

Technical Note 11 - Requirements for UKPMS Item Inventory

Distribution:

- Developers
- UKPMS Rules & Parameters Consultation Group
- UKPMS Internet Site

1. Introduction

This technical note describes the role, implications and requirements for UKPMS Item Inventory for the Comparability Test, and provides guidance for users establishing an Item Inventory in preparation for a first implementation of UKPMS. It is emphasised that, unlike previous Technical Notes, its proposed circulation is extended to the user community. Indeed, users are encouraged to copy and distribute copies of the document to colleagues and fellow professionals.

2. Business Background

A recent initiative has started the process of defining a set of Rules and Parameters that can serve as the basis for the first operational versions of UKPMS. This exercise will also result in associated guidance to users and on the operation and configuration of the system.

The first Consultation Meeting, held in July 97, identified Item Inventory as an area where guidance for Users and developers is required as a matter of urgency. Particular areas of concern are that:

- Ideally, the envisaged user community needs to be considering decisions about Item Inventory **now**. There is a corresponding urgent need for guidance and explanation.
- The current scope and implications of Item Inventory in UKPMS have evolved dynamically during the current project and no longer coincide with the Stage 2 documentation. Thus, for example, the 'Minimum Item Inventory' defined in Appendix C of the Engineering Document, Volume 1 is no longer applicable.
- Further clarification of the role of Item Inventory is likely to be helpful to the Developer community.

3. General Principles

Item Inventory is currently used in UKPMS for the following purposes¹:

- 3.1 To 'refine' the Pavement Type that is associated with a Defect recorded in a Condition Survey. For example, the Defect

'WT major cracking' 'Bituminous Surface, Unknown Construction' 'Carriageway'

Might be transformed using inventory information into

'WT major cracking' 'Covered Concrete' 'Carriageway'

- 3.2 For Defects recorded in DVI's (Detailed Visual Inspections), to calculate the Defectiveness of the observed Defect and hence assign a Rating value to the Defect. For example, the extent of the Defect

BCRJ (Major Cracking on a Bituminous Surfaced Carriageway)

Might be recorded as 80 square metres over a chainage interval of 20 metres. The corresponding lane area, derived from the inventory, might be 200 square metres thus giving a Defectiveness of 40% (i.e. 80/200).

- 3.3 To calculate the estimated works costs of the treatments generated by the Treatment Selection process. Linear extents or areas of Features are calculated and combined with unit cost rates.

In cases 3.2 and 3.3 the user may opt to use 'Default' Inventory, as described in paragraph 4, below. Alternatively, the user may choose to refine the UKPMS results by collecting and maintaining an explicit Item Inventory, as described in paragraph 4. It may also be that such an Item Inventory, perhaps collected for routine maintenance or asset management purposes, already exists, and it would clearly be advantageous to make use of it for UKPMS purposes.

The exception to the above is the Concrete Joint Inventory described in paragraph 5, below. Users wishing to process Concrete Joint Defects for a DVI survey must have a corresponding Concrete Joint Inventory. There are no defaults.

Note that the UKPMS Inconsistency Report allows users to highlight discrepancies between data collected in Condition Surveys and the Item Inventory, but that there is no enforcement of correspondence between condition data and inventory data at a chainage and cross section position level.

¹ The list above is applicable to Tranches 1 and 2 of UKPMS. Currently the Consultant does not think there are any Tranche 3 implications, but only detailed investigation, scheduled after the release of this note, will be able to confirm this.

4. Default Inventory

'Default' Inventory allows users to define default feature widths where Item Inventory is not recorded. The description that follows has evolved from the Codes and Parameters consultation project and is an extension of the functionality described by the UKPMS Logical Design. More technical detail about this topic will be given in Technical Note 17.

Each Section has a Road Type. It is a mandatory attribute. Examples of possible Road Types are:

Wide Dual 3-Lane
Dual 2-Lane
Single 2-Lane
Roundabout (2 Lane)

A recommended set of Default Road types will be published later.

Each Section also has a Road Hierarchy. It is a mandatory attribute. The currently defined Road Hierarchies are:

Strategic Routes
Main Distributor
Secondary Distributor
Local Roads
Local Access Roads
Rural Unclassified
No Carriageway

Default widths are a function of Feature, Road Type and Road Hierarchy. These widths can be used in the calculations corresponding to 3.1 to 3.3 above.

When an area of Feature is required, the default width is used when **no** explicit Item Inventory exists, for an XSP, between the start and end chainage of the Feature being considered. The inventory width is assumed to apply over the complete chainage interval.

Recommended defaults values for widths and numbers of lanes will be will be published later.

It should be noted that UKPMS does not support the concept of default inventory Construction Type (see also paragraph 5. below).

5. Paved Surface Inventory

The following Features

Carriageways
Cycletracks
Footways
Verges
Kerbs

Comprise the Paved Surface inventory. The geometry of Kerb is defined by start and end chainage only. For other items widths are also recorded.

If a Paved Surface inventory is recorded, the minimum attributes to be maintained for a Section, Feature and XSP are:

Start Chainage
End Chainage
Start Width (not for Kerbs)
End Width (not for Kerbs)
Hierarchy (not for Carriageways)²

That is, aside from kerbs, the geometry of the paved surfaces is modelled as a series of trapezoidal facets. Users wishing to use the rectangular facet approach adopted by, for example, RMMS could set the End Width equal to the Start Width.

This minimal set of data, does not support the refining of Defects based upon Construction Type described in 3.1 above, and which allows - for the Defects and Construction Types currently set up for UKPMS - the user to distinguish between, and to separately consider, Covered Concrete and fully flexible Bituminous surface types. In order to do so users must maintain

Construction Type

as well. The ability to maintain Construction Type as an attribute of an inventory item is mandatory for UKPMS Comparability, as is the ability to transform Defects based upon those defects.

In practical terms, it is unlikely that a user will have comprehensive information on construction types in an initial implementation of UKPMS. The intention is that such information would build up over time as and when new works are carried out, or be determined from coring and investigation works. Given that Construction Type represents the 'invisible' properties of a pavement, it is far more likely that the 'visible' Surface Type - which plays no algorithmic role in UKPMS - will be available as an attribute of an inventory item,

² For Carriageways, Hierarchy is defined by a Section attribute.

particularly where an existing inventory is being utilised for an initial implementation. In practice, Surface Type will be same as Construction Type, in all instances except for bituminous surfaced carriageways. For these, users will either have to make an initial assessment of construction based upon local knowledge, site inspections or historic records, or assume flexible or rigid construction at a network or sub-network level, according to the locally prevalent construction type. Setting the rule data for 'unknown' Construction to be the same as flexible or covered concrete construction as appropriate, will have the same effect. Note that for the rule data supplied for the comparability tests, this approach has been taken, with flexible construction rules taken as the default where construction is unknown.

Recommended values for Construction Type and Surface Type will be will be published later.

6. Concrete Joint Inventory

As previously stated, if the user wishes to process Concrete Joint Defects then a corresponding Concrete Joint Inventory has to be maintained. Longitudinal and lateral joints are addressed separately. The minimum attributes to be maintained for a Section, Feature and XSP are:

Longitudinal Concrete Joint

Start Chainage
End Chainage
Number of Joints

Lateral Concrete Joint

Chainage
Lateral Extent

7. Minimum Inventory Items

The following table summarises the UKPMS Item Inventory defined in paragraphs 4. and 5. They are applicable to a Section, Feature and XSP.

Feature	Attributes
Carriageways Cycletracks Footways Verges	Start Chainage
	End Chainage
	Start Width
	End Width
	Hierarchy (not for Carriageways)
	Construction Type
	Surface Type (for information)
Longitudinal Concrete Joint	Start Chainage
	End Chainage
	Number of Joints
Lateral Concrete Joint	Chainage
	Lateral Extent
Kerb	Start Chainage
	End Chainage
	Surface Type (for information)

Table 1. UKPMS Inventory

8. Other Inventory

The Stage 2 Logical Design for UKPMS included complex, sophisticated facilities for building up estimates of works costs which take account not only of inventory of the type described above, but also other features such as crossovers, ironwork and the like. This functionality is particularly applicable to the Interactive Pass described in the Stage 2 documentation.

The current project has scoped a core sub-set of Stage 2 functionality. Among other things, that sub-set does not address the Interactive Pass and radically simplifies Estimating. As a result, no other Item Inventory, other than that described in the paragraphs above, plays an active algorithmic role in the currently scoped UKPMS.

However, the Tranche 1 tests (which address Network Referencing and Item Inventory) do require Developers to provide at least rudimentary facilities for handling more general inventories. This functionality is required in order to allow, in principle, UKPMS to become a fundamental building block in a maintenance organisation's wider IS initiatives and to facilitate basic compatibility with possible future developments relating to the Interactive Pass. It may also provide for developers adding value to their systems through the provision of more sophisticated estimating and/or scheme building facilities, over and above the minimum requirements for UKPMS comparability.

Developers should note the current intention that only the inventory capabilities described in preceding paragraphs of this Note will play a role in Tranche 2 and Tranche 3 testing.

9. Cross Section Position Granularity

Both Item Inventory and Condition Data may be collected on a per section basis, using either 'minimal' (a.k.a. 'simple') or 'full' XSP's. The former merely indicates if a Feature or Defect is on the Carriageway, to its left, or to its right. For both the left and right hand sides of the highway, the latter model references individual lane positions and provides for multiple off-Carriageway Features such as more than one Footway.

UKPMS allows for the processing of 'mixed' XSP's. That is, full XSP Item Inventory along with minimal XSP Condition data and vice versa.

It should be noted that RMMS XSP coding is not recommended for UKPMS, and that although RMMS inventory can be converted for UKPMS, some XSPs will be incorrectly converted. It is suggested that if an authority is collecting an inventory to support both UKPMS and RMMS-type use, that either BOTH sets of XSP codes be recorded, or that the UKPMS convention is adopted, which CAN be reliably converted to RMMS coding.

10. Conclusions and Recommendations

Any organisation contemplating the use of UKPMS or, indeed, any highways management system, should be considering three interacting topics early in their deliberations:

- How they will reference their Networks.
- The extent and accuracy of the Item Inventory they wish to establish.
- The scope and composition of their Condition Survey regime.

UKPMS is not prescriptive about any them and allows considerable flexibility in order that an organisation may use the system in a way that best matches its particular requirements, capabilities and resources.

However some general recommendations and options are possible concerning Item Inventory:

- 10.1 Do not necessarily be put off from carrying out UKPMS Condition Surveys because you do not immediately have the time and/or resources to establish an Item Inventory. If you have to choose one or the other, choose the Condition Surveys and their consequent benefits. Processing relating to Condition Surveys can use a simple Default Inventory and later, if required, can be re-processed when an Item Inventory has been established.

- 10.2 Moreover, rating of CVI surveys, and of SCRIM, Deflectograph and HRM does not require an item inventory, so that provided the necessarily coarse cost estimates derived from default inventory are sufficient, item inventory may well not be required on the parts of the network where DVI surveys are not carried out.
- 10.3 It may also be an option, for authorities choosing to carry out limited DVI surveys targeted at specific locations identified by coarse surveys, to collect inventory on an ad-hoc basis, as and when required to support DVI surveys.
- 10.4 However, it is generally considered good practice for an appropriate Item Inventory to be collected as the foundation for a highway management system. In the absence of other constraints collect a UKPMS Item Inventory is consistent with this principle.
- 10.5 A 'mixed' approach may well be beneficial in the derivation of an Inventory strategy that best suits a user's priorities, capabilities and resources. A number of possible options would be:
- Collect Item Inventory for Carriageways and use defaults for other Features.
 - Collect full XSP inventory on strategic parts of the network, where lane-specific treatments may be carried out, and minimal XSP inventory on other parts of the network.
 - Integrate the collection of minimal inventory data with visual condition surveys.
- 10.6 If you intend to phase the establishment of Item Inventory, the following precedence may be helpful:
- Establish in Hierarchical Order - A Roads before B Roads and so on.
 - Establish Carriageway before non-Carriageway items.
- 10.7 The trapezoidal area approach (that is, start and end widths as introduced in paragraph 4.) may simplify inventory data collection and may result in more accurate assessments. It certainly results in a more accurate model of the geometry of pavement features.
- 10.8 Think carefully about the implications of Concrete Joint Inventory. Although onerous to collect, it may well bring about real benefits in the management of concrete carriageways, particularly in the ability to target individual concrete bays.