NEW VICTORIA OFFICE, MANCHESTER

18/11/2022

Form G - Combined Certificate of Approval in Principle, Design and Check for Design Check Category I permanent works.

Alan Johnston Partnership Ltd

Ref: NV-AJP-RP-S-0003

Prepared By

Document Owner(s)	Organization Role
Danny Sinclair CRE Permanent works design (civil & structural)	Director

Project Closure Report Version Control

Version	Date	Author	Change Description
01	18.11.2022	Danny Sinclair	First Issue

Record of Approval

Originator	Approved	Date
Danny Sinclair (CRE)	Alvin Loh	18.11.2022

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NOTE; Refer to NR/L2/CIV/003 clause 12.2 for conditions of use for this Form.

Project Title	New Victoria Phase 2 Toriview	
Project Nr	174522-NW7557	
Remit / Technical Work Scope (TWS) Nr	N/A	
Requirements documents reference Nr	N/A	
CR-T Reference Nr	N/A	
Other documents associated with this combined submission		

PART 1: DETAILS

1.1 Proposed Works and Scope of Design

As set out in the Contracts Requirement Technical (CR-T) & Requirements documents, this combined submission relates to the Design of the following altered or new asset(s).

Asset No 1

Description	River Irk Culvert		
Location	Manchester Victoria Station		
ELR	MVM	Mileage	0m0022yds
Asset Nr	4	OS grid ref	SJ 841 990
Permanent Works	N/A	Design Check Category	CAT I

Asset No 2

Description	Victoria Station Metrolink Roof Structure		
Location	Manchester Victoria Station		
ELR	MVM	Mileage	0m0022yds
Asset Nr		OS grid ref	SJ 841 990
Permanent Works	N/A	Design Check Category	CAT I

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1.2 Design Criteria and design Statement

1.2.1 General

Planning approval for a multi storey office in this location was received in 2016. Under direction of the new site owner and developer “Morgan Capital” a new planning submission was made in June 2022.

As requested within the NR document “Conditions & requirements for engineering works in the vicinity of Network Rail tunnels” due to the proposed office location the development team started discussions with the NR asset protection team early in the project design development.

Asset 1 is not a tunnel NR have confirmed this guidance is the most applicable document they have. The 5m pile exclusion zone stated within this document from the external face of abutment has been reflected by the office development and bettered by 1.770m.

Asset 2 interaction has been reviewed due to the proposed office development proximity with the roof buttress piled foundation culvert bridging slab.

There are no elements of design of construction that will be handed back for Network Rail’s ownership but “Construction Record” drawings will be issued to NR. The proposed development is engineering assured to Building Control and this submission is for the development effects on NR assets only.

The proposed development contains a single storey basement for the full extent of the building footprint. The perimeter support for this excavation is being provided by a contiguous piled wall that also supports the building perimeter columns. An insitu concrete frame is proposed for the structure of the new office with a precast concrete façade.

1.2.2 Geotechnical Design and considerations

British Geological Survey 1:50,000 geological map sheet 85 for Manchester identifies the site to be underlain by superficial deposits of Made Ground, overlying possible Alluvium & Glacial Till. The solid geology is recorded to be the Chester Pebble Beds Formation of the Triassic Sherwood Sandstone (sandstone reddish brown moderately cemented).

Relevant exploratory holes from numerous phases of ground investigation identify the ground conditions to comprise Made Ground to between 31mOD and 26mOD overlying the Sherwood Sandstone.

The project has a specific intrusive site investigation report completed by GRM with the report dated August 2022.

BS EN 1997-1 Category 2 which includes conventional substructure such as spread foundations, piled foundations and retaining walls.

1.2.3 Design Criteria

50 year design life

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1.3 Standards used in the Design

1.3.1 Date of standards freeze

November 2022

1.3.2 List of Design standards

N/A

1.4 Variations to standards (with justification)

N/A

1.5 Other relevant information

N/A

1.6 Requirements for operation, inspection, maintenance, repair, renewal or removal including special access arrangements

N/A

1.7 Temporary Works

It is currently expected that the contiguous piled wall and capping beam will be propped in the temporary condition to limit/control deflection prior to the basement and ground floor slab being completed that provide the permanent propping force. As an alternative option the piles can be designed to cantilever in the temporary condition, to remove the requirement for temporary propping.

1.8 Detailed Design Drawings and Models

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New Victoria Office Block Interaction Assessment with Station Canopy Roof – Document produced from Byland dated 1st November 2022.

New Victoria Office Engineering Strategy – Document produced from AJP with Version 01 dated October 2022

Structure Culvert Location Plan – Drawing produced from AJP with Rev P06 dated 12.10.2022.

1.9 Accompanying drawings and other documents

New Victoria Office Block Interaction Assessment with Station Canopy Roof - Document produced from Byland dated 1st November 2022.

New Victoria Office Engineering Strategy - Document produced from AJP with Version 01 dated October 2022

Structure Culvert Location Plan - Drawing produced from AJP with Rev P06 dated 12.10.2022.

Designers risk assessment - Document produced from AJP dated October 2022

1.10 Matters that have been considered in the Design

The matters that do not apply to the Works to meet the particular CR-T and Requirements documents are to be struck out by the approved CRE appointed for the Design phase
1. So far as is reasonably practicable, the Asset affected will be safe in use when used in accordance with its intended purpose. 2. Hazards are managed in accordance with requirements of the CDM Regulations and CSM regulations. Residual risks are documented in a Risk Register. Risks to both (a) health and safety during construction, maintenance, use, railway operations and (b) occupational health and safety, are as low as reasonably practicable or better. 3. The provisions for examination, maintenance and eventual renewal/removal are satisfactory. 4. The overall Design concept and the appearance of the infrastructure are appropriate for their purpose, location and site conditions. 5. Where the proposal includes the strengthening, partial renewal or removal of structures, the stability of the whole structure and all its parts/elements at all

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stages of the Works are addressed, including the long-term adequacy of the remaining parts/elements of the structure and supporting soil.

6. The effects of the proposals on existing infrastructure are adequately considered.
7. Arrangements for liaison and consultation with external bodies (such as Local Authorities, statutory undertakers, the British Transport Police, the Environmental Regulators and landowners) are satisfactory and the likely effects of the proposals on external organisations are addressed. Required Permissions/Approvals have been obtained to support the proposals.
8. The impact of the proposals on services and service routes is adequately investigated and appropriate mitigation measures have been agreed with the appropriate Authority and incorporated into the Design.
9. The effects on other rail engineering disciplines including track, gauging, signalling (including signal sighting), telecommunications, electrification, lighting, and other operational electrical and mechanical equipment have been satisfactorily considered and no interfaces have been identified which would negate the use of this FormG to NR/L2/CIV/003 clause 12.2.
10. Mining related risks have been assessed in the development of the proposed design and are considered to be acceptable, in accordance with **NR/L2/CIV/191/MOD05.**
11. The requirements/recommendations of Railway Group Standards and RIS, Network Rail standards and Department for Transport Design Standards for Accessible Railway Stations have been addressed and proposed variations from these standards are identified and justified.
12. The requirements of the Building Regulations are met and any planning conditions are met.
13. The proposed Design loadings are appropriate and any non-standard accidental loadings are correctly identified.
14. The requirements of **NR/L2/CIV/003/F1990** to **NR/L2/CIV/003/F1994** and **NR/L2/CIV/003/F1997** have been considered and the selected options/choice recorded in this design.
15. The proposed Design standards and methods of Design are suitable.
16. The GIR/GDR information presented in or referred to in this combined design submission FormG is appropriate for the detailed design and assumptions have been verified or measures for verification of assumptions have been incorporated in the detailed design.
17. A Geotechnical Design Report, which meets the requirements of BS EN 1997 and NR/L3/CIV/071 is available. This Report justifies the selection of the Geotechnical Design parameters and outlines any further work required for implementation.
18. A plan of geotechnical related construction supervision and monitoring (including details of items to be checked during construction or requiring maintenance or monitoring) have been incorporated in the detailed design and meet the requirements of BS EN 1997.
19. The Design complies with structure clearance and platform stepping distance requirements.
20. Important Design matters not covered by standards are identified.

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21. The proposals are economical and sustainable.
22. The proposed works will not compromise the structural robustness of any existing structures.
23. The proposals have considered requirements for environmental and sustainable development. The design has adequately considered the results and actions required from the Environmental and Social Appraisal and the Environmental and Social Management Plan, where required by **NR/L2/ENV/015.**
24. The selection of post-installed anchors in concrete and masonry meet the requirements of BS 8539.
25. All materials specified in the design of structures are compatible with the intended application and environment. This includes, but is not limited to:
    - fixing metallic structures to masonry with studs bonded with resin, grout or other chemical bonding products
    - fixing design is to current standards and guidance
    - design and installation comply with manufacturer's requirements, are compatible with substrate and includes appropriate verification testing
    - building fabric design and associated fixings are appropriate for the security risk and associated requirements
    - suitable and sufficient investigation, as far as reasonably practical, has been carried out to determine that materials to be used will be compatible.
    - Design calculations have been completed where applicable and checked in accordance with the Design Check Category.
26. The provision of this design on this FormG meets with the requirements of **NR/L2/CIV/003** clause 12.2.
27. A completed IDC certificate has been provided with this design to comply with NR/L2/RSE/02009 clause 15.3
28. A Designers Risk Assessment has been provided with this design.
29. The Permanent Works designer has outlined their proposed construction methodology and envisaged temporary works requirements in order to facilitate construction of the Permanent Works.
30. The Permanent Works designer has outlined their proposed construction methodology and envisaged temporary works requirements to comply with the Diversity Impact Assessment (DIA), e.g., provision of temporary structures such as accessible temporary footbridges
31. The provision of new assets has taken account of the effects on existing assets, such as effects on cuttings, embankments, other structures or GSM-R.
32. The design has adequately considered pedestrian flow, fire risk, means of escape and security requirements.
33. A specification of workmanship and materials has been provided with the detailed design submission.

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PART 2: DESIGNER'S SUBMISSION

I confirm:

1. that the criteria specified in NR/L2/CIV/003 have been considered and:

   (a) this combined design submission FormG, incorporating Approval in Principle Design, Statement of Design Intent and Design and Check certificate, is submitted on behalf of

   Alan Johnston Partnership Ltd, 1 Dale St, Liverpool, L2 2ET

2. that reasonable professional skill and care have been used with the objective of checking that the Design:

   (a) unless identified in 1.4, (i) the Design will comply with all relevant standards and will be delivered in accordance with the CR-T/Requirements documents and (ii) the deliverables identified within the CR-T/Requirements documents have been completed and submitted in support of this submission.

   (b) complies with the design standards, codes and methods stated in **PART 1**.

   (c) is accurately described by the drawings, models, schedules, performance, materials and workmanship specifications, list of matters that have been considered in the design and other documents in **PART 1,** that have been prepared for issue as Approved for Construction (AFC) pending the completion of **PART 5, PART 5A** and **PART 6** of this form

   (d) incorporates any feedback from Network Rail on any pre-submission design development work

Signed D. Sinclair	Title CRE Design (Civil & Structural)
Name (print) Danny Sinclair	Date 18.11.2022
To be signed by the Contractor's Responsible Engineer.	

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PART 3: CHECK

I certify that reasonable professional skill and care have been used in checking the Design identified in **PART 1** of this submission, with the objective of checking that the Design

(a) complies with the Design standards, codes and methods and other requirements stated in **PART 1** of this submission.

(b) was checked as stated in **PART 1** and has been carried out with the level of independence specified in **NR/L2/CIV/003**.

Signed	Title Chartered Structural Engineer
Name (print) Alvin Loh	Date 18.11.2022
To be signed by the Checker	

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PART 4: CONSTRUCTION ORGANISATION'S ACKNOWLEDGEMENT OF COMBINED SUBMISSION BY A SUB-CONTRACT DESIGNER

The organisation named in **PART 2** is engaged as a sub-contractor to the organisation stated below. I acknowledge this combined submission to Network Rail in support of our contract/sub-contract *delete as applicable* obligation for the provision of this design on behalf of *insert name and address of organisation responsible for Construction Works*.

Further acknowledgement section(s) are to be completed where there is more than one layer of sub-contract relationship. Insert 'not required' where there is a direct contract with Network Rail.

Where formal Alliancing contracts are in place the wording of Part 4 of this form may be adjusted to suit, with agreement of wording by the DPE.

I confirm that, unless stated in **PART 2**, the submission complies with the CR-T.

Signed	Title
Name (print)	Date
To be signed by the Contractor's Responsible Engineer appointed for the Construction phase	

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PART 5: PROJECT ENGINEER'S COMMENTS AND ACCEPTANCE ON BEHALF OF NETWORK RAIL

I have considered the combined design submission and confirm that the information specified in **NR/L2/CIV/003** and the CR-T/Requirements document is included in this submission. My comments on the submission are in the associated closed out DRN.

I have reviewed the combined submission and confirm that, unless stated in **PART 1**, it complies with the Asset Manager's requirements for this project as set out in the Requirements documents and CR-T.

I accept that, so far as can reasonably be ascertained from the information submitted, the relevant procedures for the Design and Design Check as specified in **NR/L2/CIV/003** have been followed properly.

I have considered the Design Check statement provided in accordance with 12.2 of **NR/L2/CIV/003** and confirm that the stated method of checking was suitable and that all criteria for the use of this FormG have been satisfied.

I confirm that the Design has been checked in accordance with **NR/L2/CIV/003** with the design check categories agreed with the DPE as listed in Part 1;

Refer to DRN ref: 174522-NW7557-DRN-CIV-FG-01 dated 7/12/2022.

Signed		Title	Designated Project Engineer
Name (print)	Richard Scobie	Date	7/12/2022
To be signed by the Project Engineer (Building and Civil Engineering)			

~~Signed~~	~~Title~~
~~Name (print)~~	~~Date~~
~~To be signed by other responsible person *(if applicable)*~~ ~~(Project Engineer (Building Services) for example)~~	

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PART 5A: SUPPLEMENTARY NETWORK RAIL REVIEWER ENDORSEMENT

The following Part is to be completed where supplementary signatories are required for this combined design submission FormG. Where not required, the following is to be struck out and annotated as such with evidence by the DPE. The extent of other discipline reviews and arrangements for reviewer signatures are to be identified by the Sponsor as required.

Security, Emergency and Contingency Review

My comments on the submission are given below. Provided that these comments are addressed, I hereby endorse this combined design submission FormG submission of the above proposals regarding the security arrangements of railway infrastructure.

Signed	Title
Name (print)	Date
To be signed by the competent security role holder assigned to the project	

Station Pedestrian Capacity and Evacuation Review

My comments on the combined submission are given below. Provided that these comments are addressed, I hereby endorse this combined design submission FormG of the above proposals regarding Station capacity and evacuation.

Signed	Title
Name (print)	Date
To be signed by the Network Rail Capacity Engineer	

Fire Safety Review

My comments on the combined submission are given below. Provided that these comments are addressed, I hereby endorse this combined design submission FormG of the above proposals regarding Fire Safety.

Signed	Title
Name (print)	Date
To be signed by the Network Rail Fire Engineer	

NR/L2/CIV/003/FormG. Combined Certificate of Approval in Principle, Design and Check for Design Check Category I permanent works.				
Document reference	NV-AJP-RP-S-0003	Revision	01	
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PART 6: ASSET MANAGER'S APPROVAL

I have considered the combined submission and confirm that the proposed deviations to the Requirements documents / CR-T *(delete as appropriate)* are acceptable subject to any comments listed below being addressed prior to proceeding to Approved for Construction (AFC) Design as defined in NR/L2/RSE/02009. (Statement to be struck out where deviation from the Project Requirements is not being sought).

I have considered the combined design submission FormG and confirm that this is approved subject to the comments given below being addressed prior to proceeding to Approved for Construction (AFC) Design as defined in NR/L2/RSE/02009.

Signed Mark Brundle	Title Digitally signed by Mark Brundle DN: cn=Mark Brundle gn=Mark Brundle c=GB United Kingdom l=GB United Kingdom o=Network Rail ou=NW RAM Structures e=mark.brundle@networkrail.co.uk Reason: I am approving this document Location: Date: 2023-01-25 10:59Z
Name (Print)	Date
To be signed by the Asset Manager (Structures)	

~~Signed~~	~~Title~~
~~Name (Print)~~	~~Date~~
~~To be signed by the Asset Manager (Geotechnical)~~	

~~Signed~~	~~Title~~
~~Name (Print)~~	~~Date~~
~~To be signed by the Asset Manager (Drainage)~~	

Signed M. Cheadle.	Title Senior Asset Engineer Buildings
Name (Print) M Cheadle	Date 10/01/23
To be signed by the Asset Manager (Buildings)	

New Victoria Office - Network Rail Discussion Summary

ENGINEERING STRATEGY

October 2022

AJP Ref: 221-132

PREPARED BY DANNY SINCLAIR

Network Rail Discussion Summary

New Victoria Office, Manchester

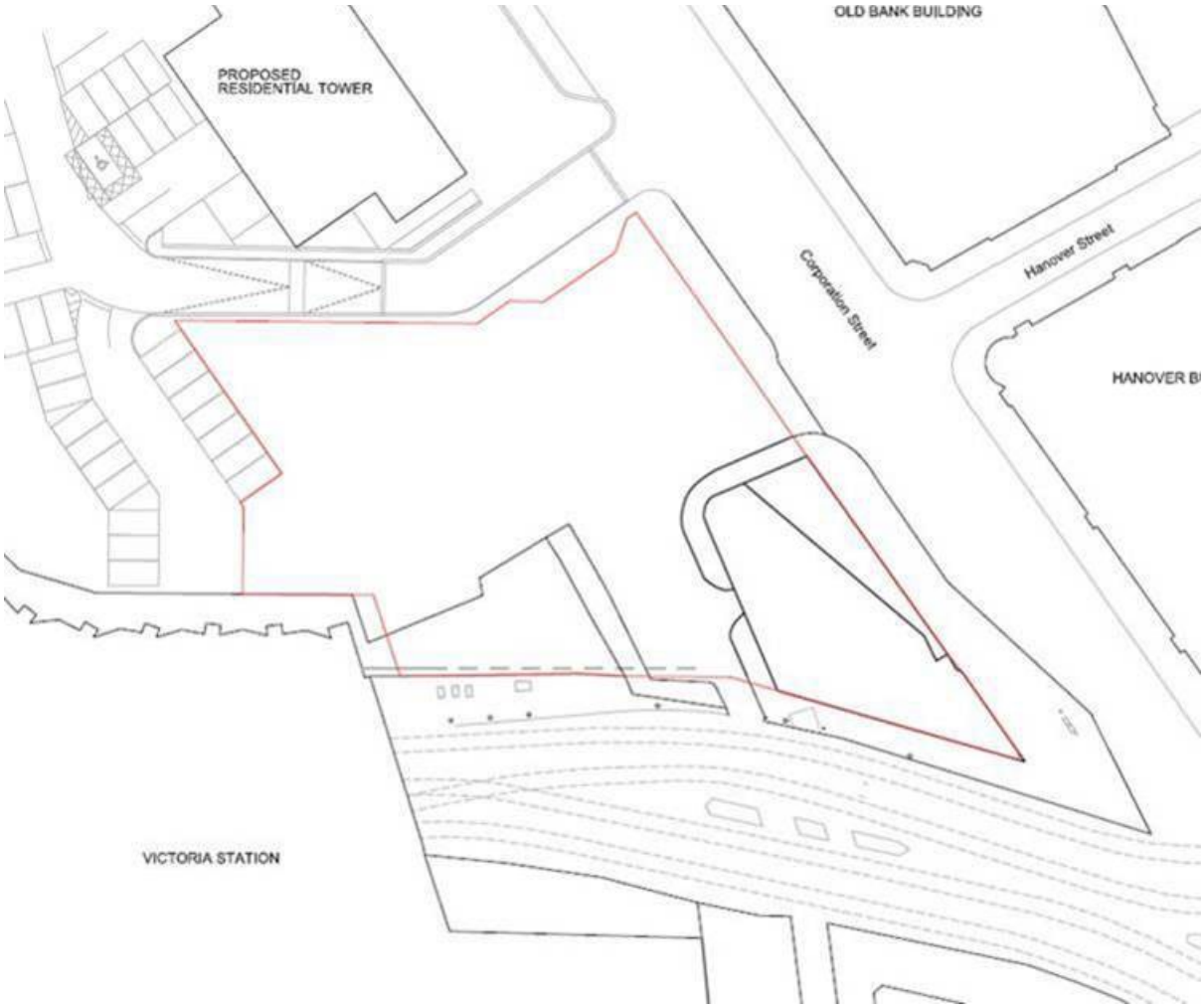
Record of Approval	Originator:	Approved:	Date:
	D Sinclair - Director	M Carr - Senior Structural Engineer	Oct 2022
Version	Author:	Change Description:	
01	D Sinclair	First Issue	Oct 2022

Introduction

Planning approval for a multi storey office in this location was received in 2016.

Under direction of the new site owner and developer "Morgan Capital" a new planning submission was made in June 2022.

The purpose of this document is to collate the content of the informal discussions held to date with the NR asset protection team team in preparation for a formal submission.



Network Rail Guidance

As requested within the NR document "Conditions & requirements for engineering works in the vicinity of Network Rail tunnels" due to the proposed office location the development team started discussions with the NR asset protection team. Whilst the asset is not a tunnel NR have confirmed this guidance is the most applicable document they have. The 5m pile exclusion zone stated within this document from the external face of abutment has been reflected by the office development and bettered by 1.770m.

Lessons Learnt

The culvert monitoring equipment from the Phase 1 residential development was installed in September 2020 with the majority still being in place. This monitoring has proven that piles, substructure excavation and associated civil engineering works can be completed in close proximity to the culvert while remaining within the green zones identified in the Byland Monitoring & Response Action Plan (MRAP). Only isolated exceedances have occurred in relation to individual construction events, mostly relating to local accidental vibration exceedances and unrelated to the permanent works. Any exceedances were investigated and practical measures put in place to avoid future exceedances. The lessons learnt in Phase 1 will be applied to Phase 2 to further minimise risk of exceedances.

Why the situation is different to the residential phase

During the residential phase discussions when NR engineering assurance was being considered, various elements were raised by the NR asset protection team. These are briefly discussed below explaining why the office development is vastly different:-

- Height - The residential block 1 rises to roof slab level 26 (SSL +119.310m AOD) with Block 2 rising to roof slab level 21 (SSL 103.780m AOD).

Office response - The office development rises to roof slab level 10 (SSL 76.010m AOD). The office development highest accessible roof slab level is 43m lower than the residential phase. As part of the Morgan Capital brief there is to be an allowance within the structural design of increasing the building height by two storeys, if this occurs the office roof slab would still be 35.5m lower than the residential phase.

- Proximity - At the closest point the bearing piles to both Phase 1 residential blocks were approximately 2.5m from pile centre line to the external face of the culvert abutment.

Office response - The office development contiguous piled wall at its closest location is 6.77m to the external face of the culvert abutment. Due to the office parallelogram shape on plan the 6.770m is only applicable for a 4.5m length, the dimension then increases to approximately 22m to the external face of the culvert abutment.

It is important to note that during discussions with the NR asset protection team the dimension from the piled wall to the culvert has been increased from 5.0m to 6.77m to increase the offset from the culvert. 6.77m was adopted as a pragmatic and practical reduction in the scope of works jointly agreed between NR and AJP.

- Adjacency - On Phase 1 comments were raised by the NR engineering team regarding long term fatigue due to the residential blocks being directly opposite each other either side of the culvert.

Office response - The office development is a singular building located on one side of the culvert.

- Horizontal movement - On Phase 1 comments were raised by the NR engineering team regarding horizontal pile head displacement under wind load conditions. Due to the over slab being constructed we could never report against the original culvert movement predictions.

Office response - A continuous capping beam will be constructed around the contiguous pile wall and will be permanently propped by the reinforced concrete ground floor slab forming a very stiff structure. As the whole substructure & superstructure would be mobilised, there would be significant redundancy in the structure to resist horizontal forces.

Key design consideration

The toe level of the contiguous piled wall will be socketed into the engineering rock head level below the founding strata of the culvert abutment construction.

The item that has attracted the most discussion to date from the NR asset protection team is the horizontal deflection of the contiguous piled wall.

The development team have maintained the involvement of the geotechnical specialist Byland Engineering Ltd who were involved throughout the Phase 1 residential development, they have prepared the commentary below:-

It is proposed to construct the basement within a contiguous bored pile embedded retaining wall which is propped at high level in the temporary condition and in the permanent condition by basement and ground floor reinforced concrete slabs.

Ciria C760 - Guidance on embedded retaining wall design provides guidance on methods by which ground movements due to embedded retaining wall installation & basement excavation may be estimated. Whilst these generally relate to ground movements at surface they may be considered as an upper bound to displacements that may be induced at NR culvert level. For a propped wall, as is the case here, the settlement profile behind the wall is analogous to the deflected profile of the embedded retaining wall as detailed in Figure 6.17 of C760 as shown below.

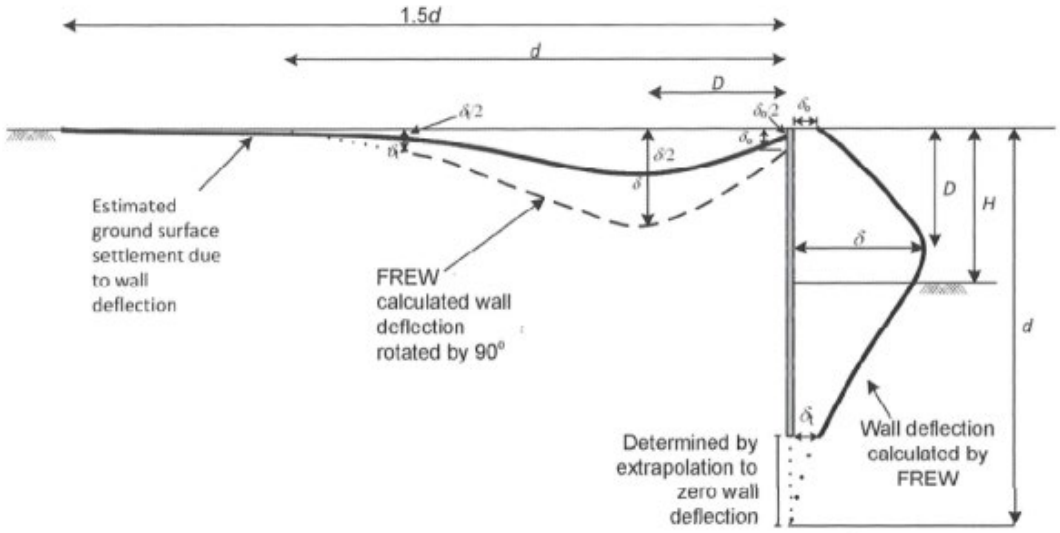
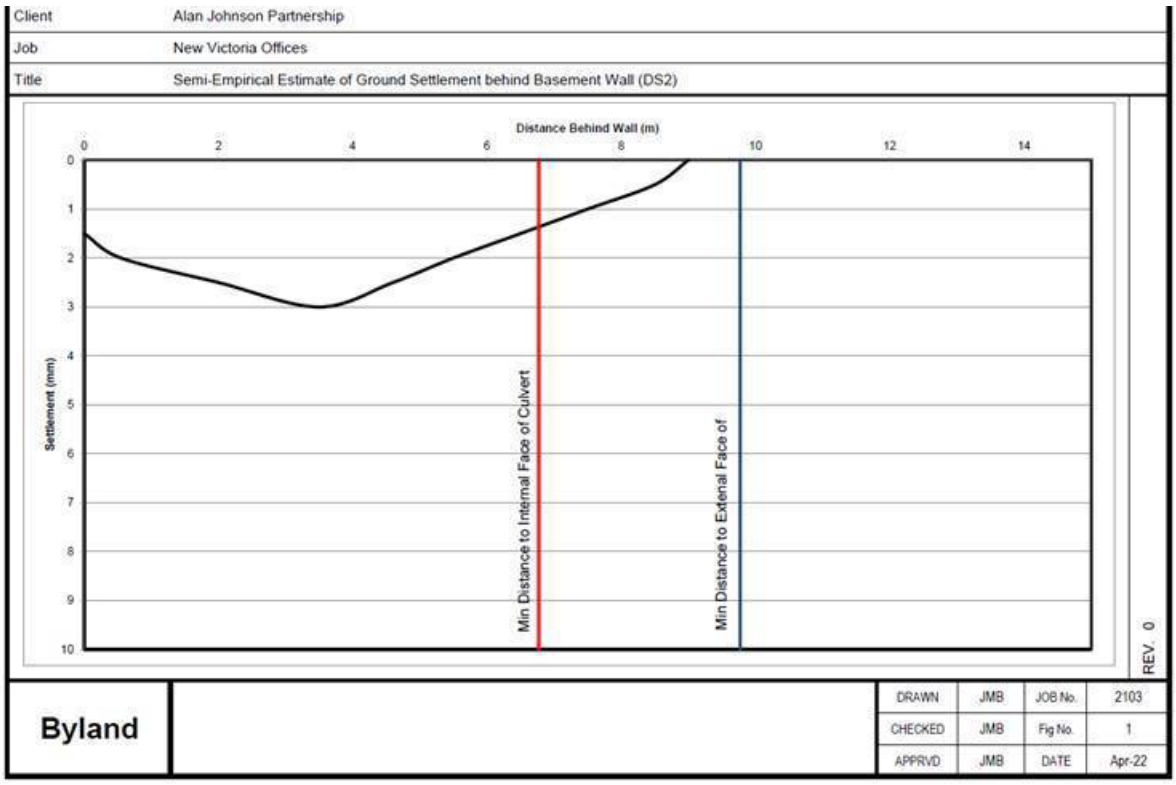


Figure 6.17 Relationship between analysed lateral (propped) wall deflections and predicted ground surface settlements in stiff ground

Based on a preliminary analysis of the embedded contiguous pile walls, the predicted profile of settlement at ground level is as per the chart below. The settlement predicted within the 3.0m wide masonry culvert wall is indicated. The upper bound predicted settlement is 1.5mm at the external face of the culvert abutment and 0mm on the internal face, since this is greater than distance 'd' equal to the preliminary assessed pile depth of 9m.



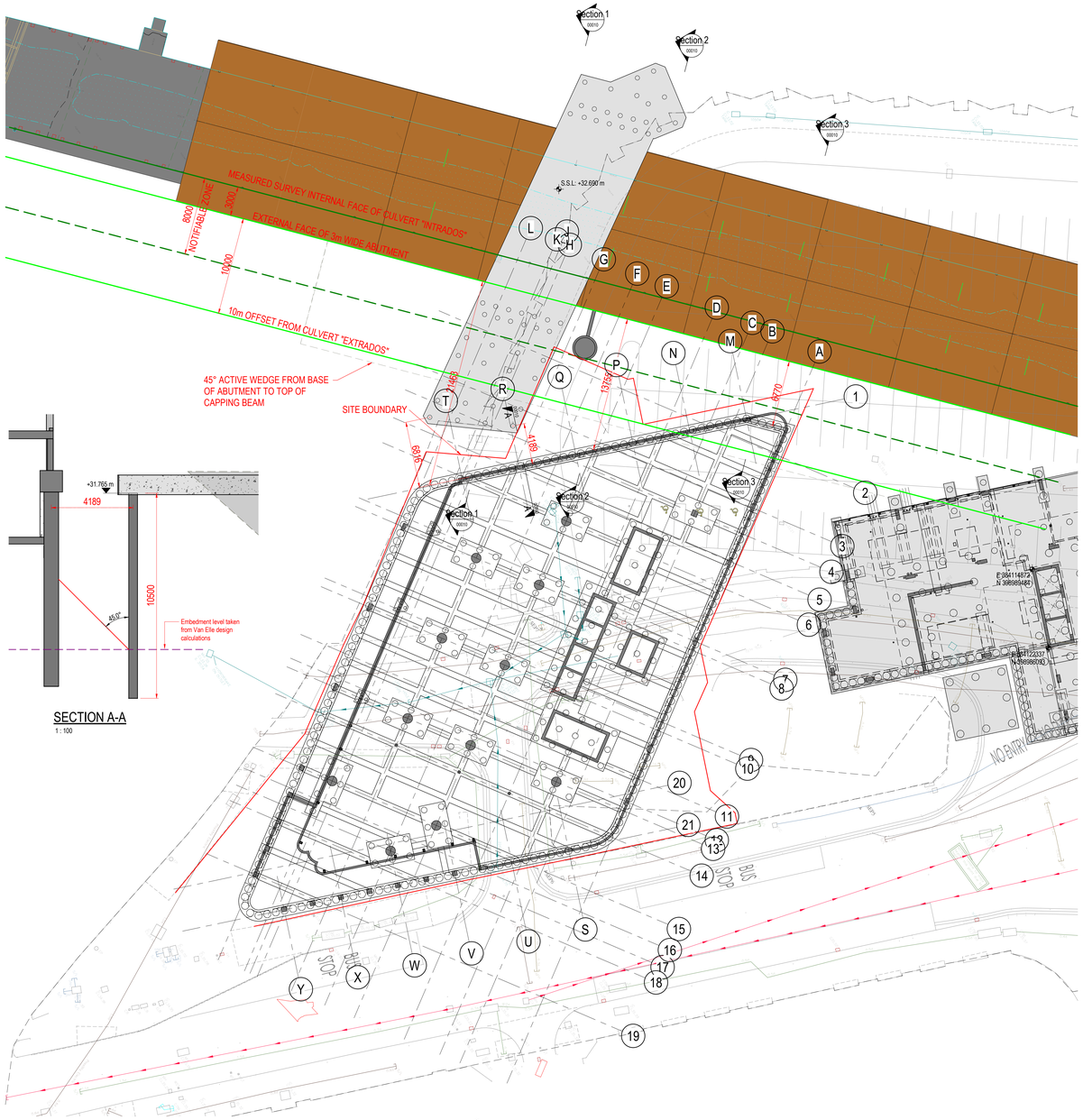
Conclusion

It is near impossible to unequivocally demonstrate the office development has no interaction with the adjacent NR asset. The design and NR risk reduction elements discussed above whilst considering the conservative nature of the pile shaft horizontal deflection assessment demonstrate that the new office development will cause no detrimental disturbance or structural effect to the existing NR River Irk culvert asset.

It has been discussed that the NR/L2/CIV/003FormG document may be suitable for the formal submission and acceptance method.

Next Steps

Once an approval in principle has been received from NR the Form G paperwork will formally submitted for acceptance or comment.



PLAN
1 : 200

SECTION A-A
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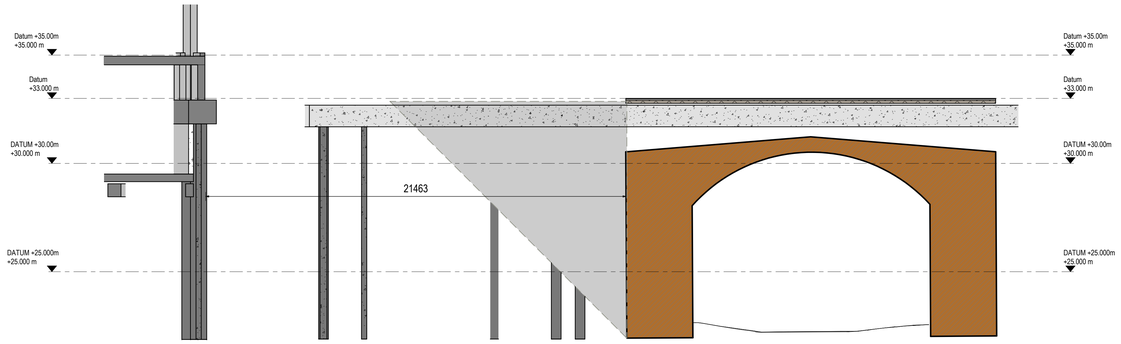
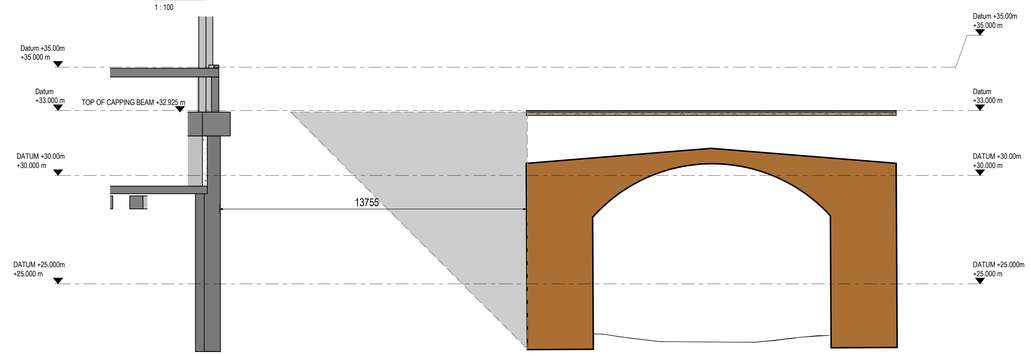
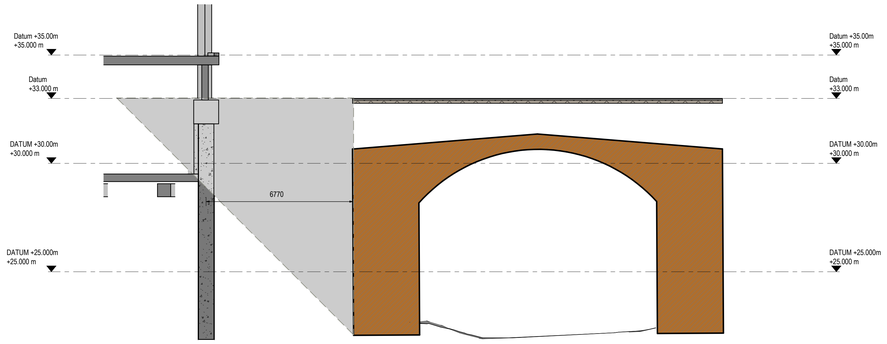


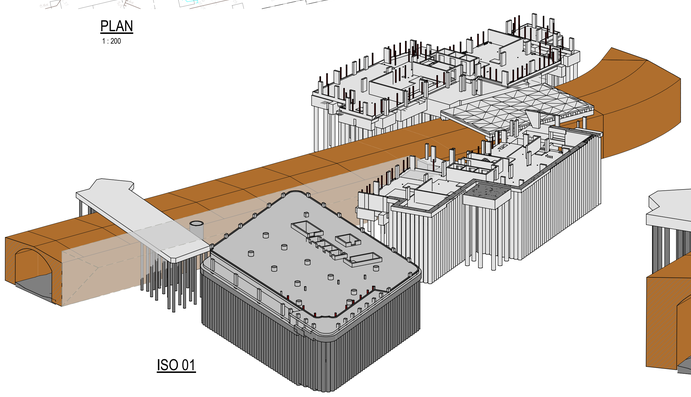
Section 1
1 : 100



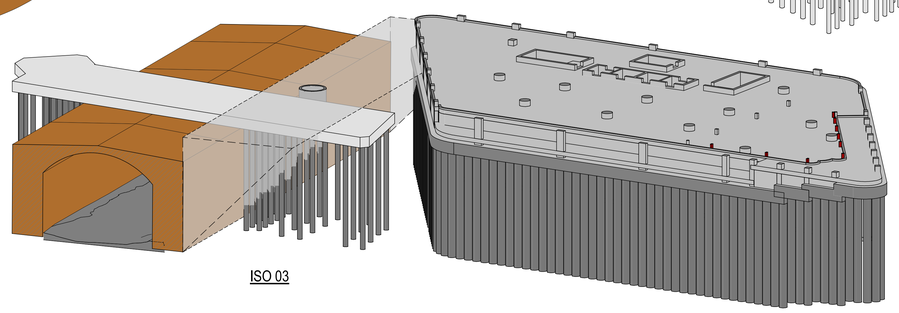
Section 2
1 : 100



Section 3
1 : 100



ISO 01



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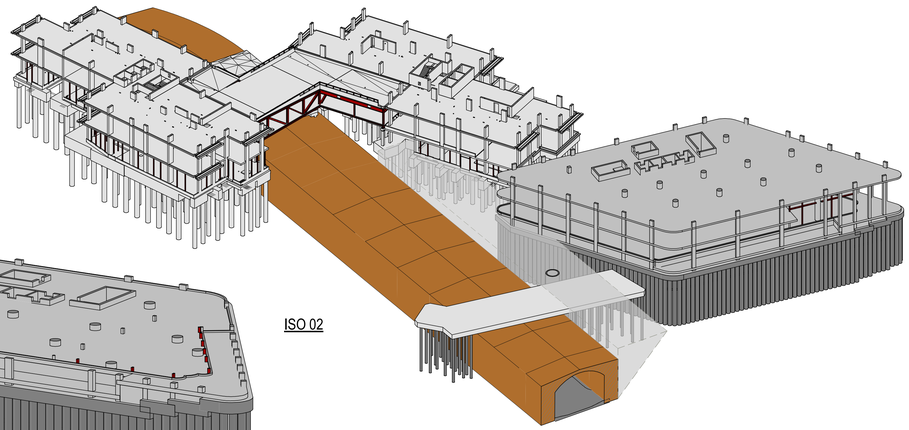

ISO 02

REV	DATE	DESCRIPTION	BY	APP
P06	12.10.2022	SECTION A-A ADDED	CW	DS
P05	08.09.2022	BASEMENT EXTENT REDUCED TO REFLECT NATIONAL RAIL DISCUSSION	CW	DS
P04	07.09.2022	UPDATED FOR NETWORK RAIL DISCUSSION	CW	DS
P03	21.07.2022	UPDATED FOR NETWORK RAIL DISCUSSION	KB	DS
P02	21.04.2022	SHADOW LOAD TRIANGLE ADDED FOR VISUAL PURPOSES	CW	DS
P01	01.04.2022	STAGE 2 ISSUE - PRELIMINARY	CW	DS

DRAWING STATUS:
PRELIMINARY

CLIENT:
MORGAN CAPITAL

ARCHITECT:
PIERCY & COMPANY

PROJECT:
NEW VICTORIA OFFICE

TITLE:
STRUCTURE CULVERT LOCATION PLAN

STATUS	PROJECT No.	PROJECT	ORIGIN	FUNCT.	SPECIAL	FORM	DISC	DRAWING No.	REV
S2	221-132	NV	-AJP-	XX -	XX -	SK -	S -	00010	P06

SCALE @ A0	DESIGNED:	DRAWN:	CHECKED:	APPROVED:	DATE:
1:200	M. Carr	C. Webber	D. Sinclair	D. Sinclair	April 2022

AJP consulting engineers
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1st November 2022

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New Victoria Office Block Interaction Assessment with Station Canopy Roof

A new office block complete with single story basement is proposed to be constructed as part of the New Victoria development in Manchester, which is located immediately southeast of the Manchester Victoria Train Station. Byland Engineering Limited (BEL) have been appointed by Alan Johnston Partnership (AJP) to undertake a preliminary review of the interaction between the existing Manchester Victoria Station Canopy Roof piled foundations and the new office block basement.

1. Site Location & Scope

The site is bound to the north by Manchester Victoria Station and to the west by the Transport for Greater Manchester tram lines. To the northeast of the site is the Phase 1 residential development of New Victoria and to the southwest of the site is Corporation Street. The buried River Irk Culvert passes north of the office development, below the Manchester Victoria Station.

The office development is a 10-story block with a single-story basement with formation level of approx. 29mOD and a retained height of approx. 4.0-5.5m (higher adjacent to Corporation Rd where ground level are approx. 35mOD). Proposals are to construct the basement within an embedded contiguous pile wall, locally propped in the temporary condition and permanently propped at all locations by reinforced concrete basement and ground floor slabs.

This letter report considers the interaction between the station canopy roof piled foundations and the embedded contiguous pile wall, which at the closest point are 4.19m apart.

2. Documentation

1. NV-AJP-XX-XX-SK-S-00010 New Victoria Office, Structure Culvert Location Plan, Rev P03
2. 100262-HYD-02-ZZ-DR-S-GXX-4510 Manchester Victoria Station Redevelopment Metrolink, Pile Setting-Out GA, Rev AFC1, dated 11/10/13
3. 100262-HYD-02-ZZ-DR-S-GXX-4531 Manchester Victoria Station Redevelopment Metrolink, Culvert Bridge Structures Details and Sections, Rev AFC1, dated 11/10/13
4. VE/120448/03 Manchester Victoria, Buttress Culvert Bridge Piles (sheet 1 of 2), Rev P3
5. 120448 Van Elle Limited Pile Design Schedule, Rev P3, dated 9/07/13

3. Ground Conditions

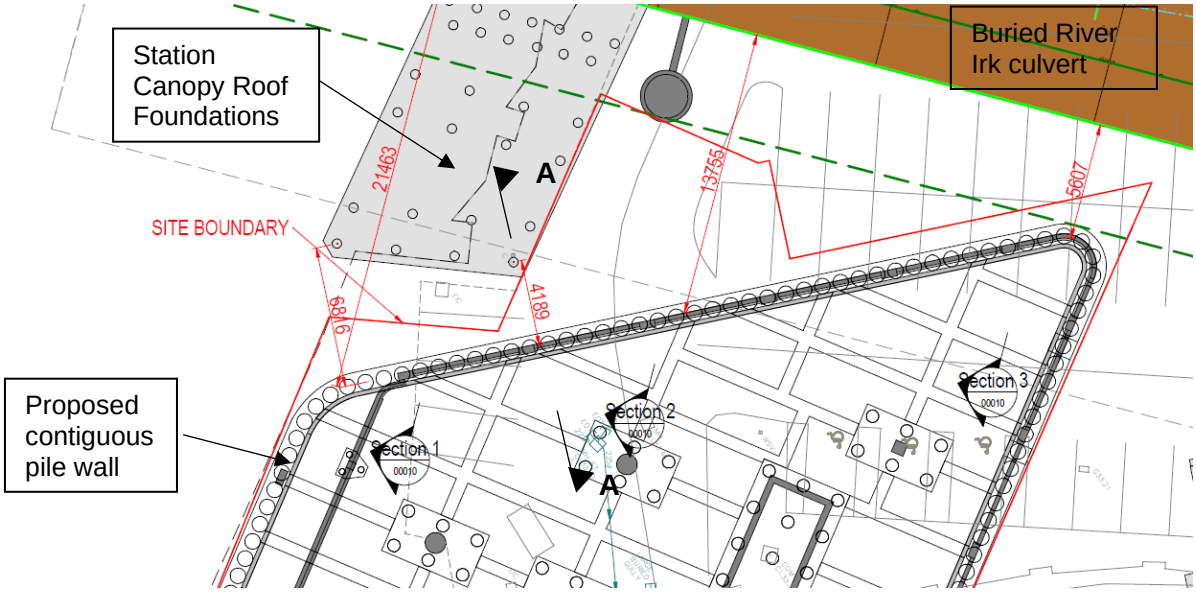
The ground conditions encountered are briefly summarised as follows.

British Geological Survey 1:50,000 geological map sheet 85 for Manchester identifies the site to be underlain by superficial deposits of Made Ground, overlying possible Alluvium & Glacial Till. The solid geology is recorded to be the Chester Pebble Beds Formation of the Triassic Sherwood Sandstone (sandstone reddish brown moderately cemented).

Relevant exploratory holes from numerous phases of ground investigation identify the ground conditions to comprise Made Ground to between 31mOD and 26mOD overlying the Sherwood Sandstone.

4. Interaction Assessment

The closest point between the proposed embedded contiguous pile wall and the existing Canopy Roof piled foundations is shown in drawing NV-AJP-XX-XX-SK-S-00010 Rev P03 an extract of which is provided below:



The interaction between the Station Canopy Roof and the new development will be considered at Section A-A, identified above.

Design drawings of the station canopy roof identify the closest pile to be P45. The Van Elle (VE) pile schedules identify the pile to comprise a 450mm diameter pile with a 10.5m design pile length (toe level 22.3mOD) subject to a minimum 2.5m rock socket.

At section A-A, existing ground level is approximately 33.3mOD, therefore, the proposed basement retained height is approx. 4.2m. A sketch of Section A-A is enclosed within this report and demonstrates that the closest station canopy pile (P45) is outside the 45° active wedge line taken from formation level of the embedded contiguous pile wall. As the bearing pile is wholly outside of the 45° active wedge, the following can be stated:

1. Being outside of the active wedge, the axial capacity of the station canopy piles will be unaffected. Furthermore, the axial capacity of the station canopy piles is generated from the rock socket length at depth below the basement such that works above this level should not impact on the resistance to the axial loads.

2. Outside of the active wedge there is no change to the soil state. Therefore, no additional loads (lateral or axial) will be induced on the station canopy roof piled foundations.

The proposed office development basement embedded wall will also support column loads from the superstructure, however with a minimum pile centre to centre spacing of 4.189m this represents approx. 7 x (600mm) pile diameters, which is greater than the typical 3 x pile diameters to avoid interaction effects and is therefore satisfactory.

Finally, the provided pile schedules identify a characteristic shear force of 65kN applied to P45 (which is typical or the piles within the closest pile cap). By inspection the load path for the horizontal force will be through the soil, into the contiguous pile wall which will distribute it to the ground floor and basement floor slabs to resist this force. Thus, the detailed design can consider this shear force applied to the contiguous pile wall with the piles, temporary props and permanent props designed to accommodate this theoretical maximum loading (very conservative as it assumes no load dissipation through the ground).

5. Summary

The interaction between the new office block and the piled Manchester Victoria Station Canopy has been considered within this letter report.

Overall, the impact of the new basement development on the existing station canopy piled foundations is considered to be negligible for the following reasons:

1. The 45° active wedge line, taken from formation level of the embedded contiguous pile wall, does not intersect the station canopy roof bearing piles. Therefore, no additional load (lateral or axial) will be induced on the station canopy roof bearing foundations.

2. The existing station canopy piles generate their axial resistance from the rock socket length which is below basement formation level.

3. The existing station canopy piles and embedded contiguous wall piles are min 7 x pile (600mm) diameter φ apart, which is greater than the typical minimum spacing of 3 x pile diameter to avoid interaction effects.

4. The detailed design of the contiguous pile wall, temporary props and permanent props will be designed to accommodate the maximum theoretical shear force from P45.

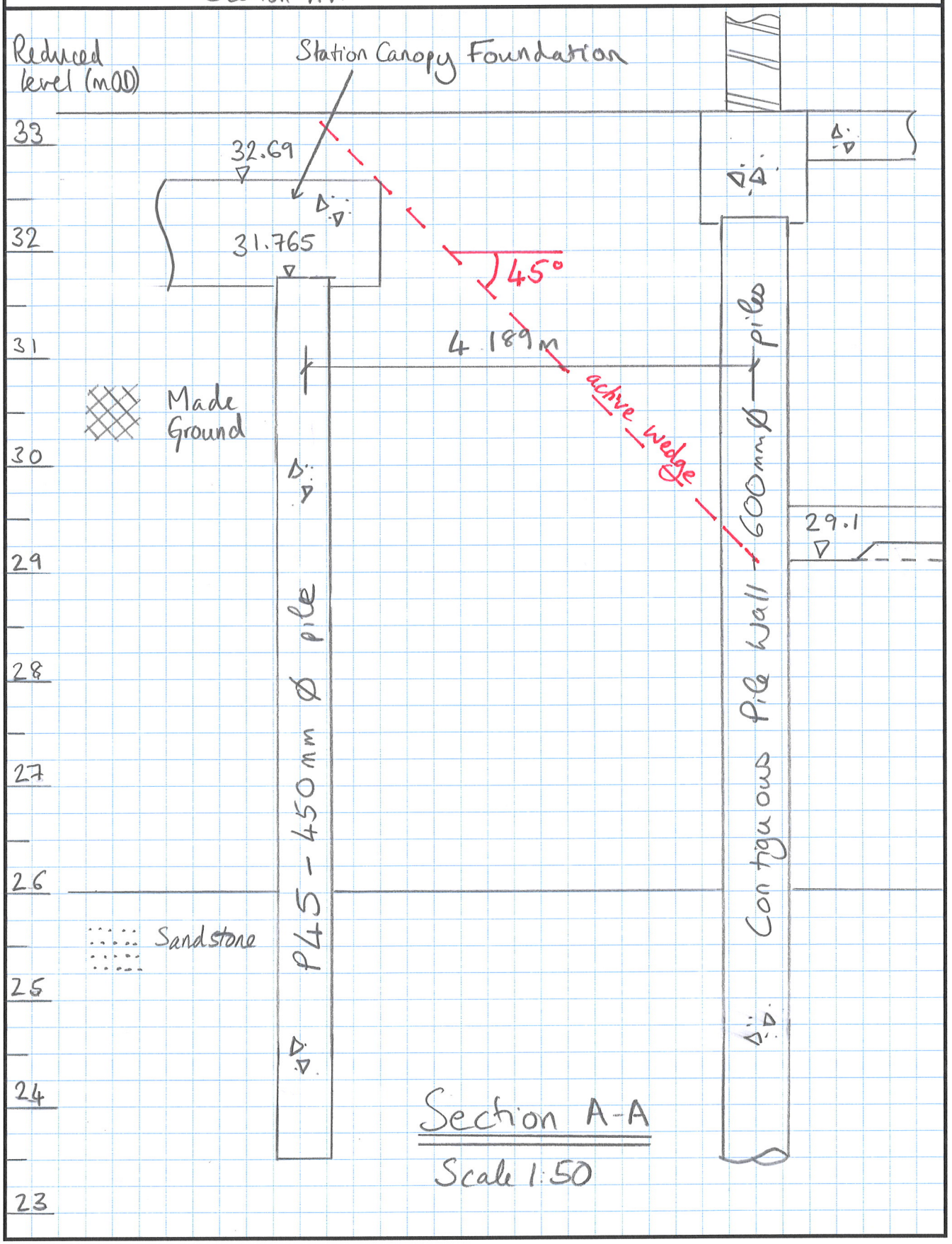
Yours sincerely,

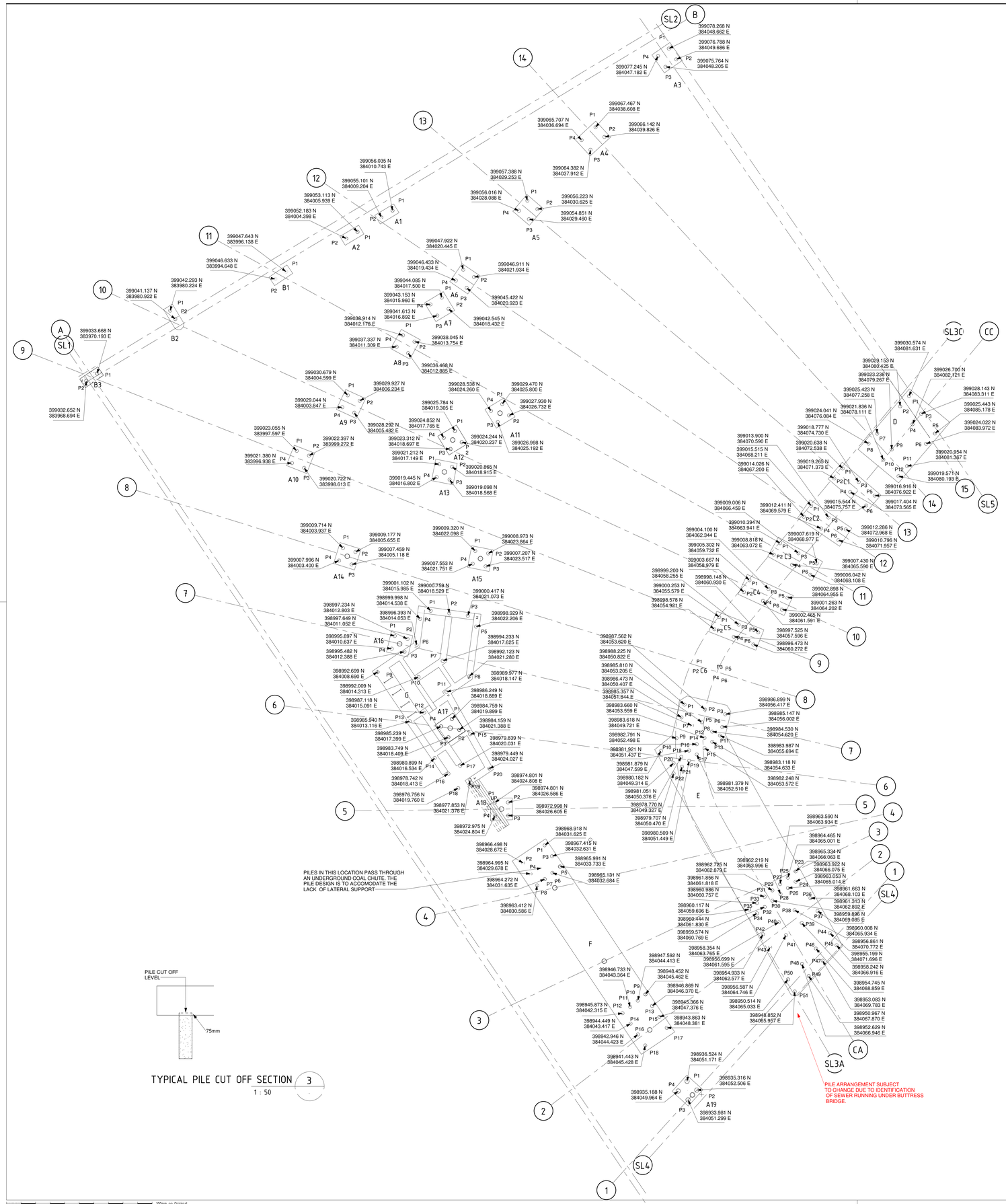
James Binns
BSc MSc CEng MICE FGS
Director

Enclosed

1. 2103 – New Victoria, Office Development – Interaction with station canopy, Section A-A
2. 100262-HYD-02-ZZ-DR-S-GXX-4510 Manchester Victoria Station Redevelopment Metrolink, Pile Setting-Out GA, Rev AFC1, dated 11/10/13
3. 100262-HYD-02-ZZ-DR-S-GXX-4531 Manchester Victoria Station Redevelopment Metrolink, Culvert Bridge Structures Details and Sections, Rev AFC1, dated 11/10/13
4. VE/120448/03 Manchester Victoria, Buttress Culvert Bridge Piles (sheet 1 of 2), Rev P3
5. 120448 Van Elle Limited Pile Design Schedule, Rev P3, dated 9/07/13

Byland	Calculations		
Job No. 2103	Originator ML	Date 23/08/22	
Job Name New victoria - Office.	Checker	Date	
Section Interaction with station canopy Section A-A	Revision	Page	





TYPICAL PILE CUT OFF SECTION 3
1 : 50

Notes:

1. DO NOT SCALE FROM THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH DRAWING No. 100262-HYD-02-ZZ-DR-S-GXX-4500 (CURRENT REVISION).
3. REFER TO DRAWING 4520 FOR PILECAP SETTING-OUT.
4. REFER TO DRAWING 4511 & 4512 FOR PILE LOADS.
5. THE CO-ORDINATES SHOWN ON THE PLAN ARE DERIVED DIRECTLY FROM THE STRUCTURAL MODEL. THE CO-ORDINATES SHOWN IN THE TABLES ARE HAND COPIED FROM THE PLAN FOR INFORMATION FOR THE CONTRACTOR. THE CO-ORDINATES SHOULD BE CROSS-CHECKED BY THE INSTALLER AND ANY DISCREPANCIES HIGHLIGHTED TO THE ENGINEER FOR RESOLOUTION PRIOR TO INSTALLING PILES.

PILE CO-ORDINATES

PILE CAP REFERENCE	PILE REFERENCE	EASTING	NORTHING	PILE CUT OFF LEVEL	Pile Dia (mm)
4 - PILE PILECAPS					
A3	P1	384048.662	399078.268	32.775	450
	P2	384049.686	399076.788	32.775	450
	P3	384048.205	399075.764	32.775	450
	P4	384047.182	399077.245	32.775	450
A4	P1	384038.608	399067.467	33.075	450
	P2	384039.826	399066.142	33.075	450
	P3	384037.912	399064.382	33.075	450
	P4	384036.694	399065.707	33.075	450
A5	P1	384029.253	399057.388	33.025	450
	P2	384030.625	399056.223	33.025	450
	P3	384029.460	399054.851	33.025	450
	P4	384028.088	399056.016	33.025	450
A6	P1	384020.445	399047.922	33.075	450
	P2	384021.934	399046.911	33.075	450
	P3	384020.923	399045.422	33.075	450
	P4	384019.434	399046.433	33.075	450
A7	P1	384017.500	399044.085	33.075	450
	P2	384018.432	399042.545	33.075	450
	P3	384016.892	399043.153	33.075	450
	P4	384015.960	399043.553	33.075	450
A8	P1	384012.178	399038.914	33.075	450
	P2	384013.754	399038.045	33.075	450
	P3	384012.885	399036.468	33.075	450
	P4	384011.309	399037.337	33.075	450
A9	P1	384004.599	399030.679	32.875	450
	P2	384006.234	399029.927	32.875	450
	P3	384005.482	399028.292	32.875	450
	P4	384003.847	399029.044	32.875	450
A10	P1	383997.597	399023.055	32.875	450
	P2	383999.272	399022.397	32.875	450
	P3	383998.613	399020.722	32.875	450
	P4	383996.938	399021.380	32.875	450
A11	P1	384024.260	399028.538	32.575	450
	P2	384025.800	399029.470	32.575	450
	P3	384026.732	399027.930	32.575	450
	P4	384024.244	399025.784	32.575	450
A12	P1	384017.765	399024.852	32.575	450
	P2	384018.915	399020.865	32.575	450
	P3	384018.568	399019.098	32.575	450
	P4	384018.697	399023.312	32.575	450
A13	P1	384017.149	399021.212	32.575	450
	P2	384016.802	399019.445	32.575	450
A14	P1	384005.655	399009.177	32.675	450
	P2	384005.118	399007.459	32.675	450
	P3	384003.400	399007.996	32.675	450
	P4	384003.937	399009.714	32.675	450
A15	P1	384022.098	399009.320	32.525	450
	P2	384023.864	399008.973	32.525	450
	P3	384021.751	399007.553	32.525	450
	P4	384021.407	399007.207	32.525	450
A16	P1	384010.637	398995.897	32.075	450
	P2	384011.052	398997.649	32.075	450
	P3	384012.388	398995.482	32.075	450
	P4	384009.803	398997.234	32.075	450
A17	P1	384018.889	398986.268	32.175	450
	P2	384019.899	398984.759	32.175	450
	P3	384018.409	398983.748	32.175	450
	P4	384017.399	398985.238	32.175	450
A18	P1	384024.801	398974.808	32.275	450
	P2	384025.801	398973.301	32.275	450
	P3	384024.296	398972.298	32.275	450
	P4	384023.296	398973.805	32.275	450
A19	P1	384051.171	398936.524	32.675	450
	P2	384052.506	398935.316	32.675	450
	P3	384051.299	398933.981	32.675	450
	P4	384049.964	398935.188	32.675	450
2 - PILE PILECAPS					
A1	P1	384009.204	399055.101	33.125	450
	P2	384010.743	399056.035	33.125	450
A2	P1	384005.939	399053.113	33.125	450
	P2	384004.398	399052.183	33.125	450
B1	P1	383996.138	399047.643	33.385	450
	P2	383994.648	399046.633	33.385	450
B2	P1	383980.224	399042.293	33.075	450
	P2	383980.922	399041.137	33.075	450
B3	P1	383970.193	399033.668	33.075	450
	P2	383968.694	399032.652	33.075	450
6 - PILE PILECAPS					
C1	P1	384072.538	399020.638	31.275	450
	P2	384073.565	399019.265	31.275	450
	P3	384074.730	399018.777	31.275	450
	P4	384073.565	399017.404	31.275	450
	P5	384076.922	399016.916	31.275	450
	P6	384075.757	399015.544	31.275	450
C2	P1	384077.258	399025.423	31.275	450
	P2	384078.111	399021.836	31.275	450
	P3	384076.084	399024.041	31.275	450
	P4	384074.730	399018.777	31.275	450
	P5	384072.538	399020.638	31.275	450
	P6	384071.373	399019.265	31.275	450
C3	P1	384063.941	399010.394	31.275	450
	P2	384062.966	399012.411	31.275	450
	P3	384064.131	399014.026	31.275	450
	P4	384065.106	399012.411	31.275	450
	P5	384068.977	399007.618	31.275	450
	P6	384067.812	399009.006	31.275	450
C4	P1	384063.072	399008.818	31.275	450
	P2	384062.577	399003.667	31.275	450
	P3	384064.746	399006.042	31.275	450
	P4	384065.033	399004.100	31.275	450
	P5	384059.732	399005.302	31.275	450
	P6	384058.979	399003.667	31.275	450
C5	P1	384061.591	399001.263	31.275	450
	P2	384060.930	398998.148	31.275	450
	P3	384064.202	399002.465	31.275	450
	P4	384065.957	398948.852	31.275	450
	P5	384057.596	398997.525	31.275	450
	P6	384060.272	398996.473	31.275	450
C6	P1	384056.016	399056.223	31.275	450
	P2	384057.388	399055.016	31.275	450
	P3	384054.851	399054.460	31.275	450
	P4	384053.620	399055.857	31.275	450
	P5	384056.002	399985.147	31.275	450
	P6	384053.572	399982.248	31.275	450
D	P1	384077.258	399025.423	31.275	450
	P2	384078.111	399021.836	31.275	450
	P3	384083.311	399028.143	31.275	450
	P4	384083.972	399024.022	31.275	450
	P5	384085.178	399025.443	31.275	450
	P6	384081.367	399020.954	31.275	450
	P7	384076.084	399024.041	31.275	450
	P8	384074.730	399018.777	31.275	450
	P9	384072.538	399020.638	31.275	450
	P10	384071.373	399019.265	31.275	450
	P11	384080.193	399019.571	31.275	450
	P12	384076.922	399016.916	31.275	450
E	P1	384082.425	399029.153	31.275	450
	P2	384079.267	399023.238	31.275	450
	P3	384082.121	399026.700	31.275	450
	P4	384083.311	399028.143	31.275	450
	P5	384081.367	399020.954	31.275	450
	P6	384080.193	399019.571	31.275	450
	P7	384077.258	399025.423	31.275	450
	P8	384076.084	399024.041	31.275	450
	P9	384074.730	399018.777	31.275	450
	P10	384073.565	399017.404	31.275	450
	P11	384076.922	399016.916	31.275	450
	P12	384075.757	399015.544	31.275	450
	P13	384072.968	399012.411	31.275	450
	P14	384071.957	399010.796	31.275	450
	P15	384063.941	399010.394	31.275	450
	P16	384062.966	399012.411	31.275	450
	P17	384064.131	399014.026	31.275	450
	P18	384065.106	399012.411	31.275	450
	P19	384068.977	399007.618	31.275	450
	P20	384067.812	399009.006	31.275	450
	P21	384063.072	399008.818	31.275	450
	P22	384062.577	399003.667	31.275	450
	P23	384064.746	399006.042	31.275	450
	P24	384065.033	399004.100	31.275	450
	P25	384059.732	399005.302	31.275	450
	P26	384058.979	399003.667	31.275	450
	P27	384061.591	399001.263	31.275	450
	P28	384060.930	398998.148	31.275	450
	P29	384064.202	399002.465	31.275	450
	P30	384065.957	398948.852	31.275	450
	P31	384057.596	398997.525	31.275	450
	P32	384060.272	398996.473	31.275	450
	P33	384056.002	398985.147	31.275	450
	P34	384053.572	398982.248	31.275	450
	P35	384056.016	399056.223	31.275	450
	P36	384057.388	399055.016	31.275	450
	P37	384054.851	399054.460	31.275	450
	P38	384053.620	399055.857	31.275	450
	P39	384056.002	398985.147	31.275	450
	P40	384053.572	398982.248	31.275	450
	P41	384064.465	399964.465	31.275	450
	P42	384065.001	399965.334	31.275	450
	P43	384066.063	399963.922	31.275	450
	P44	384066.075	399963.053	31.275	450
	P45	384065.014	399961.663	31.275	450
	P46	384068.103	399961.313	31.275	450
	P47	384062.892	399959.896	31.275	450
	P48	384069.085	399960.008	31.275	450
	P49	394065.934	398956.861	31.275	450
	P50	384070.772	398955.199	31.275	450
	P51	384071.696	398958.242	31.275	450
	P52	384066.916	398954.745	31.275	450
	P53	384068.859	398953.083	31.275	450
	P54	384069.783	398950.967	31.275	450
	P55	384067.870	398952.629	31.275	450
	P56	384066.946	398953.083	31.275	450

PILE CO-ORDINATES

PILE CAP REFERENCE	PILE REFERENCE	EASTING	NORTHING	PILE CUT OFF LEVEL	Pile Dia (mm)
6- PILE PILECAPS					
C4	P1	384059.732	399005.302	31.275	450
	P2	384058.979	399003.667	31.275	450
	P3	384062.344	399004.100	31.275	450
	P4	384061.591	399002.465	31.275	450
	P5	384064.955	399002.898	31.275	450
	P6	384064.202	399001.263	31.275	450
C5	P1	384055.578	399000.253	31.275	450
	P2	384054.921	398998.518	31.275	450
	P3	384058.255	398999.200	31.275	450
	P4	384057.596	398997.525	31.275	450
	P5	384060.930	398998.148	31.275	450
	P6	384060.272	398996.473	31.275	450
C6	P1	384052.151	398994.644	31.275	450
	P2	384051.614	398992.926	31.275	450
	P3	384054.895	398993.786	31.275	450
	P4	384054.358	398992.068	31.275	450
	P5	384057.839	398992.980	31.275	450
	P6	384051.102	398991.211	31.275	450
LINKED BUTTRESSES					
D	P1	384081.431	399030.574	31.275	450
	P2	384080.425	399029.153	31.275	450
	P3	384083.311	399028.143	31.275	450
	P4	384082.121	399026.700	31.275	450
	P5	384085.178	399025.443	31.275	450
	P6	384083.972	399024.022	31.275	450
	P7	384077.258	399025.423	31.275	450
	P8	384076.084	399024.041	31.275	450
	P9	384079.267	399023.238	31.275	450
	P10	384078.111	399021.836	31.275	450
	P11	384081.367	399020.954	31.275	450
	P12	384080.193	399019.571	31.275	450
BUTTRESS SLAB OVER CULVERT					
F	P1	384050.822	398988.225	31.765	450
	P2	384053.620	398987.562	31.765	450
	P3	384056.417	398986.899	31.765	450
	P4	384055.857	398985.147	31.765	450
	P5	384053.572	398982.248	30.565	450
	P6	384056.002	398983.147	30.565	450
	P7	384057.258	398977.853	31.765	450
	P8	384056.086	398963.412	30.565	450
	P9	384054.462	398958.452	30.565	450
	P10	384054.413	398947.592	30.565	450
	P11	384053.364	398946.733	30.565	450
	P12	384052.315	398945.873	30.565	450
	P13	384051.266	398944.449	30.565	450
	P14	384050.217	398943.863	31.765	450
	P15	384049.168	398942.946	31.765	450
	P16	384048.119	398941.443	31.765	450
	P17	384047.070	398939.574	31.765	450
	P18	384046.021	398937.853	31.765	450
	P19	384044.972	398936.524	31.765	450
	P20	384043.923	398935.188	31.765	450
	P21	384042.874	398933.981	31.765	450
	P22	384041.825	398935.316	30.565	450
	P23	384040.776	398936.524	30.565	450
	P24	384039.727	398937.853	30.565	450
	P25	384038.678	398939.574	30.565	450
	P26	384037.629	398941.443	30.565	450
	P27	384036.580	398942.946	30.565	450
	P28	384035.531	398944.449	30.565	450
	P29	384034.482	398945.873	30.565	450
	P30	384033.433	398946.733	30.565	450
	P31	384032.384	398947.592	30.565	450
	P32	384031.335	398958.452	30.565	450
	P33	384030.586	398963.412	30.565	450
	P34	384029.758	398977.853	30.565	450
	P35	384028.929	398982.248	30.565	450
	P36	384027.100	398983.147	30.565	450
	P37	384026.271	398977.853	30.565	450
	P38	384025.442	398958.452	30.565	450
	P39	384024.613	398947.592	30.565	450
	P40	384023.784	398946.733	30.565	450
	P41	384022.955	398945.873	30.565	450
	P42	384021.126	398944.449	30.565	450
	P43	384020.297	398943.863	30.565	450
	P44	384019.468	398942.946	30.565	450
	P45	384018.639	398941.443	30.565	450
	P46	384017.810	398939.574	30.565	450
	P47	384016.981	398937.853	30.565	450
	P48	384015.152	398936.524	30.565	450
	P49	384014.323	398935.188	30.565	450
	P50	384013.494	398933.981	30.565	450
	P51	384012.665	398935.316	30.565	450
COLUMN SLAB OVER CULVERT					
F	P1	384031.625	398968.918	31.765	450
	P2	384028.672	398966.498	31.765	450
	P3	384032.631	398967.410	31.765	450
	P4	384029.678	398964.995	31.765	450
	P5	384033.733	398965.991	30.565	450
	P6	384032.684	398965.131	30.565	450
	P7	384031.635	398964.272	30.565	450
	P8	384030.586	398963.412	30.565	450
	P9	384045.462	398948.452	30.565	450
	P10	384044.413	398947.592	30.565	450
	P11	384043.364	398946.733	30.565	450
	P12	384042.315	398945.873	30.565	450
	P13	384041.266	398944.449	30.565	450
	P14	384040.217	398943.863	31.765	450
	P15	384039.168	398942.946	31.765	450
	P16	384038.119	398941.443	31.765	450
	P17	384037.070	398939.574	31.765	450
	P18	384036.021	398937.853	31.765	450
	P19	384034.972	398936.524	31.765	450
	P20	384033.923	398935.188	31.765	450
	P21	384032.874	398933.981	31.765	450
	P22	384031.825	398935.316	30.565	450
	P23	384030.776	398936.524	30.565	450
	P24	384029.727	398937.853	30.565	450
	P25	384028.678	398939.574	30.565	450
	P26	384027.629	398941.443	30.565	450
	P27	384026.580	398942.946	30.565	450
	P28	384025.531	398944.449	30.565	450
	P29	384024.482	398945.873	30.565	450
	P30	384023.433	398946.733	30.565	450
	P31	384022.384	398947.592	30.565	450
	P32	384021.335	398958.452	30.565	450
	P33	384020.586	398963.412	30.565	450
	P34	384019.758	398977.853	30.565	450
	P35	384018.929	398982.248	30.565	450
	P36	384017.100	398983.147	30.565	450
	P37	384016.271	398977.853	30.565	450
	P38	384015.442	398958.452	30.565	450
	P39	384014.613	398947.592	30.565	450
	P40	384013.784	398946.733	30.565	450
	P41	384012.955	398945.873	30.565	450
	P42	384011.126	398944.449	30.565	450
	P43	384010.297	398943.863	30.565	450
	P44	384009.468	398942.946	30.565	450
	P45	384008.639	398941.443	30.565	450
	P46	384007.810	398939.574	30.565	450
	P47	384006.981	398937.853	30.565	450
	P48	384005.152	398936.524	30.565	450
	P49	384004.323	398935.188	30.565	450
	P50	384003.494	398933.981	30.565	450
	P51	384002.665	398935.316	30.565	450
MEZZANINE					
G	P1	384015.985	399001.102	32.055	450
	P2	384018.529	399000.759	32.055	450
	P3	384021.073	399000.417	32.055	450
	P4	384014.538	398999.998	33.055	450
	P5	384022.207	398998.929	32.055	450
	P6	384014.053	398996.393	33.055	450
	P7	384011.625	398994.233	33.055	450
	P8	384021.280	398992.123	32.055	450
	P9	384008.690	398992.699	33.055	450
	P10	384009.313	398992.009	32.055	450
	P11	384018.147	398989.977	32.055	450
	P12	384015.091	398987.118	32.055	450
	P13	384013.116	398985.940	33.055	450
	P14	384016.534	398980.899	33.055	450
	P15	384021.388	398984.159	32.055	450
	P16	384018.413	398978.742	32.280	450
	P17	384020.031	398979.839	32.280	450
	P18	384019.760	398976.756	32.280	450
	P19	384021.378	398977.853	32.055	450
	P20	384024.027	398979.449	32.055	450

Approved For Construction

Signed _____

Name _____

Date _____

Contractor's Engineering Manager (Construction Phase)

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
AFC1	11.10.13	APPROVED FOR CONSTRUCTION	GRB	ACD	AD
D06	13.09.13	FORM 3 SUBMISSION	SR	ACD	AD
D05	26.08.13	FORM 3 SUBMISSION FOUNDATIONS	SR	ACD	JL
D04	31.07.13	FORM 3 SUBMISSION MEZZANINE FOUNDATIONS	SR	ACD	JL
D03	05.07.13	FORM 3 SUBMISSION, CULVERT STRUCTURES	SR	ACD	JL
D02	18.07.13	FORM 3 SUBMISSION, CULVERT STRUCTURES	SR	ACD	JL
D01	20.06.13	FORM 3 SUBMISSION, PILES AND PILECAPS	SR	ACD	JL

APPROVED FOR CONSTRUCTION

Transport for Greater Manchester

NetworkRail

Hyder Consulting (UK) Limited
10 Fairscroft Court, Centre Park
Warrington, WA1 1RQ
Phone 44 (0)1925 893 256
Fax 44 (0)1925 572 442

Contractor(s):

MORGAN SINDALL

Project:

MANCHESTER VICTORIA STATION REDEVELOPMENT METROLINK

Drawing Title:

PILE SETTING-OUT GA

Designed	D.ROWLINSON	Signed	Date
Drawn	S. ROBERTS	Signed	Date
Checked	A. C-DAVIES	Signed	Date
Approved	A DUGDALE	Signed	Date
Scale(s)	As indicated	ELR & Mileage	
Alternative Reference	UA004621		Sheet
Drawing Number	100262-HYD-02-ZZ-DR-S-GXX-4510		Revision AFC1

100mm on Original

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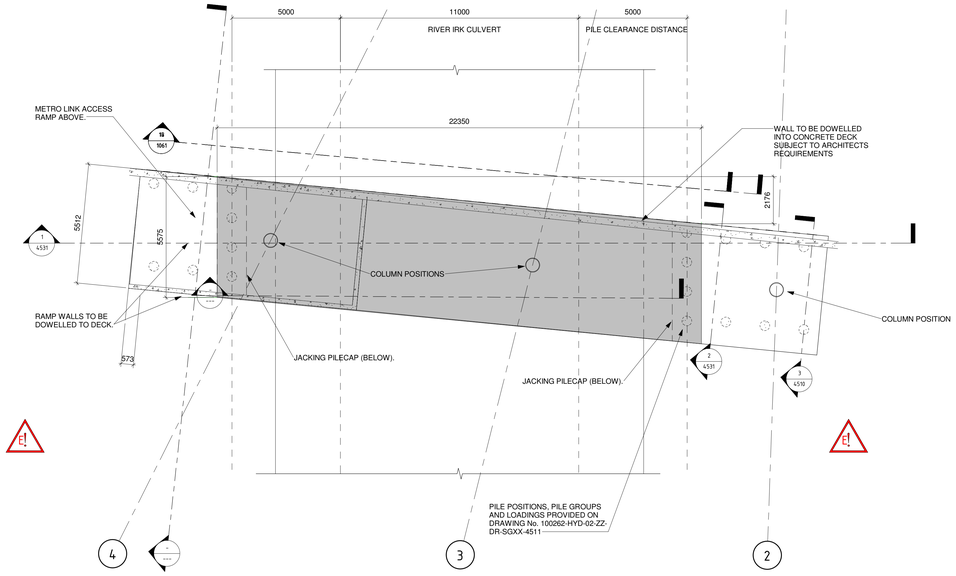
Sheet Size AD 1188x841



COLUMN BRIDGE DECK AND PILECAP PLAN 4
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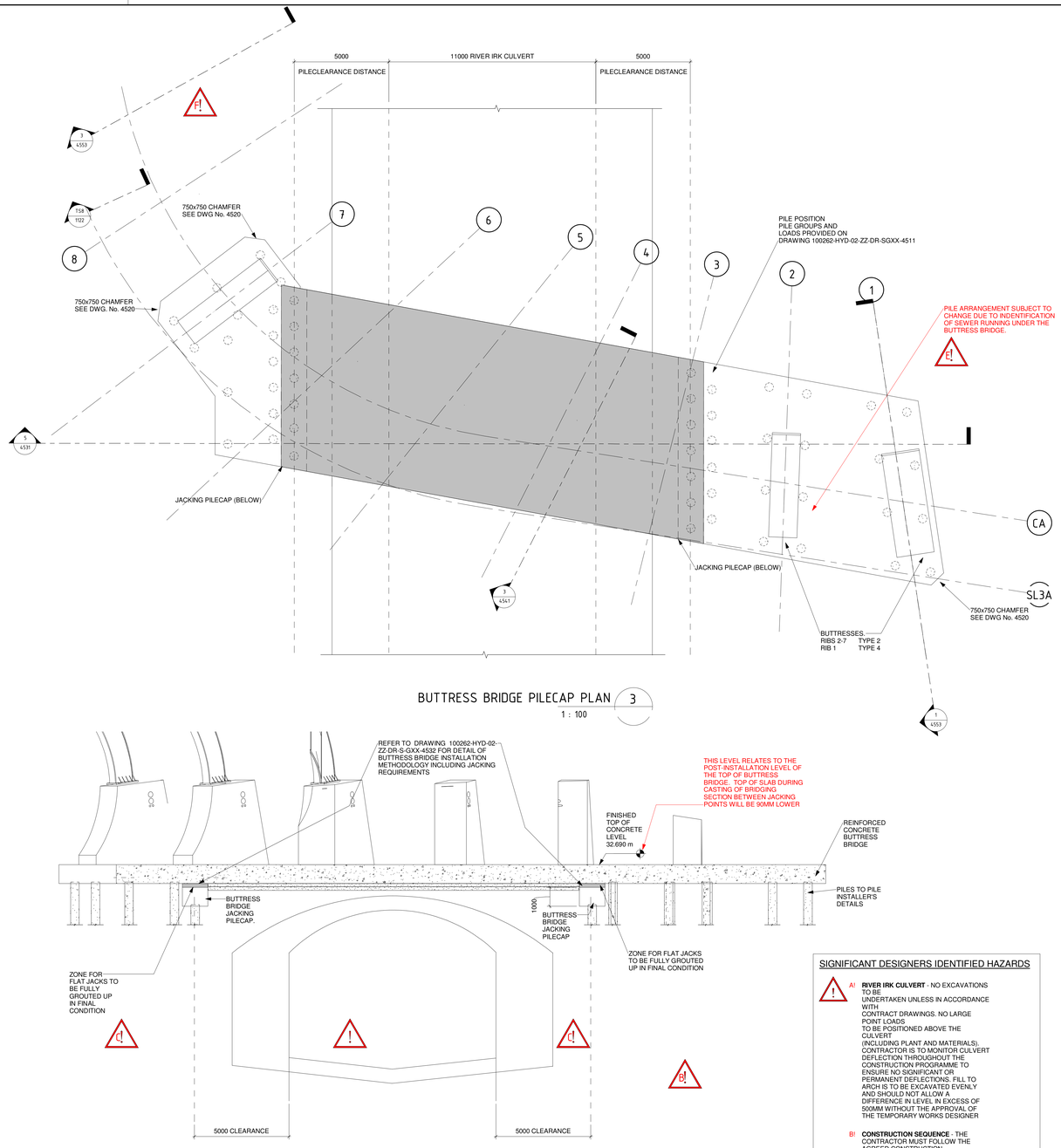

BUTTRESS BRIDGE PILECAP PLAN 3
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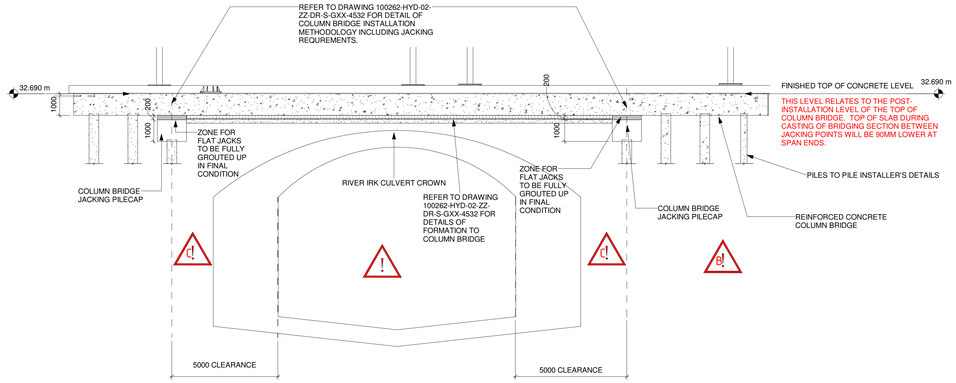
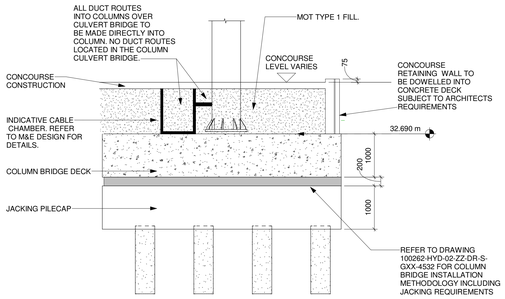


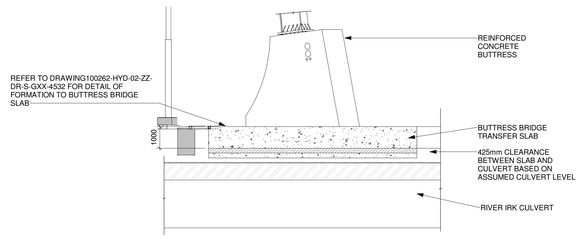
SECTION 1 1 / 4531
1 : 100

(WALL DETAILS OMITTED FOR CLARITY)



SECTION 2 2 / 4531
1 : 50

SECTION 5 5 / 4531
1 : 100



SECTION 6 6 / 4531
1 : 100

SIGNIFICANT DESIGNERS IDENTIFIED HAZARDS

A! **RIVER IRK CULVERT** - NO EXCAVATIONS TO BE UNDERTAKEN UNLESS IN ACCORDANCE WITH CONTRACT DRAWINGS. NO LARGE POINT LOADS TO BE POSITIONED ABOVE THE CULVERT (INCLUDING PLANT AND MATERIALS). CONTRACTOR IS TO MONITOR CULVERT DEFLECTION THROUGHOUT THE CONSTRUCTION PROGRAMME TO ENSURE NO SIGNIFICANT OR PERMANENT DEFLECTIONS. FILL TO ARCH IS TO BE EXCAVATED EVENLY AND SHOULD NOT ALLOW A DIFFERENCE IN LEVEL IN EXCESS OF 500MM WITHOUT THE APPROVAL OF THE TEMPORARY WORKS DESIGNER

B! **CONSTRUCTION SEQUENCE** - THE CONTRACTOR MUST FOLLOW THE AGREED CONSTRUCTION SEQUENCE AND ARTICULATION PLAN TO ENSURE THAT CRITICAL SECTIONS ARE NOT OVERLOADED.

C! **BASEMENTS - UNDERGROUND** STRUCTURE AND BASEMENTS. NO EXCAVATION TO BE UNDERTAKEN UNLESS SPECIFIED IN THE CONTRACT DRAWINGS.

D! **METROLINK OHLE** - OVERHEAD POWER LINES ABOVE METROLINK LINES. ISOLATION REQUIRED FOR WORKS CLOSE TO OR ABOVE OHLE.

E! **RISK OF DAMAGE TO EXISTING SERVICES-** IT IS CONSIDERED LIKELY THAT THERE ARE UNCHARTED SERVICES/DRAINAGE IN THE VICINITY OF THE CULVERT. THE CONTRACTOR IS TO UNDERTAKE SUFFICIENT PROBING/RADAR SURVEYS ETC TO IDENTIFY ALL BURIED STRUCTURES AND SATISFY HIMSELF THAT ALL PILES WILL AVOID SUCH STRUCTURES. THE CONTRACTOR SHOULD NOTIFY THE ENGINEER OF ANY CLASHES TO ALLOW LOCAL ADJUSTMENT OF THE POSITION OF THE PILES TO BE MADE TO SUIT SITE SURVEY.

F! **RISK OF DESTABILISATION OF NEW PILES AND CULVERT TRANSFER STRUCTURE -** A NEW DEEP CONNECTION TO THE RIVER IRK CULVERT IS REQUIRED IN THE VICINITY OF THE NEW BUTTRESS TRANSFER STRUCTURE. THE CONTRACTOR SHOULD UNDERTAKE THIS WORK IN SUCH A WAY OR IN SUCH A SEQUENCE AS TO ENSURE THAT THE STABILITY OF THE PILES OR THE BUTTRESS TRANSFER SLAB ARE NOT COMPROMISED DURING INSTALLATION

- FOR MORE DETAILED INFORMATION PLEASE REFER TO THE ROOF DESIGNERS H&S HAZARD RECORD REFERENCE 100262-ST-REP-HYD-4505.
- THIS DRAWING HIGHLIGHTS SIGNIFICANT RESIDUAL RISKS AND RISKS NOT OBVIOUS TO A COMPETENT CONTRACTOR. REFER TO THE DESIGNERS RISK ASSESSMENT AND FURTHER INFORMATION.
- SHOULD ANY ADDITIONAL HAZARDS BE IDENTIFIED THE CONTRACTOR SHOULD NOTIFY ALL RELEVANT PROJECT TEAM MEMBERS.

Notes:

1. DO NOT SCALE FROM THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH DRAWING No. 100262-HYD-02-ZZ-DR-S-GXX-4500 (CURRENT REVISION).
3. REFER TO DRAWING 4510 FOR PILE SETTING-OUT AND CUTOFF LEVELS.
4. REFER TO DRAWING 4520 FOR PILECAP SETTING-OUT.
5. 75MM BLINDING IS TO BE PROVIDED BENEATH ALL PILECAPS
6. TOP CORNERS OF PILECAPS ARE TO BE PROVIDED WITH 25MM X 25MM CHAMFERS TO PREVENT CORNERS BEING DAMAGED DURING BACKFILLING.
7. ALL FORMED SURFACES BELOW GROUND LEVEL TO BE PAINTED WITH BITUMINOUS PROTECTION, REFER TO SPECIFICATION.
8. FOR DETAILS OF PILECAP CONCRETE, REFER TO SPECIFICATION.
9. CONSTRUCTION OF THE CULVERT SPANNING STRUCTURES REQUIRES A DETAILED CONSTRUCTION SEQUENCE. ENSURE THE CULVERT BRIDGE CONSTRUCTION SEQUENCE DRAWING 100262-HYD-02-DR-S-GXX-4532 IS REFERRED TO.
10. LEVELS SHOWN ON DRAWINGS ARE THE STRUCUTRE. THE STRUCTURES WILL BE CAST AT DIFFERENT LEVELS AND THEN JACKED. DO NOT USE LEVELS SHOWN ON GENERAL ARRANGEMENT DRAWINGS FOR CONSTRUCTION. INSTEAD REFER TO THE CULVERT BRIDGE CONSTRUCTION SEQUENCE DRAWINGS.
11. CULVERT SPANNING STRUCTURES WILL BE CAST ON A FOAM LAYER. THIS WILL BE ZOTEFOAM'S PLASTAZOTE LD15 OR SIMILAR APPROVED. APPROXIMATELY 10% COMPRESSION IS REQUIRED AT 25KN/M2^2
12. THE CONTRACTOR WILL BE RESPONSIBLE FOR MINOR ADJUSTMENTS TO KICKER FOR THE BUTTRESS/ROOF COLUMNS TO ACCOMMODATE ANY DEVIATION FROM THE PREDICTED AND RESULTANT DEFLECTIONS OF THE CULVERT SPANNING STRUCTURES.
13. EARTHING AND BONDING TAPE IS TO BE PROVIDED TO ALL REINFORCEMENT CAGES FOR CONNECTION TO THE EARTHING CIRCUIT. DETAIL TO M&E DESIGN BY OTHERS.

KEY

INITIAL SLAB (PRE JACKING)

Approved For Construction
Signed
Name
Date
Contractor's Engineering Manager (Construction Phase)

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
AFC1	11.10.13	APPROVED FOR CONSTRUCTION	GRB	ACD	AD
D03	13.09.13	FORM 3 SUBMISSION	SR	ACD	AD
D02	18.07.13	FORM 3 SUBMISSION, CULVERT STRUCTURES	SR	ACD	JL
D01	20.06.13	FORM 3 SUBMISSION, PILES AND PILECAPS	SR	ACD	JL

APPROVED FOR CONSTRUCTION

Transport for Greater Manchester

NetworkRail

Hyder Consulting (UK) Limited
130 Fairway Court, Centre Park
Warrington, WA1 1RQ
Phone 44 (0)1925 820 226
Fax 44 (0)1925 572 462

Contractor(s)

MORGAN SINDALL

Project

MANCHESTER VICTORIA STATION REDEVELOPMENT METROLINK

Drawing Title

CULVERT BRIDGE STRUCTURES DETAILS AND SECTIONS

Designed	D.ROWLINSON	Signed	Date
Drawn	S. ROBERTS	Signed	Date
Checked	A. C-DAVIES	Signed	Date
Approved	A DUGDALE	Signed	Date
Scale(s)	As indicated	ELR & Mileage	
Alternative Reference	UA004621	Sheet	
Drawing Number	100262-HYD-02-ZZ-DR-S-GXX-4531	Revision AFC1	

100mm on Original

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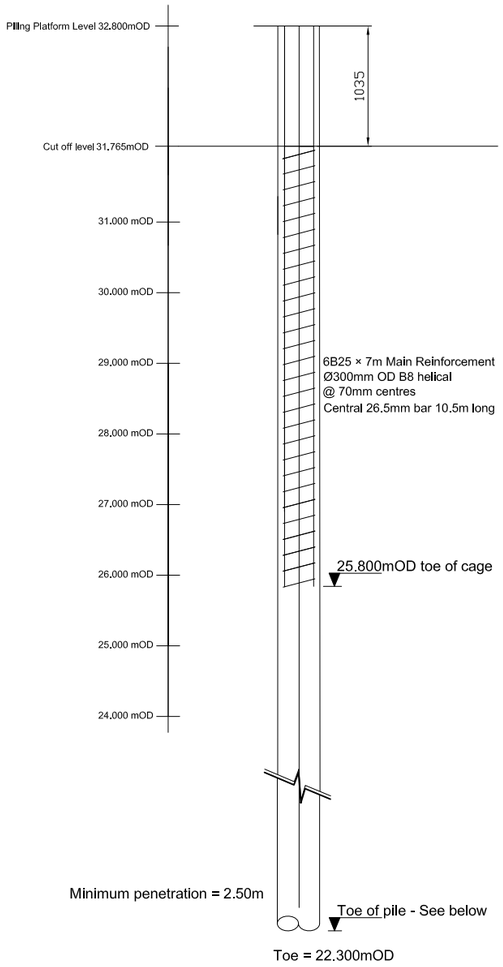
Sheet Size A0 1189x841

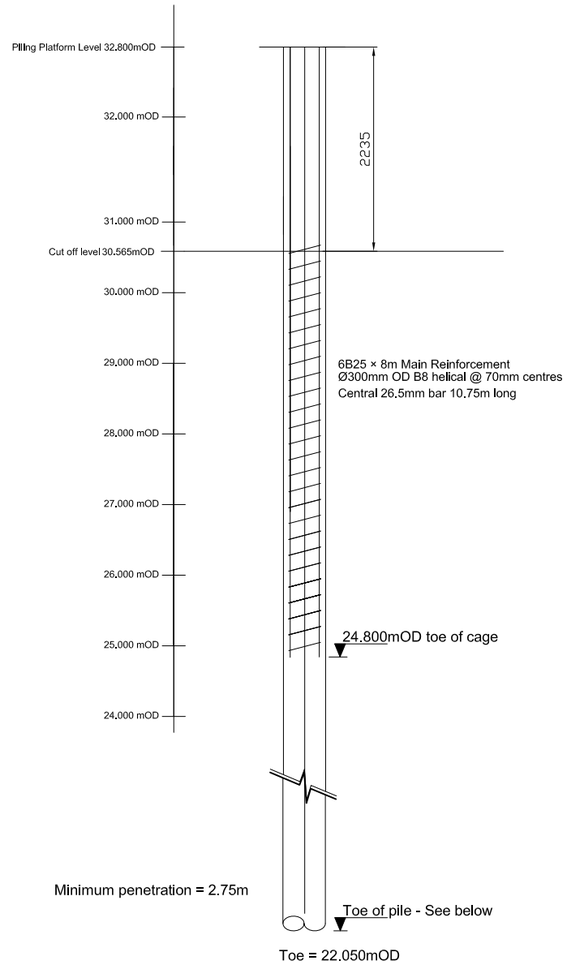
Buttress Culvert Bridge Piles

RIB 1



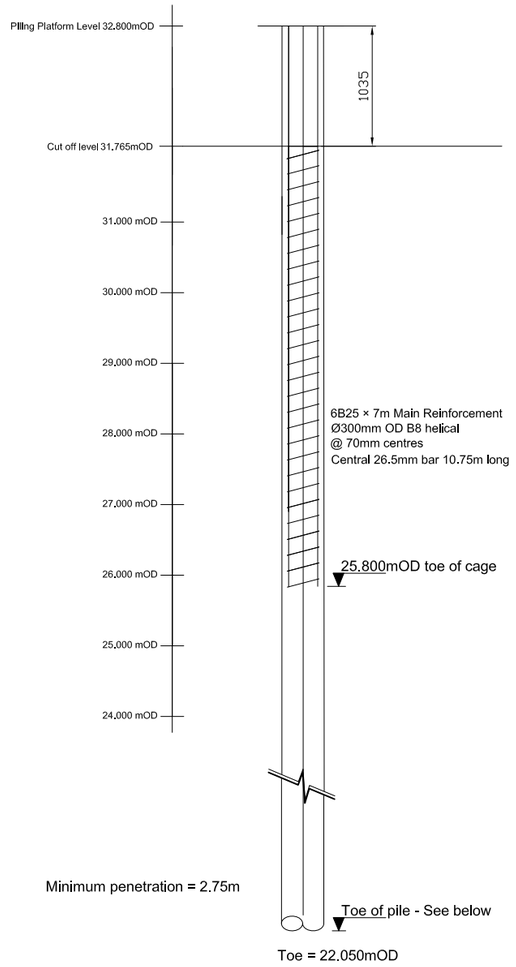
Buttress Culvert Bridge Piles

RIB 2



Buttress Culvert Bridge Piles

2nd ROW



	Pile No	Pile Diameter	PPL (mOD)	COL (mOD)	Minimum Penetration (m)	Design Pile Length (m)	Main Reinforcement	Central Reinforcement	Helical
2nd ROW	P8	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P12	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P14	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P16	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P18	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P20	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm

	Pile No	Pile Diameter	PPL (mOD)	COL (mOD)	Minimum Penetration (m)	Design Pile Length (m)	Main Reinforcement	Central Reinforcement	Helical
RIB 1	P44	450	32.800	31.765	2.50	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm
	P45	450	32.800	31.765	2.500	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm
	P46	450	32.800	31.765	2.500	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm
	P47	450	32.800	31.765	2.500	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm
	P48	450	32.800	31.765	2.500	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm
	P49	450	32.800	31.765	2.500	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm
	P50	450	32.800	31.765	2.500	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm
	P51	450	32.800	31.765	2.500	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm
RIB 2	P36	450	32.800	30.565	2.750	10.75	6B25×8.0m	26.5mm×10.75m	B8@70mm
	P37	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P38	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P39	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P40	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P41	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P42	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P43	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
2nd ROW	P24	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P26	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P28	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P30	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P32	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm
	P34	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm

NOTES

- Pile to be formed using C35/45 DC-4 concrete.
- Main cage reinforcement to be grade B500B
- Central bar reinforcement to be Dywidag PSS threadbar (*fy*/*fu* = 950/1050 N/mm²)
- For layout refer to Hyder Drawing Ref: 100262-HYD-02-ZZ-DR-S-GXX-D01-4510 Rev. D01

NOTES

- Pile to be formed using C35/45 DC-4 concrete
- Main cage reinforcement to be grade B500B
- Central bar reinforcement to be Dywidag PSS threadbar (fy/fu = 950/1050 N/mm²)
- Pile length determined by assuming 8m depth to bedrock. Final pile length to be determined on site.
- Pile 36 cut off level appear inconsistent with others in group. Confirmation should be sought prior to installation.
- For layout refer to Hyder Drawing Ref: 100262-HYD-02-ZZ-DR-S-GXX -D01-4510 Rev. D01

REVISION NOTES:

VAN ELLE
Total Foundation Solutions

Van Elle Limited
Kirkby Lane, Pinxton
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NG16 6JA

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CLIENT:

MORGAN SINDALL

CONTRACT:

MANCHESTER VICTORIA

DRAWING TITLE:

BUTTRESS CULVERT BRIDGE PILES (Sheet 1 of 2)

DATE: 24.07.13	DRAWN BY: DPM
SCALE: NTS	CHECKED BY: DW
DRAWING No: VE/120448/03	REV: - P3

Project Title	Manchester Victoria				
Job No	120448	Date	17.07.13		
Client	Morgan Sindall	Calcs By	DPM	Checked	
Drawing Ref	100262-HYD-02-ZZ-DR-S-GXX-D01-4512 Rev D01			REV:	P3

VAN ELLE
TOTAL FOUNDATION SOLUTIONS

PILE DESIGN SCHEDULE: HUNTSBANK CORNER

Pile No	Characteristic Actions			Design Actions - Vertical (kN)				Penetration (m)			Pile Diameter	PPL (mOD)	COL (mOD)	Minimum Penetration[c] (m)	Design Pile Length[b] (m)	Main Reinforcement	Central Reinforcement[a]	Helical	PPL - COL
	Vertical (kN)		Horizontal (kN)	Combination 1		Combination 2													
	Max	Min		Max	Min	Max	Min	Comb 1	Comb 2	Fk × 1.5									
1991	185	-137	73	217	-256	212	-207	1.0	1.5	1.5	450	34.480	33.075	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@125mm	1.4
1993	593	124	73	843	30	678	114	1.0	1.5	1.5	450	34.480	33.075	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@125mm	1.4
1996	327	111	73	734	400	367	101	1.0	1.5	1.5	450	34.450	33.075	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@125mm	1.4
1997	166	-116	73	126	-273	197	-170	1.0	1.5	1.5	450	34.450	33.075	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@125mm	1.4
2000	229	57	73	287	6	251	26	1.0	1.5	1.5	450	34.440	33.185	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@125mm	1.3
2001	108	-192	73	133	-299	138	-252	1.0	1.5	1.5	450	34.440	33.185	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@125mm	1.3

Notes

Notes

(a) Central reinforcement to be Dywidag PSS Threadbar (fy/fu = 950/1050 N/mm²)
(b) Design pile length is based on assumed 8m depth to sandstone. Final length dictated by depth to rock plus penetration into sandstone
(c) Minimum required penetration into sandstone
The above piles to be formed in Tarmac GM0.5 Grout

Project Title	Manchester Victoria				
Job No	120448	Date	17.07.13		
Client	Morgan Sindall	Calcs By	DPM	Checked	
Drawing Ref	100262-HYD-02-ZZ-DR-S-GXX-D01-4512 Rev D01			REV:	P3

VAN ELLE
TOTAL FOUNDATION SOLUTIONS

PILE DESIGN SCHEDULE: COLUMN 4 PILE GROUP

Pile No	Characteristic Actions			Design Actions - Vertical (kN)				Penetration (m)			Pile Diameter	PPL (mOD)	COL (mOD)	Minimum Penetration[c] (m)	Design Pile Length[b] (m)	Main Reinforcement	Central Reinforcement[a]	Helical	PPL - COL
	Vertical (kN)		Horizontal (kN)	Combination 1		Combination 2													
	Max	Min		Max	Min	Max	Min	Comb 1	Comb 2	Fk × 1.5									
2006	347	198	35	488	191	387	210	1.0	1.25	1.5	450	34.280	33.025	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2007	358	-43	35	480	-94	432	-88	1.0	1.25	1.5	450	34.280	33.025	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2008	189	95	35	254	74	204	84	1.0	1.25	1.5	450	34.280	33.025	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2009	483	59	35	578	-30	556	5	1.0	1.25	1.5	450	34.280	33.025	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2012	424	257	35	597	254	472	263	1.0	1.25	1.5	450	34.270	33.015	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2013	365	43	35	508	5	427	9	1.0	1.25	1.5	450	34.270	33.015	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2014	226	35	35	259	-15	254	6	1.0	1.25	1.5	450	34.270	33.015	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2015	475	73	35	567	-9	545	22	1.0	1.25	1.5	450	34.270	33.015	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2018	509	289	35	715	290	566	280	1.0	1.25	1.5	450	34.170	32.775	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.4
2019	218	-78	35	320	-123	270	-115	1.0	1.25	1.5	450	34.170	32.775	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.4
2020	95	-152	35	123	-232	123	-199	1.0	1.25	1.5	450	34.170	32.775	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.4
2021	462	135	35	536	65	518	93	1.0	1.25	1.5	450	34.170	32.775	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.4
2024	349	206	35	489	195	385	226	1.0	1.25	1.5	450	34.320	33.075	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.2
2025	383	-47	35	514	-102	462	-96	1.0	1.25	1.5	450	34.320	33.075	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.2
2026	206	121	35	289	113	227	134	1.0	1.25	1.5	450	34.320	33.075	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.2
2027	493	72	35	590	-15	567	19	1.0	1.25	1.5	450	34.320	33.075	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.2
2030	523	383	35	736	314	584	318	1.0	1.25	1.5	450	34.350	33.075	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2031	643	151	35	833	-14	761	123	1.0	1.25	1.5	450	34.350	33.075	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2032	402	328	35	564	243	446	255	1.0	1.25	1.5	450	34.350	33.075	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2033	604	222	35	637	89	688	192	1.0	1.25	1.5	450	34.350	33.075	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2036	382	234	35	535	226	421	248	1.0	1.25	1.5	450	34.310	32.875	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.4
2037	427	-60	35	569	-129	513	-119	1.0	1.25	1.5	450	34.310	32.875	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.4
2038	197	147	35	272	146	194	147	1.0	1.25	1.5	450	34.310	32.875	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.4
2039	484	108	35	572	33	550	62	1.0	1.25	1.5	450	34.310	32.875	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.4
2042	397	246	35	552	225	429	258	1.0	1.25	1.5	450	34.050	32.825	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.2
2043	453	44	35	590	-14	526	-6	1.0	1.25	1.5	450	34.050	32.825	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.2
2044	187	133	35	257	123	183	143	1.0	1.25	1.5	450	34.050	32.825	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.2
2045	460	69	35	550	-11	529	20	1.0	1.25	1.5	450	34.050	32.825	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.2
2048	212	64	35	301	39	242	59	1.0	1.25	1.5	450	33.960	32.675	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2049	497	117	35	656	67	567	73	1.0	1.25	1.5	450	33.960	32.675	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2050	370	270	35	482	250	388	258	1.0	1.25	1.5	450	33.960	32.675	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2051	376	-11	35	461	-97	440	-62	1.0	1.25	1.5	450	33.960	32.675	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.3
2054	280	161	35	398	147	320	148	1.0	1.25	1.5	450	33.920	32.075	1.50	9.50	6B16×7.5	26.5mm×9.5m	B8@210mm	1.8
2055	604	253	35	815	141	689	232	1.0	1.25	1.5	450	33.920	32.075	1.50	9.50	6B16×7.5	26.5mm×9.5m	B8@210mm	1.8
2056	576	428	35	734	365	631	393	1.0	1.25	1.5	450	33.920	32.075	1.50	9.50	6B16×7.5	26.5mm×9.5m	B8@210mm	1.8
2057	530	120	35	531	-30	624	91	1.0	1.25	1.5	450	33.920	32.075	1.50	9.50	6B16×7.5	26.5mm×9.5m	B8@210mm	1.8
2060	138	24	35	195	-3	156	9	1.0	1.25	1.5	450	33.970	32.175	1.50	9.50	6B16×7.5	26.5mm×9.5m	B8@210mm	1.8
2061	465	111	35	617	62	529	69	1.0	1.25	1.5	450	33.970	32.175	1.50	9.50	6B16×7.5	26.5mm×9.5m	B8@210mm	1.8
2062	374	241	35	452	218	400	227	1.0	1.25	1.5	450	33.970	32.175	1.50	9.50	6B16×7.5	26.5mm×9.5m	B8@210mm	1.8
2063	341	-78	35	430	-174	409	-136	1.0	1.25	1.5	450	33.970	32.175	1.50	9.50	6B16×7.5	26.5mm×9.5m	B8@210mm	1.8
2235	175	76	35	238	61	196	70	1.0	1.25	1.5	450	33.860	32.675	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.2
2236	462	161	35	640	116	515	123	1.0	1.25	1.5	450	33.860	32.675	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.2
2237	401	215	35	442	175	432	218	1.0	1.25	1.5	450	33.860	32.675	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.2
2238	322	-58	35	404	-144	385	-110	1.0	1.25	1.5	450	33.860	32.675	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	1.2
2383	131	25	35	185	-1	148	11	1.0	1.25	1.5	450	32.979	32.275	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	0.7
2384	439	82	35	590	27	499	35	1.0	1.25	1.5	450	32.979	32.275	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	0.7
2385	347	219	35	402	196	372	215	1.0	1.25	1.5	450	32.979	32.275	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	0.7
2386	334	-86	35	422	-181	402	-143	1.0	1.25	1.5	450	32.979	32.275	1.50	9.50	6B16×7.0	26.5mm×9.5m	B8@210mm	0.7

Notes

(a) Central reinforcement to be Dywidag PSS Threadbar (fy/fu = 950/1050 N/mm²)
(b) Design pile length is based on assumed 8m depth to sandstone. Final length dictated by depth to rock plus penetration into sandstone
(c) Minimum required penetration into sandstone
The above piles are to be formed in Tarmac GM0.5 Grout

Project Title	Manchester Victoria				
Job No	120448	Date	9th July 2013		
Client	Morgan Sindall	Calcs By	DPM	Checked	
Drawing Ref	100262-HYD-02-ZZ-DR-S-GXX-D01-4512 Rev D01		REV:	P3	

VAN ELLE
TOTAL FOUNDATION SOLUTIONS

PILE DESIGN SCHEDULE: BUTTRESS CULVERT BRIDGE PILES

	Pile No	Characteristic Actions			Design Actions - Vertical (kN)				Penetration (m)			Pile Diameter	PPL (mOD)	COL (mOD)	Minimum Penetration[c] (m)	Design Pile Length[b] (m)	Main Reinforcement	Central Reinforcement[a]	Helical	PPL - COL
		Vertical (kN)		Horizontal (kN)	Combination 1		Combination 2													
		Max	Min		Max	Min	Max	Min	Comb 1	Comb 2	Fk × 1.5									
RIB 1	P44	755	-260	65	1045	-450	855	-325	1.00	2.00	2.50	450	32.800	31.765	2.50	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm	1.0
	P45	755	-260	65	1045	-450	855	-325	1.00	2.00	2.50	450	32.800	31.765	2.500	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm	1.0
	P46	755	-260	65	1045	-450	855	-325	1.00	2.00	2.50	450	32.800	31.765	2.500	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm	1.0
	P47	755	-260	65	1045	-450	855	-325	1.00	2.00	2.50	450	32.800	31.765	2.500	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm	1.0
	P48	755	-260	65	1045	-450	855	-325	1.00	2.00	2.50	450	32.800	31.765	2.500	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm	1.0
	P49	755	-260	65	1045	-450	855	-325	1.00	2.00	2.50	450	32.800	31.765	2.500	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm	1.0
	P50	755	-260	65	1045	-450	855	-325	1.00	2.00	2.50	450	32.800	31.765	2.500	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm	1.0
	P51	755	-260	65	1045	-450	855	-325	1.00	2.00	2.50	450	32.800	31.765	2.500	10.50	6B25×7.0m	26.5mm×10.5m	B8@70mm	1.0
RIB 2	P36	870	-195	65	975	-300	955	-245	1.00	2.25	2.75	450	32.800	30.565	2.750	10.75	6B25×8.0m	26.5mm×10.75m	B8@70mm	2.2
	P37	870	-195	65	975	-300	955	-245	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P38	870	-195	65	975	-300	955	-245	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P39	870	-195	65	975	-300	955	-245	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P40	870	-195	65	975	-300	955	-245	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P41	870	-195	65	975	-300	955	-245	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P42	870	-195	65	975	-300	955	-245	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P43	870	-195	65	975	-300	955	-245	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
2nd ROW	P24	898	-84	65	1057	-152	973	-149	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P26	898	-84	65	1057	-152	973	-149	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P28	898	-84	65	1057	-152	973	-149	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P30	898	-84	65	1057	-152	973	-149	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P32	898	-84	65	1057	-152	973	-149	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P34	898	-84	65	1057	-152	973	-149	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
FRONT	P23	1672	370	65	2087	581	1765	302	3.00	5.75	5.25	450	32.800	30.565	5.750	13.75	6B25×8.0m	n/a	B8@70mm	2.2
	P25	1672	370	65	2087	581	1765	302	3.00	5.75	5.25	450	32.800	30.565	5.750	13.75	6B25×8.0m	n/a	B8@70mm	2.2
	P27	1672	370	65	2087	581	1765	302	3.00	5.75	5.25	450	32.800	30.565	5.750	13.75	6B25×8.0m	n/a	B8@70mm	2.2
	P29	1672	370	65	2087	581	1765	302	3.00	5.75	5.25	450	32.800	30.565	5.750	13.75	6B25×8.0m	n/a	B8@70mm	2.2
	P31	1672	370	65	2087	581	1765	302	3.00	5.75	5.25	450	32.800	30.565	5.750	13.75	6B25×8.0m	n/a	B8@70mm	2.2
	P33	1672	370	65	2087	581	1765	302	3.00	5.75	5.25	450	32.800	30.565	5.750	13.75	6B25×8.0m	n/a	B8@70mm	2.2
	P35	1672	370	65	2087	581	1765	302	3.00	5.75	5.25	450	32.800	30.565	5.750	13.75	6B25×8.0m	n/a	B8@70mm	2.2
FRONT	P11	1672	370	65	2087	581	1765	302	3.00	5.75	5.25	450	32.800	30.565	5.750	13.75	6B25×8.0m	n/a	B8@70mm	2.2
	P13	1672	370	65	2087	581	1765	302	3.00	5.75	5.25	450	32.800	30.565	5.750	13.75	6B25×8.0m	n/a	B8@70mm	2.2
	P15	1672	370	65	2087	581	1765	302	3.00	5.75	5.25	450	32.800	30.565	5.750	13.75	6B25×8.0m	n/a	B8@70mm	2.2
	P17	1672	370	65	2087	581	1765	302	3.00	5.75	5.25	450	32.800	30.565	5.750	13.75	6B25×8.0m	n/a	B8@70mm	2.2
	P19	1672	370	65	2087	581	1765	302	3.00	5.75	5.25	450	32.800	30.565	5.750	13.75	6B25×8.0m	n/a	B8@70mm	2.2
	P21	1672	370	65	2087	581	1765	302	3.00	5.75	5.25	450	32.800	30.565	5.750	13.75	6B25×8.0m	n/a	B8@70mm	2.2
	P22	1672	370	65	2087	581	1765	302	3.00	5.75	5.25	450	32.800	30.565	5.750	13.75	6B25×8.0m	n/a	B8@70mm	2.2
2nd ROW	P8	898	-84	65	1057	-152	973	-149	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P12	898	-84	65	1057	-152	973	123	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P14	898	-84	65	1057	-152	973	255	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P16	898	-84	65	1057	-152	973	192	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P18	898	-84	65	1057	-152	973	248	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
	P20	898	-84	65	1057	-152	973	-119	1.00	2.25	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	26.5mm×10.75m	B8@70mm	1.0
3rd ROW	P7	665	-470	65	845	-675	745	-565	2.00	3.25	3.25	450	32.800	31.765	3.250	11.25	6B25×7.0m	36mm×11.25m	B8@70mm	1.0
	P9	665	-470	65	845	-675	745	-565	2.00	3.25	3.25	450	32.800	31.765	3.250	11.25	6B25×7.0m	36mm×11.25m	B8@70mm	1.0
	P10	665	-470	65	845	-675	745	-565	2.00	3.25	3.25	450	32.800	31.765	3.250	11.25	6B25×7.0m	36mm×11.25m	B8@70mm	1.0
RIB 7	P1	850	-370	65	1165	-520	938	-427	1.00	2.00	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	32mm×10.75m	B8@70mm	1.0
	P2	850	-370	65	1165	-520	938	-427	1.00	2.00	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	32mm×10.75m	B8@70mm	1.0
	P3	850	-370	65	1165	-520	938	-427	1.00	2.00	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	32mm×10.75m	B8@70mm	1.0
	P4	850	-370	65	1165	-520	938	-427	1.00	2.00	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	32mm×10.75m	B8@70mm	1.0
	P5	850	-370	65	1165	-520	938	-427	1.00	2.00	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	32mm×10.75m	B8@70mm	1.0
	P6	850	-370	65	1165	-520	938	-427	1.00	2.00	2.75	450	32.800	31.765	2.750	10.75	6B25×7.0m	32mm×10.75m	B8@70mm	1.0

Notes

(a) Central reinforcement to be Dywidag PSS Threadbar (fy/fu = 950/1050 N/mm²)
(b) Design pile length is based on assumed 8m depth to sandstone. Final length dictated by depth to rock plus penetration into sandstone
(c) Minimum required penetration into sandstone
The above piles are to be formed in C35/45 concrete DC-4
COL for pile 36 shown on drawing 4510 Rev D01 as 30.565mOD which is inconsistent with the other piles in the cap. Hyder/MS to advise

Project Title	**Manchester Victoria**				
Job No	**120448**	**Date**	**9th July 2013**		
Client	**Morgan Sindall**	**Calcs By**	**DPM**	**Checked**	
Drawing Ref	**100262-HYD-02-ZZ-DR-S-GXX-D01-4512 Rev D01**		**REV:**	**P3**	

VAN ELLE
TOTAL FOUNDATION SOLUTIONS

PILE DESIGN SCHEDULE: Buttress End Pair 6 Pile Group

Pile No	Characteristic Actions			Design Actions - Vertical (kN)				Penetration (m)			Pile Diameter	PPL (mOD)	COL (mOD)	Minimum Penetration[c] (m)	Design Pile Length[b] (m)	Main Reinforcement	Central Reinforcement[a]	Helical	PPL - COL
	Vertical (kN)		Horizontal (kN)	Combination 1		Combination 2													
	Max	Min		Max	Min	Max	Min	Comb 1	Comb 2	Fk × 1.5									
2207	1001	481	100	1353	442	1112	436.0	2.00	3.25	2.50	450	32.800	31.075	3.25	11.25	8B20×7.5m	36mm×11.25m	B12@100mm	1.7
2209	646	512	100	779	481	667	493.0	2.00	3.25	2.50	450	32.800	31.075	3.250	11.25	8B20×7.5m	36mm×11.25m	B12@100mm	1.7
2210	414	4	100	602	-7	514	-18.0	2.00	3.25	2.50	450	32.800	31.075	3.250	11.25	8B20×7.5m	36mm×11.25m	B12@100mm	1.7
2212	467	123	100	677	125	559	112.0	2.00	3.25	2.50	450	32.800	31.075	3.250	11.25	8B20×7.5m	36mm×11.25m	B12@100mm	1.7
2213	333	110	100	458	27	275	70.0	2.00	3.25	2.50	450	32.800	31.075	3.250	11.25	8B20×7.5m	36mm×11.25m	B12@100mm	1.7
2214	271	-10	100	356	-133	281	-84.0	2.00	3.25	2.50	450	32.800	31.075	3.250	11.25	8B20×7.5m	36mm×11.25m	B12@100mm	1.7
2215	765	351	100	1015	313	850.0	312.0	2.00	3.25	2.50	450	32.800	31.075	3.250	11.25	8B20×7.5m	36mm×11.25m	B12@100mm	1.7
2217	605	-114	100	712	-318	699	-235.0	2.00	3.25	2.50	450	32.800	31.075	3.250	11.25	8B20×7.5m	36mm×11.25m	B12@100mm	1.7
2218	521	90	100	752	79	626	66.0	2.00	3.25	2.50	450	32.800	31.075	3.250	11.25	8B20×7.5m	36mm×11.25m	B12@100mm	1.7
2220	368	108	100	531	92	437	138.0	2.00	3.25	2.50	450	32.800	31.075	3.250	11.25	8B20×7.5m	36mm×11.25m	B12@100mm	1.7
2221	200	-128	100	239	-274	211	-216.0	2.00	3.25	2.50	450	32.800	31.075	3.250	11.25	8B20×7.5m	36mm×11.25m	B12@100mm	1.7
2222	151	-412	100	184	-625	195	-538.0	2.00	3.25	2.50	450	32.800	31.075	3.250	11.25	8B20×7.5m	36mm×11.25m	B12@100mm	1.7

Notes

(a) Central reinforcement to be Dywidag PSS Threadbar (fy/fu = 950/1050 N/mm²)
(b) Design pile length is based on assumed 8m depth to sandstone. Final length dictated by depth to rock plus penetration into sandstone
(c) Minimum required penetration into sandstone
The above piles are to be formed in C35/45 concrete DC-4

Project Title	Manchester Victoria				
Job No	120448	Date	9th July 2013		
Client	Morgan Sindall	Calcs By	DPM	Checked	
Drawing Ref	100262-HYD-02-ZZ-DR-S-GXX-D01-4512 Rev D01			REV:	P3

VAN ELLE
TOTAL FOUNDATION SOLUTIONS

PILE DESIGN SCHEDULE: BUTTRESS 6 PILE GROUP

Pile No	Characteristic Actions			Design Actions - Vertical (kN)				Penetration (m)			Pile Diameter	PPL (mOD)	COL (mOD)	Minimum Penetration[c] (m)	Design Pile Length[b] (m)	Main Reinforcement	Central Reinforcement[a]	Helical	PPL - COL
	Vertical (kN)		Horizontal (kN)	Combination 1		Combination 2													
	Max	Min		Max	Min	Max	Min	Comb 1	Comb 2	Fk × 1.5									
2159	423	375	96	575	368	432	390	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2160	511	423	96	701	415	522	436	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2161	253	111	96	348	63	253	82	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2163	260	147	96	356	107	259	123	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2164	104	-26	96	155	-40	134	-21	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2166	139	-18	96	205	-39	174	-16	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2167	500	406	96	618	387	517	424	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2168	512	397	96	707	389	543	408	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2169	-66	-220	96	-64	-319	-69	-264	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2171	-75	-193	96	-70	-277	-84	-226	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2172	453	309	96	631	303	492	319	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2174	479	-300	96	672	296	531	305	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2175	416	326	96	567	307	432	362	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2176	576	500	96	788	496	597	501	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2177	222	-49	96	239	-161	236	-116	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2179	262	23	96	322	-84	270	-41	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2180	242	-11	96	362	-2	313	-15	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2182	313	30	96	460	31	388	19	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2183	479	308	96	517	273	510	293	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2184	624	455	96	856	452	665	445	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2185	245	-113	96	261	-252	265	-201	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2187	235	6	96	317	-104	238	-60	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2188	255	12	96	380	1	327	12	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2190	369	8	96	544	0	462	-7	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2191	519	244	96	569	174	561	203	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2192	713	403	96	962	381	780	377	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2193	206	-123	96	212	-260	222	-205	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2195	228	46	96	312	-29	196	1	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2196	218	10	96	321	-7	271	43	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2198	386	45	96	566	45	475	32	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2199	543	210	96	608	131	596	163	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2200	764	385	96	1009	347	839	347	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2201	236	-182	96	259	-341	267	-277	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2203	229	25	96	315	-61	196	-26	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2204	243	11	96	358	-6	302	45	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7
2206	445	16	96	632	-1	546	-12	1.0	1.75	2.0	450	32.800	31.075	2.00	10.00	8B20×7.5	36mm×10m	B12@100mm	1.7

Notes

(a) Central reinforcement to be Dywidag PSS Threadbar (fy/fu = 950/1050 N/mm²)
(b) Design pile length is based on assumed 8m depth to sandstone. Final length dictated by depth to rock plus penetration into sandstone
(c) Minimum required penetration into sandstone
The above piles are to be formed in C35/45 concrete DC-4

Project Title	Manchester Victoria			
Job No	120448	Date	9th July 2013	
Client	Morgan Sindall	Calcs By	DPM	Checked
Drawing Ref	100262-HYD-02-ZZ-DR-S-GXX-D01-4512 Rev D01	REV:	P3	

VAN ELLE
TOTAL FOUNDATION SOLUTIONS

PILE DESIGN SCHEDULE: COLUMN CULVERT BRIDGE PILES

	Pile No	Characteristic Actions			Design Actions - Vertical (kN)				Penetration (m)			Pile Diameter	PPL (mOD)	COL (mOD)	Minimum Penetration[c] (m)	Design Pile Length[b] (m)	Main Reinforcement	Central Reinforcement[a]	Helical	PPL - COL
		Vertical (kN)		Horizontal	Combination 1		Combination 2													
		Max	Min	(kN)	Max	Min	Max	Min	Comb 1	Comb 2	Fk × 1.5									
FRONT	P5	1393	1370	10	1910	1879	1452	1428	2.50	4.50	3.00	450	33.890	30.565	4.50	12.50	6B16×9.0m	none	B8@210mm	3.3
	P6	1393	1370	10	1910	1879	1452	1428	2.50	4.50	3.00	450	33.890	30.565	4.50	12.50	6B16×9.0m	none	B8@210mm	3.3
	P7	1393	1370	10	1910	1879	1452	1428	2.50	4.50	3.00	450	33.890	30.565	4.50	12.50	6B16×9.0m	none	B8@210mm	3.3
	P8	1393	1370	10	1910	1879	1452	1428	2.50	4.50	3.00	450	33.890	30.565	4.50	12.50	6B16×9.0m	none	B8@210mm	3.3
FRONT	P9	1393	1370	10	1910	1879	1452	1428	2.50	4.50	3.00	450	33.409	30.565	4.50	12.50	6B16×9.0m	none	B8@210mm	2.8
	P10	1393	1370	10	1910	1879	1452	1428	2.50	4.50	3.00	450	33.409	30.565	4.50	12.50	6B16×9.0m	none	B8@210mm	2.8
	P11	1393	1370	10	1910	1879	1452	1428	2.50	4.50	3.00	450	33.409	30.565	4.50	12.50	6B16×9.0m	none	B8@210mm	2.8
	P12	1393	1370	10	1910	1879	1452	1428	2.50	4.50	3.00	450	33.409	30.565	4.50	12.50	6B16×9.0m	none	B8@210mm	2.8
NORTH	P1	165	-498	10	225	-690	171	-533	1.00	3.00	3.00	450	33.409	31.765	3.00	11.00	6B16×8.0m	36mm×11m	B8@210mm	1.6
	P2	165	-498	10	225	-690	171	-533	1.00	3.00	3.00	450	33.409	31.765	3.00	11.00	6B16×8.0m	36mm×11m	B8@210mm	1.6
	P3	165	-498	10	225	-690	171	-533	1.00	3.00	3.00	450	33.409	31.765	3.00	11.00	6B16×8.0m	36mm×11m	B8@210mm	1.6
	P4	165	-498	10	225	-690	171	-533	1.00	3.00	3.00	450	33.409	31.765	3.00	11.00	6B16×8.0m	36mm×11m	B8@210mm	1.6
SOUTH	P13	220	-356	10	301	-493	230	-380	1.00	3.00	3.00	450	33.890	31.765	3.00	11.00	6B16×8.0m	36mm×11m	B8@210mm	2.1
	P14	220	-356	10	301	-493	230	-380	1.00	3.00	3.00	450	33.890	31.765	3.00	11.00	6B16×8.0m	36mm×11m	B8@210mm	2.1
	P15	220	-356	10	301	-493	230	-380	1.00	3.00	3.00	450	33.890	31.765	3.00	11.00	6B16×8.0m	36mm×11m	B8@210mm	2.1
	P16	220	-356	10	301	-493	230	-380	1.00	3.00	3.00	450	33.890	31.765	3.00	11.00	6B16×8.0m	36mm×11m	B8@210mm	2.1
	P17	220	-356	10	301	-493	230	-380	1.00	3.00	3.00	450	33.890	31.765	3.00	11.00	6B16×8.0m	36mm×11m	B8@210mm	2.1
	P18	220	-356	10	301	-493	230	-380	1.00	3.00	3.00	450	33.890	31.765	3.00	11.00	6B16×8.0m	36mm×11m	B8@210mm	2.1

Notes

(a) Central reinforcement to be Dywidag PSS Threadbar (fy/fu = 950/1050 N/mm²)
(b) Design pile length is based on assumed 8m depth to sandstone. Final length dictated by depth to rock plus penetration into sandstone
(c) Minimum required penetration into sandstone
The above piles are to be formed in Tarmac GM0.5 Grout

Project Title	Manchester Victoria			
Job No	120448	Date	9th July 2013	
Client	Morgan Sindall	Calcs By	DPM	Checked
Drawing Ref	100262-HYD-02-ZZ-DR-S-GXX-D01-4611 Rev D01		REV:	P3

VAN ELLE
TOTAL FOUNDATION SOLUTIONS

PILE DESIGN SCHEDULE: MEZZANINE

	Pile No	Characteristic Actions Vertical (kN) Max	Characteristic Actions Vertical (kN) Min	Characteristic Actions Horizontal (kN)	Design Actions - Vertical (kN) Combination 1 Max	Design Actions - Vertical (kN) Combination 1 Min	Design Actions - Vertical (kN) Combination 2 Max	Design Actions - Vertical (kN) Combination 2 Min	Penetration (m) Comb 1	Penetration (m) Comb 2	Penetration (m) Fk × 1.5	Pile Diameter	PPL (mOD)	COL (mOD)	Minimum Penetration[c] (m)	Design Pile Length[b] (m)	Main Reinforcement	Central Reinforcement[a]	Helical	PPL - COL
GROUP 1	M1	282	-216	10	389	-336	300	-275	1.00	1.75	1.50	450	33.800	32.055	1.75	9.75	6B16×7.5m	26.5mm×9.75m	B8@210mm	1.7
	M2	282	-216	10	389	-336	300	-275	1.00	1.75	1.50	450	33.800	32.055	1.75	9.75	6B16×7.5m	26.5mm×9.75m	B8@210mm	1.7
	M3	282	-216	10	389	-336	300	-275	1.00	1.75	1.50	450	33.800	32.055	1.75	9.75	6B16×7.5m	26.5mm×9.75m	B8@210mm	1.7
	M4	282	-216	10	389	-336	300	-275	1.00	1.75	1.50	450	33.800	32.055	1.75	9.75	6B16×7.5m	26.5mm×9.75m	B8@210mm	1.7
	M5	282	-216	10	389	-336	300	-275	1.00	1.75	1.50	450	33.800	32.055	1.75	9.75	6B16×7.5m	26.5mm×9.75m	B8@210mm	1.7
	M6	282	-216	10	389	-336	300	-275	1.00	1.75	1.50	450	33.800	32.280	1.75	9.75	6B16×7.5m	26.5mm×9.75m	B8@210mm	1.5
GROUP 2	M7	561	314	28	764	427	595	319	1.00	1.00	1.50	450	33.800	32.055	1.50	9.50	6B16×7.5m	none	B8@210mm	1.7
	M8	561	314	28	764	427	595	319	1.00	1.00	1.50	450	33.800	32.055	1.50	9.50	6B16×7.5m	none	B8@210mm	1.7
	M9	561	314	28	764	427	595	319	1.00	1.00	1.50	450	33.800	32.055	1.50	9.50	6B16×7.5m	none	B8@210mm	1.7
	M10	561	314	28	764	427	595	319	1.00	1.00	1.50	450	33.800	32.055	1.50	9.50	6B16×7.5m	none	B8@210mm	1.7
	M11	561	314	28	764	427	595	319	1.00	1.00	1.50	450	33.800	32.280	1.50	9.50	6B16×7.5m	none	B8@210mm	1.5
	M12	561	314	28	764	427	595	319	1.00	1.00	1.50	450	33.800	32.055	1.50	9.50	6B16×7.5m	none	B8@210mm	1.7
GROUP 3	M13	1231	579	58	1747	827	1399	649	1.75	4.00	2.75	450	33.800	32.055	4.00	12.00	6B16×7.5m	none	B8@210mm	1.7
	M14	1231	579	58	1747	827	1399	649	1.75	4.00	2.75	450	33.800	32.055	4.00	12.00	6B16×7.5m	none	B8@210mm	1.7
	M15	1231	579	58	1747	827	1399	649	1.75	4.00	2.75	450	33.800	32.055	4.00	12.00	6B16×7.5m	none	B8@210mm	1.7
	M16	1231	579	58	1747	827	1399	649	1.75	4.00	2.75	450	33.800	32.055	4.00	12.00	6B16×7.5m	none	B8@210mm	1.7
	M17	1231	579	58	1747	827	1399	649	1.75	4.00	2.75	450	33.800	32.055	4.00	12.00	6B16×7.5m	none	B8@210mm	1.7
	M18	1231	579	58	1747	827	1399	649	1.75	4.00	2.75	450	33.800	32.055	4.00	12.00	6B16×7.5m	none	B8@210mm	1.7
	M19	1231	579	58	1747	827	1399	649	1.75	4.00	2.75	450	33.800	32.055	4.00	12.00	6B16×7.5m	none	B8@210mm	1.7
	M20	1231	579	58	1747	827	1399	649	1.75	4.00	2.75	450	33.800	32.055	4.00	12.00	6B16×7.5m	none	B8@210mm	1.7
GROUP 4	M21	OMITTED UNTIL CLARIFICATION OF LOADS IS RECEIVED																		1.2
	M22																			1.2
	M23																			1.2
	M24																			1.2
	M25																			1.2
	M26																			1.2
	M27																			1.2
	M28																			1.2
	M29																			1.2
	M30																			1.2
	M31																			1.2
	M32																			1.2
	M33																			1.2
	M34																			1.2
	M35																			1.2
	M36																			1.2
	M37																			1.3
	M38																			1.3
	M39																			1.3
	M40																			1.3
GROUP 5	M41	364	286	28	486	440	416	324	1.00	1.00	1.25	450	34.300	33.125	1.25	9.25	6B16×7.0m	none	B8@210mm	1.2
	M42	364	286	28	486	440	416	324	1.00	1.00	1.25	450	34.300	33.125	1.25	9.25	6B16×7.0m	none	B8@210mm	1.2
	M43	364	286	28	486	440	416	324	1.00	1.00	1.25	450	34.300	33.125	1.25	9.25	6B16×7.0m	none	B8@210mm	1.2
	M44	364	286	28	486	440	416	324	1.00	1.00	1.25	450	34.300	33.125	1.25	9.25	6B16×7.0m	none	B8@210mm	1.2

Notes

(a) Central reinforcement to be Dywidag PSS Threadbar (fy/fu = 950/1050 N/mm²)
(b) Design pile length is based on assumed 8m depth to sandstone. Final length dictated by depth to rock plus penetration into sandstone
(c) Minimum required penetration into sandstone
The above piles are to be formed in Tarmac GM0.5 Grout

Designers risk assessment

RIBA Stage 3 - Issue 2

Project Description:	New Victoria Office
	Manchester
Risk Register prepared by:	Alan Johnston Partnership LTD
Date:	Oct-22
Issue Number:	2
Project Stage:	Design

Low
Medium
High

				Risk W/O Controls						Risk
Ref	Description of Hazards	Date Registered	Impacted Activity (dropdown menu)	Likelihood (score 1-5)	Impact (score 1-5)	Risk Assessment Rating	Management Strategy	Likelihood (score 1-5)	Impact (score 1-5)	Re-assessment Rating
1	**Ground**									
1.1	Potential contamination associated with former use of Land	Sep-22	Construction	1	3	**3**	GI investigations have confirmed that no hazardous material has been encountered. Possibility of contaminated ground being uncovered remains. No remediation necessary	1	3	**3**
1.2	Potential gases	Sep-22	Construction	2	3	**6**	GI investigations have confirmed site as CS-1 (lowest risk). No remediation necessary.	1	3	**3**
1.3	Potential gases and risks from pits and culverts on site	Sep-22	Health & Safety	3	5	**15**	Culvert has been surveyed and deemed very low risk	1	5	**5**
1.4	Unknown water content of ground	Sep-22	Health & Safety	2	5	**10**	Waterproofing strategy to be developed	2	5	**10**
1.5	Underground River & Culvert runs near site	Sep-22	Design	2	5	**10**	Specialist geotechnical engineer (Byland) appointed to advise. Ongoing Network Rail approval process.	1	1	**1**
1.6	Unknown underground structures	Sep-22	Design	2	4	**8**	GI investigations have not uncovered any legacy structures.. Enabling works excavation required to confirm.	2	4	**8**
1.7	Potential UXB	Sep-22	Design	2	4	**8**	UXB survey has been carried out and has identified the site as very high risk area. The survey has confirmed that official bomb damage mapping has shown damage on site and immediately south east. Risk mitigation measures to be carried out on site. The client/Principal Contractor consider the use of Intrusive Magnetometer Survey to be carried out during piling operations, with the presence of an EOD engineer on site to supervise during piling/excavation operations.	2	4	**8**
2	**Power & Services Supplies**									
2.1	Termination of services supplies due to unexpected cable strike as part of foundation excavation	Sep-22	Construction	4	5	**20**	Utility Services review has been carried out. Comply with all statutory regulation and guidance-hsg47. contractor to allow for arrangements for isolating and provide detailed method and risk assessment prior to works commencing. further surveys may be required to determine the exact location of services. The Principal contractor must carry out a CAT scan or similar prior to excavating.	2	5	**10**
3	**Structural Integrity**									
3.1	Unknown underground structures	Sep-22	Design	4	5	**20**	GI investigations have not uncovered any legacy structures.. Enabling works excavation required to confirm.	2	5	**10**
4	**Façade**									
4.1	Materials dislodged during adverse weather	Sep-22	Design	5	5	**25**	Contractor to plan all lifts and ensure suitable cranage is in place. Design to include lifting of panels, fixing details and maintenance of façade.	2	5	**10**
4.2	Insufficient panel design	Sep-22	Design	2	5	**10**	Façade manufacturer design	1	3	**3**
4.3	Rope Access - clip onto façade	Sep-22	Design	4	5	**20**	Façade maintenance strategy to be developed	3	5	**15**
5	**Fire**									
5.1	Fire strategy - general	Sep-22	Design	5	5	**25**	Fire strategy for building to be agreed with Building Control and Fire Officer.	2	5	**10**
5.2	Fire evacuation during construction	Sep-22	Construction	3	5	**15**	Contractor to complete fire risk assessment. Temp fire alarm to be installed/stairs installed as floors progress for escape/fire and emergency plan developed	2	5	**10**
5.3	Fire boundary condition	Sep-22	Design	5	5	**25**	Agreement required as to whether a 2 hour fireproof façade is required	3	5	**15**
6	**Interiors**									
6.1	Flooring slip resistance to floors	Sep-22	Design	5	4	**20**	Slip resistance floors be confirmed as project progresses	2	2	**4**

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6.2	Refuse chute and handling	Sep-22	Construction	4	4	16	To be design further to take into consideration unblocking of chute, rodding and clearing strategy for safety and no human access is possible or permitted. How will water be disposed of from cleaning of the chute, protection from vermin and odour, storage of waste cycles increase fire loading - to be agreed with BO/FO, manual handling and cleaning requirements.	2	3	6
8	**Windows**									
8.1	Strength of glass to resist impact breaks during construction	Sep-22	Design	5	5	25	Glazing of robust strength required	1	5	5
8.2	Window cleaning	Sep-22	Design	5	5	25	Full strategy of window cleaning and maintenance is required	2	4	8
9	**Terraces**									
9.1	Falls from height	Sep-22	Design	4	5	20	Fully glazed/infilled barriers are provided on terrace areas. Height of barriers to be assessed by Architect/BCO	2	2	4
9.2	Fire risk	Sep-22	Design	4	5	20	Potential fire risk is BBQ is to be used. Design to take into consideration wind, smoke, use of gas cylinder or charcoal as fire risk	2	2	4
9.3	Waterpoofing of balconies - risk of structural deterioration	Sep-22	Design	4	5	20	Futher technical design/input required	2	3	6
9.4	Falling objects from balcony handrails	Sep-22	Design	4	5	20	Size of gap between vertical railings etc to comply with guidance to prevent falling objects.	2	5	10
9.5	Risk of ice forming on terraces	Sep-22	Design	5	3	15	Winter maintenance strategy to be developed. De-icing salts with chlorides are not to be used due to their corrosive nature.	3	2	6
10	**Frame and Floors**									
10.1	Riser & Lift Shafts - open floors - falls from height	Sep-22	Construction	4	5	20	No open floors permitted- barriered off. Risersafe plates to be installed at floor level to remove openings in risers and preventings falls from height.	2	3	6
10.2	Working near edge of roof edge from height	Sep-22	Construction	4	5	20	Working near edge not permitted unless barrier is installed and designed by an engineer	2	5	10
10.3	Floor apertures - falls from height	Sep-22	Construction	4	5	20	All floor apertures either covered or with surrounding handrails	2	5	10
10.4	Post tension floor slabs	Sep-22	Construction	3	4	12	Tensioned steel strands within the slab provide structural strength and must not be cut post construction. Design must be fully risk assessed during design stages and accounted for during and after construction. Details to be recorded in the H+S file. PT slab construction mothodology and any temporary propping arrangements are to be designed by the contractor.	2	4	8
10.5	Temporary lifts overloading	Sep-22	Construction	5	5	25	Lifts designed to meet requirements and loads by a competent person and controlled by on setter	2	5	10
10.6	Concrete pumped under pressure to height	Sep-22	Construction	3	4	12	contractor to confirm method of pumpings from either ground level up core or stage pump from floor to floor to reduce pressure.	2	3	6
10.7	Below ground walls and structures	Sep-22	Construction	5	5	25	All below ground structures designed by temporary works engineer or specialist consultant to prevent collapse.	2	5	10
10.8	Temporary works loading due to cantilever platforms	Sep-22	Construction	5	5	25	All temporary works loading requirements to be checked against capacity of floor slabs etc	2	5	10
11	**Piling**									

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11.1	Ground stability	Sep-22	Construction	5	5	25	Contractor must plan the piling works in advance to prevent the crane from overturning by providing a suitable working platform. Ensure the ground stability for the positioning of the piling rig. The Piling mat is to be designed by the Contractor to suit specialist subcontractor's requirements. Existing services information available is to be referred to before the piling commences.	2	4	8
11.2	Vibration	Sep-22	Construction	5	5	25	Driven piles are not permitted	1	5	5
11.3	Obstruction to piling rig due to constraints	Sep-22	Construction	5	5	25	Contractor to fully consider plant access and rig movement restrictions due to the surrounding buildings, tramways, highways etc. Refer to the AJP design reports for full information.	1	5	5
12	**Services**									
12.1	Lifting of heavy equipment over existing buildings	Sep-22	Design	4	4	16	Design of areas and type of equipment to be installed to be considered during design, construction and access of plant into the building and future maintenance of the plant	2	4	8
12.2	Penetrations through steel beams or concrete decks required	Sep-22	Design	2	2	4	Identify service penetrations for design planning to avoid cutting/coring on site, the more than can be preformed will reduce exposure to vibration, dust, noise etc and improve health and safety on site. All services routes are to be indicated from an early stage	2	2	4
12.3	Future maintenance of services and plant	Sep-22	Design	4	4	16	Plant replacement strategy and access and maintenance strategy to be developed	2	4	8
13	**Miscellaneous**									