the ukpms user manual

Volume 2

Visual Data Collection for UKPMS

Chapter 1: Overview of Visual Data Collection

Document Information

Title (Sub Title)	The UKPMS User Manual Volume 2: Visual Data Collection for UKPMS Chapter 1. Overview of Visual Data Collection
Product Number	UKPMS Manual_02_01
Author	James Wallis
Description	UKPMS Visual Survey Manual Introductory and Overview Chapter

Document History

Version No	***Status***	***Author***	***Date***	***Changes from Previous Version***
01	Draft	JW	March 05	First release for internal review
02	Draft	JW	30 June 05	All USG comments incorporated, issued for proof reading
03	Final	JW	July 2005	Final for Release
04	Final	JW	Feb 2007	Changes in line with new Inspector Accreditation and recommendations from UKPMS Visual Survey Sub-Group

UKPMS Support Office
Chris Britton Consultancy
#4 Howard Buildings
69 - 71 Burpham Lane
Guildford
Surrey
GU4 7NB

www.ukpms.com

Email: support@ukpms.com
Phone: +44 (0)1483 405027
Fax: +44 (0)1483 452264

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1.0 Who should read this manual?

This manual is intended to equip surveyors with the necessary information to carry out Coarse and Detailed UKPMS Visual Surveys accurately and consistently. Managers and Engineers with responsibility for arranging for UKPMS surveys to be carried out and who have to interpret the output produced from those surveys will also find it of interest and of relevance.

2.0 What is UKPMS?

UKPMS, the United Kingdom Pavement Management System, is a standard for computer systems that support the management of programmed maintenance of hard paved areas within the highway, and the monitoring of condition and need for funding on local authority road networks within the UK. The use of UKPMS is required for the production of statutory road condition Bests Value Performance Indicators. There is no single UKPMS, but a range of commercial highway management systems have been tested and accredited as meeting the UKPMS standard.

As well as software, the UKPMS standard also covers the associated survey techniques, and rules and parameters that allow the systems to be operated in a consistent, standard way.

3.0 What are the UKPMS Visual Surveys?

There are two types of UKPMS visual survey[1]; the Coarse Visual Inspection survey or CVI, is intended to be a coarse, rapid survey, usually carried out from a slow-moving vehicle, that allows a large part of a highways authority's road network to be assessed each year.

The Detailed Visual Inspection survey or DVI is a more comprehensive survey, with defects identified by a larger number of more detailed classifications. The DVI is a walked survey that provides much more detailed information than the CVI, and is typically targeted at lengths already identified as defective and potentially in need of treatment either by the CVI, or from other sources of information.

It is envisaged that a more detailed engineering survey would be carried out prior to maintenance schemes being implemented. Engineering surveys are not covered in this manual.

[1] *For the purposes of this manual, the terms "survey" and "inspection" are used interchangeably, to denote the type of condition assessment technique, of which CVI and DVI are examples, where road and road network condition and the need for planned maintenance schemes are assessed from a visual examination of the surfaces of the paved areas of the road.*

UKPMS Visual Surveys do not include the collection of Inventory data (i.e. locations, dimensions and construction of paved items) but may be combined with Inventory data to produce more accurate results when processed in a UKPMS System. Refer to Chapter 3 *Inventory* in Volume 2 of UKPMS user manual.

Some users may find it cost-effective to carry out Inventory data collection at the same time as a DVI.

4.0 What are the UKPMS Visual Surveys used for?

In many authorities UKPMS Visual Surveys have multiple uses, typically to produce a performance indicator report as required by central government and to ensure that they are allocating their budgets correctly. As SCANNER is replacing the need for CVI in the production of BV224 (a) for 2005/06, CVI surveys are still required for the production of BV224 (b), although this is under review. DVI surveys are required for the production of BV187.
In order to get most value from them, their use can be extended to include some or all of the following applications.

- Production of Audit Commission Best Value Performance Indicators (BVPI's).
- To support and audit decisions about how, when and where to carry out maintenance schemes within an authority.
- To support the authorities Asset Management Plan, including
  - Determining a required level of budget and investment over time to maintain or to achieve a required level of service or condition for a road network.
  - Assessing the future implications of current levels of funding.
  - Helping assess the highway infrastructure asset valuation.

DVI surveys can be carried out and converted into CVI surveys if the user identifies a need for this for carriageway BVPI reporting.

5.0 Who should carry out UKPMS Visual Surveys?

UKPMS surveys are designed to be carried out by staff who have been trained in the relevant survey techniques, and who are able to record defects accurately and consistently, in accordance with the definitions and procedures described in this manual. UKPMS surveyors are not expected to make decisions about the cause of defects, required treatments or to make other engineering judgements. Objectivity and consistency are paramount considerations in carrying out CVI and DVI surveys.

If survey data is to be used for the production of BVPI's the CVI/DVI inspectors must be accredited to the current nationally accepted standard. From 2nd April 2007 this will be the Inspector Accreditation Process defined by the Visual Survey Subgroup and endorsed by the UKPMS Steering Group (USG).
To ensure that surveys are consistent it is recommended that all staff who undertake CVI/DVI surveys, manage surveyors or audit surveys should be accredited to the same level.
The surveyors should also carry out the survey by using accredited software. Refer to Chapter 2 *DCD Software* in Volume 2 of UKPMS user manual.

6.0 Health and Safety

Surveyors should report all safety-related defects, even where there may be no specific requirement to do this in the survey being undertaken. The surveyor must be made aware of the council's policy on safety related defects and ensure they know who to contact in case of emergency.

The following information is advice only, the surveyor should be made aware of the contractor's or council's own health and safety policy before they undertake any surveys, including risk assessments and this will over-ride any statements within this chapter.

It is important that Surveyors remain alert to the dangers of moving vehicles. To ensure that Surveyors can always be seen, high visibility jackets conforming to BS EN 471:2003 should be worn at all times, when outside of the survey vehicle. Where possible, surveys on foot should be carried out while standing on the footway or verge. When measurements are being made on the carriageway (e.g. rut depth) by one surveyor, the other surveyor should act as a lookout to warn of oncoming traffic.

On dual carriageways, traffic management will normally be used to facilitate a safe survey. This will be carried out in accordance with Chapter 8 of the Department of Transport Traffic Signs Manual.

For CVI surveys, the survey vehicle should be equipped with high intensity roof-mounted flashing beacons. As the vehicle will be operating at slow speeds, it is recommended that the rear of the vehicle should be fitted with a blue arrow sign to diagram No. 610 of the Traffic Signs Regulations and General Directions 2002, together with a sign explaining the nature of the work (e.g. "CAUTION - SURVEYING IN PROGRESS - SLOW MOVING VEHICLE"). It is preferable to choose a vehicle of a conspicuous colour such as bright yellow or orange. In planning the survey any traffic sensitive lengths that are best-surveyed at off-peak times should be identified.

A minimum of two personnel will be required for the survey, a driver and a surveyor.

7.0 Visual Survey Details

7.1 Wheel Track Rutting

Wheel Track rutting is defined as a longitudinal depression in the wheel tracks relative to the surrounding area. Note that for UKPMS surveys, no distinction is made between "Plastic" rutting, where rutting results from "pushing" of bituminous material in the upper layer(s) of the pavement and "Structural" rutting, indicative of structural deterioration.

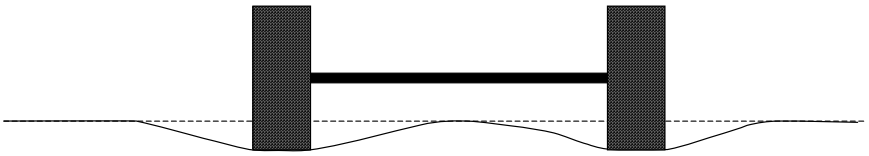


Figure 1.1 – "Structural" Wheel Track Rutting

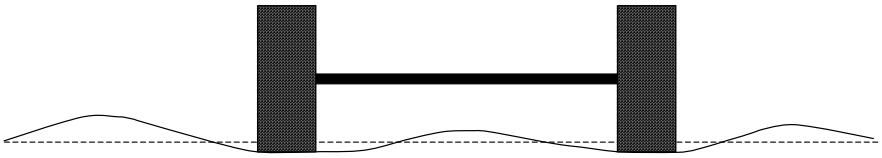


Figure 1.2 – "Plastic" Wheel Track Rutting

Wheel track rutting can be surveyed manually. For CVI surveys a simple visual assessment can be undertaken. For DVI surveys a straight edge and calibrated wedge or depth measure can be used. However, the preferred option, for both types of survey, is to undertake a machine-based assessment. Two special survey types of Machine Collected Rutting for DVI (DRUT) and Machine Collected Rutting for CVI (CRUT) have been defined to support the loading and processing of such with visual surveys. See Volume 3 "Machine Data Collection for UKPMS" of the user manual for more details on CRUT and DRUT. This is recommended both on grounds of accuracy, and for DVI surveys, safety since it removes the need to walk onto the carriageway.

Machine rut surveys use the Full Cross Sectional Position (XSP) referencing convention, separately for each lane. This will still allow Minimal XSP CVI surveys to be processed with Machine Rut data, although it will require that the DVI survey be carried out using the Full XSP convention. Refer to Chapter *Cross-section Position Referencing* in Volume 2 Chapter 4 of the UKPMS user manual.

7.2 Features

"Features" within UKPMS are the main paved items that are subject to survey, and for which condition indices and treatment proposals are produced. The Features within UKPMS are:

- Carriageway
- Footway and Footpath
- Cycleway and Cyclepath
- Paved Verge[2]
- Kerb
- Longitudinal Joint in Concrete
- Transverse Joint in Concrete

7.3 Survey Direction

Sections may be surveyed in either a 'forward direction' or a 'reverse direction'. The terms 'forward' and 'reverse' are used with respect to the 'reference direction' as defined by the start and end nodes or the section description.[3] Upon loading to the UKPMS system, reverse direction surveys will be reversed to match the normal direction recorded against the section.[4] If a section is labelled as 'reverse' then the UKPMS system will alter the data automatically, i.e. the end chainage will become the start chainage (0) and the XSP's will change from L to R and R to L.

[2] Grass verges and other unmade areas are not covered by UKPMS.
3 For one-way streets and for dual carriageways, the referenced direction of the section will normally be in the direction of traffic flow.
4 UKPMS includes a facility that allows a user to ensure that all surveys are always carried out in the same direction (i.e. forward or reverse), by recording a "normal surveying direction" against the section. It is recommended that in all but exceptional circumstances the normal surveying direction is always set to be the same as the referenced direction of the section.

7.4 Pavement Type, Surface Type and Construction Type

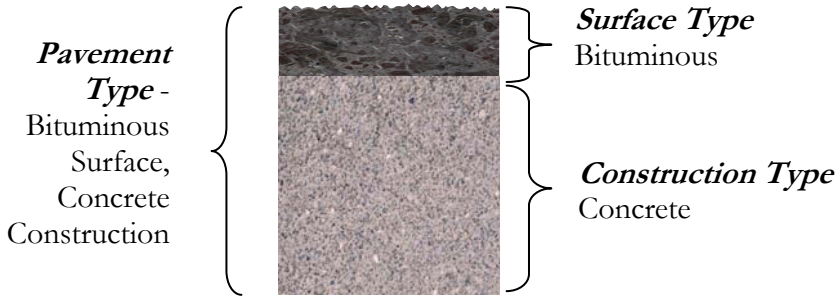


Figure 1.3 Pavement Type, Surface Type and Construction Type

The UKPMS approach for defects and processing is founded on three related concepts relating to the material from which a pavement under consideration is constructed.

- The Surface Type is the material from which the visible element of the pavement is constituted. It is this surface element that is of concern when undertaking a visual survey.
- The Construction Type of a paved feature is the structural element of a pavement.
- The Pavement Type combines the surface and construction elements of the pavement and has the most important logical role within UKPMS processing.

Each time a defect is recorded, the defect code will determine a Pavement Type, which is used to select the rules that are applied during UKPMS processing. This Pavement Type is based upon both the Surface Type implied by the survey data, but also any available information about construction held in the inventory, if this exists.[5] Figure 1.3 shows this, by way of an example, for the Bituminous Surface, Covered Concrete Pavement Type. Table 1.1 shows all possible Pavement Types, and their related Surface and Construction Types for the Features subject to UKPMS Visual Surveys.

[5] *In practice, observations always have a Pavement Type, even if, in the absence of a paved surface inventory, this is a "default", such as "Bituminous Surface Unknown Construction".*

In many cases the Surface, Construction and Pavement Types of a feature may be the same.

Feature	Surface Type	Construction Type	Pavement Type
Carriageway	Bituminous	Bituminous	Bituminous
		Concrete	Covered Concrete
		Leanmix	Bituminous Surface, Leanmix Construction
		Unknown	Bituminous Surface, Unknown Construction
	Block Paved	Block Paved	Block Paved
	Concrete	Continuously Reinforced Concrete	Continuously Reinforced Concrete
		Reinforced Jointed Concrete	Reinforced Jointed Concrete
		Unknown	Concrete Surface, Unknown Construction
		Unreinforced Jointed Concrete	Unreinforced Jointed Concrete
	Unknown	Unknown	Unknown
Cycle Track	Bituminous	Bituminous	Bituminous
	Block Paved	Block Paved	Block Paved
	Concrete	Concrete	Concrete
	Flagged	Flagged	Flagged
Footway	Bituminous	Bituminous	Bituminous
	Block Paved	Block Paved	Block Paved
	Concrete	Concrete	Concrete
	Flagged	Flagged	Flagged
Kerb	Kerb	Kerb	Kerb
Verge	Bituminous	Bituminous	Bituminous
	Block Paved	Block Paved	Block Paved
	Concrete	Concrete	Concrete
	Flagged	Flagged	Flagged

Table 1.1 Surface, Construction and Pavement Types

The Surface Types are as follows:

Bituminous Carriageways

Carriageways with a bituminous depth greater than 20mm at the surface, including hot rolled asphalt, stone mastic asphalt, dense bitumen macadam and other bituminous materials, including those with a surface dressing, proprietary thin surface, or with anti-skid surfacing applied. Includes flexible composite carriageways ("covered concrete") with a lean-mix concrete sub-base.

Concrete Carriageways

All carriageways with a concrete surface, including continuously reinforced concrete (which will have only occasional joints), and concrete constructed in bays of reinforced or unreinforced concrete. Concrete carriageways that have had a surface dressing or thin bituminous layer (up to 20mm) applied, are also included.

Block Paved Carriageways

All types of carriageways constructed from small element blocks (including concrete, cobbles, granite setts, brick and, exceptionally, wooden blocks).

Unknown Surface Carriageways

Only used for machine surveys.

Kerbs

All kerb types, including concrete, stone and extruded asphalt.

Bituminous Footways, Cycleways and Paved Verges

Includes surface dressed or slurry-sealed features.

Block Paved Footways, Cycleways and Paved Verges

Concrete blocks, brick pavers, granite setts and other small element paving.

Flagged Footways, Cycleways and Paved Verges

Concrete and stone paving flags, including smaller, square modular concrete flags.

Concrete Footways, Cycleways and Paved Verges

Concrete surfaced, with or without joints.

8.0 Network and Location Referencing

A road network comprises a spatially located and uniquely-labelled set of sections of highway, which act as the key for referencing other related data (including inventory and condition). UKPMS network referencing is not prescriptive, the intention being that an existing network referencing system such as those used for CHART or MARCH surveys can be re-used, or that the National Street Gazetteer can form the basis of a section-based network. Minimising the number of networks used within an authority helps promote exchange and integration of road related data.

UKPMS Network Referencing at its simplest requires that the road network is referenced to a list of unique sections, with some means of deriving a direction (even if only in the description). Additionally, UKPMS provides the opportunity to introduce nodes, which unambiguously define direction, and connectivity between section, and optionally, shape points, but the user determines the use of these. On those parts of the network subject to machine surveys nodes must be used to identify the start and end points of the sections from which survey direction can be inferred by the UKPMS system. Refer to Chapter *Network Referencing* in volume 1 of UKPMS user manual.

UKPMS Network referencing is characterised as follows:

1. The road network is divided into sections, each of which is identified uniquely by a label. Sections have a designated start and end to enable specific defects to be located correctly to the left and right hand sides of the road within a section. Start chainage is always zero. As shown in Example 1.1 the sections should run contiguously. This will ensure that vehicle based surveys are carried out easily and minimises any errors in processing. This type of potential difficulty is illustrated in Example 1.2, wherein Section "1" is referenced in the opposite direction to Section "0" and Section "2".

2. Location is referenced differently, depending on survey type. CVI defects are referenced by start and end chainage within section, and DVI defects by sub-section start and end chainages.[6][7]

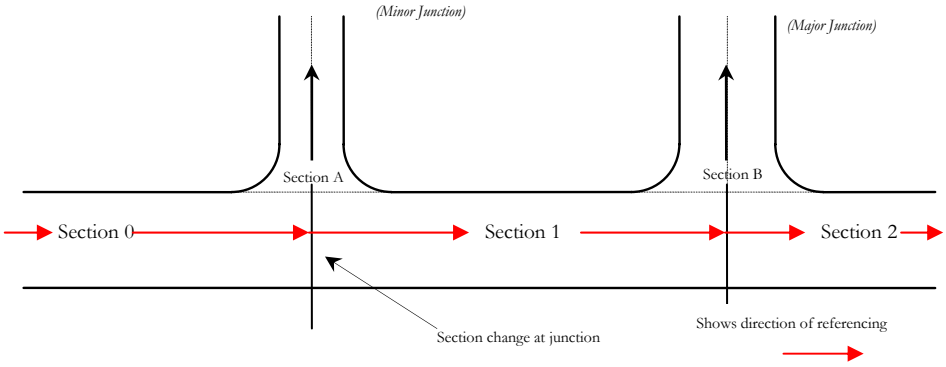
[6] *In practice, the DCD software used for DVI surveys may allow defects to be recorded by actual start and end chainage, the allocation to sub-sections being handled automatically by the software.*
[7] *Note that whilst UKPMS makes use of change based referencing, this is not incompatible with the use of co-ordinate based systems such as GPS and GIS mapping software for data collection, reporting and interaction with the user, provided that the two systems can be co-related.*

3. None of the following characteristics should change within a section (i.e. sections should be homogenous in terms of the following):

   - Carriageway Construction Type[8]
   - Number of "Permanent" Lanes
   - Road Classification
   - Maintenance Hierarchy, unless this is held as an inventory attribute, in which case a "default" value will be held for the section[9]
   - Environment (i.e. whether it is "Urban" or "Rural")
   - Speed Limit[10]

4. For all surveys, each carriageway of a dual carriageway is considered separately, as are roundabouts, which should always be surveyed in a clockwise direction. Refer to Examples 1.3 and 1.4.

Network Referencing Examples

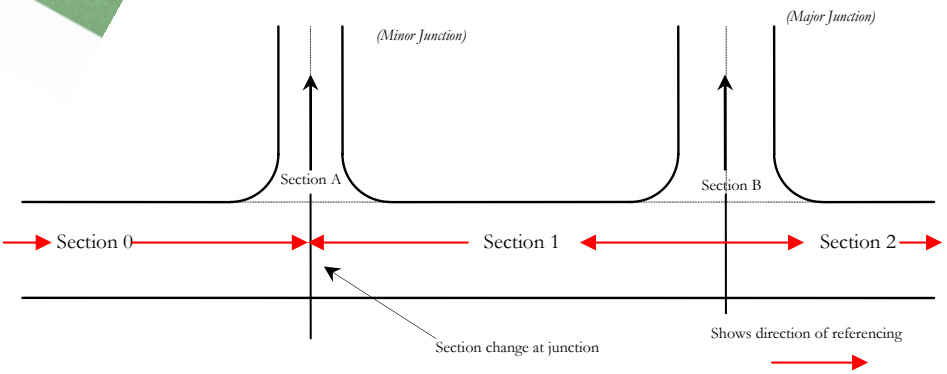


Example 1.1

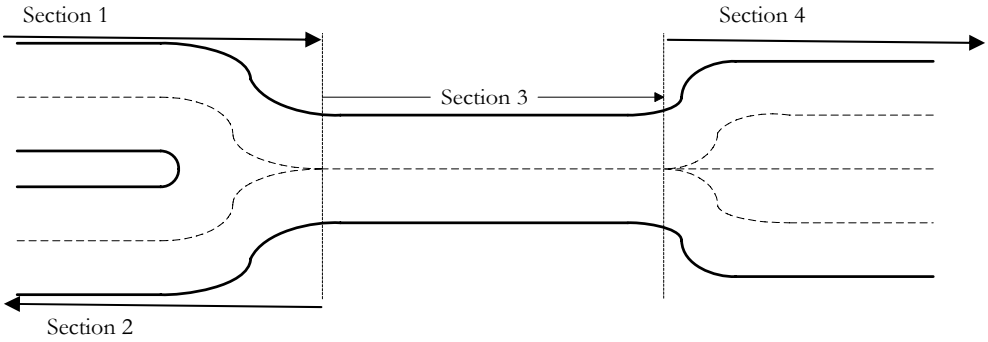
[8] *In some exceptional cases a road section may contain different construction types (e.g.: where a section on a concrete carriageway includes bituminous construction at bridge approaches, or within short housing estate cul-de-sacs).*

[9] *Classification used for the allocation of priorities and for the definition and application of standards for highway maintenance, as recommended and detailed in the Code of Practice for Highway Maintenance Management – Well-maintained Highways (Roads Liaison Group, July 2005).*

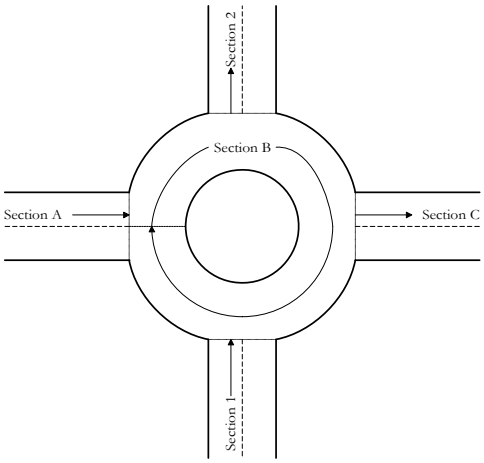
[10] *In principle, "Speed Limit" should not change within a section, since it is used for ranking schemes on the basis of condition. In practice, the current version of the UKPMS default rules and parameters, does not use this facility, so that it may be possible to leave this out - you are advised to check with your UKPMS system supplier before making this decision.*



Example 1.2



Example 1.3



Example 1.4

9.0 Cross Section Positions

In addition to locating defects, inventory items, condition indices and indicative treatments by section and chainage, UKPMS provides a convention to locate items *across* the carriageway, using *Cross Section Positions (XSP's)*. There are two alternative levels of detail for defining the transverse location of a defect:

- Minimal (Simple) Cross-Section Positions
- Full (Detailed) Cross-Section Positions

The level of detail to be used will be predetermined prior to surveying for each section, separately for the carriageway and for the off-carriageway features. Both the minimal and full options are provided to permit the user flexibility in application, according to the available resources, the requirements of a particular road hierarchy and survey type. For example, the minimal method, which allocates information to the carriageway or to the "left" or "right", would be sufficient for a little used street, where treatment of individual lanes is unlikely. The full method must be used where lane-specific machine surveys are carried out, and would be appropriate where treatment of an individual lane is a possibility.[11]

For the minimal method, the transverse location of a defect will be defined broadly by features:

- Carriageway
- Left and Right Kerb
- Left and Right Footway/Cycletrack/Verge.

In the case of Footways and Cycletracks that are not associated with a carriageway, they should be recorded on the Left.

For the full method, the cross-section position is a code representing a physical band across the highway, e.g. a traffic lane, a footway or a verge.

For each section on the UKPMS network, the preferred XSP method that should be used may be recorded, separately for the Carriageway and for the Off-Carriageway Features.
It is recommended that all surveys that are carried out on that section/feature must use the nominated XSP method, with the exception of CVI surveys, which can always be carried out using the minimal method. Refer to Chapter 4 *Cross-section Position Referencing* in Volume 2 of the UKPMS user manual.

[11] *Note that there are proposals to rationalise Cross Section Position referencing within UKPMS and to remove the distinction between full and minimal codes.*

10.0 "Not Assessed" and "Not Defective" Features

UKPMS provides for two "special" observations, for all surface types and features; "Not Assessed" and "Not Defective". "Not Assessed" means that although the recorded feature exists (for the chainage range and cross-section position recorded) it has not been inspected. This could either be planned, for example when a "Partial" survey is being carried out, or unplanned, where for example road works or parked vehicles prevent the survey of a particular feature or section.

"Not Defective" is only recorded for features and cross section positions where there are no "real" defects recorded on a section. "Not Defective" shows that although it has been inspected, it is in an "acceptable" condition. Recording "Not Defective" means that areas that are in good condition are included in reports on the condition of road network, and can be used to "project" future conditions.

'Not Defective' must be explicitly recorded for every feature/XSP which is included in the survey and which has no other defects. Note that the intention is that this should be a single observation for the feature/XSP for the entire section rather than an observation for each individual subsection.

The full recording of 'Not Defective' data (i.e. for each gap between defects) places a considerable overhead on the UKPMS Visual surveys but potentially has two main uses:

- It allows authorities to report on parts of their network that are explicitly free from defects.
- Subject to the configuration of the Rules & Parameters, it allows non-defective lengths to be included in the condition projection process for both the economic prioritisation of treatment lengths, and for projecting future network conditions.

For minimal XSP surveys of footways, cycletracks, paved verges and kerbs, "Not Defective" and/or "Not Assessed" should be recorded separately for each side (i.e. Left and Right) for which the feature exists.

11.0 Relationship of CVI and DVI Defects

The following table shows the relationship between CVI and DVI defects. As mentioned in 1.3 of this chapter DVI surveys can be converted into CVI surveys, therefore there needs to be a comparison between the defects which this table shows.

Feature	Surface Type	DVI Defect	CVI Defect
All	***All***	Not assessed	Not assessed
		Not defective	Not defective
Carriageway	***Bituminous***	WC major cracking	CVI Wearing Course
		WT major cracking	
		Transverse/Reflection cracking – Severity 1	CVI Transverse/Reflection Cracking
		Transverse/Reflection cracking – Severity 2	
		WC minor fretting	CVI Surface deterioration
		WC major chip loss	
		WC major fatting	
		WC minor chip loss	*Not Recorded for CVI*
		WC minor fatting	
		WC minor cracking	
		WC major fretting	CVI Wearing Course
		Severe Local Settlement/Subsidence	CVI Settlement/subsidence
		Moderate Local Settlement/Subsidence	*Not Recorded for CVI*
		Left Recorded Edge deterioration Severity 1	Left Recorded CVI Edge deterioration
		Left Recorded Edge deterioration Severity 2	
		Right Recorded Edge deterioration Severity 1	Right Recorded CVI Edge deterioration
		Right Recorded Edge deterioration Severity 2	
		WT rutting	CVI Rutting
	Block Paved	WT Rutting	CVI Rutting
		Severe Block Deterioration	CVI Block Deterioration
		Moderate Block Deterioration	
		Damaged Blocks	CVI Minor Block Deterioration
		Misaligned Blocks	
		Missing Filler	Not Recorded
	Concrete	Transverse Defective Seal	CVI Transverse Defective Seal
		Longitudinal Defective Seal	CVI Longitudinal Defective Seal
		Major Transverse Joint Spalling	CVI Transverse Joint Defectiveness
		Minor Transverse Joint Spalling	
		Transverse Joint Faulting	
		Transverse Joint Cracking	
		Major Longitudinal Joint Spalling	CVI Longitudinal Joint Defectiveness
		Minor Longitudinal Joint Spalling	
		Longitudinal Joint Faulting	
		Longitudinal Joint Cracking	
		Minor Concrete Surface Deterioration	CVI Concrete Surface Deterioration
		Major Concrete Surface Deterioration	
		Local Settlement	CVI Settlement
		Global Settlement	
		Minor Single Cracking[12]	CVI Concrete Cracking
		Major Single Cracking[13]	
		Multiple Cracking	
		Bituminous Patching	CVI Bituminous Patching
Kerb	***All Materials***	Inadequate Upstand	Inadequate Upstand
		Kerb Disintegration	Kerb Deterioration

[12] *Cracking defects have a "direction" parameter indicating whether they are longitudinal or transverse*
[13] *Cracking defects have a "direction" parameter indicating whether they are longitudinal or transverse*

Feature	Surface Type	DVI Defect	CVI Defect
Footway, Cycletrack and Paved Verge	***Bituminous***	Major Cracking	Major Bituminous Deterioration
		Major Fretting	
		Severe Local Settlement/Subsidence	
		Moderate Local Settlement/Subsidence	
		Spot Defects	
		Longitudinal Trip	
		Minor Cracking	Minor Bituminous Deterioration
		Minor Fretting	
	Concrete	Major Cracking	Major Concrete Deterioration
		Major Scaling/Fretting	
		Severe Local Settlement/Subsidence	
		Moderate Local Settlement/Subsidence	
		Spot Defects	
		Longitudinal Trip	
		Minor Cracking	Minor Concrete Deterioration
		Minor Scaling/Fretting	
	Flagged	Cracked and Depressed Flags	Major Flagged Deterioration
		Depressed Flags (not Cracked)	
		Spot Defects	
		Longitudinal Trip	
		Cracked but Level Flags	Minor Flagged Deterioration
	Block Paved	Cracked and Depressed Blocks	Major Block Deterioration
		Depressed or Missing Blocks	
		Spot Defects	
		Longitudinal Trip	
		Damaged Blocks	Minor Block Deterioration
		Missing Filler	Not Recorded

Table 1.2 Relationship between CVI and DVI Defects

12.0 Surveying Procedures

12.1 Recording defects

Defects must be recorded as stated within this manual or any future advice notes which may be issued from the UKPMS support consultant. Each defect must be recorded accurately, for area and location. If multiple defects exist within the same area, each defect is to be recorded separately. The surveyor MUST NOT record what he/she thinks is the worst defect.

12.2 Auditing

At present there are no national rules for auditing visual survey data, but the new inspector accreditation process defined by the visual survey subgroup, defines a recommended approach for audits. It is important that you take ownership of this data and you consider having your own audit regime, it is recommended that all data has been audited and validated for BVPI's therefore the UKPMS support consultant has issued a "Best practice Guide" for auditing which is on the UKPMS web site. (www.ukpms.com)

12.3 Survey direction

It is important the surveyor records the direction of survey in relation to the direction of the section referencing. If the survey is taking place in the opposite direction to the referencing then the survey MUST be marked as REVERSE.

12.4 Correct inventory

If you have full inventory within your system, the system will look up the inventory table and process the data against this. Therefore it is important that when carrying out a visual survey you record the defects in the correct cross-sectional position.

12.5 Machine surveys

When carrying out machine surveys, your system MUST be set up as having full cross-sectional positions on the carriageway.

13.0 Frequently asked questions

Q1. Can I mix Full and Minimal XSP surveys on the same section?

The Normal XSP Method is set separately for the carriageway and for the off-carriageway features, for each section on the network. All surveys on that section for the carriageway and for the other features should use the set method with one exception - irrespective of the XSP method set. Minimal method CVI surveys can be carried out. For example, if the XSP method for the Carriageway is set as "Detailed" although DVI and Machine surveys must use the Detailed XSP method, you can still carry out Minimal method CVI surveys.[14]

Q2. Can I carry out the surveys using paper forms?

You can not carry out paper surveys if the survey is to be used for the production of BVPI's. It may be viable to carry out very small-scale surveys using paper forms, for audit or training purposes. You must use electronic Data Capture Devices (DCD) together with appropriate accredited software for UKPMS visual surveys. Details of DCD software suppliers are given on the UKPMS web site, www.ukpms.com.

Q3. I have two separate footways on the same side of the section. Do I have to use Full XSP referencing to survey them?

It is recommended that you use full XSP referencing in this situation. But if you wish you can treat one of the footways as a paved verge (verges have the same defects, processing rules and associated standards as footways within UKPMS) then you will be able to identify them separately. However, paved verges are not rated in the same way as footways and you will find that defects recorded on paved verges may not generate works that are rated in the same way as footway defect. Note also that the footway classified as a paved verge will not be used in the calculation of BV187. Using the Minimal XSP method, they will be treated as if they were a single footway, which could lead to confusion or inaccuracy if their condition varies, or if they are of different construction.

Q4. Should cracks that have been sealed be recorded?

Sealed transverse and reflective cracks are not classed as defective within UKPMS. However, Wheel Track Cracking and Whole

[14] *Note that if you wish to process Minimal CVI data and full XSP data from other surveys together, a full XSP inventory must have been collected. Proposals to simplify XSP referencing are likely to change these provisions in the future.*

Carriageway Major Cracking on bituminous surfaced carriageways should still be recorded even if they have been sealed.

Q5. How are edge defects that extend into trafficked areas of the carriageway recorded?

Edge defects should only be recorded in locations where there is no kerb, channel blocks or other edge restraint. For cracking, fretting or deformation to be classified as edge deterioration, it must extend to the edge of the carriageway. If it extends beyond ½ metre (500mm) from the edge of the carriageway it is also recorded as the appropriate defect, such as cracking, fretting or deformation.

If cracking, fretting or deformation occurs within ½ metre of the edge of the carriageway, *but does not extend to the edge of the carriageway*, it is not recorded as edge deterioration, but only as the appropriate carriageway defect.

In Figure 1.4(a), which shows four areas of major fretting, A and B are recorded as edge deterioration, but C and D are not, since although they are wholly or partly within the ½ metre edge strip, they do not extend to the edge. In this case, C and D plus that part of A that extends outside of the ½ metre edge strip is also recorded as the appropriate carriageway fretting defect.

In Figure 1.4(b), which shows four areas of major fretting, although they are wholly or partly within the ½ metre edge strip, the carriageway has an edge restraint and therefore edge deterioration should not be recorded but should be recorded as the appropriate carriageway fretting defect.

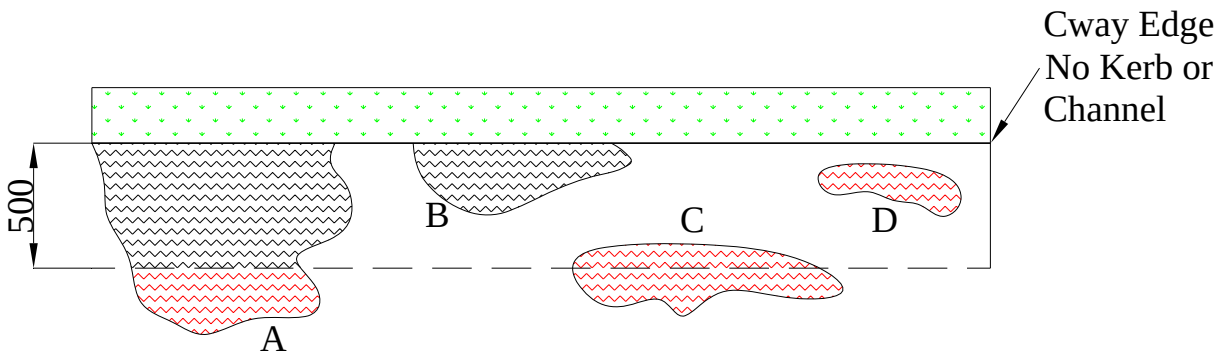
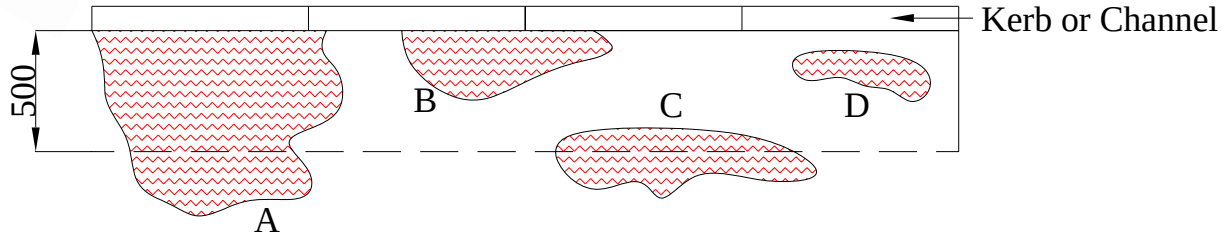


Figure 1.4(a) - Edge Defects



To be recorded as whole carriageway defect i.e. cracking, fretting etc.

Figure 1.4(b) - Edge Defects

Q6. What are "Lane Length" defects?

For both DVI and CVI surveys there are a number of defects where the lane length of the defect is required. For CVI surveys these defects (CVI Wheel Track Cracking) are recorded according to the number of lanes affected. For DVI surveys the "lane length affected" in linear metres is recorded for Wheel Track Cracking. For the defect to be present, there merely has to be some wheel track cracking in either or both of the wheel tracks. The total possible length within a sub-section will depend upon the cross-section position referencing method being used; using the Full XSP method the total possible lane length is the length of the sub section, whereas using the minimal XSP method, the total possible lane length is the length of the sub-section multiplied by the number of lanes present on the carriageway at that point.

As an example, in Figure 1.5 the length between 0 to 40 on the left hand lane, and between 80 and 100 both lanes are affected by wheel track cracking. Using the minimal XSP method with 20m sub-sections, the maximum length that can be recorded for each sub-section is 40m (i.e. sub-section length x no. of lanes). 20m of wheel track cracking is recorded for each of the first 2 sub-sections, and 40m is recorded for the final sub-section. Remember that the *Area* of the cracking is also recorded as Whole Carriageway Major cracking in DVI surveys.

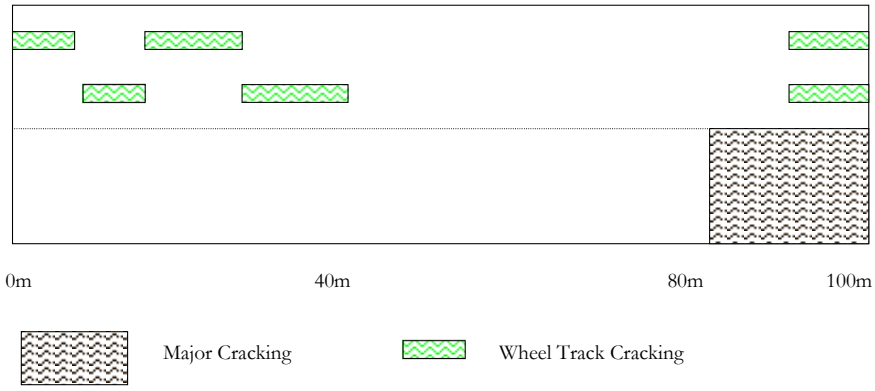


Figure 1.5 - Lane Length Defects

Q7. Can video techniques be used for recording UKPMS visual survey data?

You can not carry out video surveys if the survey is to be used for the production of BVPI's. A number of authorities have experimented with using digital video surveys to carry out CVI surveys, transcribing the data manually from the video after the survey, as if carrying out a "virtual" CVI. In principal, this approach is acceptable if:

- The same level of detail is achieved as from a driven survey (image resolution, no. of cameras and frequency of image capture being the determining factors), and
- The standard CVI procedure is adopted when transcribing the observations from the video.

Indeed, provided that equivalent accuracy is achieved, this approach has the advantage of being more auditable and less dependent upon weather conditions. The video survey can also be used for other applications, such as inventory. It is recommended that if this approach is adopted, it is trialled on a small sample so that its accuracy can be determined before data on the whole network is extracted. This approach is not recommended if you carry out DVI surveys.

Q8. Can UKPMS visual surveys be carried out at the same time as other surveys? (Safety, Streetworks etc.)

This approach is not generally recommended. The intention of condition assessment surveys such as CVI and DVI is to assess overall condition and need for treatment, whereas safety, defect and trench surveys focus on individual defects and issues together with localised remedial works. The risk of combining surveys is that defects may be missed, with the surveyor concentrating on too many separate items. Moreover, UKPMS surveys require the surveyor to be able to record accurately and methodically according to the definitions within this manual, but do not require the additional skills and knowledge of materials and maintenance techniques required to undertake defect surveys or surveys of streetworks and reinstatements.

Q9. Can short lengths or small areas of defects be ignored?

All defects that are defined in this manual should be observed and recorded (where present) because UKPMS surveys are used to determine the condition of the whole network, and are "projected" to assess future condition and need for treatment and funding. Even seemingly insignificant defects that would not be treated should be included.

Q10. Do I have to inspect the whole section when I carry out a CVI or DVI?

No. Partial surveys are permitted for UKPMS surveys. You will, however need to start chainage recording at the start of the section to determine the chainage at which the survey starts. You will also have to record "Not Assessed" for the chainage lengths where the survey is <u>not</u> being carried out. Refer to Figure 1.6.

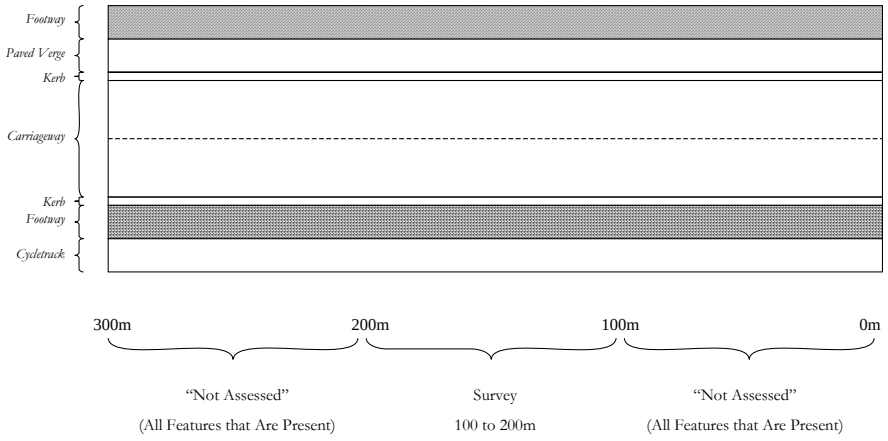


Figure 1.6 - Partial Surveys by Chainage

Q11. Do I have to inspect all paved features when I carry out a CVI or DVI?

No. Partial surveys by feature are permitted. You will need to record "Not Assessed" for the whole section for those features that exist on the section but which are not being inspected. Refer to Figure 1.7.

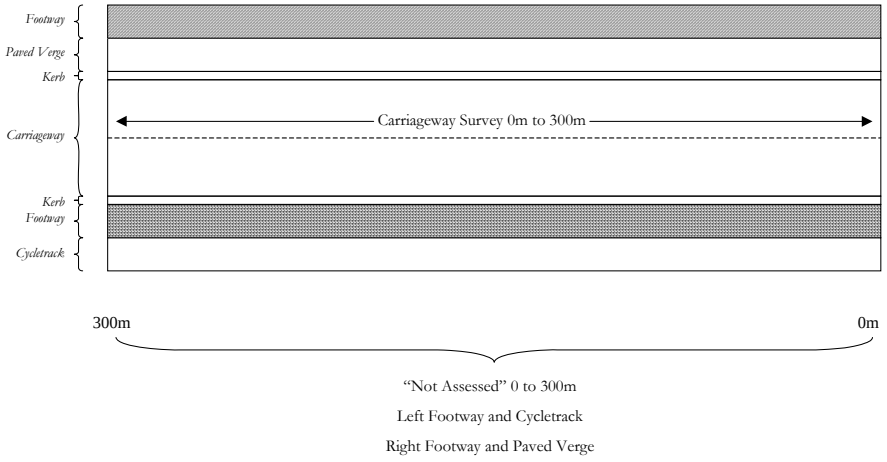


Figure 1.7 - Partial Surveys by Feature

Q12. Why are sections that are clearly not in need of treatment inspected?

UKPMS surveys are used to assess the condition of the whole of an authority's network, and are projected forward to assess future condition and need for treatment. It is important that even sections with little or no deterioration are included to ensure a complete, accurate assessment.

Q13. How is a "polished" carriageway surface recorded?

For CVI surveys, a severely polished surface, with minimal texture similar to that occurring where there is major "fatting up" of bituminous binder is recorded as "CVI Surface Deterioration" for bituminous carriageways and as "CVI Concrete Surface Deterioration" for concrete carriageways. For DVI surveys, polishing is recorded on bituminous surfaced carriageways either as Minor Fatting, where there is some surface texture remaining, or as Major Fatting, where there is no surface texture. Polished concrete carriageways are recorded using the "Loss of Texture" defect on DVI Surveys.

Q14. Are channel blocks inspected?

Channel blocks are inspected as kerbs, except that "Inadequate Upstand" is only recorded if they are sunken below the level of the carriageway.

Q15. Are dropped kerbs for vehicle access assessed for "inadequate upstand"?

Dropped kerbs are only recorded as having "Inadequate Upstand" if they are flush with or lower than the carriageway surface.

Q16. Can footpaths and cyclepaths that are "remote" (i.e. not associated with a carriageway) be inspected?

Yes. These are normally referenced as separate sections and only have defects recorded for the footway or cycleway. There is a "special" road hierarchy in UKPMS of "9" ("No Carriageway") for such sections.

Q17. How are patches and public utility reinstatements assessed?

Patches and public utility reinstatements are inspected as an integral part of the carriageway or footway. Defects contained in patches and reinstatements are recorded accordingly. Where UKPMS surveys differ from some other survey types (e.g. CHART) is that non-defective patches and reinstatements are not recorded as defects.

Q18. Where there is a central reserve between two sections of a dual carriageway, how is it assessed?

UKPMS uses the convention of identifying one of the two opposite sections as the "nominated" section to which the "shared" features are referenced. You should make sure you check which sections are the nominated sections before embarking upon a UKPMS survey of a dual carriageway.

Q19. Can I define my own UKPMS Surveys?

UKPMS allows users to define their own custom survey types and defects, and to define associated rules for rating, selecting and prioritising treatments, and for assessing need and likely future conditions and performance. Since the definition of custom rules can prove complex and onerous, most users are likely to make use of the standard "default" set of surveys and rules (at least until they have gained experience in the use of UKPMS). Moreover, if surveys are being carried out to support the production of performance indicators, used to make comparisons between different authorities on a consistent basis, then you will have to make use of the standard surveys and associated rules.

If you do wish to define custom surveys, defects and rules then it is suggested that you do so by adding local defects to the standard survey, in order that you will still be able to produce the performance indicators and other standard outputs. Alternatively, a new survey can be created by incrementally changing the default surveys and rules, rather than starting from scratch. Advice should be sought from the UKPMS support consultant if in any doubt.

Q20. What is the logic behind the defect codes?

For off-carriageway defects, there are three components to the defect codes. The first letter of the code denotes the Feature (**F**ootway, c**Y**cleway, **V**erge). The second letter denotes the Surface Type (bloc**K**, **C**oncrete, **F**lag, and **B**ituminous). The third letter denotes the severity of the defect (**M**ajor, mi**N**or), and the final letter denotes the particular defect. For example, VFMD is the code for "Major Flagged Deterioration" on a flag paved verge.

For carriageways, the first letter denotes the surface type (Bloc**K** Paved, **C**oncrete, **B**ituminous), with the remaining letters identifying the defect. Where there are major and minor versions of the defect, the final letter denotes this (**M**ajor, mi**N**or) and where there are two severities this is identified by the last character (**1** or **2**). For example, BTC2 is the code for "Transverse/Reflection Cracking – Severity Level 2" on a bituminous surfaced carriageway.

Q21. How are footway crossings inspected?

It is recommended that footway crossings (vehicle accesses over the footway or cycleway, often of a different surface type to the footway) are inspected as part of the footway. Footway crossings may be inspected as short lengths of paved verge but see the answer to Q3 above.

Q22. I already have an Inventory collected using RMMS Cross-Section Positions. Can this be used for UKPMS?

The XSP codes used for RMMS and for UKPMS are different, and the RMMS codes cannot be converted to the UKPMS codes with complete accuracy. If you are prepared to undertake some manual updating, it may be possible to carry out the conversion to an acceptable level of accuracy, particularly on parts of the network with simple configuration of lanes and features. Conversion from RMMS XSP to Simple UKPMS XSP's is more reliable than conversion to the Full XSP's.

Although procedures and programs can be written for converting RMMS inventory data to UKPMS cross-sectional positions, a number of anomalies exist which can only be resolved by user intervention. Some of the issues involved are:

- The RMMS carriageway inventory item does not include lane referencing. However, each section is designated as having a number of lanes and also whether it is a single or dual carriageway. An initial estimate could therefore be made for UKPMS lane referencing. The conversion could not take account of one-way streets (which are not differentiated from two-way single carriageways in RMMS) or additional lanes (which are not recorded in RMMS). Changes due to additional lanes (e.g. crawler lanes) should, however, be identified in the network data as they would necessitate a new CHART section because of the change in road type (e.g. from single two-lane to single three-lane).

- RMMS has only three off-carriageway cross-sectional positions for each side; Inner Verge, Footway and Outer Verge. Interrogation of the footway and verge inventory itself could make conversion reasonably accurate in the situation where there are actually no more than two verges separated by a single footway.

- RMMS uses a left-hand rule for items on the margin of two cross-sectional positions, whereas UKPMS assigns

such items to the outer cross-sectional position. RMMS also refers to the theoretical cross-sectional positions which may not actually exist. Conversion of such items will depend upon the number of lanes, type of carriageway and actual existence of footways and verges. Initial rules for each situation can be defined. It will not, however, be possible to accommodate RMMS cross-sectional positions Q, W, E, R, T and Y which have no indication of their physical location with respect to the other cross-sectional positions. These features of the RMMS method also cause problems with reversing the direction of data.

The relationship between RMMS and UKPMS cross-sectional positions is shown in Tables 1.3 and 1.4 for single carriageways and dual carriageways respectively.

RMMS XSP Description	RMMS XSP	UKPMS Full XSP	UKPMS Simple XSP
Left Outer Verge	1	L3	L
Left Footway	2	L2	
Left Inner Verge	3	L1	
Left Kerb		LE	
Left Turning/Acceleration Lane	W	-L1	
Left Lane 1	4	CL1	C
Right Lane 1	5	CR1	
Right Turning/Acceleration Lane	E	-R1	R
Right Kerb		RE	
Right Inner Verge	8	R1	
Right Footway	9	R2	
Right Outer Verge	0	R3	

Table 1.3 Single Carriageway

RMMS XSP Description	RMMS XSP	UKPMS Full XSP	UKPMS Simple XSP
Left Outer Verge	1	L3	L
Left Footway	2	L2	
Left Inner Verge	3	L1	
Left Kerb		LE	
Left Turning/Acceleration Lane	W	-L1	
Left Lane 1	4	CL1	C
Left Lane 2	5	CL2	
Left Lane 3	6	CL3	
Right Turning/Acceleration Lane	E	+L1	R
Right Kerb		RE	
Central Reserve[15]	8	R1	

Table 1.4 Dual Carriageway

[15] *On the "nominated" section*

Q23. How are grassed verges inspected?

The UKPMS system can only address paved areas; therefore grassed verges cannot be assessed, and are only collected with inventory collection for information purposes only.

Q24. Do I record "Not Defective" on a road section for all XSP's?

You should record "Not Defective" for the whole section for all the XSP's which are surveyed but have no defects recorded against it.

Figure 1.8a shows a section which has been surveyed using full XSP. "Not Defective" does not need to be recorded for CR1, because there are defects present, but should be recorded for CL1 as there are no defects present.

Figure 1.8b shows a section which has been surveyed using simple XSP. "Not Defective" does not need to be recorded for C, because there are defects present.

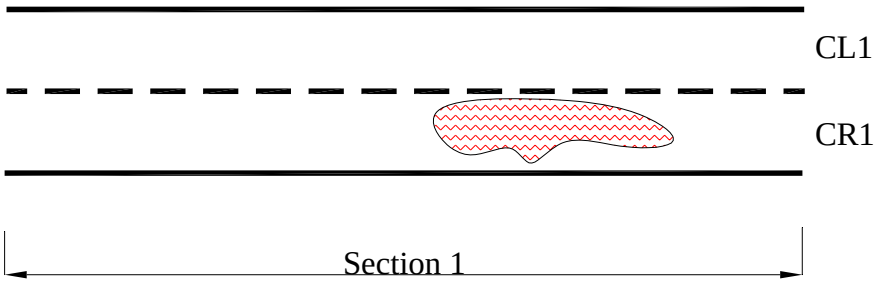


Figure 1.8a – Not Defective

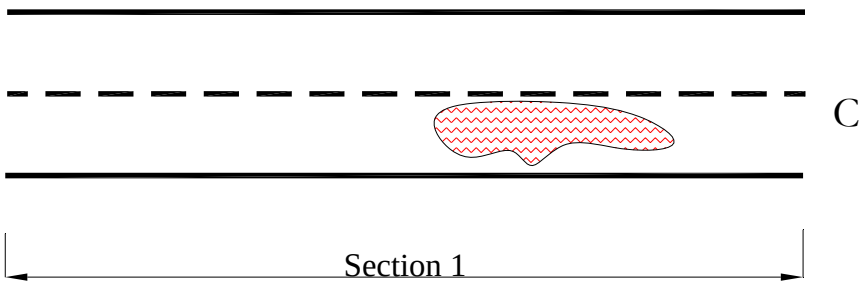


Figure 1.8b – Not Defective