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Ref	NR/SP/SIG/02026
Issue	I
Date	June 2005

Provision and Management of TASS Infrastructure Data (formerly RT/E/S/02026)

This temporary front sheet facilitates change to the new Network Rail Standards referencing nomenclature.

The Ref above will be formally allocated to this standard when it is next changed in the meantime the contents, date and issue number of this Network Rail Standard are **UNCHANGED and with immediate effect it should be referred to as “(new ref) formerly (old ref)”.**

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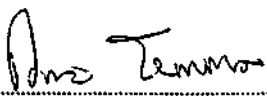
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Company Specification

Requirements for the Provision and Management of TASS Infrastructure Data

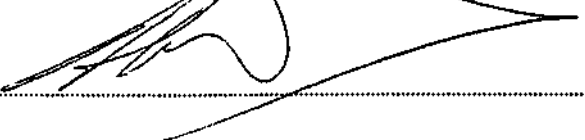
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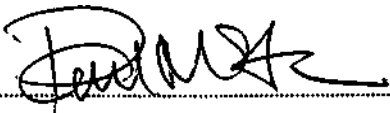
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Ref:	RT/E/S/02026
Issue:	I
Date:	June 2005

Issue record

Issue	Date	Comments
I	June 2005	New Specification

Implementation

The requirements of this specification shall apply to all Tilt Authorisation and Speed Supervision (TASS) track-based sub-system design for use on Network Rail controlled infrastructure.

Compliance

The requirements of this specification are mandatory and shall apply to Network Rail, their contractors and any other parties involved with the provision of design for TASS track-based sub-system equipment on Network Rail controlled infrastructure on or after 4th June 2005.

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I Purpose

The Tilt Authorisation and Speed Supervision (TASS) system is installed on Network Rail infrastructure.

TASS balises contain specific, location dependant data telegrams for use by passing trains. The telegram content, and the determination of balise position, relies on the provision of accurate data describing key attributes of the infrastructure.

This Specification gives information to those engaged in preparing, maintaining and managing TASS infrastructure data. The details provided set out the method by which TASS infrastructure data needs to be structured in order to meet the requirements of RT/E/S/02023. TASS system requirements are detailed in the three documents referenced in section 3.

The details in this document are specific to the infrastructure data requirements for the ALSTOM Transportation Information Solutions TASS design process.

2 Scope

This Specification applies to all those undertaking activities which may affect the content, accuracy, integrity, provision and use of TASS infrastructure data.

3 Reference documentation

RT/E/C/02022	Requirements for TASS Infrastructure – System Description
RT/E/S/02023	Requirements for TASS Infrastructure – System Design
RT/E/S/02024	Requirements for TASS Infrastructure – Installation, Test and Maintenance

4 Definitions

Absolute Mileage

The distance in miles and yards of a feature measured from a defined datum point. A Milepost table and its related Route Workbooks must only have a single datum point.

Accuracy

The degree of variance from an exact value that can be tolerated.

Balise

A track mounted spot transmission unit that uses magnetic transponder technology. Its function is to transmit/receive telegrams to/from the train passing overhead. A TASS balise is passive with no interface to a Lineside Electronic Unit (LEU) and will therefore only transmit the fixed telegram stored in its memory. This data can only be changed by reconfiguration. The balise is fixed to the track using a mounting bracket (the whole item being known as a TASS balise assembly).

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Cant Deficiency (CD)

Cant is the cross level angle of track on a curve, used to compensate for lateral forces generated by a train passing through the curve. Cant deficiency is the difference between the applied cant on the track and the equilibrium cant for the vehicle at the particular stated speed.

Diverging Route

This is an alternative line which may be used by a TASS enabled train, e.g. in large stations, where a track diverges from the main route and then returns to that main route.

Engineers Line Reference (ELR)

A unique Network Rail reference for a particular section of track.

Enhanced Permissible Speed (EPS)

The permitted speed (higher than the Permissible Speed) over a section of line which applies to a specific type of tilting train.

Gradient

The actual gradient of the track or, for gradient changes of less than 200 yards, the average over the distance. Gradients are signed (+ve rising or -ve falling) when standing with back to zero or lowest absolute mileage irrespective of direction of travel.

High Cant Deficiency (HCD)

A Cant Deficiency greater than 150mm (see Cant Deficiency above).

Mileage

The distance along the track from a defined datum.

Permissible Speed (PS)

The maximum permitted speed over a section of line which applies to all trains when not operating at an Enhanced Permissible Speed.

Supervised Speed (SS)

The speed value transmitted to a train at any one time which is the higher of either the PS or the EPS for the appropriate train.

Precision

The smallest incremental value for data presentation.

TASS

Tilt Authorisation and Speed Supervision system (ALSTOM's tilt management solution). The infrastructure portion of this system authorises tilting trains to tilt when they are within a tilt permitted area and removes this authority as the train leaves the tilt permitted area. The system similarly supervises speed by providing information on the maximum speed permissible over a section of line. This information is transmitted as a data message to trainborne computers as the train passes over a TASS balise in the track.

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TASS Designer

The TASS Designer (currently ALSTOM) is the group responsible for designing the locations of TASS balises and for providing pre-programmed TASS balises.

Track ID

The identity of the track that is equivalent to the GEOGIS Track Code.

Train Protection Warning System (TPWS)

A system in use on Network Rail lines to provide protection against signals being passed at danger and overspeed protection at certain speed restrictions.

Zone

Comprises of a start and end mileage with a single value describing an entity within these limits. A change in value of the entity requires a new zone to be defined.

5 General Requirements

5.1 Overview

5.1.1

The TASS system design requires infrastructure data to be provided in a set format. This data shall be produced using a documented process which includes appropriate integrity checks and configuration controls, as detailed in this document.

5.1.2

The TASS designer requires the latest (updated) infrastructure data set in order to progress a new or modified design. The content, format and accuracy requirements for this data are as stated in this document. This helps support the agreed validation processes. Data for the TASS designer shall be approved by Network Rail as a correct representation of the railway at the time of commissioning.

6 TASS Infrastructure Data Sources

6.1 Information Provision

6.1.1

Network Rail is responsible for requesting suitable vehicle gauging data from the train operators using the TASS system in order to establish the rolling stock tilt and speed capabilities (and therefore enable the enhanced permissible speed and tilt zones to be proposed on any required route). Traction and braking characteristics are also required.

6.1.2

Network Rail is responsible for the current layout diagram and current data for relevant infrastructure features. The total infrastructure data requirement may have to be obtained from a number of different sources. Data sources, their version and issue date shall be recorded for each set of infrastructure data produced. Where an existing TASS design requires revision, the master records held by Network Rail National Records Group (NRG) shall be considered as a starting point. The user shall decide if data sources are sufficient to meet stated accuracy requirements.

6.1.3

Appropriate Network Rail infrastructure data sources are anticipated to be:-

- Sectional Appendices.
- TASS Route Diagrams (indicating extent of TASS fitted lines).
- Milepost position information.
- Gauge Clearance information (tilt authorisation and prohibit areas defined).
- Line speed signing design (speed values and speed sign locations).
- Signalling Plans (including TPWS loop locations).
- High Cant Deficiency zone information.
- 5 Mile Plans.
- Geogis.
- GATES.
- OMNICOM.

7 TASS Infrastructure Data Content

7.1 Infrastructure Features

7.1.1

The infrastructure data for TASS use is maintained in Excel format with a Workbook for each defined route section, separate Worksheets for each infrastructure item and a separate Workbook for mileposts. Network Rail will define the extent of each applicable route section and allocate a unique reference to each in agreement with the TASS Designer.

7.1.2

The TASS balise position and telegram design processes require the following data on infrastructure features in order to be able to proceed:-

- Bi-directional track zones.
- High cant deficiency zones (per applicable train type).
- Permissible speed (PS) and Enhanced Permissible speed (EPS) zones (per applicable train type).
- Gradient zones.
- Non-preferred balise zones.
- Switch and crossing zones.
- Positioning of lineside speed boards (warning and commencement).
- Tilt authority / prohibited zones (per applicable train type).
- Locations where TPWS temporary isolation is required and adjacent TPWS locations.
- Milepost location information.

7.1.3

Infrastructure features are either defined as a zone with a start and end location, e.g. a gradient, or as a single location, e.g. a warning board. The locations are represented in terms of an Engineer's Line Reference (ELR), e.g. LEC2, a milepost, e.g. 83, and a number of yards from a full milepost, e.g. 1289.

7.1.4

Speed signing is based on quarter mileposts. All TASS features are based on the local full milepost only. This may result in some dimension references based on other milepost data not matching that required for TASS.

7.1.5

The yards distance to the feature from the milepost is always measured towards the next highest numerical Milepost, either in the current ELR or next ELR.

There are 2 exceptions to this rule:

- If the Milepost is more than one ELR away from the ELR of the feature e.g. ELR LEC3 is only 1232yards in length. If the feature is in ELR LEC4 before the 134 Milepost then measuring from 133 Milepost would cut across 2 ELRs (LEC2 and LEC3).

- If the distance between 2 Mileposts is more than a mile and a half.
e.g. at Birmingham New Street the 0 Milepost in RBS2 is not present and the distance between the last Milepost in RBS1 and the first Milepost in RBS2 is nearly 2 miles.

7.1.6

Figures 1 to 7 provide examples of infrastructure feature measurements as guidance. As some mileposts are more than a mile apart it is possible for the yards value to be greater than 1759. The ELR shall match the location of the feature although this may not be the same ELR as the location of the milepost. In all cases the ELR of the feature shall not be more than one ELR away from the ELR of the milepost.

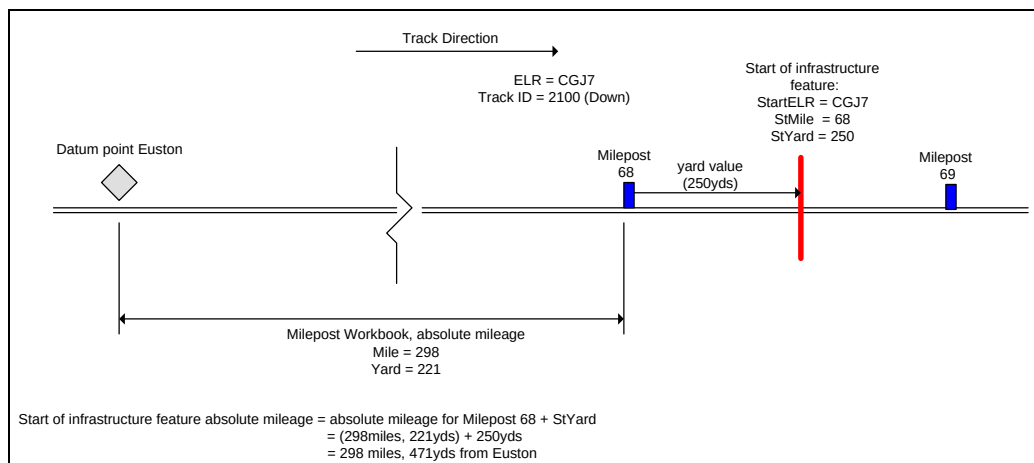


**Figure 1: Local Mileage increases from Euston;
Feature on the Down Line**

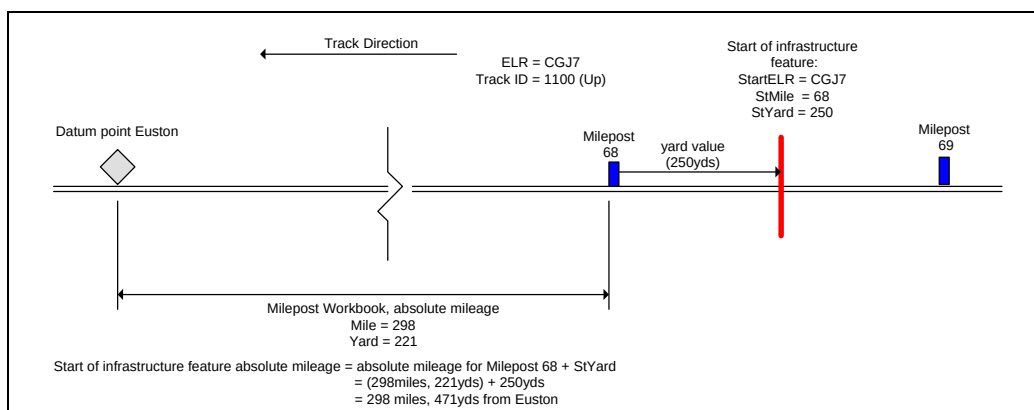


**Figure 2: Local Mileage increases from Euston;
Feature on the Up Line**

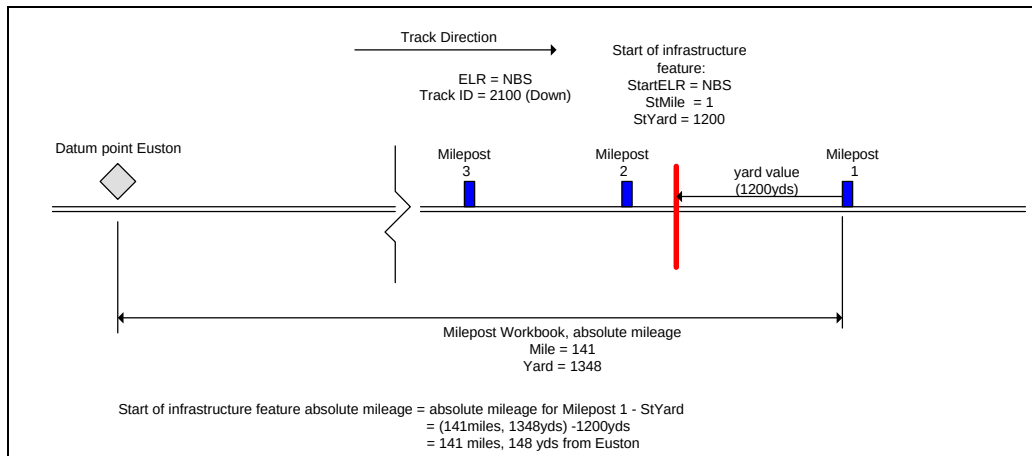


**Figure 3: Local Mileage decreases towards Euston:
Feature on the Down Line**

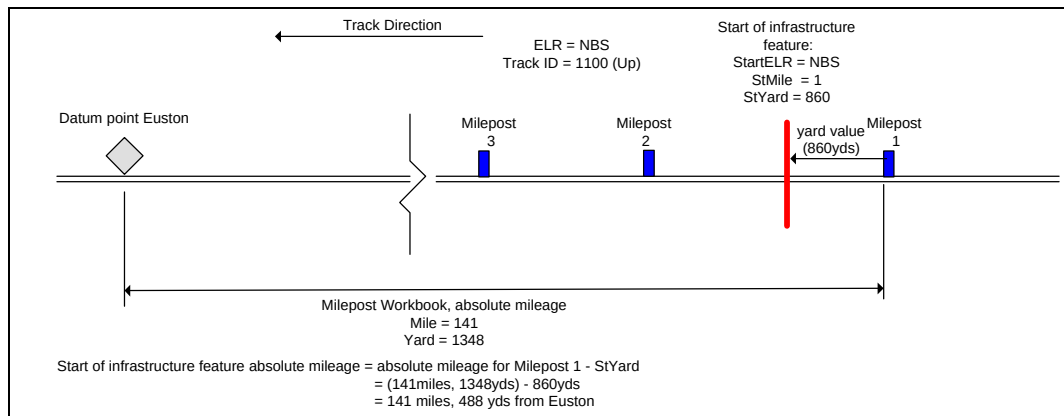


**Figure 4: Local Mileage decreases towards Euston;
Feature on the Up Line**

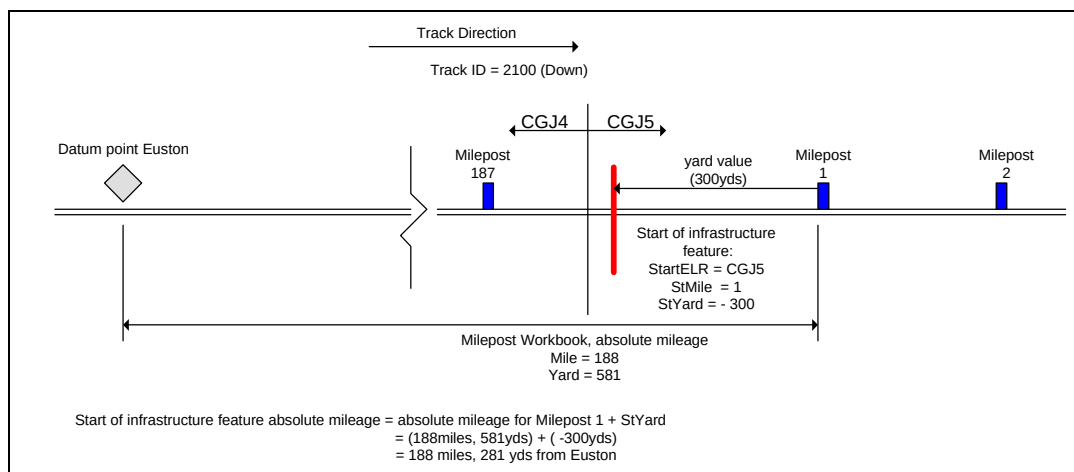


**Figure 5: ELR does not have a Milepost 0;
Feature on the Down Line**

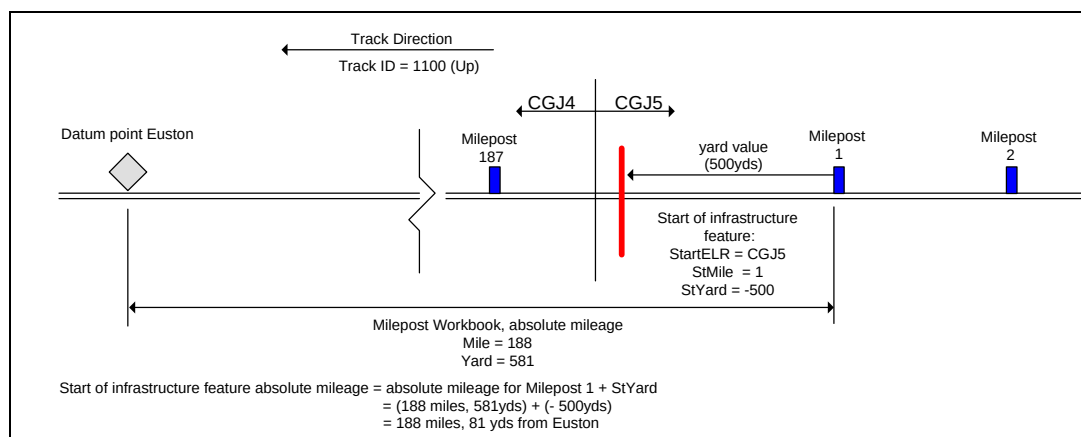


Figure 6: ELR does not have a Milepost 0; Feature on the Up Line

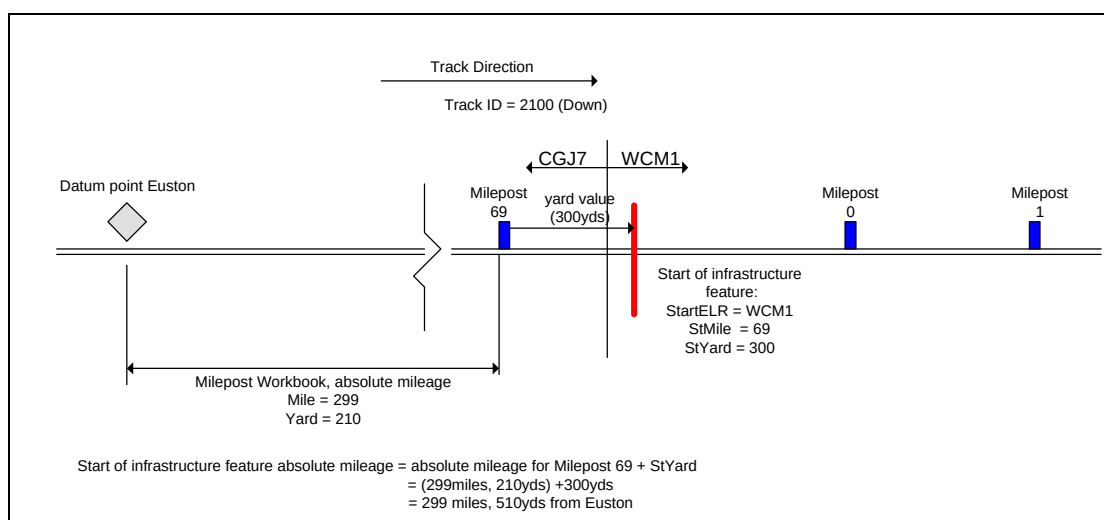


Figure 7: Feature in different ELR to Milepost on the Down Line

7.2 Zones

7.2.1

A zone is where data is specified for a section of track. This is determined by a start and an end location; both specified in terms of an ELR, milepost and yards. The direction of the zone shall match the direction of the Track ID. On the West Coast Main Line where Up lines are always towards Euston, the start location shall always have an absolute mileage value greater than the end location. For Down lines the start location shall always have an absolute mileage less than the end location. This rule applies irrespective of the sequence of the mileposts within the ELR, as illustrated in Figures 8 and 9.

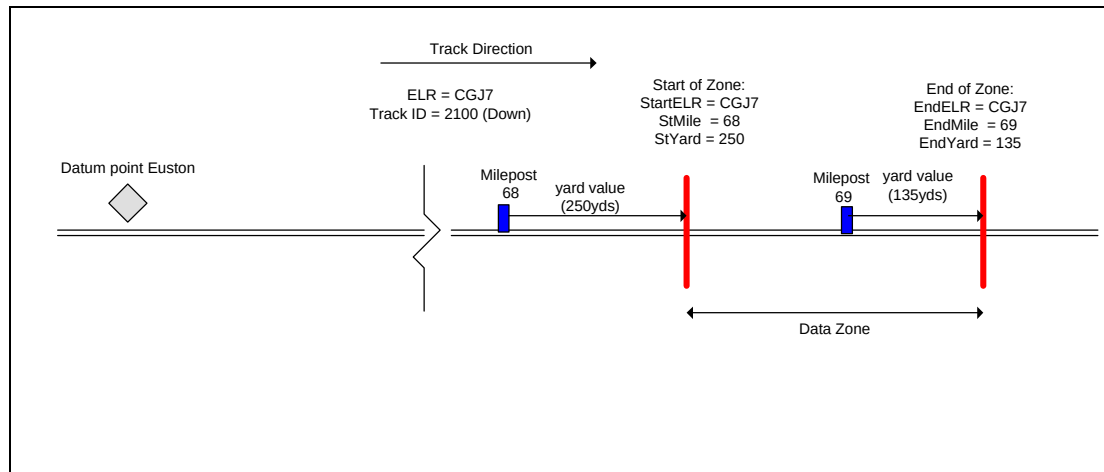


**Figure 8: Local Mileage increases from Euston;
Zone on the Down Line**

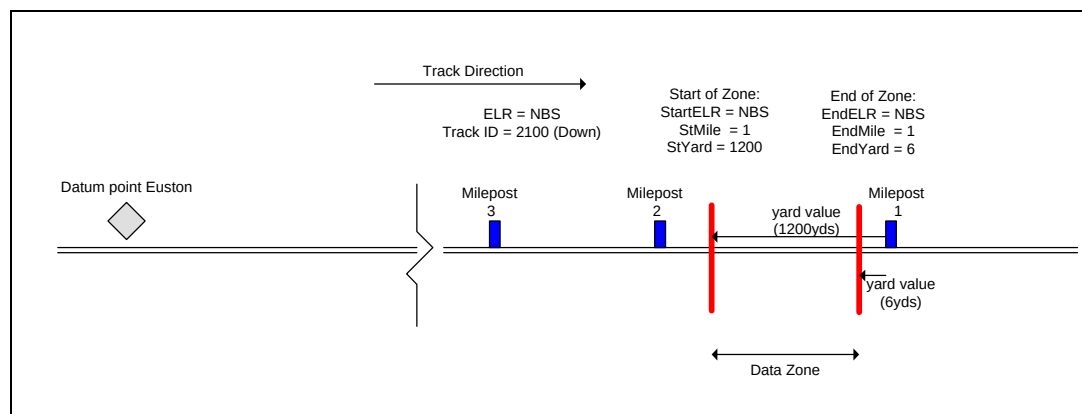


**Figure 9: Local Mileage decreases towards Euston;
Zone on the Down Line**

7.2.2

The following Worksheets require data to be specified as zones:-

- Bi-directional lines.
- High Cant Deficiency zones.
- Switch and crossing zones.
- Non-preferred balise locations.
- TPWS Speed Trap zones.

7.2.3

The following Worksheets require data to be specified as contiguous zones, i.e. the start of one zone shall follow on from the end of the previous zone, unless they are describing a diverging route (identified with a 'D' prefix – see section 7.3):-

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- Permissible Speed (PS) zones (applicable to each train type and aligned to speed sign requirements).
- Supervised Speed (SS) zones (applicable to each train type and aligned to speed sign requirements). This represents the speed profile provided for use by the TASS speed supervision function and will be the appropriate PS at locations where there is no EPS.
- Gradients (taken from available plans and only required in one direction except where there are significant differences per direction. This does not require a special site survey to be conducted).
- Tilt authorised and prohibited zones.

7.2.4

A zone shall be specified in the route in which it starts. This has two implications:-

- The end of a zone may be logically in another route, i.e. speed zones will not be arbitrarily cut at the end of a route but they will continue until the speed value or Track ID changes.
- There may not be data defined for the start of a route because the data started in the preceding route.

7.2.5

Speed boards and warning boards shall be defined in the same route as the associated speed zone. However, the definition of Track ID for these is different:-

- For speed boards, the Track ID shall match the Track ID of the associated speed zone and not the location of the speed board, e.g. if the speed board is on the main line but refers to a speed on a crossover, then the speed board Track ID will be the crossover Track ID.
- For warning boards, the Track ID shall be the Track ID matching the location of the warning board and not the associated speed board.

7.3 Diverging Routes

7.3.1

The majority of the TASS infrastructure data is provided for the main lines. However, there are areas where there are alternative lines which may be used by a TASS enabled train, e.g. in large stations. Where a line diverges from the main route and then returns to that main route, the data for that line shall be denoted by adding the prefix 'D' to the ID field, e.g. D02/PD/240. If a line diverges from a main route to become another main route then the 'D' prefix shall not be used. The following Worksheets may contain data for diverging routes:-

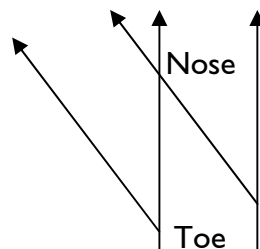
- Bi-Directional.
- Permissible Speed (PS).
- Supervised Speed (SS).
- Speed Commencement Board.
- Warning Board.
- Non-Preferred Balise Locations.
- Tilt Authority / Prohibited Zones.
- Switch and Crossing Zones.

7.4 Switch and Crossing (S&C) Zones

7.4.1

All switch and crossing locations shall be defined in the S&C Worksheet appropriate to the normal direction of travel. The start and end of an S&C zone depends on the feature:-

- Facing, where two tracks diverge in the normal direction of travel, is measured from the toe to the nose.
- Trailing, where two tracks converge in the normal direction of travel, is measured from the nose to the toe.
- Diamonds are measured from nose to nose.



7.4.2

Where it is possible for a TASS fitted train to use S&C to divert to a non-TASS fitted line, then this shall be indicated by setting the 'Off Routes- Applicable' field in the Worksheet to YES. In this situation the calculated off route distance shall be provided using default balise positions (see RT/E/S/02023) as well as the speed on the diverging line.

7.5 High Cant Deficiency Zones

7.5.1

High cant deficiency zones shall be specified from transition start to transition end and state the maximum cant deficiency value and maximum EPS allowed within that zone.

7.6 TPWS Speed Trap Zones

7.6.1

Temporary trainborne isolation of TPWS will be required where trains can pass through a TPWS protected Permanent Speed Restriction (PSR) at a higher speed than non-tilting trains, whilst the train is being speed supervised by TASS. The following infrastructure data will be required:-

- The position for the PSR overspeed sensor system zone; the start of the zone being the position of the overspeed sensor system arming loop and the end being the position of the trigger loop.
- The position of the last loop before the PSR overspeed sensor system.
- The position of the next loop after the PSR overspeed sensor system.

7.6.2

All positions shall be measured to the centre of the applicable loops.

7.7 Non-Preferred Locations

7.7.1

Locations where Network Rail do not want balises (usually for reasons of safety, access or physical obstruction) are known as non-preferred balise locations and shall be described as a zone. These shall include:-

- Tunnels, viaducts and deep cuttings, where access for installation, maintenance and repair may be difficult.
- Level crossing and occupation / foot crossing areas, where balise fixing is not possible.
- Underbridges with centre guard rails and waybeam underbridges, where balise fixing may be difficult.
- Areas of restricted clearance for on-track staff.

7.8 Bi-Directional Zones

7.8.1

All sections on a TASS enabled line where a Class 390 or Class 221 can be signalled to travel in either direction are defined as Bi-Directional Zones. If the bi-directional working is only for shunt or reversing moves then the Zone is marked with a 'C' in Column A of the Worksheet. This indicates that although the track has the capability of signalling trains in both directions it does not need to be taken into account by the TASS Designer.

7.9 Gradients

7.9.1

Gradient data shall be provided for the whole route in the Down direction for TrackID 2100 (Down Main/Fast). Gradients are always defined in terms of the indicated slope rising or falling when standing with back to zero or lowest absolute mileage. The gradient value is defined as either a signed integer indicating the slope or the value '9999999' which indicates a Level section. The slope is indicated as follows:-

- + rising gradient in direction of increasing absolute mileage, i.e. up slope.
- - falling gradient in direction of increasing absolute mileage, i.e. down slope.

7.9.2

Additional gradient data shall be provided where the Up and Down tracks have different gradients e.g. at flying junctions. The gradients for the Up line (TrackID 1100) shall still be defined in the Down direction.

7.9.3

For the purposes of TASS balise design the gradient data shall cover the whole of the SS profile.

7.10 Speed Zones

7.10.1

The PS data shall start at the same point as the SS, but shall extend beyond the end of the SS zone where TASS data finishes (e.g. at terminal stations), in order for the decrease to PS to be supervised upon expiry of the supervised speed.

8 TASS Infrastructure Data Accuracy & Measurement

8.1 Units of Measurement

8.1.1

The units of measurement of each type of parameter shall be as defined in Table 1. Conversion factors to be used in all calculations shall be as defined in Table 2.

Parameter	Unit	Comments
Mileage	mile (mi), yard (yd)	From defined datum
Gradient	1:X	Expressed as a ratio or as 9999999 for a level gradient
Gradient sign	+ - or Level	+ = up - = down
Speed	miles per hour (mph)	
Cant Deficiency	millimetre (mm)	Based on permitted speed for the stock

Table 1

Unit	Conversion Factor (multiply by)	Unit
yard (yd)	0.914400	metre (m)
mile (mi)	1.609344	kilometre (km)
Miles per hour (mph)	1.609344	kilometre per hour (km/h)
metre (m)	1.093613	yard (yd)
kilometre (km)	0.621371	mile (mi)
kilometre per hour (km/h)	0.621371	miles per hour (mph)

Table 2

8.2 Data Precision and Accuracy

8.2.1

The general and particular precision and accuracy requirements are summarised in Tables 3 and 4.

Parameter	Precision	Accuracy
Mileage	1yd	+/- 5.5yd

Table 3

Infrastructure Feature Type	Required Precision	Required Accuracy
Lineside Speed Warning Board	1 yd	+/-5.5 yd
Lineside Speed Commencement Board	1 yd	+/-5.5 yd
Tilt Authorised Zone Start Point and Finish Point	1 yd	+/-22 yd
Tilt Prohibited Zone Start Point and Finish Point	1 yd	+/-22 yd
PS Zone Start Point and Finish Point	1 yd	+/-5.5 yd
EPS Zone Start Point and Finish Point	1 yd	+/-5.5 yd
High CD Zone Start Point and Finish Point	1 yd	+/-22 yd
Gradient Zone Start Point and Finish Point	1 yd	+/-55 yd
Bi-directional Track Zone Start Point and Finish Point	1 yd	+/-22 yd
PSR TPWS overspeed sensor system zone Start Point and Finish Point	1 yd	+/-5.5 yd
Last TPWS loop before PSR overspeed sensor system	1 yd	+/-5.5 yd
Next TPWS loop after PSR overspeed sensor system	1 yd	+/-5.5 yd
Switch and crossing Zone Start Point and Finish Point	1 yd	+/-5.5 yd
Non-preferred Balise Location Zone Start Point and Finish Point	1 yd	+/-5.5 yd

Table 4