A6 to Manchester Airport Relief Road

B006 – Hill Green Accommodation Bridge
Preliminary Design Report
Report No. 1007/407/086

September 2013

STOCKPORT METROPOLITAN BOROUGH COUNCIL

MANCHESTER CITY COUNCIL

Cheshire East Council

PRELIMINARY DESIGN REPORT

Structure Name : Hill Green Accommodation Bridge

Structure Number : B006

Report No. 1007/104/086

Report Control Sheet

Version	Date	Status	Prepared By	Checked By	Approved By
P1	08/01/2012	Draft	N Afshar	N Sheena/ T Kshirsagar	N Sheena
2	10/05/2012	Draft (Final)	N Afshar	T Kshirsagar	N Sheena
3	24/01/2013	Draft (Final)	M Mfandarahwa	N Sheena	N Sheena
4	29/08	Draft	L Fields	M Mfandarawa	N Sheena
5	13/09/2013	Final	L Fields	N Sheena	N Sheena

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1. Description of Site

Hill Green Accommodation Bridge is part of the South East Manchester Multi Modal Strategy (SEMMMS) A6 to Manchester Airport Relief Road (A6MARR) and is proposed to cross the route providing accommodation, pedestrian/equestrian route access to farmland.

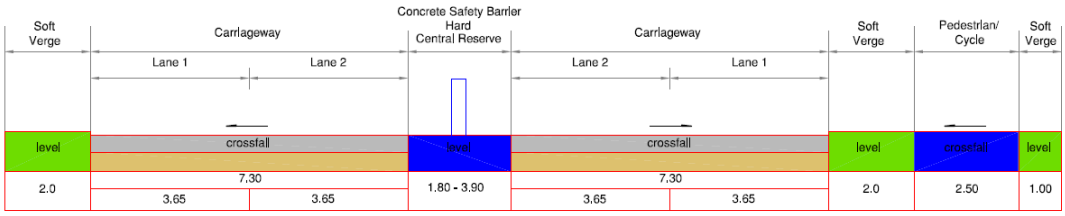
The Bridge is located in the vicinity of Park House Farm between Woodford Road, to the North, and Lower Park Road, to the South, at chainage 11040m approximately. It provides farm vehicle accommodation access and serves as a diversion of footpath FP31.

There are a few residential properties approximately 150m to the West on Woodford Road. The immediate surrounding area, however, is generally open farm land. An aerial location plan at 1:1250 scale with the bridge extents delineated in red is included in Appendix A.

2. Highway Details

Over Structure: Hill Green Accommodation Bridge; 3.0m width single carriageway with two verges and string courses (2 X 0. 5m Verges + 3.0 Carriageway + 2 X 0.5m string courses).

Under Structure: Under Structure – A6MARR with a total width of 24.7m wide. Central reserve is 2.6m. Other dimensions and arrangement are as follows:



3. Proposed structure

The proposed structural arrangement for this bridge has been changed from three spans with piers at the A6MARR verges, to a single span structure at Design Freeze 7.

The proposed structure will be a single span fully integral bridge. The superstructure will be in the form of precast prestressed concrete U beams and reinforced concrete slab deck. The square deck width including parapet up stands will be 5.0m.

The bridge superstructure will be supported on full height R.C abutments which will be founded on spread footings. Reinforced concrete wing walls with a return of approximately 45 degrees to the bridge span are proposed and will be constructed on spread footings.

A proposed General Arrangement drawing is included in Appendix B.

4. Span arrangements

The single span structure crosses the A6MARR square to the carriageway. A span of 28.7m is measured between bearing centrelines,

5. Headroom and Clearances

A minimum headroom of approximately 5.7m is provided, therefore in accordance with TD27/05 the superstructure will not need to be designed for impact load.

The abutment walls are positioned at a minimum of 4.5m from the carriageway in order to mitigate the risk of vehicular impact.

6. Road Restraint system (Bridge Parapets)

Type N2 steel parapet with mesh infill is in accordance Road Restraints Risk Assessment Process (RRRAP) and TD19/06. Working width class to be not greater than W4 and will be decided in the final stage of the design. The parapet height is to be 1800mm above finished surfacing level as required for equestrian usage. A 600mm high solid infill panel will be provided in order to obstruct an animal's view of the road below. Mesh infill will be provided for remaining height of the parapet.

Timber post and three rail fencing with a pvc coated mesh infill are to be provided at the bridge approaches.

Steel tubular hand rails are to be provided at the tops of the wingwalls.

7. Preferred Structural Option

7.1 Superstructure

Single span, fully integral pre-cast pre-stressed concrete beams and slab deck - refer to Drawing Number 1007/3D/DF7/A6-MA/B005/706 in appendix B:

Fully integral construction is a feasible and considered a cost effective solution. 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 and disadvantages of using pre-cast concrete beams are given below:

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 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

7.2 Substructure

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.

With settlement regulated by the use of imported granular fill it is proposed that the R.C. wall abutments will be supported on spread footings. Further discussion regarding the geotechnical assessment is addressed in Section 8 of this report.

8. Geotechnical Information

The ground and groundwater conditions for the Hill Green Accommodation Bridge have been assessed using relevant geological maps (Stockport Sheet 98, Solid and Drift Scale 1:50,000) and 3 No. exploratory bore holes logs provided by a number of phases of GI for the area.

8.1 Groundwater

The ground conditions described on the geological maps indicate Boulder Clay of Recent and Pleistocene age, over Pebble Beds, of Permian to Triassic age which are part of the Sherwood Sandstone Group; the ground conditions identified within ground investigation did not encounter rock head at this location.

8.2 Preliminary Geotechnical Assessment

It is anticipated that the whole area underlying the proposed embankments will need ground improvement due to the presence of soft clays and peats at shallow depths, as this should regulate the settlements.

The embankment will need to be constructed with imported granular fill (6N/6P) and will need to be monitored for groundwater, pore water pressure and settlements (inclinometers) during and after construction.

Additional deep GI/Cone Penetration Tests (CPT's) will be needed to probe for peat, and confirm presence across area before the final stage of the design.

Given that groundwater has been identified in a number of exploratory bore holes, drainage methods may 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 foundation design and drainage methods.

9. Environmental Impact Considerations

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

10. Appearance

The superstructure on elevation comprises of approximately 1.5m deep pre-cast beams and 0.5m string course spanning across the A6MARR.

The appearance of the exposed faces of the abutment walls will be determined based upon SMBC planning requirements.

Appendix A: Location Plan

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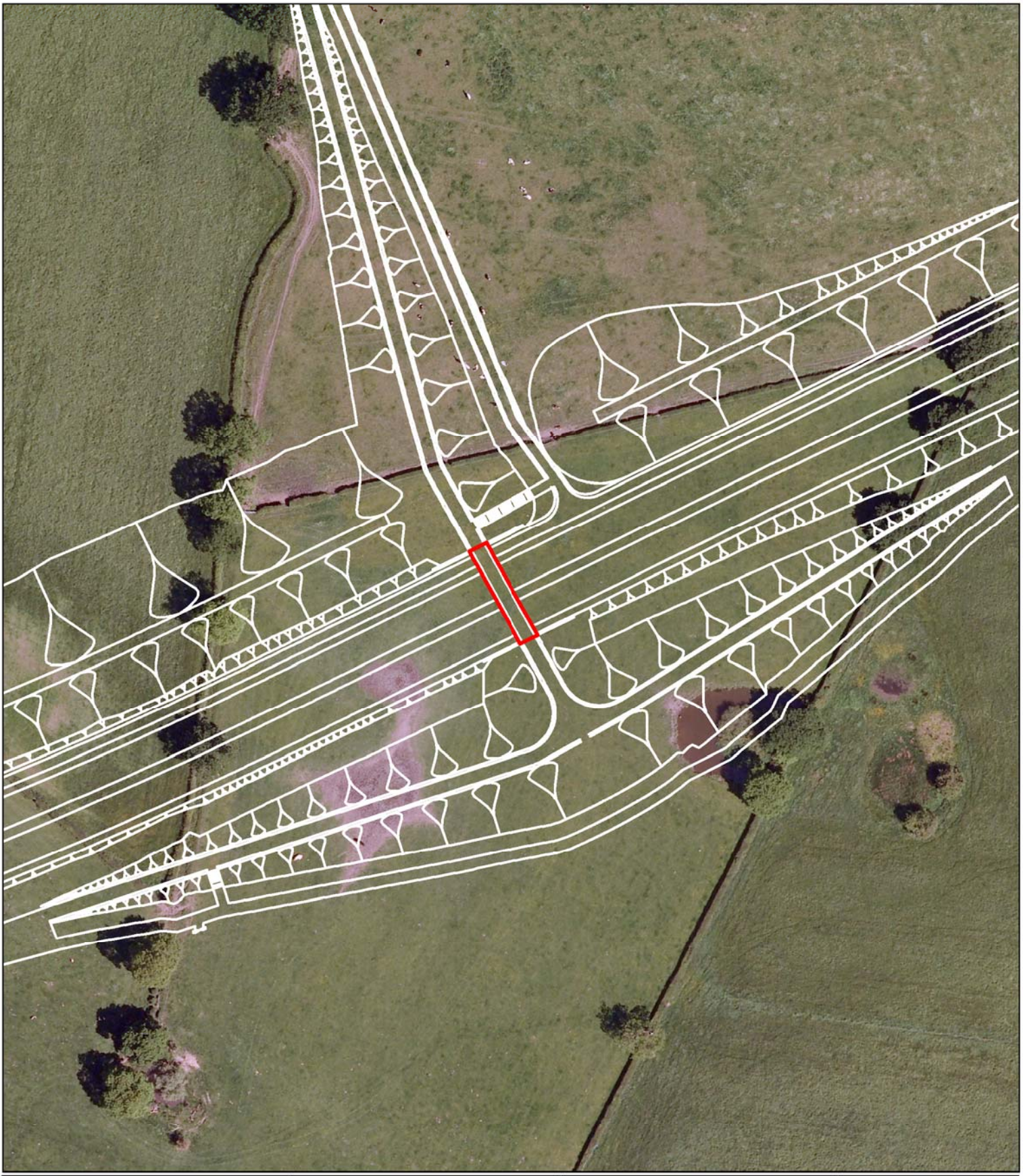
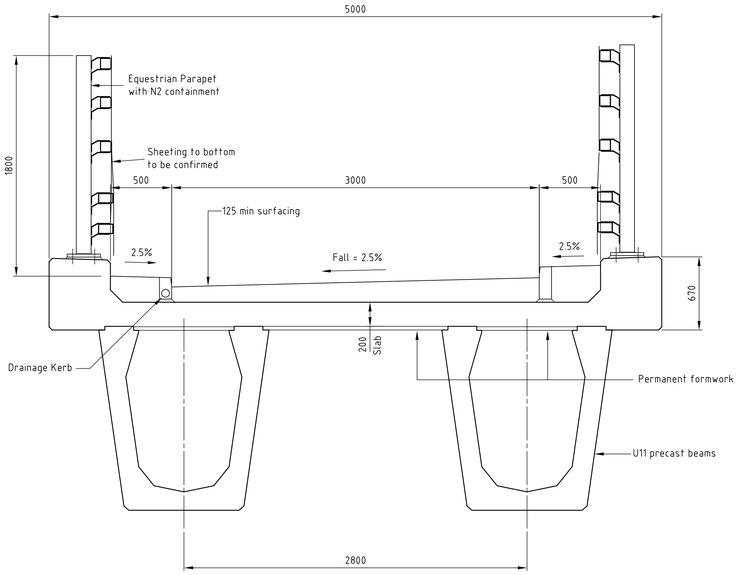


Drawn	CL	Checked	SC	Approved	NH
Date	12/08/2013	Date	12/08/2013	Date	12/08/2013
Size	A4	Scale	1 : 1,250		
GIS Task	4268	Filename			
Drawing No.	1007-3D-DF7-A6-MA-B006-ALP			Revision	

NORTH

Appendix B: Proposed General Arrangement Drawing
3D Model



SECTION 1-1

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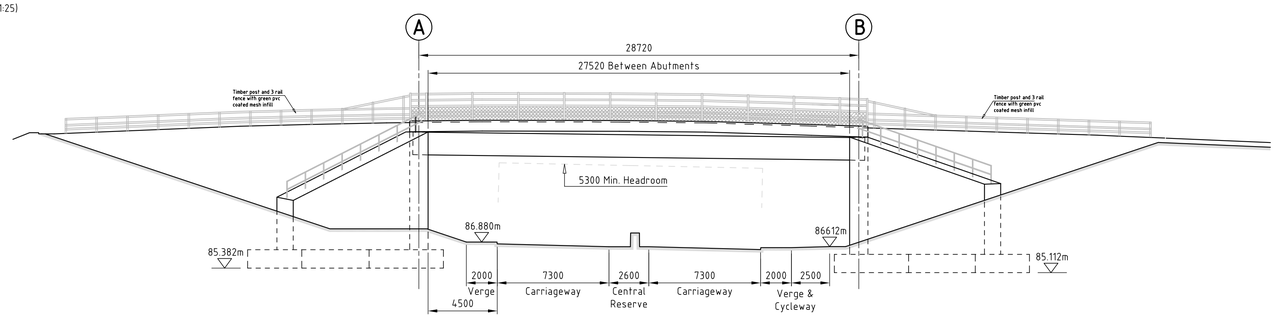
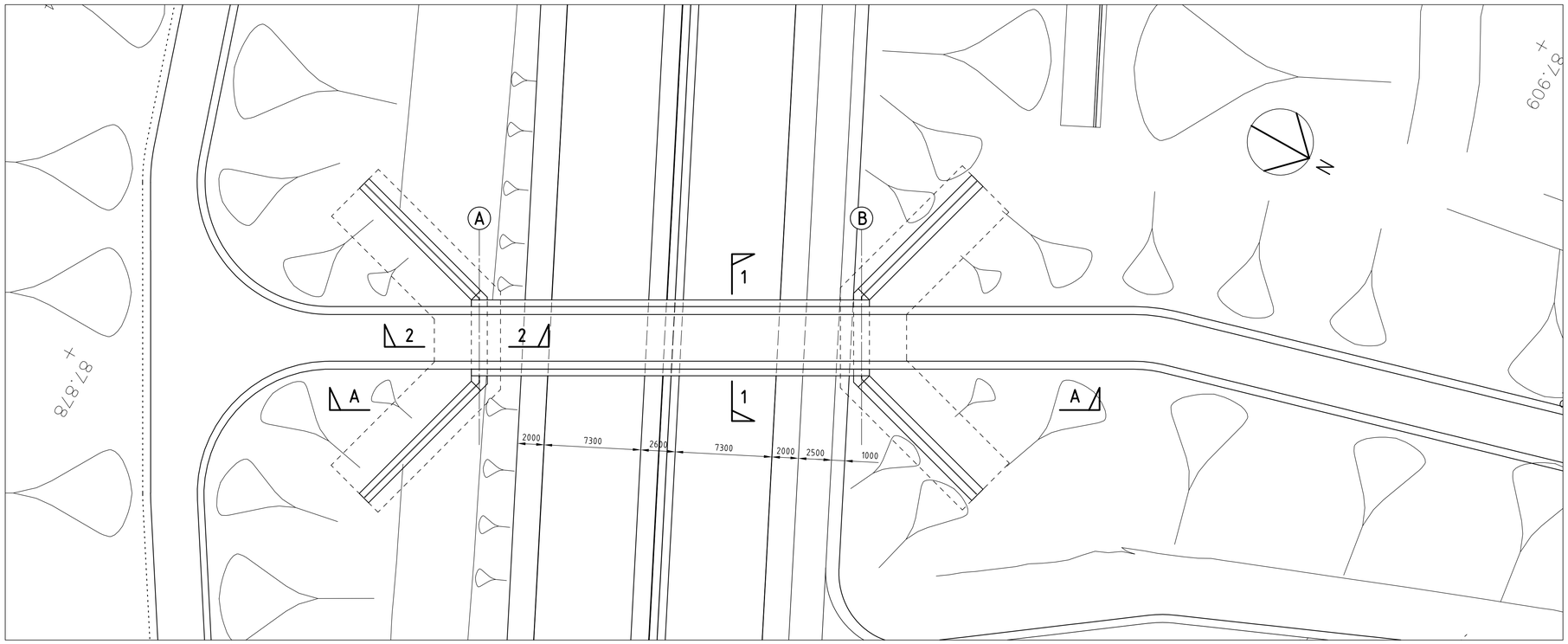


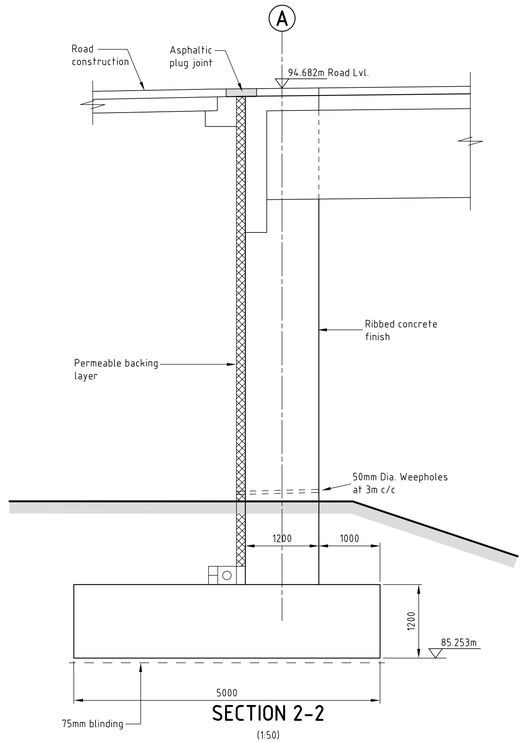
ELEVATION ON A-A

(1:200)



PLAN

(1:200)



SECTION 2-2

(1:50)

NOTES

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

Precast panel	C32/ 40
Abutment base	C32/ 40
Abutment stem	C40/ 50
Deck slab	C40/ 50
Parapet edge beams	C40/ 50
Precast beams	C50/ 60

10. Permanent formwork is required.
11. Concrete finishes to be as per MCHW specification series 1700 U.N.O. :-

Burried foundations :	F1, U1.
Abutment :	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.

Rev.	Drawn	Checked	Date	Revision Details
C	SPH	MM	12.09.13	ISSUED FOR PLANNING
B	SPH	N.S.	02/09/13	BRIDGE LOCATION AND DESIGN REVISED. ROAD ALIGNMENT UPDATED.
A	SPH	N.A.	18/03/13	REVISED INCORPORATING CLIENTS COMMENTS
-	SPH	NS	15/5/12	Elevation & sections amended.

south east manchester multi modal strategy

semms

STOCKPORT METROPOLITAN BOROUGH COUNCIL · Cheshire East Council · MANCHESTER CITY COUNCIL

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Job Title

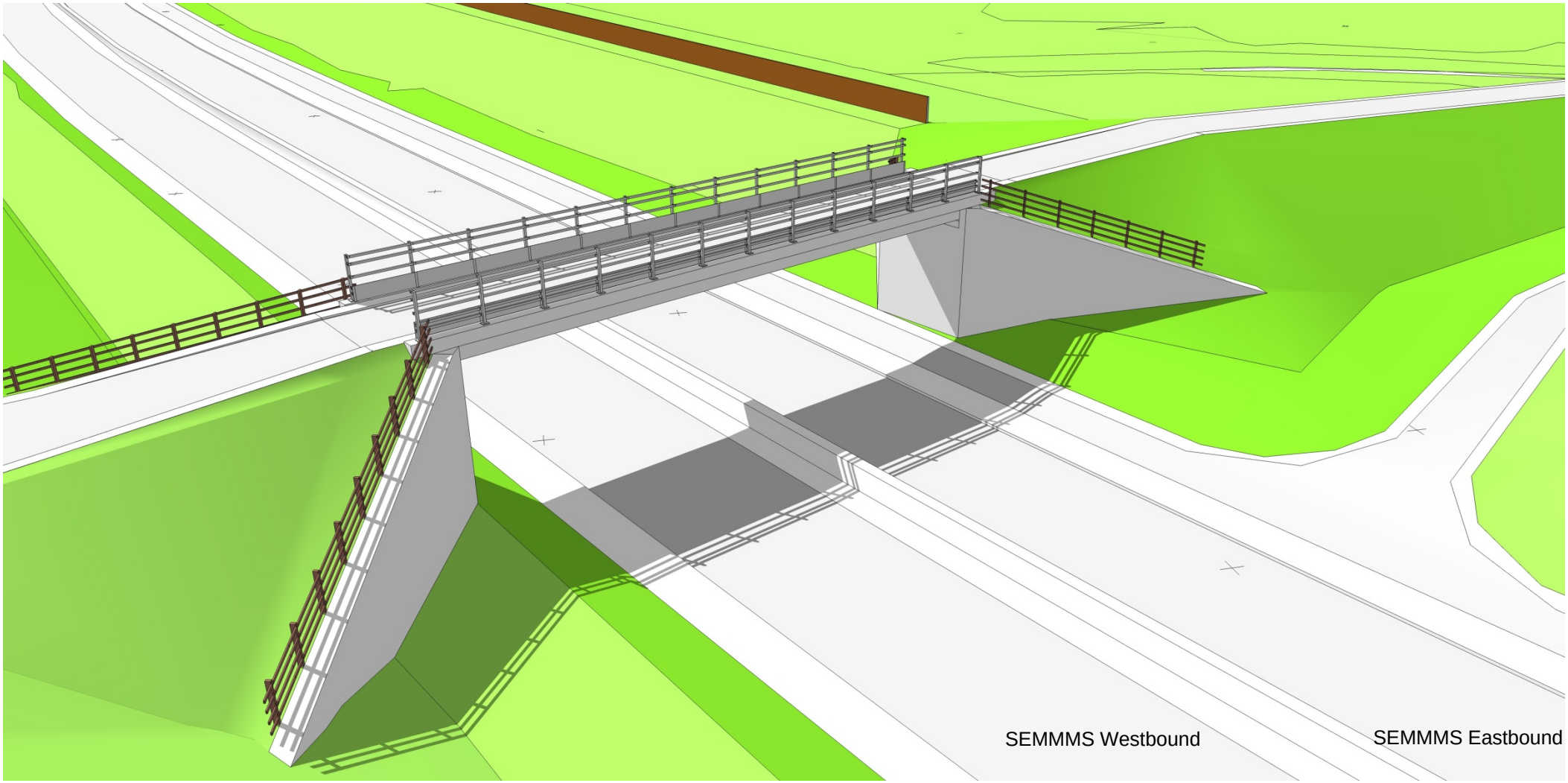
A6 TO MANCHESTER AIRPORT RELIEF ROAD

Drawing Title

B006
HILL GREEN ACC'TION BRIDGE
GENERAL ARRANGEMENT

Drawn	Engineer	Checked	Approved
JMcC	NS	LF	NS
Date	Date	Date	Date
23/12/11	DEC '11	DEC '11	DEC '11
Size	Scale		
A1	AS SHOWN		
SCG No.	Filename		

Drawing No. 1007/3D/DF7/A6-MA/B006/706 — Revision C



B006 – Hill Green Accommodation Bridge

View Looking West

Appendix C: Reviewed Ground Investigation Information

BOREHOLE LOG

Project: SEMMS		**Job No:** 37732ISG	Borehole No.
Date: 31-03-1992/31-03-1992	**Co-ordinates:** E 391177.1 N 384453.7	**Ground Level:** 87.41 (m)	**EA POYNTON 90_1**
Contractor: GEOTECHNICAL ENGINEERING LIMITED	**Engineer:** Faber Maunsell Ltd		Sheet: 1 of 1

Samples & Tests						Water/ (Flush Return)	Strata				
Depth		Type No	Test Results	TCR SCR RQD	If (mm)		O.D. Level	Depth (Thickness)	Description	Legend	Backfill/ Instrument
							87.01	(0.40) 0.40	TOPSOIL: (turfed)		
0.50	0.50	D 5585	SPT N = 2(225mm) 1 0/1 0 1 0						Soft grey and brown laminated slightly organic silty CLAY. Below 3.40m: with bands of peat.		
1.20		U 5586									
1.70	1.70	D 5587	SPT N = 2(225mm) 1 0/1 0 1 0					(3.70)			
2.40		U 501 U 5588									
2.90	2.90	D 5589	SPT N = 2(225mm) 1 0/0 0 1 1								
3.60		U 5590									
4.00		W 5592					83.31	4.10			1
4.10	4.10	D 5591	SPT N = 8(450mm) 1 2/2 2 2 2						Firm black-brown amorphous PEAT with thin layers of yellow silt.		
4.80		U 5593					82.51	(0.80) 4.90			1
5.30	5.30	D 5594	SPT N = 9(450mm) 1 1/2 2 2 3						soft grey very sandy CLAY. Below 5.30m: soft to firm brown with some subangular fine gravel. Below 6.50m: firm to stiff. Below 7.70m: stiff.		
6.00		U 5595									
6.50	6.50	D 5596	SPT N = 15(450mm) 2 3/3 4 4 4								
7.20		U 5597						(4.50)			
7.70	7.70	D 5598	SPT N = 20(450mm) 1 3/5 5 5 5								
8.40		U 5599									
8.90	8.90	D 5600	SPT N = 21(450mm) 2 3/4 5 5 7				78.01	9.40			
									End of Borehole		

Water Strikes

Strike Depth	Casing Depth	Post Mins	Post Depth	Flow Remarks
4.90		20	4.00	

Method, Equipment and Remarks

Method: CP

Scale: 1:50 @ A4	**Client:** STOCKPORT METROPOLITAN BOROUGH COUNCIL	**Logged By:**	**Data Checked By:**

AGS3_NEW.GLB | SW BH LOG (CP/RC) | K:\4.7060785 - SEMMS\05.0 PROJECT INFORMATION\GINT\4.7060785-SEMMS.GPJ | AGS3_NEW.GDT | 23/11/2011 | 10.45.21

BOREHOLE LOG

Project: SEMMS		**Job No:** 37732ISG	Borehole No.
Date: 31-03-1992/31-03-1992	**Co-ordinates:** E 391268.1 N 384475.0	**Ground Level:** 87.74 (m)	**EA POYNTON 91_1**
Contractor: GEOTECHNICAL ENGINEERING LIMITED	**Engineer:** Faber Maunsell Ltd		Sheet: 1 of 1

Samples & Tests						Water/ (Flush Return)	Strata				Backfill/ Instrument
Depth		Type No	Test Results	TCR SCR RQD	If (mm)		O.D. Level	Depth (Thickness)	Description	Legend	
							87.54	0.20	TOPSOIL: (turfed)		
0.50	0.50	D 5601	SPT N = 12(450mm) 2 2/2 3 3 4					(1.30)	firm grey mottled orange-brown silty CLAY with silt partings.		
1.20		U 5602					86.24	1.50			
1.70	1.70	D 5603	SPT N = 7(450mm) 2 2/3 2 1 1				85.84	(0.40) 1.90	Firm dark brown-black fibrous sandy PEAT with soft organic clay layers.		
2.30		U 5604							Firm red-brown sandy CLAY with a little subangular and subrounded fine gravel. Below 4.00m: brown very sandy with much gravel.		
2.80	2.80	D 5605	SPT N = 16(450mm) 2 3/4 4 4 4								
3.50		U 5606									
4.00	4.00	D 5607	SPT N = 11(450mm) 2 2/2 3 3 3					(4.40)			
4.70		U 5608									
5.20	5.20	D 5609	SPT N = 15(450mm) 1 3/3 4 4 4								
5.80		U 5610									
6.30		D 5611					81.44	6.30			
									End of Borehole		

Water Strikes

Strike Depth	Casing Depth	Post Mins	Post Depth	Flow Remarks

Method, Equipment and Remarks

Method: CP

Scale: 1:50 @ A4	**Client:** STOCKPORT METROPOLITAN BOROUGH COUNCIL	**Logged By:**	**Data Checked By:**

BOREHOLE LOG

Project: SEMMS		**Job No:** 37732ISG	Borehole No.
Date: 01-04-1992/01-04-1992	**Co-ordinates:** E 391343.0 N 384539.9	**Ground Level:** 88.13 (m)	**EA POYNTON 91_2**
Contractor: GEOTECHNICAL ENGINEERING LIMITED		**Engineer:** Faber Maunsell Ltd	Sheet: 1 of 1

Samples & Tests						Water/ (Flush Return)	Strata				
Depth		Type No	Test Results	TCR SCR RQD	If (mm)		O.D. Level	Depth (Thickness)	Description	Legend	Backfill/ Instrument
							87.83	0.30	TOPSOIL: (turfed)		
0.50	0.50	D 5612 D 5613	SPT N = 8(450mm) 1 1/2 2 2 2						Soft to firm orange and grey very sandy CLAY. Below 1.70m: fissured with some gleying.		
1.00		D 5614									
1.20		U 5615						(2.60)			
1.70	1.70	D 5616	SPT N = 10(450mm) 1 1/1 2 3 4								
2.20		D 5617									
2.40		U 5618									
							85.23	2.90			
2.90	2.90	D 5619	SPT N = 18(450mm) 2 3/3 5 5 5						Firm brown sandy CLAY with some subangular and subrounded fine and medium gravel. At 4.10m: firm to stiff.		
3.40		D 5620									
3.60		U 5621									
4.10	4.10	D 5622	SPT N = 27(450mm) 2 3/8 7 6 6								
4.60		D 5623						(3.50)			
4.80		U 5624									
5.30	5.30	D 5625	SPT N = 14(450mm) 1 1/3 3 4 4								
5.80		D 5626									
5.90		U 5627									
							81.73	6.40			
6.40		D 5628							End of Borehole		

Water Strikes				
Strike Depth	Casing Depth	Post Mins	Post Depth	Flow Remarks
2.20		20	2.20	No rise.

Method, Equipment and Remarks

Method: CP

Scale: 1:50 @ A4	**Client:** STOCKPORT METROPOLITAN BOROUGH COUNCIL	**Logged By:**	**Data Checked By:**