Free, open source translator for OS MasterMap Highways Network

April 2019

OS MasterMap Highways Network Layer (intro 1)

Essentially two distinct data sets in one product:

- National Street Gazetteer (NSG) records ‘matched’ to geometry from OS, where possible.

BOTH

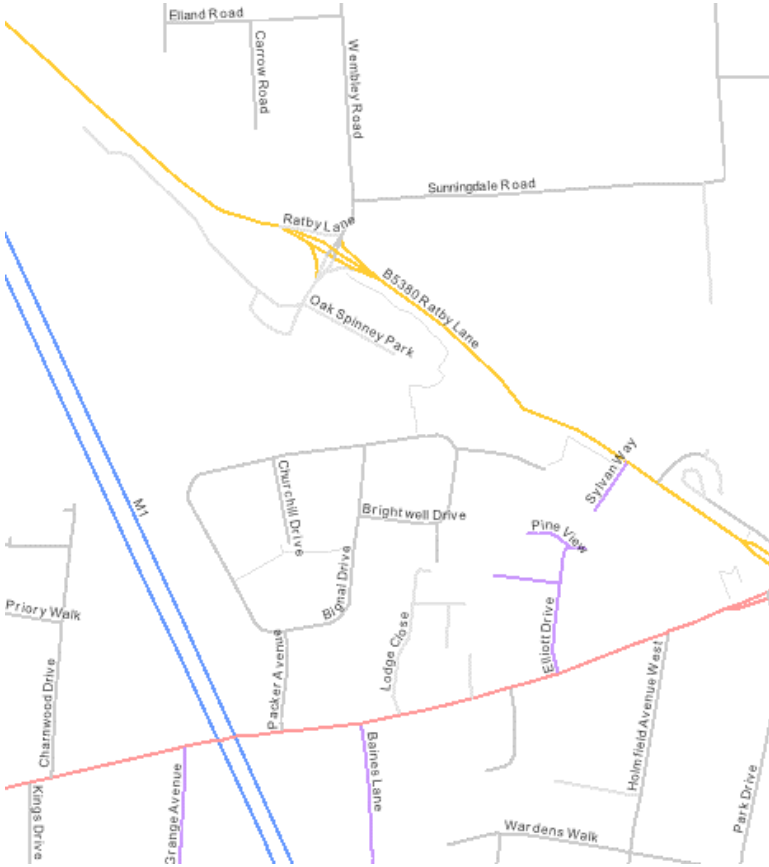
1. OS Highways – replacing the Integrated Transport Network (ITN) Layer:
   - Road, Ferry, Path and Connecting links.
   - Restrictions – one way traffic, mandatory and forbidden turns, prohibited access etc.
   - Traffic calming, roads in tunnels, mini roundabouts, fords and severe turns.
   - Road, Ferry, Path and Connecting links – at each end of the relevant links.

AND

2. NSG Streets – currently available only for England and Wales:
   - Streets – geometry taken from road link features where matched, and NSG otherwise.
   - Highway dedication rights – geometry taken from every Elementary Street Unit (ESU).
   - Maintenance information – whether the highway is maintained at public expense.
   - Reinstatement specification – work required after making an opening in the highway.
   - Special designations – full description of any relevant information about the highway.

THEREFORE

- The supplied MapInfo Pro workspace has separate map windows for these.



OS MasterMap Highways Network Layer (intro 2)

BUT

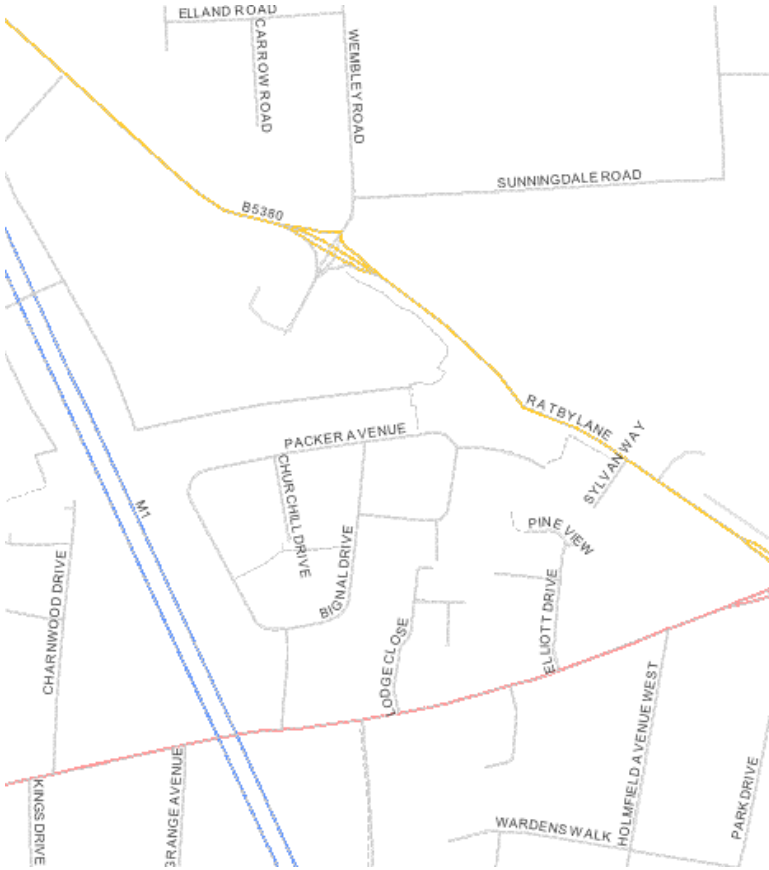
- The data structure is complex:
  - Largely inherited from the Network Reference model in the INSPIRE regulations.
  - Cross-referencing is required for several feature types in order to form the geometry.

SO

- The OpenSource translator delivers the data set in a ready-to-use form:
  - One click processes the complete data set into the OGC standard Geopackage format.
  - Styled for a particular GIS file format (with the supplied MapInfo Pro 64-bit workspace).
- Two map windows (and associated legends) are provided by default:
  - OS Highways – illustrated on the previous page; and.
  - NSG Streets – illustrated on this page.

OPTIONALLY

- The miso HighwayMap DataOptimiser service available to add further value:
  - Relationally joined, optimised and styled in a particular GIS file format (e.g. MapInfo Pro).
  - Reformulated into a compact set of layers ideal for display, querying and analysis.
  - A unified, topologically structured network, suitable for use in routing applications.
  - More sophisticated styles (e.g. average link gradients and symbols resembling traffic signs).
  - Speed Limits and Average Speeds at six periods in the week (not part of PSMA or OSMA).



Contents of each page

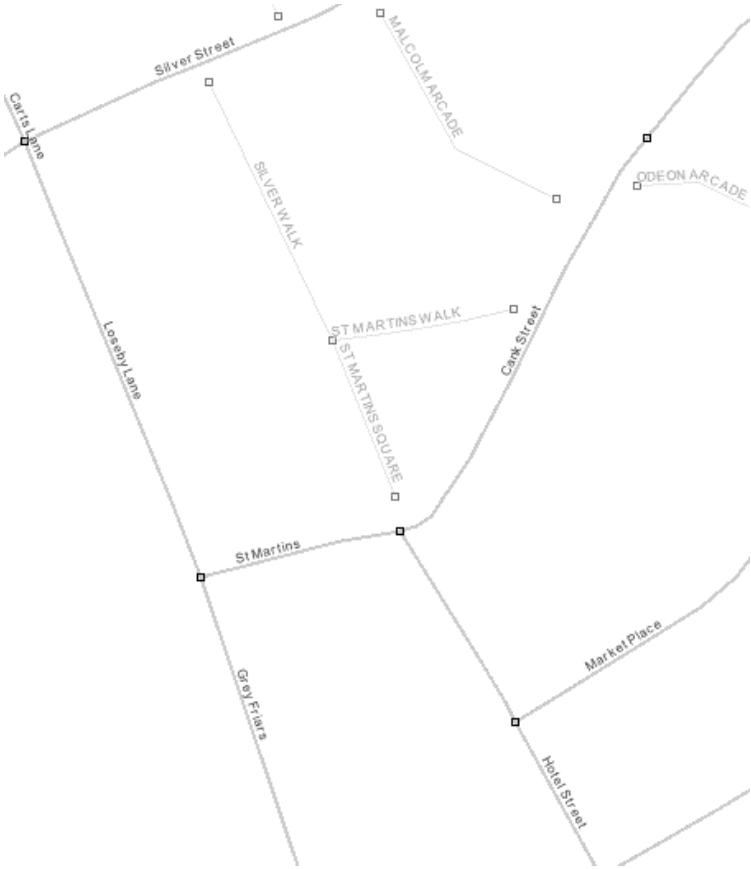
The translator’s added value

PathLink and RoadLink

- Applies to: **Paths** or **Roads with Routing and Asset Management Information** themes (the latter being duplicated in the **Roads** theme).
- Derived from: ***PathLink*** and ***RoadLink*** feature type respectively.
- These tables have line geometry, as in the raw data. This is captured by OS to fit the OS MasterMap Topography Layer. The Path and Road themes each have their own topological networks, consisting of links and nodes.
- Continuity with the ITN Layer, through *TOID* (although OS previously redefined a *TOID* from a 16-digit number to a 20-character identifier).
- The network of **RoadLink** features is not topologically structured with **ConnectingLink** features, as there is only a vertex and not a node at each point on the **RoadLink** feature where they meet.
  - The miso HighwayMap DataOptmiser service does provide this topological structuring.
- *ChunkName* enables a trace back to the specific source file of raw data.
- Styling indicates the *roadClassification* of each **PathLink** or **RoadLink** feature.

PathNode and RoadNode

- Applies to: **Paths** or **Roads with Routing and Asset Management Information** themes (the latter being duplicated in the **Roads** theme).
- Derived from: ***PathNode*** and ***RoadNode*** feature type respectively.
- These tables have point geometry, as in the raw data. The Path and Road themes each have their own topological networks, consisting of links and nodes.
- Complete set of nodes at each end of all **PathLink** and **RoadLink** features:
  - Termination of a path link or road link.
  - Junction of two or more path links or two or more road links.
  - Termination or junction within an enclosed traffic area.
  - Entry/exit junction on motorways.
  - Centre of mini roundabouts and entry/exit junction on roundabouts.
  - Grade separated intersection of a collection of road or path links (e.g. a bridge).
  - Pseudo nodes where attributes change along a single road link or path link.
- *ChunkName* enables a trace back to the specific source file of raw data.
- Styling identifies each **PathNode** or **RoadNode** feature.

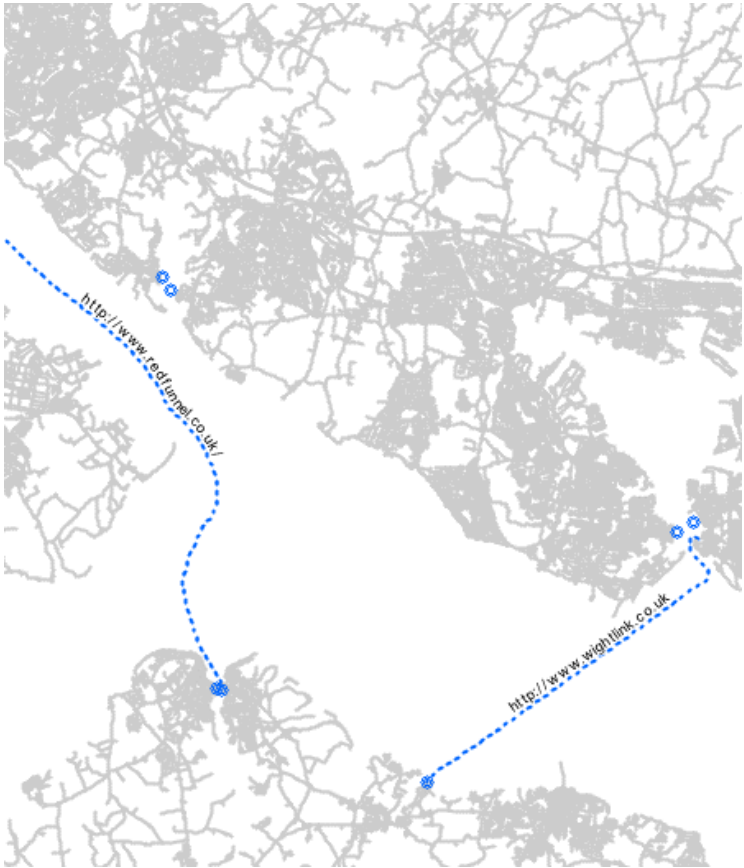


FerryLink_Paths and FerryLink_Roads

- Applies to: **Paths** and **Roads with Routing and Asset Management Information** themes (the latter being duplicated in the **Roads** theme).
- Derived from: ***FerryLink*** feature type.
- This table has line geometry, as in the raw data.
- Provides a link (following an arbitrary course) between two **FerryLink** features.
- *ChunkName* enables a trace back to the specific source file of raw data.
- Styling indicates the nature of each **FerryLink** feature.

FerryNode_Paths and FerryNode_Roads

- Applies to: **Paths** and **Roads with Routing and Asset Management Information** themes (the latter being duplicated in the **Roads** theme).
- Derived from: ***FerryNode*** feature type.
- These tables have point geometry, as in the raw data.
- *ChunkName* enables a trace back to the specific source file of raw data.
- Styling identifies each **FerryNode** feature.



FerryTerminal_Paths and FerryTerminal_Roads

- Applies to: **Paths** and **Roads with Routing and Asset Management Information** themes (the latter being duplicated in the **Roads** theme).
- Derived from: ***FerryTerminal*** feature type.
- These tables have no geometry, as in the raw data.
  - The miso HighwayMap DataOptmiser service generates polygons for *FerryTerminals*.
- Each **FerryTerminal_Paths** feature consists of references, with no geometry, to a set of **PathNode** and **FerryNode_Paths** features – and each **FerryTerminal_Roads** feature consists of references, with no geometry, to a set of **RoadNode** and **FerryNode_Roads** features.
- One feature for each ***FerryTerminal**** collection of node features.
- *ChunkName* enables a trace back to the specific source file of raw data.

TOID	identifier	type	ferryTerminalName1_text
osgb4000000003224306	4000000003224306	intermodal	Out Skerries
osgb4000000003224654	4000000003224654	intermodal	Oddsta Ferry Terminal
osgb4000000003225687	4000000003225687	intermodal	Grutness Ferry Terminal
osgb4000000003225688	4000000003225688	intermodal	Papa Stour
osgb4000000003225690	4000000003225690	intermodal	West Burrafirth
osgb4000000003265856	4000000003265856	intermodal	Wyre Ferry Terminal
osgb4000000003267427	4000000003267427	intermodal	Egilsay
osgb4000000003267429	4000000003267429	intermodal	Eday Pier
osgb4000000003267430	4000000003267430	intermodal	Stronsay
osgb4000000003267431	4000000003267431	intermodal	Sanday Ferry Terminal
osgb4000000003267432	4000000003267432	intermodal	Rapness Ferry Terminal
osgb4000000003267433	4000000003267433	intermodal	North Ronaldsay Ferry Terminal
osgb4000000003268235	4000000003268235	intermodal	Kirkwall Hatston Ferry Terminal
osgb4000000003379700	4000000003379700	intermodal	Lyness Ferry Terminal
osgb4000000003380350	4000000003380350	intermodal	St Margaret's Hope
osgb4000000003423792	4000000003423792	intermodal	Eriskay Ferry Terminal
osgb4000000003423794	4000000003423794	intermodal	Lochmaddy Ferry Terminal
osgb4000000003423795	4000000003423795	intermodal	Berneray Ferry Terminal
osgb4000000003424850	4000000003424850	intermodal	Aird Mhor
osgb4000000003445957	4000000003445957	intermodal	Leverburgh Ferry Terminal
osgb4000000003445960	4000000003445960	intermodal	Kylerhea
osgb4000000003445961	4000000003445961	intermodal	Glenelg
osgb4000000003447791	4000000003447791	intermodal	Sconser Ferry Terminal

RoadJunction

- Applies to: **Roads with Routing and Asset Management Information** theme (the latter being duplicated in the **Roads** theme).
- Derived from: ***RoadJunction*** feature type.
- This table has no geometry, as in the raw data.
  - The miso HighwayMap DataOptmiser service generates polygons for *RoadJunctions*.
- Each **RoadJunction** feature consists of references, with no geometry, to a set of **RoadNode** features.
- One feature for each ***RoadJunction*** that has either a name or number.
- *ChunkName* enables a trace back to the specific source file of raw data.

TOID	junctionType	junctionName1
osgb4000000028030345	Numbered Motorway Junction	M11 J8
osgb4000000028101102	Numbered Motorway Junction	M25 J25
osgb4000000028101108	Numbered Motorway Junction	M11 J9
osgb4000000028226026	Numbered Motorway Junction	M25 J27
osgb4000000028229478	Numbered Motorway Junction	M11 J10
osgb4000000028245799	Numbered Motorway Junction	M11 J7
osgb4000000030480744	Numbered Motorway Junction	M25 J28
osgb4000000030772800	Numbered Motorway Junction	M25 J29
osgb4000000030888053	Numbered Motorway Junction	M25 J31
osgb4000000030988282	Numbered Motorway Junction	M25 J30
osgb4000000030996076	Numbered Motorway Junction	M25 J2
osgb4000000031025710	Numbered Motorway Junction	M11 J5
osgb4000000031048496	Numbered Motorway Junction	M25 J26
osgb4000000031052799	Numbered Motorway Junction	M11 J4
osgb5000005005722617	Named Junction	Pincey Roundabout
osgb5000005005722848	Named Junction	Bassingbourn Roundabout
osgb5000005006025575	Named Junction	Priory Wood Roundabout
osgb5000005008295009	Named Junction	Wilson's Corner
osgb5000005008295392	Named Junction	Gallows Corner
osgb5000005008295467	Named Junction	Brook Street Roundabout
osgb5000005008296197	Named Junction	Preaching Cross
osgb5000005008299312	Named Junction	Stonehouse Corner Roundabout
osgb5000005008307215	Named Junction	Picknage Corner

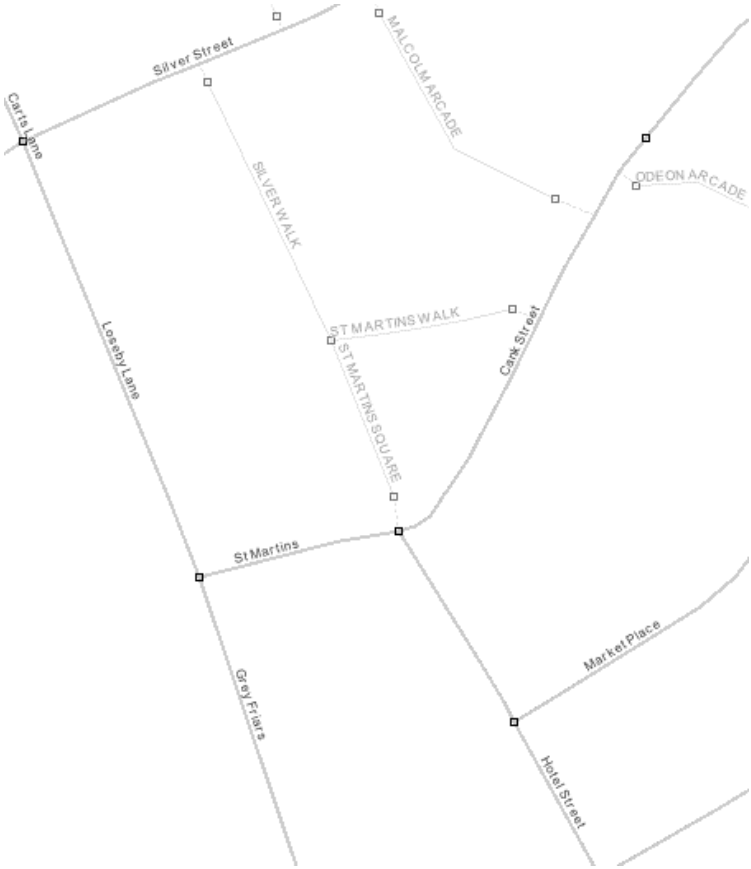
Path and Road

- Applies to: **Paths** or **Roads with Routing and Asset Management Information** themes (the latter being duplicated in the **Roads** theme).
- Derived from: ***Path*** and ***Road*** feature type respectively.
- These tables have no geometry, as in the raw data.
  - The miso HighwayMap DataOptmiser service melds the line geometry for *Paths* and *Roads* by following all the links to *PathLink* and *RoadLink* features.
- There is a feature for each path or road that has either a name or number:
  - Any links which have neither a name nor a number are omitted from this table.
  - Each **Path** or **Road** feature has only one name or road number, so there are multiple entries for a path or road with (a) more than one name or (b) a road number and at least one name.
- *ChunkName* enables a trace back to the specific source file of raw data.

TOID	nationalRoadCode	designatedName1
osgb5000005214989812		Lapwing Drive
osgb5000005219226007		Cloughton Road
osgb5000005219226009		Borrowby Close
osgb5000005219670223		Raywell Road
osgb5000005221151259		Pollards Road
osgb5000005221151261		Countryside View
osgb5000005222344064		Woodlark Road
osgb5000005222344066		Barn Owl Road
osgb5000005226500281		Pescall boulevard
osgb5000005227039729		Hackness Road
osgb5000005227039731		Cornholme Drive
osgb5000005229908619		Broomfield Crescent
osgb4000000015626974		Hinckley Road
osgb4000000019591447	A426	
osgb4000000019591445	A46	
osgb4000000027471094	A47	
osgb4000000015815552	A50	
osgb4000000019553699	A5199	
osgb4000000015685033	A5460	
osgb4000000015865333	A563	
osgb4000000015685102	A5630	
osgb4000000009461223	A594	
osgb4000000015865010	A6	

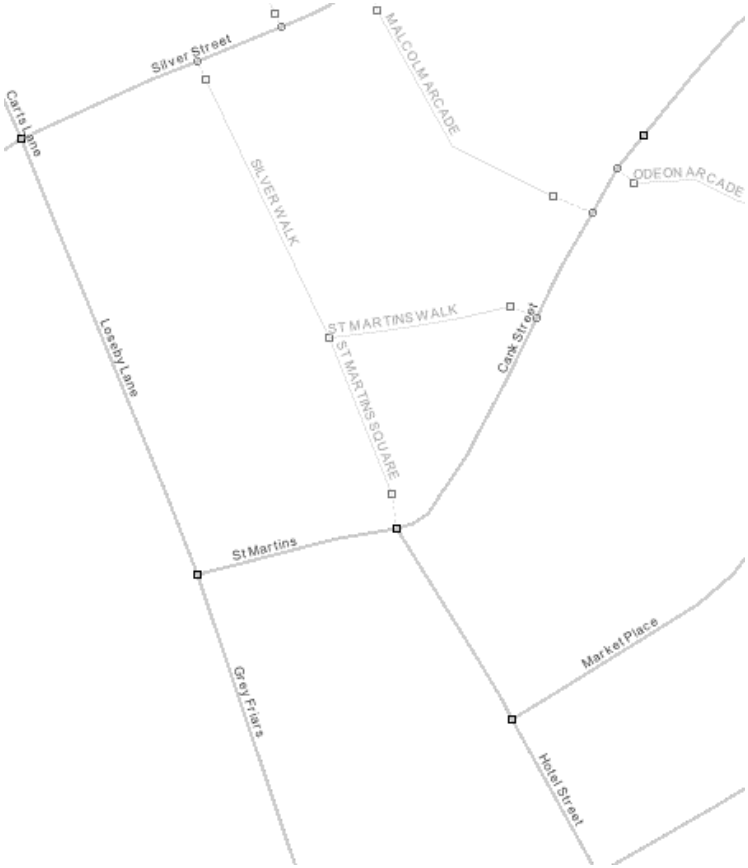
ConnectingLink

- Applies to: **Paths** theme.
- Derived from: ***ConnectingLink*** feature type.
- This table has line geometry, as in the raw data.
- Provides a link (straight across the highway) from the end of a **PathLink** feature, generally at the edge of the footway, to the centre-line of a **RoadLink** feature.
- The network of **RoadLink** features is not topologically structured with **ConnectingLink** features, as there is only a vertex and not a node at each point on the **RoadLink** feature where they meet.
  - The miso HighwayMap DataOptimiser service does provide this topological structuring.
- *ChunkName* enables a trace back to the specific source file of raw data.
- Styling identifies each **ConncectingLink** feature.



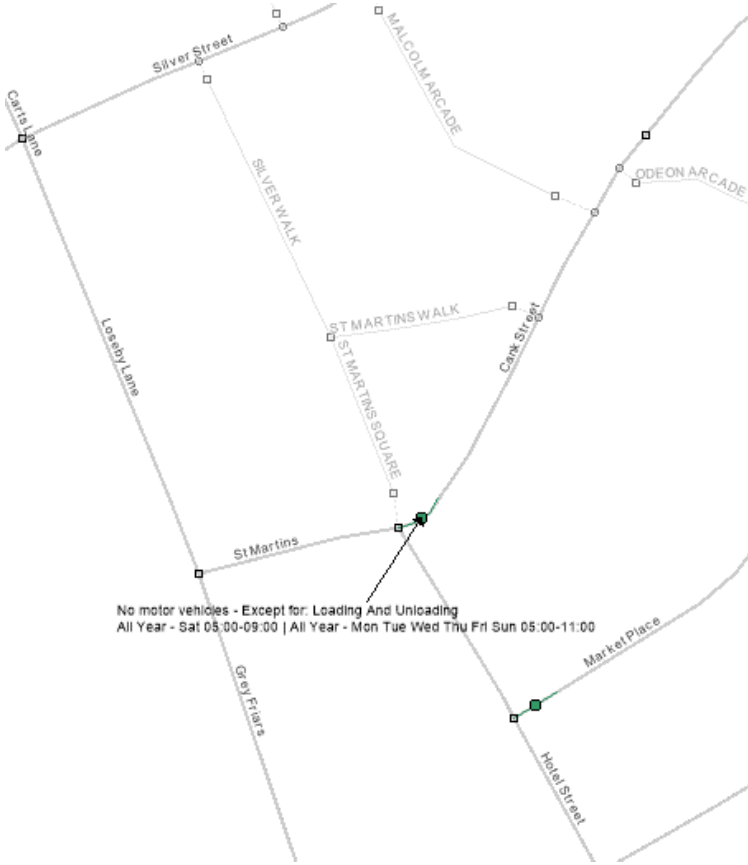
ConnectingNode

- Applies to: **Paths** theme.
- Derived from: ***ConnectingNode*** feature type.
- This table has point geometry, as in the raw data.
- Provides a point at a vertex on the centre-line of a **RoadLink** feature where a **ConnectingLink** feature meets the **RoadLink** feature.
- The network of **RoadLink** features is not topologically structured with **ConnectingLink** features, as there are no nodes at points where they meet. [The miso HighwayMap service does provide this topological structuring.]
- *ChunkName* enables a trace back to the specific source file of raw data.
- Styling identifies each **ConncectingLink** feature.



AccessRestrictionPoint and AccessRestrictionLine

- Applies to: **Roads with Routing and Asset Management Information** theme.
- Derived from: ***AccessRestriction*** and ***RoadLink*** feature types, joining the line geometry to every restriction.
- These tables have point and line geometry respectively. Each point is placed just after the junction, along with a short line along the relevant road link.
- *ChainOfNetworkLinks* identifying the related **RoadLink** features, in the appropriate sequence, with the correct orientation.
  - Plus sign (+) means the Same direction as the digitised line; Minus sign (-) means the Opposite direction; Plus or minus sign (±) means Both directions.
- *NoOfNetworkLinks* indicating the number of related **RoadLink** features.
- *ApplicablePeriod*, where available, rendered in plain English text (e.g. **All Year – Mon Tue Wed Thu Fri Sun 05:00-10:00**).
- *Restriction* summarised in plain English (e.g. **No Physical Access**).
- *Inclusion* and *Exemption* clearly combining Vehicle, Use and Load restrictions.
- *ChunkName* enables a trace back to the specific source file of raw data.
- Styling identifies each AccessRestriction.
  - The miso HighwayMap service uses custom symbols resembling road signs.

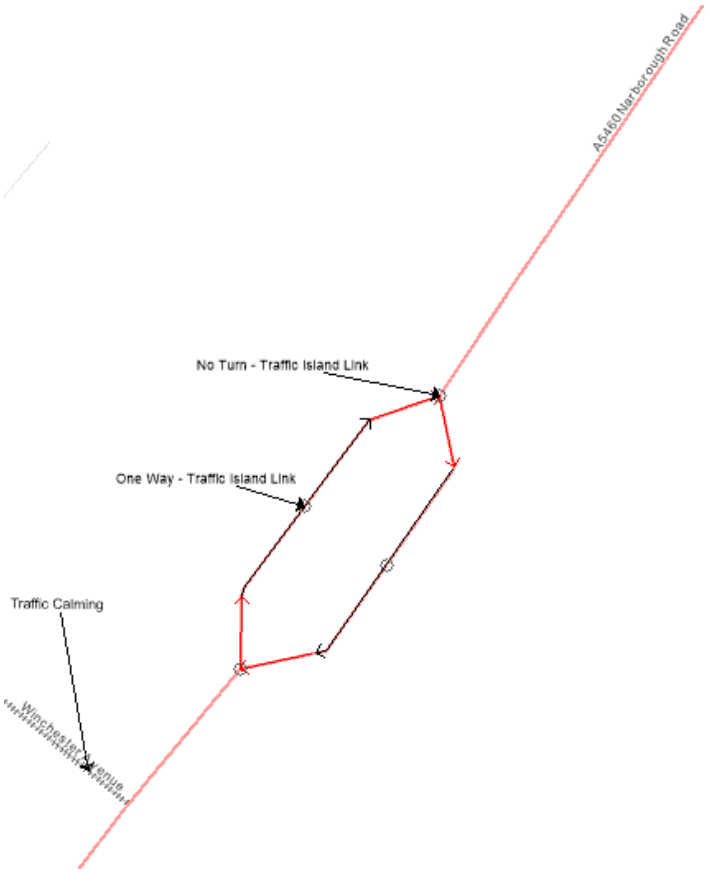


HazardAndStructure

- Applies to: **Roads with Routing and Asset Management Information** theme.
- Derived from: ***RoadLink***, ***Hazard*** and ***Structure*** feature types , joining the relevant section of line geometry to every hazard and restriction.
- This table has line geometry along the relevant road link.
- *ChainOfNetworkLinks* identifying the related **RoadLink** features, in the appropriate sequence, with the correct orientation.
  - Plus sign (+) means the Same direction as the digitised line; Minus sign (-) means the Opposite direction; Plus or minus sign (±) means Both directions.
- *NoOfNetworkLinks* indicating the number of related **RoadLink** features.
- *ChunkName* enables a trace back to the specific source file of raw data.
- Styling identifies each **HazardAndStructure** feature.
  - The miso HighwayMap service uses custom symbols resembling road signs.

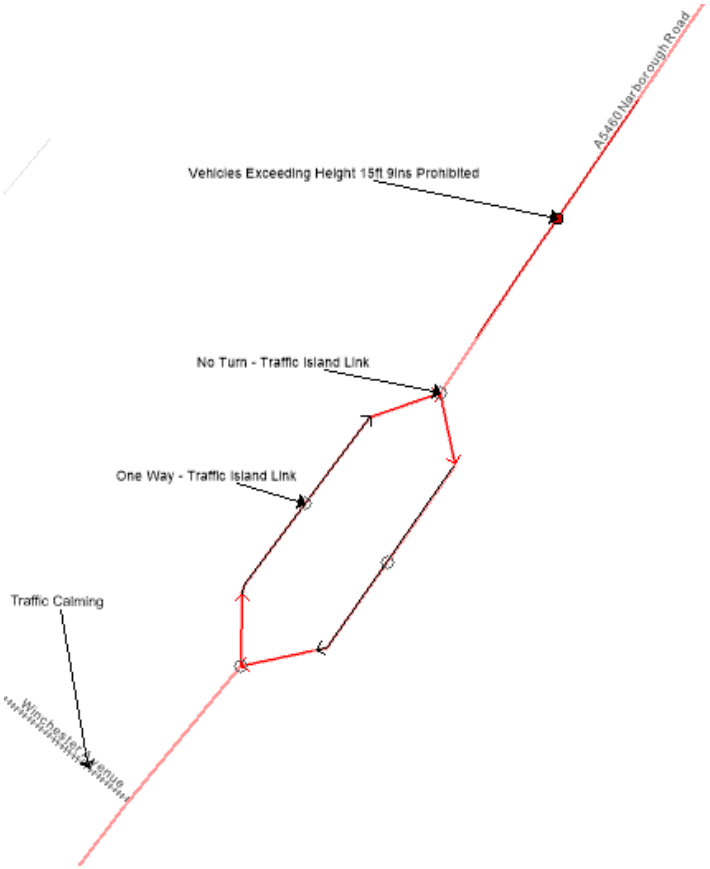
TurnRestrictionPoint and TurnRestrictionLine

- Applies to: **Roads with Routing and Asset Management Information** theme.
- Derived from: ***TurnRestriction*** and ***RoadLink*** feature types, joining the line geometry to every restriction.
- These tables have point and line geometry respectively. Each point is placed just before the junction, along with a short line along the relevant road link.
- *ChainOfNetworkLinks* identifying the related **RoadLink** features, in the appropriate sequence, with the correct orientation.
  - Plus sign (+) means the Same direction as the digitised line; Minus sign (-) means the Opposite direction; Plus or minus sign (±) means Both directions.
- *NoOfNetworkLinks* indicating the number of related **RoadLink** features.
- *ApplicablePeriod*, where available, rendered in plain English text (e.g. **All Year – Mon Tue Wed Thu Fri Sun 05:00-10:00**).
- *Restriction* summarised in plain English (e.g. **Mandatory Turn**).
- *Inclusion* and *Exemption* combining all Vehicle, Use and Load restrictions.
- *ChunkName* enables a trace back to the specific source file of raw data.
- Styling identifies each **AccessRestriction** feature.
  - The miso HighwayMap service uses custom symbols resembling road signs.



RestrictionForVehiclesPoint and RestrictionForVehiclesLine

- Applies to: **Roads with Routing and Asset Management Information** theme.
- Derived from: ***RestrictionForVehicles*** and ***RoadLink*** feature types, joining the line geometry to every restriction.
- These tables have point and line geometry respectively. Each point is placed at the exact location, together with a short line along the relevant road link.
- *ChainOfNetworkLinks* identifying the related **RoadLink** features, in the appropriate sequence, with the correct orientation.
  - Plus sign (+) means the Same direction as the digitised line; Minus sign (-) means the Opposite direction; Plus or minus sign (±) means Both directions.
- *NoOfNetworkLinks* indicating the number of related **RoadLink** features.
- *Restriction* summarised in plain English (e.g. **Maximum Height**).
- *Inclusion* and *Exemption* clearly combining all types of Vehicle, Use and Load restrictions.
- *ChunkName* enables a trace back to the specific source file of raw data.
- Styling identifies each **RestrictionForVehicles** feature.
  - The miso HighwayMap service uses a set of custom symbols resembling road signs for this.



Street_Named_Paths &_Roads, Street_Numbered_Paths &_Roads

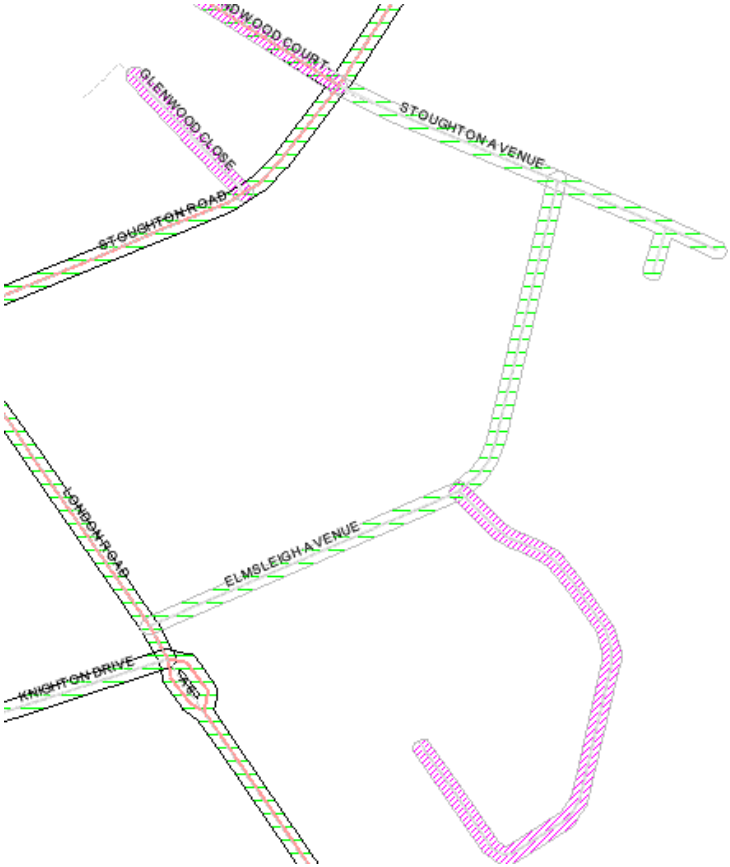
- Applies to: **Paths** and **Roads with Routing and Asset Management Information** themes (the latter being duplicated in the **Roads** theme).
- Derived from: ***Street*** feature type.
- These tables have line geometry, as in the raw data.
- Taken from the National Street Gazetteer (NSG), authoritative source for the New Roads and Street Works Act 1991 and – later – the Transport (Scotland) Act 2005, as referenced in the Electronic Transfer of Notifications (EToN).
- Separated into **Street_Named*** and **Street_Numbered***, based on *StreetType*.
- There is a feature for each section of a road or path that has a Unique Street Reference Number (USRN) – broadly similar to **Road** and **Path** features:
  - Each **Street_Named** feature has only one name, and each **Street_Numbered** feature has only one number, so there are multiple entries for roads or paths with (a) more than one name or (b) a road number and at least one name.
  - Pecked line styles allow multiple features to be seen where they coincide.
- *NationalNetworkLinks* indicates the number of related **RoadLink** features.
- *ChunkName* enables a trace back to the specific source file of raw data.
- Styling indicates the nature of each **Street** feature.

HighwayDedication

- Applies to: **Paths** and **Roads with Routing and Asset Management Information** themes.
- Derived from: ***HighwayDedication*** feature types.
- This table has line geometry, as in the raw data.
- Comprehensive set of statutory rights of use under the Highways Act 1980.
- To represent the legal definitions of rights with which each section of highway was dedicated, geometry in this table is taken directly from National Street Gazetteer (NSG) records, not matched to OS features.
- One feature for each Elementary Street Unit (ESU) connecting two nodes – broadly similar to **RoadLink** features.
- *ApplicablePeriod*, where available, rendered in plain English text.
- *ChunkName* enables a trace back to the specific source file of raw data.
- Styling indicates the nature of each **HighwayDedication** feature.

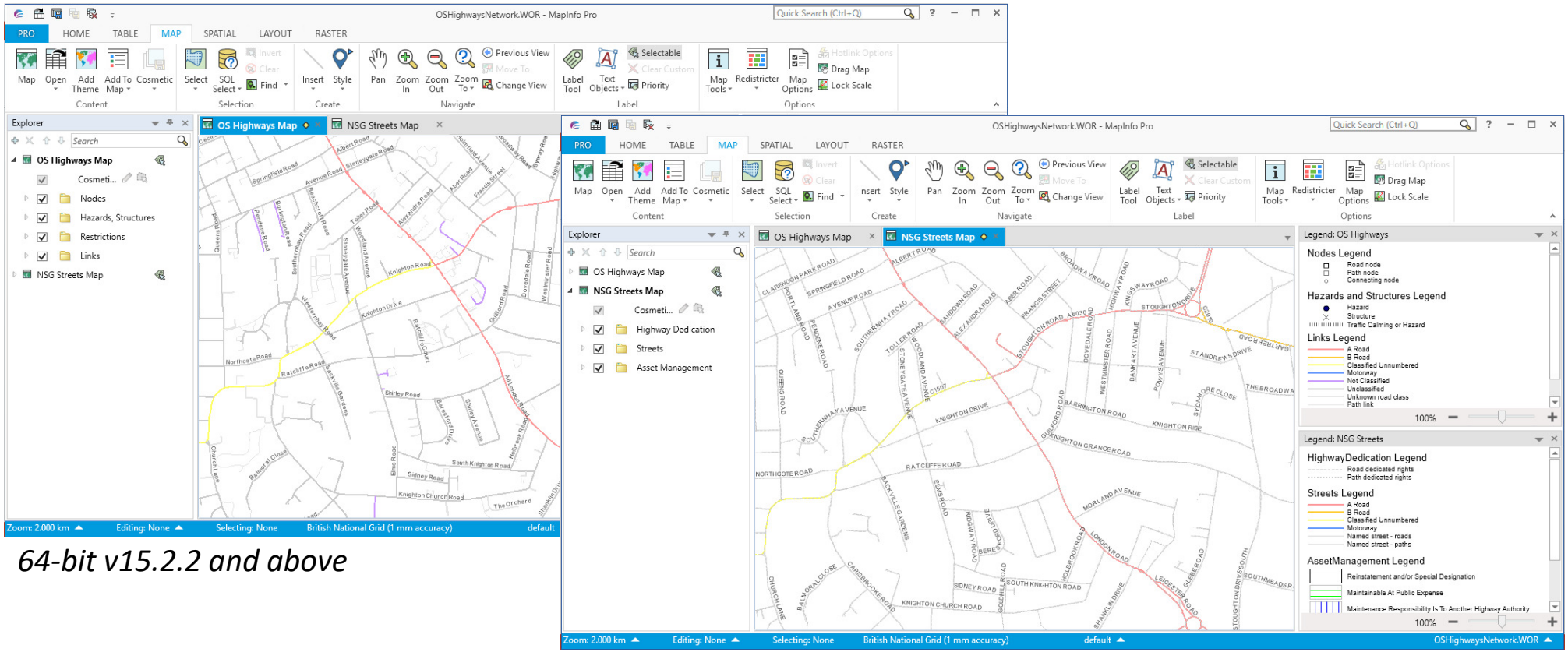
AssetManagement

- Applies to: **Paths** and **Roads with Routing and Asset Management Information** themes.
- Derived from: ***Maintenance***, ***Reinstatement***, ***Special Designation*** and ***Street*** feature types, joining the geometry where required to the asset information.
- This table has polygon geometry – created where necessary by buffering – unlike the raw data which has points, lines, polygons or no geometry.
  - Ensures that all **AssetManagement** features can be stored in a single table.
  - Where NSG geometry is a pair of points, a 'dumb-bell' shape is formed.
  - *NSG_GeomOrRef* attribute identifies the geometry type supplied in the raw data.
- The graphical presentation shows up many ASD coordinate errors in the NSG.
  - The miso HighwayMap DataOptimiser service corrects thousands of such errors.
- One feature for each Unique Street Reference Number (USRN):
  - Information on whether the highway is maintainable at public expense, how any openings in the highway must be reinstated and special characteristics on or near.
- *ApplicablePeriod*, where available, rendered in plain English text (e.g. **All Year – Mon Tue Wed Thu Fri Sun 05:00-10:00**).
- *ChunkName* enables a trace back to the specific source file of raw data.
- Styling indicates the *MaintenanceResponsibility* of each feature.



Technical guidance

Views of the translator’s MapInfo Pro workspace file



64-bit v15.2.2 and above

Notes on data format, map presentation and styling

- The FME workspaces were written for FME 2018.1. They are derived from a set published by OS on GitHub, but with substantial added value and some modifications.
- The tables are all in Geopackage format, which can be read by most popular GIS software, including 64-bit MapInfo Pro versions 15.2.2 and above.
- Dates in these GeoPackage files use the **Text** data type, rather than the **Date** type, because software may crash when trying to open a file if there are empty **Date** rows.
- Using Geopackage files, particularly for a large area of interest, may result in software performance that is much slower than for a native GIS file format.
    - The miso HighwayMap DataOptimiser service provides output in native GIS file formats, configured so that national cover can be accommodated within a file size limit of 2Gb.
- Every table contains just a single type of geometry, so it may optionally be stored in a database. The spatial referencing system is the normal British National Grid.
- Suits a Full Supply, but not a Change Only Update.
- All the associated files required to organise and style the data in MapInfo Pro are included.
    - Corresponding files for other software such as QGIS and ESRI ArcMap may be available from the open-source community.
- A pair of MapInfo Pro workspace files are supplied with the data, named **_OSHighwaysNetwork.wor** and **_OSHighwaysNetwork.wox**.
    - Taken together, these define the default map and legend windows (with their positions on screen) and also zoom layering and settings for selection and labelling.
    - These workspace files are read-only, so you can return to the default settings at any time.
- To save your settings after interacting with the data
    1. on the **HOME** tab, drop down the **Save Workspace** group and click **Save Workspace As**; and
    2. enter a workspace filename *different* from the one supplied, then click the **Save** button.

Additional output files produced by the translator

- The FME workspaces making up the translator are derived from a set published by OS. These express the relational structure of the data set as a collection of normalised tables which contain cross-reference links.
- Virtually all the tables available from the OS workspaces are produced by this translator, in addition to a number of extra added-value tables.
- The MapInfo Pro workspace files open by default only those tables that are described in this document.
- This means that certain tables are unlikely to be required, except perhaps for a specialist application.
  - An example is the set of TQ tables that encode the Time Qualifier attributes for **AccessRestriction** and **TurnRestriction** features. (OS has documented these as applying to **HighwaysDedication** also, although they are not in fact populated.)
  - The translator assembles all the Time Qualifier attributes into a plain English form as the *ApplicablePeriod* attribute.
- So that the MapInfo Pro workspace can open fully, as designed, there will be empty tables for any feature types which are absent from your data set.
  - For example some of the **Ferry*** feature types may not be present, especially in inland areas.
- To do this, the translator copies a complete set of empty tables into the output folder before overwriting some or all of them with those which contain features in your data set.
- Do not change the files in the **EmptyMasterTables** folder, or this process will fail.
- Although you will only need to interact with a single FME workspace file, it operates by running a series of other FME workspace files in turn.
  - If you wish to review how a translation performed, you may need to check separate log files for each of those workspace files and not just the one with which you have interacted.

What's new in April 2019 – v1.1 release notes

- TurnRestrictionLine
  - Shorter lines with arrowheads represent 'One-way traffic'
  - No risk of short one-way lines collapsing into points
- TurnRestrictionPoint
  - Enhanced dispersion algorithm to avoid obscuring symbols
- FerryNode_Roads and FerryNode_Paths
  - Output written to same folder as all other Geopackage files
- PathLink
  - Attribute *cycleFacility* included
- RoadLink and PathLink
  - True / False attribute *cycleFacilityWholeLink* included where cycleFacility exists
- Structure
  - All Structure Types included as point features, whether referenced to **Points**, **Nodes** or **Links**
- AssetManagement
  - *ValidFrom* attribute correctly populated, if supplied
  - If NSG geometry is a pair of points, a 'dumb-bell' shape is formed
- Associated Street Data (ASD) coordinate errors in NSG
  - Clearly shown up by graphical presentation of translator output
  - The optional miso HighwayMap DataOptimiser service corrects thousands of such errors
- ConnectingLink
  - Any **ConnectingLinks** supplied with zero length are dropped
- Performance and memory use
  - Improved technique for joining various different Feature Types
- MapInfo Pro workspace
  - Improved arrangement of layers, selectability and label expressions
- User guide
  - Updated to reflect changes, including some additional illustrations