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 - For details of the C18 Northbridge Street Level Crossing refer to drawings C.950.G.110 to 116.

Legend

BT	BT/DH
-Overhead Cabling	
-Underground Cabling	
South East Water	
-Supply Main	
Southern Water	
-Foul Sewer	
Southern Gas Networks	
-Low Pressure Main	
-Intermediate Pressure Main	
UK Power Networks	
-Underground Cables	
Virgin Media	
-Network Cable	

Note: Still awaiting response from Vodafone, VTESSE and McNicholas.

P1	27/02/15	IAB	DC	JP
Preliminary issue				
Issue	Date	By	Chkd	Appd

ARUP

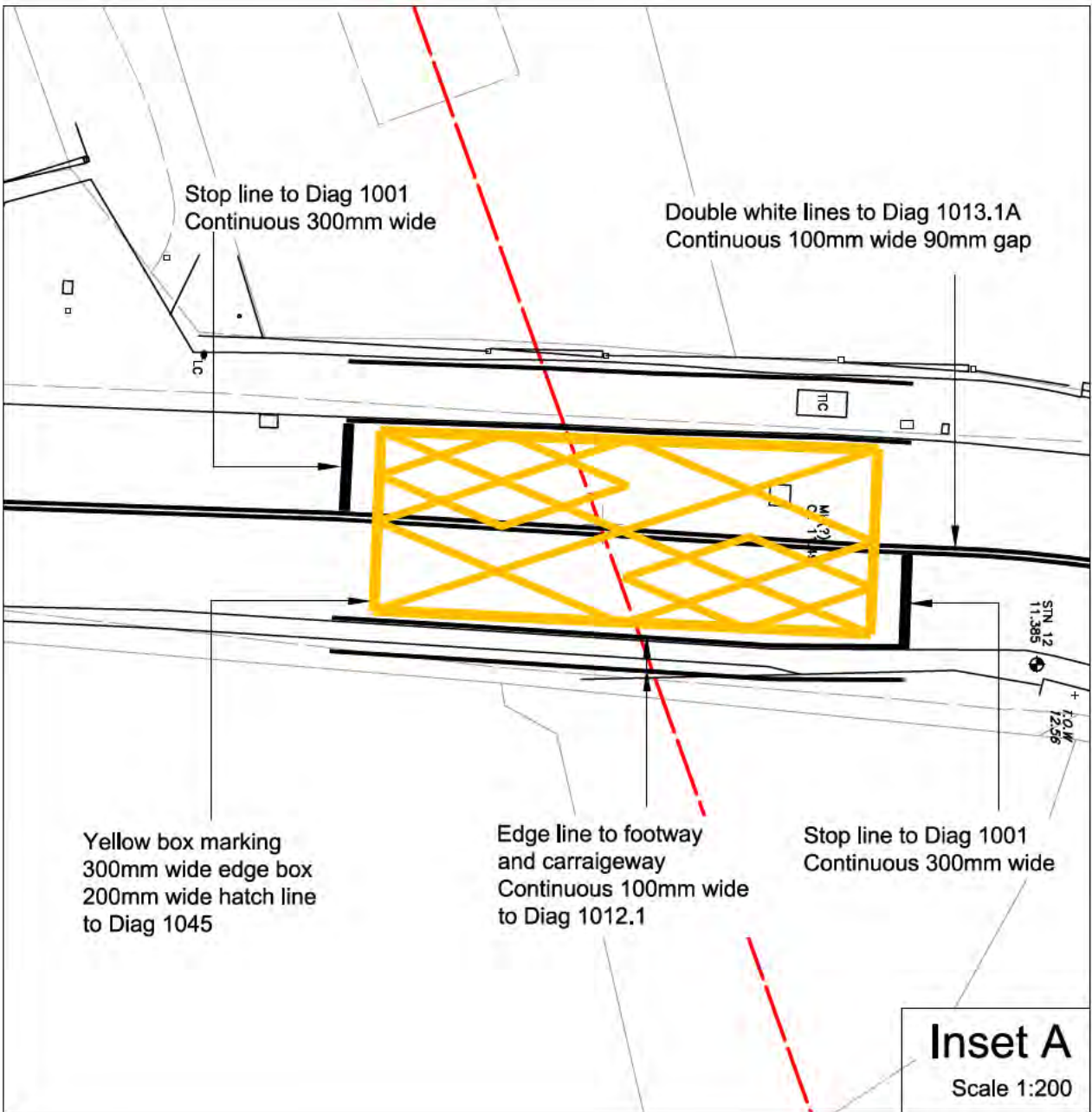
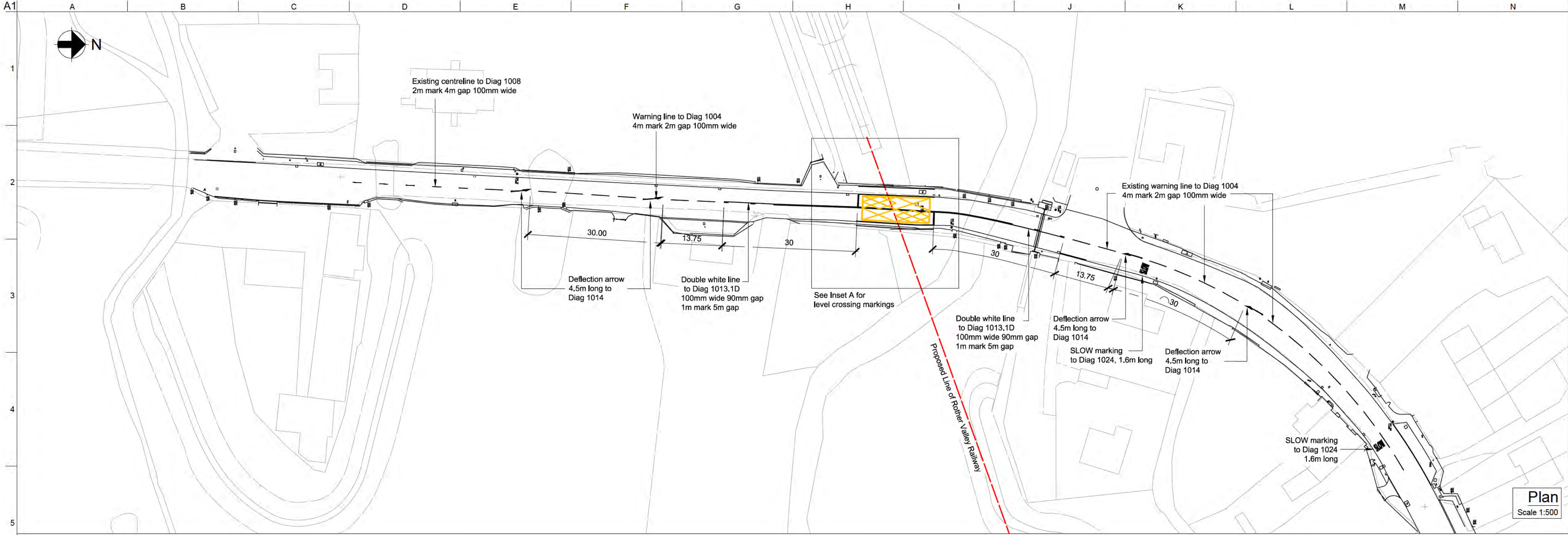
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Tel +44 (0)191 261 6080 Fax +44 (0)191 261 7879
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Client
Rother Valley Railway Limited

Job Title
**RVR Level Crossing
Highway Works**

Drawing Title
**C18 Northbridge Street
Existing Statutory Utilities**

Scale at A1	1:500 1:200
Discipline	Civils
Job No	239025-00
Drawing No	C.950.G.111
Drawing Status	For Information
Issue	P1



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- Notes: -
- 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.
 - For diagram numbers refer to the TSRGD.
 - For traffic signs refer to drawing C.950.G.114 and C.950.G.115.

P1	27/02/15	IAB	DC	JP
Preliminary issue				
Issue	Date	By	Chkd	Appd

ARUP

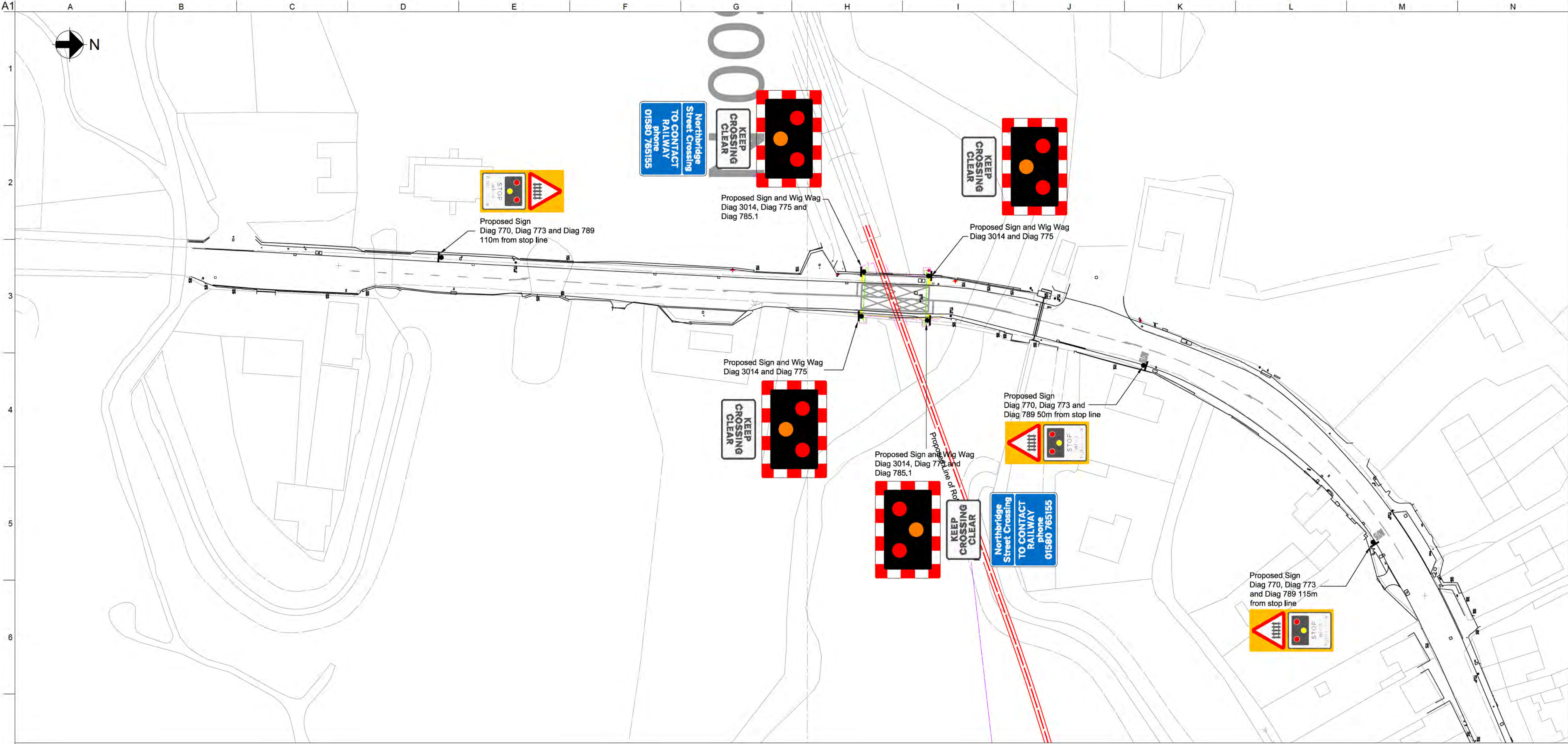
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Client
Rother Valley Railway Limited

Job Title
RVR Level Crossing
Highway Works

Drawing Title
C18 Northbridge Street
Road Markings

Scale at A1		1:200	
Discipline		Civils	
Job No		Drawing Status	
239025-00		For Information	
Drawing No		Issue	
C.950.G.113		P1	



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- Notes: -
- 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.
 - For diagram numbers refer to the TSRGD.
 - For details of traffic signs refer to drawing C.950.G.115.
 - For road markings refer to drawing C.950.G.113.

P1	27/02/15	IAB	DC	JP
Preliminary issue				
Issue	Date	By	Chkd	Appd

ARUP

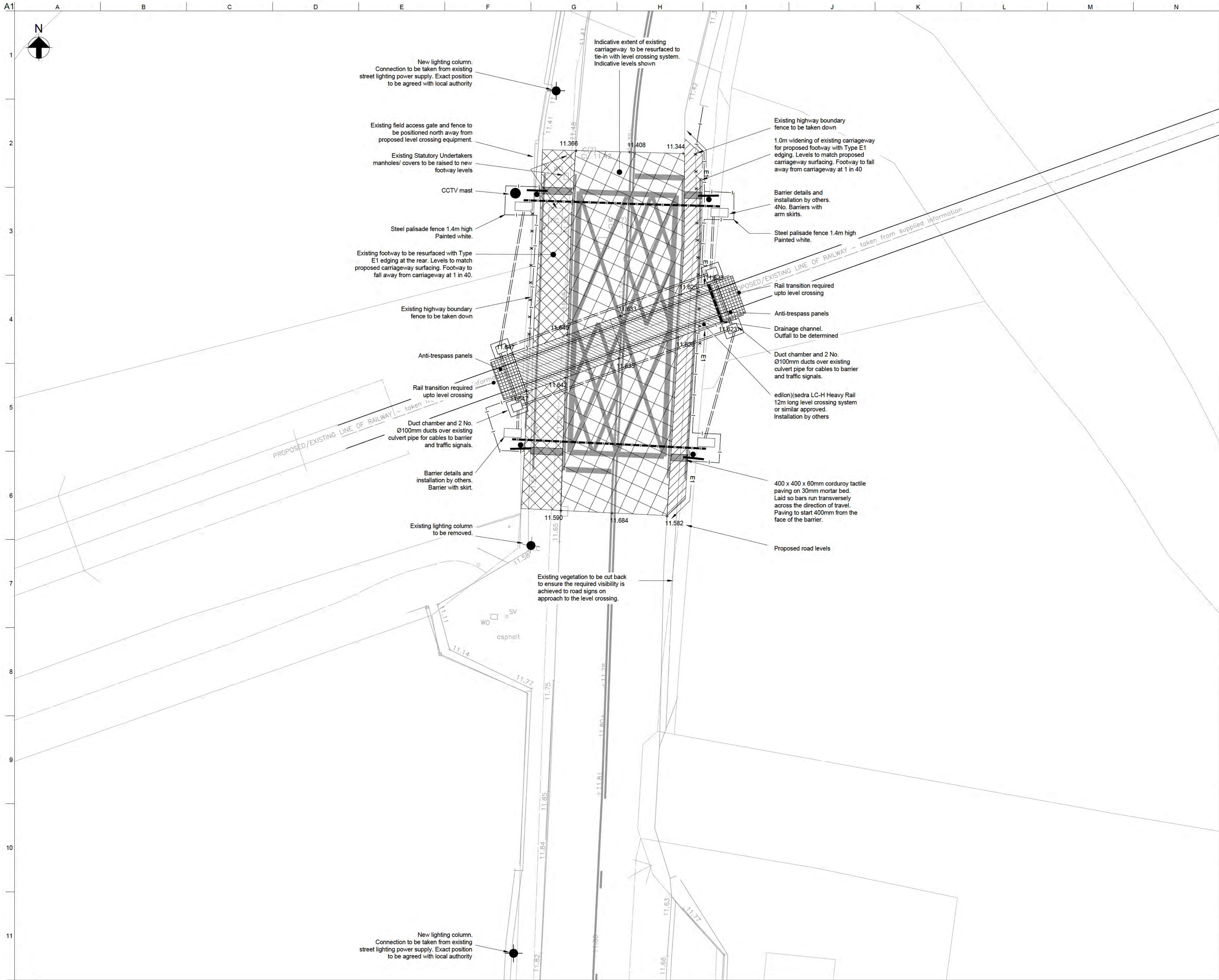
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Client
Rother Valley Railway Limited

Job Title
RVR Level Crossing
Highway Works

Drawing Title
C18 Northbridge Street
Traffic Signs

Scale at A1 1:500	
Discipline Civils	
Job No 239025-00	Drawing Status For Information
Drawing No C.950.G.114	Issue P1



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- Notes: -
- 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.
 - For diagram numbers refer to the TSRGD.
 - For road markings refer to drawing C.950.G.113
 - For traffic signs refer to drawing C.950.G.114 and C.950.G.115.
 - For construction details refer to drawing C.950.G.116

P1	27/02/15	IAB	DC	JP
Preliminary issue				
Issue	Date	By	Chkd	Appd

ARUP

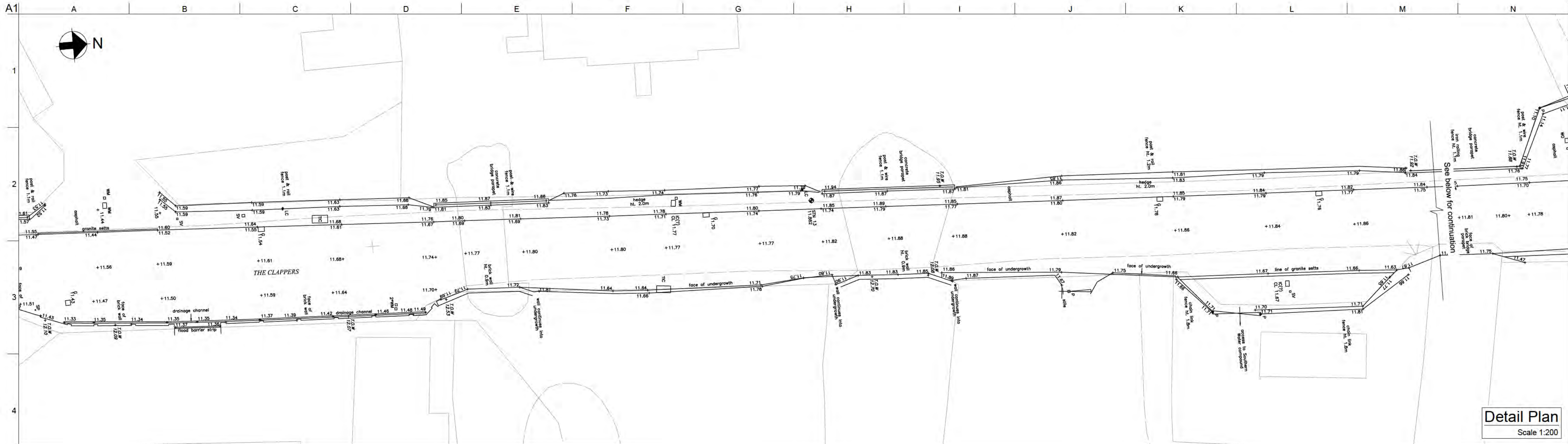
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Client
Rother Valley Railway Limited

Job Title
RVR Level Crossing
Highway Works

Drawing Title
C18 Northbridge Street
General Arrangement

Scale at A1		1:100	
Discipline		Civils	
Job No		Drawing Status	
239025-00		For Information	
Drawing No			Issue
C.950.G.112			P1



- Notes: -
1. Detail shown is an extract of the topographic survey carried out by J.C.White Geomatics Limited, October 2014
 2. For details of the C18 Northbridge Street Level Crossing refer to drawings C.950.G.110 to 116.



P1	27/02/15	IAB	DC	JP
Preliminary issue				
Issue	Date	By	Chkd	Appd

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Client
Rother Valley Railway Limited

Job Title
RVR Level Crossing
Highway Works

Drawing Title
C18 Northbridge Street
Topographic Survey Data

Scale at A1 1:200

Discipline Civils

Job No
239025-00 For Information

Drawing No
C.950.G.110

Issue
P1



For the attention of The Office of the Rail Regulator
and
East Sussex County Council

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5 November 2013

Dear Sirs

Rother Valley Railway Level Crossing – C18 Northbridge Street, Robertsbridge Stage 1 Road Safety Audit

I have the pleasure of enclosing our Rother Valley Railway Level Crossing – C18 Northbridge Street, Robertsbridge Stage 1 Road Safety Audit report. In addition to the enclosed report the Audit Team noted the following points outwith the remit of the audit. I would be grateful if you would bring these issues to the attention of the Designer and/or Maintainer as appropriate.

Additional Comments

- There is an Environment Agency access situated immediately north of the proposed level crossing site on the north bank of the River Rother. The railway will truncate this access and it is not clear how suitable, safe access to the riparian environment will be maintained.
- It is not clear whether the existing verge width (especially on the eastern side of the road) is able to safely accommodate the required traffic sign infrastructure.



IMG_2962.jpg



IMG_2947.jpg

- The drawing provided does not show the extent of the vegetation clearance required in order to provide the appropriate visibility envelope for the level crossing as set out in Railway Principles and Guidance.



IMG_2947.jpg



IMG_2940.jpg

- Northbridge road is lit, and the construction of the crossing may necessitate the removal of an existing lighting column, reducing illumination levels. The provision of consistent street lighting levels will need to be addressed in the detailed design.



IMG_2940.jpg

- The stop line markings to TSRGD diagram 1001 are shown on the incorrect side of the road; i.e. on the exit from the level crossing. These should be shown on the approaches to the level crossing.

If you have any further queries regarding this letter or the enclosed report, please do not hesitate to contact me.

Yours faithfully



Chris van Lottum
Senior Engineer
Road Safety Audit Team Leader

Enc

cc Dave Gillett, Rother Valley Railway

Rother Valley Railway

**Rother Valley Railway Level
Crossing - C18 Northbridge Street,
Robertsbridge**

Stage 1 Road Safety Audit

RSA1.1

Rev A | 5 November 2013

This report takes into account the particular instructions and requirements of our client

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party


Job number 233104-00

Ove Arup & Partners Ltd
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Document Verification

ARUP

Job title		Rother Valley Railway Level Crossing - C18 Northbridge Street, Robertsbridge		Job number		233104-00	
Document title		Stage 1 Road Safety Audit		File reference			
Document ref		RSA1.1					
Revision	Date	Filename	RP CVL RVR RSA1.1 131105 Rev A.docx				
Rev A	5 Nov 2013	Description	Revised document				
			Prepared by	Checked by	Approved by		
		Name	Chris van Lottum	Steve Wells	Steve Wells		
		Signature					
		Filename					
		Description					
			Prepared by	Checked by	Approved by		
		Name					
		Signature					
		Filename					
		Description					
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		Signature					

Issue Document Verification with Document
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Figure 1 Location of Recommendations

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Appendix A

Documents and Drawings

1 Introduction

Arup was appointed by the Rother Valley Railway to conduct a Stage 1 Road Safety Audit on proposals to construct a new automatic locally monitored fully gated level crossing on C18 Northbridge Street, Robertsbridge, East Sussex.

The agreed Audit Team consisted of:

- Mr C van Lottum MEng, MCIHT, MSoRSA
- Mr T Corke BEng, MSc, CEng, MICE, MCIHT, MSoRSA

The audit was undertaken in accordance with the brief submitted to the Audit Team on 10th October 2013. The Audit Team visited the site together on Friday 18th October 2013; weather conditions at the time of the site visit were bright and the road surface was dry.

A list of information provided to the Audit Team has been included as Appendix A to this Report.

The following information was **not** made available to the Audit Team and as such any specific influence of these details on road user safety has not been considered by this audit:

- Departures from Standard
- Road profiles
- Cross sections
- Drainage
- Landscape
- Public utilities
- Vehicle tracking
- Street lighting
- Surface finishes
- Kerbs
- Road restraint systems
- Road accident history

It is understood that no previous road safety audits have been conducted on this scheme.

This audit has been undertaken in accordance with the Terms of Reference set out in HD19/03 'Road Safety Audit'; and the Audit Team members meet the training and experience requirements set out therein. The Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria. However, to clearly explain a problem or recommendation the Audit Team may occasionally refer to design standards without engaging in technical audit.

All problems and recommendations identified by this audit are referenced to the design drawings and the locations have been indicated on the attached plan.

Other issues, including safety issues identified during the Audit but excluded from this report by the Terms of Reference, which the Audit Team wishes to draw to the attention of the Audit Project Sponsor are set out in separate correspondence.

Road Safety Audit is based upon a qualitative risk assessment process and there is no measure of the success achieved by any recommendations given herein. Road

Safety Audit cannot guarantee the safe operation of the scheme under consideration in this report as accidents are rare and random events and are largely caused by factors outside the Audit Team's influence, such as driving behaviour and to a lesser extent vehicle condition.

1.1 Site Description



Project Location

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

1.2 Project Description

The Rother Valley Railway will restore railway transport links between the main line railway system from Robertsbridge Junction to Bodiam and the extant Kent & East Sussex Railway and the attractions it serves.

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;

- C18 Northbridge Street, Robertsbridge
- A21(T) Robertsbridge Bypass; and
- B2244 Junction Road, Udiam.

1.3 Scope of Audit



Scheme Location

This Road Safety Audit is concerned only with the C18 Northbridge Street, Robertsbridge Level Crossing. The other two crossings are discussed in separate report.

No details of the vertical profile of the railway line in the vicinity of the crossing have been provided, and therefore it is not possible to assess the appropriateness of the proposed warning signs in this regard.

2 Stage 1 Road Safety Audit

The Recommendations below are numbered as follows:

STAGE . AUDIT NUMBER . RECOMMENDATION NUMBER

Location:	Northbridge Street, southbound approach
Summary:	Limited forward visibility to level crossing leading to shunt type collisions.
Description:	The approach to the level crossing is situated on a bend in the road



IMG_2951.jpg

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.

S1.1.1 Recommendation:	Move the northern-most warning signs to TSRGD Diagrams 770 and 773 to the northern side of the drainage culvert to provide additional advanced warning.
-------------------------------	---

- Location:** Northbridge Street, carriageway
- Summary:** Adjacent accesses increase the risk of blocking back at the level crossing.
- Description:** 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.



IMG_2975.jpg



IMG_2958.jpg

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.

- S1.1.2 Recommendation:** Introduce a yellow box marking to TSRGD Diagram 1045 to deter traffic from queuing over the crossing.
-

Location:	Northbridge Street, footways
Summary:	Insufficient warning for the visually impaired could lead to pedestrian injuries.
Description:	Footways are provided along both sides of Northbridge Street in the vicinity of the proposed level crossing.



IMG_2946.jpg

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.

SS1.1.3 Recommendation:	Introduce tactile warning surfaces, in line with national guidelines, on each footway approach to the crossing.
--------------------------------	---

**End of list of problems identified and recommendations offered in this
Stage 1 Road Safety Audit**

3 Road Safety Audit Statement

I certify that this audit has been carried out in accordance with HD19/03.

Audit Team Leader

Chris van Lottum MEng, MCIHT, MSoRSA

Senior Engineer

Arup

Central Square, Forth Street,
Newcastle upon Tyne, NE1 3PL



.....

5 November 2013

Audit Team Member

Tom Corke BEng, MSc, CEng, MICE, MCIHT, MSoRSA

Senior Engineer

Arup

The Arup Campus, Blythe Gate, Blythe Valley Park,
Solihull, B90 8AE

Figures

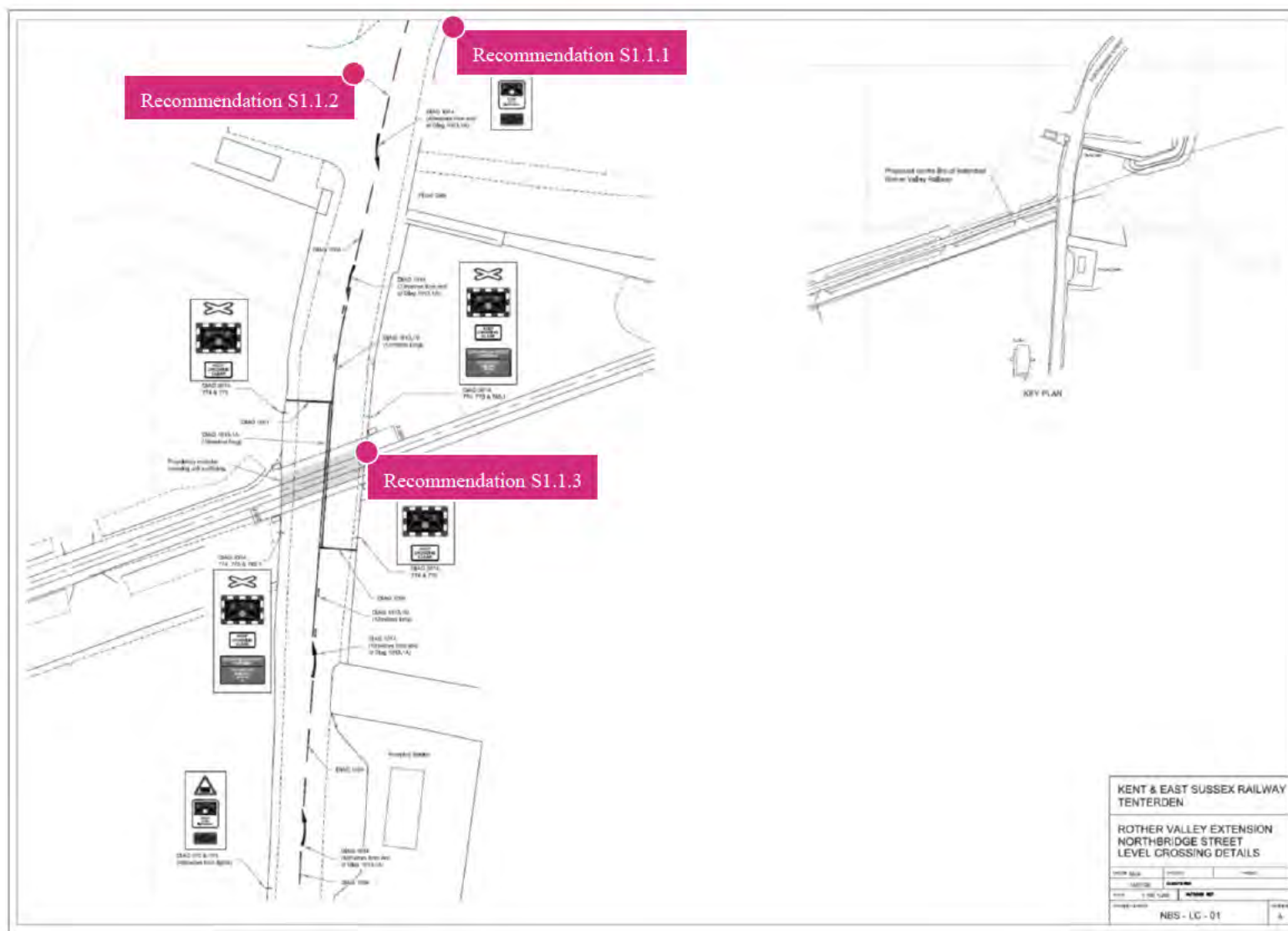


Figure 1 Location of Recommendations

Appendix A

Documents and Drawings

A1 Documents and Drawings

The following documents and drawings were supplied to the Audit Team by the Designer and have been examined in the course of conducting this audit.

A1.1 Document(s)

Title	Reference	Revision
Stage 1 and Stage 2 Road Safety Audit Brief	-	-
Rother Valley Railway A21 Robertsbridge	313090/ITD/ITQ/011	B
Non Motorised User Audit	264223/ ITD/ITQ/126	H
Rother Valley Railway Proposed level Crossings	288755/ ITD/ITW/00	E
Rother Valley Railway A21 Robertsbridge Highways and Traffic Assessment Report	313090/IDT/ITQ/0006	D

A1.2 Drawing(s)

Title	Reference	Revision
Rother Valley Extension – Northbridge Street – Level Crossing Details	NBS-LC-01	A



Annex D. Road Crossings. Narrative safety report.

New Build Level Crossing Narrative Risk Analysis (NBLC-NRA)

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1 Introduction

The Rother Valley Railway will provide a full barrier 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 embrodering new technology to further enhance the safety of the level crossing, for example;

- CCTV for improved safety & security,
- 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 review the possibility of installing the LIDAR system after the first 12 months of operation to determine if it will add any additional benefit to the safety of the level crossing.

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	Full Barrier at Grade LC
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 automatic locally monitored fully gated 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





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.



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

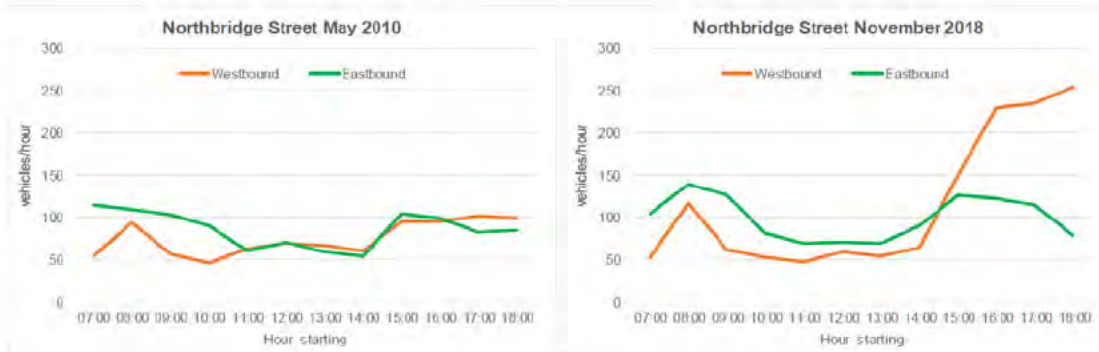


Lighting;

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 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
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 level crossing at a maximum speed of 10 mph, thus ensuring that the train has the ability to stop in 30m. The signaller shall initiate the closing sequence of the barriers having received an audible and visual signal from the strike in treadle enabling the signaller to manage and control 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.

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 signaller's 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 in 30m. The signalman shall initiate the closing sequence of the barriers having received an audible and visual signal from the strike in treadle enabling the signaller to manage and control 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.

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 barrier & CCTV 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 Maintenance Plan

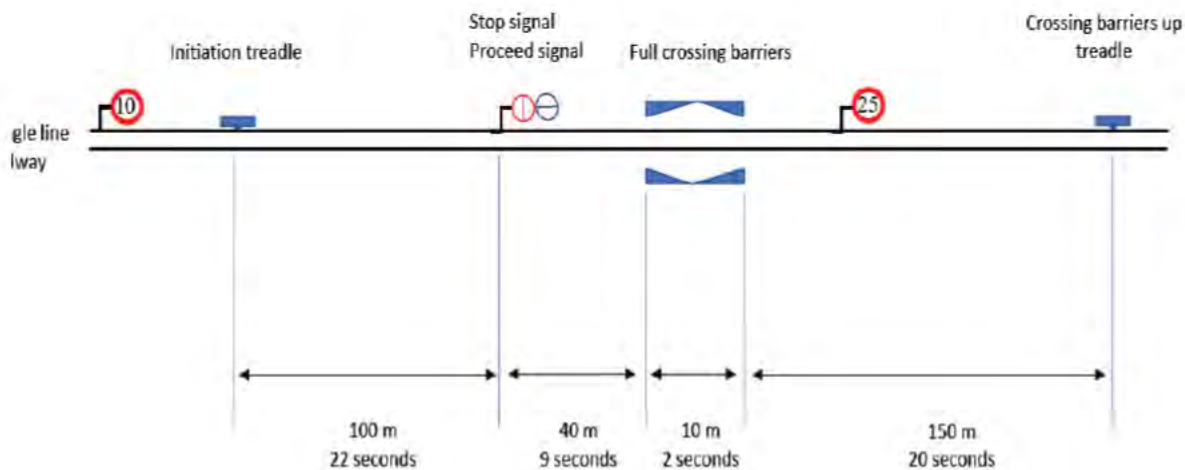
The maintenance plan for the three-level crossing shall be based on that recommended by the supplier of the equipment. It shall comprise:

- 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.

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 likelihood 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?	<p>Signal position is not consistent with the spacing between preceding signals</p> <p>Signal is of a different design to preceding signals</p> <p>Potential for, Death, Serious injury or injury</p>	4	3	12	<p>The KESR signalling arrangement will have consistent signal design.</p> <p>All staff will receive training before operation commences</p>	3	2	6



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	4	3	12	Ensure signals for all lines are visible Shield nearby signals from view Appropriate signal should be clearly associable with its line Driver training	3	2	6
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 signal's line of s 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	3	3	9	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	3	2	6



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	4	3	12	Lineside fencing / netting Railhead conditioning Management of lineside vegetation Low adhesion warning signs Driver training	2	2	4
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	2	2	4	Permissible speed on approach to the level crossing is maximum 10 mph Driver training On site staff monitoring	2	2	4
Is there a falling gradient on approach to the signal?	There is a falling gradient on the approach to the signal	4	3	12	Countdown markers Driver training	3	2	6
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.	4	3	12	Optimising position of equipment at the design stage removing any conflicting or redundant signs. Strike in times optimised. Sighting lines enhanced.	3	2	6



	<p>Instructions for safe use may be misunderstood e.g., signage, clutter detracts from key messages, conflicting information given.</p> <p>High volume of unfamiliar users e.g. irregular visitors, migrant workers.</p> <p>Known user complacency leading to high levels of indiscipline.</p> <p>Type of vehicle unsuitable for level crossing;</p> <ul style="list-style-type: none"> - 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. <p>Users experience a long waiting time.</p>				<p>Latest technology in place for user-based warning systems including wig-wag lights, sirens, full road barriers, RTL.</p> <p>Competent crossing attendant on site.</p> <p>Maximum train speed 10 mph implemented.</p> <p>Superior quality crossing surface construction material.</p> <p>De-vegetation programme in place</p>			
Pedestrian and train collision risk	<p>Ineffective whistle boards, warning inaudible, insufficient train warning time.</p> <p>Level crossing equipment and signage is not conspicuous or optimally positioned.</p>	4	3	12	<p>Optimising position of equipment at the design stage removing any conflicting or redundant signs.</p> <p>Latest technology in place for user-based warning systems including wig-wag lights, sirens, full road barriers,</p>	3	2	6



	<p>Instructions for safe use may be misunderstood.</p> <p>Surface condition could lead to slip/trip risk.</p> <p>High volume of unfamiliar users i.e. irregular visitors/ramblers/equestrian.</p> <p>Complacency leading to high levels of indiscipline e.g. users are known to rely on knowledge of timetable.</p> <p>High level of use by vulnerable people.</p> <p>High usage of cyclists.</p>				<p>RTL.</p> <p>Competent crossing attendant on site.</p> <p>Maximum train speed 10 mph implemented.</p> <p>Superior quality crossing surface construction material.</p> <p>De-vegetation programme in place.</p> <p>Regular engagement with stakeholders/authorised users reinforcing safe crossing protocol, legal responsibilities and promoting collaborative working.</p> <p>Signage to encourage users to look for approaching trains as well as providing cyclist dismount signs.</p>			
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	<p>Collision with road vehicle (see above).</p> <p>Collision with member of public (See above).</p> <p>Death</p>	4	3	12	<p>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.</p> <p>The treadle will also activate a warning tone</p>	2	2	4



	Serious 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.			
	Injury				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	4	3	12	Signal reminder sign	3	2	6
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	4	3	12	Position signal where driver not distracted by other duties Driver training	3	2	6
Distractions while using the level crossing might impair the user's ability 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). When wearing headphones (especially noise-cancelling	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. Staff training. Crossing attendant on site. Trespass guards. Traffic calming measures. Train maximum speed 10 mph. New modern full barrier crossing.	2	2	4



	<p>headphones) the user might be unable to hear warning sounds such as approaching trains and station announcements; thus reducing their situational awareness</p> <p>Changes to a user's 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.</p> <p>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.</p> <p>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 vehicle's windscreen. Other</p>				Education campaign.			
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	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.	<p>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.</p> <p>Their behaviour can become habitual, resulting in a failure to look for unexpected information, leaving them susceptible to errors of judgment.</p> <p>Regular users are more likely than infrequent users to perceive crossing risk to be low and commit a violation of safe crossing procedure.</p> <p>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.</p> <p>Potential behaviour traits of frequent users might include:</p>	4	3	12	<p>Provision of CCTV surveillance cameras and signage to deter misuse at a particular crossing and to capture evidence of violations when they arise.</p> <p>Staff training.</p> <p>Crossing attendant on site.</p> <p>Trespass guards.</p> <p>Traffic calming measures.</p> <p>Train maximum speed 10 mph.</p> <p>New modern full barrier crossing.</p> <p>Education campaign.</p>	2	2	4



	<p>Expectation by the user that there will not be any trains in the area.</p> <p>Familiar users apply prior knowledge of train times / frequencies</p> <p>User believes he / she has enough time to beat the train</p> <p>User has a low level of concentration and is easily distracted</p> <p>User does not look in both directions</p> <p>User has low perception of risk</p> <p>User thinks he / she understands procedure without reading instructions</p> <p>User unaware of risks to subsequent users</p>							
High vehicle approach speeds	<p>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 perception and attitude to risk, visibility of warning signs and visibility of the level crossing e.g. rural winding roads.</p>	4	3	12	<p>Reduced road speed on approach to level crossing.</p> <p>Traffic calming measures.</p> <p>Enhanced signage.</p> <p>New modern full barrier crossing.</p> <p>Education campaign.</p> <p>Crossing attendant</p>	2	2	4



					(Monitoring).			
Large, slow and low vehicles	<p>Drivers of large vehicles are involved in a disproportionately high number of incidents at level crossings.</p> <p>The size of the vehicles - they have less room for error when compared to cars.</p> <p>They may not be responding to the activation of the crossing warning system in sufficient time.</p> <p>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.</p> <p>Other contributory factors might include:</p> <p>The slower acceleration speed of HGVs causing the total time to cross a</p>	4	3	12	<p>Reduced road speed on approach to level crossing.</p> <p>Traffic calming measures.</p> <p>Enhanced signage</p> <p>Yellow box marking</p> <p>Level crossing road surface well maintained</p> <p>Power operated level crossing barriers</p>	2	2	4



	level crossing from standstill to increase Sightlines from a higher driving position.							
No provision of pedestrian bridges or underpasses	<p>Pedestrians and train passengers are more likely to undertake risky behaviour at vehicular level crossings where bridges or underpasses are not provided.</p> <p>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.</p> <p>Users such as Dog walkers, Wheelchair or mobility scooter users, elderly (65+) and youths (11-18yr)</p>	3	3	9	<p>Painting of road markings on the crossing that clearly show the area in which pedestrians should walk when traversing the crossing.</p> <p>New modern full barrier crossing.</p> <p>Education campaign.</p> <p>Crossing attendant on site (Monitoring).</p> <p>Clear signage.</p>	2	2	4
Ice conditions	Icy weather conditions on the approach and exit to the crossing might affect the	3	3	9	Provision of CCTV surveillance cameras.	2	2	4



	<p>behaviour of the crossing, for example, prevent vehicles from stopping in a position of safety at the crossing.</p> <p>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.</p> <p>Cause pedestrians to concentrate on their footing, rather than looking for trains or observing warning signs.</p> <p>Result in pedestrian slips, trips and falls. This is a particular risk for elderly, or mobility impaired, users.</p> <p>Level crossings on 'B' roads might present a particular hazard to vehicle drivers as these roads are not normally gritted in icy conditions.</p>				<p>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.</p> <p>Level crossing attendant on site.</p> <p>Improved crossing surface.</p> <p>Regular monitoring.</p> <p>Tactile surfaces.</p>			
User age: Elderly drivers (65+)	<p>The frequency of level crossing violation is associated with the age of the local population.</p> <p>Evidence has identified that a disproportionate</p>	3	3	9	<p>CCTV monitoring.</p> <p>New modern full barrier crossing (Audible/visual alarms).</p>	2	2	4



	number of elderly 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.				<p>Education campaign.</p> <p>Crossing attendant (Monitoring).</p> <p>Reduced road speed on approach to level crossing.</p> <p>Traffic calming measures.</p> <p>Enhanced signage.</p>			
Foliage obscuring warning signs and approaching trains	<p>The visibility (and hence effectiveness) of information on the approach to and at the level crossing is reduced by overgrown foliage.</p> <p>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.</p>	4	3	12	<p>Cutting back vegetation and removing obstructions the sighting distances for users up and down the track and to signs / warning lights are lengthened.</p> <p>Staff training i.e. HRA Guidance document HGR – A0720 Control of Vegetation (Management plan).</p> <p>Improved sighting distances.</p> <p>Train speed max 10 mph.</p> <p>CCTV monitoring.</p> <p>New modern full barrier</p>	2	2	4



	<p>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.</p> <p>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.</p>				<p>crossing (Audible/visual alarms).</p> <p>Education campaign.</p> <p>Crossing attendant on site (Monitoring).</p> <p>Reduced road speed on approach to level crossing.</p> <p>Traffic calming measures.</p> <p>Enhanced signage.</p>			
Vulnerable Users, for example, people with dogs on leads, young people, people visiting the area etc.	<p>Vulnerable users even if crossing in accordance with instructions face particular crossing risks during their traverse.</p> <p>Crossing users are possibly subject to the following risk factors:</p> <p>making slips, trips and falls, for example a dog on a lead might become a trip hazard to user.</p> <p>Dog/s might hold user back on tracks, preventing them from completing their traverse.</p>	4	3	12	<p>CCTV monitoring.</p> <p>Pedestrian walkway – defining, Painting of road markings on the crossing that clearly show the area in which pedestrians should walk when traversing the crossing.</p> <p>New modern full barrier crossing (Audible/visual alarms).</p> <p>Education campaign.</p> <p>Crossing attendant (Monitoring).</p>	2	2	4



	<p>Horses can present additional challenges if it is startled or distracted.</p> <p>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.</p> <p>Young people may be distracted by friends, using mobile telephones, headphones and so on.</p> <p>Visiting people may not be familiar with the level crossing operation, distracted by looking for directions' signs etc.</p>				<p>Reduced road speed on approach to level crossing.</p> <p>Traffic calming measures.</p> <p>Enhanced signage.</p>			
Parked vehicles in close proximity to the crossing	<p>Vehicles parked close to crossing entry and exit points might increase the risk and crossing time of other users.</p> <p>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.</p>	4	3	12	<p>Provision of CCTV surveillance cameras and signage to deter misuse at a particular crossing and to capture evidence of violations when they arise.</p> <p>Painting of road markings on the crossing that clearly show the area in which pedestrians should walk when traversing the crossing.</p>	2	2	4



	<p>Potential issues include:</p> <p>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).</p> <p>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.</p> <p>Parked vehicles obscuring the visibility of signs and signals to other crossing users.</p> <p>Traffic flow problems, such as 'blocking back'.</p> <p>Examples of situations where vehicles might stop or park near a level crossing include:</p> <p>Vehicle drivers dropping off their passengers.</p> <p>Residents without off-street parking (e.g. owners of railway cottages) choosing to park on the approach</p>				<p>Paint yellow box markings on the crossing.</p> <p>Yellow lines (double) on the road approaches to the crossing.</p> <p>New modern full barrier crossing (Audible/visual alarms).</p> <p>Education campaign.</p> <p>Crossing attendant (Monitoring).</p> <p>Traffic calming measures.</p> <p>Enhanced signage.</p>			
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	<p>and exit roads to level crossing.</p> <p>Customers parking to visit the local shops that have limited or no parking.</p> <p>Level crossings in the vicinity of schools might be used by parents as drop-off and collection points for their children.</p> <p>'Visitors' (crossing 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.</p> <p>'Visitors' might also park on the immediate approach or exit to the crossing.</p>							
Crossing utilisation or traffic moment	High crossing utilisation by users is associated with a greater chance of user risk taking behaviour.	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.	2	2	4



					<p>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.</p> <p>Level crossing attendant on site.</p> <p>Reducing the road approach speed to the level crossing to reduce the risk of collision between vehicles and gates / trains.</p> <p>New modern full barrier crossing (Audible/visual alarms).</p> <p>Education campaign.</p> <p>Crossing attendant (Monitoring).</p> <p>Traffic calming measures.</p> <p>Enhanced signage.</p>			
Unfamiliar users	Users who are not familiar with the level crossing procedure in the UK might apply an	4	3	12	Provision of CCTV surveillance cameras and signage to deter misuse at a particular crossing and to capture	2	2	4



	incorrect mental model when traversing the crossing.				<p>evidence of violations when they arise.</p> <p>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.</p> <p>Level crossing attendant on site.</p> <p>Reducing the road approach speed to the level crossing to reduce the risk of collision between vehicles and gates / trains.</p> <p>New modern full barrier crossing (Audible/visual alarms).</p> <p>Education campaign.</p> <p>Crossing attendant (Monitoring).</p> <p>Traffic calming measures.</p> <p>Enhanced signage</p>			
Traffic calming systems Road traffic calming systems on either side of a level crossing might increase the risk	Traffic calming systems, such as road width restrictions/ build-outs, positioned	3	3	9	Provision of CCTV surveillance cameras and signage to deter misuse at a particular crossing and to capture evidence of violations	2	2	4



of blocking back.	<p>on either side of a level crossing might increase the risk of vehicle drivers blocking back over the crossing.</p> <p>When the crossing is closed to road traffic, queues form along the road.</p> <p>This issue might be exacerbated due to factors such as the time of day (rush hour) and 'herd mentality'.</p> <p>Discomfort for cyclists on the road.</p> <p>Potentially more noisy approach to the crossing leading to possible complaints.</p> <p>If overused in conjunction with changes in speed the mitigation might lose its impact upon behaviour.</p>				<p>when they arise.</p> <p>Reducing the road approach speed to a level crossing to reduce the risk of collision between vehicles and gates / trains.</p> <p>A range of enhancements to improve conspicuity, comprehension of and user response to level crossing warning signs:</p>			
Housing developments Housing developments increase road traffic, level crossing use and therefore the potential for risk taking	With an increase in traffic within the local area, vehicle drivers might be less inclined to stop at a level	3	3	9	<p>CCTV monitoring.</p> <p>LC Attendant – Training/Competence.</p>	2	2	4



behaviour.	<p>crossing if their overall journey time has increased since the development of new housing and the influx of new residents; thus, increasing the potential for risky behaviour.</p> <p>The level crossing might not be designed to accommodate the increased number of users; therefore information, walkway/ road widths etc. might require updating.</p>				<p>Train speed maximum 10mph.</p> <p>Education campaign.</p> <p>Enhanced signage</p> <p>Education campaign.</p> <p>Crossing attendant (Monitoring).</p> <p>Traffic calming measures.</p> <p>Introduce a yellow box marking.</p>			
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.	3	3	9	<p>Introduce a yellow box marking.</p> <p>Traffic calming measures.</p>	2	2	4
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	2	2	4	<p>Provision of a level crossing attendant to open and close the crossing barriers for users when safe to do so.</p> <p>The level crossing attendant is deployed to monitor and police user behaviour ensuring barriers are operated correctly.</p>	1	1	2



					Staff Training. 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 user's behaviour; resulting in risk taking actions such as overtaking and not observing the level crossing warning signs.	4	4	16	Power operated barrier. CCTV monitoring. LC Attendant – Training/Competence. Education campaign. Enhanced signage	2	2	4
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	4	4	16	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	2	2	4



	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.				correctly. LC Attendant – Training/Competence. Education campaign. Enhanced signage.			
Adverse weather impacting visual information.	<p>The effectiveness of visual information at crossings can be impaired by adverse weather conditions (e.g. fog and snow).</p> <p>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</p>	3	3	9	<p>CCTV monitoring.</p> <p>New modern full barrier crossing (Audible/visual alarms).</p> <p>Education campaign.</p> <p>Crossing attendant (Monitoring).</p> <p>Reduced road speed on approach to level crossing.</p> <p>Train speed maximum 10mph</p> <p>Traffic calming measures.</p> <p>Enhanced signage.</p>	2	2	4



	<p>adopting risky behaviour.</p> <p>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.</p> <p>An example where foggy conditions have been identified as a causal factor in a level crossing incident investigation is the fatality at Barratt's Lane No.1 footpath crossing.</p>							
Alcohol and drugs	<p>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.</p> <p>Users under the influence of alcohol or drugs might exhibit</p>	3	3	9	<p>CCTV monitoring (staff training initiatives).</p> <p>Anti-trespass and cattle guard panels are designed to deter people or animals from crossing the track at unauthorised places.</p> <p>Do not trespass signs.</p> <p>New modern full barrier crossing (Audible/visual alarms).</p>	2	2	4



	<p>the following behaviours:</p> <p>be more inclined to ignore normal crossing procedures</p> <p>be physically unstable and prone to slips, trips and falls</p> <p>be unable to focus, cognitively and visually</p> <p>have a lower perception of risk.</p>				<p>Education campaign.</p> <p>Crossing attendant (Monitoring).</p> <p>Traffic calming measures.</p> <p>Enhanced signage.</p>			
Disabilities.	<p>Disabilities (e.g. reduced mobility, reduced levels of vision/hearing) will influence the behaviour of users at level crossings.</p> <p>Visually impaired users might be unable to see warning lights and signs clearly, or scan for trains before crossing.</p> <p>Hearing impaired users might be unable to hear crossing alarms, train whistles, warnings from people</p>	3	3	9	<p>CCTV monitoring (staff training initiatives).</p> <p>level crossing attendant (Monitoring)</p> <p>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.</p>	2	2	4



	<p>or the sound of approaching trains.</p> <p>Cognitively impaired users might have difficulty understanding and following the correct crossing procedure, or interpreting warning signs.</p> <p>Users with physical impairments (permanent or temporary) might encounter difficulties using level crossings of all types, but especially user worked crossings.</p> <p>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.</p>				<p>Power operated barriers.</p> <p>Provision of flange gap filler to improve crossing surface.</p> <p>Provision of tactile edges (and stop lines) and clear delineation of the footway at public vehicular crossings.</p> <p>New modern full barrier crossing (Audible/visual alarms).</p> <p>Education campaign.</p> <p>Crossing attendant (Monitoring).</p> <p>Traffic calming measures.</p> <p>Enhanced signage.</p>			
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Incorrect mental model Incidents at level crossings could occur if the user adopts the incorrect mental model of how the crossing works.	<p>Mental models are internal mental representations of an external reality.</p> <p>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.</p> <p>Users familiar with the operation of one type of crossing might apply their mental model at other types of level crossing.</p>	3	3	9	<p>CCTV monitoring (staff training initiatives).</p> <p>level crossing attendant (Monitoring)</p> <p>Provision of tactile edges (and stop lines) and clear delineation of the footway at public vehicular crossings.</p> <p>New modern full barrier crossing (Audible/visual alarms).</p> <p>Education campaign.</p> <p>Crossing attendant (Monitoring).</p> <p>Traffic calming measures.</p> <p>Enhanced signage.</p>	2	2	4
Fatigue	<p>Fatigued users will be more susceptible to making errors or to taking shortcuts when crossing.</p> <p>Fatigue has a significant effect on human performance and the likelihood of</p>	4	3	12	<p>CCTV monitoring (staff training initiatives).</p> <p>level crossing attendant (Monitoring)</p> <p>Provision of tactile edges (and stop lines) and clear delineation of the footway at public vehicular crossings.</p>	2	2	4



	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).				<p>New modern full barrier crossing (Audible/visual alarms).</p> <p>Education campaign.</p> <p>Crossing attendant (Monitoring).</p> <p>Traffic calming measures.</p> <p>Enhanced signage.</p>			
Signaller/CCTV Operator:	<p>'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.</p> <p>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:</p>	3	3	9	<p>CCTV monitoring (staff training initiatives).</p> <p>New modern full barrier crossing.</p>	2	2	4

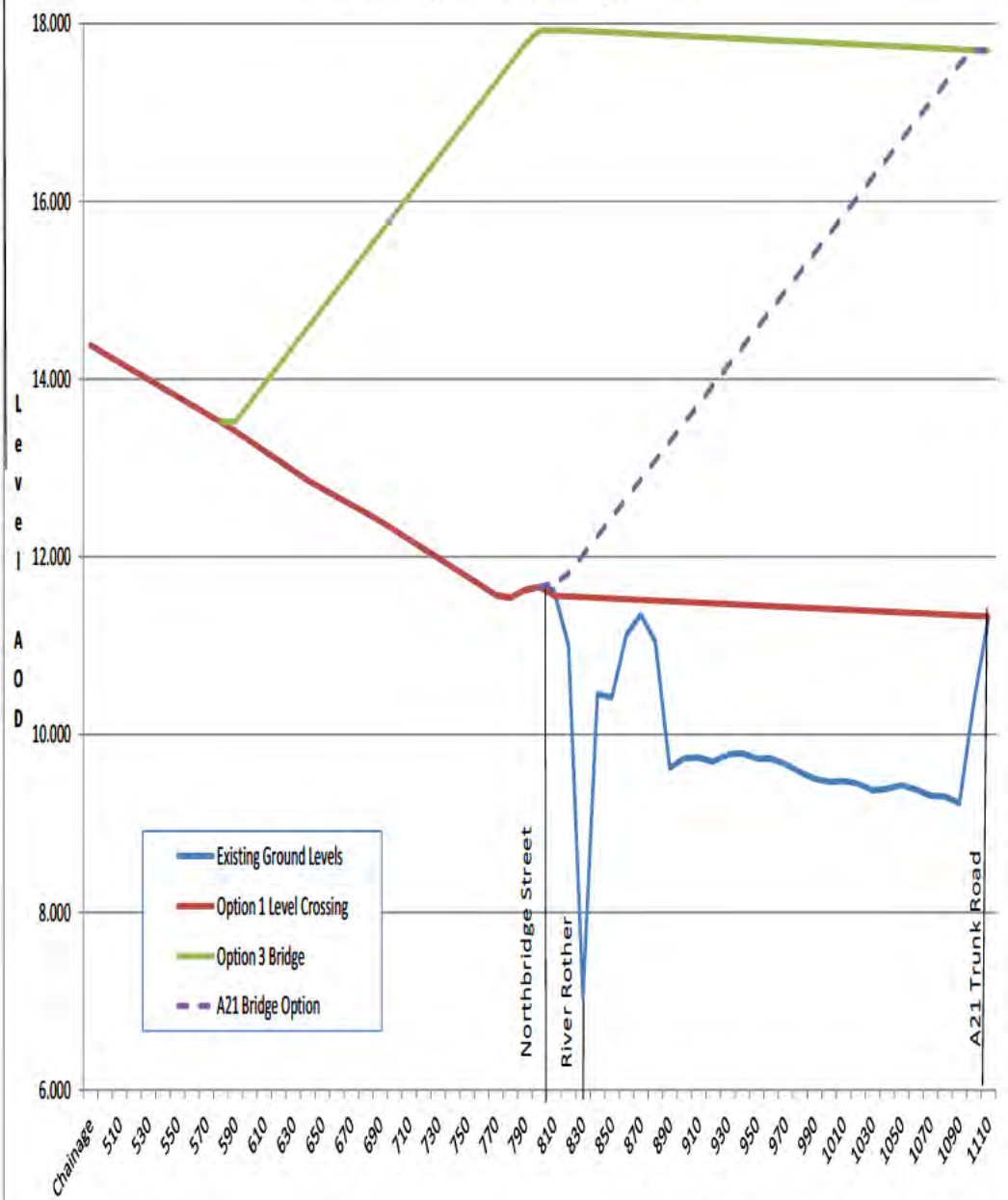


	<p>hazards associated with a particular crossing,</p> <p>how to check whether a crossing is clear.</p> <p>Signaller's/Operators not following the appropriate rules and protocols should be subject to additional monitoring and development plans.</p> <p>Inefficient CCTV scanning strategy Signaller/Operator uses an inefficient method of scanning CCTV screens.</p> <p>The scanning method employed by a signaller/Operator for monitoring CCTV screens will affect whether they successfully identify information on the CCTV screen.</p> <p>Using an inefficient scanning strategy might result in the signaller/Operator taking a longer time to identify key events, or might result in them</p>							
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	<p>missing key events on other CCTV screens.</p> <p>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.</p>							
Work in or adjacent to public roadways.	<p>Plant, equipment materials striking traffic/members of public.</p> <p>Traffic colliding with staff.</p>	3	3	9	<p>Authorised road closures and traffic management.</p> <p>Implement pedestrian walkways.</p> <p>Plant to be suitable for access to public roads.</p> <p>Comply with New Roads and Street Works Act and Traffic Signs Regulations.</p>	1	1	2

Northbridge Street Crossing Profiles



B2244 Junction Road Crossing Profiles

