



# A6 to Manchester Airport Relief Road

B004A – Norbury Bridge Widening  
Preliminary Design Report  
Report No. 1007/704/153

August 2013

## PRELIMINARY DESIGN REPORT

Structure Name : Norbury Bridge widening

Structure Number : B004A

Report No. 1007/704/153

### Report Control Sheet

Version	Date	Status	Prepared By	Checked By	Approved By
P1	29/08/2013	Draft	J Watton	M Ellis	N Sheena
P2	13/09/2013	Final	J Watton	M Ellis	N Sheena

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## **1. Description of Site**

The Norbury Bridge widening is part of the A6 to Manchester Airport Relief Road (A6MARR) proposed to allow additional lanes to be added on the approach to the Macclesfield Road/Hazel Grove junction and maintain pedestrian and cyclist access across Norbury Brook. The bridge is located south of the proposed dual carriageway, approximately 30m west of Strikes Brookside Garden Centre at chainage 9520 approximately.

There is a residential property, Norbury Court, located 70m south-west of the proposed crossing and the immediate surrounding area is woodland. An aerial location plan at 1:1250 scale is included in Appendix A.

## **2. Highway Details**

Over Structure – Norbury Bridge widening (0.5m string course + 2.5m footway/cycleway + 2 x 3.7m carriageways + 1.5m cycle lane)

Under Structure – Norbury Brook

## **3. Proposed structure**

The proposed structure will be a single span fully integral bridge. The superstructure will be in the form of precast pre-stressed concrete Y-beams supporting an in-situ reinforced concrete (R.C.) slab deck. The bridge superstructure will be supported on full height R.C. abutments which will be founded on bored piles. In-situ reinforced concrete wing walls, founded on piles, are also proposed. The medium pressure gas pipe adjacent to the existing bridge will require diverting to avoid buildability issues and will require a pipe bridge to cross the brook following confirmation from National Grid, refer to section 9 for further details. A proposed General Arrangement drawing is included in Appendix B.

## **4. Span Arrangements**

The bridge will be a single span of 19.12m, measured between the centres of each abutment, running parallel to the existing bridge.

## **5. Headroom and Clearances**

Norbury Brook is a non-navigable watercourse and therefore minimum headroom limits do not apply. The bridge will be above the anticipated high water table.

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

The parapets are proposed to be Type N2 steel with galvanised mesh infill in accordance with TD 19/06 and the Road Restraints Risk Assessment Process (RRRAP). Working width class is to be no greater than W4 and will be decided in the final phase of the design. The parapet is to stand at 1.4m above the proposed finished road level on the footway side of the bridge to accommodate pedestrian and cyclist access.

## **7. Preferred Structural Options**

### **7.1 Superstructure Options**

Single span, fully integral pre-stressed concrete Y-beams supporting an in-situ reinforced concrete slab deck. Refer to Drawing 1007/3D/DF7/A6-MA/B004A/701 and the 3D Model in Appendix B for further details.

For a span range up to 30m, 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 and bearings.

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

- Low capital & whole-life cost
- Fast and efficient build
- Factory quality with engineered tolerances
- Low maintenance
- The beams can be lifted individually
- Permanent formwork provides self-supporting system during construction and eliminates falsework
- Reduces site works which are weather dependent

Disadvantages:

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

### **7.2 Substructure Options**

It is proposed that the bridge will be supported on full height in-situ reinforced concrete wall abutments. They are regarded as the most suitable option considering the topography of the site, existing ground level and the feasibility of the work.

The R.C. wall abutments will be founded on piles in order to reduce settlements from the embankment and bridge loading. Further discussion regarding the geotechnical assessment is addressed in Section 8 of this report.

## 8. Geotechnical Information

The ground and groundwater conditions for the Bridge B004A over Norbury Brook have been assessed using relevant geological map (Stockport Sheet 98, Solid and Drift Scale 1:50,000) and 6 No. exploratory bore holes logs NWH Main GI 249, NWH Main GI 250, NWH Main GI 251, GE 610, SM 2<sup>ND</sup> SUPP BH537, SM 2<sup>ND</sup> SUPP 538 (refer to Appendix C for further information).

Groundwater strikes were encountered in three relevant exploratory bore holes with depths ranging from 79mAOD to 83mAOD, the ground at this level is interbedded layers of Glacial Sand and Gravels and Glacial Clay.

There is no known groundwater monitoring information for the site.

The geology at the foundation level, which is considered to be at approximately 82mAOD, is highly variable with inter-bedded layers of glacio-fluvial sands, gravel and glacial till. Three adjacent exploratory holes show layers of sand, gravel and clay at the same founding level. The superficial deposits at these locations are up to 12m deep and comprise a mixture of medium dense glacio-fluvial sands and gravels and generally firm to stiff glacial tills. Although the relevant bore holes show glacial material the relevant geological map indicates presence of River Terrace deposits (sands and gravels) associated with Norbury Brook. Due to the proximity of the brook, the presence of soft to firm alluvial material cannot be ignored.

Due to the high groundwater table, very variable founding material and the high anticipated differential settlement between the existing structure and the new proposed extension, shallow foundations are not considered suitable. The extension should be on a piled foundation, either bored or CFA. The underlying material is considered suitable for such piling techniques.

It should be noted that due to the presence of Coal Measures strata and the possibility of encountering Coal seams during construction a Coal Authority licence will be required for any excavation/drilling in the seams. It may also be required that a topsoil strip is undertaken along the scheme in advance of construction to reduce the risk of encountering un-recorded shafts/ shallow workings. Additional investigation may also be required at structural locations prior to the final phase of the design to confirm the presence of any voids.

The potential for chemical attack on buried concrete within the ground has not been assessed due to lack of available information. However, based on the past experience in similar material e.g., pyrites in coal measures and sulphates in superficial material derived from Mercia mudstone, aggressive ground conditions towards concrete/steel cannot be ruled out. It is recommended to undertake sulphate testing in accordance with BRE Special Digest 1: 2005 (Concrete in aggressive ground condition).

Given that high groundwater has identified in the relevant exploratory bore holes at relevantly shallow depths, drainage/dewatering 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 drainages methods, along with temporary mitigation measures during construction.

### **9. Gas Pipe Diversion**

It is proposed to divert the existing medium pressure gas pipe that currently runs adjacent to the existing section of Norbury Bridge. The reason for proposing this is due to the difficulty in constructing around the pipe and incorporating it in to the new work. As in-situ reinforced concrete wing walls, founded on piles, has been identified as the most feasible option for supporting the heavily loaded bridge then there may be buildability and health and safety issues induced by this. These issues relate to excavating and using a piling rig in very close proximity to the gas pipe. Furthermore the pipe would have to pass through the concrete wing wall and beneath the bridge which will create accessibility issues for maintenance and inspection purposes. It is therefore a more viable option to divert the pipe around the proposed structure in advance of beginning the construction works associated with the extension. This requires liaison with the service owner to ascertain the viability of our proposal to divert the gas pipe.

### **10. Appearance**

The proposed superstructure will not be completely visible to the public. The elevation comprises approximately 1.5m deep pre-cast beams and 0.65m string course spanning across Norbury Brook. The beams should have a plain concrete finish. In addition, steel parapets (post with 4 rails- open structure) will be mounted on the string courses on the western side of the bridge with the exposed faces of the abutments and wing walls to be ribbed concrete. The proposed pipe bridge to divert the existing gas pipeline may be partially visible from the extension to the bridge but it is proposed to move this away from the bridge to minimise the visual impact. (Please refer to the 3D view of the bridge included in Appendix B).

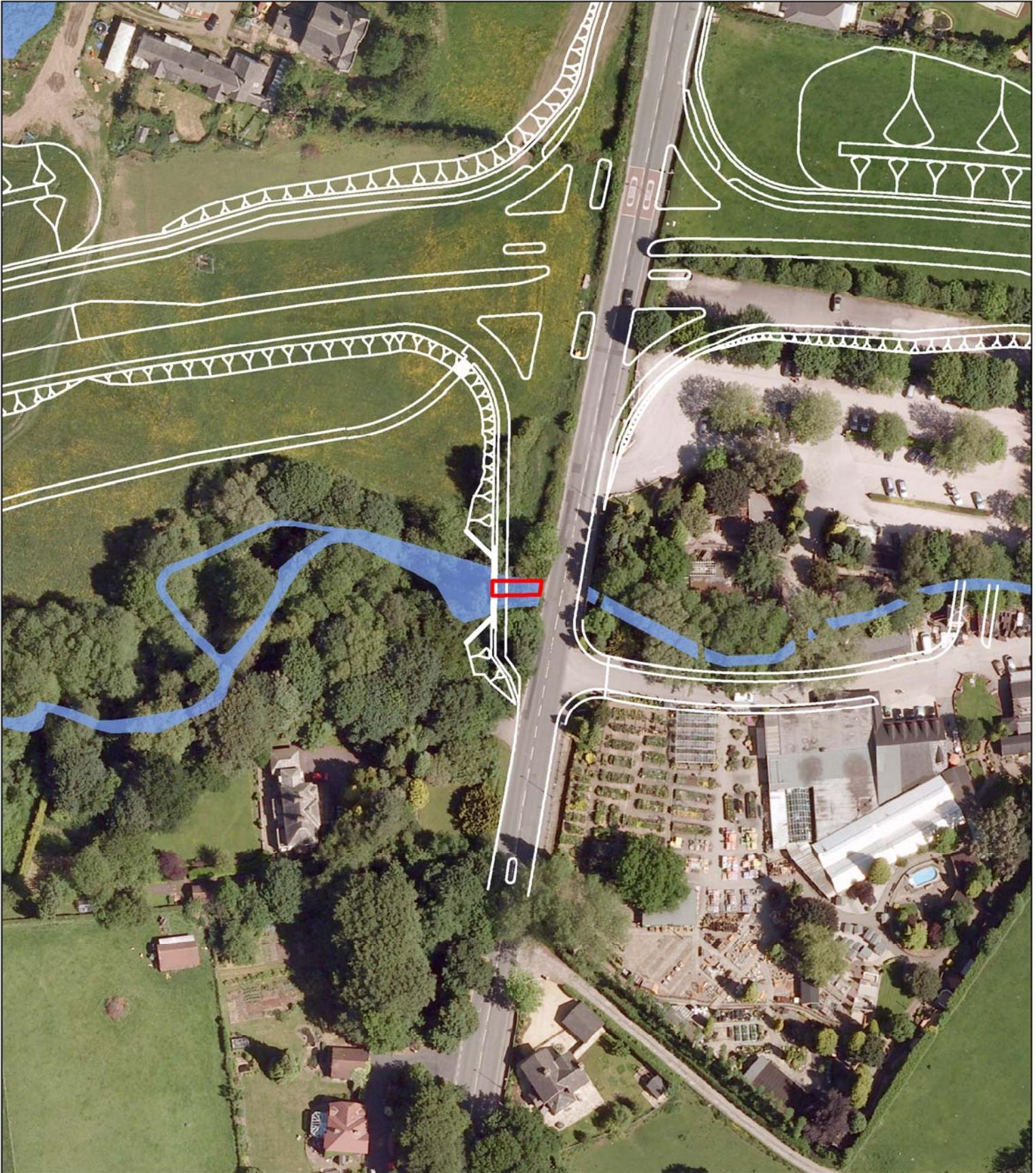
## Appendix A: Location Plans



www.semmms.info

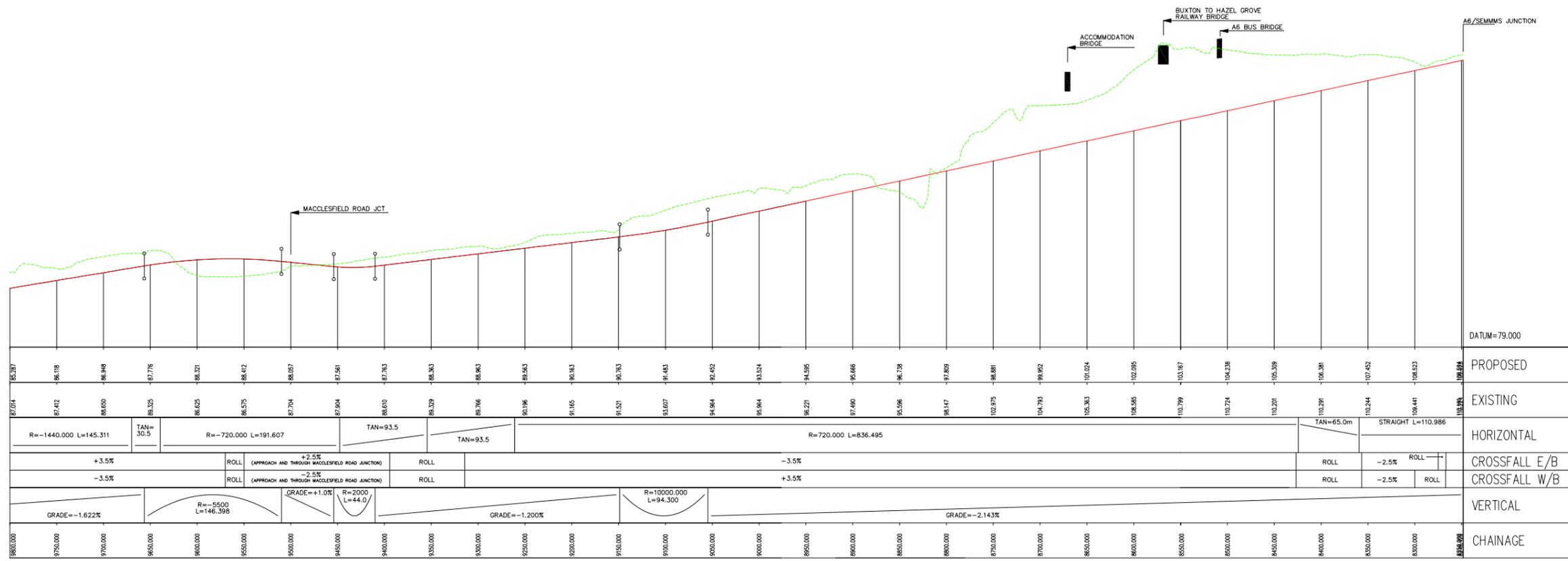
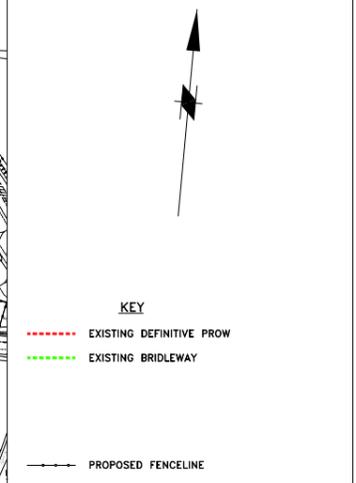
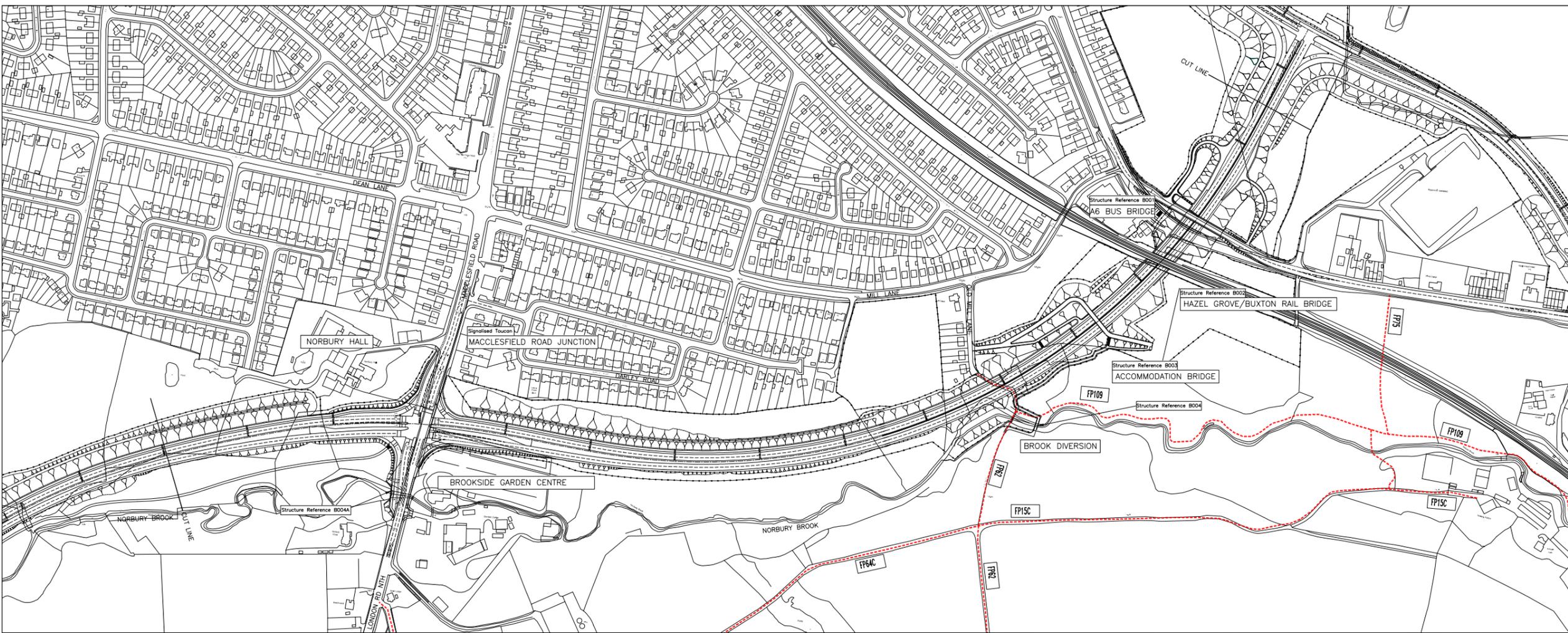


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Drawn	CL	Checked	SC	Approved	NH	 <b>NORTH</b>
Date	12/08/2013	Date	12/08/2013	Date	12/08/2013	
Size	A4	Scale	1 : 1,250			
GIS Task	4268	Filename				
Drawing No. 1007-3D-DF7-A6-MA-B004A-ALP				Revision		

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SECTION ALONG CENTRELINE OF SEMMMS RELIEF ROAD (SPEED LIMIT 50MPH)

Rev.	Drawn	Checked	Date	Revision Details

www.semmms.info

STOCKPORT MANCHESTER CHeshire East

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SERVICE DIRECTOR, MAJOR PROJECTS

STOFFORD HOUSE  
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Job Title  
**A6 to MANCHESTER AIRPORT RELIEF ROAD**

Drawing Title  
**DESIGN FREEZE 7  
GENERAL ARRANGEMENT  
SHEET 2 of 9**

Drawn	Engineer	Checked	Approved
SP	SP	NH	
Date	Date	Date	Date
18.07.13	18.07.13	18.07.13	
Size	Scale		
A1	Hz 1:2500, Vt 1:250		
SCG No.	Filename		

Drawing No. 1007/3D/DF7/A6-MA/GA/202

Revision

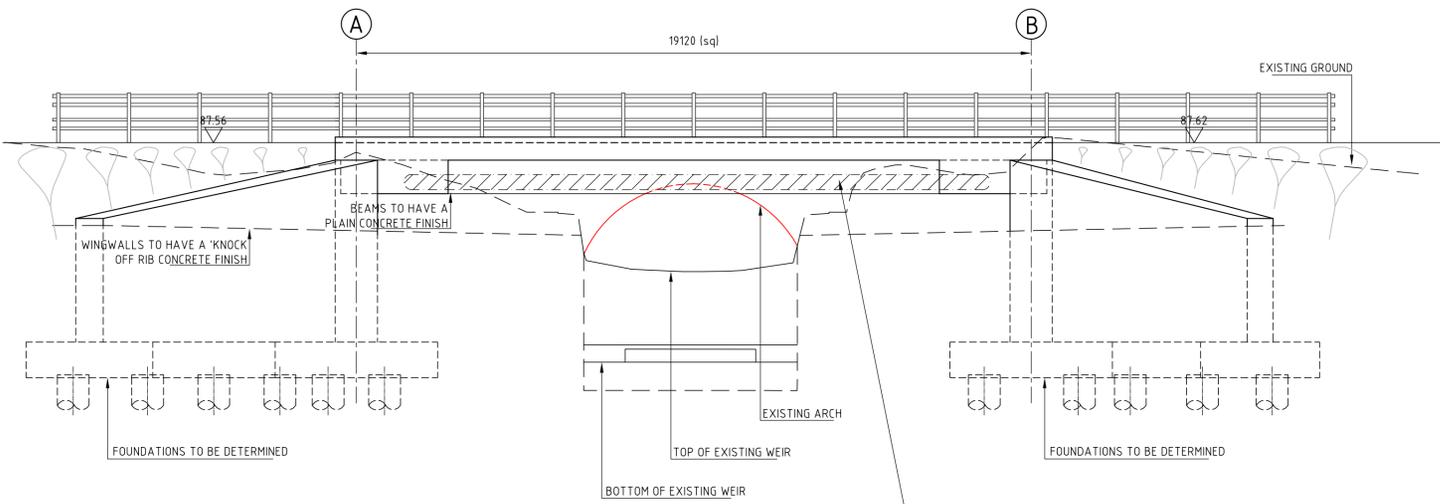
Appendix B: Proposed General Arrangement Drawing  
3D Model

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**NOTES**

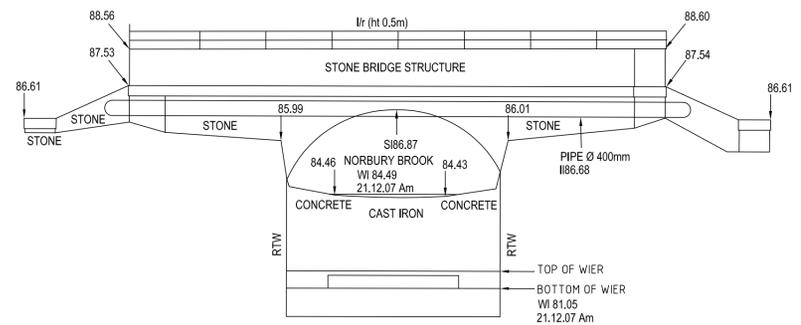
1. THIS DRAWING HAS BEEN PRODUCED MAINLY FOR THE PURPOSE OF PRELIMINARY DESIGN.
2. LEVELS ARE IN METRES AND ABOVE ORDNANCE DATUM.
3. ALL DIMENSIONS ARE IN MILLIMETRES.
4. THE OPTION SHOWN IN THIS DRAWING IS NOT FOR CONSTRUCTION.
5. THE FOUNDATION TYPE SHOWN ON THE DRAWING IS BASED ON THE LATEST AVAILABLE GEOTECHNICAL INFORMATION.
6. BASIC PRELIMINARY DESIGN HAS BEEN UNDERTAKEN TO DETERMINE THE GEOMETRY OF THE SECTION SIZES AS PER CLIENT'S INSTRUCTION.
7. THE BRIDGE HAS BEEN DESIGNED IN ACCORDANCE WITH TD 27/05.
8. CONCRETE STRENGTHS:- DECK SLAB C32/ 40 10.
9. PERMANENT FORMWORK IS REQUIRED.
10. THIS DRAWING HAS BEEN PRODUCED BASED ON THE LATEST MX HIGHWAY MODEL - DRAFT DESIGN FREEZE 7, AS PROVIDED BY THE CLIENT
11. CONCRETE FINISHES TO BE AS PER MCHW SPECIFICATION SERIES 1700 11. U.N.O. :-

BURIED FOUNDATIONS : F1, U1.  
 ABUTMENT COLUMNS : F1.  
 BURIED FACE OF ABUTMENT : F1.  
 WATERPROOFING : F4.  
 PARAPET EDGE BEAM : F3, U3.  
 DECK SLAB TOP SURFACE : U4.



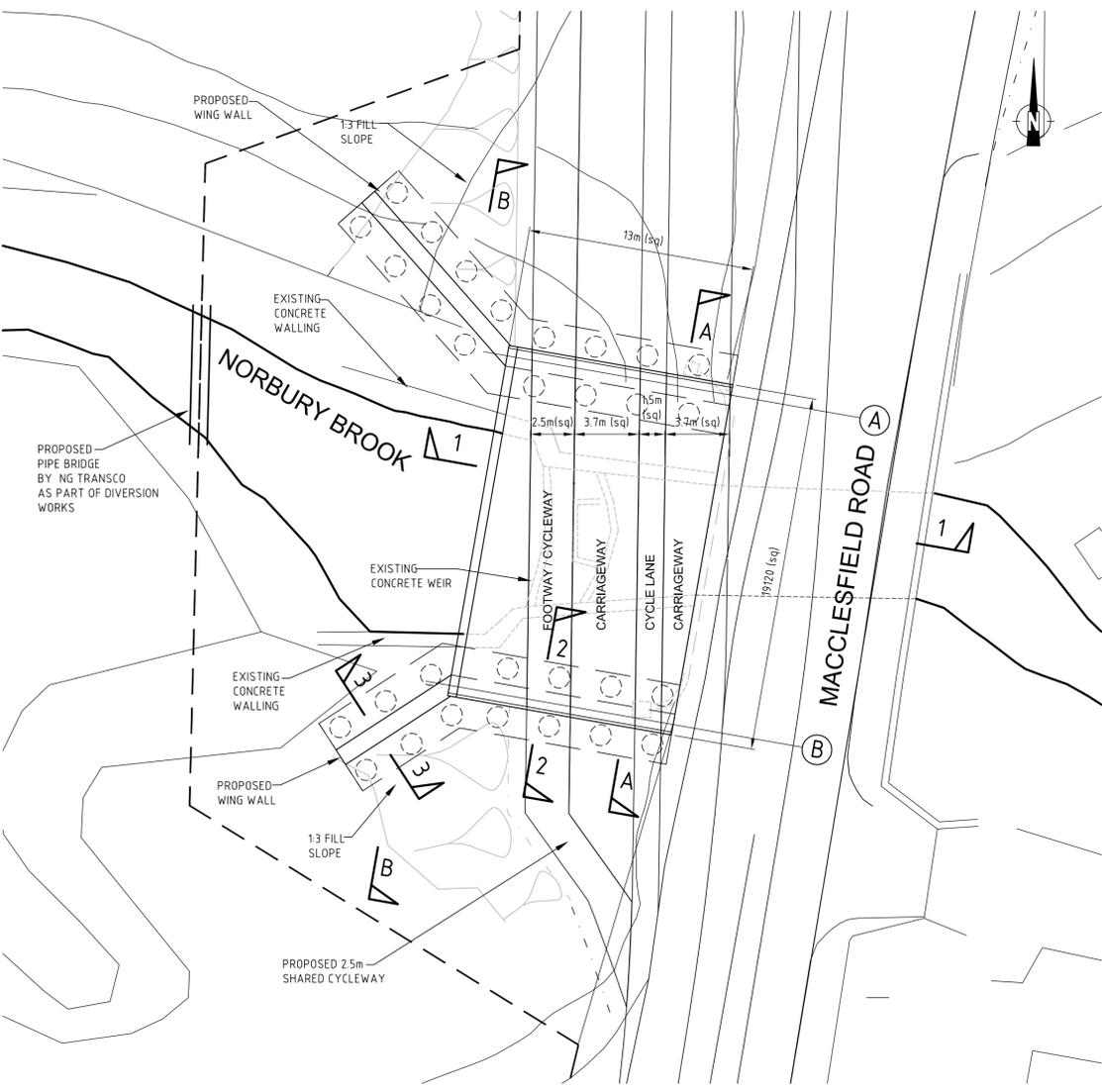
**NOTE**  
 1. THIS ELEVATION AND DIMENSIONS ARE ILLUSTRATIVE ONLY.  
 2. THE EXISTING STRUCTURE SUPPORTS AN EXTERNAL 400MM DIA UTILITIES PIPELINE.

**PROPOSED ELEVATION B-B**  
 SCALE 1:100

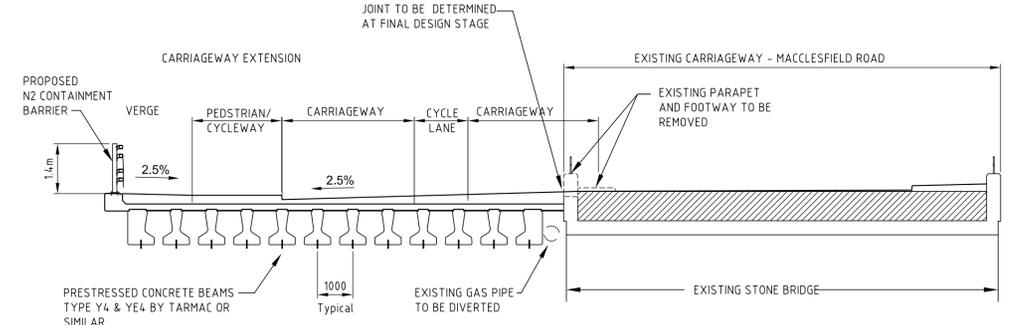


**NOTE**  
 1. THIS ELEVATION AND DIMENSIONS HAVE BEEN SUPPLIED BY STOCKPORT COUNCIL STRUCTURES DEPARTMENT.  
 2. THE CONTRACTOR SHALL SATISFY HIMSELF OF THE ACCURACY OF THESE DETAILS.

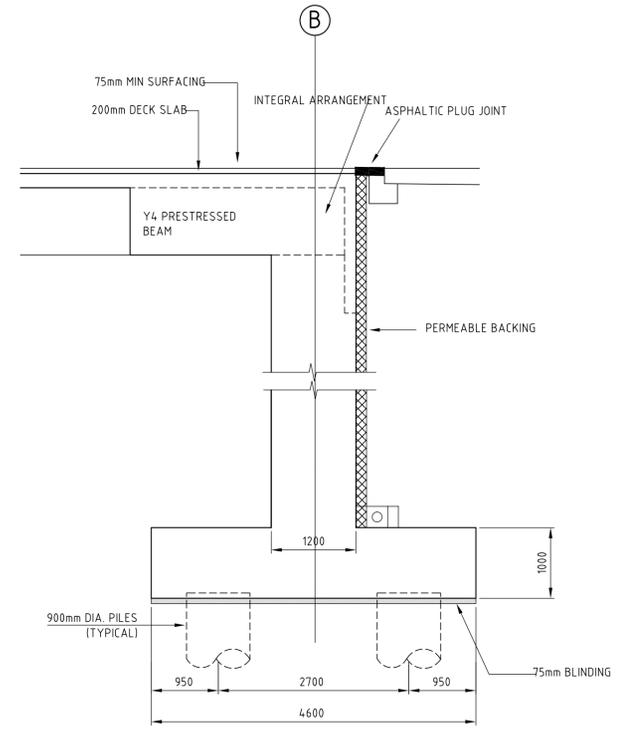
**EXISTING ELEVATION A-A**  
 SCALE 1:100



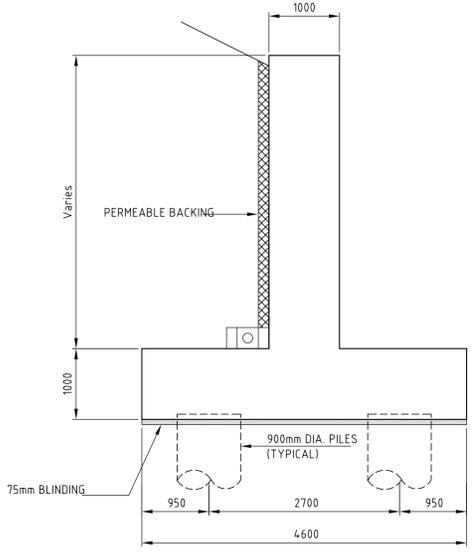
**PLAN LAYOUT**  
 SCALE 1:200



**SECTION 1-1**  
 SCALE 1:100



**SECTION 2-2**  
 (1:50)



**SECTION 3-3**  
 (1:50)

A	CT	JW	13.09.13	ISSUED FOR PLANNING
-	CT	JW	28.08.13	FIRST ISSUE (FOR CLIENT COMMENTS)
Rev.	Drawn	Checked	Date	Revision Details

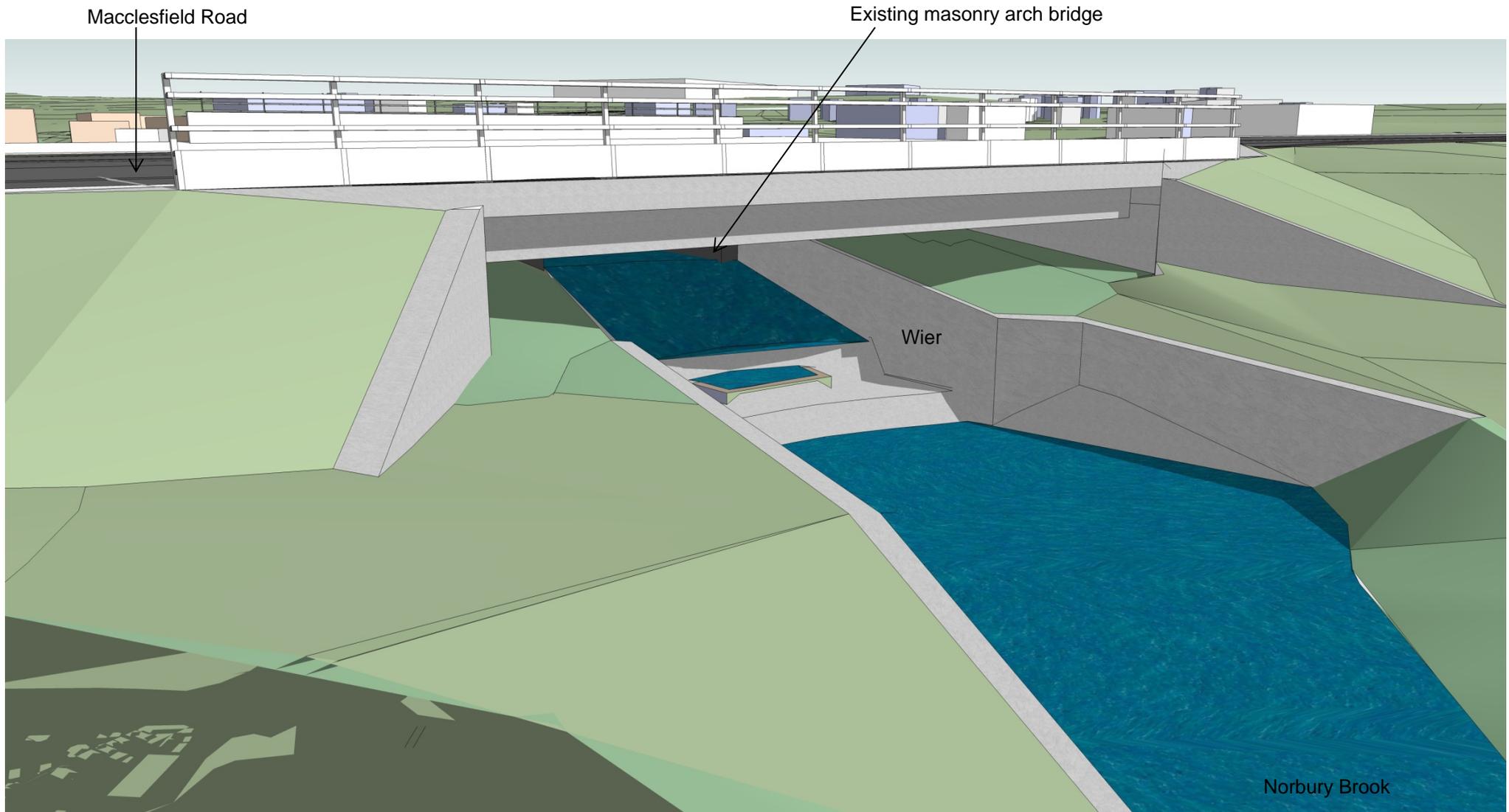
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HIGHWAYS AND STRUCTURES  
 STOPFORD HOUSE  
 STOCKPORT SK1 5UE  
 TEL  
 FAX

**A6 TO MANCHESTER AIRPORT RELIEF ROAD**

**B004A  
 NORBURY BRIDGE  
 WIDENING**

Drawn	Engineer	Checked	Approved
CT	JW	ME	NS
Date	Date	Date	Date
28.03.13	28.03.13	.	.
Size	Scale		
A1	AS SHOWN		
SCG No.	Filename		
-	-		
Drawing No.	Revision		
1007/3D/DF7/A6-MA/B004A/701	A		



**B004A – Macclesfield Road Bridge Extension**

View Looking East

## Appendix C: Ground Investigation Information

# Norwest Holst Soil Engineering Ltd.

Borehole No.  
**249**

Contract No. F.5847  
 Location A6(M) Stockport N-S By-pass  
 Client L.G. Mouchel & Partners  
 Method of Boring Percussion  
 Diameter of Borehole 150mm

## BOREHOLE LOG

Sheet 1 of 2  
 Chainage  
 Ground Level 84.87 m.A.O.D.  
 Date 17/5 - 18/5/84

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.Q.D.%	Daily Progress
TOPSOIL		(0.40)					
Firm, brown, silty, sandy CLAY with occasional fine, medium, sub-rounded gravel and rootlets.	X	0.40 (0.60) 1.00	84.47 83.87		0.40 0.50 0.95 1.00 1.00 1.45 1.50	(47) (29)	
Firm, light brown, slightly silty, sandy CLAY with some fine, medium, sub-rounded and rounded gravel.	X	(1.00) 2.00	82.87		2.00		
Soft, light orange-brown, very silty, sandy CLAY with some fine, medium, rounded gravel above 2.50m	X	(0.85) 2.85	82.02		2.45 2.50 2.50 2.95-3.00 3.00 3.00-3.50 3.45	5 for 450mm (32)	
Medium dense, mid-brown, fine, medium, coarse SAND with occasional fine, medium, sub-rounded gravel.  ... boulder from 3.60m to 4.00m.	O	(3.05) 5.90	78.97		4.00-4.50 4.00 4.45 5.00-5.50 5.00 4,6,6,6,8,6. 5.45 5.90 6.00 6.00	26 26	
Firm to stiff becoming stiff, mid-brown slightly silty, sandy CLAY, with occasional fine, sub-rounded gravel.	X	(2.40) 8.30	76.57		6.45 6.50 7.00 7.50 7.95 8.00 8.30 8.40	(61) (62)	
Very dense, red-brown, silty, slightly clayey above 10.00m, fine, medium, occasionally coarse SAND. (completely weathered sandstone)	X	(10.70)			8.85 9.00-11.00	163	

<p>Type of Sample</p> <p>Is S.P.T.    ■ Undisturbed</p> <p>Ic. C.P.T.    X Vane</p> <p>O Jar        Δ Water</p> <p>● Bulk        ● Piezometer</p>	<p>Remarks (Observations of Ground Water etc.) ( ) U100 blows</p> <p>17/5/84 - Slight water inflow at 3.00m, casing to 1.50m. Stood at 2.10m after 20 minutes.</p> <p>Moderate water inflow at 6.00m, casing to 4.50m. Stood at 4.60m after 20 minutes.</p> <p>1 hour chiselling from 3.60m to 4.00m.</p>
<p>Water levels are subject to seasonal or tidal variations and should not be taken as constant</p>	

# Norwest Holst Soil Engineering Ltd.

Borehole No.

**249**

Contract No. F5847  
 Location A6(M) Stockport N-S By-pass  
 Client L.G. Mouchel & Partners  
 Method of Boring Percussion  
 Diameter of Borehole 150mm

## BOREHOLE LOG

Sheet 2 of 2  
 Chainage  
 Ground Level 84.87 m.A.O.D.  
 Date 17/5/84 - 18/5/84

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.Q.D. %	Daily Progress		
Very dense, red-brown, silty, slightly clayey above 10.00m, fine, medium, occasionally coarse SAND. (completely weathered sandstone)				150mm	10.00-10.61	*91 for 150mm			
				17/5				17/5	
							11.00-13.00		18/5
							11.50		
							8, 17, 18, 36, 45, 60	159	
							11.95		
							13.00-15.00		
				10.70			13.00		
							2, 7, 14, 22, 31, 44	111	
							13.45		
					14.50				
					9, 22, 45, 60	105			
					14.80	for 150mm			
					15.00-17.00				
					16.00	*95 for 150mm			
					35, 60				
				150mm	17.00-19.00				
				18/5	17.00	*88 for 150mm			
					18, 70				
		19.00	65.87				18/5		
BOREHOLE COMPLETE.									

<p>Type of Sample</p> <p>S.P.T.  Undisturbed</p> <p>C.P.T.  Vane</p> <p>Jar  Water</p> <p>Bulk  Piezometer</p>	<p>Remarks (Observations of Ground Water etc.) *seating blows only</p> <p>18/5/84 - Water standing at 2.10m at start of days' shift. Final standing level at 5.00m.</p> <p>Borehole backfilled with hole arisings on completion.</p>
<p>Water levels are subject to seasonal or tidal variations and should not be taken as constant</p>	

# Norwest Holst Soil Engineering Ltd.

Borehole No.

## 250

Contract No. F5847  
 Location. A6(M) Stockport N-S By-pass  
 Client. L.G. Mouchel & Partners.  
 Method of Boring. Percussion  
 Diameter of Borehole. 150mm

### BOREHOLE LOG

BOREHOLES  
 250 & 251

Sheet.....1 of 2.....  
 Chainage.....  
 Ground Level.....87.42..... m.A.O.D.  
 Date.....17/5 - 18/5/84

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.Q.D.%	Daily Progress
MADE GROUND: dark brown, silty ash and bricks.		(0.50)			0.00-0.50		
Medium dense, dark red-brown, slightly silty, sandy, fine, medium, coarse, rounded GRAVEL.  ... became very sandy below 2.00m. (possible made ground)		0.50	86.92		0.50-2.50 0.50 2,2,3,3,4,8. 0.95	13	
Soft, mid-brown, silty, slightly sandy CLAY with some fine, medium, sub-rounded gravel.		(2.20)			1.50 3,3,4,4,5,5. 1.95	18	
Medium dense, light brown, slightly silty, fine, medium SAND, with occasional fine, medium, sub-rounded gravel.  ... very dense at 6.00m		2.70	84.72		2.50	(33)	
Firm to stiff, brown, silty, sandy CLAY with occasional fine, medium, subrounded and subangular gravel.		(0.80)			2.95 3.00		
Dense, becoming very dense, orange-red-brown, slightly silty, fine, medium SAND. (completely weathered sandstone)		3.50	83.92		3.50-4.50 3.50 4,4,5,6,6,6. 3.95	22	
		(3.50)			4.50-5.50 4.50 5,5,5,6,6,7. 4.95	24	
		5.50-6.50			5.50-6.50		
		6.00			6.00 5,7,14,20,	36,44.	
		6.45			6.45	114	
		7.00	80.42		7.00	(60)	
		(2.70)			7.45 7.50		
		8.00			8.00		
		8.50			8.50	(55)	
		8.95			8.95		
		9.00			9.00		
		9.50			9.50		
		9.70	77.72		9.70-11.00		
		(5.30)			9.70 2,3,6,9,14,20. 10.15	49	

Type of Sample	
S.P.T.	Undisturbed
C.P.T.	X Vane
Jar	Δ Water
Bulk	● Piezometer

Remarks (Observations of Ground Water etc.) ( ) U100 blows  
 17/5/84 - Borehole dry during boring.  
 Water added to assist boring from 3.50m to 7.00m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

# Norwest Holst Soil Engineering Ltd.

Borehole No.

**250**

Contract No. F5847

## BOREHOLE LOG

Location A6 (M) Stockport N-S By-pass

Sheet 2 of 2

Client L.G. Mouchel & Partners.

Chainage

Method of Boring Percussion

Ground Level 87.42 m.A.O.D.

Diameter of Borehole 150mm

Date 17/5 - 18/5/84

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.O.D.%	Daily Progress	
Dense, becoming very dense, orange-red-brown, slightly silty, fine, medium SAND.  (completely weathered sandstone)					19.70 10.15	2, 3, 6, 9, 14, 20, 49		
				150mm				17/5
				17/5		11.00-12.00		
				18/5		11.15 6, 10, 15, 22, 28, 32, 11.60	97	18/5
				(5.30)		12.00-13.00		
						12.60		
						10, 16, 16, 20, 24, 50, 13.05	110	
						13.00-14.00		
						14.00-15.00		
						14.05 20, 36, 50, 14.275	50 for 75mm	
BOREHOLE COMPLETE				15.00	25, 35	*60 for 150mm	18/5	

- Type of Sample
- S.P.T.
  - C.P.T.
  - Jar
  - Bulk
  - Undisturbed
  - Vane
  - Water
  - Piezometer

Remarks (Observations of Ground Water etc.) \* seating blows only

18/5/84 - Water added to assist boring from 11.00m to 15.00m  
Borehole dry during boring.  
Borehole backfilled with hole arisings on completion.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

# Norwest Holst Soil Engineering Ltd.

Borehole No.

## 251

Contract No. F5847

## BOREHOLE LOG

Location A6(M) Stockport N-S By-pass

Sheet 1 of 2

Client L.G. Mouchel & Partners.

Chainage

Method of Boring Percussion

Ground Level 87.32 m.A.O.D.

Diameter of Borehole 150mm

Date 19/5/84

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.Q.D.%	Daily Progress
TOPSOIL		0.50 0.50	86.82		0.00-0.50		
Soft to firm, mid-brown, silty, sandy CLAY, with occasional light brown, fine, medium sand pockets.	X	1.00 1.50	85.82		0.50 0.95 1.00 1.25 1.50	(33)	
Firm, grey-brown, very silty, sandy CLAY, with occasional fine, medium, sub-rounded gravel and light brown, fine, medium sand pockets below 2.25m.	X	1.50 3.00	84.32		1.50 1.95 2.00 2.25 2.50 2.95 3.00	(60)       	
Medium dense, with very dense bands, light orange brown, slightly sandy, fine, medium, sub-angular GRAVEL.	X	(5.00)			3.00-4.00 3.50 2,2,3,3,4,5 3.95 4.00-5.00 4.50 2,2,3,3,4,4 4.95 5.00-6.00	15       	
... stiff, brown clay bands at 7.50m.	X	8.00	79.32		6.00-7.00 6.00 3,3,5,6,17 6.45 7.50 7.95 8.00 8.00-9.00	(100)       	
Very dense, red-brown, slightly silty, fine, occasionally medium SAND.  (Completely weathered sandstone)	X	(7.00)			9.00-10.00 9.00 2,4,9,15,20 9.45	27. 55      	

<p><b>Type of Sample</b></p> <p>S.P.T.    Undisturbed</p> <p>C.P.T.    X Vane</p> <p>Jar        Δ Water</p> <p>Bulk       Piezometer</p>	<p><b>Remarks (Observations of Ground Water etc.)</b> ( ) U100 blows.</p> <p>19/5/84. Water added to assist boring from 3.00m to 15.00m Borehole dry during boring.</p> <p style="font-size: small; text-align: center;">Water levels are subject to seasonal or tidal variations and should not be taken as constant</p>
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# Norwest Holst Soil Engineering Ltd.

Borehole No.

**251**

Contract No. F5847

## BOREHOLE LOG

Location A6(M) Stockport N-S By-pass

Client L.G. Mouchel & Partners.

Method of Boring Percussion

Diameter of Borehole 150mm

Sheet 2 of 2

Chainage

Ground Level 87.32 m.A.O.D.

Date 19/5/84

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.Q.D.%	Daily Progress
Very dense, red-brown, slightly silty, fine, occasionally medium SAND.  (completely weathered sandstone)		(7.00)		150mm 19/5	10.00-11.00		
					10.50 8, 12, 15, 20, 26, 30. 10.95 11.00-12.00	91	
					12.00-13.00 12.00 10, 13, 18, 21, 30, 36. 12.45	105	
					13.00-14.00 13.50 13.50 22, 42, 50 13.725 14.00-15.00	50 for 75mm	
BOREHOLE COMPLETE		15.00	72.32		15.00 28, 50.	*78 for 150mm	19/5

Type of Sample

- Is S.P.T. Undisturbed
- Ic. C.P.T. Vane
- O Jar Water
- Bulk Piezometer

Remarks (Observations of Ground Water etc.)

\*seating blows only

19/5/84 - Borehole backfilled with hole arisings on completion.

# Norwest Holst Soil Engineering Ltd.

Borehole No.  
**314**

Contract No. F6457  
 Location A6(M) Stockport N-S By-Pass  
 Client Department of Transport  
 Method of Boring Percussion  
 Diameter of Borehole 150mm

## BOREHOLE LOG

BOREHOLE  
314

Sheet 1 of 2  
 Co. Ords: 10270N: 2589E  
 Ground Level 88.32 m.A.O.D.  
 Date 31/3/85-4/6/85

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.Q.D. %	Daily Progress
Sandy TOPSOIL		0.15	88.17				31/3
MADE GROUND; Loose pale brown grey and dark grey mottled very clayey silt sand and silty sandy clay		[1.30]			0.50		
		1.45	86.87		1.05	"5"	3/6
		1.05-1.65			1.05-1.65 s		
Soft friable brown and grey brown mottled clayey very sandy SILT with fine roots and occasional red sandstone gravel		[0.30]			1.80		
		1.75	86.57		1.95	(65)	
		[1.15]			2.40		
		2.50			2.50		
Medium dense multi coloured mottled friable locally clayey silty sandy fine medium coarse subangular and subrounded GRAVEL with occasional cobbles		[0.50]			2.55-3.00 s	"12"	
		3.40	84.92		3.20	(35)	
		3.30			3.30		
Medium dense brown and dark grey brown slightly clayey silty fine medium locally coarse SAND with much fine medium subangular to subrounded gravel and local soft sandy clay pockets		[2.90]			3.75	"8"	
		4.00			3.90		
		4.00			4.00		
		4.00-4.60			4.00-4.60 s		
Loose brown fine medium SAND with thin layers of soft darker brown faintly laminated very silty clay		[2.90]			4.80	"9"	
		5.00			5.00		
		5.00-5.60			5.00-5.60 s		
		5.80			5.80		
		6.05			6.05	"24"	
		6.05-6.50			6.05-6.50 s		
Medium dense brown slightly silty fine medium coarse sandy fine medium coarse subrounded GRAVEL		[2.60]			6.75	"18"	
		7.05			7.05		
		s			s		
		7.75			7.75		
		8.05			8.05	"29"	
		s			s		
		8.75			8.75		
Dense brown slightly silty fine locally medium SAND with occasional small lenses of soft brown clayey silt		[1.30]			9.05	'30'	
		9.05			9.05		
		9.05-9.50			9.05-9.50 s		
		9.75			9.75		

Type of Sample	Remarks (Observations of Ground Water etc.)
S.P.T.  Undisturbed C.P.T.  Vane Jar  Water Bulk  Piezometer	Inspection pit dug to 1.00 m. 3/6/85 Water struck at 3.75 m. Casing at 3.00 m Water level after 5 minutes 3.50 m Water added to assist boring at 3.75 m Water struck at 11.30 m. Casing at 11.00 m Water level after 20 minutes 8.60 m Water level at end of shift 11.25 m Casing at 13.50 m Water levels are subject to seasonal or tidal variations and should not be taken as constant

# Norwest Holst Soil Engineering Ltd.

Borehole No.  
**314**

Contract No. F6457

## BOREHOLE LOG

Location A6(M) Stockport N-S By-Pass

Sheet 2 of 2

Client Department of Transport

Co. Ords - 10270N; 2589E

Method of Boring Percussion

Ground Level 88.32 m.A.O.D.

Diameter of Borehole 150mm

Date 31/3/85-4/6/85

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.O.D.%	Daily Progress
As sheet 1		10.20	78.12		10.05	"24"	
Stiff dark brown very clayey very sandy SILT with some fine medium subangular and subrounded gravel		[0.80]			s 10.75		
		11.30	77.02		11.30		
Medium dense red brown fine medium coarse SAND with occasional fine gravel and bands of dark brown soft to firm slightly sandy very silty clay		[1.10]			11.55	"27"	
		12.40	75.92		s 12.40		
Medium dense red slightly silty fine medium SAND  (Completely weathered sandstone)  ...14.50 m becoming very dense and weakly cemented  ...15.55 m. Fragments of cream well cemented sandstone					12.55	"19"	
				3/6	s 13.40		
					13.55	"27"	3/6
		[4.10]			s 14.40		4/6
					14.55	50 for 50mm	
					s 15.40		
		16.50	71.82	150mm to 16.50	s 15.55	50 for 50mm	4/6
16.50							
End of Borehole							

<p>Type of Sample</p> <p>S.P.T.  Undisturbed</p> <p>C.P.T.  Vane</p> <p>Jar  Water</p> <p>Bulk  Piezometer</p>	<p>Remarks (Observations of Ground Water etc.) ( ) U100 blows Strata thickness</p> <p>4/6/85 Water level overnight 8.85 m Chiselling sandstone 14.60 m - 16.50 m (2 hours) Borehole backfilled with arisings</p> <p>Water levels are subject to seasonal or tidal variations and should not be taken as constant</p>
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Client **DEPARTMENT OF TRANSPORT**

Type of boring **CABLE PERCUSSION WITH ROTARY FOLLOW ON**  
DATE: 3-4-6.91

Project No. **B12420**

Ground level **+87.40m.O.D.**

150mm to 15.50m  
Diameter **92mm (PWF) to 20.90m**

150mm to 15.30m  
Casing **125mm (PX) to 15.50m**

Daily Progress	Ground water depths (m)	Depth of casing (m)	Samples			Strata		Description of strata	Interval	← 100-000
			Depth (m)	No.	Type	Depth (m) Thickness	Reduced level			
3.6.91								TOPSOIL		
			0.50	1	D	0.40	87.00	Firm to stiff reddish brown, yellow brown and brown silty sandy CLAY with much fine to coarse subangular to rounded gravel, many lenses of yellow brown and reddish brown medium to coarse sand and some lignite and coal traces. (BOULDER CLAY).	BOULDER CLAY	
			1.00-1.45 1.00-1.50 1.30	2	S(23) D,B 4A W					
	1.30		1.80	3	D	1.80	85.60	Firm dark brown sandy CLAY (locally clayey sand) with frequent pockets of sand and much fine to occasionally cobble-sized angular to rounded sandstone, siltstone and quartz gravel. (BOULDER CLAY)	BOULDER CLAY	
	2.00		2.00-2.45	4	B,C(15)	2.00	85.40			
			2.80	5	D			Loose, medium dense dark brown silty very clayey fine to coarse SAND and fine to coarse angular to rounded siltstone, sandstone, quartz and coal GRAVEL and occasional lenses of soft brown silty clay. (GLACIAL SAND AND GRAVEL)	GLACIAL SAND AND GRAVEL	
			3.00-3.45	6	B,C(7)					
			3.80	7	D	3.80	83.60	Medium dense to very dense dark brown silty clayey fine to coarse SAND and fine to coarse angular to rounded siltstone, sandstone, quartz and coal GRAVEL with occasional lenses of soft brown silty clay. 4.80-5.80m sandy (medium to coarse) GRAVEL. 5.00-6.70m reddish brown. (GLACIAL SAND AND GRAVEL)	GLACIAL SAND AND GRAVEL	
			4.00-4.45	8	B,C(10)					
			4.80	9	D			5.80-6.70m fine to medium occasionally coarse GRAVEL.	GLACIAL SAND AND GRAVEL	
			5.00-5.45	10	B,C(23)					
			5.80	11	D			Very dense brown slightly clayey slightly silty fine to coarse subangular to rounded GRAVEL with much sand and occasional lenses of reddish brown silty slightly sandy clay. 7.80-9.00m, fine to coarse angular to rounded GRAVEL. (GLACIAL SAND AND GRAVEL)	GLACIAL SAND AND GRAVEL	
			6.00-6.03	12	B,C50/30*					
			6.80	13	D	6.70	80.70	Very dense reddish brown slightly silty fine to coarse SAND (COLLYHURST SANDSTONE).	COLLYHURST SANDSTONE	
			7.00-7.145	14	B,C65/145*					
			7.80	15	D			9.80-15.00m, with occasional black and white coarse sand and fine gravel.	COLLYHURST SANDSTONE	
			8.00-8.135	16	B,C77/135*					
			8.80	17	D	9.00	78.40			
			9.00-9.225	18	B,C50/75					
			9.80	19	D	10.00	77.40			

CONTINUED OVER ON SHEET 2 of 3

**Key**  
 U ( ) .. undisturbed 106mm diameter sample  
 D .... disturbed jar sample  
 B .... disturbed bulk sample  
 W .... water sample  
 S ( ) .. standard penetration test  
 C ( ) .. standard penetration test (using cone)  
 (33) .. number of blows  
 ☒ .. groundwater encountered  
 ☒ .. groundwater rise (see remarks)

**Remarks**

Groundwater encountered 2.00m which rose to 1.30m in 20 minutes, details:  
 Time (min) Depth (m bgl)  
 5 1.90  
 10 1.70  
 15 1.30  
 Water added to assist drilling from 2.00m to 15.50m, water maintained between 3.00-1.5m b.g.l.  
 Slow boring, 6.00-6.30m: 45 mins  
 \*Seating drives only. Water level observations on sheet 3 of 3

# Record of Borehole No. 612

Project Name **A6(M) STOCKPORT NORTH-SOUTH BYPASS  
A523 GROUND INVESTIGATION**

Sheet 2 of 3

Client **DEPARTMENT OF TRANSPORT**

Type of boring **CABLE PERCUSSION WITH  
ROTARY FOLLOW-ON**

Diameter **150mm to 15.50m  
92mm (PMF) to 20.90m**  
Casing **150mm to 15.50m  
125mm (PX) to 15.50m**

Project No. **B12420**

Date <b>3-5.6.91</b>	Ground Level <b>+87.40m O.D.</b>	Co-ordinates <b>10457.0 E 2682.5 N</b>
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Sample and Insitu Tests				Progress		Water	Strata		Description of Strata	Legend	Geology
Depth (m)	No.	Type	Drilling Date Depth m	Casing Depth m	Depth m	Depth (m) Thickness	Ord Datum Level				
10.00-10.225	20	BC81/105*				10.00	77.40	Continued from Sheet 1 of 3  Very dense reddish brown, slightly silty fine to coarse SAND with occasional black and white coarse sand and fine gravel. (COLLYHURST SANDSTONE)  ... 14.00-15.50m, with bands of SANDSTONE, very weak  Reddish brown weakly cemented slightly weathered silty fine to coarse grained SANDSTONE, weak. Discontinuities are very closely spaced sub-horizontal occasionally infilled with sand. (COLLYHURST SANDSTONE) ... 16.20-17.25m, recovered as sand with some gravel sized sandstone corestones, very weak  ... 17.50-18.10m, discontinuities closely spaced ... 17.50-17.54m, recovered as sand ... 17.60-17.67m, recovered as sand  ... 18.00-18.25m, recovered as sand with occasional gravel sized sandstone corestones, very weak ... 18.35m, locally mottled yellow  ... 18.50-18.90m, discontinuities extremely to very closely spaced and ≈30°  ... 18.90-19.10m, recovered as sand with gravel and cobble sized sandstone corestones, very weak ... 19.25-19.35m, recovered as sand with gravel sized sandstone corestones, weak  ... 20.00-20.50m, discontinuities closely spaced subhorizontal open up to 40mm and infilled with sand	COLLYHURST SANDSTONE		
			10.50	10.50	3.00						
10.80	21	D	4.6.91	10.50	2.70						
11.00-11.06	22	BC50/60*				11					
11.80	23	D				12					
12.00-12.07	24	BC50/70*				13	(6.50)				
12.80	25	D				14					
13.00-13.12	26	BC81/120*				15					
13.80	27	D				16					
14.00-14.045	28	BC50/45*				17					
14.80	29	D				18					
15.00-15.04	30	BC50/40*				19					
15.50-15.531	31	BC50/31*	15.50	15.30	2.00	15.50	71.90				
			5.6.91	15.50	2.00	16					
						17					
17.50						18	(5.40)				
18.10						19					
18.90						20					
						20	20.00	67.40			
<b>Key</b> U(-) ... undisturbed 106mm diameter sample P ... piston sample D ... disturbed sample B ... bulk sample W ... water sample SI ... standard penetration test SCI ... standard penetration test (cone) f ... number of blows * ... seating drives only						√ ... groundwater encountered √ ... groundwater level after strike TCR% ... total core recovery SCR% ... solid core recovery ROD% ... rock quality designation FI ... fracture index NI ... non-intact NR ... no recovery		<b>Remarks</b> CONTINUED over on Sheet 3 of 3 Chiselling 15.00-15.50m : 1 hour Water added to assist drilling between 2.00-15.50m below ground level. Borehole advanced to 15.50m by light cable percussive methods and continued by rotary coring methods. Foam flush with diamond saw tooth bit.			

# BOREHOLE LOG

<b>Project:</b> SEMMS		<b>Job No:</b> 37732ISG		Borehole No.	
<b>Date:</b> 29-01-1990		<b>Co-ordinates:</b> E 392500.5 N 385365.0		<b>SM 2ND SUPP 537</b>	
<b>Contractor:</b> GEOTECHNICAL ENGINEERING LIMITED			<b>Engineer:</b> Faber Maunsell Ltd		Sheet: 1 of 2

Samples & Tests					Strata				Backfill/ Instrument	
Depth	Type No	Test Results	TCR SCR RGD	If (mm)	Water/ (Flush Return)	O.D. Level	Depth (Thickness)	Description		Legend
						87.20	0.30	Compact HARDCORE		
						87.00	0.50	Gravelly TOPSOIL		
1.50	B 101 C	N = 72 5 8/22 50 0 0					(2.10)	Very dense light brown slightly clayey angular to subrounde fine to medium GRAVEL of sandstone with much fine sand. Gradational boundary		
2.50	SPT	N = 9 1 2/2 3 1 3				84.90	2.60	Loose to medium dense light brown slightly clayey fine to medium SAND with a little, locally some, angular fine to medium gravel of sandstone. Gradational boundary		
3.50	SPT	N = 12 1 0/2 3 3 4					(1.80)			
4.50	B 102 C	N = 7 3 2/1 1 1 4				83.10	4.40	Loose dark brown fine to coarse SAND		
							(1.90)			
6.00	SPT	N = 12 2 1/2 2 4 4				81.20	6.30	Firm dark brown CLAY		
7.50	D D 102 U 500 U 600 U 6719						(1.90)			
8.50	C	N = 26 3 4/4 4 6 12				79.30	8.20	Medium dense reddish light brown clayey fine to coarse SAND with some subangular coarse gravel of sandstone and igneous material		
9.00	SPT	N = 0 29 50/0 0 0 0					(1.10)			
9.50	SPT	N = 33 4 3/5 7 8 13				78.20	9.30	Dense red slightly silty fine to medium SAND		

GINT Software

Water Strikes					Method, Equipment and Remarks	
Strike Depth	Casing Depth	Post Mins	Post Depth	Flow Remarks	Method: CP	
6.00		20	5.10			
8.20		20	7.20			

# BOREHOLE LOG

<b>Project:</b> SEMMS		<b>Job No:</b> 37732ISG		Borehole No.	
<b>Date:</b> 29-01-1990		<b>Co-ordinates:</b> E 392500.5 N 385365.0		<b>SM 2ND SUPP 537</b>	
<b>Contractor:</b> GEOTECHNICAL ENGINEERING LIMITED			<b>Engineer:</b> Faber Maunsell Ltd		Sheet: 2 of 2

Samples & Tests					Strata				Backfill/ Instrument	
Depth	Type No	Test Results	TCR SCR RGD	If (mm)	Water/ (Flush Return)	O.D. Level	Depth (Thickness)	Description		Legend
10.50	SPT	N = 67 69/17 50 0 0					(4.10)	Dense red slightly silty fine to medium SAND <i>(continued)</i>		
12.00	SPT	N = 50 11 22/50 0 0 0								
13.30	SPT	N = 0 50 0/0 0 0 0				74.10	13.40	End of Borehole		

gINT Software

AGS3-NEW.GLB | SW BH LOG (CP.RC) | \\WIN-MAN-001\MR\_GEOTECH\47067541 SEMMS AIP\_GEO INPUT\05.0 PROJECT INFORMATION\GINT\47060785-SEMMS.GP | AGS3\_NEW.GDT | 22/08/2013 | 18:06:47

Water Strikes					Method, Equipment and Remarks
Strike Depth	Casing Depth	Post Mins	Post Depth	Flow Remarks	Method: CP

# BOREHOLE LOG

<b>Project:</b> SEMMS		<b>Job No:</b> 37732ISG		Borehole No.	
<b>Date:</b> 27-01-1990/30-01-1990		<b>Co-ordinates:</b> E 392471.0 N 385345.5		<b>SM 2ND SUPP 538</b>	
<b>Contractor:</b> GEOTECHNICAL ENGINEERING LIMITED			<b>Engineer:</b> Faber Maunsell Ltd		Sheet: 1 of 2

Samples & Tests					Strata				Backfill/ Instrument	
Depth	Type No	Test Results	TCR SCR RGD	If (mm)	Water/ (Flush Return)	O.D. Level	Depth (Thickness)	Description		Legend
0.50	C	N = 41 6 6/9 11 10 11				85.90	1.00	Black TOPSOIL with a little angular to subangular medium to coarse brick gravel and brick cobbles. Occasional rootlets (MADE GROUND)		
1.10	C	N = 25 3 4/4 5 6 10				85.10	1.80	Medium dense brown angular to rounded fine to coarse GRAVEL with some to much angular to subrounded sandstone and brick cobbles and a little to some medium to coarse sand (MADE GROUND)		
2.10	C	N = 17 2 3/3 4 5 5						Loose to medium dense brown angular to rounded medium, locally fine and coarse, SAND with a little to some angular to subrounded fine, locally medium to coarse gravel and cobbles of sandstone and igneous rock.		
3.00	SPT	N = 9 1 1/1 2 3 3					(3.70)			
4.00	SPT	N = 11 1 1/2 2 3 4								
5.00	SPT	N = 23 4 4/5 6 6 6								
5.50	C	N = 10 1 2/2 2 3 3				81.40				
6.50	D B 101	C N = 13 2 2/2 3 4 4					(2.50)			
7.50	C	N = 14 2 2/3 3 3 5								
8.00	SPT	N = 21 3 3/4 5 5 7				78.90	8.00	Medium dense brown occasional coarse SAND		
8.80	D D 101					78.10	8.80			
9.35	D D 101						(1.40)	Very stiff dark brown and red brown slightly sandy CLAY with a little angular to rounded fine to coarse gravel and occasional pockets (10x15mm) of medium sand		

GINT Software

AGS3-NEW.GLB | SW BH LOG (CP.RC) | \\WIN-PAN-001\MR\_GEO TECH\47067541 SEMMS AIP\_GEO INPUT\05.0 PROJECT INFORMATION\GINT\47060785-SEMMS.GP | AGS3\_NEW.GDT | 22/08/2013 | 18:08:26

Water Strikes					Method, Equipment and Remarks	
Strike Depth	Casing Depth	Post Mins	Post Depth	Flow Remarks	Method: CP	

# BOREHOLE LOG

<b>Project:</b> SEMMS		<b>Job No:</b> 37732ISG		Borehole No.	
<b>Date:</b> 27-01-1990/30-01-1990		<b>Co-ordinates:</b> E 392471.0 N 385345.5		<b>Ground Level:</b> 86.90 (m) <b>SM 2ND SUPP 538</b>	
<b>Contractor:</b> GEOTECHNICAL ENGINEERING LIMITED			<b>Engineer:</b> Faber Maunsell Ltd		Sheet: 2 of 2

Samples & Tests					Strata				Backfill/ Instrument	
Depth	Type No	Test Results	TCR SCR RQD	If (mm)	Water/ (Flush Return)	O.D. Level	Depth (Thickness)	Description		Legend
						76.70	10.20	Dense to very dense red brown fine to medium occasionally coarse SAND, with a little subangular fine gravel (Probably completely becoming highly weathered red SANDSTONE bedrock)		
10.60	SPT	N = 54 1 2/6 12 15 21								
11.60	SPT	N = 78 8 8/12 19 22 25								
12.60	SPT	N = 157 8 19/23 38 46 50				(4.85)				
13.60	SPT	N = 130 9 20/37 43 50 0								
14.60	SPT	N = 50 20 36/50 0 0 0				71.85	15.05	End of borehole		

gINT Software

AGS3-NEW.GLB | SW BH LOG (CP.RC) | \\WIN-MAN-001\MR\_GEDTECH\470675\4 SEMMS AIP\_GED INPUT\05.0 PROJECT INFORMATION\GINT\47060785-SEMMS.GP | AGS3\_NEW.GDT | 22/08/2013 | 18:08:26

Water Strikes					Method, Equipment and Remarks	
Strike Depth	Casing Depth	Post Mins	Post Depth	Flow Remarks	Method: CP	

Contract No. F5847

TRIAL PIT LOG

Location AE(M) Stockport N-S By-Pass

Client L. G. Mouchel & Partners

Excavation Plant JCB 3D II

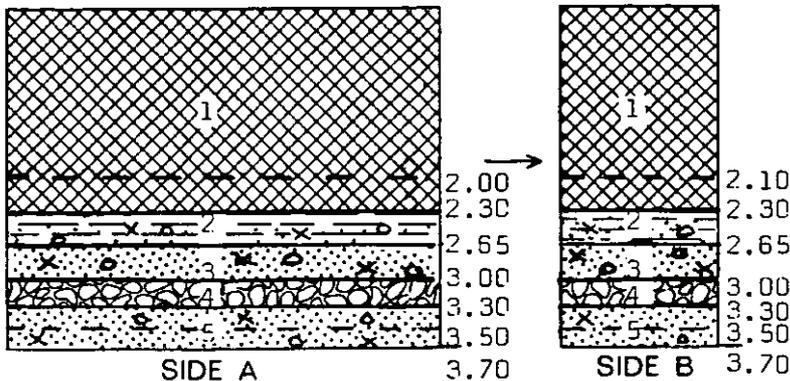
Dimensions (l x b x h) 3.00 m x 0.50 m x 3.70 m

Chainage .....

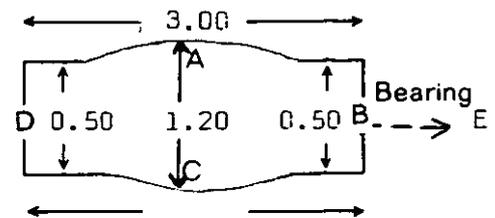
Ground Level 89.50 m.A.O.D.

Date 17/5/84

ELEVATIONS:—

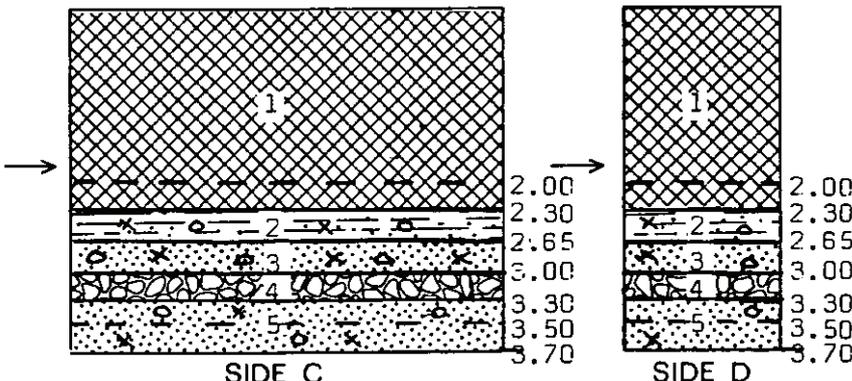


PLAN (Not to scale)



SAMPLES

No. & Type	Depth m.
J1	2.50
J2	3.50
W3	3.00



No.	Depth m.	STRATA DESCRIPTION	Cv/Cp kN/m <sup>2</sup>
1	0.00-2.30	MADE GROUND: Loose mostly granular including fine medium coarse subangular to subrounded gravel, sand, brick rubble, concrete, flagstone fragments, clay, scrap metal.	
2	2.30-2.65	Soft dark brown orange-brown light brown, mottled very silty, very sandy, CLAY with occasional fine trace of medium subangular to subrounded gravel, with more subrounded gravel with depth.	
3	2.65-3.00	Loose to medium dense light to dark orange-brown red-brown mottled slightly silty fine medium coarse SAND with a trace of fine medium subrounded to subangular gravel, becoming more moist with depth.	
4	3.00-3.30	Loose red brown fine medium coarse subrounded some subangular GRAVEL and COBBLES with some fine medium coarse sand and occasional boulders.	
5	3.30-3.70	Loose red brown slightly silty, fine, medium coarse SAND, with occasional fine, medium, sub-rounded to sub-angular gravel to 3.50m.	

NOTES Cv/Cp: Approximate value of undrained shear strength from hand vane/penetrometer  
 Groundwater: Water seepage at 3.00 m through gravel. Slow flow becoming steady.  
 Pumping: None.  
 Supports/Stability: None/Unstable from 2.50 m where sand and silt washed into pit