ROBERTSBRIDGE (RVR) JUNCTION STATION, STATION ROAD,
ROBERTSBRIDGE, EAST SUSSEX. TN32 5DG
www.rvr.org.uk

Rother Valley Railway ("RVR") Bodiam to Robertsbridge Junction

(The "Missing Link")

Summary of documentation provided to the Office of Rail and Road ("ORR") in response to their requests from late 2018 until December 2019 for further information relating to the proposed level crossings.

This document is in two parts.

The first (Part 1) provides an overview of reports and documents produced in response to requests to RVR from ORR. These are attached to this summary.

The second (Part 2) provides details of reports and copies of correspondence requested by ORR, which had been made available previously as part of the RVR Planning Application, TWAO application, the RVR Statement of Case (SoC) or which were available on the internet.

PART 1

1. In 2018, ORR requested a cross section of background information and a detailed report on options for crossing the A21. Arup was commissioned by RVR to undertake the A21 crossing work, which required extensive investigations, detailed designs and complex cost estimates. This report is **Document 2** attached. The background information referred to in this report is listed in Part 2.

2. The covering letter from RVR to ORR with the initial tranche of information is attached as Document 1.

   Document 1. RVR letter to ORR of 18 July 2019

   The reports referred to in the letter as provided on a memory stick, are all documents included in the appendices to the RVR SoC, and are listed in Part 2.

   Document 1A. Mott Macdonald Updated Traffic Study report Dec 2018

   Document 2. Arup "A21 (T) crossing Feasibility Report 4 July 2019

   This is the final version of the report. The index to the letter above should have referred to the Arup report of 4 July 2019, not 17 July 2019.

   In February 2019, ORR asked for options studies for the crossings at the B2244 Junction Road (Document 3), Salehurst Bridleway (Document 4) and Northbridge Street (Document 5). These reports provided in September 2019.

Document 3. B2244 Junction Road Crossing (10 Sept 2019)

Annexes A, C, D & E to the report were provided previously and are listed in Part 2.

Document 4. Bridleway Crossing 36b at Salehurst, Robertsbridge

(10 Sept 2019)

Annexes A-H to the report were provided previously and are in Part 2.

Document 5. Northbridge Street Crossing (10 Sept 2019)

Annexes A, C, D & E to the report were provided previously and are in Part 2.

3. At the same time, the ORR also requested demonstrations of gross cost disproportion of alternative crossings. These were provided in November 2019 as Documents 6 and 7, together with an e-mail from the Rother District Council Planning Department with informal advice on the planning issues associated with a bridge crossing of the A21. (Document 8.)

Document 6. RVR demonstration of gross disproportion (8 Sept 2019)

Early draft. ORR suggested more detail needed.

Document 7. Summary Demonstration of Gross disproportion. (15 Nov 2019)

Document 8. Informal planning response. 28 October E-mail from local planning authority

Email from Mark Cathcart (Principal Planning Officer, Rother District Council) to David Gillett (RVR) dated 28 October 2019 (Subject: informal planning enquiry on behalf of the Rother Valley Railway – Proposed railway bridge over A21 and associated works, Robertsbridge, East Sussex). This email sets out the planning officer's informal comments in respect of the planning issues associated with a bridge crossing of the A21. It explains why such development would be contrary to national and local planning policies and concludes that it would not be supported by the local planning authority. The drawing referred to is that shown in the Arup Feasibility report (Document 2.)

4. In August 2019 ORR requested detailed risk assessments for each crossing. Final versions were provided to ORR on 2 December 2019 (although the cover sheets for the narrative risk assessments refer to them as drafts).

Document 9. Narrative Risk Assessment for new build A21 level crossing.

The 5X5 Risk Assessment provides a useful portrayal of the risks presented by the system under study. The risks associated with the various events are ranked and actions prioritised accordingly.

Document 10. Narrative risk assessment. New build level crossing Junction Road.

Document 11. Narrative Risk Assessment. New build. Northbridge Street level crossing.

Document 12. Annex D. Bridleway crossing Risk Assessment

PART 2 (Details of existing reports and correspondence provided to ORR)

Where considered helpful, we have attached copies of documents that are already in the public domain, but which were not already Inquiry documents.

Document	Location
Doc 2.1 ORR letter of no objection 24 Aug 2011	Rother District Council Planning Application Documents (reference 'RR/2014/1608/P') **(Attached as Document Part 2.1)**
Doc 2.2 Further ORR letter of no objection 20 Jan 2012	Rother District Council Planning Application Documents (reference 'RR/2014/1608/P') **(Attached as Document Part 2.2)**
Doc 2.3 Mott Mac Donald Economic cost of traffic delays report	RVR SoC document reference 'RVR33'
Doc 2.4 Steer 2018 Economic benefits report	RVR SoC document reference 'RVR09'
Doc 2.5 Report on consultation.	RVR SoC document reference 'RVR19'
Doc 2.6 Footpath crossing under bridge RVR UB 12	Rother District Council Planning Application Documents (reference RR/2014/1608/P) **(Attached as Document Part 2.6)**
Doc 2.7 Horse Society advice on gates	Horse Society web site **(Attached as Document Part 2.7)**
Doc. 2.8 Temple Air Quality assessment	RVR SOC document reference 'RVR29'

Doc 2.9 Public footpath and bridleway crossing details	Rother District Council Planning Application Documents (reference RR/2014/1608/P) **(Attached as Document Part 2.9)**
Doc 2.10 -2.13 Temple ES Vols 1-4	RVR SoC document reference 'RVR24-RVR27'
Doc 2. 14 "Transforming level crossings 2015 to 2040. DfT RA5600001	DfT website **(Attached as Document Part 2.14)**

David Keay

RVR Director January 2020

Rother Valley Railway
LIMITED
IN ASSOCIATION WITH THE KENT & EAST SUSSEX RAILWAY
ROBERTSBRIDGE (RVR) STATION, STATION ROAD,
ROBERTSBRIDGE, EAST SUSSEX. TN32 5DG

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Mr Ian Prosser C.B.E
Chief Inspector of Railways
Office of Rail & Road
One Kemble Street
London,
WC2B 4AN

18th July 2019

Dear Mr Prosser,

EXTENSION of KENT & EAST SUSSEX RAILWAY:
BODIAM TO ROBERTSBRIDGE
RAILWAY LEVEL CROSSINGS

Thank you for our recent discussions with ORR concerning the documentation you would expect to see as part of our updated submission to your Level Crossings Committee in respect of the Rother Valley Railway 5.6km extension of the Kent and East Sussex Railway (K&ESR) to Robertsbridge Junction Station so as to create a direct passenger interchange with the national rail network.

Our submission is further to the two previous ORR letters of no objection to the level crossings dated 24.08.2011 and 20.01.2012. That correspondence concluded that having reviewed our submission at the time, in particular the Mott MacDonald reports, the ORR believed it would be possible to create at-grade crossings at all the level crossing sites if designed along the lines of that report. ORR additionally invited further, more detailed, proposals in due course.

As background we have already been able to construct about 2.18km of the railway extension where we have been able to acquire the old track bed from a number of land owners and have built those parts of the line under various planning approvals. That work has included the construction of a new passenger interchange station at Robertsbridge Junction adjacent to the mainline railway network and the railway on from there to the edge of the Robertsbridge conurbation. We have also built around 3/4 mile of the new line west from the current K&ESR terminus at Bodiam Castle.

Following on from our earlier work and correspondence with ORR our next step was to secure Planning Approval for the remaining 3.42km of line which included the section incorporating the level crossings. Your letters were central to that application since a precondition within the Local Plan was that RVR must demonstrate appropriate arrangements were in place for the level crossings. Securing that Planning Approval proved to be a lengthy task, but approval was finally granted in March 2017.

We are currently in the process of seeking to secure a Transport & Works Act Order for the extended railway. That is necessary having yet been unable to secure the two remaining parcels of trackbed land by voluntary sale and so TWA CPO powers will be necessary to enable us to acquire that land and finally complete the line.

We therefore write to provide the additional information sought back in the ORR letter of 20.01.2012 with greater detail of the level crossings and with associated supporting information.

Attached to this letter is a general summary of our submission. The fully detailed supporting reports etc are provided for ORR on a memory stick (access details of which are provided by way of separate email). Also attached is an annexed list of the documents on the memory stick

We hope the information provided is what the ORR requires to enable you to update the earlier letters of no objection for the level crossings using the further detail provided in this submission. Please do let us know if any other information is required which we will be happy to provide.

Yours sincerely

Mike Hart OBE
Director
Rother Valley Railway Ltd

Attached:

- Submission Overview
- Level Crossing Construction
- Supporting Information Index

OVERVIEW:

Level Crossing - Note for Office of Rail and Road

1. The former railway line between Robertsbridge and Tenterden was closed in 1961. Much of the track bed remained in place for many years and, in 1974, the line between Tenterden and Rolvenden was re-opened as the Kent and East Sussex Railway (K&ESR).The line was further reinstated to Bodiam (the site of the National Trust's Bodiam Castle) in 2000 and K&ESR has become a successful heritage railway and major tourist attraction. Reinstatement work to date on the K&ESR and the Missing Link has been undertaken mainly by volunteers and local contractors who have developed cost-effective and quality methods for the work.

2. The "Missing Link" is the section of former railway corridor 3.42km long running from Junction Road (the B2244) in Bodiam to the terminus at Robertsbridge. Policy EM 8 of the Rother District Plan expressly supports the reinstatement of RVR subject to the proposal incorporating appropriate arrangements for crossing the A21, B2244, Northbridge Street and the River Rother. The local plan was the subject of a Public Inquiry and the Inspector's report gave full support to completing the Missing Link, subject to meeting the following criteria: 1. it must not compromise the integrity of the floodplain and the flood protection measures at Robertsbridge; 2. it has an acceptable impact on the High Weald Area of Outstanding Natural Beauty; 3. it incorporates appropriate arrangements for crossing the A21, B2244 at Udiam, Northbridge Street and the River Rother. These criteria were all resolved and approved with full Planning approval given by Rother District Council in March 2017. Once completed, visitors will travel on a well-regarded Heritage Railway on the historic route within the Rother Valley between Tenterden and the mainline railway network at Robertsbridge Junction Station with stops at a number of attractive tourist destinations.

3. Over the course of a number of years, planning permission has been obtained for the re-instatement of the railway between Bodiam and Junction Road in 2011, from Robertsbridge to Northbridge Street in 2013 and the construction of Robertsbridge Junction Station. Re-construction of the railway within those sections has now been completed (utilising volunteer professionals and local subcontractors). The connection to the main line was completed in late 2016 with the support of Network Rail.

4. Following consultation over a period of 6 years, including discussions with all relevant statutory bodies and the local planning authority – as reported in the Consultation Report accompanying the TWAO application - planning consent for the Missing Link was unanimously approved by the Rother District Planning Committee on 17 March 2017. (RR/2014//1608/P). Letters of support for the project from Kent CC, East Sussex CC, Rother DC, Ashford BC, Network Rail, National Trust, and 1066 Country are included in the Consultation Report. The Planning Committee's report stated in relation to the road crossings, including the A21 that:*"If the railway is to be reinstated along its original route, it will be necessary to cross three roads, one of which, the A21, is a trunk road. Bridges and/or tunnels are not a feasible alternative option in this case and in the circumstances, the installation of a barrier-operated rail crossing over each of the roads is proposed in the application."*The planning consent was accompanied by planning conditions to ensure the safety and effectiveness of the A21 level crossing.

5. The Missing Link will comprise a simple single track railway with straightforward construction, utilising the same local contractors and volunteers (qualified and experienced, as appropriate) as on the sections already completed.

6. A comprehensive Economic Benefits Report by Steer, leading UK specialist consultant, in 2018, forecast that the RVR will generate local economic benefits of up to £35 million over a two year construction period and the first ten years of operation, and up to £4.6 million per annum of local economic benefits from 2030. It will generate approximately 34 jobs in the construction phase and up to 85 in the operational phase. Additional rail revenues of approximately £355,000 per annum are forecast to accrue to the mainline passenger railway operator.

7. The TWA documentation includes traffic studies, together with an assessment of the economic impact of delays to road traffic, undertaken by Mott MacDonald. This work was updated in late 2018. It shows, at the A21 crossing, a maximum queue length of 60-70m, except for one occasion on the May Bank Holiday weekend when a queue length of just over 140m (the distance back to the roundabout) was predicted. These will be minimal additions to journey time on already prolonged holiday journeys. However, the proposed timetable has a limited number (10) of crossing closures per day, all of which will be outside "rush hour" periods. The Mott MacDonald report on the economic cost of potential delays arising as a result of the level crossing calculated them to be minimal (just £1,910 pa with the expected 51 second closure time, and £9,214 pa allowing for a 112 second closure time).

8. An Environmental Impact Assessment was carried out by specialist consultants Temple for the planning consent and TWA application, with a detailed Flood Risk Assessment by Capita. The reports of both assessments are included in the TWA submission, together with a 2018 "air quality" study report, which shows potential changes in pollution levels at the receptors close to the A21, Northbridge Street and Junction Road to be negligible in all cases. Detailed design drawings for the three level crossings have been prepared by Arup, together with a Stage One Road Safety Assessment, the recommendations from which were included in the designs. The design documents include location plans and photographs of the proposed level crossing sites.

9. In addition to the above, Arup has been instructed to produce a report specifically on the alternatives for crossing the A21. This report (July 2019) considers 4 options for crossing the A21. The options assessment considers the feasibility and industry standard construction costs for each option. The assessment includes the costs of delivery of the A21 level crossing as worked up by RVR for the purposes of the planning consent and application for the Transport and Works Act Order. (It is not possible to provide a similar worked up costing for the other three crossing options because RVR would not be equipped to design and construct them "in-house".)
   (a) Option one, involving an "at grade" level crossing introduces the fewest engineering challenges and would cause the least disruption during construction. As noted in the Arup report, (para 5.8) the RVR estimated cost (taking account of preliminary work and advance purchases of materials already completed etc.) of £1.5m, is considered credible.

(b) Option 2, looks at the feasibility of taking the rail beneath the existing road. Principal engineering and approval challenges are around the railway being below the level of the River Rother. Disruption to local residents and road users is the most significant with this option, including a temporary diversion of the A21. The Arup estimated cost is £11.8m.
(c) Option 3, considers taking the rail over the road. This scheme involves a sizable length of elevated viaduct structure with a significant impact on cost and would involve significant visual intrusion within the AONB. The Arup estimated cost is £20.2m.
(d) Option 4, involves the vertical realignment of the existing road, over the top of a box culvert, built above the normal level of the river. This option would require long temporary road diversions and considerable disruption. The Arup estimated cost is £11.3m.[1]

10. Options for the other two crossings of the public highway (the B2244 at Junction Road Udiam and at Northbridge Street in Robertsbridge) would be very similar, and have much the same implications in terms of feasibility and cost differentials. Those construction and cost issues being similar as they are also adjacent to the River Rother/flood plain with an overbridge having similar severe landscape impact and geographic constraints within those areas of outstanding natural beauty.

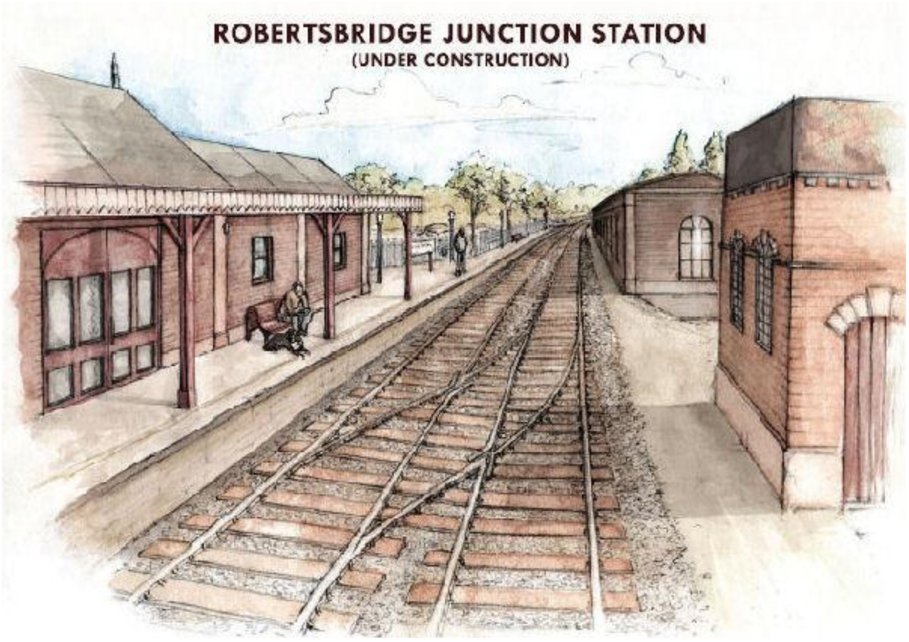
11. The anticipated final cost of implementing the outstanding work for the entirety of the "Missing Link" (including Option one), is £5.3m pounds which will be funded by the Rother Valley Railway Heritage Trust, this funding is in place. Following in principle agreement to the level crossings from ORR and the Highway Authorities the Trust has already invested over £3m in the new Robertsbridge Junction Station, the connection to Network Rail, the permanent way from Bodiam to Junction Road and from Robertsbridge Junction to Northbridge, together with the necessary specialist consultant's surveys and reports.

12. The majority of the construction materials for Option one would be delivered by rail, the fill material and track ballast via the Network Rail connection at Robertsbridge (from stock piles that RVR are already holding at several south coast ports), and track materials by rail from those already held for the project by K&ESR at Northiam Station. Upon gaining access to the land, it is anticipated that there will be 12 months of surveys in order to discharge the relevant planning conditions, with subsequent construction taking approximately 12 months. Commissioning and trials by K&ESR will take approximately 3 months. The reinstated railway will be operated by K&ESR as an integral part of its successful heritage undertaking. (K&ESR has been operating trains since 1974.)

13. The nature of the railway operation is an infrequent heritage railway, travelling at a maximum speed of 25mph and locally monitored by a signalman. The intended design of the level crossing will be a full barrier cctv design incorporating the most recent crossing technology reducing risks to level as low as reasonably practicable. A brief outline description of the level crossing operation is detailed in the Statement of Case at paras 6.1.1 to 6.1.5 and it is noted that the detail of the equipment and operation is subject to approval by the ORR.

14. The completion of the Missing Link will bring significant benefits to the local economy and there is no question that a level crossing solution is capable of being operated safely with little disruption to traffic. The Arup report supports the conclusion that there is no reasonably practicable alternative to a crossing on the level - due to the topography of the valley location and the proximity of the River Rother with associated floodplain. Full consideration has been given to the alternatives and each has been costed. Each alternative option has unacceptable environmental impacts rendering it impracticable. Further, the cost differential between the costs of implementing the level crossing solution and constructing and thereafter maintaining a tunnel or bridge at this location are grossly disproportionate.

Rother Valley Railway Ltd
July 2019



Rother Valley Railway
Summary - Level Crossing Construction

Contents

11) Additional Supporting information

1) Introduction

The Office of Rail and Road (ORR) provide guidance on how to prepare and provide evidence by anyone seeking to introduce a new railway level crossing. The ORR have a policy of no new level crossings unless there are exceptional circumstances as detailed within their own internal procedure RIG-2014-06 (August 2018).

This document considers each of the criteria identified by ORR:

- the location of the proposed crossing including photographs and diagrams;
- the reason for the crossing;
- information about the proposer of the scheme for a new crossing, the proposed crossing operator and, if applicable, the proposed authorised user(s) of the crossing;
- proposed timescales for (re)introducing any new crossing;
- confirmation that there is a right-of-way and whether any relevant authorisations/orders need to be sought through the TWA procedures;
- information about the road and rail traffic at any proposed crossing including the results of censuses;
- details of any liaison that has already taken place with other departments and agencies such as DFT, Highways Agency or local highway authorities, planning authorities and other local bodies and stakeholders plus a summary of the responses/views received;
- a description of what other options have been considered such as bridges and underpasses and clear explanations setting out why these options are not reasonably practicable alternatives to a level crossing, backed up by evidence from risk assessments;
- details on the features of the proposed crossing and what protective arrangements would be in place were it to go ahead based on a suitable and sufficient risk assessment (noting that it may be subject to a Level Crossing Order application further down the line);
- any other information that the panel considers might be relevant or helpful.

ORR's policy also states that there would only be exceptional circumstances where there is no reasonably practicable alternative to a crossing on the level at the location in question. ORR therefore expect proposers to demonstrate that full consideration has been given to finding an alternative solution to avoid the need for a level crossing and that alternative options such as bridges, underpasses or road diversions have been fully explored and costed. The enclosed Arup report provides information relating to all other possible options available and why the level crossings are the only viable option.

2) location of the proposed crossing including photographs and diagrams.

The Rother Valley Railway is located between the mainline station at Robertsbridge (on the London and Hastings Line) and the Existing Kent and East Sussex Railway, which runs between Tenterden and Bodiam.

Rother Valley Railway Limited plan to reopen the historic route, linking with an existing section of heritage railway. The section of railway which RVR are seeking to complete is termed "the missing link" which is the section of former railway corridor, approximately 3.42km long, running from Junction road (the B2244) in Udiam to the Clappers crossing in Robertsbridge.

The proposed route involves the crossing of three existing highway routes:

- A new automatic locally monitored full barrier level crossing on the A21(T) Robertsbridge Bypass, East Sussex (Figure 1).

- A new automatic locally monitored full barrier level crossing on C18 Northbridge Street, Robertsbridge, East Sussex (Figure 2).

- A new automatic locally monitored full barrier level crossing on the B2244 Junction, East Sussex (Figure 3).

The line also crosses one bridleway at Salehurst.

Figure 1 A21(T) Robertsbridge Bypass, East Sussex

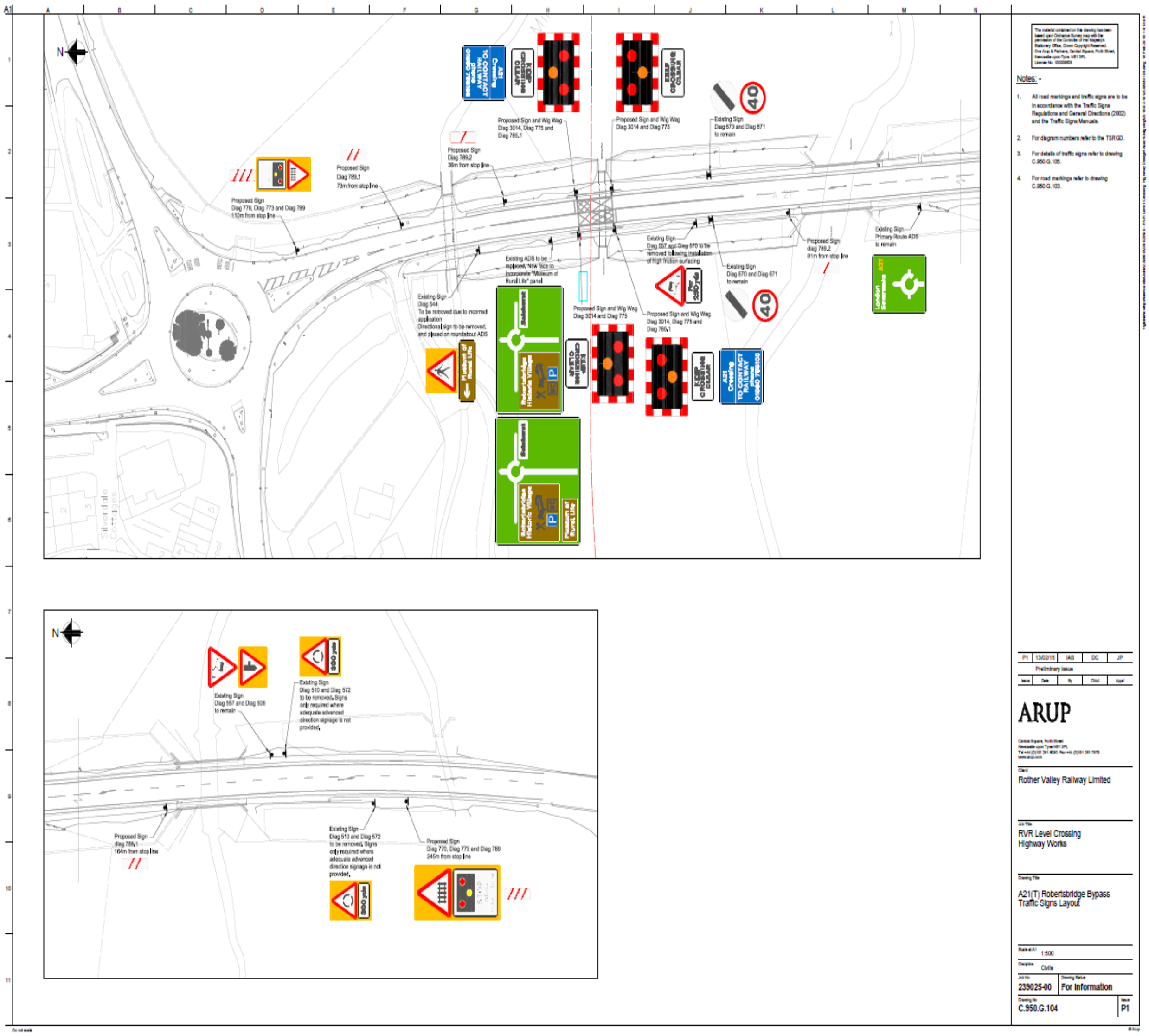


Figure 2The Clappers (Northbridge Street, Robertsbridge)

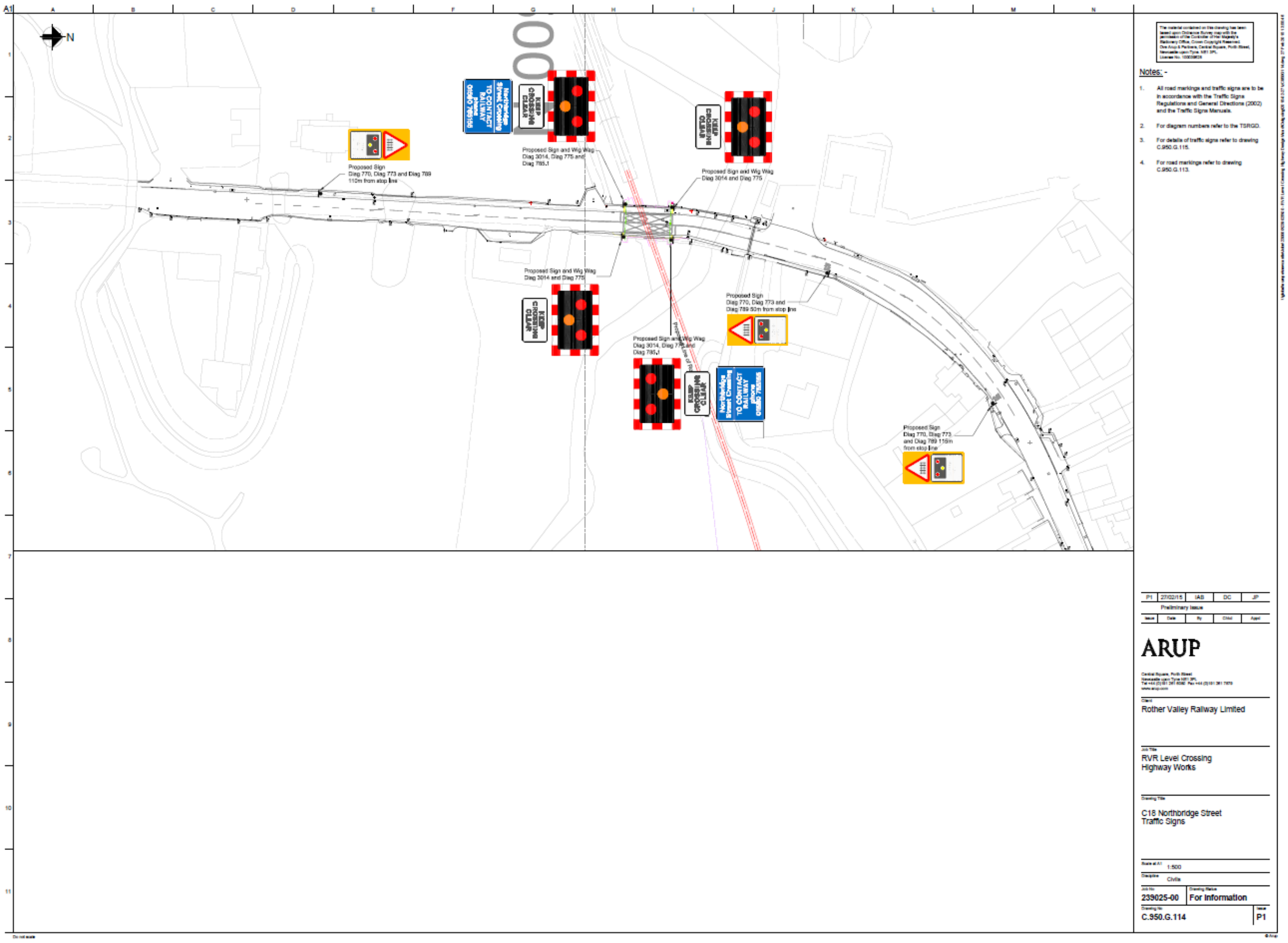
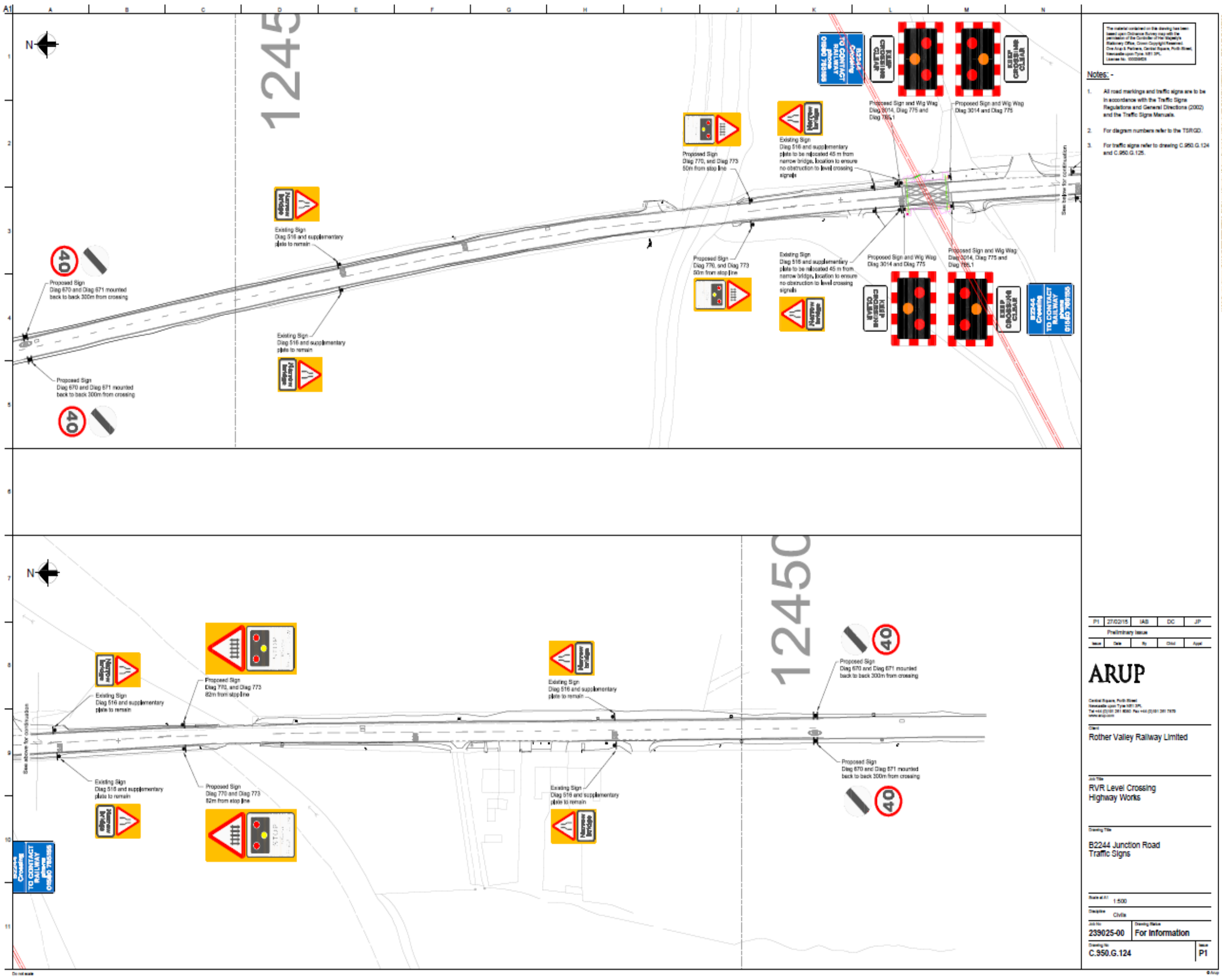


Figure 3 B2244 Junction Road, East Sussex



3) Reason for the crossings.

The Rother Valley Railway proposal is to restore a section of a former railway line to connect the Kent and East Sussex (KESR) heritage railway with Robertsbridge and the national rail network. The ‘missing link’ will enable the existing heritage train service to operate along 14 miles of line between Tenterden and Robertsbridge. In doing so, both the railway and other visitor attractions along the route will become accessible by rail, in addition to road.

By connecting the completed railway to the main Network Rail line at Robertsbridge where trains arrive from London Charing Cross and Hastings, great economic benefits will be gained in the surrounding area as follows:

There is an hourly main line service in both directions seven days a week. The journey from London is 1.3 hours and from Hastings 23 minutes. Bodiam Castle attracts 185,000 visitors a year and most arrive by car. Discounts to this National Trust property are offered to those who use public transport.

The Robertsbridge “gateway” would offer a new and larger tourist catchment area. Visitors by main line rail tours from all over the United Kingdom could make easy access to the Kent & East Sussex Railway. Tenterden is currently the largest town in Kent without a railway connected to the main line.

The full Economic Benefits Report by Steer is provided.

4) Information about the proposer.

Rother Valley Railway is based at Robertsbridge Junction, station, Station Road, Robertsbridge, East Sussex, TN32 5DG. The railway operator is Kent & East Sussex Railway.

The Rother Valley Railway (East Sussex) Ltd, was formed on the 22 May 1991 to reconstruct the railway between Bodiam and Robertsbridge and has since simplified its name to Rother Valley Railway Ltd.

The Rother Valley Railway’s proposal is to restore the missing rail link between Bodiam and Robertsbridge. This is approximately a 3.5-mile-long section. There will be an end on link with the Kent and East Sussex at Bodiam enabling through running for a total of 14 miles. Since 1991, the railway has been acquiring parts of the track bed as and when possible. Negotiations continue with the remaining landowners to secure the remainder of the route. In addition, the Railway is liaising with the various authorities to ensure that the necessary planning consents and orders will be granted.

The Rother Valley Railway intends to create a heritage railway transport link between the main line railway system at Robertsbridge Junction operating as a public leisure transport corridor serving popular attractions such as the National Trust’s Bodiam Castle, The Toy Museum at Northiam and Tenterden, the jewel of the weald.

Rother Valley Railway Heritage Trust

The Railway is controlled by the Rother Valley Railway Heritage Trust, a Registered Charity (No 1088452), which was formed in 2001.

The objects of the Trust are “To preserve for benefit of the public of Kent and East Sussex and of the Nation the historical, architectural and constructional heritage that may exist in and around Kent and East Sussex buildings (including any building as defined in section 336 of the Town and Country Planning Act 1990) or structures of particular beauty or historical, architectural or constructional interest”.

The Trust has since 2001 purchased 97% of the Ordinary voting shares and 100% of the non-voting shares of the operating company, the Rother Valley Railway Ltd, and thus now controls the Railway.

The Trust also owns the freehold of approximately one-third of the track bed between Robertsbridge and Bodiam on which the Railway is being rebuilt.

The Trust supports the rebuilding of the Railway by the provision of Grants to the Rother Valley Railway Ltd.

Rother Valley Railway Limited

Registered Office is: 3/4, Bower Terrace, Tonbridge Road, Maidstone, Kent. ME16 8RY

Registered in England, number: 2613553.

The Rother Valley Railway Ltd is a limited liability company with Share Capital, incorporated in 1991, Companies House register number 2613553. The objects of the Company are the rebuilding, development and management of the heritage railway from Robertsbridge to Bodiam including the establishment and operation of a passenger carrying train service. 100% of the issued non-voting shares and 97% of the issued voting shares of RVR Ltd are owned by the Rother Valley Railway Heritage Trust, who thus controls the Company.
The RVR Ltd is governed by a Board of Directors, up to 12 in number. The Board is supported by departmental managers.

Rother Valley Railway Supporters Association

The Rother Valley Railway is exclusively staffed and run by volunteers.
An Association, the Rother Valley Railway Supporters Association (RVRSA) was formed in March 1977. Its aims include the coordination of the volunteer labour to assist in the restoration, development and operation of the Rother Valley Railway between Robertsbridge and Bodiam, the carrying out of publicity and fund-raising activities for the benefit of the Railway and the production and publication of educational material relating to the Rother Valley Railway, its Rolling Stock and equipment.

5) Proposed timescales.

- TWA Inquiry due to be held in early 2020.

- Construction start date at the end of 2020.

- Start of Railway Operations expected 2021/22.

6) Rights-of-way.

The Railway has three road crossings, the A21, the B2244 Junction Road, and Northbridge Street/Clappers. With Safety very much at the front of the planning all three crossings will be controlled from a crossing control cabin with Video links. All 3 crossings are public highway crossings.

The railway has one Bridleway crossing at Salehurst.

Rother Valley Railway Ltd submitted its application on 19 April 2018 to the Secretary of State for Transport for a TWAO.

7) Road and rail traffic at proposed crossings.

Mott MacDonald produced a report titled "Proposed Level Crossings – Traffic Impact Study. The report included analysis of traffic demand at the locations of the 3 proposed level crossings, based on traffic counts from 2010. Using the traffic data, queue lengths that would develop when the level crossings were in use were estimated. Queue length estimates were provided for 2010, 2016 and 2021. The report formed an Addendum to the 2011 report and covered 3 main areas;

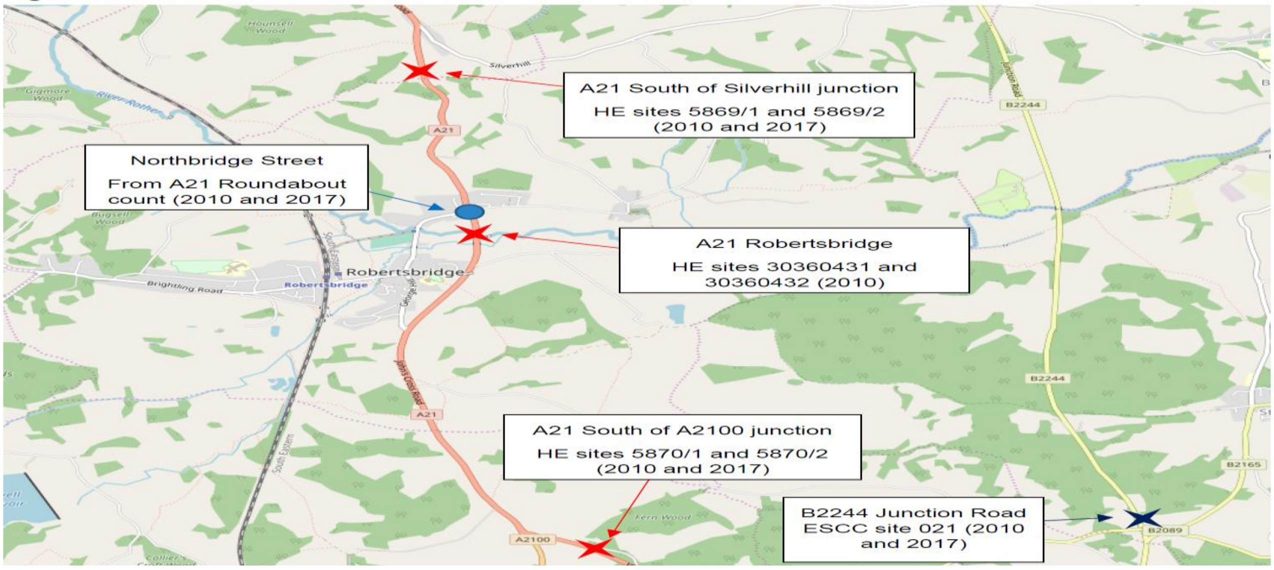
- Up to date traffic data based on counts from 2017 and 2018 and compared to the data from 2010.

- Traffic forecasts for 2021 and 2027 have been produced using the latest predictions from the national database (TEMPRO version 7.2)

- Queue length estimates for 2017, 2021 & 2027.

- Further information is available within the Addendum to the 2011 report.

Figure 1: Location of Traffic Counts



8) Liaison with other departments/Agencies.

Regular and on-going liaison has been ongoing with the following organisations:

- Office of Rail and Road
- Highways Agency
- Rother Valley District Council
- East Sussex County Council.
- Kent County Council
- DFT
- Environment Agency
- Network Rail

It should also be noted that through our liaisons, full planning consent has been granted for the construction of the railway.

9) Alternative Options Report.

RVR have considered other options such as bridges and underpasses. Arup provided a detailed report which outlined 4 different options which clearly sets out why these options are not reasonably practicable alternatives to a level crossing.

- Option 1, involving an at-grade level crossing.
- Option 2 looks at the feasibility of taking the rail beneath the existing road.
- Option 3 considers the potential to take the rail over the existing road.
- Option 4, involving realignment of the existing highway will result in a series of engineering works for both the road and rail.

The Arup Options Report is provided.

10) features of the proposed crossings.

Details on the features of the proposed crossing and protective arrangements have been outlined above which would be in place based on a suitable and sufficient risk assessment. Additional information is also available within the Arup report.

11) Additional Supporting information.

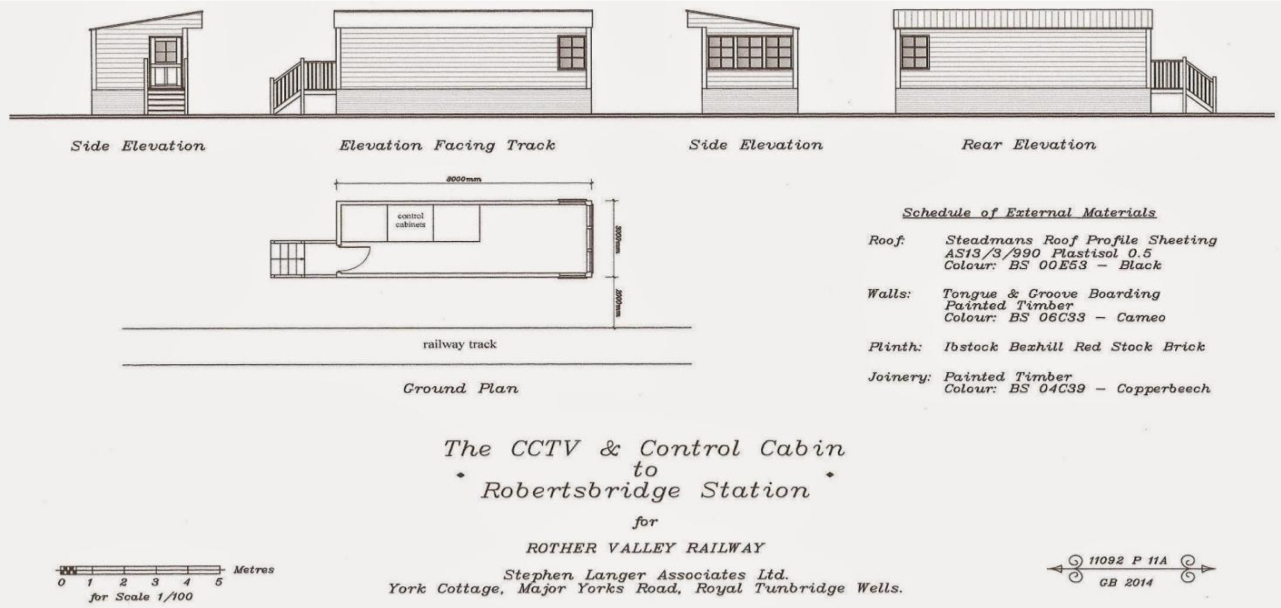
All 3 highway crossings are full barrier CCTV crossings.

The A21 is supervised locally and will also monitor the other 2 crossings. When the train activates the treadle, it informs the operator that the train is ready to cross over the LC. Railway signals are maintained at danger until the barriers have been proven to be closed preventing traffic moving onto the crossing.

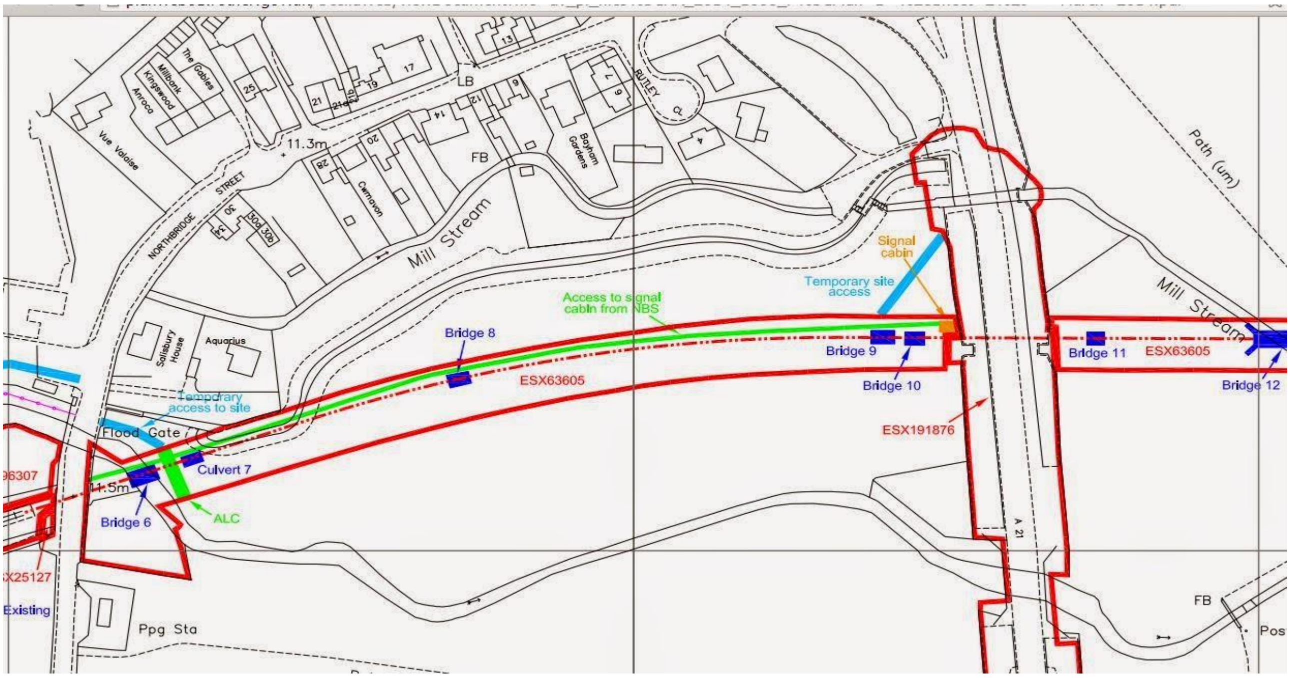
A Risk analysis has been prepared for each level crossing, supported by a Level Crossing Operations Management Plan (LCOMP) as well as a description of how the Bridleway crossings will be protected in line with Network Rail standards.

Road Crossing Control box diagrammatic

Although constructed with a heritage railway theme in mind, the cabin will house a state-of-the-art CCTV monitoring.



A cabin is proposed to the western side of the A21.



Bridleway Safety Management Arrangements.

ORR provide guidance in publication, Level crossings: a guide for managers, designers and operators.

There is only one bridleway crossing, located at Salehurst.

RVR will apply all relevant safety measures outlined in ORR guidance, additionally, RVR will consider installation of the latest technological solutions to further enhance safety at bridleway crossings, for example:

Covtec System

The Powelectrics remote condition monitoring telemetry has been incorporated into a warning system as part of Network Rail's Railway Upgrade Plan to provide a safer and more reliable railway.

Covtec are specialists, who design, install, operate and maintain surveillance systems for customers ranging from police forces and local councils to large infrastructure operators, such as Network Rail. The units at level crossings reproduce the sound of a train horn / whistle and are triggered automatically as a train approaches, providing a secondary warning in case someone at the crossing has not heard the train horn / whistle.
These new audible warning units are solar powered and require limited maintenance, so they are a practical and efficient way to improve safety at footpath or bridleway level crossings.
By sending crucial data via the Metron software system, Network Rail can see that the charge system is working, that the system operates EVERY time a train passes and they can receive fault alerts.

There are currently over 170 sites with this safety system installed. In Kent, the system has been newly-installed at footpath level crossings in Tankerton, Lenham, Whitstable and Aylesford where the user is required to stop, look and listen for a train before crossing.
In Sussex, the system has been installed at footpath level crossings in Pulborough and Rustington in West Sussex and Rye in East Sussex.

RVR are committed to ensuring that everyone who lives or works near the railway are safe, which is why we are researching a variety of projects to improve level crossing safety as part of our Railway development Plan.

Meerkat System

Network Rail (NR) has commissioned Costain to develop enhanced warning technology called Meerkat to reduce the number of incidents at passive footpath and bridleway level crossings across Britain.

The new warning devices will detect an oncoming train and provide an audible and visible warning to alert users which will have a significant impact on public safety at level crossings. The first units are set to be installed within the next 12 months, with the technology due to be rolled out at sites across Britain over the next five years. RVR are monitoring NR's installation program to ensure we install the safest solution for the bridleway crossing.

SUPPORTING DOCUMENTATION
INDEX

RVR Folder Structure	Files within Folder
1) Location of the proposed crossing including photographs and diagrams.	➢ Junction Road General Arrangements. ➢ Junction Road Traffic Signs. ➢ North Street Road Markings. ➢ North Street Traffic Signs. ➢ Robertsbridge Traffic Signs. ➢ RVR Environmental Statement 2014. ➢ RVR Environmental Statement Addendum 2016. ➢ RVR Quality Air Report. ➢ RVR Economic Impact Report. ➢ RVR Addendum to Traffic Impact Study November 2018. ➢ RVR Addendum to Traffic Impact Study December 2018.
2) Reason for the crossing.	➢ RVR Economic Impact Report.
3) Information about the proposer of the scheme for a new crossing, the proposed crossing operator and, if applicable, the proposed authorised user(s) of the crossing;	➢ Information for ORR relating to each level crossing
4) Proposed timescales for (re)introducing any new crossing.	➢ Subject to TWA process. Works are fully funded and will take 1 year to construct.
5) Confirmation that there is a right-of-way and whether any relevant authorisations/orders need to be sought through the TWA procedures.	➢ Statement of Case. ➢ RVR Final Order
6) Information about the road and rail traffic at any proposed crossing including the results of censuses.	➢ Economic Delay Report Mott Macdonald. ➢ RVR Report Addendum to Traffic Impact Study November 2018. ➢ Traffic Delays Economic Cost Executive Summary. ➢ Traffic Impact Study Conclusions and Recommendations.
7) Details of any liaison that has already taken place with other departments and agencies such as DFT, Highways Agency or local highway authorities, planning authorities and other local bodies and stakeholders plus a summary of the	➢ RVR Report on Consultation ➢ ORR Letter of no objection 24.08.2011 ➢ ORR Letter of no objection 20.01.2012

responses/views received.	
8) A description of what other options have been considered such as bridges and underpasses and clear explanations setting out why these options are not reasonably practicable alternatives to a level crossing, backed up by evidence from risk assessments.	➢ Arup- A21 Crossing Options Feasibility Report 17.07.2019.
9) Details on the features of the proposed crossing and what protective arrangements would be in place were it to go ahead based on a suitable and sufficient risk assessment.	➢ Arup- A21 Crossing Options Feasibility Report 17.07.2019
10) Any other information that the ORR LC panel considers might be relevant or helpful.	➢ Information for ORR relating to each level crossing

Rother Valley Railway Proposed Level Crossings

Addendum to Traffic Impact Study

27 November 2018

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Rother Valley Railway Proposed Level Crossings

Addendum to Traffic Impact Study

27 November 2018

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Rother Valley Railway

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A	Nov 2018	J Dalley	M Olley	S Finney	Draft report

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Contents

Figures

Tables

1 Introduction

1.1.1 In October 2011, Mott MacDonald produced a report titled "Proposed Level Crossings - Traffic Impact Study" (ref. 288755/ITD/ITW/001/E, referred to as document RVR 32 in the Statement of Case).

1.1.2 This report included analysis of traffic demand at the locations of the three proposed level crossings on the A21, B2244 and Northbridge Street, based on traffic counts from 2010. Using the traffic data, queue lengths that would develop when the level crossings were in use were estimated. Queue length estimates were provided for 2010, 2016 and 2021.

1.1.3 This report forms an Addendum to the 2011 report and covers three main areas:

- Up to date traffic data are presented based on counts from 2017 and 2018 and compared to the data for 2010;
- Traffic forecasts for 2021 and 2027 have been produced using the latest predictions from the national database (TEMPRO version 7.2);
- Queue length estimates are provided for 2017, 2021 and 2027.

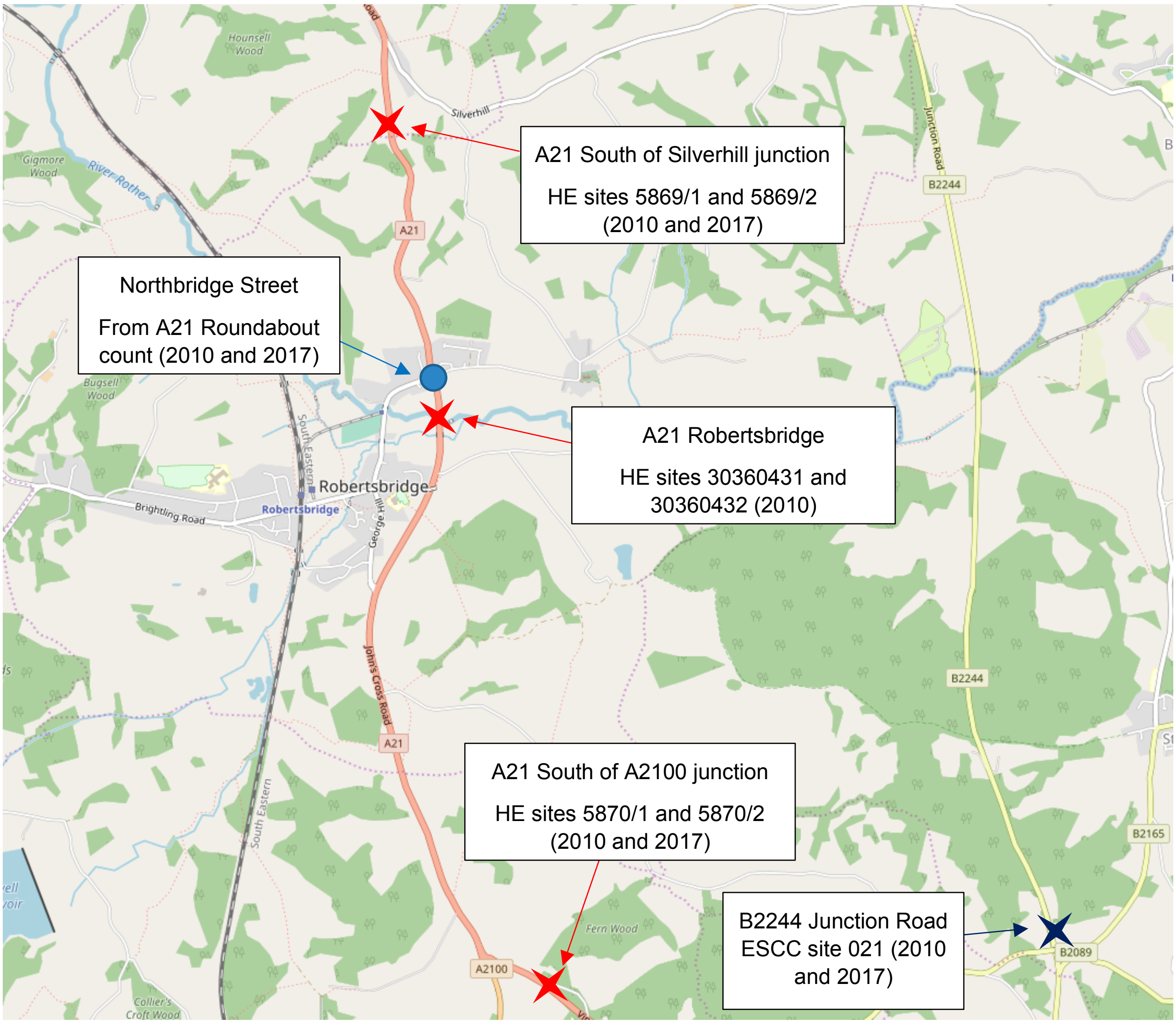
1.1.4 Section 2 of this Addendum contains the traffic data, with the queue length estimates provided in Section 3 and conclusions in Section 4.

2 2017 Traffic Data

2.1 Location of Traffic Counts

2.1.1 **Figure 1** shows the location of traffic counts that have been used in the previous work and for 2017/18 data. For the previous work, 2010 automatic traffic count (ATC) data on the A21 were obtained for the Highways England (HE) sites just south of the A21 Robertsbridge Roundabout (ref. 30360431 and 30360432). It appears that these sites are no longer in operation and no data are available after 2010. Therefore, two other HE sites have been used to estimate the A21 traffic volumes at Robertsbridge in 2017 (ref. 5869/1 and 5869/2 south of the Silverhill junction and 5870/1 and 5870/2 south of the A2100 junction).

Figure 1: Location of Traffic Counts



Source: © OpenStreetMap contributors, Highways England WebTRIS http://webtris.highwaysengland.co.uk/#

2.1.2 On the B2244, ATC data were obtained from East Sussex County Council (ESCC) for 2010 and 2017 for the site on Junction Road at Cripps Corner (ref. 021).

2.1.3 Traffic volumes on Northbridge Street were obtained from turning counts at the A21 roundabout undertaken by ESCC, as follows:

- Tuesday 14 September 2010
- Thursday 15 November 2018.

2.1.4 There are no ATC data available for Northbridge Street to allow traffic volumes on Saturdays and Sundays and at other times of the year to be determined.

2.2 A21 South of Robertsbridge

2.2.1 **Figures 2** and **3** compare traffic flows on the A21 at Robertsbridge with those at the HE sites approximately one mile to the north (south of the Silverhill junction), for Spring and Summer months in 2010.

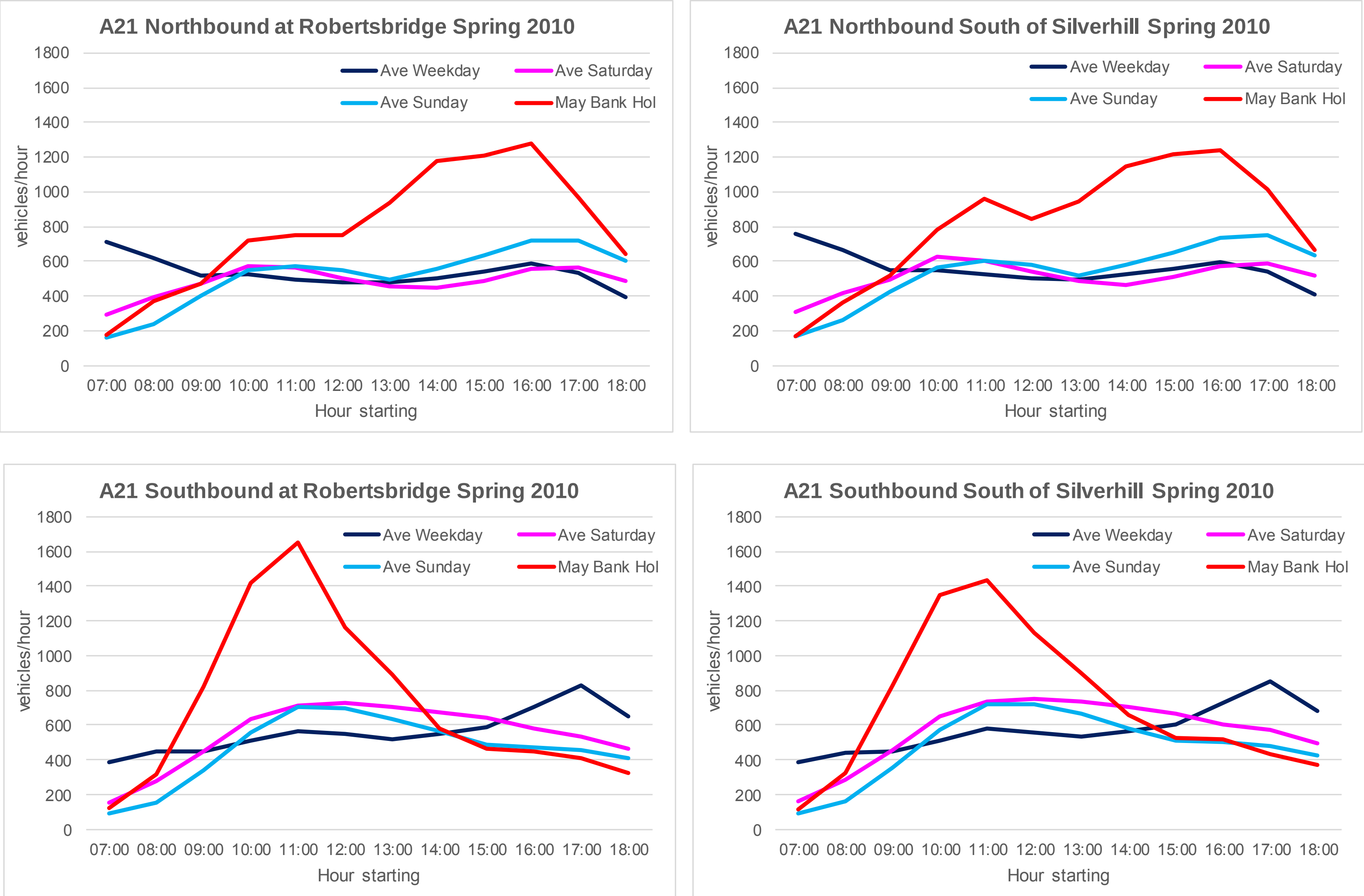
2.2.2 The graphs show that the traffic volumes were similar at the two sites, as may be expected given that there are no significant traffic generators or major side roads joining between the sites. Therefore, the northern sites have been used to estimate 2017 traffic flows at Robertsbridge, by way of growth factors for each hour and direction determined from the 2010 and 2017 data.

2.2.3 **Figures 4** and **5** show how flows at the A21 northern sites have changed between 2010 and 2017. The differences shown between 2010 and 2017 are limited, with some increases on Sundays but with reduced flow on the May Day Bank Holiday.

2.2.4 Unfortunately, there are no data available for the northern sites for the 2017 August Bank Holiday, so factors for this day have been derived from the HE sites to the south. **Figure 6** shows the traffic flows in 2010 and 2017 at this location. The main differences are increases in southbound flow around lunchtime and in northbound flow in the evening.

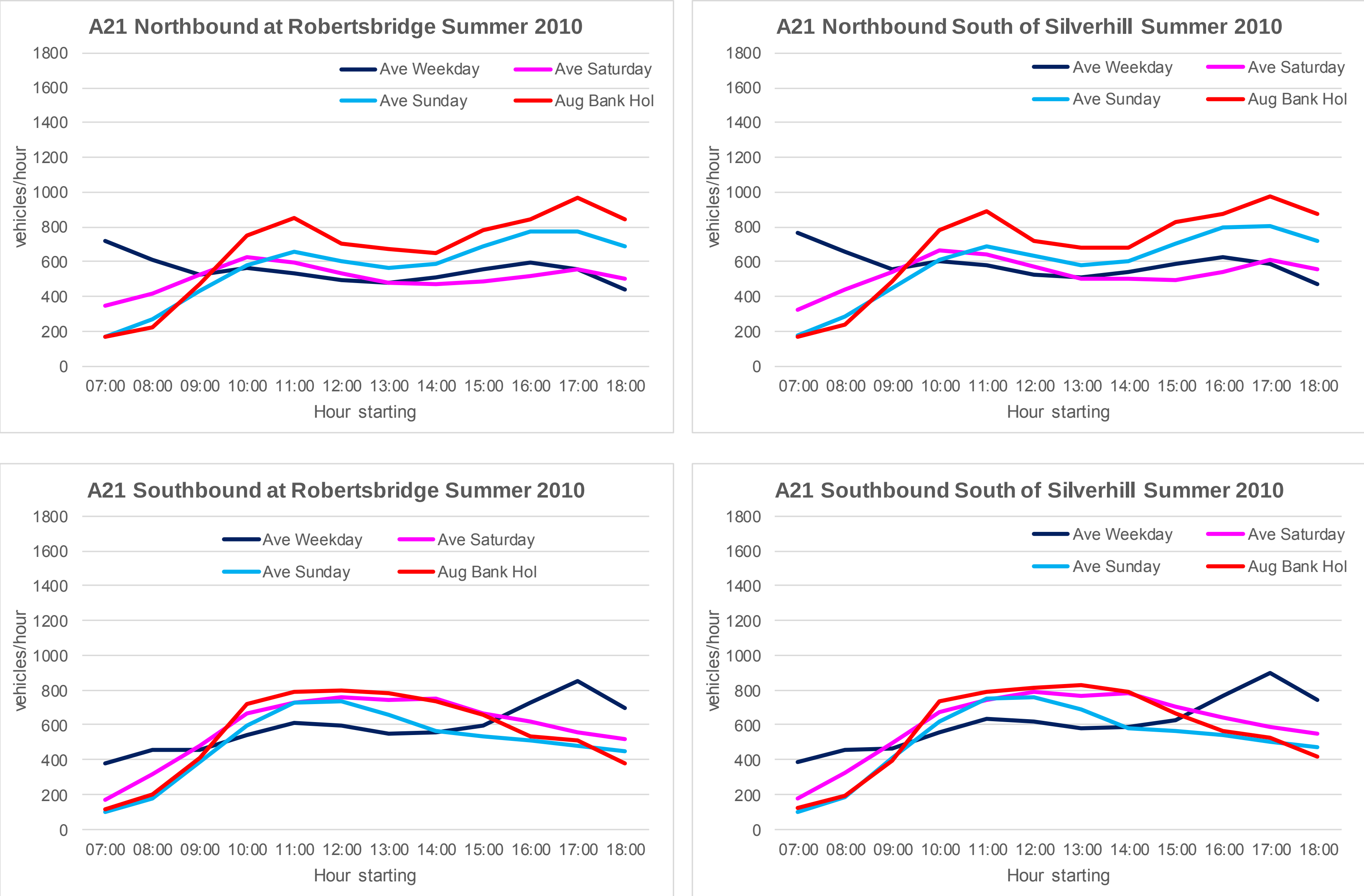
2.2.5 **Figures 7** and **8** give the resultant estimated traffic flows on the A21 at Robertsbridge in 2017, with 2010 flows shown for comparison. As noted earlier, the changes between 2010 and 2017 are limited, with some increases on Sundays and on the August Bank Holiday but reduced flow on the May Bank Holiday.

Figure 2: A21 Traffic Flows in Spring 2010



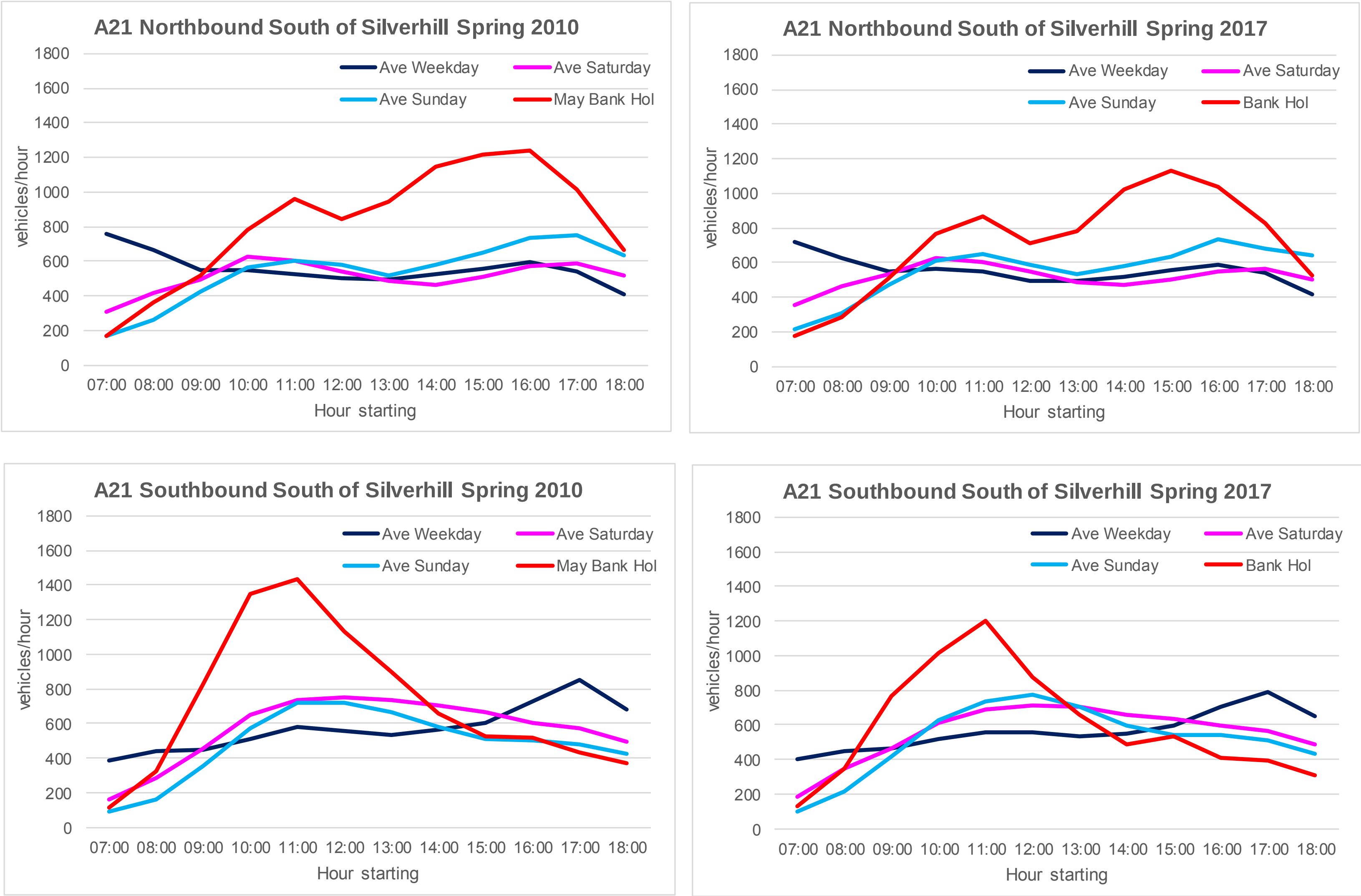
Source: http://webtris.highwaysengland.co.uk/#

Figure 3: A21 Traffic Flows in Summer 2010



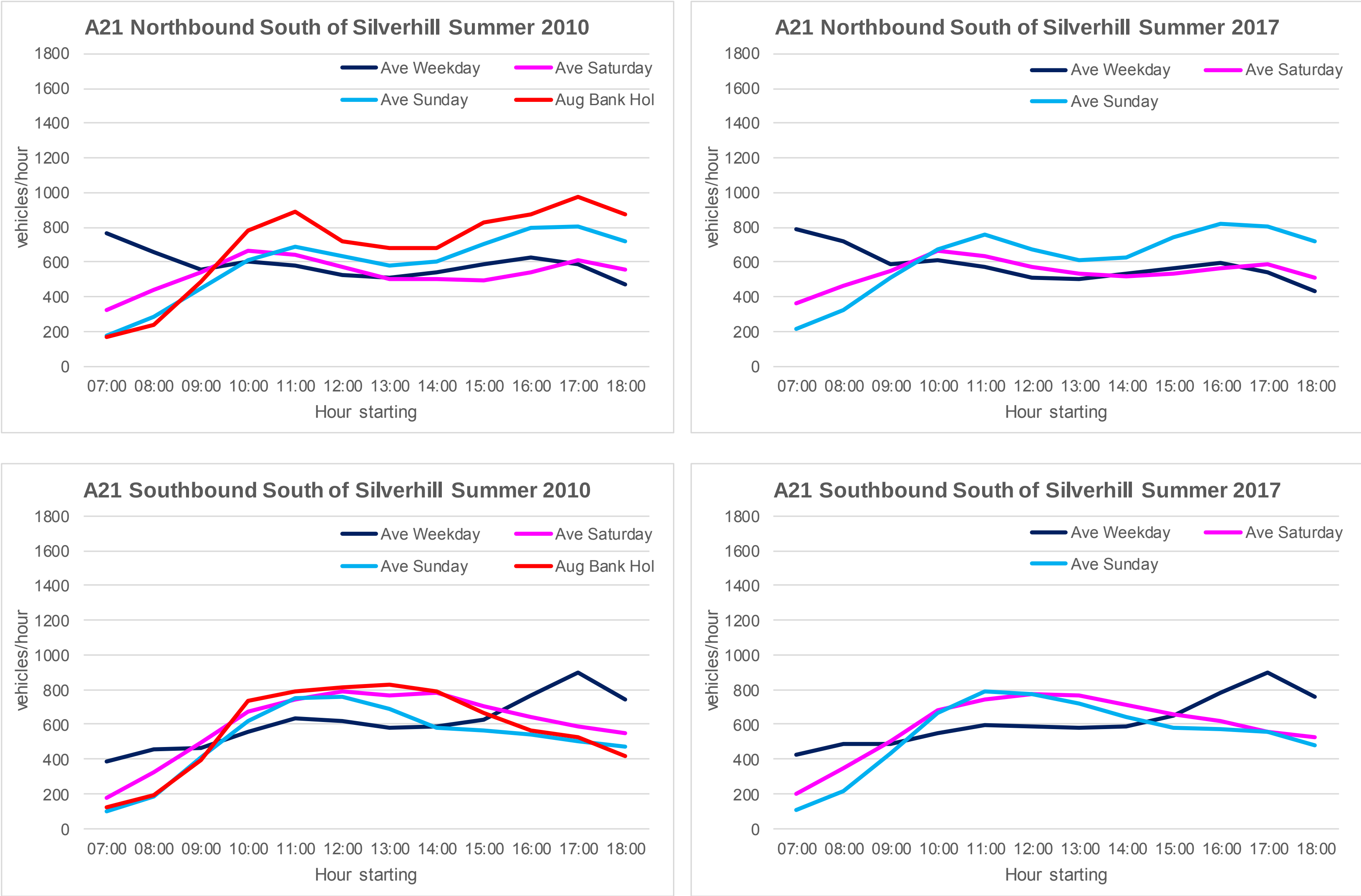
Source: http://webtris.highwaysengland.co.uk/#

Figure 4: A21 Traffic Flows South of Silverhill in Spring 2010 and 2017



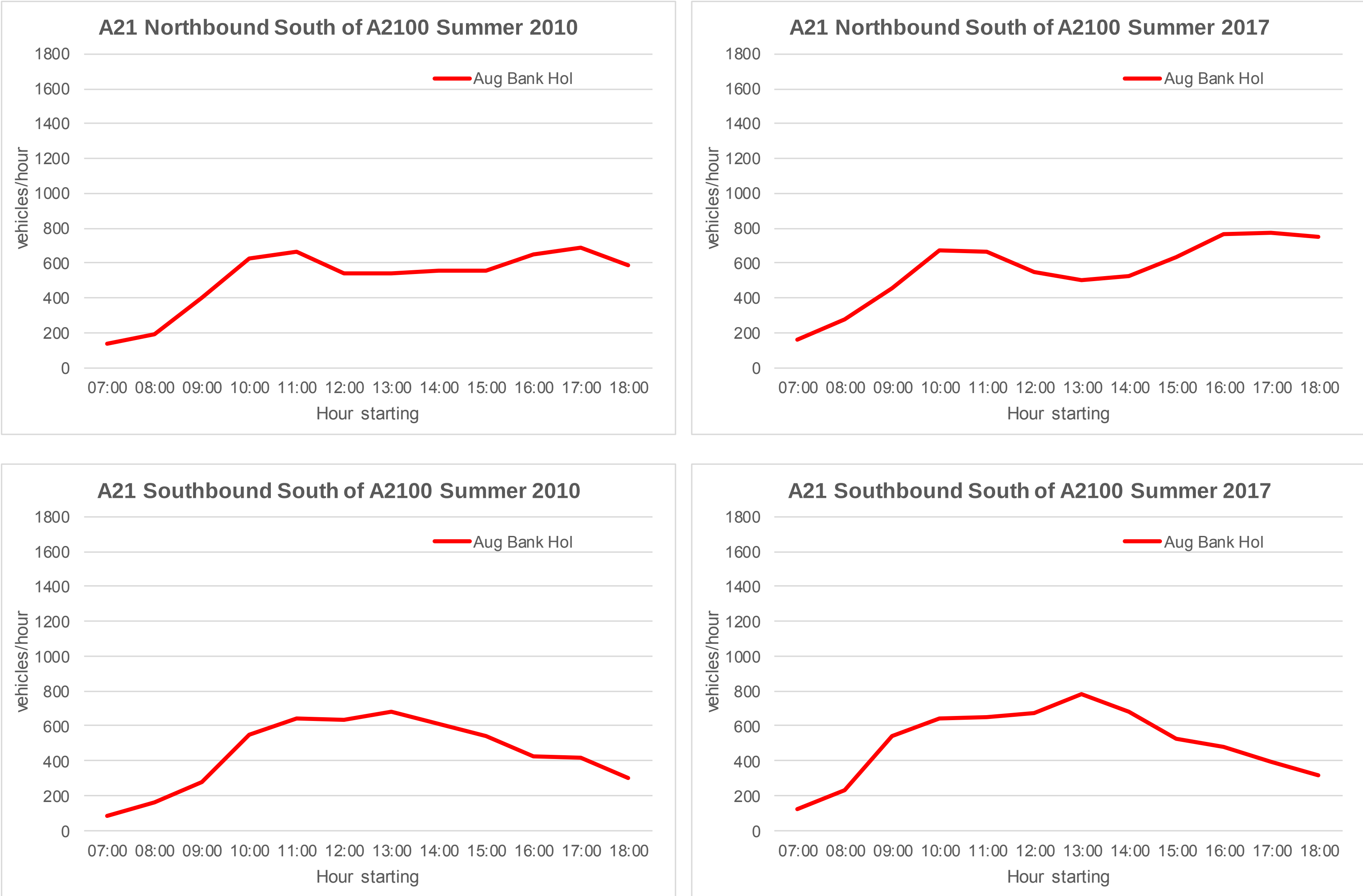
Source: http://webtris.highwaysengland.co.uk/#

Figure 5: A21 Traffic Flows South of Silverhill in Summer 2010 and 2017



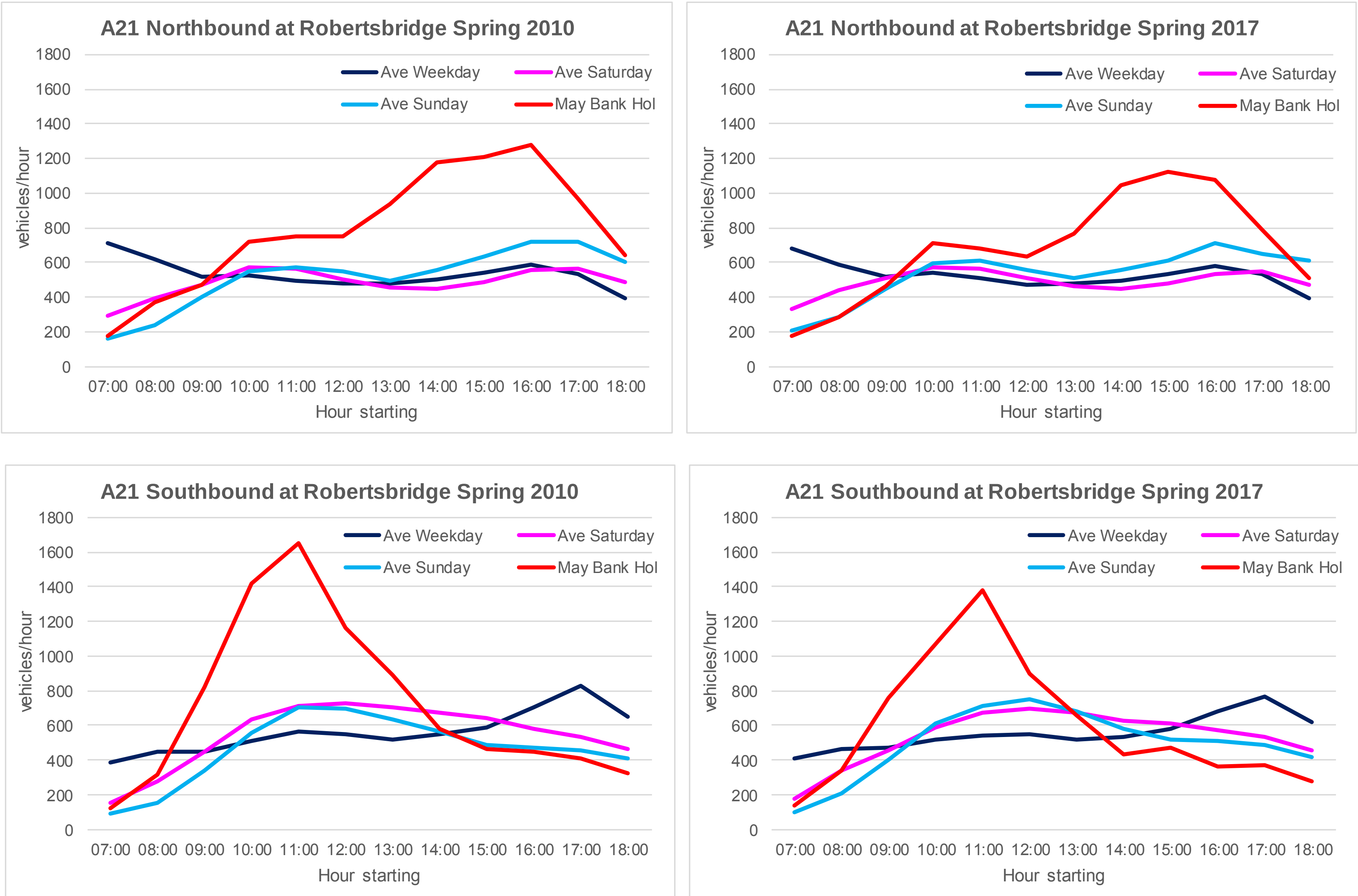
Source: http://webtris.highwaysengland.co.uk/#

Figure 6: A21 Traffic Flows South of A2100 Junction – August Bank Holiday in 2010 and 2017



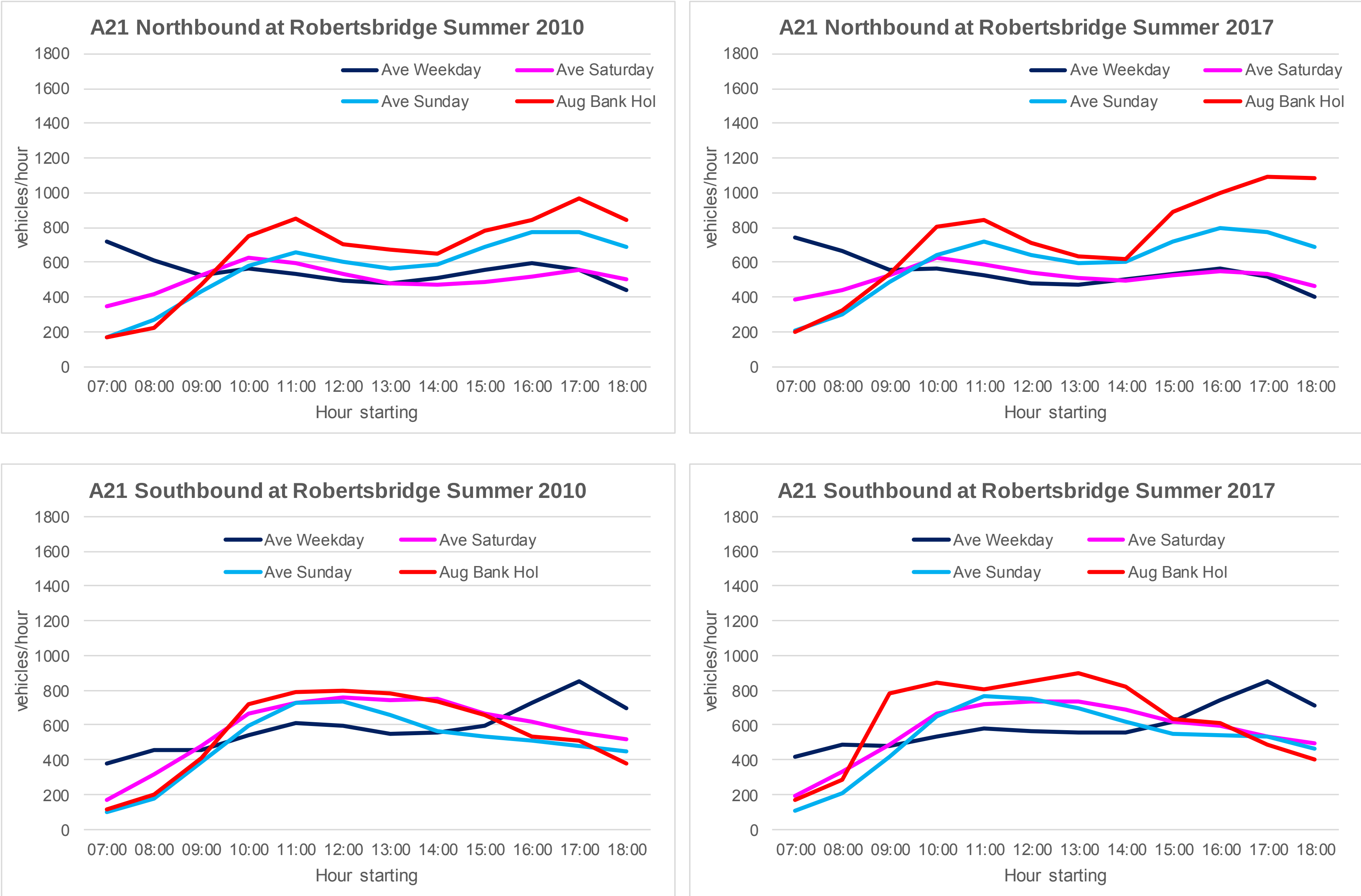
Source: http://webtris.highwaysengland.co.uk/#

Figure 7: A21 Traffic Flows at Robertsbridge in Spring 2010 and 2017



Source: http://webtris.highwaysengland.co.uk/#

Figure 8: A21 Traffic Flows at Robertsbridge in Summer 2010 and 2017



Source: http://webtris.highwaysengland.co.uk/#

2.3 B2244 Junction Road

2.3.1 **Figures 9** and **10** compare traffic flows on the B2244 Junction Road, for Spring and Summer months, based on ATC data provided by ESCC.

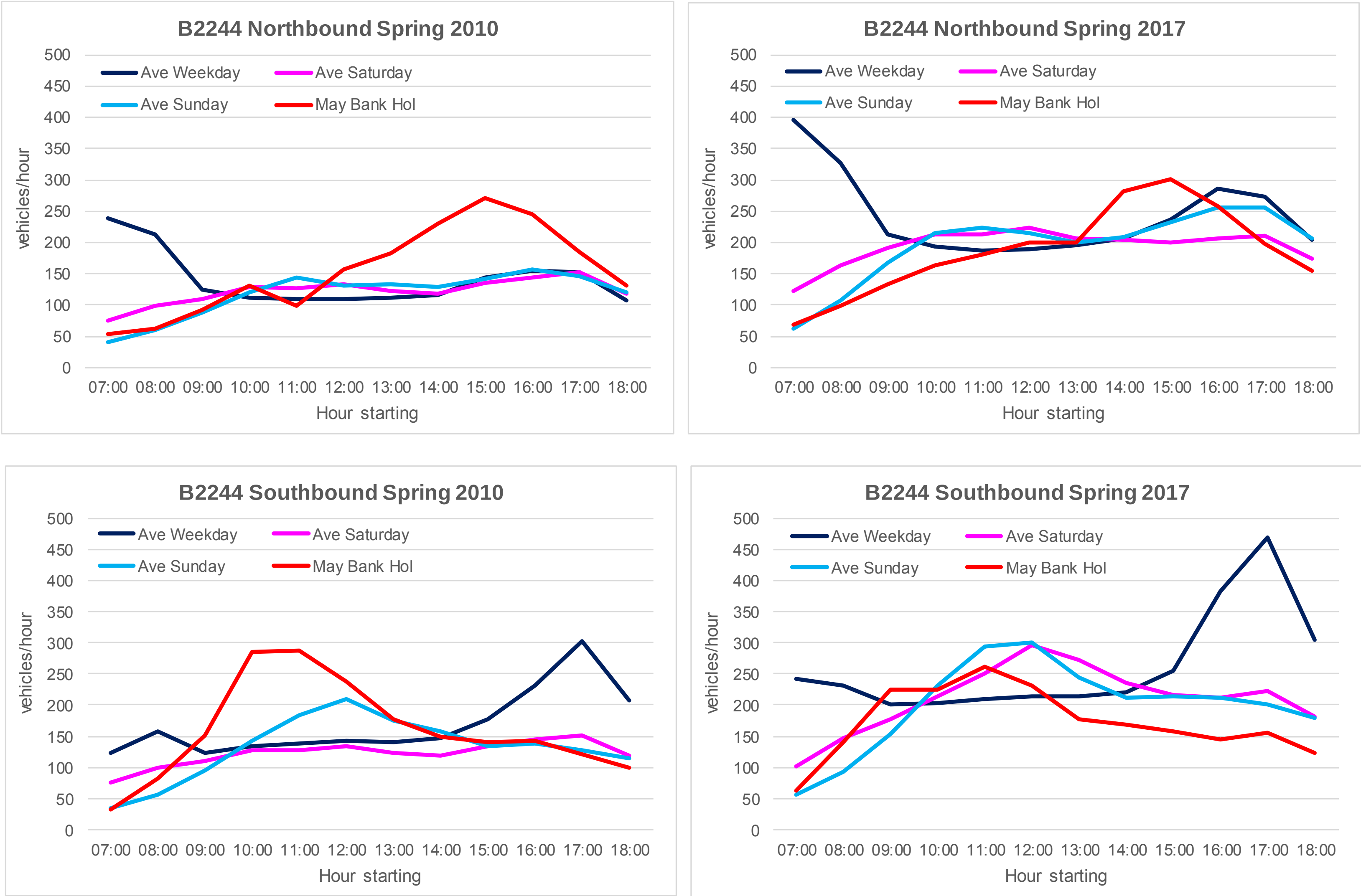
2.3.2 For most days and periods, there have been large proportional increases in flow, but volumes remain much lower than on the A21. Increases are highest for the weekday AM and PM peak periods (northbound 07:00-09:00 and southbound 16:00-18:00), as well as on the August Bank Holiday.

2.4 Northbridge Street

2.4.1 **Figure 11** compares traffic flows on Northbridge Street to the west of the A21 Roundabout for 2010 and 2018.

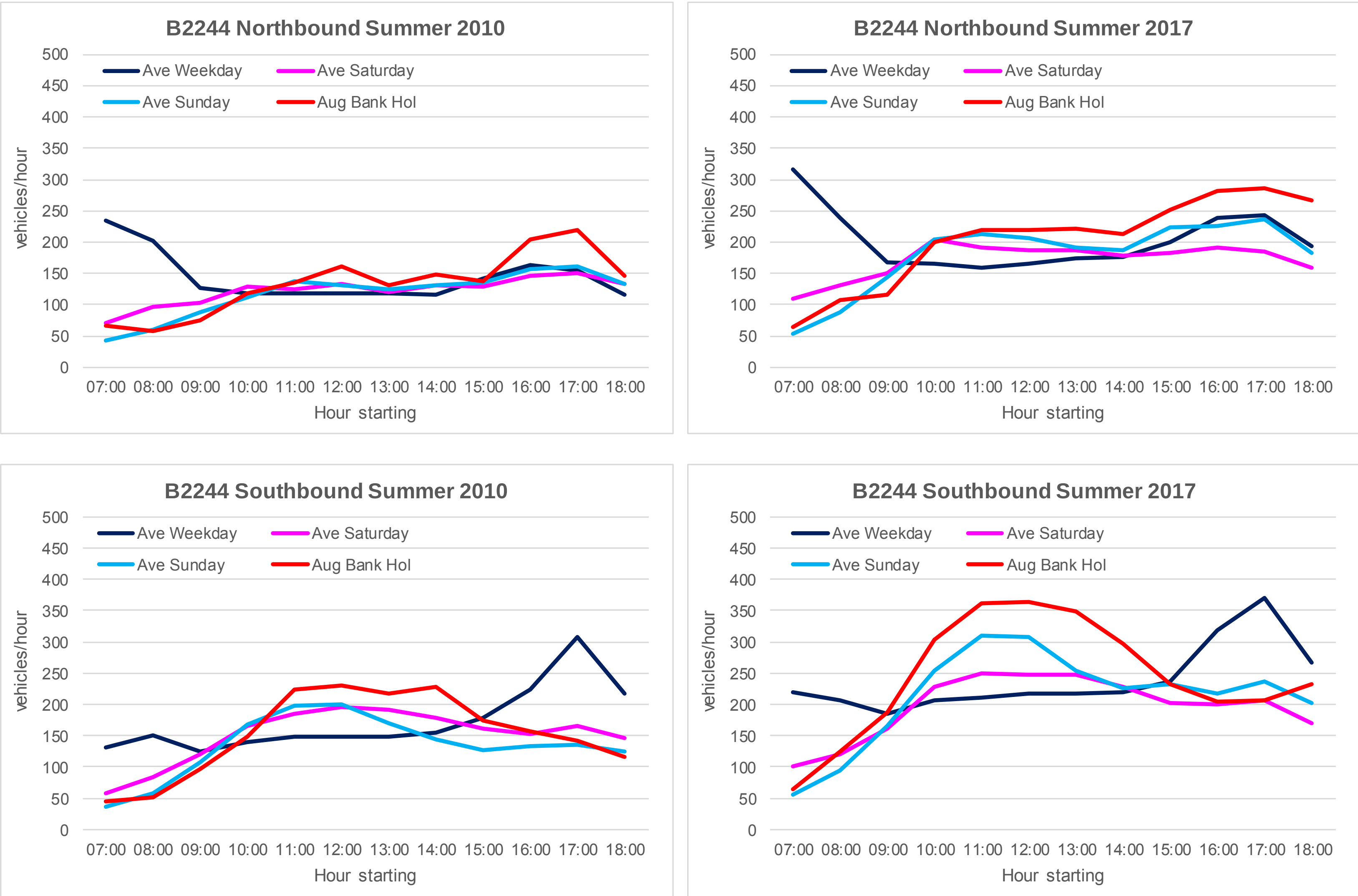
2.4.2 Flows are generally higher throughout the day but remain relatively low, although large increases are shown for the westbound direction between 16:00-19:00.

Figure 9: B2244 Traffic Flows in Spring 2010 and 2017



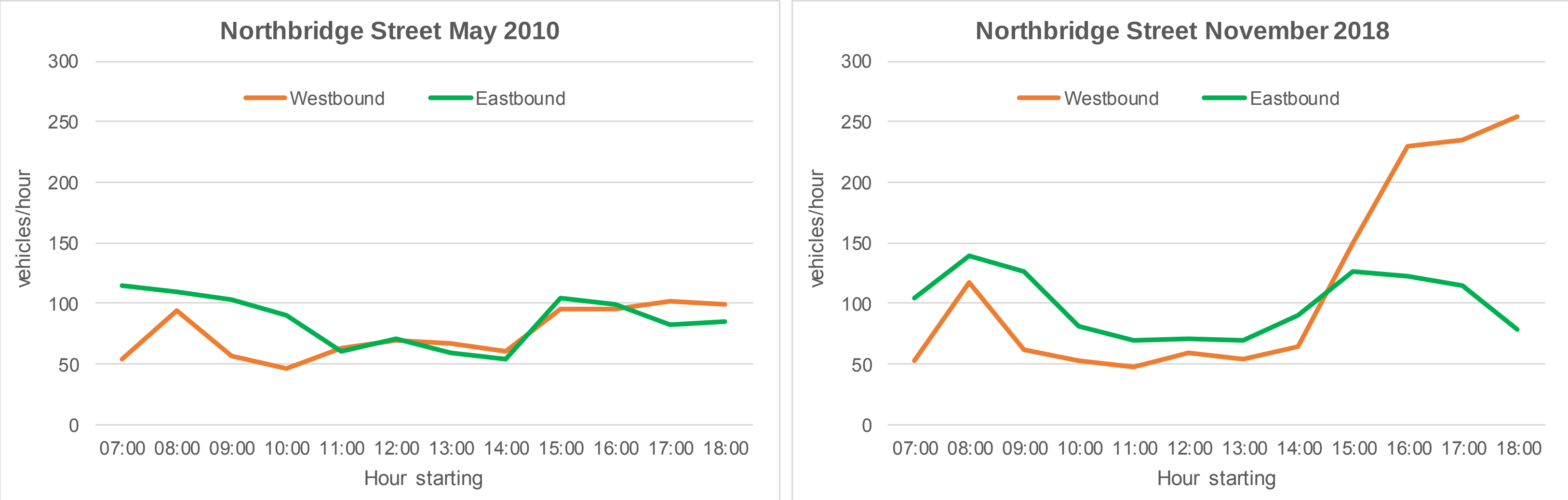
Source: ESCC ATC Site 021

Figure 10: B2244 Traffic Flows in Summer 2010 and 2017



Source: ESCC ATC Site 021

Figure 11: Northbridge Street Traffic Flows in 2010 and 2018



Source: ESCC Turning counts at A21 Roundabout on 14 September 2010 and 15 November 2018

3 Queuing Analysis

3.1 Introduction

3.1.1 As for the previous work, queuing at the level crossings has been estimated with a spreadsheet model, based on average vehicle demand per minute during the hour of each barrier closure, as well as length of time that the barrier is down. A barrier closure time of 55 seconds has been assumed, with sensitivity testing with a 110-second closure.

3.1.2 Queue lengths have been estimated with 2017 traffic demand (2018 for Northbridge Street) and predicted demand in 2021 and 2027.

3.2 Traffic Growth for Future Years

3.2.1 Traffic forecasts have been produced for 2021 and 2027 using TEMPRO version 7.2 with National Transport Model (NTM) factors (NTM dataset AF15). To calculate growth factors for the A21 and B2244 the planning data for East Sussex has been used in TEMPRO and for the C18 Northbridge Street data for Rother District. The NTM factors for a “Rural Minor” road type have then been applied to the TEMPRO factors for the C18 and B2244 and “Rural Trunk” road type for the A21 to calculate the overall traffic growth predicted, as detailed in **Tables 1** and **2**.

3.2.2 For Bank Holidays, it has been assumed that growth will be the same as for Sundays.

Table 1: Traffic Growth Factors 2017-2021

Road Name	Region	Road Type	Average Weekday	Average Saturday	Average Sunday	May Bank Holiday	August Bank Holiday
Northbridge Street	Rother District	Rural Minor	1.062	1.060	1.061	1.061	1.061
A21 Robertsbridge Bypass	East Sussex	Rural Trunk	1.078	1.076	1.077	1.077	1.077
B2244 Junction Road	East Sussex	Rural Minor	1.063	1.061	1.061	1.061	1.061

Source: TEMPRO 7.2

Table 2: Traffic Growth Factors 2017-2027

Road Name	Region	Road Type	Average Weekday	Average Saturday	Average Sunday	May Bank Holiday	August Bank Holiday
C18 Northbridge Street	Rother District	Rural Minor	1.151	1.152	1.154	1.154	1.154
A21 Robertsbridge Bypass	East Sussex	Rural Trunk	1.175	1.174	1.176	1.176	1.176
B2244 Junction Road	East Sussex	Rural Minor	1.150	1.149	1.150	1.150	1.150

Source: TEMPRO 7.2

3.3 Predicted Queue Lengths

3.3.1 **Tables 3-5** show the predicted queue lengths on the A21, B2244 and Northbridge Street, with a 55-second closure.

3.3.2 For the A21, maximum queue lengths of 60m-70m are predicted for 2017 weekdays, Saturdays and Sundays, increasing to 100m-120m on the Bank Holidays. With traffic growth, these queue lengths steadily increase to 2027. The southbound queue length is only predicted to exceed 140m (the length from the level crossing back to the roundabout) on the May Bank Holiday in 2027 and even then it is only just exceeded at 143m.

3.3.3 The May Bank Holiday queue lengths are less than predicted previously because the traffic data show that flows on this day have reduced between 2010 and 2017. Furthermore, the traffic demand predicted for 2027 remains below the saturation flow assumed for ‘freeflow’ movements at the level crossing of 30 vehicles/minute (1,800 vehicles/hour). This was not the case previously and this is what caused very long queues to be predicted.

3.3.4 For the B2244, predicted maximum queue lengths are 20m-30m in 2017, increasing to around 30m-40m in 2027.

3.3.5 Similarly, predicted maximum queue lengths are low for Northbridge Road at 20m in 2017 and 23m in 2027.

3.3.6 Queue length results with a 110-second closure are shown in **Tables 6-8**, as sensitivity tests.

3.3.7 For the A21, maximum queue lengths of 100m-150m are predicted for weekdays, Saturdays and Sundays, increasing to 160m-240m on the Bank Holidays. With traffic growth, these corresponding queue lengths increase to 120m-180m and 190m-290m by 2027.

3.3.8 For the B2244, predicted maximum queue lengths are 40m-70m in 2017, increasing to around 40m-80m in 2027.

3.3.9 Predicted maximum queue lengths for Northbridge Road are 20m-30m in 2017 and 30m-40m in 2027.

Table 3: Predicted Queue Lengths at A21 Level Crossing

	2017 Northbound		2017 Southbound		2021 Northbound		2021 Southbound		2027 Northbound		2027 Southbound	
	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
Spring/Autumn												
Weekday	51	45	60	49	55	49	65	53	60	53	71	57
Saturday	50	45	61	56	54	48	66	60	59	52	72	66
Sunday	62	52	66	54	67	56	71	58	73	61	78	64
May BH	99	75	121	62	106	81	131	66	116	89	143	72
Summer												
Weekday	50	45	74	54	54	49	80	58	59	53	88	63
Saturday	55	47	65	59	59	51	70	64	65	56	76	70
Sunday	70	60	67	57	75	64	72	61	82	70	79	67
Aug BH	96	70	79	67	103	76	85	72	113	83	93	79

Source: Mott MacDonald analysis of existing and predicted traffic volumes, queue lengths in metres assuming 5.75m/vehicle

Table 4: Predicted Queue Lengths at B2244 Level Crossing

	2017 Northbound		2017 Southbound		2021 Northbound		2021 Southbound		2027 Northbound		2027 Southbound	
	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
Spring/Autumn												
Weekday	25	19	34	21	27	20	36	22	29	21	39	24
Saturday	20	18	26	21	21	19	28	23	23	21	30	25
Sunday	23	20	26	21	24	21	28	22	26	22	30	24
May BH	26	20	23	16	28	21	24	17	30	23	26	19
Summer												
Weekday	21	17	33	21	23	18	35	23	25	19	37	25
Saturday	18	17	22	20	19	18	23	21	21	19	25	23
Sunday	21	18	27	22	22	19	29	24	24	21	31	26
Aug BH	25	21	32	26	27	22	34	28	29	24	37	30

Source: Mott MacDonald analysis of existing and predicted traffic volumes, queue lengths in metres assuming 5.75m/vehicle

Table 5: Predicted Queue Lengths at Northbridge Street Level Crossing

	2017 Westbound		2017 Eastbound		2021 Westbound		2021 Eastbound		2027 Westbound		2027 Eastbound	
	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
Spring/Autumn												
Weekday	20	8	11	8	21	8	12	8	23	9	13	9

Source: Mott MacDonald analysis of existing and predicted traffic volumes, queue lengths in metres assuming 5.75m/vehicle

Table 6: Predicted Queue Lengths at A21 Level Crossing with 110 Second Closure

	2017 Northbound		2017 Southbound		2021 Northbound		2021 Southbound		2027 Northbound		2027 Southbound	
	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
Spring/Autumn												
Weekday	101	90	120	98	109	97	130	105	119	106	141	115
Saturday	101	89	122	112	108	96	131	121	118	105	143	132
Sunday	125	104	132	108	134	112	142	117	147	122	155	127
May BH	197	151	243	123	213	162	261	133	232	177	285	145
Summer												
Weekday	100	90	149	108	108	97	161	116	117	106	175	127
Saturday	110	95	129	118	118	102	139	127	129	111	152	139
Sunday	140	119	134	114	150	129	144	122	164	140	158	134
Aug BH	192	141	158	134	206	152	170	145	225	165	186	158

Source: Mott MacDonald analysis of existing and predicted traffic volumes, queue lengths in metres assuming 5.75m/vehicle

Table 7: Predicted Queue Lengths at B2244 Level Crossing with 110 Second Closure

	2017 Northbound		2017 Southbound		2021 Northbound		2021 Southbound		2027 Northbound		2027 Southbound	
	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
Spring/Autumn												
Weekday	50	37	67	42	54	39	71	44	58	43	77	48
Saturday	39	37	52	43	42	39	55	45	45	42	60	49
Sunday	45	39	53	42	48	42	56	45	52	45	61	48
May BH	53	39	46	33	56	42	49	35	61	45	53	38
Summer												
Weekday	43	33	65	43	46	35	69	46	49	38	75	49
Saturday	36	33	44	40	38	35	46	43	41	38	50	46
Sunday	41	37	55	45	44	39	58	47	48	42	63	51
Aug BH	50	42	64	52	54	44	68	55	58	48	73	60

Source: Mott MacDonald analysis of existing and predicted traffic volumes, queue lengths in metres assuming 5.75m/vehicle

Table 8: Predicted Queue Lengths at Northbridge Street Level Crossing with 110 Second Closure

	2017 Westbound		2017 Eastbound		2021 Westbound		2021 Eastbound		2027 Westbound		2027 Eastbound	
	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
Spring/Autumn												
Weekday	40	16	22	16	43	17	24	17	46	18	26	18

Source: Mott MacDonald analysis of existing and predicted traffic volumes, queue lengths in metres assuming 5.75m/vehicle

3.4 Conclusions

3.4.1 On the A21 at Robertsbridge the changes in traffic demand between 2010 and 2017 are limited with minimal changes on weekdays, some increases on Sundays and on the August Bank Holiday but reduced flow on the May Bank Holiday.

3.4.2 On the B2244, there have been large proportional increases in flow for most days and periods, but volumes remain much lower than on the A21. Increases are highest for the weekday AM and PM peak periods (northbound 07:00-09:00 and southbound 16:00-18:00), as well as on the August Bank Holiday.

3.4.3 On Northbridge Street to the west of the A21 Roundabout 2018 flows are generally higher throughout the day but remain relatively low, although large increases are shown for the westbound direction between 16:00-19:00.

3.4.4 At the level crossing locations, predicted maximum queue lengths on the A21 are 60m-70m on weekdays, Saturdays and Sundays, increasing to 100m-120m on the Bank Holidays, using 2017 traffic demand.

3.4.5 With traffic growth, these queue lengths increase to 2027 although the southbound queue length is only predicted to exceed 140m (the length from the level crossing back to the roundabout) on the May Bank Holiday in 2027 and even then it is only just exceeded at 143m.

3.4.6 For the B2244, predicted maximum queue lengths are 20m-30m in 2017, increasing to around 30m-40m in 2027.

3.4.7 Similarly, predicted maximum queue lengths are low for Northbridge Road at 20m in 2017 and 23m in 2027.

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Rother Valley Railway

Proposed Rail Extension

A21(T) Crossing Options Feasibility Report

REP/239025/R002

Issue | 4 July 2019

Job number 239025-00

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		Name	Jonny Murrells	Jonathan Portlock	Jonathan Portlock
		Signature			
		Filename			
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		Name			
		Signature			
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		Name			
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			Prepared by	Checked by	Approved by
		Name			
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Costing Report

Appendix D

RVR Fully worked up estimate of actual cost to RVR of constructing level crossing (Option 1)

Executive Summary

The Rother Valley Railway is located between the mainline station at Robertsbridge (on the London and Hastings Line) and the existing Kent and East Sussex Railway, which runs between Tenterden and Bodiam.

When completed, the Rother Valley Railway will restore railway transport links between the main line railway system from Robertsbridge Junction to Bodiam and the Kent & East Sussex Railway and the attractions it serves. The railway already has full planning consent which incorporates arrangements for crossing a number of roads. The key focus of this report is the four options to cross the A21(T) Robertsbridge bypass (described below).

The options assessment has considered the feasibility and (industry standard) construction costs of each option so as to provide a “like for like” comparison between the option, as summarised in Table 1.

In addition, the assessment reports the actual cost estimate for delivery of the level crossing, as worked up by RVR for the purposes of the planning consent, granted in March 2017, and the application for Transport and Works Order submitted in April 2018. It is noted that it is not possible to advance a similar worked up costing for the other three crossing options because RVR would not be equipped to design and construct them “in-house”. It is therefore appropriate for a further comparison to be made between the fully worked up costs of implementation of Option 1 by RVR and the “industry standard” costs of Options 2 to 4. This is included in Table 1.

Option 1, involving an at-grade level crossing, introduces the fewest engineering challenges and is likely to involve the least disruption during construction. This option formed part of the design for the railway that received planning permission in March 2017. Construction costs for this option are the lowest.

Option 2 looks at the feasibility of taking the rail beneath the existing road. Principal engineering and approval challenges are around the railway being placed below the level of the adjacent River Rother. Mitigation of this is likely to require a long length of waterproof trough structure, with significant engineering challenges, including maintenance of water flow paths during flood events and long-term pumping requirements. Disruption to local residents and road users is likely to be most significant with this option and it would require significant additional land from third party landowners.

Option 3 considers the potential to take the rail over the existing road. This scheme introduces a sizeable length of elevated viaduct structure which will have significant impact on cost and visual intrusion. Construction duration for this option is also likely to enhance the difficulties around gaining acceptance for this option from the relevant authorities. Again, this option would require significant additional land take from third party landowners.

Option 4, involving vertical realignment of the existing highway will result in a series of engineering works for both the road and rail. Extension of existing 40mph speed restrictions close to the roundabout are likely to be required for this option with long temporary highway diversions and prolonged construction durations relevant to this option.

RVR have stated that they have already undertaken significant work on the project in the anticipation of Option One. As referred to above, following detailed studies and designs, extensive discussion and liaison with all the key authorities, RVR has full Planning Approval for this Option. Paragraph 6.7.1 of the report to the Rother District Council planning committee in March 2017 recorded that "*Bridges and/or tunnels are not a feasible option in this case and in the circumstances, the installation of a barrier-operated rail crossing over each of the roads is proposed in the application*." RVR has the engineering expertise to construct the level crossing option and has a detailed cost estimate, utilising quotes from existing sub-contractors. It is understood that RVR has already purchased a proportion of the key materials needed, as described in the RVR Cost Estimate at Appendix D.

Table 1 provides a summary of the main features of each option in relation to the key categories considered. Using industry standard allowances, Option 1 is some £4.5M cheaper than the least expensive alternative option (Option 4), rendering those other options very significantly more expensive in the context of the overall £5.3 million costs of building this single track railway (as set out in RVR's Estimate of Costs submitted with its application for TWAO). If one compares Option 4 with the actual costs of the level crossing, then the difference is £9.8M (a ratio of 7.5:1).

Table 1 – Referenced Documents

Option	Structures	Highway/Traffic	Flooding	Environment	Maintenance	Cost
1 At grade level crossing	Rail embankment Level Crossing Flood relief bridges and culverts	Most impact on permanent traffic flows H&S concerns associated with level crossings to be mitigated Least impact on traffic during construction	Modelling and FRA completed showing minimal effect to the wider area	Low land take Neutral impact on visual Best recreates the historic route Minor footpath diversions Low embodied CO2	Maintenance requirements for level crossing Maintenance and inspection of flood relief bridges and culverts	£6.8M
2 Rail under existing highway	U-Shaped RC trough A21 road bridge Inverted siphons for watercourses and flood relief	Temporary diversion required during construction No impact on permanent traffic flows as highway remains unchanged during construction phase	Modelling and FRA would have to be redone EA likely to have significant concerns regarding the use of inverted siphons making approval of the scheme unlikely	Low land take but large volume of cut Lower visual impact Inverted siphons, pumps etc detrimental to the stream environment Footpath diversion Moderate embodied CO2	Expensive and difficult for inverted siphons Maintenance and inspections required to make railway operational after flood Maintenance and inspection of road over rail bridge	£11.8M
3 Rail over existing highway	Embankments	No impact on permanent traffic flows as highway remains unchanged Restricts future highway improvements	Modelling would have to be checked. Likely to have minimal impact on flooding in the wider area so FRA would probably not need updating	Significant construction period High embodied CO2	maintenance requirements due to height and length of viaduct structure.	£20.2M
4 Highway raised by 2m with rail under	Rail embankment A21 road bridge A21 embankment Flood relief bridges and culverts	Temporary diversion required during construction Slight impact on permanent traffic due to reduced speed limit	Modelling would have to be checked. Likely to have similar results to Option 1 so FRA would probably not need updating	Low land take Moderate impact on visual Minor footpath diversions Low embodied CO2	Maintenance and inspection of road over rail bridge Maintenance and inspection of flood relief bridges and culverts	£11.3M
RVR fully costed option 1 – at grade level crossing designed and constructed by RVR	Rail embankment Level Crossing Flood relief bridges and culverts	Most impact on permanent traffic flows H&S concerns associated with level crossings to be mitigated Least impact on traffic during construction	Modelling and FRA completed to satisfaction of EA showing minimal effect to the wider area	Low land take Slight impact on visual Best recreates the historic route Minor footpath diversions Low embodied CO^2	Maintenance requirements for level crossing Maintenance and inspection of flood relief bridges and culverts	£1.5M

1 Background

The Rother Valley Railway is located between the mainline station at Robertsbridge (on the London and Hastings Line) and the existing Kent and East Sussex Railway, which runs between Tenterden and Bodiam.

When completed, the Rother Valley Railway will restore railway transport links between the main line railway system from Robertsbridge Junction to Bodiam and the Kent & East Sussex Railway and the attractions it serves. RVR has invested a significant sum of money to deliver a main line connection to the railway and a section of running line between Robertsbridge station and Northbridge Street. The proposals outlined in this report directly connect to this section of the line.

In addition to the construction of bridges and embankments to cross the flood plain of the River Rother, the railway must incorporate appropriate arrangements for crossing a number of roads. These are Northbridge Street (The Clappers), A21(T) Robertsbridge bypass and B2244 Junction Road. The railway must also cross a bridleway. Key to the scheme is the selection of a solution for crossing the A21 Robertsbridge Bypass.

Over a number of years significant work has been completed by Rother Valley Railway (RVR) and its partners to explore the feasibility of reinstating the missing railway link between Bodiam and Robertsbridge. This includes exploration into the impact of the scheme on issues such as flooding, road safety and ecology.

In addition to the previous work, Arup has modelled potential highway and rail alignments within a 3d drafting package. Further checks including highway junction sighting, confirmation of structural spans/extents and a series of bulk earthwork estimates were completed. This work was then used by Arup to inform an order of magnitude costing exercise for each option to provide a representative comparison between options, as a further mechanism to inform feasibility, rather than to provide any form of construction stage budget.

This report describes the scheme in general, discussing the various constraints and solutions and then discusses the four main options for the A21 crossing in more detail.

2 Summary of Available Information

The following reports, studies and drawings are relevant to the submission. If required they can be obtained by contacting RVR.

No.	Reference	Title	Author	Date
[1]	313090-ITD-ITQ-006-A	Highway Assessment Report	Mott MacDonald	Nov 12
[2]	A21 tech note_ 20110515	Level crossing technical note	John C. Sreeves	May 11
[3]	RotherValley Railway_FRA_June 2016	RVR Flood Risk Assessment	Capita	Jun 16
[4]	Rother Valley Railway_FRA_Modelling Report_2016	RVR Flood Risk Assessment Modelling report 2016	Capita	Jun 16
[5]	REP/239025/R001	RVR – A21 (T) Alignment review	Arup	Dec 14
[6]	Railway Safety Publication 7	Level Crossings: A guide for managers, designers and operators	ORR	Dec 11
[7]	DMRB TD19/06	Requirement for Road Restraint Systems	DoT	Aug 06
[8]	TIS_Addendum	Addendum to Traffic Impact Study	Mott MacDonald	Dec 06
[9]	Statement of Case	TWAO 1992 RVR Statement of Case of the Applicant	RVR	2018
[10]	RVR 24 ES non tech Vol 1	Environmental Statement, Volume 1 Non technical summary	Temple Group Ltd	Jun 14
[11]	RVR-QS-001	GRIP 2 Cost Estimate	Arup	Feb 19
[12]	RIG-2014-06	New level crossings – How ORR applies its policy of no new level crossings unless there are exceptional circumstances	ORR	Aug 2018

Table 2 - Referenced Documents

		Drawings		
No.	**Reference**	**Title**	**Author**	**Date**
[D1]	RVR-S-001	Sections CH 0-2100	RVR	Feb 18
[D2]	RVR-EW-005	A21 Crossing Options	RVR	Jul 18
[D3]	239025-A21-G-001	Option 1 GA	Arup	Feb 19
[D4]	239025-A21-G-002	Option 2 GA	Arup	Feb 19
[D5]	239025-A21-G-003	Option 3 GA	Arup	Feb 19
[D6]	239025-A21-G-004	Option 4 GA	Arup	Feb 19
[D7]	C.950.G.102	A21(T) Robertsbridge Bypass General Arrangement	Arup	Feb 15

Table 3 – Referenced Documents

3 Location and Scheme Description

3.1 Location

The proposed rail line extension is in East Sussex, located between Robertsbridge Junction and Bodiam, around 20 miles north of Hastings in East Sussex.

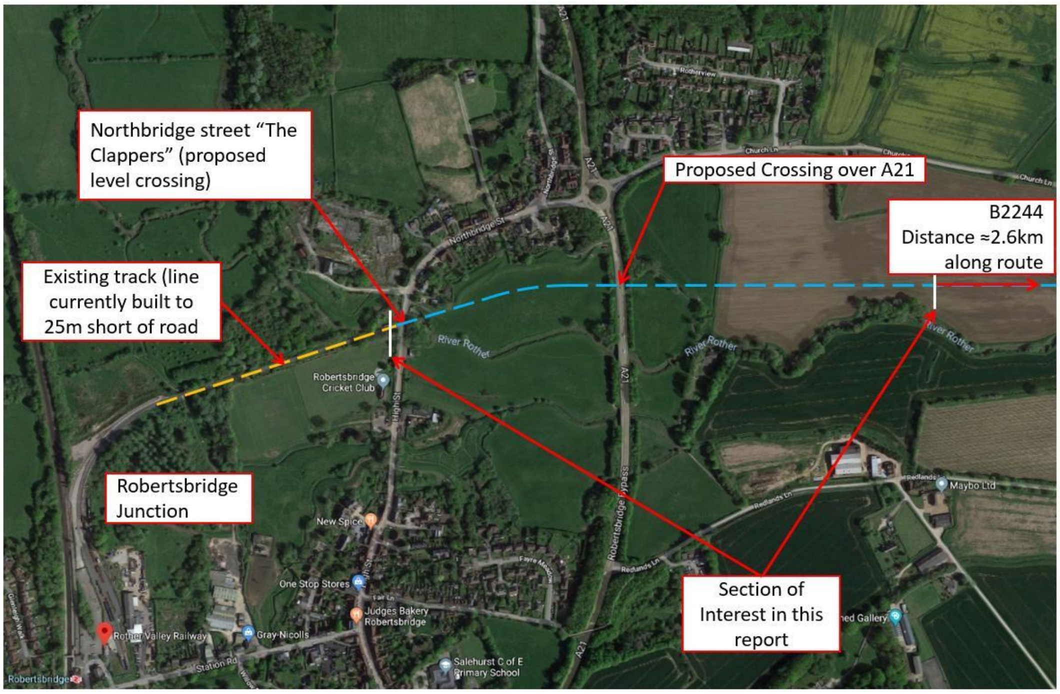


Figure 1 - Proposed location of RVR A21 crossing

This report will mainly focus on the first 1km of proposed route, heading east from the end of the existing track before the Clappers Crossing to just beyond the A21 as shown in Figure 1.

Chainage markers based on work previously undertaken by RVR will be used to describe key locations. They are based on locations by chainage and are tabulated below:

Approx. Chainage	Description
814	Northbridge street “The Clappers” crossing
1122	A21(T) Robertsbridge bypass crossing
1450	Point at which line returns to desired levels

Table 4 – Key features with chainage

3.2 Scheme Description

Rother Valley Railway plans to reopen the historic route, linking with an existing section of heritage railway at Bodiam. The section of railway which RVR is seeking to complete is termed "the missing link" which is the section of former railway corridor, approximately 3.42km long, running from Junction Road (the B2244) in Udiam to the Clappers crossing in Robertsbridge. The intention is that the proposed route crosses the floodplain, following the alignment of the historic route. At isolated locations minor deviations may be required.

3.2.1 Horizontal alignment

As noted the aim is to rebuild the railway as close as possible to the historic alignment. RVR has achieved this by overlaying the 1972 1:2,500 Ordnance Survey mapping onto the current mapping. The only minor deviation to the original alignment is around the A21 crossing where a new flood relief culvert has been built on the line of the original railway. To minimise disruption and to maintain sufficient separation between the two structures the proposed rail alignment has been relocated around 5m to the north.

From Robertsbridge station the proposed line heads eastwards, crossing the Northbridge Street/Clappers Road at coordinates 573819, 124014. Following this, the line continues to head eastward approximately 300m before meeting the main A21 Robertsbridge bypass at coordinates 574118, 124080. The line then runs roughly parallel to the river on the northern bank until it ties into the existing Kent and East Sussex Railway immediately after crossing the B2244 at coordinates 577100, 124268.

Drawing RVR-S-001 [D1] in Appendix A gives further detail on the proposed horizontal alignment.

3.2.2 Vertical alignment

In addition to a number of river crossings the proposed route involves the crossing of three existing highway routes;

1) The Clappers (Northbridge Street, Robertsbridge);

2) A21(T) Robertsbridge Junction bypass; and
3) B2244 Junction Road.

From a vertical alignment perspective, an at grade level crossing at existing road levels would be the most practicable solution.

For the purpose of this report, the Clappers and the B2244 (Junction Road) crossings will be assumed to be at grade level crossings. No further commentary on the suitability of these junctions for at grade level crossings will be given in this report. It is however noted that similar considerations apply to these crossings as to the A21 in terms of the potential crossing options (i.e. bridges and/or tunnels). As with the A21 level crossing, each of the other crossings has extent planning consent and forms part of the scheme for which RVR is seeking a TWAO.

The introduction of level crossings to the proposed scheme requires a number of important steps to be taken, including adherence to relevant guidance and policy advice. Central to this is the Office of Rail and Road's(ORR) internal guidance relating to new levels crossings [12]. In simple terms the ORR policy is that new levels crossings should only be considered appropriate in exceptional circumstances.

Due to its status as a trunk road, under the remit of Highways England, any consideration of introducing a level crossing to the A21 Robertsbridge bypass is likely to attract increased scrutiny. The purpose of this report is to summarise the various engineering options or alternative methods of crossing the A21, reviewing and, where necessary, extending on the feasibility work undertaken to date.

Outline costing has been undertaken for the options considered. The purpose of this is not to determine an actual construction cost but more to give a representative figure to allow comparison of the relative costs between the options and to understand the order of magnitude.

3.2.3 Fixed points

Northbridge Street/Clappers Junction

A number of challenges exist in altering road levels at Northbridge street.

Clappers Junction

These include:

Proximity to flood gate still crossing the road (~33m to sill);

Proximity to residential properties;

Based on the above and a desire to minimise wider disruption to adjacent properties and road users, alteration from the current road levels is not considered feasible. Therefore, for the purpose of this report the levels at the Clappers junction will be assumed to be fixed. The current elevation is 11.54mOD.

A21 Crossing

The existing road levels at the location where the proposed rail crosses the existing A21 is between 11.10m and 11.49m. More details will be given on anticipated rail levels in subsequent sections of this report. Some of the options alter levels at this point.

300m East of A21

The B2244 crossing is around 2.9km east of the A21 crossing, hence the vertical alignment around the area of the A21 crossing is not sensitive to the levels at the B2244. For the purposes of this options report any work involving the vertical alignment will target a level matching that of the Northbridge street road crossing, i.e. 11.54m at a roughly equivalent distance to the east of the A21. As noted a chainage of 1450 will be assumed.

Based on this, two fixed levels are introduced into the scheme roughly equidistant from the A21, the level for both will be taken as 11.54m.

3.3 Structures

3.3.1 Consideration of Design Presented by RVR

Drawings RVR-S-001[D1] and RVR-EW-005[D2] provide information on the number and extent of the various structures required along the length of the route considered. These drawings only consider the at grade option but are suitable for the purpose of identifying the location of key features to be crossed in all options. These are indicated as generic structural types at this stage. Broadly these comprise: level crossings over highways; rail over larger culverts (typically box culverts); smaller diameter pipe culverts; steel girder bridges taking rail over river/road; and a reinforced concrete integral box structure supporting the road with the rail placed underneath.

Individual structures are listed out below for more information.

Approx. chainage	structure type	obstacle crossed	RVR Identifier	approx. span
839	rail bridge	River Rother	bridge no. 6	12.0
855	culvert	Flood Relief	bridge no. 7	0.75
920	culvert	Flood Relief	culvert no. 8	0.75
943	rail bridge	Flood Relief & Drainage ditch/river	bridge no. 8	6
1070	culvert	Flood Relief & Drainage ditch/river	culvert no. 9	0.75
1085	rail bridge	Flood Relief & Drainage ditch/river	culvert no. 10	0.75
1120	varies	A21 crossing	varies	Varies

1150	culvert	Flood Relief & Drainage	culvert no. 11	0.75
		ditch		
1205	rail bridge	Mill stream & Flood Relief	bridge no. 12	10.2
1245	rail bridge	Flood Relief viaduct	bridge no. 13	30
1280	culvert	Flood Relief & drainage ditch	culvert no. 14	0.75
1360	rail bridge	Flood Relief	bridge no. 15	60

Table 5 – List of Structures

The potential variation of the above structures between the various options will be discussed in more detail in later sections.

3.4 Highways

For Options 1 to 3, variations in existing road levels are not generally being proposed. This includes both horizontal and vertical alignments. Whilst no changes are being made to the alignments, both rail over road and rail under road options introduce additional risks to the highway, through the form of new hazards in the verge. Mitigation of these risks e.g. via relevant set-backs and verge widths has been considered as part of the engineering proposals described.

Option 4 describes the potential to raise the vertical alignment of the A21, allowing the rail to pass beneath the road but at a higher level than Option 2. This option does not propose to alter the horizontal alignment of the road.

Consideration of increased street lighting provisions and review of existing speed restrictions are both potential risk reduction strategies relevant to all options. Alongside this a Road Restraints Risk Assessment Process (RRRAP) would be required to determine how to best avoid, reduce or control any residual risks. At this stage it is expected that a Vehicle Restraint System would be recommended for a distance in advance of the over/under bridges for options 2-4.

3.5 Flooding

Capita were commissioned to do a flood risk assessment [3] for the 3.4km length of proposed reinstated railway. Work undertake by Capita assumes the railway is reinstated to (approximately) historic levels; i.e. Option 1 as described in this report hence includes relatively low embankments and at grade level crossings over all three highways. The Purpose of the FRA was to determine the flood risk to the development and whether that risk is acceptable and to determine whether the development has an impact on flood risk to other properties.

Arup understands (from the Statement of Case) that the Environment Agency worked closely with Capita throughout the flood modelling and provided input into a number of flood mitigation measures, particularly the introduction of additional culverts beneath the rail line, which have since been incorporated into designs and documents developed by RVR. All options described in this report continue to include the additional structures agreed with the Environment Agency.

3.5.1 Flood risk to the Proposed Railway

In regards to fluvial flooding it is proposed to build most of the railway within flood zone 3a (annual probability >1% or 1:100yrs) but partially within the functional floodplain (annual probability of flooding >5% or 1:20yrs). Railways are usually classified as "less vulnerable". A "less vulnerable" development would be accepted in flood zone 3a but not within the functional floodplain (according to the Planning Practice Guidance). However, the Capita report notes that there is a case forgrading this railway as "water compatible" because it is a recreational railway line not vital infrastructure, It is therefore possible to close the line if flooding is predicted. Where a railway is accepted as a "water compatible" development, then that would be acceptable for construction within the functional floodplain.

The danger would be if passengers were to get stranded on a flooded train. The operator would have procedures in place to manage and mitigate this risk. Such measureswould be likely to include signing up to the flood warnings and having procedures in place to shut down and evacuate the line should a flood warning be issued.

According to the Capita report, fluvial flood risk is the biggest issue and the other flood mechanisms are less important. Surface water flooding is categorised as low to medium risk along the route.This will require that the culverts operate properly to prevent water ponding more than currently. Sea, reservoir and ground water are all low or non-existent.

Following review, Arup consider this approach to be logical. It also notes that the railway has planning consent under the Town and Country Planning Act 1990 and that the Environment Agency has withdrawn its objection to the proposed TWAO.

It is logical to assume that the Environment Agency has already accepted the above classification of the scheme as "water compatible".

The Capita FRA also applied the sequential and exception tests which aim to try and steer developments away from high risk areas. However Capita states that as the purpose of the proposed development is to connect two existing lines along a historic route within the floodplain there is little other option. Looking at the maps it does not look like they can move the route outside flood zone 3 and still connect the two existing lines, hence on this basis Arup agree with the interpretation.

3.5.2 Impacts on Flood Risk

As part of the above review Capita also explored the impact the proposed railway would have on flooding to other properties. To do this it undertook flood modelling of the area in a number of different return periods with and without the railway in place. An existing model provided by the Environment Agency was used with updates appropriate to the proposed works. Modelling was done using

Flood Modeller (ISIS) and TUFLOW. The updates to the model are detailed in the modelling report [4] and were done to fix errors and anomalous results found.

It is noted that verifying these minor modifications is not possible within the scope of Arup's work, although we note that on the face of it they seem to be sensible. The purpose of the modelling was to get comparative results therefore any modelling errors will be in both the 'with' and 'without railway' model runs and therefore the comparison should be valid. Capita detailed the various assumptions it made in the modelling. Again, it is beyond Arup's scope to verify them all but, in general, they all seem to be reasonable. The assumption that all the proposed culverts will be built is a particularly important one as this will allow the flood water to cross the embankment and reach the entire floodplain.

Results from the model comparison show no increase in flood risk to residential properties with the proposed rail line in place. It shows very minor increase in flood depth to fields in certain places and minor reductions in others. A lot of these differences are within the tolerance of the model and can therefore be discounted as negligible. The overall conclusion in the Capita report is that the track will not have a detrimental impact on flooding in the area. Again, it is noted that the Environment Agency and local planning authority have already approved the proposals and that the modelling was done in collaboration with the Environment Agency.

As noted, the work by Capita explores the impacts of an at grade solution, i.e. Option 1. No flood modelling has been undertaken on the other options covered within this report. Where Arup comments on the flood risk potential of these other options, we have based them on a review of the work undertaken by others to date. These comments are based upon considered application of engineering judgement with a view to providing further awareness on the likely impacts.

3.6 Environmental Effects

An Environmental Impact Assessment (EIA) has been carried out by Temple Group Ltd on behalf of RVR which outlines the likely impact of the proposed at grade scheme (Option 1) in relation to a range of key areas. Reference has been made to the non-technical summary for the purposes of this report.

This report provides summary on the likely impact of the proposals to the following key environmental areas:

- Noise and vibration;
- Air quality;
- Landscape and visual;
- Ecology;
- Pollution of waterways (accidental)
- Embodied CO_2based on extent of construction activities only
- Archaeology and cultural heritage

- Socio economic
- Traffic, transportation and access;
- Land use and agricultural.

The EIA report notes that mitigation measures have been proposed and committed to by RVR which if implemented would be expected to reduce the effects (of Option 1) to acceptable levels.

Arup is not aware of any work in relation to the alternative options described within this report. Detailed commentary on environmental issues will not be given, however where individual options are discussed in more detail consideration of any relative differences between options or significant changes from the existing will be highlighted. These observations on alternative options are based upon considered application of engineering judgement with a view to providing further awareness on the likely impacts. Refer to Sections 5 - 8 for more details.

3.7 Site Management

For all options, the management of access to the site for construction traffic will be critical to the impact on the community, in particular construction activities which impact upon the A21 trunk road. Clearly the potential impact on the community will vary depending on the option considered, with the level crossing (Option 1) expected to have fewer construction impacts due to the relatively limited scope of works. The following mitigation measures and control procedures have been proposed by RVR. Whilst Arup understand that these were developed on the basis ofa level crossing over the A21, they are be considered applicable to all options. These are outlined in the planning application by RVR and include:

- No direct construction access to be provided from or to the A21,
- Number of lorry movements to be minimised,
- Signage provided to control construction traffic,
- Dust suppression measures to be employed for site haul roads all construction traffic.

3.7.1 Utilities

In accordance with ‘Groundwise’ Services search dated 28/01/15, the following summarises the utilities present at the A21 crossing:

- BT – 2No. lines of underground plant either side of the A21. Another line and pole are present 20m east of the existing A21 in line with the intended path of the railway.
- Southern Gas Networks – LP mains either side of the A21
- Southern Water (sewers) – No indication of services by the A21

- South East Water – 200mm diameter water main
- UK Power Networks – No services by the A21

Any solution involving taking the railway across the A21 will therefore need to consider in detail the existing services.

Based on typical depth to buried services, any road crossing options at grade will require protection or diversion of the BT, LP Gas and water.

Depending on depth and location, options taking rail over existing road may allow services to remain in place. However, liaison with providers will have to take place to agree any necessary protection or access requirements. Options taking rail under existing road will require diversions for the existing services to allow works to proceed. Provision for diverted services may be required in structures crossing the A21.

Due to the low number and relatively small scale of these services, it is considered likely that in all cases diversion of the services may be the most economic approach and should be considered in advance of detailed design. It is noted that the TWAO includes the usual protective provisions for statutory undertakers and that there are no objections to the application (i.e. including level crossing) by utilities.

4 Review of Proposed Options

Four key options for the crossing of the A21 have been explored. In summary these include:

Option 1 – At grade level crossing

Option 2 – Rail under existing highway

Option 3 – Rail over existing highway

Option 4 – Highway raised by 2m with rail under

This report will examine each option in more detail and provide a summary of available information on each.

4.1 Costings

A costing exercise has been undertaken to provide comparison between the four options for an extension of the Rother Valley Railway.

This cost estimate is for the purpose of providing a high-level comparison and is not intended to provide a budget estimate for construction. The estimate offers an indicative forecast of the likely costs of construction of civil engineering elements of the project only. See costing report in Appendix C.

Costs are provided to a level roughly equivalent with Network Rail GRIP 2 stage.

They include reasonable (industry standard) assumptions for civil engineering design, delivery and construction costs for provision of the main elements of the scheme between chainages 800 and 1350. A full list of costing assumptions is provided within the costings report (Appendix C). However, it is worth noting that the cost of the individual structures – as standalone elements – has not been calculated. It stands to reason that, if one excludes the common works between those chainages and simply looks at the elements required to get across the A21, the comparative costs between the laying of a level crossing and construction of complex alternative structures are even more different.

They do not include for costs associated with licensing, permissions or land acquisition.

In addition to these costings, we have included in this report the worked up costings for implementing Option 1 prepared by RVR for the purposes of its TWAO application. These costings are on the basis that (in common with other heritage railways) the design work and much of the construction is carried out by suitably qualified, but unpaid, volunteers with recent experience of carrying out similar work on the neighbouring Kent & East Sussex Railway and that materials are sourced from known suppliers etc. (See Appendix D.) It is understood, from RVR, that it would not be capable of delivering any of the other options on a similar basis and therefore it is not unreasonable to also allow the RVR costing for Option 1 to be compared with the ARUP costing for Options 2,3 and 4 albeit that this would not be a "like for like" comparison. The Estimate of Costs submitted with the application for TWAO contains a worked up figure of £5.3 for the entirety of the railway, of which RVR have noted that £1.5m correlates to the ch 800-1350 section as costed by Arup.

5 Option 1 – At grade level crossing

This option has been explored in some detail by RVR and is described further within reference [2]. In order to ensure the validity of this data Arup has performed a review of the work undertaken, the results of which are described below.

Generally, this option includes a relatively low volume embankment across the flood plain with an at-grade level crossing over the A21 bypass close to the Northbridge street roundabout. Planning permission has already been obtained, subject to conditions directed by the (then) Highways Agency to protect the safety and efficiency of the A21, but further statutory power is required for the crossing. The need for further statutory authority is the key approval challenge for this option.

Guidance from the ORR Railway Safety Publication 7 [reference 6] provides that "Risk control should, where practicable, be achieved through the elimination of level crossings in favour of bridges, underpasses or diversions. Where elimination is not possible, risks should be reduced so far as reasonably practicable and in accordance with the principles of protection."

More recent guidance for the ORR [12] states that "other than in exceptional circumstances [there should be] no new level crossings on any railway therefore creating no new risks". The ORR guidance explains that there would be exceptional circumstances where there is no reasonably practicable alternative to a crossing on the level at the location in question. The ORR would consider an alternative to be reasonably practicable unless it can be demonstrated that the cost is grossly disproportionate when weighed against the safety benefits.

5.1 Vertical Alignment

The rail level is fixed at Clappers road crossing with an average level of 11.54m. Similarly, the road level at the A21 averages 11.31m with maximum values of 11.49 and minimum values of 11.10m.

This results in a fall in rail levels of 230mm over a distance of approximately 300m, corresponding to a gradient of approximately 1 in 1300.

Along this stretch the proposed route crosses fields and farmland, levels vary but existing ground is generally below the proposed levels at between 9.0m and 10.0m.

5.2 Structures

An at grade level crossing creates the least challenges from a structural perspective. Culverts, bridges and underpasses for this option are generally simpler and at a smaller scale than for the other options considered.

The level crossing itself is assumed to be a prefabricated precast concrete level crossing unit placed on well compacted sub-base.

There is no change to the road alignment so no significant variations to layout or loading of existing highway structures are anticipated. No special requirements are likely for any of the river/culverted crossings within the length under consideration.

Approaches to the level crossing for this option are likely to be on relatively low embankments of around 1.0m-2.0m height. It is understood that this represents roughly equivalent levels to the historic route. As such, issues such as settlement are less likely to be a concern for this option.

Using levels taken from both road topographical surveys and lidar surveys for the wider route Arup has estimated the likely volume of embankment required for this option. Calculations are based on a simple embankment with a width of 4.5m at the base of the track bed and formed with slopes set at 1:3. The length considered is that between the proposed Clappers crossing and the point at which rail levels can generally return to optimal (i.e. chainage 1450), a distance of 640m. This modelling exercise results in an embankment volume of around 10,400 cubic metres.

A schematic for the A21 crossing (239025-A21-G-001 [D3]) is included within Appendix B which gives outline information on the general arrangement of the proposed level crossing. Document C.950.G.102 [D7] provides further detail on the level crossing and associated signage. This drawing is included within Appendix A.

5.3 Highway

5.3.1 Impact to Existing Highway (A21)

Road alignment, horizontal or vertical would not be affected. A full barriered approach, signage and signals would be introduced into the highway boundary as part of the scheme.

This level crossing is likely to have lower risks than would be associated with a typical level crossing on the national network. This is due to the following factors:

- Fewer days of operation
- Fewer trains in winter when poor weather and visibility occurs
- Slow speed of trains
- Few trains operate at night/during the hours of darkness
- Few trains operating during weekday rush hours when road traffic is heaviest and motorists are impatient
- Monitored via CCTV with an attendant crossing keeper

However, residual safety concerns associated with a level crossing will need to be addressed, and would be subject to the oversight of the ORR. The following factors are likely to have a negative safety impact:

- Infrequent operation of the crossing might cause regular motorists to not expect to find it working
- Southbound traffic backing up and blocking Northbridge Street roundabout Northbound traffic queuing back from Northbridge Street roundabout blocking the crossing

Mott Macdonald undertook a series of traffic monitoring exercises to provide a traffic impact study to explore the effect of introducing level crossings. This work was undertaken in 2011 with further monitoring work undertaken in 2018 to inform an addendum to the TIA. See Section 5.4.2 for a summary of the findings of this work.

Further mitigation measures to improve the safety of the crossing could include extending the 40mph speed limit to include the approach to the crossing; improving visibility by extending the street lighting to include the crossing and clearing vegetation on the highway embankments to allow better views of both the rail and the road. Arup has been advised that RVR is aware of these potential opportunities and has been in discussions with the relevant authorities to engage on the issues.

5.3.1.1 Stopping Sight Distance

Stopping sight distance (SSD) has been assessed in accordance with TD 9/93 Highway Link Design, Table 3 and Section 2. SSD has been assessed Northbound from a distance 1.5 x SSD from the crossing location. Southbound has been assessed from the roundabout inscribed circle diameter (ICD). The analysis has been carried out using an eye height of 1.05m, with an object height of 0.26m. SSD of 215m has been assumed, based on 100kph.

Full SSD is achieved throughout the area of the proposed crossing. Results are shown in the A21(T) Alignment Review report [5].

The Office of Rail Regulation document “Level Crossings: A Guide for Managers, Designers and Operators” [6] Table 6 outlines recommended visibility requirements to the level crossing signals based on design speed. The requirements are 200m and 90m for 100kph and 70kph respectively. As full SSD of 215m is achieved in both directions, the requirements in this document have been met.

5.4 Traffic Impact

5.4.1 Construction Phase

As noted previously, construction works for the permanent way will be accessed via alternative site access locations not on the A21. Therefore, the elements of the construction works impacting on the A21 would be, the final approaches of the trackway, the barriers, the level crossing unit itself and any highway works necessary for signs lighting, signals and barriers.

Narrow lane running with potentially night-time lane closures, and/or temporary speed restrictions, may be required on the A21 for the preparatory barrier and signal works. Minor delays may be caused as a function of these works, although mitigation measures such as working within holiday periods or working outside of commuter hours could be considered to mitigate any effects.

Installation of the track bed crossing is expected to be achieved via either single lane running over a short period or more likely a single night time road closure, allowing installation to both traffic lanes. As there are no proposals to alter highway levels the length of highway affected either side of the crossing is limited.

Clearly due to the nature of the road to be crossed, consultation with the HE would be required. This will need to include detailed proposals for the works, including construction phase programme and itemised works activity lists.

5.4.2 Operational Phase

It is suggested by RVR that there will be on average around 10 train movements per day on days when the railway is operational The delay to road traffic will be the time it takes for operation of lights, barriers, proving sequence and for a train to pass.

According to work undertaken by others, the sequence will start 27 seconds before the train arrives, it will take roughly 14 seconds for the train to pass and a further 10 seconds for the barriers to raise. Therefore, road closure will be limited to less than a minute for each train movement.

Based on this, the likelihood for queuing on the A21 has been investigated, with particular reference to the potential for negative safety impacts associated with this. A traffic impact study was undertaken by Mott MacDonald in 2011 and updated in 2018. They drew the following conclusions:

- *At the level crossing locations, predicted maximum queue lengths on the A21 are 60m-70m on weekdays, Saturdays and Sundays, increasing to 100m-120m on the Bank Holidays, using 2017 traffic demand.*

- *With traffic growth, these queue lengths increase to [the year] 2027 although the southbound queue length is only predicted to exceed 140m (the length from the level crossing back to the roundabout) on the May Bank Holiday in 2027 and even then it is only just exceeded at 143m.*

In order to limit the delays to road users, the timetable could be set up to ensure the crossing remains open during peak times. It is noted that the planning consent for the scheme includes a condition restricting the time periods within which the level crossing may be operated to avoid peak travel periods, including bank holidays.

Furthermore the rail crossing at the A21 is to include an attendant crossing keeper (refer to reference [9]) who will, where necessary, be able to control the movement of trains to mitigate against any unusual events (e.g. breakdowns or exceptional vehicles).

5.5 Flooding

The modelling work done by Capita used the at-grade level crossing option for the "with railway" scenario. Therefore, provided all relevant culverts and bridges are installed in accordance with the assumptions in that document then the conclusions drawn in section 3.5 of this report remain unchanged.

We have been advised that the FRA has been discussed in detail with the EA and has their full approval. Therefore, no further modelling/FRA work would be required for this option.

5.6 Environmental

As noted in section 3.6, environmental effects have not been considered in detail as part of this report. Through consideration of the significant differences between the four options, the standout features of this option would be:

- low level of land take and the lowest cut/fill volumes,
- slight impact from a visual perspective, and
- from a heritage perspective it is felt that this option best mirrors the levels and aesthetic of the historic route.
- there will be a minor footpath diversion to allow the path to use the same bridge as the Mill Stream.
- embodied CO_2 (due to construction and maintenance operations) for this option is low when compared to the alternative options presented within this report.

5.7 Maintenance

Level crossing infrastructure; lights barriers etc. would have to be regularly maintained to ensure they are in working order. It is assumed that maintenance of infrastructure introduced to support the introduction of a level crossing would be the responsibility of RVR, with regular reporting back to the ORR and HE as required.

To improve visibility vegetation along the road around the level crossing would have to be cut regularly.

Structures and embankments along the route would also require regular inspection and maintenance. As noted, the requirements for structures as part of this option are the least onerous; this would also translate to the requirements for inspection and maintenance.

5.8 Cost

The costs for this option include the railway embankment, bridges and culverts and the level crossing. Level crossing capital costs have been provided directly by RVR and are expected to be around £300k. The budget estimate for this option is in the region of £6.8million.

For further details refer to the costing report contained in Appendix C. There will be additional costs associated with temporary closure of a single lane and overnight road closures.

As explained elsewhere, outwith the Arup budget estimate costings provided in this report, RVR has provided specific costing information based on previous projects procured and managed by RVR. Costs utilising the 'RVR' construction model demonstrate significant savings over the industry standard allowances given in the Arup costs review exercise. RVR has provided estimated costs of £1.5million based on this model. Further discussion is provided in section 9.2 with full breakdown of the costing information supplied by RVR contained in Appendix D. In our professional judgment is not unreasonable to assume that these, much lower costs are achievable given that they are specific to this single track heritage railway line, relate to the actual costs incurred elsewhere on the Kent & East Sussex line, that the design work and much of the construction would be carried out by volunteers or local contractors and that materials would be sourced from known suppliers. Due to this delivery mechanism, the RVR experience of delivering projects this way and given the efficiencies noted by RVR, Arup consider the cost build-up provided to be credible

6 Option 2 – Rail Under Existing Road

In order to explore the feasibility of removing the level crossing over the A21, this option involves the railway being dug into a cutting that passes under the existing A21 road. The level of the A21 would remain unchanged.

6.1 Vertical Alignment

The ORR Guidance on Minor Railways defines the headroom and lateral clearance requirements for new bridges over railways. They set the minimum headroom at 4.572m or 15'. As it is not a modern railway and it is unlikely the route will be electrified in the future then it is likely that a reduced headroom would be allowable.

Prior to 1977 the guidance was given in the "Blue Book" (Requirements for Passenger Lines and Recommendations for Goods Lines, 1950) and provided that the absolute minimum headroom value should be the load gauge plus 6'. By limiting the height of permanent and visiting rolling stock this value could potentially be reduced to 4.115m (13'6") which would be sufficient for W6a rolling stock (including the Flying Scotsman). However, this would require authorisation from the ORR. The minimum lateral distance between the abutments would be 4.673m (15'4").

For this option the highway level remains the same due to the complications involved with raising it. The two main issues being the vertical alignment on the approaches to the crossing and roundabout and the potential to reduce visibility to queueing cars. Also altering the road level could mean having to make modifications to the two culverts nearby as the loadings will change.

Based on the span, of less than 5m, a reinforced concrete structure is likely to represent the most appropriate structural form. In terms of structural depth, the minimum likely to achieve sufficient capacity would be a slab, around 400mm thick, with 120mm non-structural depth above for road surfacing and any waterproofing requirements.

Based on the above and an existing road level of 11.10m and the minimum vertical clearance noted above, it is possible to determine the minimum suitable rail running level beneath the A21.

- ⇨ 11.10 – 4.115 - 0.4 – 0.12 = 6.46mOD. = rail level

Further allowing 370mm for rail head and sleepers plus a minimum of 200mm ballast below with a nominal allowance for construction tolerance and vertical curves (~40mm) then an approximate formation level can be calculated.

- 6.46 – 0.37 – 0.2 -0.04 = 5.85mOD = track formation level

Based on the above and the level at the Clappers junction, an approximate gradient can be calculated, noting that the two crossings are separated by 306m.

Work undertaken by others notes that vertical curves of 900m and 600m are required at the west and east ends respectively. Account for this results in a peak gradient of around 1 in 57 over a length of around 280m.

Work within this report includes for a similar gradient to the east of the A21, although space exists for a more relaxed gradient should this be preferred. This gradient, whilst possible, is considered to be extremely steep in Permanent Way terms.

It should be noted that the rail vertical alignment described above is outside the best practice guidance and may result in unforeseen design challenges. Therefore, any further, more detailed, design work may identify areas where alterations to the alignment are required. As alignments are already at extreme values there is little scope for amendment within allowable gradients. As such any changes from the values proposed have a high risk of altering the overall levels achievable, making this option highly sensitive.

Noting that the water levels of the adjacent River Rother are around +7.0mOD, this formation level is below the level of the river. Based on similar gradients in both directions the formation level sits below river level for a distance of at least 75m in each direction. An allowance of double this to account for variation in river levels seems reasonable giving a minimum length of 150m in each direction and increasing the size of the structure considerably.

6.2 Structures

Two main structural challenges arise out of this option. This first being the need for a structural solution to the A21 road over the railway below, and the second being the fact that for a significant length the line is below the level of the adjacent River Rother.

As noted previously a reinforced concrete integral box is likely to represent a suitable structural form. This aligns with previous work undertaken, which noted that this form removes the need for movement joints and bearings, thus reducing maintenance liability. Ground pressures under a box would be reduced significantly over other solutions, which would likely have significant benefit in terms of the foundation solution. Whilst ground investigation (GI) has not been completed it is considered reasonable to assume that this form of solution could be supported on the existing geological formation at this depth.

As the structure, likely a reinforced concrete box structure, sits below ambient water levels then the trough structure will need to prevent ingress of water. As this structure would sit below water levels, buoyancy would need to be prevented. This would necessitate some form of holding down system (e.g. ground anchors or piles) or alternatively a thicker (heavier) cross section to add weight.

Despite attempts to prevent water ingress, pumping of the section of the line would still be required. This would need to be sized to deal with the likely levels of water entering the trough under typical rain events and from leakage ingress. Inundation of the system, such as under a large-scale flood event would require temporary closure of the railway until levels returned to normal and any remedial works completed to remove all water and any silt. Timescales would depend on the scale of the flood event but would likely be a number of days, if not weeks.

It is expected that the walls of the U-shaped trough would have to extend above ground levels by around 1m to prevent flood water from high frequency events from flooding the track.

As explained in section 5.2, Arup has estimated the likely volume of cut required for this option. Calculations are based on a U-shaped box with a width of 7m at the base of the track bed. Again the length considered in calculations is 640m. This modelling exercise results in a cut volume of around 5000 cubic metres.

There is a box culvert under the A21 located to the south of the proposed crossing. This may be affected by the construction of the railway under the road and therefore may require replacing/strengthening or moving.

A schematic for the A21 crossing is included as 239025-A21-G-002 [D4] within Appendix B.

Other more minor structural works are likely to be required for this option. For example works to divert the footpath adjacent to Mill Stream will need to consider the level changes, without compromising the waterproof nature of the trough.

6.3 Highway

6.3.1 Impact to Existing Highway (A21)

Following completion of the works the vertical alignment would not be affected. Approach to the road bridge would need to be considered as part of a RRRAP process but would likely involve Vehicle Restraint Systems and a full H4a parapet to protect vehicles from impact with the structure at the crossing.

6.4 Traffic Impact

6.4.1 Construction Phase

Significant structural works are required in the vicinity of the A21 for this option. It is therefore reasonable to assume that construction of a temporary diversion would be required in advance of construction for this option. Whilst no detailed assessment work has been carried out, we would anticipate this would need to take the form of a short temporary bypass diversion located on third party land around 50m to the east of the existing road. Due to the level differences from the A21 to adjacent ground levels the temporary works associated with a diversion would be significant. The diversion would likely require a total length in excess of 400m, 2No. small span road bridges and a minimum of 2No. culverts.

We would anticipate that the construction works for this option would take a minimum of 6 months and potentially as long as 12 months to complete.

6.4.2 Operational Phase

Following completion of the construction works the highway would be reinstated back to current levels. Based on this, the effect on traffic flows in the operational phase is expected to remain as currently.

Significant routine maintenance and inspection would be required, but this is not envisaged to have adverse impacts on traffic flows or highway users.

6.5 Flooding

Building a deep cutting in the flood plain would create a number of challenges for the operation of the railway. As noted above, the formation level for the railway would be around 5.85m, excluding the depth of structural concrete required for the u-trough. This is approximately 1m below the average river bed level in the area and therefore will put the railway line below the water-table (how far below will vary throughout the year).

In addition to the issues of constructing a railway below the water table, the proposed line of the route would effectively sever a number of watercourses and surface water flow paths, most notably the Mill Stream, which is an EA designated main river. At this location, ambient levels in the Mill Stream would be at a similar level to that of the rails. Hence, to allow water to cross the proposed tracks it would have to pass beneath the trough structure using an inverted siphon. This would create a pinch-point in the stream that could back up during higher flow events, could also become blocked, and would therefore potentially increase flood risk in the area during higher frequency events.

The proposed Mill Stream bridge, along with a second large viaduct, serve as flood relief culverts in extreme events and they are a requirement in the FRA. Some form of inverted siphon system beneath the structure would be required to replace these proposed structures. In addition to the issues mentioned above, inverted siphons would not function as efficiently as a culvert in flood conditions and therefore would be detrimental to the flood relief requirements.

Given the designation of the Mill Stream as a main river and the sensitivity of the wider floodplain to water flows across the line of the proposed route, we would consider it unlikely that the Environment Agency would approve the introduction of inverted siphons in this area.

As this option puts rail levels below existing ground levels, preventing flood water from flowing into the U-shaped trough would be an engineering challenge. To combat this, we would anticipate that the walls of the trough would need to extend approximately 1m above existing ground level, tying into embankments at either end. However, even this would be unlikely to prevent flooding of the troughs in larger flood events. Higher walls would also increase visual impact and engineering complexity to prevent buoyancy of the trough. Whilst solutions may exist, in general these would act to increase the environmental impact and construction costs of this option.

During low frequency major flood events overtopping of the trough walls is likely. On this basis, the flood plain would be likely to behave in a similar way to the current situation. However, during smaller flood events (higher frequency) the trough would act to sever water flow paths thereby increasing flood risk to surrounding properties.

No flood modelling has been done for this option, so the flood model and FRA would both have to be updated in order to gain approval from the Environment Agency. It is not certain that an affordable, viable solution, where flood risk to the surrounding area remains unchanged, could be found for this option.

6.6 Environmental

Through consideration of the significant differences between the four options, the standout features of this option would be:

- Relatively low level of permanent land take but higher levels of earthworks cut
- Lower visual and noise impact since below existing ground levels
- Railway levels below existing water levels leading to pumping, siphon drain/culvert to east of A21 and potential inundation of the structure under flood events
- Inverted syphons in watercourses are barriers to habitat migration and sediment transport and are therefore very detrimental to the stream environment
- The footpath near the Mill Stream would have to be diverted to cross the rail, either by going alongside the A21 and using the bridge, or by constructing a new footbridge
- Embodied CO_2 for this option is moderate when compared to the alternative options presented within this report.

6.7 Maintenance

As discussed in section 6.5, during a flood event the section of railway within the trough structure (in cutting) would fill with flood water which would then have to be pumped dry. This means that after a flood event there would be significant additional construction cost and maintenance implications; for example, providing suitable electric and signalling equipment which would then have to be dried tested before the railway can be put back into operation. The cutting would also fill with silt and debris, which would have to be cleared. There is a risk that the track bed would eventually become clogged with silt and no longer be free draining, thus requiring replacement.

The pump would have to be tested and maintained regularly as, if it were to fail, the cutting would fill with water during rain events or if the waterproofing failed.

Structures installed specifically as part of this option; road bridge, Mill Stream siphon and around 300m of U-shaped reinforced concrete trough would require regular inspection and periodic maintenance.

Other structures, such as culverts, whilst common to all schemes may be longer or more complex in this scenario, again leading to increased inspection and maintenance challenges. Any inverted siphons would require trash screens that have to be cleared periodically. They are prone to blockages therefore additional capacity may be required to provide redundancy during extreme events, e.g. by providing multiple siphons. There are also health and safety concerns regarding the inspection and maintenance of inverted siphons due to difficulty of access and the potential that they could be filled with stagnant water.

6.8 Cost

The costs for this option include the railway U-shaped trough, bridges and culverts/inverted siphons. The budget estimate for this option is in region of £11.9million.

For further details refer to the costing report contained in Appendix C.

7 Option 3 – Rail over Existing Highway

This solution involves taking the railway above the A21, providing sufficient headroom clearance to the existing levels of the highway. There are two principal options to achieve this, namely running the railway on top of an embankment or supporting it with a viaduct structure over a significant length.

In order to achieve representative comparison between the four main options this report will focus on the viaduct option as the most practicable, although many of the issues discussed are common to both approaches. The principal reasons for taking this option forward, in place of the embankment option, are the following:

- Land: at its maximum height the embankment would be around 8.7m above existing ground levels. Assuming a 6.2m crest and 1:3 slopes, that means it would be 58m wide at ground level. It is unlikely that RVR would be able to acquire the requisite third party land for such a large footprint.

- Flood risk: As stated above the embankment would have a very large footprint in the floodplain, this would reduce the floodplain storage and alter flow paths, which would be likely to increase flood risk in the area. Compensatory flood storage would have to be provided, the flood modelling and FRA would have to be re-done, and it is unlikely that asolution acceptable to the EA could be found to maintain the current levels of flood protection.

- Visual: an 8m high embankment through and Area of Outstanding Natural Beauty is unlikely to get approval and would be less popular with local residents.

By using the viaduct solution the first two issues would be capable of being resolved. However, the visual impacts would also be a relevant for the viaduct.

Should it be considered that taking the rail over the road is worth further consideration then it is recommended that the above is revisited.

7.1 Vertical Alignment

The Highways Agency Standard TD 27/05 sets out the minimum headroom and lateral clearance requirements for new bridges. The route in question is not considered to be a high load route (HE map dated 2007 but noted as published 2012), therefore the minimum headroom required would be 5.3m. The clear span of the bridge would need to be a minimum of 14.3m, assuming a verge width of 2.5m and 9.3m of carriageway.

Based on the span of less than 15m, a steel bridge similar or equivalent to the Network Rail standard D type deck would be suitable. This structure requires a minimum of 975mm from deck soffit to running rail. Alternatively looking at the standard viaduct section (refer to 7.2) for this span it is felt reasonable to assume an equivalent depth from rail to underside of the structure.

Based on this and an existing (highest) road level of 11.487m the lowest allowable deck soffit can be found as below, an allowable construction tolerance of 50mm has been included.

⇨ 11.487 + 5.30 = 16.787mOD = deck soffit level

Further allowing 975mm for structural depth, minimum ballast, sleepers, rail and construction tolerance an approximate level for the PWay can be calculated.

- 16.787 + 0.975 + 0.05 = ~17.82mOD = track running level.

Based on this, and the level at the Clappers junction, which is taken as fixed at 11.54m, an approximate level change can be calculated. This is (17.82-11.54) 6.28m. Noting that the two crossings are separated by 306m this results in peak gradients of approximately 1 in 43 over a length of around 270m

Work undertaken by others note that vertical curves of 900m and 600m are required at the west and east ends respectively. Account for this results in a peak gradient of 1 in 45.5 over a length of around 270m.

RVR has serious concerns that gradients of this nature would both increase complexity of train operation and affect the ability of the trains to brake to a halt at crossings. Concerns of this nature would need to be considered in the protocols for use of the line and could impact allowable speed limits and/or the operational times of the level crossing (Clappers).

Work within this report includes for a similar gradient to the east of the A21, although space exists for a more relaxed gradient should this be preferred.

Therefore any further, more detailed, design work might identify areas where alternations to the alignment are required. As alignments are already at extreme values there is little scope for amendment within allowable gradients. As such, any changes from the values proposed have a high risk of effecting the overall levels achievable.

7.2 Structures

This report assumes a 50m long embankment starting at the Clappers crossing. Once it reaches around 3m in height, we would anticipate the solution change to a reinforced or prestressed concrete viaduct of approximately 500m. After the A21 crossing, when the viaduct goes back down to 3m in height, it would revert to the embankment. The bridge over the Rother adjacent to the Clappers crossing would still be required, however the viaduct would cross all the other watercourses and other obstacles in the area so there would be no need for the other bridges, culverts or footpath diversions.

Whilst detailed consideration has not been given to this solution from a structural perspective, comparison to other projects would suggest that a reinforced concrete system incorporating u-shaped trough elements acting as both the track support and structure span would likely result in the most cost-effective solution. On this basis a reinforced concrete trough structure spanning between piers at around 30m centres would be a reasonable estimate at this stage. Piers would then be supported on buried pile caps with piled foundations to limit the potential of differential settlements associated with the increased loadings.

Whilst in general the proposed route follows the line of the historic route, the viaduct is likely to result in higher surcharge values. As the ground is located within the floodplain the potential for settlement of the viaduct exists, this would need to be considered within any detailed design.

A schematic for the A21 crossing is included as 239025-A21G-003 [D5] within Appendix B.

7.3 Highway

7.3.1 Impact to Existing Highway (A21)

Following completion of the works the vertical alignment of the highway would not be affected. Approach to the rail bridge would need to be considered as part of a RRRAP process as the introduction of abutments to the road corridor would likely constitute an increased risk to road users. The outcome of this process could be the introduction of Vehicle Restraint systems or similar over a length before and after the bridge.

There are no proposals to alter the existing horizontal road alignment under this arrangement.

This option would have a significant impact on the possibility of upgrading the A21 in the future. Arup understands that various schemes for upgrading the road have been proposed previously, including dualling and grade separation of the roundabout junction to the north but there are no current proposals for any change to the existing layout. Building the viaduct over the road would severely constrain future options and may prevent the A21 from being upgraded without significant expense to work around the viaduct. This is because options to elevate the highway would also require further elevation of the railway and any widening could be constrained by the locations of the piers.

7.4 Traffic Impact

7.4.1 Construction Phase

As noted high levels of standardisation are likely to benefit this option. On that basis a clear span of around 30m would be considered appropriate at the road crossing.

Given this, it is plausible that piers and foundations could be constructed with low impact to the highway. However, economic construction of the deck structure could require road closures. If these road closures prove to be significant then a temporary diversion would be likely to be required. As the temporary diversion is not a confirmed requirement it has not been included in the cost estimate for this option, but the associated costs would be significant and would require the use of third party land.

The alternative solution of a lightweight (shorter span) steel bridge lifted in over a single closure would likely also result in similar levels of impact to the highway as construction of the abutments/piers would be in close proximity to the highway.

This option includes the most significant structural works and on this basis could have the second highest impact on local transport networks during the construction phase.

On this basis the disruption to the highway can be classified as significant with impacts likely to extend over a minimum period of 6 months.

Construction of the wider scheme would result in a prolonged period of significant disruption to local residents and ecology which is likely to be unpopular. It is not known whether a prolonged disruption of this nature would be acceptable to the residents or relevant authorities.

7.4.2 Operation Phase

Following completion of the construction works the highway would be reinstated back to current levels. Based on this, the effect on traffic flows are expected to remain as per the current situation.

7.5 Flooding

The construction of a viaduct would negate the requirement for additional culverts or bridges over the various watercourses and surface water flowpaths. Therefore this option is considered likely to have relatively similar levels of impact to flooding as those of Option 1.

This option would have to be tested in the flood model and the FRA may need updating accordingly.

7.6 Environmental

Through consideration of the significant differences between the four options, the standout features of this option would be:

- Significant visual intrusion and noise issues associated with the higher embankment. As this is an Area of Outstanding Natural Beauty (AONB), a large embankment or viaduct would need considerable justification to get approval
- Significant construction period (noise, visual disruption, construction traffic etc.)
- Embodied CO_2 for this option is high when compared to the alternative options presented within this report.

7.7 Maintenance

As noted previously this option is considered the most significant in terms of structural works. Ongoing periodic inspection and maintenance of these works would be required for the duration of the structures lifetime and, in common with Options 2 and 4, would add considerably to the operating costs of the railway.

Whilst not specifically a maintenance concern, consideration would be required to the potential for the structure to be adversely affected by flood events during which foundations would be anticipated to be submerged.

7.8 Cost

The costs for this option are based on the (cheaper) viaduct solution. Principal costs include the viaduct and approach embankments. This is by far the most expensive option with budget estimate costs in the region of £20.2million.

For further details refer to the costing report contained in Appendix C.

8 Option 4 – Rail under raised highway

Option 4 is similar to Option 2 in that it would be rail under road; however, this proposal would raise the level of the road in order to reduce the depth of the cutting.

8.1 Vertical Alignment

An assessment has been done on the potential to alter the vertical alignment of the A21 at this location. The principal constraint was taken as the A21 Robertsbridge roundabout located approximately 140m north of the proposed rail alignment. To maximise the benefits of this option over those discussed previously, a design speed of 40mph (70kph) has been used for the design of the trunk road throughout.

This option results in an allowable increase in road levels of around 2.0m above the current highway alignment. Based on the altered road levels, the introduction of a suitable bridge structure allows for rail levels to be provided at 8.5m OD at the location of the A21.

8.2 Structures

This option would have similar issues to Option 2 but they would be reduced in severity due to the reduction in the depth of the cutting. Introduction of a bridging structure to support the highway over a length of around 15m would be required, with reinforced concrete trough structures for around 60m in each direction also being needed to support existing ground levels and provide an element of flood protection to the railway.

In addition to the structures highlighted in Option 2 the road level would be raised on an embankment for a length of approximately 300m. On the basis that embankment slopes are maintained at 1 in 3 there would be a relatively sizeable increase in land take for the highway, with adjacent structures (such as the culvert) requiring extension and potentially strengthening to deal with the increased embankment volumes. An alternative solution to reduce land take would be to construct concrete retaining walls for the lengths where the embankments would extend outside the present land take. This has not been explored further or included in the costings.

8.3 Highway

8.3.1 Impact to Existing Highway (A21)

From a highways perspective, assuming a 40moh speed limit throughout, the updated alignment includes the introduction of a compliant sag curve from the roundabout, with K value of 20 in order to locally steepen the gradient up and over the rail alignment. A desirable minimum crest curve, with K value of 30 was introduced at the location of the rail line allowing the road to be brought back towards existing levels as quickly as practicable.

Sightlines and stopping sight distances were checked and could be achieved for this option.

An alternative arrangement involving the introduction of a 30mph speed limit throughout could be explored in more detail. Initial information suggests this would allow the highway to be raised by a further 1.2m. Due to the requirement for changes to A21 speed limits over a considerable length of trunk road, this option has not been explored further at this time.

8.4 Traffic Impact

8.4.1 Construction Phase

Works would be required to a significant length of the A21 to construct this option. As with Option 2, this proposal would be likely to require construction of a temporary diversion of the A21 with all the attendant issues. Whilst no detailed assessment work has been carried out, we would anticipate this would need to take the form of a short temporary bypass diversion located around 50m to the east of the existing road. Due to the level differences from the A21 to adjacent ground levels the temporary works associated with a diversion would be significant. The diversion would likely require a total length in excess of 400m, 2No. small span road bridges and a minimum of 2No. culverts.

We would anticipate that the construction works for this option would take a minimum of 9 months and potential as long as 18 months to complete.

8.4.2 Operation Phase

The vertical alignment of the A21 would include exacerbated changes in gradient over that currently present. In order to remain within desirable values outlined in the relevant design documents there would be a requirement to extend the current 40mph speed restriction for a longer duration, thereby covering the full length of highway affected by the works.

8.5 Flooding

It is expected that this option would be able to incorporate all the bridges and culverts in Option 1 unaltered. if so, the modelling work and FRA would also apply to this option and the conclusions drawn would remain the same.

The railway would be at a lower level as compared to Option 1; therefore it is likely that the track will flood more frequently and require more closures, although the current model results suggest that this will only occur in the 1:20yr event.

The A21 does not currently overtop in the 1:100yr +climate change event, therefore raising the road further should not impact the floodplain connectivity. However there could be an increase in the footprint of the road embankment which would affect floodplain storage. This could be minimised by using retaining walls rather than battered slopes and would be offset by the reduction in rail embankment size. It is therefore unlikely that additional culverts would be required to maintain the current levels of flood risk.

It would be advisable to run this option through the flood model to ensure that there is no change to the results gained from Option 1 and ensure the FRA does not need updating.

8.6 Environmental

Through consideration of the significant differences between the four options, the standout features of this option would be:

- Relatively low permanent third party land take but higher levels of earthworks cut offset by higher landtake around the highway for embankments to support the higher road levels required as part of this option
- Lower visual and noise impact since below existing ground levels, again off set by negative impact of road raising by 2m and increase visual and noise
- The footpath near the Mill Stream would have to incorporate a walking rail crossing
- Embodied CO_2 for this option would be moderate when compared to the alternative options presented within this report.

8.7 Maintenance

Maintenance and inspection would be required for the new structures present on the route. This would include the increased embankments on the A21 and any changes to these structures. Consideration would be required as to how this would be managed as it seems appropriate that any existing assets supporting the A21 would remain the responsibility of Highways England.

As per Option 2, regular inspection and maintenance would be required for the structures on or over the railway. The potential for this option to require pumping (during extreme events) would introduce further maintenance liabilities which would need to be considered in more detail if required.

8.8 Costs

The costs for this option include the embankment for the railway and associated bridges and culverts, as well as raising the highway and the bridge to take the A21 over the railway. Budget estimate costs are in the region of £11.3million.

For further details refer to the costing report contained in Appendix C.

9 Cost Comparison

9.1 Typical industry benchmarked costs

The following summary table is taken from the high level cost comparison exercise, assuming industry standard costs and relationships. For details refer to the cost report which is contained within Appendix C.

Table 5: Summary of costs taken from Costing Report

	GRAND SUMMARY	Total (£) Option 1	Total (£) Option 2	Total (£) Option 3	Total (£) Option 4
1	**Direct Construction Works**				
1.01	Railway Control Systems (level crossing only)	£300,000	excl.	excl.	excl.
1.02	Train Power Systems	excl.	excl.	excl.	excl.
1.03	Electric Power and Plant	excl.	excl.	excl.	excl.
1.04	Permanent Way	excl.	excl.	excl.	excl.
1.05	Telecommunication Systems	excl.	excl.	excl.	excl.
1.06	Buildings and Property	n/a	n/a	n/a	n/a
1.07	Civil Engineering	£2,464,000	£4,796,000	£8,361,000	£4,607,000
1.08	Enabling Works	£276,000	£480,000	£669,000	£460,000
Sub -Total (Direct Construction Cost Only)		**£3,040,000**	**£5,276,000**	**£9,030,000**	**£5,067,000**
2	**Indirect Construction Works**				
2.01	Preliminaries (25%)	£760,000	£1,319,000	£2,258,000	£1,267,000
2.02	Contractor Overheads and profit (8%)	£304,000	£528,000	£903,000	£507,000
Sub -Total (Construction Costs)		**£4,104,000**	**£7,123,000**	**£12,191,000**	**£6,841,000**
3	**Project / Design Team Fees and Other Project Costs**				
3.01	Design Team Fees (10%)	£410,000	£712,000	£1,219,000	£684,000
3.02	Project Team Fees (5%)	£205,000	£356,000	£610,000	£342,000
3.03	Other Project Development Costs				
	Possessions	excl.	excl.	excl.	excl.
	Land	excl.	excl.	excl.	excl.
	Utilities	excl.	excl.	excl.	excl.
Sub -Total (before Risk/Optimism Bias)		**£4,719,000**	**£8,191,000**	**£14,020,000**	**£7,867,000**
4	**Risk**				
4.01	Optimism Bias 44%	£2,076,000	£3,604,000	£6,169,000	£3,461,000
5	**Inflation**				
5.01	Inflation	excl.	excl.	excl.	excl.
6	**Taxation & Grants**				
6.01	Tax allowance and grants	excl.	excl.	excl.	excl.
Grand Total		**£6,795,000**	**£11,795,000**	**£20,189,000**	**£11,328,000**

These comparative results show that Option 1 would be the lowest cost, with an estimate of around 60% of the next lowest cost option.

Option 3 is by far the highest cost, being 71% higher than the next highest cost option (option 2). Options 2 and 4 are of similar cost.

9.2 RVR costed delivery

It is relevant to highlight that RVR have delivered a number of schemes in recent times using a documented and successful delivery mechanism. This has resulted in projects costing less than if delivered through a more traditional client/contractor relationship.

As noted RVR has already been to the market and obtained prices for delivering Option 1 under this mechanism and these prices are included here.

See Appendix D for a full breakdown of the estimated costs as supplied by RVR. As per the attached the total is just over £1.5million.

These costings are on the basis that (in common with other heritage railways) the design work and much of the construction is carried out by suitably qualified, but unpaid, volunteers with recent experience of carrying out similar work on the neighbouring Kent & East Sussex Railway and that materials are sourced from known suppliers.

RVR has explained that it has already undertaken significant work on the project in the anticipation of Option 1. Following detailed studies and designs, extensive discussion and liaison with all the key authorities, RVR has full planning approval for this Option. It already has a detailed cost estimate, utilising quotes from their existing sub-contractors, and has already purchased a proportion of the key materials needed.

It should be noted that aspects of the other options covered in this report could potentially also be delivered at a lower cost, but RVR does not have access to the relevant resource/expertise to enable this. It would therefore be purely hypothetical and, for this reason, it does not warrant further investigation.

10 Summary

Arup was instructed to explore options to take the proposed RVR heritage railway across the A21(T) near Robertsbridge. Whilst it would be feasible to construct all of the four options assessed, each comes with differing impacts both during construction and through operation.

Option 1, involving an at-grade level crossing, introduces the fewest engineering challenges and would involve the least disruption during construction. Construction costs are the lowest for this option. Full planning consent exists for this option, but further statutory authority is required and RVR would be required to demonstrate that there are exceptional circumstances to justify the creation of a new road level crossing.

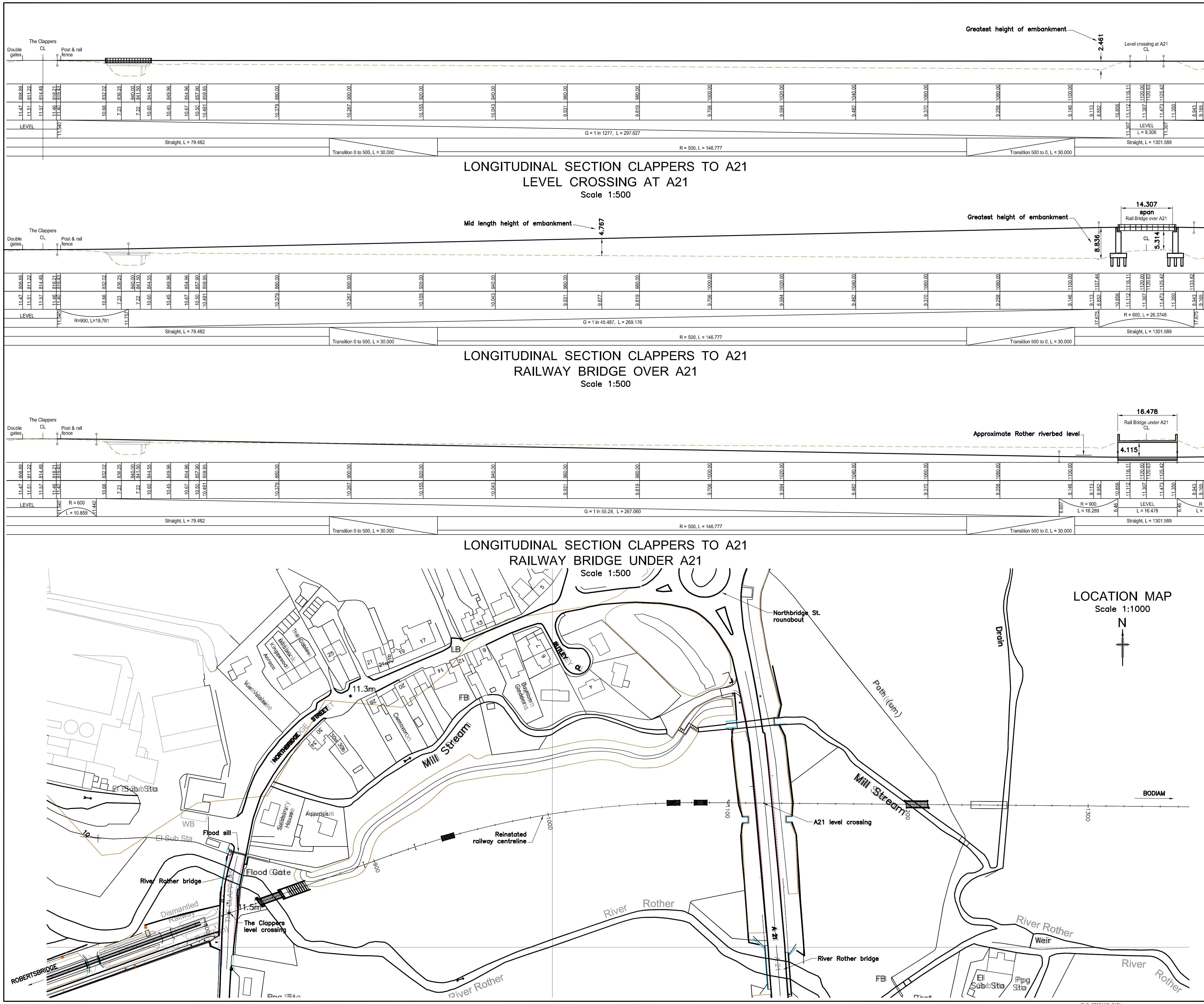
Option 2 looks at the feasibility of taking the rail beneath the existing road. Principal engineering and approval challenges are around the railway being placed below the level of the adjacent River Rother. Mitigation of this is likely to require a long length of waterproof trough structure, with significant engineering challenges including maintenance of water flow paths during flood events and long-term pumping requirements. Planned flood relief culverts and bridges would not be possible with this option and the alternatives would be unlikely to be accepted by the Environment Agency. Disruption to local residents and road users is likely to be very significant with this option.

Option 3 considers the potential to take the rail over the existing road. This scheme introduces a sizeable length of elevated viaduct structure which would have significant impacts, both on cost and visual intrusion. Construction duration for this option is also likely to enhance the difficulties around gaining acceptance for this option from the relevant authorities. The structural works for this option are by far the most extensive than any of the other options.

Option 4, involving realignment of the existing highway, would result in a series of engineering works for both the road and rail. Extension of existing speed restrictions close to the roundabout would be required for this option, together with temporary highway diversions and prolonged construction durations.

Appendix A

Existing Drawings and Schematics (by Others)



Key to profile

Datum 5.00m
Chainage
Datum 0.00m
Exg. Ground Level
Vertical Profile
Horizontal Profile

PRELIMINARY

1:500 — 10 0 10 20m

1:1000 — 20 10 0 20 40m

Revision	By	Checked	Approved	Date	Description
A	JCS	-	-	18.07.18	Logo change

Client
Rother Valley Railway Ltd
Rother Valley Railway Station, Robertsbridge, East Sussex, TN32 5DG
Tel 01580 881833
www.rvr.org.uk

Rother Valley Railway

Project
ROTHER VALLEY RAILWAY

Drawing
A21 CROSSING OPTIONS

Drawn by JCS — Date: 18/07/18
Checked by - — Date: -
Authorised by - — Date: -

Drawing No.
RVR - EW - 005

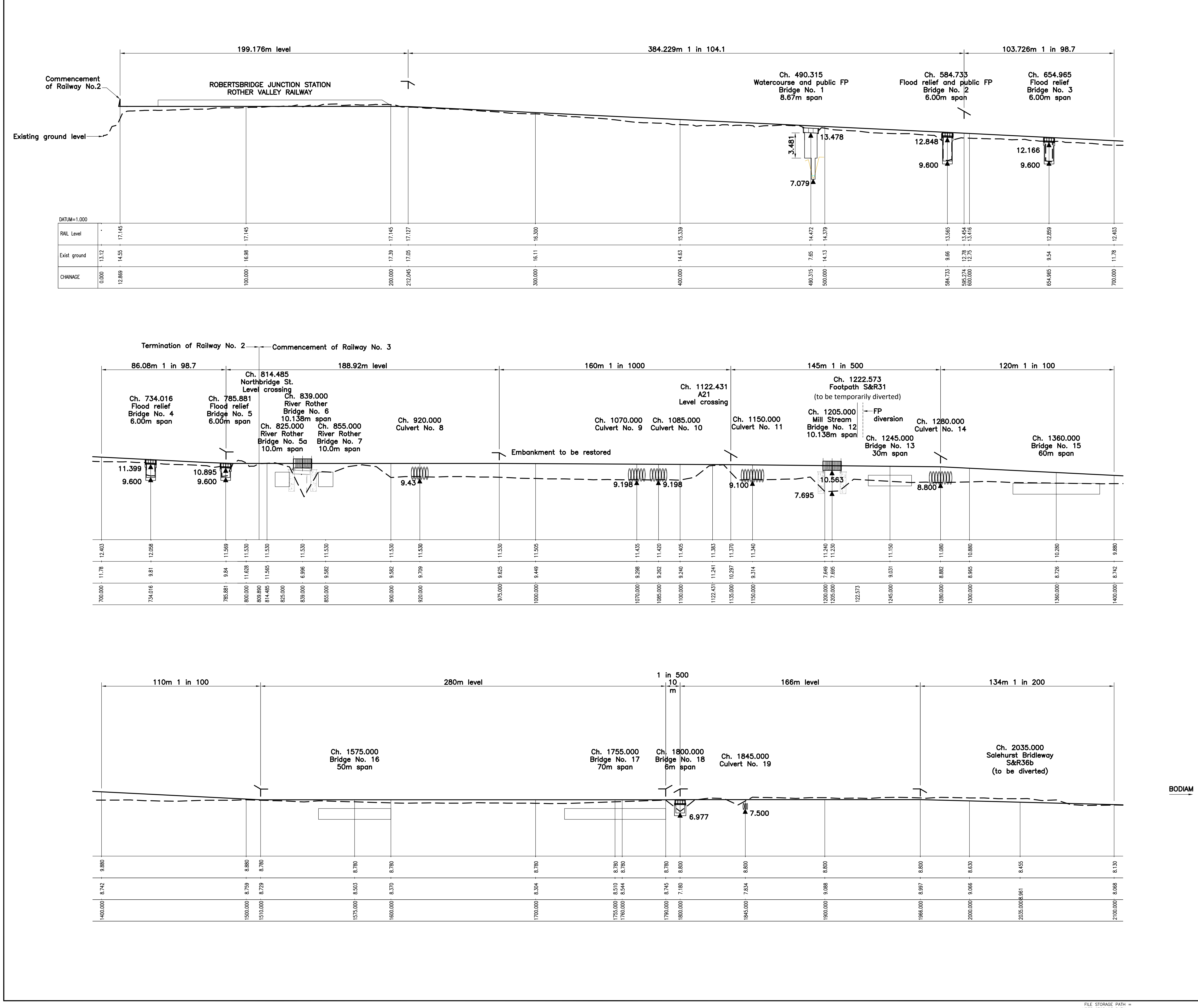
Revision
A

Drawing Scale: 1:500, 1000 at A1
CAD Filename: - — Plot Scale: 1:1

FILE STORAGE PATH =
XREF STORAGE PATH =

ORIGINATING DEPT = HTI - BP
PLOT DATE = 18/07/18

Drawing file path & name: C:\Users\sreevesjc\Documents\private\KESR\CAD\Level Crossing\ RVR-EW-005a 2018-07-18.dwg
User and Plot Date : SreevesJC : 18 Jul 2018 - 9:26 am



SHEET 9

SECTION RAILWAY NO. 2

SECTION RAILWAY No. 3

A	-	-	-	-	-
Revision	By	Checked	Approved	Date	Description

Client
Rother Valley Railway Ltd
Rother Valley Railway Station, Robertsbridge, East Sussex, TN32 5DG
Tel 01580 881833
www.rvr.org.uk

Rother Valley Railway

Project
ROTHER VALLEY RAILWAY

Drawing
SECTIONS CH 0-2100
RAILWAY No. 2 (PART)
RAILWAY No. 3 (PART)

Drawn by JCS — Date: 12/02/18
Checked by - — Date: -
Authorised by - — Date: -

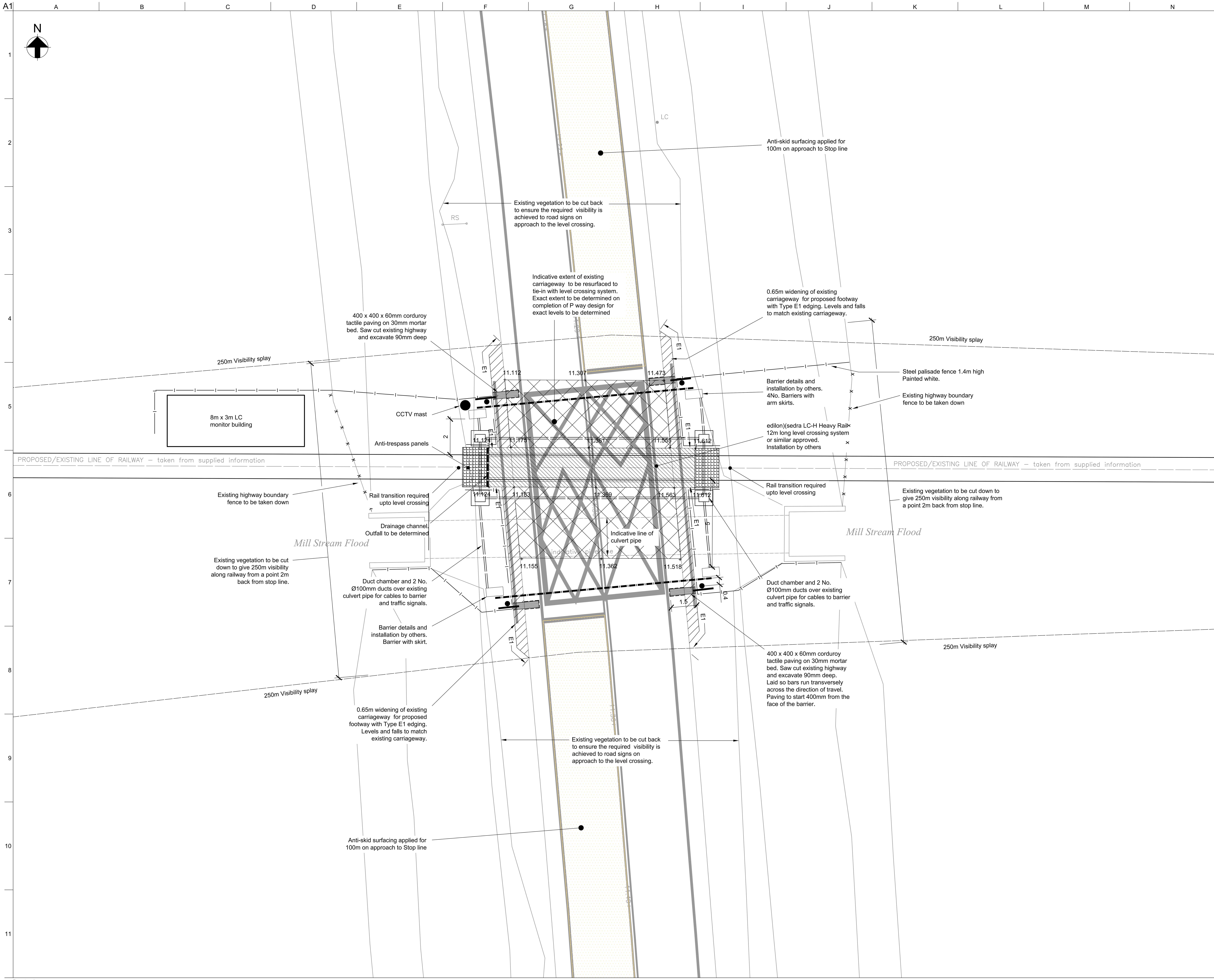
Drawing No. RVR - S - 001 — Revision -

Drawing Scale: 1:250 V, 1 : 1250 H

CAD Filename: - — Plot Scale: 1:1

FILE STORAGE PATH =
XREF STORAGE PATH =

ORIGINATING DEPT = HTI - BP
PLOT DATE = 12/02/18



A1

Notes: -

1. All road markings and traffic signs are to be in accordance with the Traffic Signs Regulations and General Directions (2002) and the Traffic Signs Manuals.
2. For diagram numbers refer to the TSRGD.
3. For road markings refer to drawing C.950.G.103
4. For traffic signs refer to drawing C.950.G.104 and C.950.G.105.
5. For construction details refer to drawing C.950.G.106

Issue	Date	By	Chkd	Appd
P3	27/02/15	IAB	DC	JP
	Drainage channel and indicative levels added			
P2	18/02/15	IAB	DC	JP
	Drawing revised and details removed			
P1	13/02/15	IAB	DC	JP
	Preliminary issue			

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Client
Rother Valley Railway Limited

Job Title
RVR Level Crossing
Highway Works

Drawing Title
A21(T) Robertsbridge Bypass
General Arrangement

Scale at A1 1:100 1:10

Discipline Civils

Job No 239025-00

Drawing Status For Information

Drawing No C.950.G.102

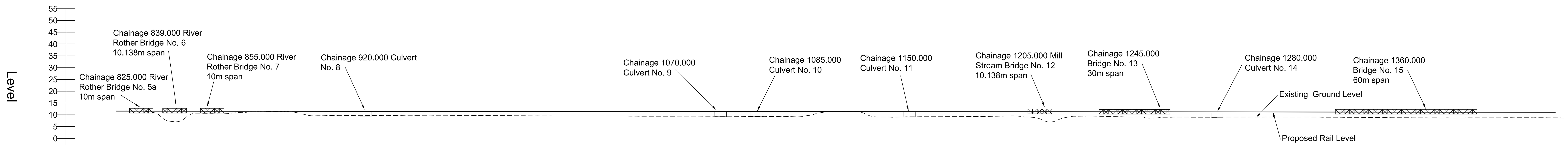
Issue P3

Appendix B

General Arrangement Drawings

Plan View

Scale 1:10000



Chainage	800.000	810.000	820.000	830.000	840.000	850.000	860.000	870.000	880.000	890.000	900.000	910.000	920.000	930.000	940.000	950.000
Proposed Ground Levels			11.563	11.555	11.547	11.539	11.531	11.524	11.516	11.508	11.500	11.492	11.484	11.477	11.469	11.461
Existing Ground Levels			11.618	11.009	7.059	10.451	10.423	11.124	11.350	11.048	9.622	9.735	9.741	9.695	9.777	9.791

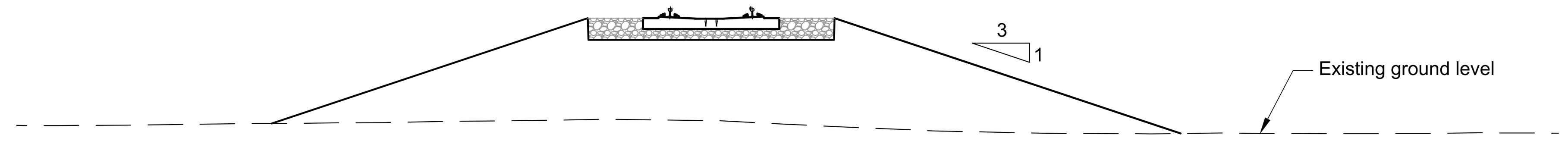
Chainage	960.000	970.000	980.000	990.000	1000.000	1010.000	1020.000	1030.000	1040.000	1050.000	1060.000	1070.000	1080.000	1090.000	1100.000	1110.000
Proposed Ground Levels	11.453	11.445	11.438	11.430	11.422	11.414	11.406	11.398	11.391	11.383	11.375	11.367	11.359	11.351	11.344	11.336
Existing Ground Levels	9.728	9.731	9.666	9.576	9.503	9.468	9.477	9.448	9.371	9.389	9.430	9.382	9.313	9.303	9.230	10.372

Chainage	1120.000	1130.000	1140.000	1150.000	1160.000	1170.000	1180.000	1190.000	1200.000	1210.000	1220.000	1230.000	1240.000	1250.000	1260.000	1270.000
Proposed Ground Levels	11.331	11.327	11.320	11.312	11.304	11.296	11.288	11.280	11.273	11.265	11.257	11.249	11.241	11.233	11.226	11.218
Existing Ground Levels	11.312	10.930	9.038	9.166	9.217	9.237	9.297	9.439	9.030	6.979	9.390	9.366	9.160	8.610	8.966	8.956

Chainage	1280.000	1290.000	1300.000	1310.000	1320.000	1330.000	1340.000	1350.000	1360.000	1370.000	1380.000	1390.000	1400.000	1410.000	1420.000
Proposed Ground Levels	11.210	11.202	11.194	11.186	11.179	11.171	11.163	11.155	11.147	11.139	11.132	11.124	11.116	11.108	11.100
Existing Ground Levels	8.969	9.011	9.019	9.082	9.017	8.953	8.906	8.823	8.774	8.720	8.715	8.748	8.760	8.768	8.757

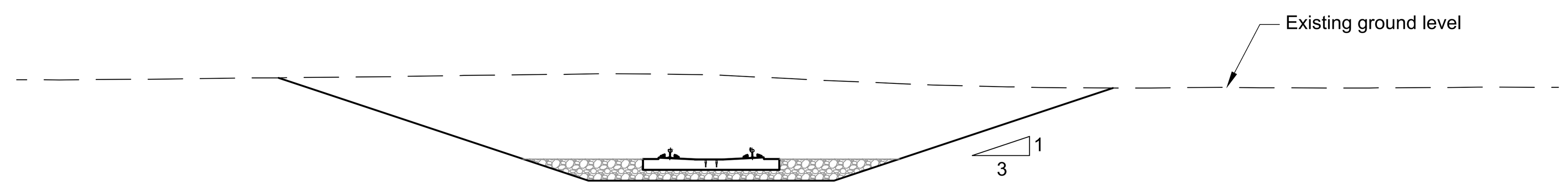
Longitudinal Section

Scale: 1:1000



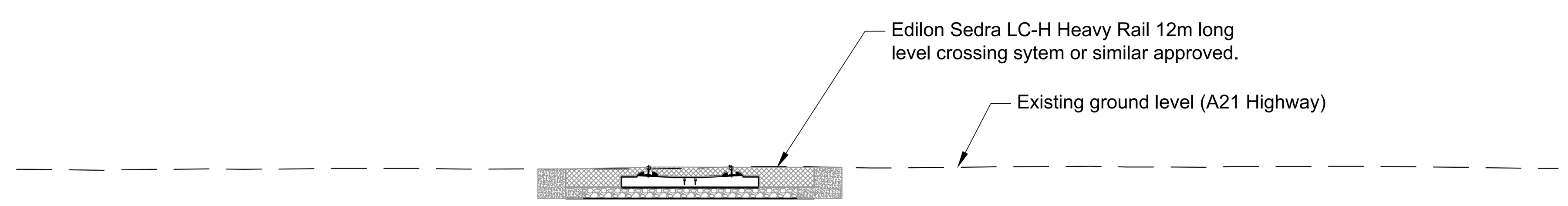
Typical Section Through Embankment

Scale: 1:100



Typical Section Through Cutting

Scale: 1:100



Section Through A21 Crossing (CH 1120.000)

Scale: 1:100

Issue	Date	By	Chkd	Appd
P1	01 /02/19	PC	HS	JP
	Options feasibility			

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Client

Rother Valley Railway

Project Title

Rother Valley Railway
Proposed Rail Extension

Drawing Title

Option 1
Level Crossing
General Arrangement

Scale at A1 1:1000 (U.N.O.)

Role

Suitability -

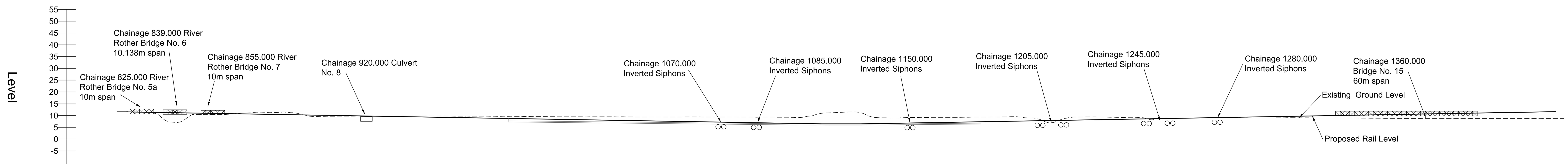
Arup Job No 239025

Rev P1

Name 239025-A21-G-001

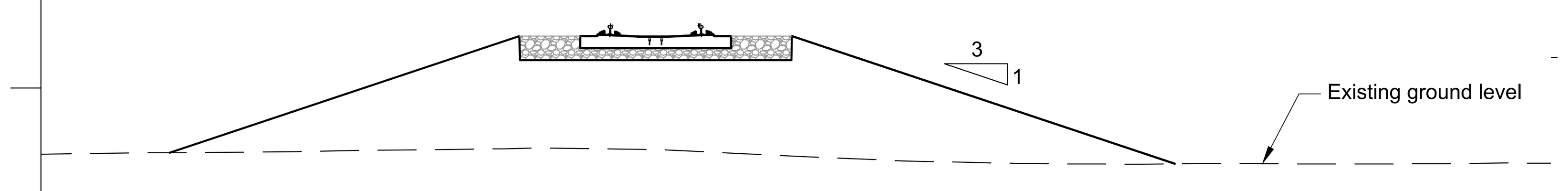
Do not scale

Plan View
Scale 1:10000



Chainage	Proposed Ground Levels	Existing Ground Levels
800.000		
810.000		
820.000	11.538	11.618
830.000	11.365	11.009
840.000	11.193	7.059
850.000	11.020	10.451
860.000	10.847	10.423
870.000	10.675	11.124
880.000	10.502	11.350
890.000	10.329	11.048
900.000	10.157	9.622
910.000	9.984	9.735
920.000	9.811	9.741
930.000	9.639	9.695
940.000	9.466	9.777
950.000	9.293	9.791
960.000	9.121	9.728
970.000	8.948	9.731
980.000	8.775	9.666
990.000	8.603	9.576
1000.000	8.430	9.503
1010.000	8.257	9.468
1020.000	8.085	9.477
1030.000	7.912	9.448
1040.000	7.739	9.371
1050.000	7.567	9.389
1060.000	7.394	9.430
1070.000	7.221	9.382
1080.000	7.049	9.313
1090.000	6.876	9.303
1100.000	6.703	9.230
1110.000	6.531	10.372
1120.000	6.484	11.312
1130.000	6.498	10.930
1140.000	6.674	9.038
1150.000	6.850	9.166
1160.000	7.026	9.217
1170.000	7.202	9.237
1180.000	7.378	9.297
1190.000	7.553	9.439
1200.000	7.729	9.030
1210.000	7.905	6.979
1220.000	8.081	9.390
1230.000	8.257	9.366
1240.000	8.432	9.160
1250.000	8.608	8.610
1260.000	8.784	8.966
1270.000	8.960	8.956
1280.000	9.136	8.969
1290.000	9.312	9.011
1300.000	9.487	9.019
1310.000	9.663	9.082
1320.000	9.839	9.017
1330.000	10.015	8.953
1340.000	10.191	8.906
1350.000	10.366	8.823
1360.000	10.542	8.774
1370.000	10.718	8.720
1380.000	10.894	8.715
1390.000	11.070	8.748
1400.000	11.245	8.760
1410.000	11.421	8.768
1420.000	11.597	8.757

Longitudinal Section
Scale: 1:1000



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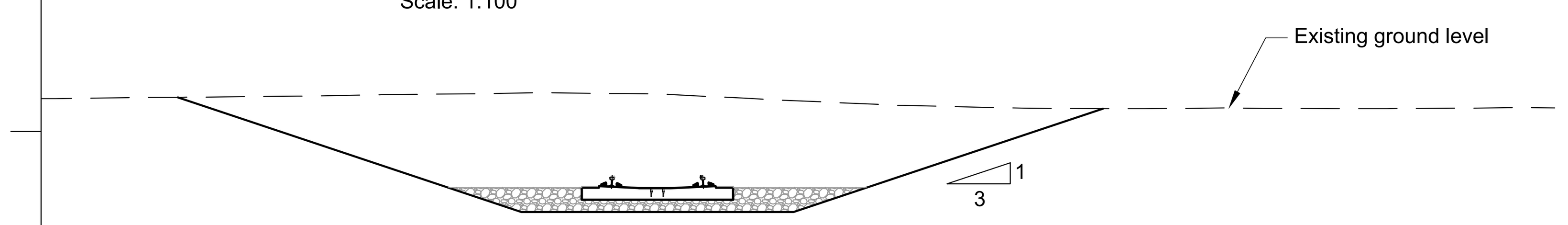
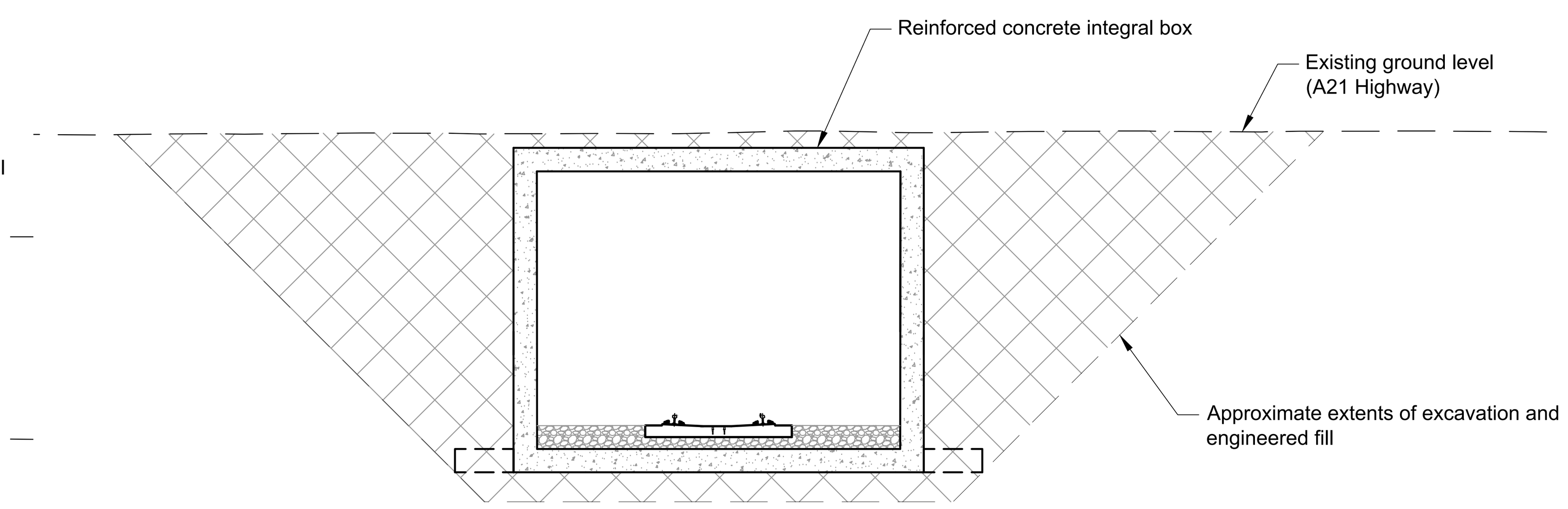
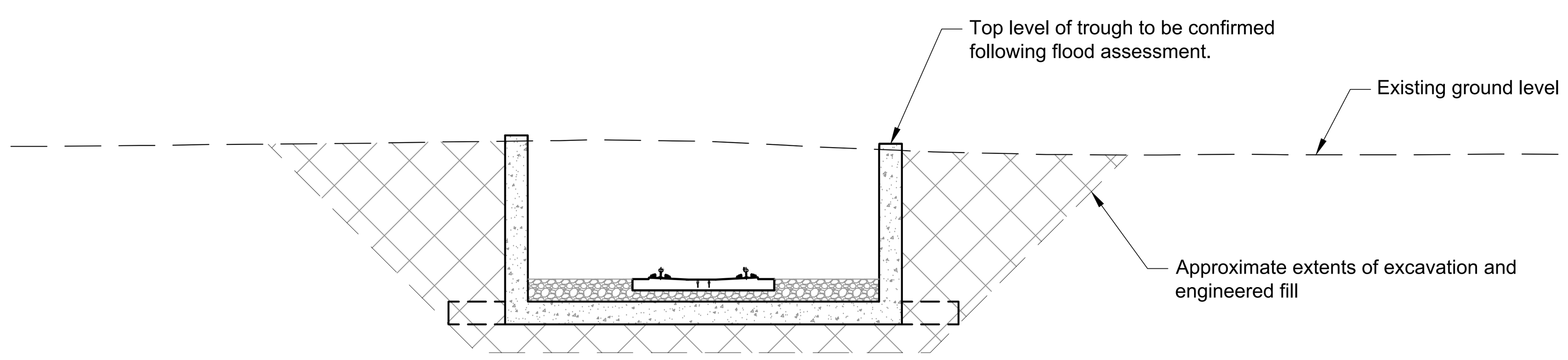


Typical Section Through Cutting
Scale: 1:100



Section Through A21 Crossing (CH 1120.000)
Scale: 1:100



Typical Section Through Trough
Scale: 1:100

Issue	Date	By	Chkd	Appd
P1	01 /02/19	PC	HS	JP
Options feasibility				

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Client
Rother Valley Railway

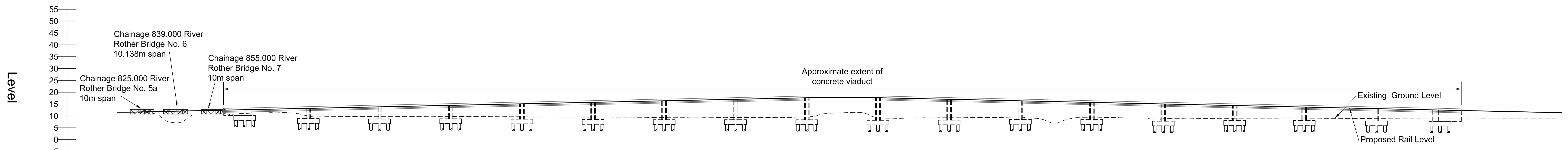
Project Title
Rother Valley Railway
Proposed Rail Extension

Drawing Title
Option 2
Rail Under Road
General Arrangement

Scale at A1: 1:1000 (U.N.O.)
Role
Suitability: -
Arup Job No: 239025
Rev: P1
Name: 239025-A21-G-002

Do not scale

Plan View
Scale 1:10000



Chainage	Proposed Ground Levels	Existing Ground Levels
800.000		
810.000		
820.000	11.596	11.618
830.000	11.808	11.009
840.000	12.021	7.059
850.000	12.233	10.451
860.000	12.445	10.423
870.000	12.658	11.124
880.000	12.870	11.350
890.000	13.082	11.048
900.000	13.295	9.622
910.000	13.507	9.735
920.000	13.719	9.741
930.000	13.932	9.695
940.000	14.144	9.777
950.000	14.356	9.791
960.000	14.568	9.728
970.000	14.781	9.731
980.000	14.993	9.666
990.000	15.205	9.576
1000.000	15.418	9.503
1010.000	15.630	9.468
1020.000	15.842	9.477
1030.000	16.055	9.448
1040.000	16.267	9.371
1050.000	16.479	9.389
1060.000	16.692	9.430
1070.000	16.904	9.382
1080.000	17.116	9.313
1090.000	17.329	9.303
1100.000	17.541	9.230
1110.000	17.699	10.372
1120.000	17.699	11.312
1130.000	17.699	10.930
1140.000	17.563	9.038
1150.000	17.343	9.166
1160.000	17.124	9.217
1170.000	16.904	9.237
1180.000	16.684	9.297
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1270.000	14.705	8.956
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1290.000	14.266	9.011
1300.000	14.046	9.019
1310.000	13.826	9.082
1320.000	13.606	9.017
1330.000	13.386	8.953
1340.000	13.166	8.906
1350.000	12.946	8.823
1360.000	12.727	8.774
1370.000	12.507	8.720
1380.000	12.287	8.715
1390.000	12.067	8.748
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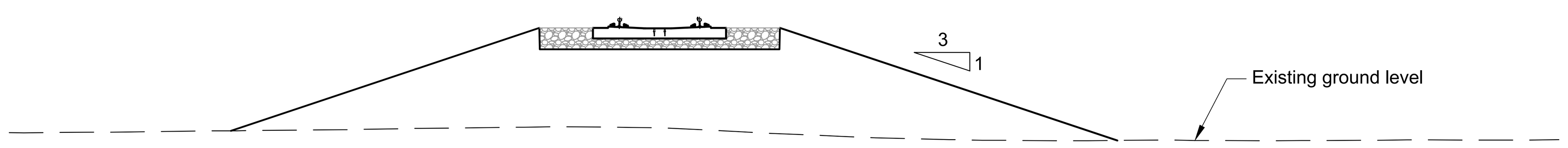
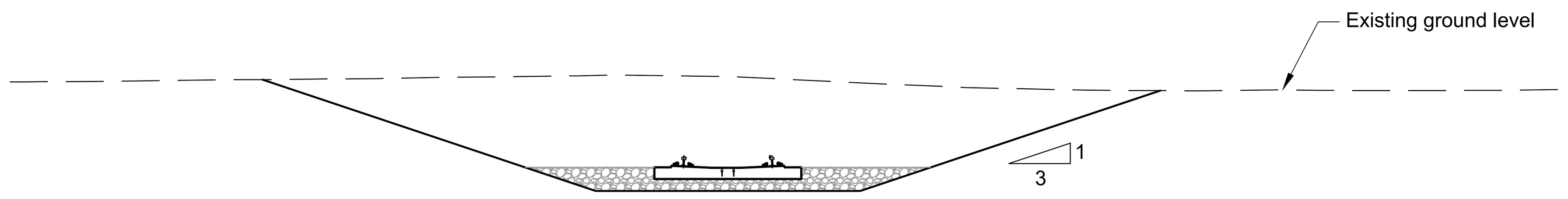
1410.000	11.627	8.768
1420.000	11.408	8.757

Longitudinal Section
Scale: 1:1000



Typical Section Through Embankment
Scale: 1:100



Typical Section Through Cutting
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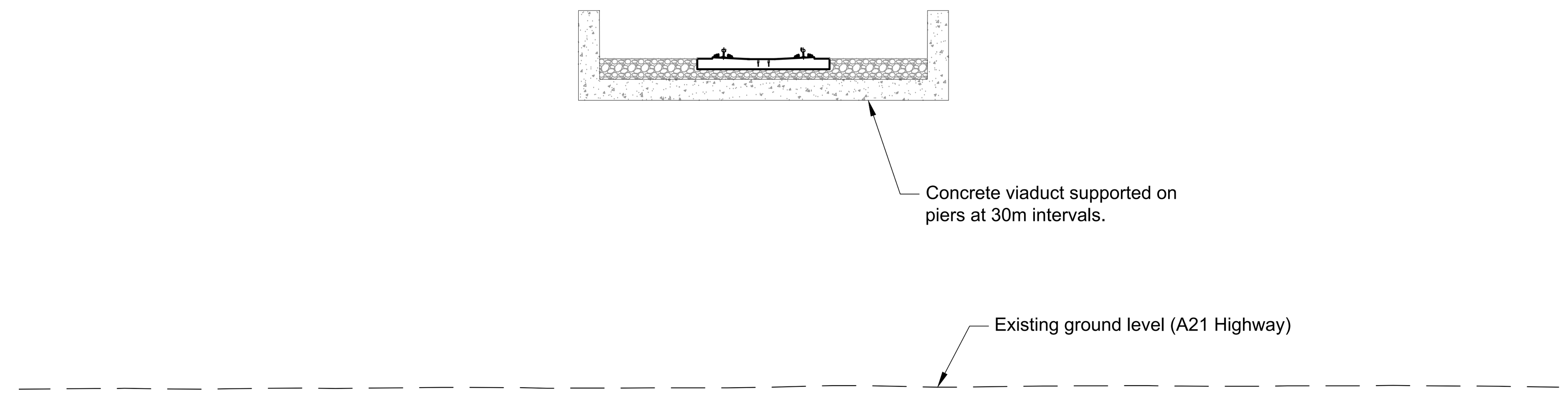

Section Through A21 Crossing (CH 1120.000)
Scale: 1:100

Issue	Date	By	Chkd	Appd
P1	01 /02/19	PC	HS	JP
Options feasibility				

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Client: Rother Valley Railway

Project Title: Rother Valley Railway Proposed Rail Extension

Drawing Title: Option 3 Rail Over Road General Arrangement

Scale at A1: 1:1000 (U.N.O.)

Role

Suitability: -

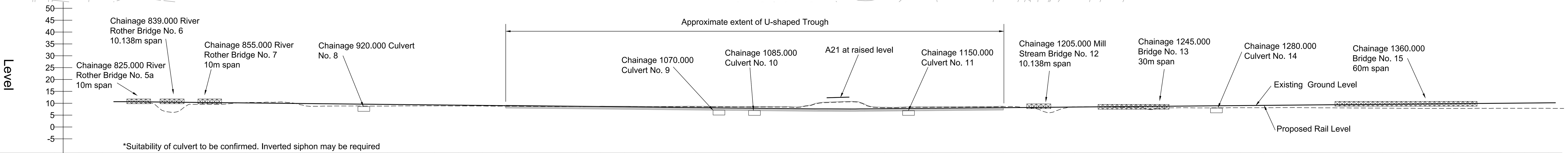
Arup Job No: 239025

Rev: P1

Name: 239025-A21-G-003

Do not scale

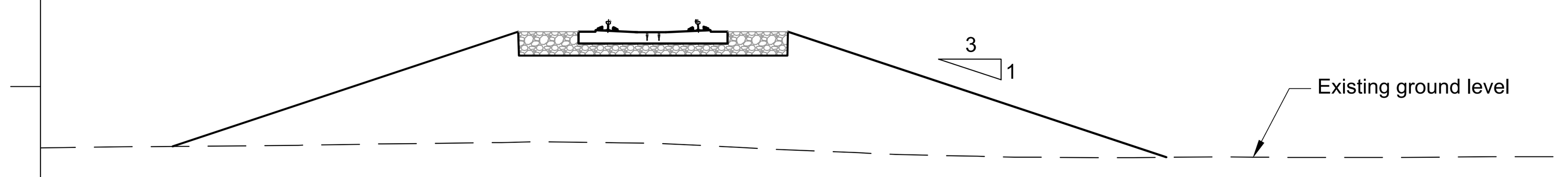
Plan View
Scale 1:10000



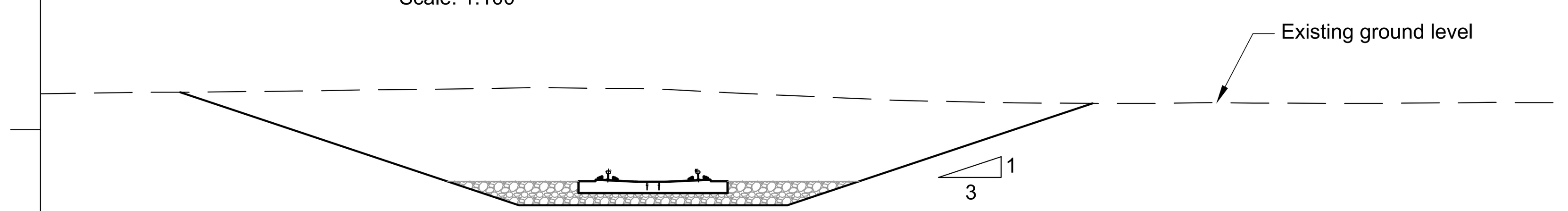
*Suitability of culvert to be confirmed. Inverted siphon may be required

Chainage	Proposed Ground Levels	Proposed Ground Levels A21	Existing Ground Levels
800.500			
810.000			
820.000	11.548		11.618
830.000	11.444		11.009
840.000	11.340		7.059
850.000	11.236		10.451
860.000	11.132		10.423
870.000	11.028		11.124
880.000	10.924		11.350
890.000	10.820		11.048
900.000	10.716		9.622
910.000	10.612		9.735
920.000	10.508		9.741
930.000	10.404		9.695
940.000	10.300		9.777
950.000	10.196		9.791
960.000	10.092		9.728
970.000	9.988		9.731
980.000	9.884		9.666
990.000	9.780		9.576
1000.000	9.676		9.503
1010.000	9.572		9.468
1020.000	9.468		9.477
1030.000	9.364		9.448
1040.000	9.260		9.371
1050.000	9.156		9.389
1060.000	9.052		9.430
1070.000	8.948		9.382
1080.000	8.844		9.313
1090.000	8.739		9.303
1100.000	8.635		9.230
1110.000	8.531		10.372
1120.000	8.490	13.206 13.385	11.312
1130.000	8.495		10.930
1140.000	8.582		9.038
1150.000	8.671		9.166
1160.000	8.760		9.217
1170.000	8.849		9.237
1180.000	8.938		9.297
1190.000	9.026		9.439
1200.000	9.115		9.030
1210.000	9.204		6.979
1220.000	9.293		9.390
1230.000	9.382		9.366
1240.000	9.471		9.160
1250.000	9.560		8.610
1260.000	9.649		8.966
1270.000	9.738		8.956
1280.000	9.826		8.969
1290.000	9.915		9.011
1300.000	10.004		9.019
1310.000	10.093		9.082
1320.000	10.182		9.017
1330.000	10.271		8.953
1340.000	10.360		8.906
1350.000	10.449		8.823
1360.000	10.538		8.774
1370.000	10.626		8.720
1380.000	10.715		8.715
1390.000	10.804		8.748
1400.000	10.893		8.760
1410.000	10.982		8.768
1420.000	11.071		8.757

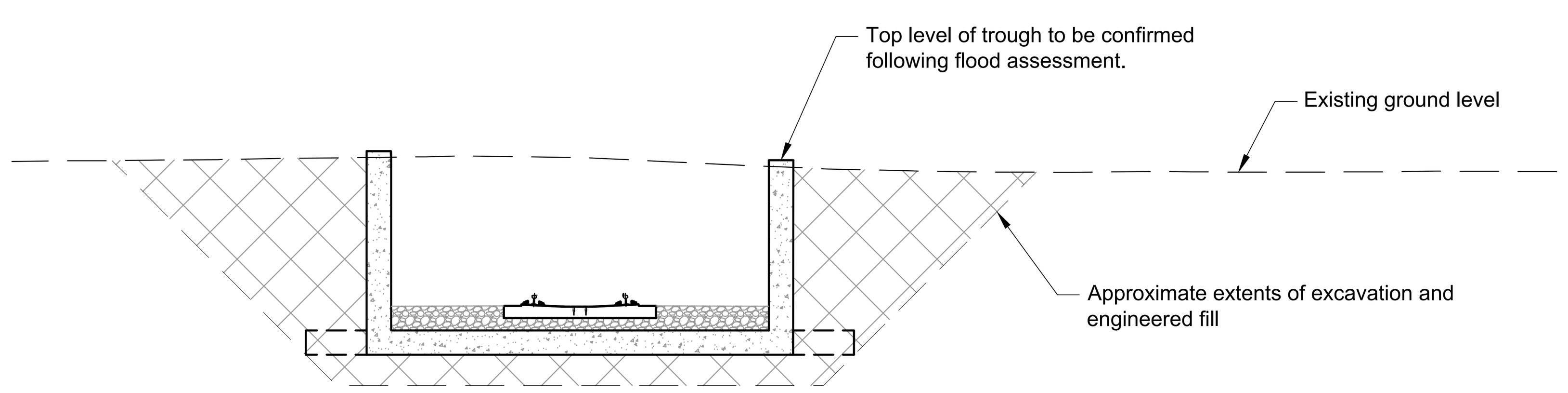
Longitudinal Section
Scale: 1:1000



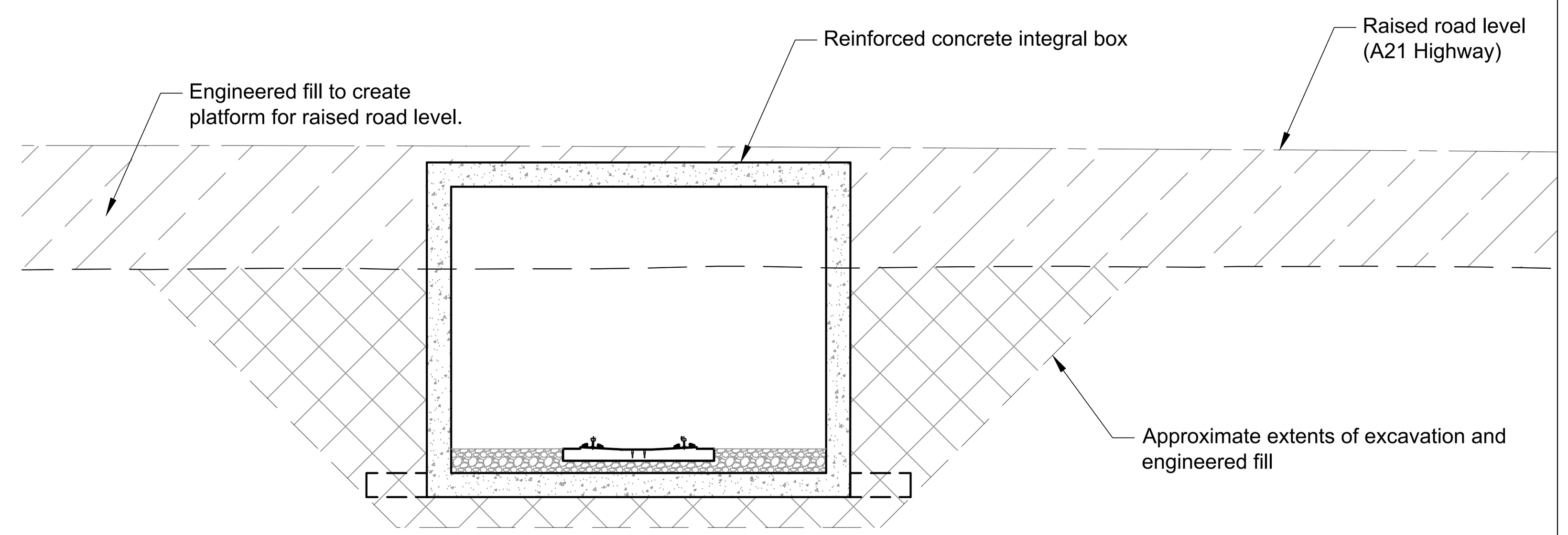
Typical Section Through Embankment
Scale: 1:100



Typical Section Through Cutting
Scale: 1:100



Typical Section Through Trough
Scale: 1:100



Section Through A21 Crossing (CH 1120.000)
Scale: 1:100

Issue	Date	By	Chkd	Appd
P1	01/02/19	PC	HS	JP
	Options feasibility			

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Client
Rother Valley Railway

Project Title
Rother Valley Railway
Proposed Rail Extension

Drawing Title
Option 4
Road Over Rail
With Raised Road
General Arrangement

Scale at A1: 1:1000 (U.N.O.)
Role
Suitability: -
Arup Job No: 239025
Rev: P1
Name: 239025-A21-G-004

Do not scale

Appendix C

Costing Report

Rother Valley Railway

GRIP 2 Cost Estimate

05 February 2019

Revision Issue

ARUP

ARUP

Document Verification

Job Title	**Rother Valley Railway**	Job Number	**239025-02**
Document Title	**GRIP 2 Cost Estimate**	File Reference	
Document Ref	**RVR-QS-001**		

Revision	Date	Filename	RVR Cost Estimate		
Issue	05/02/2019	Description	Cost estimate for Rother Valley Railway		
			Prepared by: Alice Norbury	Checked by: Stuart Humphreys	Approved by: Stuart Humphreys
		Description			
		Signature			
Revision	Date	Filename			
		Description			
			Prepared by:	Checked by:	Approved by:
		Description			
		Signature			
Revision	Date	Filename			
		Description			
			Prepared by:	Checked by:	Approved by:
		Description			
		Signature			
Revision	Date	Filename			
		Description			
			Prepared by:	Checked by:	Approved by:
		Description			
		Signature			

ARUP

Section	Heading
1.0	Introduction
2.0	Basis of Costs
3.0	Assumptions and Exclusions
4.0	Referenced Documents
5.0	Executive Summary
6.0	Detailed Cost Estimate
6.1	Option 1
6.2	Option 2
6.3	Option 3
6.4	Option 4

Document: GRIP 2 Cost Estimate
Revision: Issue
Date: 05-Feb-19
Arup Job Number: 239025-02

Appendices

Quality Check

Rev	Status	Prepared by	Checked by	Approved by	Date
Issue	Issue	A Norbury	S Humphreys	S Humphreys	05/02/2019

Controlled Document Distribution

Issued to	Company	Nr Copies	Transmission	Date
J Murrells	Arup	1	Email	05/02/2019

1.0 COST REPORT

1.1 Introduction

The purpose of this report is to present a high level comparison between four options for an extension of the Rother Valley Railway.

This cost estimate is for the purpose of providing a relative cost comparison between four options which forms part of an option appraisal process.
These costs are not intended to provide any representative price for construction costings and budgeting. The estimate offers an indicative forecast of the likely costs of construction of civil engineering elements of the project only.

1.2 Method of Measurement

The structure of this cost estimate follows the structure of the Rail Method of Measurement 1 (RMM1).
The level of detail of design is at appoximately GRIP 2 Feasibility level. Therefore, the method of measurement used to prepare this cost estimate, the rates included method of measuring various works elements selected in order to complement the level of information, has been retained. It is prudent to allow an estimate sensitivity tolerance of +/- 40%.

1.3 Other Development / Project Costs

Other development / project costs are for costs that are not directly associated with the construction works or project / design team professional fees, but form part of the total cost of the project to the client. These costs may include insurances, planning fees, land purchase, rental costs, compensation, relocation costs of personnel / products / equipment / habitats, marketing costs and contributions to local authority obligations.

No allowance has been made within this cost estimate for other development / project costs at this stage.

1.4 Project Location

The proposed project site location is through green field within Rother Valley. There is limited interaction with live railway (only for tie in purposes).
The project will have impact on live roadway.

1.5 Project / Design Team Professional Fees

Project/ design team professional fees have been excluded from this estimate. The estimate has been produced to detail the estimated outturn costs of civil engineering construction activities only. Any specialist surveys necessary prior to the works, are expected to be undertaken by the contractor and as such will form part of the main contractor's preliminaries (i.e. GI surveys and the like)

1.6 Risk and Optimism Bias Allowances

Risk and optimism bias allowance considers risks associated with design development, construction related risks as the works progress onsite, for changes introduced by the client during both the design process and the construction process and any other risks to the client, including acceleration, postponement, unconventional tender action, special contract arrangements, and the like, to a reasonable extent.

An allowance of 44% has been included for optimism bias in line with HM Treasury Green Book Supplementary Guidance - No allowance has been made separately for Risk.

1.7 Inflation Forecast

No allowance has been made for inflation forecasting.

1.8 Conclusion and Recommendations

At this stage of design, it is clear that Option 1 - Level Crossing is the least expensive option within this option appriasal. The cost of options 2 and 4 are of a similar magintude and the cost of option 3 greatly outweights that of the other options.

2.0 BASIS OF COSTS

2.1 Rother Valley Railway

The proposed works for the Rother Valley Railway extension. The works extend from (but not including) the Clappers level crossing (Ch 814) to approximately 320m beyond the A21 crossing (Ch 1,450). There are four different options to be costed and these are outlined below.

Option 1

The extension of track will be laid on an embankment (average 2m high) with a level crossing at the A21. The works will also include a number of small bridges and culverts for flood alleviation purposes.

Option 2

The extension of track will be taken under the A21 through a combination of cutting, retained cut and cut & cover tunnel. The cut & cover tunnel is required at the A21 crossing. The works will include a small bridge and inverted siphons for flood alleviation purposes. There is an additional requirements of temporary diversion on the A21.

Option 3

The extension of track will be taken over the A21 using embankment and viaduct. The works will include 1 small bridge and 1 small culvert for flood alleviation purposes for embankment sections.

Option 4

The extension of track will taken under the A21 through a combination of cutting, retained cut and cut & cover tunnel. The works also include raising a 315m section of the A21 to allow for a more shallow alignment of rail. The works will also include a small bridge and inverted siphons for flood alleviation purposes. There is an additional requirements of temporary diversion on the A21.

The principle purpose of the costing is to provide a high level comparison between the four options as part of an options appraisal process, rather than to provide any representative prices for construction costing or budgeting. On this basis, elements common to all options, such as trackbed drainage, ballast, sleepers and rails have been excluded from cost estimates.

The estimate base date is Q1 2019.

Prices used in this estimate are drawn from historical in-house data and from published data.

Prices are based upon the assumption that the works will be procured by competitive tender.

3.0 ASSUMPTIONS AND EXCLUSIONS

3.1 Assumptions

The following assumptions have been allowed for within this cost plan:

1. This order of cost estimate has been based on the referenced documents and therefore, costs are indicative only. This should be taken into consideration when used in future reports.
2. Assumed all material excavated within the rail corridor cannot be reused and therefore shall be disposed off site.
3. Assumed all material required for embankments shall be imported from off site.
4. Assumed no contaminated earthworks are within the rail corridor.
5. Assumed no diversion of watercourses required.
6. Assumed to alterations to the A21 roundabout.
7. Assumed no alterations to existing rail corridor, west of The Clappers Crossing.
8. This cost estimate does not include any alteratiosn to Northbridge Street at Clappers Junction as this is present in all options and will therefore not affect the comparison.
9. Assumed no impact to adjacent properties.
10. Bridges 5a and 15 are not considered within these estimates as they are present in all options and will therefore not affect the comparison.

3.2 Exclusions

The following items are excluded from this cost estimate:

1. Additional land purchases and compensation costs
2. The effects of inflation beyond the estimate base date
3. Client's in house management and administration costs
4. Cost of financing the works
5. VAT, taxes and other levies
6. Rolling Stock
7. Permanent Way
8. Railway control systems (apart from Level Crossing at A21)
9. Operational telecommunication systems
10. Utility Diversions
11. Risk (other employer risks not covered by optimism bias)
12. Possessions (TOC)
13. Operational/Maintenance (OPEX) costs.

4.0 REFERENCED DOCUMENTS

4.1 Documents

The following documents have been referenced for the basis of this cost estimate:

Ref.	Date	Document Description	Author
239025-A21-G-001 P1	01/02/2019	Rother Valley Railway Proposed Rail Extension - Option 1 Level Crossing General Arrangement	Arup
239025-A21-G-002 P1	01/02/2019	Rother Valley Railway Proposed Rail Extension - Option 2 Rail Under Road General Arrangement	Arup
239025-A21-G-003 P1	01/02/2019	Rother Valley Railway Proposed Rail Extension - Option 3 Rail Over Road General Arrangement	Arup
239025-A21-G-004 P1	01/02/2019	Rother Valley Railway Proposed Rail Extension - Option 4 Road Over Rail With Raised Road General Arrangement	Arup
REP/239025/R001	05/02/2019	A21(T) Crossing Options Feasibility Report	Arup

Rother Valley Railway
GRIP 2 Cost Estimate

ARUP

Job Number : 239025-02

5.0 EXECUTIVE SUMMARY

GRAND SUMMARY		Total (£) Option 1	Total (£) Option 2	Total (£) Option 3	Total (£) Option 4
1	**Direct Construction Works**				
1.01	Railway Control Systems (level crossing only)	£300,000	excl.	excl.	excl.
1.02	Train Power Systems	excl.	excl.	excl.	excl.
1.03	Electric Power and Plant	excl.	excl.	excl.	excl.
1.04	Permanent Way	excl.	excl.	excl.	excl.
1.05	Telecommunication Systems	excl.	excl.	excl.	excl.
1.06	Buildings and Property	n/a	n/a	n/a	n/a
1.07	Civil Engineering	£2,464,000	£4,796,000	£8,361,000	£4,607,000
1.08	Enabling Works	£276,000	£480,000	£669,000	£460,000
Sub -Total (Direct Construction Cost Only)		**£3,040,000**	**£5,276,000**	**£9,030,000**	**£5,067,000**
2	**Indirect Construction Works**				
2.01	Preliminaries (25%)	£760,000	£1,319,000	£2,258,000	£1,267,000
2.02	Contractor Overheads and profit (8%)	£304,000	£528,000	£903,000	£507,000
Sub -Total (Construction Costs)		**£4,104,000**	**£7,123,000**	**£12,191,000**	**£6,841,000**
3	**Project / Design Team Fees and Other Project Costs**				
3.01	Design Team Fees (10%)	£410,000	£712,000	£1,219,000	£684,000
3.02	Project Team Fees (5%)	£205,000	£356,000	£610,000	£342,000
3.03	Other Project Development Costs				
	Possessions	excl.	excl.	excl.	excl.
	Land	excl.	excl.	excl.	excl.
	Utilities	excl.	excl.	excl.	excl.
Sub -Total (before Risk/Optimism Bias)		**£4,719,000**	**£8,191,000**	**£14,020,000**	**£7,867,000**
4	**Risk**				
4.01	Optimism Bias 44%	£2,076,000	£3,604,000	£6,169,000	£3,461,000
5	**Inflation**				
5.01	Inflation	excl.	excl.	excl.	excl.
6	**Taxation & Grants**				
6.01	Tax allowance and grants	excl.	excl.	excl.	excl.
Grand Total		**£6,795,000**	**£11,795,000**	**£20,189,000**	**£11,328,000**

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Ref	Series	Description	Quantity	Unit	Rate	Total	Notes
6.1		**Option 1**					
1		Direct Construction Works					
	1.01	Railway Control Systems				300,000	
	1.02	Train Power Systems				excl.	
	1.03	Electric Power and Plant				excl.	
	1.04	Permanent Way				excl.	
	1.05	Telecommunication Systems				excl.	
	1.06	Buildings and Property				n/a	
	1.07	Civil Engineering				2,464,000	
	1.08	Enabling Works				276,000	
		Carried Forward to Grand Summary				3,040,000	

Rother Valley Railway
GRIP 2 Cost Estimate
6.0 Detailed Cost Estimate

Job Number : 239025-02

ARUP

Ref	Series	Description	Quantity	Unit	Rate	Total	Notes
6.1		Option 1					
1.01		Railway Control Systems					
		Level Crossing	1.00	item		300,000	includes for the installation of the crossing, gates, controls and signals. Provided by Client/Engineer
		Carried Forward to Construction Works Summary				300,000	

Rother Valley Railway
GRIP 2 Cost Estimate
6.0 Detailed Cost Estimate

ARUP

Job Number : 239025-02

Ref	Series	Description	Quantity	Unit	Rate	Total	Notes
6.1		**Option 1**					
1.07		Civil Engineering					
	1.07.01	Earthworks					
		Embankment	10392	m^3	47	494,000	
		Cutting	146	m^3	40	6,000	
	1.07.02	Coastal and estuarial defences					
	1.07.03	Tunnels and shafts					
	1.07.04	Subways and underpasses					
	1.07.05	Bridges and viaducts					
		Bridge no. 6	51	m^2	3,366	172,000	
		Bridge no. 7 - Culvert	10	m	6,235	62,000	
		Bridge no. 8	30	m^2	3,984	120,000	
		Bridge no. 9	51	m^2	4,260	217,000	
		Bridge no. 10	51	m^2	4,260	217,000	
		Bridge no. 11	51	m^2	4,260	217,000	
		Bridge no. 12	50	m^2	3,984	199,000	
		Bridge no. 13	150	m^2	3,608	541,000	
		Bridge no. 14	50	m^2	3,984	199,000	
	1.07.06	Footbridges					
	1.07.07	Retaining Walls					
	1.07.08	Fencing and enclosures					
	1.07.09	General drainage					
	1.07.10	Track foundations					
	1.07.11	Roads, pavements and hardstandings					
		Traffic Management allowance to A21.	1.00	item	20,000	20,000	No major works to divert the A21. Traffic Management only, 2 overnight closures. Assumed the level crossing installation can be completed within these 2 overnight closures.
	1.07.12	Troughing					
		Carried Forward to Construction Works Summary				2,464,000	

Rother Valley Railway
GRIP 2 Cost Estimate
6.0 Detailed Cost Estimate

Job Number : 239025-02

ARUP

Ref	Series	Description	Quantity	Unit	Rate	Total	Notes
6.1		Option 1					
1.08		Enabling Works					
	1.08.01	Extra ordinary site investigation works	2.5%			69,000	Allowance of 2.5% of direct works included for enabling works
	1.08.02	Site clearance and preparation works	2.5%			69,000	Allowance of 2.5% of direct works included for enabling works
	1.08.03	Structure specific enabling works	5.0%			138,000	Allowance of 5% of direct works included for enabling works
		Carried Forward to Construction Works Summary				276,000	

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Job Number : 239025-02

Ref	Series	Description	Quantity	Unit	Rate	Total	Notes
6.2		**Option 2**					
1		Direct Construction Works					
	1.01	Railway Control Systems				excl.	
	1.02	Train Power Systems				excl.	
	1.03	Electric Power and Plant				excl.	
	1.04	Permanent Way				excl.	
	1.05	Telecommunication Systems				excl.	
	1.06	Buildings and Property				n/a	
	1.07	Civil Engineering				4,796,000	
	1.08	Enabling Works				480,000	
		Carried Forward to Grand Summary				5,276,000	

Rother Valley Railway
GRIP 2 Cost Estimate
6.0 Detailed Cost Estimate

Job Number : 239025-02

ARUP

Ref	Series	Description	Quantity	Unit	Rate	Total	Notes
6.2		**Option 2**					
1.07		Civil Engineering					
	1.07.01	Earthworks					
		Cutting	5084	m^3	40	202,000	
		Embankment	2222	m^3	47	106,000	
	1.07.02	Coastal and estuarial defences					
	1.07.03	Tunnels and shafts	15.00	m	7,707	116,000	
	1.07.04	Subways and underpasses					
	1.07.05	Bridges and viaducts					
		Bridge no. 6	51	m^2	3,366	172,000	
		Bridge no. 7 - Culvert	10	m	6,235	62,000	
		Bridge no. 8 - inverted siphon 3m deep	8	m	10,417	83,000	
		Bridge no. 9 - inverted siphon 4m deep	8	m	11,569	93,000	
		Bridge no. 10 - inverted siphon 5m deep	8	m	12,759	102,000	
		Bridge no. 11 - inverted siphon 5m deep	8	m	12,759	102,000	
		Bridge no. 12 - inverted siphon 3m deep - 4 pipe	8	m	12,987	104,000	
		Bridge no. 13 - inverted siphon 3m deep - 4 pipe	8	m	12,987	104,000	
		Bridge no. 14 - inverted siphon 5m deep	8	m	12,759	102,000	
		Temporary Bridges to A21 diversion	200	m^2	1,335	267,000	
		Temporary Culverts to A21 diversion	20	m	1,000	20,000	
	1.07.06	Footbridges					
	1.07.07	Retaining Walls (twin)	340.00	m	6,629	2,254,000	Retained Cut
	1.07.08	Fencing and enclosures					
	1.07.09	General drainage					
	1.07.10	Track foundations					
	1.07.11	Roads, pavements and hardstandings					
		Temporary Diversion of A21	1.00	item	346,000	346,000	including traffic management and removal
		Reinstatement of A21 following cut & cover tunnel completion	1.00	item	561,000	561,000	
	1.07.12	Troughing					
		Carried Forward to Construction Works Summary				4,796,000	

Rother Valley Railway
GRIP 2 Cost Estimate
6.0 Detailed Cost Estimate

Job Number : 239025-02

Ref	Series	Description	Quantity	Unit	Rate	Total	Notes
6.2		**Option 2**					
1.08		Enabling Works					
	1.08.01	Extra ordinary site investigation works	2.5%			120,000	Allowance of 2.5% of direct works included for enabling works
	1.08.02	Site clearance and preparation works	2.5%			120,000	Allowance of 2.5% of direct works included for enabling works
	1.08.03	Structure specific enabling works	5.0%			240,000	Allowance of 5% of direct works included for enabling works
		Carried Forward to Construction Works Summary				480,000	

Rother Valley Railway
GRIP 2 Cost Estimate
6.0 Detailed Cost Estimate

ARUP

Job Number : 239025-02

Ref	Series	Description	Quantity	Unit	Rate	Total	Notes
6.3		**Option 3**					
1		Direct Construction Works					
	1.01	Railway Control Systems				excl.	
	1.02	Train Power Systems				excl.	
	1.03	Electric Power and Plant				excl.	
	1.04	Permanent Way				excl.	
	1.05	Telecommunication Systems				excl.	
	1.06	Buildings and Property				n/a	
	1.07	Civil Engineering				8,361,000	
	1.08	Enabling Works				669,000	
		Carried Forward to Grand Summary				9,030,000	

Rother Valley Railway
GRIP 2 Cost Estimate
6.0 Detailed Cost Estimate

Job Number : 239025-02

ARUP

Ref	Series	Description	Quantity	Unit	Rate	Total	Notes
6.3		**Option 3**					
1.07		Civil Engineering					
	1.07.01	Earthworks					
		Embankments	3274	m	47	155,000	
		Cutting	33	m	40	1,000	
	1.07.02	Coastal and estuarial defences					
	1.07.03	Tunnels and shafts					
	1.07.04	Subways and underpasses					
	1.07.05	Bridges and viaducts					
		Bridge no. 6	51	m²	3,366	172,000	
		Bridge no. 7 - Culvert	18	m	6,235	112,000	
		Viaduct	3500	m²	2,263	7,921,000	
	1.07.06	Footbridges					
	1.07.07	Retaining Walls					
	1.07.08	Fencing and enclosures					
	1.07.09	General drainage					
	1.07.10	Track foundations					
	1.07.11	Roads, pavements and hardstandings					
	1.07.12	Troughing					
		Carried Forward to Construction Works Summary				8,361,000	

Rother Valley Railway
GRIP 2 Cost Estimate
6.0 Detailed Cost Estimate

Job Number : 239025-02

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Ref	Series	Description	Quantity	Unit	Rate	Total	Notes
6.3		**Option 3**					
1.08		Enabling Works					
	1.08.01	Extra ordinary site investigation works	2.5%			209,000	Allowance of 2.5% of direct works included for enabling works
	1.08.02	Site clearance and preparation works	2.5%			209,000	Allowance of 2.5% of direct works included for enabling works
	1.08.03	Structure specific enabling works	3.0%			251,000	Allowance of 3% of direct works included for enabling works
		Carried Forward to Construction Works Summary				669,000	

Rother Valley Railway
GRIP 2 Cost Estimate
6.0 Detailed Cost Estimate

ARUP

Job Number : 239025-02

Ref	Series	Description	Quantity	Unit	Rate	Total	Notes
6.4		**Option 4**					
1		Direct Construction Works					
	1.01	Railway Control Systems				excl.	
	1.02	Train Power Systems				excl.	
	1.03	Electric Power and Plant				excl.	
	1.04	Permanent Way				excl.	
	1.05	Telecommunication Systems				excl.	
	1.06	Buildings and Property				n/a	
	1.07	Civil Engineering				4,607,000	
	1.08	Enabling Works				460,000	
		Carried Forward to Grand Summary				5,067,000	

Rother Valley Railway
GRIP 2 Cost Estimate
6.0 Detailed Cost Estimate

ARUP

Job Number : 239025-02

Ref	Series	Description	Quantity	Unit	Rate	Total	Notes
6.4		**Option 4**					
1.07		Civil Engineering					
	1.07.01	Earthworks					
		Embankment	2586	m³	47	123,000	
		Cutting	1817	m³	40	72,000	
	1.07.02	Coastal and estuarial defences					
	1.07.03	Tunnels and shafts	15.00	m	7,707	116,000	
	1.07.04	Subways and underpasses					
	1.07.05	Bridges and viaducts					
		Bridge no. 6	51	m²	3,366	172,000	
		Bridge no. 7 - Culvert	10	m	6,235	62,000	
		Bridge no. 8	30	m²	3,984	126,000	
		Bridge no. 9	51	m²	4,260	229,000	
		Bridge no. 10	51	m²	4,260	229,000	
		Bridge no. 11	51	m²	4,260	229,000	
		Bridge no. 12	50	m²	3,984	211,000	
		Bridge no. 13	150	m²	3,840	384,000	
		Bridge no. 14	50	m²	3,984	211,000	
		Temporary Bridges to A21 diversion	200	m²	1,335	267,000	
		Temporary Culverts to A21 diversion	20	m	1,000	20,000	
	1.07.06	Footbridges					
	1.07.07	Retaining Walls (twin)	100.00	m	4,827	483,000	Retained Cut
	1.07.08	Fencing and enclosures					
	1.07.09	General drainage					
	1.07.10	Track foundations					
	1.07.11	Roads, pavements and hardstandings					
		Temporary Diversion of A21	1.00	item	346,000	346,000	including traffic management
		Reinstatement of A21 following cut & cover tunnel completion	1.00	item	561,000	561,000	
		Embankment to A21	16128	m³	47	766,000	
	1.07.12	Troughing					
		Carried Forward to Construction Works Summary				4,607,000	

Ref	Series	Description	Quantity	Unit	Rate	Total	Notes
6.4		**Option 4**					
1.08		Enabling Works					
	1.08.01	Extra ordinary site investigation works	2.5%			115,000	Allowance of 2.5% of direct works included for enabling works
	1.08.02	Site clearance and preparation works	2.5%			115,000	Allowance of 2.5% of direct works included for enabling works
	1.08.03	Structure specific enabling works	5.0%			230,000	Allowance of 5% of direct works included for enabling works
		Carried Forward to Construction Works Summary				460,000	

Appendix D

RVR Fully worked up estimate of actual cost to RVR of constructing level crossing (Option 1)

Rother Valley Railway
LIMITED
IN ASSOCIATION WITH THE KENT & EAST SUSSEX RAILWAY
ROBERTSBRIDGE JUNCTION STATION, STATION ROAD,
ROBERTSBRIDGE, EAST SUSSEX. TN32 5DG
www.rvr.org.uk

16 May 2019

Our ref: Chairman/GSC/761
Your ref:

RVR A21 Crossing Options Report
Option 1 - Pricing

1. Introduction
RVR has priced Option 1 (At-grade Crossing) on the basis that will be constructed using the well proven RVR construction model.

2. RVR Construction Model
Rother Valley Railway Ltd acts as the Engineering, Procurement, Installation, and Commissioning (EPIC) contractor delivering phases of the Bodiam to Robertsbridge Reconnection Project for the Client which is the RVR Heritage Trust.
RVR has within its EPIC team:

- Volunteer professional designers and certifiers,
- Volunteer project managers,
- Small local subcontractors,
- Volunteer track laying contractor

3. EPIC Team Construction Experience
RVR has already built 2km of railway to mainline railway standards, winning many industry awards:
Phases 1, 2, and 3 from Bodiam to Junction Road, 1.5km of rebuilt embankment, culverts, and track bed.
Phase 5 from Robertsbridge Junction Station to Northbridge Street includes 1 strengthened bridge with new steel deck, 1 bridge deck replacement, 3 new RC bridges with steel decks, and a steel sheet piling river wall. (Institution of Civil Engineers' Engineering Excellence Awards 2013 - Restoration Award)
Phase 6 includes an embankment widening, a new connection to the Network Rail mainline, a reinforced concrete retaining wall, five coach platform, (ICE SE Engineering Excellence Awards 2017 - Community Benefit Award)
Phase 7 includes the foundations for the water tower and water crane, and foundations for the booking hall and toilet block.
For Kent and East Sussex Railway (K&ESR), RVR project managed a new 4 road Carriage Storage Shed and sidings. (ICE South Coast Engineering Excellence Awards 2015 - Special Award (Community))
Working as K&ESR, the team reconstructed the 5.7km line between Northiam and Bodiam Stations
K&ESR more recently reconstructed the A26 level crossing with the deck system proposed for the RVR level crossings.

4. Cost Estimate

1	Design and Certification (Volunteer Professionals)	£0.00
2	Site Facilities	£18,310.00
3	Embankment and Culverts	£957,590.00
4	Steel Sheet Piling	£168,000.34
5	Bridge Decks (RVR owned)	£0.00
6	Bridge Deck Transport and Setting	£16,800.00
7	Level Crossing Installation	£171,000.00
	Subtotal	£1,331,700.34
8	Supervision	£28,600.00
9	Overheads	£39,317.00
10	Profit (Registered Charity)	£0.00
	Subtotal	£1,399,617.34
11	Contingency 10%	£139,692.00
	Total	**£1,539,579.34**
	Note: Excludes VAT and Inflation	

5. Attachments

A. Price build up
B. Copies of quotations
C. Andrew Wood's detailed estimate
D. Award certificates

Gardner Crawley BSc(Eng), CEng, FICE
Chairman Rother Valley Railway Ltd

Ref	Description	Amount
	Option 1 Cost Summary	
	Construction of Formation from Northbridge Street to East of A21 (Chainage 820+00 to 1420+00)	
1	Design and Certification (Volunteer Professionals)	£0.00
2	Site Facilities	£18,310.00
3	Embankment and Culverts	£957,590.00
4	Steel Sheet Piling	£168,000.34
5	Bridge Decks (RVR owned)	£0.00
6	Bridge Deck Transport and Setting	£16,800.00
7	Level Crossing Installation	£171,000.00
	Subtotal	£1,331,700.34
8	Supervision	£28,600.00
9	Overheads	£39,317.00
10	Profit (Registered Charity)	£0.00
	Subtotal	£1,399,617.34
11	Contingency 10%	£139,962.00
	Total	**£1,539,579.34**

Description	Element	Option 1	Option 2	Option 3	Option 4
Item 1 Design and Certification					
Volunteer Professional Engineers					
Graham Bessant	Certification	Yes	No	No	No
Alan Hayward	Culverts	Yes	No	No	No
Derek Kent	Temporary Works	Yes	No	No	No
John Streeves	Steel Bridges	Yes	No	Yes	No
Total to Summary		£0.00	N/A	N/A	N/A

Description	Qty	Unit	Rate	Amount	Total
Item 2 Site Facilities					
Construction Period					
Andrew Wood estimate 24-Apr-19					
AW Duration 6 months	6	months			
	26	weeks			
Wheelwash (Rahul Sodha)					
Hire	26	weeks	£255.00	£6,630.00	
Transport Each way	4	trips	£995.00	£3,980.00	
					£10,610.00
Toilet (4Jays)					
Hire	26	weeks	£200.00	£5,200.00	
Transport Each way	4	trips	£100.00	£400.00	
					£5,600.00
Office (4Jays)					
Hire	26	weeks	£35.00	£910.00	
Transport Each way	4	trips	£100.00	£400.00	
					£1,310.00
Storage (4Jays)					
Hire	26	weeks	£15.00	£390.00	
Transport Each way	4	trips	£100.00	£400.00	
					£790.00
Total to Summary					£18,310.00

Description	Detail	Total
Item 3 Embankment and Culverts		
Groundwork		
Andrew Wood Estimate 24-Apr-19		
North Bridge Street yard (RB.J side)		£17,120.00
North Bridge Street yard (A21side)		£17,680.00
Rother Bridge foundations	(Excl SSP & Crane))	£60,720.00
Rother Bridge flood bund retaining wall		£38,490.00
Bridge 7	pipe culvert	£29,320.00
Bridge 8	4 unit wide box culvert	£71,280.00
Bridge 9	2 unit wide box culvert	£42,865.00
Bridge 10	2 unit wide box culvert	£42,865.00
Bridge 11	2 unit wide box culvert	£42,865.00
Mill Stream Bridge foundations	(Excl SSP & Crane))	£67,720.00
Bridge 13	pipe culvert	£131,400.00
Bridge 14	2 unit wide box culvert	£42,865.00
Embankment		£352,400.00
Total to Summary		£957,590.00

Description	Qty	Unit	Rate	Total
Item 4 Steel Sheet Piling				
Installation				
Mobilisation and demobilisation of all equipment to and from site.	2	per visit	£8,050.00	£16,100.00
External Site Move	2	per move	£3,770.00	£7,540.00
Provide a Warranty - cost subject to agreed wording		sum		Not Offered
Production of a full sheet pile Design Report & drawings No. of Design Cases; Excludes work on Frame Design, AIP or Rail Forms **1**	1	sum	£750.00	£750.00
Provide a Bond - cost subject to agreed wording		sum		Not Offered
Reaction stand set up.	4	lin.m	£1,370.00	£5,480.00
Bridge 6 - River Rother East Abutment - Internal Dimensions - 4.14m x 7.14m	226.8	m²	£144.75	£32,829.30
Bridge 6 -River Rother West Abutment - Internal Dimensions - 4.14m x 7.14m	226.8	m²	£144.75	£32,829.30
Bridge 12 - Mill Stream East Abutment - Internal Dimensions - 4.14m x 7.14m	226.8	m²	£144.75	£32,829.30
Bridge 12 -Mill StreamWest Abutment - Internal Dimensions - 4.14m x 7.14m	226.8	m²	£144.75	£32,829.30
EO for Interlocking corner pieces	36	lin m	£67.69	£2,436.84
Flame cutting piles during installation, in free air	214.2	per visit	£20.00	£4,284.00
Mobilisation of welders to flame cut the sheet piles after removal of the frames	4	per visit	£1,100.00	£4,400.00
Mobilisation of an "Oasis Unit" as per our Pricing Notes		per visit	£520.00	Ext if Reqd
Hire of an "Oasis Unit" as per our Pricing Notes (minimum 1 week hire)		week	£270.00	Ext if Reqd
Supply 1no. O&M Manual in electronic format		sum	£1,000.00	Ext if Reqd
Supply a setting out engineer for the sheet piling element of our works		week	£2,144.00	Ext if Reqd
Supply a Non Working SSSTS Supervisor for the Piling element of our works		week	£2,400.00	Ext if Reqd
Due on Installation				£172,308.04
This estimate is based on the following durations for each specific task.				
Please allow for any potential delays that you consider may occur at the rates below -				
16 days to install the sheet piles with 1no piling gang		day	£2,990.00	Ext if Reqd

Description	Qty	Unit	Rate	Total
Item 4 Steel Sheet Piling				
2 days to cut down the sheet piles to top of abutment level with 1no gang		day	£1,750.00	Ext if Reqd
				£172,308.04
less 2.5% discount for prompt payment				-£4,307.70
Dayworks/Standing Time from Dayworks Page	1	item	£0.00	
				£168,000.34

Description	Detail	Total
Item 5 Bridge Decks		
RVRL already owned, in storage		
Bridge No 6 (River Rother)		
Bought from Cow Lane Bridge Replacement, Reading		
Scrap price paid		
Plus haulage		
Bridge No 12 (Mill Stream)		
- ditto -		
Total to Summary		£0.00

Description	Detail	Total
Item 6 Bridge Deck Transport and Setting		
Coussens Estimate 11-Apr-19		
Bridge No 6 (River Rother)		
Crane for each visit on CPA Contract lift		£3,200.00
Transport with escorting		£2,000.00
Crane for each visit on CPA Contract lift		£3,200.00
Bridge No 12 (Mill Stream)		
Crane for each visit on CPA Contract lift		£3,200.00
Transport with escorting		£2,000.00
Crane for each visit on CPA Contract lift		£3,200.00
Total to Summary		£16,800.00

Description	Qty	Unit	Rate	Amount
Item 7 Level Crossing Installation				
Site Works (Peter Barber email 4 Apr 2019):				
Ground investigations		Sum		£10,000.00
Surface water drainage		Sum		£5,000.00
Service diversions - none		Sum		£0.00
Approach signage		Sum		£10,000.00
Subtotal				
Level Crossing Installation (Peter Barber email 2 Feb 2019)				
Crossing units and rail bonded in	18	m	£2,000.00	£36,000.00
Crane hire		Sum		£5,000.00
Ground works to bottom of concrete level		Sum		£20,000.00
Make good road and white lining		Sum		£10,000.00
High friction road surface	40	m	£250.00	£10,000.00
Rail and corrosion protection		Sum		£5,000.00
Subtotal				
Level Crossing Equipment (Paul Baker and RH&DR)				
Road Management		Sum		£10,000.00
CCTV		Sum		£10,000.00
Lifting barriers & Control system		Sum		£40,000.00
Total to Summary				

Total
£25,000.00
£86,000.00
£60,000.00
£171,000.00

Description	Qty	Unit
Item 8 Supervision		
Average costs from Company Accounts		
6 months construction manager		
Weeks	26	
Days	130	
Rate	£160.00	
Total		£20,800.00
Expenses		
Days	130	
Accommodation	£60.00	
		£7,800.00
Total to Summary		£28,600.00

Description	Amount	Total
Item 9 Overheads		
Company Overheads		
Annual (2015)	£52,000.00	
Rate	£4,333.33	
Months	6	
Total		£26,000.00
Site Overheads		
Construction Cost	£1,331,700.34	
Phases 5, 6, 7	1.00%	
Total		£13,317.00
Total to Summary		£39,317.00

Rother Valley Railway Ltd
A21 Options Report - Costing

Details	2010	2011	2012	2013	2014	2015	2016	2017
From Annual Accounts – Trading, Profit & Loss Account								
INCOME:								
Rent Receivable	5,221	5,016	4,975	4,975	4,975	6,100	7,087	6,813
Donations	9,276	9,738	7,239	9,845	9,913	9,658	9,693	10,065
Sundry Income	31	281					4,340	158
Revenue grants	19,814	29,037	24,011	40,605	58,892	81,225	74,155	73,168
Bank Interest Received								
Sale of Scrap		3,199	6,164	2,455	2,953	1618	584	
Legacy					500			
Profit from disposal of Fixed Assets		3,903		7,304		87		
Total:	34,342	51,174	42,389	65,184	77,233	98,688	95,859	90,204
Per Accounts	34,342	51,174	42,389	65,184	77,233	98,868	95,859	90,204
EXPENDITURE:								
Rent Payable	4,376	4,382	4,377	4,377	4,376	4,372	5,126	4,901
Insurance	3,533	3,767	3,934	3,761	3,797	3,716	3,943	4,425
Electricity & Heating Gas	895	827	1,236	1,568	1,402	1,157	1,129	1,706
Telephone & Broadband	289	437	388	389	430	518	541	532
Water & Sewerage	87	150	314	358	241	228	158	265
Waste collection	162	318	384	457	729	905	1,172	793
Weedkilling								
Bank Charges	127	201	195	182	136	138	183	140
Health & Safety expenses	62	56	44	222	355	181	4	248
Legal & Professional Fees	55	14	14	13	13	13	380	13
Subscriptions	45	47	65	65	105	165	160	160
NR connection charge								
General Repairs & Maintenance	8,879	782	3,849	1,335	1,361	1,005	3,867	524
Maintenance of Rolling Stock	241	3,270	127	495	353	2,243	2,239	2,543
Diesel fuel	200	160	50	125	128	75	40	35
Tools & General cons	2,393	3,646	2,299	2,914	3,972	3,327	3,216	2,018
Forestry & Gardening		-	60		110		2,850	2,197
Cleaning			351		923	1,040	1,085	749
Sundry Expenses	754	632		1,499	861	875	2,443	2,181
Supervision					9,150	24,190	3,910	
Depreciation - Permanent Way	9,915	22,661	16,907	29,850	39,776	44,983	49,324	51,192
Depreciation – Buildings & Structures	669	669	858	858	189	189	3,074	11,075
Depreciation – Fixtures & Fittings	263	343	343	750	607	604	413	365
Depreciation – Plant & Equipment	457	311	589	730	675	1,698	1,807	1,901
Depreciation – Rolling Stock	3,858	7,003	7,888	7,458	7,318	7,318	7,318	7,318
Loss from disposal of Fixed Asset					1,884		567	
Total:	37,260	49,676	44,272	57,406	78,891	98,940	94,949	95,281
Overheads (Ex Depreciation & Superv	27,345	27,015	27,365	27,556	39,115	53,957	45,625	44,089

LIMITED
IN ASSOCIATION WITH THE KENT & EAST SUSSEX RAILWAY
ROBERTSBRIDGE JUNCTION STATION, STATION ROAD,
ROBERTSBRIDGE, EAST SUSSEX. TN32 5DG
www.rvr.org.uk

RVR A21 Crossing Options Report
Option 1 – Pricing Appendices

1 Design and Certification - Volunteer Professionals Confirmation
2 Site Facilities – Suppliers Quotations
3 Embankment and Culverts – Andrew Wood Quotation
4 Steel Sheet Piling – Berryrange Quotation
5 Bridge Decks (RVR owned)
6 Bridge Deck Transport and Setting – Coussens Quotation
7 Level Crossing Installation – Peter Barber Quotation
8 Supervision - RVRL records
9 Overheads - RVRL records
10 Profit - RVRL records

Appendix 1- Design and Certification

Volunteer Professionals Confirmation:

Description	Element	Option 1	Option 2	Option 3	Option 4
Graham Bessant	Certification	Yes	No	No	No
Alan Hayward	Culverts	Yes	No	No	No
Derek Kent	Temporary Works	Yes	No	No	No
John Streeves	Steel Bridges	Yes	No	Yes	No
Total to Summary		£0.00	N/A	N/A	N/A

Appendix 2 - Site Facilities

Suppliers' Quotations attached

Duration 6 months	6	months			
	26	weeks			
Wheelwash (Rahul Sodha)					
Hire	26	weeks	£255.00	£6,630.00	
Transport Each way	4	trips	£995.00	£3,980.00	
					£10,610.00
Toilet (4Jays 1 May 2019)					
Hire	26	weeks	£200.00	£5,200.00	
Transport Each way	4	trips	£100.00	£400.00	
					£5,600.00
Office (4Jays 1 May 2019)					
Hire	26	weeks	£35.00	£910.00	
Transport Each way	4	trips	£100.00	£400.00	
					£1,310.00
Storage (4Jays 1 May 2019)					
Hire	26	weeks	£15.00	£390.00	
Transport Each way	4	trips	£100.00	£400.00	
					£790.00
Total to Summary					£18,310.00

Lorry Wheel Wash not included

From: Rahul Sodha
Sent: 23 April 2019 11:14
To: andrewwoodplant@hotmail.co.uk
Subject:

HI Andrew,

Hope you are well ...

Thanks for your time earlier on the phone. Sorry for the delay in someone getting back to you with a prices.

Please see below prices;

Adjustable Wheelwash
£255.00 + VAT Per week

Transport
£995.00 + VAT each way

If you have any questions, please do not hesitate to get in touch with me.

Thanks and kind regards,
Rahul Sodha

Microsoft Outlook Web App

Type here to search Entire Mailbox

Options Sign out

Mail
Calendar
Contacts

Deleted Items (105)
Drafts [638]
Inbox (14027)
Junk E-Mail
Sent Items

Click to view all folders

Bad address
Pending
Rotary

Manage Folders...

Reply Reply All Forward Close

RE: Four Jays - contact form

Debs - Four Jays Group [Debs@fourjays.co.uk]

To help protect your privacy, some content in this message has been blocked. If you're sure this message is from a trusted sender and you want to re-enable the blocked features, click here.

Sent: 01 May 2019 08:16
To: Gardner Crawley
Cc: Jax - Four Jays Group [Jax@fourjays.co.uk]

Dear Crawley

We charge at present £200 p.w. for a 12ft x 8ft welfare which is a 6 man one and includes a weekly service, plus haulage + VAT.

We do stores and offices. A 12ft store is £15 p.w. and hiab delivery and collection + VAT we also do offices which can be static or trailer and these vary but are usually £35 - £45 p.w. depending on size.

If you hired the store and office and both were static they could be delivered together on one delivery and collection on the hiab lorry.

I hope this helps if you need any more information please call the office.

Kind regards,

Debs Roberts
Four Jays Group

PLEASE VIEW OUR WEBSITE
www.fourjays.co.uk

Tel.: 01622 843135
Fax: 01622 844410
Email: debs@fourjays.co.uk
www.fourjays.co.uk

MUTAmarq Best practice accredited

Find us on Facebook

From: Enquiries - Four Jays Group <enquiries@fourjays.co.uk>
Sent: 01 May 2019 08:06
To: Jax - Four Jays Group <Jax@fourjays.co.uk>

Subject: FW: Four Jays - contact form

Kind regards,

Sarah Worsfold
Director, Four Jays Limited
Partner, Janet's China Hire
Director, Smart Event Support Limited

PLEASE VIEW OUR WEBSITES
www.fourjays.co.uk
www.janetschinahire.co.uk
www.smarteventsupport.co.uk

Tel.: 01622 843135
Fax: 01622 844410
Email: sarah@fourjays.co.uk

From: Four Jays Group <gardner.crawley@dalsterling.com>
Sent: 01 May 2019 07:06
To: Commercial - Four Jays Group <commercial@fourjays.co.uk>
Subject: Four Jays - contact form

From: Gardner Crawley
Email: gardner.crawley@dalsterling.com
Telephone Number: 07776 236465
Items Required: welfare unit for 6 people 12ft office 12ft store
How did you hear about us?: Word of Mouth

Event Information
Date of Event:
Type of Event:
Location of Event:
Expected number of guests:

Commercial Information
Location of site: Robertsbridge
Requirements: We are looking at a 6 month construction project for Summer 2020. Please give me a budget price for on/off cost + hire for 12ft welfare unit + service costs
Duration: 6 months.

Connected to Microsoft Exchange

Rother Valley Railway Limited
RVR A21 Crossing Options Report
Option 1 – Pricing Appendices

Appendix 3 - Embankment and Culverts

Andrew Wood Quotation dated 24 April 2019 attached

Andrew Wood Plant Hire

Elwyn Farm
Playden
Rye
East Sussex
TN31 7UN

VAT No: 702981340
Tel. 07860 837085

Quotation   Page 1

Rother Valley Railway
C/O David Felton
78 Halstead Walk
Maidstone
Kent
ME16 0PW

Invoice No.	1522
Invoice/Tax Date	24/04/2019
Order No.	
Account No.	ROTHERV

Details	Net Amt	VAT
Groundwork estimate for proposed rail extension to Bodiam		
TOTALS		
North Bridge Street yard (RBJ side)	17,120.00	3,424.00
North Bridge Street yard (A21 side)	17,680.00	3,536.00
Rother Bridge foundations	60,720.00	12,144.00
Rother Bridge flood bund retaining wall	38,490.00	7,698.00
Bridge 7 pipe culvert	29,320.00	5,864.00
Bridge 8 4 unit wide box culvert	71,280.00	14,256.00
Bridge 9 2 unit wide box culvert	42,865.00	8,573.00
Bridge 10 2 unit wide box culvert	42,865.00	8,573.00
Bridge 11 2 unit wide box culvert	42,865.00	8,573.00
Mill Stream Bridge foundations	67,720.00	13,544.00
Bridge 13 pipe culvert	131,400.00	26,280.00
Bridge 14 2 unit wide box culvert	42,865.00	8,573.00
Embankment	352,400.00	70,480.00

BANK DETAILS. ACC NO 82457182
SORT CODE 60-18-09

PAYMENT TERMS: STRICTLY 28 DAYS FROM INVOICE DATE.

Total Net Amount	957,590.00
Total VAT Amount	191,518.00
Invoice Total	1,149,108.00

Appendix 4 - Steel Sheet Piling

Berryrange Quotation dated 21 April 2019 attached

Date :- **21st April 2019** Our Ref :- **E7478A** /BQ/ 02 R0

Berryrange

Client :- **Rother Valley Railway - DAL Streling**
Contract :- **Phase 4, Rother Valley Railway, Robertsbridge.** **Option 2 - Non-Conforming Design**
F.A.O. **Mr. Gardner Crawley** **Installation with a WP 150 Piler**

Item	Description	Quant.	Unit	Rate	Amount
	Sheet Piling **Based on Berryrange design -** V1				
	Installation				
1	Mobilisation and demobilisation of all equipment to and from site.	2	per visit	£8,050.00	£16,100.00
(a)	External Site Move	2	per move	£3,770.00	£7,540.00
2	Provide a Warranty - cost subject to agreed wording		sum		Not Offered
3	Production of a full sheet pile Design Report & drawings No. of Design Cases;	1	sum	£750.00	£750.00
	Excludes work on Frame Design, AIP or Rail Forms ***1***				
4	Provide a Bond - cost subject to agreed wording		sum		Not Offered
5	Reaction stand set up.	4	no	£1,370.00	£5,480.00
6	Bridge 6 - River Rother East Abutment - Internal Dimensions - 4.14m x 7.14m				
	Supply, handle and install the following sheet piles using a				
	WP150 silent piler or similar for a quiet and vibration free method	25.2	lin.m		
	42 no. GU21N @ 9.0 m long to retain 3.10 m Propped by others	226.8	m²	£144.75	£32,829.30
	Top of the sheet pile installed to +11.5m with an EGL at +10.65m to a				
	formation level of +7.55m. Factor of Safety for Stability = 1.11 > 1.0 ok				
	Temporary Prop/s; @ 11.25mOD, 27kN/m, (ULS) or 22kN/m (SLS)				
	Suggest using a hired hydraulic frame.				
	Surcharges; 10kPa General				
	Anticipated Deflections < 5mm				
7	Bridge 6 -River Rother West Abutment - Internal Dimensions - 4.14m x 7.14m				
	Supply, handle and install the following sheet piles using a				
	WP150 silent piler or similar for a quiet and vibration free method	25.2	lin.m		
	42 no. GU21N @ 9.0 m long to retain 3.10 m Propped by others	226.8	m²	£144.75	£32,829.30
	Top of the sheet pile installed to +11.5m with an EGL at +10.65m to a				
	formation level of +7.55m. Factor of Safety for Stability = 1.11 > 1.0 ok				
	Temporary Prop/s; @ 11.25mOD, 27kN/m, (ULS) or 22kN/m (SLS)				
	Suggest using a hired hydraulic frame.				
	Surcharges; 10kPa General				
	Anticipated Deflections < 5mm				
8	Bridge 12 - Mill Stream East Abutment - Internal Dimensions - 4.14m x 7.14m				
	Supply, handle and install the following sheet piles using a				
	WP150 silent piler or similar for a quiet and vibration free method	25.2	lin.m		
	42 no. GU21N @ 9.0 m long to retain 3.10 m Propped by others	226.8	m²	£144.75	£32,829.30
	Top of the sheet pile installed to +11.0m with an EGL at +10.35m to a				
	formation level of +7.25m. Factor of Safety for Stability = 1.11 > 1.0 ok				
	Temporary Prop/s; @ 10.75mOD, 27kN/m, (ULS) or 22kN/m (SLS)				
	Suggest using a hired hydraulic frame.				
	Surcharges; 10kPa General				
	Anticipated Deflections < 5mm				
9	Bridge 12 -Mill StreamWest Abutment - Internal Dimensions - 4.14m x 7.14m				
	Supply, handle and install the following sheet piles using a				
	WP150 silent piler or similar for a quiet and vibration free method	25.2	lin.m		
	42 no. GU21N @ 9.0 m long to retain 3.10 m Propped by others	226.8	m²	£144.75	£32,829.30
	Top of the sheet pile installed to +11.0m with an EGL at +10.35m to a				
	formation level of +7.25m. Factor of Safety for Stability = 1.11 > 1.0 ok				
	Temporary Prop/s; @ 10.75mOD, 27kN/m, (ULS) or 22kN/m (SLS)				
	Suggest using a hired hydraulic frame.				
	Surcharges; 10kPa General				
	Anticipated Deflections < 5mm				

10	EO for Interlocking corner pieces Interlocking corners - 4 no. allowed @ 9.0 m long	36.0	lin m	£67.69	£2,436.84
11	Flame cutting piles during installation, in free air	214.2	lin m	£20.00	£4,284.00
12	Mobilisation of welders to flame cut the sheet piles after removal of the frames	4	per visit	£1,100.00	£4,400.00
13	Mobilisation of an "Oasis Unit" as per our Pricing Notes		per visit	£520.00	Ext if Reqd
14	Hire of an "Oasis Unit" as per our Pricing Notes (minimum 1 week hire)		week	£270.00	Ext if Reqd
15	Supply 1no. O&M Manual in electronic format ***Please note that all As-Built drawings/Information to come from Setting Out Engineer***		sum	£1,000.00	Ext if Reqd
16	Supply a setting out engineer for the sheet piling element of our works ***(If required, please extend for 4 weeks)***		week	£2,144.00	Ext if Reqd
17	Supply a Non Working SSSTS Supervisor for the Piling element of our works ***(If required, please extend for 4 weeks)***		week	£2,400.00	Ext if Reqd
	This bill is to be read in conjunction with the pricing notes, design assumption notes, technical notes, piling attendances and our T's & C's				
	Due On Installation				£172,308.04
18	This estimate is based on the following durations for each specific task. Please allow for any potential delays that you consider may occur at the rates below -				
	16 days to install the sheet piles with 1no piling gang		day	£2,990.00	Ext if Reqd
	2 days to cut down the sheet piles to top of abutment level with 1no gang		day	£1,750.00	Ext if Reqd
					£172,308.04
	less 2.5% discount for prompt payment				-£4,307.70
A	Dayworks/Standing Time from Dayworks Page -	1	item	0.00	
	Total				**£168,000.34**
	Standing time for any reason beyond our control will be charged, based on a 10 hour working day, at the following hourly rates - Piling Gang **£299.00** Flame Cutting Gang **£175.00**				

Appendix 5 - Bridge Decks

RVR owned, purchased for cost of scrap and transport from Cow Lane, Reading

Cow Lane, Reading 19 August 2011

Appendix 6 - Bridge Deck Transport and Setting

Coussens Quotation dated 11 April 2019 attached

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5092-KVE-Nordsee Ost (29)
8881-MC-Nuon (602)
8889-KS-Eldfisk (364)
8904-DEC-Sur IPP (16)
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Pending
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RE: RVR Phase 4 Bridge Decks

Margaret Coussens [margaret@coussenscranes.co.uk]

You replied on 11/04/2019 20:45.

Sent: 11 April 2019 19:07
To: Gardner Crawley

Good Afternoon
From the current information available it would be difficult to give exact pricing but some ball park figures below

Loading and transport
Crane for each visit on CPA Contract lift circa £3200.00 plus Vat per visit
Transport with escorting circa £2000.00 per visit

If you need anything else please let me know
Thanks

Margaret
Hiredesk
Coussens Cranes Ltd
01424 892380
margaret@coussenscranes.co.uk

From: Paul Coussens [mailto:coussens.paul@googlemail.com]
Sent: 11 April 2019 08:49
To: Margaret Coussens <margaret@coussenscranes.co.uk>
Subject: Fwd: RVR Phase 4 Bridge Decks

Paul Coussens
Coussens Cranes
Tel 01424 892380
Mob 07860 643049
Fax 01424 893466

Begin forwarded message:

> **From:** Info <info@coussenscranes.co.uk>
> **Date:** 25 March 2019 at 08:46:00 GMT
> **To:** "'coussens.paul@googlemail.com'" <coussens.paul@googlemail.com>
> **Cc:** Margaret Coussens <margaret@coussenscranes.co.uk>
> **Subject: FW: RVR Phase 4 Bridge Decks**

Appendix 7 - Level Crossing Installation

Description	Qty	Unit	Rate	Amount	Total
Site Works (Peter Barber):					
Ground investigations		Sum		£10,000.00	
Surface water drainage		Sum		£5,000.00	
Service diversions - none		Sum		£0.00	
Approach signage		Sum		£10,000.00	
Subtotal					£25,000.00
Level Crossing Installation (Peter Barber email 2 Feb 2019)					
Crossing units and rail bonded in	18	m	£2,000.00	£36,000.00	
Crane hire		Sum		£5,000.00	
Ground works to bottom of concrete level		Sum		£20,000.00	
Make good road and white lining		Sum		£10,000.00	
High friction road surface	40	m	£250.00	£10,000.00	
Rail and corrosion protection		Sum		£5,000.00	
Subtotal					£86,000.00
Level Crossing Equipment (Paul Baker and RH&DR)					
Road Management		Sum		£10,000.00	
CCTV		Sum		£10,000.00	
Lifting barriers & Control system		Sum		£40,000.00	
					£60,000.00
Total to Summary					£171,000.00

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RE: RVR A21 - Costing exercise by Arup in the "Options Report"

Peter Barber [peter.barber59@outlook.com]

Sent: 01 February 2019 09:52
To: David Gillett [david.gillett@davg.co.uk]
Cc: ian@bertramross.com; Gardner Crawley; 'David Keay' [david.keay@outlook.com]; 'Mike Hart (RWS)' [mikehart@railwaywheelset.co.uk]
Attachments: Offer - 1000008165 - Engla~1.pdf (3 MB) [Open as Web Page]

Hi David

I attached the offer for Jn Rd as reference but I would allow 18 m crossing and added in a bit of risk. The Jn Rd was done costing wise as a favour and as things stand we would get a reduction but we shouldn't rely on this.

Crossing units and rail bonded in @ £2k m £36.000
Crain hire £5,000
Ground works to bottom of concrete level £20,000
Make good road and white lining £20,000
High friction road surface circa 20 m each side of crossing £10,000
Rail and corrosion protection £5,000
Service diversion if any ????
Road management ????

As a ball park £100,00 but by pulling in some favours we get under this.

I have assume that we have a 52 hour closure but with detailed planning we may be able under traffic lights reduce the closure to 28 hrs but will have a knock on to cost.

I will get a more detailed breakdown and whole life cost based on a NR risk assessment for an A road but I relying on favours so is taking a bit longer.

Regards

Peter

-----Original Message-----
From: David Gillett <david.gillett@davg.co.uk>
Sent: 31 January 2019 13:27
To: 'Peter Barber' <peter.barber59@outlook.com>
Cc: ian@bertramross.com; 'Gardner Crawley' <Gardner.Crawley@dalsterling.com>; 'David Keay' <david.keay@outlook.com>
Subject: RE: RVR A21 - Costing exercise by Arup in the "Options Report"

Hi Peter,
Many thanks for the information on the crossing units etc. earlier today.
Sorry to chase, but have you managed to put any approximate costs together for the KESR crossing installation last year.
Kind regards
David(G)

-----Original Message-----
From: Peter Barber [mailto:peter.barber59@outlook.com]
Sent: 22 January 2019 17:14
To: David Gillett <david.gillett@davg.co.uk>
Cc: ian@bertramross.com; Gardner Crawley <Gardner.Crawley@dalsterling.com>;
David Keay <david.keay@outlook.com>; Mike Burnham <mike@mikeburnham.com>

edilon)(sedra

edilon)(sedra bv · Postbus 1000 · NL-2003 RZ Haarlem · The Netherlands

Kent & East Sussex Railway Company
Registered Charity No. 2624812244

B2244 Junction Road
Robersbridge
TN32 5XD
United Kingdom

Haarlem, April 12, 2018

Project	: 1000008165 – England – Kent & East Sussex Railway – B2244 Junction Road
Subject	: e)(s LCS (Level Crossing System), including Corkelast® ERS (Embedded Rail System)
Our reference	: 02.388.308

Dear Mr. Barber,

Following our discussions of last week we present you our final and best offer for the edilon)(sedra LCS (Level Crossing System) for the B2244 Junction Road Level Crossing.

<u>The System</u>
The e)(s LCS system combines prefabricated concrete level crossing slabs with the elastic edilon)(sedra Corkelast® Embedded Rail System (ERS) which provides continuously support of the rail in its fastening. This makes it very suitable for heavy (road) traffic loads. An additional advantage is the high durability of the slabs which provides a stable track support and a minimum of maintenance requirements. Road traffic safety is secured by the high skid resistance finish of the slab's upper surface.

<u>Our offer</u>
Standard pricing for edilon)(sedra LCS level crossing including ERS materials:

Quantity and system description	**Price per meter track**
e)(s LCS slabs three 3 or 4 m slabs (12 m single track) edilon)(sedra ERS design Ha 2016-0320D rail type to use: 56E1, rail inclination 1:20	€ 1.450,00

<u>Afore mentioned price setting includes the following:</u>

e)(s LCS prefabricated concrete LCS slabs (as per drawing Ma2016-0223B);

<u>Concrete quality</u>:
- Concrete strength class C45/55 according to DIN EN 206-1

edilon)(sedra

Haarlem : March 12, 2018
Project : 1000008165 – England – Kent & East Sussex – B2244 Junction Road
Subject : e)(s LCS (Level Crossing System), including Corkelast® ERS (Embedded Rail System)
Our reference : 02.388.308

Structural Analysis:

- Verification of the level crossing slabs according to rail road
- traffic load model UIC 71 and road vehicle load model SLW 60

Surface treatment:

- Top surface of the slab; skid resistance treatment with Reckli Rhombus imprint.

ERS Materials:

- edilon)(sedra Corkelast®;
- edilon)(sedra Primers (both impregnating primer and bonding primer);
- Resilient rail strip and Dex-G 20 adhesive;
- Alignment materials to fix the rail in the channel;
- edilon)(sedra Joint Filler between slabs.

Additional items:

Slab protection shield (according to drawing Ma2016-0506)	€ 150,00 per set of two
Slab protection shield provision in slab ends (according to drawing Ma2016-0506). With this option dowels are provided in 2 slab ends so no drilling is necessary to fasten the protection shields	€ 190,00 per two slab ends
4 lifting devices (DEHA 6000-5,0-0120 5T) suitable for the lifting of slabs will be supplied for use at the project free of charge. However if these are not returned to edilon)(sedra within 2 weeks after slab installation we will invoice € 275,00 per lifting device	Free of charge / returnable
Flared flange ways at both level crossing ends (according to drawing Ma2016-0711A)	€ 250,00 each slab side
ERS Installation and Supervision Two operatives including travel and lodging	€ 5.600,00
Transport DAP work site Junction Road (B2244) near Robertsbridge (UK), according to Incoterms 2010	€ 2.700,00

edilon)(sedra

Haarlem : March 12, 2018
Project : 1000008165 – England – Kent & East Sussex – B2244 Junction Road
Subject : e)(s LCS (Level Crossing System), including Corkelast® ERS (Embedded Rail System)
Our reference : 02.388.308

Total cost overview	**Quantity**	**Unit**	**Unit price**	**Total price**
e)(s LCS system	12	m^1	€ 1.450,00	€ 17.400,00
Slab protection shield	2	pcs	€ 75,00	€ 150,00
Provision protection shield	2	pcs	€ 95,00	€ 190,00
Flared flangeways	2	slab end	€ 250,00	€ 500,00
Lifting devices	4	pieces		Free fo charge
ERS installation/ supervision	1	e)(s team		€ 5.600,00
Transport				€ 2.700,00
Total price				€ 26.540,00
One time only project discount				- € 2.654,00
Grand total:				**€ 23.886,00**

Prices for the standard edilon)(sedra LCS level crossing and materials include the following:

- **edilon)(sedra** provides delivery of edilon)(sedra to the agreed destination. Unloading at the work site is not included), transport costs include one waiting hour per delivery per truck. Further waiting hours, not caused by edilon)(sedra, are charged at € 80,00 per truck per hour.
- **edilon)(sedra** provides the supply of edilon)(sedra materials to the agreed destination. Transportation to and from the specific work location is the responsibility of the client.
- **edilon)(sedra** provides materials, equipment and personnel to install the edilon)(sedra Corkelast® Embedded Rail System.
- **edilon)(sedra** takes care of possible application of bad weather facilities and creation of appropriate climatic conditions, for the purpose of application of edilon)(sedra Corkelast® Embedded Rail System.

Prices do not included:

- Delivery and installation of nylon pull wire (to position cables in the ERS tubes);
- Logistical solutions to get edilon)(sedra materials and equipment on and off the job;
- The workplace must be free of any obstacles that can hinder the progress of edilon)(sedra activities;
- Removal and discard of old track and other materials;
- Preparation of subsoil;
- Unloading and placement of concrete elements;
- Supply, welding and handling of rail;
- Sandblasting and priming of rail;
- Surveyor for track alignment;
- Conditioned storage of materials if so required;
- Taking care of discharging edilon)(sedra packaging material;
- Road and traffic safety management;
- Permits and other locally required arrangements.

Weather Services

When necessary, edilon)(sedra will install non storm proof bad weather facilities. Once these have been placed, we will try to create the right climate conditions, for instance by heating, to meet the requirements necessary for application of the edilon)(sedra Corkelast® Embedded Rail System.

When organizing the bad weather facilities the following shall be taken into account:

- Availability of tent materials
- Assembly and disassembly
- Lighting
- Heaters

Specific conditions:

- Client provides space and opportunity to install bad weather facilities.
- When necessary the client provides rail-bound equipment for the supply of materials.
- Depending on the location, the bad weather facilities can be applied up to wind force 6 beau fort.
- Client must prevent water flowing into the channels.

Planning influence:

The following times can be considered in the planning when applying these provisions:

- Setting up bad weather facilities, depending on the length, approximately one to two hours of work;
- Creating of proper climatological circumstances and blow drying / heating rail and channel, depending on the ambient temperature and humidity, about 2-3 hours;
- Cleaning up bad weather facilities approximately 1 hour work.

edilon)(sedra

Haarlem : March 12, 2018
Project : 1000008165 – England – Kent & East Sussex – B2244 Junction Road
Subject : e)(s LCS (Level Crossing System), including Corkelast® ERS (Embedded Rail System)
Our reference : 02.388.308

Terms and conditions:

Prices	: In euro's, excluding V.A.T.;
Delivery	: DAP work site Junction Road (B2244) near Robertsbridge (UK), according to Incoterms 2010; Unloading not included;
Lead time	: 8 weeks after receipt of a written order (except for works holiday closings);
Payment	: 30 days after receipt of invoice.
Other	: edilon)(sedra general terms of delivery will apply.

We trust to have made you an interesting offer. The undersigned will contact you within a few days after submittal of this offer to discuss possible further steps on this project.

If you have any questions sooner than that or if you require additional information, please feel free to contact us.

With kind regards,

Nick Duijvelshoff

Sales Engineer
edilon)(sedra bv

Haarlem : March 12, 2018
Project : 1000008165 – England – Kent & East Sussex – B2244 Junction Road
Subject : e)(s LCS (Level Crossing System), including Corkelast® ERS (Embedded Rail System)
Our reference : 02.388.308

Attachments:

- General terms and conditions edilon)(sedra bv
- LCS system information sheet
- e)(s LCS formwork drawing Ma2016-0223B
- e)(s ERS cross section drawing Ha2016-0320D
- Flared flange way drawing Ma2016-0711A
- Slab protection plate drawing Ma2016-0506
- Cross section sketch of installed level crossing Ha2016-0825A
- General e)(s level crossing installation instruction

Appendix 8 – Supervision

From RVRL Accounts

Description	Qty	Unit
Supervision		
6 months construction manager		
Weeks	26	
Days	130	
Rate	£160.00	
Total		£20,800.00
Expenses		
Days	130	
Accommodation	£60.00	
		£7,800.00
Total to Summary		£28,600.00

David Felton FCA

Alasdair Stewart Engineering Services

Rother Valley Railway,
C/0 David Felton,
78 Halstead Walk,
Maidstone,
Kent,
ME16 OPW.

3 Noddfa,
Penrhyndeudraeth,
Gwynedd,
LL48 6BT

Mob: 07931738976

ORDER No. DATE 09 / 09 / 2016

INVOICE No.

0110

QUANTITY	DESCRIPTION	AMOUNT
21 Days	Site supervision at Robertsbridge, & Rolvenden January – September 2016	£3,150.00
1	Mobilisation	£760.00

TOTAL £3,910.00

Appendix 9 – Overheads

From RVRL Accounts

Description	Amount	Total
Overheads		
Company Overheads		
Annual (from 2015 accounts)	£52,000.00	
Rate	£4,333.33	
Months	6	
Total		£26,000.00
Site Overheads		
Construction Cost	£1,331,700.34	
Rate from Phases 5, 6, 7	1.00%	
Total		£13,317.00
Total to Summary		£39,317.00

David Felton FCA

Appendix 10 – Profit

Rother Valley Railway Ltd is controlled by the Trustees of Rother Valley Railway Heritage Trust, a registered charity no. 1088452. The principal activity of the Company continues to be the reconstruction of the Kent & East Sussex Railway from Bodiam to Robertsbridge in East Sussex.

The reconstruction work is capital work and is not revenue earning.

No profit is added to the cost of the works. Individual subcontractors have included for their own profit within their prices.

David Felton FCA

Andrew Wood Plant Hire

Elwyn Farm
Playden
Rye
East Sussex
TN31 7UN

VAT No: 702981340
Tel. 07860 837085

Quotation Page 1

Rother Valley Railway
C/O David Felton
78 Halstead Walk
Maidstone
Kent
ME16 0PW

Invoice No.	1522
Invoice/Tax Date	24/04/2019
Order No.	
Account No.	ROTHERV

Details	Net Amt	VAT
Groundwork estimate for proposed rail extension to Bodiam		
TOTALS		
North Bridge Street yard (RBJ side)	17,120.00	3,424.00
North Bridge Street yard (A21 side)	17,680.00	3,536.00
Rother Bridge foundations	60,720.00	12,144.00
Rother Bridge flood bund retaining wall	38,490.00	7,698.00
Bridge 7 pipe culvert	29,320.00	5,864.00
Bridge 8 4 unit wide box culvert	71,280.00	14,256.00
Bridge 9 2 unit wide box culvert	42,865.00	8,573.00
Bridge 10 2 unit wide box culvert	42,865.00	8,573.00
Bridge 11 2 unit wide box culvert	42,865.00	8,573.00
Mill Stream Bridge foundations	67,720.00	13,544.00
Bridge 13 pipe culvert	131,400.00	26,280.00
Bridge 14 2 unit wide box culvert	42,865.00	8,573.00
Embankment	352,400.00	70,480.00

BANK DETAILS. ACC NO 82457182
SORT CODE 60-18-09

PAYMENT TERMS: STRICTLY 28 DAYS FROM INVOICE DATE.

Total Net Amount	957,590.00
Total VAT Amount	191,518.00
Invoice Total	1,149,108.00

Andrew Wood Plant Hire

Elwyn Farm
Playden
Rye
East Sussex
TN31 7UN

VAT No: 702981340
Tel. 07860 837085

Quotation	Page 1

Rother Valley Railway
C/O David Felton
78 Halstead Walk
Maidstone
Kent
ME16 0PW

Invoice No.	1512
Invoice/Tax Date	22/04/2019
Order No.	
Account No.	ROTHERV

Details	Net Amt	VAT
Groundworks estimates for the proposed rail extension to Bodiam		
North Bridge Street (RBJ side) works yard 25m x 15m		
Clear site, lay compacted type 1 sub base with tarmac road frontage and 2.4m high solid site hoarding fence and 6m wide weld mesh gate		
Plant and labour	2,500.00	500.00
140t type 1	3,920.00	784.00
terram membrane	200.00	40.00
80m site fencing	8,000.00	1,600.00
Site gate	1,500.00	300.00
2m x 12m tarmac apron to front	1,000.00	200.00

BANK DETAILS. ACC NO 82457182
SORT CODE 60-18-09

PAYMENT TERMS: STRICTLY 28 DAYS FROM INVOICE DATE.

Total Net Amount	17,120.00
Total VAT Amount	3,424.00
Invoice Total	20,544.00

Andrew Wood Plant Hire

Elwyn Farm
Playden
Rye
East Sussex
TN31 7UN

VAT No: 702981340
Tel. 07860 837085

Quotation | Page 1

Rother Valley Railway
C/O David Felton
78 Halstead Walk
Maidstone
Kent
ME16 0PW

Invoice No.	1513
Invoice/Tax Date	22/04/2019
Order No.	
Account No.	ROTHERV

Details	Net Amt	VAT
Groundworks estimates for the proposed rail extension to Bodiam		
North Bridge Street (A21 side) works yard 20m x 20m		
Clear site, lay compacted type 1 sub base with tarmac road frontage and 2.4m high soilid site hoarding fence and 6m wide weld mesh gate		
Plant and labour	2,500.00	500.00
160t type 1	4,480.00	896.00
Terram membrane	200.00	40.00
80m site fencing	8,000.00	1,600.00
Site gate	1,500.00	300.00
2m x 12m tarmac apron to front	1,000.00	200.00

BANK DETAILS. ACC NO 82457182
SORT CODE 60-18-09

PAYMENT TERMS: STRICTLY 28 DAYS FROM INVOICE DATE.

Total Net Amount	17,680.00
Total VAT Amount	3,536.00
Invoice Total	21,216.00

Andrew Wood Plant Hire

Elwyn Farm
Playden
Rye
East Sussex
TN31 7UN

VAT No: 702981340
Tel. 07860 837085

Quotation **Page 1**

Rother Valley Railway
C/O David Felton
78 Halstead Walk
Maidstone
Kent
ME16 0PW

Invoice No.	1514
Invoice/Tax Date	22/04/2019
Order No.	
Account No.	ROTHERV

Details	Net Amt	VAT
Groundworks estimate for the proposed rail extension to Bodiam		
Rother Bridge foundations		
Site preperation to provide 10m x 20m hard standing work site		
Plant and labour	1,000.00	200.00
80t type 1 sub base	2,240.00	448.00
Terram membrane	100.00	20.00
Excavate caisson, 8m x 5m x 3m, mass fill with concrete and build cast concrete ballast wall		
Plant and labour	27,000.00	5,400.00
260m concrete	28,600.00	5,720.00
8m Ballast wall concrete	880.00	176.00
Ballast wall steel reinforcing	900.00	180.00

BANK DETAILS. ACC NO 82457182
SORT CODE 60-18-09

PAYMENT TERMS: STRICTLY 28 DAYS FROM INVOICE DATE.

Total Net Amount	60,720.00
Total VAT Amount	12,144.00
Invoice Total	72,864.00

Andrew Wood Plant Hire

Elwyn Farm
Playden
Rye
East Sussex
TN31 7UN

VAT No: 702981340
Tel. 07860 837085

Quotation **Page 1**

Rother Valley Railway
C/O David Felton
78 Halstead Walk
Maidstone
Kent
ME16 0PW

Invoice No.	1519
Invoice/Tax Date	24/04/2019
Order No.	
Account No.	ROTHERV

Details	Net Amt	VAT
Groundwork estimate for the proposed rail extension to Bodiam		
Rother Bridge flood bund retaining wall section		
Plant and labour	14,000.00	2,800.00
Concrete	11,000.00	2,200.00
Steel reinforcing	1,000.00	200.00
Terram membrane	150.00	30.00
80 tons type 1	2,240.00	448.00
40 2m high concrete retaining L sections	9,500.00	1,900.00
Fixing bolts	600.00	120.00

BANK DETAILS. ACC NO 82457182
SORT CODE 60-18-09

PAYMENT TERMS: STRICTLY 28 DAYS FROM INVOICE DATE.

Total Net Amount	38,490.00
Total VAT Amount	7,698.00
Invoice Total	46,188.00

Andrew Wood Plant Hire

Elwyn Farm
Playden
Rye
East Sussex
TN31 7UN

VAT No: 702981340
Tel. 07860 837085

Quotation **Page 1**

Rother Valley Railway
C/O David Felton
78 Halstead Walk
Maidstone
Kent
ME16 0PW

Invoice No.	1516
Invoice/Tax Date	22/04/2019
Order No.	
Account No.	ROTHERV

Details	Net Amt	VAT
Groundworks estimate for the proposed rail extension to Bodiam		
Bridge 7, 10.8m span pipe culvert		
Plant and labour	11,600.00	2,320.00
36 750mm dia pipe sections	9,000.00	1,800.00
52m concrete	5,720.00	1,144.00
Steel reinforcing	600.00	120.00
120 Hollow blocks	300.00	60.00
Sand, ballast and cement	300.00	60.00
150t selected backfill	1,800.00	360.00

BANK DETAILS. ACC NO 82457182
SORT CODE 60-18-09

PAYMENT TERMS: STRICTLY 28 DAYS FROM INVOICE DATE.

Total Net Amount	29,320.00
Total VAT Amount	5,864.00
Invoice Total	35,184.00

Andrew Wood Plant Hire

Elwyn Farm
Playden
Rye
East Sussex
TN31 7UN

VAT No: 702981340
Tel. 07860 837085

Quotation Page 1

Rother Valley Railway
C/O David Felton
78 Halstead Walk
Maidstone
Kent
ME16 0PW

Invoice No.	1515
Invoice/Tax Date	22/04/2019
Order No.	
Account No.	ROTHERV

Details	Net Amt	VAT
Groundworks estimate for the proposed rail extension to Bodiam		
Bridge 8, 4 units wide box culvert		
PLEASE NOTE WEIGHT OF EACH UNIT IS 9.4 TONS SO WILL REQUIRE MOBILE CRANE TO UNLOAD AND PLACE. NOT INCLUDED IN COSTINGS		
Plant and labour	15,500.00	3,100.00
16 box culvert sections	40,000.00	8,000.00
120t type 1	3,360.00	672.00
54m concrete	5,940.00	1,188.00
Wing wall and coping construction labour	3,500.00	700.00
Steel reinforcing	1,000.00	200.00
Wing wall and coping concrete	1,980.00	396.00

BANK DETAILS. ACC NO 82457182
SORT CODE 60-18-09

PAYMENT TERMS: STRICTLY 28 DAYS FROM INVOICE DATE.

Total Net Amount	71,280.00
Total VAT Amount	14,256.00
Invoice Total	85,536.00

Andrew Wood Plant Hire

Elwyn Farm
Playden
Rye
East Sussex
TN31 7UN

VAT No: 702981340
Tel. 07860 837085

Quotation Page 1

Rother Valley Railway
C/O David Felton
78 Halstead Walk
Maidstone
Kent
ME16 0PW

Invoice No.	1517
Invoice/Tax Date	22/04/2019
Order No.	
Account No.	ROTHERV

Details	Net Amt	VAT
Groundwork estimate for the proposed rail extension to Bodiam		
Bridges 9,10, 11 and 14 2 units wide box culvert COST PER BRIBGE		
PLEASE NOTE WEIGHT OF EACH UNIT IS 9.4 TONS SO WILL REQUIRE MOBILE CRANE TO UNLOAD AND PLACE. NOT INCLUDED IN COSTINGS		
Plant and labour	11,625.00	2,325.00
8 box culvert sections	20,000.00	4,000.00
60t type 1	1,680.00	336.00
28m concrete	3,080.00	616.00
Wing wall and coping construction labour	3,500.00	700.00
Steel reinforcing	1,000.00	200.00
Wing wall and coping concrete	1,980.00	396.00

BANK DETAILS. ACC NO 82457182
SORT CODE 60-18-09

PAYMENT TERMS: STRICTLY 28 DAYS FROM INVOICE DATE.

Total Net Amount	42,865.00
Total VAT Amount	8,573.00
Invoice Total	51,438.00

Andrew Wood Plant Hire

Elwyn Farm
Playden
Rye
East Sussex
TN31 7UN

VAT No: 702981340
Tel. 07860 837085

Quotation	Page 1

Rother Valley Railway
C/O David Felton
78 Halstead Walk
Maidstone
Kent
ME16 0PW

Invoice No.	**1518**
Invoice/Tax Date	**22/04/2019**
Order No.	
Account No.	**ROTHERV**

Details	Net Amt	VAT
Groundworks estimate for the proposed rail extension to Bodiam		
Mill Stream Bridge 12 foundations		
Site preperation on A21 side to provide 10m x 20m hard standing work site		
Plant and labour	1,000.00	200.00
80t type 1 sub base	2,240.00	448.00
Teram membrane	100.00	20.00
Excavate caisson 8m x 5m x 3m, mass fill with concrete and build cast concrete ballast wall		
Plant and labour	27,000.00	5,400.00
260m concrete	28,600.00	5,720.00
8m Ballast wall concrete	880.00	176.00
Ballast wall steel reinforcing	900.00	180.00
Walkway under bridge using sheet pile side (not included) with concrete finish over sub base fill 2m wide x 30m long		
Plant and labour	4,000.00	800.00
Sub base fill	1,680.00	336.00
concrete	1,320.00	264.00

BANK DETAILS. ACC NO 82457182
SORT CODE 60-18-09

PAYMENT TERMS: STRICTLY 28 DAYS FROM INVOICE DATE.

Total Net Amount	67,720.00
Total VAT Amount	13,544.00
Invoice Total	81,264.00

Andrew Wood Plant Hire

Elwyn Farm
Playden
Rye
East Sussex
TN31 7UN

VAT No: 702981340
Tel. 07860 837085

Quotation **Page 1**

Rother Valley Railway
C/O David Felton
78 Halstead Walk
Maidstone
Kent
ME16 0PW

Invoice No.	**1523**
Invoice/Tax Date	**24/04/2019**
Order No.	
Account No.	**ROTHERV**

Details	Net Amt	VAT
Groundwork estimate for proposed rail extension to Bodiam		
Bridge 13 50m span pipe culvert		
Plant and labour	55,000.00	11,000.00
140 750mm dia pipe sections	35,000.00	7,000.00
300m concrete	33,000.00	6,600.00
600t selected backfill	7,200.00	1,440.00
Steel reinforcing	600.00	120.00
120 Hollow blocks	300.00	60.00
Sand, ballast and cement	300.00	60.00

BANK DETAILS. ACC NO 82457182
SORT CODE 60-18-09

PAYMENT TERMS: STRICTLY 28 DAYS FROM INVOICE DATE.

Total Net Amount	131,400.00
Total VAT Amount	26,280.00
Invoice Total	157,680.00

Andrew Wood Plant Hire

Elwyn Farm
Playden
Rye
East Sussex
TN31 7UN

VAT No: 702981340
Tel. 07860 837085

Quotation Page 1

Rother Valley Railway
C/O David Felton
78 Halstead Walk
Maidstone
Kent
ME16 0PW

Invoice No.	1520
Invoice/Tax Date	24/04/2019
Order No.	
Account No.	ROTHERV

Details	Net Amt	VAT
Groundwork estimate for the proposed rail extension to Bodiam		
Embankment and crushed concrete trackbed base		
To provide 5m wide at top x 500m embankment with min 200mm crushed concrete trackbed base over terram membrane		
PRICE ALLOWS FOR FILL AT £10/TON. IT MAY BE POSSIBLE TO OBTAIN SOME SUITABLE FILL FREE OF CHARGE SUBJECT TO AVAILABILITY		
Plant and labour	125,000.00	25,000.00
Embankment fill material	208,000.00	41,600.00
Terram membrane	1,400.00	280.00
Crushed concrete	18,000.00	3,600.00

BANK DETAILS. ACC NO 82457182
SORT CODE 60-18-09

PAYMENT TERMS: STRICTLY 28 DAYS FROM INVOICE DATE.

Total Net Amount	352,400.00
Total VAT Amount	70,480.00
Invoice Total	422,880.00

JP Concrete
DESIGN | SUPPLY | INSTALL

JP Concrete Quotation
Quotation Date: 24-04-2019
Quotation No: 21097

Andrew Wood Plant
Peasmarsh Road
Rye

East Sussex
TN31 7UN

Andrew Wood
07860 837 085

L Shaped retaining wall

Product Name	Dimensions (mm)	Description	Unit weight Kg	Price £	Quantity	Total
2.0m L Shape	1000mm wide	Bolt-down Retaining Wall	890kg	175.95	40.00	7,038.00
Ground Fixing Kit 1m - 2m	2 Holes per unit	Sika Anchorfix	-	21.84	40.00	873.60
2.5 Tonne Lifting Clutch	-	Pair	-	105.00	1.00	105.00
Installation Shackles	-	-	-	180.00	1.00	180.00
Haulage - Delivery	Flatbed 28t Payload	SITE TO OFFLOAD	Price dependent on haulage questionnaire	650.00	2.00	1,300.00

Total 9,496.60

VAT 20% 1,899.32
Total including VAT 11,395.92

SALES QUOTATION

D11/81600

John Davidson (Pipes) Ltd
Ellingham Way
Ashford
TN23 6JU

Fax: 01233 618324
General Tel: 01233 618323

Invoice Address
ANDREW WOOD LTD

ELWAN FARM PLAYDEN
RYE
EAST SUSSEX
TN31 7UN

Delivery Address
ANDREW WOOD LTD

TN23 6JU

Document Date: 08/04/19
Payment Terms: AR EOM + 1 Month
Account No: C013057
Your Ref: Andrew wood

Valid Until: 08/05/2019
Prepared By: D11 Ashford
Representative: ASHFORD
Method: Direct

Further to your recent enquiry, we have pleasure in confirming the prices requested as detailed.

ITEM CODE	DESCRIPTION	QTY		GROSS	DISC	PRICE	TOTAL
---- Pipe ----							
1811	750MM S&S PIPE	116.00	EA	238.32	0.00%	238.32	27,645.12
1801	LUBRICANT	5.00	EA	11.35	0.00%	11.35	56.75
---- Culvert ----							
1801	1500 X 2500 X 1500 CULVERT	48.00	EA	2,038.54	0.00%	2,038.54	97,849.92
1801	MILSEAL 25X40 JOINTING MATERIAL UNITS	29.00	EA	52.00	0.00%	52.00	1,508.00
1801	16X16 CAULKING GROOVE BITUMINOUS WATER PROOFING	47.00	EA	8.15	0.00%	8.15	383.05

Code	Rate %	Net Amount	VAT Amount	Total Amount	Currency
O1	20.00	127,442.84	25,488.57	152,931.41	GBP

We trust that you find our offer of interest and should you require any further information please do not hesitate to contact me.
All prices quoted are subject to VAT at the prevailing rate.
JDP Terms and Conditions of Sale apply and are available upon request.
This Quotation does not constitute an offer . E&OE.
This order may be subject to a charge for delivery in line with our standard terms and conditions.
BACS PAYMENTS TO: Barclays SORT CODE: 200000 A/C No: 40734853 VAT NO: GB265136463

MILTON PRECAST QUOTATION

PROVIDING CONCRETE SOLUTIONS

Project Number:	MIPR005847A/-	**Quote Number:**	SQ5847A	TENDER	SMS
Your reference:		**Date:**	19/04/2019		

Customer: Jewson Ltd
Whitbread Lane, Northaim, East Sussex, TN31 6QF
For the attention of Mark Scott

Project: NORTHIAM STATION
Site: RYE, TN31 6QP

Dear Sir/Madam
We thank you for your enquiry of the 12-Apr-19 for our precast concrete box culverts which we have pleasure in quoting for the following:

CULVERT DETAILS - Requested size offered

Culvert MC
25.15T

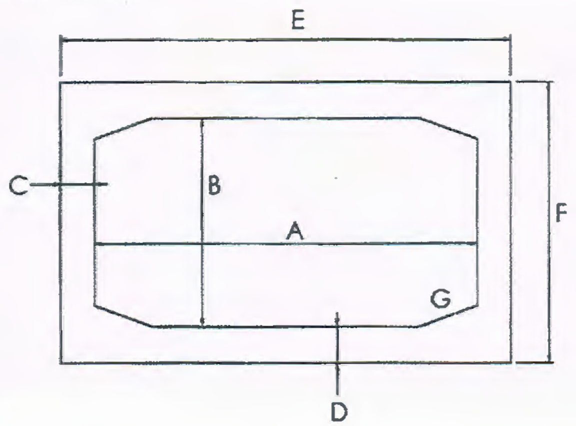
Cross Sectional Area
3.690 m^2

Type
Flat Invert

Weight
9.396 t

CULVERT DIMENSIONS

FLOW RATE: 8.82m^3/s



Internal Width A	Internal Height B
2.500m.	1.500m.
Wall Width C	**Slab Width D**
0.200m.	0.300m.
External Width E	**External Height F**
2.900m.	2.100m.
Corner Splay G	
0.300m.	

Standard Walls & Slabs thickend by +75 0.100m.

CULVERT COSTING

QTY	LENGTH	WIDTH	HEIGHT	PRICE PER UNIT	TOTAL
48	1.500m.	2.500m.	1.500m.	£ 3,497.41	£ 167,875.68
					£ -
					£ -
29 No.	MILSEAL 25 X 40mm JOINTING MATERIAL UNITS **Includes works applied primer**				£ 1,539.55

TOTAL PRICE FOR CULVERT UNITS	**£ 169,415.23**

QUOTATION

Project No.
Quote No. MI-SQ013561
Status of Quote

Milton Pipes Ltd.
England/Wales Sales & Head Office
Church Marsh, Off Gas Rd
Sittingbourne,ME10 2QF
Tel: 01795 425191
Fax: 01795 420360

Contact Name

JEWSON LTD
NORTHIAM 3180
WHITBREAD LANE
NORTHIAM
TN31 6QP

Contact Tel. No. 01797 252211
Contact Name: JEWSON LTD

Delivery Address:

JEWSON LTD
NORTHIAM 3180
WHITBREAD LANE
NORTHIAM
TN31 6QP

Date of Quote: 09/04/2019
Quotations are valid for one month from the above date

Quotation Raised and Managed by:
Name: Sharon Davidson
Tel:

Line No.	Product Code	Quantity (No)	Product Description	Weight Each	Price Each	Disc. %	Each Price after discount	Totals	
								Weight (T)	Price £
1	P750	118	750 X 2.50M SUPERSEAL PIPE HBR	1.96	£261.38		£261.38	231.52	£30842.84
2	059843	5	FORSHEDA PIPE LUBRICANT 2.5KG	0.00	£9.00		£9.00	0.01	£45.00
			The use of CPM lubricant is strongly recommended with the CPM integral jointed pipe system. Non-compliance may result in installation problems for which CPM can accept no responsibility. If we are called to site for pipe jointing issues and it is found that CPM lubricant has not been used, then there will be a charge of £150 to cover CPM costs.						
			Carriage paid in full loads, delivered direct to site on flat bed articulated vehicles, responsibility with site to off load. 14no = 1 full load.						
			TERMS 5% NETT MA.						

This Quotation, and all orders when accepted by Milton Pipes Ltd, are subject to the Milton Pipes Ltd Conditions of Trading, which are available on request or can be downloaded from www.miltonprecast.com
Advisory notes and recommendations regarding the above products can be found on our website :www.miltonprecast.com

Products are kitemarked where applicable

CE - For full markings go to www.miltonprecast.co.uk

Please note all deliveries are on flatbed articulated lorries for customer to offload unless otherwise specified.

Side Protection, Rigid/Restricted access and Crane Off-Load available on request but are not standard

One hour is standard time for off-loading. Waiting Time will apply after this time

Alterations to orders within 24 hours of delivery may result in charges being applied

Standard Surcharges applicable for short depth Chamber Ring - 50% for 500mm, 100% for 250mm
Surcharges applicable for Non-Stepped Chamber Ring
Pipes - MPC recommend MPC lubricant with integral jointed pipe system. Where problems arise on site when MPC lubricant has not been used, we reserve the right to charge for any site visits to resolve.

Pipes - Rockers and Butts charged at 3xmetre rate
Pipes - Bends charged at 10xmetre rate up to 45 degrees
Pipes - Bends over 45 degrees charged at 15xmetre rate

MILTON PRECAST QUOTATION

PROVIDING CONCRETE SOLUTIONS

MIPR005847A/-

Culvert Designed to Standards:

BS EN1990
BS EN1991-2
BS EN1992-1-1
BS EN1992-2
PD6694-1

Culverts to be laid

Bitumen Strip used to seal joints
5mm gap between joints
Units have spigot & socket faces for joining

Concrete Design Mix:

In accordance with:	**BS8500-1**
Compressive Stength Class:	**C40/50**
Cement:	**CIIB-V+SR**
DC Class:	**DC4**
Crack Width:	**0.3**

Manufacturing Tolerances: allowable dimensional variations in accordance with BS EN: 14844-2006

Finishes
External: Semi Dry F2 Wet Cast F3
Internal: All types F3

AIP -

Specification -

Our quotation includes design costs and the provision of design calculations, general arrangement and Reinforcement drawings. These will be issued in electronic format for approval by the customer upon receipt of order.
Should an order be placed with us and subsequently cancelled, design and drawing costs will be charged in full.
Design and check certificates for Category 0 – 1 included in our quotation.
Category 2 / 3 – Price on application.

DELIVERY

Haulage: ARTIC 2 per load

All deliveries are on a flat bed artic unless otherwise requested. Side protection available at an additional charge. Culverts will be flat on vehicle. Units would need to be turned, suitbale strops and craneage required to unload and place. Care would need to be taken to protect the spigot and socket detail.

Lifting: M36 Lifting Loops/Swivel Eyes supplied but crane and chains required on-site for off-loading

Dates: To be arranged.

Delivery programme to be confirmed at the time of placing an order

Storage: £10.00 Charge per unit per week after 28 days after agreed delivery dates

Additional Notes:

All due care and attention is taken when reviewing the information provided via email/telephone/fax, however the responsibility lies with the purchaser that all information is correct. Should the actual design parameters vary from those shown, we reserve the right to adjust our quoted rates. This quotation is open for acceptance within 30 days and is based on current market prices and we reserve the right to adjust our rates following receipt of any order.

Yours Faithfully p.p. MILTON PRECAST

Milton Precast. off Gas Road, Milton Regis, Sittingbourne, Kent, ME10 2QB
Tel: **01795 425191** Culvert Sales: **01795 415686** Email: **Jane@miltonprecast.com**

MILTON PRECAST QUOTATION

PROVIDING CONCRETE SOLUTIONS

OPTIONAL EXTRAS - TO BE CONFIRMED MIPR005847A/-

	NO.	Each	Total
16x16 Caulking Groove	47x	£ 8.32	£ 391.04
Bituminous Water Proofing			
-			
Plain End	- 1x	£ 183.75	£ 183.75
Plain End & Starter Bars	-		
-			
Plain Splayed End (MAX...)			
-			
End Wall			
Access			
Radial Access			
Sockets & Bars/Kwikastrip			
-			
Internal Insitu			
-			
Splayed Joint (MAX 4°)			
T-Junction			
90° Bend			
Steps			
Square Holes: 0 SQ for 0mm DIA.			
0 SQ for 0mm DIA.			
0 SQ for 0mm DIA.			
Round Holes: 0mm DIA. for 0mm DIA.			
0mm DIA. for 0mm DIA.			
0mm DIA. for 0mm DIA.			

Prices above are NETT M.A. plus VAT

TECHNICAL DETAILS

Cover Level 0.3m - 0.6m TO BE CONFIRMED

Cover to Reinf. 50mm

Loading RU

Cover idenified as underside of rainway sleepers

Design Life 120 years

Exposure Class XD3

Braking & Accel. NO

Reinforcement
500B/500C to BS4449 to BS4482 where applicable. Cages to be fabricated in accordance with HA DMRB BA 40/93

Milton Precast, off Gas Road, Milton Regis, Sittingbourne, Kent, ME10 2QB
Tel: 01795 425191 Culvert Sales: 01795 415686 Email: Jane@miltonprecast.com

safesite® FACILITIES

Safesite Facilities Ltd
Unit 1 Martello Enterprise Centre
Courtwick Lane
Littlehampton
West Sussex
BN17 7PA
0845 463 5421
info@safesitefacilities.co.uk
www.safesitefacilities.co.uk

Customer: ANDREW WOOD PLANT HIRE

Address: Peasmarsh Road
Rye
TN31 7UN

Date: 09/04/2019

Site: Robertsbridge
East Sussex
TN32 5DG

Order No:

Quote No: 36365

Acct No:

Contact: Andrew Wood

SALES QUOTATION

Dear Sirs,

As discussed, here is the quotation for the supply of the goods detailed below.

Description	Stock No	Qty	Unit Price	Amount
2.4m Dug in Timber Hoarding To supply and install a timber framed hoarding using 150mm x 75mm timber posts at 1.8m centres, 3no. 100mm x 50mm rails horizontally fixed to the front of the upright posts with 18mm ply screwed directly to the front of the rails. Top and bottom 150mm x 22mm PAR capping and skirting fixed to front of ply. All timber FSC	TIHS012	500	75.00	£37,500.00
6m x 2.4m Double Leafed Welded Mesh Vehicle Gates - Dug in Posts	THGS025	2	1,550.00	£3,100.00
Painting - 2 Coats of 1 standard colour - priced in square metres	TIHAS0004	1200	6.50	£7,800.00
Site Specific Design/s and calculations	TIHAS0007	1	400.00	£400.00
			Sub-Total:	£48,800.00
			VAT:	£9,760.00
			Total:	**£58,560.00**

Subject to site visit and site specific design
Final measure upon completion

If you have any further questions, please do not hesitate in contacting us.

Yours faithfully,

Greig

Rother Valley Railway
LIMITED
IN ASSOCIATION WITH THE KENT & EAST SUSSEX RAILWAY
ROBERTSBRIDGE JUNCTION STATION, STATION ROAD,
ROBERTSBRIDGE, EAST SUSSEX. TN32 5DG
www.rvr.org.uk

RVR A21 Crossing Options Report
Option 1 – Attachment D
Awards and Industry VIPs

1 Institution of Civil Engineers (ICE) Engineering Excellence Awards 2013 - Restoration Award

2 National Railway Heritage Awards (NRHA) 2013 - The Volunteers Award

3 Institution of Civil Engineers Presidential Visit June 2014 - Geoff French

4 Institution of Civil Engineers South Coast Engineering Excellence Awards 2015 - Special Award (Community)

5 Network Rail Chairman Sir Peter Hendy 2016 - Official Opening Mainline Connection

6 Institution of Civil Engineers SE Engineering Excellence Awards 2017 - Community Benefit Award

7 Heritage Railway Association (HRA) Annual Awards 2017 - Small Groups

ICE South East England
Kent & East Sussex Branch

Engineering Excellence Awards 2013

Restoration Award
Winner

Rother Valley
Restoration Phase 5

ice
Institution of Civil Engineers

Project Team:

Rother Valley Railway Heritage Trust
Rother Valley Railway Supporters Association
Complete Land Management LLP
DDF Formwork Limited
D J Williams & Son
Beever Limited

Derek Kent
Graham Bessant
Alan Hayward
John Sreeves

Andrew Wood Plant Hire
Coussens Cranes Limited
Russell Norman Fencing
Rother Valley Railway Limited
J C White Geomatics Limited
Berry Range Limited

Geoff French
ICE Senior Vice President

Rob James
ICE Kent & East Sussex Branch Chair

National Railway Heritage Awards

NRHA

The Volunteers Award

Highly Commended Certificate

presented to:

Rother Valley Railway Heritage Trust
for Rother Valley Railway Bridge Replacements

by Loyd Grossman OBE FSA

on the 4th December 2013

Institution of Civil Engineers Presidential Visit June 2014 - Geoff French

ICE South East England
Kent & East Sussex Branch

South Coast Engineering Excellence Awards 2015

Special Award (Community)

Kent & East Sussex Railway, Rolvenden Carriage Storage Shed

ice
Institution of Civil Engineers

Project Team:

Funding Body:
Rother Valley Railway Heritage Trust
CDM Coordinator:
Rother Valley Railway Ltd

Client:
Kent & East Sussex Railway Ltd
Electrical Engineer:
LECS (UK) Ltd

Stewart Biggs
ICE Kent & East Sussex Branch
Chair

Suzanne Moroney
ICE South East England
Regional Director

South Coast Award

Kent & East Sussex Railway, Rolvenden Carriage Storage Shed

Cost:	**£500,000**
Location:	**Tenterden, Kent**
Completed:	**December 2014**
Submitted by:	**Rother Valley Railway Heritage Trust**
Team:	**Rother Valley Railway Heritage Trust, Kent & East Sussex Railway Ltd, Rother Valley Railway Ltd, LECS (UK) Ltd, Kent & East Sussex Railway Ltd, London Underground Ltd, D Kenward & Sons, Yiannis Doors Ltd, Scorpion Engineering Construction Ltd, Andrew Wood Plant Hire, CLM, Price-Whitehead**

Saving historic carriages on the Kent & East Sussex Railway from the ravages of the weather within the cost of £500,000 required an extremely economic design matched with donations of professional skills, volunteer labour, gifts and recycling of materials.

Rother Valley Railway funded and project managed the construction of a four road, 20 carriage storage shed 120m long by 18m wide with electric lighting and roller shutter doors. Carried out without interruption to the existing railway, the K&ESR volunteers fabricated and laid 1 mile of track and 12 points using materials recycled from elsewhere or donated.

Network Rail Chairman Sir Peter Hendy 2016 - Official Opening Mainline Connection

ICE South East England
Engineering Excellence Awards 2017

Community Benefit Award

Winner

In association with

ICE
BENEVOLENT
FUND

Robertsbridge Junction Station Platform and Mainline Connection

ice
Institution of Civil Engineers

Suzanne Moroney
Regional Director, ICE South East England

Tim Broyd
President, ICE

HERITAGE RAILWAY ASSOCIATION

ANNUAL AWARDS 2017

SMALL GROUPS

Rother Valley Railway

For the new connection at Robertsbridge

RUNNER UP

10 February 2018

DATE

HRA

BRIAN SIMPSON OBE
CHAIRMAN

IN ASSOCIATION WITH THE KENT & EAST SUSSEX RAILWAY
ROBERTSBRIDGE (RVR) JUNCTION STATION, STATION ROAD,
ROBERTSBRIDGE, EAST SUSSEX. TN32 5DG
www.rvr.org.uk

Rother Valley Railway (Bodiam to Robertsbridge Junction) Order B2244 Junction Road Crossing

Prepared for:
The Office of Rail and Road
One Kemble Street,
London WC2B 4AN

Gardner Crawley BSc(Eng) FICE

Engineering/GSC/773 B2244 DRAFT

10 September 2019

Version	Author	Checked by	Approved by	Date	Type
A	G S Crawley			10-Sep-19	Draft

Registered Office: 3-4 Bower Terrace, Tonbridge Road, Maidstone, Kent, ME16 8RY
A company registered in England number 2613553
Full member of the Heritage Railway Association

Summary
The completion of the Missing Link will bring significant benefits to the local economy and there is no question that a level crossing solution is capable of being operated safely with little disruption to traffic. The cost differential between the costs of implementing the level crossing solution at £0.3M and constructing and thereafter maintaining a viaduct and bridge at B2244 Junction Road at £12.5M is grossly disproportionate.

1. Introduction

The former railway line between Robertsbridge and Tenterden was closed in 1961. Much of the trackbed remained in place for many years and, in 1974, the line between Tenterden and Rolvenden was re-opened as the Kent and East Sussex Railway. (K&ESR).The line was further reinstated to Bodiam (the site of the National Trust's Bodiam Castle) in 2000 and K&ESR has become a successful heritage railway and major tourist attraction. Reinstatement work to date on the K&ESR and the Missing Link has been undertaken mainly by volunteers and local contractors who have developed cost-effective and quality methods for the work.

The "Missing Link" is the section of former railway corridor 3.42km long running from Junction Road (the B2244) in Bodiam to the terminus at Robertsbridge. Policy EM 8 of the Rother District Plan expressly supports the reinstatement of RVR. The local plan was the subject of a Public Inquiry and the Inspector's report gave full support to completing the Missing Link, subject to meeting the following criteria:
"(i) it must not compromise the integrity of the floodplain and the flood protection measures at Robertsbridge;
(ii) it has an acceptable impact on the High Weald Area of Outstanding Natural Beauty;
(iii) it incorporates appropriate arrangements for crossing the A21, B2244 at Udiam, Northbridge Street and the River Rother."
These criteria were all resolved and approved with full Planning approval given by Rother District Council in March 2017. Once completed, visitors will travel on a well-regarded Heritage Railway on the historic route within the Rother Valley between Tenterden and the mainline at Robertsbridge, with stops at a number of attractive tourist destinations.

Over the course of a number of years, planning permission has been obtained for the re-instatement of the railway between Bodiam and Junction Road in 2011, from Robertsbridge to B2244 Junction Road in 2013 and the construction of Robertsbridge Junction Station. Re-construction of the railway within those sections has now been completed (utilising volunteer professionals and local subcontractors). The connection to the main line was completed in late 2016 with the support of Network Rail.

Following consultation over a period of 6 years, including discussions with all relevant statutory bodies and the local planning authority – as reported in the Consultation Report accompanying the TWAO application - planning consent for the Missing Link was unanimously approved by the Rother District Planning Committee on 17 March 2017. (RR/2014//1608/P). Letters of support for the project from Kent CC, East Sussex CC, Rother DC, Ashford BC, Network Rail, National Trust, and 1066 Country are included in the Consultation Report. The planning consent was accompanied by planning conditions to ensure the safety and effectiveness of the road level crossings.

The Missing Link will comprise a simple single track railway with straightforward construction, utilising the same local contractors and volunteers (qualified and experienced, as appropriate) as on the sections already completed.

This document relates to the proposed level crossing at B2244 Junction Road.

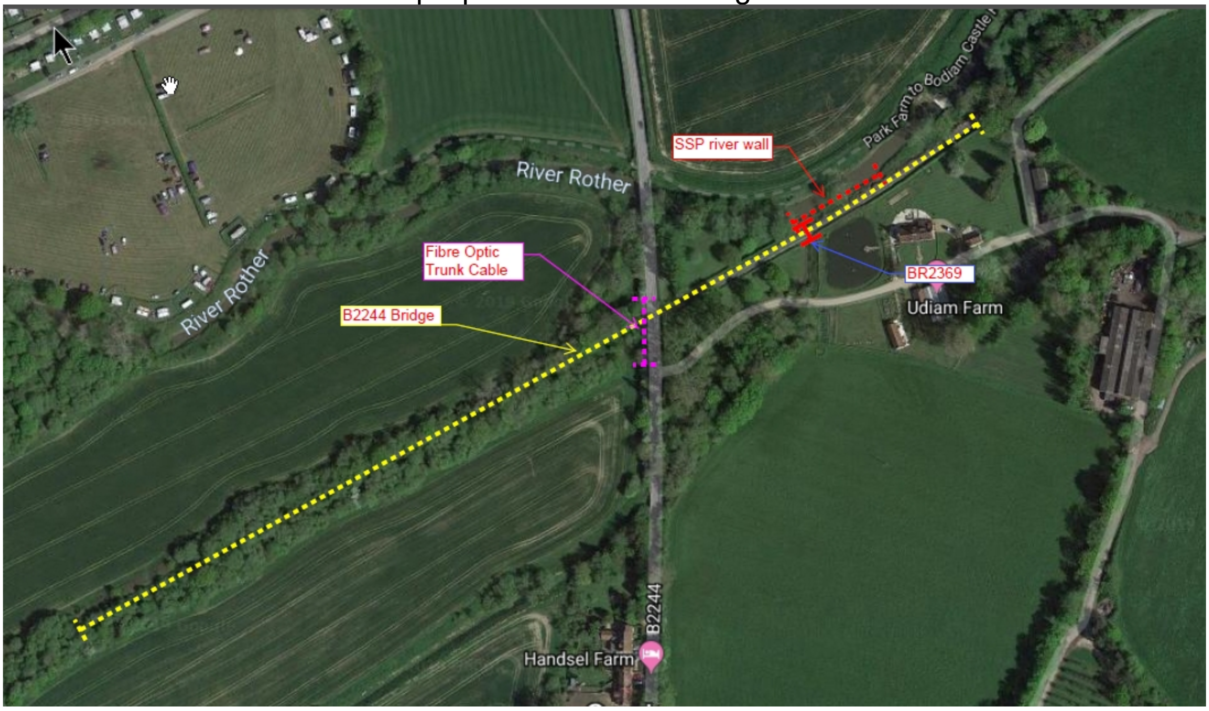


Figure 1 - Proposed location of C18 B2244 Junction Road crossing

2. Economic Benefits

A comprehensive Economic Benefits Report by Steer, leading UK specialist consultant, in 2018, forecast that the RVR will generate local economic benefits of up to £35 million over a two year construction period and the first ten years of operation, and up to £4.6 million per annum of local economic benefits from 2030. It will generate approximately 34 jobs in the construction phase and up to 85 in the operational phase. Additional rail revenues of approximately £355,000 per annum are forecast to accrue to the main line operator.

3. Traffic Studies

The TWA documentation includes traffic studies. However, the proposed timetable has a limited number (10) of crossing closures per day, all of which will be outside "rush hour" periods. The Mott MacDonald Study shows that the queue on normal weekdays would be only 28m, and an Environmental Impact Assessment was carried out by specialist consultants Temple for the planning consent and TWA application, with a detailed Flood Risk Assessment by Capita. The reports of both assessments are included in the TWA submission, together with a 2018 "air quality" study report, which shows potential changes in pollution levels at the receptors close to the A21, Northbridge Street and Junction Road to be negligible in all cases.

4. Drawings

Detailed design drawings for the three level crossings have been prepared by Arup, together with a Stage One Road Safety Assessment, the recommendations from which were included in the designs. The design documents include location plans of the proposed level crossing site at Junction Road. (Annex A), with further photographs of the site at Annex B.

In addition to the above, Arup has produced a report specifically on the alternatives for crossing the A21. The Options for crossing Junction Road are similar to the A21, though the site conditions and challenges are somewhat different.

5. The Crossing Options

The key focus of this report is four options to cross B2244 Junction Road "The Clappers":

- Option 1 is an at-grade level crossing
- Option 2 is a tunnel under B2244 Junction Road
- Option 3 is a railway bridge over B2244 Junction Road
- Option 4 raises B2244 Junction Road with a railway bridge over

5.1. The Options Compared

Option 1, involving an at-grade level crossing, introduces the fewest engineering challenges and is likely to involve the least disruption during construction. This option formed part of the design for the railway that received planning permission in March 2017. Construction costs for this option are the lowest.

Option 2 looks at the feasibility of taking the rail beneath the existing road. Principal engineering and approval challenges are:

- Restricted site access particularly on the Bodiam side of the crossing.
- Stabilization of river bank where close to the track (7m).
- Reconstruction of Bridge BR2369 tributary to River
- Prolonged closure of a major North South road

Mitigation of this is likely to require a long length of waterproof trough structure, with significant engineering challenges, including maintenance of water flow paths during flood events and long-term pumping requirements. Disruption to local residents and road users is likely to be most significant with this option and it would require significant additional land from third party landowners.

Option 3 considers the potential to take the rail over the existing road. Principal engineering and approval challenges are:

- This scheme introduces a sizeable length of elevated viaduct structure which will have significant impact on cost and visual intrusion.
- Restricted site access particularly on the Bodiam side of the crossing.
- Stabilization of river bank where close to the track (7m).

Construction duration for this option is also likely to enhance the difficulties around gaining acceptance for this option from the relevant authorities. Again, this option would require significant additional land take from third party landowners.

Option 4, involving vertical realignment of the existing highway will result in a series of engineering works for both the road and rail. There would be no cost saving compared with Option 2 due to the proximity of the road bridges over the River and its tributary Rother.

5.2. Cost of Options

This options assessment is based on the very detailed options report prepared by Arup for the A21 crossing. Arup's report considered the feasibility and (industry standard) construction costs of each option so as to provide a "like for like" comparison between the options. In addition Arup's assessment reported the actual cost estimate for delivery of the level crossing, as worked up by RVR for the purposes of the planning consent, granted in March 2017, and the application for Transport and Works Order submitted in April 2018.

Arup noted that it is not possible to advance a similar worked up costing for the other three crossing options because RVR would not be equipped to design and construct them "in-house".

RVR has already undertaken significant work on the project in the anticipation of Option One. As referred to above, following detailed studies and designs, extensive discussion and liaison with all the key authorities, RVR has full Planning Approval for this Option. Paragraph 6.7.1 of the report to the Rother District Council planning committee in March 2017 recorded that "*Bridges and/or tunnels are not a feasible option in this case and in the circumstances, the installation of a barrier-operated rail crossing over each of the roads is proposed in the application*." RVR has the engineering expertise to construct the level crossing option and has a detailed cost estimate, utilising quotes from existing sub-contractors. RVR has already purchased a proportion of the key materials needed, as described in the RVR A21 Crossing Cost Estimate as annexed to Arup A21 Crossing Options Report.

5.3 Summary of Options

Table 1 provides a summary of the main features of each option in relation to the key categories considered. Using industry standard allowances, Option 1 at £0.7M is some £11.8M cheaper than Option 2 at £12.5M and £18.8 M cheaper than Option 3 at £19.5M (ratios of 17:1 and 27:1 respectively).

Using the comparison between what RVR can build it for and the industry standard cost applicable to construction by commercial construction companies Option 1 at £0.3M is some £12.3M cheaper than the cheapest alternative option (Option 2) at £12.5M (a ratio of 41.8).

GRAND SUMMARY B2244 Junction Road	Total (£) Option 1	Total (£) Option 2	Total (£) Option 3	Total (£) Option 4	RVR (£) Option 1	**Comments**
Direct Construction Works						
Railway Control Systems (level crossing only)	£300,000			N/A	£171,000	Option 1 only
Civil Engineering	£20,000	£5,094,000	£7,921,000		£18,310	
Enabling Works	£32,000	£509,000	£792,000		£69,890	
Sub -Total (Direct Construction Cost Only)	£352,000		£8,713,000		£259,200	
Indirect Construction Works						
Preliminaries (25%)	£88,000	£1,401,000	£2,178,000			
Contractor Overheads and profit (8%)	£35,000	£560,000	£871,000			
Sub -Total (Construction Costs)	£475,000	£7,564,000	£11,762,000		£259,200	
Project / Design Team Fees and Other Project Costs						
Design Team Fees (10%)	£48,000	£756,000	£1,176,000			
Project Team Fees (5%)	£24,000	£378,000	£588,000		£7,776	RVR 3%
Other Project Development Costs					£5,184	RVR 2%
Sub -Total (before Risk/Optimism Bias)	£547,000	£8,698,000	£13,526,000		£272,160	
Risk						
Optimism Bias 44%	£241,000	£3,827,000	£5,951,000		£27,216	RVR 10% contingency
Grand Total	£788,000	£12,525,000	£19,477,000		£299,376	

Table 1 – Crossing Options Costs

6. Timing

The majority of the construction materials for Option one would be delivered by rail, the fill material and track ballast via the Network Rail connection at Robertsbridge (from stock piles that RVR are already holding at several south coast ports), and track materials by rail from those already held for the project by K&ESR at Northiam Station. Upon gaining access to the land, it is anticipated that there will be 12 months of surveys in order to discharge the relevant planning conditions, with subsequent construction taking approximately 12 months. Commissioning and trials by K&ESR will take approximately 3 months.

7. Operation

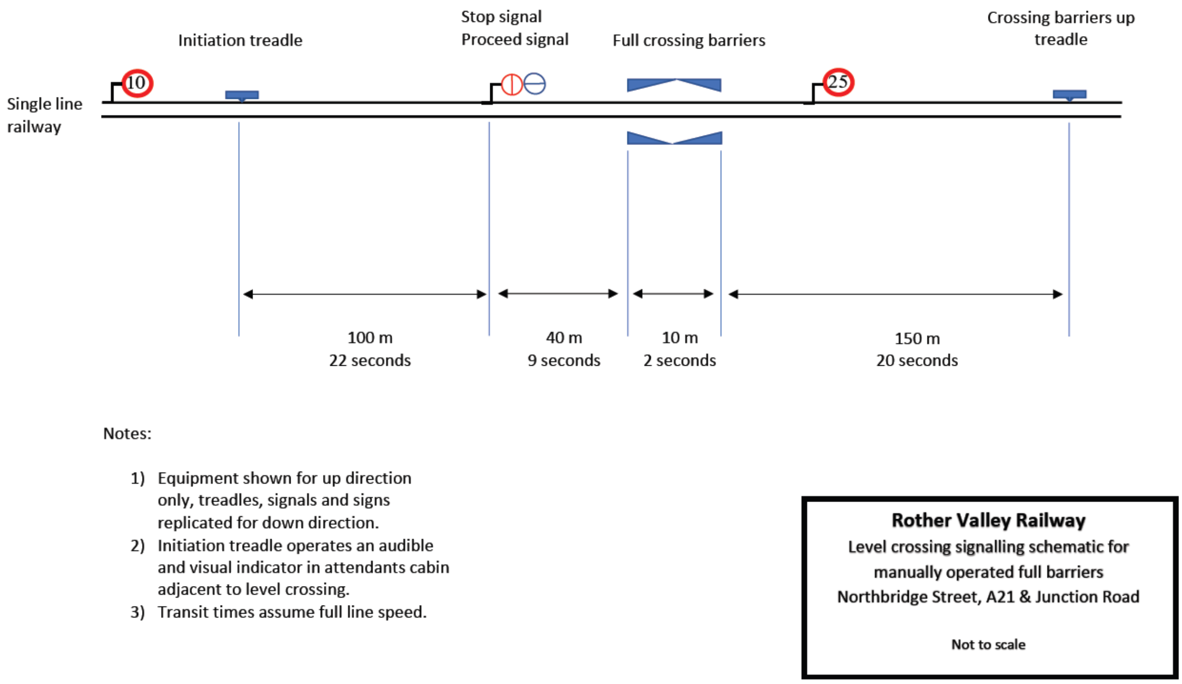
The nature of the railway operation is an infrequent heritage railway, travelling at a maximum speed of 25mph and locally monitored by a signalman. The intended design of the level crossing will be a full barrier CCTV design incorporating the most recent crossing technology reducing risks to level as low as reasonably practicable.

Sight lines will managed in accordance with the HRA published guidance on vegetation management. RVR has applied to ESCC for a Road Traffic Regulation Order to reduce the speed limit from the National Speed Limit of 60mph to 40mph over the crossing.

A brief outline description of the level crossing operation is detailed in the Statement of Case at paras 6.1.1 to 6.1.5 and it is noted that the detail of the equipment and operation is subject to approval by the ORR.

The reinstated railway will be operated by K&ESR as an integral part of its successful heritage undertaking. (K&ESR has been operating trains since 1974.)

Level Crossing Signalling Arrangement



8. Narrative Risk Assessment

The "Narrative Risk Assessment" documentation for the road level crossing shows how the risks of a level crossing would be managed in accordance with ORR guidance.

Arup has produced a detailed Stage 1 Road Safety Audit (Annex C) which was submitted to East Sussex County Highways during the planning application process.

9. Funding

The anticipated final cost of implementing the outstanding work for the entirety of the "Missing Link" (including Option one), is £5.3m pounds which will be funded by the Rother Valley Railway Heritage Trust, this funding is in place. Following in principle agreement to the level crossings from ORR and the Highway Authorities (link to their letters to RDC below) the Trust has already invested over £3m in the new Robertsbridge Junction Station, the connection to Network Rail, the permanent way from Bodiam to Junction Road and from Robertsbridge Junction to Northbridge, together with the necessary specialist consultant's surveys and reports.

SUPPORTING DOCUMENTATION
(Documents 1, 2, 3, 8, 9 as provided to ORR previously with A21 Crossing Information)

1. Mott MacDonald Level Crossing Impact Report (2011, and updated report in December 2018).
2. RVR September 2018, Statement of Case. (Summary).
3. Draft RVR (Bodiam to Robertsbridge Junction) Order. (Giving full details of necessary right of way orders etc.)
4. Annex A. Detailed layout drawings and location plan.
5. Annex B. Location photographs.
6. Annex C. Arup Stage 1, Road Safety Audit.
7. Annex D. Road Crossings. Narrative safety report.
8. Road crossing, safety arrangements.
9. Ove Arup A21 Crossing Options Report
10. Annex E. Options Profiles

CHECKLIST

ORR requested information:	**Provided**
1. the location of the proposed crossing including photographs and diagrams;	Para 1, Annex A, B
2. the reason for the crossing;	Para 1
3. information about the proposer of the scheme for a new crossing, the proposed crossing operator and, if applicable, the proposed authorised user(s) of the crossing;	Para 5.2, 7
4. proposed timescales for (re)introducing any new crossing;	Para 6
5. confirmation that there is a right-of-way and whether any relevant authorisations/Orders need to be sought through the TWA procedures;	Para 1
6. information about the road and rail traffic at any proposed crossing including the results of censuses;	Para 3, Annex C
7. details of any liaison that has already taken place with other departments and agencies such as DfT, Highways Agency or local highway authorities, planning authorities and other local bodies and stakeholders plus a summary of the responses/views received;	Para 1, 9
8. a description of what other options have been considered such as bridges and underpasses and clear explanations setting out why these options are not reasonably practicable alternatives to a level crossing, backed up by evidence from risk assessments;	Para 5 Annex D, E
9. details on the features of the proposed crossing and what protective arrangements would be in place were it to go ahead based on a suitable and sufficient risk assessment (noting that it may be subject to a Level Crossing Order application further down the line);	Para 7
10. any other information that the panel considers might be relevant or helpful.	

Annex A. Detailed Layout Drawings and Location Plan

Annex B. Location Photographs

B2244 Aerial

B2244 North

B2244 East

B2244 South

B2244 West

Annex C. Arup Stage 1, Road Safety Audit

Annex D. Road Crossings. Narrative Safety Report

Annex E. Options Profiles

IN ASSOCIATION WITH THE KENT & EAST SUSSEX RAILWAY
ROBERTSBRIDGE (RVR) JUNCTION STATION, STATION ROAD,
ROBERTSBRIDGE, EAST SUSSEX. TN32 5DG

Rother Valley Railway (Bodiam to Robertsbridge Junction) Order Bridleway Crossing 36b at Salehurst, Robertsbridge

Prepared for:
The Office of Rail and Road
One Kemble Street,
London WC2B 4AN

Engineering/DG/773SBW DRAFT 10 September 2019

Version	Author	Checked by	Approved by	Date	Type
A	D Gillett			10-Sep-19	Draft

Summary
The completion of the Missing Link will bring significant benefits to the local economy and there is no question that a grade level crossing solution at Salehurst is capable of being self-operated safely for horses and pedestrians. The cost differential between the costs of the proposed bridleway crossing (£30K) and implementing and constructing and thereafter maintaining a bridge (approximately £400K) at this location is grossly disproportionate. A tunnel under option is not practical as it would be subject to flooding from the nearby River Rother and would require almost constant pumping to keep it safe for use by pedestrians.

1. Introduction

The former railway line between Robertsbridge and Tenterden was closed in 1961. Much of the trackbed remained in place for many years and, in 1974, the line between Tenterden and Rolvenden was re-opened as the Kent and East Sussex Railway (K&ESR).The line was further reinstated to Bodiam (the site of the National Trust's Bodiam Castle) in 2000 and K&ESR has become a successful heritage railway and major tourist attraction. Reinstatement work to date on the K&ESR and the Missing Link has been undertaken mainly by volunteers and local contractors who have developed cost-effective and quality methods for the work.

The "Missing Link" is the section of former railway corridor 3.42km long running from Junction Road (the B2244) in Bodiam to the terminus at Robertsbridge. Policy EM 8 of the Rother District Plan expressly supports the reinstatement of RVR. The local plan was the subject of a Public Inquiry and the Inspector's report gave full support to completing the Missing Link, subject to meeting the following criteria:
"(i) it must not compromise the integrity of the floodplain and the flood protection measures at Robertsbridge;
(ii) it has an acceptable impact on the High Weald Area of Outstanding Natural Beauty;
(iii) it incorporates appropriate arrangements for crossing the A21, B2244 at Udiam, Northbridge Street and the River Rother."
These criteria were all resolved and approved with full Planning approval given by Rother District Council in March 2017. Once completed, visitors will travel on a well-regarded Heritage Railway on the historic route within the Rother Valley between Tenterden and the mainline at Robertsbridge, with stops at a number of attractive tourist destinations.

Over the course of a number of years, planning permission has been obtained for the re-instatement of the railway between Bodiam and Junction Road in 2011, from Robertsbridge to Northbridge Street in 2013 and the construction of Robertsbridge Junction Station. Re-construction of the railway within those sections has now been completed (utilising volunteer professionals and local subcontractors). The connection to the main line was completed in late 2016 with the support of Network Rail.

Following consultation over a period of 6 years, including discussions with all relevant statutory bodies and the local planning authority – as reported in the

Consultation Report accompanying the TWAO application - planning consent for the Missing Link was unanimously approved by the Rother District Planning Committee on 17 March 2017. (RR/2014//1608/P). Letters of support for the project from Kent CC, East Sussex CC, Rother DC, Ashford BC, Network Rail, National Trust, and 1066 Country are included in the Consultation Report. The planning consent was accompanied by planning conditions to ensure the safety and effectiveness of the road crossings.

The Missing Link will comprise a simple single track railway with straightforward construction, utilising the same local contractors and volunteers (qualified and experienced, as appropriate) as on the sections already completed.

This document relates to the proposed level crossing at Bridleway S&R36b at Salehurst.

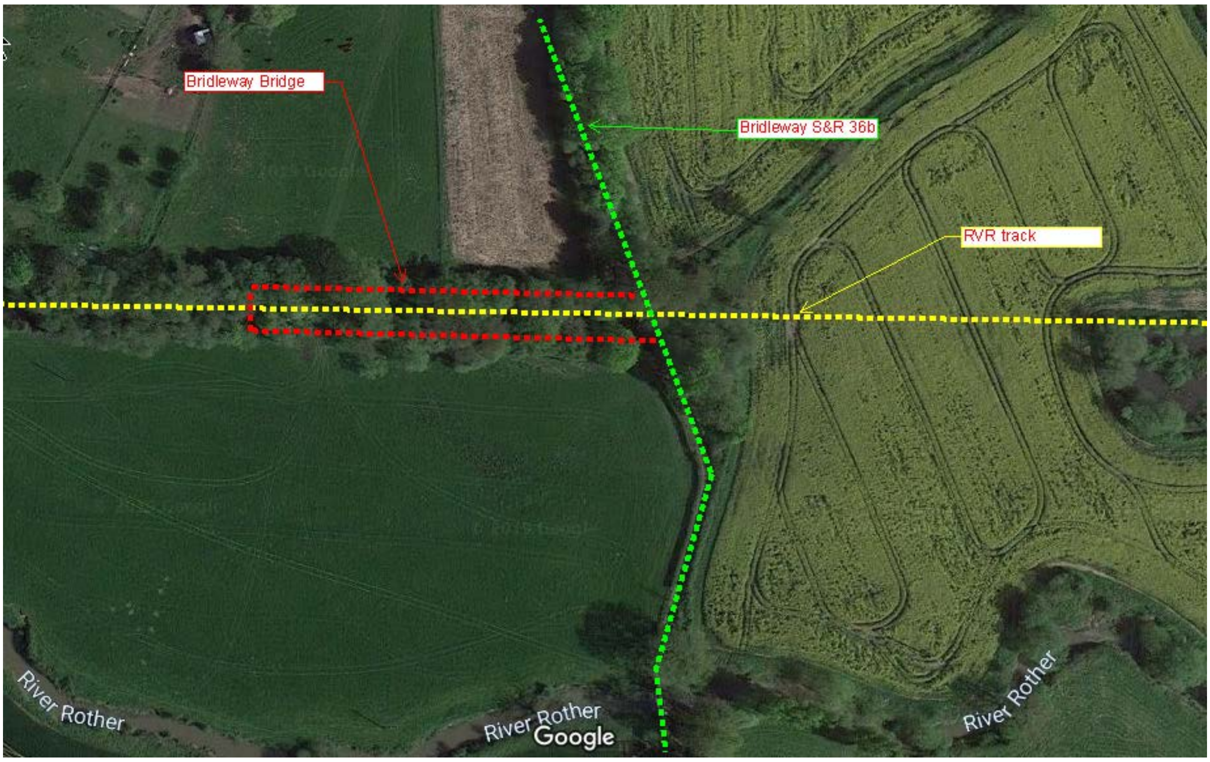


Figure 1 - Proposed location of Bridleway S&R36b crossing at Salehurst

2. Economic Benefits

A comprehensive Economic Benefits Report by Steer, leading UK specialist consultant, in 2018, forecast that the RVR will generate local economic benefits of up to £35 million over a two year construction period and the first ten years of operation, and up to £4.6 million per annum of local economic benefits from 2030. It will generate approximately 34 jobs in the construction phase and up to 85 in the operational phase. Additional rail revenues of approximately £355,000 per annum are forecast to accrue to the main line operator.

3. Traffic Studies

In respect of the Bridleway Crossing (S&R 36b) at Salehurst, a crossing design similar to that used on the West Highland Railway was proposed and included in the planning documentation that was approved by Rother District Council. (RDC). (See Annex A). During the course of the preparation of the planning documentation, extensive discussions and site visits to the location of the bridleway crossing were held with the local representative of the horse riders, (Tamara Strap), the East Sussex County Council Senior Rights of way Officer, (Mathew Harper), the Ramblers Association (Andrew Bonnet), and the Horse Society Access Field Officer for London and the South East. (Sarah Raysfield.)

4. Drawings

During the discussions, the various representatives made a number of requests for minor modifications and additions to the crossing drawings including mounting plinths, special gate catches etc. and it has been agreed that these would be included. Key correspondence with Tamara Strap at Annex B, with Mathew Harper at Annex C, and with Sarah Raysfield at Annex D.

There are a number of bridleway crossings on the existing Kent and East Sussex Railway that operate safely, effectively and without difficulty. Crossing Surveys were held at the Salehurst site over a period of a week in mid-summer. These showed an average of 4 pedestrians crossing on weekdays, and up to 20 a day at weekends. Whilst no horses were recorded, the local horse representative advised that normally around 4 horses would use the crossing each way at weekends, and less frequently on weekdays and in the winter. The Ramblers Association and the Horse Society advised us that their members are familiar with the bridleway crossing proposed and did not envisage any problems with them, particularly as there would be a maximum of only 10 train crossings a day in the summer months and none in the winter.

5. The Crossing Options

At the time of the Planning preparations no other options for the crossing were considered. However the options are:-

(a) Option one, involving an “at grade” level crossing introduces the no engineering challenges and would cause minimal disruption during construction. The RVR estimated cost (taking account of preliminary work and advance purchases of materials already completed etc.) is approximately £30,000.

(b) Option 2, looks at the feasibility of taking the bridleway beneath the railway either parallel to or at right angles to the railway. Principal engineering and approval challenges are around the bridleway being below the level of the River Rother which is nearby. (See profile at Annex E Parallel to railway and Annex F Across Track). The tunnel would flood in a 5 year flood and above to a depth of 10 feet and would be significant risk to local children and pedestrians in wet weather. The estimated cost is £6.8m.

(c) Option 3, considers taking the rail over the bridleway. This scheme involves a sizable length of elevated viaduct structure with a significant impact on cost and would involve significant visual intrusion within the

AONB. The viaduct would be adjacent to the existing houses in Salehurst and be particularly visible and intrusive to a quiet and most pleasant village. The estimated cost would be similar to that calculated by Arup for the A21 crossing at £20.2m.

(d) Option 4, would be a bridge carrying the bridleway over the railway. This would involve two long approach ramps either parallel to or at right angles to the railway due to the required maximum gradient for horses of 1 in 16, and the need for intermediate "level landings" to meet normal health and safety requirements. (See profile at Annex E Parallel to railway and Annex F Across Track). Obviously the presence of a bridge and ramps directly on the bridleway alignment will prevent its use by farm vehicles, so the bridge has to have sufficient load bearing capacity to carry those vehicles. The Bridge would appear intrusive to the residents of Salehurst and several houses would lose the privacy of their rear gardens. The estimated cost for this option based on similar schemes by Network Rail elsewhere (e.g. over the main line railway at Kings Mill), and pro rata for this more straight forward location, is around £400,000. A recent new pedestrian crossing bridge at Wool Station by Network Rail cost £825,000.This option would also require a significant additional compulsory land take, above that required for option one, the "at grade" crossing.

6. Timing

The majority of the construction materials for Option one would be delivered by rail, the fill material and track ballast via the Network Rail connection at Robertsbridge (from stock piles that RVR are already holding at several south coast ports), and track materials by rail from those already held for the project by K&ESR at Northiam Station. Upon gaining access to the land, it is anticipated that there will be 12 months of surveys in order to discharge the relevant planning conditions, with subsequent construction taking approximately 12 months. Commissioning and trials by K&ESR will take approximately 3 months. The reinstated railway will be operated by K&ESR as an integral part of its successful heritage undertaking. (K&ESR has been operating trains since 1974.)

7. Operation

The nature of the railway operation is an infrequent heritage railway, travelling at a maximum speed of 25mph. The intended design of the Bridleway crossing will incorporate the most recent crossing technology reducing risks to level as low as reasonably practicable. It is noted that the detail of the equipment and operation is subject to approval by the ORR.

The reinstated railway will be operated by K&ESR as an integral part of its successful heritage undertaking. (K&ESR has been operating trains since 1974.)

8. Risk Assessment

The "Risk Assessment" documentation (Annex G) for the road crossings shows how the risks of a level crossing would be managed in accordance with ORR guidance, as will the Bridleway Safety management arrangements.

9. Funding

The anticipated final cost of implementing the outstanding work for the entirety of the "Missing Link" (including Option one), is £5.3m pounds which will be funded by the Rother Valley Railway Heritage Trust, this funding is in place. Following in principle agreement to the level crossings from ORR and the Highway Authorities (link to their letters to RDC below) the Trust has already invested over £3m in the new Robertsbridge Junction Station, the connection to Network Rail, the permanent way from Bodiam to Junction Road and from Robertsbridge Junction to Northbridge, together with the necessary specialist consultant's surveys and reports.

SUPPORTING DOCUMENTATION

1. Annex A. Plan of "at grade" bridleway crossing.(Option 1)
2. Annex B. Correspondence with local horse riders representative,
3. Annex C. Correspondence with District Council Senior Rights of Way officer
4. Annex D. Correspondence with the Horse Society representative
5. Annex E. Bridleway Crossing parallel to railway profile. (Options 2PL and 4PL)
6. Annex F. Bridleway Crossing across railway track profile (Options 2AT and 4AT)
7. Annex G. Bridleway crossing, narrative safety report.
8. Annex H. Location plan.
9. Annex I. Site photographs.

CHECKLIST

ORR requested information:	Provided
1. the location of the proposed crossing including photographs and diagrams;	Para 1, Annex A, H, I
2. the reason for the crossing;	Para 1
3. information about the proposer of the scheme for a new crossing, the proposed crossing operator and, if applicable, the proposed authorised user(s) of the crossing;	Para 7
4. proposed timescales for (re)introducing any new crossing;	Para 6
5. confirmation that there is a right-of-way and whether any relevant authorisations/Orders need to be sought through the TWA procedures;	Para 1
6. information about the road and rail traffic at any proposed crossing including the results of censuses;	Para 3
7. details of any liaison that has already taken place with other departments and agencies such as DfT, Highways Agency or local highway authorities, planning authorities and other local bodies and stakeholders plus a summary of the responses/views received;	Para 4 Annex B, C, D
8. a description of what other options have been considered such as bridges and underpasses and clear explanations setting out why these options are not reasonably practicable alternatives to a level crossing, backed up by evidence from risk assessments;	Para 5 Annex E, F
9. details on the features of the proposed crossing and what protective arrangements would be in place were it to go ahead based on a suitable and sufficient risk assessment (noting that it may be subject to a Level Crossing Order application further down the line);	Para 7, Annex G
10. any other information that the panel considers might be relevant or helpful.	

Annex A. Plan of "At Grade" Bridleway Crossing (Option 1)

Annex B. Correspondence with Local Horse Riders Representative

Annex C. Correspondence with District Council Senior Rights of Way Officer

Annex D. Correspondence with the Horse Society Representative

Annex E. Bridleway Crossing parallel to railway profile. (Options 2PL and 4PL)

Annex F. Bridleway Crossing across railway track profile (Options 2AT and 4AT)

Annex G. Bridleway Crossing, Risk Assessment

Annex H. Location plan.

Annex I. Site photographs.

Salehurst Bridleway Aerial

Salehurst Bridleway North

Salehurst Bridleway East

Salehurst Bridleway South

Salehurst Bridleway West

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Rother Valley Railway (Bodiam to Robertsbridge Junction) Order Northbridge Street Crossing

Prepared for:
The Office of Rail and Road
One Kemble Street,
London WC2B 4AN

Gardner Crawley BSc(Eng) FICE

Engineering/GSC/773NBS DRAFT 10 September 2019

Version	Author	Checked by	Approved by	Date	Type
A	G S Crawley			10-Sep-19	Draft

Registered Office: 3-4 Bower Terrace, Tonbridge Road, Maidstone, Kent, ME16 8RY
A company registered in England number 2613553
Full member of the Heritage Railway Association

Summary
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1. Introduction

The former railway line between Robertsbridge and Tenterden was closed in 1961. Much of the trackbed remained in place for many years and, in 1974, the line between Tenterden and Rolvenden was re-opened as the Kent and East Sussex Railway. (K&ESR).The line was further reinstated to Bodiam (the site of the National Trust's Bodiam Castle) in 2000 and K&ESR has become a successful heritage railway and major tourist attraction. Reinstatement work to date on the K&ESR and the Missing Link has been undertaken mainly by volunteers and local contractors who have developed cost-effective and quality methods for the work.

The "Missing Link" is the section of former railway corridor 3.42km long running from Junction Road (the B2244) in Bodiam to the terminus at Robertsbridge. Policy EM 8 of the Rother District Plan expressly supports the reinstatement of RVR. The local plan was the subject of a Public Inquiry and the Inspector's report gave full support to completing the Missing Link, subject to meeting the following criteria:
"(i) it must not compromise the integrity of the floodplain and the flood protection measures at Robertsbridge;
(ii) it has an acceptable impact on the High Weald Area of Outstanding Natural Beauty;
(iii) it incorporates appropriate arrangements for crossing the A21, B2244 at Udiam, Northbridge Street and the River Rother."
These criteria were all resolved and approved with full Planning approval given by Rother District Council in March 2017. Once completed, visitors will travel on a well-regarded Heritage Railway on the historic route within the Rother Valley between Tenterden and the mainline at Robertsbridge, with stops at a number of attractive tourist destinations.

Over the course of a number of years, planning permission has been obtained for the re-instatement of the railway between Bodiam and Junction Road in 2011, from Robertsbridge to Northbridge Street in 2013 and the construction of Robertsbridge Junction Station. Re-construction of the railway within those sections has now been completed (utilising volunteer professionals and local subcontractors). The connection to the main line was completed in late 2016 with the support of Network Rail.

Following consultation over a period of 6 years, including discussions with all relevant statutory bodies and the local planning authority – as reported in the Consultation Report accompanying the TWAO application - planning consent for the Missing Link was unanimously approved by the Rother District Planning Committee on 17 March 2017. (RR/2014//1608/P). Letters of support for the project from Kent CC, East Sussex CC, Rother DC, Ashford BC, Network Rail, National Trust, and 1066 Country are included in the Consultation Report. The planning consent was accompanied by planning conditions to ensure the safety and effectiveness of the road level crossings.

The Missing Link will comprise a simple single track railway with straightforward construction, utilising the same local contractors and volunteers (qualified and experienced, as appropriate) as on the sections already completed.

This document relates to the proposed level crossing at Northbridge Street.

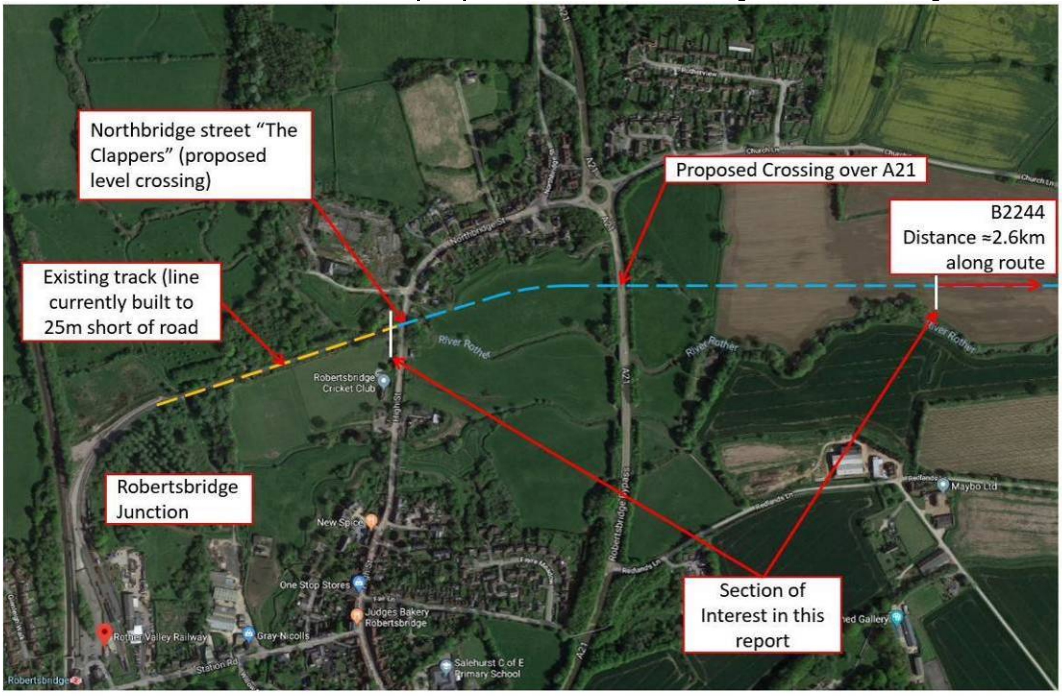


Figure 1 - Proposed location of C18 Northbridge Street crossing

2. Economic Benefits

A comprehensive Economic Benefits Report by Steer, leading UK specialist consultant, in 2018, forecast that the RVR will generate local economic benefits of up to £35 million over a two year construction period and the first ten years of operation, and up to £4.6 million per annum of local economic benefits from 2030. It will generate approximately 34 jobs in the construction phase and up to 85 in the operational phase. Additional rail revenues of approximately £355,000 per annum are forecast to accrue to the main line operator.

3. Traffic Studies

The TWA documentation includes traffic studies. However, the proposed timetable has a limited number (10) of crossing closures per day, all of which will be outside "rush hour" periods. The Mott MacDonald Study at Annex C, shows that the queue on normal weekdays would be only 12m, and an Environmental Impact Assessment was carried out by specialist consultants Temple for the planning consent and TWA application, with a detailed Flood Risk Assessment by Capita. The reports of both assessments are included in the TWA submission, together with a 2018 "air quality" study report, which shows potential changes in pollution levels at the receptors close to the A21, Northbridge Street and Junction Road to be negligible in all cases.

4. Drawings

Detailed design drawings for the three level crossings have been prepared by Arup, together with a Stage One Road Safety Assessment, the recommendations from which were included in the designs. The design documents include location plans of the proposed level crossing site at Northbridge Street (Annex A), with further photographs of the site at Annex B.

In addition to the above, Arup has produced a report specifically on the alternatives for crossing the A21. The Options for crossing Northbridge Street are similar to the A21, though the site conditions and challenges are somewhat different.

5. The Crossing Options

The key focus of this report is four options to cross C18 Northbridge Street "The Clappers":

- Option 1 is an at-grade level crossing
- Option 2 is a tunnel under Northbridge Street
- Option 3 is a railway bridge over Northbridge Street
- Option 4 raises Northbridge with a railway bridge over

The vertical profiles of the options is shown in Annex E

5.1. The Options Compared

Option 1, involving an at-grade level crossing, introduces the fewest engineering challenges and is likely to involve the least disruption during construction. This option formed part of the design for the railway that received planning permission in March 2017. Construction costs for this option are the lowest.

Option 2 looks at the feasibility of taking the rail beneath the existing road. Principal engineering and approval challenges are:

- Reconstruction of existing flood relief structures, Bridges 3, 4, and 5.
- Stabilization of existing tied steel sheet piling river wall.
- Tunnelling under the adjacent River Rother to 10m depth.
- Approach ramp gradient of 1:18.
- Prolonged closure of the only road between two parts of the village

Mitigation of this is likely to require a long length of waterproof trough structure, with significant engineering challenges, including maintenance of water flow paths during flood events and long-term pumping requirements. Disruption to local residents and road users is likely to be most significant with this option and it would require significant additional land from third party landowners. This option is not feasible due to the gradient of the approach ramp on the RBJS side of the crossing.

Option 3 considers the potential to take the rail over the existing road. Principal engineering and approval challenges are:

- This scheme introduces a sizeable length of elevated viaduct structure which will have significant impact on cost and visual intrusion.
- Approach ramp gradient of 1:88.
- Stabilization of existing tied steel sheet piling river wall.

Construction duration for this option is also likely to enhance the difficulties around gaining acceptance for this option from the relevant authorities. Again, this option would require significant additional land take from third party landowners.

Option 4, involving Northbridge Street raised with the railway beneath will result in a series of engineering works for both the road and rail. There would be no cost saving compared with Option 2 as the depth of the tunnel is dictated by the invert of the River Rother.

5.2. Cost of Options

This options assessment is based on the very detailed options report prepared by Arup for the A21 crossing. Arup's report considered the feasibility and (industry standard) construction costs of each option so as to provide a "like for like" comparison between the options. In addition Arup's assessment reported the actual cost estimate for delivery of the level crossing, as worked up by RVR for the purposes of the planning consent, granted in March 2017, and the application for Transport and Works Order submitted in April 2018.

Arup noted that it is not possible to advance a similar worked up costing for the other three crossing options because RVR would not be equipped to design and construct them "in-house".

RVR has already undertaken significant work on the project in the anticipation of Option One. As referred to above, following detailed studies and designs, extensive discussion and liaison with all the key authorities, RVR has full Planning Approval for this Option. Paragraph 6.7.1 of the report to the Rother District Council planning committee in March 2017 recorded that "*Bridges and/or tunnels are not a feasible option in this case and in the circumstances, the installation of a barrier-operated rail crossing over each of the roads is proposed in the application.*" RVR has the engineering expertise to construct the level crossing option and has a detailed cost estimate, utilising quotes from existing sub-contractors. RVR has already purchased a proportion of the key materials needed, as described in the RVR A21 Crossing Cost Estimate as annexed to Arup A21 Crossing Options Report.

5.3 Summary of Options

Table 1 provides a summary of the main features of each option in relation to the key categories considered. Using industry standard allowances, Option 1 at £0.8M is some £10 M cheaper than the only feasible alternative option (Option 3) at £10.8M (a ratio of 17:1).

Using the comparison between what RVR can build it for and the industry standard cost applicable to construction by commercial construction companies Option 1 at £0.3M is some £10.5M cheaper than the only feasible alternative option (Option 3) at £10.8M (a ratio of 36.1).

GRAND SUMMARY Northbridge Street	Total (£) Option 1	Total (£) Option 2	Total (£) Option 3	Total (£) Option 4	RVR (£) Option 1	**Comments**
Direct Construction Works						
Railway Control Systems (level crossing only)	£300,000	N/A		N/A	£171,000	Option 1 only
Civil Engineering	£20,000		£4,391,000		£18,310	
Enabling Works	£32,000		£440,000		£69,890	
Sub -Total (Direct Construction Cost Only)	£352,000		£4,831,000		£259,200	
Indirect Construction Works						
Preliminaries (25%)	£88,000		£1,208,000			
Contractor Overheads and profit (8%)	£35,000		£483,000			
Sub -Total (Construction Costs)	£475,000		£6,522,000		£259,200	
Project / Design Team Fees and Other Project Costs						
Design Team Fees (10%)	£48,000		£652,000			
Project Team Fees (5%)	£24,000		£326,000		£7,776	RVR 3%
Other Project Development Costs					£5,184	RVR 2%
Sub -Total (before Risk/Optimism Bias)	£547,000		£7,500,000		£272,160	
Risk						
Optimism Bias 44%	£241,000		£3,300,000		£27,216	RVR 10% contingency
Grand Total	£788,000		£10,800,000		£299,376	

Table 1 – Crossing Options Costs

6. Timing

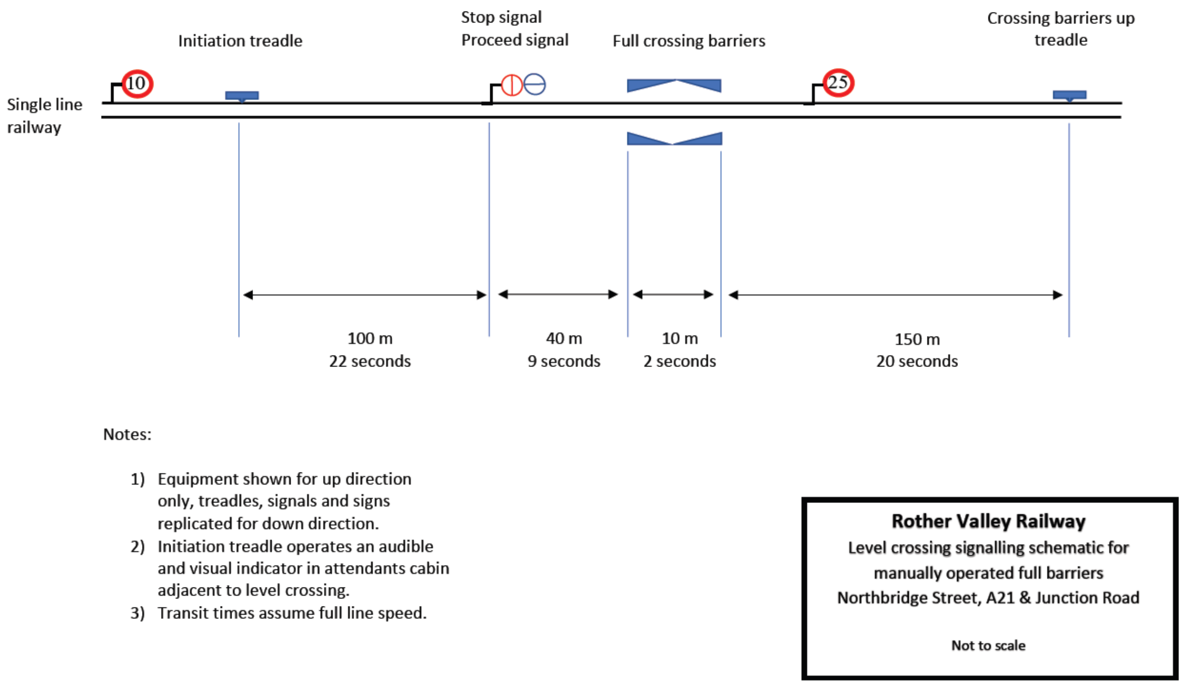
The majority of the construction materials for Option one would be delivered by rail, the fill material and track ballast via the Network Rail connection at Robertsbridge (from stock piles that RVR are already holding at several south coast ports), and track materials by rail from those already held for the project by K&ESR at Northiam Station. Upon gaining access to the land, it is anticipated that there will be 12 months of surveys in order to discharge the relevant planning conditions, with subsequent construction taking approximately 12 months. Commissioning and trials by K&ESR will take approximately 3 months.

7. Operation

The nature of the railway operation is an infrequent heritage railway, travelling at a maximum speed of 25mph and locally monitored by a signalman. The intended design of the level crossing will be a full barrier CCTV design incorporating the most recent crossing technology reducing risks to level as low as reasonably practicable. A brief outline description of the level crossing operation is detailed in the Statement of Case at paras 6.1.1 to 6.1.5 and it is noted that the detail of the equipment and operation is subject to approval by the ORR.

The reinstated railway will be operated by K&ESR as an integral part of its successful heritage undertaking. (K&ESR has been operating trains since 1974.)

Level Crossing Signalling Arrangement



8. Narrative Risk Assessment

The "Narrative Risk Assessment" documentation for the road level crossing (Annex D), shows how the risks of a level crossing would be managed in accordance with ORR guidance.

Arup has produced a detailed Stage 1 Road Safety Audit (Annex C) which was submitted to East Sussex County Highways during the planning application process.

9. Funding

The anticipated final cost of implementing the outstanding work for the entirety of the “Missing Link” (including Option one), is £5.3m pounds which will be funded by the Rother Valley Railway Heritage Trust, this funding is in place. Following in principle agreement to the level crossings from ORR and the Highway Authorities (link to their letters to RDC below) the Trust has already invested over £3m in the new Robertsbridge Junction Station, the connection to Network Rail, the permanent way from Bodiam to Junction Road and from Robertsbridge Junction to Northbridge, together with the necessary specialist consultant’s surveys and reports.

SUPPORTING DOCUMENTATION
(Documents 1, 2, 3, 8, 9 as provided to ORR previously with A21 Crossing Information)

1. Mott MacDonald Level Crossing Impact Report (2011, and updated report in December 2018).
2. RVR September 2018, Statement of Case. (Summary).
3. Draft RVR (Bodiam to Robertsbridge Junction) Order. (Giving full details of necessary right of way orders etc.)
4. Annex A. Detailed layout drawings and location plan.
5. Annex B. Location photographs.
6. Annex C. Arup Stage 1, Road Safety Audit.
7. Annex D. Road Crossings. Narrative safety report.
8. Road crossing, safety arrangements.
9. Ove Arup A21 Crossing Options Report
10. Annex E. Crossing Options Profiles

CHECKLIST

ORR requested information:	**Provided**
1. the location of the proposed crossing including photographs and diagrams;	Para 1, Annex A, B
2. the reason for the crossing;	Para 1
3. information about the proposer of the scheme for a new crossing, the proposed crossing operator and, if applicable, the proposed authorised user(s) of the crossing;	Para 5.2, 7
4. proposed timescales for (re)introducing any new crossing;	Para 6
5. confirmation that there is a right-of-way and whether any relevant authorisations/Orders need to be sought through the TWA procedures;	Para 1
6. information about the road and rail traffic at any proposed crossing including the results of censuses;	Para 3, Annex C
7. details of any liaison that has already taken place with other departments and agencies such as DfT, Highways Agency or local highway authorities, planning authorities and other local bodies and stakeholders plus a summary of the responses/views received;	Para 1, 9
8. a description of what other options have been considered such as bridges and underpasses and clear explanations setting out why these options are not reasonably practicable alternatives to a level crossing, backed up by evidence from risk assessments;	Para 5
9. details on the features of the proposed crossing and what protective arrangements would be in place were it to go ahead based on a suitable and sufficient risk assessment (noting that it may be subject to a Level Crossing Order application further down the line);	Para 7
10. any other information that the panel considers might be relevant or helpful.	

Annex A. Detailed Layout Drawings and Location Plan

Annex B. Location Photographs

Northbridge Street Aerial

Northbridge Street North

Northbridge Street East

Northbridge Street South

Northbridge Street West

Annex C. Arup Stage 1, Road Safety Audit

Annex D. Road Crossings. Narrative safety report.

Annex E. Crossing Options Profiles

Rother Valley Railway level crossings

Demonstration of gross disproportion

Assumptions

- Only the crossing of the A21 has been considered since the other two crossings can only realistically be crossed on the level due to the constraints of the River Rother and the topography.
- The crossing is a manually controlled with full barriers and obstacle detection (MCB OD). Rother Valley Railway have detailed costs for the crossing infrastructure that are verified by the various suppliers.
- There is a 44% optimism bias in the costs
- RVR risk assessments have been subjected to further progressive safety analysis.

Evidence & calculation

The lowest cost of any of the alternatives to a level crossing over the A21 is the option of a tunnel with vertical realigning of the A21. The cost is estimated to be **£11,328,000 (a)** *source Arup costs report*

The cost of a manually controlled full barrier with obstacle detection is **£1,513,103 (b)** *source RVR costs*

The estimated cost of replacing and maintaining the barriered crossing over 50 years is estimated to be **£ 360,000 (c)** at current prices, based upon complete replacement of barriers, machines and control equipment every 25 years.

Network Rail have concluded that the total risk in Fatalities and Weighted Injuries (FWI) for the 55 Manually Controlled full Barrier crossings with Obstacle Detection is 0.1 (*source Transforming level crossings 2015-2040*) This equates to a 1 in 55 year chance of a serious injury at a crossing. The exposure to risk at the A21 crossing is at least one order of magnitude lower than that a Network Rail crossing due to the limited number of trains and the days of operation. However, to demonstrate a worst case safety dis-benefit using Network Rail figures RVR has considered one serious of injury in 50 years.

The DfT published cost of preventing a serious injury sustained on the highway at 2018 prices is £251,458 (*DfT publication RAS60001*) which when aligning to all costs at 2019 prices is **£ 255,229 (d).** This is higher than the RSSB value of £194,600.

For a 50 year period, ignoring the costs of maintaining the tunnel, the difference between the tunnel cost and the crossing together with the safety dis-benefits equates to:
a – ((b +c) + d) = **£9,199,668 showing gross disproportion in cost between a tunnel and a level crossing.**

The credible risks set out in the RVR risk assessment have been assessed to mainly having a remote likelihood with one event being unlikely. To demonstrate the range of consequences using the extreme upper limit of an unlikely event, 10 serious injuries over a 50 year period are considered.

The safety dis-benefit would be **£2,552,290,** giving a total difference of **£ 6,647,378 showing gross disproportion between a tunnel and a level crossing.**

Conclusion

The difference in cost between a tunnel and a level crossing including the safety dis-benefits, the level of uncertainty in the costs and the credible range of consequences is grossly disproportionate and within the range of 3 to 10 as suggested by the HSE.

o Heritage Trust o
IN ASSOCIATION WITH THE KENT & EAST SUSSEX RAILWAY
ROBERTSBRIDGE JUNCTION STATION, STATION ROAD,
ROBERTSBRIDGE, EAST SUSSEX. TN32 5DG

Rother Valley Railway Level Crossings
Summary Demonstration of Gross Disproportion

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RVR
15.11.2019

From: Mark Cathcart [redacted]
Sent: 28 October 2019 11:52
~~**To:**~~ David Gillett [redacted]
Subject: Rother DC planning: RVR: A21 bridge crossing, Robertsbridge, East Sussex.

Dear Mr Gillett,

Re: informal planning enquiry on behalf of the Rother Valley Railway
Proposed railway bridge over A21 and associated works, Robertsbridge, East Sussex.

I refer to your email of 24 October 2019 together with the attached Arup drawing of the 'bridge Option' for crossing the A21.

Planning permission has previously been granted by Rother District Council for an extension to the heritage railway, which incorporated a level crossing over the A21 (as well as Northbridge Street and Junction Road); it is now understood that consideration has to be given to alternative options for road crossings. Any such scheme would need to be the subject of a revised planning application and you have requested informal comments from the Local Planning Authority in respect of the planning issues.

A principal planning issue in considering the proposal would be the impact of the development on the setting of the village and the countryside landscape, which is within the designated High Weald Area of Outstanding Natural Beauty. The Government's planning policies and how they should be applied are set out in the National Planning Policy Framework (NPPF), which states at paragraph 172 that great weight should be given to conserving and enhancing landscape in Areas of Outstanding Natural Beauty, which have the highest status of protection in relation to these issues. The Council's own development plan policies as contained in the Core Strategy (2014) at EN1 and the emerging Development and Sites Allocation (DaSA) Plan at DEN2 accord with the NPPF and are consistent with this approach. With respect to the proposed development, the A21 at the point of the proposed bridge crossing sits within the broad flat landscape of the Rother valley; it is considered that the substantial scale of the structure rising from the flood plain, combined with its appearance - incorporating large concrete bases and columns, would appear intrusive and quite alien in the rural landscape. In the circumstances it would be harmful to the character and appearance of the AONB and contrary to the afore-mentioned national and local planning policies.

A further planning issue would be impact on the residential amenities of local residents in relative proximity to the bridge and elevated section of railway, particularly the properties on the south side of Northbridge Street and Rutley Close. Core Strategy Policy OOS4 (ii) requires that all development should not unreasonable harm the amenities of neighbouring properties; in this regard the development would appear visually oppressive and unreasonably intrusive for the occupiers of those properties, as well as potentially giving rise to some disturbance from passing trains when in use. The development would therefore conflict with the Core Strategy.

In view of the planning issues outlined above, it is my informal opinion as a planning officer of the Council that a revised planning application for the bridge structure would not be supported by the Local Planning Authority.

Yours sincerely,

Mark Cathcart

Mark Cathcart BSc MA MRTPI
Principal Planning Officer
Strategy and Planning

[redacted]
rother.gov.uk

Rother
District Council

Annex A. Road Crossings. Narrative Risk Assessment.

New Build A21 Level Crossing MCB+CCTV+OD - Narrative Risk Analysis (NBLC-NRA)

Contents

Rother Valley Railway

1 Introduction

The Rother Valley Railway will provide a full barrier level crossing (MCB+CCTV+OD), incorporating the latest technology for the operation and protective equipment. The crossing will be fully compliant with that is widely used on Network Rail infrastructure today, thus, ensuring the crossing would not require any product approvals, derogations or changes to standards. The maintenance regime would also be standard and no bespoke parts would need to be produced or stocked specifically for the crossing. For the above reasons, the crossing presents a very low reliability and risk concern and would most likely incur the lowest maintenance costs.

A level crossing does not currently exist on the A21 Robertsbridge, therefore a Quantitative Risk Assessment would not provide sufficient evidence to demonstrate that possible risk has been assessed and managed accordingly. However, it is important to establish possible risk from the introduction of a level crossing and possible mitigation measures at an early stage of development.

This NBLC-NRA analyses all relevant data as well as expert opinion to demonstrate that all possible risk has been addressed as well as embroidering new technology to further enhance the safety of the level crossing, for example;

- CCTV for improved safety & security,
- Obstacle Detection – LIDAR
- Home Office Approved Red Light Cameras
- Evaluate the risks at the level crossing.
- Early engagement with stakeholders from different sectors, local authorities, communities and 'users' associations.
- Take engineering measures and find innovative solutions
- Take educational and awareness measures and collaborate with the rail and road sectors.

The level crossing will be carefully assessed via this analysis in collaboration with railways and the road infrastructure managers, local authorities and industry experts to make it more visible and easier to cross particularly for long, heavy and oversized vehicles.

All stakeholders will be in a position to cooperate and design the best level crossing environment.

Narrative Risk Assessments currently used by Network Rail are enabling better targeting of risk reduction measures; blending quantitative modelled risk with structured observation and judgement from competent staff. The NRA process is considered as part of this analysis to encompass the whole level crossing asset system and assess wider aspects of level crossing risk.

This analysis builds upon excellent safety initiatives which were introduced for the first Automatic Full Barrier level crossing by Network Rail including the safety benefits provided, however, RVR intend to introduce additional safety measures such as the use of Red-light safety equipment (RLSE), which has currently been installed at 31 public road level Crossings on the National Railway Network to improve user behaviour, deterring deliberate misuse. Trials have demonstrated that these Home Office Type Approved (HOTA) cameras have reduced deliberate misuse by approximately 90 per cent at some locations.

RVR have considered the installation of an object detection system at the A21 Robertsbridge level crossing. The objection detection system utilises laser technology to scan the crossing before allowing for trains to safely manoeuvre through. The LIDAR system detects obstacles on the ground and around the edge of the barrier lines and delivers unique small object detection protecting children and adults as well as vehicles and other large objects. RVR will install the LIDAR (or equivalent obstruction detection system) before railway operation commences.

2 Level Crossing Overview

This is a risk analysis for the A21 Robertsbridge Road level crossing. However, it should be noted that at present a level crossing does not exist, therefore, the analysis is based on the probability of risk if a level crossing was in place. It is imperative that a full Quantitative (and Narrative) Risk Assessment (QRA) is completed before any trains operate over the crossing and that the QRA is presented to the ORR.

Crossing Details	
Name	A21 Robertsbridge Bypass
Type	MCB+CCTV+OD
Crossing status	Public Highway
Overall crossing status	Design Stage
Engineers Lin Reference	N/A
OS grid reference	
Number of lines crossed	1
Line speed (mph)	10
Electrification	No
Signal box	Yes (A21 level crossing)

3 Information Sources

The table below shows the stakeholder consultation that was undertaken as part of the risk analysis.

- ORR
- K&SR
- Bakerail
- ESDC
- RVDC
- I-Transport
- ARUP

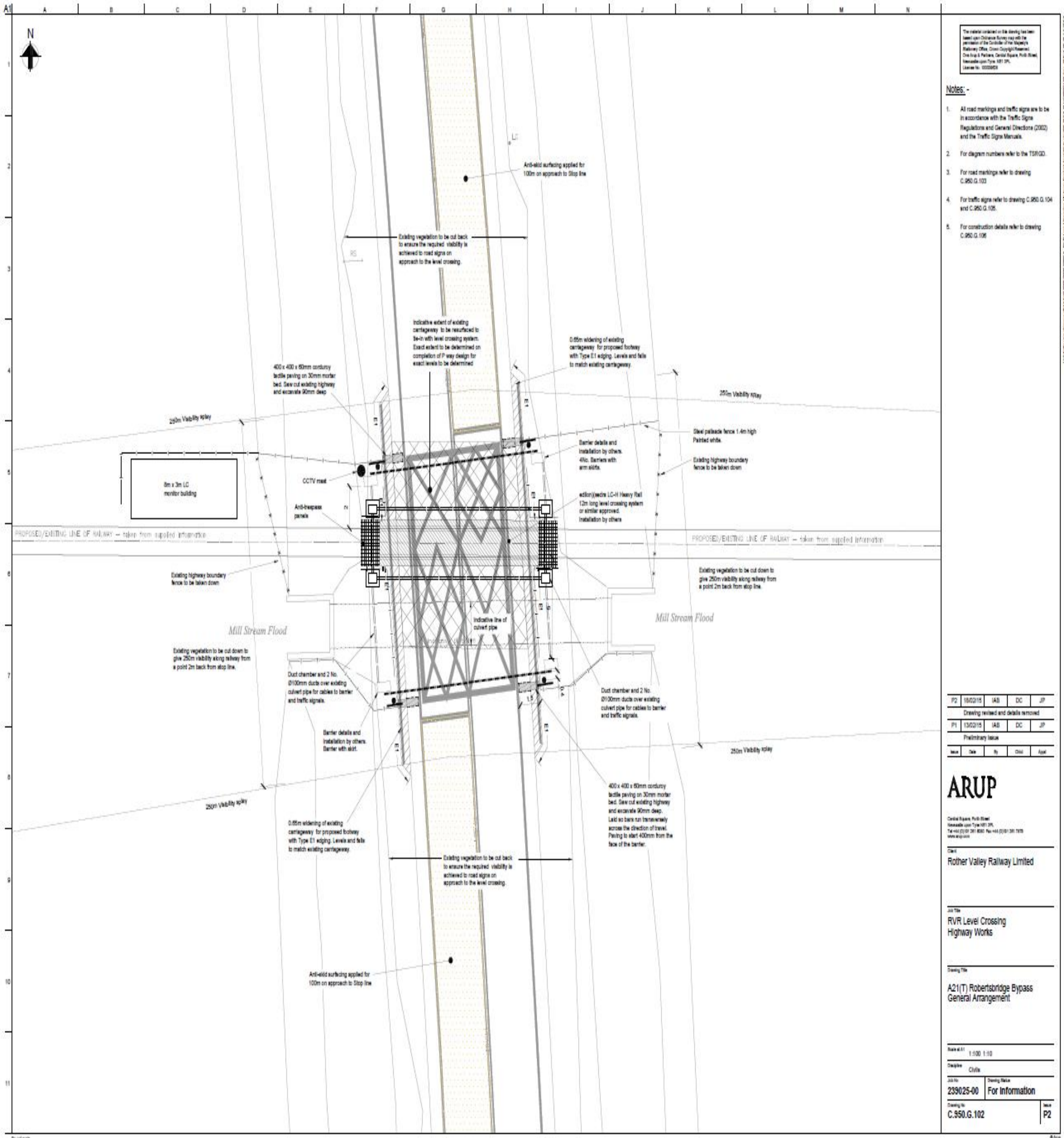
Reference sources used during the risk analysis;

- ARUP A21 Options Report
- ARUP Road Safety Audit
- Mott Macdonald road survey report
- Network Rail QRA information
- GG19 Road Safety Report
- ORR Documentation
- GPR219-IDF- Level Crossing Safety
- EU SAFER-LC Project
- Level Crossing Risk Management Tool (LXRMT).

4 Level Crossing Diagrammatic Scheme

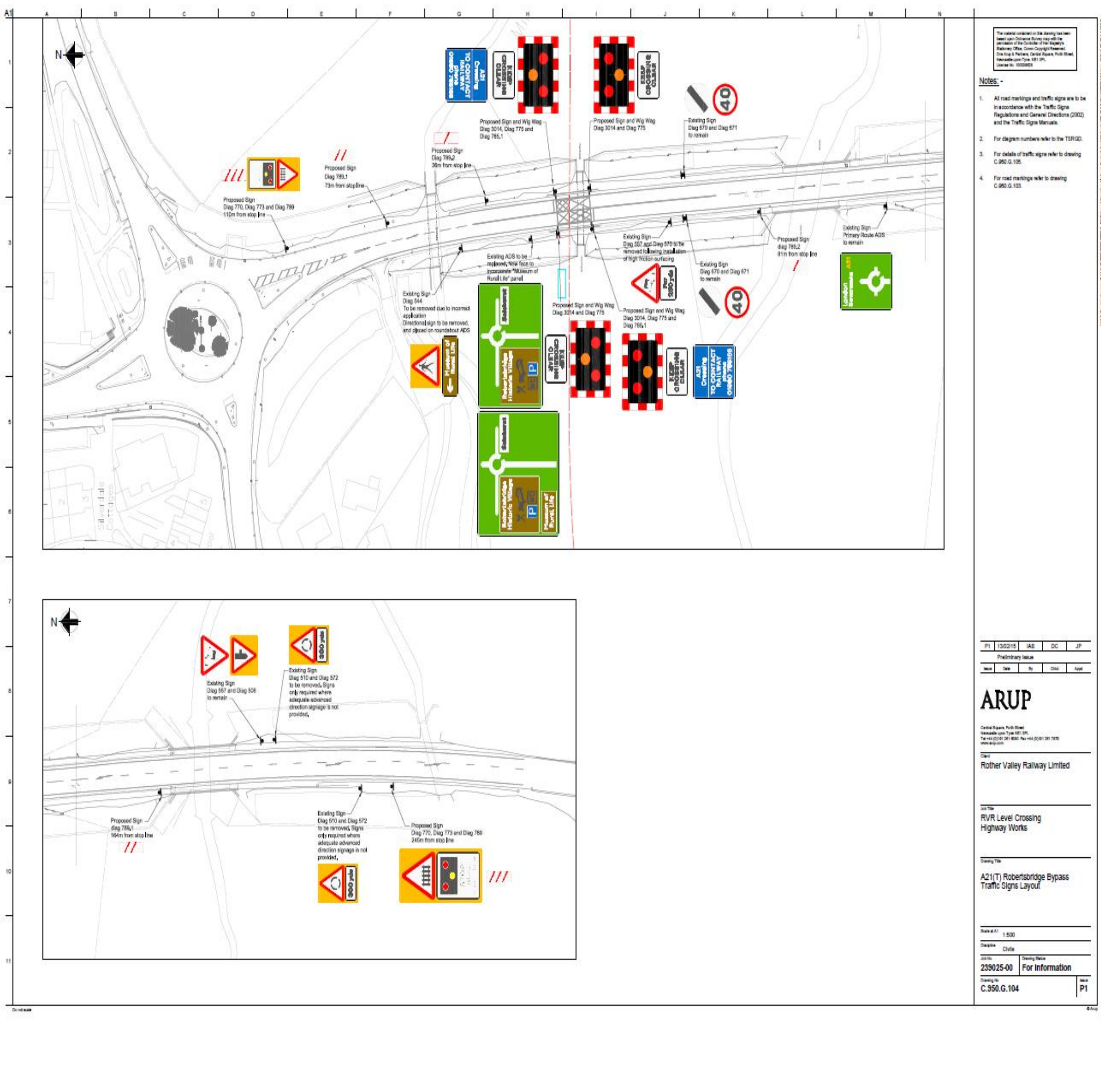
The new level crossing to be constructed is an MCB+CCTV+OD on the A21(T) Robertsbridge Bypass. The road approach speed is 40 mph. The profile of the railway line in the vicinity of the crossing has been provided (below), as well as the appropriateness of the proposed warning signs in this regard.

Diagram of the proposed railway Alignment

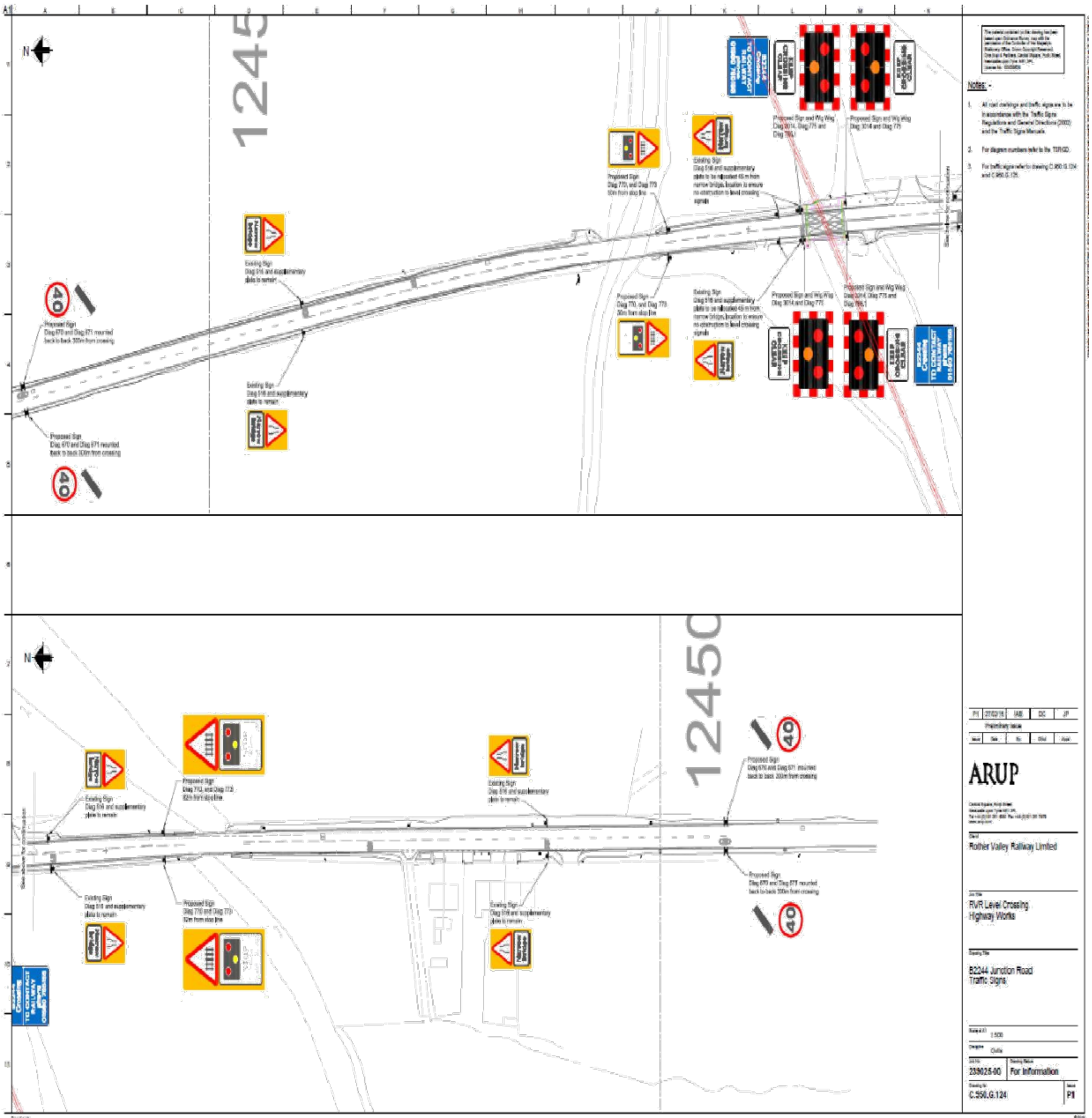


Rother Valley Railway

Diagram of the proposed traffic signs



Rother Valley Railway



5 Site Visit General Observations

The A21(T) Robertsbridge Bypass Stage 1 Road Safety Audit report identified possible road distractions which are considered as part of this analysis, for example,

- Blocking on the circulatory carriageway of a roundabout can lead to significant frustration for drivers on the side roads, not included in the main queue. This can lead to drivers trying to force their way around the junction, resulting in circulatory collisions.

To remove this concern, it is advised to reduce the speed limit over this length of road.

- The adjacent features see in photograph 1 (below) increase the risk of blocking back at the proposed level crossing, additionally, there is a private access road located close to the proposed level crossing location as well as the narrow bridges to the north and south. Turning traffic waiting on the carriageway by the proposed level crossing will increase the risk of blocking back over the crossing leading to potential vehicle/train conflict.

To remove this concern, it is advised to Introduce yellow box markings to, as far as possible, maintain the turning movements at the roundabout.

Photograph 1

- The proposed level crossing layout does not consider the existing traffic signing or the effect of the proposed level crossing signing on the existing signing. This could lead to drivers missing some signs and the warnings they portray leading to a range of conflicts and/or collision types, photographs 2 (a), (b) below.

A comprehensive review of the existing signing on the A21(T) should be incorporated into the detailed design of the level crossing including visibility splays to the various signs to demonstrate there will be no masking.

Photograph 2(a)

Photograph 2b

- The level crossing is proposed some 40m from the end of the existing street lighting system on the approach to the A21(T) Northbridge Street roundabout. It is not proposed to light the level crossing. Some drivers' eyes can take several seconds to adjust from lit to unlit conditions, and vice versa. A hazard such as a level crossing or queue located within that transition distance could result in shunt type collisions or a collision at the crossing itself.

To remove this concern, it is advised to extend the street lighting system to the south side of the level crossing in order to adequately light the hazard.

Photograph 3

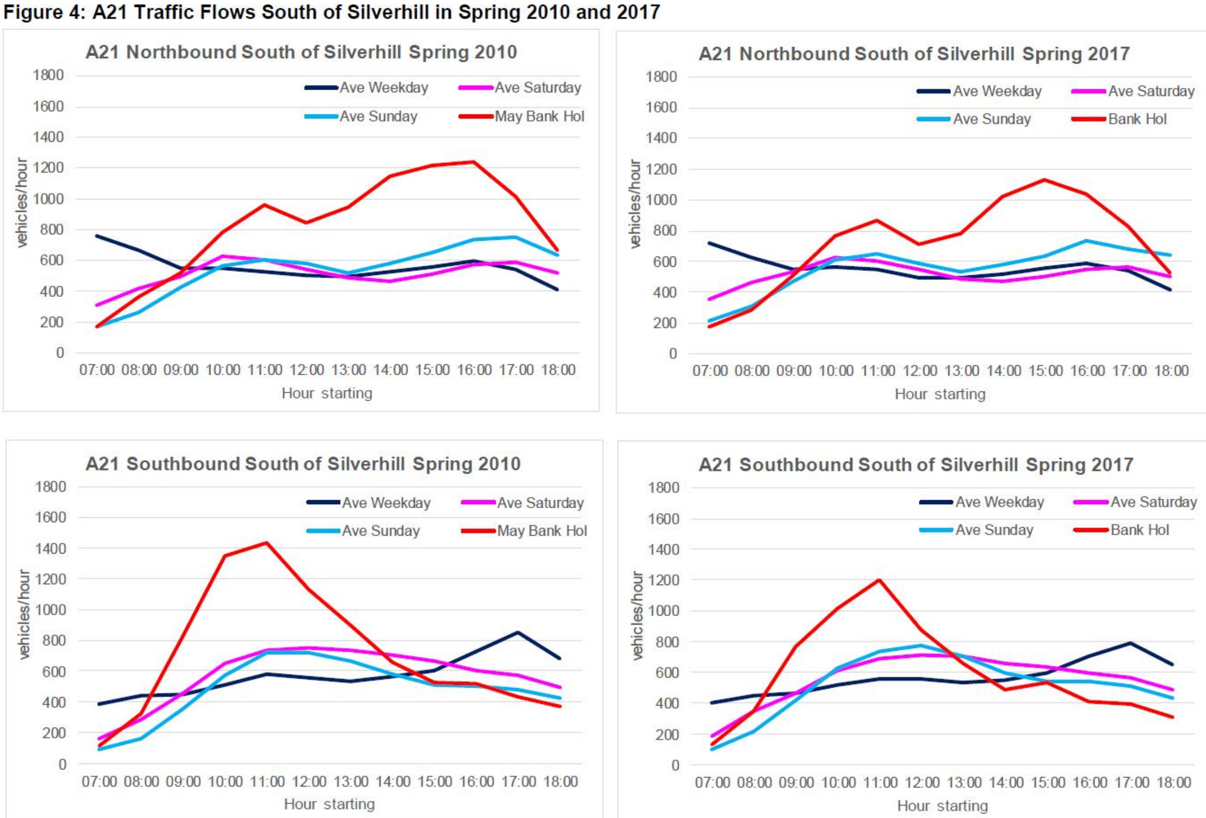
6 A21 Robertsbridge Bypass Traffic Flows

The chart below compares traffic flows on A21(T) Robertsbridge Bypass, for Spring and Summer months, based on ATC data provided by ESCC.

On the A21 at Robertsbridge the changes in traffic demand between 2010 and 2017 are limited with minimal changes on weekdays, some increases on Sundays and on the August Bank Holiday but reduced flow on the May Bank Holiday.

The predicted maximum queue lengths on the A21 are 60m-70m on weekdays, Saturdays and Sundays, increasing to 100m-120m on the Bank Holidays, using 2017 traffic demand. With traffic growth, these queue lengths increase to 2027 although the southbound queue length is only predicted to exceed 140m (the length from the level crossing back to the roundabout) on the May Bank Holiday in 2027 and even then, it is only just exceeded at 143m.
(Mott Macdonald Addendum report 2018).

Figure 4: A21 Traffic Flows South of Silverhill in Spring 2010 and 2017



For the A21, maximum queue lengths of 100m-150m are predicted for weekdays, Saturdays and Sundays, increasing to 160m-240m on the Bank Holidays. With traffic growth, these corresponding queue lengths increase to 120m-180m and 190m-290m by 2027.

For the August Bank Holiday, the average northbound queue lengths are a little higher in 2017 and 2021, when compared to the previous results, and maximum queue lengths are higher by 10m-13m. For the southbound direction, the new results are higher by up to 18m but the maximum queue length in 2021 is 85m, still well below the 140m back to the A21 roundabout.

Traffic Growth Factors 2017 –2021 –2027

Table 3: Predicted Queue Lengths at A21 Level Crossing

	2017 Northbound		2017 Southbound		2021 Northbound		2021 Southbound		2027 Northbound		2027 Southbound	
	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
Spring/Autumn												
Weekday	51	45	60	49	55	49	65	53	60	53	71	57
Saturday	50	45	61	56	54	48	66	60	59	52	72	66
Sunday	62	52	66	54	67	56	71	58	73	61	78	64
May BH	99	75	121	62	106	81	131	66	116	89	143	72
Summer												
Weekday	50	45	74	54	54	49	80	58	59	53	88	63
Saturday	55	47	65	59	59	51	70	64	65	56	76	70
Sunday	70	60	67	57	75	64	72	61	82	70	79	67
Aug BH	96	70	79	67	103	76	85	72	113	83	93	79

Source: Mott MacDonald analysis of existing and predicted traffic volumes, queue lengths in metres assuming 5.75m/vehicle

Table 6: Predicted Queue Lengths at A21 Level Crossing with 110 Second Closure

	2017 Northbound		2017 Southbound		2021 Northbound		2021 Southbound		2027 Northbound		2027 Southbound	
	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
Spring/Autumn												
Weekday	101	90	120	98	109	97	130	105	119	106	141	115
Saturday	101	89	122	112	108	96	131	121	118	105	143	132
Sunday	125	104	132	108	134	112	142	117	147	122	155	127
May BH	197	151	243	123	213	162	261	133	232	177	285	145
Summer												
Weekday	100	90	149	108	108	97	161	116	117	106	175	127
Saturday	110	95	129	118	118	102	139	127	129	111	152	139
Sunday	140	119	134	114	150	129	144	122	164	140	158	134
Aug BH	192	141	158	134	206	152	170	145	225	165	186	158

Source: Mott MacDonald analysis of existing and predicted traffic volumes, queue lengths in metres assuming 5.75m/vehicle

Conclusion;

On the A21 at Robertsbridge the changes in traffic demand between 2010 and 2017 are limited with minimal changes on weekdays, some increases on Sundays and on the August Bank Holiday, however, reduced flow on the May Bank Holiday.

Comparison with the queue length predictions reported in October 2011 shows the new 2017 and 2021 results are generally similar to the previous results for 2016 and 2021 on the A21. The major difference is that long queues are no longer predicted for the A21 Southbound on the May Bank Holiday. This is because the traffic demand recorded in 2017 is significantly lower than that in 2010 (reduced from around 1,600 vehicles/hour to 1,400 vehicles/hour).

7 The Railway

The train service over the A21 Robertsbridge level crossing will consist of passenger trains only. There will be approximately 10 trains per day. The highest permissible line speed of trains over the crossing will be 10 mph. Trains are timetabled to run for 10 hours per day.

The RVR Level Crossing Operational Management Plan (LCOMP) sets out the strategy for operational management of the A21 Robertsbridge level crossing to be installed on the Rother Valley Railway (RVR) where it interfaces with the road at level grade, so requiring control of road vehicles to enable a train to cross.

The LCOMP describes the principles of how the level crossing is to be operated under normal conditions and in the event of failure. This shall be the basis for developing operational procedures for the railways operation when services commence to which staff shall be trained and assessed on an ongoing basis.

Compliance with Industry guidelines;

The design for the level crossings, developed from this document, shall be compliant with industry guidelines, e.g. The Office of Rail Regulation: A Guide for Managers, Designers and Operators and approved by a suitably independent person before installation.

A21 Robertsbridge Level Crossing Operation;

It shall be noted that a signal box, with signaller on duty at all times of normal operation, shall be located at the A21 crossing. The person in charge shall oversea operation of the crossings at the A21.

Normal operation towards Robertsbridge

The train will approach the protecting signal at the level crossing at a maximum speed of 10 mph, thus ensuring that the train has the ability to stop within 30 metres. The signalman shall check the CCTV monitors, ensure the obstacle detection system displays a clear crossing indication, then operate the closing sequence of the barriers demonstrating that the signaller has full and control of the operation, two train crew members will operate the train and good sighting will always be maintained.

This shall initiate a sequence of warnings to road users of klaxons, flashing yellow lights changing to flashing red lights then barrier closure, which shall be full barriers across the road, in the standard accepted sequence as adopted on the National Rail network. Note: The barriers will not close if at any time an obstruction is detected
There shall be a visual indication presented to the train driver that the sequence has been initiated which will be repeated as necessary for sighting purposes, and which shall change to confirm that the closure sequence has been successfully completed. The train can then pass over the level crossing.

If the level crossing is crossed under normal operating conditions the barriers will lower on the approach and rise following the initiation by the signaller, the raising also being initiated by the signaller having received an audible and visual signal from the strike in treadle.

There shall be an indication to the two locomotive crew that the barriers have risen correctly and this shall be checked by the train driver.

Degraded Operation

If the signaller cannot initiate the closing sequence on the control panel or the closing sequence fails, the indication to the driver shall not change, i.e. the indication to the driver shall be that the train must stop on the approach to the crossing. The driver shall contact the signaller to reach an understanding of what the issue is that has prevented the signal clearing.

The signaller can attempt to re-start the closing sequence from the signal box panel or at ground level at the level crossing local control. Should either of these fail the barriers can be manually lowered by the signaller, however, assistance from the train crew may be necessary to halt road traffic safely.

Once the level crossing is safely closed to road traffic the train shall cross. In such circumstances of a failure where the fault cannot be identified or rectified no further train crossings shall be attempted.

All irregular operation of the level crossing system must be reported immediately by the A21 signal box signaller who shall arrange for faulting attendance to the site.

Normal Operation towards Bodiam

The train will approach the level crossing at a maximum speed of 10 mph, thus ensuring that the train has the ability to stop within 30 meters. The signalman shall check the CCTV monitors, ensure the obstacle detection system displays a clear crossing indication, then operate the closing sequence of the barriers demonstrating that the signaller has full and control of the operation, two train crew members will operate the train and good sighting will always be maintained., two train crew members will operate the train and good sighting will always be maintained

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There shall be a visual indication presented to the train driver that the sequence has been initiated which will be repeated as necessary for sighting purposes, and which shall change to confirm that the closure sequence has been successfully completed. The train can then pass over the level crossing.

If the level crossing is crossed under normal operating conditions the barriers will lower on the approach and rise following the initiation by the signaller, the raising also being initiated by the signaller having received an audible and visual signal from the strike in treadle

There shall be an indication to the two locomotive crew that the barriers have risen correctly and this shall be checked by the train driver.

Degraded Operation

If the signaller cannot initiate and complete the closing sequence on the control panel the indication to the driver shall not change, i.e. the indication to the driver shall be that they must stop the train on the approach to the crossing. The driver shall contact the signaller to reach an understanding of what the issue is that has prevented the signal clearing.

The signaller can attempt to re-start the closing sequence from the signal box panel or at ground level at the level crossing local control. Should either of these fail the barriers can be manually lowered by the signaller, however, assistance from the train crew may be necessary to halt road traffic safely.

Once the level crossing is safely closed to road traffic the train shall cross. In such circumstances of a failure where the fault cannot be identified or rectified no further train crossings shall be attempted.

All irregular operation of the level crossing system must be reported immediately by the A21 signal box signaller who shall arrange for faulting attendance to the site.

Level Crossing barriers, CCTV & OD Systems Maintenance Plan

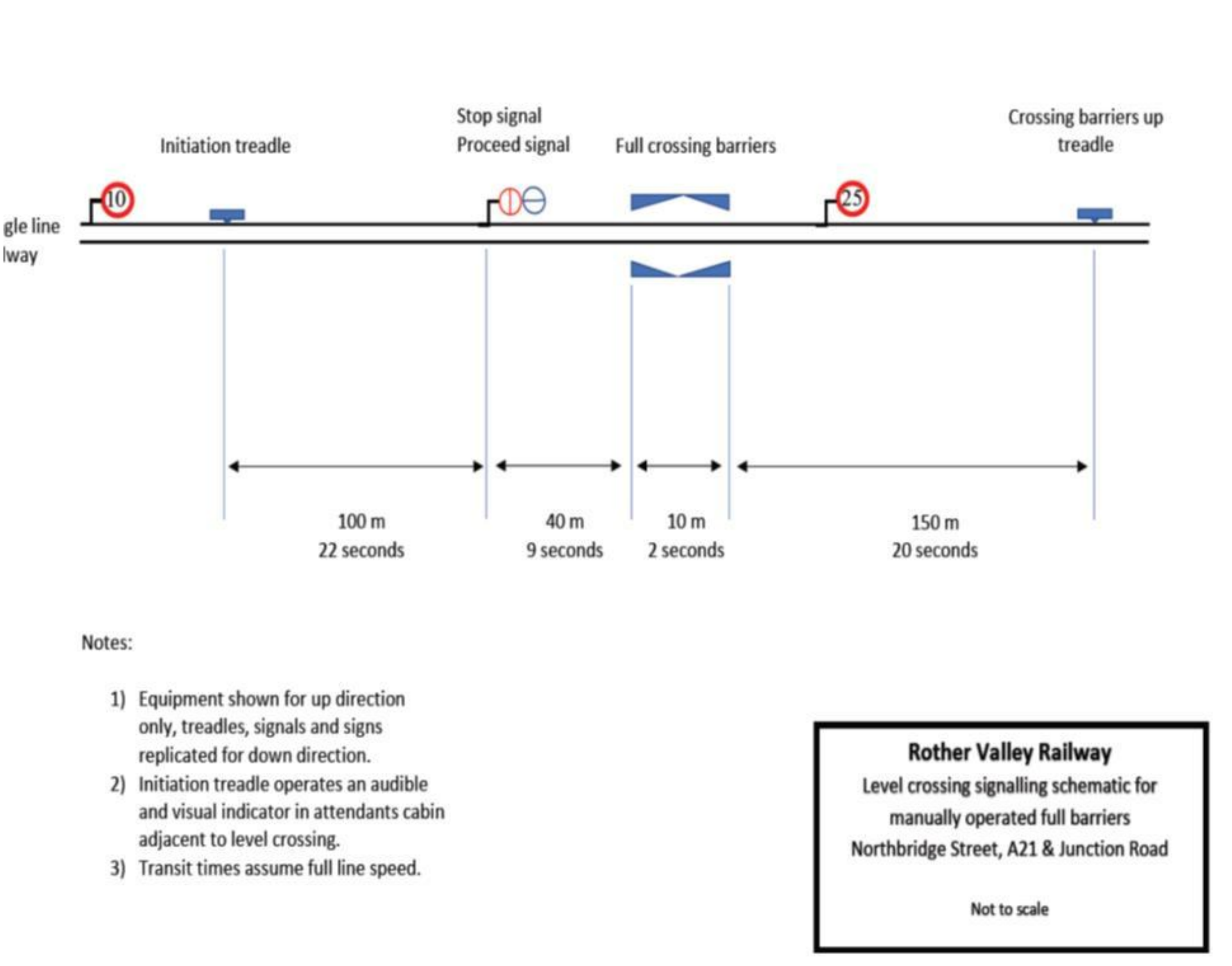
The maintenance plan for the three-level crossings shall be based on that recommended by the supplier of the equipment. It shall comprise:

- Regular planned maintenance at the required intervals.
- Work arising from planned maintenance, within the required timescales
- Fault response, within specified timescales.
- Work arising from fault responses, within the required timescales.
- Work arising due to other parties planned work.

Road Crossing Design and Construction

The construction of the road crossings comprise concrete units designed to meet the requirements of a high friction skid resistant road surface through the crossing. This has been tested for the proposed installation and passed the test level requirement as set by The Highways Agency, reference document RD/GN/009 dated September 1989.

Level Crossing Signalling Diagram



8 5 X 5 Risk Assessment

Hazards are identified, listing possible causes if appropriate and assessed for severity. These are then multiplied by the frequency or likeliness of an incident occurring if no controls were applied. This produces the risk factor; the numerical assessment table gives guidelines on how to assess severity and frequency.

This risk assessment is generic and whereas the basic principles will always apply, it is acknowledged risk can change significantly from one site to another. Generic risk assessments will always be reviewed by the appointed Project Manager and then expanded upon if required to nullify or apply the necessary controls to hazards identified during site visits (pre-works) or through information passed to them by a third party.

The 5x5 risk assessment considers risk assessment associated to MCB CCTV (OD) operated level crossings on the railway's national network as well as consideration of ORR's guidance for use of the LXRMTK which is based on industry research and best practice. It has been produced on behalf of the Rail Safety and Standards Board (RSSB).

The LXRMTK allows you to explore the human factor risks associated with level crossings and provides guidance on appropriate risk reduction measures. LXRMTK also has a range of applications, from being an information resource for anyone with an interest in public behaviour at level crossings, to being used to support various more specific activities.

The RA includes accepted best practice when evaluating severity based on what could credibly occur whenever the event occurs, i.e., assess severity based on what could credibly result, should this event occur or re-occur. Additionally, each hazard including possible causes identified, potential risk or consequences associated with the hazard and control measures have been considered by a team of safety professionals and debated accordingly.

This risk assessment is in no way to be viewed as exhaustive and may need to be expanded upon depending on the site being visited when fully operational and the activities being undertaken. As well as clearly identifying a hazard it also vitally important to understand the contributory factors wherever possible. Bearing this in mind, each hazard has been expanded upon to list the most common causes or reasons why the hazard may occur.

The process of using this 5x5 risk assessment is to inform decisions relating to the control and reduction of risks which have been divided into 3 stages:

- Preparing the assessment;
- Carrying out the assessment;
- Post-assessment activities.

In practice this provides a useful framework for outlining the guiding principles and factors considered throughout the process.

In preparing for the assessment, the additional factors were considered:

- What is the appropriate scope for the assessment?
- What is an appropriate approach, and what level of detail is needed?
- Who is going to be involved in carrying out the assessment?

the basic steps to be followed include:

- Identify the hazards;

- Identify the possible consequences;
- Estimate the likelihood of the possible consequences;
- Estimate the risk;
- Evaluate the risk;
- Record the findings.

It should be noted that additional evidence was used to support the risk assessment including the use of an ideal obstacle detection system that provides a safety integrity, no worse, and ideally better, than a manually operated crossing, cause no or minimal delays to trains due to equipment failure or false detections, affordable in terms of whole life costs, operate in all weather and temperatures, and be practical to use and maintain (MCB + CCTV + OD).

The detection system to be used will confirm that a crossing is not occupied by a person (including small children or someone who may have fallen over) or by any object that may cause damage to a moving train. Separate technology as well as manual operation is used to confirm that the crossing is closed by barriers once the detection system has confirmed the crossing is clear, then the train is allowed to proceed across the crossing. This is achieved by clearing the protecting signals.

Numerical Assessment			
Severity (S)		**Likelihood of Occurrence (L)**	
1	No Injuries / Minor Damage	1	Remote
2	Single Minor Injury	2	Unlikely
3	Single Major Injury / Minor Pollution	3	Occasional
4	Single Fatality / Major Pollution	4	Likely
5	Multiple Fatalities	5	Highly Likely

Risk Factor

		Likelihood of Occurrence (L)				
		5	4	3	2	1
Severity	5	25	20	15	10	5
	4	20	16	12	8	4
	3	15	12	9	6	3
	2	10	8	6	4	2
	1	5	4	3	2	1

Risk Factors between 16 to 25 = Unacceptable Risk. Risk Factors > 8 will be strictly monitored. Hazards Identified with a Severity Assessed at 3 or above will also be strictly monitored.

Hazards and possible causes identified	Potential Risk or consequences associated with the Hazard	S	L	RF	Control Measures	S	L	RF
SIGNALLING								
Relative to previous signals: Will the signal be in a different position, or does it have a different configuration?	Signal position is not consistent with the spacing between preceding signals. Signal is of a different design to preceding signals. Potential for, Death, Serious injury or injury.	5	3	15		5	1	5

Could the signal be confused with other signals on an adjacent line or on the same gantry	Signal is on a post and could be confused with other signals Signal has an identical profile / outline to adjacent signals Death Serious injury Injury	5	2	10	Ensure signals for all lines are visible Shield nearby signals from view Appropriate signal should be clearly associable with its line Driver training	5	1	5
Could the signal be obscured from the driver's view	Signal reading time is inadequate. Signal is positioned round a curve and the reading angle is inadequate Signal is positioned round a curve and there is an obstruction blocking the line of sight Signal can be obscured by vegetation Signal can be obscured (intermittently or otherwise) by a bridge or other structure, for example station structures edge of signal back	5	2	10	Increase backboard size (by 50%) Manage vegetation Maximum train speed is 10 mph Remove / shield potential distractions in stations Reposition signal on straight track Make signal post more conspicuous Driver training	5	1	5

	plate is less than 100 mm from edge of aspect							
TRACK								
Will the track on approach to the signal suffer from adhesion problems?	Signal is located in an area which suffers from ice, frost, leaf fall, dampness or other adhesion problems Death Serious injury Injury	5	3	15	Lineside fencing / netting Railhead conditioning Management of lineside vegetation Low adhesion warning signs Driver training	5	1	5
Is there a reduction in permissible speed on the approach to the signal?	There is a reduction in permissible speed on the approach to the signal Death Serious injury Injury	5	2	10	Permissible speed on approach to the level crossing is maximum 10 mph Driver training On site staff monitoring	5	1	5
Is there a falling gradient on approach to the signal?	There is a falling gradient on the approach to the signal	5	2	10	Countdown markers Driver training	5	1	5
COLLISION								
Road Vehicle and train collision risk	Insufficient train warning time for all vehicle types known to be exasperated by the driving position e.g. Tractor. LC Equipment/signage	5	3	15	Optimising position of equipment at the design stage removing any conflicting or redundant signs. Benefit from MCB+CCTV+OD Strike in times optimised.	5	1	5

	is not conspicuous or optimally positioned. Instructions for safe use may be misunderstood e.g., signage, clutter detracts from key messages, conflicting information given. High volume of unfamiliar users e.g. irregular visitors, migrant workers. Known user complacency leading to high levels of indiscipline. Type of vehicle unsuitable for level crossing; - Large, low, slow, making access or egress difficult and or vehicle is too heavy for the crossing surface –risk of grounding and or severity of gradient adversely affects ability to traverse. Users experience a long waiting time.				Sighting lines enhanced. Latest technology in place for user-based warning systems including wig-wag lights, sirens, full road barriers, RTL. (MCB+CCTV+OD) Competent crossing attendant on site. Maximum train speed 10 mph implemented. Superior quality crossing surface construction material. De-vegetation programme in place			
Pedestrian and train	Ineffective whistle boards, warning	5	2	10	Optimising position of		5 1	5

collision risk	inaudible, insufficient train warning time. Level crossing equipment and signage is not conspicuous or optimally positioned. Instructions for safe use may be misunderstood. Surface condition could lead to slip/trip risk. High volume of unfamiliar users i.e. irregular visitors/ramblers/equestrian. Complacency leading to high levels of indiscipline e.g. users are known to rely on knowledge of timetable. High level of use by vulnerable people. High usage of cyclists.				equipment at the design stage removing any conflicting or redundant signs. Latest technology in place for user-based warning systems including wig-wag lights, sirens, full road barriers, RTL. (MCB+CCTV+OD) Competent crossing attendant on site. Maximum train speed 10 mph implemented. Superior quality crossing surface construction material. De-vegetation programme in place. Regular engagement with stakeholders/authorised users reinforcing safe crossing protocol, legal responsibilities and promoting collaborative working. Signage to encourage users to look for approaching trains as well as providing cyclist dismount signs.			
Hazards and possible causes identified	Potential Risk or consequences associated with the Hazard	S	L	RF	Control Measures	S	L	RF

SPAD OCCURRENCE								
Train driver passes protecting signal without authority	Collision with road vehicle (see above). Collision with member of public (See above). Death Serious injury Injury	5	3	15	Treadle on protecting signal (passed at danger without authority) will activate the road crossing wig wag lights and siren to indicate to all road users that a train is coming. Barriers will not activate at this stage. The treadle will also activate a warning tone and visual sign to the local level crossing attendant that the train approaching the level crossing has passed the signal at danger without authority. The level crossing attendant will check to ensure the level crossing is clear of any traffic, pedestrians etc and activate a switch/plunger on site to operate the full barriers hence safely closing the level crossing to all road users. Driver training. Level crossing operator training. Maximum speed of train 10 mph.	5	1	5
Hazards and possible causes identified	Potential Risk or consequences associated with the Hazard	S	L	RF	Control Measures	S	L	RF
Additional Risk Influencing factors								
Distraction								
Can the driver be	Driver could be	5	3	15	Signal reminder sign	5	1	5

distracted by something outside the cab?	distracted by trespassers							
Could the driver be distracted by other tasks at or on approach to the signal?	There is a level crossing in the vicinity of the signal	5	3	15	Position signal where driver not distracted by other duties Driver training	5	1	5
Distractions while using the level crossing might impair the users likelihood that they will cross quickly and safely.	If a user is distracted, there is an increased risk that they will not see the crossing, train, warning signs, for example; Other persons in the car (e.g. children) Thoughts on personal matters, work stresses etc. Using the telephone, Behaviour of other crossing users, In car entertainment Seasonal events (e.g. fun fairs, fireworks) Mobile phones, iPads, handheld computers etc. Signage (e.g. speed limit signs). Distractions might be more likely for users who frequently use the crossing (e.g. delivery drivers), due to them potentially having a lower level of concentration than those who use it infrequently.	5	3	15	Provision of CCTV surveillance cameras (MCB+CCTV+OD) and signage to deter misuse at a particular crossing and to capture evidence of violations when they arise. Staff training. Traffic calming measures. Train maximum speed 10 mph. New modern full barrier crossing. (MCB+CCTV+OD) Education campaign.	5	1	5

	A change in speed limit and the associated speed limit signs. The proximity of the speed limit signs to the crossing might reduce the attention given to the crossing, or remove attention away from it completely. The signs might also draw a car driver's attention to the vehicle speedometer to check vehicle speed and away from maintaining vision out of the vehicle windscreen.							
High vehicle approach speeds	The vehicle speed over a level crossing is a factor in vehicle driver	5	3	15	Reduced road speed on approach to level crossing.	5	1	5
	errors. Risk factors include, the speed limit(s) in the surround areas, driver's perception and attitude to risk, visibility of warning signs and visibility of the level crossing e.g. rural winding roads. High risk behaviour such as high vehicle speeds and late, heavy braking will result in a higher frequency of collisions due to driver error.				Traffic calming measures. Enhanced signage. New modern full barrier crossing. (MCB+CCTV+OD) Education campaign. Crossing attendant (Monitoring).			

Large, slow and low vehicles	Drivers of large vehicles are involved in a disproportionately high number of incidents at level crossings. The larger size of the vehicles results in less room for error when compared to cars. They may not be responding to the activation of the crossing warning system in sufficient time. Studies have proposed that large (HGV) vehicles may attempt to traverse the crossing once the barriers have already started to descent, suggesting that it could be to do with the driver's awareness of their vehicle's poorer braking performance, and therefore, considering it safer to continue. Another contributory factor might include: The slower acceleration speed of HGVs causing the total time to cross a level crossing from standstill to increase sightlines from a higher driving position.	5	3	15	Reduced road speed on approach to level crossing. Traffic calming measures. Enhanced signage Yellow box marking Level crossing road surface well maintained Power operated level crossing barriers	5	1	5
Ice conditions	Icy weather conditions on approach/exit to LC may affect behaviour	5	3	15	Provision of CCTV surveillance cameras. (MCB+CCTV+OD)	5	1	5

	of the crossing for example, prevent vehicles from stopping in a position of safety at the crossing. Encourage vehicle drivers to ignore the initial warning activation when they are close to the train line because of the risk of sliding forward onto the tracks. Cause pedestrians to concentrate on their footing, rather than looking for trains or observing warning signs. Result in pedestrian slips, trips and falls. This is a particular risk for elderly, or mobility impaired, users. Level crossings on 'B' roads might present a particular hazard to vehicle drivers as these roads are not normally gritted in icy conditions.				Level crossings local training plans, training and briefing signallers/attendants receive on communications skills, hazards associated with a particular crossing (icy conditions), how to check whether a crossing is clear. Level crossing attendant on site. Improved crossing surface. Regular monitoring. Tactile surfaces.			
Foliage obscuring warning signs and approaching trains	The visibility (and hence effectiveness) of information on the approach to and at the level crossing is reduced by overgrown foliage. Overgrown foliage on the approach to a level crossing can obscure	5	3	15	Cutting back vegetation and removing obstructions the sighting distances for users up and down the track and to signs / warning lights are lengthened. Staff training i.e. HRA Guidance document HGR – A0720 Control of	5	1	5

	signs and signals located at the crossing, and also restrict the visibility of approaching trains. This could result in the user either not seeing the sign or train (complete or partial) or the user not seeing the sign or train in time to sufficiently interpret the information and respond appropriately. This issue can be exacerbated when the visibility of the level crossing is reduced, either due to its type or its location e.g. on the bend in a road or on a high-speed road, as the vehicle driver has even less time to respond. foliage is also applicable to train drivers. Foliage on the lineside might impact on the train driver's ability to see information, objects or people on the crossing.				Vegetation (Management plan). Improved sighting distances. Train speed max 10 mph. CCTV monitoring. New modern full barrier crossing (Audible/visual alarms. (MCB+CCTV+OD) Education campaign. Crossing attendant on site (Monitoring). Reduced road speed on approach to level crossing. Traffic calming measures. Enhanced signage.			
Crossing utilisation or traffic moment	High crossing utilisation by users is associated with a greater chance of user risk taking behaviour.	5	3	15	Provision of CCTV surveillance cameras and signage to deter misuse at a particular crossing and to capture evidence of violations when they arise. Level crossings local training plans.	5	1	5

					and briefing signallers/attendants receive on communications skills, hazards associated with a particular crossing (icy conditions), how to check whether a crossing is clear. Level crossing attendant on site. Reducing the road approach speed to the level crossing to reduce the risk of collision between vehicles and gates / trains. New modern full barrier crossing (Audible/visual alarms). (MCB+CCTV+OD) Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.			
Vulnerable of unfamiliar users, for example, people with dogs on leads, young people, people visiting the area etc.	Vulnerable users and those who are not familiar with the level crossing procedure might apply an incorrect mental model	4	3	12	Provision of CCTV surveillance cameras and signage to deter misuse at a particular crossing and to capture evidence of violations when they arise.	4	1	4

	When traversing the crossing. Other risks include, crossing users who are possibly subject to slips, trips and falls, Dog/s might hold user back on tracks, preventing them from completing their traverse. Horses can present additional challenges if it is startled or distracted. Animals might try to run down tracks, especially if startled or skittish or if it smells an animal to chase etc, pulling the user with it. Young people may be distracted by friends, using mobile telephones, headphones and so on. Visiting people may not be familiar with the level crossing operation, distracted by looking for signs etc.				Level crossings local training plans, training and briefing signallers/attendants receive on communications skills, hazards associated with a particular crossing (icy conditions), how to check whether a crossing is clear. Level crossing attendant on site. Reducing the road approach speed to the level crossing to reduce the risk of collision between vehicles and gates / trains. Enhanced Signage New modern full barrier crossing (Audible/visual Alarms). (MCB+CCTV+OD) Traffic calming Education campaign.			
Traffic calming systems Road traffic calming systems on either side of a level crossing might increase the risk of blocking back.	Traffic calming systems, such as road width restrictions/ build-outs, positioned on either side of a level crossing might increase the risk of vehicle	5	3	15	Provision of CCTV surveillance cameras and signage to deter misuse at a particular crossing and to capture evidence of violations when they arise.	5	1	5

	drivers blocking back over the crossing. When the crossing is closed to road traffic, queues form along the road. This issue might be exacerbated due to factors such as the time of day (rush hour) and 'herd menta Discomfort for cyclists on the road. Potentially noisier approach to the crossing leading to possible complaints. If overused in conjunction with changes in speed the mitigation might lose its impact upon behaviour.				Reducing the road approach speed to a level crossing to reduce the risk of collision between vehicles and gates / trains. A range of enhancements to improve conspicuity, comprehension of and user response to level crossing warning signs:			
Multiple traffic signs leading to distraction, missed warnings and road user collisions.	There are a number of existing traffic signs on both the northbound and southbound in the vicinity of the level crossing, notably, direction signing, warning signing, and tourist signs.	5	3	15	Traffic calming measures including a comprehensive review of the existing signing to be incorporated into the detailed design of the level crossing including visibility splays to the various signs to demonstrate there will be no masking.	5	1	5

	The level crossing layout could lead to drivers missing some signs and the warnings they portray leading to a range of conflicts and/or collision types.				Education campaign. Crossing attendant (Monitoring). Enhanced signage.			
Queuing at the level crossing could block the roundabout leading to injudicious manoeuvres and road user conflicts.	Queue lengths at the level crossing leading to, blocking turning movements. Blocking on the circulatory carriageway of a roundabout can lead to significant frustration for drivers on the side roads, not included in the main queue. This can lead to drivers trying to force their way around the junction, resulting in circulatory collisions	3	3	9	Traffic calming measures. - Introduce yellow box markings to, as far as possible, maintain the turning movements at the roundabout. Education campaign. Enhanced signage	3	1	3
Limited forward visibility. Adjacent features increase the risk of blocking back at the level crossing. Unlit hazard in lighting transition leading to shunt or crossing collisions.	Lack of good visibility at the level crossing leading to shunt type collisions. The level crossing is in close proximity to the end of the existing street lighting system.	3	3	9	Extend the street lighting system to the south side of the level crossing in order to adequately light the hazard. Introduce a yellow box marking. Traffic calming measures.	3	1	3

	conditions, and vice versa. A hazard such as a level crossing or queue located within that transition distance could result in shunt type collisions or a collision at the crossing itself.							
Single train line Greater risk-taking behaviour in both vehicle drivers and pedestrians is reported on single train lines. .	This user behaviour is in line with risk compensation theory - the user, perceiving there to be less of a risk to him/herself, behaves less cautiously	5	2	10	Provision of a level crossing attendant to open and close the crossing barriers for users when safe to do so. The level crossing attendant is deployed to monitor and police user behaviour ensuring barriers are operated correctly. Staff Training. Maximum train speed 10 mph. Enhanced signage.	5	1	5
Farming vehicles Farm traffic might influence the speed and behaviour of other vehicles traversing the crossing.	Farm traffic tends to move at a much slower speed and, being much larger, reduce the visibility of other vehicle drivers. This can cause distraction and frustration and change other road behaviour; resulting in	5	4	20	Power operated barrier. CCTV monitoring. LC Attendant – Training/Competence.	5	2	10

	risk taking actions such as overtaking and not observing the level crossing warning signs.				Education campaign. Enhanced signage			
Commercial driver	Commercial drivers might have increased risk taking behaviour at level crossings. Commercial vehicle drivers, such as salespersons, work to strict timescales and therefore their driving behaviour is often influenced by having to reach destinations on time. Commercial drivers using a level crossing might be inclined to 'beat the lights' to avoid having to wait at the crossing, or they might fail to follow the correct crossing procedure at unprotected crossings.	5	3	15	A range of enhancements to improve conspicuity, comprehension of and user response to level crossing warning signs: The level crossing attendant is deployed to monitor and police user behaviour ensuring barriers are operated correctly. LC Attendant – Training/Competence. Education campaign. Enhanced signage.	5	1	5
Adverse weather impacting visual information.	The effectiveness of visual information at crossings can be impaired by adverse weather conditions (e.g. fog and snow).	5	2	10	CCTV monitoring. New modern full barrier crossing (Audible/visual alarms).		5 1	5

	The ability of vehicle drivers or other crossing users to detect the presence of level crossings, hazard information, warning lights or approaching trains might be impaired by adverse weather conditions, e.g. fog and snow. This might result in users failing to see warning information or oncoming trains, which could lead to users unintentionally adopting risky behaviour. In addition, in heavy snow users might not be able to see the tracks and inadvertently stand in a position of danger. Visibility in and around the crossing might also be impaired by banks of snow. An example where foggy conditions have been identified as a causal factor in a level crossing incident investigation is the fatality at No.1 footpath crossing.				Education campaign. Crossing attendant (Monitoring). Reduced road speed on approach to level crossing. Train speed maximum 10 mph Traffic calming measures. Enhanced signage.			
Alcohol and drugs	The effects of drink	5	3	15	CCTV monitoring (staff	5	1	5

	and/or drugs can radically alter user behaviours. Motor and cognitive function might be impaired and users might also have a reduced perception of risk. Users under the influence of alcohol or drugs might exhibit the following behaviours: be more inclined to ignore normal crossing procedures be physically unstable and prone to slips, trips and falls be unable to focus, cognitively and visually have a lower perception of risk.				training initiatives). Anti-trespass and cattle guard panels are designed to deter people or animals from crossing the track at unauthorised places. Do not trespass signs. New modern full barrier crossing (Audible/visual alarms). (MCB+CCTV+OD) Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.				
Disabilities.	Disabilities (e.g. reduced mobility, reduced levels of vision/hearing) will influence the behaviour of users at level crossings. Visually impaired users might be unable to see	4	2	8	CCTV monitoring (staff training initiatives). level crossing attendant (Monitoring) Increase volume of auditable warning to the maximum permitted to make the alarm	4	1	4	

	warning lights and signs clearly, or scan for trains before crossing. Hearing impaired users might be unable to hear crossing alarms, train whistles, warnings from people or the sound of approaching trains. Cognitively impaired users might have difficulty understanding and following the correct crossing procedure, or interpreting warning signs. Users with physical impairments (permanent or temporary) might encounter difficulties using level crossings of all types, but especially user worked crossings. Potential difficulties include struggling to cross within the warning time provided; being more prone to slips, trips and falls on the crossing, especially if the crossing surface				more conspicuous and potentially deter pedestrian violations. Additionally, Intelligent auditory alarm –takes account of ambient noise levels and produces alarm 5dB louder so it can always be heard clearly. Power operated barriers. Provision of flange gap filler to improve crossing surface. Provision of tactile edges (and stop lines) and clear delineation of the footway at public vehicular crossings. New modern full barrier crossing (Audible/visual alarms). (MCB+CCTV+OD) Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.			

	is uneven or missing. Similarly, mobility scooter users might encounter problems with uneven crossing surfaces and the opening and closing gates or barriers.							
Incorrect mental model Incidents at level crossings could occur if the user adopts the incorrect mental model of how the crossing works.	Mental models are internal mental representations of an external reality. People develop a mental model of how to use a level crossing from their prior experience of using similar or comparable crossings (or road junctions), from instructions or by observing the behaviour of other users. Users familiar with the operation of one type of crossing might apply their mental model at other types of level crossing.	5	2	10	CCTV monitoring (staff training initiatives). level crossing attendant (Monitoring) Provision of tactile edges (and stop lines) and clear delineation of the footway at public vehicular crossings. New modern full barrier crossing (Audible/visual alarms). (MCB+CCTV+OD) Education campaign. Traffic calming measures. Enhanced signage	5	1	5
Fatigue	Fatigued users will be more susceptible to making errors or to taking shortcuts when crossing	5	2	10	CCTV monitoring (staff training initiatives). LC attendant monitoring	5	1	5

	Fatigue has a significant effect on human performance and the likelihood of errors. Level crossing users suffering from fatigue might miss important information (crossing warning signs, lights, etc), or be more inclined to take shortcuts in the crossing procedure (fail to use the telephone, fail to close the gates at user worked crossings, etc).				Provision of tactile edges (and stop lines) and clear delineation of the footway at public vehicular crossings. New modern full barrier crossing (Audible/visual alarms). Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.			
Signaller/CCTV Operator:	'Habit intrusion' in CCTV monitoring CCTV operatives follow habituated patterns of behaviour which might result in the entrapment or injury of crossing users at MCB and MCB-CCTV crossings. Use of level crossings is primarily covered in Local Training Plans and by the training and briefing	5	2	10	CCTV monitoring (staff training initiatives). New modern full barrier crossing. (MCB+CCTV+OD)		5 1	5

	signallers/Operators receive on communications skills. It is important local training plans cover: hazards associated with a particular crossing, how to check whether a crossing is clear. Signaller's/Operators not following the appropriate rules and protocols should be subject to additional monitoring and development plans. Inefficient CCTV scanning strategy Signaller/Operator uses an inefficient method of scanning CCTV screens. The scanning method employed by a signaller/operator for monitoring CCTV screens will affect whether they successfully identify information on the CCTV screen. Using an inefficient							

	scanning strategy might result in the signaller/Operator taking a longer time to identify key events, or might result in them missing key events on other CCTV screens. An efficient scanning method is particularly important where there are multiple CCTV screens being monitored by one signaller/Operator, or the signaller/Operator has a high level of workload from other tasks.							
Work in or adjacent to public roadways.	Plant, equipment materials striking traffic/members of public. Traffic colliding with staff.	5	2	10	Authorised road closures and traffic management. Implement pedestrian walkways. Plant to be suitable for access to public roads. Comply with New Roads and Street Works Act and Traffic Signs Regulations.	5	1	5

Annex B. Road Crossings. Narrative Safety Report

New Build Level Crossing Junction Road (MCB+CCTV+OD) - Narrative Risk Analysis (NBLC-NRA)

Contents

1 Introduction

The Rother Valley Railway will provide a full barrier level crossing (MCB+CCTV+OD), incorporating the latest technology for the operation and protective equipment. The crossing will be fully compliant with that is widely used on Network Rail infrastructure today, thus, ensuring the crossing would not require any product approvals, derogations or changes to standards. The maintenance regime would also be standard and no bespoke parts would need to be produced or stocked specifically for the crossing. For the above reasons, the crossing presents a very low reliability and risk concern and would most likely incur the lowest maintenance costs.

A level crossing does not currently exist at Junction Road; therefore, a Quantitative Risk Assessment would not provide sufficient evidence to demonstrate that possible risk has been assessed and managed accordingly. However, it is important to establish possible risk from the introduction of a level crossing and possible mitigation measures at an early stage of development.

This NBLC-NRA analyses all relevant data as well as expert opinion to demonstrate that all possible risk has been addressed as well as embroidering new technology to further enhance the safety of the level crossing, for example;

- CCTV for improved safety & security,
- Obstacle Detection – LIDAR
- Home Office Approved Red Light Cameras
- Evaluate the risks at the level crossing.
- Early engagement with stakeholders from different sectors, local authorities, communities and 'users' associations.
- Take engineering measures and find innovative solutions
- Take educational and awareness measures and collaborate with the rail and road sectors.

The level crossing will be carefully assessed via this analysis in conjunction with the railways, and together with the road infrastructure managers, local authorities and industry experts to make it more visible and easier to cross particularly for long, heavy and oversized vehicles.

All stakeholders will be in a position to cooperate and design the best level crossing environment.

Narrative Risk Assessments currently used by Network Rail are enabling better targeting of risk reduction measures; blending quantitative modelled risk with structured observation and judgement from competent staff. The NRA process is considered as part of this analysis to encompass the whole level crossing asset system and assess wider aspects of level crossing risk.

This analysis builds upon excellent safety initiatives which were introduced for the first Automatic Full Barrier level crossing by Network Rail including the safety benefits provided, however, RVR intend to introduce additional safety measures such as the use of Red-light safety equipment (RLSE), which has currently been installed at 31 public road level Crossings on the National Railway Network to improve user behaviour, deterring deliberate misuse. Trials have demonstrated that these Home Office Type Approved (HOTA) cameras have reduced deliberate misuse by approximately 90 per cent at some locations.

RVR have considered the installation of an object detection system at Junction Road level crossing. The objection detection system utilises laser technology to scan the crossing before allowing for trains to safely manoeuvre through. The LIDAR system detects obstacles on the ground and around the edge of the barrier lines and delivers unique small object detection protecting children and adults as well as vehicles and other large objects. RVR will install the LIDAR (or equivalent obstruction detection system) before railway operation commences.

2 Level Crossing Overview

This is a risk analysis for Junction Road level crossing. However, it should be noted that at present a level crossing does not exist, therefore, this assessment is based on the probability of risk if a level crossing was in place. It is imperative that a full Quantitative (and Narrative) Risk Assessment (QRA) is completed before any trains operate over the crossing and that the QRA is presented to the ORR.

Crossing Details	
Name	Junction Road
Type	MCB+CCTV+OD
Crossing status	Public Highway
Overall crossing status	Design Stage
Engineers Lin Reference	N/A
OS grid reference	
Number of lines crossed	1
Line speed (mph)	10
Electrification	No
Signal box	Yes (A21 level crossing)

3 Information Sources

The table below shows the stakeholder consultation that was undertaken as part of the risk analysis.

- ORR
- K&SR
- Bakerail

- ESDC
- RVDC
- I-Transport
- ARUP

Reference sources used during the risk analysis;

- ARUP A21 Options Report
- ARUP Road Safety Audit
- Mott Macdonald road survey report
- Network Rail QRA information
- GG19 Road Safety Report
- ORR Documentation
- GPR219-IDF- Level Crossing Safety
- EU SAFER-LC Project
- Level Crossing Risk Management Tool (LXRMT).

4 Level Crossing Diagrammatic Scheme

The new level crossing to be constructed is an MCB+CCTV+OD level crossing on B2244 Junction Road, East Sussex. The road approach speed is 40 mph. The profile of the railway line in the vicinity of the crossing has been provided (below), as well as the appropriateness of the proposed warning signs in this regard.

Diagram of the proposed railway Alignment

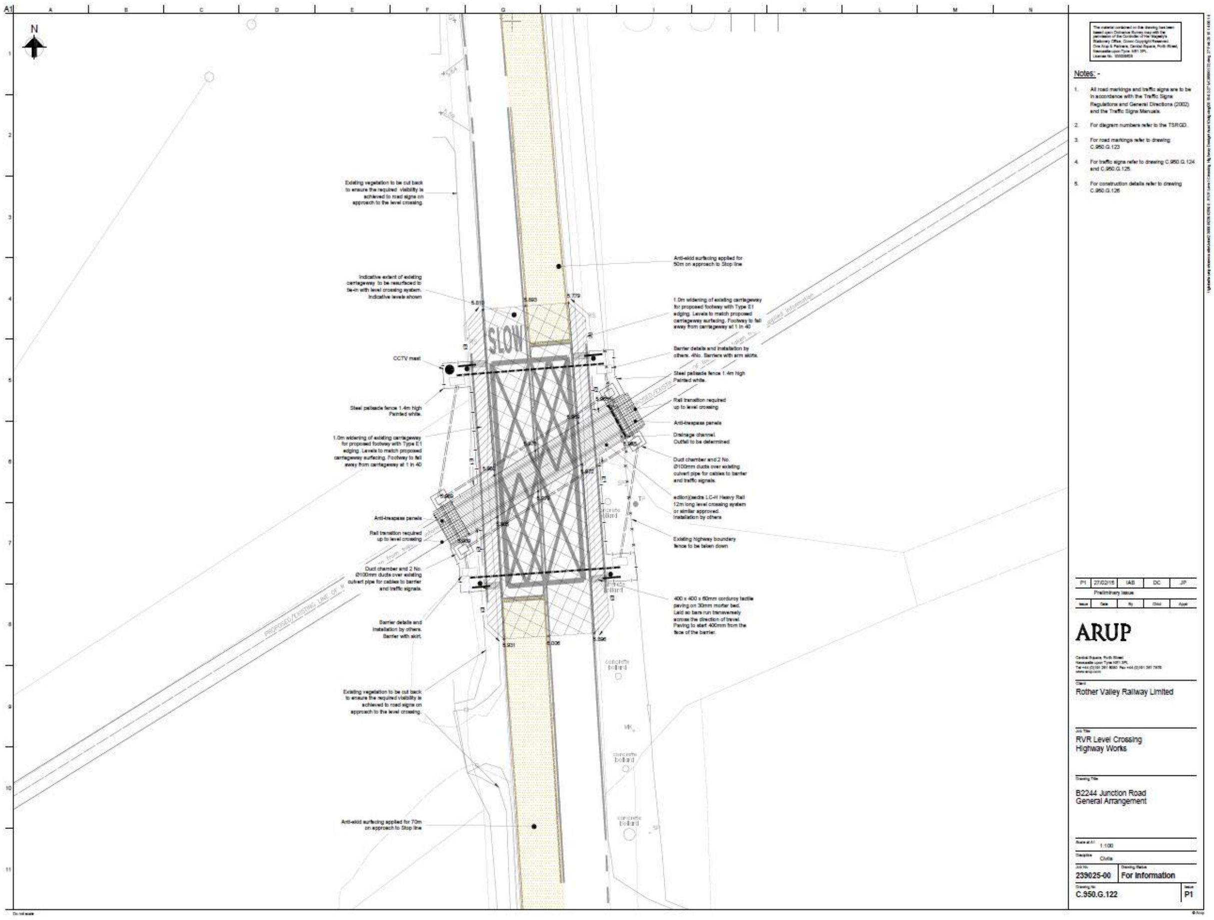
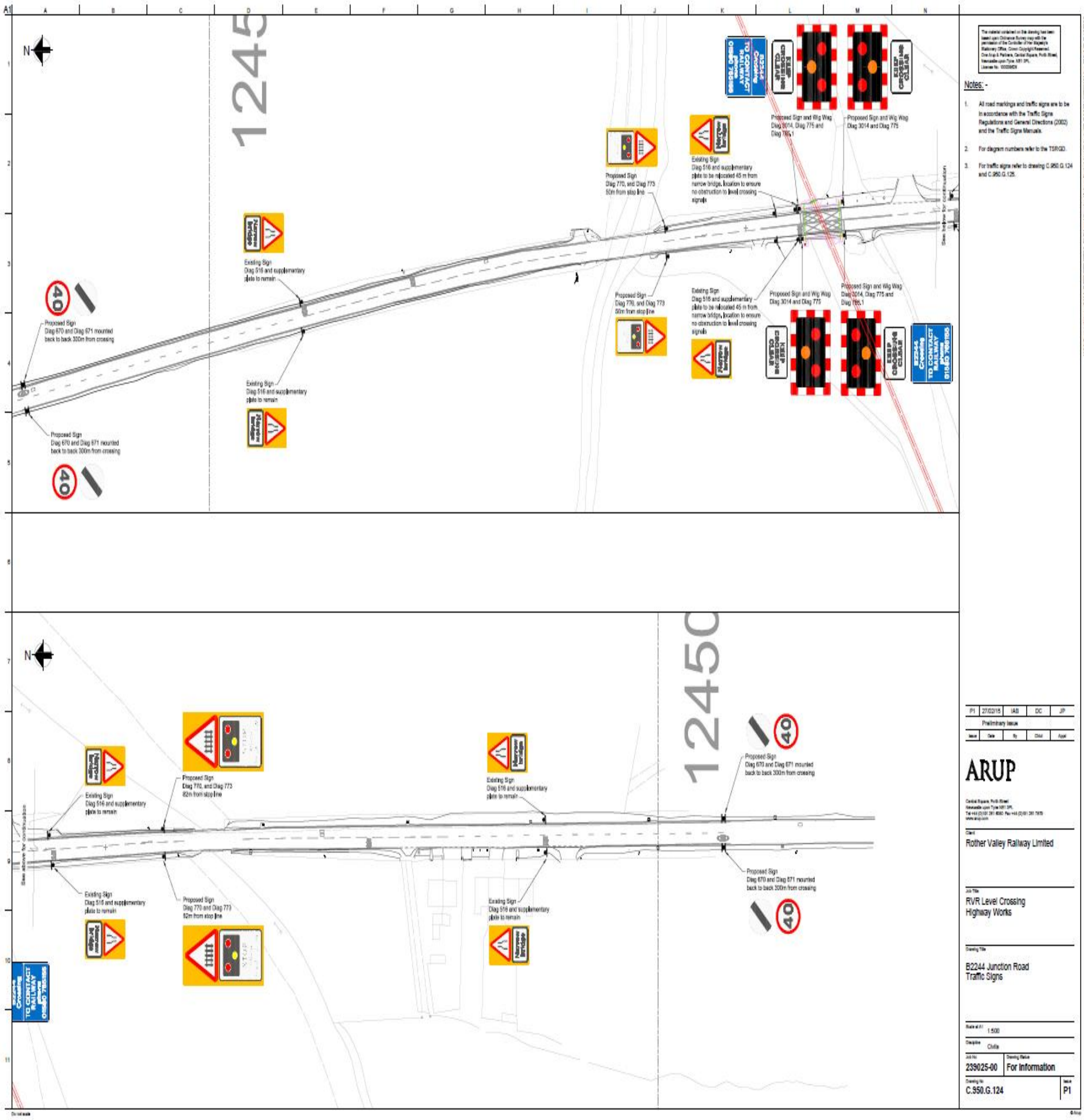


Diagram of the proposed traffic signs



5 Site Visit General Observations

The B2244 Junction Road, Udiam Stage 1 Road Safety Audit report identified possible road distractions which are considered as part of this analysis, for example,

- Speeding vehicles pose a threat to other road users along with a high frequency of heavy braking on the approaches to the narrow bridges which could result in higher frequency of collisions due to driver error.

To remove this concern, it is advised to reduce the speed limit over this length of road.

- The adjacent features see in photograph 1 (below) increase the risk of blocking back at the proposed level crossing, additionally, there is a private access road located close to the proposed level crossing location as well as the narrow bridges to the north and south. Turning traffic waiting on the carriageway by the proposed level crossing will increase the risk of blocking back over the crossing leading to potential vehicle/train conflict.

To remove this concern, it is advised to introduce a yellow box marking to deter blocking back at the crossing

Photograph 1

- There are a number of existing traffic signs both north and southbound B2244 in the vicinity of the proposed level crossing, hence, multiple traffic signs could lead to distraction, missing warning signs and possible road user collision as seen in Photograph 2(a) (b) below.

A comprehensive review of the existing signing on the B2244 should be incorporated into the detailed design of the level crossing including visibility splays to the various signs to demonstrate there will be no masking.

Photograph 2(a)

Photograph 2b

➢ There are two narrow bridges situated either side of the proposed level crossing site. The bridges are too narrow for large vehicles to pass without forcing oncoming traffic to stop leading to the crossing being obstructed and potential vehicle/train conflict, see photographs 3(a) (b) below.

To remove this concern, it is advised to establish priority at the narrowing crossings.

Photograph 3(a)

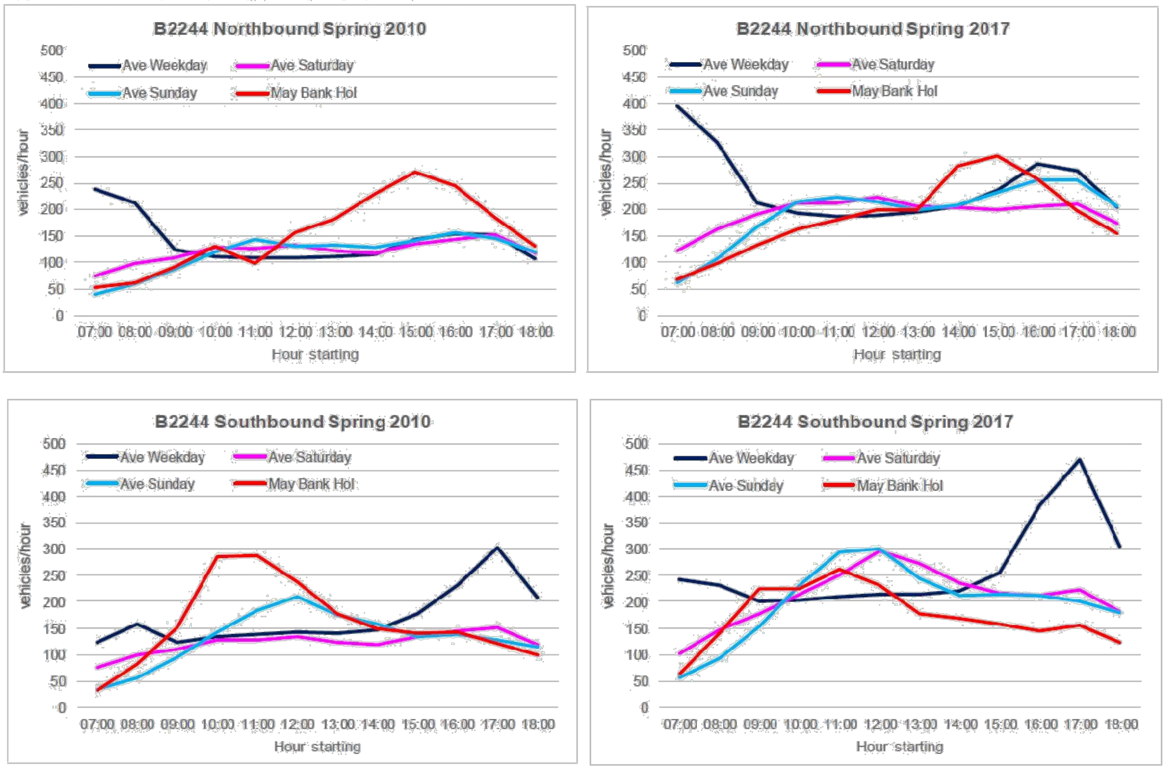
Photograph 3(b)

6 Junction Road Traffic Flows

The chart below compares traffic flows on B2244 Junction Road, for Spring and Summer months, based on ATC data provided by ESCC.

For most days and periods, there have been large proportional increases in flow, but volumes remain much lower than on the A21. Increases are highest for the weekday AM and PM peak periods (northbound 07:00-09:00 and southbound 16:00-18:00), as well as on the August Bank Holiday.

Figure 9: B2244 Traffic Flows in Spring 2010 and 2017



Source: ESCC ATC Site 021

Queuing at the level crossing has been estimated, based upon average vehicle demand per minute during the hour of each barrier closure, as well as length of time that the barrier is down. A barrier close time of 55 seconds has been assumed, with sensitivity testing with a 110-second closure.

Queue lengths have been estimated with 2018 traffic demands and predicted demand in 2021 and 2027.

Traffic Growth for future years;

Traffic forecasts have been produced for 2021 and 2027 using TEMPRO version 7.2 with National Transport Model (NTM) factors (NTM datasheet AF15). To calculate growth factors for Junction Road LC data for Rother District has been used.

For Bank Holidays, it has been assumed that growth will be the same as for Sundays.

Table 1 Traffic Growth Factors; 2017 - 2021

Road Name	Region	Road Type	Average Weekday	Average Saturday	Average Sunday	May Bank Holiday	August Bank Holiday

B2244 Junction Road	East Sussex	Rural Minor	1.063	1.061	1.061	1.061	1.061

Table 2 Traffic Growth Factors 2017 –2027

Road Name	Region	Road Type	Average Weekday	Average Saturday	Average Sunday	May Bank Holiday	August Bank Holiday
B2244 Junction Road	East Sussex	Rural Minor	1.150	1.149	1.150	1.150	1.150

Predicted Queue Lengths;

Table 3 (below) shows the predicted queue lengths for Junction Road Level Crossing with a 55 second closure.

Table 3: Predicted Queue Lengths at Junction Road Level Crossing

	2017 Northbound		2017 Southbound		2021 Northbound		2021 Southbound		2027 Northbound		2027 Southbound	
	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
Spring/Autumn												
Weekday	25	19	34	21	27	20	36	22	29	21	39	24
Saturday	20	18	26	21	21	19	28	23	23	21	30	25
Sunday	23	20	26	21	24	21	28	22	26	22	30	24
May BH	26	20	23	16	28	21	24	17	30	23	26	19
Summer												
Weekday	21	17	33	21	23	18	35	23	25	19	37	25
Saturday	18	17	22	20	19	18	23	21	21	19	25	23
Sunday	21	18	27	22	22	19	29	24	24	21	31	26
Aug BH	25	21	32	26	27	22	34	28	29	24	37	30

Source: Mott MacDonald analysis of existing and predicted traffic volumes, queue lengths in metres assuming 5.75m/vehicle

For the B2244, predicted maximum queue lengths are 20m-30m in 2017, increasing to around 30m-40m in 2027

Queue lengths with a 110-second closure (below) are shown as sensitivity tests. Predicted maximum queue lengths for Junction road are 40m-70m in 2017, increasing to around 40m-80m in 2017.

Table 4 Predicted Queue Lengths at Junction Road Level Crossing with 110 Second Closure

	2017 Northbound		2017 Southbound		2021 Northbound		2021 Southbound		2027 Northbound		2027 Southbound	
	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
Spring/Autumn												
Weekday	50	37	67	42	54	39	71	44	58	43	77	48
Saturday	39	37	52	43	42	39	55	45	45	42	60	49
Sunday	45	39	53	42	48	42	56	45	52	45	61	48
May BH	53	39	46	33	56	42	49	35	61	45	53	38
Summer												
Weekday	43	33	65	43	46	35	69	46	49	38	75	49
Saturday	36	33	44	40	38	35	46	43	41	38	50	46
Sunday	41	37	55	45	44	39	58	47	48	42	63	51
Aug BH	50	42	64	52	54	44	68	55	58	48	73	60

Source: Mott MacDonald analysis of existing and predicted traffic volumes, queue lengths in metres assuming 5.75m/vehicle

Conclusion;

On the B2244, there have been large proportional increases in flow for most days and periods, however, volumes remain much lower than on the A21. Increases are highest for the weekday AM and PM peak periods (northbound 07:00-09:00 and southbound 16:00-18:00, as well as on the August Bank Holiday. Predicted maximum queue lengths are 20m-30m in 2017, increasing to around 30m-40m in 2027.

7 The Railway

The train service over Junction Road level crossing will consist of passenger trains only. There will be approximately 10 trains per day. The highest permissible line speed of trains over the crossing will be 10 mph. Trains are timetabled to run for 10 hours per day.

The RVR Level Crossing Operational Management Plan (LCOMP) sets out the strategy for operational management of the Junction Road level crossing to be installed on the Rother Valley Railway (RVR) where it interfaces with the road at level grade, so requiring control of road vehicles to enable a train to cross.

The LCOMP describes the principles of how the level crossing is to be operated under normal conditions and in the event of failure.

This shall be the basis for developing operational procedures for the railways operation when services commence to which staff shall be trained and assessed on an ongoing basis.

Compliance with Industry guidelines;

The design for the level crossings, developed from this document, shall be compliant with industry guidelines, e.g. The Office of Rail Regulation: A Guide for Managers, Designers and Operators and approved by a suitably independent person before installation.

Junction Road Level Crossing Operation;

Normal operation towards Robertsbridge

The train will approach the protecting signal at the level crossing at a maximum speed of 10 mph, thus ensuring that the train has the ability to stop within 30 metres. The signalman shall check the CCTV monitors, ensure the obstacle detection system displays a clear crossing indication, then operate the closing sequence of the barriers demonstrating that the signaller has full and control of the operation, two train crew members will operate the train and good sighting will always be maintained.

This shall initiate a sequence of warnings to road users of klaxons, flashing yellow lights changing to flashing red lights then barrier closure, which shall be full barriers across the road, in the standard accepted sequence as adopted on the National Rail network. Note: The barriers will not close if at any time an obstruction is detected

There shall be a visual indicator presented to the train driver that the sequence has been initiated which will be repeated as necessary for sighting purposes, and which shall change to confirm that the closure sequence has been successfully completed.

If the level crossing is crossed under normal operating conditions the barriers will lower on the approach and rise following the initiation by the signaller, the raising being initiated by a suitably located treadle.

There shall be an indication to the two locomotive crew that the barriers have risen correctly and this shall be checked by the train driver.

Degraded Operation

Should the closure sequence fail to initiate or change, the driver shall be required to stop the train short of the crossing to investigate why and, as necessary, manually initiate a closure sequence using a local control panel located on the approach side of the level crossing.

If the closure sequence can be initiated and completed successfully in powered mode, the driver can proceed. If it cannot but the barriers can be manually lowered then the guard of the train must be called forward to assist, this may include carrying out duties to stop road traffic and assist in manually lowering the barrier mechanism.

Should the circumstances of the failure be such that the train crew consider it unsafe to proceed then the train shall be secured and Bodiam signal box, be informed to request suitable assistance and instruction, e.g. propel back to Bodiam under the operational rules. The signal box operative shall be responsible for escalating the problem to company officials.

On crossing the driver shall ensure that the light beyond indicating that the barriers are down is illuminated. If it is not or showing an illumination, the driver shall draw up to it and stop and act as if the barriers have failed to rise, as below.

If the barriers have failed to rise, the indication beyond the train referred to above, shall show this and the driver shall be required to stop. The driver shall inform the Guard to go to the local control panel on the Robertsbridge side of the level crossing to initiate closure under powered mode. If this is unsuccessful the Guard shall inform the train driver and then proceed to raise the barrier manually, requesting assistance from the locomotive crew if necessary.

All irregular operation of the level crossing system must be reported immediately to the A21 signal box using the lineside phones that shall be located at the local control panels. The level crossing system shall also send an alarm.

The signaller at the A21 shall ensure faulting attendance to the site.

Normal Operation towards Bodiam

The train will approach the level crossing at a maximum speed of 10 mph, thus ensuring that the train has the ability to stop within 30 meters. The signalman shall check the CCTV monitors, ensure the obstacle detection system displays a clear crossing indication, then operate the closing sequence of the barriers demonstrating that the signaller has full and control of the operation, two train crew members will operate the train and good sighting will always be maintained., two train crew members will operate the train and good sighting will always be maintained
This shall initiate a sequence of warnings to road users of klaxons, flashing yellow lights changing to flashing red lights then barrier closure, which shall be full barriers across the road, in the standard accepted sequence as adopted on the National Rail network. Note: The barriers will not close if at any time an obstruction is detected

There shall be a visual indicator presented to the train driver that the sequence has been initiated which will be repeated as necessary for sighting purposes, and which shall change to confirm that the closure sequence has been successfully completed.

If the level crossing is crossed under normal operating conditions the barriers will lower on the approach and rise following the initiation by the signaller, the raising being initiated by a suitably located treadle.

There shall be an indication to the two locomotive crew that the barriers have risen correctly and this shall be checked by the train driver.

Degraded Operation

Should the closure sequence fail to initiate, the driver shall be required to stop the train short of the crossing to investigate why and, as necessary, manually initiate a closure sequence using a local control panel located on the approach side of the level crossing.

If the closure sequence can be initiated and completed successfully in powered mode the driver can proceed. If it cannot but the barrier can be manually lowered then the guard must be called forward to assist, this may include carrying out duties to stop road traffic and assist in manually lowering the barrier mechanism.

Should the circumstances of the failure be such that the train crew consider it unsafe to proceed then the train shall be secured and Bodiam signal box be informed to request suitable assistance and instruction, e.g. propel back to Bodiam under the operational rules. The signal box operative shall be responsible for escalating the problem to company officials.

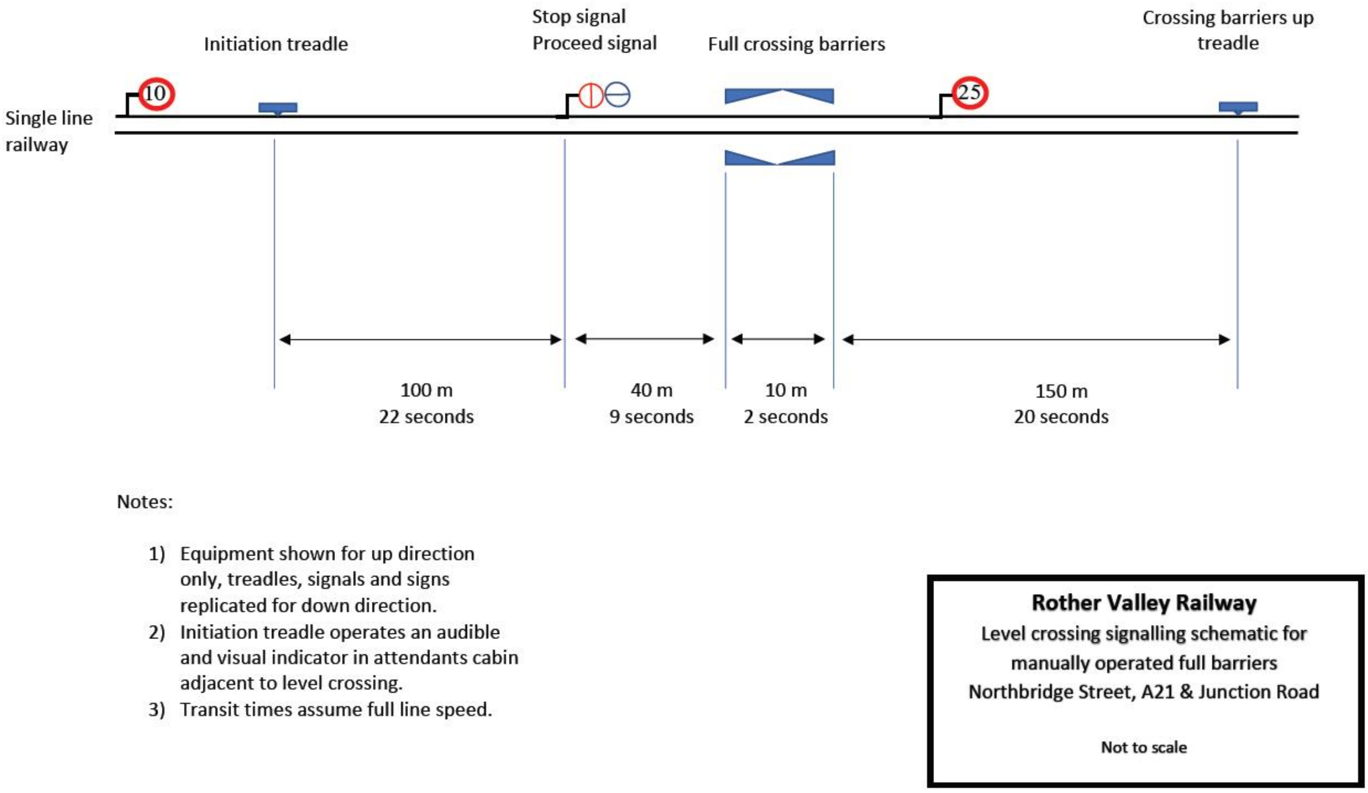
On crossing the driver shall ensure that the light beyond indicating that the barriers are down is illuminated. If it is not or showing an illumination the driver shall draw up to it and stop and act as if the barriers have failed to rise, as below.

If the barriers have failed to rise, the indication beyond the train referred to above, shall show this and the driver shall be required to stop. The driver shall inform the Guard to go to the local control panel on the Robertsbridge side of the level crossing to initiate closure under powered mode. If this is unsuccessful then the Guard shall inform the train driver and then proceed to raise the barrier manually, requesting assistance from the locomotive crew if necessary.

All irregular operation of the level crossing system must be reported immediately to the A21 signal box using the lineside phones that shall be located at the local control panels. The level crossing system shall also send an alarm.

The signaller at the A21 shall ensure faulting attendance to the site.

Level Crossing Signalling Design



Level Crossing barriers & CCTV + OD Systems Maintenance Plan

The maintenance plan for the three-level crossings shall be based on that recommended by the supplier of the equipment. It shall comprise:

- Regular planned maintenance at the required intervals.
- Work arising from planned maintenance, within the required timescales
- Fault response, within specified timescales.
- Work arising from fault responses, within the required timescales.
- Work arising due to other parties planned work.

Road Crossing Design and Construction

The construction of the road crossings comprise concrete units designed to meet the requirements of a high friction skid resistant road surface through the crossing. This has been tested for the proposed installation and passed the test level requirement as set by The Highways Agency, reference document RD/GN/009 dated September 1989.

8 5 X 5 risk assessment

The 5x5 risk assessment considers risk assessment associated to MCB+ CCTV+OD operated level crossings
on the railway's national network as well as consi which is based on industry research and best practice. It has been produced on behalf of the Rail Safety and Standards Board (RSSB).

The LXRMTK allows you to explore the human factor risks associated with level crossings and provides guidance on appropriate risk reduction measures. LXRMTK also has a range of applications, from being an information resource for anyone with an interest in public behaviour at level crossings, to being used to support various more specific activities.

The RA includes accepted best practice when evaluating severity based on what could credibly occur whenever the event occurs, i.e., assess severity based on what could credibly result, should this event occur or re-occur. Additionally, each hazard including possible causes identified, potential risk or consequences associated with the hazard and control measures have been considered by a team of safety professionals and debated accordingly.

This risk assessment is in no way to be viewed as exhaustive and may need to be expanded upon depending on the site being visited when fully operational and the activities being undertaken. As well as clearly identifying a hazard it also vitally important to understand the contributory factors wherever possible. Bearing this in mind, each hazard has been expanded upon to list the most common causes or reasons why the hazard may occur.

The process of using this 5x5 risk assessment is to inform decisions relating to the control and reduction of risks which have been divided into 3 stages:

- Preparing the assessment;
- Carrying out the assessment;
- Post-assessment activities.

In practice this provides a useful framework for outlining the guiding principles and factors considered throughout the process.

In preparing for the assessment, the additional factors were considered:

- What is the appropriate scope for the assessment?
- What is an appropriate approach, and what level of detail is needed?
- Who is going to be involved in carrying out the assessment?

the basic steps to be followed include:

- Identify the hazards;
- Identify the possible consequences;

➢ Estimate the likelihood of the possible consequences;

➢ Estimate the risk;

➢ Evaluate the risk;

➢ Record the findings.

It should be noted that additional evidence was used to support the risk assessment including the use of an ideal obstacle detection system that provides a safety integrity, no worse, and ideally better, than a manually operated crossing, cause no or minimal delays to trains due to equipment failure or false detections, affordable in terms of whole life costs, operate in all weather and temperatures, and be practical to use and maintain (MCB + CCTV + OD).

The detection system to be used will confirm that a crossing is not occupied by a person (including small children or someone who may have fallen over) or by any object that may cause damage to a moving train. Separate technology as well as manual operation is used to confirm that the crossing is closed by barriers once the detection system has confirmed the crossing is clear, then the train is allowed to proceed across the crossing. This is achieved by clearing the protecting signals.

Hazards are identified, listing possible causes if appropriate and assessed for severity. These are then multiplied by the frequency or likeliness of an incident occurring if no controls were applied. This produces the risk factor; the numerical assessment table gives guidelines on how to assess severity and frequency.

This risk assessment is generic and whereas the basic principles will always apply, it is acknowledged risk can change significantly from one site to another. Generic risk assessments will always be reviewed by the appointed Project Manager and then expanded upon if required to nullify or apply the necessary controls to hazards identified during site visits (pre-works) or through information passed to them by a third party.

Numerical Assessment			
Severity (S)		**Likelihood of Occurrence (L)**	
1	No Injuries / Minor Damage	1	Remote
2	Single Minor Injury	2	Unlikely
3	Single Major Injury / Minor Pollution	3	Occasional
4	Single Fatality / Major Pollution	4	Likely
5	Multiple Fatalities	5	Highly Likely

Risk Factor

		Likelihood of Occurrence (L)				
		5	4	3	2	1
Severity	5	25	20	15	10	5
	4	20	16	12	8	4
	3	15	12	9	6	3
	2	10	8	6	4	2
	1	5	4	3	2	1

Risk Factors between 16 to 25 = Unacceptable Risk. Risk Factors > 8 will be strictly monitored.
Hazards Identified with a Severity Assessed at 3 or above will also be strictly monitored.

Hazards and possible causes identified	Potential Risk or consequences associated with the Hazard	S	L	RF	Control Measures	S	L	RF
SIGNALLING								
Relative to previous signals: Will the signal be in a different position, or does it have a different configuration?	Signal position is not consistent with the spacing between preceding signals. Signal is of a different design to preceding signals. Potential for, Death, Serious injury or injury.	5	3	15		5	1	5
Could the signal be confused with other signals on an adjacent line or on the same Gantry	Signal is on a post and could be confused with other signals Signal has an identical profile / outline to adjacent signals Death Serious injury Injury	5	2	10	Ensure signals for all lines are visible Shield nearby signals from view Appropriate signal should be clearly associable with its line Driver training	5	1	5
Could the signal be obscured from the driver's view	Signal reading time is inadequate. Signal is positioned round a curve and the reading angle is inadequate Signal is positioned round a curve and there is an obstruction blocking the line of sight	5	2	10	Increase backboard size (by 50%) Manage vegetation Maximum train speed is 10 mph Remove / shield potential distractions in stations	5	1	5

	Signal can be obscured by vegetation Signal can be obscured (intermittently or otherwise) by a bridge or other structure, for example station Structures. Edge of signal backplate is less than 100mm from edge of aspect				Reposition signal on straight track Make signal post more conspicuous Driver training			

TRACK					Lineside fencing /			
Will the track on approach to the signal suffer from adhesion problems?	Signal is located in an area which suffers from ice, frost, leaf fall, dampness or other adhesion problems Death Serious injury Injury	5	3	15	Lineside fencing/netting Railhead Conditioning Management of lineside vegetation Low adhesion warning signs Driver training	5	1	5
Is there a reduction in permissible speed on the approach to the signal?	There is a reduction in permissible speed on the approach to the signal Death Serious injury Injury	5	2	10	Permissible speed on approach to the level crossing is maximum 10 mph Driver training On site staff monitoring	5	1	5
Is there a falling gradient on approach to the signal?	There is a falling gradient on the approach to the signal	5	3	15	Countdown markers Driver training	5	1	5

COLLISION								
Road Vehicle and train collision risk	Insufficient train warning time for all vehicle types known to be exasperated by the driving position e.g. Tractor. Level crossing equipment and signage is not conspicuous or optimally positioned. Instructions for safe use may be misunderstood e.g., signage, clutter	5	3	15	Optimising position of equipment at the design stage removing any conflicting or redundant signs. Benefit from MCB+CCTV+OD Strike in times optimised. Sighting lines enhanced.	5	1	5

	detracts from key messages, conflicting information given. High volume of unfamiliar users e.g. irregular visitors, migrant workers. Known user complacency leading to high levels of indiscipline. Type of vehicle unsuitable for level crossing; - Large, low, slow, making access or egress difficult and or vehicle is too heavy for the crossing surface – risk of grounding and or severity of gradient adversely affects ability to traverse. Users experience a long waiting time.				Latest technology in place for user-based warning systems including wig- wag lights, sirens, full road barriers, RTL. (MCB+CCTV+OD) Competent crossing attendant on site. Maximum train speed 10 mph implemented. Superior quality crossing surface construction material. De-vegetation programme in place			
Pedestrian and train collision risk	Ineffective whistle boards, warning inaudible, insufficient train warning time. Level crossing equipment and signage is not conspicuous or optimally positioned. Instructions for safe use may be misunderstood. Surface condition could lead to slip/trip risk.	5	3	15	Optimising position of equipment at the design stage removing any conflicting or redundant signs. Latest technology in place for user-based warning systems including wig- wag lights, sirens, full road barriers, RTL. (MCB+CCTV+OD) Comptent attendant on site	5	1	5

	High volume of unfamiliar users i.e. irregular visitors/ramblers/equestrian. Complacency leading to high levels of indiscipline e.g. users are known to rely on knowledge of timetable. High level of use by vulnerable people. High usage of cyclists.				Maximum train speed 10 mph implemented. Superior quality crossing surface construction material. De-vegetation programme in place. Regular engagement with stakeholders/authorised users reinforcing safe crossing protocol, legal responsibilities and promoting collaborative working. Signage to encourage users to look for approaching trains as well as providing cyclist dismount signs.			
Hazards and possible causes identified	Potential Risk or consequences associated with the Hazard	S	L	RF	Control Measures	S	L	RF
SPAD OCCURRENCE								
Train driver passes protecting signal without authority	Collision with road vehicle (see above). Collision with member of public (See above). Death Serious injury Injury	5	3	15	Treadle on protecting signal (passed at danger without authority) will activate the road crossing wig wag lights and siren to indicate to all road users that a train is coming. Barriers will not activate at this stage. The treadle will also activate a warning tone and visual sign to the local level crossing attendant	5	1	5

					that the train approaching the level crossing has passed the signal at danger without authority. The level crossing attendant will check to ensure the level crossing is clear of any traffic, pedestrians etc and activate a switch/plunger on site to operate the full barriers hence safely closing the level crossing to all road users. Driver training. Level crossing operator training. Maximum speed of train 10 mph.			

Hazards and possible causes identified	Potential Risk or consequences associated with the Hazard	S	L	RF	Control Measures	S	L	RF
Additional Risk Influencing factors								
Distraction								
Can the driver be distracted by something outside the cab?	Driver could be distracted by trespassers	5	3	15	Signal reminder sign	5	1	5
Could the driver be distracted by other tasks at or on approach to the signal?	There is a level crossing in the vicinity of the signal	5	3	15	Position signal where driver not distracted by other duties Driver training	5	1	5
Distractions while using the level crossing might impair the to cross quickly and safely.	If a user is distracted, there is an increased likelihood that they will not see the crossing, train, warning signs, for example; Other persons in the car (e.g. children) Thoughts on personal matters, work stresses etc. Using the telephone, Behaviour of other crossing users, In car entertainment Seasonal events (e.g. fun fairs, fireworks) Mobile phones, iPads, handheld computers etc. Signage (e.g. speed limit signs). Distractions might be more likely for users who frequently use the crossing (e.g. delivery drivers), due to them potentially having a lower	5	3	15	Provision of CCTV surveillance cameras and signage to deter misuse at a particular crossing and to capture evidence of violations when they arise. (MCB+CCTV+OD) Staff training. Traffic calming measures. Train maximum speed 10 mph. New modern full barrier crossing. (MCB+CCTV+OD) Education campaign.	5	1	5

	level of concentration than those who use it infrequently. A change in speed limit and the associated speed limit signs This proximity of the speed limit signs to the crossing might reduce the attention given to the crossing, or remove attention away from it completely. The signs might also draw a car driver's attention to the vehicle speedometer to check vehicle speed and away from maintaining vision out of the windscreen. Other signs in the vicinity of a level crossing that are not related to that crossing could also have been a potential distraction.							
High vehicle approach speeds	The vehicle speed over a level crossing is a factor in vehicle driver errors. Risk factors include, the speed limit(s) in the surrounding area including, perception and attitude to risk, visibility of warning signs and visibility of the level crossing e.g. rural winding roads. High risk behaviour such as high vehicle speeds and late, heavy braking will result in a higher frequency of collisions due to driver error.	5	3	15	Reduced road speed on approach to level crossing. Traffic calming measures. Enhanced signage. New modern full barrier crossing. (MCB+CCTV+OD) Education campaign. Crossing attendant (Monitoring).	5	1	5
Large, slow and low vehicles	Drivers of large vehicles are involved in a disproportionately high number of incidents at	5	3	15	Reduced road speed on approach to level crossing.	5	1	5

	level crossings. The size of the vehicles - they have less room for error when compared to cars. They may not be responding to the activation of the crossing warning system in sufficient time. Studies have proposed that large (HGV) vehicles may attempt to traverse the crossing once the barriers have already started to descent, suggesting that it could be to do with the driver's awareness of their vehicle's poorer braking performance, and therefore considering it safer to continue. Other contributory factors might include: The slower acceleration speed of HGVs causing the total time to cross a level crossing from standstill to increase Sightlines from a higher driving position.				Traffic calming measures. Enhanced signage Yellow box marking Level crossing road surface well maintained Power operated level crossing barriers			
Ice conditions	Icy weather conditions on the approach and exit to the crossing might affect the behaviour of the crossing, for example, prevent vehicles from stopping in a position of safety at the crossing. Encourage vehicle drivers to ignore the initial warning activation when they are close to the train line because of the risk of	5	3	15	Provision of CCTV surveillance cameras. (MCB+CCTV+OD) Level crossings local training plans, training and briefing signallers/attendants receive on communications skills, hazards associated with a particular crossing (icy conditions), how to check	5	1	5

	sliding forward onto the tracks. Cause pedestrians to concentrate on their footing, rather than looking for trains or observing warning signs. Result in pedestrian slips, trips and falls. This is a particular risk for elderly, or mobility impaired, users. Level crossings on 'B' roads might present a particular hazard to vehicle drivers as these roads are not normally gritted in icy conditions.				whether a crossing is clear. Level crossing attendant on site. Improved crossing surface. Regular monitoring. Tactile surfaces.			
Foliage obscuring warning signs and approaching trains	The visibility (and hence effectiveness) of information on the approach to and at the level crossing is reduced by overgrown foliage. Overgrown foliage on the approach to a level crossing can obscure signs and signals located at the crossing, and also restrict the visibility of approaching trains. This could result in the user either not seeing the sign or train (complete or partial) or the user not seeing the sign or train in time to sufficiently interpret the information and respond appropriately. This issue can be	5	2	10	Cutting back vegetation and removing obstructions the sighting distances for users up and down the track and to signs / warning lights are lengthened. Staff training i.e. HRA Guidance document HGR – A0720 Control of Vegetation (Management plan). Improved sighting distances. Train speed max 10 mph. CCTV monitoring. New modern full barrier	5	1	5

	exacerbated when the visibility of the level crossing is reduced, either due to its type or its location e.g. on the bend in a road or on a high-speed road, as the vehicle driver has even less time to respond. foliage is also applicable to train drivers. Foliage on the lineside might impact on the train driver's ability to see information, objects or people on the crossing.				crossing (Audible/visual alarms. (MCB+CCTV+OD) Education campaign. Crossing attendant on site (Monitoring). Reduced road speed on approach to level crossing. Traffic calming measures. Enhanced signage.			
Crossing utilisation or traffic moment	High crossing utilisation by users is associated with a greater chance of user risk taking behaviour.	5	2	10	Provision of CCTV surveillance cameras and signage to deter misuse at a particular crossing and to capture evidence of violations when they arise. Level crossings local training plans, training and briefing signallers/attendants receive on communications skills, hazards associated with a particular crossing (icy conditions), how to check whether a crossing is clear. Level crossing attendant on site. Reducing the road approach speed to the level crossing to reduce the risk of collision between vehicles and gates / trains.	5	1	5

					New modern full barrier crossing (Audible/visual alarms. (MCB+CCTV+OD) Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.			
Unfamiliar users or vulnerable people, for example, cyclists, horse riders, walkers etc.	Unfamiliar users or vulnerable people who may not familiar with the level crossing procedure may apply an incorrect mental model when traversing the crossing.	4	3	12	Provision of CCTV surveillance cameras and signage to deter misuse at a particular crossing and to capture evidence of violations when they arise. Level crossings local training plans, training and briefing signallers/attendants receive on communications skills, hazards associated with a particular crossing (icy conditions), how to check whether a crossing is clear. Level crossing attendant on site. Reducing the road approach speed to the level crossing to reduce the risk of collision between vehicles and gates / trains.	4	1	4

					New modern full barrier crossing (Audible/visual alarms. (MCB+CCTV+OD) Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage			
Traffic calming systems Road traffic calming systems on either side of a level crossing might increase the risk of blocking back.	Traffic calming systems, such as road width restrictions/ build-outs, positioned on either side of a level crossing might increase the risk of vehicle drivers blocking back over the crossing. When the crossing is closed to road traffic, queues form along the road. This issue might be exacerbated due to factors such as the time of day (rush hour) and 'herd mental Discomfort for cyclists on the road. Potentially more noisy approach to the crossing leading to possible complaints.	4	3	12	Provision of CCTV surveillance cameras and signage to deter misuse at a particular crossing and to capture evidence of violations when they arise. Reducing the road approach speed to a level crossing to reduce the risk of collision between vehicles and gates / trains. A range of enhancements to improve conspicuity, comprehension of and user response to level crossing warning signs:	4	1	4

	If overused in conjunction with changes in speed the mitigation might lose its impact upon behaviour.							
Multiple traffic signs leading to distraction, missed warnings and road user collisions.	There are a number of existing traffic signs on both the northbound and southbound in the vicinity of the level crossing, notably those warning drivers of the narrow bridges.	5	3	12	Reducing the road approach speed to the level crossing to reduce the risk of collision between vehicles and gates / trains. New modern full barrier crossing (Audible/visual alarms. (MCB+CCTV+OD) Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.	5	1	5
Pinch points could lead to blocking back at the level crossing.	There are two narrow bridges situated either side of the level crossing site. The bridges are too narrow for large vehicles to pass without forcing oncoming traffic to stop. A platoon of half a dozen vehicles could obstruct the crossing leading to potential vehicle / train conflict	5	2	10	Traffic calming measures. - establish priority at for vehicles driving away from the level crossing. Education campaign. Enhanced signage	5	1	5
Limited forward visibility. Adjacent	Lack of good visibility at	3	3	9	Introduce a yellow box	3	1	3

features increase the risk of blocking back at the level crossing. private access located close to the proposed level crossing location, in addition to the narrow bridges to the north and south.	the level crossing leading to shunt type collisions.				marking. Traffic calming measures.			
Single train line Greater risk-taking behaviour in both vehicle drivers and pedestrians is reported on single train lines. .	This user behaviour is in line with risk compensation theory - the user, perceiving there to be less of a risk to him/herself, behaves less cautiously	4	2	8	Provision of a level crossing attendant to open and close the crossing barriers for users when safe to do so. The level crossing attendant is deployed to monitor and police user behaviour ensuring barriers are operated correctly. Staff Training. Maximum train speed 10mph. Enhanced signage.	4	1	4
Farming vehicles Farm traffic might influence the speed and behaviour of other vehicles traversing the crossing.	Farm traffic tends to move at a much slower speed and, being much larger, reduce the visibility of other vehicle drivers. This can cause distraction and frustration and change other road user's behavior resulting in risk taking actions such as overtaking and not observing the level	5	3	15	Power operated barrier. CCTV monitoring. LC Attendant – Training/Competence. Education campaign. Enhanced signage	5	1	5

	crossing warning signs.							
Commercial driver	Commercial drivers might have increased risk taking behaviour at level crossings. Commercial vehicle drivers, such as salespersons, work to strict timescales and therefore their driving behaviour is often influenced by having to reach destinations on time. Commercial drivers using a level crossing might be inclined to 'beat the lights' to avoid having to wait at the crossing, or they might fail to follow the correct crossing procedure at unprotected crossings.	5	3	15	A range of enhancements to improve conspicuity, comprehension of and user response to level crossing warning signs: The level crossing attendant is deployed to monitor and police user behaviour ensuring barriers are operated correctly. LC Attendant – Training/Competence. Education campaign. Enhanced signage.	5	1	5
Adverse weather impacting visual information.	The effectiveness of visual information at crossings can be impaired by adverse weather conditions (e.g. fog and snow). The ability of vehicle drivers or other crossing users to detect the presence of level crossings, hazard information, warning lights or approaching	5	3	15	CCTV monitoring. New modern full barrier crossing (Audible/visual alarms). (MCB+CCTV+OD) Education campaign. Crossing attendant (Monitoring).	5	1	5

	trains might be impaired by adverse weather conditions, e.g. fog and snow. This might result in users failing to see warning information or oncoming trains, which could lead to users unintentionally adopting risky behaviour. In addition, in heavy snow users might not be able to see the tracks and inadvertently stand in a position of danger. Visibility in and around the crossing might also be impaired by banks of snow. An example where foggy conditions have been identified as a causal factor in a level crossing incident investigation is the fatality Lane No 1 footpath crossing				Reduced road speed on approach to level crossing. Train speed maximum 10mph Traffic calming measures. Enhanced signage.			
Alcohol and drugs	The effects of drink and/or drugs can radically alter user behaviours. Motor and cognitive function might be impaired and users might also have a reduced perception of risk. Users under the influence of alcohol or drugs might exhibit the	5	2	10	CCTV monitoring (staff training initiatives). Anti-trespass and cattle guard panels are designed to deter people or animals from crossing the track at unauthorised places. Do not trespass signs. New modern full barrier crossing (Audible/visual	5	1	5

	following behaviours: be more inclined to ignore normal crossing procedures be physically unstable and prone to slips, trips and falls be unable to focus, cognitively and visually have a lower perception of risk.				alarms). (MCB+CCTV+OD) Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.			
Disabilities. 4	Disabilities (e.g. reduced mobility, reduced levels of vision/hearing) will influence the behaviour of users at level crossings. Visually impaired users might be unable to see warning lights and signs clearly, or scan for trains before crossing. Hearing impaired users might be unable to hear crossing alarms, train whistles, warnings from people or the sound of approaching trains. Cognitively impaired users might have	4	2	8	CCTV monitoring (staff training initiatives). level crossing attendant (Monitoring) Increase the volume of the audible warning up to the maximum permitted level to make the alarm more conspicuous and potentially deter pedestrian violations. Additionally, Intelligent auditory alarm –takes account of ambient noise levels and produces alarm 5dB louder so it can always be heard clearly. Power operated barriers.	4	1	4

	difficulty understanding and following the correct crossing procedure, or interpreting warning signs. Users with physical impairments (permanent or temporary) might encounter difficulties using level crossings of all types, but especially user worked crossings. Potential difficulties include struggling to cross within the warning time provided; being more prone to slips, trips and falls on the crossing, especially if the crossing surface is uneven or missing. Similarly, mobility scooter users might encounter problems with uneven crossing surfaces and the opening and closing gates or barriers.				Provision of flange gap filler to improve crossing surface. Provision of tactile edges (and stop lines) and clear delineation of the footway at public vehicular crossings. New modern full barrier crossing (Audible/visual alarms). (MCB+CCTV+OD) Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.			

Incorrect mental model Incidents at level crossings could occur if the user adopts the incorrect mental model of how the crossing works.	Mental models are internal mental representations of an external reality. People develop a mental model of how to us a LC from their prior experience of using similar crossings (or road junctions), from instructions or by observing the behaviour of other users. Users familiar with the operation of one type of crossing might apply their mental model at other types of level crossing.	5	2	10	CCTV monitoring (staff training initiatives). level crossing attendant (Monitoring) Provision of tactile edges (and stop lines) and clear delineation of the footway at public Vehicular crossings MCB+CCTV+OD Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.	5	1	5
Fatigue	Fatigued users will be more susceptible to making errors or to taking shortcuts when crossing. Fatigue has a significant effect on human performance and the likelihood of errors. Level crossing users suffering from fatigue might miss important information	5	2	10	CCTV monitoring (staff training initiatives). level crossing attendant (Monitoring) Provision of tactile edges (and stop lines) and clear delineation of the footway at public vehicular crossings. New modern full barrier	5	1	5

	(crossing warning signs, lights, etc), or be more inclined to take shortcuts in the crossing procedure (fail to use the telephone, fail to close the gates at user worked crossings, etc).				crossing (Audible/visual alarms). MCB+CCTV+OD Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.			
Signaller/CCTV Operator:	'Habit intrusion' in CCTV monitoring CCTV operatives follow	5	2	10	CCTV monitoring (staff training initiatives).	5	1	5

	habituated patterns of behaviour which might result in the entrapment or injury of crossing users at MCB and MCB-CCTV crossings. Use of level crossings is primarily covered in Local Training Plans and by the training and briefing signallers/Operators receive on communications skills. It is important local training plans cover: hazards associated with a particular crossing, how to check whether a crossing is clear. Signaller's/ following the appropriate rules and protocols should be subject to additional monitoring and development plans. Inefficient CCTV scanning strategy Signaller/Operator uses an inefficient method of scanning CCTV screens. The scanning method employed by a signaller/Operator for monitoring CCTV screens will affect whether they				New modern full barrier crossing. MCB+CCTV+OD			

	successfully identify information on the CCTV screen. Using an inefficient scanning strategy might result in the signaller/Operator taking a longer time to identify key events, or might result in them missing key events on other CCTV screens. An efficient scanning method is particularly important where there are multiple CCTV screens being monitored by one signaller/Operator, or the signaller/Operator has a high level of workload from other tasks.							
Work in or adjacent to public roadways.	Plant, equipment materials striking traffic/members of public. Traffic colliding with staff.	5	3	15	Authorised road closures and traffic management. Implement pedestrian walkways. Plant to be suitable for access to public roads. Comply with New Roads and Street Works Act and Traffic Signs Regulations.	5	1	5

Annex C. Road Crossings. Narrative safety report.

New Build North Bridge Street MCB+CCTV+OD Level Crossing - Narrative Risk Analysis (NBLC-NRA)

Contents

Rother Valley Railway

1 Introduction

The Rother Valley Railway will provide a full barrier **MCB+CCTV+OD** level crossing incorporating the latest technology for the operation and protective equipment. The crossing will be fully compliant with that is widely used on Network Rail infrastructure today, thus, ensuring the crossing would not require any product approvals, derogations or changes to standards. The maintenance regime would also be standard and no bespoke parts would need to be produced or stocked specifically for the crossing. For the above reasons, the crossing presents a very low reliability and risk concern and would most likely incur the lowest maintenance costs.

A level crossing does not currently exist at Northbridge Street, therefore a Quantitative Risk Assessment would not provide sufficient evidence to demonstrate that possible risk has been assessed and managed accordingly. However, it is important to establish possible risk from the introduction of a level crossing and possible mitigation measures at an early stage of development.

This NBLC-NRA analyses all relevant data as well as expert opinion to demonstrate that all possible risk has been addressed as well as embroidering new technology to further enhance the safety of the level crossing, for example;

- CCTV for improved safety & security,
- Obstacle Detection – LIDAR
- Home Office Approved Red Light Cameras
- Evaluate the risks at the level crossing.
- Early engagement with stakeholders from different sectors, local authorities, communities and 'users' associations.
- Take engineering measures and find innovative solutions
- Take educational and awareness measures and collaborate with the rail and road sectors.

The level crossing will be carefully assessed via this analysis in collaboration with railway, and the road infrastructure managers, local authorities and industry experts to make it more visible and easier to cross particularly for long, heavy and oversized vehicles.

All stakeholders will be in a position to cooperate and design the best level crossing environment.

Narrative Risk Assessments currently used by Network Rail are enabling better targeting of risk reduction measures; blending quantitative modelled risk with structured observation and judgement from competent staff. The NSA process is considered as part of this analysis to encompass the whole level crossing asset system and assess wider aspects of level crossing risk.

This analysis builds upon excellent safety initiatives which were introduced for the first Automatic Full Barrier level crossing by Network Rail including the safety benefits provided, however, RVR intend to introduce additional safety measures such as the use of Red-light safety equipment (RLSE), which has currently been installed at 31 public road level Crossings on the National Railway Network to improve user behaviour, deterring deliberate misuse. Trials have demonstrated that these Home Office Type Approved (HOTA) cameras have reduced deliberate misuse by approximately 90 per cent at some locations.

RVR have considered the installation of an object detection system at Northbridge Street level crossing. The objection detection system utilises laser technology to scan the crossing before allowing for trains to safely manoeuvre through. The LIDAR system detects obstacles on the ground and around the edge of the barrier lines and delivers unique small object detection protecting children and adults as well as vehicles and other large objects. RVR will install the LIDAR (or equivalent obstruction detection system) before railway operation commences.

2 Level Crossing Overview

This is a risk analysis for Northbridge Street level crossing. However, it should be noted that at present a level crossing does not exist, therefore, this analysis is based on the probability of risk if a level crossing was in place. It is imperative that a full Quantitative (and Narrative) Risk Assessment (QRA) is completed before any trains operate over the crossing and that the QRA is presented to the ORR.

Crossing Details	
Name	Northbridge Street
Type	MCB+CCTV+OD
Crossing status	Public Highway
Overall crossing status	Design Stage
Engineers Lin Reference	N/A
OS grid reference	coordinates 573819, 124014
Number of lines crossed	1
Line speed (mph)	10
Electrification	No
Signal box	Yes (A21 level crossing)

3 Information Sources

The table below shows the stakeholder consultation that was undertaken as part of the risk analysis.

Consulted	Attended site
ORR	
K&SR	
Bakerail	
ESCC	
RVDC	
I-Transport	
ARUP	All attended sit visits

Reference sources used during the risk analysis;

- ARUP A21 Options Report
- ARUP Road Safety Audit
- Mott Macdonald road survey report
- Network Rail QRA information
- GG19 Road Safety Report
- ORR Documentation
- GPR219-IDF- Level Crossing Safety
- EU SAFER-LC Project
- Level Crossing Risk Management Tool (LXRMT).

4 Level Crossing Diagrammatic Scheme

The new level crossing to be constructed is an MCB+CCTV+OD level crossing on C18 Northbridge Street, Robertsbridge, East Sussex. The road approach speed is 30 mph. The profile of the railway line in the vicinity of the crossing has been provided (below), as well as the appropriateness of the proposed warning signs in this regard.

Diagram of the proposed railway Alignment

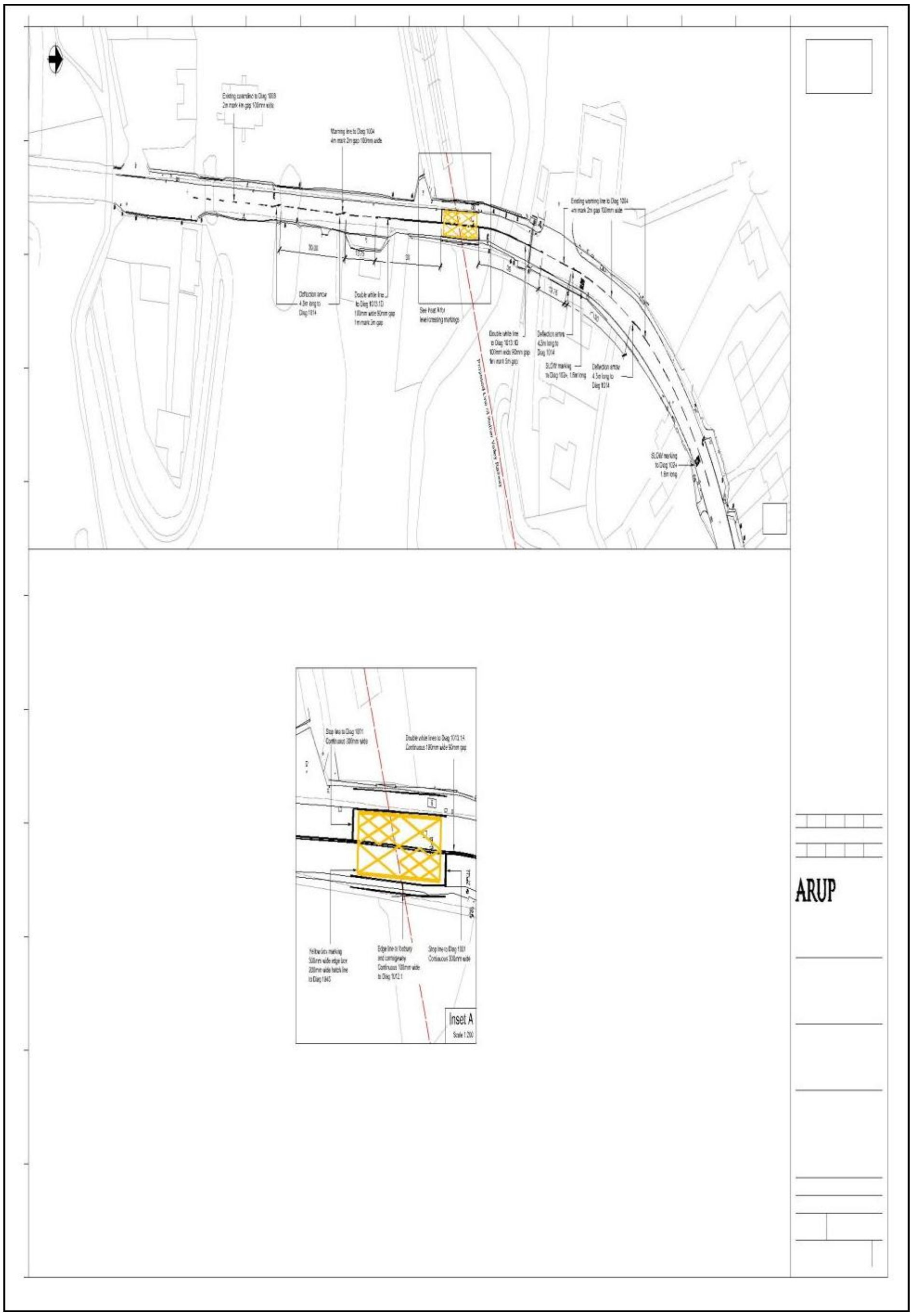
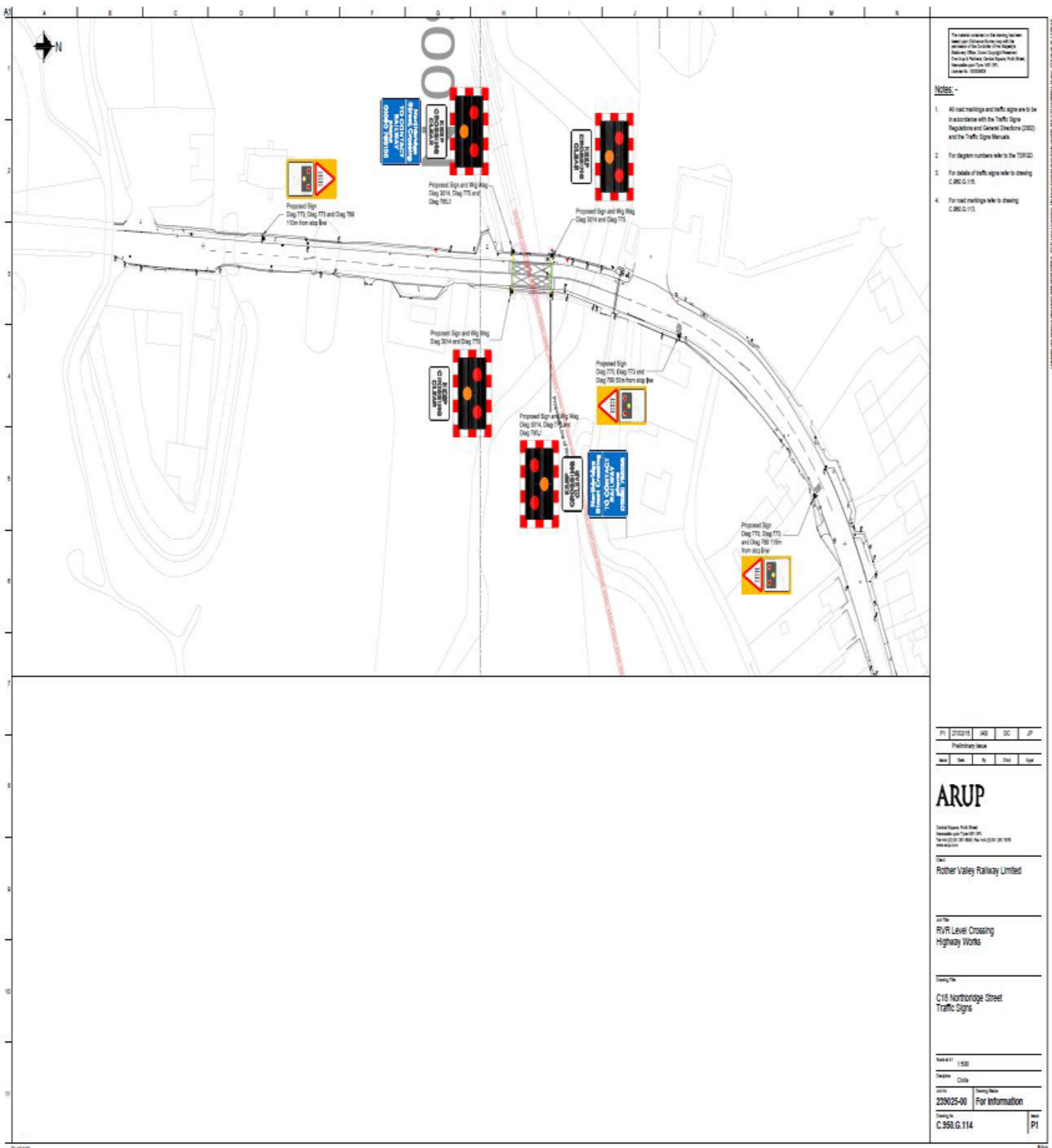


Diagram of the proposed traffic signs



5 Site Visit General Observations

The C18 Northbridge Street, Robertsbridge Stage 1 Road Safety Audit report identified possible road distractions which are considered as part of this analysis, for example,

- Limited forward visibility to level crossing leading to shunt type collisions. The approach to the level crossing is situated on a bend in the road (Photograph 1).

There is a cottage located close to the road limiting drivers' forward visibility on the bend. In the same location there is on-street residents' parking, which requires traffic to cross the carriageway centreline. This could draw drivers' attention away from downstream hazards such as a stationary queue of vehicles at the level crossing, leading to shunt collisions.

To remove this concern, it is advised to move the northern-most warning signs to the northern side of the drainage culvert to provide additional advanced warning.

Photograph 1

- The adjacent access increases the risk of blocking back at the level crossing (Photograph 2a & 2b) below.

There are a number of accesses close to the proposed level crossing location, not least that of a four-hectare industrial development site, which could generate a significant volume of additional traffic movements. A planning proposal has recently been submitted for around 40 houses/flats on the Old Mill site to the North West of the crossing, however it is not anticipated that this small development will affect safety at the crossing other than increased traffic).

The limited carriageway width and on-street parking could result in traffic waiting on the carriageway by the level crossing and will increase the risk of vehicles queuing over the level crossing, leading to potential vehicle / train conflict.

It is intended to Introduce a yellow box marking to deter traffic from queuing over the crossing.

Photograph 2(a)

Photograph 2 (b)

➢ Insufficient warning for the visually impaired could lead to pedestrian injuries.

Rother Valley Railway

Footways are provided along both sides of Northbridge Street in the vicinity of the proposed level crossing (Photograph 3).

The visually impaired use tactile warning surfaces to identify hazards ahead. A visually impaired pedestrian could enter the level crossing zone without realising the hazardous nature of the environment, placing them at risk of being trapped by the barriers.

Tactile warning surfaces will be provided in line with national guidelines on each footway approach to the crossing.

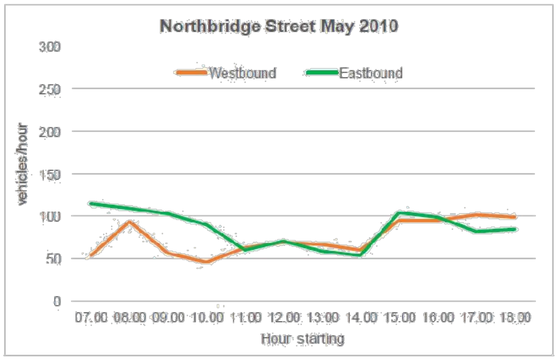
Photograph 3

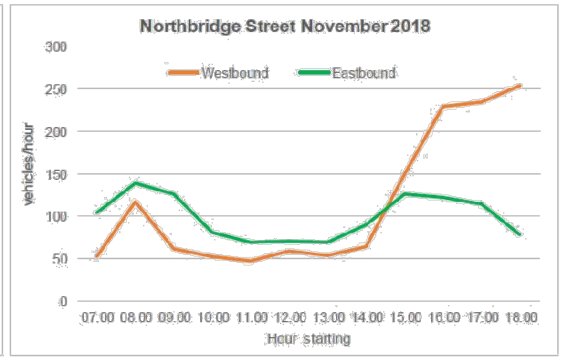
Lighting;

There is currently a system of lighting along the length of Northbridge Street and, due to the proximity of a lighting column at the proposed level crossing in Robertsbridge, it has been deemed necessary to remove that column and introduce a lighting column either side of the crossing at a safe distance. The proposed location of the two columns provides a level of illumination and uniformity consistent with other sections of that road. Consultation has been undertaken with the Parish Council to ensure that their needs are addressed prior to proposing an alteration to the lighting.

6 Northbridge Street Traffic Flows

The chart below compares traffic flows on Northbridge Street to the west of the A21 Roundabout for 2010 and 2018. Flows are generally higher throughout the day but remain relatively low, although large increases are shown for the westbound direction between 16:00-19:00. (Mott Macdonald Addendum report 2018.





Queuing at the level crossing has been estimated, based upon average vehicle demand per minute during the hour of each barrier closure, as well as length of time that the barrier is down. A barrier close time of 55 seconds has been assumed, with sensitivity testing with a 110-second closure.

Queue lengths have been estimated with 2018 traffic demands and predicted demand in 2021 and 2027.

Traffic Growth for future years;

Traffic forecasts have been produced for 2021 and 2027 using TEMPRO version 7.2 with National Transport Model (NTM) factors (NTM datasheet AF15). To calculate growth factors for Northbridge Street LC date for Rother Distract has been used.

For Bank Holidays, it has been assumed that growth will be the same as for Sundays.

Table 1 Traffic Growth Factors 2017 - 2021

Road Name	Region	Road Type	Average Weekday	Average Saturday	Average Sunday	May Bank Holiday	August Bank Holiday
Northbridge Street	Rother District	Rural Minor	1.062	1.060	1.061	1.061	1.061

Table 2 Traffic Growth Factors 2017 –2027

Road Name	Region	Road Type	Average Weekday	Average Saturday	Average Sunday	May Bank Holiday	August Bank Holiday
C18 Northbridge Street	Rother District	Rural Minor	1.151	1.152	1.154	1.154	1.154

Predicted Queue Lengths;

Table 3 (below) shows the predicted queue lengths for Northbridge Street Level Crossing with a 55 second closure.

Table 3: Predicted Queue Lengths at Northbridge Street Level Crossing

	2017 Westbound		2017 Eastbound		2021 Westbound		2021 Eastbound		2027 Westbound		2027 Eastbound	
	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
Spring/Autumn												
Weekday	20	8	11	8	21	8	12	8	23	9	13	9

Predicted maximum queue lengths are 20m in 2017 and 23m in 2027.

Queue lengths with a 110-second closure (below) are shown as sensitivity tests. Predicted maximum queue lengths for Northbridge Street LC are 20m –30m in 2017 and 30m –40m in 2027.

Table 4 Predicted Queue Lengths at Northbridge Street Level Crossing with 110 Second Closure

	2017 Westbound		2017 Eastbound		2021 Westbound		2021 Eastbound		2027 Westbound		2027 Eastbound	
	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
Spring/Autumn												
Weekday	40	16	22	16	43	17	24	17	46	18	26	18

Conclusion;

On Northbridge Street to the West of the A21 Roundabout 2018 flows are generally higher throughout the day but still remain relatively low, although larger increases are shown for the westbound direction between 16:00 –19:00. It is not anticipated that the increased queue lengths by 2027 would have any significant impact of the Level Crossing operation.

7 The Railway

The train service over Northbridge Street level crossing will consist of passenger trains only. There will be approximately 10 trains per day. The highest permissible line speed of trains over the crossing will be 10 mph. Trains are timetabled to run for 10 hours per day.

The RVR Level Crossing Operational Management Plan (LCOMP) sets out the strategy for operational management of the Northbridge street level crossing to be installed on the Rother Valley Railway (RVR) between Robertsbridge Junction Station and Bodiam where it interfaces with the road at level grade, so requiring control of road vehicles to enable a train to cross.

The LCOMP describes the principals of how the level crossing is to be operated under normal conditions and in the event of failure.

This shall be the basis for developing operational procedures for the railways operation when services commence to which staff shall be trained and be assessed on an ongoing basis.

Compliance with Industry guidelines;

The design for the level crossings, developed from this document, shall be compliant with industry guidelines, e.g. The Office of Rail Regulation: A Guide for Managers, Designers and Operators and approved by a suitably independent person before installation.

Northbridge Street Level Crossing Operation;

It shall be noted that a signal box, with signaller on duty at all times of normal operation, shall be located at the A21 crossing. The person in charge shall manage operation of the crossing at Northbridge Street.

Towards Robertsbridge;

Normal Operation;

The train will approach the protecting signal at the level crossing at a maximum speed of 10 mph, thus ensuring that the train has the ability to stop within 30 metres. The signalman shall check the CCTV monitors, ensure the obstacle detection system displays a clear crossing indication, then operate the closing sequence of the barriers demonstrating that the signaller has full and control of the operation, two train crew members will operate the train and good sighting will always be maintained.

This shall initiate a sequence of warnings to road users of klaxons, flashing yellow lights changing to flashing red lights then barrier closure, which shall be full barriers across the road, in the standard accepted sequence as adopted on the National Rail network. Note: The barriers will not close if at any time an obstruction is detected

There shall be a visual indicator presented to the train driver that the sequence has been initiated which will be repeated as necessary for sighting purposes, and which shall change to confirm that the closure sequence has been successfully completed.

If the level crossing is crossed under normal operating conditions the barriers will lower on the approach and rise following the initiation by the signaller, the raising also being initiated by the signaller having received an audible and visual signal from the strike in treadle. There shall be an indication to the two locomotive crew that the barriers have risen correctly and this shall be checked by the train driver.

Degraded Operation;

Should the closure sequence fail to complete, the indication to the driver will not change to confirm closure sequence completed and so he/she shall be required to stop the train short of the crossing to contact the signaller, using a suitably located lineside telephone to inform the signaller of the situation and request manual initiation of the closure sequence, using the signallers local control panel from the signal box.

If the closure sequence can be initiated and completed successfully in powered mode by the signaller, the driver can proceed once the proceed indication has been given. If the barriers cannot be operated in the powered mode the signaller shall be required to act to stop road traffic and manually lower the barriers and on completion give a proceed indication to the train crew.

If the barriers have failed to rise following the passage of the train over the level crossing, a trackside indication shall show this to the driver and shall be required to stop. The driver shall then contact the signaller on a suitably located lineside telephone ask him/her to check on the local control panel the indication and if necessary, initiate the operation under powered mode. If this is unsuccessful then the signaller shall be responsible for manual operation i.e., the signaller shall inform the train driver and then proceed to raise the barrier manually, requesting assistance from the locomotive crew if necessary.

All irregular operation of the level crossing system must be reported immediately to the A21 signal box using the lineside phones that shall be located at the local control panels. The level crossing system shall also send an alarm.

The signaller at the A21 shall ensure faulting attendance to the site.

Towards Bodiam –Normal Operation

The train will approach the level crossing at a maximum speed of 10 mph, thus ensuring that the train has the ability to stop within 30 meters. The signalman shall check the CCTV monitors, ensure the obstacle detection system displays a clear crossing indication, then operate the closing sequence of the barriers demonstrating that the signaller has full and control of the operation, two train crew members will operate the train and good sighting will always be maintained., two train crew members will operate the train and good sighting will always be maintained

This shall initiate a sequence of warnings to road users of klaxons, flashing yellow lights changing to flashing red lights then barrier closure, which shall be full barriers across the road, in the standard accepted sequence as adopted on the National Rail network. Note: The barriers will not close if at any time an obstruction is detected

There shall be a visual indicator presented to the train driver that the sequence has been initiated which will be repeated as necessary for sighting purposes, and which shall change to confirm that the closure sequence has been successfully completed.

If the level crossing is crossed under normal operating conditions the barriers will lower on the approach and rise following the initiation by the signaller, the raising also being initiated by the signaller having received an audible and visual signal from the strike in treadle. There shall be an indication to the two locomotive crew that the barriers have risen correctly and this shall be checked by the train driver.

Degraded Operation

Should the closure sequence fail to complete the indication, the driver will be required to stop the train short of the crossing to investigate why and, as necessary, manually initiate a closure sequence using a local control panel located on the approach.

If the closure sequence can be initiated and completed successfully in powered mode the driver can proceed. If it cannot and the barriers have to be manually lowered then the guard must be called forward to assist in closing the barriers, this may include carrying out duties to stop road traffic and manually lower the barrier mechanism.

Should the circumstances of the failure be such that the train crew consider it unsafe to proceed then the train shall be secured and Bodiam signal box be informed to request suitable assistance and instruction, e.g. propel back to Bodiam under the operational rules. The signal box operative shall be responsible for escalating the problem to company officials.

If the barriers have failed, an indication shall show this and the driver shall be required to stop. The guard will go to the local control panel on the Robertsbridge side of the level crossing to initiate closure under powered mode. If this is unsuccessful then the Guard shall inform the train driver and then proceed to raise the barrier manually, requesting assistance from the locomotive crew if necessary.

All irregular operation of the level crossing system must be reported immediately to the A21 signal box using the lineside phones that shall be located at the local control panels. The level crossing system shall also send an alarm.

The signaller at the A21 shall ensure faulting attendance to the site.

Level Crossing barriers, CCTV & OD Systems Maintenance Plan

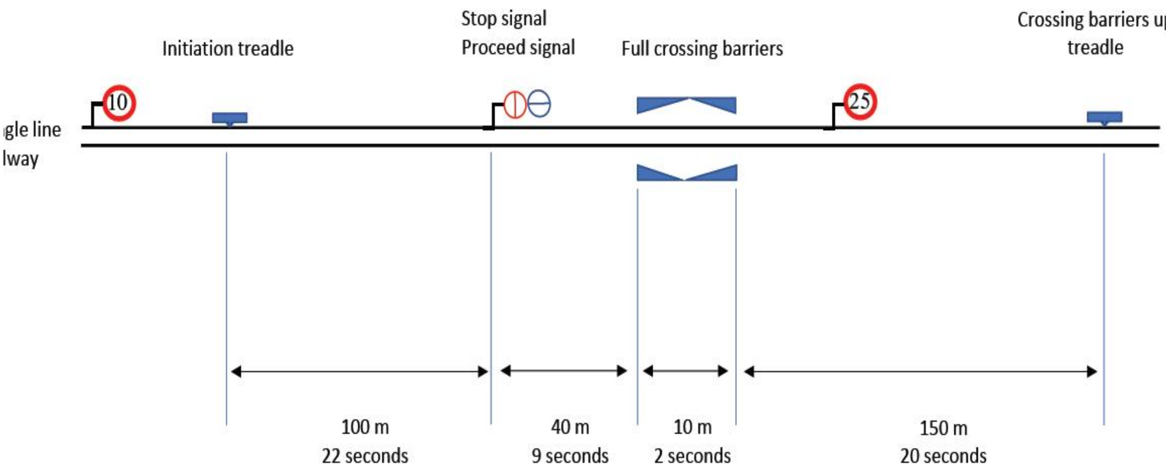
The maintenance plan for the three-level crossings shall be based on that recommended by the supplier of the equipment. It shall comprise:

- Regular planned maintenance at the required intervals.
- Work arising from planned maintenance, within the required timescales
- Fault response, within specified timescales.
- Work arising from fault responses, within the required timescales.
- Work arising due to other parties planned work.

Road Crossing Design and Construction

The construction of the road crossings comprise concrete units designed to meet the requirements of a high friction skid resistant road surface through the crossing. This has been tested for the proposed installation and passed the test level requirement as set by The Highways Agency, reference document RD/GN/009 dated September 1989.

Signalling Diagram Layout



Notes:

1) Equipment shown for up direction only, treadles, signals and signs replicated for down direction.
2) Initiation treadle operates an audible and visual indicator in attendants cabin adjacent to level crossing.
3) Transit times assume full line speed.

Rother Valley Railway
Level crossing signalling schematic for manually operated full barriers
Northbridge Street, A21 & Junction Road

Not to scale

8 5 X 5 Risk Assessment

Hazards are identified, listing possible causes if appropriate and assessed for severity. These are then multiplied by the frequency or likeliness of an incident occurring if no controls were applied. This produces the risk factor; the numerical assessment table gives guidelines on how to assess severity and frequency.

This risk assessment is generic and whereas the basic principles will always apply, it is acknowledged risk can change significantly from one site to another. Generic risk assessments will always be reviewed by the appointed Project Manager and then expanded upon if required to nullify or apply the necessary controls to hazards identified during site visits (pre-works) or through information passed to them by a third party.

The 5x5 risk assessment considers risk assessment associated to MCB CCTV (OD) operated level crossings on the railway's national network as well as consider which is based on industry research and best practice. It has been produced on behalf of the Rail Safety and Standards Board (RSSB).

The LXRMTK allows you to explore the human factor risks associated with level crossings and provides guidance on appropriate risk reduction measures. LXRMTK also has a range of applications, from being an information resource for anyone with an interest in public behaviour at level crossings, to being used to support various more specific activities.

The RA includes accepted best practice when evaluating severity based on what could credibly occur whenever the event occurs, i.e., assess severity based on what could credibly result, should this event occur or re-occur. Additionally, each hazard including possible causes identified, potential risk or consequences associated with the hazard and control measures have been considered by a team of safety professionals and debated accordingly.

This risk assessment is in no way to be viewed as exhaustive and may need to be expanded upon depending on the site being visited when fully operational and the activities being undertaken. As well as clearly identifying a hazard it also vitally important to understand the contributory factors wherever possible. Bearing this in mind, each hazard has been expanded upon to list the most common causes or reasons why the hazard may occur.

The process of using this 5x5 risk assessment is to inform decisions relating to the control and reduction of risks which have been divided into 3 stages:

- Preparing the assessment;
- Carrying out the assessment;
- Post-assessment activities.

In practice this provides a useful framework for outlining the guiding principles and factors considered throughout the process.

In preparing for the assessment, the additional factors were considered:

- What is the appropriate scope for the assessment?
- What is an appropriate approach, and what level of detail is needed?
- Who is going to be involved in carrying out the assessment?

the basic steps to be followed include:

- Identify the hazards;
- Identify the possible consequences;
- Estimate the likelihood of the possible consequences;
- Estimate the risk;
- Evaluate the risk;
- Record the findings.

It should be noted that additional evidence was used to support the risk assessment including the use of an ideal obstacle detection system that provides a safety integrity, no worse, and ideally better, than a manually operated crossing, cause no or minimal delays to trains due to equipment failure or false detections, affordable in terms of whole life costs, operate in all weather and temperatures, and be practical to use and maintain (MCB + CCTV + OD).

The detection system to be used will confirm that a crossing is not occupied by a person (including small children or someone who may have fallen over) or by any object that may cause damage to a moving train. Separate technology as well as manual operation is used to confirm that the crossing is closed by barriers once the detection system has confirmed the crossing is clear, then the train is allowed to proceed across the crossing. This is achieved by clearing the protecting signals.

Rother Valley Railway

Numerical Assessment

Severity (S)		Likelihood of Occurrence (L)	
1	No Injuries / Minor Damage	1	Remote
2	Single Minor Injury	2	Unlikely
3	Single Major Injury / Minor Pollution	3	Occasional
4	Single Fatality / Major Pollution	4	Likely
5	Multiple Fatalities	5	Highly Likely

Risk Factor

		Likelihood of Occurrence (L)				
		5	4	3	2	1
Severity	5	25	20	15	10	5
	4	20	16	12	8	4
	3	15	12	9	6	3
	2	10	8	6	4	2
	1	5	4	3	2	1

Risk Factors between 16 to 25 = Unacceptable Risk. Risk Factors > 8 will be strictly monitored. Hazards Identified with a Severity Assessed at 3 or above will also be strictly monitored.

Hazards and possible causes identified	Potential Risk or consequences associated with the Hazard	S	L	RF	Control Measures	S	L	RF
SIGNALLING								
Relative to previous signals: Will the signal be in a different position, or does it have a different configuration?	Signal position is not consistent with the spacing between preceding signals Signal is of a different design to preceding signals Potential for, Death, Serious injury or injury	5	3	15	The KESR signalling arrangement will have consistent signal design. All staff will receive training before operation commences	5	1	5

Could the signal be confused with other signals on an adjacent line or on the same gantry	Signal is on a post and could be confused with other signals Signal has an identical profile / outline to adjacent signals Death Serious injury Injury	5	3	15	Ensure signals for all lines are visible Shield nearby signals from view Appropriate signal should be clearly associable with its line Driver training	5	1	5
Could the signal be obscured from view?	Signal reading time is inadequate. Signal is positioned round a curve and the reading angle is inadequate Signal is positioned round a curve and there is an obstruction blocking the line of sight Signal can be obscured by vegetation Signal can be obscured (intermittently or otherwise) by a bridge or other structure, for example station structures edge of signal back plate is less than 100 mm from edge of aspect	5	2	10	Increase backboard size (by 50%) Manage vegetation Maximum train speed is 10 mph Remove / shield potential distractions in stations Reposition signal on straight track Make signal post more conspicuous Driver training	5	1	5

TRACK								
Will the track on approach to the signal suffer from adhesion problems?	Signal is located in an area which suffers from ice, frost, leaf fall, dampness or other adhesion problems Death Serious injury Injury	5	3	15	Lineside fencing / netting Railhead conditioning Management of lineside vegetation Low adhesion warning signs Driver training	5	1	5
Is there a reduction in permissible speed on the approach to the signal?	There is a reduction in permissible speed on the approach to the signal Death Serious injury Injury	5	2	10	Permissible speed on approach to the level crossing is maximum 10 mph Driver training On site staff monitoring	5	1	5
Is there a falling gradient on approach to the signal?	There is a falling gradient on the approach to the signal	5	2	10	Countdown markers Driver training	5	1	5
COLLISION								
Road Vehicle and train collision risk	Insufficient train warning time for all vehicle types known to be exasperated by the driving position e.g. Tractor. Level crossing equipment and signage is not conspicuous or optimally positioned.	5	3	15	Optimising position of equipment at the design stage removing any conflicting or redundant signs. Also, MCB+CCTV+OD Strike in times optimised. Sighting lines enhanced.	5	2	10

	Instructions for safe use may be misunderstood e.g., signage, clutter detracts from key messages, conflicting information given. High volume of unfamiliar users e.g. irregular visitors, migrant workers. Known user complacency leading to high levels of indiscipline. Type of vehicle unsuitable for level crossing; - Large, low, slow, making access or egress difficult and or vehicle is too heavy for the crossing surface – risk of grounding and or severity of gradient adversely affects ability to traverse. Users experience a long waiting time.				Latest technology in place for user-based warning systems including wig-wag lights, sirens, full road barriers, RTL., MCB+CCTV+OD Competent crossing attendant on site. Maximum train speed 10 mph implemented. Superior quality crossing surface construction material. De-vegetation programme in place			
Pedestrian and train collision risk	Ineffective whistle boards, warning inaudible, insufficient train warning time. Level crossing equipment and signage is not conspicuous or optimally positioned.	5	3	15	Optimising position of equipment at the design stage removing any conflicting or redundant signs. Latest technology in place for user-based warning systems including wig-wag lights, sirens, full road barriers,	5	1	5

	Instructions for safe use may be misunderstood. Surface condition could lead to slip/trip risk. High volume of unfamiliar users i.e. irregular visitors/ramblers/equestrian. Complacency leading to high levels of indiscipline e.g. users are known to rely on knowledge of timetable. High level of use by vulnerable people. High usage of cyclists.				RTL. MCB+CCTV+OD Competent crossing attendant on site. Maximum train speed 10 mph implemented. Superior quality crossing surface construction material. De-vegetation programme in place. Regular engagement with stakeholders/authorised users reinforcing safe crossing protocol, legal responsibilities and promoting collaborative working. Signage to encourage users to look for approaching trains as well as providing cyclist dismount signs.			
Hazards and possible causes identified	Potential Risk or consequences associated with the Hazard	S	L	RF	Control Measures	S	L	RF
SPAD OCCURRENCE								
Train driver passes protecting signal without authority	Collision with road vehicle (see above). Collision with member of public (See above). Death	5	3	15	Treadle on protecting signal (passed at danger without authority) will activate the road crossing wig wag lights and siren to indicate to all road users that a train is coming. Barriers will not activate at this stage. The treadle will also activate a warning tone	5	1	5

	Serious injury Injury				and visual sign to the local level crossing attendant that the train approaching the level crossing has passed the signal at danger without authority. The level crossing attendant will check to ensure the level crossing is clear of any traffic, pedestrians etc and activate a switch/plunger on site to operate the full barriers hence safely closing the level crossing to all road users. Driver training. Level crossing operator training. Maximum speed of train 10 mph.			

Hazards and possible causes identified	Potential Risk or consequences associated with the Hazard	S	L	RF	Control Measures	S	L	RF
Additional Risk Influencing factors								
Distraction								
Can the driver be distracted by something outside the cab?	Driver could be distracted by trespassers	5	3	15	Signal reminder sign	5	1	5
Could the driver be distracted by other tasks at or on approach to the signal?	There is a level crossing in the vicinity of the signal	5	3	15	Position signal where driver not distracted by other duties Driver training	5	1	5
Distractions while using the level crossing might impair the user's to cross quickly and safely.	If a user is distracted, there is an increased likelihood that they will not see the crossing, train, warning signs, for example; Other persons in the car (e.g. children) Thoughts on personal matters, work stresses etc. Using the telephone, Behaviour of other crossing users, In car entertainment Seasonal events (e.g. fun fairs, fireworks) Mobile phones, iPads, handheld computers etc. Signage (e.g. speed	5	2	10	Provision of CCTV surveillance cameras and signage to deter misuse at a particular crossing and to capture evidence of violations when they arise. Staff training. Crossing attendant on site. Trespass guards. Traffic calming measures. Train maximum speed 10 mph.	5	1	5

	limit signs). When wearing headphones (especially noise-cancelling				New modern full barrier crossing. MCB+CCTV+OD			

	headphones) the user might be unable to hear warning sounds such as approaching trains and station announcements; thus reducing their situational awareness Changes to situational awareness and level of concentration might cause the user to miss important information and lead to poor decision making, hesitation or risk-taking behaviours. Distractions might be more likely for users who frequently use the crossing (e.g. delivery drivers), due to them potentially having a lower level of concentration than those who use it infrequently. A change in speed limit and the associated speed limit signs This proximity of the speed limit signs to the crossing might reduce the attention given to the crossing, or remove attention away from it completely. The signs might also draw a car driver's a the vehicle speedometer to check vehicle speed and away from maintaining vision out of the vehicle windscreen. Other				Education campaign.			

	signs in the vicinity of a level crossing that are not related to that crossing could also have been a potential distraction.							
Regular users and those living close to level crossings are more likely to undertake risk taking behaviour when using the crossing.	Level crossing users that live or work in close proximity to a crossing can become familiar with the crossing attributes and procedures required for crossing. Their behaviour can become habitual, resulting in a failure to look for unexpected information, leaving them susceptible to errors of judgment. Regular users are more likely than infrequent users to perceive crossing risk to be low and commit a violation of safe crossing procedure. Users living close to a level crossing might undertake risky behaviour when using the crossing. Some locals disregard crossing procedures because they feel aggrieved at having to wait for trains to pass. might include:	5	3	15	Provision of CCTV surveillance cameras and signage to deter misuse at a particular crossing and to capture evidence of violations when they arise. Staff training. Crossing attendant on site. Trespass guards. Traffic calming measures. Train maximum speed 10 mph. New modern full barrier crossing. MCB+CCTV+OD Education campaign.	5	1	5

	Expectation by the user that there will not be any trains in the area. Familiar users apply prior knowledge of train times / frequencies User believes he / she has enough time to beat the train User has a low level of concentration and is easily distracted User does not look in both directions User has low perception of risk User thinks he / she understands procedure without reading instructions User unaware of risks to subsequent users							
High vehicle approach speeds	The vehicle speed over a level crossing is a factor in vehicle driver errors. Risk factors include, the speed limit(s) in the surround areas, driver's pe and attitude to risk, visibility of warning signs and visibility of the level crossing e.g. rural winding roads.	5	3	15	Reduced road speed on approach to level crossing. Traffic calming measures. Education Awarenss Enhanced signage. New modern full barrier crossing. MCB+CCTV+OD Crossing attendant	5	1	5

					(Monitoring).			
Large, slow and low vehicles	Drivers of large vehicles are involved in a disproportionately high number of incidents at level crossings. The size of the vehicles - they have less room for error when compared to cars. They may not be responding to the activation of the crossing warning system in sufficient time. Studies have proposed that large (HGV) vehicles may attempt to traverse the crossing once the barriers have already started to descent, suggesting that it could be to do with the driver's awareness of their vehicle's poorer braking performance, and therefore considering it safer to continue. Other contributory factors might include: The slower acceleration speed of HGVs causing the total time to cross a level crossing from	5	3	15	Reduced road speed on approach to level crossing. Traffic calming measures. Enhanced signage Yellow box marking Level crossing road surface well maintained Power operated level crossing barriers, MCB+CCTV+OD	5	1	5

	standstill to increase Sightlines from a higher driving position.							
No provision of pedestrian bridges or underpasses	Pedestrians and train passengers are more likely to undertake risky behaviour at vehicular level crossings where bridges or underpasses are not provided. Observation and experience has identified that on hearing/ seeing the activation of the level crossing warning system, pedestrians might choose to risk traversing the crossing so as to avoid having to wait, aware that they have no alternative means of crossing during the activated warning. This behaviour will be more likely in users who are under time pressure and have a low perception and attitude to risk. Users such as Dog walkers, Wheelchair or mobility scooter users, elderly (65+) and youths (11-18yr)	3	3	9	Painting of road markings on the crossing that clearly show the area in which pedestrians should walk when traversing the crossing. New modern full barrier crossing, including CCTV and OD. Education campaign. Crossing attendant on site (Monitoring). Clear signage.	3	1	3
Ice conditions	Icy weather conditions on the approach and exit to the crossing might affect the behaviour of the	5	3	15	Provision of CCTV + OD surveillance cameras. Level crossings local	5	1	5

	crossing, for example, prevent vehicles from stopping in a position of safety at the crossing. Encourage vehicle drivers to ignore the initial warning activation when they are close to the train line because of the risk of sliding forward onto the tracks. Cause pedestrians to concentrate on their footing, rather than looking for trains or observing warning signs. Result in pedestrian slips, trips and falls. This is a particular risk for elderly, or mobility impaired, users. Level crossings on 'B' roads might present a particular hazard to vehicle drivers as these roads are not normally gritted in icy conditions.				training plans, training and briefing signallers/attendants receive on communications skills, hazards associated with a particular crossing (icy conditions), how to check whether a crossing is clear. Level crossing attendant on site. Improved crossing surface. Regular monitoring. Tactile surfaces.			
User age: Elderly drivers (65+)	The frequency of level crossing violation is associated with the age of the local population. Evidence has identified that a disproportionate Number of elderly	3	3	9	CCTV monitoring (OD). New modern full barrier crossing.	3	1	3

	people were seen to traverse when the red warning lights were displayed. This behaviour has been associated with lower reaction times and lack of visual awareness of the immediate surroundings, rather than being attributed to purposeful crossing misuse.				Education campaign. Crossing attendant (Monitoring). Reduced road speed on approach to level crossing. Traffic calming measures. Enhanced signage.			
Foliage obscuring warning signs and approaching trains	The visibility (and hence effectiveness) of information on the approach to and at the level crossing is reduced by overgrown foliage. Overgrown foliage on the approach to a level crossing can obscure signs and signals located at the crossing, and also restrict the visibility of approaching trains. This could result in the user either not seeing the sign or train (complete or partial) or the user not seeing the sign or train in time to sufficiently interpret the information and respond appropriately. This issue can be	5	3	15	Cutting back vegetation and removing obstructions the sighting distances for users up and down the track and to signs / warning lights are lengthened. Staff training i.e. HRA Guidance document HGR – A0720 Control of Vegetation (Management plan). Improved sighting distances. Train speed max 10 mph. CCTV monitoring. New modern full barrier	5	1	5

	exacerbated when the visibility of the level crossing is reduced, either due to its type or its location e.g. on the bend in a road or on a high-speed road, as the vehicle driver has even less time to respond. foliage is also applicable to train drivers. Foliage on the lineside might impact on the train driver's ability to see information, objects or people on the crossing.				crossing (Audible/visual alarms. MCB+CCTV+OD Education campaign. Crossing attendant on site (Monitoring). Reduced road speed on approach to level crossing. Traffic calming measures. Enhanced signage.			
Vulnerable Users, for example, people with dogs on leads, young people, people visiting the area etc.	Vulnerable users even if crossing in accordance with instructions face particular crossing risks during their traverse. Crossing users are possibly subject to the following risk factors: making slips, trips and falls, for example a dog on a lead might become a trip hazard to user. Dog/s might hold user back on tracks, preventing them from completing their traverse.	4	3	12	CCTV monitoring + OD. Pedestrian walkway – defining, Painting of road markings on the crossing that clearly show the area in which pedestrians should walk when traversing the crossing. New modern full barrier crossing (Audible/visual alarms. Education campaign. Crossing attendant (Monitoring).	4	1	4

	Horses can present additional challenges if it is startled or distracted. Animals might try to run down tracks, especially if startled or skittish or if it smells an animal to chase etc, pulling the user with it. Young people may be distracted by friends, using mobile telephones, headphones and so on. Visiting people may not be familiar with the level crossing operation, distracted by looking for directio signs etc.				Reduced road speed on approach to level crossing. Traffic calming measures. Enhanced signage.			
Parked vehicles in close proximity to the crossing	Vehicles parked close to crossing entry and exit points might increase the risk and crossing time of other users. Vehicle drivers who stop or park near a level crossing (e.g. close to the entry and exit points) might create issues for other level crossing users. Potential issues	5	3	15	Provision of CCTV surveillance cameras + OD including signage to deter misuse at a particular crossing and to capture evidence of violations when they arise. Painting of road markings on the crossing that clearly show the area in which pedestrians should walk when traversing the	5	1	5

	include: Diverted attention from the level crossing and associated warning signs while concentrating on avoiding and manoeuvring around the parked vehicles (or associated pedestrians e.g. school children). Having to drive around the vehicles and onto the other side of the road/down the centre of the road, resulting in conflicts with oncoming vehicles. Parked vehicles obscuring the visibility of signs and signals to other crossing users. Traffic flow problems, such as ‘blocki back’. Examples of situations where vehicles might stop or park near a level crossing include: Vehicle drivers dropping off their passengers. Residents without off-street parking (e.g. owners of railway cottages) choosing to park on the approach and exit roads to level				crossing. Paint yellow box markings on the crossing. Yellow lines (double) on the road approaches to the crossing. New modern full barrier crossing (Audible/visual alarms. MCB+CCTV+OD Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.			

	crossing. Customers parking to visit the local shops that have limited or no parking. Level crossings in the vicinity of schools might be used by parents as drop-off and collection points for their children. 'Visitors' (cro inspectors and maintainers) parking in the 'long/slow' vehicle lay by, which is used by long/slow vehicle drivers to stop and contact the signaller. This might prevent drivers of long or slow vehicles from stopping and cause them to drive over the crossing without informing the signaller. 'Visitors' might park on the immediate approach or exit to the crossing.							
Crossing utilisation or traffic moment	High crossing utilisation by users is associated with a greater chance of user risk taking behaviour.	5	3	15	Provision of CCTV surveillance cameras + OD including signage to deter misuse at a particular crossing and to capture evidence of violations when they arise.	5	1	5

					Level crossings local training plans, training and briefing signallers/attendants receive on communications skills, hazards associated with a particular crossing (icy conditions), how to check whether a crossing is clear. Level crossing attendant on site. Reducing the road approach speed to the level crossing to reduce the risk of collision between vehicles and gates / trains. New modern full barrier crossing (Audible/visual alarms. Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.			
Unfamiliar users	Users who are not familiar with the level crossing procedure in the UK might apply an incorrect mental	5	3	15	Provision of CCTV surveillance cameras + OD including signage to deter misuse at a particular crossing and to capture evidence of violations when they	5	1	4

	model when traversing the crossing.				arise. Level crossings local training plans, training and briefing signallers/attendants receive on communications skills, hazards associated with a particular crossing (icy conditions), how to check whether a crossing is clear. Level crossing attendant on site. Reducing the road approach speed to the level crossing to reduce the risk of collision between vehicles and gates / trains. New modern full barrier crossing (Audible/visual alarms. Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage			
Traffic calming systems Road traffic calming systems on either side of a level crossing might increase the risk of blocking back.	Traffic calming systems, such as road width restrictions/ build-outs, positioned on either side of a	4	3	12	Provision of CCTV surveillance cameras + OD including signage to deter misuse at a particular crossing and to capture evidence of violations when they	4	1	4

	level crossing might increase the risk of vehicle drivers blocking back over the crossing. When the crossing is closed to road traffic, queues form along the road. This issue might be exacerbated due to factors such as the time of day (rush hour) and mentality' Discomfort for cyclists on the road. Potentially noisier approach to the crossing leading to possible complaints. If overused in conjunction with changes in speed the mitigation might lose its impact upon behaviour.				arise. Reducing the road approach speed to a level crossing to reduce the risk of collision between vehicles and gates / trains. A range of enhancements to improve conspicuity, comprehension of and user response to level crossing warning signs:			
Housing developments Housing developments increase road traffic, level crossing use and therefore, the potential for risk taking behaviour.	With an increase in traffic within the local area, vehicle drivers might be less inclined to stop at a level crossing if their overall	5	3	15	CCTV monitoring + OD. LC Attendant – Training/Competence.	5	1	5

	journey time has increased since the development of new housing and the influx of new residents; thus, increasing the potential for risky behaviour. The level crossing might not be designed to accommodate the increased number of users; therefore information, walkway/ road widths etc. might require updating.				Train speed maximum 10mph. Education campaign. Enhanced signage Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Introduce a yellow box marking.			
Limited forward visibility. The approach to the level crossing is situated on a bend in the road	Lack of good visibility at the level crossing leading to shunt type collisions.	5	3	15	Introduce a yellow box marking. Traffic calming measures.	5	1	5
Single train line Greater risk-taking behaviour in both vehicle drivers and pedestrians is reported on single train lines. .	This user behaviour is in line with risk compensation theory - the user, perceiving there to be less of a risk to him/herself, behaves less cautiously	4	2	8	Provision of a level crossing attendant to open and close the crossing barriers for users when safe to do so. The level crossing attendant is deployed to monitor and police user behaviour ensuring barriers are operated correctly. Staff Training.	4	1	4

					Maximum train speed 10mph. Enhanced signage.			
Farming vehicles Farm traffic might influence the speed and behaviour of other vehicles traversing the crossing.	Farm traffic tends to move at a much slower speed and, being much larger, reduce the visibility of other vehicle drivers. This can cause distraction and frustration and change other road behaviour; resulting in risk taking actions such as overtaking and not observing the level crossing warning signs.	5	4	20	Power operated barrier. CCTV monitoring + OD. LC Attendant – Training/Competence. Education campaign. Enhanced signage	5	1	5
Commercial driver	Commercial drivers might have increased risk taking behaviour at level crossings. Commercial vehicle drivers, such as salespersons, work to strict timescales and therefore their driving behaviour is often influenced by having to reach destinations	5	4	20	A range of enhancements to improve conspicuity, comprehension of and user response to level crossing warning signs: CCTV + OD The level crossing attendant is deployed to monitor and police user behaviour ensuring barriers are operated correctly.	5	2	10

	on time. Commercial drivers using a level crossing might be inclined to 'beat the lights' to avoid having to wait at the crossing, or they might fail to follow the correct crossing procedure at unprotected crossings.				LC Attendant – Training/Competence. Education campaign. Enhanced signage.			
Adverse weather impacting visual information.	The effectiveness of visual information at crossings can be impaired by adverse weather conditions (e.g. fog and snow). The ability of vehicle drivers or other crossing users to detect the presence of level crossings, hazard information, warning lights or approaching trains might be impaired by adverse weather conditions, e.g. fog and snow. This might result in users failing to see warning information or oncoming trains, which could lead to users unintentionally adopting risky behaviour.		5	3 15	CCTV monitoring + OD.5 New modern full barrier crossing (Audible/visual alarms). Education campaign. Crossing attendant (Monitoring). Reduced road speed on approach to level crossing. Train speed maximum 10mph Traffic calming measures. Enhanced signage.	1	5	

Rother Valley Railway

	In addition, in heavy snow users might not be able to see the tracks and inadvertently stand in a position of danger. Visibility in and around the crossing might also be impaired by banks of snow. An example where foggy conditions have been identified as a causal factor in a level crossing incident investigation is the fatality a Lane No.1 footpath crossing.							
Alcohol and drugs	The effects of drink and/or drugs can radically alter user behaviours. Motor and cognitive function might be impaired and users might also have a reduced perception of risk. Users under the influence of alcohol or drugs might exhibit the following behaviours:	5	3	15	CCTV monitoring + OD (staff training initiatives). Anti-trespass and cattle guard panels are designed to deter people or animals from crossing the track at unauthorised places. Do not trespass signs. New modern full barrier crossing (Audible/visual alarms). Education campaign.	5	1	5

	be more inclined to ignore normal crossing procedures be physically unstable and prone to slips, trips and falls be unable to focus, cognitively and visually have a lower perception of risk.				Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.			
Disabilities.	Disabilities (e.g. reduced mobility, reduced levels of vision/hearing) will influence the behaviour of users at level crossings. Visually impaired users might be unable to see warning lights and signs clearly, or scan for trains before crossing. Hearing impaired users might be unable to hear crossing alarms, train whistles, warnings from people or the sound of approaching trains.	5	3	15	CCTV + OD monitoring (staff training initiatives). level crossing attendant (Monitoring) Increase the volume of the audible warning up to the maximum permitted level to make the alarm more conspicuous and potentially deter pedestrian violations. Additionally, Intelligent auditory alarm –takes account of ambient noise levels and produces alarm 5dB louder so it can always be heard clearly. Power operated barriers. Provision of flange gap	5	1	5

	Cognitively impaired users might have difficulty understanding and following the correct crossing procedure, or interpreting warning signs. Users with physical impairments (permanent or temporary) might encounter difficulties using level crossings of all types, but especially user worked crossings. Potential difficulties include struggling to cross within the warning time provided; being more prone to slips, trips and falls on the crossing, especially if the crossing surface is uneven or missing. Similarly, mobility scooter users might encounter problems with uneven crossing surfaces and the opening and closing gates or barriers.				filler to improve crossing surface. Provision of tactile edges (and stop lines) and clear delineation of the footway at public vehicular crossings. New modern full barrier crossing (Audible/visual alarms). Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.			
Incorrect mental model	Mental models are	5	3	15	CCTV + OD monitoring	5	1	5

Incidents at level crossings could occur if the user adopts the incorrect mental model of how the crossing works.	internal mental representations of an external reality. People develop a mental model of how to use a level crossing from their prior experience of using similar or comparable crossings (or road junctions), from instructions or by observing the behaviour of other users. Users familiar with the operation of one type of crossing might apply their mental model at other types of level crossing.				(staff training initiatives). level crossing attendant (Monitoring) Provision of tactile edges (and stop lines) and clear delineation of the footway at public vehicular crossings. New modern full barrier crossing (Audible/visual alarms). Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.			
Fatigue	Fatigued users will be more susceptible to making errors or to taking shortcuts when crossing. Fatigue has a significant effect on human performance and the likelihood of errors. Level crossing users suffering from fatigue might miss important information	5	3	15	CCTV + OD monitoring (staff training initiatives). level crossing attendant (Monitoring) Provision of tactile edges (and stop lines) and clear delineation of the footway at public vehicular crossings. New modern full barrier crossing (Audible/visual	5	1	5

Rother Valley Railway

	(crossing warning signs, lights, etc), or be more inclined to take shortcuts in the crossing procedure (fail to use the telephone, fail to close the gates at user worked crossings, etc).				alarms). Education campaign. Crossing attendant (Monitoring). Traffic calming measures. Enhanced signage.			
Signaller/CCTV Operator:	'Habit intrusion' in CCTV monitoring CCTV operatives follow habituated patterns of behaviour which might result in the entrapment or injury of crossing users at MCB and MCB-CCTV crossings. Use of level crossings is primarily covered in Local Training Plans and by the training and briefing signallers/Operators receive on communications skills. It is important local training plans cover: hazards associated with a particular crossing,	5	2	10	CCTV + OD monitoring (staff training initiatives). New modern full barrier crossing.	5	1	5

Work in or adjacent to public roadways.	Plant, equipment materials striking traffic/members of public. Traffic colliding with staff.	5	2	10	Authorised road closures and traffic management. Implement pedestrian walkways. Plant to be suitable for access to public roads. Comply with New Roads and Street Works Act and Traffic Signs Regulations.	5	1	5

IN ASSOCIATION WITH THE KENT & EAST SUSSEX RAILWAY

ROBERTSBRIDGE (RVR) JUNCTION STATION, STATION ROAD,

ROBERTSBRIDGE, EAST SUSSEX. TN32 5DG

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Rother Valley Railway - Annex D. Bridleway Crossing, Risk Assessment

Bridleway Safety Management Arrangements including

5 x 5 Risk Assessment

Hazards and possible causes identified	Potential Risk or consequences associated with the Hazard	S	L	RF	Control Measures	S	L	RF
Regular users are more likely to undertake risk taking behaviour at crossings with a low frequency of trains.	The regularity of trains is a risk factor for crossing users, due to "the rarity of them encountering a train and the reduced vigilance that they might therefore demonstrate in crossing". Accidents at are associated with lines that have low frequencies of trains.	5	2	10	The introduction of an audible alarm to provide a cue to users that a train is approaching. RVR intend to use the most relevant up to date safety equipment i.e. Meerkat or Convec.	5	1	5
Regular users and those living close to level crossings are more likely to undertake risk taking behaviour when using the crossing.	Potential behaviour traits of frequent users might include: Expectation by the user that there will not be any trains in the area. Familiar users apply prior knowledge of train times / frequencies. User believes he / she has enough time to beat the train. User has a low level of concentration and is easily distracted. User does not look in both directions. User has low perception of risk. User thinks he / she understands procedure without reading instructions User unaware of risks to subsequent users. User assumes that the train is stopping at the station (based on prior experience) and chooses to cross in front of the train.	5	2	10	The introduction of an audible alarm to provide a cue to users that a train is approaching. RVR intend to use the most relevant up to date safety equipment i.e. Meerkat or Convec. Use of level crossings is primarily covered in Local Training Plans to cover; Hazards associated with the crossing, How to make decisions about whether requests to cross can be granted. how to check whether a crossing is clear.	5	1	5
Low train speeds might increase the risk-taking behaviour of users	It has been established that users might perceive the crossing to be safer to cross when trains are moving more slowly. This might result in them behaving less cautiously e.g. by	5	3	15	The introduction of an audible alarm to provide a cue to users that a train is approaching. RVR intend to use the most relevant up to date safety equipment i.e. Meerkat or Convec.	5	1	5

	crossing while a train is in view, crossing more slowly, or checking the line less often while crossing.				Eyes watching signs to encourage users to behave safely e.g. put dogs on leads, close gates etc. Education Awareness			
Young children who are not old enough to understand safe crossing procedure might cross unsafely.	Young children might not fully understand the risks associated with level crossings or the correct crossing procedure and therefore traverse in an unsafe manner. This issue might be particularly prevalent in locations where it is likely that unaccompanied children use the crossing, such as near residential areas, schools, playgrounds and youth clubs.	5	3	15	The introduction of an audible alarm to provide a cue to users that a train is approaching. RVR intend to use the most relevant up to date safety equipment i.e. Meerkat or Convec. Use of level crossings is primarily covered in Local Training Plans to cover; Hazards associated with the crossing, How to make decisions about whether requests to cross can be granted. how to check whether a crossing is clear. Ensure signage is appropriate for the status and specific risks at, and on the approaches to, a crossing. Education Campaign.	5	1	5
Errors by crossing users might increase at crossings without warning signs or lights in the hours of darkness.	Poor lighting conditions at and around the crossing can affect a user's behaviour in several ways: Failure to see the crossing / crossing equipment and signs. Deviation from the crossing Inability to read crossing instructions. Misjudgement of train speed.	5	2	10	The introduction of an audible alarm to provide a cue to users that a train is approaching. RVR intend to use the most relevant up to date safety equipment i.e. Meerkat or Convec. Use of level crossings is primarily covered in Local Training Plans to cover; Hazards associated with the crossing, How to make decisions about whether requests to cross can be granted. how to check whether a crossing is clear. Ensure signage is			

					appropriate for the status and specific risks at, and on the approaches to, a crossing. Education Campaign.			
The visibility (and hence effectiveness) of information on the approach to and at the crossing is reduced by overgrown foliage.	Overgrown foliage on the approach to a level crossing can obscure signs at the crossing, and also restrict the visibility of approaching trains. This could result in the user either not seeing the sign or train (complete or partial) or the user not seeing the sign or train in time to sufficiently interpret the information and respond appropriately.	5	3	15	Foliage Management System in place. The introduction of an audible alarm to provide a cue to users that a train is approaching. RVR intend to use the most relevant up to date safety equipment i.e. Meerkat or Convec.	5	1	5
An uneven and/or slippery crossing surface might present a potential hazard to those using the crossing.	Poor surfaces might present particular problems for cyclists (especially those wearing cycling shoes with slippery soles), horse riders, mobility scooter users, wheelchair users, the elderly, visually or physically impaired crossing users, and users with encumbrances such as luggage or pushchairs. The crossing surface might also present a hazard to road vehicles in general as well as a hazard to trains. Reasons for uneven/slippery crossing surfaces include: Missing, partial, worn or damaged crossing deck Poor decking panel alignment / position on skewed crossing Wet or icy weather conditions Uneven ballast distribution	3	3	9	Foliage Management System in place which ensures that all crossing surfaces are maintained, including the approach to the crossing, not just the area between the gates and signs. Th Bridleway will allow sufficient space to provide a position of safety before/after the crossing for all users. Additionally, ensuring that the Bridleway crossing surface is profiled as the user moves through the entrance/exit to reduce the risk of slips, trips and fall thus preventing risk of personal injury.	3	2	6

Footpath crossings (including at stations) and bridleway crossings.

ORR provide guidance for all users of footpath and bridleway crossings as described within appendix 1 below, additional information can be found in ORR publication, Level crossings: a guide for managers, designers and operators.

There is only one bridleway crossing, located at Salehurst; see plan below.

RVR will apply all relevant safety measures outlined below, as a minimum, to each bridleway crossing, Additionally, RVR will consider installation of the latest technological solutions to further enhance safety at bridleway crossings, for example,

Covtec System

The Powelectrics remote condition monitoring telemetry has been incorporated into a warning system as part of Network Rail's Railway Upgrade Plan to provide a safer and more reliable railway.

Covtec are specialists, who design, install, operate and maintain surveillance systems for customers ranging from police forces and local councils to large infrastructure operators, such as Network Rail. For this project, they installed solar powered units at level crossings. These reproduce the sound of a train horn and are triggered automatically as a train approaches, providing a secondary warning in case someone at the crossing has not heard the train horn.

These new audible warning units are solar powered and don't require a lot of maintenance, so they are a practical and efficient way to improve safety at footpath level crossings."

There are currently over 170 sites with this safety kit installed. In Kent, the system has been newly-installed at footpath level crossings in Tankerton, Lenham, Whitstable and Aylesford where the user is required to stop, look and listen for a train before crossing.

In Sussex, the system has been installed at footpath level crossings in Pulborough and Rustington in West Susssex and Rye in East Sussex.

RVR are committed to ensuring that everyone who lives or works near the railway are safe, which is why we're researching a variety of projects to improve level crossing safety as part of our Railway development Plan.

Meerkat System

Costain are currently developing an enhanced warning technology system called Meerkat to reduce the number of incidents at passive footpath and bridleway level crossings across Britain.

The new warning devices will detect an oncoming train and provide an audible and visible warning to alert users which will have a significant impact on public safety at level crossings.

The the first units are set to be installed within the next 12 months, with the technology due to be rolled out at sites across Britain over the next five years. RVR are monitoring the program to ensure we install the safest solution for their bridleway crossings.

General description

bridleways are those which:

- are shown on definitive maps and statements maintained under Part III of the Wildlife and Countryside Act 1981; or
- have come into being following public path creation agreements or public path creation orders under Part III of the Highways Act 1980; or
- otherwise exist as either public or private rights of way.

Users are expected to use reasonable vigilance to satisfy themselves that no trains are approaching before they start to cross the line. They should cross quickly and remain alert whilst crossing. Users should have sufficient time from first seeing, or being warned of, an approaching train to cross safely.

Footpath crossings should be protected by a stile or self-closing wicket gate on both sides of the railway. They should not have a gate on one side and a stile on the other, nor different widths or types of gates. Stiles and kissing gates may not be appropriate at crossings where the use of bicycles, pushchairs, wheelchairs, etc. is foreseeable.

Bridleway crossings should be protected by a self-closing wicket gate on both sides of the railway.

Unless required to dismount, it should be possible for a mounted horse rider to open the gates without dismounting.

Riders may be required to dismount because of the presence of overhead live conductors.

Otherwise, assume that horse riders will remain mounted while crossing. Make allowances for young or inexperienced riders to lead their mounts. Consider whether cyclists use the crossing. Where appropriate, take measures to encourage cyclists to dismount.

RVR will provide mounting blocks on each side of the crossing.

At bridleway crossings, the gate should be at the decision point. Where this is not practicable, there should be sufficient space to allow a person on horseback to make a decision from a place of safety.

A sign explaining how to cross safely should be displayed at the decision point on each side of the crossing. Appropriate instructions to the users must be provided at appropriate points.

The minimum width between fences guiding users to the decision point or safe waiting area should be 1m for footpath crossings. For bridleway crossings the minimum width should be 3m. These widths may need to be increased depending on user requirements.

Care should be taken not to provide misleading displays to crossing users. Where, for instance, miniature stop lights are provided on one part of a multiple track crossing, they should be provided on all parts of the crossing.

At a user worked crossing which is subject to additional footpath or bridleway crossing rights, stiles or separate gates for use by the pedestrians or riders should be provided. Vehicular gates may be locked shut and restricted to authorised private usage.

Method of operation

The warning time should be greater than the time required by users to cross between the decision points at either end of a crossing. In assessing how quickly users will cross, take account of the mobility of likely users and the type of crossing surface.

As a guide, a walking speed of 1.2 metres per second (m/s) may be used where the surface is level and close to rail level. In other cases, 1 m/s may be more appropriate. Increase the calculated time to cross to take account of foreseeable circumstances such as impaired mobility of users, numbers of pushchairs and bicycles or where there is a slope or step up from the decision point.

Where the warning time is insufficient, additional protective equipment should be provided and may include:

- miniature stop lights,
- telephones provided on both sides of the crossing and connected to a supervising point, which is always open when the railway line is open; or
- audible warnings of trains (preferably generated at the crossing itself). Where train speeds are low and the service infrequent, whistle boards positioned not more than 400 m from the crossing may help give warning of a train's approach.

Where whistle boards are considered, take account of:

- the speed of sound (330 m/s) and the speed of the train;
- the possibility that train drivers will not sound the horn, especially at certain times of the day or night;
- the possibility that train horns may be inaudible at the crossing because of background noise; and
- the possible impact of train horn noise on nearby residents.
- Where whistle boards are provided, they are normally required on all railway approaches. The time between first hearing a horn and arrival of a train should be the same for trains travelling in either direction

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OFFICE OF **RAIL REGULATION**

24 August 2011

Mr Mike Hart OBE
Rother Valley Railway Ltd
Robertsbridge Station
Station Road
Robertsbridge
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TN32 5DG

Dear Mike

Extension of Kent & East Sussex Railway: Bodiam to Robertsbridge - Proposed railway level crossings

Thank you for the letter you sent to David Keay on 19th July 2011 along with the various enclosures. Apologies that it has taken me a little while to respond to your submission.

The documents summarise the case well and the technical note from John Sreeves of Halcrow is very helpful.

As Halcrow's note rightly says it remains ORR policy that level crossings should be avoided wherever possible. Having said that, where there is a suitable justification we do not object to their creation if they are shown to present tolerable levels of risk to road and rail users, that the alternatives are not reasonably practicable and their creation is beneficial in a wider sense. Such cases are not uncommon in the reopening of disused railway lines by heritage operators.

The documents supporting your proposal refer in a number of places to ORR and earlier guidance. I should advise you that on 4 August 2011 ORR republished the guidance on level crossings[1]. This has updated the previous RSPG guidance and consolidated into it the guidance on how to obtain level crossing orders. Whilst the guidance has been modernised I do not believe that you will find any substantial change in the principles that are set out.

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[1] http://www.rail-reg.gov.uk/server/show/nav.1567

Road Closure times

If you do decide to seek a Level Crossings Act Order one of the important considerations that comes into that process is the effect that the road closure time may have on the 'convenience' afforded to road users. The assessment work of Mott MacDonald is important in that respect.

Within the Mott MacDonald assessment of traffic impact they have used a likely crossing closure time of 45 seconds, with some sensitivity analysis to show the effect of a 60 second closure. ORR guidance is that crossings should normally see a train arriving at the crossing within 27 seconds of the crossing sequence commencing, but our guidance accepts that there may be variability and states that 95% of trains should arrive within 75 seconds. The time taken to pass over the crossing is then clearly dependent on train speed and length, and we would assume that the barriers would be fully raised in a maximum of 10 seconds.

Overall I would suggest that the 'worst case' for the analysis should assume 75 seconds for the train to arrive, with 27 seconds being a minimum.

For a 115m long train, it would take around 11 seconds to pass over the width of a 7 metre wide road crossing at 25 mph, or 27 seconds at 10 mph.

There would then be a minimum of 4 seconds and a maximum of 10 seconds for the barriers to rise.

Theoretical road closure time is therefore a minimum of 27 + 11 + 4 = 42 seconds and a maximum of 75 + 27 + 10 =112 seconds. A normal figure is likely to lie between these extremes, with arrival times of 30 seconds, crossing of 15 seconds and barrier raising of 6 seconds, a total of 51 seconds.

I believe that the Mott MacDonald analysis should consider a slightly longer normal figure than 45 seconds, and that their sensitivity analysis should extend to the extreme 112 second case.

Crossing Layout

Our republished guidance does refer to the importance of sighting for crossings where the train driver has to establish that the crossing is clear as they approach. It appears that the relatively straight alignment of the proposed extension is favourable in this respect and train drivers should be able to see any standing obstructions on the crossings in plenty of time to allow them to brake to a stand.

For the A21 crossing I have would like you to consider whether the provision of a length of central reserve island on either side to the crossing would help to deter motorists from 'weaving round' the barriers. This type of crossing abuse by motorists is all too common and the need for this or other measures to discourage abuse should be considered.

Level Crossing Equipment

Much of the cost of crossings can come from the specialised control equipment that so often seems to be deemed necessary for such cases.

Given the mitigations that exist by the slower speed of operation of the railway you might consider that systems to normal railway signalling levels of integrity may not be required and instead systems that operate to the levels expected of road traffic signal controllers may be perfectly acceptable. For example ORR is supportive of the work being done by the Romney, Hythe and Dymchurch Railway into the development of PLC based level crossing control systems and welcomes innovative new approaches that can reduce industry costs while maintaining appropriate levels of safety.

In summary I hope you can be assured that whilst we do not welcome new level crossings, we would not object in principle to crossings being created in this case. There are clearly many details to be developed and I will look forward to hearing from you as the proposals progress.

Yours sincerely

I. Raxton

Eur Ing Ian Raxton
HM Inspector of Railways

INVESTOR IN PEOPLE

OFFICE OF **RAIL REGULATION**

Mr Mike Hart OBE
Rother Valley Railway Ltd
Robertsbridge Station
Station Road
Robertsbridge
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TN32 5DG

Your Ref: n/a

Our Ref: #435949.02

Case Ref: 4264052

20 January 2012

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Dear Mike

EXTENSION OF ROTHER VALLEY RAILWAY – LEVEL CROSSINGS

After the discussions we have now had over some time I thought it would be helpful to summarise the topics into one letter so that we can move forward.

Principle of crossings

As other safety issues have been brought under better control on Britain's railways so incidents at level crossings have become an ever larger proportion of the risk on railways, whether mainline or heritage operations. For this reason the Office of Rail Regulation (ORR) policy to is resist the creation of new level crossings, indeed we actively seek the closure of existing crossings when possible.

This policy is driven very much by the large number of crossing on the mainline railway and the substantial risks that collisions on these crossings represent with fatalities and multiple serious injuries being normal outcomes.

Crossings on minor railways can present a different risk profile however due to the differing form of operation compared to the main line. Where an out of use railway line is being brought back to use with wider benefits to the locality there is a persuasive argument that a crossing can be reinstated with modern crossing controls, and if used properly by all users, as a 'safe' option for crossing the highway.

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As a regulator ORR's main tool for considering all works is the Health and Safety at Work etc. Act 1972. From this comes the principle that "risks are reduced to as low as is reasonably practicable", and in turn this gives us the concept of "reasonable practicability".
Any proposal to build a crossing would have to be shown to the most practicable option which means demonstrating that constructing a bridge, either for road or rail, would be disproportionately expensive compared to the benefit achieved.

Having considered the arguments that you have put forward I believe that in each of the three crossings it is not practicable to have grade separated crossings of road and rail and that an at-grade level crossing of the highway is the practicable option.
Overall the reinstatement of the railway would seem to have considerable benefit to the community at large.
As a minor railway the speed limit on both the existing Rother Valley railway and the Kent and East Sussex Railway is a maximum of 40 kph (25 mph) and I would not expect the extension to seek any higher maximum speed, indeed I would expect that for some of the crossings locations you will wish to impose a lower train operation speed.
There is no reason why if the crossings are constructed to modern standards that risks should not be tolerable.

As a result I think that in the case of all three crossings I would not make any objection to their reinstatement.

Power to cross the highway

As all three roads being crossed are public highways you will need some form of powers to cross the highway and interfere with the public's right of way.
The modern method to achieve this is the Transport and Works Act Order (TWAO), though similar powers exist though the old Light Railways Act Orders and the various form of Private Acts of Parliament that some railways hold.

Modern TWAOs for railways can be quite diverse in their format, but all will as a minimum create the railway as a statutory undertaker and give the right to cross the highways on the level.

TWAOs have other benefits such as providing powers to compulsory purchase land if required and providing an alternative to some aspects of local planning processes.
It is likely that a public enquiry would need to be held as part of the process.

Once powers to cross are in place via a TWAO then the railway would be in a position to construct and operate the crossings.

In some cases it is found necessary to have in addition to the TWAO an order under the Level Crossings Act (LCA) 1983 as well. These orders cannot in themselves create the right to have a crossing, but where that crossing has been authorised by other powers then the LCA order can define in detail the form and operating method of the crossing and define the respective responsibilities of the railway and the highway authority.
I would emphasise that a LCA order is not compulsory; indeed the majority of UK level crossings do not have such orders.

It is ORR who administer and issue LCA orders on behalf of the Secretary of State. The process for seeking LCA Orders is set out in the recently republished ORR guidance document RSP7[1] "Level crossings: A guide for managers, designers and operators". This guidance note also sets out what ORR considers good practice for various crossings types.

Having reviewed the report produced on your behalf by Mott MacDonald I believe that it will be possible to create a safe at-grade crossing at all three sites if designs along the lines of those set out in the report are provided.

I look forward to seeing your future proposals in due course.

Yours sincerely

Ian Raxton
HM Inspector of Railways

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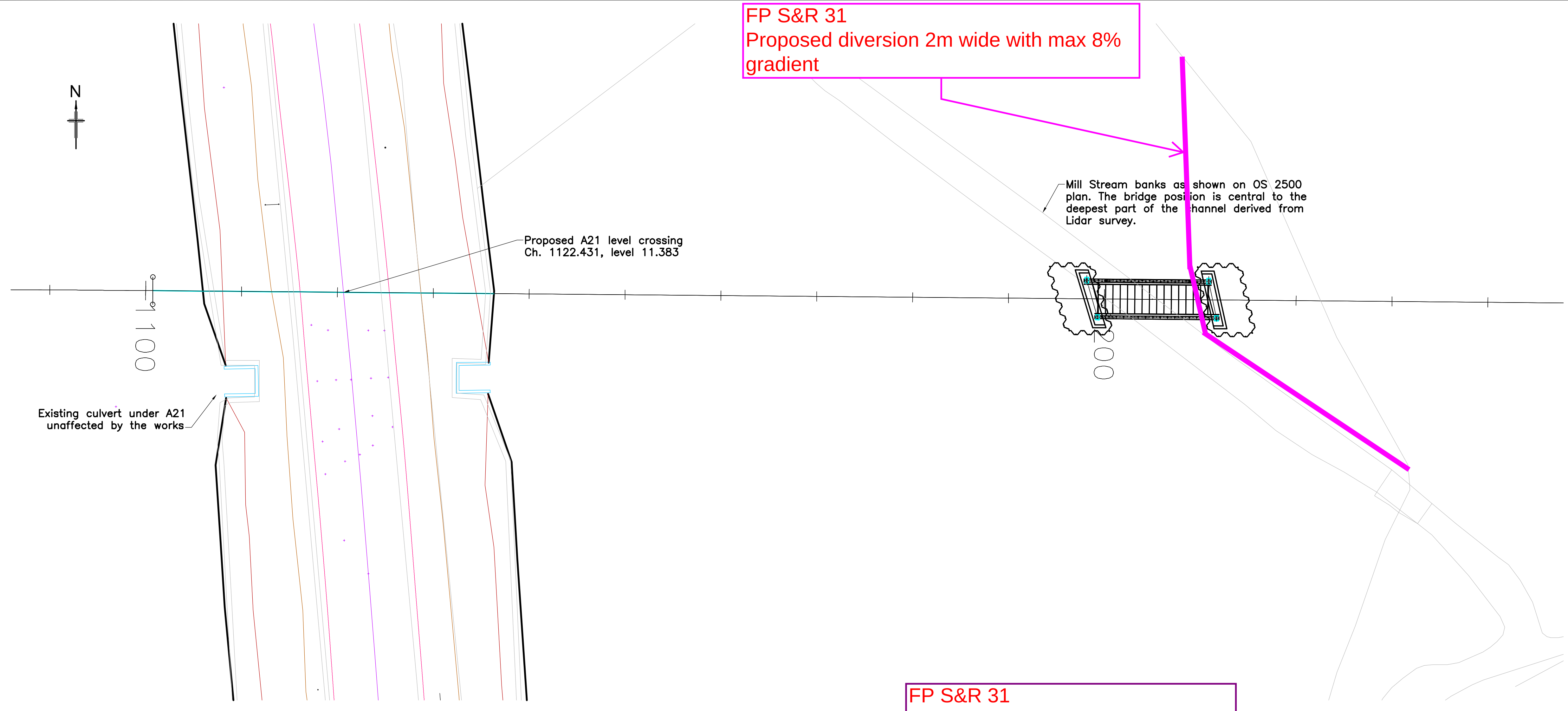
[1] http://www.rail-reg.gov.uk/upload/pdf/level_crossings_guidance.pdf



SITE PLAN
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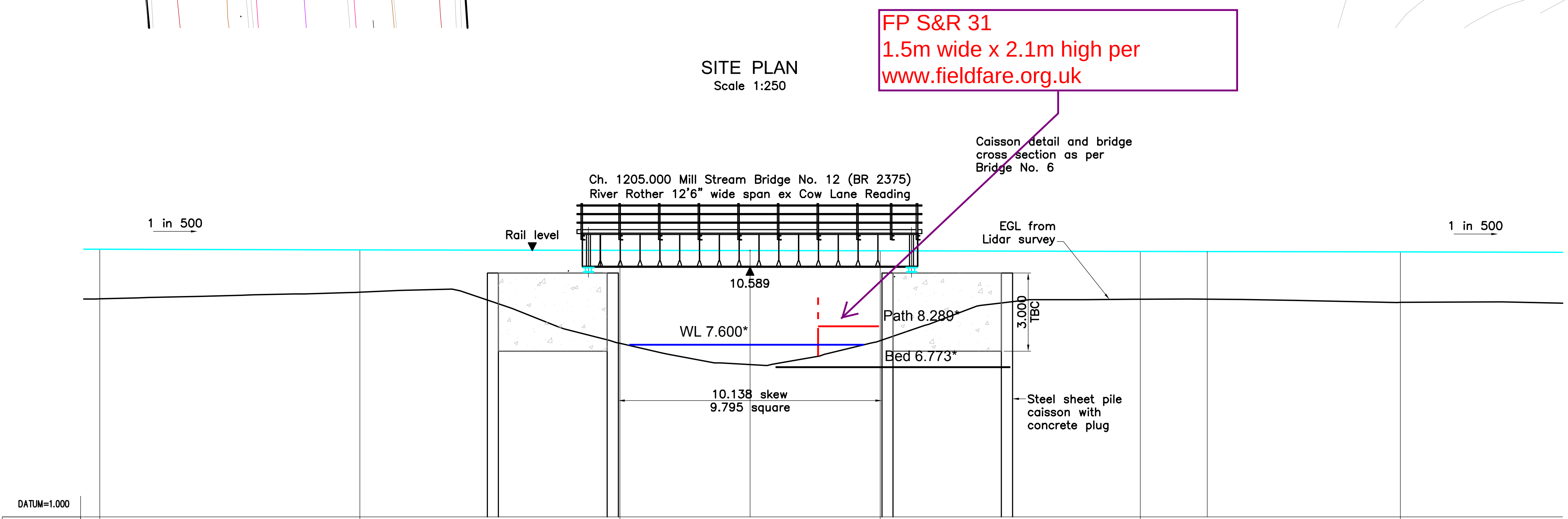

RAIL Level	11.280	11.260	11.240	11.230	11.220	11.200	11.195	11.180
Exist ground	9.374	9.631	7.666		7.769	9.358		9.239
CHAINAGE	1180.000	1190.000	1200.000	1205.000	1210.000	1220.000	1222.573	1230.000

LONGITUDINAL PROFILE & ELEVATION A-A
Scale 1:100

NOTES

1 Imperial measurements are exact and take precedence over metric.

2 .

1:250 5 0 5 10m
1:100 2 1 0 2 4m
1:50 1 0 1 2m

* Levels to be checked by survey

Revision	By	Checked	Approved	Date	Description

Client
Rother Valley Railway Ltd
Rother Valley Railway Station, Robertsbridge, East Sussex, TN32 5DG
Tel 01580 881833
www.rvr.org.uk
Rother Valley Railway

Halcrow Transportation Infrastructure
Burderop Park Swindon Wiltshire SN4 0QD
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www.halcrow.com
Halcrow

Project
ROTHER VALLEY RAILWAY

Drawing
MILL STREAM BRIDGE
SITE PLAN

Drawn by JCS Date: 10/10/13
Checked by - Date: -
Authorised by - Date: -

Drawing No. RVR - UB12 - 001 Revision 2

Drawing Scale: 1:25, 12.5 at A1
CAD Filename: - Plot Scale: 1:1

FILE STORAGE PATH =
XREF STORAGE PATH =
ORIGINATING DEPT = HTI - BP
PLOT DATE = 10/10/13

ADVICE ON

Gaps, Gates and Vehicle Barriers

The British Horse Society

Advice applying in England and Wales only[1]

The British Horse Society is often asked by government agencies, local authorities and landowners for the ideal equestrian gate. For ultimate safety, convenience and ease of use there should be no gates across a route. A gate is a barrier that has to be negotiated by equestrians and, no matter how good its design or installation, there is a risk attached. For equestrians, a gap is always preferable to a gate.

However, there may be times when a gate may be considered essential. Under certain conditions new gates on a right of way may be authorised by the highway authority. Government guidance for local authorities in England about rights of way, including the authorisation of structures on rights of way, is given in circular 1/09 (version 2) and may be found at www.defra.gov.uk/publications/files/pb13553-rowcircular1-09-091103.pdf. Extracts from this circular are reproduced at Appendix A. Guidance in Wales may be found at www.wales.gov.uk/topics/environmentcountryside/consmanagement/countrysidecoastalaccess/rightsofway.

The provision of any gate should always comply with the requirements of the Equality Act 2010. The British Horse Society reminds highway authorities and landowners that, on routes used by equestrians, persons with mobility problems may include persons on horseback or driving a horse-drawn vehicle, for whom the horse can provide a means of taking healthy exercise and accessing parts of the countryside that they would otherwise be unable to reach. The provisions of the Equality Act apply equally to such persons. English Government guidance for local authorities on compliance with the Equality Act 2010 may be found at http://archive.defra.gov.uk/rural/documents/countryside/prow/gpg-equality.pdf. Its most important elements are reproduced at Appendix B.

The Society maintains that, in accordance with good practice, all installations should comply, as a minimum, with the relevant British Standard where one exists. The Society was represented on the group that designed the British Standard for Gaps Gates and Stiles, BS 5709:2006 and endorses the policy of providing the 'least restrictive option'.

Even the best designed and most carefully installed and maintained gates present some inconvenience and safety issues to equestrians, some a great

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[1] For advice on gates and barriers in Scotland, contact Helene Mauchlen, BHS Director for Scotland, Woodburn, Crieff, Perthshire PH7 3RG; 02476 840727; helene.mauchlen@bhs.org.uk. For information on Northern Ireland, contact Susan Irwin, BHS Director for Ireland, 02476 840736, s.irwin@bhs.org.uk.

deal more than others. No single design of gate will always be suitable in every situation. The most appropriate type of gate, hinge and catch will vary according to many factors, such as the environment and landscape, the purpose of the gate, the likely users of the route (including the landowner or occupier), the type of livestock, the wind conditions and the soil.

The Society's recommendation [2]

1 The Society's first preference is always for a gap. The minimum clear space should be 1.5m (5ft) on a bridleway and 3m (10ft) on a byway or restricted byway, as provided in the Highways Act 1980.

If a gate has to be provided, the Society's order of preference is:

2 A gate complying with BS 5709:2006 without a self-closing mechanism, preferably with a simple hook and chain at the top of the gate, although other catches may also be acceptable[3] (that are not self-closing or securing).

The Highways Act 1980 provides that on a bridleway, there must be a minimum of five feet (1.5m) clear space between posts, or wider if conditions permit; on a byway or restricted byway, there must be a minimum 10 feet (3m) of clear space. If a mid-height latch is required[4] then the latch shall have a handle extending above the top rail of the gate[5]. If a spring bolt latch is used it shall, if possible, be protected and be operated by an approximately vertical rod as its lever[6].

3 A hydraulic self-closing gate complying with BS5709:2006 with an

[2] This recommendation does not apply to gates at railway crossings used by equestrians, see 'Gates associated with railway crossings'.

[3] The British Standard states that mechanisms should be 'visible, accessible and operable from both sides of the gate'. For equestrians, they should also be accessible while mounted (above the second rail from the top of the gate) and operable with one hand.

[4] Gates longer than 1.8m may flex sufficiently that if secured by a latch at the top rail, stock, especially lambs, are able to push against the bottom of the closing end of the gate, force a gap and either squeeze through or become trapped. A latch at mid-height may therefore be necessary but must have a lever to operate it from above the top rail.

[5] Some catches may not be operable on foot or from a wheelchair from both sides of the gate. Equality of access standards may require a latch that can be operated from the top of the gate by riders and lower down by other users (Equality Act 2010).

adjustable closing mechanism set to close with a closing time of a minimum of 26 seconds[7] (pending further research – see 'Problems with self-closing gates')

Self-closing gates have disadvantages and hazards for equestrians and should only be used if livestock security is high priority (such as for a gate adjoining a busy A road) and there is evidence that a non-self-closing gate will be left open by users.

4. Where the above are not possible, a solution to be agreed with the local BHS Access and Bridleway Officer and approved by the Regional Access and Bridleways Officer following national BHS guidelines.

In accordance with the principle of least restrictive option, gates installed for livestock security should be removed or tied back when there is no livestock in the field.

Once installed, gates cannot be forgotten. Catches and gates on wooden posts will need repeated checking and adjustment because the gates and posts will shrink and swell as they age and with the effects of the weather. Gate posts on clay ground will need to be well concreted in and the gates checked more frequently because of clay's tendency to move.

Good installation and maintenance are vital. The best gate and latch in the world can be difficult to use if put in poorly or not maintained.

Health and Safety

For health and safety reasons, good gate design and installation on public equestrian routes are essential to avoid injuries to horse and/or rider. Very serious injuries may be caused to a horse and/or rider by poorly designed or installed gates, latches or hinges.

A rider's leg or the horse may be gashed or severely bruised while passing through a gateway. If a rider is unseated or thrown when the horse is injured

[6] There are 'cattle-proof' handles manufactured for spring latches which extend above the top of the gate. They comprise a metal sleeve, sliding over a vertical rod, which has to be lifted to clear its retainer before it can be pushed towards the gate hinges to retract the spring bolt of the latch. This design is to prevent cattle opening a gate by rubbing against a simple rod handle with sufficient pressure to withdraw the spring bolt. However, they are much more difficult to operate for equestrians and those with protected characteristics, requiring movement in three directions at once, and therefore should be fitted only where absolutely necessary.

[7] The time used in the BHS trial – 'A trial of self-closing bridle gates and a horse friendly vehicle barriers' by The British Horse Society 2011 (www.bhs.org.uk/~/media/BHS/Files/PDF%20Documents/Access%20leaflets/BHS%20Gates%20report%202011.ashx) published 2012.

or frightened while going through a gateway, very serious injury or even death of the rider could result.

The horse is likely to be frightened if it is bumped or trapped by the gate, if the horse's or rider's leg becomes caught on anything attached to the gate or gatepost, or if part of its bridle, martingale, saddle or stirrup becomes caught up on the gate, gatepost or latch.

Once injured or frightened while going through a gate, a horse will remember the experience. Afterwards, it will then either refuse to go through gates or panic and rush through them, making it more likely that the rider's leg or the horse will be caught against the gatepost and possibly the rider be unseated and/or severely injured. Even after months of retraining, some horses will never go through a similar looking gate again without fear. An accident at a gate can also damage the horse's overall confidence in its rider, making horse and rider altogether less safe, not only while negotiating gates, but also in other situations such as in traffic or on a bridge over a motorway.

A previous accident at a gate, or fear of an accident at a gate, leads riders to avoid using routes with gates. Once one horse or rider in a district has been injured by a gate, other riders will understandably be reluctant to risk their horse and their own safety by using the gate. As there is rarely an alternative off-road route or circuit for horseriders, this will result in equestrians having to ride on roads. The effective loss of off-road routes and circuits can be very damaging to local equestrian businesses.

Therefore, on routes used by equestrians, every effort should be made to ensure that gates, their hinges and closing mechanisms are designed and installed so that they are safe and easy for equestrians to use. This applies not only to the gate itself but also to the construction and the immediate environment, such as the height of the hanging and closing posts and the adjacent fencing, vegetation and ground conditions.

A summary list of the installation requirements to make a gate safe and easy to use for equestrians is at Appendix C.

Manoeuvring space

The British Standard's emphasis on providing sufficient unencumbered manoeuvring space around the gate and on a firm level surface is particularly important.

There needs to be space for the horse's head and neck when the horse stands parallel to the gate facing away from the hinges with the latch approximately level with the horse's shoulder so that the rider can reach and operate it, and space for the horse to approach the gate and turn to this position.

This 'heels to hinges' method of operating a gate (see Appendix D) is recommended as the safest because it substantially reduces the chance of the reins, bridle or martingale becoming caught up on the gate or its handle, or of the horse being hit on the underside of its jaw by the gate or handle. It enables the rider to operate the gate one handed, controlling the horse throughout the manoeuvre with the other hand, thus avoiding a possible loss of control of the horse or gate while the rider changes hands.

Allowance needs to be made for the space taken up by the gate as the rider pulls it open and by the horse as it reverses while the rider operates the gate. Two or more horses travelling together will need more space; normally a group of three horses should be allowed for, since a horse may become difficult to control if left alone while its companions move on.

Ideally, for safe and easy operation of a 1.5m bridle gate, a minimum clear manoeuvring space of 4m (preferably 5.8m) wide by 4m long should be provided before and after the gate, with a minimum additional 4m length of waiting space if use by groups of horses is likely[8]. The gate should be positioned within the in-line fencing so that at least 1.8m of space is available for the horse's head and neck beyond the gate catch when the horse stands parallel to the gate. For a field, byway or restricted byway gate the total width required for safe and easy operation on horseback will be a minimum of 4.8m (to provide 1.8m of space for the ridden horse's head and neck beyond the latch post when the horse stands parallel to the gate), and the length on the opening side may need to be increased, depending on the length of the gate.

Riders of larger horses may not be able to operate a bridlegate using the heels to hinges method as, because of the length of the horse, the rider cannot keep a hand on the gate and may have to approach diagonally, making the space required at the latch end particularly important, so that the rider can position the horse beyond the latch in order that they may reach it with the hand closest to the hinges.

For all gates and barriers, the manoeuvring space must be on even solid ground, have no overhead or trip hazards, no ditches, holes, steps or deep mud, and no signs or notices intruding into the space where the horse's

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[8] In the 2011 BHS trial of self-closing gates (www.bhs.org.uk/~/media/BHS/Files/PDF%20Documents/Access%20leaflets/BHS%20Gates%20report%202011.ashx), a width of approximately 5.8m was provided, and several horses needed to use all this space.

head needs to go for heels to hinges operation.

Any obstacle or impediment within or close to the manoeuvring space and gateway greatly increases the difficulty of operating the gate safely and provides potential for injury to horse or rider. This includes low overhanging branches, roofs or gutters, barbed or electric wire, loose wire or sheep netting, overgrown hedges, steps, sleepers or the bar of an H-frame gate, ditches, uneven or sloping ground or other obstacle. Electric fencing near gates can present a particularly serious hazard and obstruction to use. Please see the Society's advice note on electric fencing.

There should be no vegetation poisonous to horses (such as yew or privet) within the manoeuvring space as the rider may not be able to prevent the horse from eating it while trying to operate the gate. Nor should there be any prickly or stinging shrub or plant within the manoeuvring space.

Where for legal or for valid environmental reasons sufficient clear manoeuvring space cannot be provided, the Society recommends that a mounting block should be made available on each side of a gate, in a position where it can safely be used. Guidance on the design and positioning of mounting blocks is at Appendix E. A self-closing gate is not the answer. Indeed it may compound the problem, especially if it is one-way opening.

The need for manoeuvring space means that gates should not be placed on bridges, narrow lanes or where width is less than 4m because it would be difficult and could be dangerous for a mounted rider to open and close the gate.

Gates beside roads should be set back to allow manoeuvring space off the carriageway and, ideally, the waiting space beside a road should be large enough for at least three horses to wait before or after passing through a gate, because a horse will become difficult to control if asked to wait on its own on one side of the road when its companions have crossed.

Gate width

Some of the bridleway gates which cause problems or accidents for riders prove, on measurement, to be of less than the statutory minimum width of 1.5m (5ft) between the gateposts (Section 145 of the Highways Act 1980, see Appendix F).

The local authority should be contacted if a public bridleway gate is narrower than 1.5m (5ft) between the posts and asked to exercise its statutory powers.

In 1835, when the minimum statutory width for a bridle gate was set, bridle gates would normally have been one-way opening, with their hinges and catch mounted on the outside face of the gatepost, so that the gap between the gateposts would not have been narrowed by anything protruding into it. This is not the case with many modern gates. The Society recommends that where the catch, or hinges, or the gate when open, take up some of the space between the gateposts, the gap between the gateposts should be widened so as to ensure that fully five feet of space is provided for riders to pass through.

Where space permits, a 1.68m (5ft 6in) or 1.8m (6ft) wide gate can be better for riders, while still deterring motor vehicles.

A 1.5m (5ft) to 1.8m (6ft) gate is generally easier to handle, particularly in a strong wind, than a longer field gate. As it is lighter, it is also less likely to cause the gatepost to shift and the catch to become misaligned. However, on a restricted byway, byway open to all traffic, or public carriageway, a 3m (10ft) gate is required[9].

Where a bridleway or byway goes through a wide gateway with double field gates, one of the gates should be firmly anchored so that the rider only has to move one gate. If neither gate is pinned and both swing under their own weight, this can present an impossible situation for anyone alone, with or without a horse. The central anchoring pin or gatepost must fit into a metal sleeve sunk into concrete or rock so that the gate does not drop and become impossible to operate on horseback.

Use of gates while mounted

Gates on public equestrian routes should not require the rider to dismount in order to use them.

Riders are not encouraged to mount from the ground as this can induce back pain in the horse and/or twist the saddle. For these reasons, many riding schools insist that all clients mount using mounting blocks. Furthermore, many horse riders cannot, or cannot easily, dismount and remount when out on a ride. There can be many reasons for this: a minor or major disability affecting the rider[10], age of rider, a large horse, a small rider, a fidgety or young horse, a horse with a sensitive back, riding one horse and leading another.

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[9] Highways Act 1980 Section 145

[10] See Appendix B for English government guidance on the Equality Act 2010 and www.wales.gov.uk/docs/desh/publications/101005gatesen.pdf for Welsh government guidance

Some circumstances make mounting and dismounting difficult or even dangerous when on a ride, for example where there is livestock in a field which the rider is entering or exiting, particularly young cattle or defensive suckler cows and their calves, or other horses.

Having to dismount and remount, especially repeatedly, severely reduces enjoyment of the ride for even the most agile rider with the easiest horse.

The ridden horse is controlled by the reins and the rider's seat and legs. When the rider dismounts, two of these means of control are removed. The reduction in control reduces safety for both the rider and any other people nearby. There may be a particular lack of control while the rider attempts to remount.

In a narrow gateway such as a bridle gate, the horse may accidentally tread on the rider or even knock the rider over while the dismounted rider is trying to lead it through the gateway; this is particularly the case with one-way opening self-closing gates as the rider may not have space to hold the gate off the horse while they both pass through the gateway.

While there is no specific statutory requirement for bridleway gates to be useable on horseback, the owner of the land is required under Section 146 of the Highways Act 1980 to keep any gate or similar structure across a bridleway or restricted byway in a safe condition, and to the standard of repair required to prevent unreasonable interference with the rights of the persons using the bridleway or restricted byway. The persons using a bridleway or restricted byway will normally include persons on horseback. In the case of Durham City Council v Scott (1990), Lord Justice Watkins and Mr Justice Potts held that gates tied by twine to hedges and held closed by a loop of twine, barring the entire breadth of a bridleway, constituted an obstruction of the highway, although it was clear that members of the public were able to pass and re-pass, access only being momentarily deferred. They directed the justices to convict Mr Scott.

Gate catches

Different types of gate catches with their advantages and disadvantages are given in Appendix G. In general, equestrians need:

1 A catch that can be operated from horseback with the lever or catch on the top of the gate so the rider does not have to bend so low as to risk being unbalanced. For fastenings below the top rail, an extended handle should be provided to enable use on horseback for horses and riders of all sizes and abilities.

2 A catch that can be operated together with the gate, with one hand only. The other hand is needed to hold the reins and control the horse. Dropping the reins to use two hands is asking for trouble (and conflicts with the Highway Code).

3 A catch that does not need much physical strength to operate as 75 percent of riders are female, 34 percent are children; some have arthritic hands or other disabilities (Equality Act 2010).

4 A catch that can be operated equally easily from either side of the gate. The rider needs to be able to see what she is doing and to be able to reach the catch.

5 There should be no sharp edges and no horizontal projection from the side of the gate or gatepost that can catch, cut or bruise the side of the horse, the rider's leg or the saddle (all have happened to riders).

6 Where the catch protrudes into the gateway, extra space between the posts needs to be allowed so as to ensure that safety is not compromised.

7 The catch should allow some leeway for the gatepost to move a little (they all do) and for the rider to close it quickly and easily.

8 Operating the catch should be straightforward and obvious and remain at the top of the gate even if the rider has to let go of the handle in order to control the horse, the catch should remain possible to operate while mounted.

9 A handle that requires lifting as well as pulling is difficult to use (and disliked by riders). It will be particularly difficult for riders with disabilities.

Problems with self-closing gates

The Society has become aware of an increasing number of accidents and incidents occurring which are associated with self-closing gates. Seventy-five percent of the accidents and incidents with gates reported to the Society between November 2010 and the end of October 2012[11] have involved self-closing gates.

It has too often been found that self-closing gates have been installed with insufficient manoeuvring space, perhaps because the installer has wrongly assumed that manoeuvring space is not required if the gate is self-closing.

Self-closing gates are almost impossible to use when riding and leading a

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[11] Reports to its accident reporting website, www.horseaccidents.org.uk

horse. Any hazard or risk associated with single horses rises in groups travelling together.

As a result of the increasing number of problems and accidents that horse riders have been experiencing in negotiating self-closing bridle gates and in the absence of any formal published trials of self-closing bridle gates, in 2011 the BHS conducted a trial[12] to identify a commercially available, self-closing bridle gate, installed to comply with British Standard 5709:2006, which closed reliably and which was safe and easy for horse riders to use. The main findings and recommendations of that trial were:

1 Self-closing bridle gates are inherently neither as safe nor as easy to use for horse riders as British Standard 5709:2006 compliant non-self-closing gates and, following the principle of the least restrictive option, should not be used routinely on public rights of way or other land with statutory equestrian access.

2 The Centrewire 'Worcester' hydraulic one-way gate was the best of the six gates trialled when set to its maximum closing speed of 26 seconds. However, there were still some problems for riders with this gate.

3 The Centrewire 'Chiltern' two-way self-closing gate as supplied is not recommended for use and should be discontinued promptly.

4 None of the other self-closing gates (the Centrewire 'Henley' one- and two-way gates, the Centrewire 'Chiltern' one-way gate and an unbranded wooden one-way gate) can be recommended in preference to non-self-closing gates installed to meet British Standard 5709:2006.

5 Following the principle of least restrictive option, stockproof handles should not be installed except where it can be proved that they are needed and that the need outweighs the potential damage to horse and rider.

6 Any self-closing bridle gates (including those which self-close only through non-purpose-made offset hinges) which have been installed in conditions which do not provide clear manoeuvring space to the British Standard and The British Horse Society's recommendations should either be repositioned or their surroundings altered so that they fully meet the requirements for manoeuvring space, and adjusted to close as slowly as possible, or be replaced by well-balanced non-self-closing gates.

7 Gates can be one- or two-way opening. One-way self-closing gates

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[12] 'A trial of self-closing bridle gates and a horse friendly vehicle barrier' by The British Horse Society 2011 (www.bhs.org.uk/~/media/BHS/Files/PDF%20Documents/Access%20leaflets/BHS%20Gates%20report%202011.ashx)

performed better than the two-way gates tested. The riders found the one-way gates easier when pulled towards them and also often preferred to open the two-way gates towards them. Evidence suggests that there may be a difference between men and women as to whether they prefer to open gates towards them or away from them, perhaps due to relative strength. The majority of horseriders in the UK are female. Further research on the relative merits of one or two-way gates may be required.

8 Further research is required and includes:

- Establish an optimum overall closing speed and the best balance between the controlling screws for the Centrewire 'Worcester' hydraulic one-way gate which will allow safe and easy passage for riders and their horses but ensure that livestock cannot escape.
- Test the Centrewire 'Worcester' hydraulic two-way bridle gate.
- Establish whether self-closing bridle gates perform better if they were widened to provide more than 1.52m clear width when fully open.
- Establish whether the comparative results between the Centrewire gates in this trial would be substantially different if all or none of the handles were stockproof.
- Test the gates with users with a full range of disabilities who access the countryside and rights of way in compliance with the Equality Act 2010.

This research should be conducted by Natural England, other government bodies, gate manufacturers and/or landowner organisations, in conjunction with the BHS.

9 While the additional research is pending, it is recommended that the routine installation of self-closing bridle gates should be discontinued. (A possible solution where there is a proven need for extra livestock security is the New Forest Box Gate, see Appendix H.)

10 British Standard 5709:2006 requires revision in respect of self-closing bridle gates.

Gates associated with cattle grids

Particular legal requirements apply to cattle grids. Please see the BHS advice note on cattle grids for legal information and the Society's recommendations on design. Key safety points are:

- The gate should always be hung with hinges towards the grid so that the horse is as far from the grid as possible while the rider is operating the catch.

- There should be a fence separating the grid from the bypass area and its immediate approach so that a horse cannot step into the grid if startled while in the bypass.
- There needs to be adequate safe manoeuvring space around the gate, especially at the latch end so that there is room for 'heels to hinges' operation.

Gates associated with railway crossings

For safety reasons, horses and riders need to cross and exit the railway as speedily as possible; therefore bridle gates should always open away from the railway, should be gently self-closing and should have no latches. If a latch is necessary to prevent livestock from straying onto the railway, a generously proportioned corral (at least 5.8m wide x 8m long is recommended) should be provided leading to a further gate which is either two-way opening or opening towards the livestock field. There should be no barbed wire, electric fencing or other hazards on or inside the corral.

However, on the principle of least restrictive option, fencing the livestock off the right of way should be considered first.

On railway crossings where there are latched carriage gates with narrow pedestrian gates beside them, the Society strongly recommends that where the crossing could be used by ridden horses the pedestrian gates should be replaced with bridle gates as above. This minimises the risk of a collision due to the horse and rider having to linger on the railway while they struggle to close one gate and then open the next.

Anti-vehicle barriers

Attempts to prevent mechanically propelled vehicles using bridleways and restricted byways have led to the development of a number of arrangements designed to allow access for equestrians to paths where no livestock is present, while deterring access by motor vehicles. Such barriers are obstructions on a right of way unless the right of way was created subject to barriers as limitations, or unless they are installed by the highway authority under Section 66 or 115B of the Highways Act 1980.

However, unless well designed and installed, these barriers to vehicular access can cause serious hazards for horses, riders and other members of the public. It is very important that installations comply with the specifications and recommendations at Appendix I, otherwise very dangerous structures may result. It is also important that the requirements of the Equality Act 2010 are considered.

While recognising that no such barrier is 100 percent effective in deterring motorcycles, the Society recommends that where such measures prove really necessary and the legal conditions are complied with, the Horse Stile or the Kent Carriage Gap as specified in BS5709:2006 as appropriate should be used (Appendix I).

Horse stiles must not be installed with gates across them. This is vital. The sleepers of the stile prevent safe operation of the gate.

If vehicular access along a bridleway needs to be maintained for the landowner or occupier and there is insufficient space for a gap, bridle gate or Horse Stile complying with BS5709:2006 as appropriate to be installed alongside a locked field gate, the anti-vehicle gate/horse friendly vehicle barrier (which can be locked) is a possible solution, though the least restrictive option would always be a gap. See Appendix I for installation requirements.

It is particularly important that with any of these structures there should be a straight approach and landing, the ground should be flat and well drained and soft enough that the horse will not slip or injure itself if it jumps it. There should be ample space for at least three horses to wait safely and comfortably between a horse stile or anti-vehicle barrier and any motor vehicular road, plus space to land safely if the horse jumps the structure. Horses are herd animals and a horse can become anxious and difficult to control if its companions have crossed the road leaving it alone. Most horses will have been taught to jump structures similar to horse stiles and anti-vehicle barriers, and some horses may fail to understand that they are not supposed to jump these.

Appendix A – Government Guidance in England

Circular 1/09 from the Department for Environment, Food and Rural Affairs, provides the following guidance concerning gates on public rights of way:

6.7 Stiles, gates and other structures on a public right of way are unlawful obstructions on a public right of way unless they are recorded on the definitive statement as a limitation or it can be shown that the way was dedicated with such a structure despite not being recorded on the definitive statement (i.e. the statement requires updating) or have been authorised by the highway authority under section 147 of the 1980 Act. Authorisation to install a structure may only be granted in relation to footpaths or bridleways (but not restricted byways or byways open to all traffic) where the owner or occupier of agricultural land, or land being brought into such use, makes an application showing that the structures are necessary for preventing the ingress or egress of animals. Section 145 of the 1980 Act specifies that a minimum width of 5 feet must be provided for gate across a bridleway. On granting consent for a structure an authority may impose conditions for maintenance or ease of use by members of the public. A highway authority is required to keep a record of any authorisations granted and it is considered good practice to make such records publicly available. It is known that some authorities have poor records of structure authorisations and it would clarify matters if any shortcomings were addressed by reassessment of the validity of structures erected under claimed section 147 agreements.

6.8 The requirements of the Disability Discrimination Act 1995 (as amended by the Disability Discrimination Act 2005) will be particularly relevant in specifying limitations or authorised structures. In authorising a structure, section 147 of the 1980 Act requires the authority to have regard to the needs of persons with mobility problems. Whilst there are no mandatory standards laid down for structures which, if met, will satisfy the requirements of the Disability Discrimination Acts, the British Standards Institute has developed a comprehensive standard, the current version of which has been published as BS5709:2006. The Pittecroft Trust has produced an explanatory document to describe BS5709:2006. Authorities may develop their own comprehensive standards for the purpose of meeting the requirements of the Acts.

6.9 Unless a way is dedicated with a limitation of a gate, restricted byways and byways open to all traffic may not have such a structure placed across them. Section 145 of the 1980 Act specifies that a byway gate must have a minimum width of 10 feet in circumstances where such a gate may be installed.

6.10 Under section 146(1) of the 1980 Act, landowners are responsible for maintaining gates, stiles and similar structures across footpaths, bridleways or restricted byways, whether or not they are shown on the definitive map. Authorities must contribute not less than a quarter of the expenses reasonably incurred by landowners in doing so. Where it appears to an authority that the landowner is not complying with his statutory duty, the authority may give notice to the landowner of their intention to take the necessary steps for repairing and making good the stile, gate or other works. The authority may recover the expenses reasonably incurred on doing so from the landowner.

6.11 Under the provisions of section 147ZA of the 1980 Act a highway authority may enter in to an agreement with a landowner, lessee or occupier for the replacement or improvement of a structure which will make the structure safer or more convenient for members of the public with mobility problems. The agreement may include any temporary or permanent conditions that the authority thinks fit.

Appendix B – Equality Act Guidance for Local Authorities

Authorising structures (gaps, gates and stiles) on rights of way – 'Good practice guidance for local authorities on compliance with the Equality Act 2010' (Version 1 October 2010) from the Department for Environment, Food and Rural Affairs www.archive.defra.gov.uk/rural/documents/countryside/prow/gpg-equality.pdf. Sections of the Guide which are of particular importance are:

Main Recommendations (page 7)

As a matter of good practice, authorities should:

1 have a published policy on how they will meet the requirements of the Equality Act in relation to public rights of way

2 ensure that any structures they give lawful authority to are clearly specified and documented

3 consider including in any specification, provision to remove or vary the structure when the need for it changes or ceases

Annex B – The Equality Act (page 10 paragraph B.7)

. . . it is important that anybody involved with the potential implementation or maintenance of structures on rights of way does not restrict their Equality Act considerations purely to, for instance, the effect on people in wheelchairs. A non-exhaustive list would also encompass ensuring that the needs of those with problems of: mobility, sight loss, learning difficulties, manual dexterity or physical coordination are considered and catered for. Within this context, gates that require excessive force to open, or have latches that are difficult to operate would fall within the ambit of the Equality Act.

Annex C – The recording of structures under section 147 of the 1980 Act (page 14 paragraphs C6-C10)

Annex D – Authorities' policies on structures on rights of way (page 16 paragraph D.1)

Annex E – Maintenance of authorised structures (page 22 paragraph E.22)

Annex G – Specifying Structures (page 26 of 35 paragraphs G3-G4)

The number of structures on a route should be kept to the minimum that are necessary. There should be a clear and justifiable reason for each structure.

The type of structure should be the least restrictive that is consistent with the landholder's requirement. The authority may consider defining a specification which is variable according to the changes in land use.

Appendix C – Gate Installation Checklist

This checklist is a summary and should not be used in isolation. Please refer to the main text for explanation of all points.

1 Minimum 1.5m (5ft) gap between posts or between protrusions from posts (e.g. catch mechanism).

2 The gate must open freely on its hinges to at least 90 degrees but preferably not swing away from the rider to 180 degrees.

3 It must not require lifting to open or close it or for the catch to fasten.

4 1.8m space is needed for the horse's head and neck in line with the gate beyond the gate post at the latch end. Allowance should be made for a hedge's growth between cuts.

5 Minimum manoeuvring space 4m wide and 4m long with a height of 3.7m is required with width of 5.8m if possible.

6 The ground throughout the manoeuvring space should be firm, level and even and free of any obstacle on or above the ground up to 3.7m.

7 The gate should be operable from horseback with the lever or catch on

the gate itself to enable one-handed opening at top rail height.

8. Double field gates should have one gate firmly anchored. If a lift over latch design is used, it must be such that it will not trap fingers and be light enough to manipulate with ease by anyone.

9 Gates beside cattle grids must be hung with the catch away from the grid and with a barrier between the gate and grid, extending beyond both sides of the grid.

10 The gate, its fittings and installation should fully take into account those with disabilities, children and the elderly who may have less strength or dexterity.

11 There should be no sharp protrusions or edges which could injure the horse or rider, and no places where the rider's fingers could be pinched or trapped.

12 Catches and hinges on wooden posts and gates will need repeated checking and adjustment.

13 Gates beside roads should be set back far enough so that the gate can be operated with the horse well off the carriageway and to provide waiting space for at least three horses.

14 Good installation and maintenance are vital. The best gate and latch in the world can still be difficult if put in poorly.

Appendix D – The 'heels to hinges' method to operate a gate on horseback

This method is recommended by the Society.

The rider approaches the gate's hinges and turns to position the horse alongside and parallel to the gate, 'heels to hinges', with the catch approximately level with the horse's shoulder (the exact position will depend on the size of both horse and rider) and the horse's head and neck extending beyond the gate, alongside the fence, wall or hedge in line with the gate.

Throughout the manoeuvre the rider operates the latch and moves and holds the gate away from the horse with one hand, keeping control of the reins with the other hand.

With a gate that opens away from the rider:

1 The rider leans sideways and forwards and releases the catch, then pushes the gate to gain a large enough opening. Keeping hold of the

gate as it opens, the rider reverses the horse far enough to bring its head into the gateway, turning it and encouraging it through the opening while holding the gate away.

2 The rider may be able to turn the horse tightly round the end of the gate while still maintaining a hand on the gate and push it shut when the horse is clear, facing the hinges; or

3 The rider may turn the horse toward the heels to hinges position on the other side of the gate, letting go of the gate at some point, then push the gate closed with the other hand while encouraging the horse alongside the gate to secure the catch.

With a gate that opens towards the rider:

1 With the horse parallel to the gate, the rider leans sideways and forwards and opens the catch, then moves the horse backwards and sideways, turning the horse round the end of the gate while pulling the gate towards them, opening the gate to give a large enough opening to encourage the horse forward through it, while keeping one hand on the gate for as long as possible to hold it off the horse if necessary. Some will be able to keep one hand on the gate until it closes, with the horse now facing the hinges on the other side of the gate.

2 For others, the rider will have to let go of the gate at some point, then with the horse through the gateway, leaning over to reach the gate and pull it closed while taking care that it does not bump the horse.

Important note:

It is important to note that in either case, a rider on a large or long horse or lacking physical strength or mobility will not be able to keep one hand on the gate or to hold the gate open, particularly if it is a bridle gate because the horse is simply too long to turn in the space space available, or the rider cannot remain bent over far enough while manoeuvring. The rider may have to thrust the gate open and hope it stays open long enough to pass through the opening, or to catch it as it closes and give another push.

If it swings closed or cannot swing back to at least 90 degrees, there is a high risk of injury to the horse or rider as they move through the narrowing gap. The rider's ability to push the gate will be limited if she is already at full stretch to reach the handle.

A rider leading another horse (for example an experienced rider with a novice, a small child or a disabled rider on a lead rein) or a group will probably have to let go of the gate and will need it to stay open while the second horse comes through.

Where there is insufficient manoeuvring space around the gate on both sides, for instance where the catch is in a corner or an overgrown hedge obstructs the places where the horse's head and neck or hind quarters need to go, it is not possible to use the heels to hinges method to open the gate or possibly even to shut the gate securely having opened it and gone through.

Problems can occur where the heels to hinges method cannot be used

Although many horses and riders do manage to negotiate gates head-on (that is, with the horse approximately at right angles to the gate), gates at which you cannot stand the horse parallel and operate the gate one-handed are hazardous and, for some riders, impossible to use on horseback because:

- A small pony is not tall enough to put its head and neck over the gate, so the rider cannot reach the catch.
- The gate or handle may hit the horse's jaw or head as the rider thrusts the gate open.
- The danger of part of the bridle, martingale or reins becoming caught on the gate or its handle is greatly increased. If this happens, the horse will panic, which can result in a serious accident. A horse may refuse to approach and pass through a gate again.
- The rider has to open the latch with one hand and then use the other hand to move the gate so that the horse can pass through the opening.

  This means that the rider has to let go of the gate and/or the reins while she changes hands which could result in a lack of control of the horse or the gate at a crucial time. If the horse has already started to move through the gateway and the gate is not designed and installed so that the gate remains open, it will bang against the horse or may trap and possibly even impale the horse.

Appendix E – Mounting blocks

A rider usually has best control of a horse while mounted, but there are some circumstances in which it is desirable to provide mounting facilities. The specification given below provides a good working mounting block. Other mounting block designs are possible.

Specific Requirements for Mounting Blocks

- The step height should be 240mm to 260mm
- The total height should be no higher than 780mm

- The step width should be at least 600mm
- The step length should be at least 450mm
- The top platform should have length at least 750mm
- Ideally, there should be steps on both sides of the top platform

There should be a clear manoeuvring space 4m high and at least 1.8m wide on at least one side of the mounting block and contiguous with it. This space is to allow the horse to stand while being mounted, and to allow entry and exit from the standing space. It needs to extend at least 3m before and beyond the mounting block. It is desirable that there should be such a space on both sides of the block.

If steps are only provided on one side of the block, they should be such that there is space for the horse on the right hand side of the rider as she walks up the steps. This ensures that she can mount on the near (left hand) side of the horse, the side of the horse riders are taught to mount from. Many riders cannot mount from the right hand side of the horse and would not attempt it.

Safety point: we strongly recommend that steps are provided on both sides of the top platform. If a horse continues to walk forward, the rider can then go down the steps rather than have to jump off a high platform.

The material forming the mounting block should be such that striking it with horses' hooves or riders' footwear should not make a sudden noise likely to startle a horse.

The material forming the steps and platform should be of a non-slip nature.

Appendix F – Legislation concerning gate widths

Section 81 of the Highways Act 1835 said:

> "That if any Gate across any public Cartway shall be less than Ten Feet wide, or any Gate across any public Horseway shall be less than Five Feet wide, clear between the Posts thereof, then and in every such Case, upon Notice in Writing from the Surveyor to the Person to whom such Gate shall belong, left at the Dwelling House of such Person or his Steward or Agent, requiring him to enlarge the same, if such Person shall neglect for the Space of Twenty-one Days after such Notice shall have been left as aforesaid to remove or enlarge such Gate, he shall forfeit a Sum not exceeding Ten Shillings for every Day he shall so neglect to remove or to enlarge such Gate as aforesaid."

Thus it can be seen that since 1835 there has been a clear expectation that public bridleway gates should have a minimum of five feet clear width between the posts. It is worth noting that failure to comply with a Notice concerning a gate incurred what was in those days a very substantial daily financial penalty.

The successor to this power is now section 145 of the Highways Act 1980, which says:

> "Where there is a gate of less than the minimum width across so much of a highway as consists of a carriageway, or across a highway that is a bridleway, the highway authority for the highway may by notice to the owner of the gate require him to enlarge the gate to that width or remove it. In this subsection 'the minimum width' means, in relation to a gate across so much of a highway as consists of a carriageway, 10 feet and, in relation to a gate across a bridleway, 5 feet, measured in either case between the posts of the gate."

Appendix G – A selection of gate catches

Photographs of a selection of gate catches can be viewed in the report 'A trial of self-closing bridle gates and a horse friendly vehicle barrier by the British Horse Society 2011' (www.bhs.org.uk/~/media/BHS/Files/PDF%20Documents/Access%20leaflets/BHS%20Gates%20report%202011.ashx)

1 A hook and eye – good if at the top of the gate. The hook should be on the gate and the eye on the gatepost. Probably the easiest for riders to use and has proved stock proof for both cattle and sheep when installed on one-way gates up to 10 feet wide. However, on wider wooden field gates it is possible for flexion of the gate to enable lambs to become trapped or escape below the catch. Cheap and easily maintained.

2 A chain loop – good providing the gate post doesn't move too much. It is easier to use if the chain is stapled to the gate rather than loose or stapled to the post. Cheap.

3 A traditional hunter catch – one-way opening only. Adequate for equestrians provided it is installed far enough up and out from the gatepost for the rider's fingers not to get caught in it, and positioned on the gatepost far enough away from the gate to lessen the risk of the horse's side brushing against it as it passes through. The catch should be rounded and have no sharp edges. Cheap. But, it can be stiff to operate and reins/martingale can get caught on handle. May not meet the requirements of the Equality Act for people in mobility vehicles.

4 Triangular gravity catch – one-way opening only. Normally requires two

hands (undesirable for equestrians as this means dropping the reins). If used, it should be combined with a D catch, not a bar, so as to reduce the likelihood of injury, and have an extended handle. However these handles have been known to break off. Cheap.

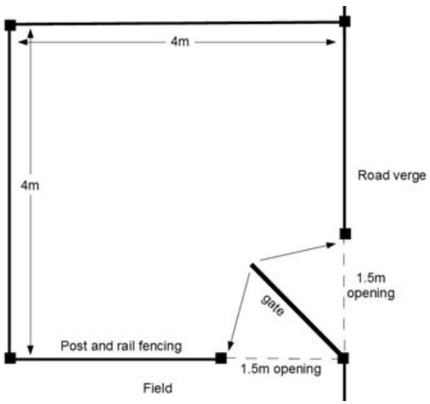
5 Horizontal spring catch – needs a long handle attachment (extending above top rail of gate) as it is almost impossible to operate without. However, riders and horses can be injured by the bolt if it springs back (unless it is protected by a D ring) and bridle/reins/martingale can be caught on the extended handle. Important to ensure that the spring is not too powerful or stiff and that the space it fits into is roomy enough to allow for some movement. More expensive.

6 Trombone handle adaptation of horizontal spring catch – easier for riders to use. Less likely to get reins caught in it, but if caught, more difficult to free the horse. More expensive.

7 Equi-catch/Equine Catch/Easy-catch – has no projection on the gate but projects from the inside of the gatepost. Best fitted with a gate wider than 1.5m and with a lifter. More expensive.

Appendix H – New Forest Box Gate

The New Forest Box Gate was devised for certain roadside locations in the New Forest where stock security was required. The principle is of an enlarged kissing gate where the gate will secure either opening but it is usually hung to very gently close towards the roadside. Livestock may therefore enter the pen from the field, which assists in keeping vegetation down, but will leave the pen when horses enter, providing a space in which riders can operate the gate and secure it behind them with much lower risk of stock escaping. Notices saying 'Please close the gate' are recommended.



Installation Notes

1 The gate opens into the gate only and is hung to secure either opening though defaults to the roadside. It must not have self-closing fittings but may close gently with gravity only towards the roadside.

2 Clear manoeuvring space of 4m x 4m is required.

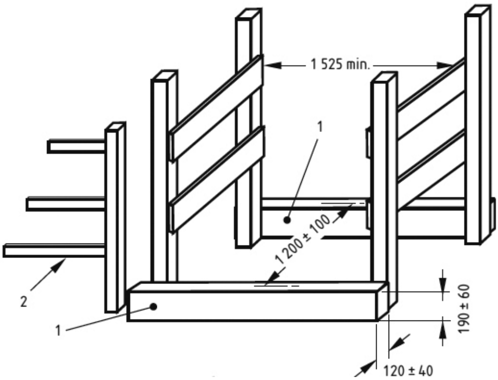
3 The ground throughout the structure and approach should be firm, level and free from mud or vegetation that would reduce the useable area.

4 All other recommendations for gates, catches and surroundings apply (free of protrusions, barbed wire and so on).

Appendix I – Installation requirements for anti-vehicle barriers

Further details of construction of a horse stile or Kent Carriage Gap can be found in the British Standard.

Horse Stile



1 – Bar (railway sleepers work well)

2 – Adjacent fencing or other barrier

Installation Notes

1 Height of top of the bars above ground shall be 190mm +/- 60mm.

2 No gap between the ground and the bar.

3 Thickness of bars along the path shall be between 80mm and 160mm.

4 Minimum width of bar across the path shall be 1525mm.

5 Distance between centre lines of bars shall be 1200mm +/- 100mm.

6 No gates shall require to be opened across the stile or its manoeuvring space.

7 Clear manoeuvring space 4m height[13], a minimum of 5m long and at least 2m wide both sides of the horse stile and contiguous with it so that the horse can walk straight through the structure. Where it adjoins a vehicular road, a minimum width of 5.6m or a length of 9.5m[14] should be provided to allow for safe use by groups of up to three horses at a time to wait between the stile and the carriageway.

8 The ground through the stile and on the approaches should be flat, firm and well drained but not hard, slippery or stony; that is, it should be a surface on which a horse can safely jump. This surface will inevitably need regular maintenance. It is particularly important that the space between the bars shall be free draining.

9 Access for other users, for example a kissing gate or RADAR®, should be provided to the side of the horse stile.

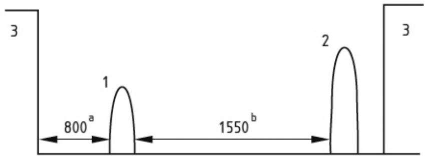
10 The material of the bars should be such that striking them with horses' hooves should not make a sudden clang sound likely to startle a horse. Wood is recommended.

11 An alternative version of the BS5709 horse stile has a third bar between the two standard bars and has been successful in deterring use by motorcyclists where the standard horse stile had failed. The design has bars of height 200mm, no less than 100mm deep with 500mm gap between them. Those dimensions are important for optimum function. All other dimensions, parts of the structure, surface and space are as the standard horse stile.

[13] Extra height is required compared with a gate, in case the horse jumps the stile

[13] Distances derived from trial of vehicle barrier in 'A trial of self-closing bridle gates and a horse friendly vehicle barrier by The British Horse Society 2011' (www.bhs.org.uk/~/media/BHS/Files/PDF%20Documents/Access%20leaflets/BHS%20Gates%20report%202011.ashx)

Kent Carriage Gap



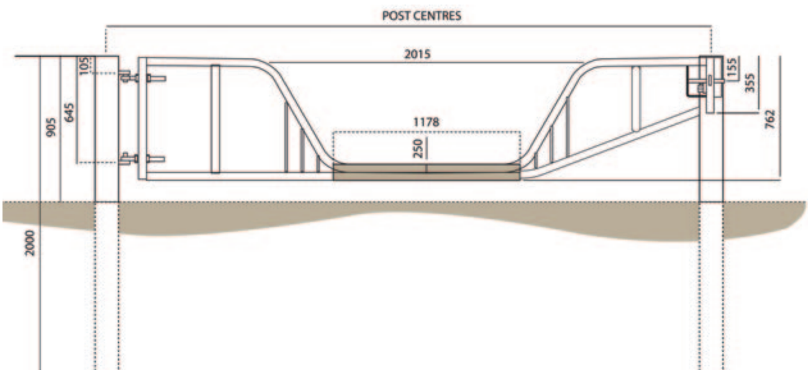
The Kent Carriage Gap comprises one pair of smooth concrete bollards (1 and 2 on the diagram), 330 to 380mm high (13 to 15 inches), 1525mm (60 inches) apart, with a clear space of at least 600mm (24 inches) wide outside one or both of the bollards (a).

It is intended to permit access by all users of a minor highway except four-wheeled vehicles and can be used to enforce a Traffic Regulation Order prohibiting four-wheeled vehicles. There are some horse-drawn carriages that might be obstructed by the structure but most will be able to pass with care either between the bollards or, for wider carriages, with one wheel outside bollard 1. It does not prevent motor cycles or very small cars.

The pair of bollards may be reinforced by one or more additional pairs if forced access by large vehicles is likely. Any remaining space outside the bollards up to banks or fences (3), can be restricted with taller bollards.

All the bollards must be very solidly planted, and the surface throughout must be hard and level, including approaches and between bollard 1 and boundary 3.

Vehicle barrier



The BHS recommendations (including conclusions from a trial of a horse friendly vehicle barrier carried out by the BHS in 2011[15]) are:

1 Anti-vehicle barriers are only suitable for use on bridleways. On byways open to all traffic, restricted byways and unsurfaced, unclassified roads the Kent Carriage Gap should be used instead.

2 A 1.5m (5ft) gap beside a field gate is preferable for equestrians (the least restrictive option) and visually more in keeping with the countryside.

3 Anti-vehicle barriers should only be used on bridleways where all of the following circumstances apply:

- where private motor vehicular access needs to be maintained while deterring motor vehicular use by the public
- where there is insufficient space beside a field gate for a gap (or a well designed and installed bridle gate)
- where there is clear evidence of persistent problems with unlawful public motor vehicular access
- where the necessary legal requirements for installing a structure on a public right of way have been met.

4 The set-back distance for a horse stile or horse friendly vehicle barrier from the edge of a carriageway should be a minimum of five metres; six metres or more is desirable where space permits.

5 Unless at least 5.5m of width can be provided in the waiting space on the road side of the barrier, the minimum set-back from the carriageway should be increased to 9.5 m, to allow for use by groups of up to three horses at a time.

6 The space over the barrier and its approaches should be clear of overhanging branches and other hazards to a height of 4m.

7 The ground under the barrier and on the approaches should be flat, firm and well drained but not hard, slippery or stony; that is, it should be a surface on which a horse can safely jump. This surface will inevitably need regular maintenance.

8 The space in the centre through which the horse passes should be no less than 1.2m wide at the bottom and no less than 2m wide at the top.

9. The top of the central section over which the horse steps should be

[15] 'A trial of self-closing bridle gates and a horse friendly vehicle barrier by the British Horse Society 2011' (www.bhs.org.uk/~/media/BHS/Files/PDF%20Documents/Access%20leaflets/BHS%20Gates%20report%202011.ashx)

190mm ± 60mm from the ground. Care should be taken to ensure that it does not exceed the maximum recommended height of 250mm overall height measured from the ground beneath that part of the barrier.

10 There should be a damper on the lock so that the barrier does not clang if the horse's foot touches it.

11 There should be solid wooden cladding on both sides of the central section, so that the barrier does not clang if the horse's foot touches it.

12 The wooden cladding should extend as close to the ground as possible to minimise the chance of a horse's hoof being caught in the barrier and so that the horse can judge the obstacle more easily. The wood may need to be painted so that the horse can distinguish it more easily from the ground.

13 The edges of the wood should be rounded so that the horse's legs will not be grazed if they scrape it.

14 There should be no screws or other projections on which a horse could be injured.

Further conclusions of the trial were:

- That BS 5709:2006 requires revision in respect of the set-back distance from the carriageway and the width of the waiting space.
- That further research is carried out to establish whether any alterations to the design will make horse friendly vehicle barriers easier for horses to judge so that they are less prone to hitting them.
- That pending such research, where possible the British Standard horse stiles should be used in preference to horse friendly barriers.
- That where horse friendly vehicle barriers are installed, provision should be made for regular inspection and replacement where necessary of the wooden section.

2013/1

For more information on The British Horse Society's rights of way work contact:

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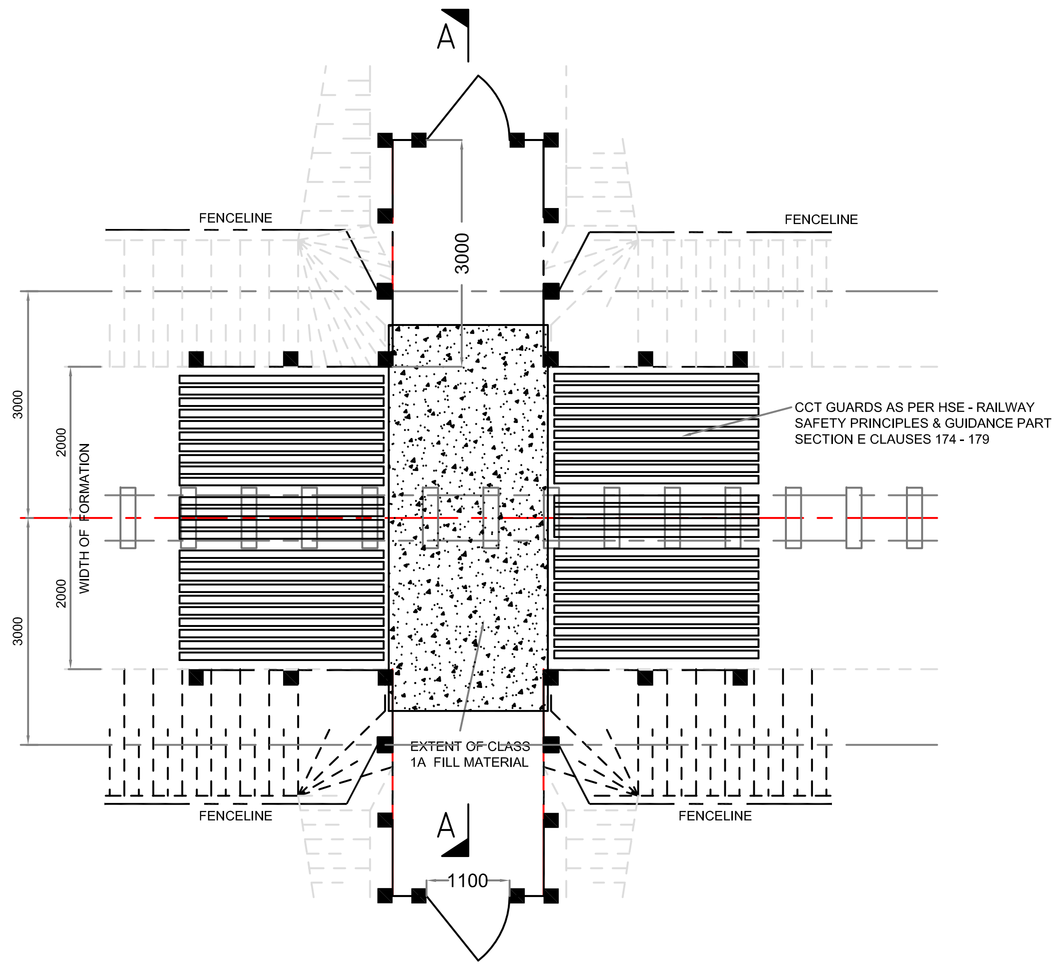
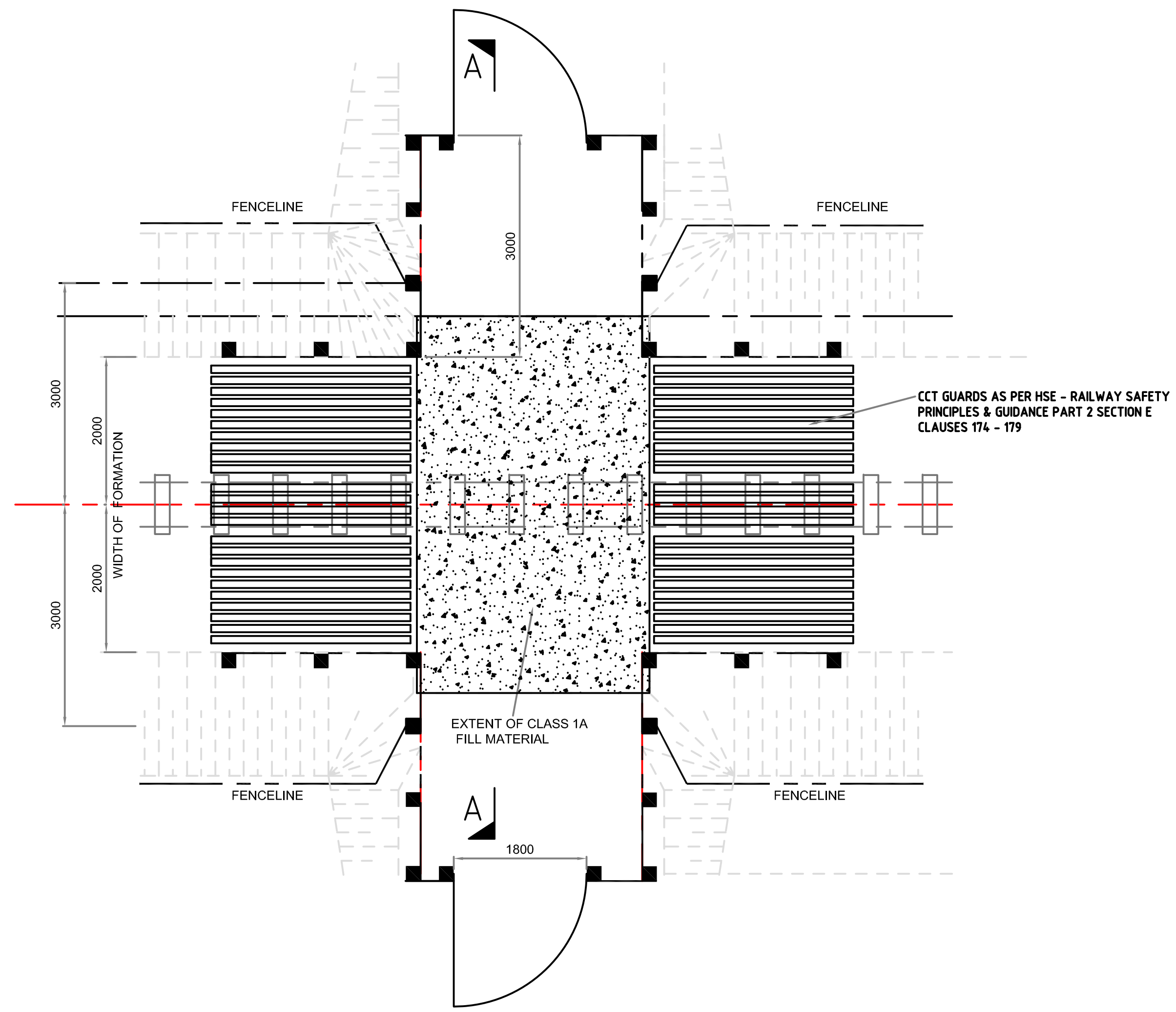
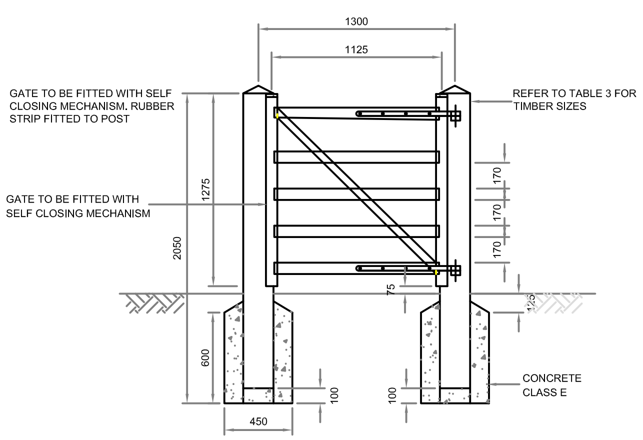
The British Horse Society



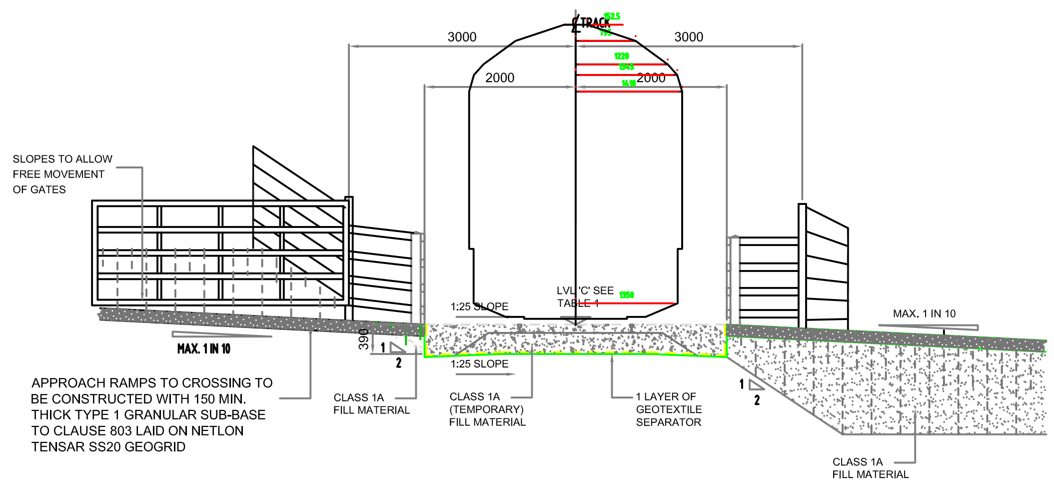
PLAN OF FOOTPATH CROSSING
SCALE 1:100



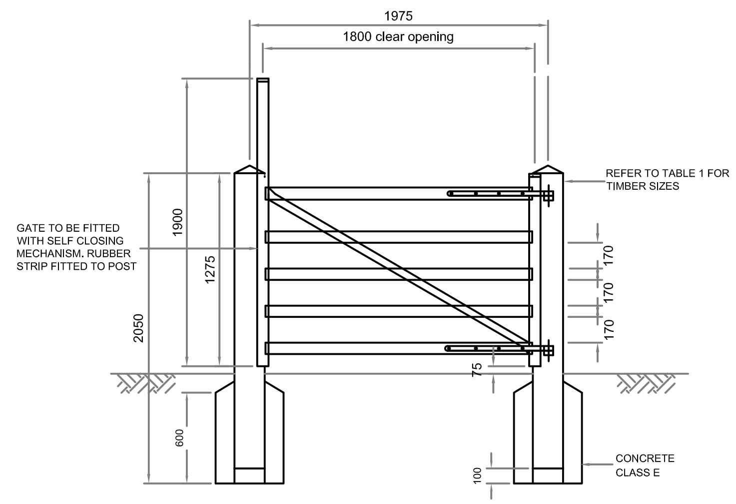
PLAN OF BRIDLEWAY CROSSING
SCALE 1:100



PUBLIC FOOTPATH GATE
SCALE 1:50



SECTION 'A-A' THROUGH CROSSINGS
SCALE 1:100



TYPICAL BRIDLEWAY GATE (TIMBER)
SCALE 1:50

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
2. GATES SHALL COMPLY WITH CLAUSES 405, 413 AND 2641 AND BS 3470.
3. ALL THROUGH TENONS SHALL BE PEGGED WITH 13mm DIA OAK DOWELS.
4. GATE FITTINGS SHALL COMPLY WITH BS 3470.
5. FITTINGS SHALL BE MALLEABLE IRON OR MILD STEEL WITH THE EXCEPTION OF THE SPRING CATCH WHICH SHALL BE TEMPERED STEEL.
6. ALL FERROUS FITTINGS AND BOLTS SHALL BE GALVANIZED TO BS 729 UNLESS OTHERWISE SPECIFIED.
7. THE GATE SHALL BE HUNG AS SHOWN FOR SELF CLOSING WITH NO LATCHING ASSEMBLY AS PER HSE
8. ALL GATES SHALL OPEN AWAY FROM THE RAILWAY.
9. ALL TIMBER FOR GATE STOP SHALL BE IN ACCORDANCE WITH CLAUSE 405 AND PRESERVED AS SPECIFIED IN CLAUSE 2641
10. ALL MATERIALS AND CONSTRUCTION SHALL COMPLY TO WO SPECIFICATION FOR ROAD AND BRIDGE WORKS 1976 AND AMENDMENTS AS APPLICABLE.

TABLE 1

DESCRIPTION OF TIMBER MATERIALS	SIZE
HANGING POST	200 x 200 x 2100 LONG
SHUTTING POST	175 x 175 x 2100 LONG
HANGING SIDE	100 x 75 FOR 3m GATE 125 x 75 FOR 3.6m GATE
SHUTTING SIDE	75 x 75
TOP RAIL	100 x 75 FOR 3m GATE 125 x 75 FOR 3.6m GATE BOTH TAPERING TO 75 x 75
ALL OTHER RAILS	75 x 25
BRACES HOUSED IN TOP RAIL	75 x 25

ROTHER VALLEY RAILWAY
ROBERTSBRIDGE

PUBLIC FOOTPATH, FOOTPATH AND BRIDLEWAY CROSSINGS

ORIGINAL SIZE A3

DRAWN McN	CHECKED	PASSED	
DATE 20/06/2014	CLIENT'S REF.		
SCALE AT A3	AUTOCAD REF.		
DRAWING No. WHRP STD 00004			REVISION

NR17

Transforming Level Crossings

2015 - 2040

A vision-led long-term strategy to improve safety at level crossings on Great Britain's railways

Contents

Level Crossing Safety Strategy 2015 - 2040

1. Executive summary

This document outlines Network Rail's long-term strategy to improve level crossing safety in Great Britain. It is a vision-led safety strategy, designed to work towards eliminating accidental fatalities at level crossings. The strategy provides the details of the work Network Rail will undertake to improve level crossing safety for the benefit of crossing users, train crew and rail passengers alike.

Key elements of the Level Crossing Safety Strategy include:

- Continued focus on targeted level crossing closures
- Working to a time-bound framework for making all passive crossings 'active', providing clear warnings of approaching trains and replacing telephones and whistle boards to reduce the likelihood of human error
- Prioritising the elimination of passive crossings on high speed lines and at stations
- Improving underfoot conditions and signage, including marking of danger zones to raise user knowledge and situational awareness – reducing opportunities for human error
- Developing and rolling out automatic full barrier crossings with obstacle detection to help reduce pedestrian errors and deliberate road vehicle user violations on the network
- Prioritising the removal of AHBs near to stations and schools
- Continuing the use of red light safety cameras at public road level crossings, to reduce deliberate violations by road vehicle users
- Ensuring that the whole organisation takes account of the strategy in what they do, not just the level crossing community
- Working collaboratively with other functional areas of the business and taking opportunities for innovation, for example through technology within a digital railway

The strategy details the work that needs to be done between now and the end of CP9[1] (March 2039), allowing Network Rail to plan long-term across a number of funding periods.

2. Background

Level crossings represent one of the biggest public safety risks on the railway. They account for 8%[2] of total system risk on the British rail network. Network Rail's All Level Crossing Risk Model (ALCRM) calculates 12 Fatalities and Weighted Injuries (FWI) across all types of crossings nationally. The risk at unprotected footpaths and user worked level crossings accounts for over half of this.

[1] *CP or Control Period (Network Rail receives its funding allocations in 5 yearly blocks or Control Periods)*
[2] *As measured by Rail Safety & Standards Board (RSSB); source Safety Risk Model (SRM) v8.1*

Level crossings are the main interface between the rail and the road networks. Due to the nature of the UK road and rail network, both types of infrastructure are extremely congested in parts of the country, which increases the challenge of managing level crossings. There are in the region of 6,000 active-open level crossings across the network, ranging from passive crossings with simplest risk controls, through to public road crossings with active risk controls.

Closing level crossings will always be the most preferable and best solution to manage safety. However, it is not possible to close all level crossings on the network. A broad range of interventions and initiatives are needed to address long-term issues at crossings which remain open. The scale of work involved is significant and will take several control periods to complete. Incorporating all of the interventions and initiatives into a single, risk based Level Crossing Safety Strategy and implementation plan, informs the rail industry of the resources and timescales needed to comprehensively improve level crossing safety across the network. The Level Crossing Safety Strategy has a large focus on reducing risk at passive level crossings[3]. This is a targeted approach that will improve safety through the provision of active systems to warn users of approaching trains and through infrastructure improvements such as demarcation of the danger zone[4]. The strategy also focuses on other areas of level crossing safety involving other types of level crossings; notably, as part of our vision for reducing risk, there is an emphasis on motorist safety at public road crossings.

In the area of level crossing safety, Network Rail has moved forward a long way between 2011 and 2017. Through the Level Crossing Safety Improvement Programme the company has improved its organisational capability by introducing over 100 Level Crossing Managers (LCM) and Route Level Crossing Managers (RLCM). These key personnel are dedicated to the safety and risk management of the level crossing estate. These positions have also helped to clarify roles and responsibilities, resolving the previously fragmented structure. Network Rail has also improved its processes around level crossing risk assessment and asset inspection and has worked hard to resolve data and system integration problems. Over the last two years the business has embedded these changes and we are now seeing these improvements successfully reflected in the risk management of our level crossings.

Level Crossing Managers

Mobile apps have replaced paper based systems for risk assessment and asset inspections of level crossings

[3]*Footpath and private vehicle crossings which require users to make safe decisions to traverse based on sighting alone or interface with Signallers using telephones (where provided)*

[4]*RSSB research paper T984 recommendation relating to the identification of 'unsafe areas' or danger zones at passive crossings*

In parallel to investing in people, the Level Crossing Safety Improvement Programme has worked to reduce risk through a number of physical works projects. These include:

i. the closure programme (over 1000 level crossings closed since 2010);

ii. sighting improvement project (over 1100 passive level crossings had sighting improved);

iii. barrier-overlay installed at a proportion of automatic open crossings on the network including those high risk locations;

iv. barrier-inhibition retro-fitted to manual crossings with no approach locking;

v. a fleet of new BTP-staffed MSVs introduced around the country;

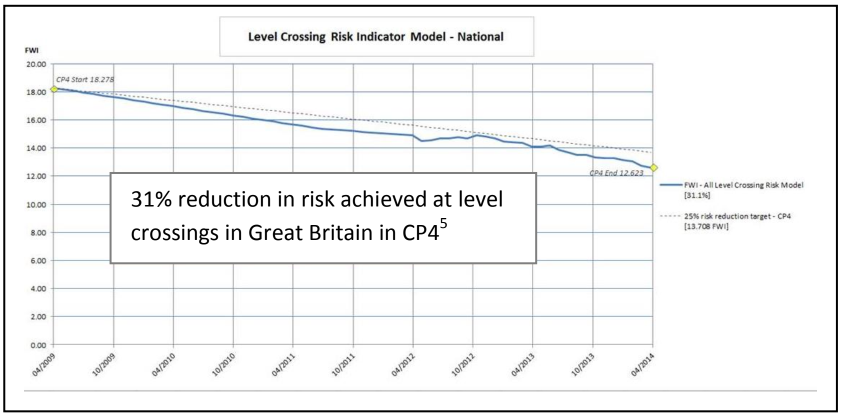
vi. 36w filament bulb road traffic light signals replaced with brighter LED heads (at almost 500 public road crossings);

vii. new spoken audible warnings installed at a number of sites to inform users when a second train is approaching; and

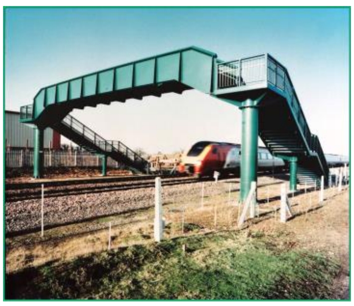
viii. power operated gate openers (POGO) installed at some private vehicle crossings to reduce the number of traverses a vehicle user makes on foot and also to reduce the likelihood of gates being deliberately left open; and

ix. a new full barrier signal protected level crossing type, which uses obstacle detection technology, has been introduced on the rail network.

These combined initiatives helped to reduce level crossing risk by 31% in CP4[5]; reflecting a safety investment of c.£132m.



LED conversion programme of road traffic light signals at c.500 assets and eradication of 36w filament bulbs from the network



Over 1000 level crossings closed

Barrier overlay installed at a significant proportion of automatic open crossings across

MSV fleet introduced to support improved user awareness & behaviour

[5] *CP4: 1st April 2009 to 31st March 2014*

For CP5[6], the Office of Rail and Road (ORR) allocated a ring-fenced fund of £99m which must be invested for maximum risk reduction during the control period. This programme is largely targeting closure of higher risk passive level crossings; although some of the money will be used for other innovative risk reduction schemes. Critically, the fund cannot be used to pay for basic legal compliance measures, for which Network Rail is otherwise funded.

Great Britain can demonstrate a very good safety record at level crossings in comparison to the rest of Europe, indeed ours is one of the best level crossing safety records of any major rail network in the world. Just one accident with multiple fatalities could, however, significantly change this.

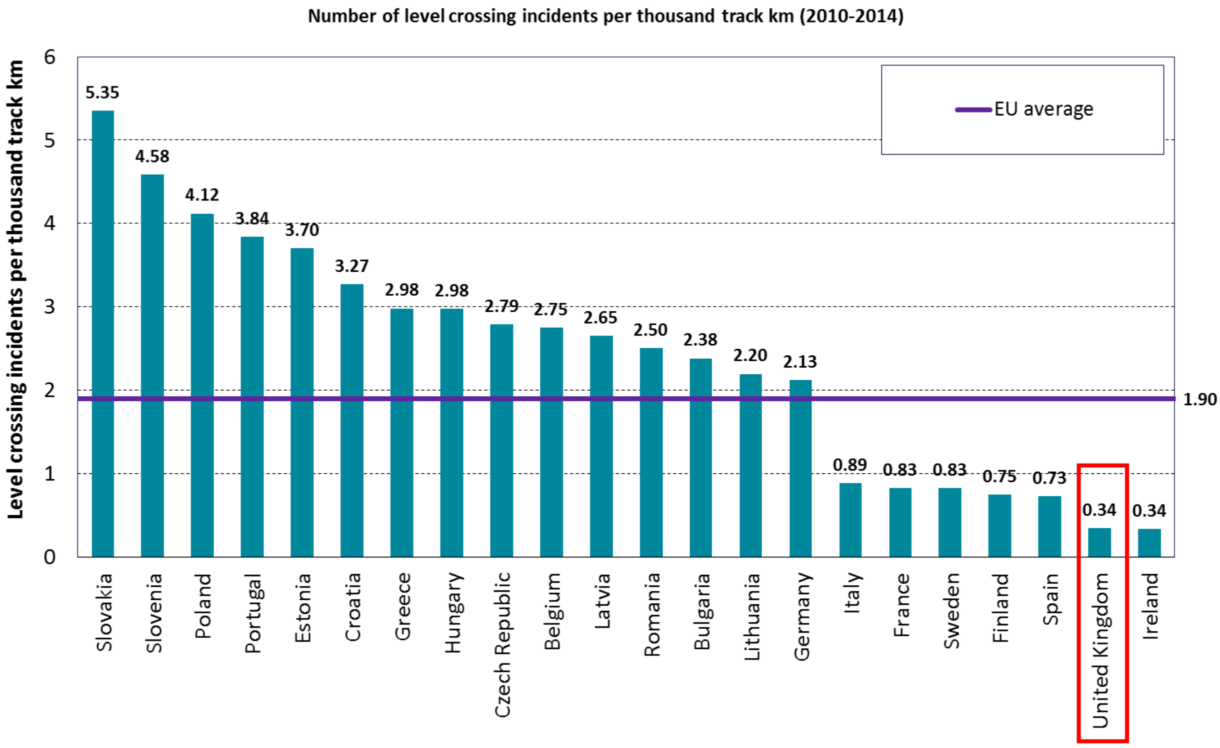


Figure 1

Level crossing incident rate across Europe per thousand track kilometres[7] 2010 - 2014

Commentators have extrapolated these figures to conclude that Britain has the safest level crossings in the world. The good record is assisted by factors such as:

i. relatively few level crossings compared to other major rail networks; and

ii. public awareness of rail/level crossing safety is generally high.

Both factors have benefitted from previous and current Network Rail focus.

[6] *CP5: 1st April 2015 to 31st March 2019*
[7] *Source: Eurostat Data – extracted August 2015*

Despite recent improvements in level crossing safety, there are still many issues to address, particularly with passive level crossings. Network Rail will adopt a long-term vision-led strategy for level crossings to permanently address the legacy issues and to design out foreseeable risks of the future.

3. Our vision, objectives and approach

*"Our vision is for **no accidents at level crossings**."*

To achieve this vision Network Rail will commit to a more comprehensive approach to level crossing risk management than has previously been employed.

Our strategic objectives

Our Level Crossing Safety Strategy is underpinned by a number of vision-led strategic objectives. These are:

- Eliminate fatalities at level crossings
- Eliminate accidents at level crossings
- Reduce safety risk to the public, passengers and the workforce
- Reduce business and reputational risk

Our mission

To achieve our safety vision for level crossings, we will move away from reactive management of emerging single issues in isolation, in favour of a targeted strategic plan to improve safety. This transition benefits all and will help to avoid a management culture of constant fire-fighting, waste, duplication of effort and sub-optimal solutions not aligned to a wider business strategy. In adopting a prioritised and targeted plan which is truly holistic and proactive in its approach, we will seek to:

- resolve all existing level crossing issues through a holistic, risk-based implementation strategy, and;
- take cognisance of societal needs into the mid-21st Century, together with available technology to develop the next generation of level crossings, and;
- take account of Network Rail's wider Group Strategy and sustainability plans.

We will invest in additional risk controls at level crossings across the network in order to tackle the range of legacy issues that remain currently. It is anticipated that allocated funding, resource and deliverability challenges and technology constraints will combine to make the implementation complex and a long-term objective. The vision-led safety strategy is accordingly estimated to last into CP9 or beyond.

Our vision-led commitments

Implementation of the Level Crossing Safety Strategy will deliver the following milestones:

- We will develop a safety-led technology strategy for level crossings which will consistently review emerging technology and seek to integrate level crossing operations with on-board train technology
- We will work with local authorities, government and communities to sensitively close level crossings where there is an alternative and practicable diversionary route available
- **By 2019** we will have an asset management plan for every level crossing on the network
- **By 2019** all whistle boarded crossings with known use during the night-time quiet period will be equipped with train detection/warning systems
- **By 2020** a new approved Automatic Full Barrier crossing design with obstacle detection will be available
- **By 2024** all road traffic light signals will be of LED type design; eradicating filament bulb signal heads from the network
- **By 2025** there will be no user worked crossings in long sections on the network which rely on telephones as the primary means of protection
- **By 2025** all whistle boards will have either been replaced or will be supported by automatic user-based warning systems
- **By 2030** telephones will not be the primary means of protection at any of our user worked crossings
- **By 2030** all footpath crossings will have a decked surface which indicates the 'danger zone'
- **By 2035** all Automatic Open and Half Barrier level crossings will have been replaced with full barrier crossings
- **By 2039** all existing passive crossings will be equipped with automatic user-based warning systems

4. Relative risk profile

At the beginning of CP5 there were 6,291 level crossings in use on the rail network[8]. The chart below illustrates the relative numbers of passive, automatic and fully protected level crossings.

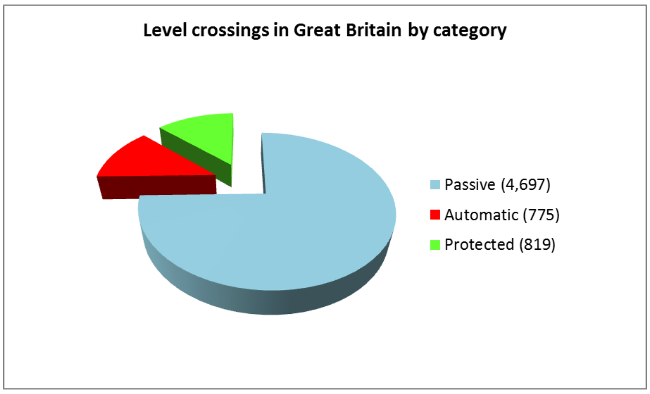


Figure 2

[8]*Source – All Level Crossing Risk Model (ALCRM), August 2015*

Passive crossings

The vast majority of the level crossing estate is classed as 'passive' level crossing types. Passive crossings are so called because they do not provide users with warning or protection from approaching trains. The primary method of operation for passive crossings is through users observing whether it is safe to cross. For this method of operation there needs to be enough sighting distance available to provide users with adequate time to cross and this is based on the railway line speed. If vehicles use the crossing then the traverse time is increased by factors such as vehicle length, use of trailers etc. Where pedestrians use the crossing the traverse time is affected by use by vulnerable users or those with mobility impairments. Passive crossing types include: footpaths, station crossings, bridleways, user worked crossings and user worked crossings with telephones.

Automatic crossings

At automatic level crossings, trains are detected automatically through track circuits or treadles which initiate a warning at the crossing. The majority of automatic crossings provide both an audible and a visual warning for pedestrian and road vehicle users. Warnings will typically consist of audible alarms, road traffic light signals and half barriers at crossings on public roads and audible alarms and stop lights at footpath or private vehicle crossings (UWCs). Most automatic crossings on public roads have half barriers. Whilst they offer some protection and provide an exit route for road vehicles and pedestrians, they also conversely present an opening or opportunity for deliberate misuse/risk taking behaviour. Automatic crossing types include: automatic half barrier crossings (AHBs), automatic barrier crossings locally monitored (ABCLs), automatic open crossings locally monitored (AOCLs) and footpath or UWCs with miniature stop lights (MSLs).

Protected crossings

The final category is fully protected crossings. These have the most comprehensive levels of protection. These crossings tend to be situated on public roads and they include crossing types such as: obstacle detection (MCB OD), those supervised/operated by CCTV (MCB CCTV), manually operated with barriers (MCB), or manually operated with gates (MCG). Protection typically includes: full barriers or gates which completely close-off the road approaches from the railway, a mechanism to confirm that there are no obstacles on the railway (including RADAR/LIDAR technology or visual check by a Signaller/Crossing Keeper on site or using CCTV), railway signals which are only cleared for trains to proceed once it is confirmed that the crossing is clear, visual warnings for road vehicle drivers in the form of road traffic light signals (and barriers) and audible warnings for pedestrians.

Road risk is also a factor at level crossings with, for example, risks from the surface condition at automatic crossings or direct vehicle impact where crossing operators manually close gates.

Table 1 below provides a breakdown[9] of the crossing numbers in more detail along with the total risk in Fatalities and Weighted Injuries (FWI) for each core crossing type.

[9]*Source – ALCRM, August 2015*	**Crossing core type**	**Number of level crossings on the network**	**FWI** (as calculated by ALCRM)
Passive level crossings	UWC/Bridleway (with telephone)	1717	1.1
	Footpath/bridleway/station	2246	2.8
	UWC	686	0.4
	Open crossing	48	0.1
Automatic level crossings	AHB	443	4.0
	ABCL/AOCL+B	119	0.4
	AOCL/R	39	0.6
	MSL	174	0.6
Protected level crossings	MCB CCTV	425	2.2
	MCB OD	55	0.1
	MCB	185	0.6
	MCG/Train Crew Operated	154	0.1
Total		**6291**	**13**

The following chart[9] compares each crossing type as a percentage of the overall estate (shown in blue) against risk as the respective percentage of level crossing system risk (shown in red).

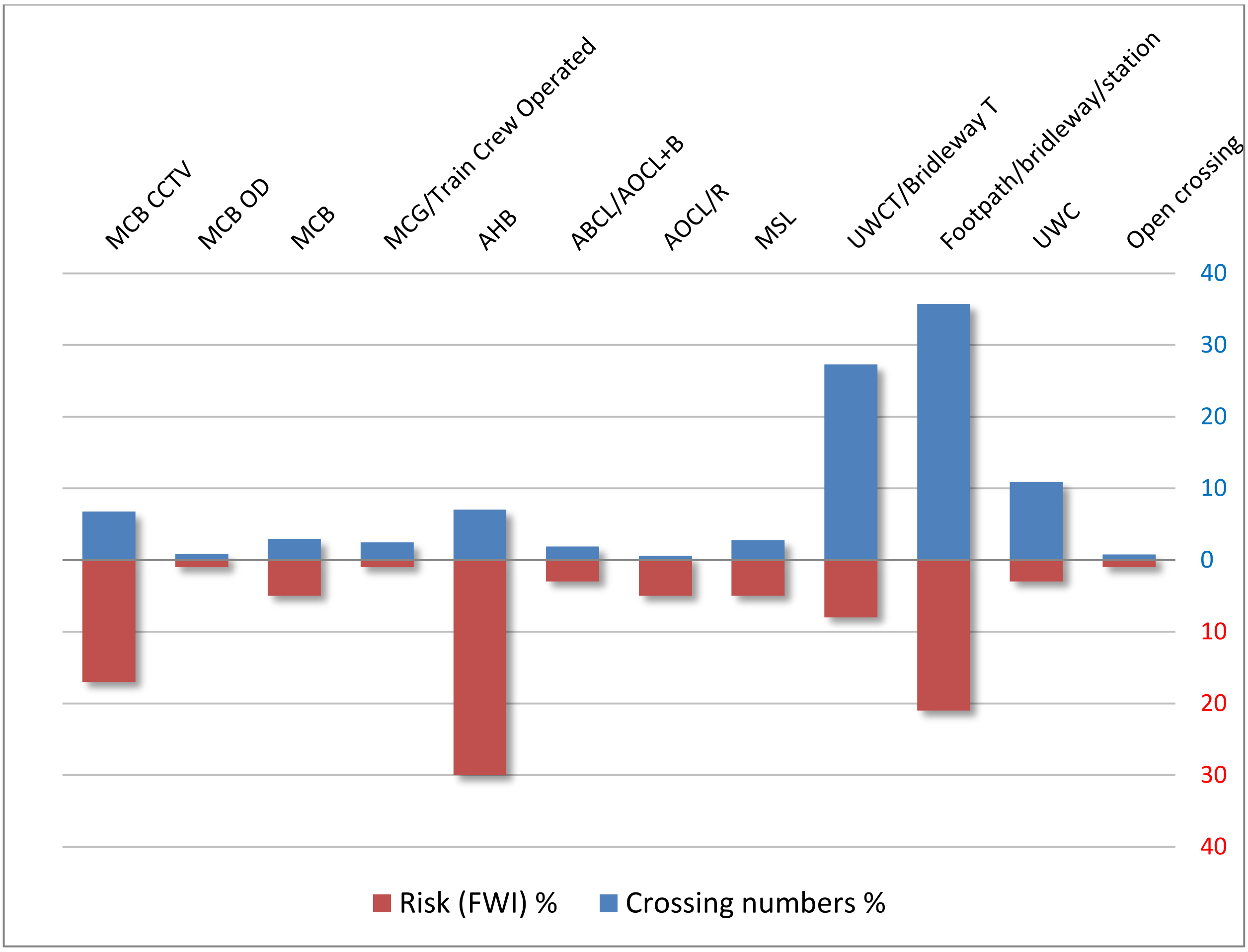


Figure 3

Level crossing types and risk properties expressed as % of the total estate

[9]*Source – ALCRM, August 2015*

Figure 3 illustrates the spread of risk in relation to the types of crossings which make up the level crossing estate. Relative to the proportion of AHBs in relation to the total number of level crossings on the network, risk is high across these crossing types. This is to be expected due to their design type and known residual risks as discussed above. The factors that make up risk vary from crossing to crossing however, and whilst a good indicator, caution is required in drawing too many conclusions from the data. Elements of risk are associated with the method of operation; other elements of risk simply reflect local conditions and user/train moment. At automatic half barrier crossings the risks can be significantly reduced by improving/upgrading the level crossings (treatable risk). Similarly at footpath, bridleway and user worked crossings the risk can be reduced by implementing additional controls. At fully protected crossings such as MCB CCTV and MCB OD crossings, the risk cannot easily be reduced any further.

5. Passive level crossings

Closures

Footpath crossings account for the largest share of the level crossing estate, but a lower proportion of the risk in relative terms. The risk at passive crossings is not distributed evenly across the estate and the majority of the FWI risk resides at those locations with the highest usage and the greatest number of train services; i.e. those crossings with the greatest 'traffic moment.' For that element of the level crossing portfolio, the only effective control is closure. We are not able to simply stop running train services and equally we cannot prevent users from enjoying their legal rights of way over the railway at these crossing locations. Closure via bridging, underpass or diversion is the only viable option in managing risk holistically. Closures have been central to the CP4 and CP5 Level Crossing Risk Reduction Programmes and have significantly contributed to reducing risk and improving safety across the network. Closures will continue in CP6 and beyond as funded business-as-usual activity.

Sighting

Sighting for footpaths, bridleways and user worked crossings can be limited by factors such as lineside equipment, structures and track curvature. Network Rail has a duty of care to provide users with enough time to traverse a level crossing safety. Where the obstruction cannot be resolved, the main options available are:

a) install a train warning system, or

b) install telephones to the Signaller such that they are required to advise users if it is safe to cross, or

c) install whistle boards, or

d) apply line speed restrictions on train services.

In addition:

- Around 1,600 passive level crossings are fitted with whistle boards. Whistle boards have been an accepted mitigation for poor sighting for many years. However they have increasingly been recognised as a mitigation which may be susceptible to elements which can reduce their effectiveness. Whistle boards place the onus onto the train driver to sound a warning which can lead to either no warning being sounded or inconsistent warning times (based on whether the train driver sounds the horn on approach to the board, at the board or beyond the board). Whistle boards do not account for locations affected by ambient noise, users with hearing difficulties, or those using mobile communications or personal stereos. Furthermore, since 2008, train horns are not used during set hours known as the night time quiet period (NTQP). The NTQP hours were adjusted in 2016 to better reflect the times people use such crossings. The current NTQP hours are between: 23:59 and 06.00; an adjustment from 23:00 to 07:00 hours.

- Circa 1,600 crossings are fitted with telephones as mitigation for poor sighting, primarily at vehicular user worked crossings. Telephones have significant weaknesses as a risk control in that:
  - they are dependent on users consistently and reliably using the telephones. It is known that users regularly fail to use telephones to obtain permission to cross;
  - rely on the controlling Signaller being able to identify the location of any trains in relation to the crossing in order to advise the users if they can cross. This is not possible on lines with long signal sections; and
  - there can be miscommunication and failure to reach a clear understanding which can lead to incidents and accidents.
- Although over 1,100 level crossings had their sighting distances improved in 2010-2011, some level crossing remain where restrictions exist and the sighting is poor. This includes user worked crossings where the sighting for vehicular users is affected by the boundary fence-line, gates and gate posts and other third party structures such as bridges and property. These issues are compounded by the fact that crossings can be used by various vehicle types or modes of transport from large plant/agricultural vehicles to small cars. Agricultural vehicles are also increasing in size.

Passive level crossings rely on users making their own judgement about whether it is safe to cross, which in turn increases human factor based risks (see Section 10). To address all of the above, Network Rail will seek to replace or supplement whistle boards and telephones with automatic train detection/warning systems over a phased programme. Similarly, crossings with poor or insufficient sighting will also be fitted with automatic train detection/warning systems; a step on our journey toward our long-term goal and the elimination of passive crossings from the network. Our vision: ***The ultimate aim is to provide automatic train detection/warning systems at every passive level crossing.*** There would be an FWI benefit of c.2.52 FWI per year if all passive crossings were fitted with automatic warning systems (figure calculated from ALCRM modelling).

The main drivers behind the long-term programme will be improved safety – especially preventing major injuries and accidental fatalities. Additional benefits include better legal compliance, avoided prosecutions and enforcement action, reputational benefits and performance benefits (TSRs removed or avoided).

Note: *Eradication of passive crossings on high speed lines should be a priority as line speeds and train services continue to increase and trains continue to become quieter. Passive crossings on high speed lines should be either closed or fitted with train detection/warning systems. High line speed should be considered as being those above 100mph. Station crossings also present a significant risk and should also be a priority target.*

Marking danger zones, improving underfoot conditions and signage, and designing for accessibility
RSSB research has demonstrated that pedestrians do not understand that the mandatory 'Stop, Look, Listen, Beware of Trains' signs mark the decision point where they should stand and look in both directions for trains before crossing. The research indicates that a more effective measure would be to mark the danger zone with yellow coloured decking over the width of the crossing and up to two to three metres from the nearest running rail. This would involve installing new yellow decking at

c.3,000 footpath and station crossings along with guide fencing and improved signage. It is also likely that further work in this area will be needed to address risk at vehicular user worked crossings as a result of re-assessing decision points.

Network Rail will take account of user needs at passive level crossings and, where required, will seek to improve accessibility.

6. Automatic level crossings

Development of Automatic Full Barrier (AFB) crossings

As reflected in Figure 3 above, the relative risk at AHB crossings is disproportionately high. Even with audible and visual warnings provided at automatic crossings, some pedestrian and road vehicle users ignore the warnings, pass the lights and weave around the barriers. A new design of automatic full barrier crossing (incorporating obstacle detection) will be developed to improve safety – especially where AHB crossings are situated near to stations or other areas where pedestrian numbers or urgency incentivise deliberate misuse.

It is desirable to retain the reduced barrier down-time afforded by automatic crossings. Reduced barrier down-time may lessen risk-taking behaviour and also avoids the greater costs associated with railway signal protected crossings. An automatic full barrier crossing will improve safety by preventing pedestrians from walking unchecked onto the crossing on the 'off side' and also prevent motorists from weaving around the barriers later in the sequence when the train is closest to the crossing. There is an estimated benefit of 2.15 FWI per year if all automatic half barrier/automatic open crossings were converted to an automatic full barrier type solution.

Improve conspicuity of road traffic light signals (RTLs)

There has already been a campaign to eradicate all 36w filament bulb road traffic light signals from the network through a programme that converted them to brighter LED lamps. The scope of this programme did not include 50w halogen lamps, which are brighter than 36w lamps, but not as bright as LEDs. Furthermore, the flashing LED lamps are more conspicuous because they have an instant 'rise and fall' compared to filament or halogen lamps. Network Rail will install LED road traffic lights at all public road level crossings and thus eradicate filament bulb RTLs from the network.

Audible warnings

There are some automatic level crossings on the network which are fitted with miniature stop light (MSL) train detection systems that provide a visual warning only. Network Rail will identify these crossings and develop a plan to install audible warning devices at these locations. Furthermore, 87 AHB level crossings are equipped with audible warning devices which conform to a previous design standard meaning that the warnings cease to sound when the half barriers reach the lowered position. Whilst these assets are compliant, they will be brought up to current design standards whereby the audible warnings continue until the end of the completed sequence; i.e. after the train has passed clear and the barriers have raised.

Red Light Safety Equipment (RLSE)

Network Rail has worked with technology suppliers and the Home Office to develop Home Office Type Approved (HOTA) digital red light enforcement cameras. We have also worked with the British Transport Police (BTP) and Staffordshire Police to develop a back office facility to process prosecutions. Finally the BTP have helped to develop a bespoke red light education and awareness course to prevent repeat offences. Network Rail will determine the effectiveness of the RLSE cameras through a benchmarking exercise at a number of level crossing trial sites in order to quantify the achievable risk reduction. This will be used as part of the business case for rolling out fixed RLSE cameras at the highest risk automatic crossings.

Furthermore, RLSE equipped level crossings are qualitatively recognised as being capable of instilling improved user behaviour. It should therefore be considered good practice for RLSE to be an integral part of public road level crossing renewals in the future.

Note: *The revenue generated from fines goes direct to the Department for Transport (DfT). The rail industry will continue to explore, with the DfT, whether roll out of RLSE cameras could be carried out as a DfT self-funding scheme.*

Mobile Safety Vehicles (MSVs)

Network Rail has worked with the BTP and technology suppliers to establish a fleet of fifteen mobile safety vehicles which are equipped with Automatic Number Plate Recognition (ANPR) cameras and are operated by BTP staff. These vehicles are at the front line of enforcement of level crossing safety. They are highly visual and provide a mechanism for reactive response to level crossings experiencing emerging deliberate misuse. They are also effective mechanisms for promoting safety awareness at events and shows, and as part of dedicated safety days such as ILCAD (International Level Crossing Awareness Day).

Network Rail will explore opportunities and business appetite to allow for a full fleet renewal during CP6 and, if agreeable, again during CP8. It is possible therefore that a fleet of mobile safety vehicles will be in operation until the end of CP9.

Automatic Half Barrier crossings (AHB)

AHBs will not be renewed 'like for like' as AHBs where they are adjacent to stations, in sight of stations and/or near to schools.

Automatic Open Level Crossings (AOCLs)

Network Rail will fit barriers to remaining AOCLs on the network. When renewing existing AOCL or AOCL+B assets, they should be renewed as automatic barrier crossings locally monitored (ABCLs) as a minimum.

7. Protected level crossings

Development of new generation of Primary Obstacle Detection

Currently LIDAR is used to supplement Honeywell RADAR systems at obstacle detection (OD) crossings. The LIDAR provides the capability to detect pedestrians very close to barriers or prone on the crossing surface. Lower LIDAR necessitates expensive crossing profiling work and other failure modes. Therefore each OD installation is subject to site specific assessment to decide whether LIDAR is required. Network Rail will identify an improved Primary Obstacle Detection system that will negate the need for expensive re-profiling work or other secondary obstacle detection equipment.

State of the art technology

Some protected (and automatic) level crossings use older technology and were installed prior to current designs becoming a mandated requirement. Some also use equipment that does not reflect the current state of the art technology. This includes some manual full barrier and gated level crossings that do not have full signal interlocking or approach locking. It also includes some AHB crossings that have audible alarms which cease earlier in the sequence as discussed earlier. Network Rail will upgrade affected crossings to meet modern design specifications.

Figure 4 illustrates the targeted vision-led implementation plan for primary schemes. Delivery of the plan in accordance with the timescale shown is dependent on many variables; these include funding, resource and availability of technology.

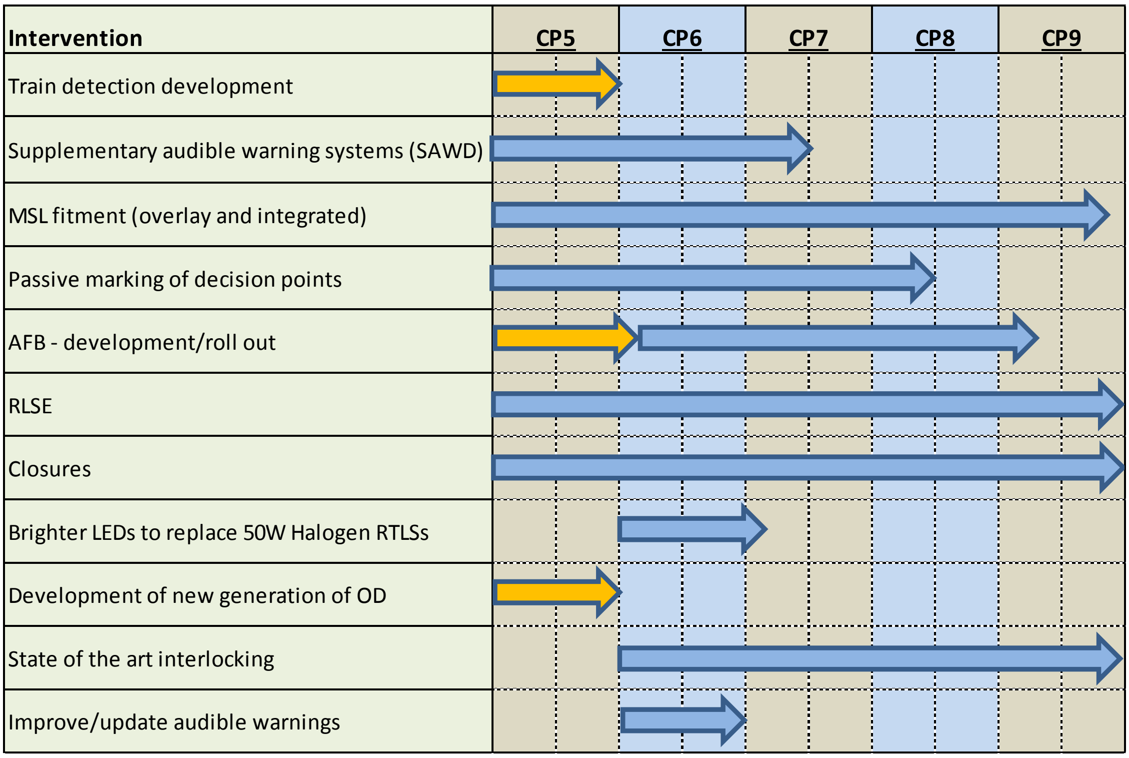


Figure 4

Vision-led implementation timescales

8. Designing for safety

Adopting a strategy which tackles legacy issues within a consolidated plan will significantly improve level crossing safety in the UK. It will also reinforce our reputation as world leaders in level crossing safety and will be welcomed by key stakeholders including the ORR and RAIB.

Safety risk is, however, an ever-changing landscape. If we focus only on addressing known legacy issues, it is likely that new and emerging risks will materialise during the lifetime of the implementation plan; either following accidents or incidents, through new stakeholder concerns or through changes in user behaviour. This is foreseeable and will result in a fresh set of safety concerns to address in the future. To move to a truly proactive strategy we need to critically evaluate existing level crossing designs using hazard identification and FMEA techniques, based on current progressive thinking regards level crossing safety. We need to predict foreseeable accident types of the future and incorporate additional preventative controls and mitigations into the design of new crossing types.

There are four key areas to explore in order to design out level crossing risk. These are discussed in the table below.

Note: *RV = road vehicle, RTA = road traffic accident, SPAD = signal passed at danger, DCI = Drivers crossing indicator, OTP = on-track plant, RRV = road-rail vehicle*

User mistake or error including slips and lapses	RV fails to observe level crossing RV driver turns onto railway Environmental factors RV on level crossing due to RTA Blocking back Grounding Second train coming RV failed on level crossing Error due to gates left open Error due to poor sighting Pedestrian nips in front of train Distraction
Deliberate misuse/violations	RV Driver Suicide RV Driver deliberate action RV deliberately placed on level crossing
Level crossing asset failure or defect	Lights/barriers fail to operate Failure to detect approaching train Slip trip fall due to defect
Irregular working by operator e.g. Signaller	Signaller/crossing keeper error Railway staff error in local control SPAD at protecting signal/stop board/DCI Train driver error – over-speeding Train driver error Operator error OTP/RRV

The Level Crossing Strategy and future level crossing design will take account of other key railway group strategy initiatives which include modernisation of the railway infrastructure through Digital Railway/ERTMS. This will include adapting crossing design to utilise possible opportunities for better train location capability, obstacle detection and communication between the level crossing and approaching trains regarding crossing status.

Note: *All future schemes, whether stand-alone or major enhancement schemes, will incorporate the principles of the Level Crossing Safety Strategy within their scope of works. For example, refrain from installing telephones as primary risk controls at passive crossings and avoid renewing AHBs as 'like for like' assets where they are adjacent to stations, in sight of stations and/or near to schools.*

9. Risk management

Network Rail has significantly improved the way risk is managed at level crossings over recent years. Dedicated Level Crossing Managers (LCMs) and Route Level Crossing Managers (RLCMs) have been introduced to bring together a number of level crossing related activities under a single role. Key activities of the role include risk assessment and asset inspection, first line defect rectification and stakeholder liaison.

Improved training, guidance and risk assessment methodology has been introduced. The All Level Crossing Risk Model (ALCRM) has also been developed and improved in support of enhanced risk management. Going forward, Network Rail will continue to utilise dedicated level crossing specialists in sufficient number to manage level crossing risk. Network Rail shall continue to invest in developing and improving risk management systems including the ALCRM. Site specific risk assessments will continue and will be underpinned by the Narrative Risk Assessment (NRA) process, ensuring a balanced quantitative and qualitative approach is assured. These site specific risk assessments will take the Level Crossing Safety Strategy into account when identifying appropriate risk controls and mitigations.

Note: *Network Rail will also continue the roll out of extended census gathering as part of risk assessment improvements, using mobile camera technology and third party census providers as core activity. This enhanced intelligence can provide invaluable information about how level crossings are used, who uses them, when they are used and helps target controls and prioritise improvements.*

10. Influencing user behaviour

Much of the level crossing strategy is about employing engineering controls to eliminate risk where possible or to reduce risk where elimination is not possible. User behaviour is the biggest contributory factor to level crossing risk. Some of the causes relate to an error on the part of the user and others relate to deliberate acts and violations.

The following Generic Error Model illustrates how switching occurs between the different types of information processing in tasks.

Figure 5
Human failure – Generic error model

Education and awareness campaigns will continue as ongoing 'business as usual' activity so as to reduce knowledge based errors. These safety campaigns will include both national media and/or targeted localised campaigns aimed at educating users about crossing safety.

There are other elements of the Level Crossing Safety Strategy which are also specifically aimed at influencing user behaviour, such as enforcement (in section 6) and marking danger zones, improving underfoot conditions and signage (in section 5).

11. Implementing the strategy

The development and implementation of a comprehensive, vision-led level crossing safety strategy provides many benefits for the rail industry in targeting improved level crossing safety.

It serves to highlight the various level crossing safety issues that exist and the respective work-streams that are required to address them. Therefore, it acts as a holistic problem statement for level crossings as an asset type and draws attention to the funding, resource and deliverability challenges that lie ahead. It also allows us to place single level crossing safety issues into wider context; an approach which is essential in order to collate all of the various work-streams in a structured, ordered way so that they can be prioritised according to safety risk.

The safety strategy is able to inform Network Rail, the wider rail industry, DfT and the Office of Rail and Road (ORR) about the level of resources needed to address the various level crossing safety issues. It allows us to quantify how much funding is then needed over a number of control periods to deliver the safety vision.

This strategy also incorporates deliverability and the achievable pace of change; allowing Network Rail to define key milestones in comprehensively transforming level crossing safety.

Finally, the safety strategy forms a reference point for all subsequent future decisions about level crossing investment, new or emerging initiatives and the impact of re-prioritisation.

All elements of Network Rail that have responsibilities for, or interface with level crossing operation, maintenance and renewal, must be aware of the Level Crossing Safety Strategy. It must be incorporated into technical standards and be reflected in the remits and scope for future renewals and enhancement schemes. Furthermore, the Level Crossing Safety Strategy should be used to inform and underpin funding in future control periods at both route and national levels.

12. Strategy review, tracking and governance

Implementation of the safety strategy will be subject to continuous review and evaluation. In delivering this ambitious safety vision, specific focus will be needed in relation to:

a) Delivery against the implementation plan; taking account of elements such as:
   - Financial authority and funding
   - Availability of technology and approved status
   - Supplier capability
   - Resource and logistics – implementation or delivery

b) Changes to the strategy content or the priory of remaining work-streams by taking account of elements such as:
   - point a) above;
   - new and emerging risks or hazards
   - changes in user behaviour or crossing use

Delivery against the implementation plan will be monitored through a Programme Board Governance Group. The group Chair will be the Senior Responsible Owner and all Routes will report progress through this group.

Ongoing review of whether the implementation plan work-streams remain current and have the correct prioritisation shall be undertaken through regular internal review by Network Rail, liaison meetings with the ORR and at the cross industry Level Crossing Strategy Group.

Appendix A

Fundamental principles of level crossing safety at Network Rail

Priorities

Network Rail's main priority is to continually improve the way we identify, manage and remove risk at level crossings so as to improve safety for all. This requires a cross-functional approach which includes the need for strong processes, decision-making and continuous technical improvement.

Effective risk assessment and management

A suite of existing tools support the risk management process and assist with decision making to improve safety and remove risk. We will continue to refine and use risk assessment tools and methodologies to identify our highest risk crossings on the network.

We will continue to invest in our Level Crossing Managers; those who undertake risk assessment of our level crossings and who manage their day to day safety. We will carry on building their expertise in risk assessment techniques and continue to share good practice across the business.

The Level Crossing Managers are at the heart of delivering effective risk assessments and making safe decisions. We will ensure they remain at the core of all risk based decisions; whether day-to-day risk management or longer-term decisions and future options.

Legislation and enforcement

We will continue to review level crossing legislation and support change where this helps clarify accountabilities and responsibilities regarding the management and closure of level crossings. We will continue to support the Law Commission's review of level crossing legislation and lobby for the proposals to be heard in Parliament.

There are opportunities to streamline level crossing legislation and this is crucial to successful delivery of our safety strategy. As a world leader in level crossing safety, we will lead this discussion with the ORR and other stakeholders.

We will roll out greater capability to support enforcement across the network, tackling both road vehicle and pedestrian violations at level crossings.

Leadership

We will continue to build on our achievements as world leaders in level crossing safety. We will share our good practice with our rail industry colleagues from around the globe. We will also conduct regular worldwide benchmarking exercises to ensure that we are delivering the best possible, fit-for-purpose solutions at level crossings in Great Britain.

We will embed level crossing safety awareness across the business and suitably equip those who are responsible for working on or who interface with level crossings; so that we have the best people working on our highest risk public interfacing asset.

Investment and technology

We will work collaboratively to invest more funding at passive level crossings. We will work to replace whistle boards with technology at level crossings with sighting restrictions.

It is imperative that solutions which employ technology are fit for purpose and are appropriate for the safety risks that they manage. We will administer this through better product acceptance and technical review processes. We will do this transparently and efficiently.

We will look for alternatives to automatic half barrier crossings rather than routinely upgrading to a full barrier solution which may not be appropriate for the local infrastructure.

Key to this element of the strategy is the need to continuously review emerging technology. We will not restrict ourselves in looking only for railway solutions; we will also look to other industries to help solve our problems.

We will negotiate with our regulators to optimise the funding available to improve level crossing safety. In return, we will optimise risk reduction, dealing with complex level crossings, as well as those with viable alternative routes nearby.

Asset condition and information

We will improve the information we currently hold on level crossings to enrich our intelligence and better drive holistic decision making. We will review our asset reliability and challenge suppliers on their performance.

We will seek to provide greater clarity and clearer accountabilities[*] around asset ownership. In addition, we will work to provide greater standardisation of level crossing types.

Note: *[*]Level crossings are unique in that they are not considered to be a 'single asset' with a single asset owner; they interface with many functions of the business. This has the potential to generate confusion or inconsistencies in how level crossings are managed. Enhanced clarity relating to ownership responsibility and asset management process is essential to success.*

We will not be able to close all level crossings and so it is crucial that we have the best possible processes established to deal with managing the condition of the asset. We will do this through identifying ring-fenced funding for level crossing maintenance throughout the business. We will prioritise components based on safety and identify 'gold-plated' components so as to improve reliability and safety.

Level crossing maintenance will be delivered in the most efficient way. Good planning is crucial to this and we will help maintenance teams optimise their resources. We will reduce the number of temporary closures of level crossings following asset failure. An agreed renewals programme for both passive and controlled crossings is required.

Personal responsibility and education

It is crucial that we all recognise that level crossing safety is everyone's business. We will continue to run targeted education campaigns for external stakeholders and users of our level crossings. We will continue to help our people manage level crossings better through improved knowledge, equipment and IT solutions.