Leak Survey Management at Enbridge Gas Distribution Inc. Using an ArcGIS Server Solution

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Enbridge Gas Distribution Inc.

- Largest natural gas utility in Canada
- Longest-serving natural gas utility in Ontario with 166 years of history
- +2 million customers (+92% residential)
- 36,000km of transmission and distribution mains
- Distribute about 400 BCF of natural gas per year
- Own about 105 BCF of underground gas storage facilities

Project Description

Objective:

- Develop and implement a geospatially driven Leak Survey Management System

Project Details:

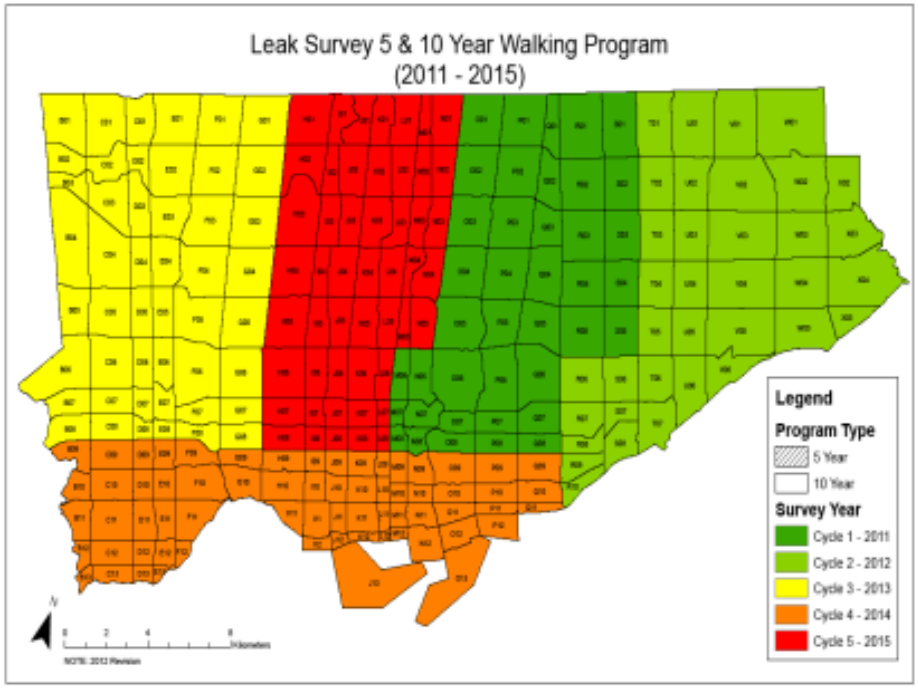
- Project began in early 2012 with a 12 month business requirements gathering process
- January 2013 released an invited RFP to potential vendors
- March to May 2013 evaluated proposals and awarded contract to 3-GIS LLC
- Agile build approach July 2013 to March 2014
- System and user testing from April to July 2014
- Implemented with 35 users in August 2014

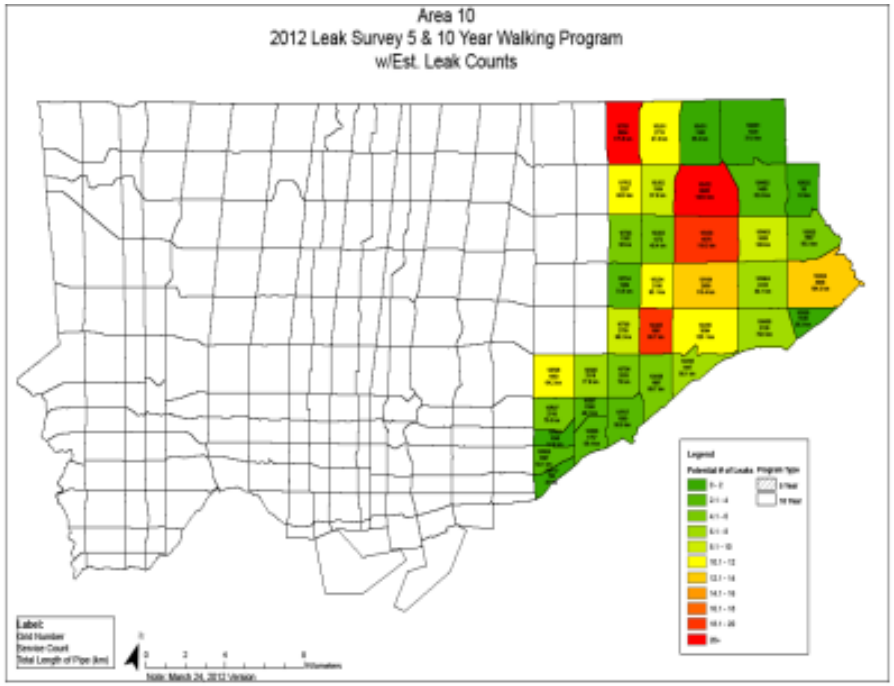
Leak Survey Operations

- EGD is legally required to perform regular leak surveys to detect and then remediate natural gas leaks.
- Performed by walking and driving in proximity to gas mains and services using sensitive detection equipment.

Summary Stats: Leak Survey Operation

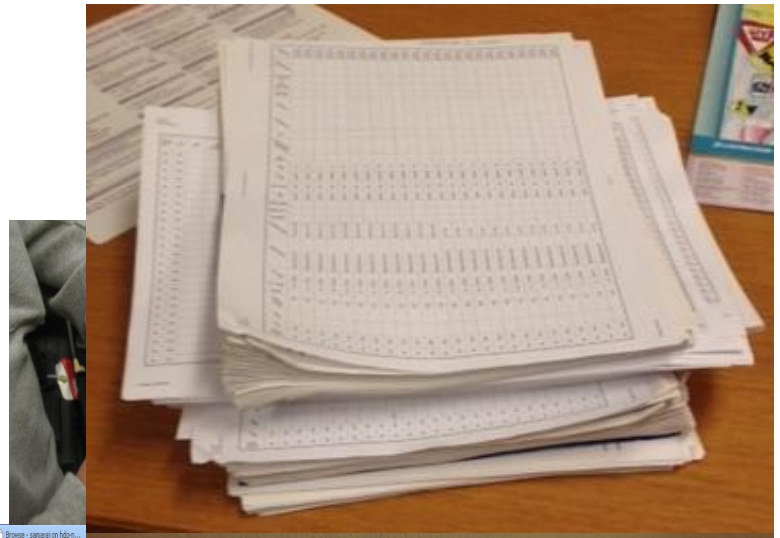
- 2013 Leak Survey Stats:
  - 467,000 gas services
  - 10,450 Kilometres of gas main
  - 2274 Leak indications found
  - 35 Leak Surveyors (Company and Contractor)

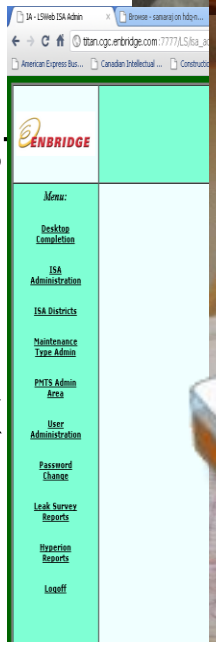




Previous System: LSWEB

- LSWEB implemented in 2007
- Web based application handled all creation, and scheduling
- Field computer used for field completions
- All users relied heavily on paper service listings and s need atlas plates
- Intensive backend upload process for contractor work





Leak Survey Management System Design Requirements

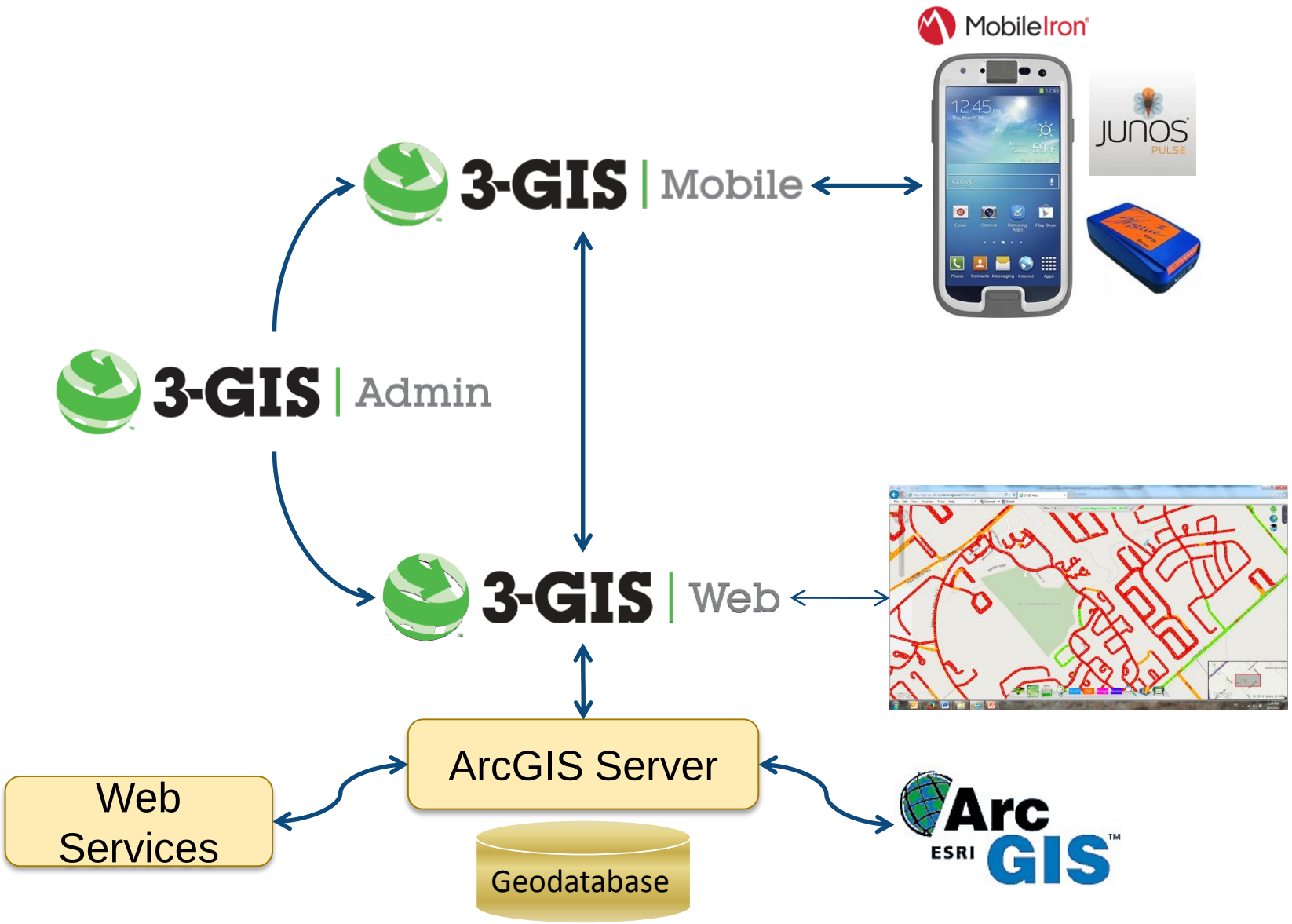
Three primary design objectives:

1. Leak Survey Program Management
   - Design and creation of survey programs
   - Scheduling
   - Assessment
   - Reporting
2. Focus on field execution
   - Ease of use for field users
3. Provide meaningful, accessible and defendable data
   - Right information in right format at right time

Leak Survey Management System

- LSMS is a GIS driven GPS tracked system to manage all Leak Survey programs from creation to completion
- Designed to work within the Esri ecosystem
- Office side application is web based
- Field side application designed to be deployed on any Android device
- Developed with 3-GIS a Gold Level esri Business Partner

System Overview



Focus on Field Execution

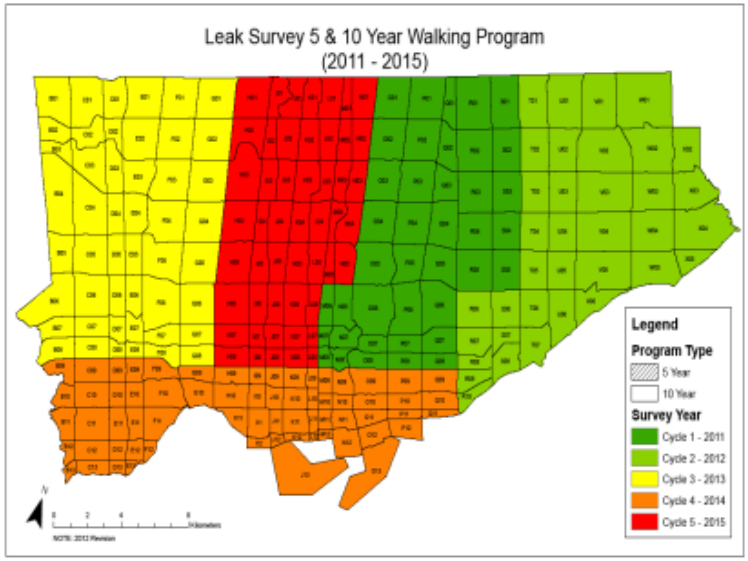
The system is designed to provide Leak Surveyors with:

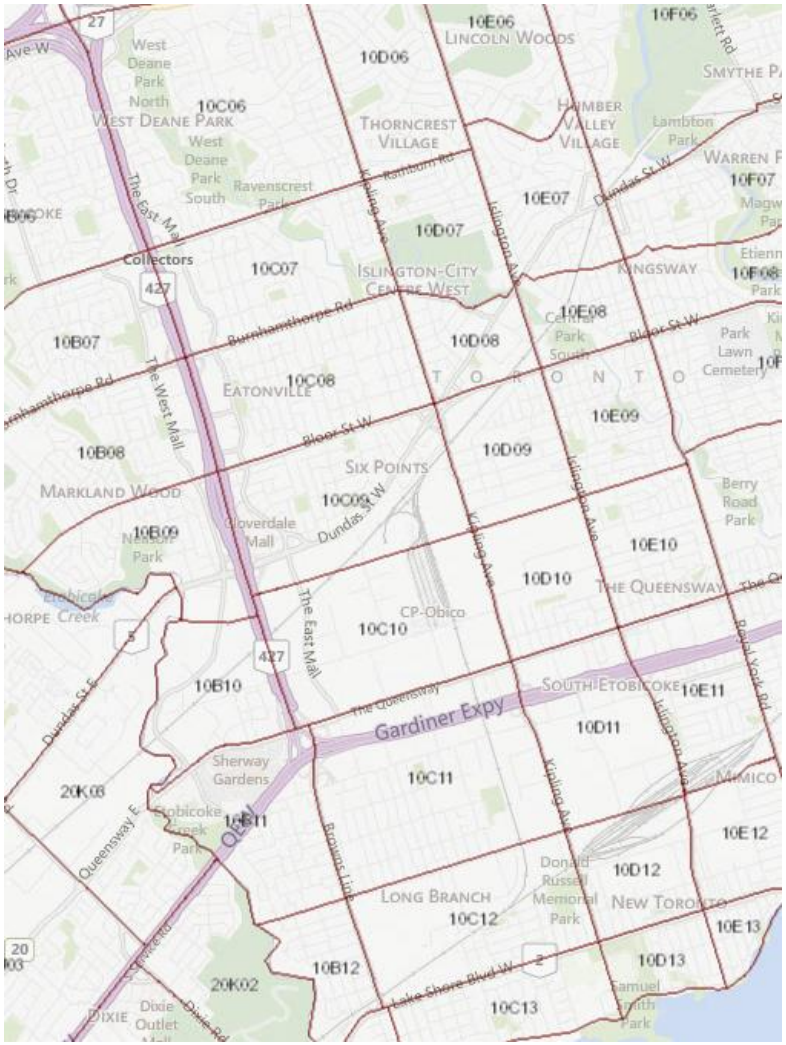
- Ability to get assigned work from any location having a mobile connection
- Ability to perform work without a mobile connection
- Have more detail and guidance of the assets needed to be surveyed and hazards that can be encountered when surveyed
- Log and report any survey findings
- Ability to record emergency surveys
- Fast data synchronization
- Not interfere with the leak surveying activity

Leak Survey Program Design

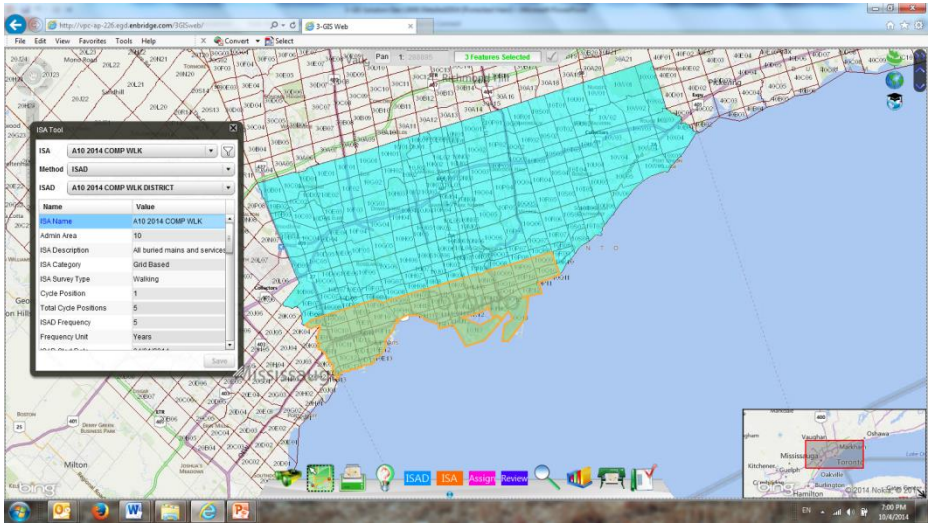
Background:

- Leak survey programs are primarily organized using a GIS Grid layer
- Cyclical (Months to 10 Years)
- Geospatially managed





Leak Survey Program Design



Inspection Survey Area District (ISAD)	+	Program Survey Type (PST)	=	Inspection Survey Area (ISA)
A collection of grid(s) used for a specific leak survey program		Type and kind of assets used to be surveyed		Executable leak survey program

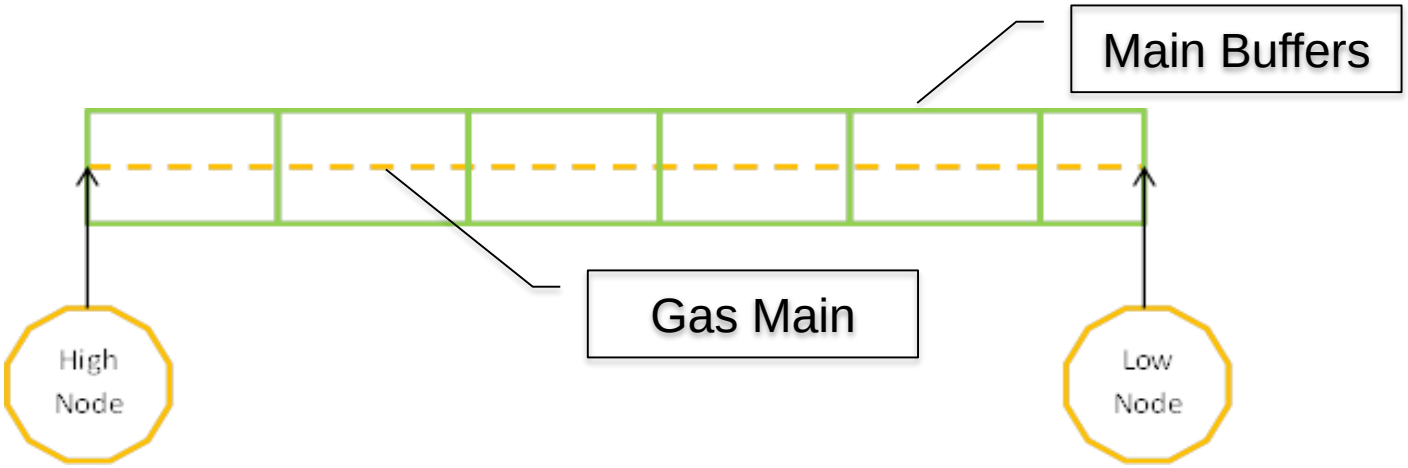
Gas Main Inspection Management

Challenge:

- Relate a GPS recorded survey path to a particular gas main asset
- Provisions for data and GPS inaccuracies

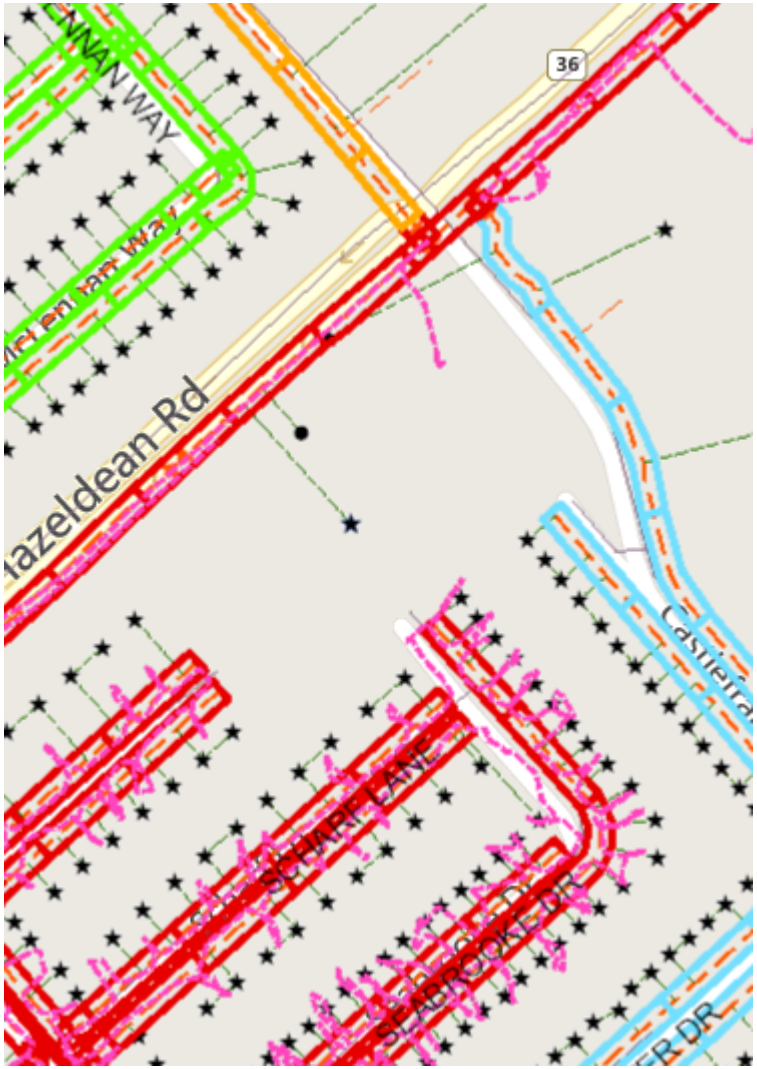
Solution:

- Generation of customizable colour coded **Main Buffers** that are linked to the gas main and the survey path



Gas Main Inspection Management
Main Buffer Generation

Gas Main Inspection Management
Leak Surveyor Completion



- Based on Surveyor's location within the main buffer the survey status of the main buffer completes automatically.
- Main buffers are colour coded to illustrate survey status
  - GREEN is not completed
  - RED is Automatically Completed
  - ORANGE is Manually Completed
  - BLUE is Unable to Survey

Gas Service Inspection Management

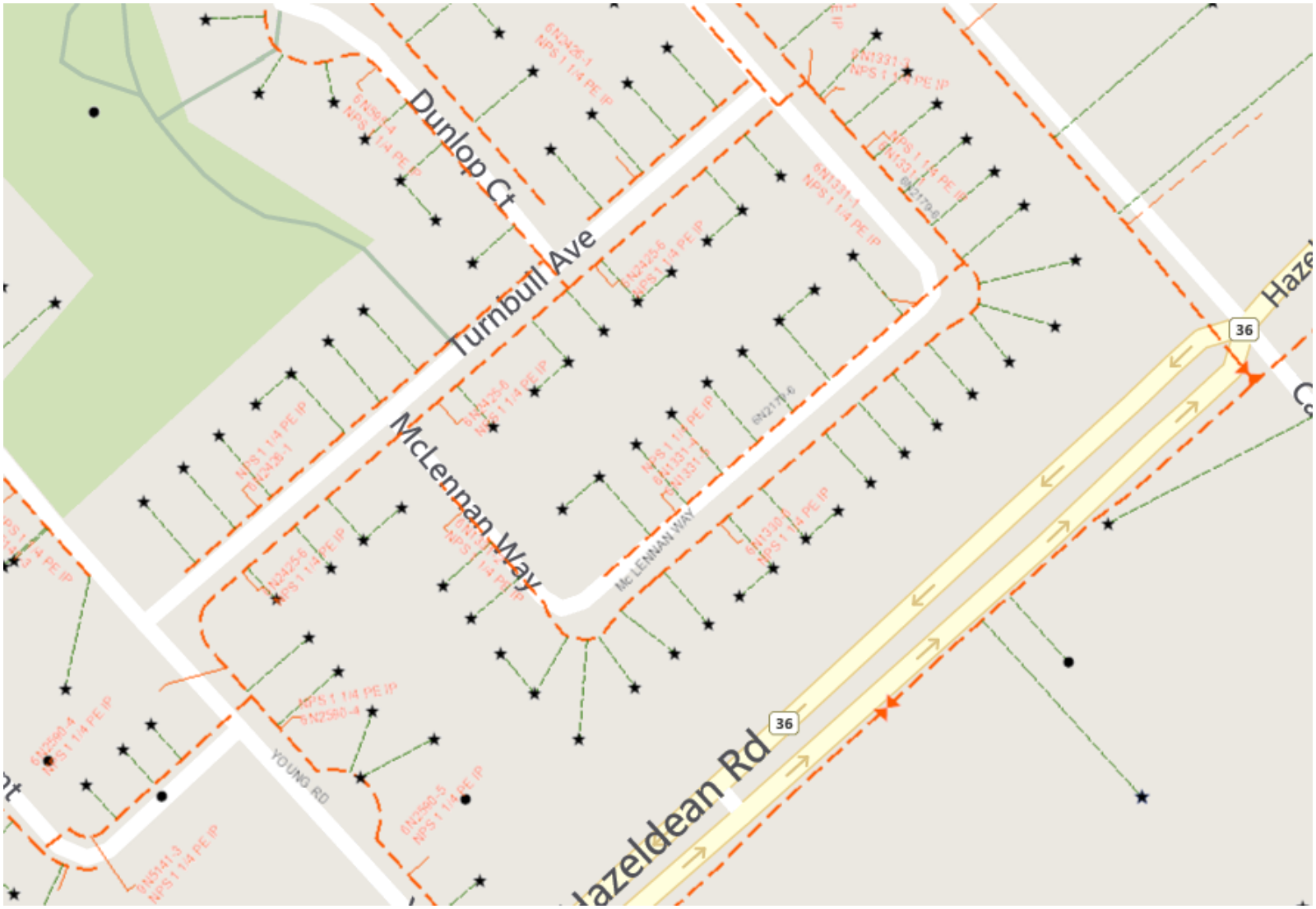
Challenge:

- Do we relate a GPS recorded survey path to a particular gas service asset?
- Provisions for virtual service lines, data and GPS inaccuracies

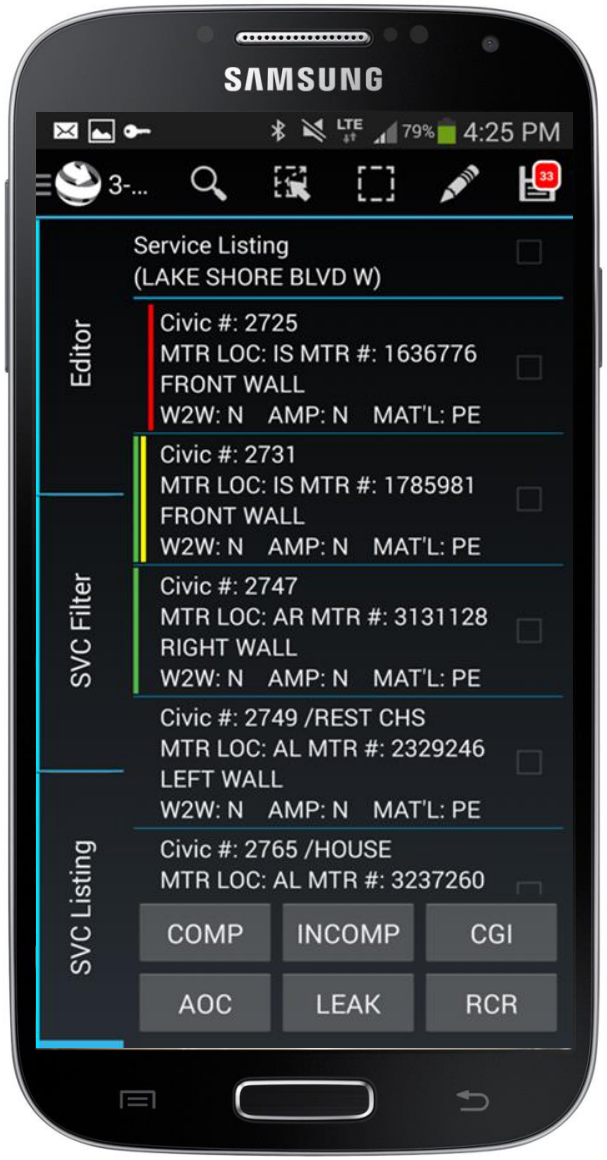
Solution:

- Tabular service listings with based on Surveyor's field requirements
- Services selected to be part of the program based on:
  1. The service attributes (e.g. Copper, W2W, Farm Taps)
  2. The address point's (Centroid) location with ISAD

Gas Service Inspection Management
Service Listing Program Generation

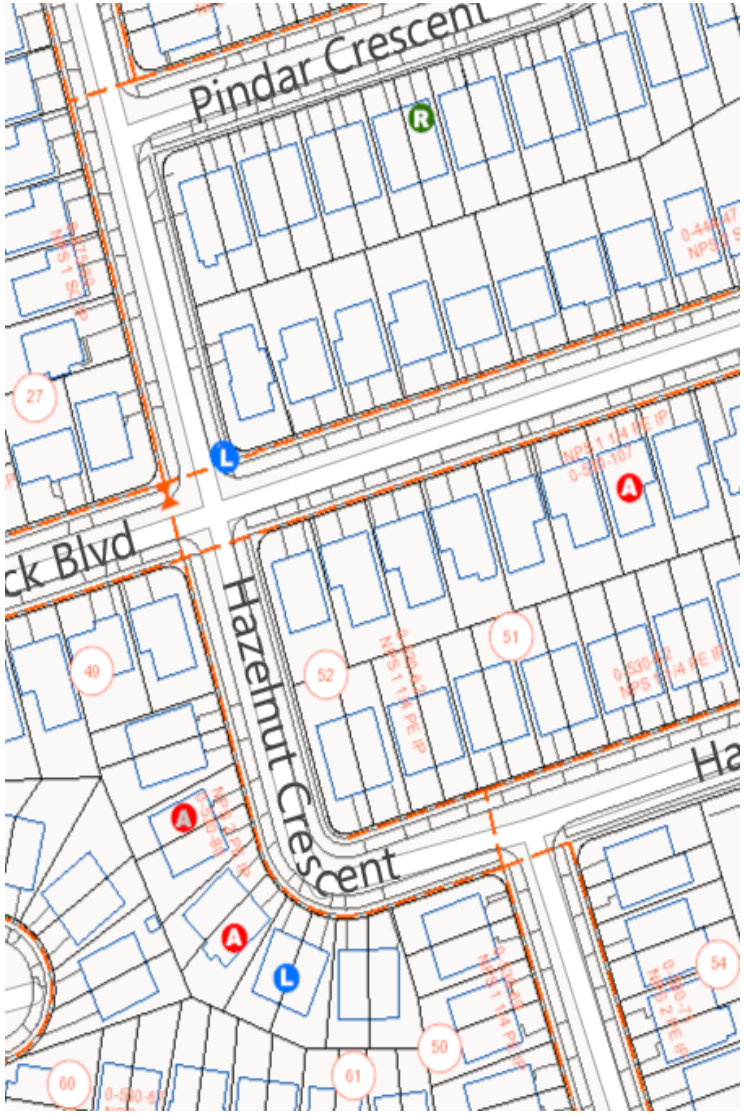


Gas Service Inspection Management
Leak Surveyor Completion



- Service listings can be filtered and organized several ways for the user
- Service listings are produced and colour coded to illustrate known hazards, found features, and survey completions
- Commands to:
  - Complete survey events
  - Record access issues
  - Create Leaks, Abnormal Operating Conditions and Record Correct Requests
- Service details with relevant location, installation, and hazard details

Feature Identification Management



- All features found by Leak Surveyors are mapped to the service or main asset that it was found on, found features include:
  - Leak Indications
  - Abnormal Operating Conditions (AOC)
  - Records Correction Requests
- This information is sharable and retrievable by other Leak Surveyors.

Program Control and Assessment

Challenge:

- Assurance that program work is completed
- Maintained oversight of survey quality and findings

Solution:

- Review tool with functionality to allow quick assessment of the program's completion and findings at the program level down to the survey event level.
- Provide zoom function to allow Supervisors to easily check on Leak Surveyor's spatial work from the tabular survey event level.

Program Control and Assessment

Review Tool

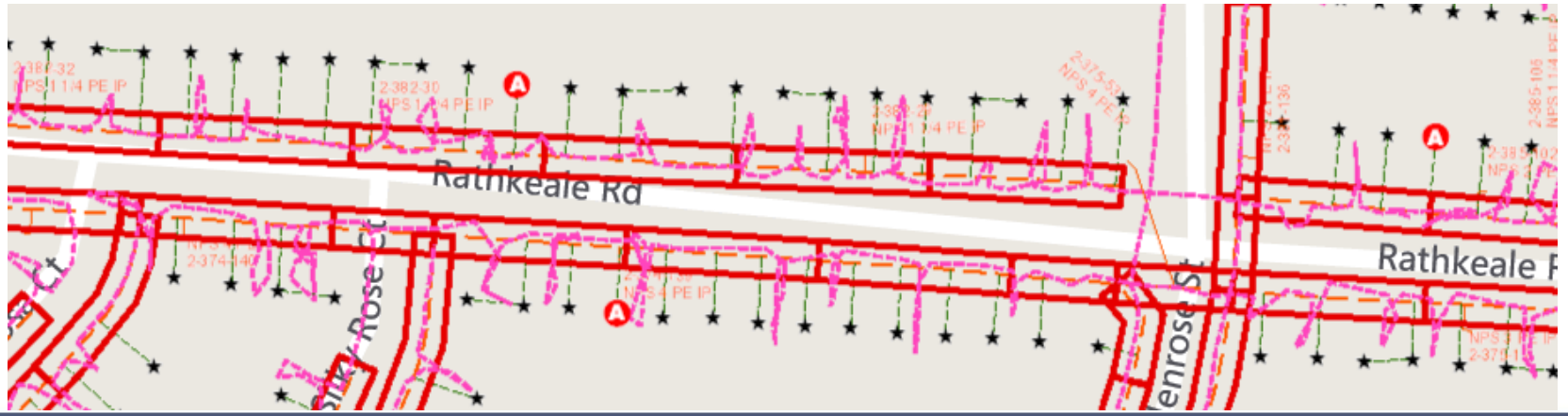
ISA: A20 2014 WLK COMP

ISA Name	Grid Name	Total No Service	Total Meters of Mains	% of Services	% of Mains	Crew	Status
A20 2014 WLK COMP	20D06	6439	109081	99%	98%	kessinip	Active
A20 2014 WLK COMP	20E05	4222	66172	36%	37%	costellp, garbea	Active
A20 2014 WLK COMP	20E06	5353	63122	95%	99%	kessinip	Active
A20 2014 WLK COMP	20F06	5618	72394	99%	100%	kessinip	Active
A20 2014 WLK COMP	20G05	3077	52382	9%	7%	kyddm, dykstraz, edwards2	Active

Completed | Load Events | Historical

Asset ID	Asset Type	House Number	Street Name	Premise ID	Surveyed By	Surveyed On	Survey Status	CGI Indicator	Leak Indicator	AOC Indicator
1653164	Service	4830	RATHKEALE RD	1094387	garbea	08/28/2014	Manual Complete			
1071127	Service	4952	NATKARNI CRES	1177266	garbea	08/27/2014	Manual Complete			
2072547	Service	4656	CROSSCREEK CRT	1102425	garbea	08/27/2014	Manual Complete			
1787765	Service	4771	RATHKEALE RD	1366875	garbea	08/28/2014	Manual Complete			
2580124	Service	1461	EDENROSE ST	1113770	garbea	08/28/2014	Manual Complete			

Zoom | Details | Reject | Completed: 1741 Total: 4740 Loaded Isa: A20 2014 WLK COMP Loaded Grid: 20E05



Since System Implementation

Implemented Mid-August 2014

First 60 days of use:

- Created more than 360,000 survey events including 6,000km of main buffers
- Leak Surveyors have completed:
  - More than 60,000 gas service line surveys
  - More than 1,000km of gas main surveys

User Feedback

- Love the device!!! Nice to be able to capture the little nuances and show them in the bread-crumb trail. User friendly and far faster for service references. I used to spend a lot of time referencing EGIS, huge savings! Only the third day in the field with it, but already I'm a disciple! – WH

- Everyone truly did embrace the new technology and were more than pleased with the finished product! –PC

- Love the system! - MK

Questions?

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