5.4 Abutment 4: Bank Seat on Reinforced Soil

5.4.1 Description

Abutment 4 is bank seat abutment on reinforced soil.

The fill is compacted in suitable layers and is reinforced using Geogrid mats laid at regular height intervals (typically 600mm) through the abutment. The reinforced soil is founded on a piled reinforced concrete base. Construction works take place behind the concrete facing panels. Back of wall drainage is installed as the backfilling progresses behind the abutments.

Refer to drawing 4300392/1700/107 in Appendix A.

5.4.2 Estimated initial budget works estimate of carrying out the works

See Appendix B.

5.4.3 Whole life costs

Whole Life Costs have been calculated over a period of 120 years. See Appendix B.

5.4.4 Key risks

None.

5.4.5 Assumptions

None.

5.4.6 Departures from standards

None.

5.4.7 Benefits and Dis-benefits

Benefits

- Bank seat abutments are simple to construct.
- Reinforced earth construction can be done in conjunction with the embankment construction.

Dis-benefits

- Piled foundations are still required therefore the cost saving advantages of reinforced soil are not as great as would otherwise be the case.

6 Discussion

6.1 Construction

6.1.1 Construction Traffic Management

Access to the structure will be through the KCC infrastructure from the south or through the developer construction to the north. Pedestrian of vehicular access to the site shall be prohibited during the construction of the viaduct.

6.1.2 Anticipated Construction Sequence

Note: the sequence will be staged along the length of the bridge therefore items listed below with be run congruently to save time. The following anticipated construction sequence is for a composite deck option.

Set up site compound including welfare facilities, fence off site, excavate to base of pile cap elevation, pile foundations, cast pile cap, cast abutment/columns, backfill as necessary, cast capping beams, install bearings and temporarily fix guided/free bearings, assemble pre-fabricated steel girders with permanent and temporary formwork for deck casting, lift beams into position starting with pier section then abutment/span sections, bolt together girder sections, once girders are connect directly to the permanent fixed bearing the temporary fixings can be released, cast the deck and coping in segments, install parapets, remove temporary formwork, lay carriageway and footway surfacing with provisional ducts for future services, finishing works and demobilisation.

6.2 Maintenance requirements

Two types of steel were considered weathering steel and painted carbon steel. Weathering steel removes the maintenance requirement of the protective coating associated with painted steel. The precast concrete beams also have a relatively lower maintenance requirement as they are not subject to direct corrosion although they are subject to chloride ion attack (from road salt) and carbonation (from the air). They are prepared to a high quality in controlled factory conditions when compared to in-situ concrete, although this benefit is negated by the manufacturers claiming reduced cover allowances. The presence of a joint between the beams at each pier is a potential maintenance liability from chloride ion ingress and carbonation should the deck slab allow water to seep through.

There are two long term principal inspection options available to the scheme. One is to inspect the structure using an overbridge unit, the other is to construct a maintenance access track.

Inspection from the topside would require hire of a MOOG 230 overbridge unit for up to three nights and require two lanes to be closed and traffic lights system in place using the bus lane to allow vehicle movements, alternatively the cycle/footway and one carriageway lane closure with traffic lights in the remaining lane if the no bus lane layout is chosen.

During construction the contractor will have to design and construct an access route. This track and two associated bridges would remain as a permanent maintenance access route for future inspection/maintenance works. It is suggested that this route might be a 3.5m wide grass-crete track or similar permeable construction for flood resilience, and that the bridges be constructed as pseudo-slabs using pre-stressed inverted "T" beams to reduce maintenance.

Consultation with KCC structures management team has highlighted concerns with the use of the permanent maintenance access route. Primarily approval from the Environmental Agency is not anticipated to be granted for this option. In addition KCC would prefer not have liability for the future inspection and maintenance of the access bridges due to their infrequent use.

Both bridge inspection options for of the span over the railway will require a line possession.

The abutments and bearings will be inspectable via a viewing platform, accessible from the footway, or from the inspection gallery (Abutments 2 and 3).

The cable stayed option will required additional inspection/maintenance requirements. The cables prevent an overbridge unit from deploying from the topside therefore and underbridge unit will be required. In addition the pillars and cable ends will need to be inspection via and internal chamber accessible for an internal stairwell, ladder shaft.

6.3 Environmental considerations

The Sturry Link road does not pass through an Area of Outstanding Natural Beauty, SSSI, National Park or other protected area. The scheme will involve permanent land take from private land owners. The land take within the flood plain for each option is similar, therefore the duration of the project is the significant environmental consideration. The environmental aspects and impacts of this will be detailed in a separate environmental report.

6.3.1 Contamination

The scheme crosses the Great Stour River and part of its flood plain used for flood storage. Therefore temporary effects, including spills and leakages from materials and construction plant and emissions to air, water or land must be eliminated or minimised in method statements for all work elements. All waste should be segregated appropriately and stored in a safe manner. Sub-contractors removing waste from site must possess a current waste carriers license and all waste processing or disposal sites must also be appropriately licensed.

6.3.2 Invasive Species

The Preliminary Ecological Appraisal, report no. Co04300299/EC01 dated July 2015 states:

"No non-native invasive or other notable plants were recorded during the walkover, although Bioscan have noted the presence of the county-rare tufted sedge (Carex elata) in wet pasture north of the river. The invasive Nuttall's waterweed (Elodea Nuttallii) has been recorded by the Environment Agency at Vauxhall Bridge".

6.3.3 Noise

The site lies within a rural landscape that includes industrial buildings. The bridge spans the Ashford to Tonbridge railway. Noisy methods of construction will be avoided where possible and temporary noise attenuation barriers can be utilised if required. Agreed working hours will be strictly followed and advanced notices of work will be issued to local businesses and residents. It is likely that night time works will take place for short periods during construction of the bridge

6.3.4 Heritage

There are no archaeological or cultural heritage considerations to take into account during the design or construction of the bridge or the associated approach retaining walls.

6.3.5 Air Quality

The local air quality may be affected by dust generated by the works. To control airborne dust generated during the construction works, it is recommended that physical barriers are installed and regular water sprays are carried out to damp dust down, particularly during dry weather periods.

6.3.6 Waste Management

Although no longer a legal requirement by the UK government, due to the scheme's size it would be considered good practice to have a Site Waste Management Plan (SWMP) in place on site. This would help to encourage better waste management practices, reduce the cost of waste disposal and improve environmental performance of the scheme.

Much of the site waste generated from the works will be removed from site and taken to a licensed recycling centre in accordance with the SWMP.

6.3.7 Road Users

No vehicle traffic will be permissible during the construction of the viaduct.

6.4 Combined Budget Works Estimates and Whole Life Costs

The costs given are given in the format (Option).(Width) as appropriate based on the descriptions given in Section 4.

The estimated costs for the bridge deck options with bus lane are shown in Table 1, without bus lane in Table 2, comparable abutment costs in Table 3 and comparable steel option cost in Table 4 below.

Table 1 Comparable Cost estimates for options with bus lane

	Capital Cost	Maintenance Cost	Total WLC
Option 1.1 5 No. precast concrete beam	£19,552,957	£349,640	£19,902,597
Option 2.1 4 No. steel beam composite, flat soffit	£21,445,591	£349,640	£21,795,231
Option 3.1 4 No. steel beam composite, curved soffit	£21,667,070	£349,640	£22,016,710
Option 4.1 6 No. steel beam composite, curved soffit	£23,217,419	£349,640	£23,567,059
Option 6.1 Twin tower cable stayed	£23,547,849	£398,776	£23,946,625

Table 2 Comparable Cost estimates for options without bus lane

	Capital Cost	Maintenance Cost	Total WLC
Option 1.2 4 No. precast concrete beam	£17,539,516	£229,191	£17,768,707
Option 5.2 Ladder beam composite, curved soffit	£17,901,935	£248,428	£18,150,363
Option 6.2 Twin tower cable stayed	£20,225,672	£299,032	£20,524,704

Table 3 Comparable Cost of abutment options

	Capital Cost	Maintenance Cost	Total WLC
Abutment 1 – Baseline Wing walls perpendicular to abutment face	-	-	-
Abutment 2 Splayed wing walls with inspection gallery	£103,125	£31,560	£134,685
Abutment 3 Splayed wing walls with inspection gallery	£65,625	£14,310	£79,935
Abutment 4 Bank seat on reinforced soil	-£183,750	£43,625	-£140,125

Table 4 Comparable Cost steel options

	Capital Cost	Maintenance Cost	Total WLC
Beam 1 – Baseline Unpainted weathering steel (Corten)	-	-	-
Beam 2 Painted carbon steel	£42,200	£229,954	£272,154

It has been shown that the precast concrete beam options have the lowest estimated capital cost and estimated WLC, both with and without bus lane. The flat and curved steel options are not too dissimilar in cost and are the midrange priced options. The six beam and cable-stayed options are the most expensive. In addition the cable stayed option has approximately £50,000 more maintenance cost compared to the concrete and other steel options. The maximum variance in cost is between the options is 20% therefore n

Abutment options 2 and 3 have increased capital and maintenance costs therefore would not benefit the client. However the capital cost savings for abutment option 4 is beneficial. Therefore this would be the recommended abutment option.

The painted carbon steel has been shown to have very little capital cost compared to the weathering steel. However the cost associated with repainting every 20 years makes a difference on the maintenance cost. The painting schedule would also require specialist measures for paining over the two arms of the Great Stour River and railway. Therefore wreathing steel is recommended for the steel beam options.

6.5 Option Scoring

Each option has been compared on a weighted scoring matrix that consists of three criteria, each criterion having five aspects. The three criteria are Construction, Maintenance and Aesthetics/Environmental.

Construction is broken down into construction cost, weighted 35% and construction hazards, being sub divided into foundations, sub-structure, super structure and erection, weighted 15%.

Maintenance is broken down into maintenance cost, weighted 15% and maintenance hazards, being sub divided into bearings, sub-structure, super structure and joints, weighted 15%.

Environmental is broken down into aesthetics, weighted 10% and environmental impact, being sub divided into noise/vibration, pollution/ecology, embedded energy and duration, weighted 10%.

Each aspect has been scored between 0 and 10. The cost/aesthetic aspects are scored on a benefit system, scoring 0 for least beneficial and 10 for most beneficial. The twelve hazard/impact aspects are scored on a risk system, scoring 0 for no risk and 10 for maximum risk. The average risk score is then converted to a benefit score prior to weighting.

The options comparison matrices are given in Appendix C.

After review of the scoring matrices Option 3.1 curved soffit steel beam composite and Option 5.2 curved soffit ladder beam composite score best for the with bus lane and without bus lane viaduct respectively.

7 Conclusions

Amey have been commissioned by Kent County Council (KCC) to develop the concept design of a new link road in the Borough of Canterbury, Kent, to link the A28 Sturry Road to the A291 Herne Bay Road. The scheme involves constructing a new link road spanning two arms of the Stour River and a railway line in order to serve the intended development scheme to the west of Sturry.

Six viaduct options, four abutment options and two types of steel options have been considered and compared in this report. The recommendations for the Sturry Link viaduct are as follows:

4 No. weathering-steel beam composite, curved soffit, on reinforced soil abutments if bus lane is required.

Or;

Weathering-steel ladder-beam deck, curved soffit, on reinforced soil abutments if no bus-lane is required.

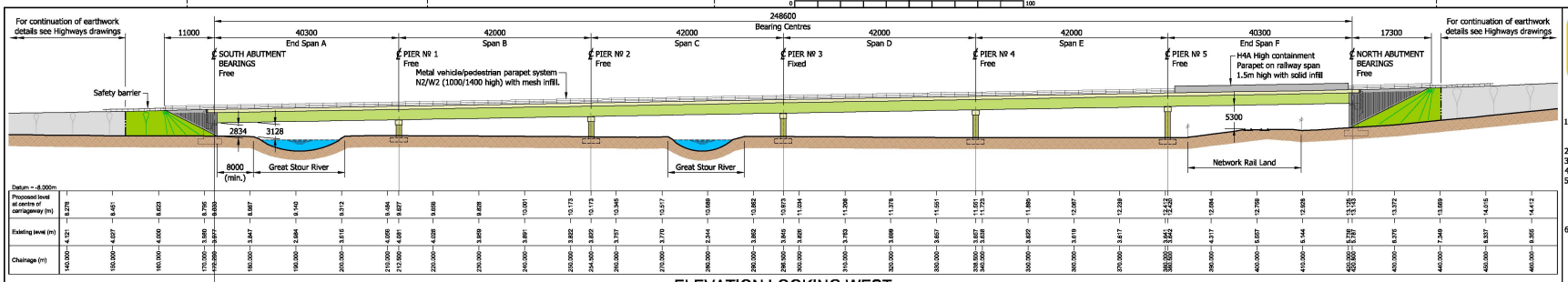
All the options have been assessed on the minimum number of spans required, however up to two additional spans to the south can be added dependent upon flood storage requirements.

Appendix A Structures Options Drawings

Appendix B Estimated Costs

Appendix C Options Scoring

Appendix D Network Rail Front End Pack



ELEVATION LOOKING WEST
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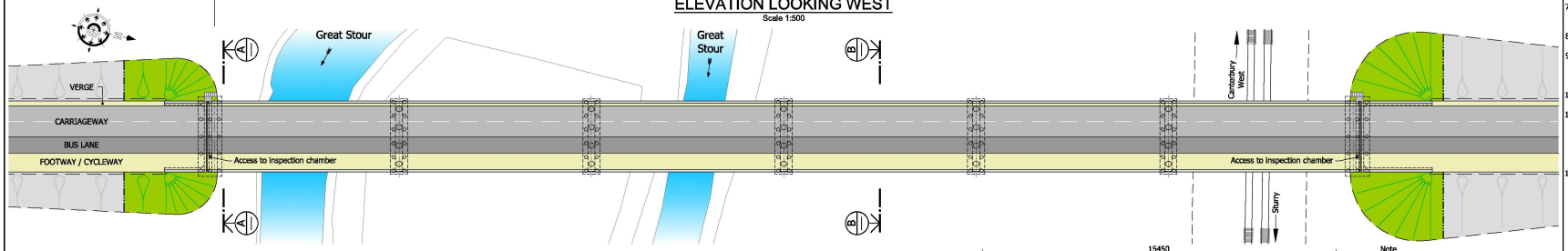

PLAN ON VIADUCT
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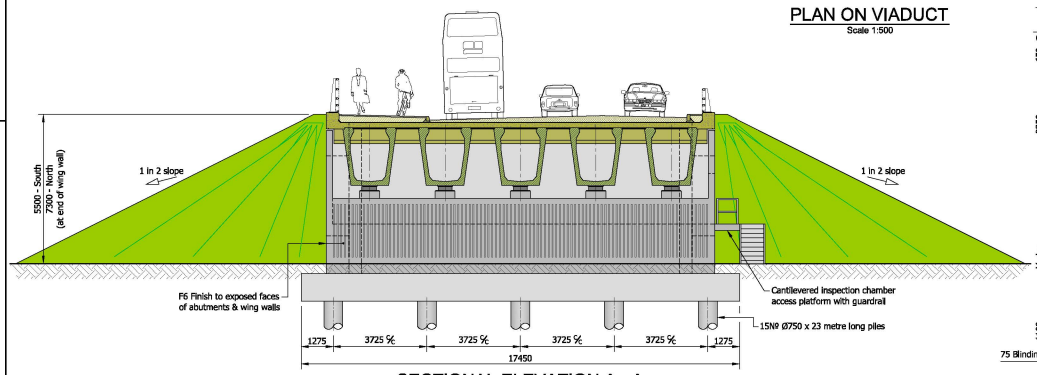

SECTIONAL ELEVATION A - A
SOUTH ABUTMENT AND WING WALLS
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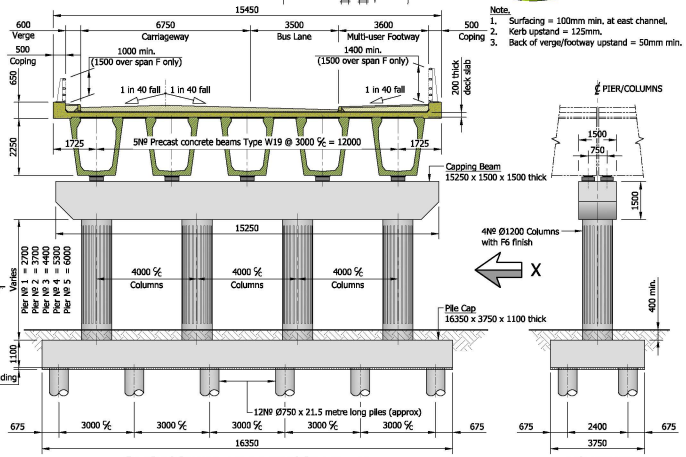
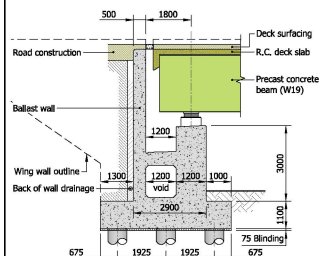


SECTIONAL ELEVATION B - B
Scale 1:100

VIEW X
Scale 1:100

Note.
1. Surfacing = 100mm min. at east channel.
2. Kerb upstand = 125mm.
3. Back of verge/footway upstand = 50mm min.



TYPICAL SECTION THROUGH SOUTH ABUTMENT
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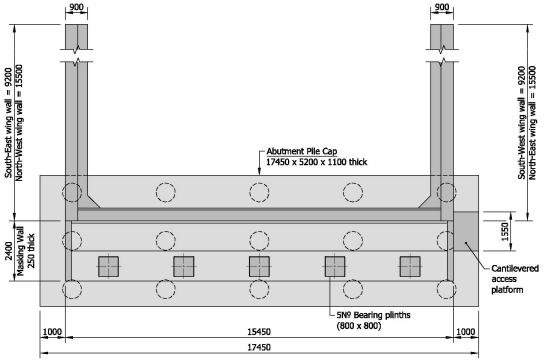
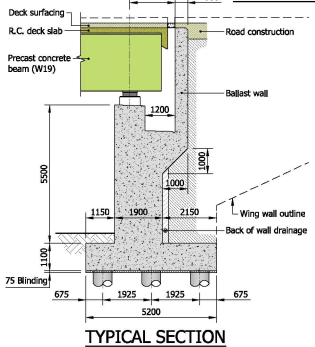
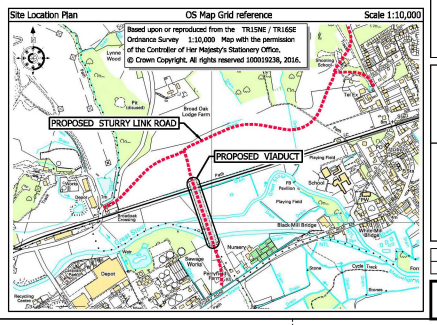


PLAN ON ABUTMENT & WING WALLS
Scale 1:100



TYPICAL SECTION THROUGH NORTH ABUTMENT
Scale 1:100



RESIDUAL DESIGN HAZARDS

(The following information has been collected from Preconstruction Information and Amey Process PLC-H&S-201 – Hazard Management for Designers.)

1. Please enter project specific hazards here.

NOTES

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2. All measurements are in millimetres unless otherwise stated.
3. All levels are in metres A.S.D. (Above Site Datum).
4. Do not scale from this drawing. Use written dimensions only.
5. The scheme design of the foundations is based upon our interpretation of geotechnical data obtained from "A28 Sturry Bypass, Geotechnical Site Investigation, Factual Report Volume II, September 1996" which is considered to be reasonably representative. Final design will be subject to full and relevant site investigation.
6. Constraints to be complied with:
   a. No pier/column to be within 8.0m of top of river bank
   b. No pier/column permitted within the river channel
   c. No construction to be within 4.0m of Network Rail boundary
   d. Live load clearance over watercourses to be 2.65m
   e. Live load clearance over rail tracks to be 5.1m
7. The structure is to be aesthetically pleasing and sympathetic to the existing landscape. There is no requirement to provide dedicated wildlife crossings over or through the structure.
8. The environmental impact of required maintenance work during the design life is to be minimized.
9. Structure supports to be kept open, and light penetration beneath bridge decks to be maximized to encourage the continued growth of flora and fauna after completion. The footprint of supports within the flood-plain to be minimized to reduce mitigation requirements
10. Highway Loading in accordance with Eurocode 1: Actions on Structures - BS EN 1991-2:2003. Allowance made for Special Vehicle SV100.
11. For costing purposes, the preliminary beam details have been obtained from Banagher's precast concrete catalogue.
    a. W19 beams assumed.
    b. Beam depth 2300 mm.
    c. Associated slab thickness 200 mm.
    d. Beam spacing as shown.
12. Reinforcement quantities for costing purposes only:

a.	Deck	225 kg/m³ + Permanent formwork (e.g. Omnia planks)
b.	Pier cross-beams	160 kg/m³
c.	Pier columns	125 kg/m³
d.	Pier pile caps	110 kg/m³
e.	Pier piles	120 kg/m³
f.	Abutment stems	140 kg/m³
g.	Abutment pile caps	130 kg/m³
h.	Abutment piles	120 kg/m³
i.	Wing wall stems	190 kg/m³
j.	Wing wall bases	130 kg/m³

13. 4№ Piles to be raked at 1 in 4 at fixed bearing pier (one pier only).
14. Parapets on railway span to be 1.5m high with solid infill.
15. Preliminary sub soil classification considered to be as follows:
    a. Design Sulphate Class DS-1.
    b. Aggressive Chemical Environment for Concrete - ACEC ClassAC-1s in accordance with BRE Special Digest 1 (BRE 2005).

Rev	Revision details	Chkd	Appd	Date

Drawn:	RKA	Preliminary	✓
Design:	DT	For Comment	
Chkd:	AG	For Tender	
Appd:	NM	For Construction	
Date:	24/03/2017	As Constructed	
		Other	

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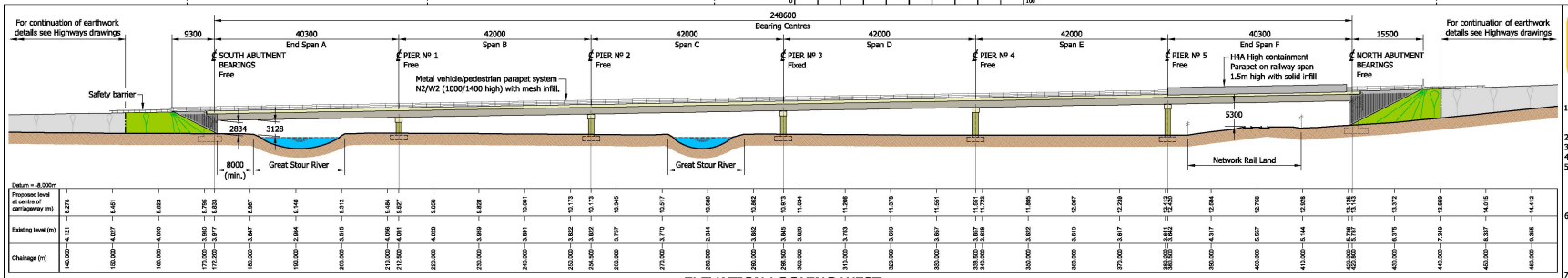
Client
Kent County Council
kent.gov.uk

Project Name
A28 STURRY LINK ROAD

Drawing Title
STRUCTURES
OPTION 1
GENERAL ARRANGEMENT
5№ PRE-STRESSED BEAM VIADUCT
(SIX SPANS)

Original Drawing Size : A1	Dimensions : Millimetres
Scale : As Shown	Copyright © Amey

Drawing No 4300392/1700/101
Rev P0



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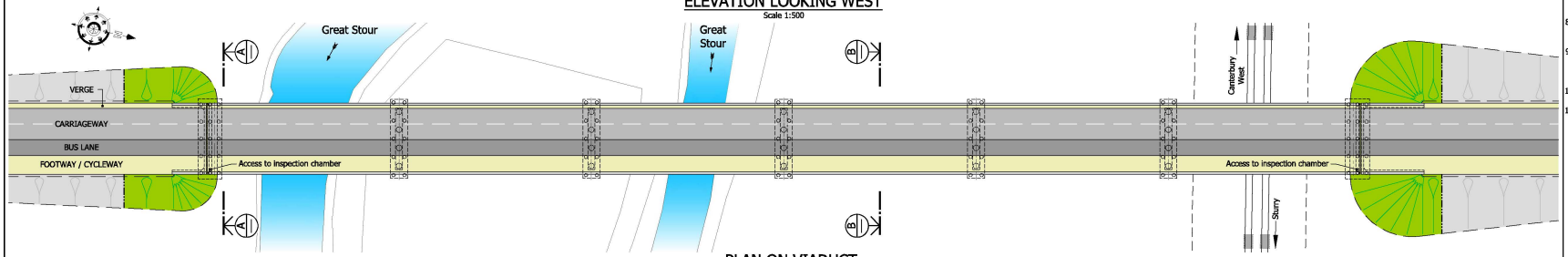

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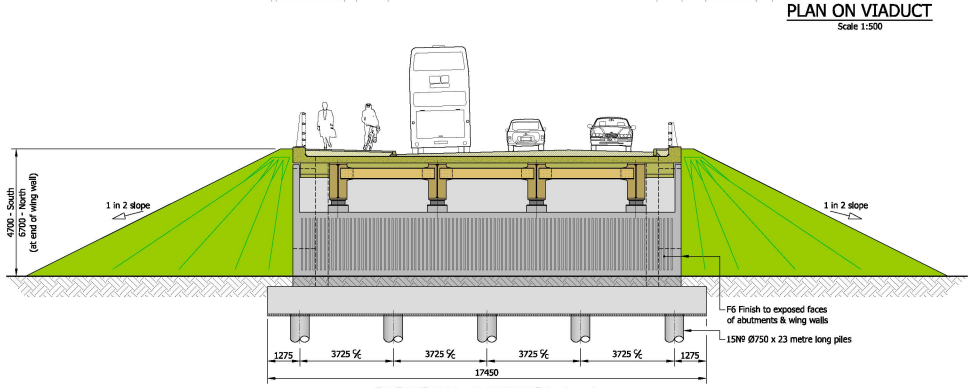
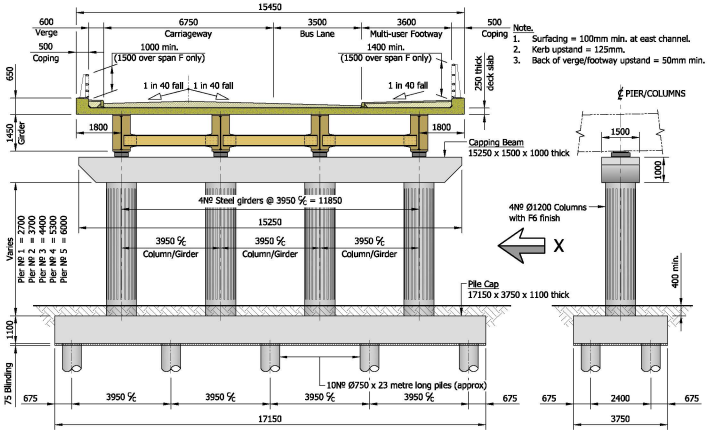


SECTIONAL ELEVATION A - A
SOUTH ABUTMENT AND WING WALLS
Scale 1:100



SECTIONAL ELEVATION B - B
Scale 1:100

VIEW X
Scale 1:100

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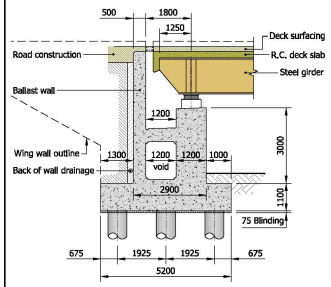

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THROUGH SOUTH ABUTMENT
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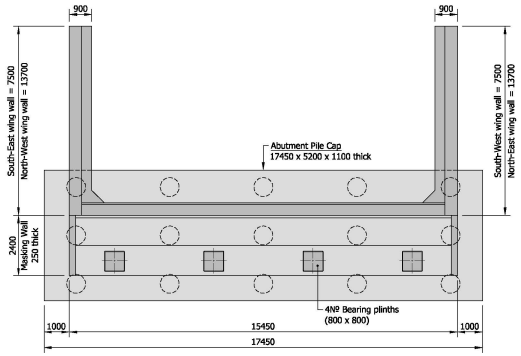
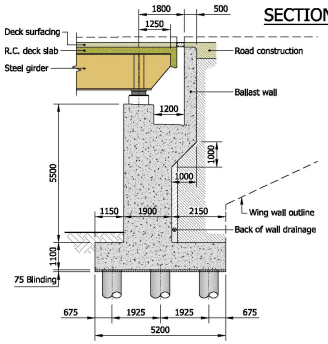


PLAN ON ABUTMENT & WING WALLS
Scale 1:100



TYPICAL SECTION
THROUGH NORTH ABUTMENT
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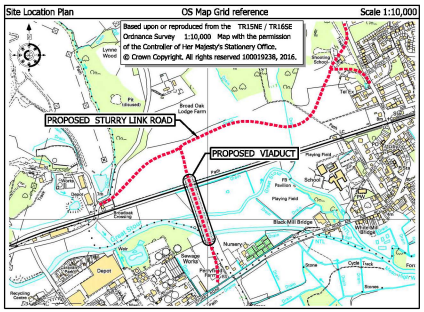

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9. Structure supports to be kept open, and light penetration beneath bridge decks to be maximized to encourage the continued growth of flora and fauna after completion. The footprint of supports within the flood-plain to be minimized to reduce mitigation requirements
10. Highway Loading in accordance with Eurocode 1: Actions on Structures - BS EN 1991-2:2003. Allowance made for Special Vehicle SV100.
11. Preliminary girder details for costing purposes only.
    a. Overall girder depth 1450 mm.
    b. Sizes given are for painted steel. For weathering steel add 1.5mm to all exposed surfaces.

Abutment sections:		Mid-span sections:	
Length adjacent to abutment 9.54m		top flange	450 x 20
top flange	450 x 20	web	1395 x 20
web	1410 x 20	bottom flange	600 x 32
bottom flange	600 x 20		

Pier sections, each side of pier:
Length of internal spans 10.13m
Length of abutment spans 9.77m
top flange 450 x 35
web 1370 x 20
bottom flange 600 x 45

12. Reinforcement quantities for costing purposes only:
    a. Deck 280 kg/m³ + Permanent formwork (e.g. Omnia planks)
    b. Pier cross-beams 160 kg/m³
    c. Pier columns 125 kg/m³
    d. Pier pile caps 110 kg/m³
    e. Pier piles 120 kg/m³
    f. Abutment stems 140 kg/m³
    g. Abutment pile caps 130 kg/m³
    h. Abutment piles 120 kg/m³
    i. Wing wall stems 190 kg/m³
    j. Wing wall bases 130 kg/m³
13. 4Nº Piles to be raked at 1 in 4 at fixed bearing pier (one pier only).
14. Parapets on railway span to be 1.5m high with solid infill.
15. Preliminary sub soil classification considered to be as follows:
    a. Design Sulphate Class DS-1.
    b. Aggressive Chemical Environment for Concrete - ACEC ClassAC-1s in accordance with BRE Special Digest 1 (BRE 2005).

Rev	Revision details	Chkd	Appd	Date

Drawn:	RKA	Preliminary	✓
Design:	DT	For Comment	
Chkd:	AG	For Tender	
Appd:	NM	For Construction	
Date:	24/03/2017	As Constructed	
		Other	

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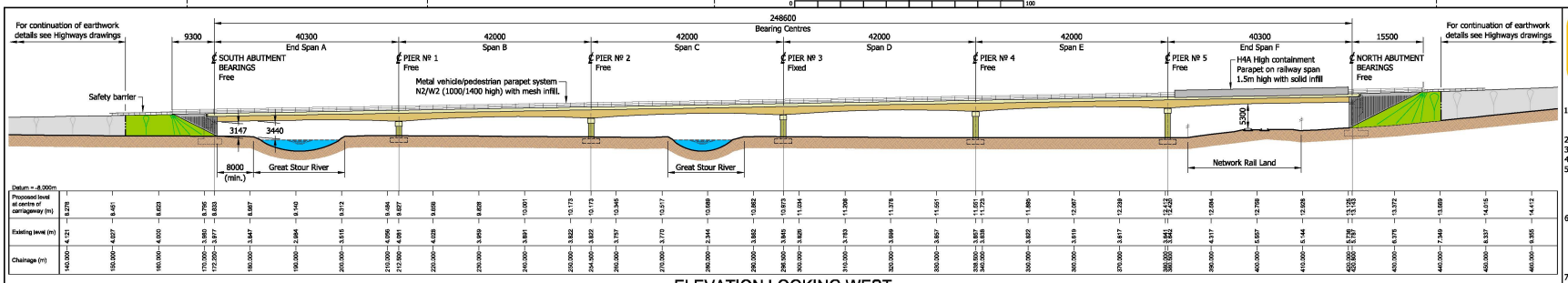
Client
Kent County Council
kent.gov.uk

Project Name
A28 STURRY LINK ROAD

Drawing Title
STRUCTURES
OPTION 2
GENERAL ARRANGEMENT
4Nº GIRDER COMPOSITE VIADUCT
(SIX SPANS WITH FLAT SOFFIT)

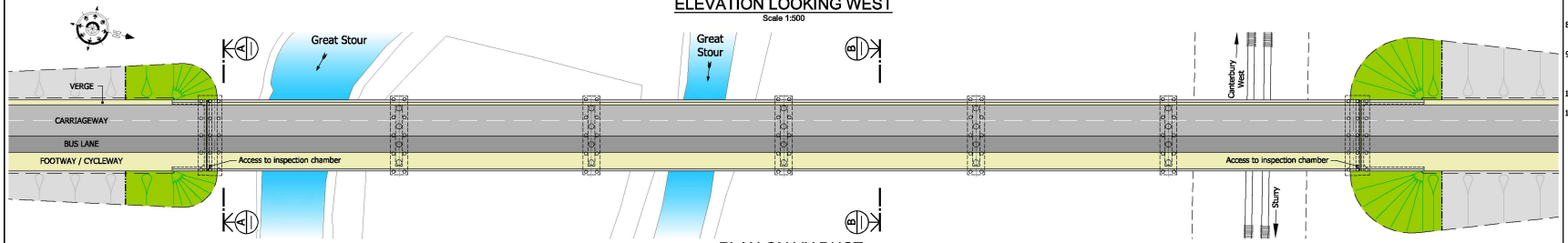
Original Drawing Size : A1	Dimensions : Millimetres
Scale : As Shown	Copyright © Amey

Drawing No	Rev
4300392/1700/102	P0



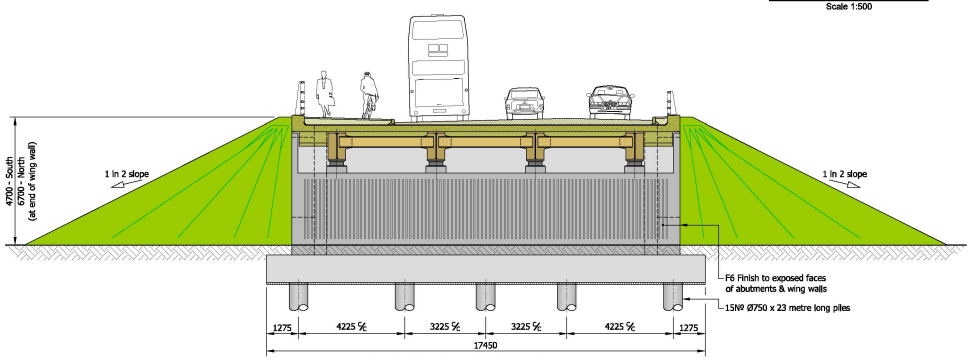
ELEVATION LOOKING WEST

Scale 1:500



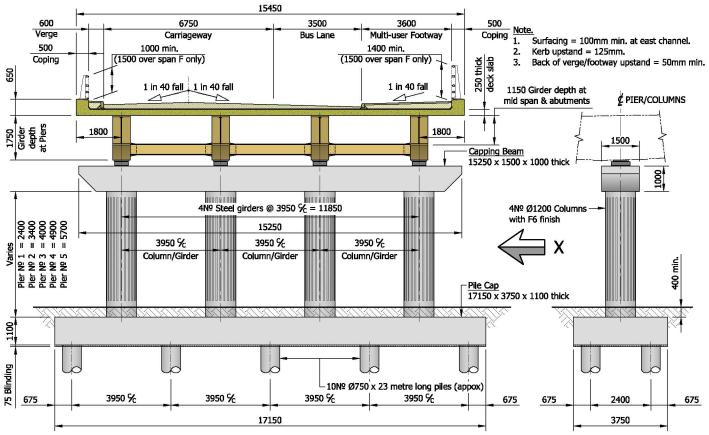
PLAN ON VIADUCT

Scale 1:500



SECTIONAL ELEVATION A - A SOUTH ABUTMENT AND WING WALLS

Scale 1:100



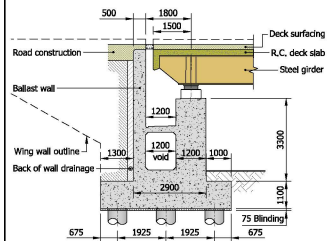
Note.
1. Surfacing = 100mm min. at east channel.
2. Kerb upstand = 125mm.
3. Back of verge/footway upstand = 50mm min.

SECTIONAL ELEVATION B - B

Scale 1:100

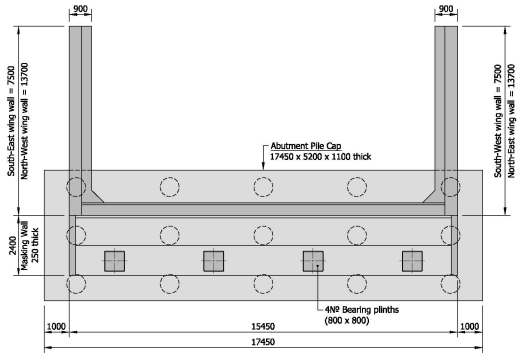
VIEW X

Scale 1:100



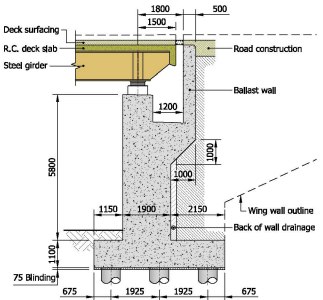
TYPICAL SECTION THROUGH SOUTH ABUTMENT

Scale 1:100



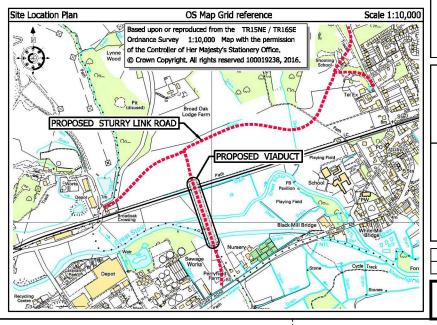
PLAN ON ABUTMENT & WING WALLS

Scale 1:100



TYPICAL SECTION THROUGH NORTH ABUTMENT

Scale 1:100



RESIDUAL DESIGN HAZARDS

(The following information has been collected from Preconstruction Information and Amey Process PLC-H&S-201 – Hazard Management for Designers.)

1. Please enter project specific hazards here.

NOTES

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4. Do not scale from this drawing. Use written dimensions only.
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6. Constraints to be complied with:
   a. No pier/column to be within 8.0m of top of river bank
   b. No pier/column permitted within the river channel
   c. No construction to be within 4.0m of Network Rail boundary
   d. Live load clearance over watercourses to be 2.65m
   e. Live load clearance over rail tracks to be 5.1m
7. The structure is to be aesthetically pleasing and sympathetic to the existing landscape. There is no requirement to provide dedicated wildlife crossings over or through the structure.
8. The environmental impact of required maintenance work during the design life is to be minimized. Where applicable, the benefits of using weathering steel have been evaluated.
9. Structure supports to be kept open, and light penetration beneath bridge decks to be maximized to encourage the continued growth of flora and fauna after completion. The footprint of supports within the flood-plain to be minimized to reduce mitigation requirements
10. Highway Loading in accordance with Eurocode 1: Actions on Structures - BS EN 1991-2:2003. Allowance made for Special Vehicle SV100.
11. Preliminary girder details for costing purposes only:
    a. Overall girder depth varies (1150 - Abutments/Mid span & 1750 - Piers)
    b. Sizes given are for painted steel. For weathering steel add 1.5mm to all exposed surfaces.

Abutment sections:		Mid-span sections:	
Length adjacent to abutment 9.54m		top flange	450 x 32
top flange	450 x 32	web	1083 x 20
web	1083 x 20	bottom flange	600 x 35
bottom flange	600 x 35		

Pier sections, each side of pier:
Length of internal spans 10.13m
Length of abutment spans 9.77m
top flange 450 x 20
web 1688 x 20
bottom flange 600 x 42

12. Reinforcement quantities for costing purposes only:
    a. Deck 280 kg/m³ + Permanent formwork (e.g. Omnia planks)
    b. Pier cross-beams 160 kg/m³
    c. Pier columns 125 kg/m³
    d. Pier pile caps 110 kg/m³
    e. Pier piles 120 kg/m³
    f. Abutment stems 140 kg/m³
    g. Abutment pile caps 130 kg/m³
    h. Abutment piles 120 kg/m³
    i. Wing wall stems 190 kg/m³
    j. Wing wall bases 130 kg/m³
13. 4Nº Piles to be raked at 1 in 4 at fixed bearing pier (one pier only).
14. Parapets on railway span to be 1.5m high with solid infill.
15. Preliminary sub soil classification considered to be as follows:
    a. Design Sulphate Class DS-1.
    b. Aggressive Chemical Environment for Concrete - ACEC ClassAC-1s in accordance with BRE Special Digest 1 (BRE 2005).

Rev	Revision details	Chkd	Appd	Date

Drawn:	RKA	Preliminary	✓
Design:	DT	For Comment	
Chkd:	AG	For Tender	
Appd:	NM	For Construction	
Date:	24/03/2017	As Constructed	
		Other	

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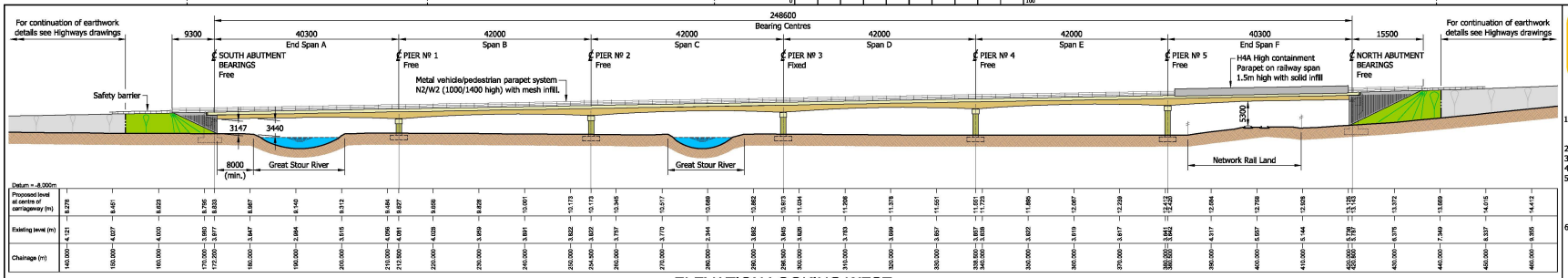
Client
Kent County Council
kent.gov.uk

Project Name
A28 STURRY LINK ROAD

Drawing Title
STRUCTURES
OPTION 3
GENERAL ARRANGEMENT
4Nº GIRDER COMPOSITE VIADUCT
(SIX SPANS WITH CURVED SOFFIT)

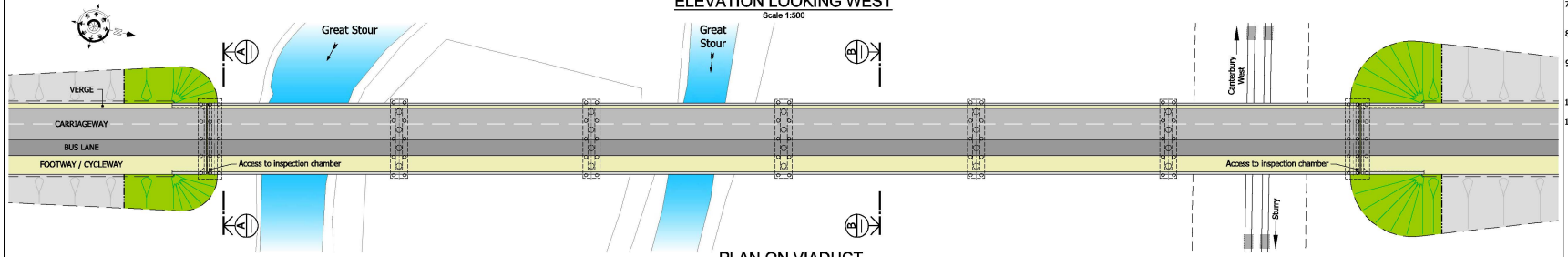
Original Drawing Size : A1	Dimensions : Millimetres
Scale : As Shown	Copyright © Amey

Drawing No	Rev
4300392/1700/103	P0



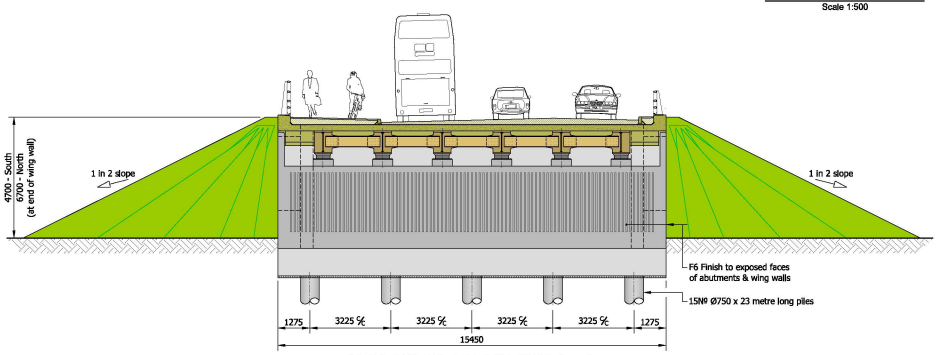
ELEVATION LOOKING WEST

Scale 1:500



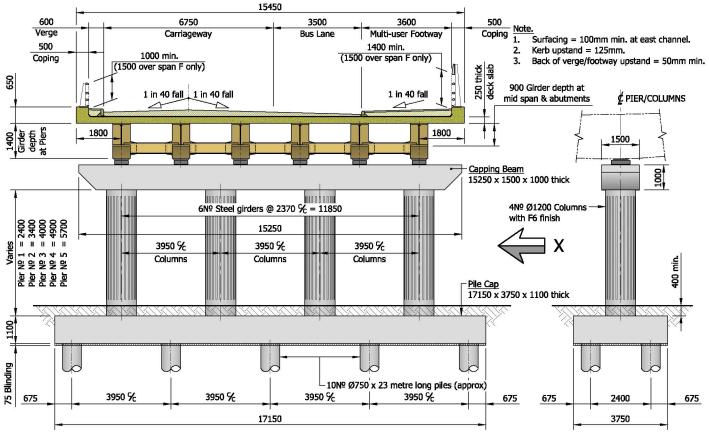
PLAN ON VIADUCT

Scale 1:500



SECTIONAL ELEVATION A - A SOUTH ABUTMENT AND WING WALLS

Scale 1:100



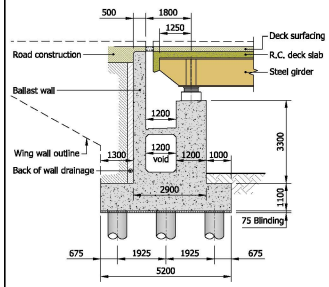
Note.
1. Surfacing = 100mm min. at east channel.
2. Kerb upstand = 125mm.
3. Back of verge/footway upstand = 50mm min.

SECTIONAL ELEVATION B - B

Scale 1:100

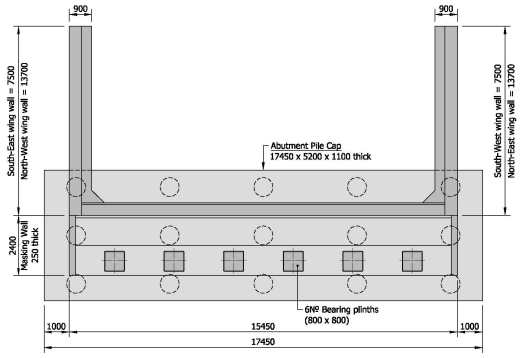
VIEW X

Scale 1:100



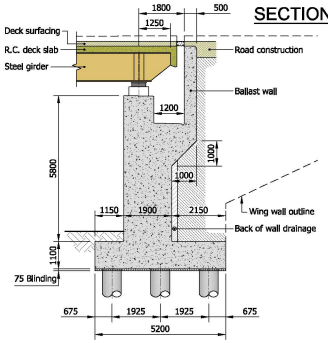
TYPICAL SECTION THROUGH SOUTH ABUTMENT

Scale 1:100



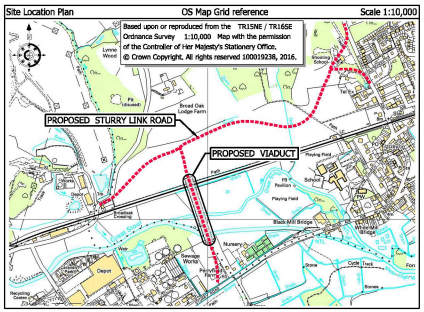
PLAN ON ABUTMENT & WING WALLS

Scale 1:100



TYPICAL SECTION THROUGH NORTH ABUTMENT

Scale 1:100



RESIDUAL DESIGN HAZARDS

(The following information has been collected from Preconstruction Information and Amey Process PLC-H&S-201 – Hazard Management for Designers.)

1. Please enter project specific hazards here.

NOTES

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6. Constraints to be complied with:
   a. No pier/column to be within 8.0m of top of river bank
   b. No pier/column permitted within the river channel
   c. No construction to be within 4.0m of Network Rail boundary
   d. Live load clearance over watercourses to be 2.65m
   e. Live load clearance over rail tracks to be 5.1m
7. The structure is to be aesthetically pleasing and sympathetic to the existing landscape. There is no requirement to provide dedicated wildlife crossings over or through the structure.
8. The environmental impact of required maintenance work during the design life is to be minimized. Where applicable, the benefits of using weathering steel have been evaluated.
9. Structure supports to be kept open, and light penetration beneath bridge decks to be maximized to encourage the continued growth of flora and fauna after completion. The footprint of supports within the flood-plain to be minimized to reduce mitigation requirements
10. Highway Loading in accordance with Eurocode 1: Actions on Structures - BS EN 1991-2:2003. Allowance made for Special Vehicle SV100.
11. Preliminary girder details for costing purposes only:
    a. Overall girder depth varies (900 - Abutments/Mid span & 1400 - Piers).
    b. Sizes given are for painted steel. For weathering steel add 1.5mm to all exposed surfaces.

Abutment sections:		Mid-span sections:	
Length adjacent to abutment 9.54m		top flange	350 x 25
top flange	350 x 20	web	835 x 16
web	860 x 18	bottom flange	550 x 40
bottom flange	550 x 20		

Pier sections, each side of pier:
Length of internal spans 10.13m
Length of abutment spans 9.77m

top flange	350 x 28
web	1337 x 18
bottom flange	550 x 35

12. Reinforcement quantities for costing purposes only:

a.	Deck	280 kg/m³ + Permanent formwork (e.g. Omnia planks)
b.	Pier cross-beams	160 kg/m³
c.	Pier columns	125 kg/m³
d.	Pier pile caps	110 kg/m³
e.	Pier piles	120 kg/m³
f.	Abutment stems	140 kg/m³
g.	Abutment pile caps	130 kg/m³
h.	Abutment piles	120 kg/m³
i.	Wing wall stems	190 kg/m³
j.	Wing wall bases	130 kg/m³

13. 4Nº Piles to be raked at 1 in 4 at fixed bearing pier (one pier only).
14. Parapets on railway span to be 1.5m high with solid infill.
15. Preliminary sub soil classification considered to be as follows:
    a. Design Sulphate Class DS-1.
    b. Aggressive Chemical Environment for Concrete - ACEC ClassAC-1s in accordance with BRE Special Digest 1 (BRE 2005)

Rev	Revision details	Chkd	Appd	Date

Drawn:	RKA	Preliminary	✓
Design:	DT	For Comment	
Chkd:	AG	For Tender	
Appd:	NM	For Construction	
Date:	24/03/2017	As Constructed	
		Other	

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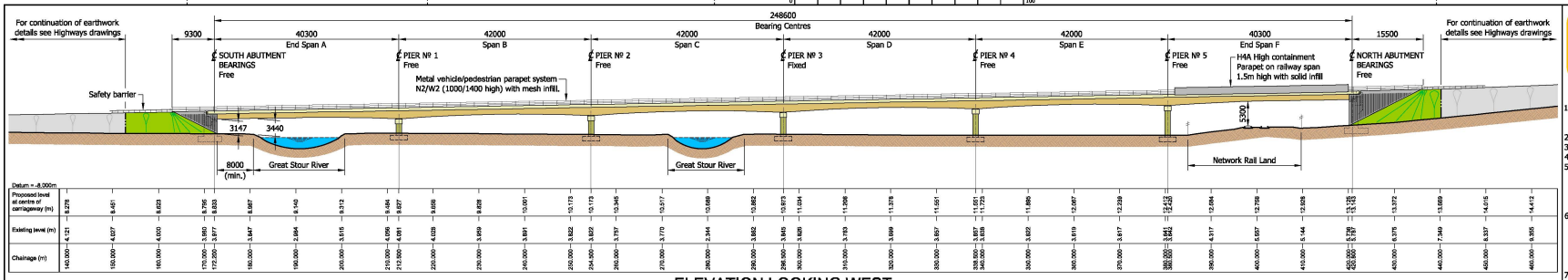
Client
Kent County Council
kent.gov.uk

Project Name
A28 STURRY LINK ROAD

Drawing Title
STRUCTURES
OPTION 4
GENERAL ARRANGEMENT
6Nº GIRDER COMPOSITE VIADUCT
(SIX SPANS WITH CURVED SOFFIT)

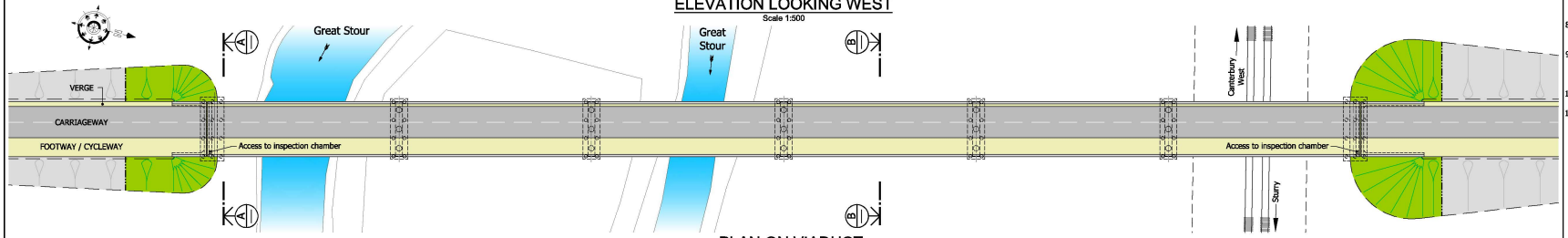
Original Drawing Size : A1	Dimensions : Millimetres
Scale : As Shown	Copyright © Amey

Drawing No 4300392/1700/104
Rev P0



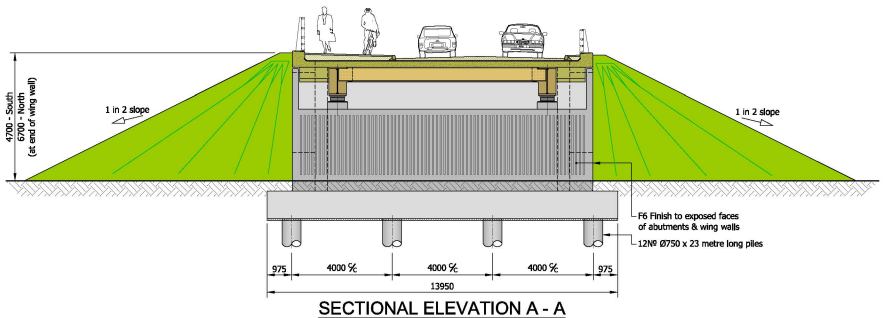
ELEVATION LOOKING WEST

Scale 1:500



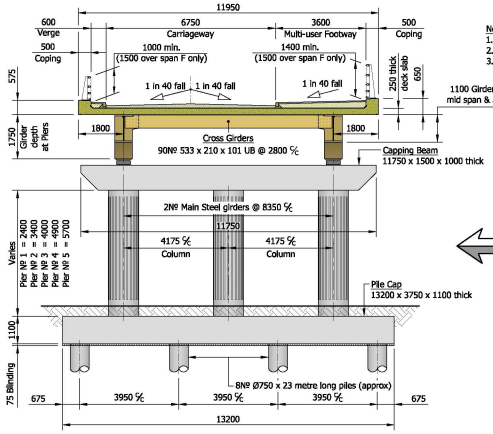
PLAN ON VIADUCT

Scale 1:500



SECTIONAL ELEVATION A - A SOUTH ABUTMENT AND WING WALLS

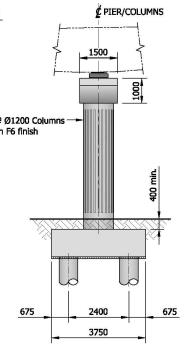
Scale 1:100



SECTIONAL ELEVATION B - B

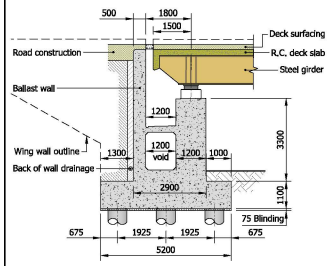
Scale 1:100

Note.
1. Surfacing = 100mm min.
2. Kerb upstand = 125mm.
3. Back of verge/footway upstand = 50mm min.



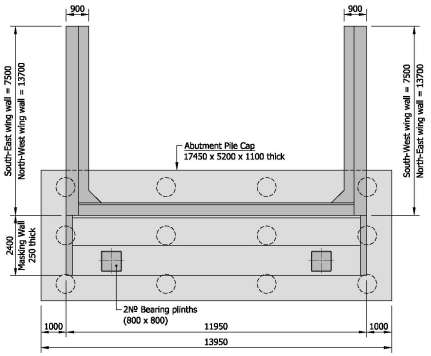
VIEW X

Scale 1:100



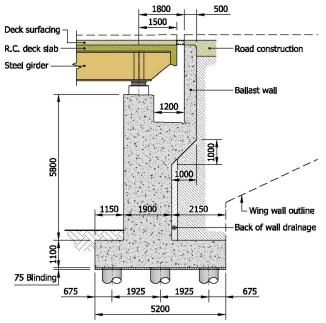
TYPICAL SECTION THROUGH SOUTH ABUTMENT

Scale 1:100



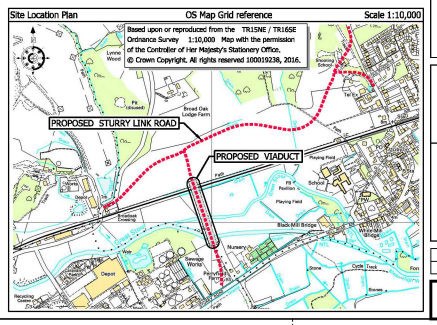
PLAN ON ABUTMENT & WING WALLS

Scale 1:100



TYPICAL SECTION THROUGH NORTH ABUTMENT

Scale 1:100



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    b. Sizes given are for painted steel. For weathering steel add 1.5mm to all exposed surfaces.

Abutment sections:		Mid-span sections:	
Length adjacent to abutment 9.54m		top flange	500 x 25
top flange	500 x 20	web	1015 x 20
web	1055 x 30	bottom flange	800 x 60
bottom flange	800 x 25		

Pier sections, each side of pier:
Length of internal spans 10.13m
Length of abutment spans 9.77m

top flange	500 x 20
web	1695 x 25
bottom flange	800 x 35

12. Reinforcement quantities for costing purposes only:
    a. Deck 280 kg/m² + Permanent formwork (e.g. Omnia planks)
    b. Pier cross-beams 160 kg/m³
    c. Pier columns 125 kg/m³
    d. Pier pile caps 110 kg/m³
    e. Pier piles 120 kg/m³
    f. Abutment stems 140 kg/m³
    g. Abutment pile caps 130 kg/m³
    h. Abutment piles 120 kg/m³
    i. Wing wall stems 190 kg/m³
    j. Wing wall bases 130 kg/m³
13. 4Nº Piles to be raked at 1 in 4 at fixed bearing pier (one pier only).
14. Parapets on railway span to be 1.5m high with solid infill.
15. Preliminary sub soil classification considered to be as follows:
    a. Design Sulphate Class DS-1.
    b. Aggressive Chemical Environment for Concrete - ACEC ClassAC-1s in accordance with BRE Special Digest 1 (BRE 2005).

Rev	Revision details	Chkd	Appd	Date

Drawn:	RKA	Preliminary	✓
Design:	DT	For Comment	
Chkd:	AG	For Tender	
Appd:	NM	For Construction	
Date:	24/03/2017	As Constructed	
		Other	

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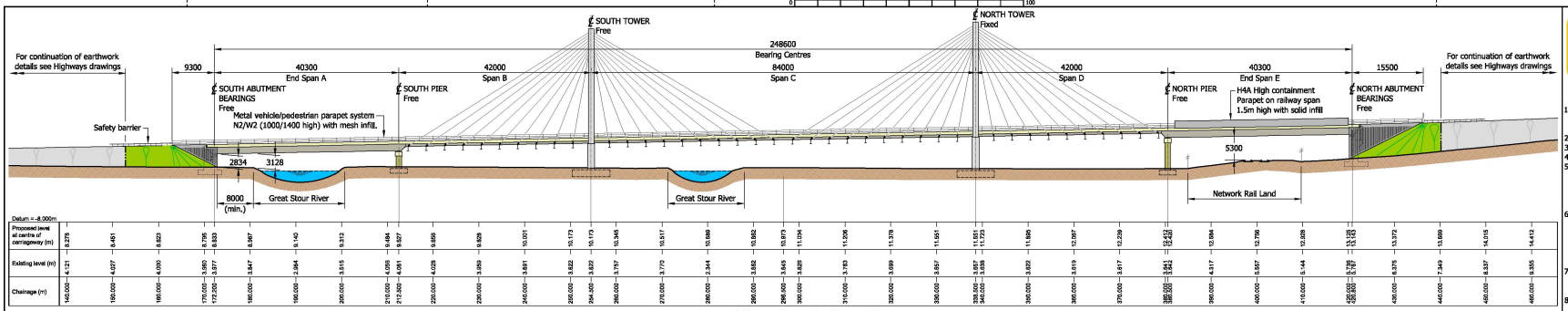
Client
Kent County Council
kent.gov.uk

Project Name
A28 STURRY LINK ROAD

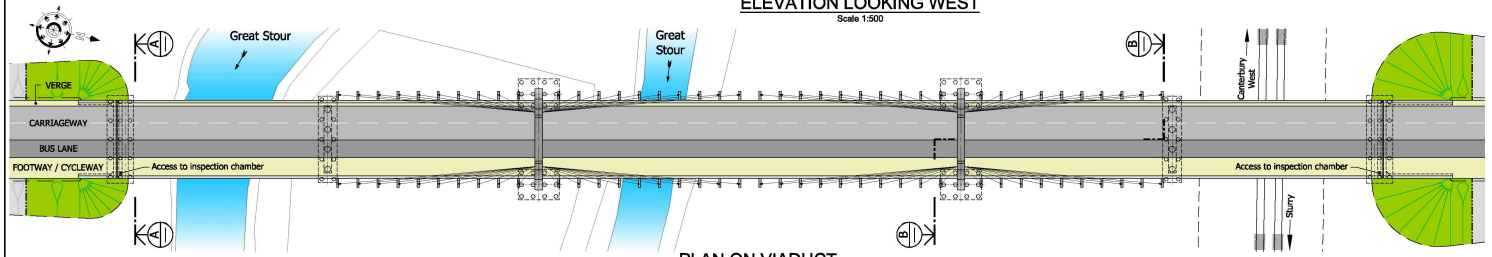
Drawing Title
STRUCTURES
OPTION 5
GENERAL ARRANGEMENT
LADDER DECK COMPOSITE VIADUCT
(SIX SPANS WITH CURVED SOFFIT)

Original Drawing Size : A1	Dimensions : Millimetres
Scale : As Shown	Copyright © Amey

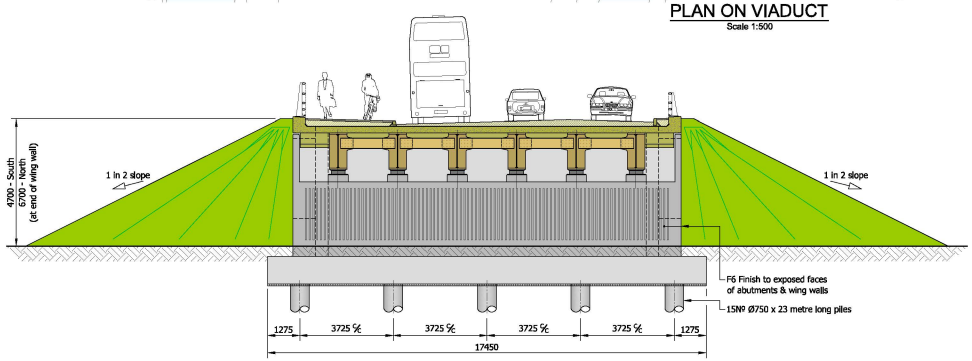
Drawing No	Rev
4300392/1700/105	P0



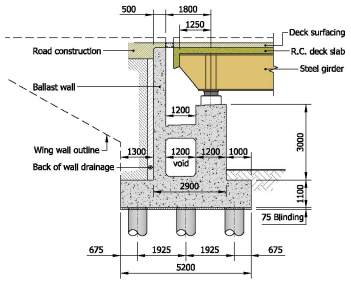
ELEVATION LOOKING WEST
Scale 1:500



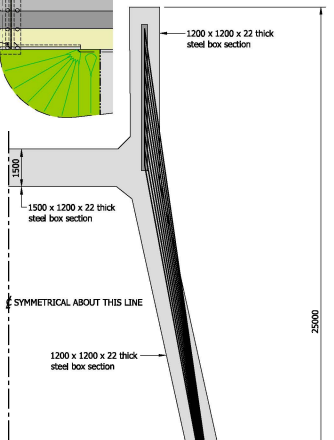
PLAN ON VIADUCT
Scale 1:500



SECTIONAL ELEVATION A - A
SOUTH ABUTMENT AND WING WALLS
Scale 1:100



TYPICAL SECTION
THROUGH SOUTH ABUTMENT
Scale 1:100



Note.
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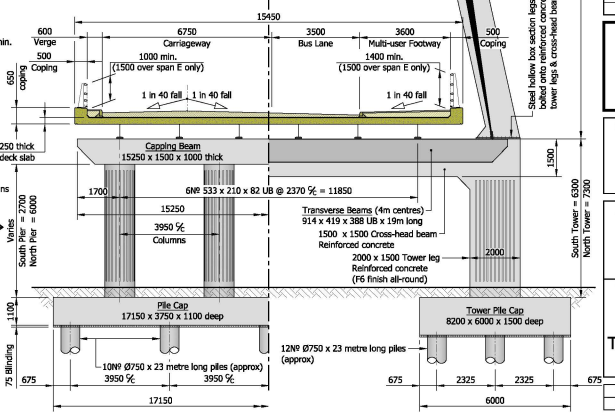
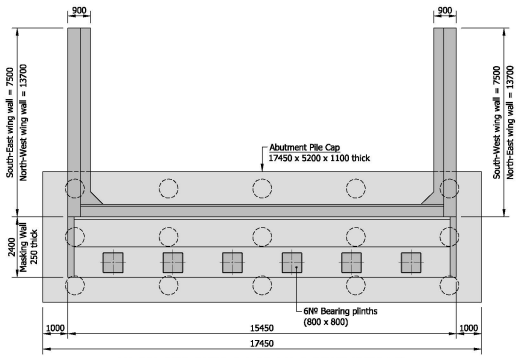
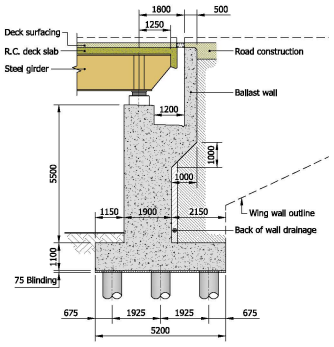
3. Back of verge/footway upstand = 50mm min.



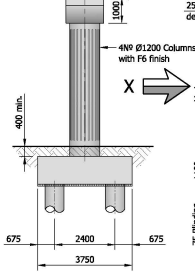
STAGGERED SECTIONAL ELEVATION B - B
Scale 1:100



PLAN ON ABUTMENT & WING WALLS
Scale 1:100



TYPICAL SECTION
THROUGH NORTH ABUTMENT
Scale 1:100



VIEW X
Scale 1:100

RESIDUAL DESIGN HAZARDS

(The following information has been collected from Preconstruction Information and Amey Process PLC-H&S-201 – Hazard Management for Designers.)

1. Please enter project specific hazards here.

NOTES

1. This drawing forms a part of the options report for this scheme, and is intended to allow comparison with alternative proposals contained within the options report only. Not for construction.
2. All measurements are in millimetres unless otherwise stated.
3. All levels are in metres A.S.D. (Above Site Datum).
4. Do not scale from this drawing. Use written dimensions only.
5. The scheme design of the foundations is based upon our interpretation of geotechnical data obtained from "A28 Sturry Bypass, Geotechnical Site Investigation, Factual Report Volume II, September 1996" which is considered to be reasonably representative. Final design will be subject to full and relevant site investigation.
6. Constraints to be complied with:
   a. No pier/column to be within 8.0m of top of river bank
   b. No pier/column permitted within the river channel
   c. No construction to be within 4.0m of Network Rail boundary
   d. Live load clearance over watercourses to be 2.65m
   e. Live load clearance over rail tracks to be 5.1m
7. The structure is to be aesthetically pleasing and sympathetic to the existing landscape. There is no requirement to provide dedicated wildlife crossings over or through the structure.
8. The environmental impact of required maintenance work during the design life is to be minimized. Where applicable, the benefits of using weathering steel have been evaluated.
9. Structure supports to be kept open, and light penetration beneath bridge decks to be maximized to encourage the continued growth of flora and fauna after completion. The footprint of supports within the flood-plain to be minimized to reduce mitigation requirements
10. Highway Loading in accordance with Eurocode 1: Actions on Structures - BS EN 1991-2:2003. Allowance made for Special Vehicle SV100.
11. Preliminary girder details for costing purposes only:
    a. Abutment spans (not supported by cables) overall girder depth 1200mm.
    b. Sizes given are for painted steel. For weathering steel add 1.5mm to all exposed surfaces.

Abutment sections:		Mid-span sections:	
Length adjacent to abutment 9.54m		top flange	400 x 30
top flange	400 x 20	web	1148 x 16
web	1160 x 16	bottom flange	550 x 22
bottom flange	550 x 20		

Pier sections, each side of pier:
Length of internal spans 10.13m
Length of abutment spans 9.77m

top flange	400 x 28
web	1330 x 18
bottom flange	550 x 42

12. Preliminary girder details for costing purposes only:
    a. Spans supported by cables.
    b. Sizes given are for painted steel. For weathering steel add 1.5mm to all exposed surfaces.
       6Nº Longitudinal beams - 533 x 210 x 82 UB.
       Transverse beams - 914 x 419 x 388 UB at 4.0m centres.
    c. Cables to be parallel strand HT cables (15.7mm dia-7 wire strand) with proprietary anchors by VSL International Ltd or similar. Max cable working load = 300kN
13. Reinforcement quantities for costing purposes only:
    a. Deck 280 kg/m³ + Permanent formwork (e.g. Omnia planks)
    b. Pier cross-beams 160 kg/m³
    c. Pier columns 125 kg/m³
    d. Pier pile caps 110 kg/m³
    e. Pier piles 120 kg/m³
    f. Abutment stems 140 kg/m³
    g. Abutment pile caps 130 kg/m³
    h. Abutment piles 120 kg/m³
    i. Wing wall stems 190 kg/m³
    j. Wing wall bases 130 kg/m³
14. 4Nº Piles to be raked at 1 in 4 at fixed bearing pier (one pier only).
15. Parapets on railway span to be 1.5m high with solid infill.
16. Preliminary sub soil classification considered to be as follows:
    a. Design Sulphate Class DS-1.
    b. Aggressive Chemical Environment for Concrete - ACEC ClassAC-1s in accordance with BRE Special Digest 1 (BRE 2005).

Rev	Revision details	Chkd	Appd	Date

Drawn:	RKA	Preliminary	✓
Design:	DT	For Comment	
Chkd:	AG	For Tender	
Appd:	NM	For Construction	
Date:	24/03/2017	As Constructed	
		Other	

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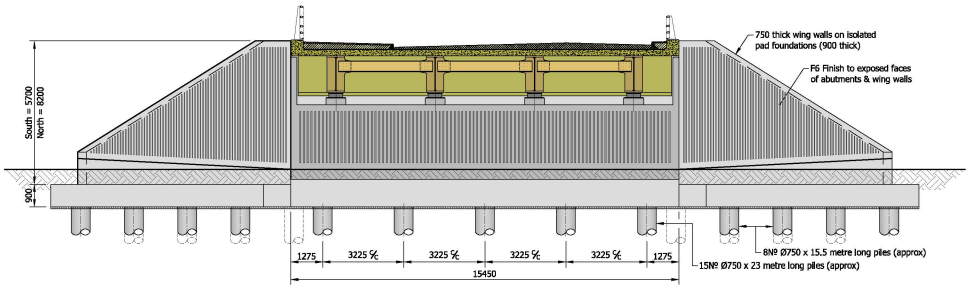
Client
Kent County Council
kent.gov.uk

Project Name
A28 STURRY LINK ROAD

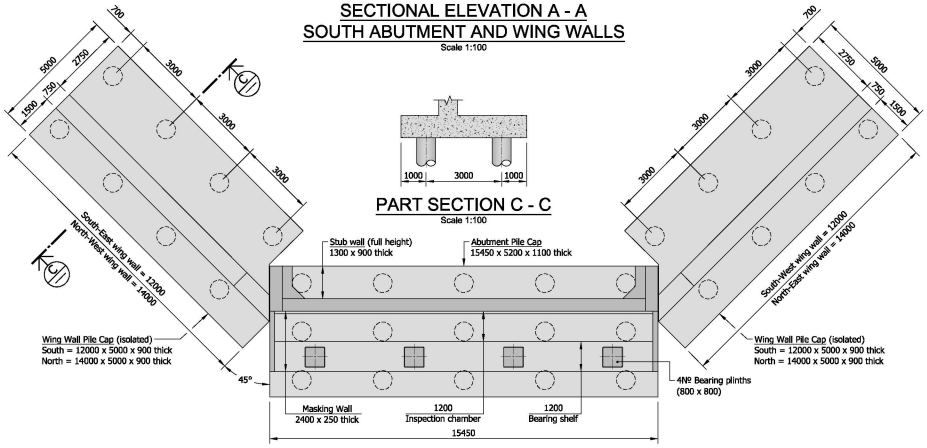
Drawing Title
STRUCTURES
OPTION 6
GENERAL ARRANGEMENT
TWIN TOWER CABLE-STAYED VIADUCT
(FIVE SPANS)

Original Drawing Size : A1	Dimensions : Millimetres
Scale : As Shown	Copyright © Amey

Drawing No	Rev
4300392/1700/106	P0



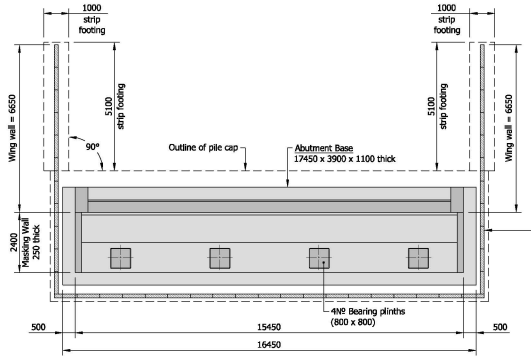
SECTIONAL ELEVATION A - A
SOUTH ABUTMENT AND WING WALLS
Scale 1:100



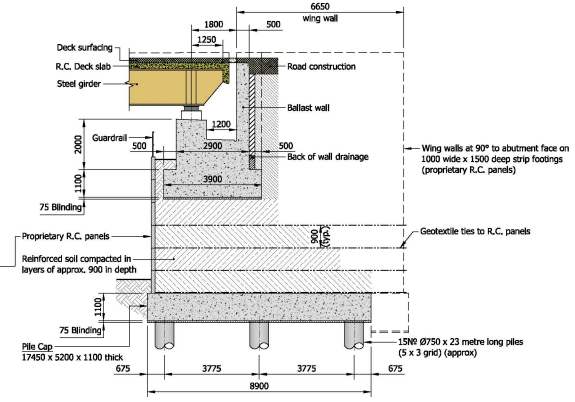
PART SECTION C - C
Scale 1:100

PLAN ON ABUTMENT & WING WALLS
Scale 1:100

WING WALL ALTERNATIVE - OPTION 1
(ISOLATED WING WALLS ON PAD FOUNDATIONS AT 45° SPLAY)

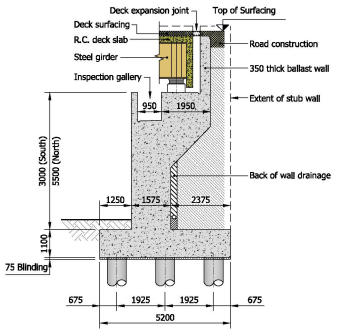


PLAN ON ABUTMENT & WING WALLS
Scale 1:100

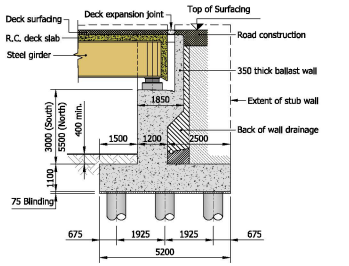


TYPICAL SECTION
Scale 1:100

REINFORCED SOIL ABUTMENT



ALTERNATIVE ABUTMENT SECTION - 1
Scale 1:100



ALTERNATIVE ABUTMENT SECTION - 2
Scale 1:100

ALTERNATIVE ABUTMENT SECTIONS

RESIDUAL DESIGN HAZARDS

(The following information has been collected from Preconstruction Information and Amey Process PLC-H&S-201 – Hazard Management for Designers.)

1. Please enter project specific hazards here.

NOTES

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    c. Abutment piles 120 kg/m³
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Rev	Revision details	Chkd	Appd	Date

Drawn: RKA		Preliminary	✓
Design: .		For Comment	
Chkd: .		For Tender	
Appd: .		For Construction	
Date: .		As Constructed	
		Other	

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Client
Kent County Council
kent.gov.uk

Project Name
A28 STURRY LINK ROAD

Drawing Title
STRUCTURES
ALTERNATIVE OPTION DETAILS

Original Drawing Size : A1	Dimensions : Millimetres
Scale : As Shown	Copyright © Amey

Drawing No
4300392/1700/107

Rev
P0

STURRY LINK ROAD BRIDGE OPTIONS
COST PLAN No 1 - 17th March 2017

Total Project Cost Summary

Ref	Cost Element	Option 1.1 5 Pre-Stressed Beams, 6 Spans	Option 1.2 5 Pre-Stressed Beams, 6 Spans (no Bus Lane)	Option 2.1 4 Girder, 6 Spans, Flat Soffit	Option 3.1 4 Girder, 6 Spans, Curved Soffit	Option 4.1 6 Girder, 6 Spans, Curved Soffit	Option 5.2 Ladder Deck, 6 Spans, Curved Soffit (No bus lane)	Option 6.1 Twin Tower Cable-Stayed, 5 Spans	Option 6.2 Twin Tower Cable-Stayed, 5 Spans (no Bus Lane)
1	**TOTAL CONSTRUCTION COST**	£7,725,000	£6,475,000	£8,900,000	£9,037,500	£10,000,000	£6,700,000	£10,050,000	£7,987,500
2	Developing Business Case	£210,000	£210,000	£210,000	£210,000	£210,000	£210,000	£210,000	£210,000
3	Outline Design	£350,000	£350,000	£350,000	£350,000	£350,000	£350,000	£350,000	£350,000
4	Planning & Consultation Costs	£720,000	£720,000	£720,000	£720,000	£720,000	£720,000	£720,000	£720,000
5	Detailed Design Fees	£540,750	£453,250	£623,000	£632,625	£700,000	£469,000	£703,500	£559,125
6	Supervision Fees	£720,000	£720,000	£720,000	£720,000	£720,000	£720,000	£800,000	£800,000
7	Surveys & Studies	£60,000	£60,000	£60,000	£60,000	£60,000	£60,000	£60,000	£60,000
8	Archaeology Studies	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000
9	Ecology Studies	£35,000	£35,000	£35,000	£35,000	£35,000	£35,000	£35,000	£35,000
10	Demolitions	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000
11	Advance Works	£25,000	£25,000	£25,000	£25,000	£25,000	£25,000	£25,000	£25,000
12	Utilities	£135,000	£135,000	£135,000	£135,000	£135,000	£135,000	£135,000	£135,000
13	Accommodation Works	£40,000	£40,000	£40,000	£40,000	£40,000	£40,000	£40,000	£40,000
14	Highway Landscape Manitenance	£0	£0	£0	£0	£0	£0	£0	£0
15	KCC Direct Costs	£324,000	£324,000	£324,000	£324,000	£324,000	£324,000	£396,000	£396,000
16	KCC Legal Costs	£55,000	£55,000	£55,000	£55,000	£55,000	£55,000	£55,000	£55,000
17	KCC Clerk of Works	£63,000	£63,000	£63,000	£63,000	£63,000	£63,000	£77,000	£77,000
18	Land Costs	£1,200,000	£1,200,000	£1,200,000	£1,200,000	£1,200,000	£1,200,000	£1,200,000	£1,200,000
19	Land Disposal	£0	£0	£0	£0	£0	£0	£0	£0
20	LCA Part 1 Costs	£250,000	£250,000	£250,000	£250,000	£250,000	£250,000	£250,000	£250,000
21	Lane Rental	£0	£0	£0	£0	£0	£0	£0	£0
22	Commuted Sums	£1,000,000	£1,000,000	£1,000,000	£1,000,000	£1,000,000	£1,000,000	£1,000,000	£1,000,000
23	KCC Adoption Fees	£0	£0	£0	£0	£0	£0	£0	£0
24	Funder Monitoring	£10,000	£10,000	£10,000	£10,000	£10,000	£10,000	£10,000	£10,000
25	Network Rail								
26	Possessions	£250,000	£250,000	£250,000	£250,000	£250,000	£250,000	£250,000	£250,000
27	Design Supervision	£475,000	£475,000	£475,000	£475,000	£475,000	£475,000	£475,000	£475,000
28	TOC Compensation	£25,000	£25,000	£25,000	£25,000	£25,000	£25,000	£25,000	£25,000
29	Track Monitoring	£100,000	£100,000	£100,000	£100,000	£100,000	£100,000	£100,000	£100,000
30	Sundry Costs (Advertising etc)	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000
31	Risks	£3,283,188	£2,948,813	£3,597,500	£3,634,281	£3,891,750	£3,009,000	£3,946,625	£3,394,906
32	**Sub-Total**	£17,685,938	£16,014,063	£19,257,500	£19,441,406	£20,728,750	£16,315,000	£21,003,125	£18,244,531
33	Inflation (4Q 2016 - 1Q 2019)	£1,867,019	£1,525,454	£2,188,091	£2,225,664	£2,488,669	£1,586,935	£2,544,724	£1,981,141
34	**TOTAL ESTIMATED PROJECT COST (excluding VAT)**	**£19,552,957**	**£17,539,516**	**£21,445,591**	**£21,667,070**	**£23,217,419**	**£17,901,935**	**£23,547,849**	**£20,225,672**
35	**TOTAL WHOLE LIFE COST (excluding VAT)**	**£349,640**	**£229,191**	**£349,640**	**£349,640**	**£349,640**	**£248,428**	**£398,776**	**£299,032**
36	**TOTAL COMBINED COST (excluding VAT)**	**£19,902,597**	**£17,768,707**	**£21,795,231**	**£22,016,710**	**£23,567,059**	**£18,150,363**	**£23,946,625**	**£20,524,704**

STURRY LINK ROAD BRIDGE OPTIONS
COST PLAN No 1 - 10th February 2017

Elemental Construction Costs

Item	Description	Option 1.1 5 Pre-Stressed Beams, 6 Spans				Option 1.2 4 Pre-Stressed Beams, 6 Spans (no Bus Lane)				Option 2.1 4 Girder, 6 Spans, Flat Soffit				Option 3.1 4 Girder, 6 Spans, Curved Soffit				Option 4.1 6 Girder, 6 Spans, Curved Soffit				Option 5.2 Ladder Deck, 6 Spans, Curved Soffit (No bus lane)			
		Quantity	Unit	Rate	£	Quantity	Unit	Rate	£	Quantity	Unit	Rate	£	Quantity	Unit	Rate	£	Quantity	Unit	Rate	£	Quantity	Unit	Rate	£
	Series 200: Site Clearance																								
A	General allowance for site clearance	5,600	m2	0.50	2,800.00	5,600	m2	0.50	2,800.00	5,600	m2	0.50	2,800.00	5,600	m2	0.50	2,800.00	5,600	m2	0.50	2,800.00	5,600	m2	0.50	2,800.00
	Series 200: Site Clearance				**2,800.00**				**2,800.00**				**2,800.00**				**2,800.00**				**2,800.00**				**2,800.00**
	Series 300: Fencing																								
A	Knee Rails	0	m	25.00	0.00	0	m	25.00	0.00	0	m	25.00	0.00	0	m	25.00	0.00	0	m	25.00	0.00	0	m	25.00	0.00
B	Acoustic Fence (Allowance)	0	m	320.00	0.00	0	m	320.00	0.00	0	m	320.00	0.00	0	m	320.00	0.00	0	m	320.00	0.00	0	m	320.00	0.00
C	General Site Fencing	0	m	29.40	0.00	0	m	29.40	0.00	0	m	29.40	0.00	0	m	29.40	0.00	0	m	29.40	0.00	0	m	29.40	0.00
	Series 300: Fencing				**0.00**				**0.00**				**0.00**				**0.00**				**0.00**				**0.00**
	Series 400: Safety Barriers																								
A	Vehicle Parapet; metal parapet system N2/W2 with mesh infil, 1m high	239	m	500.00	119,500.00	239	m	500.00	119,500.00	239	m	500.00	119,500.00	239	m	500.00	119,500.00	239	m	500.00	119,500.00	239	m	500.00	119,500.00
B	Pedestrian Parapet; metal parapet system N2/W2 with mesh infil, 1.4m high	239	m	600.00	143,400.00	239	m	600.00	143,400.00	239	m	600.00	143,400.00	239	m	600.00	143,400.00	239	m	600.00	143,400.00	239	m	600.00	143,400.00
	Series 400: Safety Barriers				**262,900.00**				**262,900.00**				**262,900.00**				**262,900.00**				**262,900.00**				**262,900.00**
	Series 500: Drainage																								
	Surface Water Drainage																								
A	Rod access points to Beaney kerb (2no/25m)	44	nr	325.00	14,404.00	44	nr	325.00	14,404.00	44	nr	325.00	14,404.00	44	nr	325.00	14,404.00	44	nr	325.00	14,404.00	44	nr	325.00	14,404.00
B	Allowance for connection to existing highway drainage services		item		5,000.00		item		5,000.00		item		5,000.00		item		5,000.00		item		5,000.00		item		5,000.00
	Series 500: Drainage				**19,404.00**				**19,404.00**				**19,404.00**				**19,404.00**				**19,404.00**				**19,404.00**
	Series 600: Earthworks																								
A	Excavate class 5a (topsoil) and deposit on site.	0	m3	8.00	0.00	0	m3	8.00	0.00	0	m3	8.00	0.00	0	m3	8.00	0.00	0	m3	8.00	0.00	0	m3	8.00	0.00
B	Excavate Class 5a (topsoil) and dispose off-site.	195	m3	25.00	4,880.00	195	m3	25.00	4,880.00	101	m3	25.00	2,515.00	101	m3	25.00	2,515.00	101	m3	25.00	2,515.00	86	m3	25.00	2,145.00
C	Excavate acceptable material and deposit on site	0	m3	8.00	0.00	0	m3	8.00	0.00	0	m3	8.00	0.00	0	m3	8.00	0.00	0	m3	8.00	0.00	0	m3	8.00	0.00
D	Excavate acceptable material and remove from site	4,034	m3	24.00	96,816.00	3,967	m3	24.00	95,198.40	3,671	m3	24.00	88,104.00	3,804	m3	24.00	91,296.00	4,051	m3	24.00	97,224.00	3,969	m3	24.00	95,256.00
E	Allowance for dealing with contaminated material.	211	m3	69.00	14,590.74	208	m3	69.00	14,358.21	377	m3	69.00	26,024.04	195	m3	69.00	13,470.87	208	m3	69.00	14,323.02	203	m3	69.00	13,989.06
F	Imported acceptable material	195	m3	37.00	7,222.40	195	m3	37.00	7,222.40	101	m3	37.00	3,722.20	101	m3	37.00	3,722.20	101	m3	37.00	3,722.20	86	m3	37.00	3,174.60
G	Excavate material in areas of soft fill, remove from site and backfill will acceptable material 50% reclaimed and 50% imported.	0	m3	65.00	0.00	0	m3	65.00	0.00	0	m3	65.00	0.00	0	m3	65.00	0.00	0	m3	65.00	0.00	0	m3	65.00	0.00
H	Extra over for hard dig	0	m3	34.00	0.00	0	m3	34.00	0.00	0	m3	34.00	0.00	0	m3	34.00	0.00	0	m3	34.00	0.00	0	m3	34.00	0.00
I	Lightweight Fill	0	m3	72.00	0.00	0	m3	72.00	0.00	0	m3	72.00	0.00	0	m3	72.00	0.00	0	m3	72.00	0.00	0	m3	72.00	0.00
J	General Fill	0	m3	27.00	0.00	0	m3	27.00	0.00	0	m3	27.00	0.00	0	m3	27.00	0.00	0	m3	27.00	0.00	0	m3	27.00	0.00
K	Allowance for Geotextiles	945	m2	5.00	4,725.80	945	m2	5.00	4,725.80	945	m2	5.00	4,725.80	945	m2	5.00	4,725.80	945	m2	5.00	4,725.80	945	m2	5.00	4,725.80
	Series 600: Earthworks				**128,234.94**				**126,384.81**				**125,091.04**				**115,729.87**				**122,510.02**				**119,290.46**