Ordnance Survey®

The Scottish Road Works Register

How roads authorities and utilities cooperated to produce a centralised national roadworks register with OS MasterMap at its core

Case study

THE OFFICE OF THE
SCOTTISH ROAD WORKS COMMISSIONER

Introduction

For several years the entire community of roads authorities and utilities in Scotland have cooperated in the development of, and benefited from using, a centralised electronic register to coordinate roadwork's activities. The application of the latest GIS technologies, underpinned by Ordnance Survey OS MasterMap® data, has enabled the community to unlock the benefits of the Scottish Road Works Register (SRWR), and is opening up the opportunities for a new era in the management and coordination of roadworks. Not only can this provide improved efficiencies for utility and roads authority operations, but can also reduce the disruptive impact of the works on commercial and private road users.

In the current version of SRWR, supplied in 2006 by Symology Ltd, OS MasterMap was chosen as the solution for providing mapping data due to its intelligent structure and geospatial features, such as road polygons and centrelines, which have proved invaluable for geospatial coordination across a large diverse community.

The SRWR is currently accessible, via the Internet, to 33 roads authorities and 34 utilities, with a combined total of almost 1 200 users across the whole of Scotland and is used for all notification, coordination, monitoring and inspection processes.

History

Susiephone Ltd was created more than 25 years ago and is a company limited by guarantee, with members from roads authorities and utilities. The company was originally created to provide an underground plant protection service, with its name being based on 'Statutory Undertakers Services Information for Excavators' (SUSIE).

Over time, Susiephone Ltd developed the concept and specification for a centralised Scottish roadworks register and then brought it into being. By the early 2000s it was recognised that the register required to be upgraded. This need for an upgrade was driven by a number of factors, which are set out in the following section.

Drivers for change

Legislative change

In recent years the Traffic Management Act 2004 (covering England and Wales) and the Transport (Scotland) Act 2005 have amended existing and created new requirements for utilities and road and street authorities as an enhancement to the New Roads and Street Works Act (NRSWA) 1991.

In Scotland the NRSWA includes the following with regard to road works coordination:

Section 118(1) of NRSWA requires roads authorities to 'use their best endeavours to coordinate the execution of works…
(a) In the interests of safety.
(b) To minimise the inconvenience to persons using the road.
(c) To protect the structure of the road and the integrity of apparatus in it.'

Section 119(1) of NRSWA places a duty on undertakers to use their best endeavours, in regard to the execution of roadworks, to cooperate with the roads authority and one another, with the same threefold objectives as mentioned above.

Section 16 of the Transport (Scotland) Act 2005 also created the office of Scottish Road Works Commissioner. The purpose of the office of Commissioner is to work with the roadworks community to oversee improvements to the planning, coordination and quality of road works in Scotland.

Although the NRSWA requirements in Scotland are slightly different to England, they are based on a similar framework, with Sections 118(1) and 119(1) being the same as Sections 59(1) and 60(1) that operate in England. With regard to systems, however, in Scotland the situation is a little different to England and Wales. Under section 112A of NRSWA the Scottish Road Works Commissioner is required to keep a register with respect to each road in Scotland, containing information with respect to roadworks and other prescribed types of works. So, rather than each highway authority and utility having its own local system, as happens in England and Wales, there exists a single centralised SRWR and it is now a statutory duty for roads authorities and utilities to record their works on it. From 1 April 2008 the Commissioner took on the role of 'keeper' of the SRWR and has appointed Susiephone Ltd as the 'provider' of the SRWR.

The Transport (Scotland) Act 2005, which demanded an increased focus on improving the effectiveness of roadworks and minimising public disruption, under the auspices of The Scottish Road Works Commissioner was therefore a significant driver for change.

User community aspirations

Although there had been incremental improvements to the previous register over the years, the wishes of the community to have improved functionality highlighted the need for a significant upgrade. In particular, there was seen to be a need for greater use of digital mapping technology, with the aim of improving coordination.

Emerging technologies

The continuing emergence of technologies that could provide improved functionality in ways which were previously not viable.

'The community felt that although the incremental changes undertaken had been effective, the emergence of new technologies and the benefits which GIS mapping was bringing to other areas of their business indicated that there was a need for a step-change upgrade to the register.'
Alex Rae, Scottish Water, RAUC(S) Co Chair.

Solution delivered

The current SRWR system was implemented in 2006 by Symology Ltd following an extensive procurement exercise. The following are some of the key elements delivered by the new system.

Spatial information

The SRWR system is now fully GIS-enabled, with:
- OS MasterMap topological data providing the detailed background;
- Ordnance Survey raster data providing the background images at large scale; and
- gazetteers supplied by the roads authorities providing associated road information.

The main roadworks' application and the maps are fully integrated in a context-sensitive manner such that users can select roads or works and switch to the map zoomed in on the correct road or works at the press of a single button.

All 1 200 users of the system can access the geospatial data held within the GIS. However, somewhat unusually for systems like this, all users can also edit the spatial data. Utilities and roads authorities need to plot the locations of their planned/actual works. This allows all works

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recorded on the system to be spatially located via the unique reference number (TOID®) held in the OS MasterMap layer. Users can plot the works as simple points or lines, or as polygons representing the general intended area of working, or the actual physical locations of the individual trenches.

This spatial layer provides a historic record of every single work that has been plotted. However, this layer is not actually very useful on a day-to-day basis. With over 100 000 works being recorded every year, the map screen can soon start looking very cluttered, as it resembles the patchwork quilt of reinstatements that exists in the real world. Therefore a separate spatial 'Daily Whereabouts' layer is maintained. This layer contains all works that are currently in progress or are planned but have yet to start. This reduces the layer to a manageable size of roughly 3 000 'live' works for the whole of Scotland at any one point in time, or an average of about 100 per roads authority area. This is the key information that users of the system are interested in for coordination purposes.

There is also date filtering, which allows the user to choose a period and view the works proposed for that period. This particularly aids forward planning.

So now the works are spatially referenced, how does works coordination take place? A large proportion is still performed manually using the know-how and experience of each roads authority roadworks team. However, the Daily Whereabouts layer provides the basis for an element of automated GIS coordination.

As each new work is recorded or plotted, the system automatically checks the location of the new work against the existing works already registered. If it finds any existing or proposed works with overlapping start and end dates, it generates a 'map conflict', should one of the following criteria be fulfilled:

- The works are on the same road.
- The works are within a user-defined distance of each other, for example, 100 metres.
- The works are both on roads within the same user-defined road group, for example, groups of roads representing one-way systems, priority bus routes, diversionary routes and so on.

SRWR is also used to spatially define 'pinch points' on the network. These can represent centres of congestion, major interchanges and so on. The coordination can then be enhanced to raise conflicts on any works within a set distance, via the road network routing of these pinchpoints.

These facilities are examples where simple GIS concepts and the additional OS MasterMap functionality play a significant role in improving the coordination function.

Tracking and monitoring works

The life cycle of the each works is controlled and monitored using a series of notices, which the works promoter issues to enable all affected persons to be fully aware of planned and actual activities.

With volumes of 12 000 notice transactions each week, monitoring works is a daunting task, requiring sophisticated exception reporting facilities within the SRWR to make it viable. Facilities are available to provide a range of prompts, including:

- when planned activities should start and end;
- when statutory timeframes are about to be exceeded; and
- when defects have been detected in the work that is carried out.

An automatic monitoring system ensures that each activity is progressed to conclusion.

Benefits of the system

Improved coordination

The first major benefit of the improved SRWR is in improved coordination. Works and other potentially disruptive events and activities (such as scaffolding, cranes, carnivals, marathons and so on) may be plotted on the OS MasterMap Topography Layer, using a point, line or polygon to represent the extent of their impact.

This provides the works promoter with automatic warnings at the time of planning the works. Similar warnings occur where there are planned road resurfacing or reconstruction works, to ensure that all excavations are completed before the new road surface is laid. If the promoter does not heed the warnings, prompts are automatically raised within the appropriate roads authority.

Common location using Intelligent data – OS MasterMap

The key to increasing the operational efficiency for the SRWR was successfully coordinating and integrating its information systems using OS MasterMap as the core foundation. The data that utilities and roads authorities hold and manage is rooted in location; whether they are of assets, resources or customers.

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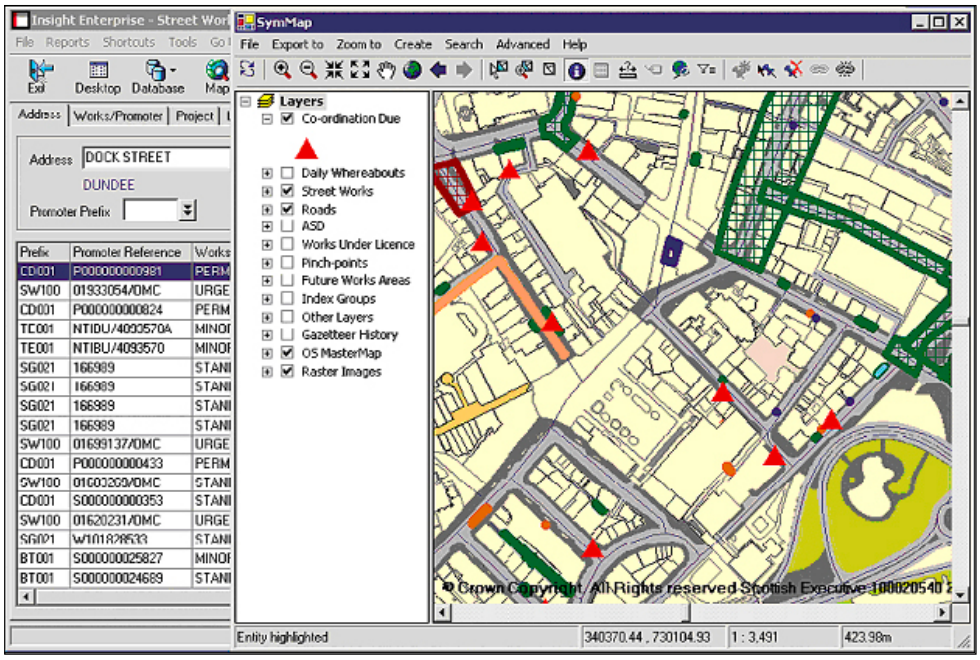
Current/planned works are shown in green. Potential conflicts are highlighted as red triangles.
Historic works are colour coded by works promoter.



'The SRWR is one such example of collaboration between public and private sector communities developing innovative solutions using Ordnance Survey's digital data as a core integrating platform.'

Marc Hobell, Ordnance Survey

The Ordnance Survey products used within the SRWR include both raster maps and the latest OS MasterMap Topography Layer. The Ordnance Survey geographic intelligence enables detailed, accurate and up-to-date information to be exchanged seamlessly. OS MasterMap is the underpinning dataset and is displayed at the lowest level of detail, whilst three different levels of raster map are introduced automatically to replace the OS MasterMap background when viewing on a larger scale.

Each organisation involved in the Register (a total of 33 roads authorities and 34 utilities) is able to identify the scope of their interest in the road network, either by an 'area of interest' polygon or by identifying the specific roads within the network. If the organisation so desires, a separate area of interest may be defined for each division. This ensures correct notification of all relevant data, direct to the department concerned.

'One benefit of the increased accuracy of the location is on site. When roads authority inspectors are on the ground at a road with multiple reinstatements, it can be difficult for them to locate the site that they should be inspecting. If they have a copy of the map plot with them, including the correct geographic reference, this can make identification of the correct reinstatement much simpler.'
Brian Cooper, East Lothian Council, RAUC(S) Co Chair

Public access

One of the legislative requirements of the revised Code of Practice for England/Wales was *'To facilitate access, street authorities must publish their register on their own public Internet website'.* Most local authorities are now doing this and most are using a GIS front-end to present roadworks information across their local authority area.

Scotland had one big advantage over England and Wales, in that the SRWR has 100% coverage for the whole of Scotland contained within a single system, as all road works that take place are recorded on the SRWR.

The SRWR has developed a simple Internet front-end for street works information called 'Scottish Road Works On-line'. This allows members of the public to view the Daily Whereabouts layer to see all current and planned roadworks, and can be found at **www.roadworksscotland.org**. As well as viewing the spatial location of the works, the user can view the attributes of the works, for example, start/end dates, description of works, works promoter contact details and so on.

Indicators

The SRWR produces a variety of statistical reports related to a range of performance and monitoring issues, including:

- fixed penalty notices and potential fixed penalty notices;
- roads authority noticing failures;
- emergency and urgent works;
- early start requests;
- NRSWA 'direction' and 'delay' notices; and
- works extensions.

These Indicators are seen as being the key to improving the performance of roads authorities and utilities as it is now possible for each organisation to benchmark against a range of others.

Scottish Road Works Commissioner statistical Indicators can be found on the Commissioner website at **www.roadworksscotland.gov.uk**

Centrally managed service

Providing a centrally managed system frees up staff time to concentrate on their core duties of co-ordination and management of works. Each individual organisation does not have to dedicate resources to the procurement and ongoing management and maintenance of its own individual system.

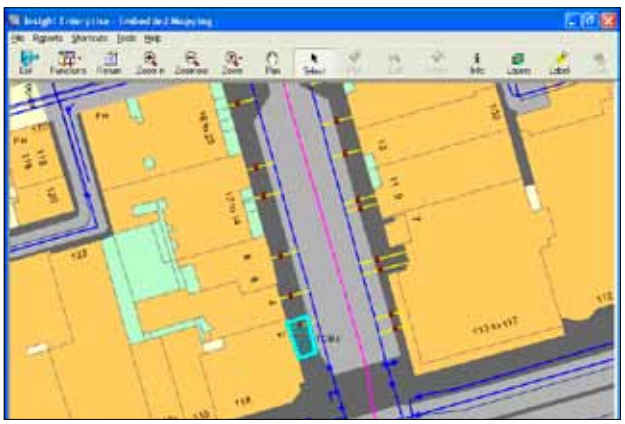
The management is undertaken by the SRWR Management Group, which is drawn from members of the Scottish roadworks community. It has also been able to determine where development to the SRWR would provide added value to the system, and has project managed these developments through to delivery.

Ongoing improvements

Since the current system was implemented in 2006, feedback from the community has resulted in a raft of further improvements, which include:

- a consents and permissions module to enable consents and permissions (for skip, scaffolding, materials and so on) to be issued as well as recorded on the system;
- a self-service gazetteer validation tool;
- a process for requesting early and late starts and their management; and
- a suite of indicators measuring the performance of both roads authorities and undertakers.

Example SRWR information made available via a publicly accessible website.



Example display of underground plant linked to the OS MasterMap topography polygons.

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The future

Plant protection and VISTA trial

Scotland is represented on the Steering Group of The National Underground Assets Group (NUAG), which has set out its vision for the future of buried services. It aims to develop and implement standardised procedures on how location information is recorded and stored. This is to ensure that all of those with an interest in buried services can access and share information easily, with the aim of ensuring that works can be undertaken more effectively. The ultimate goal is to have the ability to visualise and distinguish, on demand, all underground asset records in any one given area. **www.nuag.co.uk**

Although the current Scottish system of Plant Information Requests (PIRs) works well to avoid plant damage, it is cumbersome for requesters to have to analyse the maps and plans from all of the roads authorities and utilities. It is also time-consuming for the plant owners to distribute the maps to the requesters every time the information is requested.

The Scottish roadworks community has recognised that with a central GIS datastore at the heart of the SRWR system, it should be possible for utilities and roads authorities digitised underground plant information to be made available to all other users via the SRWR.

The vision is that users will be able to interrogate the SRWR using the maps to find nearby underground plant at the earliest stages of planning their work. In many cases this would remove the need for the PIRs and in other cases it would relieve the administration burden for both the requester and the provider. With over 5 000 PIRs a year in Scotland, this simple act of publishing the GIS data on SRWR could save huge amounts of administration time. If the underground apparatus data contains depth information, there is also the prospect of users being able to view 3-D maps. The data could also be used by employees of both utilities and roads authorities called out to urgent situations without the need to go back to an office and obtain plans, thus improving safety and minimising the risk of damage to underground plant.

With a view to delivering the above vision, Scotland is taking part in the VISTA trial to evaluate the potential to use the SRWR as the portal for directly accessing plant information records held by the Scottish community. The ultimate concept of NUAG and VISTA is to use the SRWR to seamlessly access, via the Internet, a map-based interface showing the underground plant information from all utility companies and roads authorities taken directly from their own systems, so that it is always completely up to date.

Although the stage 1 trial undertaken this year was limited to using data from Scottish Water®, Scottish and Southern Energy®, Perth & Kinross Council and Transport Scotland over a limited geographic area, it did prove the concept to be operationally feasible across the different proprietary systems feeding the data into the Register. The next stage of the trial is being planned, and it is hoped that this will operate over a wider geographic area with a larger number of organisations streaming their data into the SRWR.

It is recognised that there may be issues of commercial and political sensitivity related to sharing this data, and a clear need for the data providers to clearly state the level of accuracy and currency of the data they are supplying. However, it is considered that these issues can be addressed and it will be possible to provide the plant protection benefits in the near future.

'I strongly support the NUAG and VISTA trials being undertaken. Anything which makes the sharing of accurate and up-to-date underground plant information with those who are required to plan and undertake roadworks has obvious benefits, particularly in relation to the safety of those undertaking the works.'
John Gooday, Scottish Road Works Commissioner

All of this discussion applies to street and roadworks across the whole of the UK. The SRWR has been used as an example, in particular because the shared community system approach makes progress easier. It can clearly be seen that not only is GIS currently at the heart of roadworks coordination but that it is a driving factor in pushing forward the boundaries of what can be achieved, and that this advancement is reliant on the use of OpenGIS® standards.

Mapping

There are plans to develop the system using the OS MasterMap Integrated Transport Network™ (ITN) Layer link TOID referenced to the road name as an associated data record, to deliver a topologically structured roads network which will deliver the solution for the 'potential conflict' concept, network routing information, and the impact on spatially referenced pinch-points such as focal points of congestion, major interchanges and reroutes for the public.

Third-party access to SRWR

It is recognised that there should be potential benefits to third-party organisations in having access to the roadworks information contained within the SRWR, especially now that the data is available in a map-based format. The Commissioner has developed an agreement to allow access to organisations that provide a public service such as bus companies, police forces, and the ambulance and fire services.

'Although SRWR is recognised as being one of the most advanced systems of its type, the Scottish roadworks community wishes to continue to develop it in the future to further maximise the benefits which it provides.'
Alex Rae, Scottish Water, RAUC(S) Co Chair

Collaboration

Thanks to the One Scotland Mapping Agreement, public services in Scotland now have greater and more flexible access to geographic information than ever before. The agreement brings the member organisations together to make sure that they are all able to get the most out of Ordnance Survey products within it, and understand the new terms that allow for greater data sharing between members who increasingly work in partnership with one another.

http://www.ordnancesurvey.co.uk/oswebsite/media/news/2009/may/onescotland.html

The One Scotland agreement includes a broad range of Ordnance Survey products, including OS MasterMap Topography and ITN Layers as well as almost all the supporting scales of contextual digital mapping. These products will support a diverse range of services, including transportation, land registration, grant and subsidy management, environmental protection, habitat mapping, emergency planning and response, community development initiatives.

'The SRWR is one such example of collaboration between public and private sector communities developing innovative solutions using Ordnance Survey's digital data as a core integrating platform.'
Marc Hobell Ordnance Survey.

And finally

'I am privileged to be the 'keeper' of the SRWR. Susiephone Ltd and the Scottish Road Works Register Management Group have over the last two decades developed and put into place a central electronic road works register covering the whole of Scotland. This is unique in probably being the only such national register anywhere in the world. Given that this system has been developed through a collaborative partnership of roads authorities and utilities makes its delivery and ongoing improvement a doubly remarkable success.'
John Gooday, the Scottish Road Works Commissioner

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