamination***	Localised and basic personal decontamination facilities

*Where RPE has to be worn continuously for long periods (e.g. more than 1-hour), then powered RPE may be necessary.
**Reduction in control measures possible if natural mitigation factors are present (e.g. raining, wet ground)
***Guide only; suitability of selected personal hygiene measures may be reviewed on a site/contamination-specific basis

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APPENDIX 10

GAS AND GROUNDWATER DEPTH MONITORING RESULTS

Gas & Groundwater Monitoring

Site: **MCFC**

Job No.: **4490**

Exploratory Hole	Date	Time	Engineer	Response zone range	Water level	Base level	Atm. pressure	Pressure Trend	Flow		CH_4		LEL		Hex		CO_2		O_2			H_2S	CO	Total Volatiles (PID)		Remarks
				(m bgl)	(m bgl)	(m bgl)	(mbar)		(l/hr)		(%)		(%)		(%)		(%)		(%)			(ppm)	(ppm)	(ppm)		
									peak	steady	peak	steady	peak	steady	peak	steady	peak	steady	high	steady	low	peak	peak	peak	steady	
CP301	08/04/2026	10:42:00	LG	1.00 - 3.00	1.63	3.05	1019	Rising	0.1	0.1	0.1	0.1	0.1	0.1	0.001	0.001	0.1	0.1	19.5	19.1	19.1	1.0	1.0	-	-	Bailed to 2.72m bgl at 10:54; redipped to 2.65m bgl at 11:22
	22/04/2026	13:15:00	LG		1.77	3.06	1023	Falling	0.1	0.1	0.1	0.1	0.1	0.1	0.001	0.001	0.1	0.1	19.8	19.8	19.2	1.0	1.0	5.2	4.5	Bailed to 2.26m bgl at 13:34; redipped to 2.22m bgl at 14:17
	05/05/2026	10:14:00	CC		1.80	3.07	1009	Falling	0.1	0.1	0.1	0.1	0.1	0.1	0.001	0.001	0.1	0.1	19.2	19.2	15.1	1.0	1.0	-	-	Bailed to 3.04m bgl; redipped to 3.04m bgl at 10:46.
	15/05/2026	11:14:00	LG		1.53	3.06	1003	Rising	0.1	0.1	0.1	0.1	0.1	0.1	0.001	0.001	0.2	0.2	19.1	19.0	18.8	1.0	1.0	-	-	Bailed to 2.27m bgl at 11:23; redipped tp 2.22m bgl at 11:50.
DS302	08/04/2026	10:57:00	LG	0.60 - 1.20	0.25	1.04	1020	Rising	0.1	0.1	0.1	0.1	0.1	0.1	0.001	0.001	0.1	0.1	19.7	19.7	19.3	1.0	1.0	-	-	Bailed to 0.99m bgl at 11:05; redipped to 0.90m bgl at 11:23
	22/04/2026	13:30:00	LG		0.75	1.05	1022	Falling	59.1	0.1	0.1	0.1	0.1	0.1	0.001	0.001	0.1	0.1	19.3	18.7	18.7	1.0	1.0	2.3	1.7	Flow fell below instrument detection limits after 10 seconds. Bailed to 0.95m bgl at 13:40; redipped to 0.94m bgl at 14:22
	05/05/2026	09:35:00	CC		0.51	1.03	1010	Falling	70.8	0.1	0.1	0.1	0.1	0.1	0.001	0.001	0.1	0.1	18.8	0.1	0.1	1.0	1.0	-	-	Flow fell below instrument detection limits after 15 seconds. Bailed to 0.93m bgl at 9:50; redipped to 0.80 m bgl at 10:44.
	15/05/2026	11:27:00	LG		0.64	1.04	1004	Rising	92.6	0.1	0.1	0.1	0.1	0.1	0.001	0.001	0.1	0.1	19.3	19.2	19.2	1.0	1.0	-	-	ell below detection limits after 5 minutes. Bailed to 0.99m bgl at 11:37; redipped to 0.96m bgl at
CP302	08/04/2026	11:09:00	LG	5.00 - 8.00	7.69	7.92	1019	Rising	0.1	0.1	0.1	0.1	0.1	0.1	0.001	0.001	0.2	0.2	19.6	14.1	14.1	1.0	27.0	-	-	-
	22/04/2026	13:50:00	LG		7.49	7.89	1022	Falling	0.1	0.1	0.1	0.1	0.1	0.1	0.001	0.001	0.5	0.5	19.4	7.8	7.8	1.0	1.0	3.8	3.0	-
	05/05/2026	10:30:00	CC		7.51	7.91	1009	Falling	0.4	0.1	0.1	0.1	0.1	0.1	0.001	0.001	0.9	0.9	16.3	5.4	5.4	1.0	1.0	-	-	Flow fell below instrument detection limits after 2 seconds.
	15/05/2026	11:41:00	LG		7.21	7.91	1004	Rising	0.1	0.1	0.1	0.1	0.1	0.1	0.001	0.001	1.0	1.0	19.2	3.3	3.3	1.0	1.0	-	-	-

Response zone partially flooded. Results should be treated with caution in accordance with BS8485:2015 + A1 2019

Response zone flooded. Results considered unreliable in accordance with BS8485:2015 + A1 2019

Values recorded below instrument detection limit

TEST DATE AND CONDITIONS	
Date	8/1/26
Atmospheric pressure	987mb
Ambient Temp	19.7°C
Environics Serial No.	9634

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GFM436-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

INSTRUMENT DETAILS

Serial No	Customer
13397	IGE Consulting Ltd

INSTRUMENT CHECKS

Keyboard	✓	Pump Flow	500cc/min
Display Contrast	✓	Pump Flow @ -200mB	300cc/min
Clock Set / Running	✓	S/W Version	G436.0027/0010
Labels Fitted	✓	Recalibration Date	8/1/27

GAS CHECKS

Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	CH4 (%)	tol. (% vol.)	CO2 (%)	tol. (% vol.)	O2 (%)	tol. (% vol.)
N2	100%	0.0	0.0	0.0	0.0	0.0	+/-0.1
CH4	5%	4.9	+/-0.3	0.0	0.0	0.0	+/-0.1
	60%	59.9	+/-3.0	0.0	0.0	0.0	+/-0.1
CO2	5%	0.0	0.0	4.9	+/-0.3	0.0	+/-0.1
	40%	0.0	0.0	39.8	+/-3.0	0.0	+/-0.1
O2	20.9%	0.0	0.0	0.0	+0.1	20.9	+/-0.5

OPTIONAL GAS CHECKS

Calibration Gas		Instrument Gas Channels Read						
Gas Type	Applied Conc.	Label	H2S	CO			Hexane	tol. (% vol.)
		Range	5000ppm	2000ppm			2.00%	
N2	100%		0	0			0.000	0.0
H2S	1500ppm		1520	0				+/- 5.0
CO	1000ppm		90	1003				+/- 5.0
Hexane	2.00%						2.089	+/- 10.0

PRESSURE CHECKS

Calibration Pressure		Instrument Pressure Channels Read					
Pressure @	Applied Pressure	Atmospheric [Ap] (mB)	tol. (mB)	Static [Sp] (mB)	tol. (mB)		
All Ports	Current Atmospheric	987	+/-2.0		0.0		
Ap Port (Internal)	+800mB(a)	800	+/-5.0		0.0		
	+1200mB(a)	1199	+/-5.0		0.0		

TEST DATE AND CONDITIONS	
Date	8/1/26
Atmospheric pressure	987mb
Ambient Temp	19.7°C
Environics Serial No.	9634

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FLOW CHECKS

Calibration Flow		Instrument Flow Channels Read			
Applied Flow (l/hour)	Applied Pressure (Pa)	Flow [Flow] (l/hour)	tol. (l/hour)	Differential Pressure [Dp] (Pa)	tol. (Pa)
-30.0	-373	-29.7	+/-3.0	-375	+/-50
-3.0	-17	-3.1	+/-1.0	-19	+/-6
0.0	0	0.0	0.0	0	0.0
+3.0	14	2.8	+/-0.5	13	+/-3
+30.0	345	29.2	+/-3.0	339	+/-50
+60.0	1036	61.6	+/-6.0	1081	+/-130
+90.0	2073	91.5	+/-9.0	2164	+/-250

TEMPERATURE CHECK

Calibration Temperature	Instrument Temperature Channel Read	
Applied Equivalent Temperature (°C)	Temperature [Temp] (°C)	tol. (°C)
-10.0	-10.5	+/- 2.0
0.0	0.0	+/- 1.0
30.0	30.0	+/- 1.0
60.0	60.0	+/- 1.0
100.0	99.5	+/- 1.0

Notes:

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015, BS EN ISO 14001:2015 and BS EN ISO 45001:2018 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated. The results displayed on the instrument at each stage are recorded above.

Gas Data Ltd is certified to: BS EN ISO 9001:2015
BS EN ISO 14001:2015
BS EN ISO 45001:2018

TEST DATE AND CONDITIONS	
Date	9/1/26
Atmospheric pressure	979 mb
Ambient Temp	19.1 °C
Environics Serial No.	9634

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GFM436-1 OUTWARD INSPECTION & QUALITY CHECK SHEET

INSTRUMENT DETAILS					
SO Number	Instrument Banner	Instrument Serial Number + SW Version	Job Number(s)		
346524	GFM436	13397/27-1Φ	3184Φ		

Calibration Techn [redacted] **DATE** 8/1/26

Inspection Techni [redacted] **DATE** 9/1/26

INSTRUMENT CHECKS		Pass (P), Fail (F) or not applicable(NA)
Function Tests	Dust Caps Fitted	P
	Keyboard Test (All keys)	P
	Backlight Test	P
	Clock Set / Running	P
	Comms Test	P
	Pump Flow Test (In & Out)	P
	Overall Leak Test (30mb)	N/A
	Battery Charge Test	P
	Service Date set to?	8/1/27
Channel Tests	Data Logging Enabled?	P
	Verify CH4/LEL/Hexane/PID	P
	Verify CO2	P
	Verify O2	P
	Verify H2S	P
	Verify CO	P
	Verify LEL	P
	Verify 1st Option gas	N/A
	Verify atmospheric pressure	P
	Verify differential pressure	P
	Verify flow	P
	Verify temperature probe input	P
	Verify vane anemometer input	P
DataBase Checks	Jobcard(s) completed and signed	P
	Jobcard(s) booked off database	P
	Calibration certificate completed	P
	Complete & print QI record	N/A
Label Checks	No. of Calibration label fitted	14397
	MCERTS label not displayed	P
	Warranty label fitted	P
H2S Range	H2S Range from SO	5000 ppm
	H2S Range from cal cert	5000 ppm
	Over-range value correct?	P

INSTRUMENT PACKING LIST		Tick if included
Instrument		✓
Leather Case		✓
Instrument Strap		✓
AC Battery Charger (UK)		✓
AC Battery Charger (EURO)		X
AC Battery Charger (US)		X
AC Battery Charger (AUS)		X
Gas Sample Pipe		✓
Hard Carry Case		✓
Spares Pot		✓
Allen Key		X
Flow Sample Pipe		✓
Temperature Probe		X
Vane Anemometer		X
USB Cable		✓
USB Memory Stick		X
SM V5 Software	Ver	X
Internal Filter Pack	Qty	X
External Filter Pack	Qty	X
Field Guide		X
EX Safety Flier		X

Extra Items:

Comments



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