[redacted]
By email: s[redacted]

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Freedom of Information
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5th July 2018

Dear [redacted]

Information request
Reference number: FOI2018/00730

Thank you for your email of 8th June 2018, in which you requested the following information:

'Please could you provide me with the risk assessment for the Leasowe (Wirral, Merseyside) level crossing.'

I have processed your request under the terms of the Freedom of Information Act 2000 (FOIA).

I can confirm that we hold the information you requested. Please find attached the document referenced "CWK3 05m 65ch Leasowe 160616_Redacted".

Please note I have withheld personal information from the document which could allow living individuals to be identified under section 40(2) of the FOIA. This exemption allows us to withhold information in circumstances where its disclosure would breach the data protection principles set out at s.35 of the Data Protection Act 2018 and Article 5 of the General Data Protection Regulations. In this instance, disclosure would breach the first principle which mandates that data must be processed fairly and lawfully.

If you have any enquiries about this response, please contact me in the first instance at FOI@networkrail.co.uk or on 01908 782405. Details of your appeal rights are below.

Please remember to quote the reference number at the top of this letter in all future communications.

Yours sincerely

Anisha Pandya
Information Officer

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If you are unhappy with the way your request has been handled and wish to make a complaint or request a review of our decision, please write to the FOI Compliance and Appeals Manager at Network Rail, Freedom of Information, The Quadrant, Elder Gate, Milton Keynes, MK9 1EN, or by email at foi@networkrail.co.uk. Your request must be submitted within 40 working days of receipt of this letter.

If you are not content with the outcome of the internal review, you have the right to apply directly to the Information Commissioner for a decision. The Information Commissioner can be contacted at:

Information Commissioner's Office
Wycliffe House
Water Lane
Wilmslow
Cheshire SK9 5AF

London North Western (LNW) Route
Level Crossing Risk Assessment

Leasowe

Manually Controlled Barrier with CCTV, 16/06/2016

CONTENTS

1 INTRODUCTION 1

2 DESCRIPTION OF THE SITE 1

3 HAZARDS 5

4 SAFETY MANAGEMENT INFORMATION SYSTEM 7

5 OTHER FACTORS AFFECTING THE CROSSING 8

6 OPTIONS EVALUATED 9

7 CONCLUSIONS AND RECOMMENDATIONS 10

8 APPROVAL 12

9 APPENDIX A 13

10 APPENDIX B 15

11 APPENDIX C 16

1 INTRODUCTION

1.1 Reason for the risk assessment

Network Rail has a responsibility and legal duty under the Health and Safety at Work Act 1974 for the health, safety and welfare of its employees and for protecting others against risk.

Network Rail also has a legal responsibility under the Management of Health and Safety at Work Regulations 1999. Section 3 focuses on the requirement for suitable and sufficient assessments of risk to health and safety of employees and others in connection with their undertaking.

Network Rail is committed to reducing the risk on the railway and has identified that one of its greatest public risks is at level crossings. This is where the railway has a direct interface with other elements e.g. vehicles and/or pedestrians. Network Rail is working to reduce this risk to as low as is reasonably practicable.

2 DESCRIPTION OF THE SITE

2.1 Level crossing details

Name of crossing	Leasowe
Type	Manually Controlled Barrier with CCTV
Engineers Line Reference (ELR)	CWK3
Mileage	05m 65ch
OS grid reference	SJ270907
Number of lines crossed	2
Line speed (mph)	60mph
Electrification	Electrified – Third Rail
Signal box	Sandhills
Risk assessment next due date	16/09/2018

As part of a level crossing risk assessment, data is entered into the industry accepted risk modelling support tool (All Level Crossing Risk Model) which enables Network Rail to compare risk at all level crossings throughout the network. Results for this level crossing are provided below; see Appendix A for further details on how this is calculated.

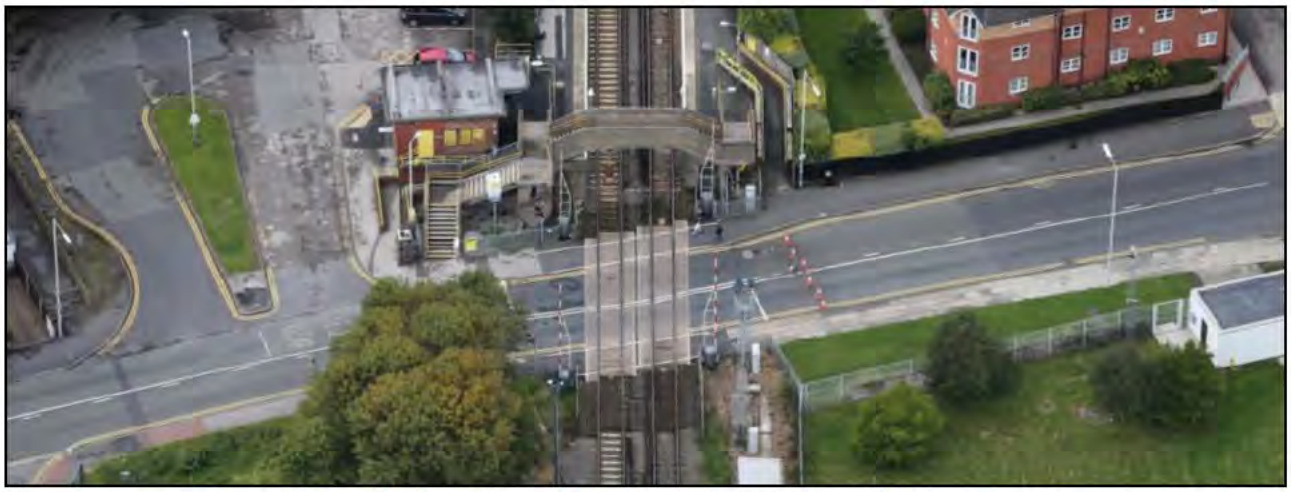
ALCRM Risk Details	
Risk Score	C4
FWI	0.004853513

Leasowe level crossing is a protected crossing. This means that the crossing is protected from train movements ensuring that trains are not authorised to pass over the crossing until the crossing is closed and the crossing area has been checked to be clear.

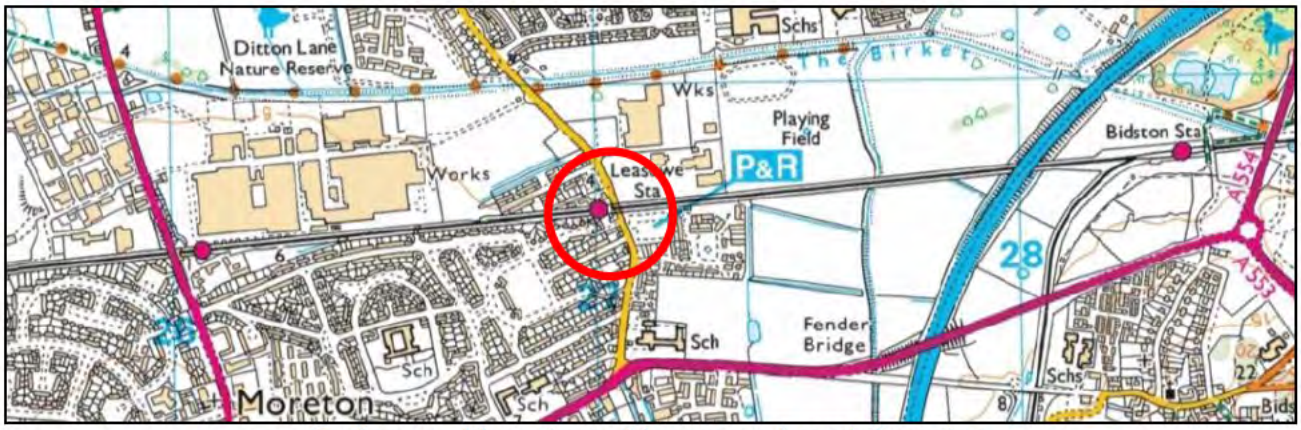
The level crossing is also known as an active crossing as there is an active method of warning is provided to warn users of an approaching train. At this location, Road Traffic Signals are in place to give a visual warning that the level crossing sequence is beginning and a train is approaching. Audible warning is also given for pedestrian users. Full barriers fully prevent access to the railway as trains approach and traverse the level crossing.

At present, there are 770 level crossings on the LNW route. Out of this figure Leasowe crossing is ranked number 54. However, if you compare this level crossing to other crossings of a similar type it is ranked 11 out of 55.

2.2 Crossing imagery



Aerial view of Leasowe Level Crossing



Ordnance Map view of Leasowe Level Crossing

Up side approach of Leasowe

Down side approach of Leasowe

Additional photographs of the surrounding environment are provided in Appendix B.

2.3 Crossing environment

Leasowe level crossing is located to the north of Moreton which is a town in the Wirral Borough with a population of approximately 17,700 (based on 2001 census). Further to the north of the crossing is the town of Leasowe, which has an approximate population of 14,600 (based on 2001 census).

Directly to the north of the crossing there are a small number of dwellings and a number of larger business and industrial units. Further north is the town of Leasowe which has a large number of dwellings, small business and local amenities.

Directly to the south of the crossing there are a large number of dwellings, Leasowe train station car park and a local college. Further south lies the town of Moreton which has a large number of dwellings, small business and local amenities.

Leasowe train station is located directly to the west of the crossing. Leasowe train station has an approximate footfall of 0.607 million per (based on 2015/2016 figures). Many station users will traverse the crossing to access opposite platforms; however a pedestrian footbridge is also situated at the crossing which provides pedestrian access to both sides of the railway without having to use the level crossing.

2.4 Approach to crossing

This crossing is located between Bidston station and Leasowe station. At this location the crossing spans two lines with a maximum line speed of 60 mph. The railway is orientated from east to west.

Approaching the crossing from the south the first track met is the down line. Users approaching from the south travel along Reeds Lane heading north toward Leasowe. Once over the level crossing users continue north into the town of Leasowe.

Approaching the crossing from the north the first track met is the up line. Users approaching the crossing from the north travel from the town of Leasowe along Reeds Lane toward the train station and level crossing. Once over the crossing, users continue south along Reeds Lane toward the town of Moreton.

At this location, the road speed is designated as 30mph. It appears that many users do abide by the legal road speed limit, however on approach to the crossing, the road is long and straight, which may lead to users travelling along the road at speeds in excess of 30mph.

2.5 Crossing usage

Normal passenger services run between the hours of 05:45 and 23:59 with approximately 128 services per day. There are no scheduled freight services along this line of route; however freight services can run along the line if required. The

number and frequency of services can fluctuate depending on operational requirements, engineering works or during times of disruption.

A quick 30 minute census was undertaken on 16/06/2016 to determine the number and type of users traversing the level crossing. The level crossing is situated on a main road between two towns. Because of this, there is a lot of traffic movement along the road and over level crossing.

User Type	Number
Cars	161
Vans / Small Lorries	19
Buses	6
HGVs	3
Pedal / Motor Cycles	3
Pedestrians	22
Horses / Horse Riders	0
Animals on the Hoof	0
Tractors / Farm Vehicles	0

The census visually identified vulnerable users such as young children (many of whom unaccompanied) and elderly users. However it must be noted that a visual census does not fully identify all users with protected characteristics. There are two large schools located nearby, Kingsway Academy and Leasowe Primary.

ALCRM calculated the 24 hour usage to be :- 5103 vehicles per day and 675 pedestrians.

There did not appear to be a high number of irregular users and it appeared that many of the users were local residents travelling within the area.

3 HAZARDS

3.1 Sighting and traverse

Leasowe level crossing is protected by road traffic light signals and lifting barriers on both sides of the railway. An audible warning to pedestrians is also provided. The barriers are normally kept in the raised position and, when lowered, extend across the whole width of the carriageway on each approach. As such, sighting and traverse times are not calculated for protected crossings.

3.2 Identified hazards and risks

Hazard	Potential impact	Mitigations
Trains	Fatality or serious injury	• Level crossing signage. • Barriers present to prevent access to railway as trains approach. • Road Traffic Signals (RTS) in place for visual warning of crossing sequence. • Audible warning present for pedestrian users to warn of crossing sequence. • Standard crossing layout, compliant with Office of Rail and Road guidance.
Slip, trip, falls	Fatality or serious injury	• Appropriate crossing decking for crossing type and location. • Regular crossing inspections and maintenance regime in place.
Difficulty on hearing approaching trains due to inclement weather	Fatality or serious injury	• Level crossing signage. • Vegetation management plan in place. • Barriers present to prevent access to railway as trains approach. • Road Traffic Signals (RTS) in place for visual warning of crossing sequence. • Audible warning present for pedestrian users to warn of crossing sequence.
Darkness	Fatality or serious injury	• Review of night time usage completed – crossing operates as usual during hours of darkness.
Vegetation growth between visits reducing the ability to see trains approaching crossing	Fatality or serious injury	• Vegetation management plan in place. • Regular inspection and maintenance regime in place. • Barriers present to prevent access to railway as trains approach. • Road Traffic Signals (RTS) in place for visual warning of crossing sequence. • Audible warning present for pedestrian users to warn of crossing sequence.
Unfamiliar users	Fatality or serious injury	• Standard crossing layout, compliant with Office of Rail and Road guidance. • Instructional signage at crossing. • Barriers present to prevent access to railway as trains approach. • Road Traffic Signals (RTS) in place for visual warning of crossing sequence. • Audible warning present for pedestrian users to warn of crossing sequence.
Crossing near the station	Fatality or serious injury	• Road Traffic Signals (RTS) in place for visual warning of crossing sequence. • Audible warning present for pedestrian users to warn of crossing sequence.

The risk assessment is based on data collected at the crossing and entered into ALCRM. This is a computer-based application used by Network Rail to assist in the risk management of level crossings. The risk result consists of a 'letter' and 'number' classification of safety risk, giving the 'letter' (A-M for individual risk) or 'number' (1-13 for collective risk) band. These rankings represent the range of risk across all types of crossings where A and 1 are the highest and M and 13 are the lowest.

Safety Risk

Individual Risk	H
Collective Risk	4

User Type	Ind Risk (Fraction)	Ind Risk (Numeric)	Collective Risk	Derailment
Car	1 in 11111111	9.00E-08	3.38E-04	
Van / Small Lorries	1 in 1049317	9.53E-07	3.99E-05	
HGV	1 in 503018	1.99E-06	2.07E-06	
Bus	1 in 10101010	9.90E-08	4.15E-06	
Tractor / Farm Vehicle	0	0	0	
Cyclist / Motorcyclist	1 in 114285	8.75E-06	5.17E-04	
Pedestrian	1 in 114285	8.75E-06	0.003794193	
Passengers			4.08E-05	97.21233631
Staff			1.17E-04	3.765749058
Total			**0.004853513**	0.907279671

Collision Frequencies

	Train / User	User Equipment	Other
Vehicle:	7.78E-04	0.159737453	8.73E-04
Pedestrian:	0.004881179	0.003500553	0.013275325

Collision Risk

	Train / User	User Equipment	Other
Vehicle:	3.84E-04	0	0
Pedestrian:	0.003963517	5.60E-05	2.92E-04

4 SAFETY MANAGEMENT INFORMATION SYSTEM

4.1 Network Rails internal safety management information systems have been interrogated and revealed that during the previous 5 years there have been 8 reported incidents at the crossing, see details below.

04/05/2016 – At approximately 1530 hours an elderly gentleman began crossing just as the lowering sequence started. When he reached the lowering down entrance barrier he ducked under it but appeared to lose his footing and fell down quite heavily.

06/04/2016 – Wirral Signaller observed a green metallic car clip the entrance barrier skirt at Leasowe whilst being lowered; it appeared a piece of the runner at the bottom of the skirt had been snapped off.

31/03/2015 – Wirral Signaller advised that they observed a member of the public trapped in the barriers after they had operated crossing clear.

22/01/2014 – Member of Public reported an elderly lady was trapped on the wrong side of the level crossing barrier.

03/05/2013 – Wirral Signaller stated that whilst lowering the barriers a young couple with a pram tried to beat the lowering sequence. The barriers didn't appear to strike either of them but the male fell over the pram.

02/05/2013 – 5W41 reported a near miss at Leasowe level crossing. The Driver advised as they approached the crossing they saw an elderly lady with a zimmer frame. Driver blew the horn and made an emergency brake application; the lady was approx. 3 feet from the train on the down line as the train passed.

07/03/2013 – Wirral Signaller advised that a person had been stood beneath the up side exit barrier during the lower sequence. The Signaller did not see the person but had pressed the crossing clear button, then observed the person inside the barriers.

17/02/2013 – Due to work by UnitedUtilities, traffic was blocking back round the level crossing, resulting in traffic weaving round the barriers.

5 OTHER FACTORS AFFECTING THE CROSSING

5.1 At the time of this assessment there were no other factors that affected the crossing.

6 OPTIONS EVALUATED

6.1 Detailed below are a number of options that have been considered to reduce the risk at the crossing.

Option	Original ACLRM risk score	New ALCRM risk score	New ALCRM FWI	Safety benefit %	Cost	Cost Benefit Ratio
Closure by Vehicular Over Bridge	H4	M13	0.0000	100%	£3,000,000	**0.07**
Closure by Vehicular Underpass	H4	M13	0.0000	100%	£4,000,000	**0.07**
Closure by Diversion of Public Highway	H4	M13	0.0000	100%	£1,200,000	**0.18**
Upgrade to MCB with Obstacle Detection	H4	H4	0.004853513	0%	£2,000,000	**0.00**
Installation of Red Light Safety Equipment (RLSE)	H4	H4	0.004756443	2%	£145,000	**0.05**

NOTES
The following CBA criteria are used as a support to decision making:

a. benefit to cost ratio is ≥ 1: positive safety and business benefit established;
b. benefit to cost ratio is between 0.99 and 0.5: reasonable safety and business benefit established where costs are not grossly disproportionate against the safety benefit; and
c. benefit to cost ratio is between 0.49 and 0.0: weak safety and business benefit established.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 *Closure by Vehicular Over Bridge*

One option at this location would be to close the level crossing and construct a vehicular over bridge. A vehicular over bridge at this location would completely eliminate risk at this location and would allow users to reach point A to B without traversing the crossing.

However, due to the surrounding environment, a vehicular over bridge appears unfeasible as the bridge would require large amounts of land and would require a compete re-structure of the highways. Additionally, a vehicular over bridge may require purchase and demolition of a number of buildings in order to fit the structure in place.

Because of these issues, a bridge at this location is deemed unsuitable as the cost of the project greatly outweighs the safety benefit.

Closure by Vehicular Underpass

Another option at this location would be to close the level crossing and develop a vehicular underpass. An underpass at this location would completely eliminate risk at this location and would allow users to reach point A to B without traversing the crossing.

However, due to the surrounding environment, an underpass appears unfeasible as this would also require large amounts of land and would require a compete re-structure of the highways. Additionally, an underpass may require purchase and demolition of a number of houses in order to route the road under the railway.

Because of these issues, an underpass at this location is deemed unsuitable as the cost of the project greatly outweighs the safety benefit.

Closure by Diversion of Public Highway

Another option considered at this location is closure of the crossing and diversion of the highway. This option would again be incredibly costly, would require large amounts of land purchase and a complete restructure of the highways network.

There are no viable diversions at this time, and if a diversion was to be explored it would require vast restructuring of the nearby highways and development of new roads.

Because of the incredible cost involved with this suggestion, the option has been discounted as the cost of the project significantly outweighs the safety benefit.

Upgrade to MCB with Obstacle Detection

Another suggestion at this location would be to upgrade the crossing to MCB-OD. This would remove risk of human error at the crossing as the crossing would be operated by track circuits and scanned by a radar system to ensure the crossing is clear before allowing the train to traverse the crossing.

This option is estimated to cost approximately £2,000,000 plus re-signalling costs but does not provide any safety benefit in ALCRM. Although the system removes the risk of human error, this option is incredibly expensive to provide no risk reduction in ALCRM.

As this option does not reduce risk, and costs approximately £2,000,000 the cost significantly outweighs the safety benefit and therefore has been discounted at this time.

Installation of Red Light Safety Enforcement Cameras

A final option at this location is to install Red Light Enforcement Cameras. This option only provides a 2% risk reduction but the cost is not deemed as excessive and therefore may be considered. This option could to reduce crossing misuse by allowing easier prosecutions of those who jump the crossing lights or swerve the crossing barriers.

7.2 Network Rail is subject to the requirements of the Health and Safety at Work Act etc. 1974 to reduce risk ‘so far as is reasonably practicable’. In simple terms this means that the cost, time and effort required in providing a specific risk reduction measure needs to be commensurate with the safety benefit that will be obtained as a result of its implementation.

Following the completion of the risk assessment and having reviewed all relevant information and options, the assessor feels that the risk at the crossing can currently be considered to be as low as is reasonably practicable. At present, no further action is required, other than routine inspection and monitoring until the next risk review, or changes in the risk profile are identified.

8 APPROVAL

Prepared by:	Signature [redacted]
Job Title:	Network Rail Level Crossing Manager
Date:	10/05/18
Approved by: [redacted]	Signatur [redacted]
Job Title:	Network Rail Route Level Crossing Manager
Date:	10/05/18

9 APPENDIX A

ALCRM provides an estimate of both the individual and collective risks at a level crossing.

The individual and collective risk is expressed in Fatalities and Weighted Injuries (FWI). The following values help to explain this:

- **1** = 1 fatality per year or 10 major injuries or 200 minor RIDDOR events or 1000 minor non-RIDDOR events
- **0.1** = 20 minor RIDDOR events or 100 minor non-RIDDOR events
- **0.005** = 5 minor non-RIDDOR events

INDIVIDUAL RISK

This is the annualised probability of fatality to a 'regular user'. *NOTE: A regular user is taken as a person making a daily return trip over the crossing; assumed 500 traverses per year.*

Individual risk:

- Applies only to crossing users. It is not used for train staff and passengers
- Does not increase with the number of users.
- Is presented as a simplified ranking:
  - Allocates individual risk into rankings A to M
    (A is highest, L is lowest, and M is 'zero risk' e.g. temporary closed, dormant or crossings on mothballed lines)
  - Allows comparison of individual risk to average users across any crossings on the network

Individual Risk Ranking	Upper Value (Probability)	Lower Value (Probability)	Upper Value (FWI)	Lower Value (FW)
A	1 in 1	Greater than 1 in 1,000	1	0.001000000
B	1 in 1,000	1 in 5,000	0.001000000	0.000200000
C	1 in 5,000	1 in 25,000	0.000200000	0.000040000
D	1 in 25,000	1 in 125,000	0.000040000	0.000008000
E	1 in 125,000	1 in 250,000	0.000008000	0.000004000
F	1 in 250,000	1 in 500,000	0.000004000	0.000002000
G	1 in 500,000	1 in 1,000,000	0.000002000	0.000001000
H	1 in 1,000,000	1 in 2,000,000	0.000001000	0.000000500
I	1 in 2,000,000	1 in 4,000,000	0.000000500	0.000000250
J	1 in 4,000,000	1 in 10,000,000	0.000000250	0.000000100
K	1 in 10,000,000	1 in 20,000,000	0.000000100	0.000000050
L	Less than 1 in 20,000,000	Greater than 0	0.000000050	Greater than 0
M	0	0	0	0

COLLECTIVE RISK

This is the total risk for the crossing and includes the risk to users (pedestrian and vehicle), train staff and passengers.

Collective risk:

- Is presented as a simplified ranking:
  - Allocates collective risk into rankings 1 to 13
    (1 is highest, 12 is lowest, and 13 is 'zero risk' e.g. temporary closed, dormant or crossings on mothballed lines)
  - Can easily compare collective risk between any two crossings on the network

Collective Risk Ranking	Upper Value (FWI)	Lower Value (FW)
1	Theoretically infinite	Greater than 5.00E-02
2	0.050000000	0.010000000
3	0.010000000	0.005000000
4	0.005000000	0.001000000
5	0.001000000	0.000500000
6	0.000500000	0.000100000
7	0.000100000	0.000050000
8	0.000050000	0.000010000
9	0.000010000	0.000005000
10	0.000005000	0.000001000
11	0.000001000	0.000000500
12	0.0000005	0
13	0.00E+00	0.00E+00

10 APPENDIX B

Additional photographs of crossing environment (such as upside looking up, up side looking down, down side looking up and down side looking down).

Up side looking up

Down side looking up

Up side looking down

Down side looking down

Up side across crossing

Down side across crossing

11 APPENDIX C

SUN GLARE ASSESSMENT			
Step	**Question**	**Outputs**	**Answers**
-	ALCRM ID / Name of Crossing		ALCRM ID: 8272 / Leasowe
-	Name of Assessor		Shaun Edwards
-	Time & Date of Visit		16/06/2016, 10:00AM
-	Weather Conditions		Overcast with sunny spells
1	Is this crossing in the list of 'Crossings potentially at risk of Sun Glare'?	If 'yes', then continue to Q2. If 'no', then record 'Tolerable, no work required' in the narrative risk assessment. End of Process.	**Yes**
2	Is the crossing fitted with 50W halogen wig-wag signals? *Note: these have a red domed lens as shown:* 	If 'yes', then record 'Non-Urgent, requires work' and go to Q4. If 'no', then continue to Q3.	**No**
3	If LED Wig-Wag signals are fitted, do they suffer from significantly reduced visibility in bright sunlight? *Note: LED Wig-Wag signals have a flat front lens as shown opposite, and flash on-off abruptly, i.e. no fade.* 	If 'yes', then record 'Non-Urgent, requires work' and go to Q4. If 'no', then continue to Q4.	**No**

SUN GLARE ASSESSMENT			
Step	**Question**	**Outputs**	**Answers**
4	During the assessment, if the sun disk becomes directly visible on the approach to the crossing, is a glare index of 1, 2 or 3 obtained? *Note: The glare index is shown below.* Or (if the sun disk is not visible) is the horizon/background scene such that the sun disk may be directly visible and likely to cause unacceptable levels of glare?	If 'yes', then record 'CRITICAL, requires work' and go to Step 7. If 'no', then continue to Q5.	**No**
5	Is the road surface worn or smooth such that it is potentially susceptible to bright reflections of sunlight? Or is the road surface potentially susceptible to pooled water? *Examples are given below.*   	If 'yes', then record 'Non-Urgent, requires work' and continue to Q6. If 'no', then continue' to Q6. *Note that susceptible road surfaces tend to be smooth; non-susceptible surfaces tend to have greater texture. Also, some darker surfaces may be smooth, i.e. more susceptible to glare than rougher, light grey road surfaces for example. Reflections from car headlights may be useful in assessing the reflectivity of the road surface.*	**No**

SUN GLARE ASSESSMENT			
Step	**Question**	**Outputs**	**Answers**
6	Is the approach to the crossing and/or the background scene optically complex, e.g. contains lights, signs or other features that may cause distraction or confusion?	If 'yes', then record 'Non-Urgent, requires work' and complete the final outcome before continuing to Step 7. If 'no', then record 'Tolerable, no work required' and complete the final outcome. End of process.	**No**
		Outcome Indicate the final outcome: □ Critical, work required □ Non-urgent, work required □ Tolerable, no work	**Tolerable, no work required.**
7	Consider Risk Mitigation measures (see below)	Indicate which risk mitigation measure(s) are required. Please also list those measures which are considered to be not suitable.	**N/A**
			N/A

Glare scale index developed for Sun Glare at Level Crossings			
Glare Criterion	**Glare Index**	**Example**	**Acceptable**
Intolerable and unacceptable	1	Glare source prevents visibility of other lights and objects. Visual pain may be experienced.	No
Just tolerable and unacceptable	2	Glare source significantly reduces visibility of other lights and objects. Visual discomfort is likely.	No
Just unacceptable	3	Glare source reduces visibility of other lights and objects. Visual discomfort is likely.	No
Just acceptable	4	Glare source has a noticeable effect on the visibility of other lights and objects. Visual discomfort is possible.	Just
Acceptable	5	The visibility of other lights and objects is not significantly affected. Visual discomfort is possible.	Yes
Distracting	6	The visibility of other lights and objects is slightly affected. Visual discomfort is possible.	Yes
Perceptible	7	Presence of the glare source is apparent, but it has negligible effect on the visibility of other lights and objects.	Yes
Just perceptible	8	Presence of the glare source is just apparent, but it has no effect on the visibility of other lights and objects.	Yes
Imperceptible	9	Presence of the glare source is barely detectable, and it has no effect on the visibility of other lights and objects.	Yes

List of Sun glare Risk Mitigation Measures		
#	**Risk Mitigation Measure**	**Benefit / Effective**
1	Modified / Supplementary advance signage	Useful where signage is required before a junction or a bend in the road on approach to a crossing.
2	Countdown Markers	These are useful in complex areas, providing additional warning of the hazards ahead.
3	Rumble Strips	
4	New road markings	
5	Extended hoods for non-LED Wig-Wag signals	These shield the wig-wag front lens when the sun is low in the sky and/or slightly to the side of the axis of the signal. See Annex L.
6	High output LED Wig-Wag signals	These are expected to give the highest available optical performance in sun glare viewing conditions.
7	Relocation / realignment of the Wig-Wag signals	In the event of obscuration or non-optimal viewing.
8	Enhanced barrier boom features	This may include increased numbers of boom lights, brighter boom lights, 'animated' boom light sequence, boom skirts, and retro-reflective materials.
9	Extended back-boards	Where the sun disk may pass through the sky directly behind the signals. Note: larger back boards increase the wind loading on wig-wag signals and the support structures.
10	Screening (other than back-boards)	Where the sun disk may be visible behind / to the side of the crossing. Subject to clearances and wind loading.
11	Road surface treatment	In the case of worn and/or smooth road surfaces on the approach to 'at risk' crossings, a darker, non-reflective road surface is expected to reduce the reflected glare.
12	Active road-car warning system	Future technology may permit a transmitter below the road surface to transmit 'warning – level crossing' into road vehicles fitted with suitable technology
13	Repairs to existing features	This may apply if existing features are damaged or degraded.