MANAGING AN ASSET THROUGH A CIVIL DEFENCE EMERGENCY

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ABSTRACT

Modern asset management systems and Tools are about reducing the friction between the data and users so that asset owners and managers can focus on improved solutions. This is never more important than during an emergency when accurate and timely information needs to be shared.

Our advanced works management systems and dashboards allow for the visualisation and active management of all jobs, providing transparency of what is unfolding across the infrastructure assets in a timely way as well as indicating the extent of the issues. This allows for improved communication and reporting to key stakeholders, allowing the decision makers to act quickly during the early stages of an emergency event. It also supports the day to day management of reactive, routine and planned work activities where there are significant job volumes and conflicting priorities.

Downer has successfully applied these new systems and dashboards which is illustrated in the following case studies.

Case Study 1: Wanganui Civil Defence Emergency event June 2015: The largest flooding event to hit the Wanganui district since records began, with rivers rising to over 9m above normal levels, causing significant devastation. The Downer team were responsible for managing over 2,000 separate slip/dropout locations, numerous drainage system failures and bridging issues.

Case Study 2: Watercare Reticulation Maintenance Contract which commenced on 1 July 2015: This is the largest water reticulation contract in New Zealand with an average of 3,500 reactive jobs dispatched per month.

KEYWORDS

- **Data visualization**
- **Job management**
- **Sharing asset data**
- **System integration**

PRESENTER PROFILE

Helen is Chartered Civil Engineer with over 27 years' experience, including senior management roles within local authorities, consultancies and contractors. She has a strong background in asset management, maintenance, contract management, financial management, supply chain and operational effectiveness, across a range of utility services. This has given her a very broad background and the ability to build strong working relationships.

At Downer Helen works collaborative across the Infrastructure Services team, developing and implementing the asset management strategy and initiatives within the utilities business (Water, OSM and FM). She is focused on continuous improvement in the delivery of operations and maintenance contracts.

1 INTRODUCTION

This paper outlines how Downer has applied its in-house asset management system (Fuse) and Esri ArcGIS applications to successfully manage a major civil defence emergency on behalf of the Wanganui District Council and the transition of New Zealand's largest water reticulation maintenance contract for Watercare.

2 FUSE APPLICATION

Fuse is Downer's asset management system which uses the latest spatial enabled technology to hold asset data and links to job management system requirements. This enables better visualisation of the information held within the system linked to Esri ArcGIS platform maps and dashboards.

2.1 BENEFITS

Some of the benefits of Fuse include:

- Enhanced reporting via dashboards and integration with Esri GIS platform to deliver information to support business and engineering decisions.
- Standardisation of coding and workflow to enable multi-site and/or regional/national reporting.
- Standard reporting provided through to the people that need access to the information - decision makers and clients.
- Fuse is an enterprise system allowing tight integration with other key systems.
- Fuse enables the business to drive operational improvements through programme analysis, delivery and reporting efficiencies.
- Assets can be 'rolled back in time' to see and analyse previous states of performance and then advanced forward to enable better planning.

3 ESRI ARCGIS APPLICATIONS AND TOOLS

Downer has significant expertise in the application of GIS and is one of only two Esri Gold Partners. This has allowed Downer to develop a range of GIS tools to support its Infrastructure Services business. The use of GIS dashboards linked to real time job management information aids in the dispatching process to visualise data held within the work management system. In addition, inspection data is captured electronically in the field and is immediately available for viewing through a portal. This enables real time access to inspection information by multiple stakeholders.

The following section summarises some of the GIS tools and associated benefits that Downer has developed.

Operational Dashboards - allow visual presentation of operational data such as work activities, priorities and status.

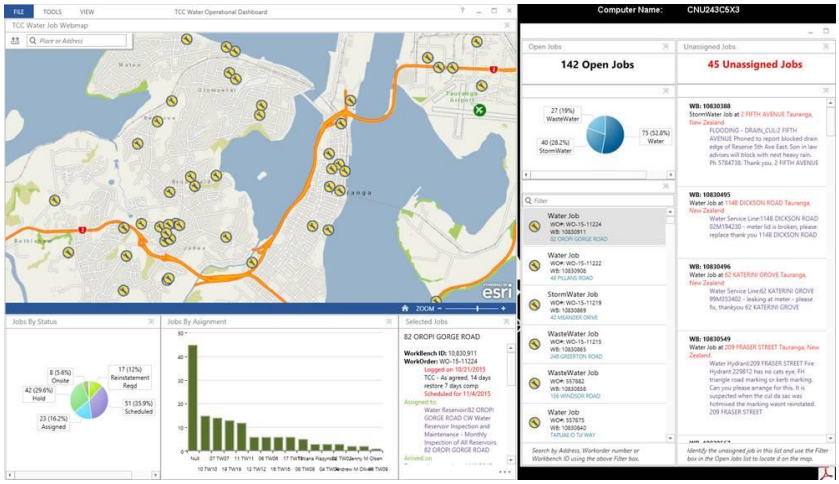


Image 1: Screenshot: Job locations, priorities and status.

Asset Collector - allows asset data to be captured in the field against a specific location or asset ID, including photographs.

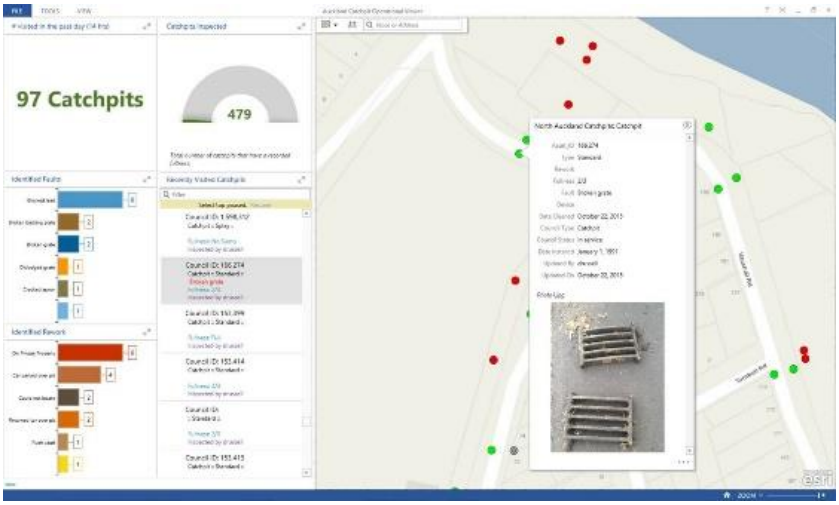


Image 2: Screenshot: Catch pit locations and data.

Survey 123 - allows site inspection results and reports to be captured in the field using standard templates and for information to be stored centrally for ease of access and analysis.

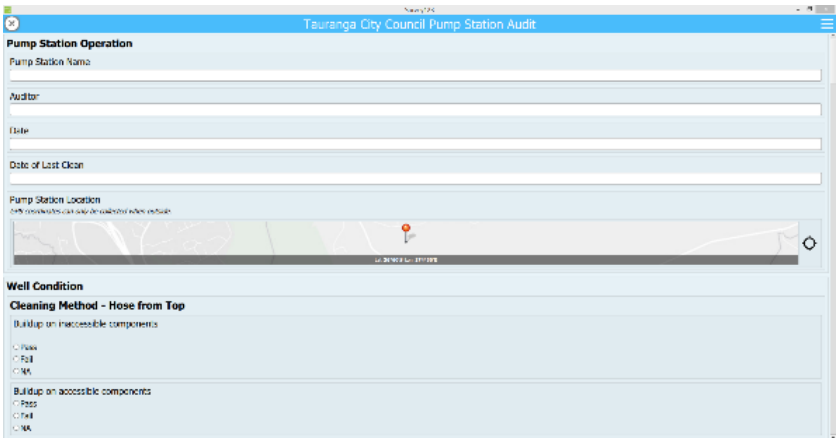


Image 3: Screenshot: Pump station inspection report.

Web Portal - uses GIS map portal to share and view inspection information enabling real time sharing of work completed and faults identified.

Network Route Analysis - determines shortest route for routine inspections to optimise travel time and enables better scheduling of crews.

3.1 BENEFITS

Some of the many benefits from the field data capture tools have included:

- Confirmation that routine activities have been completed as scheduled (providing clients with confidence that 'we do what we say we do');
- Identification and rescheduling of work that could not be accessed;
- Monitoring productivity, activities completed per day, km travelled per task;
- Identification of hotspots and optimisation of maintenance, inspection or cleaning frequencies;
- Identifying and recording asset condition and defects and making recommendations for capital improvements;
- Assigning and verifying field assets to a unique asset ID (previously this was not possible and is fundamental if the information is to be of value to the asset managers);
- Scheduling tool;
- Easy access to current information by the client;
- Spatial view of information that can also be presented as Excel data for analysis.

4 CASE STUDY 1: WANGANUI CIVIL DEFENCE EMERGENCY

On the 20th June 2015 the largest recorded flooding event occurred in the Wanganui district. Rivers rose over 9m above normal levels, causing significant devastation. This civil defence emergency required swift co-ordination of resources. Downer's initial response involved dispatching 40 crews across the region to clear the roads and associated drainage systems. The Downer team were responsible for managing over 2,000 separate slip/dropout locations, numerous drainage system failures and bridging issues.

4.1 THE STATS

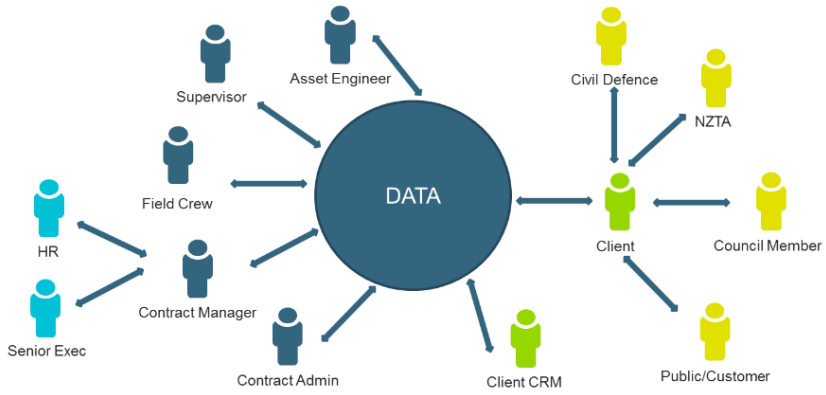
Fault	Count
Dropouts	293
Slips	888
Culvert/SWC	474
Other Flood Events	386

Est Repair Value: $23.5 Million

4.2 CHALLENGE

During a major civil defence emergency one of the key challenges is how to effectively communicate accurate information, that changes rapidly as the emergency unfolds, with multiple stakeholders. Key questions from the response team:

- How do we capture, manage and report information to relevant stakeholders?
- How do we do this effectively without duplication of effort, loss of data, or wasted time extracting information?



4.3 RESPONSE

Fundamental to Downer's response was its comprehensive asset and job management system (Fuse) that had just gone live as part of a new alliance contract between Downer and the Wanganui DC. As part of the Fuse implementation, the Alliance team had setup reporting frameworks with:

- Automated, standardised reporting.
- Reports developed with regard to specific needs from internal users, client, or NZTA. For example, the 'Summarised Defects by Road' report detailing location, quantity and rough estimate of repair costs. Also, detailed reports for each defect including photos.
- Access both internally and externally via SharePoint, to allow multiple stakeholders to view information.

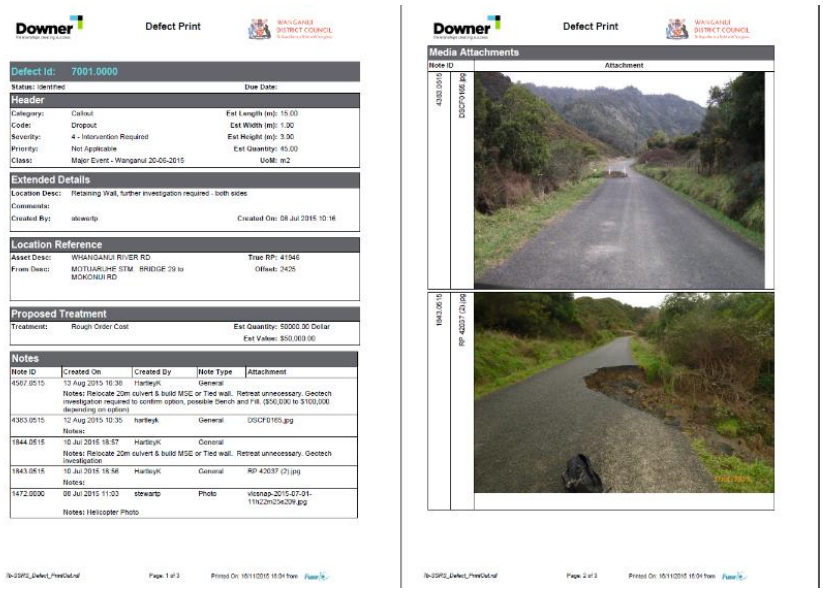


Image 4: Sample defect report.

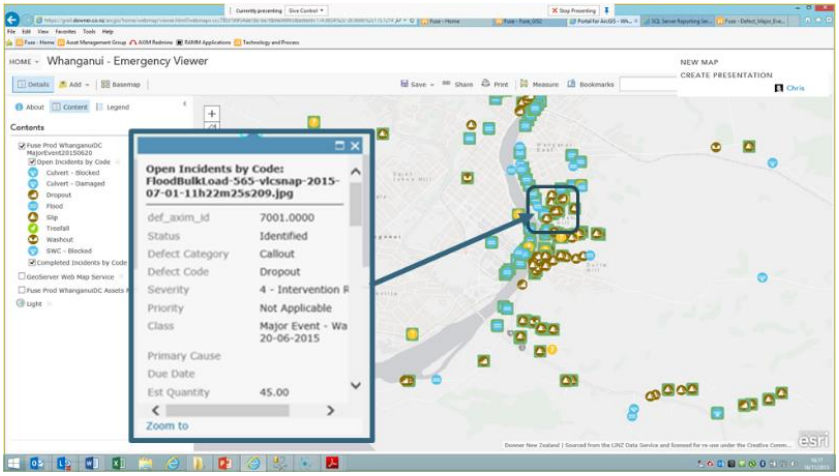


Image 5: Screenshot: Wanganui Emergency Viewer.

During the event Fuse was used to record location and quantities of defects during and after the event. Customer requests, received via the client call centre, were recorded in Fuse and assigned to crews for inspection/repair. Defects which were identified by the inspectors/field crew were linked to the relevant customer requests in Fuse. Downer also hired a helicopter to capture video for roads which we unable to be accessed. This gave greater coverage to the extent of the flooding damage, and defects identified using video footage were geospatially located, and could be recorded in Fuse against the network section. The system allowed full traceability and history of all jobs against the asset. Detailed information was available on expected time to complete individual repairs which assisted communication with customers (for example - areas without access may take four days to get assistance due to the slips along their road). Timely and accurate costings were provided to council due to a significant reduction in effort required to capture costs against completed work. All information was logged consistently within Fuse.

During the event Esri ArcGIS dashboards and maps were used with standardised symbology for event types, which made it easy to visualise the type and location of faults across the roading network. This assisted with the dispatching of crews and aligning their skills, plant and equipment with the nature and location of the fault.

The sharing and access to event information in real time via web portals to multiple stakeholders, with access to multimedia meant timely communication of information such as progress notes, photos, and video. This kept stakeholders informed as to how the clean-up works were progressing without tying up call centre, supervisors and field staff.

The new technology gave the ability to take spatially captured information and reference to linear network (helicopter video footage for example as shown below). This greatly reduced the time required to gain information about the extent of damage and repair requirements.

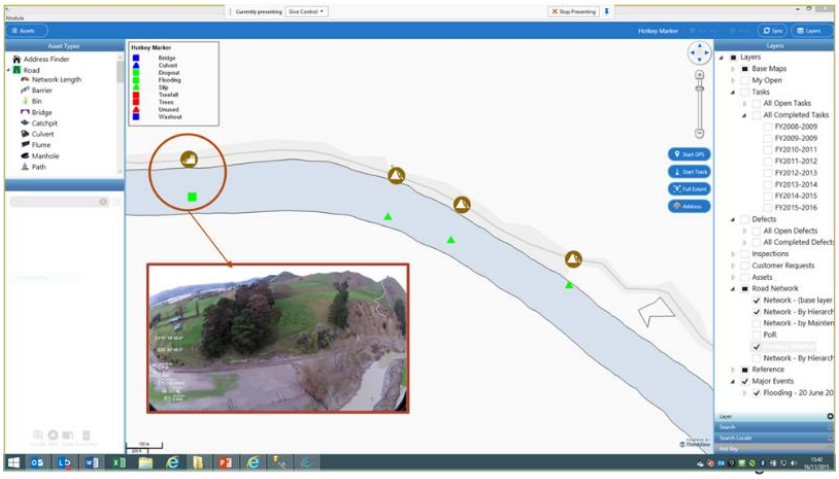


Image 6: Screenshot: Spatially captured info - video footage.

Previously it would have taken several months to fully identify the extent of damage and estimate the repair cost. For this major civil defence emergency the estimated cost of repair work was determined within two weeks by linking video and photo footage information to network assets and quantifying time and cost estimates.

The visualisation of information via GIS interface was used in meetings with Council Board members. Unlike written materials with multiple page reports and spreadsheets

the visualisation of the information made the communication process with key decision makers very easy as they were able to easily see the extent of the damage and impact on key parts of the roading network.

5 CASE STUDY 2: WATERCARE RETICULATION MAINTENANCE

In May/ June 2015 Downer transitioned into the largest water reticulation maintenance contract in New Zealand with an average of 3,500 reactive jobs per month and a workforce of 85 in-house staff plus sub-contractors across a network with approximately 165,000 customer connections. The level of work volume requires an effective job management and dispatching system with clear business processes and communication between client and contractor.

Part of the transition involved making changes to our job management system (which was already integrated with Watercare's asset management system, Hansen, due to our previous involvement in delivering water services to the Rodney District Council) to accommodate in excess of 1,500 individual scheduled work items as well as a significant increase in job volumes.

5.1 CHALLENGES

In addition to the high number of scheduled items and job volumes one of the key challenges during the first month of the contract was a requirement to pick up and manage a large backlog of maintenance activities left by the previous service provider. To complete this work in a timely and effective manner required effective job scheduling and management.

Other challenges involved data quality management and team training. A key to the successful roll out was the contract and IT teams ability to identify process faults and errors early and put in place controls to refine the business processes to address data quality issues. Alongside training programmes was the development of a series of system controls with standard dropdown menus. This helped to improve data quality and validation which supports claim accuracy. A number of reports were developed to check data quality and ensure all jobs were effectively managed from data transfer perspective. This ensures Watercare's Hansen asset management system is populated with correct information for future analysis and so the claim can be processed accurately. Given the complexity with the schedule of prices, large field crews, and high work volumes this is no easy task.

The accurate allocation of job priorities was also an important factor. If too many non-urgent events are allocated as urgent it affects the smooth dispatching of crews. With a significant volume of reactive jobs it is easy for crews to be dispatched ineffectively if status information is not accurate. There is a need to ensure that crews are dispatched to the true highest priority job before others. Also a need to keep on top of non-urgent routine work as new urgent jobs come through on a daily basis.

5.2 RESPONSE

As part of the systems integration improvements the Downer IT team were involved with:

- Building capacity within Downers hardware and software solutions for increased job volume;

- Refinement of data structures aligned to new reporting requirements;
- Verification of new asset register;
- Incorporating new schedule of prices with 1600 individual line items;
- Roll-out of field devices and training for staff of 85 plus subcontractors;
- Integration with ArcGIS tools to visualise data.

The Downer GIS team were involved and responsible for setting up and implementing the following GIS tools:

Operational Dashboard - used to track and dispatch both planned and reactive jobs.

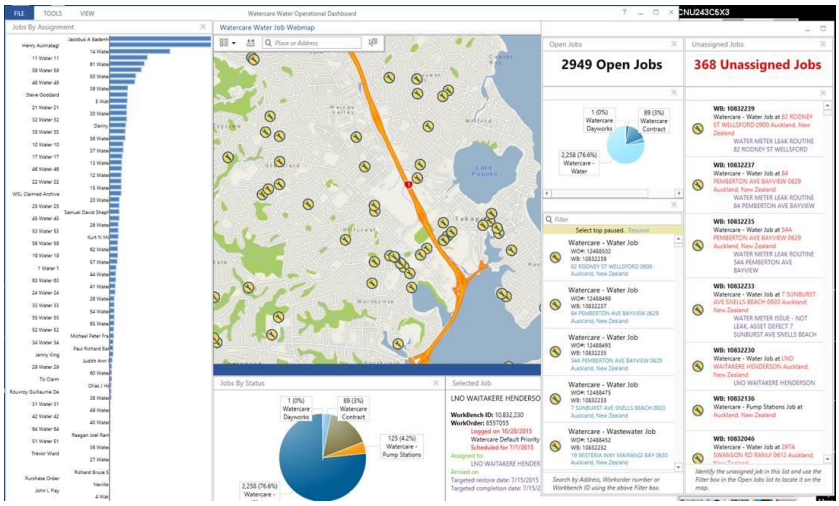


Image 7: Screenshot: Operational dashboard.

Using a colour coded priority system the status of jobs is easily recognisable. Additional symbols have been used to identify key customers that field crews can click on using their field device to determine any special needs or notifications that have been agreed and set up with the customer.

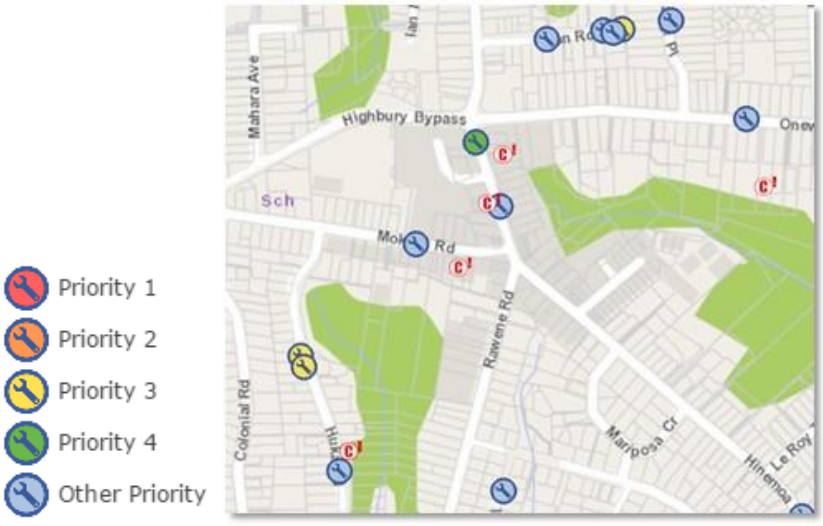


Image 8: Colour coded priority view.

Survey 123 and Geoforms - updating pump station operational data and recording of inspection information (base asset data, network data, overflow information) in electronic form and visualising that information via GIS web portal for ease of access to both field based and office based staff. Allows site inspection results and reports to be captured in the field using standard templates and for information to be stored centrally for ease of access and analysis (snapshot below).

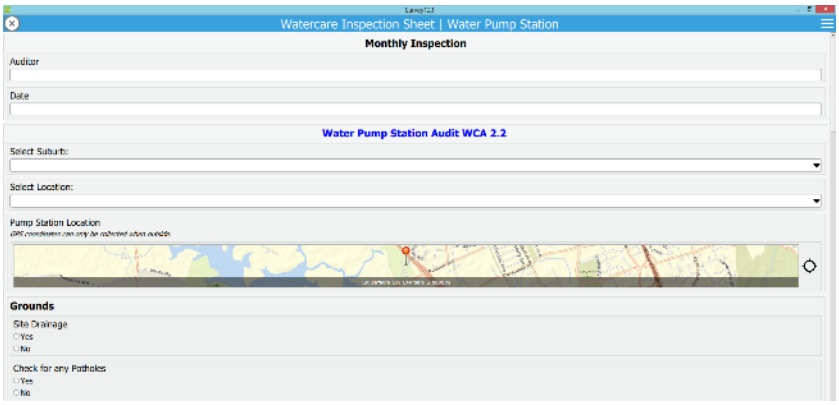
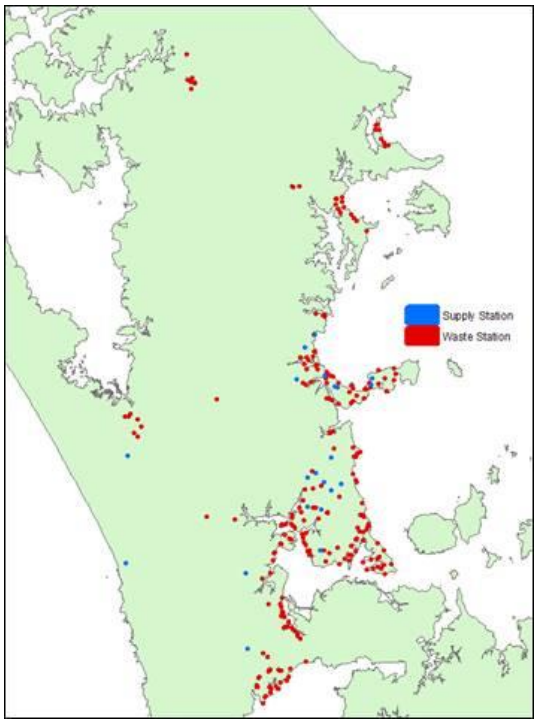


Image 9: Screenshot: form for capturing data in the field.

Network Route Analysis - used to determine the shortest route for routine pump station inspections to optimise travel time and enable better scheduling of crews.



Since the start of the contract work management systems, controls and business processes have been further developed and refined to smooth out the dispatching and claim processes. The Downer in-house IT and GIS teams have been working with contract teams to further refine systems. We have also reviewed maintenance work history recorded in the job management system to determine seasonal variations, trends across the network, common faults, and identification of urgent reticulation renewal requirements.

6 CONCLUSIONS

Modern spatially based asset and work management systems linked to GIS tools, with clear business process, can significantly improve the effectiveness of operations and maintenance contracts. The utilisation of best technology to visualise data as it is captured adds real value in reducing timeframes from the collection of data to the distribution of information to multiple stakeholders. Well-structured business processes that remove the duplication of effort, paper based data capture, and manual intervention improves operational effectiveness.

Another major outcome is that key decision makers and stakeholders benefit from improvements in receiving key information from field crews in a timely manner, which enables good data-based decision making to occur.

ACKNOWLEDGEMENTS

- Wanganui Alliance Team
- Watercare Contract Team