

Sub-Task 1.2: Inspection Panel Report

Task 1-444 Collaborative Research Project

Highways England, Eurobitume UK and Mineral Products
Association (MPA)

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Executive Summary

The overall objective of this project is focused on ensuring that asphalt surfacing continues to deliver value for money and to maximise the benefits from innovation on the Strategic Road Network. This project is a collaborative outcome between AECOM, Highways England (HE), Eurobitume UK and Mineral Products Association (MPA).

The principal concept of the new Inspection Panel Procedure focuses on integrating automated data driven systems to carry out video visual condition surveys on selected sites. This new Inspection Panel Procedure is proposed instead of a footway or walk over survey. The main role of the current inspection panel is to act as an arbitration tool in disputes over early life or premature failures for Thin Surface Course Systems (TSCS) in the United Kingdom. The information obtained from the new "Inspection Panel" Protocol has the potential to provide valuable information on the state and performance of TSCS over time. Typical sites suitable for the inspection panel include:

- Sites with early life or premature failures.
- Sites that are coming up to their warranty period.
- Sites with warranty claims.
- Recent maintenance schemes.
- Sites with innovative solutions as part of the Technology Readiness Level and approval process.

The new inspection procedure was carried out on defective sites on A20 Dover identified by Highways England. This comprised of Prince of Wales Junction and York Street Junction. The inspection panel workshop and assessment from the A20 were used solely for testing and validating the new inspection procedures. The inspection panel procedure developed was able to identify a range of defects including fretting/loss of aggregates, potholes, transverse and longitudinal cracking and open joints. The procedure identified poor workmanship on gully repairs, condition of kerbs, drainages and ironworks.

The inspection panel procedure developed for this project provides a useful, convenient and repeatable system for carrying out visual condition surveys. The method eliminates the risks associated with physically having individuals on site conducting visual condition surveys. The assessment can be completed remotely from sites. The new inspection panel helps improve safety and provides cost savings.

It is recommended that additional inspection panels are completed using the procedures detailed in this report. A key component of the exercise must include the field validation exercise to verify failures identified in the inspection panel workshop. The lighting of the videos/images plays a significant role most especially in distinguishing between rutting and fatting. The data for this procedure must be collected using 4K High Definition compatible systems.

1. Introduction

Arup AECOM consortium was commissioned by Highways England, Eurobitume UK and Mineral Products Association (MPA) as part of Task 1-444 Collaborative Research 2017/2018 Road Trials (Phase II) and QA Measurement Methods to develop a new 'Inspection Panel' assessment method and criteria to monitor the ongoing performance of Thin Surface Course Systems (TSCS) on the Strategic Road Network (SRN).

This report focuses on Sub-Task 1.2 of the project. The approach and scope are detailed in Figure 1.

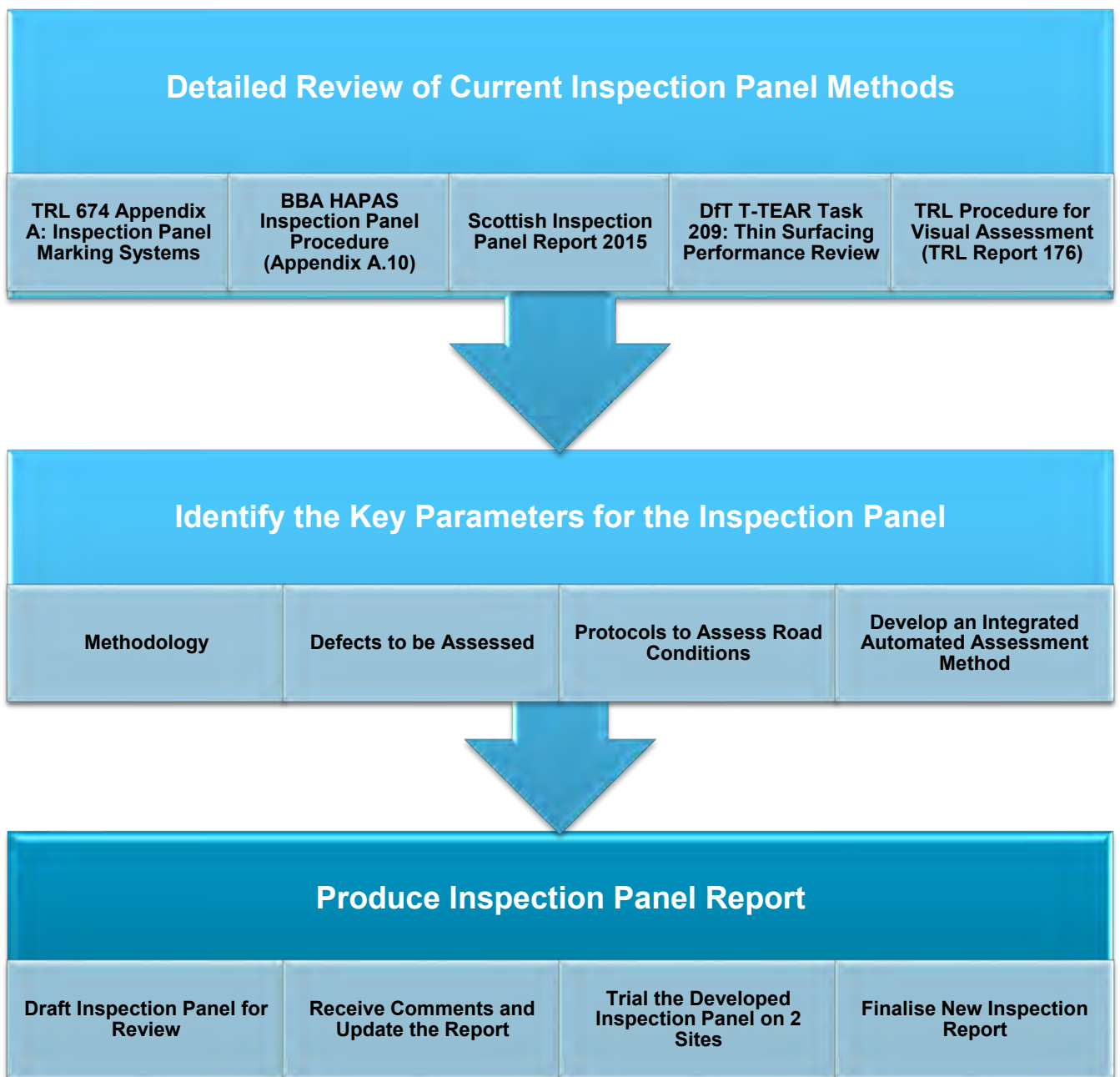


Figure 1: Approach and Scope to Developing the New Inspection Panel

In developing the new method for assessing and scoring asphalt pavement surfacing, the following documents were reviewed:

- Durability of Thin Asphalt Surfacing Systems – Part 4 (TRL 674 Appendix A: Inspection Panel Marking System, 2010).
- Laboratory Tests on High Friction Surfaces for Highways (TRL 176 Appendix R: Procedure for Visual Assessment of Trial Sites, 1997).
- BBA HAPAS Inspection Panel Procedure – (Appendix A.10 Visual Assessment of Trial Sites, 2013).
- Scottish Inspection Panel Report - 2015.
- DfT T-TEAR Task 209 – (Thin Surfacing Performance Review, 2013).
- Surface Dressing Test Methods – Visual Assessment of Defects (BS EN 12272-2: 2003).
- DfT Technical Note – (Road Condition and Maintenance Data, 2018).

The key defining factors for these methods are summarised below:

- TRL 674 provides a well-defined visual observation method for identifying surface defects. The procedure includes an assessment of the relative severity of the surface using a defined scoring system. TRL 674 makes use of an inspection panel comprised of representatives from Highways England and experts from industry. The assessment works based on a scoring system of the asphalt surfacing that includes: Excellent, Good, Moderate, Suspect, Poor and Bad.
- The Scottish Inspection Panel makes use of the same method as detailed in TRL Report 674. Panel members undertake a walk for each section of the road assessing the visual condition. The process makes use of a distinct marking based on the 7-point scale in TRL 674.
- The Scottish Inspection Panel process focuses mostly on sites reaching the end of their warranty period. Additional sites and locations can be added at the discretion of Transport Scotland.
- The BBA HAPAS Inspection Panel Procedure – Appendix A.10 Visual Assessment of Trial Sites makes use of the same system and procedures as detailed in TRL 674.
- Task 209 made use of video surveys from 40 TSCS sites on the motorway and trunk roads to sample the overall condition of the SRN. Video surveys were used in this method. This procedure made use of an Inspection Panel in a workshop forum to evaluate video surveys. Following this, statistical analyses were carried out to produce estimations of pavement condition of surfaces on the SRN.

2. New Inspection Panel Procedure

The principal concept of the new Inspection Panel Procedure focuses on integrating automated data driven systems to carry out video visual condition surveys on selected SRN sites. This new Inspection Panel Procedure is instead of a footway or walk over survey. The assessment will be carried out remotely from site such as in an office. It must be noted that while this report relates specifically to sites on the SRN operated by Highways England, the procedures and concepts detailed in the report could be used by other stakeholders for other networks. The key steps involved in the new inspection panel procedure are detailed in the following sections:

2.1 Role of Inspection Panel

The inspection panel has several roles dependent on the sites selected for inspection. The main role of the current inspection panel is to act as an arbitration tool in disputes over early life or premature failures for TSCS. The information obtained from this procedure has the potential to provide valuable information on the state and performance of TSCS on the SRN over time.

2.2 Site Selection

Highways England is tasked with identifying and proposing sites suitable for the Inspection Panel procedure. Potential sites include but are not limited to the following:

- Sites with early life or premature failures.
- Sites that are coming up to their warranty period.
- Sites with warranty claims.
- Recent maintenance schemes.
- Sites with innovative solutions as part of the Technology Readiness Level and approval process.

Please note that sites could be proposed at the discretion of Highways England.

2.3 Selection of Inspection Panel

- Highways England nominates and appoints the convenor for the Inspection Panel.
- The Inspection Panel shall comprise of 12 members agreed with Highways England. This consist of experienced members identified with extensive knowledge of asphalt surfacing.
- Members shall comprise of representatives from Highways England, Contractors/Supply Chain and Consultants.
- A minimum of five members of the Inspection Panel must be in attendance to consider the observations valid.

2.4 Quality Requirements of the Automated Data Driven Video Surveys

- The Automated Data Driven Video Surveys must have video and still picture quality with 4K HD capabilities. Minimum nominal resolution of 3,840 x 2,160 pixels. This must provide details to assess pavement condition similar to the naked eye; all faults must be identifiable to ensure accurate assessment of the surface.
- The system must be able to provide high-resolution multi-view 4K HD videos and still pictures of road features such as marker post signs, carriageways, footways, drainage systems, line markings, lamp posts and traffic island.
- Key information to be reviewed includes the condition of the joints and edges. Additional information includes evidence of fatting up, loss of aggregates, cracking, stripping, rutting and potholes.
- Obtained data must be compatible with HAPMS and UKPMS including HMDIF and XML type formats. Inventory items should be easily converted to Shape and TAB files for integration with MapInfo®.

2.5 Responsibilities of the Convenor and Inspection Panel Members

- The Convenor after fixing the date for inspection shall inform other members as soon as possible but not less than 21 days before the inspection and inspection panel workshop is to be carried out. Inspection Panel members are to confirm attendance to the workshop with the Convenor. If less than five members are available, the Convenor shall rearrange the date for the convenience of members.
- The convenor shall ensure that all Inspection Panel Members are familiar with the Inspection Panel procedures.
- Subject to the requirement for the inspection, sites shall be selected and provided to the convenor. The convenor is tasked with the collection of available site information including Traffic-Speed Condition Surveys (TRACS), Traffic Speed Deflectometer (TSD) and Sideway-force Coefficient Routine Investigation Machine (SCRIM) data for the site. Information from TRACS, TSD and SCRIM will be summarised comprehensively in a concise manner and disseminated to members before the Inspection Panel workshop.
- Information obtained from TRACS, TSD and SCRIM would provide a sense check on obtained Automated Data Driven Video Surveys.

2.6 Initial Calibration of the Automated Data Driven Video Surveys

- Initial calibration of the automated data driven video surveys is a key requirement. This is an onsite foot/walk over visual condition survey of the same sites. The same inspection panel members following the inspection panel workshop are to be maintained.
- The inspection panel shall assess the Automated Data Driven Video Surveys firstly using imagery and secondly on foot in person.
- Subject to the outcome of the calibration, adjustment to the inspection results shall be agreed by the panel and recorded.
- The number of calibration sites is dependent on the variations in defects recorded and overall condition result with a minimum of one for each set of 40 sites.

2.7 Scoring and Assessment System of the New Inspection Panel

- The scoring and assessment system of the new inspection panel procedure is based on the TRL 674 system but also to include an assessment of joints on the surface of the pavement. The scoring system is detailed in Table 1 and Table 2
- Following a review of associated site information, the automated data driven video surveys are viewed with the scoring and assessment by inspection panel members completed independently.
- Defects are monitored in terms of defects present and the extent to which they are present.
- The convenor provides a comprehensive means to collate, review and determine the final score for the site. A consensus assessment is agreed and recorded.

Table 1: Proposed Scoring System (Adopted from TRL 674)

Mark	Description	
E (Excellent)	No discernible fault	Termed "Satisfactory"
G (Good)	No significant fault	
M (Moderate)	Some faults but insufficient to be categorised as "Serious"	
A (Acceptable)	Several faults categorised as "Acceptable"	
S (Suspect)	Seriously faulted but still serviceable in the short term	Termed "Unsatisfactory"
P (Poor)	Requires remedial treatment	
B (Bad)	Requires immediate remedial treatment	

Table 2: Identification and Classification Table (Adopted from TRL 674)

Suffix	
v	Variable (random variations from point to point within a section only, not “traffic laning” or obvious variations)
t	Variability with traffic intensity (marked transverse differences caused by variations in traffic intensity between lanes)
+	Fatting up
-	Loss of aggregates
p	Potholes
r	Rutting
s	Stripping
c	Cracking
oj	Open joint
fj	Fretting at joint
fs/fd	Fuel spill/fire damage
other	Please provide a detailed description

3. Inspection Panel Workshop on A20 Dover

3.1 Overview of the Procedures

The new inspection panel protocol was carried out on the A20 Dover. The site was identified by Highways England. The sections comprised of Prince of Wales Junction and York Street Junction. The Automated Data Driven Video Surveys were carried out on 29th October 2018 in line with the quality requirements detailed in Section 2.4 of this report. The inspection panel workshop and assessment from this site are used solely for testing and validating the new inspection procedures as detailed in the report.

The system used in carrying out the Automated Data Driven Video Surveys can record the Forward (Figure 2), Reverse (Figure 3), Vertical (Figure 4), Down (Figure 5), Left (Figure 6) and Right (Figure 7) views in 4K HD.



Figure 2: Forward View



Figure 3: Reverse View



Figure 4: Vertical View



Figure 5: Down View



Figure 6: Left View



Figure 7: Right View

The dashboard for the Automated Data Driven Video Surveys provides a map and the unique chainage system for the road section can be recorded.

3.2 Inspection Panel Workshop

The inspection panel workshop on the A20 Dover site was carried out on 20th December 2018 in London. The workshop was attended by 4 Inspection Panel members and 1 Technical Administrator.

The typical defects identified on the A20 Dover sites during the workshop are detailed below. The failure mechanisms are identified and classified as detailed in Table 2. A typical worksheet used in recording defects for the new inspection panel procedure is presented in Appendix A.



Figure 8: Loss of Aggregates (-) and Evidence of Pothole Formation (p)



Figure 9: Variable Defects (v) including Potholes (p)



Figure 10: Transverse and Longitudinal Cracks (c)



Figure 11: (c) and Open Joints (oj)



Figure 12: Fattening Up (+)



Figure 13: Loss of Aggregates/Fretting (f)



Figure 14: Loss of Texture and Ripples on the High Friction Surface (other)



Figure 15: Repairs to Gully (other)

3.2.1 Feedback

The feedback from the workshop was that the procedure was useful, convenient, can be used remotely, improves safety, provides cost savings, is repeatable and provides different viewing angles for the assessors.

The key factors for implementation and areas for improvement include:

- The use of a 4K resolution screen is a key factor for the inspection panel procedure.
- HAPMS chainages would be the preferred chainage system. Match the chainages for Lanes 1 and 2.
- The lighting of the videos/images play a major role most especially in distinguishing between rutting and fatting.
- Validation of the exercise by carrying out a footway/walkover survey is essential*.

*The validation exercise could not be completed on the A20 Dover site. This was due to the fact that remedial works were carried out on the site to rectify defects.

4. Conclusions and Recommendations

4.1 Conclusions

The new “Inspection Panel Procedure” makes use of automated data driven systems to carry out video visual condition surveys on selected sites. The new Inspection Panel Procedure is instead of a footway or walk over survey. The main role of the current inspection panel is to act as an arbitration tool in disputes over early life or premature failures for TSCS. The information obtained from this procedure has the potential to provide valuable information on the state and performance of TSCS on the SRN over time. The new “Inspection Panel” procedure is summarised below in Figure 16.

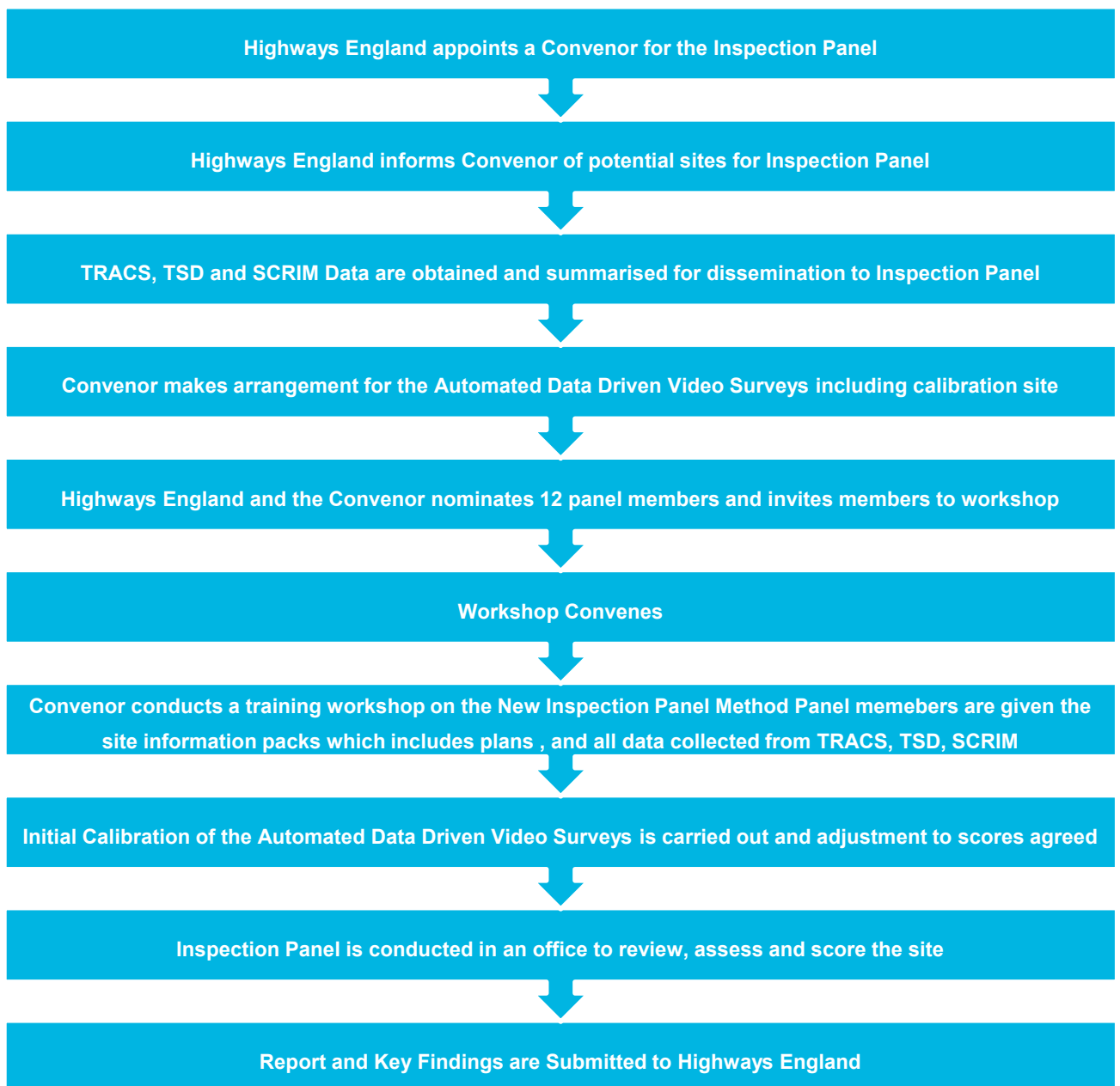


Figure 16: New Inspection Panel Procedure

The inspection panel procedure developed was able to identify a range of defects including fretting/loss of aggregates, potholes, transverse and longitudinal cracking and open joints. The protocol was also able to identify evidence of poor workmanship on gully repairs and damaged kerbs. The protocol provided information on the visual condition of drainages and ironworks for the road sections.

The inspection panel procedure developed provides a useful, convenient and repeatable system for carrying out visual condition surveys. The procedure eliminates the risks associated with physically having individuals on site conducting visual condition surveys. The assessment can be completed remotely from site. The new inspection panel helps improve safety and provides cost savings.

4.2 Recommendations

The recommendations to further improve and develop the new inspection panel procedure is detailed below:

- Data must be collected and viewed using 4K High Definition compatible systems. This is a key factor for implementation.
- HAPMS chainages are the preferred chainage system to be used for the inspection panel procedure. Ideally, chainages for Lanes 1 and 2 should match.
- The lighting of the videos/images plays a major role most especially in distinguishing between rutting and fatting.
- Validation of the exercise by carrying out a footway/walkover survey is essential. The validation exercise could not be completed on the A20 Dover site. Remedial works were carried out on the site to rectify defects before the footway/walk over surveys could be completed.
- It is recommended that additional inspection panels are completed using the procedures detailed in this report. A key component of the exercise must include the validation exercise to verify failures identified in the workshop.

Appendix A – A20 Dover Worksheet

Prince of Wales Junction: Review and Analysis

Appendix Table 1: Prince of Wales Junction: Identification and Classification

Route	Identification and Classification					
	Forward View	Reverse View	Vertical View	Left View	Right View	Additional Comments
Route 1: 0.00 m to 536.35 m						

Name and Affiliation:

Mark/Scoring for Prince of Wales Junction:

Comments:

