East West Rail Phase 2

Technical Note: TDC 19-02830-TWAP - EWR2 application in principle to discharge draft condition

Discipline: Offline Highways

Document Number: 133735_RW-EWR-XX-XX-RP-CH-000155

Rev B01

Notice

This Technical Note was produced by the Alliance for the specific purpose of the Alliance

This Technical Note may not be used by any person other than the Alliance without the Alliance's express permission. In any event, Alliance accepts no liability for any costs, liabilities or losses arising as a result of the use of or reliance upon the contents of this report by any person other than the Alliance.

Document History

Project Number: 133735/5187843			**DOCUMENT REF:**133735_RW-EWR-XX-XX-RP-CH-000155			
Revision	**Purpose and description**	**Originated**	**Checked**	**Reviewed**	**Authorised**	**Date**
B01	Issued for Information	Z. Ahmed	W. Zuo	M. Wright	J. Baldock	21/04/2020

Project:	**East West Rail Phase 2**	**To:**	**Oxfordshire County Council**
Discipline:	**Offline Highways**	**From:**	**EWR2 Alliance**
Grip Stage:	**-**	**cc:**	**-**
Title:	**TDC 19-02830-TWAP - EWR2 application in principle to discharge draft condition**		

Executive Summary

East West Rail (EWR) Alliance issued a Pavement Assessment Report (document reference 133735_RW-EWR-XX-XX-RP-CH-000041, dated 15 Nov 2019) to Oxfordshire County Council (OCC).

On 22nd January 2020, OCC responded to the report via letter (document reference TDC 19/02830/TWAP). The letter and accompanying patching schedule challenged the findings of the EWR Alliance report, summarised the findings of a visual survey carried out by OCC during w/c 13th January, and concluded that 5,044m2 of pre-emptive maintenance were required (3,158m2 of inlay/overlay and 1,886m2 of full depth reconstruction).

The purpose of this technical note is to summarise the pavement treatment decision making process undertaken by EWR Alliance, and compare this to the assessment undertaken by OCC.

The OCC pavement assessment appears to have been undertaken based upon a surface condition assessment only. This is significantly different to the assessment approach undertaken by EWR Alliance, which considered the following three sets of criteria:

- Forecast Traffic

  The forecast EWR Alliance traffic in Link 102 is only 0.36msa during the 5 years construction period, comprising of approximately 72% of the total commercial vehicles in Link 102.
- Surface Condition Assessment

  The surface condition of the Link 102 was analysed from 4K HD GPS based video survey conducted in August 2018. The analysis showed only 0.10 lane-km of section was “At Risk” which accounts for 4.18% of total lane-length, whilst the majority of section was either “Sound” or at “Limited Risk”.
- Structural Pavement Condition Assessment

  The structural condition of the Link 102 was analysed from Ground Penetrating Radar (GPR) survey undertaken in August 2018. The analysis shows 0.01 lane-km of section is “At Risk” (0.4%) since it has thickness less then 150mm and 0.20 lane-km of section is at “Potential Risk” (8.4%) since the thickness is 150mm to 200mm whilst the majority of the section 102 is either “Sound” or at “Limited Risk”.

As per the Table 5 EWR2 Treatment Rules in the Pavement Assessment Report, only two isolated sections (30 lane-m in total) are identified as 100mm inlay in accordance with the treatment rule matrix above. However, the sections have been rationalised as no treatment in accordance with the defined rules as localised patching would be more applicable to improve the pavement condition in these locations. Therefore, based on the forecast EWR2 traffic during the 5 construction years and the treatment rules defined in the pavement assessment report, no treatment has been proposed after rationalisation.

Taking the above into consideration, we disagree with the findings of the OCC assessment. However, EWR Alliance will review the condition of the pavement over the next 5 years and ensure it is handed back to OCC in a similar condition to that recorded at the time of undertaking the baseline assessment in August 2018.

Please be advised that any localised/patching work and any post-construction treatment are excluded in the pro-active pavement treatment work specified in the report, as stated in section 6.1 in Pavement Assessment Report for Oxfordshire Council (document reference 133735_RW-EWR-XX-XX-RP-CH-000041).

1. Introduction

East West Rail (EWR) Alliance issued Pavement Assessment Report (document reference 133735_RW-EWR-XX-XX-RP-CH-000041, dated 15 Nov 2019) to Oxfordshire County Council (OCC).

On 22nd January 2020, OCC responded to the report via letter (document reference TDC 19/02830/TWAP). This letter and accompanying patching schedule summarised the findings of a visual survey carried out by OCC during w/c 13th January, and stated the following concern:

> *"The attached schedule identifies additional maintenance identified [by OCC officers] as being necessary to avoid serious deterioration during the construction period, and the consequent likely necessity to close the road for emergency maintenance, which would have a severe impact on the project.*
>
> *The bulk of this schedule relates to EWR section 102, which is indicated in the report as requiring 'no treatment'. This we cannot accept as we found numerous defects in this section. Although the road was dragon patched in late 2019, the road looks better than it is. Dragon patching is only a temporary fix and not designed to withstand large volumes of HGVs."*

This technical note summarises the treatment matrix adopted and the presents the data behind the decision-making process. In Section 2, the existing and predicted construction traffic is presented. In Section 3, the surface and structural condition assessment for Link 102 are attend. In Section 4, the potential pro-active pavement has been analysed and a conclusion is stated in Section 5.

2. Design Traffic

Table 1 below shows the total design traffic and EWR2 design traffic for link 102.

Table 1 – EWR2 Design Traffic Summary for Link 102

Link ID	Road Name	Road Feature	EWR2 Construction Traffic (msa)	Total Commercial Traffic (msa)	% Traffic from EWR2
102	-	Network	0.36	0.51	72%

3. Pavement Condition Assessment

Surface Condition Assessment

To identify the sections that might be at risk of premature failure and to obtain an indication of pavement condition, a surface condition assessment has been performed using video survey data and the risk categories stated below:

Table 2 Pavement Surface Condition Risk Categories

Sound (Green)	Limited Risk (Amber)	At Risk (Red)
Sound and not likely to require a surface maintenance intervention	Adequate but could potentially require a maintenance intervention	Likely to be inadequate and may fail due to EWR2 construction traffic

The 4K HD GPS based video survey was conducted in August 2018 and the captured video was analysed in accordance with the UK Pavement Management System (UKPMS). The defects observed from the video survey for link 102 are summarised in Appendix A and example photographs of the surface condition indicator observed in link 102 from video data are illustrated in Appendix B. The surface condition assessment methodology, as described in section 4.2 in Pavement Assessment Report for Oxfordshire Council (document referenece133735_RW-EWR-XX-XX-RP-CH-000041), has been applied and the results for link 102 are illustrated in Table 3 and Figure 1 below

Table 3 – Indicator of Pavement Surface Condition Risk Rating

Risk Category	At Risk	Limited Risk	Sound
Length (lane-km)	0.10 (4.18%)	1.09 (45.61%)	1.20 (50.21%)

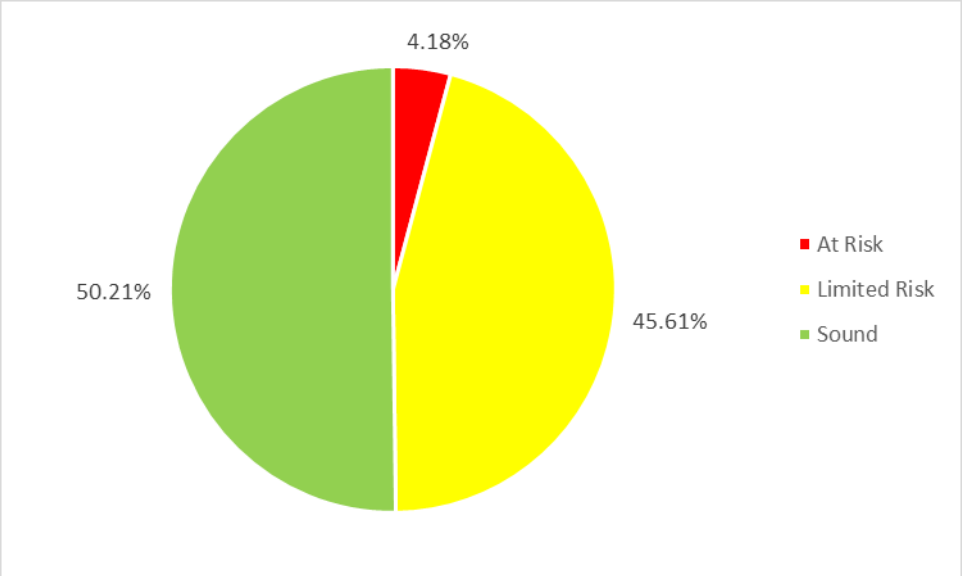


Figure 1 – Pavement Surface Condition Identified from Video Survey Data

Both Table 3 and Figure 1 indicate that there is only 0.10 lane-km within link 102 that is deemed to be “At Risk”, in terms of pavement surface condition. A surface condition risk map for link 102 is provided in Appendix C.

Structural Condition Assessment

To identify sections that may be at risk of premature structural failure, four risk categories, as illustrated in Table 4, have been adopted in accordance with available Ground Penetration Radar (GRP) surveyed thickness.

Table 4 Pavement Structural Condition Risk Categories

Sound (Green)	Limited Risk (Amber)	Potential Risk (High Amber)	At Risk (Red)
Structurally sound and not likely to require structural maintenance intervention.	Structure is likely to be adequate but may require maintenance intervention.	Structure may be inadequate and may require maintenance intervention.	Structurally inadequate - design thickness is insufficient by current design standards or there are extensive structural defects present.

The existing pavement construction thickness forms a key part of the structural condition assessment. This is based on the principal that a designed pavement construction of significant thickness will be able to support the anticipated commercial vehicle traffic and be less susceptible to structural deterioration. In contrast, a thin pavement will be less likely to spread the pavement loading and will be highly susceptible to damage under commercial vehicle trafficking.

The flexible pavement thickness threshold for the structural assessment have been selected in accordance with the requirements of HD 26/06 on a typical design traffic of 9msa, 1msa and less than 1msa (refer to section 4.3 in Pavement Assessment Report for Oxfordshire Council for details). The structural analysis and available GPR thickness for link 102 are illustrated in Table 5, Figure 2 and Figure 3 below.

Table 5 – Summary of Flexible Pavement Construction Thickness within Link 102

Construction Thickness Category	Risk Rating	Pavement Construction Thickness Range	Flexible Pavement Lane Length (lane-km)
Pavement has sufficient construction thickness	Sound	>=270mm	1.39 (58.2%)
Pavement is likely to have sufficient construction thickness	Limited Risk	200mm to 270mm	0.79 (33.1%)
Pavement may have insufficient construction thickness	Potential Risk	150mm to 200mm	0.20 (8.4%)
Pavement has insufficient construction thickness	At Risk	<150mm	0.01 (0.4%)

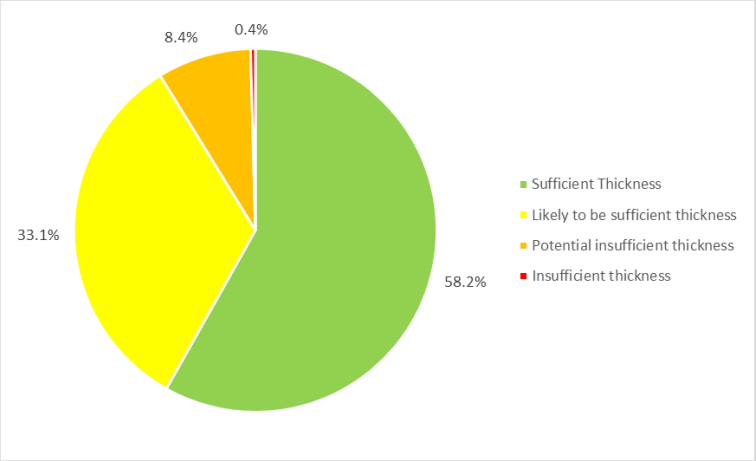


Figure 2 – Pavement Thickness Range Identified from GPR Data

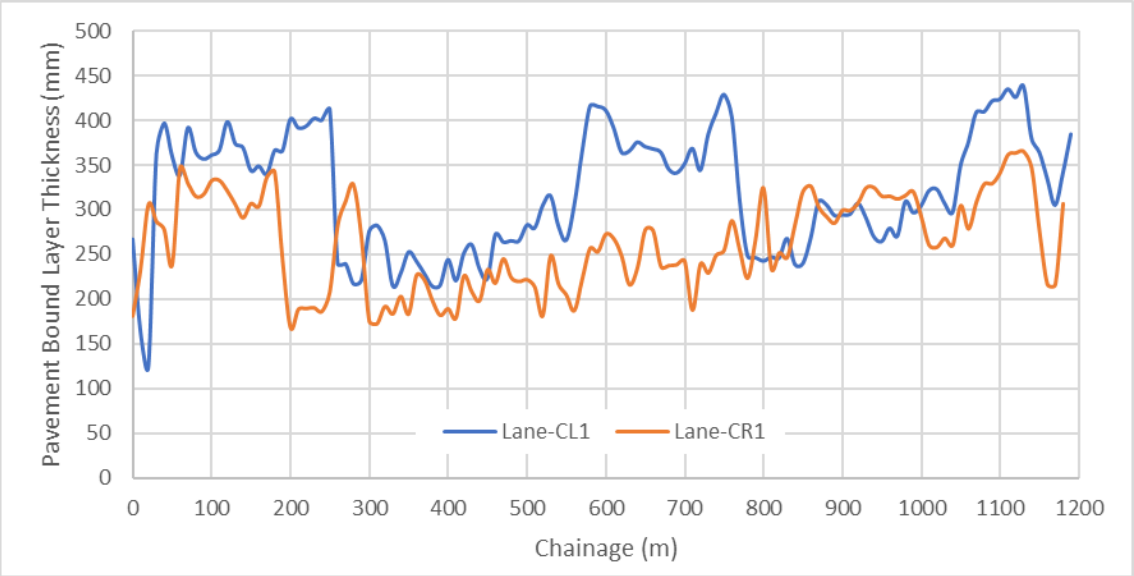


Figure 3 –GPR Surveyed Pavement Thickness (mm) in Link 102

It demonstrates that:

- 2.18 lane-km sections within link 102 have sufficient construction thickness with regards to the low commercial traffic (0.51msa, as indicated in Table 1), comprising approximately 91.3% of the link in length;
- 0.20 lane-km sections within link 102 have been categorised as “Potential Risk” due to the construction thickness is between 150mm and 200mm. It should be noted that the “Potential Risk” category was initially proposed assuming the expected commercial traffic is 1msa. As the expected commercial traffic is estimated at 0.51msa there is a low risk of these 0.20 lane-km section to be structural insufficient to support the expected commercial traffic; and
- Only 0.01 lane-km section within link 102 is categorised as “At Risk” because it has a pavement construction thickness of less than 150mm.

A structural condition risk map for link 102 is provided in Appendix D. An overall condition risk map for link 102 is provided in Appendix E.

4. Treatment Analysis

A 3-stage treatment methodology for the initial implementation work, as illustrated in Appendix F, has been developed based on the traffic data, surface and structural condition assessment. Please refer to the chapter 6 in Pavement Assessment Report for Oxfordshire Council (document referenece133735_RW-EWR-XX-XX-RP-CH-000041) for details. The pavement standard details can be found in drawings 133735_RW-EWR-XX-XX-DR-CH-000108 and 000137.

It is proposed to pro-actively treat concurrent sections (to ensure construction works are not delayed) where the EWR2 construction traffic is deemed to be significant and structural condition is considered to be “At Risk”. In addition, it is proposed to treat any sections where the structural condition is deemed to be a “Potential Risk” and the surface condition is “At Risk” as shown below. It is important to note that the treatment rules applied are designed to mitigate the risk associated with EWR2 construction traffic and not treat all existing defects on the network.

Table 6 EWR2 Treatment Rules

Treatment Category	Surface Condition Index	Structural Condition Index
100mm Treatment Overlay/ partial overlay (if not kerbed and where feasible)/ Inlay if not possible to overlay	At Risk	Potential Risk
	Sound	At Risk
	Limited Risk	At Risk
250mm Full Depth Reconstruction on Class 2 Foundation (as required)	At Risk	At Risk

The pavement treatment schedule for link 102 is illustrated in Appendix G, which shows the decision-making process. The schedule demonstrates two isolated sections (30 lane-m in total) are identified as 100mm inlay in accordance with the treatment rule matrix above. However, the sections have been rationalised as no treatment in accordance with the defined rules as localised patching, as defects occur, would be more applicable to improve the pavement condition in these locations.

In accordance with section 6.1 in Pavement Assessment Report for Oxfordshire Council (document referenece133735_RW-EWR-XX-XX-RP-CH-000041), any localised/patching work and any post-construction treatment are excluded in the pro-active pavement treatment work specified in the report.

5. Conclusion

Based on the forecast EWR2 construction traffic for Link 102 within Oxfordshire, only 0.36msa of construction traffic is anticipated within the originally envisaged 5 years construction period.

The surface and structural assessments that have been carried out for Link 102 demonstrate the majority of the existing pavement is in a sound or limited risk condition, with regards to the low expected commercial traffic within the construction period. According to the treatment matrix described in Table 6 in this technical note, no treatment has been proposed for the link 102 after rationalisation.

Taking the above into consideration, we disagree with the findings of the OCC assessment, which was based upon a surface condition assessment only, and concluded that 5044m^2 of pre-emptive maintenance were required (3158m^2 of inlay/overlay and 1886m^2 of full depth reconstruction).

However, EWR Alliance will review the condition of the pavement over the next 5 years and ensure it is handed back to OCC in a similar condition to that recorded at the time of undertaking the baseline assessment in August 2018.

Appendix A - Pavement Defects

Table A1 – Summary of Defective Area (m2) from Video Survey Data (August 2018)

Pavement Defect	Defect Code	Total Areas Identified (m2)
Edge Deterioration Severity 1(Minor) at Left Edge	BLE1	2.6
Edge Deterioration Severity 2(Major) at Left Edge	BLE2	37.5
Edge Deterioration Severity 1(Minor) at Right Edge	BRE1	0.8
Edge Deterioration Severity 2(Major) at Right Edge	BRE2	3.7
Rutting	BRUT	0.0
Wheel Track Cracking	BCRW	84.2
Major Area Cracking	BCHJ	77.4
Major Fatting	BFAJ	0.0
Major Surface Defectiveness	BFEJ	14.8
Pothole	BPHO	16.4
Major Transverse Crack	BTCK	0.0
Subsidence	BSES	0.1
Concrete Defective Seal (Transverse)	NDFS	0.0
Concrete Defective Seal (Longitudinal)	NDLS	0.0
Concrete Joint Defectiveness (Transverse)	NFLT	0.0
Concrete Joint Defectiveness (Longitudinal)	NJDF	0.0
Concrete Surface Defectiveness	NSCR	0.0
Concrete Settlement	NSTM	0.0
Concrete Cracking	NCRA	0.0
Total		**237**

Table A2 – Details of Defective Area (m2) from Video Survey Data (August 2018)

Pavement Defect	Defect Code	Lane	Start Chainage (m)	End Chainage (m)	Length (m)	Width (m)
Major Surface Defectiveness	BFEJ	CL1	10.0	17.0	7.0	0.5
Major Area Cracking	BCHJ	CL1	21.1	26.0	4.9	0.3
Subsidence	BSES	CL1	26.1	26.5	0.4	0.2
Major Area Cracking	BCHJ	CL1	26.5	29.0	2.5	0.6
Major Area Cracking	BCHJ	CL1	29.0	31.6	2.6	0.3
Major Area Cracking	BCHJ	CL1	37.1	45.1	8.0	0.3
Major Surface Defectiveness	BFEJ	CL1	49.0	53.8	4.8	0.4
Wheel Track Cracking	BCRW	CL1	57.36	67.05	9.7	0.5
Major Area Cracking	BCHJ	CL1	72.9	80.9	8.0	1.4
Wheel Track Cracking	BCRW	CL1	81.62	85.34	3.7	0.3
Major Area Cracking	BCHJ	CL1	90.6	103.9	13.3	0.1

Wheel Track Cracking	BCRW	CL1	105.91	111.88	6.0	0.1
Wheel Track Cracking	BCRW	CL1	113.74	119.06	5.3	0.1
Major Area Cracking	BCHJ	CL1	166.2	169.0	2.8	0.2
Major Surface Defectiveness	BFEJ	CL1	174.5	176.7	2.1	0.3
Major Area Cracking	BCHJ	CL1	313.5	317.6	4.1	0.1
Major Area Cracking	BCHJ	CL1	321.1	331.1	10.0	0.1
Major Area Cracking	BCHJ	CL1	345.4	348.8	3.4	0.1
Major Area Cracking	BCHJ	CL1	368.7	368.8	0.1	0.1
Major Surface Defectiveness	BFEJ	CL1	379.8	381.0	1.2	0.2
Major Surface Defectiveness	BFEJ	CL1	382.4	384.7	2.3	0.4
Major Area Cracking	BCHJ	CL1	387.6	388.0	0.4	0.1
Major Area Cracking	BCHJ	CL1	413.4	414.0	0.6	0.1
Major Area Cracking	BCHJ	CL1	416.6	418.4	1.8	0.1
Pothole	BPHO	CL1	419.2	419.2	0.0	
Major Area Cracking	BCHJ	CL1	421.2	422.0	0.8	0.1
Major Area Cracking	BCHJ	CL1	428.5	433.8	5.3	0.1
Pothole	BPHO	CL1	431.5	431.5	0.0	
Major Surface Defectiveness	BFEJ	CL1	435.4	435.9	0.5	0.2
Major Area Cracking	BCHJ	CL1	449.4	459.4	10.0	0.3
Major Area Cracking	BCHJ	CL1	464.6	469.1	4.5	0.6
Pothole	BPHO	CL1	488.4	488.4	0.0	
Major Area Cracking	BCHJ	CL1	488.7	490.3	1.5	0.1
Major Surface Defectiveness	BFEJ	CL1	493.5	494.7	1.2	0.4
Major Surface Defectiveness	BFEJ	CL1	511.6	514.4	2.8	0.4
Pothole	BPHO	CL1	537.4	537.4	0.0	
Major Area Cracking	BCHJ	CL1	543.6	553.6	10.0	0.1
Major Area Cracking	BCHJ	CL1	569.0	572.8	3.8	0.3
Major Area Cracking	BCHJ	CL1	575.6	578.6	3.0	0.1
Major Area Cracking	BCHJ	CL1	594.9	607.6	12.7	0.5
Major Area Cracking	BCHJ	CL1	610.9	615.4	4.5	0.2
Major Area Cracking	BCHJ	CL1	627.0	628.1	1.0	0.5
Major Surface Defectiveness	BFEJ	CL1	627.8	628.1	0.3	0.2
Wheel Track Cracking	BCRW	CL1	639.91	641.82	1.9	0.4
Major Area Cracking	BCHJ	CL1	670.7	670.9	0.2	0.1
Wheel Track Cracking	BCRW	CL1	674.14	676.51	2.4	0.1
Major Area Cracking	BCHJ	CL1	731.8	743.1	11.3	0.6
Major Area Cracking	BCHJ	CL1	737.3	750.5	13.3	0.1
Wheel Track Cracking	BCRW	CL1	756.31	773.49	17.2	0.5
Major Area Cracking	BCHJ	CL1	762.2	765.3	3.0	0.1
Wheel Track Cracking	BCRW	CL1	772.98	778.91	5.9	0.2

Wheel Track Cracking	BCRW	CL1	855.08	858.14	3.1	0.4
Pothole	BPHO	CL1	855.2	855.2	0.0	
Major Surface Defectiveness	BFEJ	CL1	864.9	872.9	8.0	0.3
Major Area Cracking	BCHJ	CL1	896.5	902.7	6.2	0.2
Major Surface Defectiveness	BFEJ	CL1	1149.5	1149.7	0.3	0.1
Major Area Cracking	BCHJ	CL1	1174.8	1176.0	1.2	0.1
Major Area Cracking	BCHJ	CL1	1176.7	1186.0	9.3	0.1
Major Area Cracking	BCHJ	CL1	1182.9	1183.6	0.7	0.1
Major Area Cracking	BCHJ	CL1	1184.4	1184.9	0.5	0.2
Pothole	BPHO	CL1	1186.7	1186.7	0.0	
Major Surface Defectiveness	BFEJ	CR1	23.9	25.3	1.4	0.2
Wheel Track Cracking	BCRW	CR1	40.99	45.96	5.0	0.5
Wheel Track Cracking	BCRW	CR1	58.04	73.98	15.9	0.5
Wheel Track Cracking	BCRW	CR1	92.67	96.66	4.0	0.2
Wheel Track Cracking	BCRW	CR1	115.01	116.77	1.8	0.1
Major Area Cracking	BCHJ	CR1	155.3	157.4	2.1	0.1
Major Area Cracking	BCHJ	CR1	224.5	232.5	8.0	0.1
Wheel Track Cracking	BCRW	CR1	283.89	292.56	8.7	0.2
Major Area Cracking	BCHJ	CR1	286.6	293.1	6.5	0.1
Major Area Cracking	BCHJ	CR1	296.9	300.9	4.0	0.1
Wheel Track Cracking	BCRW	CR1	303.41	324.41	21.0	0.3
Major Area Cracking	BCHJ	CR1	303.6	320.9	17.2	0.2
Major Area Cracking	BCHJ	CR1	325.1	327.9	2.8	0.1
Major Area Cracking	BCHJ	CR1	327.2	330.6	3.5	0.1
Major Area Cracking	BCHJ	CR1	337.2	340.4	3.2	0.1
Major Area Cracking	BCHJ	CR1	384.1	384.5	0.4	0.1
Major Surface Defectiveness	BFEJ	CR1	385.8	389.4	3.7	0.5
Major Area Cracking	BCHJ	CR1	386.4	388.8	2.3	0.1
Major Area Cracking	BCHJ	CR1	397.0	400.3	3.3	0.1
Pothole	BPHO	CR1	430.1	430.1	0.0	
Major Surface Defectiveness	BFEJ	CR1	431.4	432.1	0.7	0.3
Major Surface Defectiveness	BFEJ	CR1	466.5	467.9	1.4	0.3
Wheel Track Cracking	BCRW	CR1	467.61	480.1	12.5	0.4
Wheel Track Cracking	BCRW	CR1	483.8	495.76	12.0	0.4
Wheel Track Cracking	BCRW	CR1	496.78	500.41	3.6	0.5
Major Area Cracking	BCHJ	CR1	505.7	508.0	2.3	0.5
Wheel Track Cracking	BCRW	CR1	512.41	523.21	10.8	0.5
Wheel Track Cracking	BCRW	CR1	523.71	532.76	9.0	0.2
Major Area Cracking	BCHJ	CR1	527.2	532.6	5.4	0.1
Major Surface Defectiveness	BFEJ	CR1	537.9	539.4	1.5	0.2

Major Area Cracking	BCHJ	CR1	554.3	557.5	3.2	0.1
Major Area Cracking	BCHJ	CR1	557.5	558.0	0.5	0.1
Major Area Cracking	BCHJ	CR1	558.0	566.0	8.1	0.1
Major Area Cracking	BCHJ	CR1	562.9	565.6	2.7	0.2
Major Area Cracking	BCHJ	CR1	565.6	568.7	3.1	0.2
Pothole	BPHO	CR1	567.0	567.0	0.0	
Major Area Cracking	BCHJ	CR1	586.1	590.1	4.0	0.1
Major Area Cracking	BCHJ	CR1	642.8	643.8	1.0	0.1
Major Area Cracking	BCHJ	CR1	666.9	669.3	2.4	0.1
Major Area Cracking	BCHJ	CR1	669.0	671.0	2.0	0.1
Wheel Track Cracking	BCRW	CR1	671.61	679.75	8.1	0.1
Major Area Cracking	BCHJ	CR1	719.8	727.9	8.2	0.1
Wheel Track Cracking	BCRW	CR1	722.99	738.93	15.9	0.3
Major Area Cracking	BCHJ	CR1	727.9	729.9	1.9	0.1
Major Area Cracking	BCHJ	CR1	729.9	732.0	2.1	0.1
Wheel Track Cracking	BCRW	CR1	745.06	748.02	3.0	0.2
Pothole	BPHO	CR1	746.6	746.6	0.0	
Major Area Cracking	BCHJ	CR1	754.6	756.0	1.3	0.1
Wheel Track Cracking	BCRW	CR1	757.23	774.59	17.4	0.2
Major Area Cracking	BCHJ	CR1	768.4	773.7	5.4	0.1
Major Area Cracking	BCHJ	CR1	775.0	779.0	4.0	0.1
Major Area Cracking	BCHJ	CR1	822.8	825.2	2.5	0.2
Major Area Cracking	BCHJ	CR1	900.4	903.4	3.0	0.1
Major Area Cracking	BCHJ	CR1	917.5	923.4	5.9	0.1
Wheel Track Cracking	BCRW	CR1	925.67	939.62	14.0	0.2
Major Area Cracking	BCHJ	CR1	1000.3	1002.9	2.6	0.1
Major Area Cracking	BCHJ	CR1	1024.6	1026.9	2.4	0.1
Major Surface Defectiveness	BFEJ	CR1	1114.9	1116.5	1.6	0.2
Wheel Track Cracking	BCRW	CR1	1138.5	1154.45	16.0	0.4
Major Area Cracking	BCHJ	CR1	1154.5	1166.2	11.7	0.7
Major Area Cracking	BCHJ	CR1	1166.2	1174.2	8.0	0.4
Major Area Cracking	BCHJ	CR1	1174.2	1178.2	4.0	0.2
Wheel Track Cracking (2 crackings)	BCRW	CR1	1178.4	1186.37	8.0	0.5
Major Area Cracking	BCHJ	CR1	1188.3	1190.0	1.7	0.1
Major Area Cracking	BCHJ	CR1	1189.5	1190.4	1.0	0.1

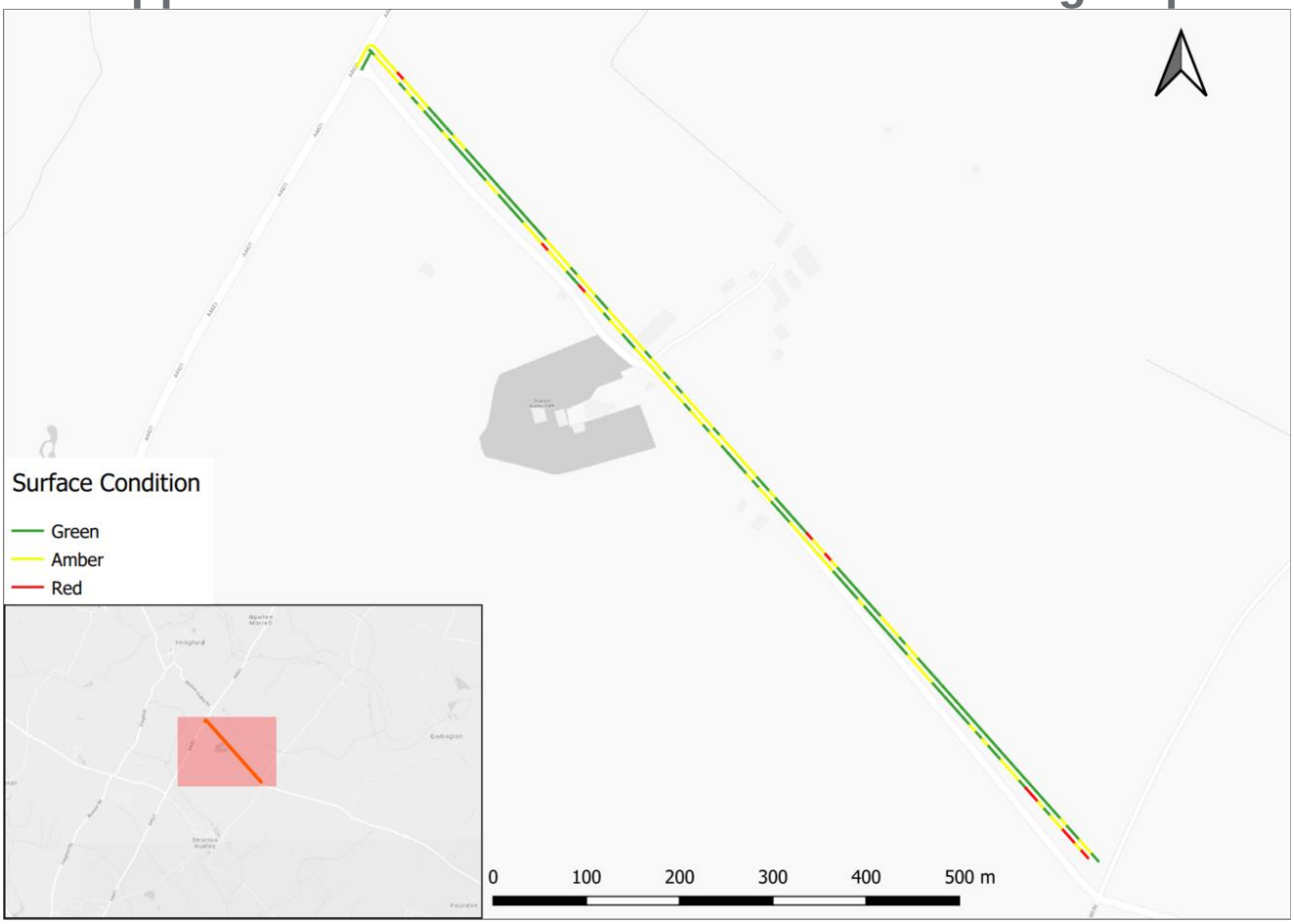
Appendix B Example Photos of Typical Surface Condition Observed in Link 102 from Video Survey Data (August 2018)

Figure B-1 Surface Indicator of Pavement Risk "At Risk" Condition

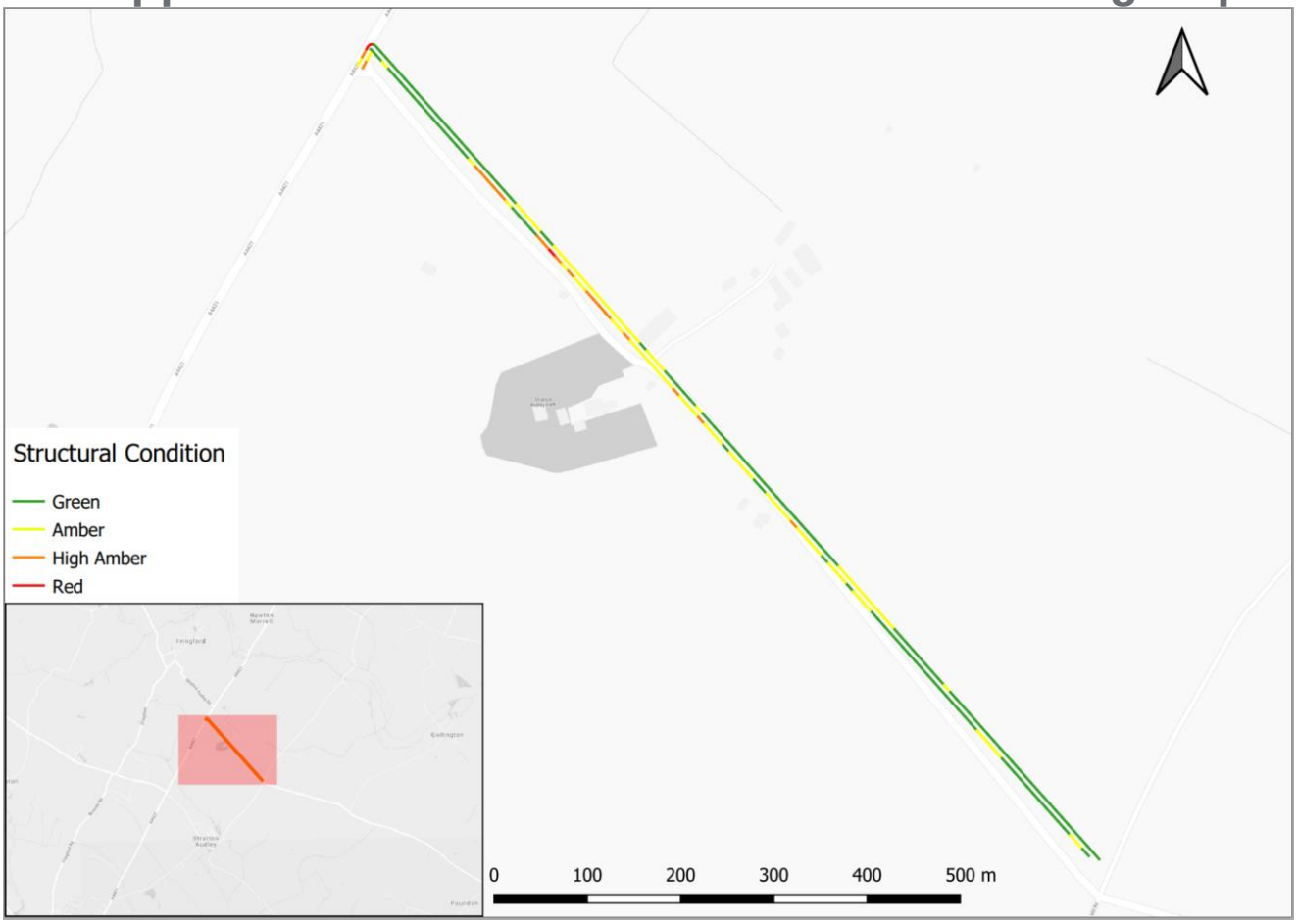
Figure B-2 Surface Indicator of Pavement Risk "Limited Risk" Condition

Figure B-3 Surface Indicator of Pavement Risk "Sound" Condition

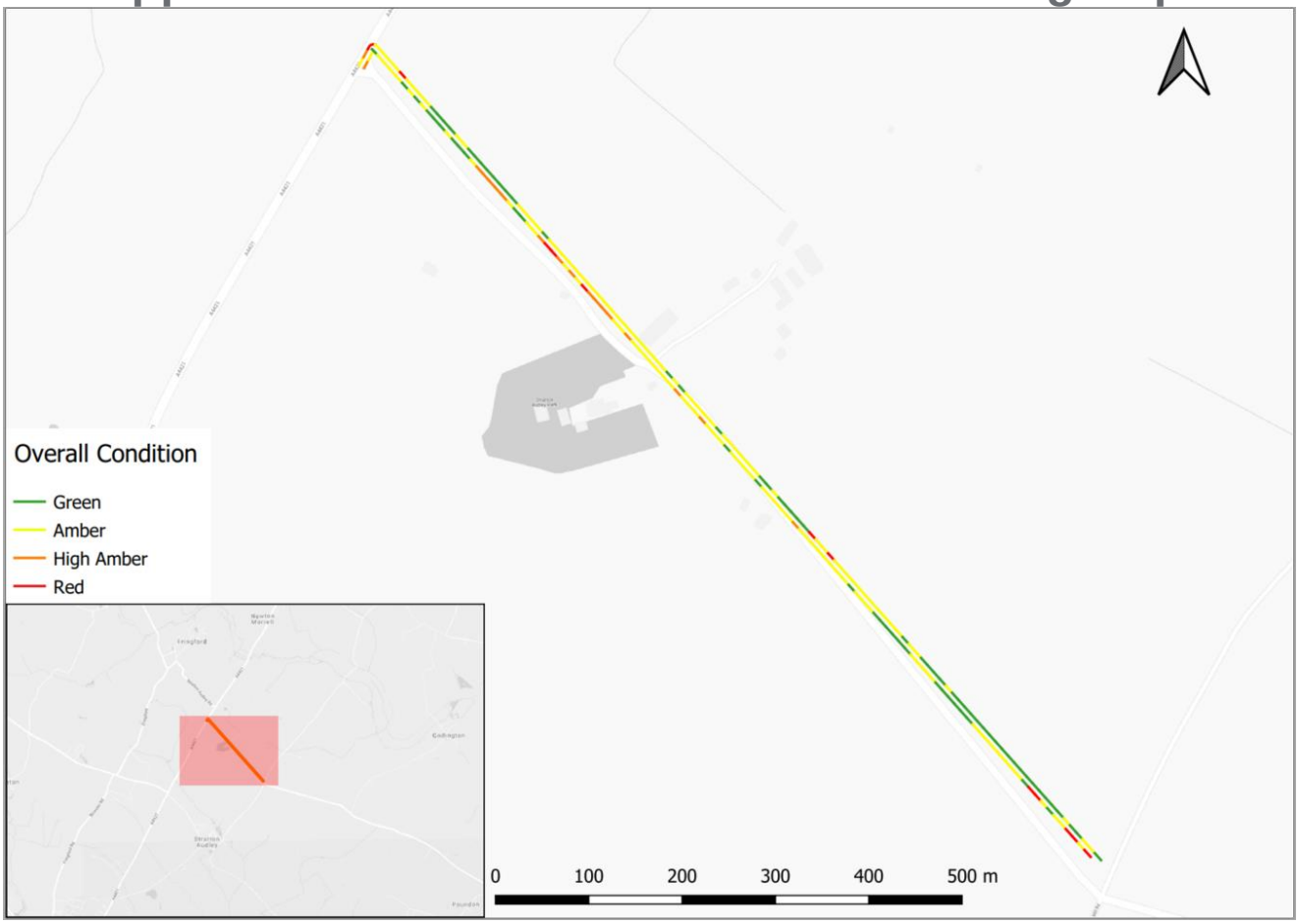
Appendix C – Surface Condition Risk Rating Map



Appendix D – Structural Condition Risk Rating Map



Appendix E – Overall Condition Risk Rating Map



Appendix F – Treatment Methodology

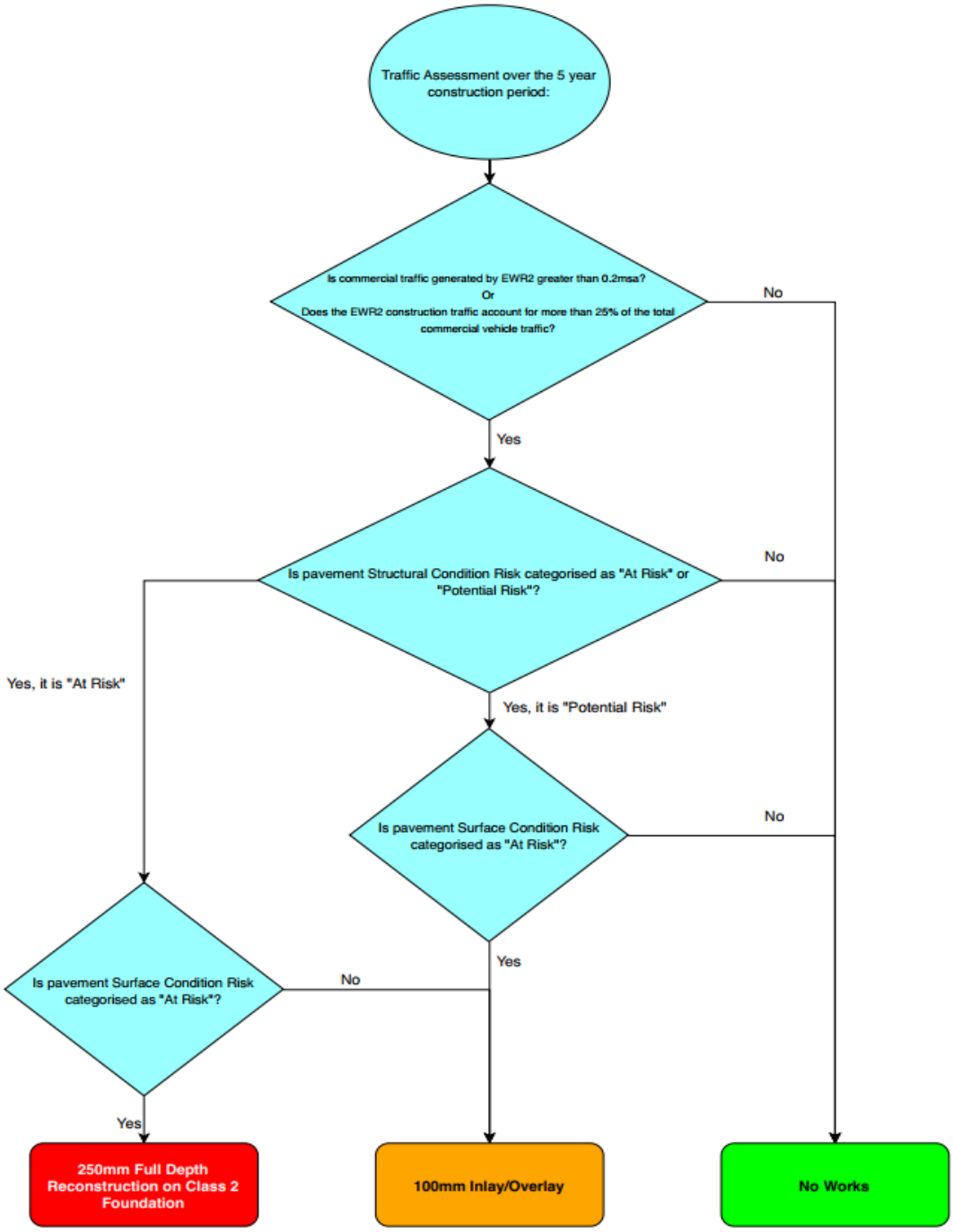


Figure F-1 – Pavement Treatment Methodology for Stages 1 & 2

Appendix G – Treatment Schedule

Table G-1 – Treatment Details for Link 102

Start Ch.	End Ch.	Lane	Surface Condition Index	Structural Condition Index	Original Treatment Rules	Rationalised Treatment Rules
0	10	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
10	20	CL1	Limited Risk	Potential Risk	No Treatment	No Treatment
20	30	CL1	Limited Risk	At Risk	100mm Inlay	No Treatment
30	40	CL1	Limited Risk	Sound	No Treatment	No Treatment
40	50	CL1	Limited Risk	Sound	No Treatment	No Treatment
50	60	CL1	Limited Risk	Sound	No Treatment	No Treatment
60	70	CL1	Limited Risk	Sound	No Treatment	No Treatment
70	80	CL1	At Risk	Sound	No Treatment	No Treatment
80	90	CL1	Limited Risk	Sound	No Treatment	No Treatment
90	100	CL1	Limited Risk	Sound	No Treatment	No Treatment
100	110	CL1	Limited Risk	Sound	No Treatment	No Treatment
110	120	CL1	Limited Risk	Sound	No Treatment	No Treatment
120	130	CL1	Sound	Sound	No Treatment	No Treatment
130	140	CL1	Sound	Sound	No Treatment	No Treatment
140	150	CL1	Sound	Sound	No Treatment	No Treatment
150	160	CL1	Sound	Sound	No Treatment	No Treatment
160	170	CL1	Limited Risk	Sound	No Treatment	No Treatment
170	180	CL1	Limited Risk	Sound	No Treatment	No Treatment
180	190	CL1	Sound	Sound	No Treatment	No Treatment
190	200	CL1	Sound	Sound	No Treatment	No Treatment
200	210	CL1	Sound	Sound	No Treatment	No Treatment
210	220	CL1	Sound	Sound	No Treatment	No Treatment
220	230	CL1	Sound	Sound	No Treatment	No Treatment
230	240	CL1	Sound	Sound	No Treatment	No Treatment
240	250	CL1	Sound	Sound	No Treatment	No Treatment
250	260	CL1	Sound	Sound	No Treatment	No Treatment
260	270	CL1	Sound	Limited Risk	No Treatment	No Treatment
270	280	CL1	Sound	Limited Risk	No Treatment	No Treatment
280	290	CL1	Sound	Limited Risk	No Treatment	No Treatment
290	300	CL1	Sound	Limited Risk	No Treatment	No Treatment
300	310	CL1	Sound	Sound	No Treatment	No Treatment
310	320	CL1	Limited Risk	Sound	No Treatment	No Treatment
320	330	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
330	340	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
340	350	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
350	360	CL1	Sound	Limited Risk	No Treatment	No Treatment

360	370	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
370	380	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
380	390	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
390	400	CL1	Sound	Limited Risk	No Treatment	No Treatment
400	410	CL1	Sound	Limited Risk	No Treatment	No Treatment
410	420	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
420	430	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
430	440	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
440	450	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
450	460	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
460	470	CL1	Limited Risk	Sound	No Treatment	No Treatment
470	480	CL1	Sound	Limited Risk	No Treatment	No Treatment
480	490	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
490	500	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
500	510	CL1	Sound	Sound	No Treatment	No Treatment
510	520	CL1	Limited Risk	Sound	No Treatment	No Treatment
520	530	CL1	Sound	Sound	No Treatment	No Treatment
530	540	CL1	Limited Risk	Sound	No Treatment	No Treatment
540	550	CL1	Limited Risk	Sound	No Treatment	No Treatment
550	560	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
560	570	CL1	Limited Risk	Sound	No Treatment	No Treatment
570	580	CL1	Limited Risk	Sound	No Treatment	No Treatment
580	590	CL1	Sound	Sound	No Treatment	No Treatment
590	600	CL1	Limited Risk	Sound	No Treatment	No Treatment
600	610	CL1	Limited Risk	Sound	No Treatment	No Treatment
610	620	CL1	Limited Risk	Sound	No Treatment	No Treatment
620	630	CL1	Limited Risk	Sound	No Treatment	No Treatment
630	640	CL1	Limited Risk	Sound	No Treatment	No Treatment
640	650	CL1	Limited Risk	Sound	No Treatment	No Treatment
650	660	CL1	Sound	Sound	No Treatment	No Treatment
660	670	CL1	Sound	Sound	No Treatment	No Treatment
670	680	CL1	Limited Risk	Sound	No Treatment	No Treatment
680	690	CL1	Sound	Sound	No Treatment	No Treatment
690	700	CL1	Sound	Sound	No Treatment	No Treatment
700	710	CL1	Sound	Sound	No Treatment	No Treatment
710	720	CL1	Sound	Sound	No Treatment	No Treatment
720	730	CL1	Sound	Sound	No Treatment	No Treatment
730	740	CL1	At Risk	Sound	No Treatment	No Treatment
740	750	CL1	Limited Risk	Sound	No Treatment	No Treatment
750	760	CL1	Limited Risk	Sound	No Treatment	No Treatment

760	770	CL1	At Risk	Sound	No Treatment	No Treatment
770	780	CL1	Limited Risk	Sound	No Treatment	No Treatment
780	790	CL1	Sound	Limited Risk	No Treatment	No Treatment
790	800	CL1	Sound	Limited Risk	No Treatment	No Treatment
800	810	CL1	Sound	Limited Risk	No Treatment	No Treatment
810	820	CL1	Sound	Limited Risk	No Treatment	No Treatment
820	830	CL1	Sound	Limited Risk	No Treatment	No Treatment
830	840	CL1	Sound	Limited Risk	No Treatment	No Treatment
840	850	CL1	Sound	Limited Risk	No Treatment	No Treatment
850	860	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
860	870	CL1	Limited Risk	Limited Risk	No Treatment	No Treatment
870	880	CL1	Limited Risk	Sound	No Treatment	No Treatment
880	890	CL1	Sound	Sound	No Treatment	No Treatment
890	900	CL1	Limited Risk	Sound	No Treatment	No Treatment
900	910	CL1	Limited Risk	Sound	No Treatment	No Treatment
910	920	CL1	Sound	Sound	No Treatment	No Treatment
920	930	CL1	Sound	Sound	No Treatment	No Treatment
930	940	CL1	Sound	Sound	No Treatment	No Treatment
940	950	CL1	Sound	Sound	No Treatment	No Treatment
950	960	CL1	Sound	Limited Risk	No Treatment	No Treatment
960	970	CL1	Sound	Sound	No Treatment	No Treatment
970	980	CL1	Sound	Sound	No Treatment	No Treatment
980	990	CL1	Sound	Sound	No Treatment	No Treatment
990	1000	CL1	Sound	Sound	No Treatment	No Treatment
1000	1010	CL1	Sound	Sound	No Treatment	No Treatment
1010	1020	CL1	Sound	Sound	No Treatment	No Treatment
1020	1030	CL1	Sound	Sound	No Treatment	No Treatment
1030	1040	CL1	Sound	Sound	No Treatment	No Treatment
1040	1050	CL1	Sound	Sound	No Treatment	No Treatment
1050	1060	CL1	Sound	Sound	No Treatment	No Treatment
1060	1070	CL1	Sound	Sound	No Treatment	No Treatment
1070	1080	CL1	Sound	Sound	No Treatment	No Treatment
1080	1090	CL1	Sound	Sound	No Treatment	No Treatment
1090	1100	CL1	Sound	Sound	No Treatment	No Treatment
1100	1110	CL1	Sound	Sound	No Treatment	No Treatment
1110	1120	CL1	Sound	Sound	No Treatment	No Treatment
1120	1130	CL1	Sound	Sound	No Treatment	No Treatment
1130	1140	CL1	Sound	Sound	No Treatment	No Treatment
1140	1150	CL1	Limited Risk	Sound	No Treatment	No Treatment
1150	1160	CL1	Sound	Sound	No Treatment	No Treatment

1160	1170	CL1	Sound	Sound	No Treatment	No Treatment
1170	1180	CL1	Limited Risk	Sound	No Treatment	No Treatment
1180	1190	CL1	Limited Risk	Sound	No Treatment	No Treatment
1190	1200	CL1	Sound	Sound	No Treatment	No Treatment
0	10	CR1	Sound	Potential Risk	No Treatment	No Treatment
10	20	CR1	Sound	Limited Risk	No Treatment	No Treatment
20	30	CR1	Limited Risk	Sound	No Treatment	No Treatment
30	40	CR1	Sound	Sound	No Treatment	No Treatment
40	50	CR1	Limited Risk	Sound	No Treatment	No Treatment
50	60	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
60	70	CR1	Limited Risk	Sound	No Treatment	No Treatment
70	80	CR1	Limited Risk	Sound	No Treatment	No Treatment
80	90	CR1	Sound	Sound	No Treatment	No Treatment
90	100	CR1	Limited Risk	Sound	No Treatment	No Treatment
100	110	CR1	Sound	Sound	No Treatment	No Treatment
110	120	CR1	Limited Risk	Sound	No Treatment	No Treatment
120	130	CR1	Sound	Sound	No Treatment	No Treatment
130	140	CR1	Sound	Sound	No Treatment	No Treatment
140	150	CR1	Sound	Sound	No Treatment	No Treatment
150	160	CR1	Limited Risk	Sound	No Treatment	No Treatment
160	170	CR1	Sound	Sound	No Treatment	No Treatment
170	180	CR1	Sound	Sound	No Treatment	No Treatment
180	190	CR1	Sound	Sound	No Treatment	No Treatment
190	200	CR1	Sound	Limited Risk	No Treatment	No Treatment
200	210	CR1	Sound	Potential Risk	No Treatment	No Treatment
210	220	CR1	Sound	Potential Risk	No Treatment	No Treatment
220	230	CR1	Limited Risk	Potential Risk	No Treatment	No Treatment
230	240	CR1	Limited Risk	Potential Risk	No Treatment	No Treatment
240	250	CR1	Sound	Potential Risk	No Treatment	No Treatment
250	260	CR1	Sound	Limited Risk	No Treatment	No Treatment
260	270	CR1	Sound	Sound	No Treatment	No Treatment
270	280	CR1	Sound	Sound	No Treatment	No Treatment
280	290	CR1	Limited Risk	Sound	No Treatment	No Treatment
290	300	CR1	Limited Risk	Sound	No Treatment	No Treatment
300	310	CR1	Limited Risk	Potential Risk	No Treatment	No Treatment
310	320	CR1	At Risk	Potential Risk	100mm Inlay	No Treatment
320	330	CR1	Limited Risk	At Risk	100mm Inlay	No Treatment
330	340	CR1	Limited Risk	Potential Risk	No Treatment	No Treatment
340	350	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
350	360	CR1	Sound	Potential Risk	No Treatment	No Treatment

360	370	CR1	Sound	Limited Risk	No Treatment	No Treatment
370	380	CR1	At Risk	Limited Risk	No Treatment	No Treatment
380	390	CR1	Limited Risk	Potential Risk	No Treatment	No Treatment
390	400	CR1	Limited Risk	Potential Risk	No Treatment	No Treatment
400	410	CR1	Limited Risk	Potential Risk	No Treatment	No Treatment
410	420	CR1	Sound	Potential Risk	No Treatment	No Treatment
420	430	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
430	440	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
440	450	CR1	Sound	Potential Risk	No Treatment	No Treatment
450	460	CR1	Sound	Limited Risk	No Treatment	No Treatment
460	470	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
470	480	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
480	490	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
490	500	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
500	510	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
510	520	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
520	530	CR1	Limited Risk	Potential Risk	No Treatment	No Treatment
530	540	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
540	550	CR1	Sound	Limited Risk	No Treatment	No Treatment
550	560	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
560	570	CR1	Limited Risk	Potential Risk	No Treatment	No Treatment
570	580	CR1	Sound	Limited Risk	No Treatment	No Treatment
580	590	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
590	600	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
600	610	CR1	Sound	Sound	No Treatment	No Treatment
610	620	CR1	Sound	Limited Risk	No Treatment	No Treatment
620	630	CR1	Sound	Limited Risk	No Treatment	No Treatment
630	640	CR1	Sound	Limited Risk	No Treatment	No Treatment
640	650	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
650	660	CR1	Sound	Sound	No Treatment	No Treatment
660	670	CR1	Limited Risk	Sound	No Treatment	No Treatment
670	680	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
680	690	CR1	Sound	Limited Risk	No Treatment	No Treatment
690	700	CR1	Sound	Limited Risk	No Treatment	No Treatment
700	710	CR1	Sound	Limited Risk	No Treatment	No Treatment
710	720	CR1	Limited Risk	Potential Risk	No Treatment	No Treatment
720	730	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
730	740	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
740	750	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
750	760	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment

760	770	CR1	Limited Risk	Sound	No Treatment	No Treatment
770	780	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
780	790	CR1	Sound	Limited Risk	No Treatment	No Treatment
790	800	CR1	Sound	Limited Risk	No Treatment	No Treatment
800	810	CR1	Sound	Sound	No Treatment	No Treatment
810	820	CR1	Sound	Limited Risk	No Treatment	No Treatment
820	830	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
830	840	CR1	Sound	Limited Risk	No Treatment	No Treatment
840	850	CR1	Sound	Sound	No Treatment	No Treatment
850	860	CR1	Sound	Sound	No Treatment	No Treatment
860	870	CR1	Sound	Sound	No Treatment	No Treatment
870	880	CR1	Sound	Sound	No Treatment	No Treatment
880	890	CR1	Sound	Sound	No Treatment	No Treatment
890	900	CR1	Sound	Sound	No Treatment	No Treatment
900	910	CR1	Limited Risk	Sound	No Treatment	No Treatment
910	920	CR1	Limited Risk	Sound	No Treatment	No Treatment
920	930	CR1	Limited Risk	Sound	No Treatment	No Treatment
930	940	CR1	Limited Risk	Sound	No Treatment	No Treatment
940	950	CR1	Sound	Sound	No Treatment	No Treatment
950	960	CR1	Sound	Sound	No Treatment	No Treatment
960	970	CR1	Sound	Sound	No Treatment	No Treatment
970	980	CR1	Sound	Sound	No Treatment	No Treatment
980	990	CR1	Sound	Sound	No Treatment	No Treatment
990	1000	CR1	Sound	Sound	No Treatment	No Treatment
1000	1010	CR1	Limited Risk	Sound	No Treatment	No Treatment
1010	1020	CR1	Sound	Limited Risk	No Treatment	No Treatment
1020	1030	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
1030	1040	CR1	Sound	Limited Risk	No Treatment	No Treatment
1040	1050	CR1	Sound	Limited Risk	No Treatment	No Treatment
1050	1060	CR1	Limited Risk	Sound	No Treatment	No Treatment
1060	1070	CR1	Limited Risk	Sound	No Treatment	No Treatment
1070	1080	CR1	Limited Risk	Sound	No Treatment	No Treatment
1080	1090	CR1	Sound	Sound	No Treatment	No Treatment
1090	1100	CR1	At Risk	Sound	No Treatment	No Treatment
1100	1110	CR1	At Risk	Sound	No Treatment	No Treatment
1110	1120	CR1	Limited Risk	Sound	No Treatment	No Treatment
1120	1130	CR1	Sound	Sound	No Treatment	No Treatment
1130	1140	CR1	Limited Risk	Sound	No Treatment	No Treatment
1140	1150	CR1	Limited Risk	Sound	No Treatment	No Treatment
1150	1160	CR1	At Risk	Sound	No Treatment	No Treatment

1160	1170	CR1	At Risk	Limited Risk	No Treatment	No Treatment
1170	1180	CR1	Limited Risk	Limited Risk	No Treatment	No Treatment
1180	1190	CR1	At Risk	Sound	No Treatment	No Treatment

EWR Alliance
2nd Floor
Phoenix House
Elder Gate
Milton Keynes
MK9 1AW