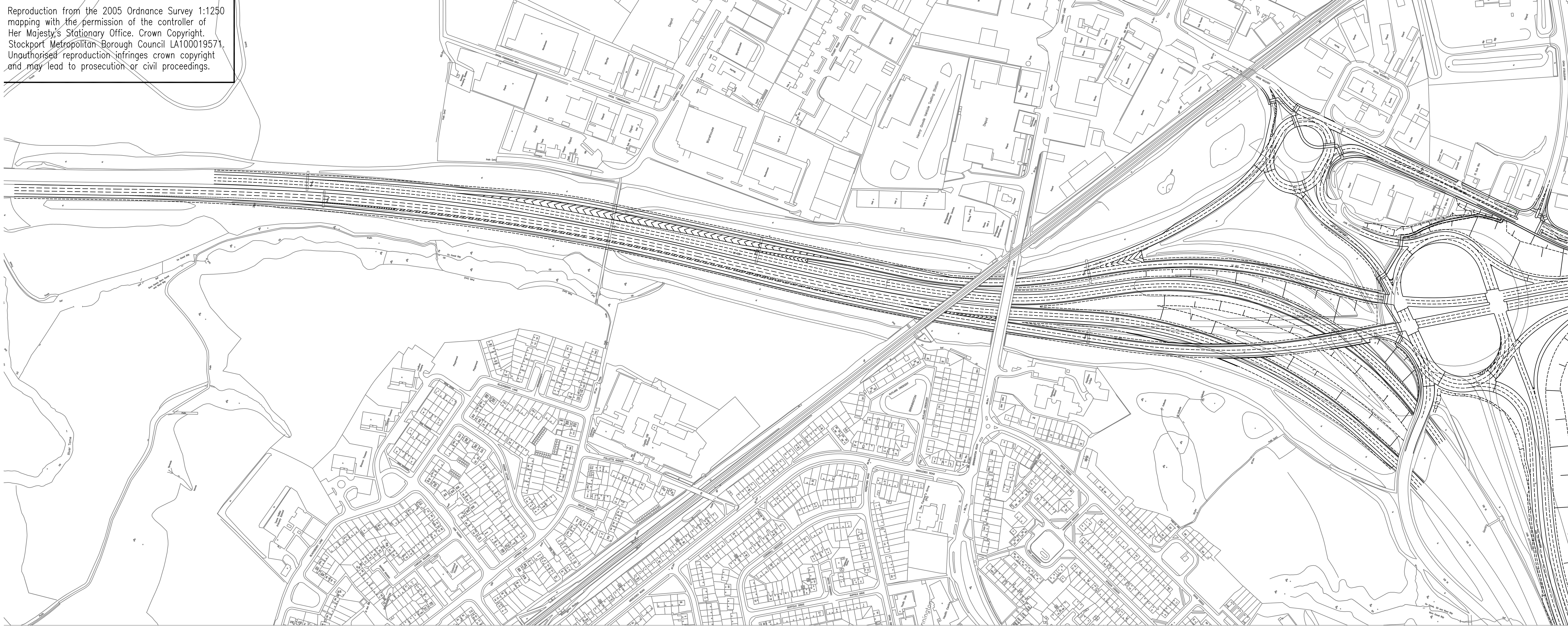
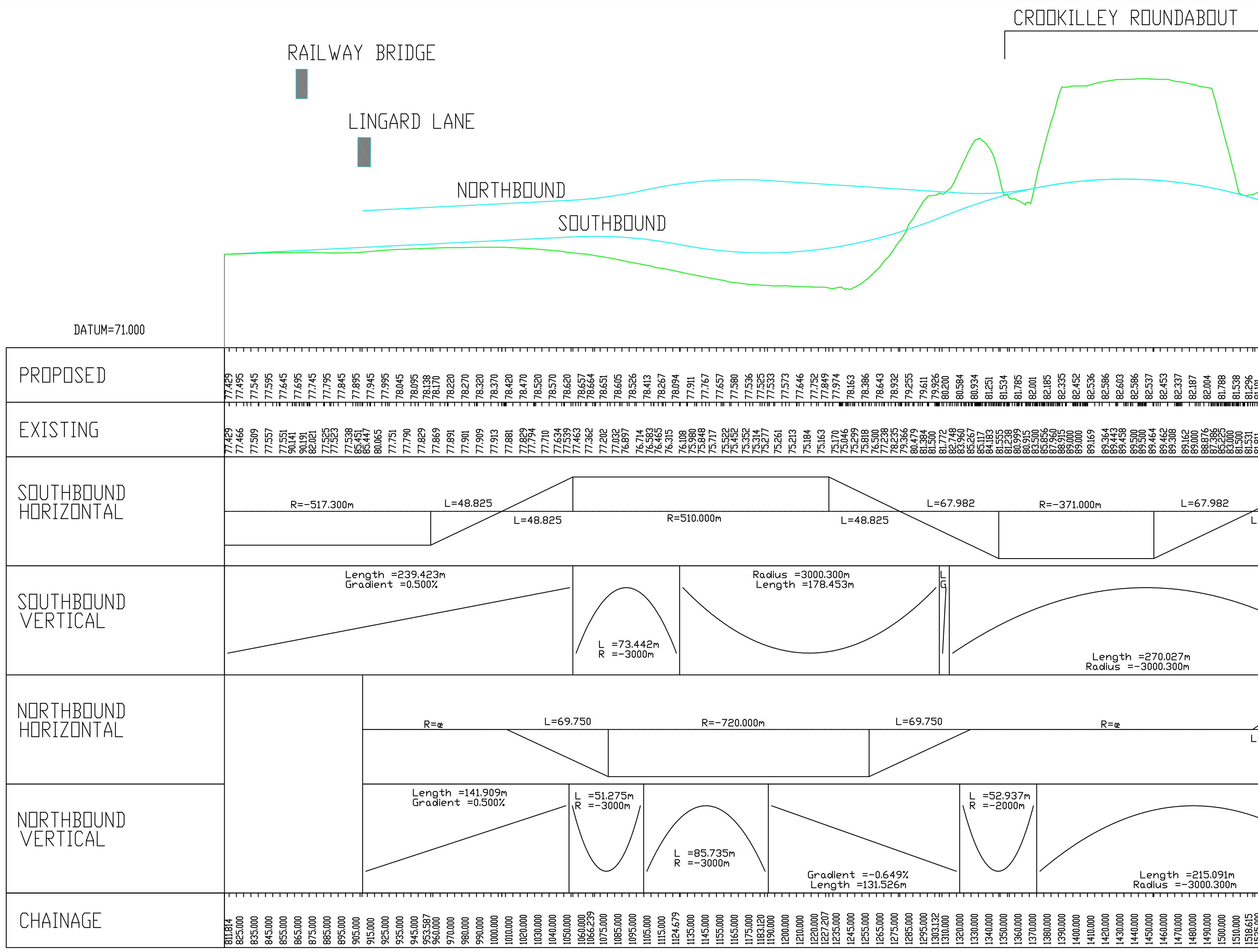
Appendix 1

A60 TO M60 SCHEME ALIGNMENT (ORIGINAL ALIGNMENT FROM 2006 WHICH WILL BE REVIEWED AS THE DEVELOPMENT PROCESS FOR THE A6 TO M60 RELIEF ROAD CONTINUES)



NOTES

1. EXTENTS OF RETAINING WALLS AND BRIDGES ARE INDICATIVE ONLY
2. ALL EARTHWORKS SLOPES ASSUMED TO BE 1:3 UNLESS OTHERWISE STATED



Rev.	Drawn	Checked	Date	Revision Details

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FAX 0161 476 0721

Elaine Mclean BA(Hons), BPhil, MBA
DIRECTOR OF ENVIRONMENT & ECONOMIC DEVELOPMENT SERVICES

Job Title

SEMMMS MAJOR ROAD SCHEMES

A555
M60 (jct 25) to WOODFORD RD (Bramhall)

Drawing Title

DESIGN FREEZE 4A
MAINLINE DESIGN
Sheet 1 of 23

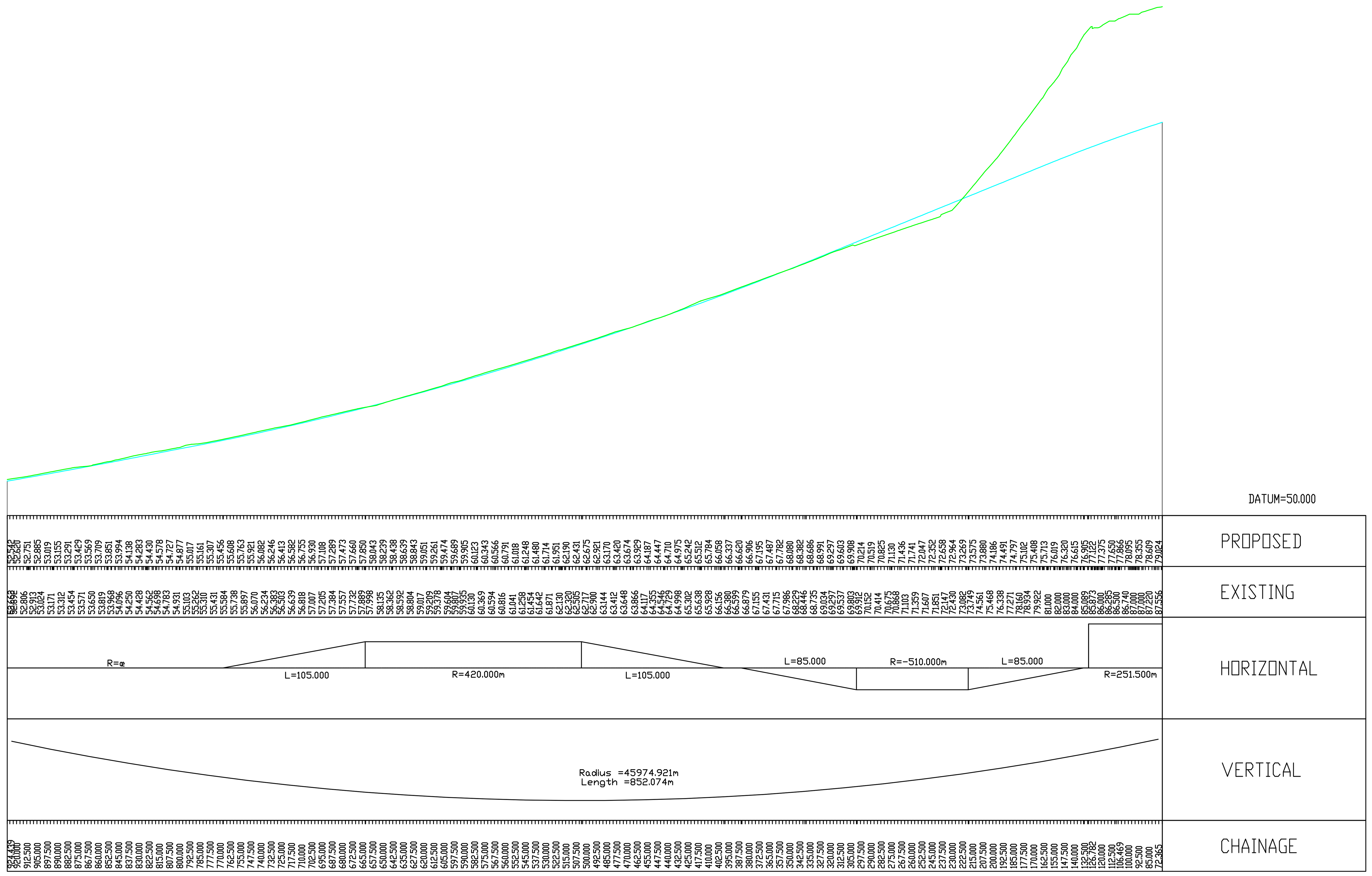
Drawn	Checked	Engineer	Approved
S Payne			
Date 16.03.06	Date	Date	Date

Size	Scales
A1	PLAN 1:2500 – SECTION HZ 1:2500, VT 1:250
A3	PLAN 1:5000 – SECTION HZ 1:5000, VT 1:500
Status	Filename

Drawing No.	Revision
1007/D/DF4A/001	

NOTES

1. EXTENTS OF RETAINING WALLS AND BRIDGES ARE INDICATIVE ONLY
2. FOR DETAILS OF THE TUNNEL REFER TO FABER MAUNSELL DRAWING Nos 37732/FM/AIP/001 to 010 incl
3. ALL EARTHWORKS SLOPES ASSUMED TO BE 1:3 UNLESS OTHERWISE STATED



Rev.	Drawn	Checked	Date	Revision Details

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Drawing Title

DESIGN FREEZE 4A
MAINLINE DESIGN
Sheet 2 of 23

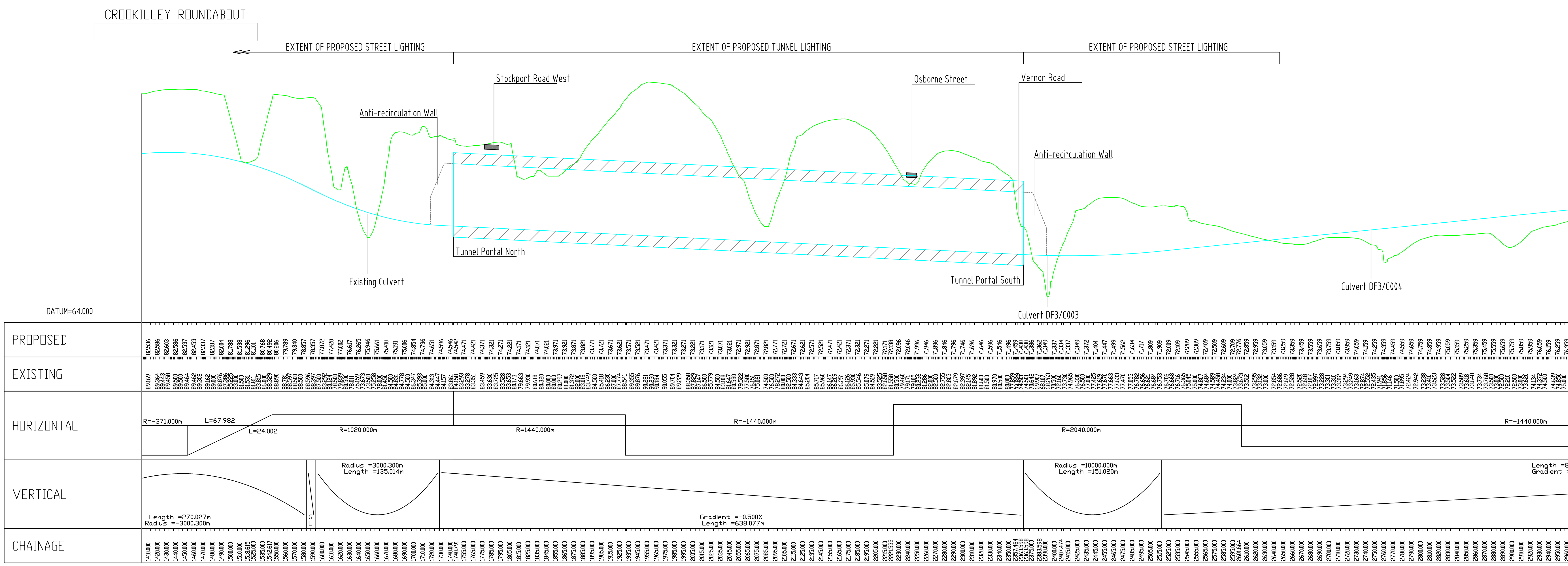
Drawn	Checked	Engineer	Approved
S Payne			
Date 16.03.06	Date	Date	Date

Size	Scales
A1	PLAN 1:2500 – SECTION HZ 1:2500, VT 1:250
A3	PLAN 1:5000 – SECTION HZ 1:5000, VT 1:500
Status	Filename Q:\..........\DRAWINGS\DESIGN FREEZE 4A\HMH1007-D_DF4A_002.DWG

Drawing No.	Revision
1007/D/DF4A/002	

NOTES

1. EXTENTS OF RETAINING WALLS AND BRIDGES ARE INDICATIVE ONLY
2. FOR DETAILS OF THE TUNNEL REFER TO FABER MAUNSELL DRAWING Nos 37732/FM/AIP/001 to 010 incl
3. ALL EARTHWORKS SLOPES ASSUMED TO BE 1:3 UNLESS OTHERWISE STATED



Rev.	Drawn	Checked	Date	Revision Details

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Job Title

SEMMMS MAJOR ROAD SCHEMES

A555
M60 (jct 25) to WOODFORD RD (Bramhall)

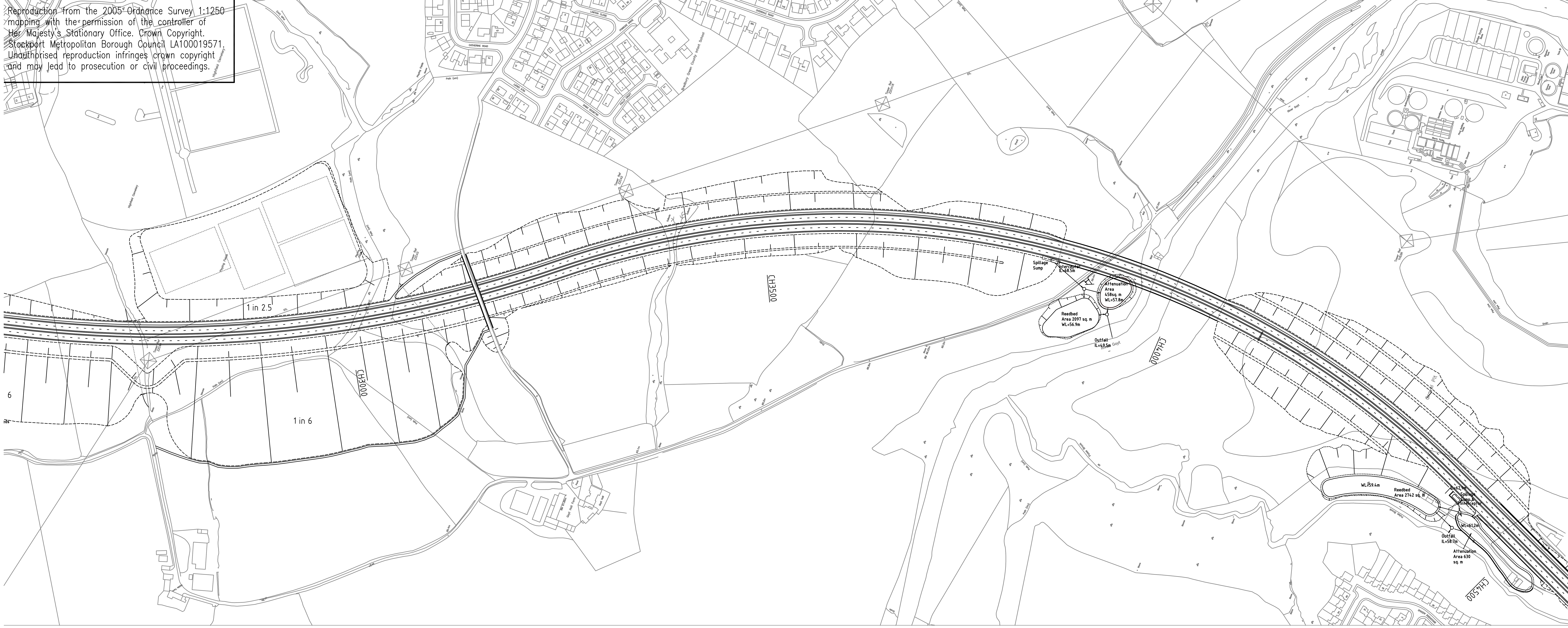
Drawing Title

DESIGN FREEZE 4A
MAINLINE DESIGN
Sheet 3 of 23

Drawn	Checked	Engineer	Approved
S Payne			
Date 16.03.06	Date	Date	Date
Size A1 A3	Scales PLAN 1:2500 – SECTION HZ 1:2500, VT 1:250 / PLAN 1:5000 – SECTION HZ 1:5000, VT 1:500		
Status	Filename Q:\.........\DRAWINGS\DESIGN FREEZE 4A\HMH1007-D_DF4A_003.DWG		

Drawing No. 1007/D/DF4A/003

Revision



NOTES

1. EXTENTS OF RETAINING WALLS AND BRIDGES ARE INDICATIVE ONLY
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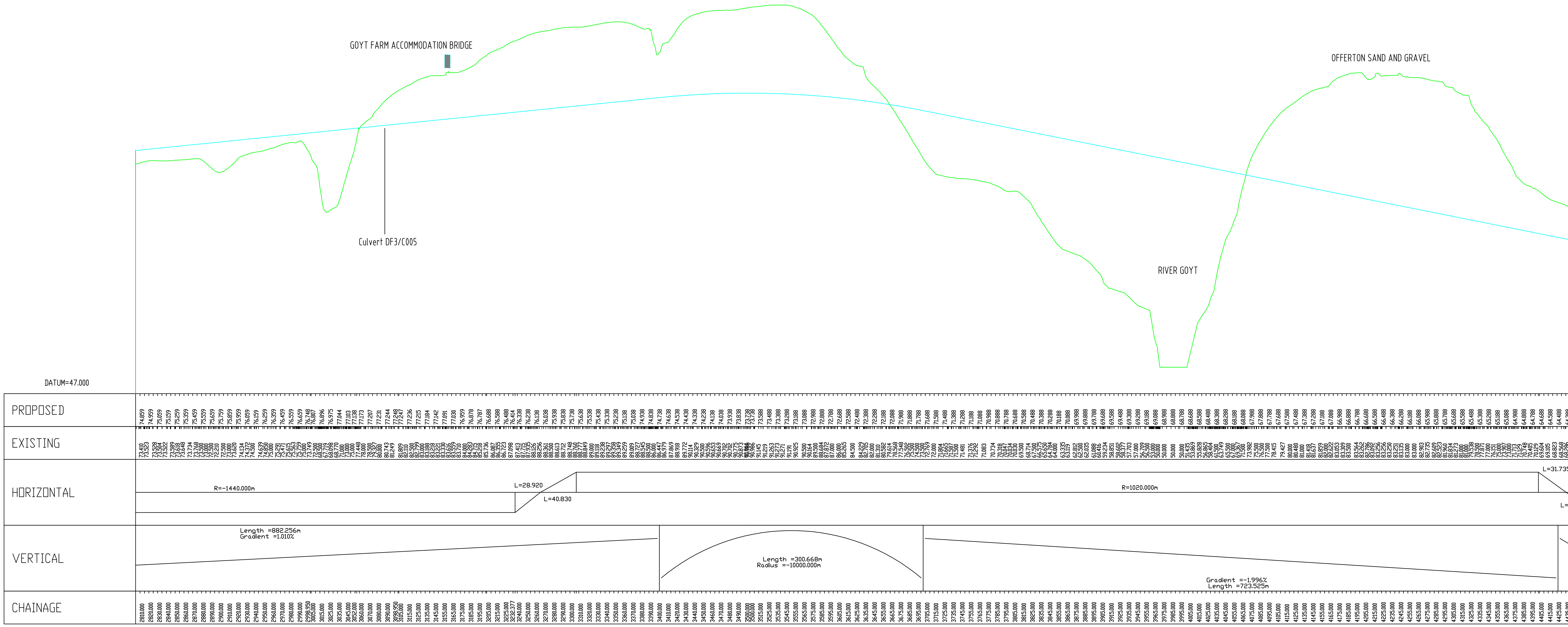

Rev.	Drawn	Checked	Date	Revision Details

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Drawing Title

DESIGN FREEZE 4A
MAINLINE DESIGN
Sheet 4 of 23

Drawn	Checked	Engineer	Approved
S Payne			
Date 16.03.06	Date	Date	Date

Size	Scales
A1	PLAN 1:2500 – SECTION HZ 1:2500, VT 1:250
A3	PLAN 1:5000 – SECTION HZ 1:5000, VT 1:500

Status	Filename
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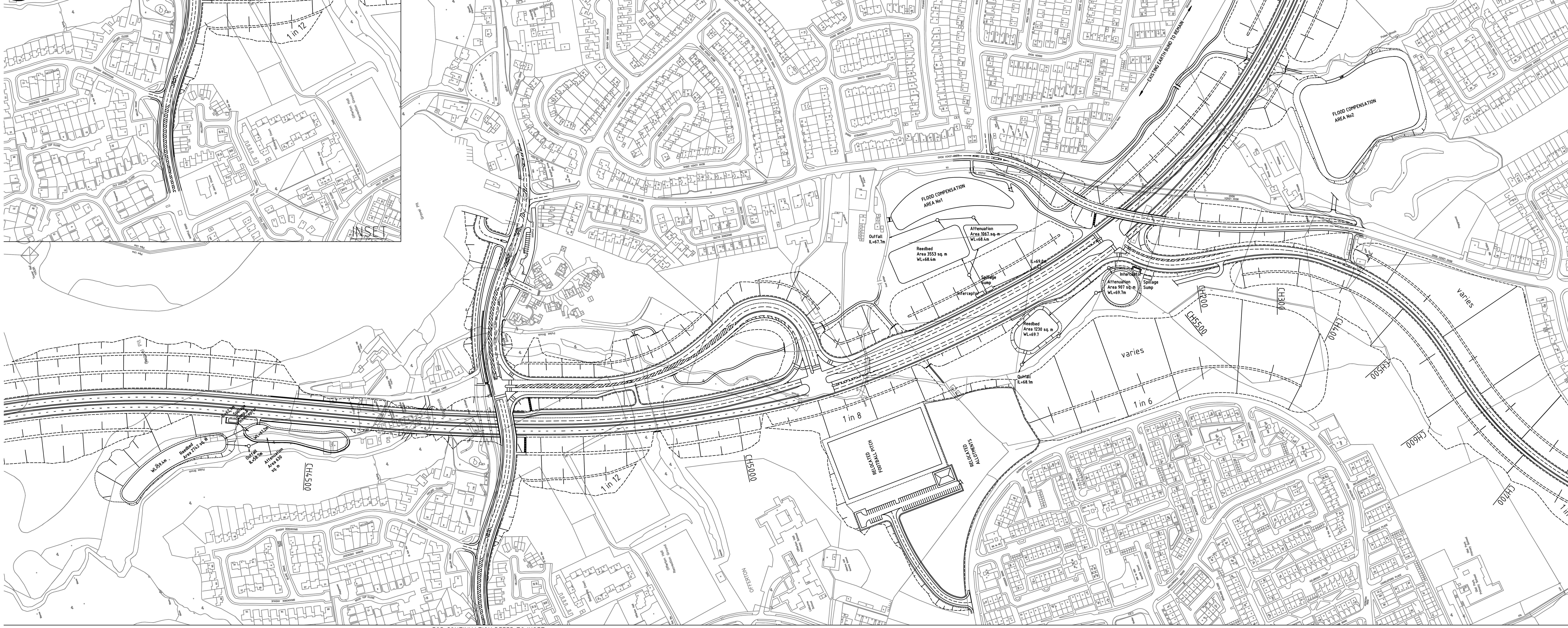
Drawing No.	Revision
1007/D/DF4A/004	



FOR CONTINUATION REFER TO INSET

NOTES

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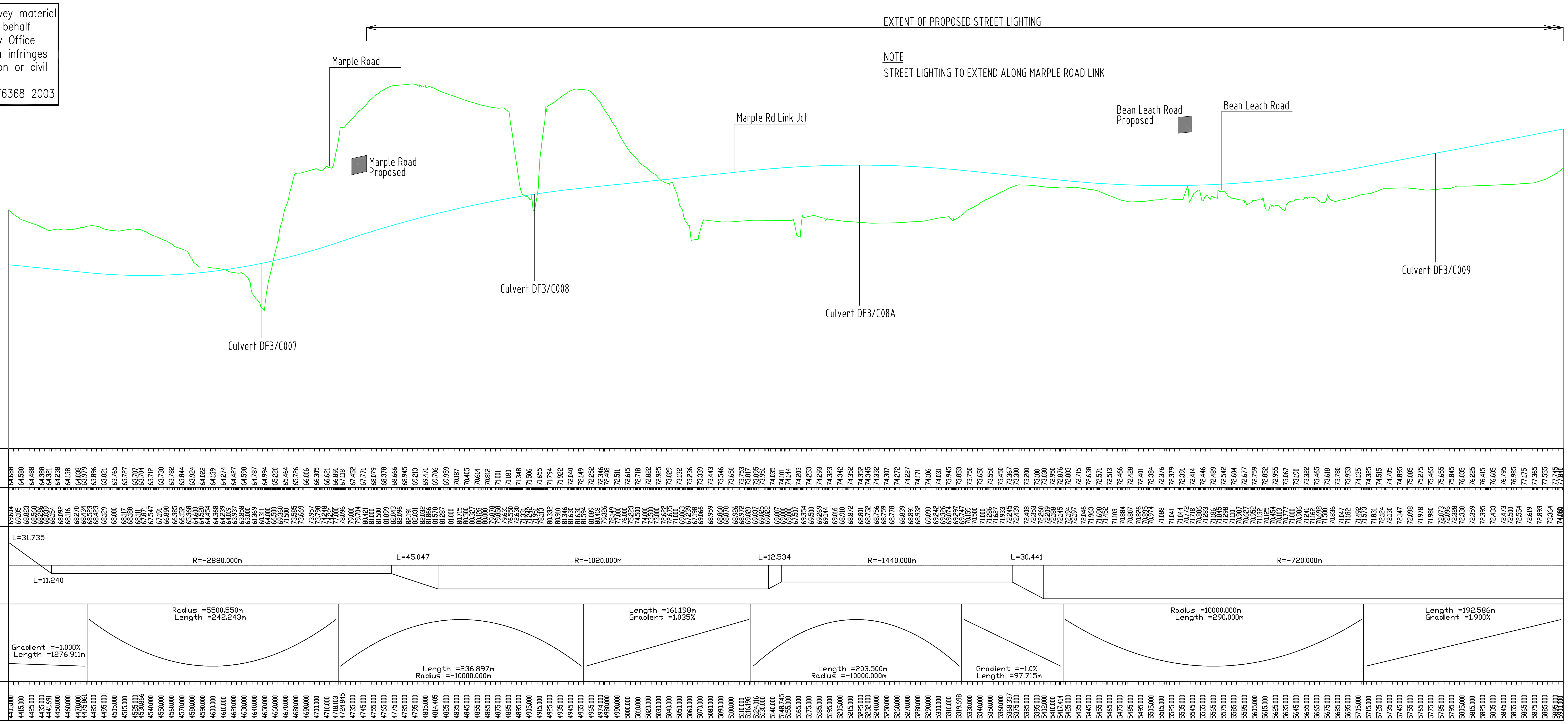

DATUM=47.000

PROPOSED

EXISTING

HORIZONTAL

VERTICAL

CHAINAGE

Rev.	Drawn	Checked	Date	Revision Details

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A555
M60 (jct 25) to WOODFORD RD (Bramhall)

Drawing Title

DESIGN FREEZE 4A
MAINLINE DESIGN
Sheet 5 of 23

Drawn	Checked	Engineer	Approved
S Payne			
Date 16.03.06	Date	Date	Date
Size A1 A3	Scales PLAN 1:2500 – SECTION HZ 1:2500, VT 1:250 PLAN 1:5000 – SECTION HZ 1:5000, VT 1:500		
Status	Filename Q:\.........\DRAWINGS\DESIGN FREEZE 4A\HMH1007-D_DF4A_005.DWG		

Drawing No. 1007/D/DF4A/005

Revision

NOTES

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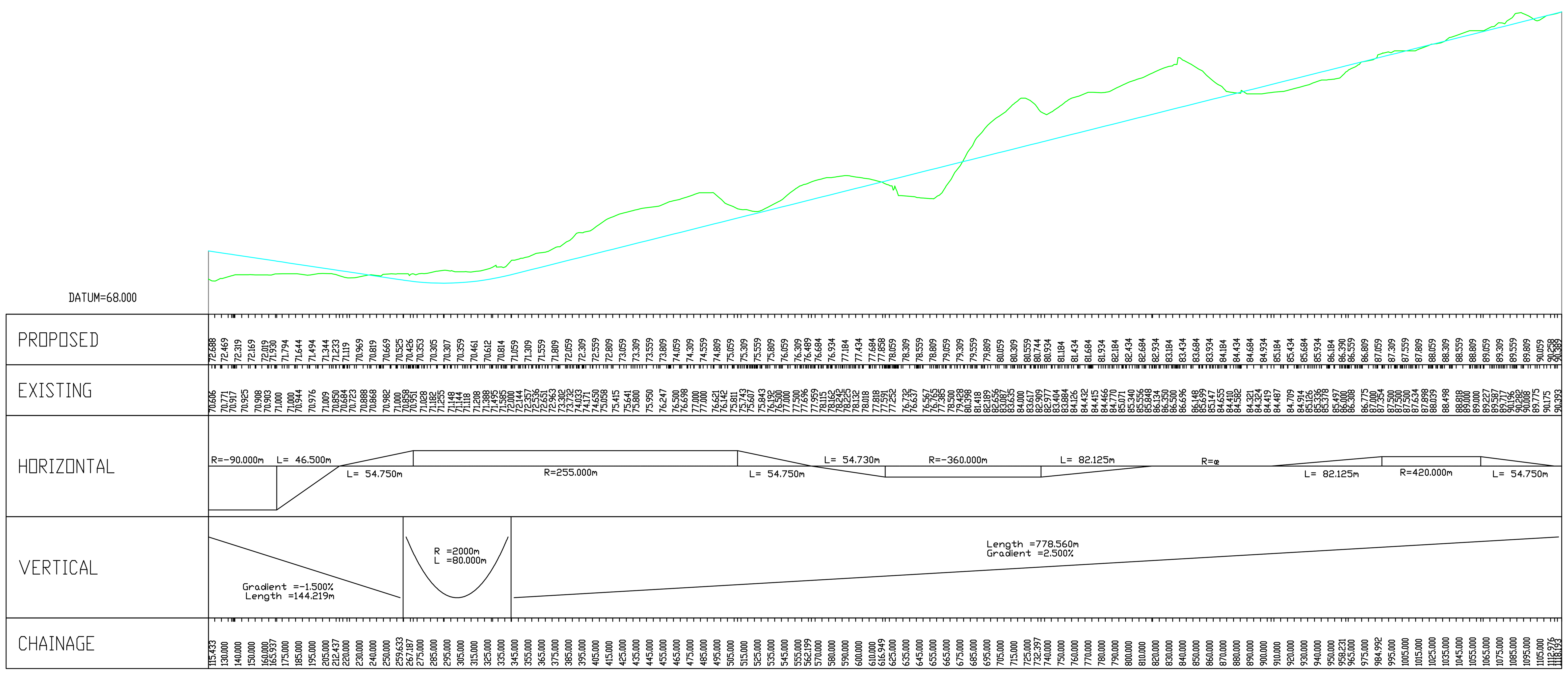
2. ALL EARTHWORKS SLOPES ASSUMED TO BE 1:3 UNLESS OTHERWISE STATED



Rev.	Drawn	Checked	Date	Revision Details

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A555
M60 (jct 25) to WOODFORD RD (Bramhall)

Drawing Title

DESIGN FREEZE 4A
MAINLINE DESIGN
Sheet 6 of 23

Drawn	Checked	Engineer	Approved
S Payne			
Date 16.03.06	Date	Date	Date

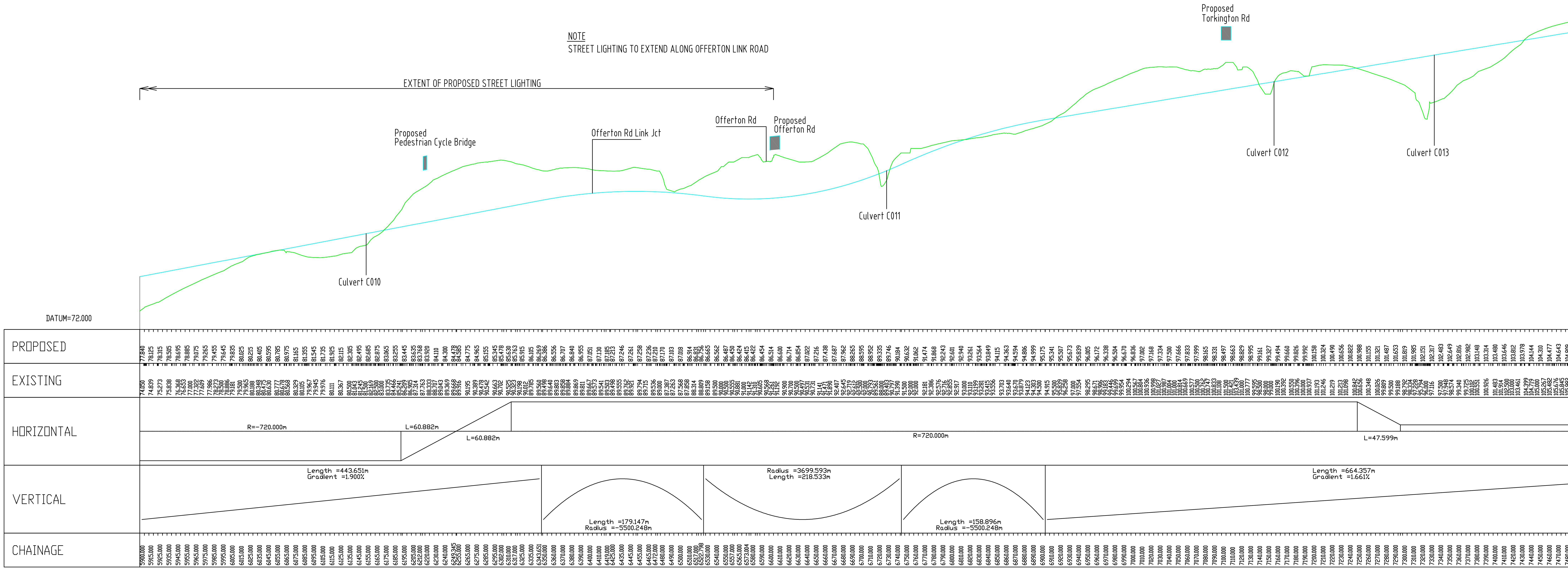
Size	Scales
A1	PLAN 1:2500 – SECTION HZ 1:2500, VT 1:250
A3	PLAN 1:5000 – SECTION HZ 1:5000, VT 1:500

Status	Filename
	Q:\..........\DRAWINGS\DESIGN FREEZE 4A\HMH1007-D_DF4A_006.DWG

Drawing No.	Revision
1007/D/DF4A/006	

NOTES

1. EXTENTS OF RETAINING WALLS AND BRIDGES ARE INDICATIVE ONLY
2. ALL EARTHWORKS SLOPES ASSUMED TO BE 1:3 UNLESS OTHERWISE STATED



Rev.	Drawn	Checked	Date	Revision Details

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SEMMMS MAJOR ROAD SCHEMES

A555
M60 (jct 25) to WOODFORD RD (Bramhall)

Drawing Title
DESIGN FREEZE 4A
MAINLINE DESIGN
Sheet 7 of 23

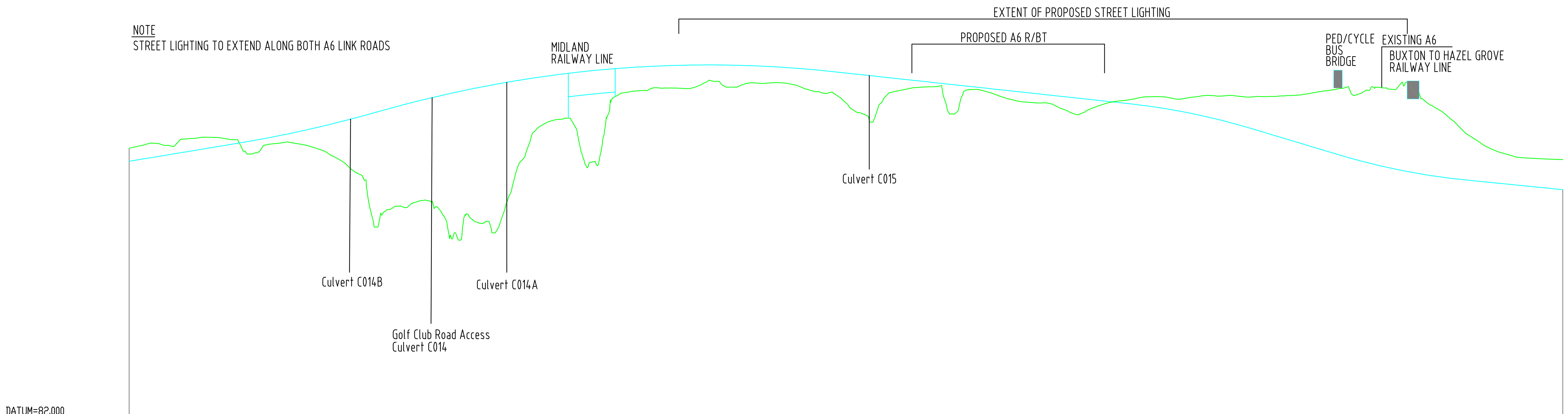
Drawn	Checked	Engineer	Approved
S Payne			
Date 16.03.06	Date	Date	Date

Size	Scales
A1	PLAN 1:2500 – SECTION HZ 1:2500, VT 1:250
A3	PLAN 1:5000 – SECTION HZ 1:5000, VT 1:500
Status	Filename

Drawing No. 1007/D/DF4A/007 | Revision

NOTES

1. EXTENTS OF RETAINING WALLS AND BRIDGES ARE INDICATIVE ONLY
2. ALL EARTHWORKS SLOPES ASSUMED TO BE 1:3 UNLESS OTHERWISE STATED



PROPOSED	[illegible]
EXISTING	[illegible]
HORIZONTAL	R=3300.000m; R=∞; L =83.700m; R=720.000m
VERTICAL	Length =664.357m Gradient =1.661%; Radius =10000.000m Length =118.032m; Length =392.385m Radius =-10000.000m; Gradient =-1.083% Length =253.198m; Length =105.440m R; Gradient= -3.0% L =72.677m; Radius =5500.248m Length =110.005m; Gradient= -1.0% L =83.680m
CHAINAGE	7480.000 – 8695.000

A	SP	DT	11.05.06	HAZEL GROVE GOLF COURSE CULVERTS AMENDED
Rev.	Drawn	Checked	Date	Revision Details

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Job Title
SEMMMS MAJOR ROAD SCHEMES
A555
M60 (jct 25) to WOODFORD RD (Bramhall)

Drawing Title
DESIGN FREEZE 4A
MAINLINE DESIGN
Sheet 8 of 23

Drawn	Checked	Engineer	Approved
S Payne			
Date 16.03.06	Date	Date	Date

Size A1 / A3
Scales: PLAN 1:2500 – SECTION HZ 1:2500, VT 1:250; PLAN 1:5000 – SECTION HZ 1:5000, VT 1:500
Status
Filename: Q:\.........\DRAWINGS\DESIGN FREEZE 4A\HMH1007-D_DF4A_008.DWG
Drawing No. 1007/D/DF4A/008
Revision A

NOTES

1. EXTENTS OF RETAINING WALLS AND BRIDGES ARE INDICATIVE ONLY
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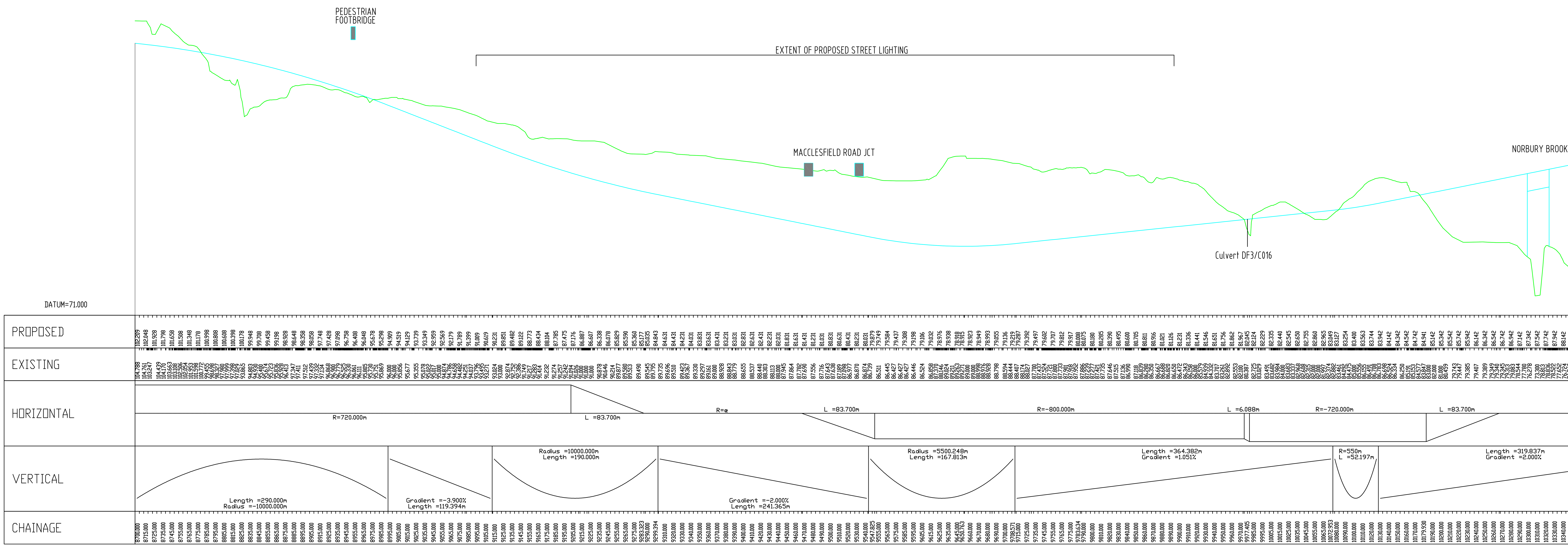

Rev.	Drawn	Checked	Date	Revision Details

south east manchester multi modal strategy

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FAX 0161 476 0721

Job Title

SEMMMS MAJOR ROAD SCHEMES

A555
M60 (jct 25) to WOODFORD RD (Bramhall)

Drawing Title

DESIGN FREEZE 4A
MAINLINE DESIGN
Sheet 9 of 23

Drawn	Checked	Engineer	Approved
S Payne			
Date 16.03.06	Date	Date	Date

Size	Scales
A1	PLAN 1:2500 – SECTION HZ 1:2500, VT 1:250
A3	PLAN 1:5000 – SECTION HZ 1:5000, VT 1:500
Status	Filename Q:\..........\DRAWINGS\DESIGN FREEZE 4A\HMH1007-D_DF4A_009.DWG

Drawing No.	Revision
1007/D/DF4A/009	

NOTES

1. EXTENTS OF RETAINING WALLS AND BRIDGES ARE INDICATIVE ONLY
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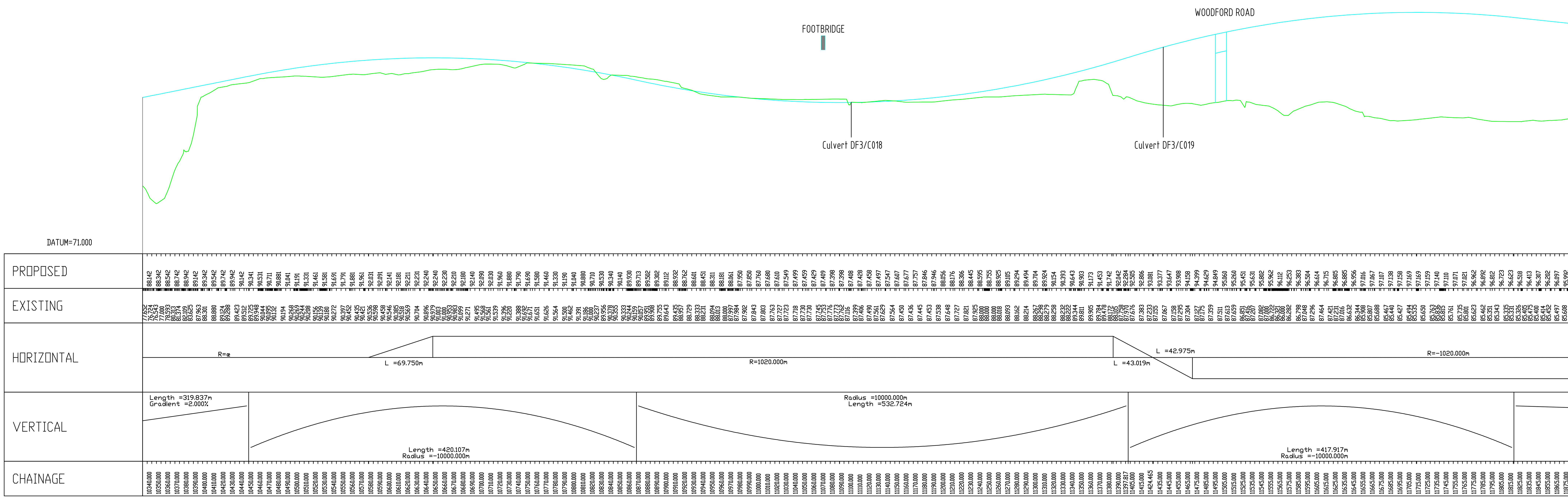

Rev.	Drawn	Checked	Date	Revision Details

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M60 (jct 25) to WOODFORD RD (Bramhall)

Drawing Title

DESIGN FREEZE 4A
MAINLINE DESIGN
Sheet 10 of 23

Drawn	Checked	Engineer	Approved
S Payne			
Date 16.03.06	Date	Date	Date

Size	Scales
A1	PLAN 1:2500 – SECTION HZ 1:2500, VT 1:250
A3	PLAN 1:5000 – SECTION HZ 1:5000, VT 1:500
Status	Filename

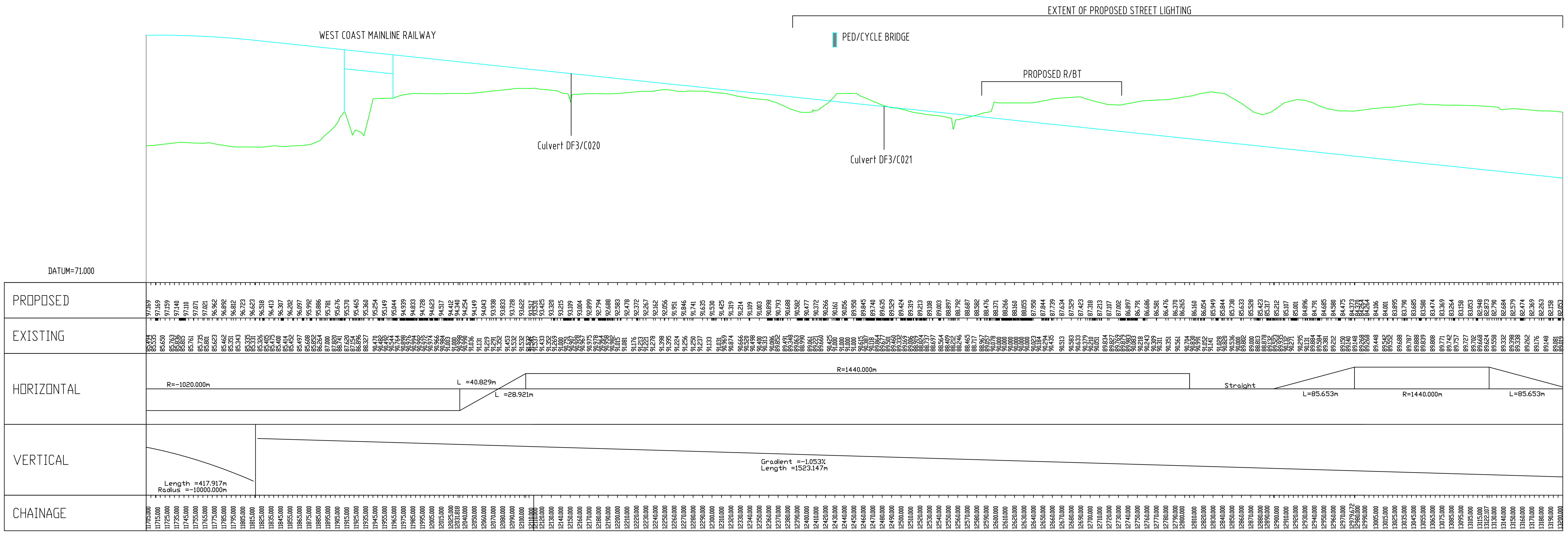
Drawing No.	Revision
1007/D/DF4A/010	

NOTES

1. EXTENTS OF RETAINING WALLS AND BRIDGES ARE INDICATIVE ONLY
2. ALL EARTHWORKS SLOPES ASSUMED TO BE 1:3 UNLESS OTHERWISE STATED

NOTES

1. STREET LIGHTING TO EXTEND ALONG CHESTER RD LINK WITHIN STOCKPORT MBC BOUNDARY.
2. REFER TO CHESHIRE CC FOR DETAILS ON THE POYNTON BYPASS
3. STREET LIGHTING TO EXTEND ALONG THE OIL TERMINAL ACCESS ROAD TO A POINT 80m FROM THE PROPOSED ROUNDABOUT.



Rev.	Drawn	Checked	Date	Revision Details

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Job Title

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A555
M60 (jct 25) to WOODFORD RD (Bramhall)

Drawing Title

DESIGN FREEZE 4A
MAINLINE DESIGN
Sheet 11 of 23

Drawn	Checked	Engineer	Approved
S Payne			
Date 16.03.06	Date	Date	Date

Size	Scales
A1	PLAN 1:2500 – SECTION HZ 1:2500, VT 1:250
A3	PLAN 1:5000 – SECTION HZ 1:5000, VT 1:500
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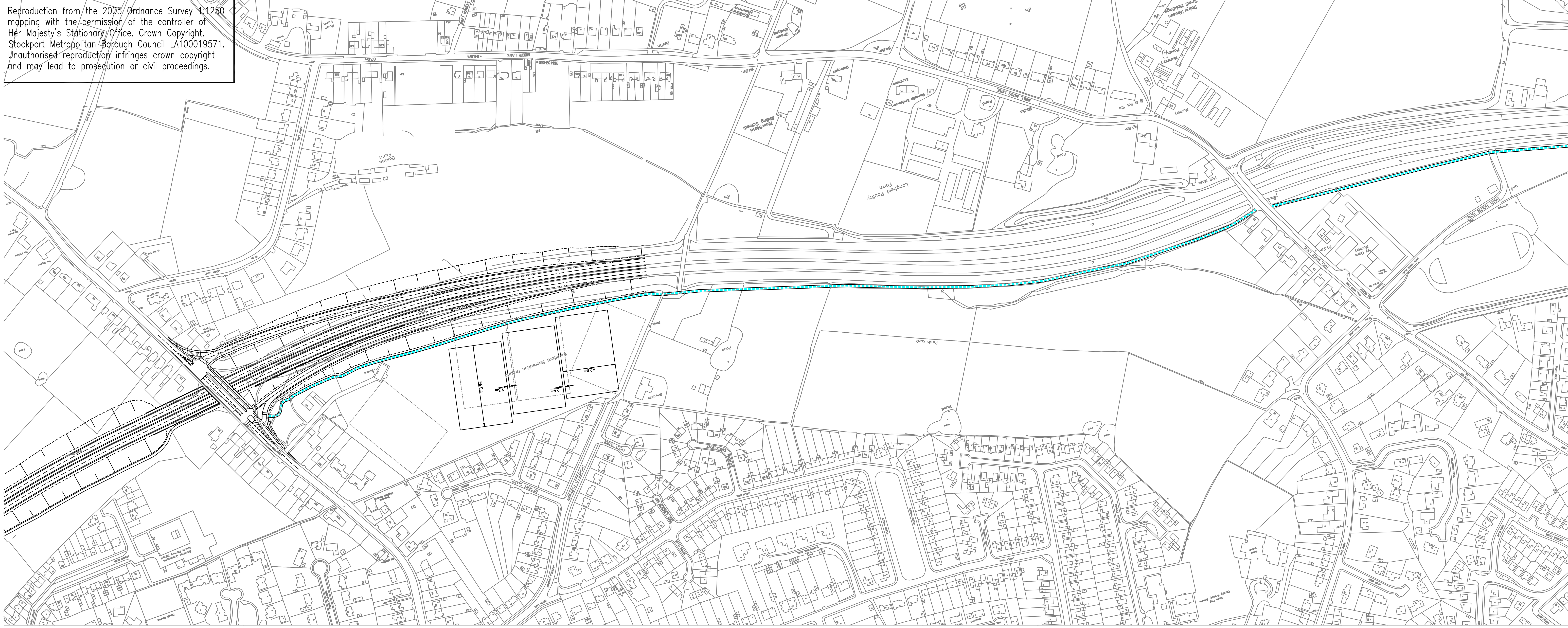
Drawing No. 1007/D/DF4A/011 | Revision



NOTES

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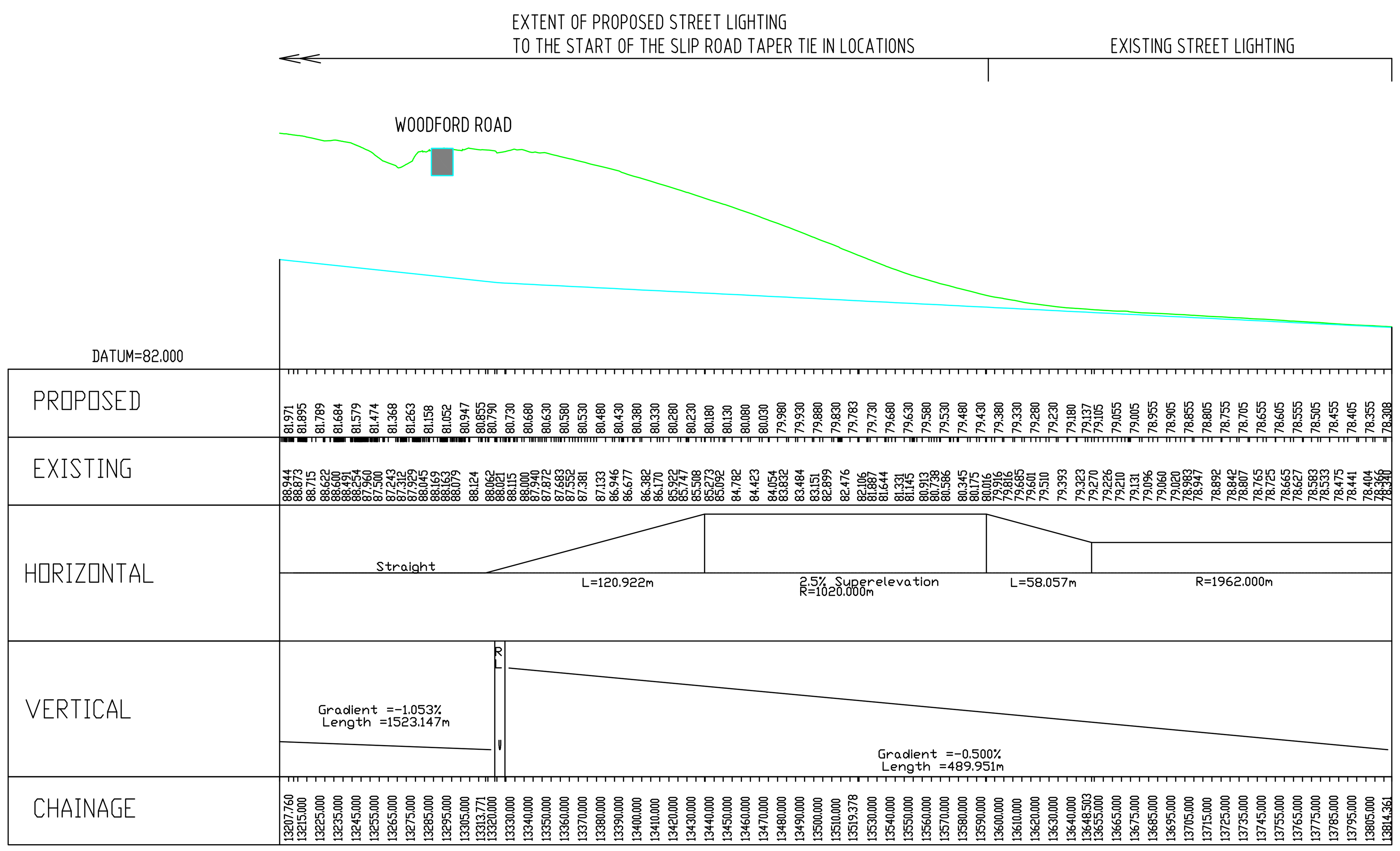
KEY

EXISTING A555 PROPOSED PED/CYCLE ROUTE



Rev.	Drawn	Checked	Date	Revision Details

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Job Title

SEMMMS MAJOR ROAD SCHEMES

A555
M60 (jct 25) to WOODFORD RD (Bramhall)

Drawing Title

DESIGN FREEZE 4A MAINLINE DESIGN Sheet 12 of 23

Drawn	Checked	Engineer	Approved
S Payne			
Date 16.03.06	Date	Date	Date

Size: A1 / A3

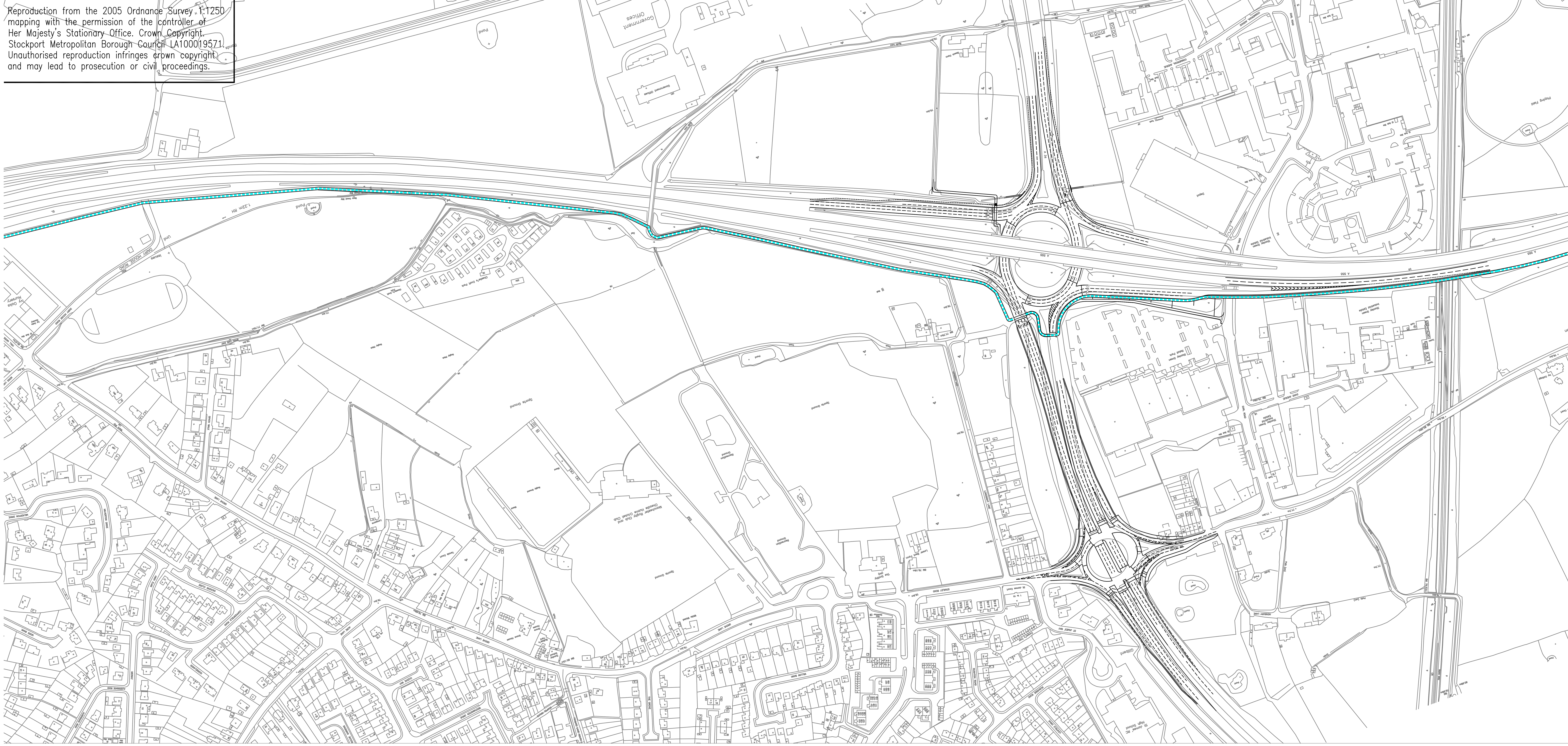
Scales:
PLAN 1:2500 – SECTION HZ 1:2500, VT 1:250
PLAN 1:5000 – SECTION HZ 1:5000, VT 1:500

Status

Filename: Q:\..........\DRAWINGS\DESIGN FREEZE 4A\HMH1007-D_DF4A_012.DWG

Drawing No. 1007/D/DF4A/012

Revision



NOTES

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KEY

EXISTING A555 PROPOSED PED/CYCLE ROUTE

Rev.	Drawn	Checked	Date	Revision Details

south east manchester multi modal strategy

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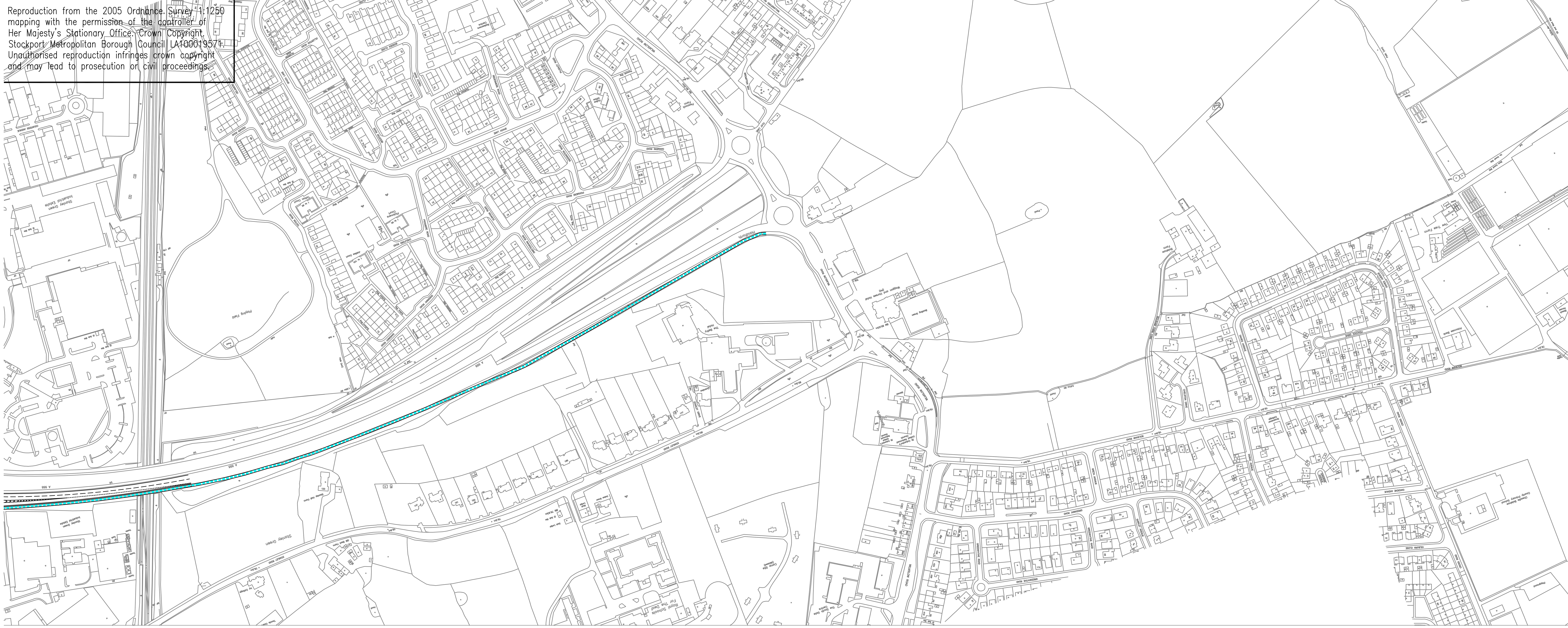
Drawing Title

DESIGN FREEZE 4A
MAINLINE DESIGN
Sheet 13 of 23

Drawn	Checked	Engineer	Approved
S Payne			
Date 16.03.06	Date	Date	Date

Size	Scales
A1	PLAN 1:2500 – SECTION HZ 1:2500, VT 1:250
A3	PLAN 1:5000 – SECTION HZ 1:5000, VT 1:500
Status	Filename

Drawing No.	Revision
1007/D/DF4A/013	



NOTES

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KEY

EXISTING A555
PROPOSED PED/CYCLE ROUTE

Rev.	Drawn	Checked	Date	Revision Details

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Drawing Title

DESIGN FREEZE 4A
MAINLINE DESIGN
Sheet 14 of 23

Drawn	Checked	Engineer	Approved
S Payne			
Date 16.03.06	Date	Date	Date

Size: A1 / A3

Scales:
PLAN 1:2500 – SECTION HZ 1:2500, VT 1:250
PLAN 1:5000 – SECTION HZ 1:5000, VT 1:500

Status

Filename: Q:\...........\DRAWINGS\DESIGN FREEZE 4A\HMH1007-D_DF4A_014.DWG

Drawing No. 1007/D/DF4A/014

Revision

Appendix 2

LETTERS OF SUPPORT

Transport for Greater Manchester

2 Piccadilly Place
Manchester M1 3BG

0161 244 1000
www.tfgm.com

Department for Transport
Great Minster House
33 Horseferry Road
London
SW1P 4DR

Our ref
Your ref

27 July 2016

Dear Sir/Madam

A6 – M60 Relief Road (SEMMMS Phase 2) highway scheme

Application for Funding for Scheme Development Costs (Large Local Major Transport Schemes) 2017/18

As Chief Executive, I support the above application for funding, which is to be considered by the Department for Transport for funding for scheme development costs as a Large Local Major Transport Scheme.

TfGM has worked alongside local authority leaders and other stakeholders to develop ambitious plans to drive growth within the city region, as set out in the Greater Manchester Strategy and Growth Reform Plan. Supporting investment in strategic transport schemes is an essential accompaniment to the planned growth of the local economy, specifically the SEMMMS relief road and this is recognised in GM2040, Greater Manchester's transport strategy, whose consultation draft was launched this month (July 2016).

The SEMMMS strategy has been developed to address both the regeneration needs of Stockport, the Manchester Airport area and neighbouring parts of Cheshire. It is a major initiative and has been the subject of detailed development for a number of years. Phase 1 of the SEMMMS highway element, the A6-MARR (Manchester Airport

Relief Road) is currently under construction, with completion in late 2016 and a planned opening date in 2017.

We consider delivery of this scheme will play an essential part in fulfilling the overall strategy, by completing the planned highway infrastructure and opening the door to provision of a comprehensive package of complementary sustainable transport improvements in the SE Stockport sector.

The project is closely aligned with the objectives of the Greater Manchester Transport Strategy 2040 through;

- Supporting the growth of a globally connected city region;
- Improving sustainable transport links in to the Regional Centre;
- Improving sustainable transport options across the wider city region;
- Providing infrastructure to serve new development areas.

We have no doubt that the delivery of the transport infrastructure will contribute significant economic, social and environmental benefits to Greater Manchester. Such investments are recognised as the key to making the Northern Powerhouse concept a reality and we trust that support from the Department for Transport will allow this key strategic scheme to be progressed to delivery, further stimulating the economic growth potential of Greater Manchester.

Yours faithfully,

Dr Jon Lamonte
Chief Executive

Greater Manchester
Local Enterprise Partnership

Department for Transport
Great Minster House
33 Horseferry Road
London
SW1P 4DR

27th July 2016

Dear Sir/Madam

A6 to M60 Relief Road (SEMMMS Phase 3) highway scheme

Application for Funding for Scheme Development Costs (Large Major) 2017 - 2019

As Chair of the Greater Manchester LEP, I strongly support the above application for development funding, which is to be considered by the Department for Transport for funding the scheme development costs of this Large Local Major Transport Scheme. The LEP has worked alongside the Greater Manchester Combined Authority to develop ambitious plans to drive growth within the city region, as set out in the Greater Manchester Strategy and Growth Reform Plan.

Supporting investment in strategic transport schemes is an essential accompaniment to the planned delivery of growth of the local economy, specifically the SEMMMS: A6 to M60 Relief Road. This is recognised in Greater Manchester's 2040 Transport Strategy, whose consultation draft was launched this month (July 2016).

The SEMMMS strategy was developed to specifically address both the regeneration and connectivity needs of Stockport, the Manchester Airport area and neighbouring parts of Cheshire East and Derbyshire. It is a major initiative and has been the subject of detailed development for a number of years. Phase 1 of the SEMMMS highway element, the A6-MARR (Manchester Airport Relief Road) is currently under construction, with completion in late 2016 and a planned opening date in 2017 while Phase 2 the Poynton Relief Road is currently within the planning process and supported by the Warrington and Cheshire LEP.

We support the further development of this scheme as it is important to better understand the role that it can have, in light of current and emerging transport policy, in fulfilling the overall SEMMMS strategy by removing congestion from local roads, enabling a comprehensive package of complementary sustainable transport improvements, improving access to the M60 motorway, enhancing surface access to the Manchester Airport and improving accessibility to the economic growth area at Airport City.

We have no doubt that there is need for further improvement in transport infrastructure in the area and that it will contribute significant economic, social and environmental benefits to Greater Manchester. Such investments are recognised as the key to making the Northern Powerhouse concept a reality and we trust that support from the Department for Transport will facilitate the further development of this key project.

Yours faithfully,

Mike Blackburn
Chair of the Greater Manchester Local Enterprise Partnership

c/o Greater Manchester Integrated Support Team, Room 308, Level 3, Town Hall, Manchester, M60 2LA

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Appendix 3

SUMMARY OF PHASE HISTORY

Title	Source	Date of Issue
Cheshire East Local Plan - Local Plan Strategy Proposed Changes (Consultation Draft)	Cheshire East Council	Mar-16
Cheshire East Local Plan Strategy - Proposed Changes 'Clean Version'	Cheshire East Council	Mar-16
Stockport's 5 Year Housing Land Supply Assessment 2015-20	Stockport Metropolitan Borough Council	Apr-15
Redrock Stockport Scheme Newsletter	Stockport Metropolitan Borough Council	Apr-16
http://www.stockport.gov.uk/services/communitypeopleliving/newapproach/investingingrowth/stockportexchange_overview/	Stockport Metropolitan Borough Council	May-16
http://www.stockportexchange.co.uk/	Stockport Exchange website	May-16
http://www.stockport.gov.uk/services/communitypeopleliving/newapproach/investingingrowth/cyclingconsultation/	Stockport Metropolitan Borough Council	May-16
http://www.stockport.gov.uk/services/communitypeopleliving/newapproach/investingingrowth/a6marr_overview/	Stockport Metropolitan Borough Council	May-16
Stockport Highway Investment Programme	Stockport Metropolitan Borough Council	Jan-16
http://www.stockport.gov.uk/services/communitypeopleliving/newapproach/investingingrowth/hip_overview/	Stockport Metropolitan Borough Council	May-16
http://www.stockport.gov.uk/services/communitypeopleliving/newapproach/investingingrowth/towncentreaccess/	Stockport Metropolitan Borough Council	May-16
Stockport Town Centre Access Plan	Stockport Metropolitan Borough Council	Jan-15
http://www.stockport.gov.uk/services/communitypeopleliving/newapproach/investingingrowth/aurorastockport_overview/	Stockport Metropolitan Borough Council	May-16
http://www.stockport.gov.uk/services/communitypeopleliving/newapproach/investingingrowth/marketplace_overview/	Stockport Metropolitan Borough Council	May-16
http://www.stockport.gov.uk/services/communitypeopleliving/newapproach/investingingrowth/transportinterchange_overview/	Stockport Metropolitan Borough Council	May-16
http://www.stockport.gov.uk/services/transport/transportpolicy/coventgardenvillage	Stockport Metropolitan Borough Council	May-16
http://www.stockport.gov.uk/services/transport/transportpolicy/lhm_challengefund	Stockport Metropolitan Borough Council	May-16
http://www.airportcity.co.uk/	Airport City Manchester	May-16
Airport Sustainable Development Plan 2015	Manchester Airport	Jun-15
Airport Sustainable Development Plan 2015 - ECONOMY AND SURFACE ACCESS	Manchester Airport	Jun-15
Manchester Airport Enterprise Zone	Manchester Airport	Mar-11
Manchester Core Strategy Development Plan	Manchester City Council	Jul-12

Appendix 4

M60 JUNCTION 25 SMART MOTORWAY REVIEW

SEMMMS A6-M60 RELIEF ROAD: STAGE 2 STUDY

REVIEW OF M60 JUNCTION 25 - DRAFT

TECHNICAL NOTE NO 001: MARCH 2017

QUALITY MANAGEMENT

Job Number	Date	Author	Checked	Authorised
70019764	March 2017	Andy Hicks	Laura Woodbyrne	Stuart Atkin

1 INTRODUCTION

1.1.1 The design of the M60 Junction 25 has not been updated during this phase of work, therefore the reviews carried out and presented below, have been based on the Design Freeze 4A version. The design is at a preliminary stage of development, further work would be required at later stages to update and refine it, reviewing the compliancy with design standards and taking cognisance of the information gathered during this stage.

2 TECHNICAL REVIEW OF M60 JUNCTION 25 DESIGN FREEZE 4A VERSION

2.1 MAINLINE CARRIAGEWAY (ASSUMED DESIGN SPEED 120A)

NORTHBOUND

2.1.1 The existing mainline carriageway horizontal radius is approx. 580R which is 2-steps below Desirable Minimum. The proposed realignment of the northbound carriageway reduces the horizontal radius to 510R which is also 2-Steps below Desirable Minimum but this reduction in horizontal curvature is an acceptable relaxation in accordance with TD9 para 3.4. The proposed horizontal Stopping Sight Distance (SSD) is approx. 160m which is 2-Steps below Desirable Minimum but this reduction in standard is an acceptable relaxation in accordance with TD9 para 2.8.

2.1.2 The SSD in the vertical plane has not been assessed. Relaxations in SSD are not permitted on the immediate approach to junctions and therefore 295m SSD is required on the approach to Junction 25 northbound merge for a length of carriageway 1.5X the Desirable Minimum SSD (i.e. 295m SSD is required 450m from the back of the merge nose). Desirable Minimum SSD is not currently achieved on this approach because of the proposed abutments and earthworks and the current design would require a departure from standard.

2.1.3 The proposed cross section of the mainline carriageway meets the requirements of TD27 for a dual 3 lane motorway – D3M.

SOUTHBOUND

2.1.4 The existing mainline carriageway horizontal radius is approx. 255R which is 4-steps below Desirable Minimum. The proposed realignment of the southbound carriageway increases the horizontal radius to 360R which is 3-Steps below Desirable Minimum and would be a departure from standard in accordance with TD9 para 3.4. The proposed horizontal SSD is approx. 160m which is 2-Steps below Desirable Minimum but this reduction in standard is an acceptable relaxation in accordance with TD9 para 2.8.

2.1.5 The SSD in the vertical plane has not been assessed. Relaxations in SSD are not permitted on the immediate approach to junctions and therefore 295m SSD is required on the approach to Junction 25 southbound diverge for a length of carriageway 1.5X the Desirable Minimum SSD (i.e. 295m SSD is required 450m from the back of the diverge nose). The Desirable Minimum horizontal SSD seems to be achieved to through this diverge.

2.1.6 The proposed cross section of the mainline carriageway meets the requirements of TD27 for a dual 3 lane motorway – D3M.

2.2 NORTHBOUND JUNCTION 25 MERGE (ASSUMED DESIGN SPEED 85)

2.2.1 The existing offside merge is proposed to be replaced with a standard nearside merge. The chosen proposed merge is a Type H – Ghost Island Merge with Auxiliary Lane and its use would be a departure in accordance with TD22 par 2.30. This layout has presumably been chosen due the site constraints and the difficulty of providing an additional lane northbound to Junction 24.

2.2.2 The geometric design parameters for the merging lane do not fully comply with TD22 Table 4/3 and would need to be reassessed to ensure that departures from standards are not required.

2.2.3 The connector road (interchange link) from the at-grade traffic signal roundabout to the Type H Merge has a design speed of 85kph and the horizontal radii are above Desirable Minimum. The proposed horizontal SSD is approx. 160m which is Desirable Minimum but the SSD in the vertical plane has not been assessed.

2.2.4 The proposed cross section of the connector road meets the requirements of TD 27 as an IL2A (interchange link).

2.3 SOUTHBOUND JUNCTION 25 DIVERGE

2.3.1 The proposed diverge is a Type B – Ghost Island Diverge and geometric parameters for the diverging lane complies with TD22 Table 4/4. A successive diverge follows the mainline diverge and the spacing from nose tip to nose tip is approx. 405m which is greater than 3.75V (V=85) and therefore compliant to TD 22 para 4.30.

2.3.2 The proposed taper and nose length for the interchange diverge are greater than TD 22 Table 4/4.

2.3.3 The connector road (interchange link) from the mainline to the at-grade traffic signal roundabout design speed of 85kph and the horizontal radii are 1-Step below Desirable Minimum. The proposed horizontal SSD is approx. 160m which is Desirable Minimum but the SSD in the vertical plane has not been assessed.

2.3.4 The proposed cross section of the connector road meets the requirements of TD 27 as an IL2A (interchange link) except a hard shoulder has not been provided.

3 M60 SMART MOTORWAYS OPERATIONAL CONCEPT PROPOSALS FROM JUNCTION 24 TO JUNCTION 27

3.1 REVIEW OF SMART MOTORWAYS SCHEMATIC

3.1.1 Communication is ongoing with Highways England Smart Motorways team. A proposed schematic layout has been provided for information to the project team; however this is at very early stages of development and therefore is subject to change. A review has been carried out to understand the interaction between the two schemes as they currently stand.

3.1.2 It is presumed that D4-ALR is not taken through Junction 25 as the existing discontinuous hard shoulder and the provision of 4 lanes would require the demolition of 3no existing structures. Progression of the A6-M60 scheme would necessitate one structure to be demolished and reconstructed on an amended alignment.

3.1.3 The delivery timeframes for each scheme are dependent on a number of factors.

- → If the A6-M60 scheme was to be constructed first, the proposed Type H - Ghost Island Merge with Auxiliary Lane for the Junction 25 northbound merge could be converted to a lane gain. This would encompass a Type F Lane Gain Ghost Island Merge which would provide the additional lane to Junction 24.

- If the Smart Motorway scheme was to be constructed first and the junction forms change, consideration would need to be given to the Entry Datum points and their interaction with the position of gantry locations.

3.1.4 From Junction 25 to Junction 26 in both directions the current Smart Motorways proposals do not interact with the current A6-M60 scheme proposal.

3.1.5 Visibility to gantries would need to be reviewed due to the horizontal radius through Junction 25 and the over bridges.

3.1.6 The width of the carriageway cross section under the rail bridge & Lingard Lane over bridge would need to be reviewed at a later stage in scheme development.

4 COMMENTS FROM ASSET SUPPORT CONTRACTORS

4.1.1 Information has been provided to Highways England's Asset Support Contractors, Balfour Beatty Mott MacDonald, for them to carry out a high level review of the proposed design, capturing and reporting key issues and comments that should be considered as the scheme develops during later stages. Comments have been provided regarding the current performance of Junction 25 and the surrounding areas, identifying issues that may be pertinent to the development of this scheme.

4.1.2 The following aspects were noted through this engagement, some of which may be worthy of consideration or review at a later stage of the design development.

- The horizontal radii of the M60 in the vicinity of Junction 25, which are below desirable minimum. The current version of the proposed design would not provide a significant improvement on existing conditions.
- The Junction 26 / Crookiley Way junction arrangement, which is an unconventional layout. The current proposals under this scheme do not incorporate changes/improvements at this location.
- The central reservation detail (drainage and vehicle restraint barrier) between M60 Junction 24 and 25 is considered to be in need of review. The current proposals under this scheme would incorporate improvement of this infrastructure, although the detail has not yet been developed.
- The offside merge detail on the anticlockwise carriageway warrants review, which has been incorporated within the current design proposals on the A6-M60 scheme, where the proposal is to provide a conventional nearside merge.

Appendix 5

TUNNEL OPTION REVIEW

MEMO

TO: Laura Woodbyrne

FROM: Ian Crook

SUBJECT: High Level Review of Tunnel Arrangement

DATE: 01 March 2017

High Level Review of Tunnel Arrangement

Introduction

This document sets out the findings of a high level review of the proposed tunnel at the north end of the A6 to M60 relief road scheme. The document provides brief consideration of alternative engineering solutions, before considering structural options for a tunnel solution.

The content of this document has been produced based on the Design Freeze 4A alignment for the scheme, supported by publicly available desktop information.

The options and considerations provided are based on WSP Parsons Brinckerhoff's collective experience of similar crossings and structural forms. No structural calculations or detailed design development has been undertaken for any option.

Site Location and Local Geography

The proposed highway alignment passes in an approximately north-south direction, through an area of scrubland between two adjacent residential estates. Although no public rights of way exist across the site, aerial imagery shows worn footpaths which are indicative of regular informal use.

Existing ground levels undulate along the length of the proposed tunnel, with three notable peaks and an intermediate low point, where OS mapping indicates the presence of a small watercourse.

The highest existing ground level along this section of route, at approximately 90.2m above ordnance datum, lies approximately 17m above the proposed road level, thus requiring a large scale civil engineering solution to accommodate the proposed vertical alignment.

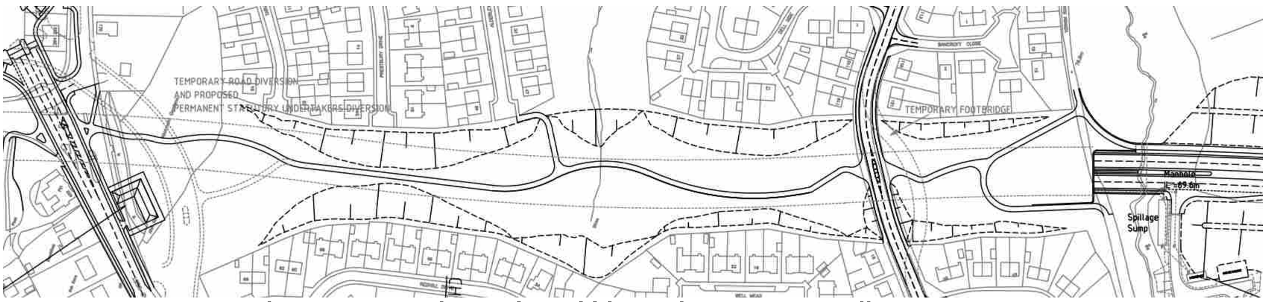

Figure 1 - Tunnel Location within Design Freeze 4A Alignment

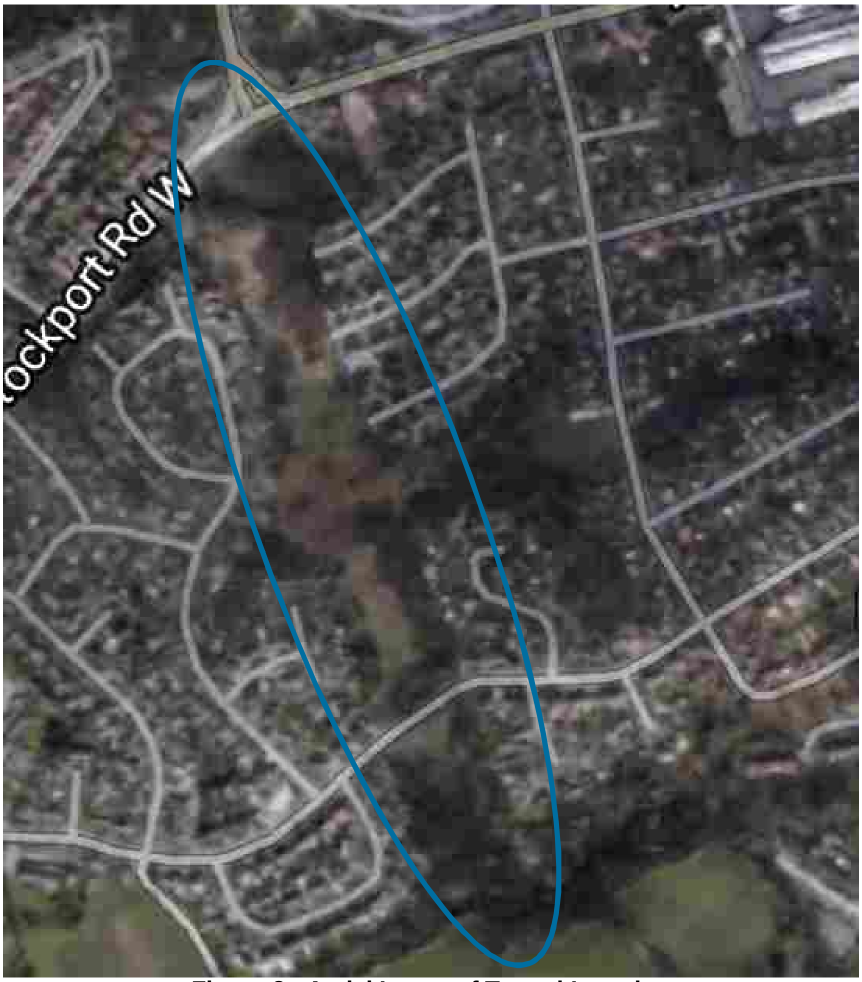

Figure 2 - Aerial Image of Tunnel Location

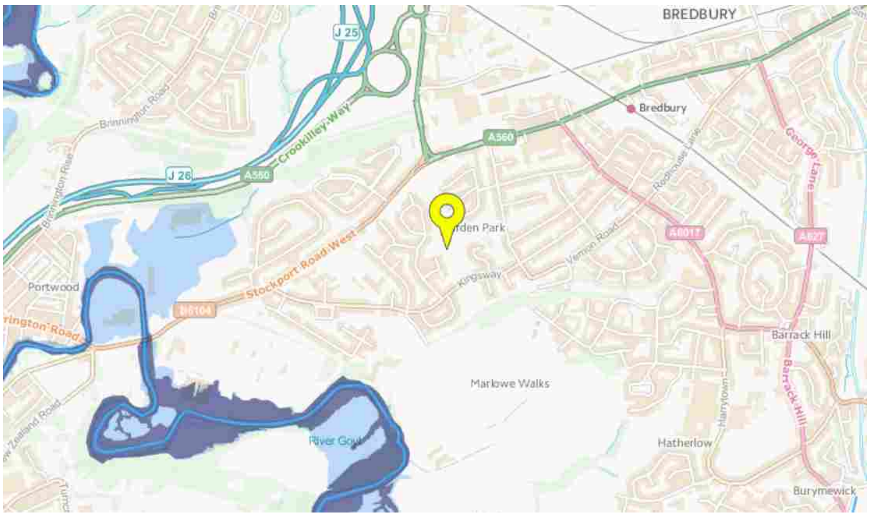

Figure 3 - EA Flood Mapping at the Proposed Tunnel Site

High Level Solutions for the Proposed Site

Given the significant difference in level between the existing ground surface and the proposed highway alignment along much of the route between approximate chainages 1740m and 2360m, a cutting or tunnelling solution must be considered.

At approximate scheme chainage 1960m, the existing ground level lies at approximately 90.2m above ordnance datum, circa 17m above the proposed road level. At this point, the clear distance between the edge of the highway and adjacent residential properties is less than 10m. Such a level difference could not be accommodated with earthworks alone, and thus a combination of earthworks and significant retaining walls is likely to be required.

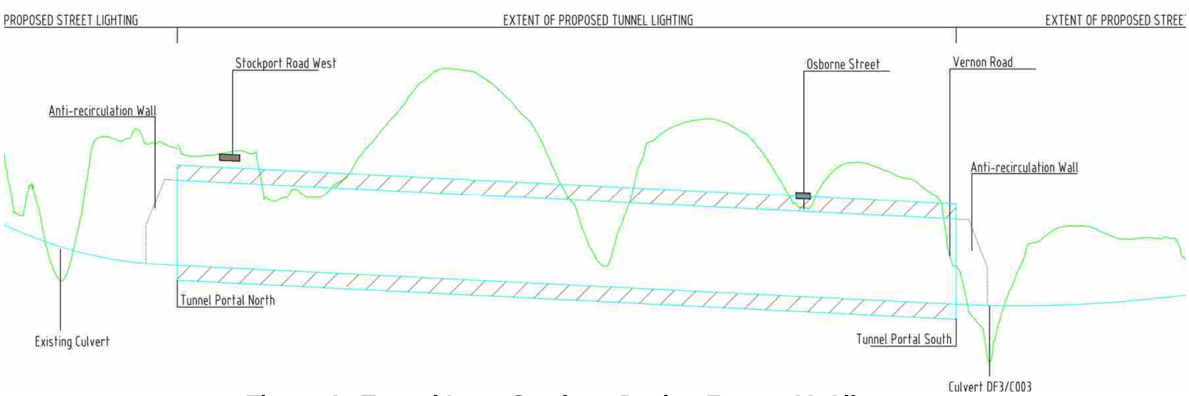

Figure 4 - Tunnel Long Section - Design Freeze 4A Alignment

Table 1 below considers high level options for the structure at this location, and concludes that a single tunnel structure or a hybrid combination of tunnel and retaining solutions could be considered.

It is recommended that at subsequent design development stages, more detailed consideration is given to the hybrid options, to determine suitable combinations of the two based on existing levels, highway alignment and proximity of adjacent properties.

Table 1 – High Level Options

OPTION	COMMENTARY	ADVANTAGES	DISADVANTAGES
Cutting Solution	A cutting solution would utilise a combination of sloped earthworks and retaining walls to accommodate the highway at the proposed level, which is generally below existing ground level. Given the retained height requirements and the close proximity of adjacent properties, the option for a cutting solution has been discounted at this stage on constructability grounds.	• Significantly reduced cost compared with tunnel solution; • Reduced long term maintenance and operational costs; • Improved long term safety.	• Significant increase in noise, air pollution and landscape impacts to adjacent properties, which are in close proximity to the proposed alignment at this location; • Long term loss of green space and habitat; • Potential for disruption to groundwater; • Requirement for retaining walls upwards of 15m, with extensive associated construction difficulties (particularly associated with adjacent properties); • The close proximity of adjacent properties (less than 10m in some areas), makes it extremely difficult to construct structurally independent retaining walls, as insufficient space would exist behind these walls to batter earth back in the construction phase.
Tunnel Solution	A tunnel solution would comprise a below ground tunnel, with associated approach cuttings. Specific options for tunnelling solutions are considered within **Table 2**.	• Reduced impact on adjacent properties; • Reduced long term environmental impact in comparison with the cutting solution;	• Significant increase in cost; • Increased construction difficulty and temporary disruption; • Increased long term maintenance and operational costs.

OPTION	COMMENTARY	ADVANTAGES	DISADVANTAGES
			• Potential for disruption to groundwater.
Hybrid Solution – Combined Tunnel and Cutting Solution	A hybrid solution could be considered, which incorporates shorter sections of cut and cover in conjunction with sections of earthworks and retaining walls. As discussed above, some sections are not suitable for a retaining wall solution, but a combined approach could reduce tunnel requirements to a single shorter tunnel or two short tunnels.	• Reduction in long term maintenance costs; • Safer in terms of fire and evacuation, with potential to remove the 'tunnel' classification if less than 150m.	• Increased noise, air pollution and landscape impacts on adjacent properties; • Long term loss of green space and habitat; • Potential for disruption to groundwater; • Loss of shared use pedestrian/cycle route currently shown on Design Freeze 4A layout; • Tunnel approach, entrance and exit areas typically exhibit a higher level of traffic incident risk than tunnel interiors, so multiple short tunnels increase traffic risk to some degree.
Hybrid Solution – Combined Tunnel and Cutting Solution with the addition of 'green bridges'	This option is identical to the hybrid solution as described above, with the addition that the tunnel sections could be utilised as 'green bridges' providing habitat and green space connectivity.	As above, with the following additions: • Increased green space retention compared with retaining wall solution.	As above, with the following additions: • Green space provision would be discrete, and would not necessarily provide interconnectivity between adjacent green areas.

Tunnel Options

Based on the considerations discussed within the section above, it is likely that a tunnel solution will be required for all or part of the section.

A fairly limited number of high level structural options are available in tunnel construction, and these are considered within **Table 2** below, along with the advantages and disadvantages of each form.

The **Table 2** below sets out some of the key considerations for each of the main structural forms which might be considered, and lists advantages and disadvantages of each form:

Table 2 – Structural Form Considerations for Tunnel Structure

STRUCTURAL OPTION	FEATURES	ADVANTAGES	DISADVANTAGES	FURTHER CONSIDERATIONS
Bored Tunnel Solution	Modern day Tunnel Boring Machines (TBM's) can be used to accurately bore underground tunnels through a variety of strata using laser guidance systems. A wide variety of TBM designs are available to accommodate various ground conditions, including earth-pressure balance machines which have pressurised sections at the cutting face and immediately behind, pressurising the ground ahead of the TBM to balance the water pressure associated with the surrounding water table. The tunnel boring method provides an excellent engineering solution for deep tunnels in congested or urban areas, where the impact at surface level needs to be kept to a minimum. In the case of the A6 to M60 relief road scheme, the tunnel is very shallow, thus negating the key advantages of a bored tunnel and bringing in additional complexities. Given the significant disadvantages of this solution and the negligible advantages, this option has been **discounted**.	• Reduced impact at surface level. • Reduces impacts on: noise, ecology, archaeology or landscape receptors during construction and operation.	• Significant increase in cost compared with other tunnelling techniques; • Relatively slow tunnelling progress compared with other tunnelling techniques; • Construction programme reliant on a single machine, and thus breakdowns can have large programme impacts; • Tunnel profile limited to being circular, which is less efficient in terms of tunnel volume and cross section; • 2no. tunnel bores likely to be required to accommodate the cross sections and headrooms. • Potential disruption to ground water, • Concentration of air pollutants from vents with potential to affect local air quality.	• A key advantage of tunnel boring is limited impact on the ground and properties above the tunnel, however the land above the tunnel proposed as part of this scheme is currently vacant, so this advantage is negated; • The progress of a TBM bored tunnel is typically very slow, as the excavation occurs only at the cutting face of the machine as it moves along it's defined route. Tunnelling time can be reduced by use of TBM's working from each end of the tunnel, or even several cutting faces using intermediate shafts. Given the very high cost of TBM's, such approaches are unlikely to be practical at this site; • The tunnel boring method by necessity creates circular tunnel profiles. In order to accommodate the necessary cross sections, two large diameter tunnel bores are likely to be required.
Cut and Cover – Bottom Up Method	The cut and cover tunnelling method is a relatively simple construction method for construction of shallow tunnels. In its most basic form, it involves the excavation of a trench or cutting, construction of a tunnel structure, and backfilling of the trench. Given the space limitations of most sites, and in order to minimise excavation volumes, most cut and cover tunnels rely on the use of diaphragm walls, contiguous bored pile walls or secant piled walls in order to support vertical excavation faces during construction. This approach significantly reduces excavation volumes and allows the tunnel to be constructed within relatively confined geometry. Typical construction sequence: • Install diaphragm walls (or secant/bored pile walls); • Excavate between walls, installing props as the depth increases; • Install base slab and any intermediate tunnel walls to form cellular structure; • Install roof slab; • Backfill excavation, removing props as necessary.	• Reduced cost compared with bored solution; • Walling and excavation works can progress on multiple fronts, or along the whole tunnel length, thus reducing construction time; • Rectangular cross section more efficient in providing necessary cross section and headroom; • Reduced operational effects on landscape, ecology, air quality and noise.	• Increased disruption at surface level during construction works; • Potential effects on unknown buried archaeology, • Potential disruption to ground water, • Concentration of air pollutants from vents with potential to affect local air quality. • Potential significant construction effects on ecology, landscape, heritage setting and noise.	
Cut and Cover – Top Down Method	A top down cut and cover tunnel is very similar to a bottom up structure, with the exception that any roof slabs etc. are installed as the excavation progresses downwards. Openings are left within these slabs to facilitate excavation of the lower levels.	Advantages similar to the bottom up cut and cover method with the exceptions:	Disadvantages similar to the bottom up cut and cover method with the exceptions:	Further considerations similar to the bottom up cut and cover method with the exceptions: • Using the top down cut and cover tunnelling

STRUCTURAL OPTION	FEATURES	ADVANTAGES	DISADVANTAGES	FURTHER CONSIDERATIONS
	Typical construction sequence: • Install diaphragm walls (or secant/bored pile walls); • Excavate between walls, installing props as the depth increases; • Install tunnel roof slab, leaving openings for onward excavation; • Backfill the excavation, with the exception of openings; • Continue excavation of lower levels using openings in roof slab for access; • Install base slab and any intermediate walls to form cellular structure; • Close up openings in roof slab; • Backfill above openings.	• Backfilling of the majority of the tunnel can be completed at a much earlier stage.	• Increased construction complexity compared with a bottom up method.	method, backfilling of the majority of the tunnel can be completed at a much earlier stage, allowing roadways and services to be re-instated at a much earlier stage. For the site under consideration, two local roads cross the tunnel route, so the top down method has potentially significant advantages; • Using the top down method, excavation of material from the lower sections of the tunnel once the roof slab is in place becomes slightly more complex.

Ground Conditions

The linear extent of a tunnel means that it will traverse a greater variety of groundwater and geological conditions as for example, a bridge structure with its discrete supports. As such the importance of adequate ground investigation for a tunnel structure cannot be overstated.

Potentially aggressive ground water conditions will require special consideration to be given to construction materials, and concrete mixes and cover may need to be adjusted accordingly.

An appropriate detailed ground investigation should be undertaken at the tunnel site at an early stage within the design development.

Constructability

In general terms, construction of a buried tunnel structure (or combination of tunnels and retaining walls) at this location will present a considerable construction challenge, particularly given the close proximity of adjacent properties.

The installation of diaphragm walls (or similar), subsequent excavation, de-watering and temporary propping will require specialist construction methodologies, and contracting organisations with appropriate experience in such activities should be targeted in any tendering process.

Given the close proximity of adjacent properties, construction access would generally be made along the route corridor, and vehicle/plant access outside the plan area of the tunnel will be relatively limited due to adjacent property boundaries.

A key consideration during the construction stage will be the significant net export of fill material, and significant temporary storage requirements during construction of the tunnel structure. A holistic scheme wide cut/fill balance should be carefully examined at future design stages, and areas of land within the site should be identified for temporary lay down of excess material which will subsequently be used in backfilling of the tunnel. Notwithstanding other considerations, a top down construction sequence can limit this problem to some degree.

Two local roads cross the proposed tunnel route, and appropriate temporary bridging or diversion will be required in advance of the works. Stockport Road West to the north of the site will present a particular constraint, and it is likely that the tunnel will need to be completed in discrete sections to allow a temporary highway diversion to be placed across a previously completed tunnel section. As the design progresses, this key constraint will inform any decisions with regard to a tunnel only structure, or combination of tunnel and retaining measures.

Other aspects of constructability specific to the structural solutions considered are discussed within **Table 2**.

Maintenance

Although reinforced concrete represents a relatively durable and low maintenance material, once in-situ within the tunnel environment, structural repairs other than cosmetic surface repairs will become relatively difficult.

As the design develops, consideration could be given to provision of a corrosion monitoring system to provide early warning of the onset of corrosion. Additionally, each section of the tunnel could be coupled into a cathodic protection system and associated earthing system such that corrosion protection may be activated during the lifetime of the structure if determined to be necessary.

Access to the deck soffit and inside face of the tunnel walls will be possible within appropriate lane/carriageway closures using scaffold or Mobile Elevated Work Platforms (MEWPs). Access to the buried faces of deck slab, ground slab and tunnel walls will not be possible during the lifetime of the structure, and appropriate durability (through concrete cover) should be designed in.

In addition to the main structural elements, a buried tunnel will require significant ancillary equipment such as jet fans, fire suppression equipment, CCTV, lighting etc., all of which will require ongoing maintenance. BD 78/99 Figure 14.1 provides indicative cleaning and maintenance frequencies for such equipment.

Materials

As discussed within **Table 2** above, a cut and cover tunnel can be created using diaphragm walls, contiguous bored piles or secant piling. All of these options utilise the reinforced concrete concept in one way or another, and tunnel base slab, deck slab and cell walls are also most feasibly constructed using reinforced concrete.

The alkaline environment of reinforced concrete provides the embedded steel reinforcement with a good degree of protection; hence this material is particularly suited to the aggressive environment within a tunnel, with the combination of road salt, soot and chemical substances from vehicles.

Vehicle fires in tunnels can result in very high temperatures (up to around 1000 degrees Celsius) as a result of burning fuel and vehicles. Concrete does not burn, and does not emit harmful gasses when subject to high temperatures (unlike asphalt for example which ignites at around 500^{o}C and emits suffocating smoke and soot vapours, and was a major contributor to the Mont Blanc tunnel fire in 1999). As an additional layer of protection, an internal cladding system with appropriately designed fire resistant anchorages may be incorporated. Such a cladding system can improve the aesthetics where elements have been cast against ground such as diaphragm walls etc.

For a buried tunnel structure, particular attention should be paid to the placement, detailing and execution of concrete construction joints and movement joints. Failure and leakage of such joints can lead to significant long term maintenance and remedial costs, and if not rectified can lead to extensive structural damage.

Cross Sections and Headrooms

The cross section of the proposed tunnel should be developed in line with the requirements of TD27/05 Cross-Sections and Headrooms, and should also give due consideration to the relevant requirements of BD78/99 Design of Road Tunnels. For example, headroom provision will need to comply with the requirements of TD27/05 with additional provision for luminaires and ventilation systems, and an additional allowance of 250mm to this equipment as specified in BD78/99.

At present, the design freeze 4A alignment makes sufficient provision for a dual 2 lane all-purpose (D2AP) roadway, contained within a two cell tunnel structure with appropriate clearances. As the scheme design progresses, consideration should be given to any requirements for escape cell provision, as any such requirement will significantly alter the tunnel cross section. Although TD27/05 and BD78/99 make no specific requirement in this regard, BD78/99 requires that a Tunnel Design and Safety Consultation Group (TDSCG) shall be set up to confirm basic design and operating procedures, hence it would be prudent to obtain appropriate agreement to this assumption as early as possible within the design evolution.

Design Standards

As a member of the European Union, the UK is required to comply with the Construction Products Regulation (CPR) and the Public Procurement Directive (PPD), which mandate the use of European Standards in member states.

Any structural design undertaken as part of a publicly funded scheme should therefore be undertaken in accordance with the suite of structural Eurocodes.

In addition the above, HE (formerly HA) Interim Advice Note 124/11 (IAN 124/11) provides guidance and requirements for the use of Eurocodes for the design of highway structures on the strategic road network.

Safety

With regards to safe design, the following general points applicable to the whole scheme are noted:

- Structures should be safe by design, from construction, through maintenance to eventual demolition;
- The principle of prevention to eliminate, reduce and control risks in accordance with the CDM Regulations 2015 should be adopted (and is a legal requirement);
- The safe construction and maintenance of the individual elements of a structure varies greatly by structural form. The individual impacts associated with any design option choice need to be considered in relation to the overarching construction strategy and programme for the scheme;

The safety of the tunnel in operation will have a much greater influence on the structural design than other types of structure, and as such, operational safety issues should be considered as early as possible within the design phase. Relevant issues include, but are not limited to tunnel geometry and sightlines, approach geometry, lighting, fire, accidents, breakdowns, loss of power (resulting in failure of ventilation and lighting), traffic queues etc.

Fires in tunnels are particularly serious, given the high concentration of fumes, poisonous gasses, high temperatures and heat radiation. As such, fire prevention and escape strategies should be fundamental to the design progression from the earliest stages. BD78/99 requires that a Tunnel Design and Safety Consultation Group (TDSCG) shall be set up, and shall comprise appropriate levels of representation from the Overseeing Organisation, Design Organisation, Police, Maintaining Agent and Emergency Services.

Other Considerations

Vehicle Crossovers – BD 78/99 requires that vehicle crossovers are provided on approach to buried tunnels, to accommodate contraflow working during maintenance operations.

Design Speed – BD 78/99 requires that tunnel design speed be the same as the approach design speed.

Cross Passages – Cross passages should be installed between adjacent tunnel cells (or between main tunnel cells and escape cells) to facilitate emergency evacuation and emergency services access.

Anti-Recirculation Walls – Anti recirculation walls for a twin cell tunnel are likely to be required to prevent smoke recirculation from one tunnel bore to the other.

References

- BD 78/99 - Design of Road Tunnels (Design Manual for Roads and Bridges – Highways England)
- TD 27/05 – Cross-Sections and Headrooms (Highways England);
- Interim Advice Note 124/11 (IAN 124/11) – Use of Eurocodes for the Design of Highway Structures (Highways England);
- Construction Products Regulation (CPR) - Regulation (EU) No. 305/2011 – European Parliament;
- Public Procurement Directive (PPD) - Direrctive 2014/24/EU – European Parliament;
- Structural Eurocodes (full suite of design codes) – British Standards Institute.

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