



# A6 to Manchester Airport Relief Road

B010B Woodford Road Bridge (Bramhall)  
Preliminary Design Report  
Report No. 1007/704/133

September 2013

## PRELIMINARY DESIGN REPORT

Structure Name : Woodford Road Bridge (Bramhall)  
Structure Number : B10B

Report No. 1007/704/133

### Report Control Sheet

Version	Date	Status	Prepared By	Checked By	Approved By
P1	12/03/2013	Final	N Afshar	N Sheena	N Sheena
2	17/04/2013	Final	A Leahy	T Kshirsagar	N Sheena
3	06/09/2013	Draft	L Fields	M Mfandarahwa	N Sheena
4	13/09/2013	Final	L Fields	N Sheena	N Sheena

## Table of Contents

1. Description of Site .....	1
1.1. Site Constraints.....	1
2. Highway Details .....	1
3. Proposed structure.....	1
3.1. Highway Bridge .....	1
3.2. Earthworks .....	2
3.3. Permanent Propping .....	2
4. Span arrangements .....	2
5. Headroom and Clearances .....	2
6. Road Restraint system (Bridge Parapets).....	3
7. Preferred Structural Option .....	3
7.1. Superstructure.....	3
7.2. Substructure Options.....	3
8. Geotechnical Information .....	4
8.1 Groundwater.....	4
8.2 Preliminary Geotechnical Assessment .....	4
9. Environmental Impact Considerations .....	5
10. Appearance.....	5

Appendix A: Location Plan

Appendix B: Proposed General Arrangement Drawing & 3D Models

Appendix C: Ground Investigation Information

## **1. Description of Site**

The Woodford Road Bridge (Bramhall) is part of the South East Manchester Multi Modal Strategy (SEMMMS) A6 to Manchester Airport relief road (A6MARR).

The new bridge is proposed to cross the A6MARR at chainage 13300m and carries the existing Woodford Road toward Bramhall. Woodford Junction Bridge is located between Woodford Recreation Ground and Moorend Golf Course and will be constructed at the existing roundabout connecting A555 and Woodford Road (A5102).

There have been changes to the proposed alignment of Woodford Road from the need for two bridges (Bridge B010 and Bridge B011) to a single bridge (Bridge B010A). (For more information, please see previous reports for B010 and B011). The current proposal is designated as B010B due to additional constraints.

There are a number of residential and commercial properties in the vicinity of the site mainly along the Woodford Road before and after the bridges.

An aerial location plan at 1:1250 scale with the bridge extents delineated in red is included in Appendix A.

### **1.1. Site Constraints**

The vertical alignment of the relief road has been constrained by the presence of existing statutory services beneath Woodford Road at highway Design Freeze 7. The statutory services are foul sewers and it has been determined that full diversion of the services is not a viable option. Preliminary quotation for diversion, from United Utilities, estimates a cost of £7m plus 6 months road closure. In order to provide a maintained headroom beneath the services the finished road level of the A6MARR at Design Freeze 7 is an approximate maximum of 10m below existing ground level.

## **2. Highway Details**

Over Structure: Woodford Road carries two carriageways and a central reserve. East carriageway is 11.0m with a 3.0m footway/cycleway. West carriageway is approximately 4.5m with 2.0m hard verge. The central reserve is approximately 2.0m wide.

Under Structure: Under Structure – A6MARR (Square width is 20.6m wide)

## **3. Proposed structure**

### **3.1. Highway Bridge**

The proposed structure will be a single span fully integral construction bridge. The superstructure will be in the form of pre-cast pre-stressed concrete beams and reinforced concrete slab deck.

The square deck width including parapet up stands will be approximately 23.7m.

The bridge superstructure will be supported on propped contiguous bored pile wall abutments. Further details of the retaining walls below.

### **3.2. Earthworks**

Due to proximity of residential properties contiguous bored pile walls are proposed to support the earthworks required for the cutting.

Adjacent earthworks to the west of the bridge will be retained by splaying retaining walls constructed from contiguous bored piles, whereas to the east contiguous bored pile retaining walls, separate from the main bridge, will provide support for the adjacent ground.

### **3.3. Permanent Propping**

Preliminary design has determined that the retaining wall will require propping to limit the deflections of the piles. At this preliminary stage it is proposed that the highway bridge superstructure will not contribute to the propping of the earthworks.

A propping slab will be required along the length of the retaining wall below the road level. The level of this propping slab will be determined by the highway drainage design.

A beam and slab propping structure is proposed below the soffit of the highway bridge and beneath the invert level of the piped services below Woodford Road. This prop will be structurally independent of the bridge deck and will serve to support the foul sewer as well as propping the retaining walls. To close the void between the propping slab and the highway bridge deck non-structural masking wall will be required.

A proposed General Arrangement drawing is included in Appendix B.

## **4. Span arrangements**

Single skewed span of B010B 23.6m measured between abutment faces. Skew angle is approximately 34 degrees.

The square span between abutment faces and retaining walls is 21.4m.

## **5. Headroom and Clearances**

The headroom provided to the propping structure beneath the bridge and services is 5.5m as determined by the invert level of the foul sewer. In accordance with BD60/04 the propping structure will require to be designed to resist impact loading.

The lane widths and cycle way widths are in accordance with TD 27/05.

## **6. Road Restraint system (Bridge Parapets)**

Type N2 steel parapet with mesh infill is in accordance with Road Restraints Risk Assessment Process (RRRAP) and with TD 19/06. Working width class to be not greater than W4 and will be decided in the final stage of the design. A parapet height of 1.1m on the west verge and 1.4m on the east footway to accommodate cyclist usage will be provided.

Tubular handrails 1.0m high will be provided on the west facing splayed wing walls.

## **7. Preferred Structural Option**

### **7.1. Superstructure**

Single span, fully integral 1.1m deep pre-cast pre-stressed concrete beams and slab deck. Refer to 1007/3D/DF7/A6-MA/B010B/707a & 707b and the 3D Model in Appendix B:

For a span range up to 25m, fully integral construction is normally considered a cost effective option. Elimination of movement joints removes a major cause of maintenance problems from penetration of dirt, water and de-icing salts, which corrode substructures.

The advantages for using pre-cast concrete beam construction are as follows:

- Low capital & whole-life cost
- Good aesthetics due to symmetrical structure
- Fast and efficient build
- Factory quality with engineered tolerances
- Low maintenance
- The beams could be lifted individually
- Permanent formwork provides self supporting system during construction and eliminates false-work
- Reduces site works which is weather dependent

Disadvantages:

- Precast concrete beams are usually heavier than comparable steel beams. As a result bigger cranes might be required to lift the precast concrete beams
- Heavier superstructure mentioned above might lead to bigger foundation sizes
- Delivery times are dependent on specialist supplier

### **7.2. Substructure Options**

Topography of the site, existing ground level and the feasibility of the work govern the choice of substructure. Taking also the geotechnical information into account, contiguous bored piled wall abutments would be a suitable

solution in order to reduce settlements from the embankment and bridge loading. Further discussions regarding the geotechnical assessment is addressed in section 8 of this report.

## **8. Geotechnical Information**

The ground conditions for Woodford Road Bridge have been assessed using relevant geological maps (Stockport Sheet 98, Solid and Drift Scale 1:50,000) along with ground investigation information located at B010B. Six exploratory bore holes have been reviewed (refer to Appendix C for the geotechnical information).

### **8.1 Groundwater**

Groundwater was encountered in 5 of the 6 exploratory bore holes, within the CLAY, SAND and GRAVEL bands, at depths ranging from 4.45mbgl (83.45mAOD) and 18mbgl (69.95mAOD). All groundwater strikes indicated a rise in level after 20mins therefore indicating mobile groundwater. Exploratory bore hole EA POYNTON 69\_3 identified groundwater at depths of 4.45mbgl (83.45mAOD) which is above the proposed A6MARR level of around 78.45mAOD and therefore consideration will be needed during construction (temporary measures) and for the design in the form of drainage.

### **8.2 Preliminary Geotechnical Assessment**

It is anticipated that contiguous bored pile wall foundations are the most appropriate foundation method for the proposed bridge due to the presence of soft material interbedded with the firm to stiff strata, which would lead to significant settlements.

The pile lengths, at the preliminary design stage, have been calculated as 27m (10m Retained + 17m embedded).

By propping the retaining walls below road level (as described in section 3.3) it is anticipated that deflection limits can be satisfied using 1800mm diameter piles.

The inclusion of the secondary propping slab below the highway bridge means that the bridge abutments can be constructed using 1050mm diameter piles.

Additional ground investigation will be required at the location of B010B to confirm the existing ground conditions.

The potential for chemical attack on buried concrete within the ground has not been assessed. This will be the responsibility of the foundation designer, following a supplementary ground investigation.

Given that groundwater has been identified in a number of exploratory bore holes and some at relevantly shallow depths, above the foundation level, drainage methods will need to be considered in the design. Further investigation into the groundwater levels and changes with seasons, along with flow rates is recommended for the design and drainage methods, along with temporary mitigation measures during construction.

## **9. Environmental Impact Considerations**

Refer to Volume 1 (Main Text) of the Environmental Statement.

## **10. Appearance**

On elevation of the structure has a total depth of approximately 4.3m. This is inclusive of the stringcourse, bridge beams, masking wall and propping beam to the soffit of the propping slab.

In addition, N2 steel parapets (post with 3 rails- open structure) will be mounted on the string courses either sides of the bridge (please refer to the 3D view of the bridge included in Appendix B).

The appearance of the exposed faces of the contiguous bored pile retaining walls and abutments will have a ribbed concrete finish. Plain concrete finishes will be used for bridge beams and the masking walls.



## Appendix A: Location plans

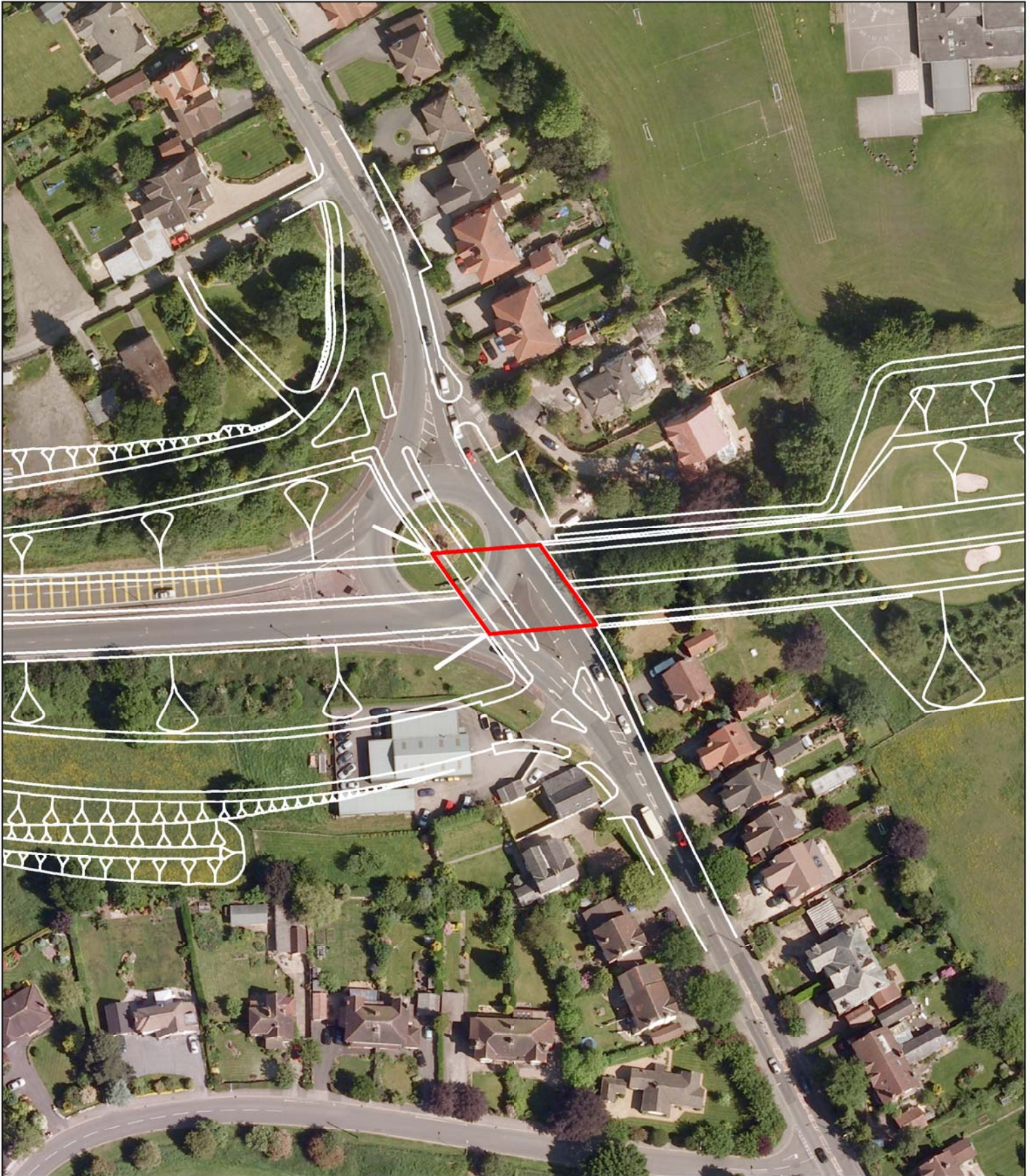





www.semmms.info



© Crown copyright and database rights 2013  
Ordnance Survey 100019571



Drawn	CL	Checked	SC	Approved	NH	 <b>NORTH</b>
Date	12/08/2013	Date	12/08/2013	Date	12/08/2013	
Size	A4	Scale	1 : 1,250			
GIS Task	4268	Filename				
Drawing No. 1007-3D-DF7-A6-MA-B010A-ALP				Revision		



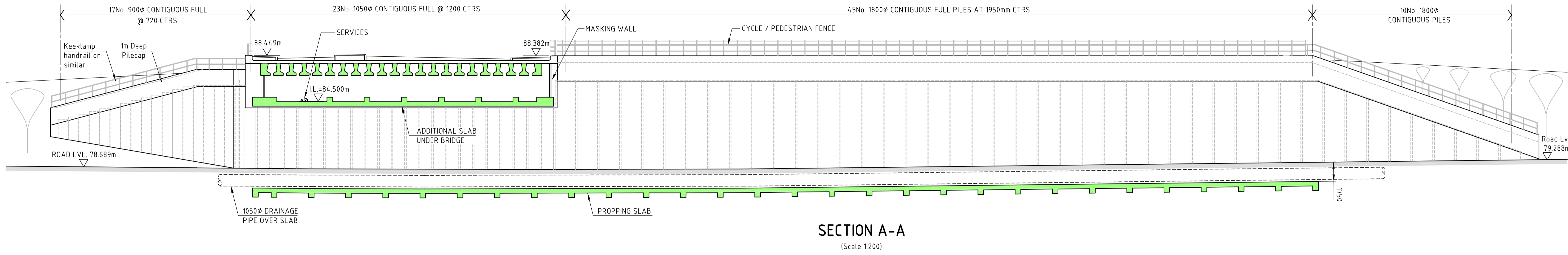
Appendix B: Proposed General Arrangement Drawing & 3D Model

**NOTES**

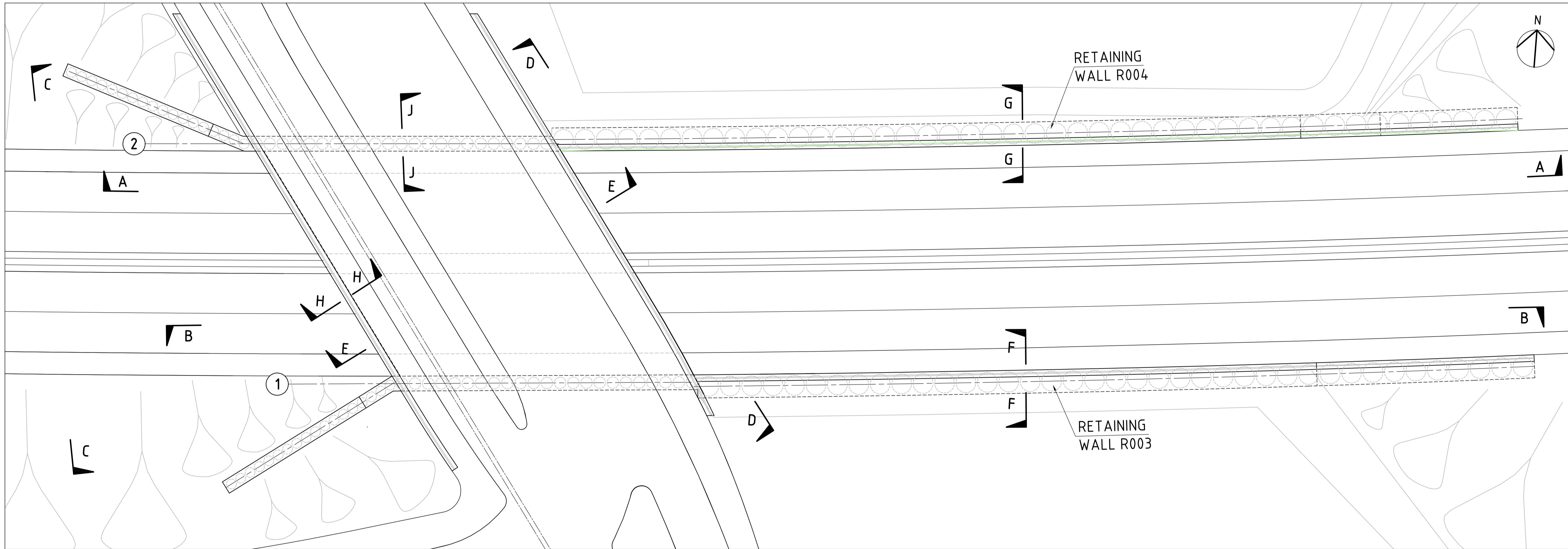
- This drawing has been produced based on the latest MX highway model - Draft Design Freeze DF7, as provided by the client (July 2013).
- This drawing has been produced mainly for the purpose of preliminary design / costing.
- Only one option has been considered for this location as per client's instructions.
- Levels are in metres and above Ordnance Datum.
- All dimensions are in millimetres.
- The option shown in this drawing is not for construction.
- The foundation type shown on the drawing is based on the latest available geotechnical information.
- Basic preliminary design has been undertaken to determine the geometry of the section sizes as per client's instruction.
- Concrete strengths:-
 

Precast panel	C32/ 40
Secant / Bored piles	C32/ 40
Abutment diaphragm	C40/ 50
Deck slab	C40/ 50
Parapet edge beams	C40/ 50
Precast beams	C50/ 60
- Permanent formwork is required.
- Concrete finishes to be as per MCHW specification series 1700 U.N.O. :-
 

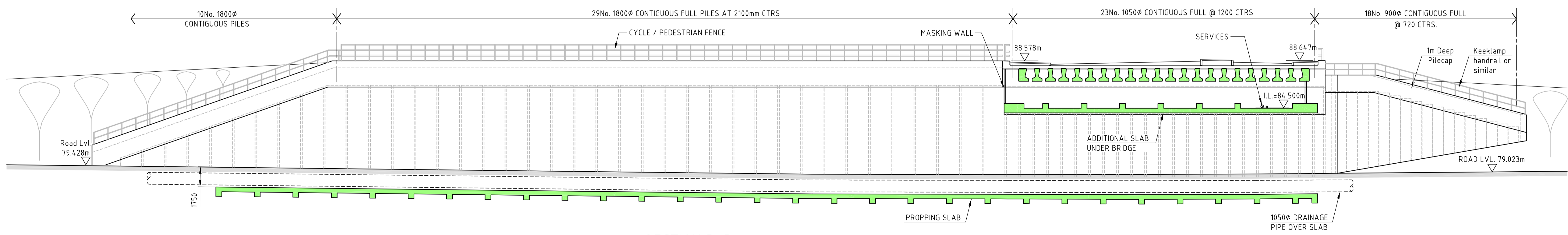
Buried foundations	F1, U1.
Abutment columns	F1.
Buried face of abutment	F1.
Waterproofing	F4.
Precast beams	F5.
Precast concrete panel	F4.
Parapet edge beam	F3, U3.
Deck slab top surface	U4.



**SECTION A-A**  
(Scale 1:200)



**PLAN ON BRIDGE**  
(1:200)



**SECTION B-B**  
(Scale 1:200)

Rev.	Drawn	Checked	Date	Revision Details
B	SPH	MM	12.09.13	ISSUED FOR PLANNING
A	SPH	MM	30.08.13	ROAD ALIGNMENT REVISED
-	SPH	NS	19.04.13	Revised to incorporate Clients comments.

South east manchester multi modal strategy

FRED PERRY HOUSE, 6/O STAFFORD HOUSE  
PICCADILLY, STOCKPORT S16 5SE  
TEL 0161 474 474  
FAX 0161 474 474

**A6 TO MANCHESTER AIRPORT RELIEF ROAD**

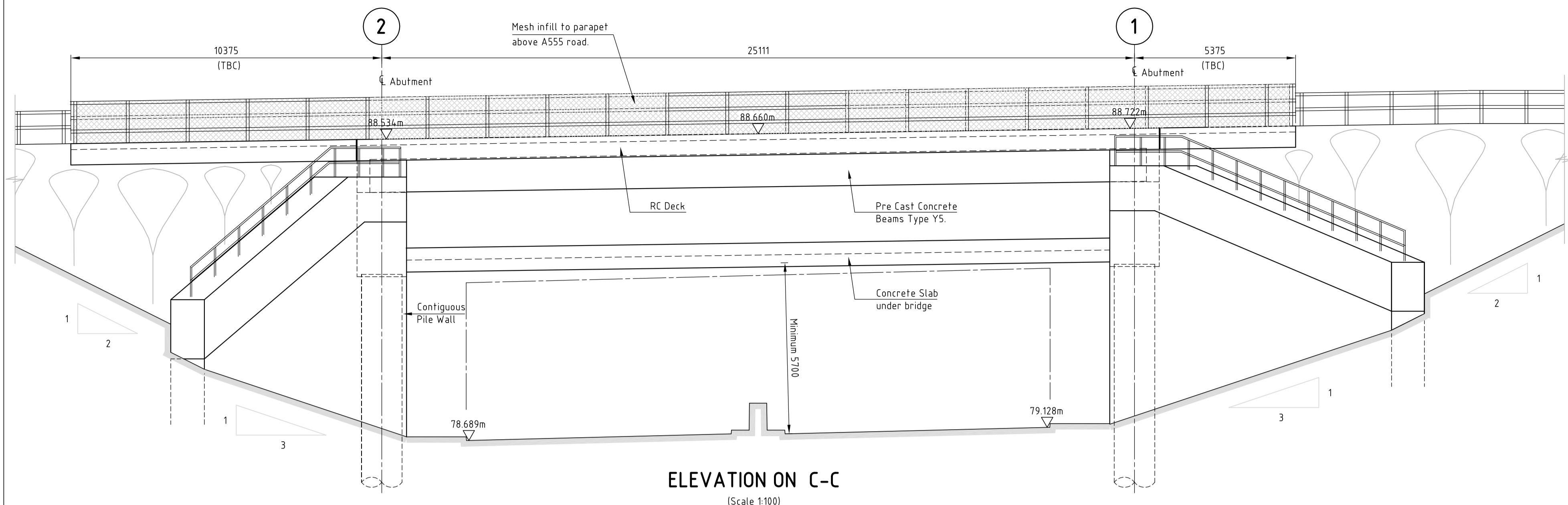
**B010 - WOODFORD ROAD BRIDGE - BRAMHALL GENERAL ARRANGEMENT (SHEET 1 OF 2)**

Drawn	Engineer	Checked	Approved
SPH	NA	NS	NS
Date	Date	Date	Date
MAR '13	MAR '13	MAR '13	MAR '13
Size	Scale	AS SHOWN	
A1	Filename		
SCG No.	Drawing No.		
1007/3D/DF7/A6-MA/B010B/707a	Revision		
	B		

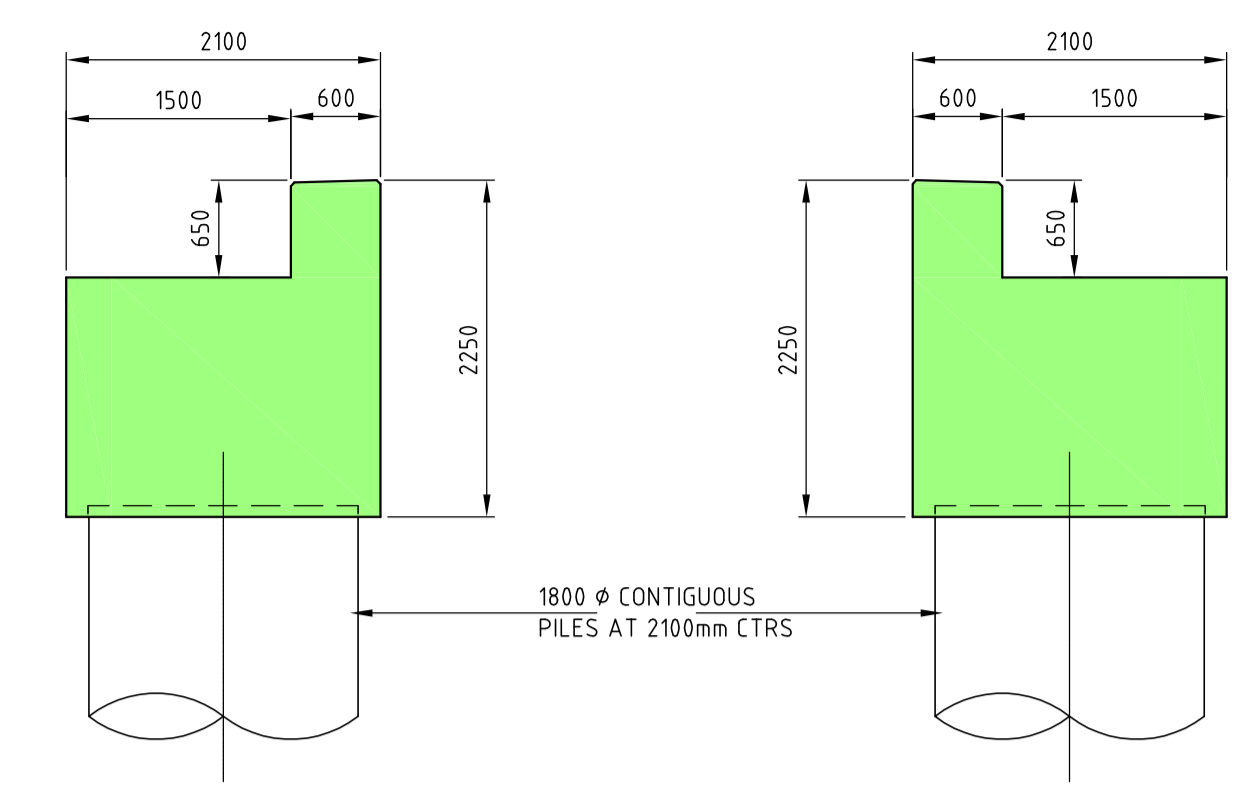


**NOTES**

- This drawing has been produced based on the latest MX highway model - Draft Design Freeze DF7, as provided by the client (July 2013).
- This drawing has been produced mainly for the purpose of preliminary design / costing.
- Only one option has been considered for this location as per client's instructions.
- Levels are in metres and above Ordnance Datum.
- All dimensions are in millimetres.
- The option shown in this drawing is not for construction.
- The foundation type shown on the drawing is based on the latest available geotechnical information.
- Basic preliminary design has been undertaken to determine the geometry of the section sizes as per client's instruction.
- Concrete strengths:-
  - Precast panel C32/ 40
  - Secant / Bored piles C32/ 40
  - Abutment diaphragm C40/ 50
  - Deck slab C40/ 50
  - Parapet edge beams C40/ 50
  - Precast beams C50/ 60
- Permanent formwork is required.
- Concrete finishes to be as per MCHW specification series 1700 UNO :-
  - Buried foundations : F1, U1.
  - Abutment columns : F1.
  - Buried face of abutment : F1.
  - Waterproofing : F4.
  - Precast beams : F5.
  - Precast concrete panel : F4.
  - Parapet edge beam : F3, U3.
  - Deck slab top surface : U4.

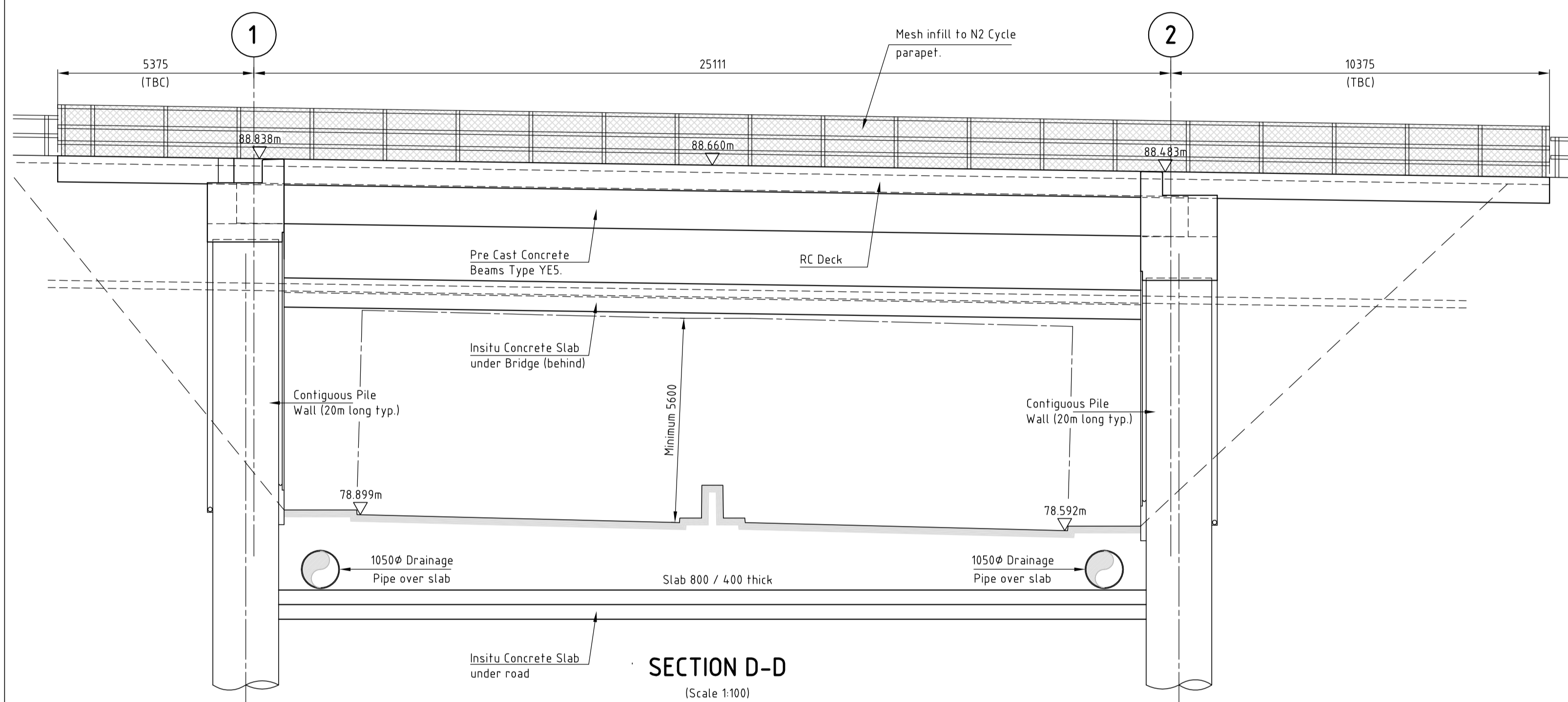


**ELEVATION ON C-C**  
(Scale 1:100)

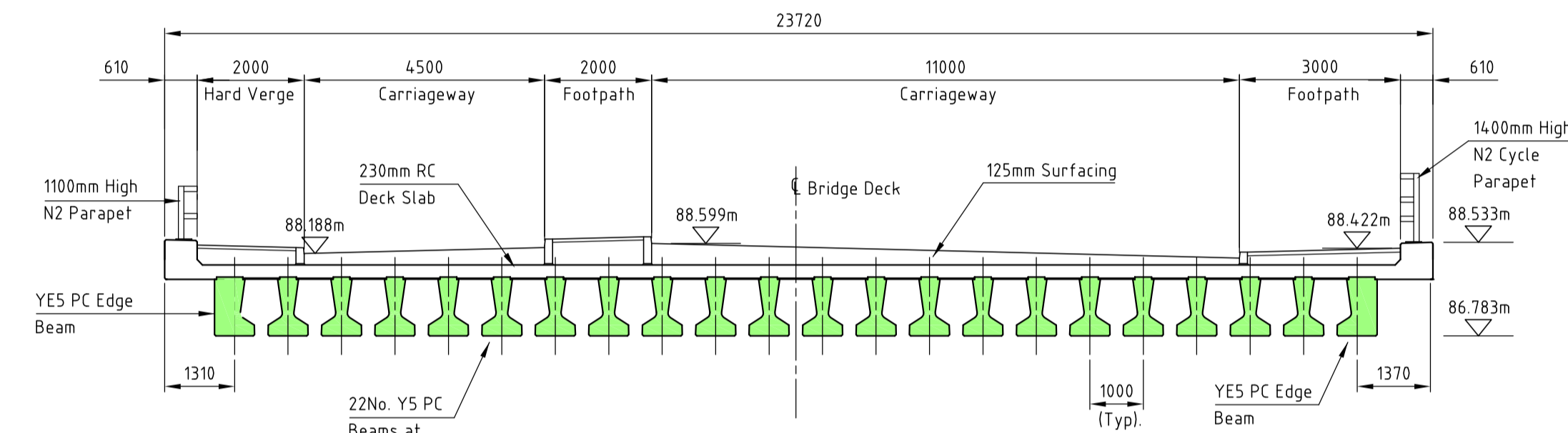


**SECTION F-F**  
(Scale 1:50)

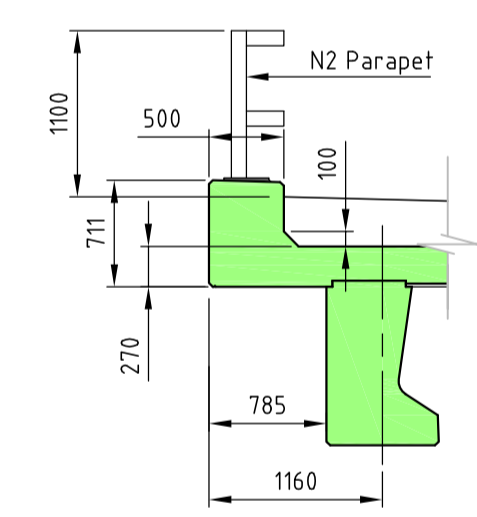
**SECTION G-G**  
(Scale 1:50)



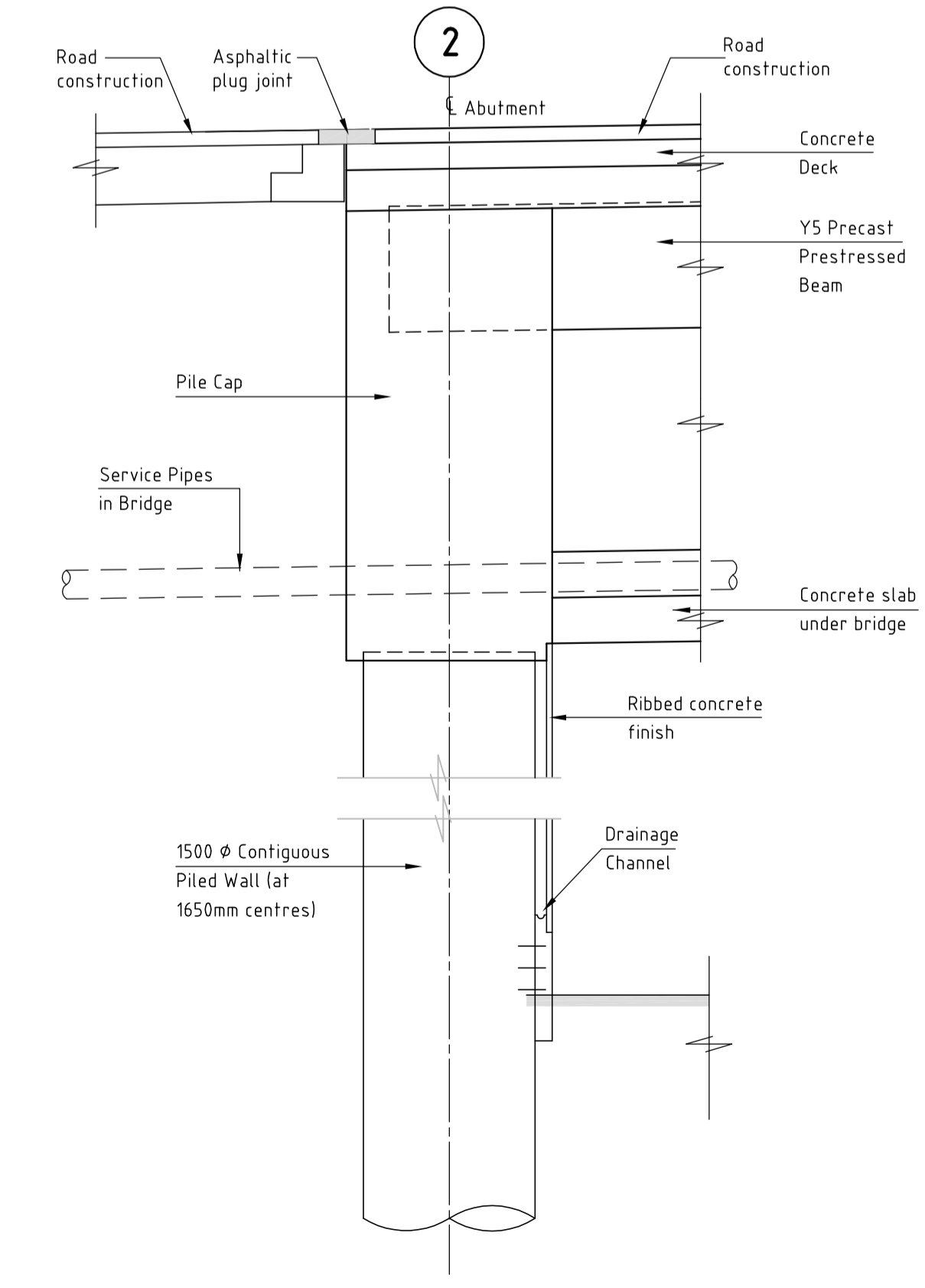
**SECTION D-D**  
(Scale 1:100)



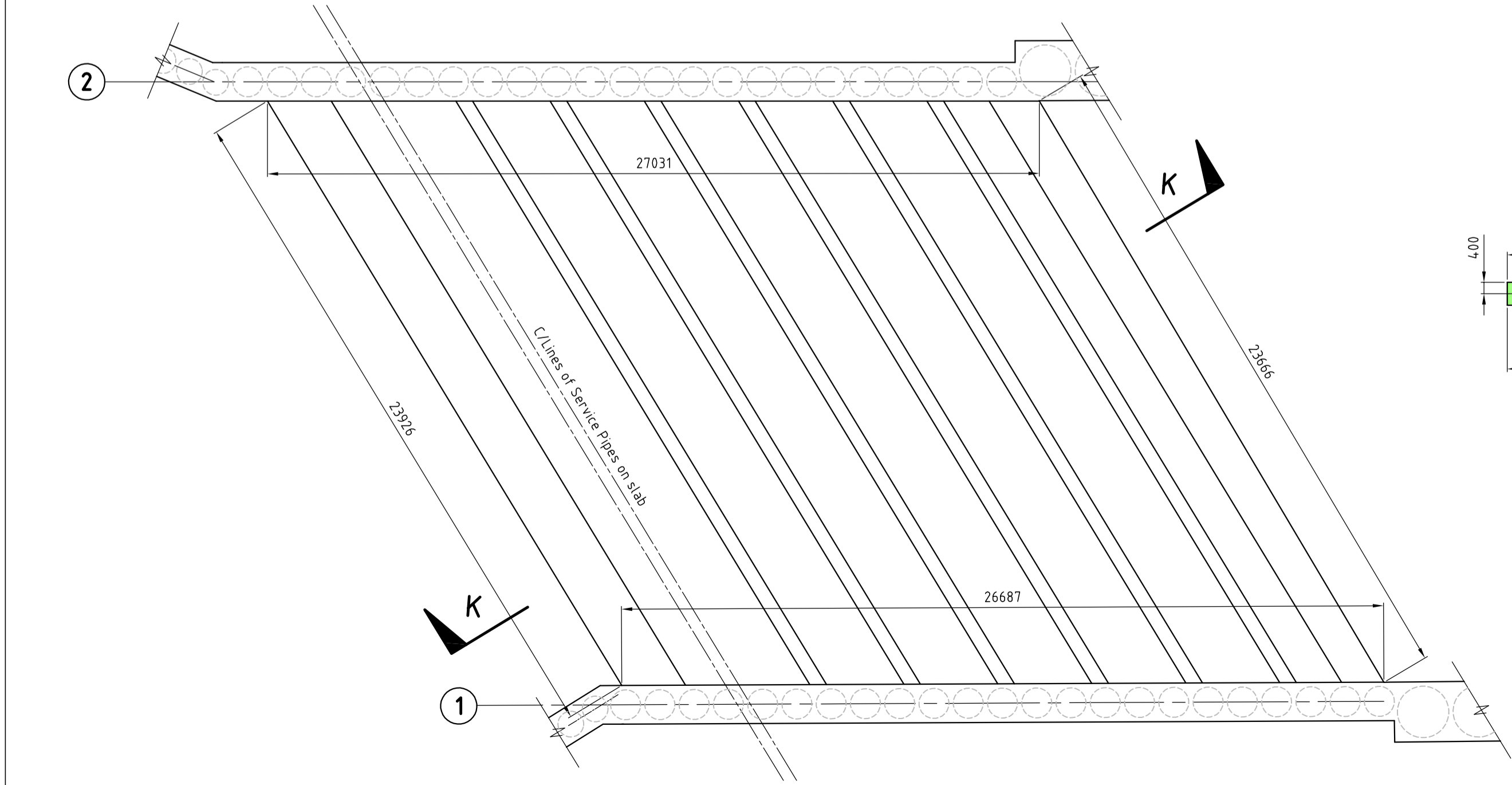
**SECTION E-E**  
(Scale 1:100)



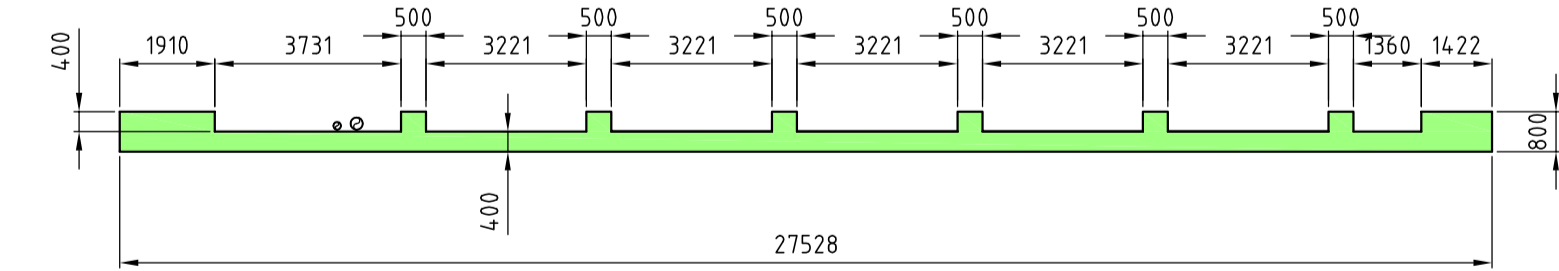
**SECTION H-H**  
(Scale 1:50)



**SECTION J-J**  
(Scale 1:50)



**PLAN ON LOWER BRIDGE SLAB**  
(1:150)



**SECTION K-K**  
(Scale 1:150)

Rev.	Drawn	Checked	Date	Revision Details
-	SPH	NS	12.09.13	ISSUED FOR PLANNING

South east manchester multi modal strategy

**semms**  
SPECIALIST ENGINEERING MANAGEMENT & SURVEILLANCE

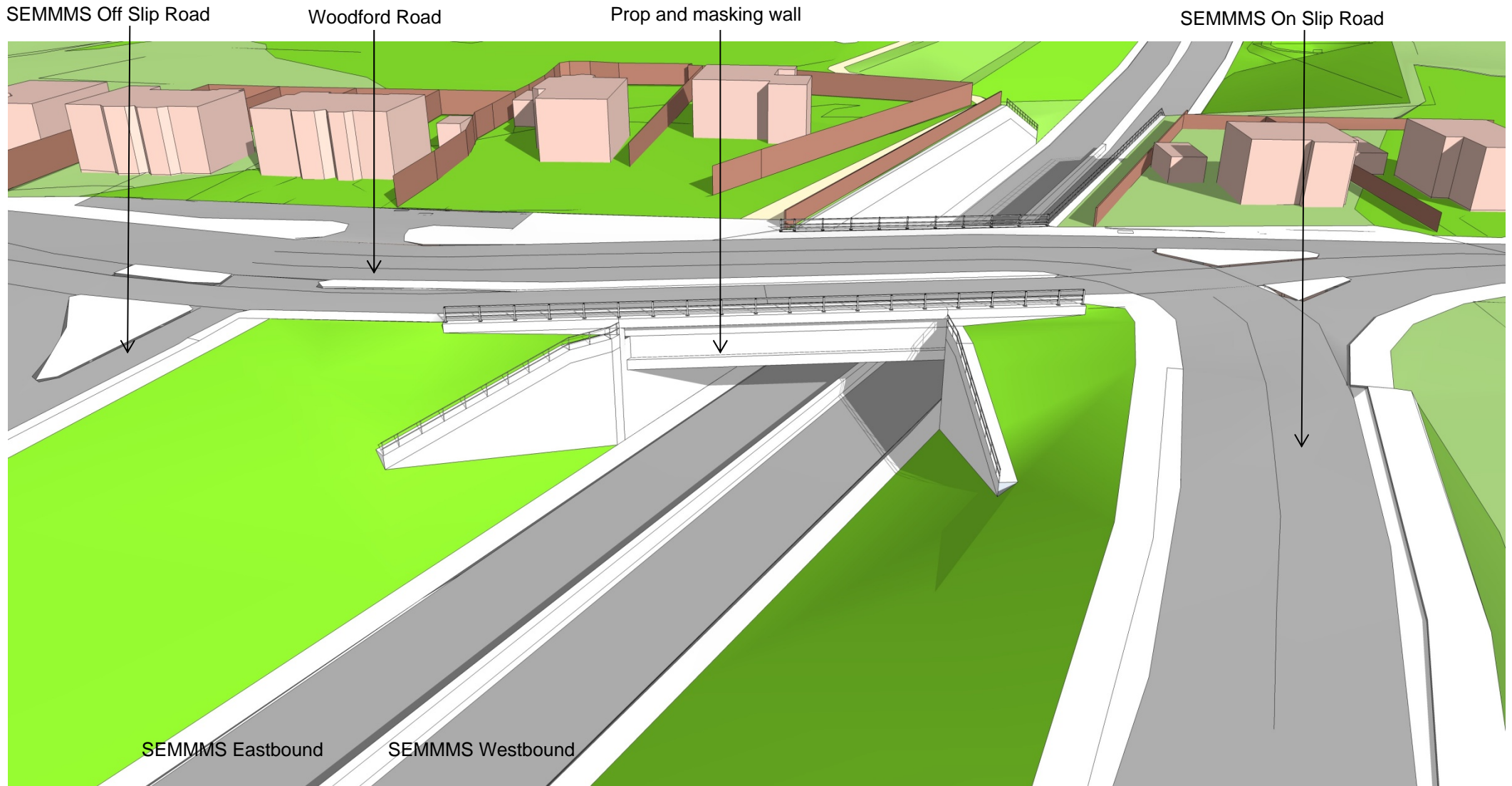
**STOCKPORT** **CHESTER** **MANCHESTER CITY COUNCIL**

FRED PERRY HOUSE, C/O STORFORD HOUSE  
PICCADILLY, STOCKPORT, SK1 3ZE  
TEL: 0161 424 2222  
FAX: 0161 424 2222

Job Title  
**A6 TO MANCHESTER AIRPORT RELIEF ROAD**

Drawing Title  
**B010 - WOODFORD ROAD BRIDGE - BRAMHALL GENERAL ARRANGEMENT (SHEET 2 OF 2)**

Drawn	Engineer	Checked	Approved
SPH	LF	NS	NS
Date	Date	Date	Date
12.09.13	12.09.13	12.09.13	12.09.13
Size	Scale	AS SHOWN	
A1			
SCG No.	Filename		
Drawing No. 1007/3D/DF7/A6-MA/B010B/707b			
Revision			
-			



**B010B – Woodford Road Bridge (Bramhall)**

Elevation Looking East

Appendix C: Reviewed Ground Investigation Information  
(Refer to the Geotechnical Report)