TOWNSHIP OF SOUTH FRONTENAC
COMMITTEE OF THE WHOLE MEETING
AGENDA

This will be a joint meeting with the Township of Central Frontenac to review the presentation from ORH on a Joint Station Location and Fleet Study. South Frontenac Council will be joining a Central Frontenac Council meeting already in progress.

TIME:	5:00 PM,
DATE:	Tuesday, January 25, 2022
PLACE:	Council Chambers.

1. *Join Central Frontenac's Council meeting (already in progress)*

(a) South Frontenac will not be streaming this meeting to their Facebook Live page as Central Frontenac is the designated host for this meeting.

Members of the public who wish to join this meeting virtually can register themselves.

2. *Reports Requiring Direction*

(a) Joint Station Location and Fleet Study - Final Report from ORH 2 - 115

3. *Adjournment*

(a) South Frontenac will adjourn this meeting when the presentation has been completed.

A regular Council meeting is scheduled for 7:00 pm.

Natural, Vibrant and Growing - A Progressive Rural Leader

Joint Station Location and Fleet Study

South and Central Frontenac

Final Report

January 21, 2022

PLAN. PREPARE. PERFORM.

Disclaimer and Accreditations

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ORH's information security management system is ISO 27001:2017 certified: evidence of ORH's commitment to implementing international best practice with regard to data security.

Disclaimer

The information in this report is presented in good faith using the information available to ORH at the time of preparation. It is provided on the basis that the authors of the report are not liable to any person or organization for any damage or loss which may occur in relation to taking, or not taking, action in respect of any information or advice within the document.

Accreditations

Other than data provided by SFT/CFT, this report also contains data from the following sources:

Executive Summary

- ORH is pleased to provide this final report for a joint station location study to South and Central Frontenac townships.
- We have taken an iterative, data-driven approach to assessing station locations, combining analysis of historical data, sophisticated optimization modelling and consultancy with both townships.
- The modelling has shown that the distribution of stations is generally well-aligned to covering residential properties and roads, however some opportunities for improvement could be achieved when station rebuilds are required.
- Although no immediate efficiencies were identified in terms of shared locations, these should be considered as the population grows in future years.

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Background and Scope

Introduction

- Operational Research in Health Limited (ORH) is pleased to provide this final report for a Join Fire Station Location and Fleet Study to South and Central Frontenac.
- The purpose of this study was to review the current fire station locations and resources in both townships.
- ORH has a tried and tested approach to this type of review, combining analysis, modelling and consultancy.
- We applied this methodology, tailored to the specific requirements of the two townships, to complete an iterative assessment of station locations.

Background

- There are currently 13 stations in South and Central Frontenac Fire and Rescue services:
  - SFFR = eight fire stations
  - CFFR = four fire stations and one sub-station
- With two exceptions, the current estate for SFFR needs significant upgrades or total rebuilds, so it is necessary to evaluate potential options for relocating and/or rationalizing stations in the area. This should be assessed for two future scenarios:
  - SFFR and CFFR continue to operate as independent fire services.
  - There is one joint fire service across the two townships.

Scope

- The key objective was to support SFFR and CFFR in making data-driven decisions around the future locations of fire stations and fleet across the townships.
- This had to determine the ability to provide suitable coverage from facilities, considering the potential for joint working between the two fire and rescue services.
- In the time available, ORH sought to :
  - Analyze historical incident demand
  - Build appropriate optimization and coverage models
  - Appraise current and optimal locations for all fire stations
  - Evaluate options for potential station combinations
  - Map travel times, road distance and coverage statistics

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About ORH

ORH helps emergency services around the world to optimise resource use and respond in the most effective and efficient way.

About ORH

We have set the benchmark for emergency service planning, with a proven approach that combines rigorous scientific analysis with experienced, insightful consultancy.

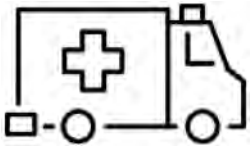
Our expert team uses sophisticated spatial interaction modelling techniques to identify opportunities for improvement and uncover hidden capacity.

The outputs of our work enable clients to make robust, data-driven decisions and explain them clearly to stakeholders.

Above all, we are committed to getting it right, for the good of our clients and the people who rely on their services.

Examples of ORH Global Experience

ORH Sectors

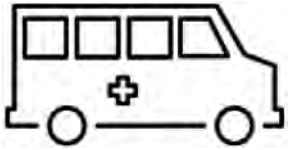


Emergency Medical Services

Police

Fire

Control Rooms



Non-Emergency Transport

Other Sectors

ORH Support to FRSs

Risk

- Quantifying Risks
- Identifying Relationships
- Targeting Activities

Resources

- Matching to Risk
- Optimal Locations
- Resource Types

Response

- Efficient and Effective
- Day-to-day Management
- Contingency Planning

Fire Service Planning Questions

What is the current level of demand and performance?

Where would facilities be located on a blank canvas basis?

Which vehicle types should the service deploy and where?

Where are the optimal locations for new stations?

Can the service provide a response to new types of incidents?

How does the level of risk vary across the service area?

What are the optimal hours for deploying units?

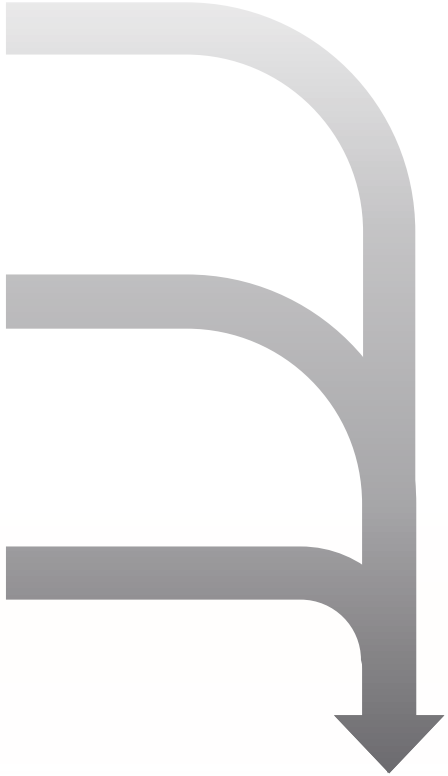
Which are the most appropriate crewing models?

How will population growth affect service delivery?

What targets should the service set for response?

ORH Data-Driven Process

Data	Identify sources Test reliability
Analysis	Service understanding Inform modelling
Modelling	Optimised solutions Test options for change



Consultation with the client throughout

Better Decision Making

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Approach and Timetable

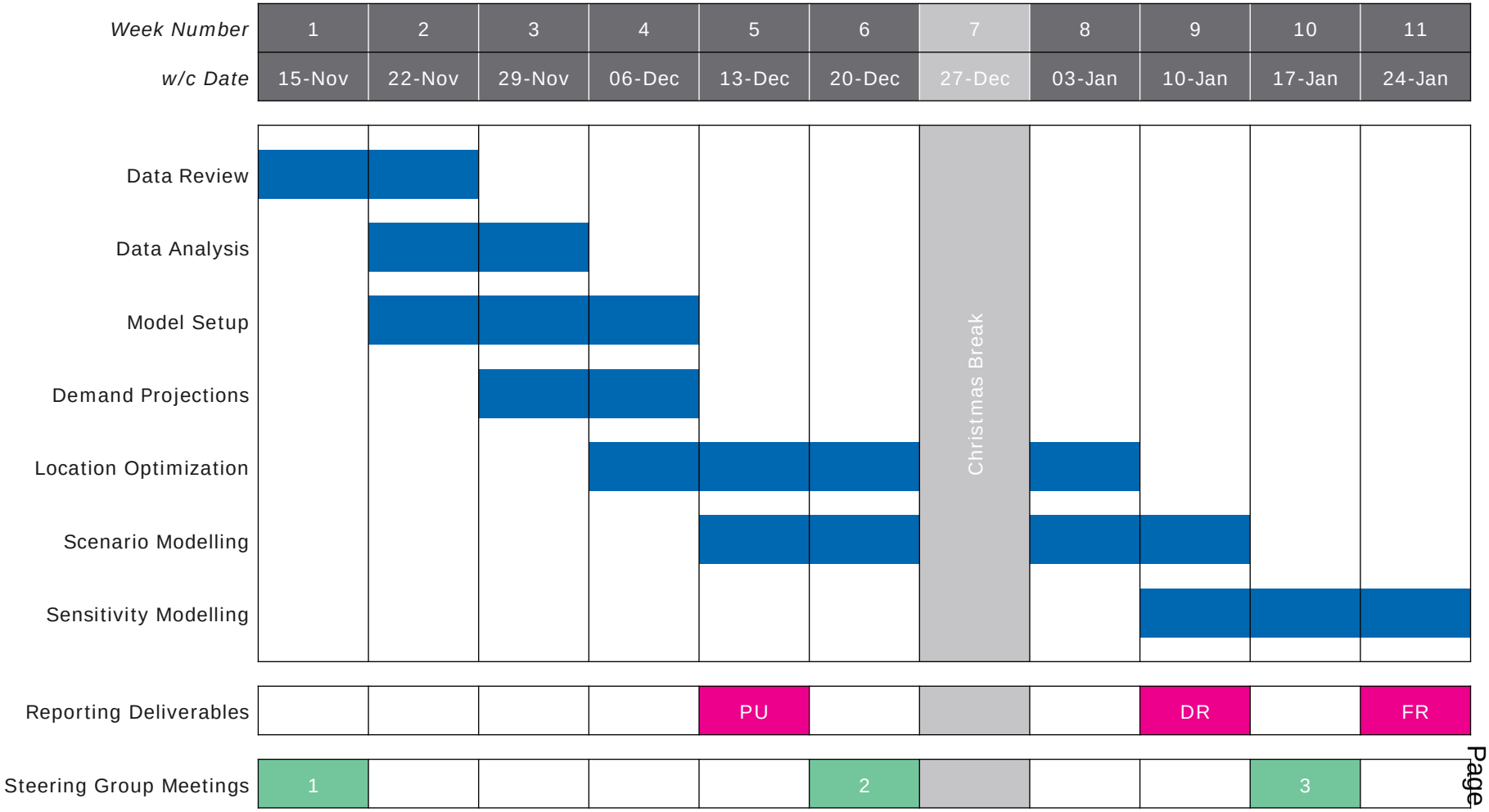
Approach (1)

- SFFR/CFFR formed a steering group comprised of the Fire Chief and the Chief Administrative Officer for each township.
- At the project initiation ORH discussed the requirements for data collection, finalized the project timetable and presented the proposed approach in more detail.
- SFFR/CFFR provided ORH with incident and response data from the past six years. ORH analyzed the data to build an understanding of demand trends.
- In addition, the County of Frontenac provided data on land use and addresses across the two townships.

Approach (2)

- Using commercially available travel time data, ORH built an appropriate model of journeys across the townships and verified this against historic response times. We then mapped the coverage provided by current stations.
- ORH conducted initial optimization runs to minimize average time to all roads in the townships. In agreement with the steering group, the objective was changed to maximizing coverage to residential properties and roads.
- In addition to township-wide and combined optimization runs, ORH modelled a series of changes to station locations as specified by SFFR/CFFR. For all options, ORH presented the coverage to properties and roads, compared to the current position.

Proposed Timetable



Key:

PU - Progress Update
DR - Final Report
FR - Final Report

SG Meeting 1 - Project Initiation, Data Collection and Stakeholder Engagement
SG Meeting 2 - Emerging Outcomes of Analysis and Initial Modelling Runs
SG Meeting 3 - Present Final Report and Outstanding Requirements

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Data Collection and Analysis

Data Requirements

- ORH specified the following data requirements…
- Incident and workload data
  - Detailed information for the past five years
  - Summary of the number of incidents by month/year
- Current and planned station locations, plus relevant additional information on station condition or size (number of bays for apparatus)
  - List of apparatus located at each station
- Volunteer availability or expected staff numbers by station
- Access to data on expected population change by locality
- Information on land use and/or addresses

Incident Data Requirements

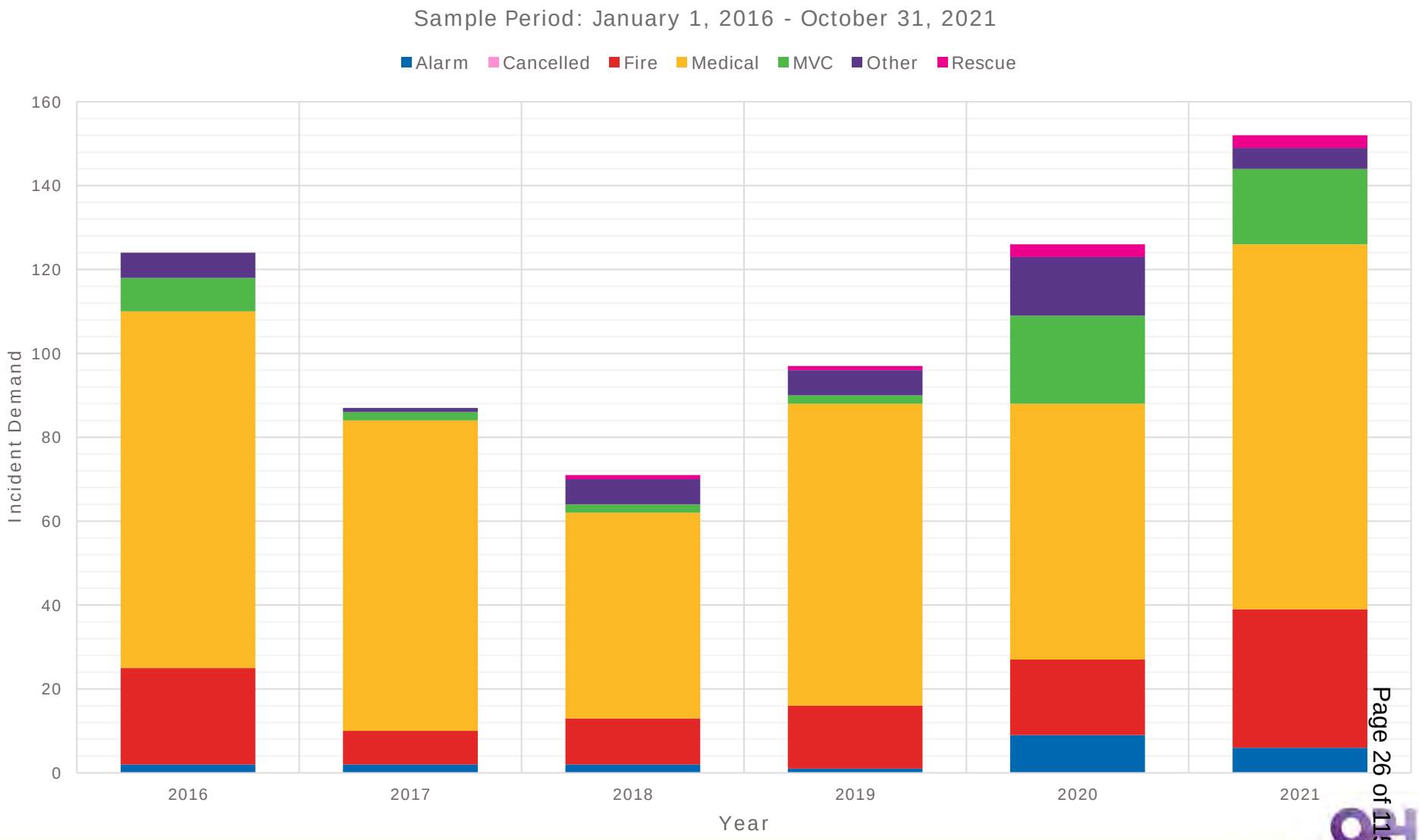
- For incident data, ORH provided an example of the key data fields, specifying that this should include all calls to which SFFR/CFFR mobilized a unit, including the location and type of call, plus key time fields...

Data Type	Field	Notes/format
Incident level data (one row per incident)	Incident ID	A unique identifier for the incident
	Date & Time of Call	YYYY-MM-DD hh:mm:ss
	Incident Location	Latitude and Longitude
	Incident Type	Specify whether this is at time of call or final category
Response level data (one row per response, can be multiple per incident)	Incident ID	To match to the incident data
	Unit ID	The responding unit's callsign/identifier
	Date & Time Vehicle Assigned	YYYY-MM-DD hh:mm:ss
	Date & Time Vehicle Mobilised	YYYY-MM-DD hh:mm:ss
	Date & Time Arrived at Scene	YYYY-MM-DD hh:mm:ss
	Date & Time Left Scene	YYYY-MM-DD hh:mm:ss

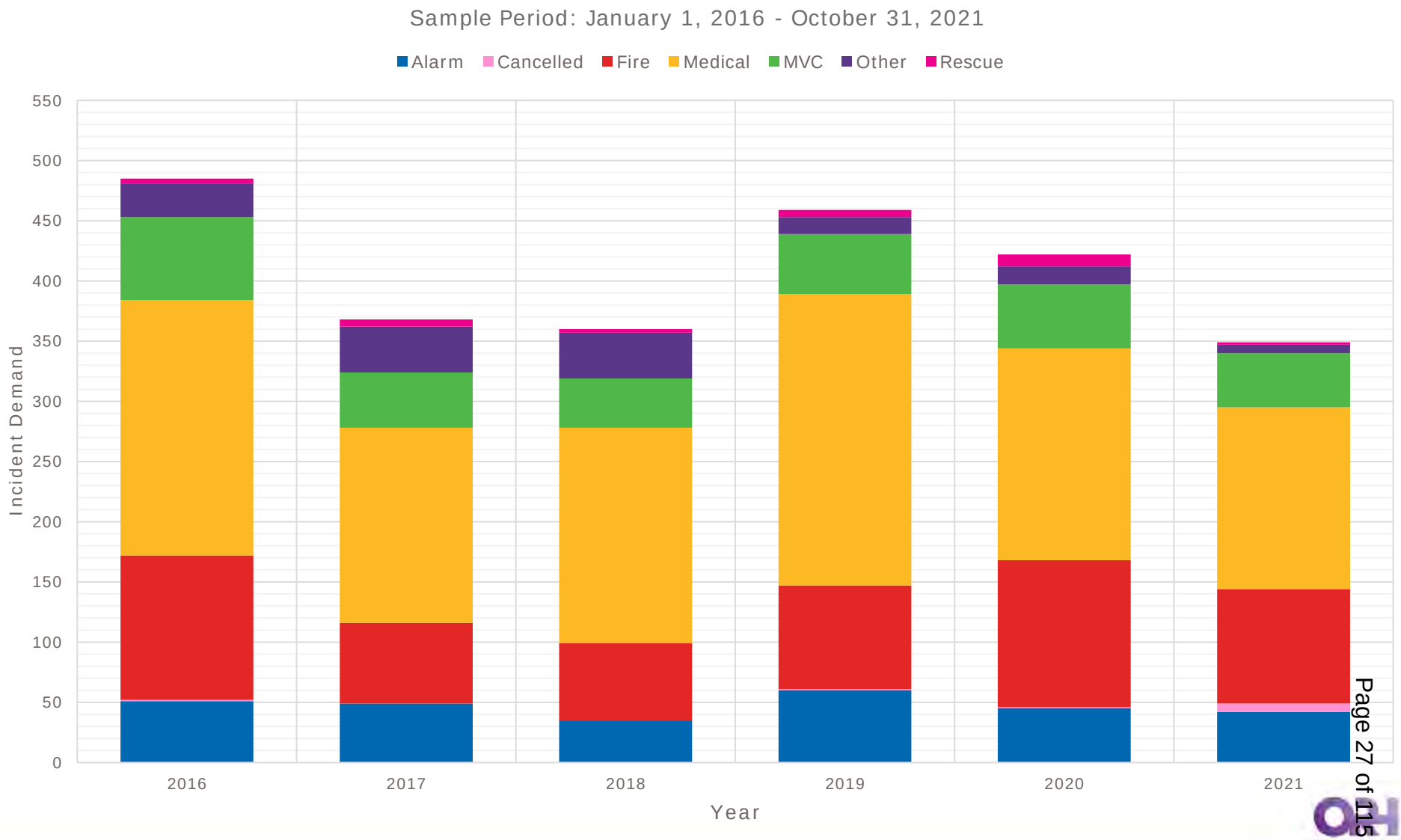
Incident Demand Analysis

- ORH analyzed the incident and response data provided by SFFR/CFFR to evaluate:
  - Trends for incident demand
  - Categories of incidents
  - Geographical distribution of incidents
  - Workload by station
- An incident is defined as any call in South or Central Frontenac to which at least one unit from SFFR/CFFR responded.

Total Incidents – Central Frontenac



Total Incidents – South Frontenac



Average Weekly Demand

Area	ORHCategory	2016	2017	2018	2019	2020	2021	Overall
Central Frontenac	Alarm	0.04	0.04	0.04	0.02	0.17	0.14	0.07
	Cancelled	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fire	0.44	0.15	0.21	0.29	0.35	0.76	0.35
	Medical	1.63	1.42	0.94	1.38	1.17	2.00	1.41
	MVC	0.15	0.04	0.04	0.04	0.40	0.41	0.17
	Other	0.11	0.02	0.12	0.12	0.27	0.12	0.12
	Rescue	0.00	0.00	0.02	0.02	0.06	0.07	0.03
	Overall	2.37	1.67	1.36	1.86	2.42	3.50	2.16
South Frontenac	Alarm	0.98	0.94	0.67	1.15	0.86	0.97	0.93
	Cancelled	0.02	0.00	0.00	0.02	0.02	0.16	0.03
	Fire	2.30	1.28	1.23	1.65	2.34	2.19	1.82
	Medical	4.05	3.11	3.43	4.64	3.38	3.48	3.69
	MVC	1.32	0.88	0.79	0.96	1.02	1.04	1.00
	Other	0.54	0.73	0.73	0.27	0.29	0.16	0.46
	Rescue	0.08	0.12	0.06	0.12	0.19	0.05	0.10
	Total	9.28	7.06	6.90	8.80	8.09	8.04	8.03

Station Workload

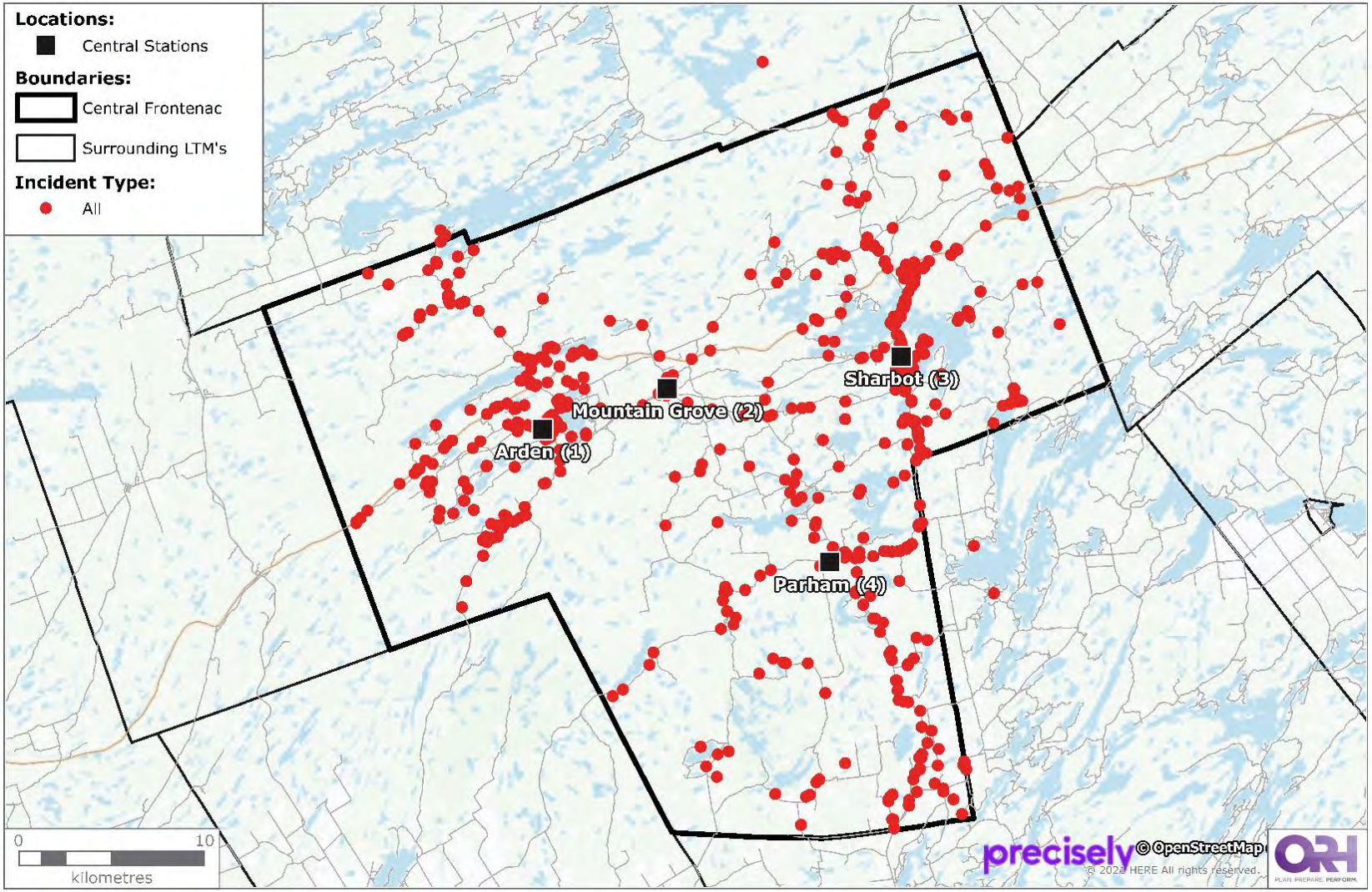
Area	Station	Total Incidents	Average Weekly
Central Frontenac	Arden (1)	264	0.87
	Mountain Grove (2)	51	0.17
	Sharbot (3)	236	0.78
	Parham (4)	106	0.35
	Overall	657	2.16
South Frontenac	Bradshaw (1)	67	0.22
	Burridge (2)	93	0.31
	Verona (3)	383	1.26
	Hartington (4)	379	1.25
	Sydenham (5)	424	1.39
	Perth Road (6)	351	1.15
	Latimer (7)	239	0.79
	Sunbury/Battersea (8)	403	1.32
	Overall	2,339	7.69

This table shows the number of incidents, based on the home station of the first responding unit, during the six-year data sample

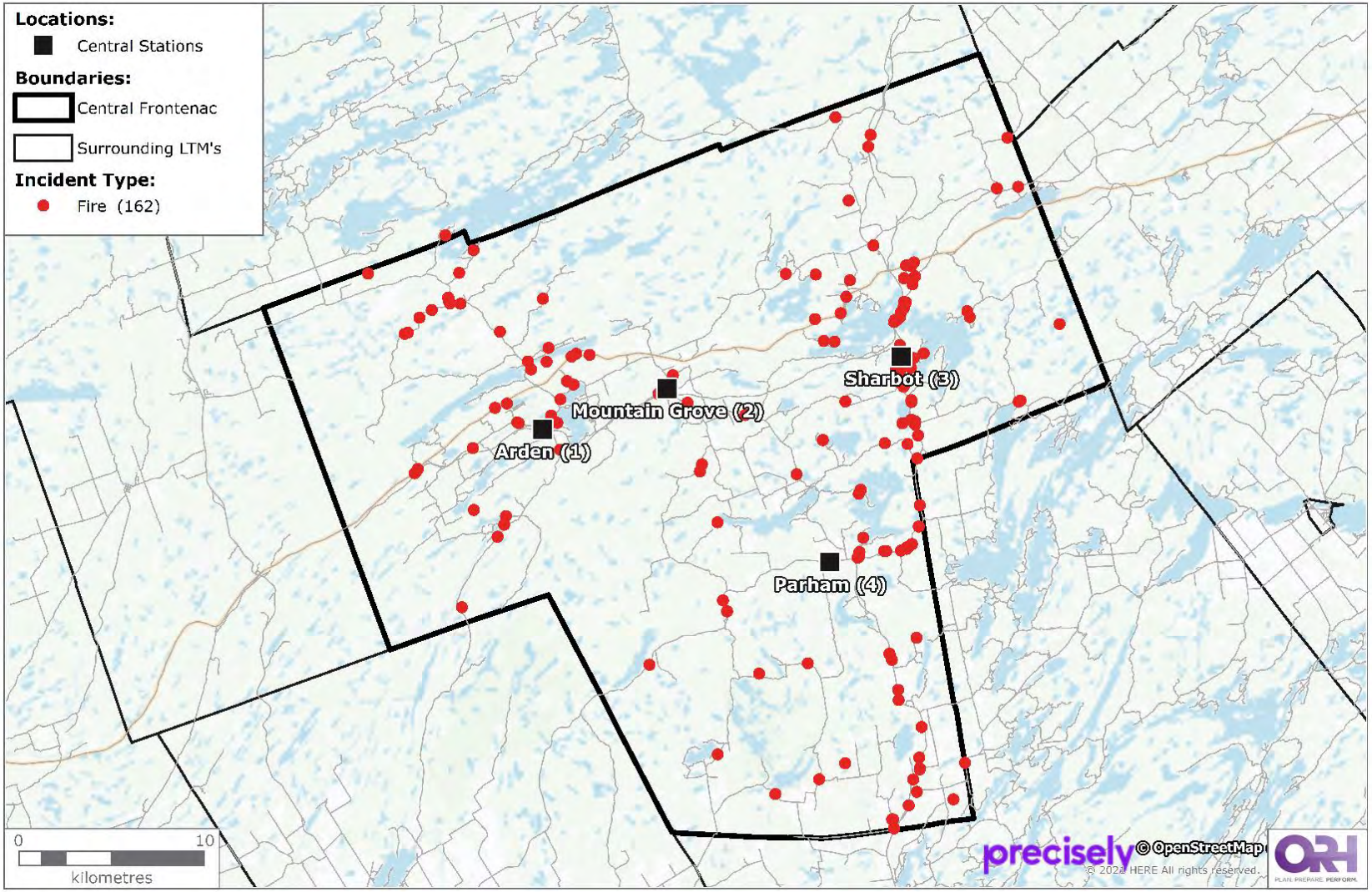
Incident Location Maps

- Using the incident data for both fire services, ORH produced maps showing the geographical distribution of incident locations in each township.
- The following maps represent each incident in the six-year sample period with a dot marking the coordinates that were recorded for the incident.
- There is a map of all incident locations in each township, followed by maps for incident categories: fires, alarms, motor vehicle collisions, medical and other incidents.
- In general, incidents are clustered in the built-up areas, although the road network can be identified in the MVC maps.

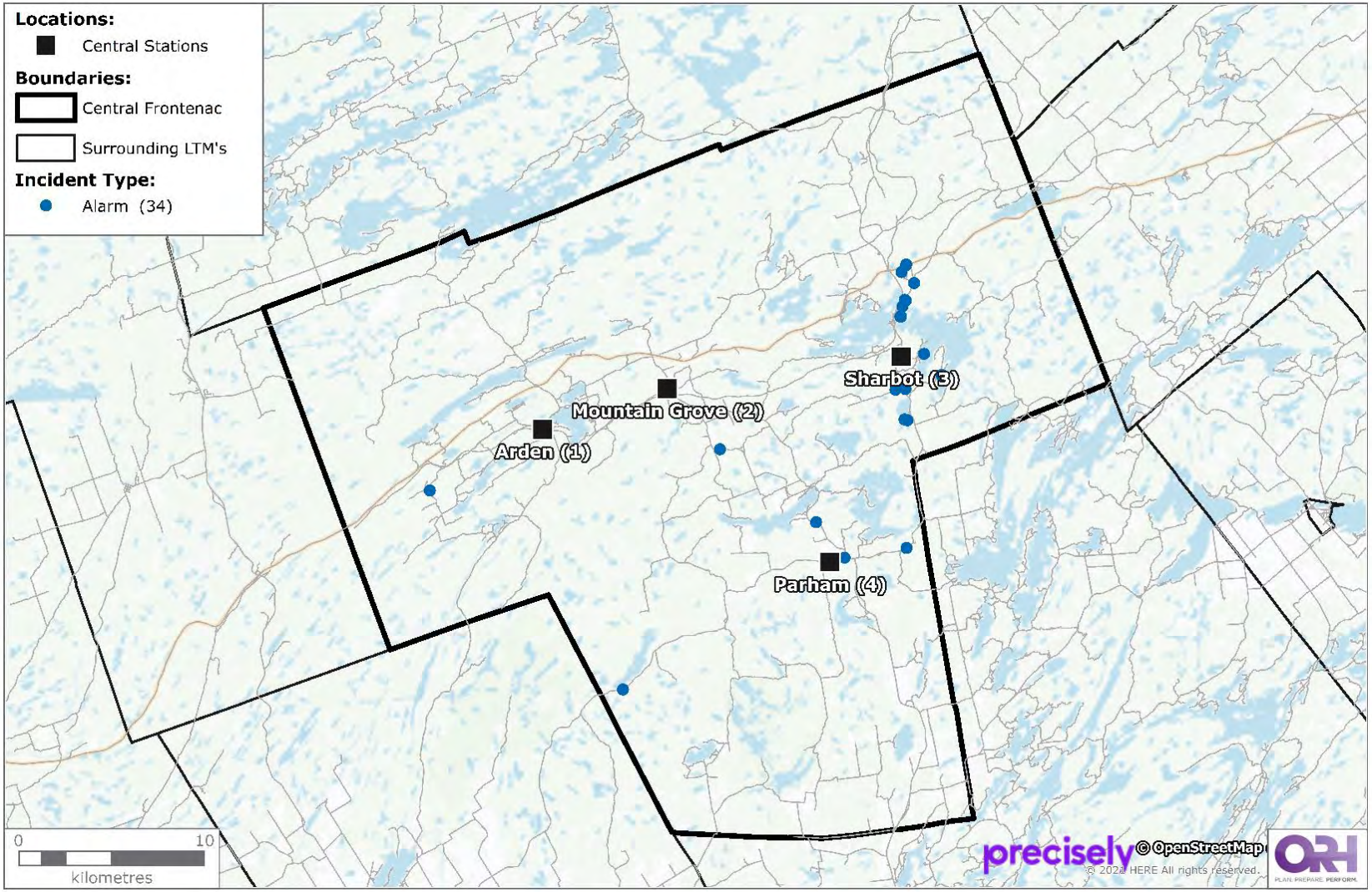
Central Frontenac: All Incidents



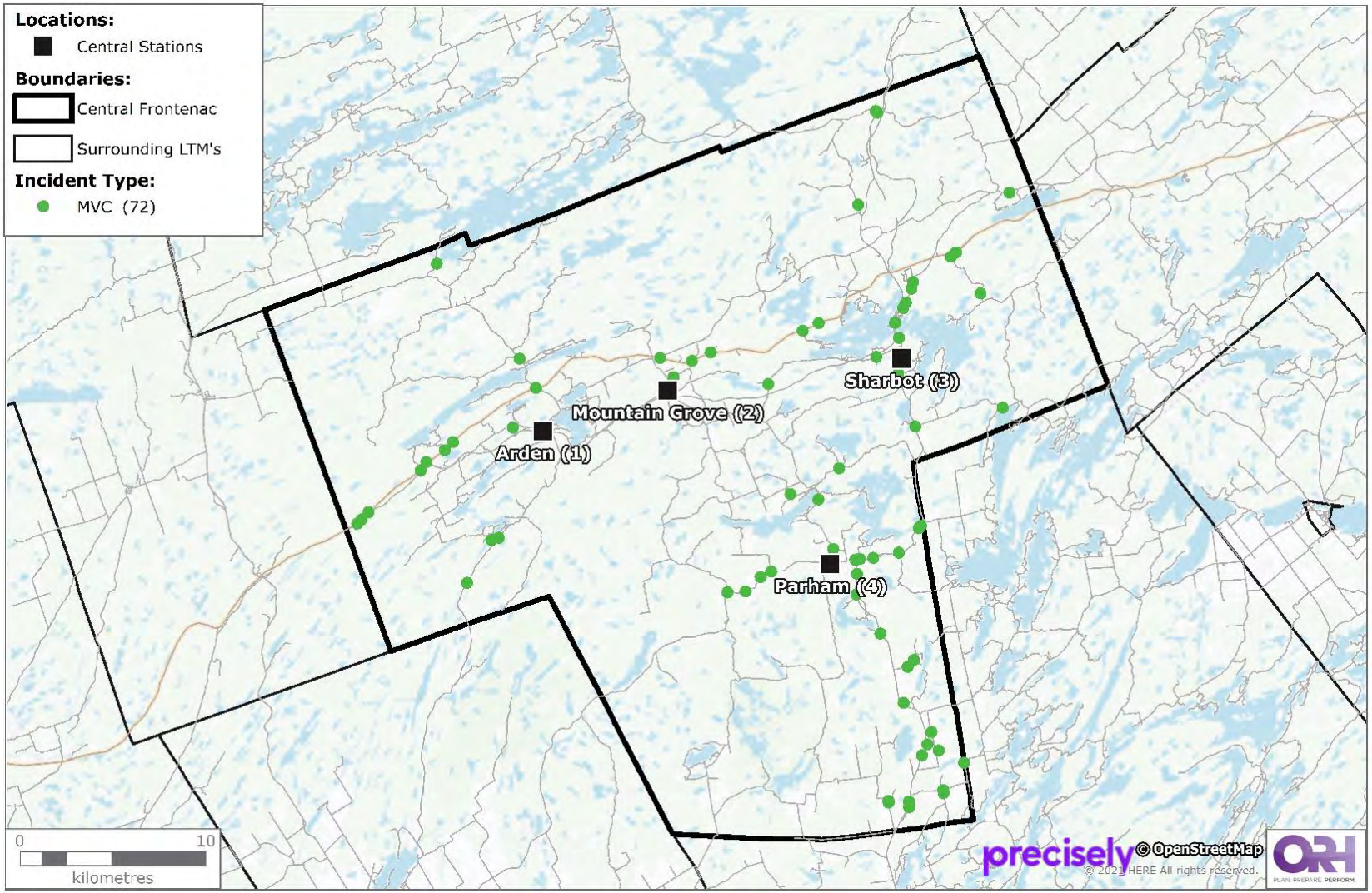
Central Frontenac: Fire Incidents



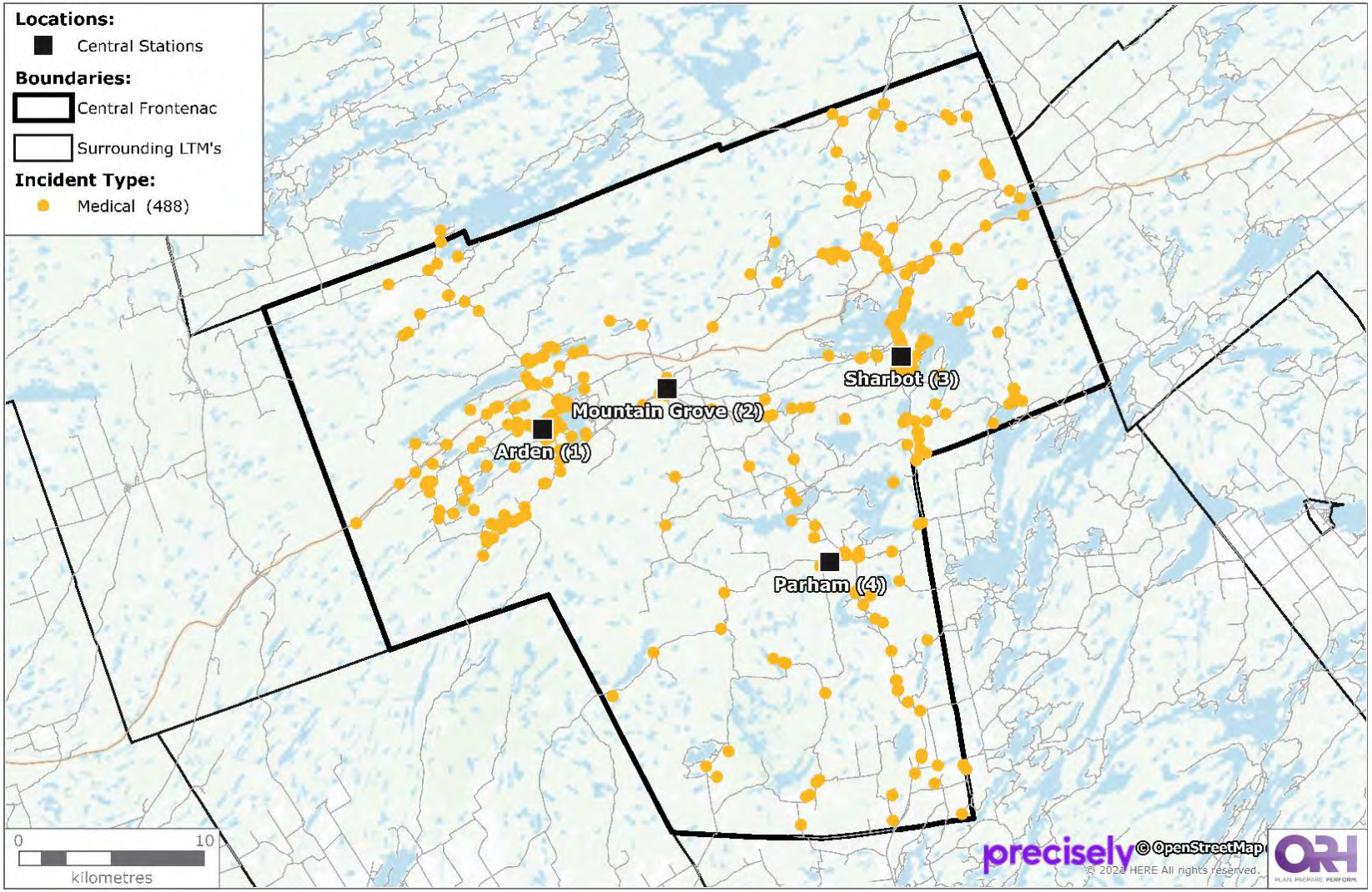
Central Frontenac: Alarm Incidents



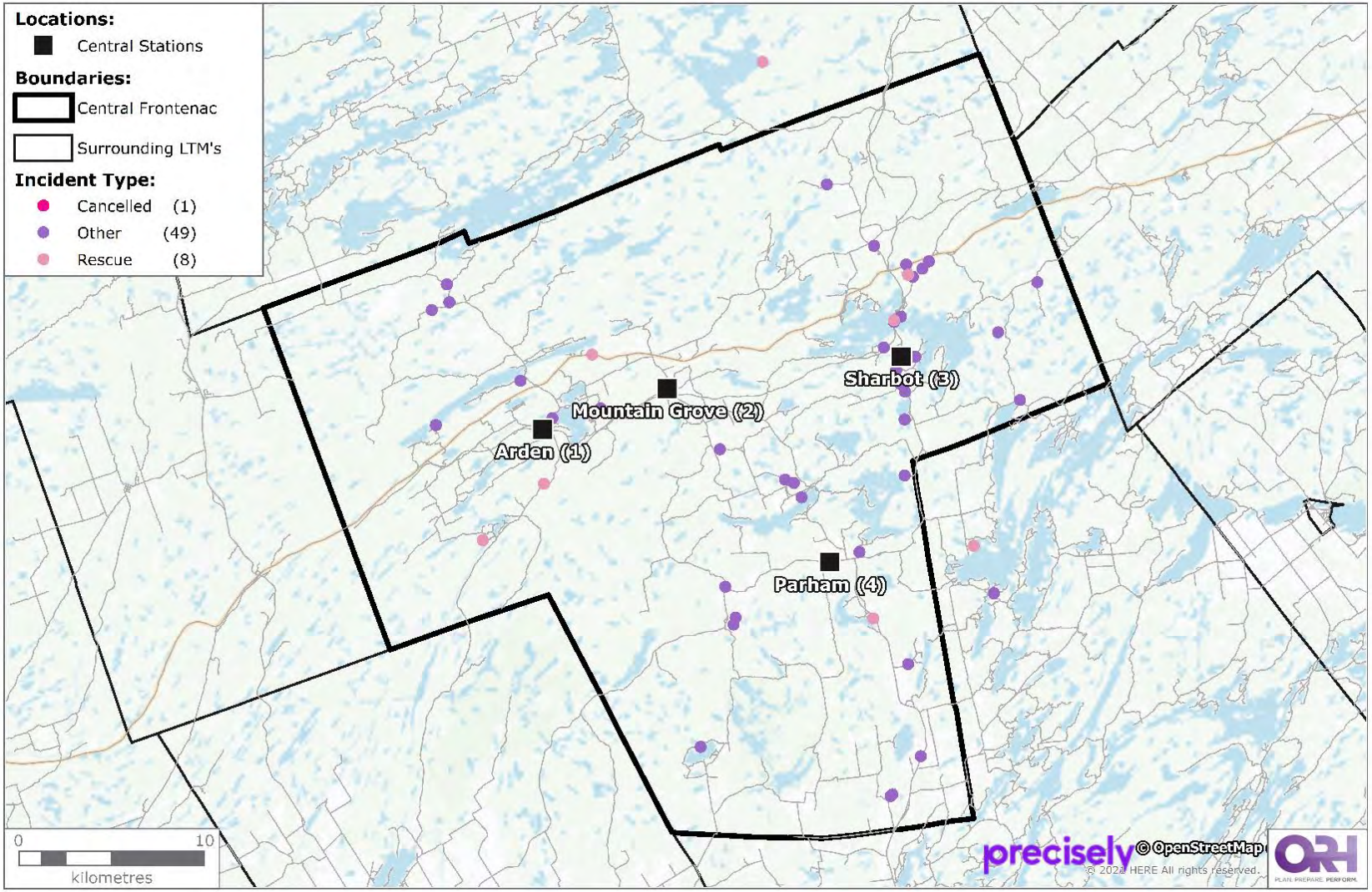
Central Frontenac: MVC Incidents



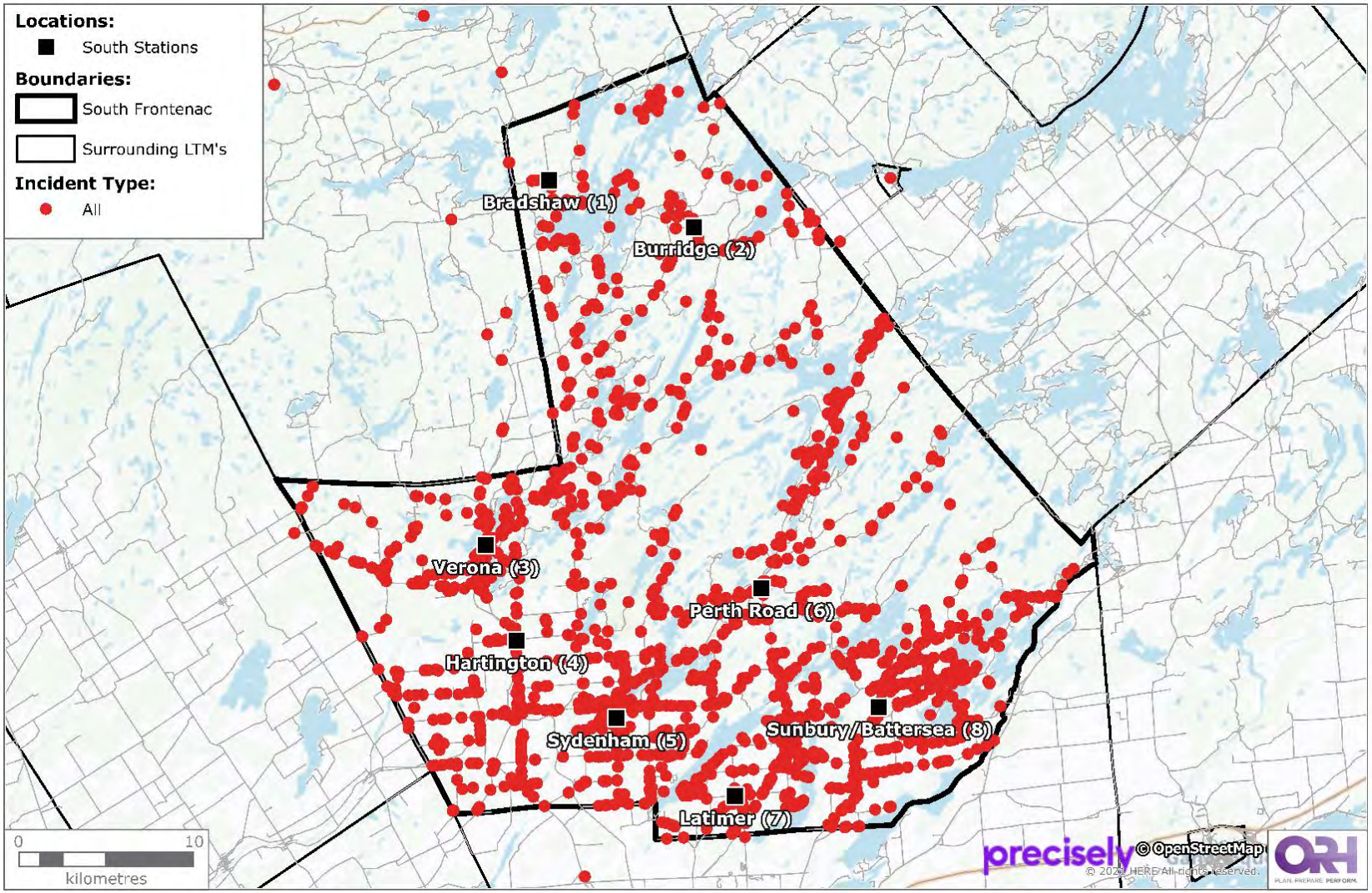
Central Frontenac: Medical Incidents



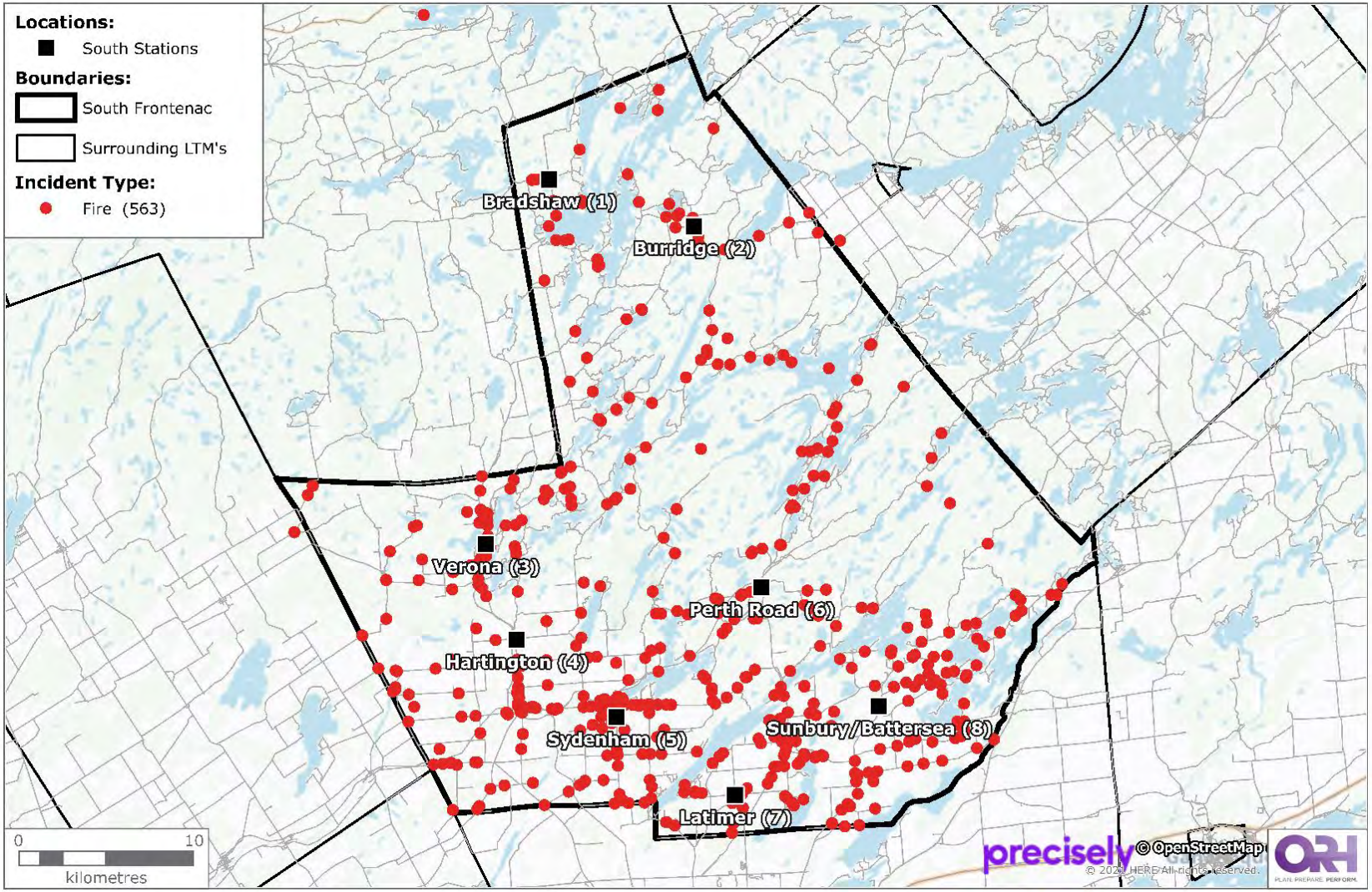
Central Frontenac: Other Incidents



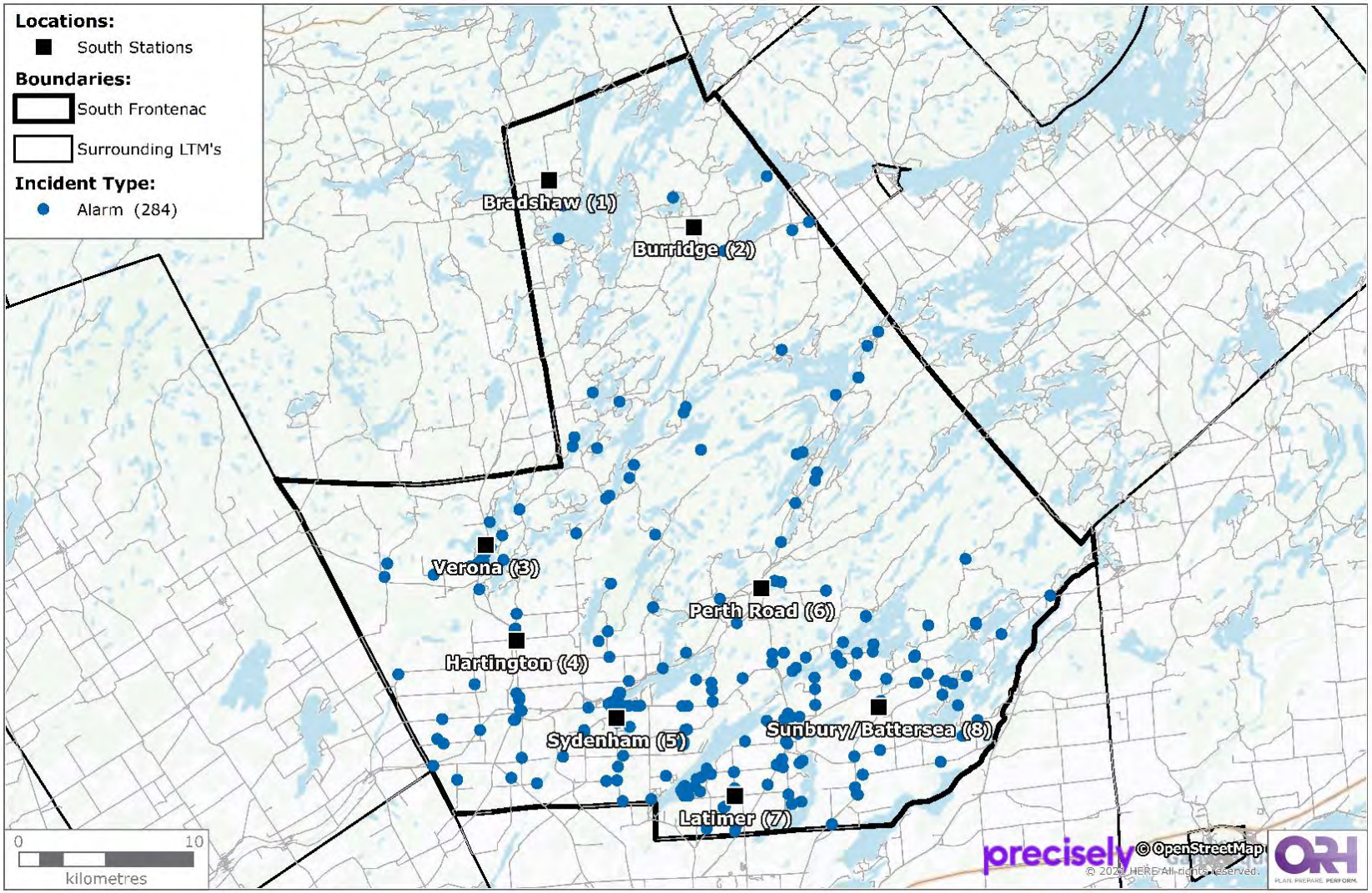
South Frontenac: All Incidents



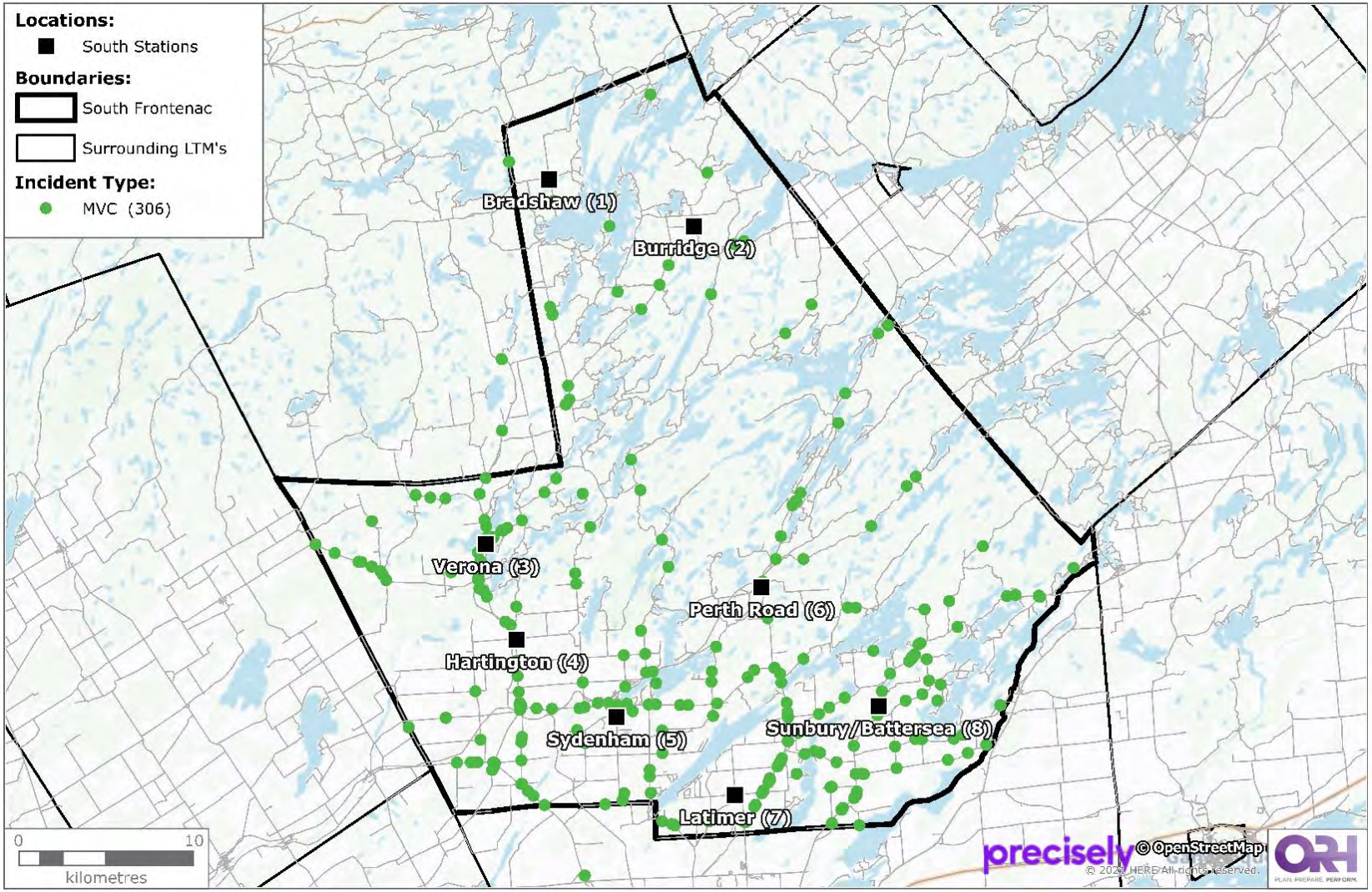
South Frontenac: Fire Incidents



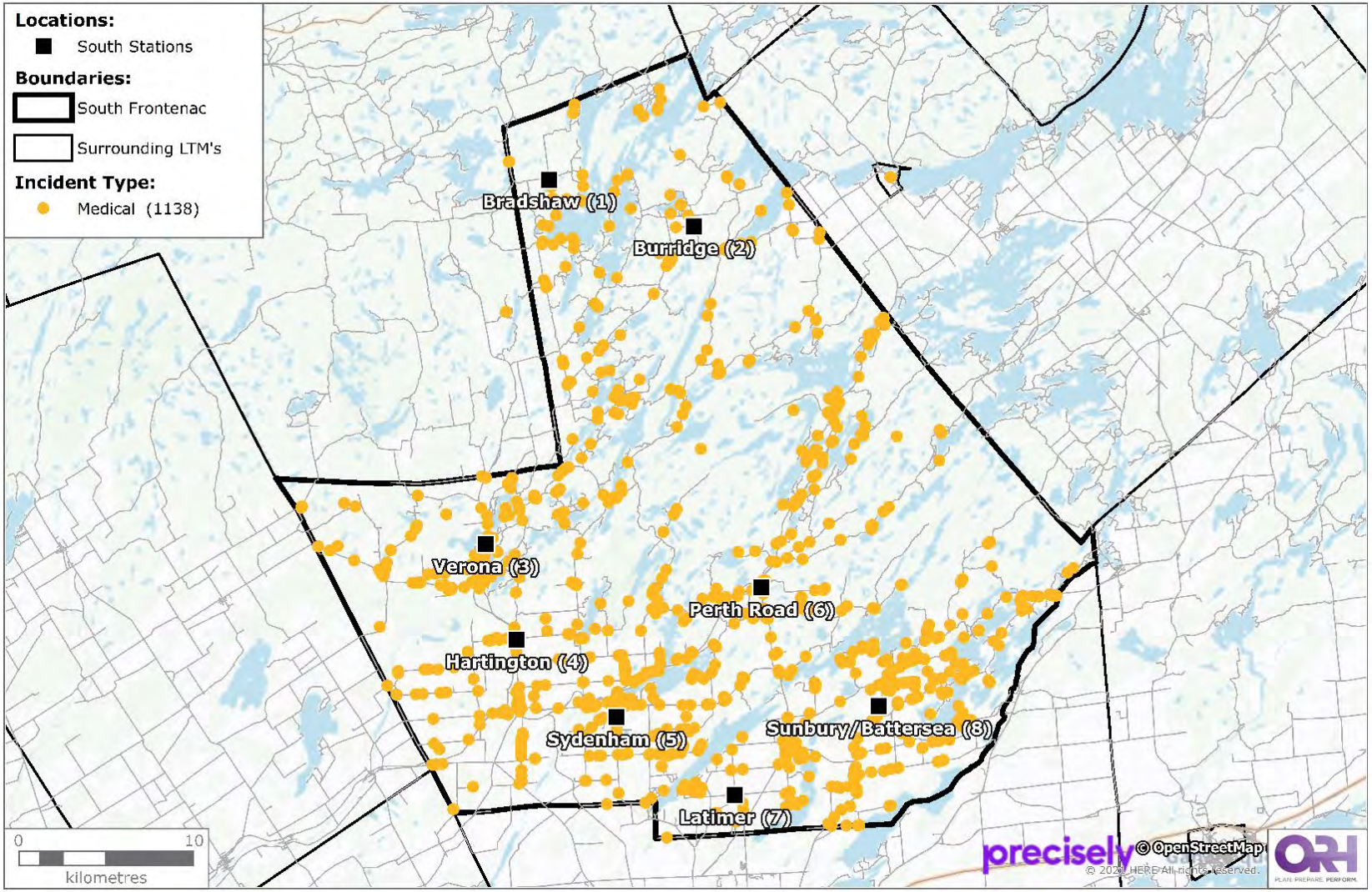
South Frontenac: Alarm Incidents



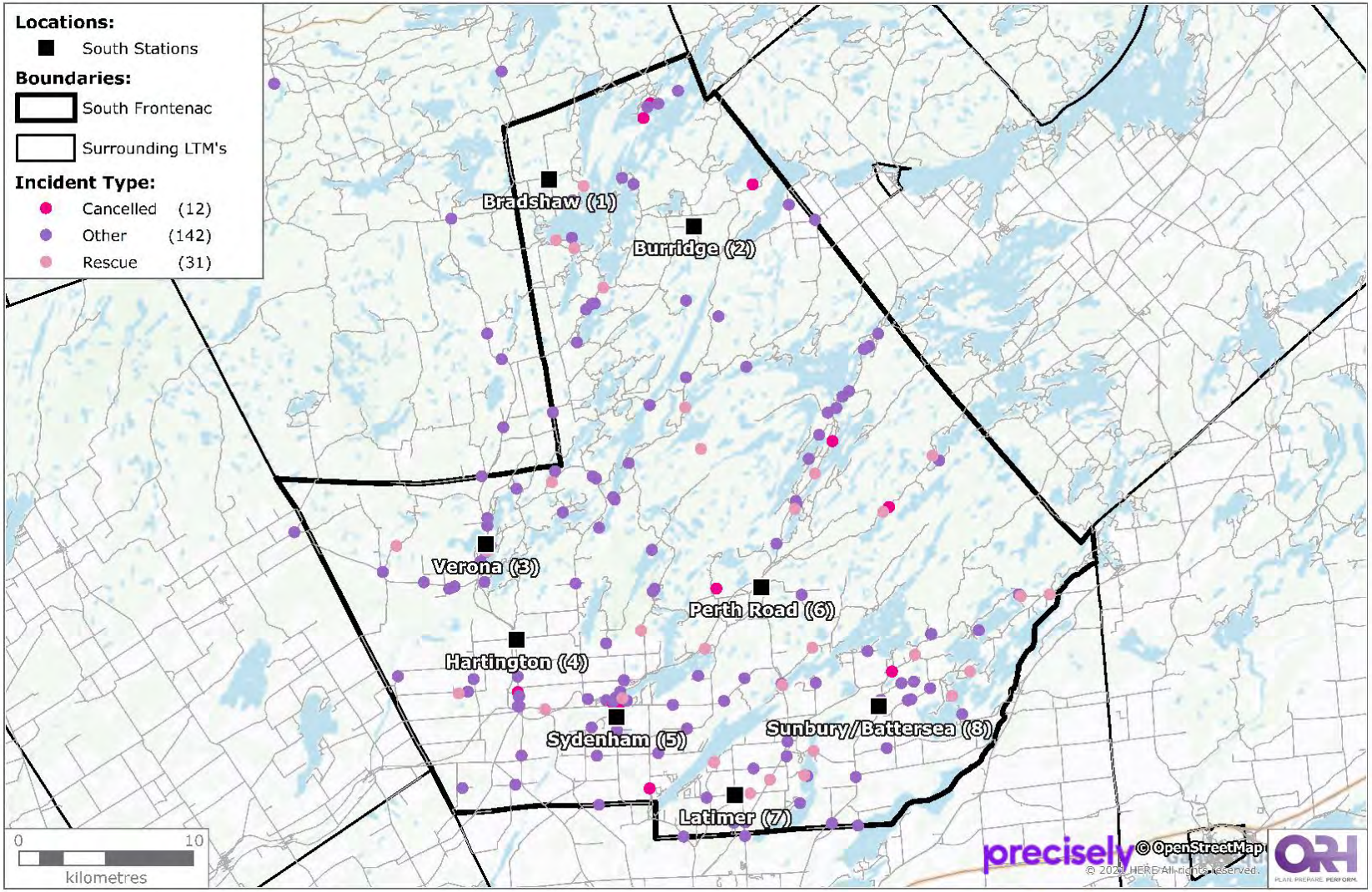
South Frontenac: MVC Incidents



South Frontenac: Medical Incidents



South Frontenac: Other Incidents

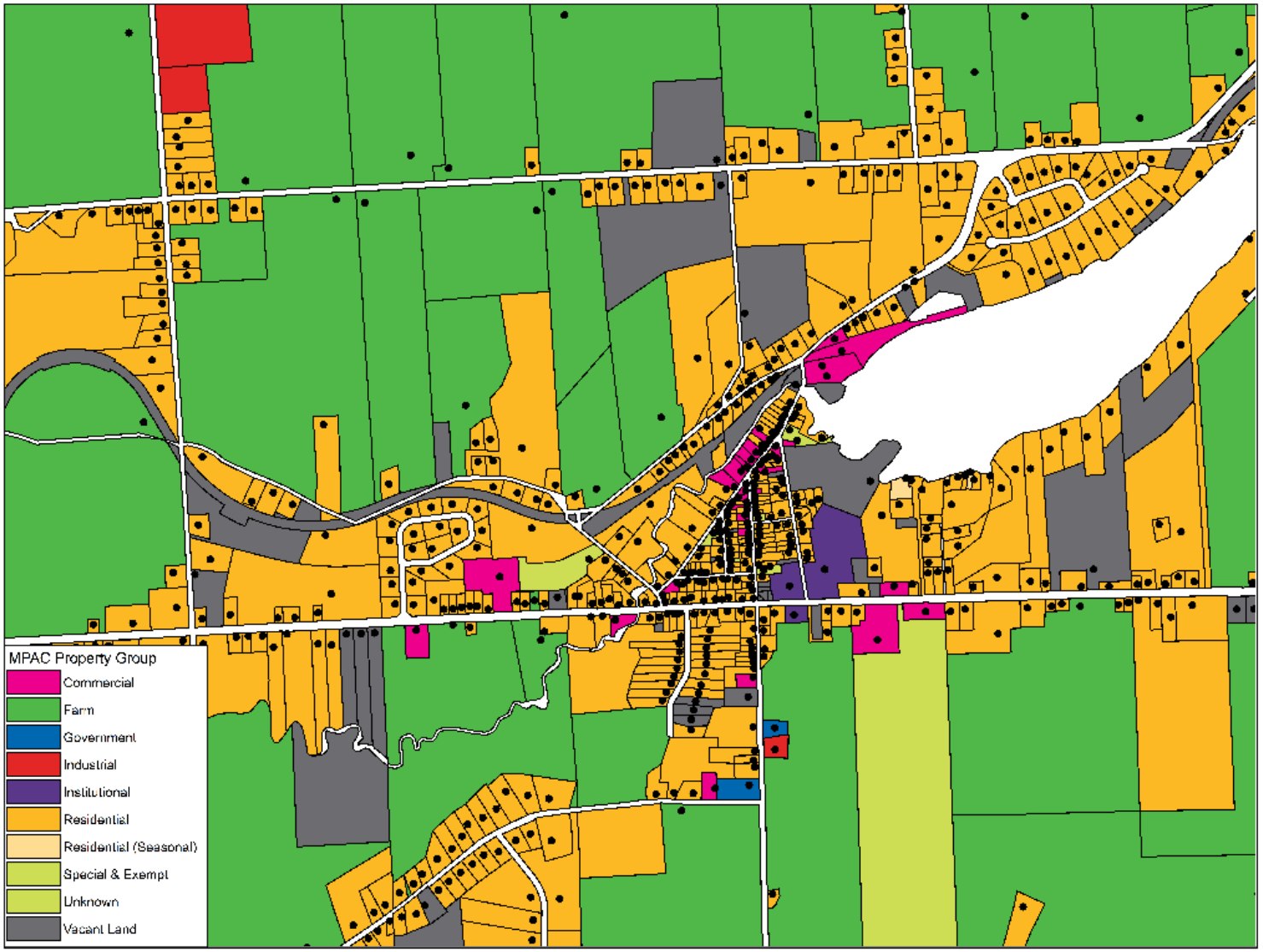


GIS Data Analysis

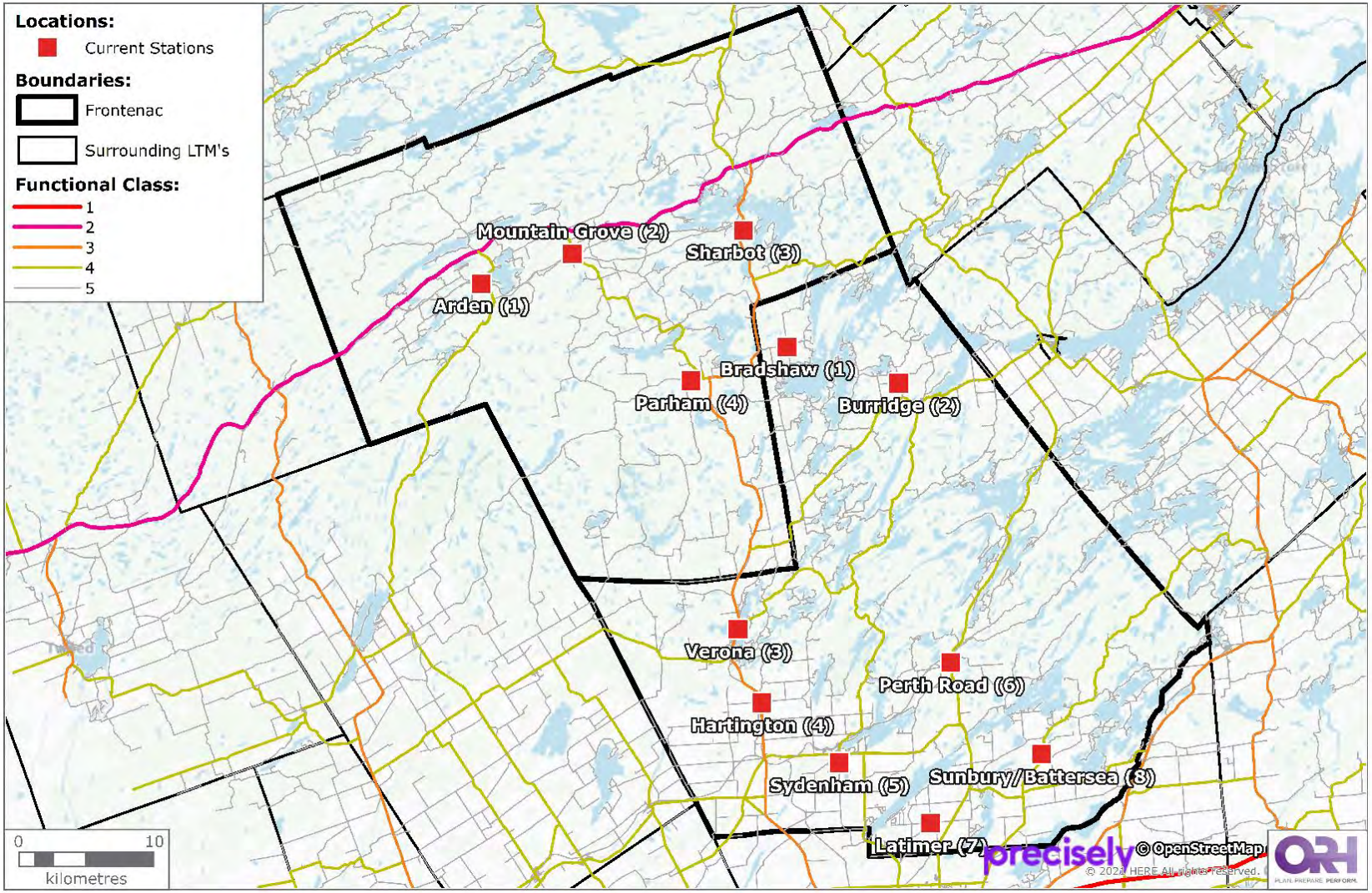
- In addition to analyzing incident and response data provided by SFFR/CFFR, ORH also evaluated GIS data from the County of Frontenac.
- This data related to street addresses, land use and building footprints. The objective was to analyze the distribution of residential properties in the area and then include these in the optimization and coverage models.
- Finally, ORH used commercially available road network data to profile the roads within the two townships, again with the intention of using road coverage as part of the assessment of station locations.

Property Data: Raw Information

Property Data: Land Use Analysis



Road Network Data



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Model Setup

Model Setup

- ORH used two models in evaluating station locations:
  - Optimization model: to identify ideal locations based on defined optimization criteria and constraints
  - Coverage model: to report key statistics on the distance/time coverage from potential sites to relevant geographical distributions
- Both models were populated with outcomes from the analysis of incident and GIS data, plus a calibrated travel time matrix based on the current road network.
- Having determined the optimal locations in any scenario, ORH then tested the resulting coverage against key measures.

Optimization Approach

- At the start of the study, ORH discussed various options for optimization objectives, for example:
  - Travel time vs. travel distance
  - Minimizing average vs. maximizing within X minutes
  - Incidents / roads / population as the risk proxy
- ORH conducted a series of area-wide optimization runs to assess different options. In agreement with SFFR/CFFR the objective was to:
  - Optimize coverage of all residential properties and the road network to maximize the proportion reachable within 5, 8 and 13 kilometres of stations.

Measuring Coverage

- To compare current and future scenarios for station locations, ORH used a coverage model to summarize service provision against geographical measures.
- For all assessed options, ORH provided SFFR/CFFR with the expected coverage by risk proxy (residential properties and roads), area (SFFR, CFFR and combined) and distance (5, 8 and 13km).
- Outputs were provided in terms of tables summarizing the proportion of residences/roads within 5/8/13 kms and maps depicting the geographical coverage for key options.

Site-search Mapping

- For selected options, ORH produced site-search maps, that used optimization modelling to determine the optimal location a particular station within its local area.
- This followed the same optimization approach with all other station deployments fixed.
- The resulting site search maps are based on the road and residential coverage for hundreds of alternative locations in the area around the existing stations, with interpolation used for areas between each point.
- The colours on the map represent the suitability of moving the station to each point, relative to the current location.

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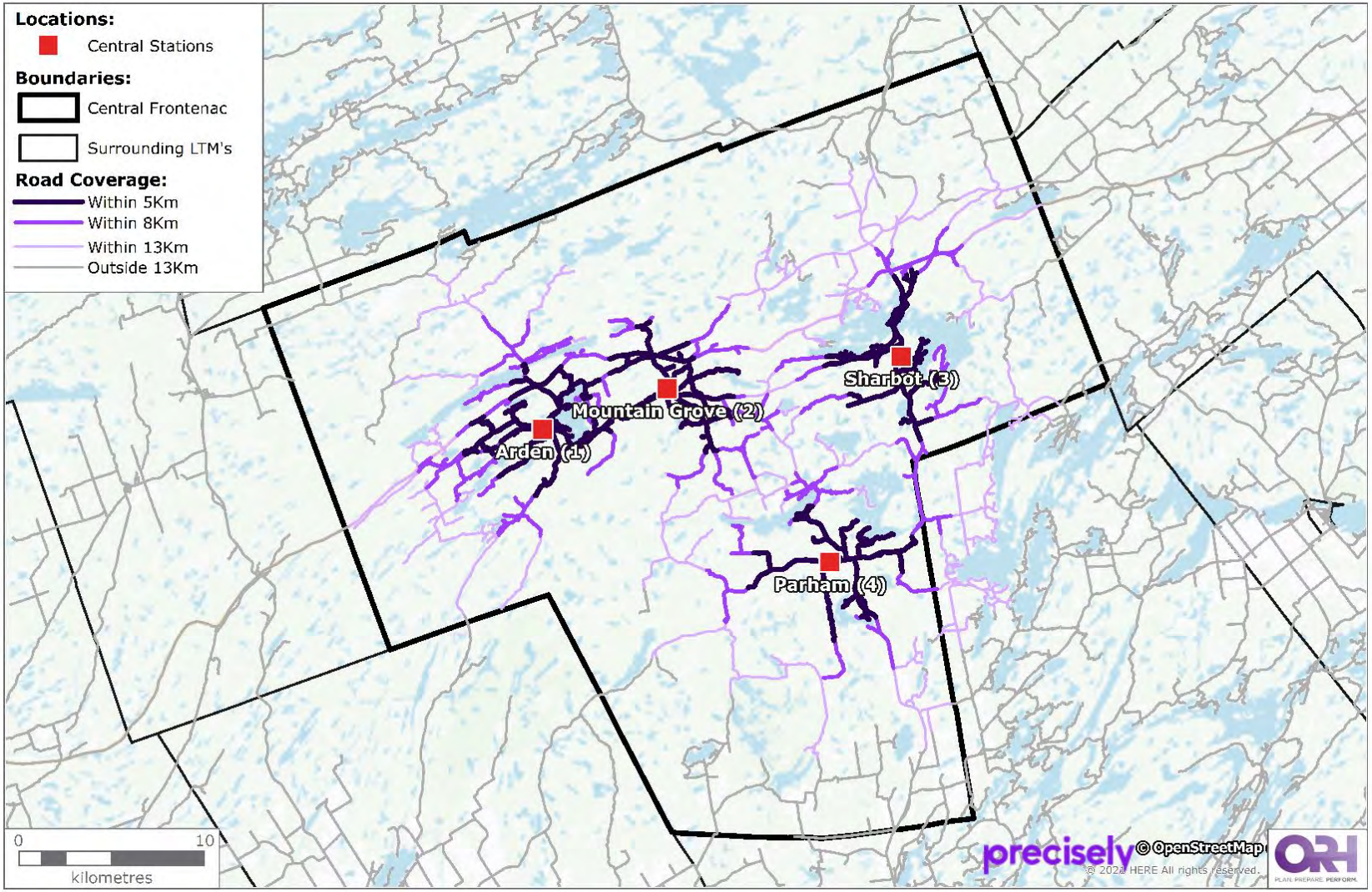
Current Coverage

Current Road Coverage

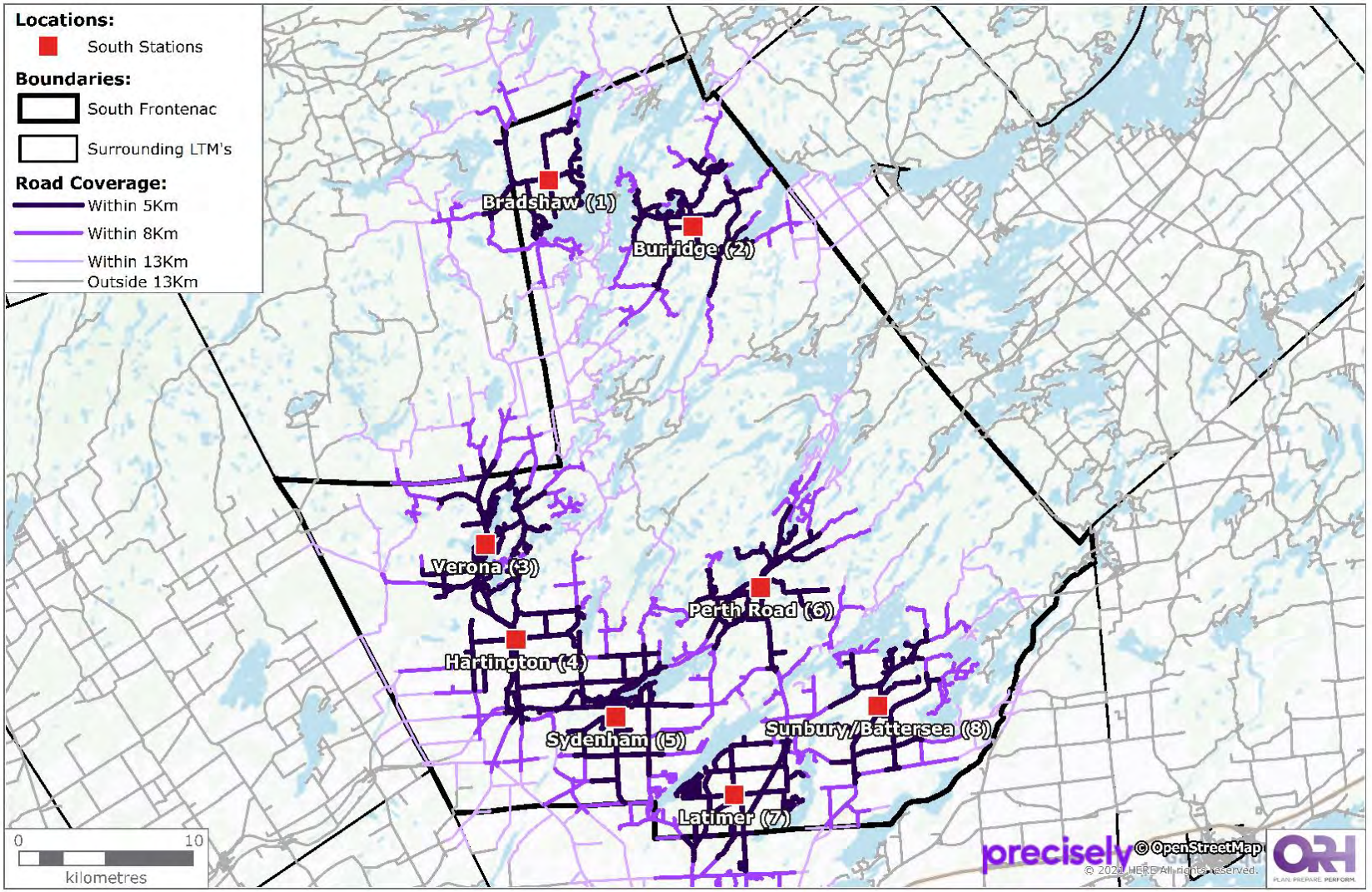
- Based on the modelling methodology, ORH calculated the proportion of the road network that is within 5, 8 and 13 kilometres driving distance of current stations, for CFFR, SFFR and the combined area.
- Maps for road coverage in the three geographies are provided on the subsequent pages.

Distance (Km)	Central	South	Overall
5	24.7%	36.4%	31.6%
8	47.5%	61.5%	55.8%
13	84.2%	86.3%	85.4%

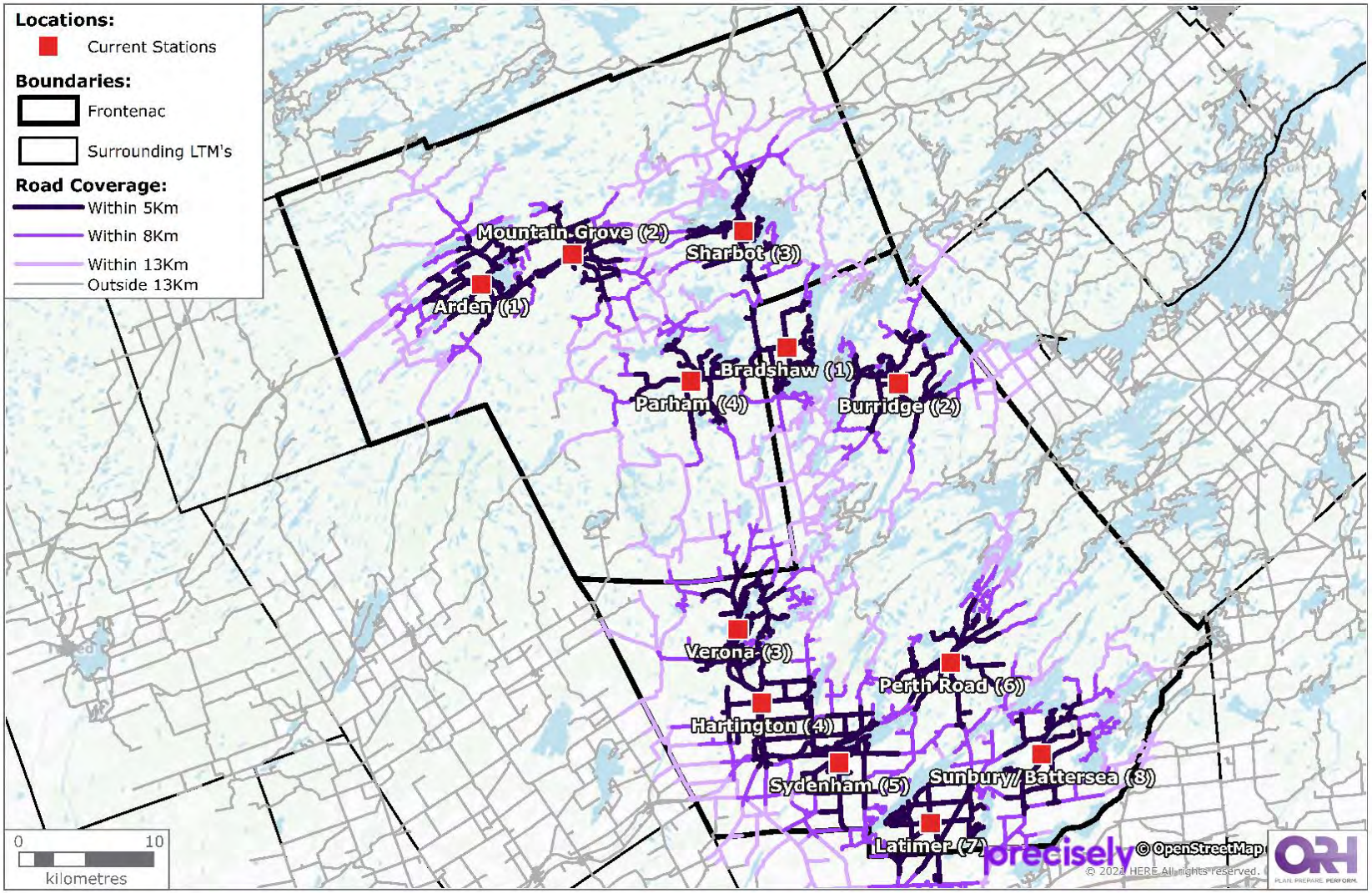
Current Road Coverage: Central



Current Road Coverage: South



Current Road Coverage: Combined

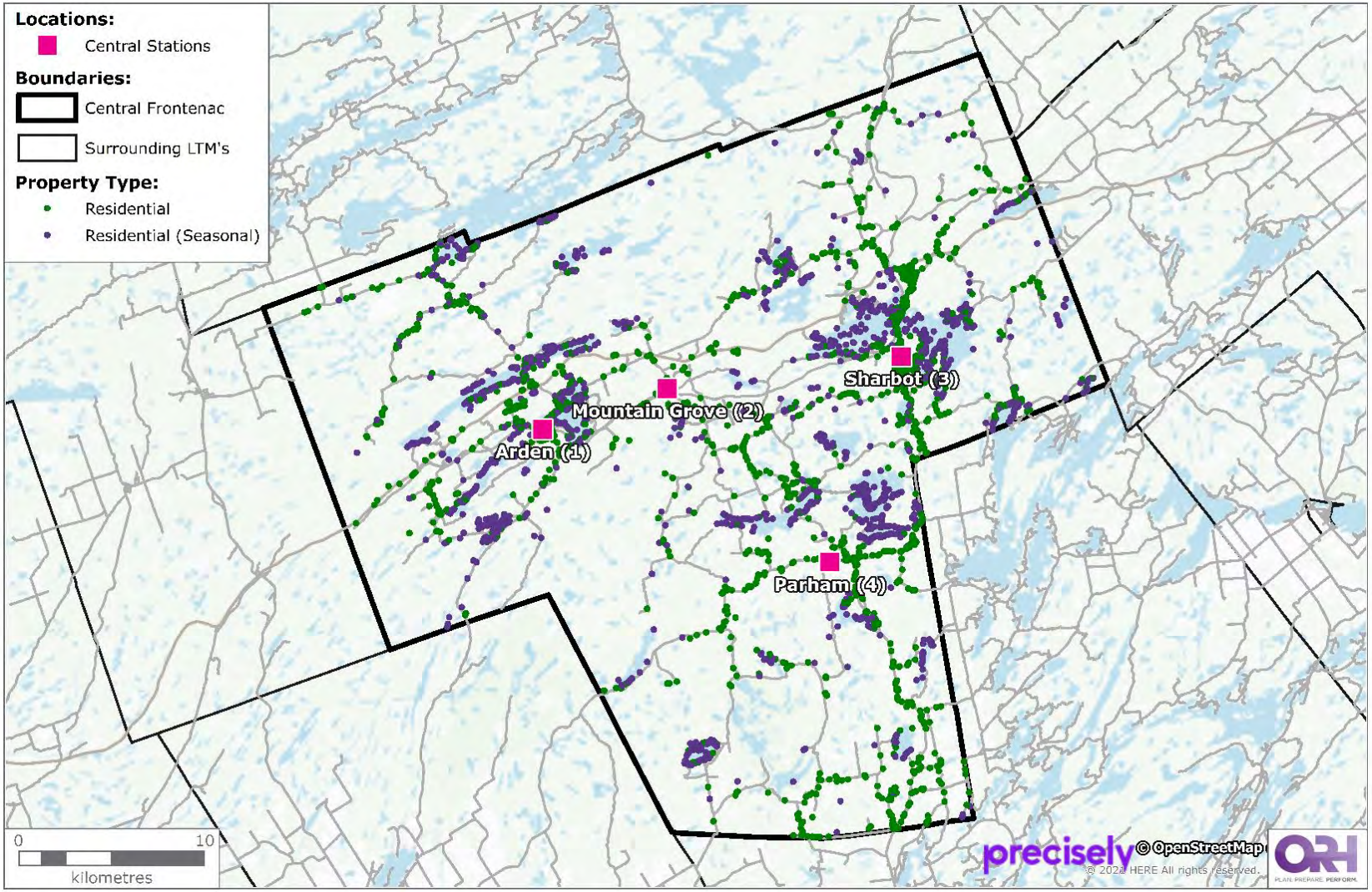


Residential Property Coverage

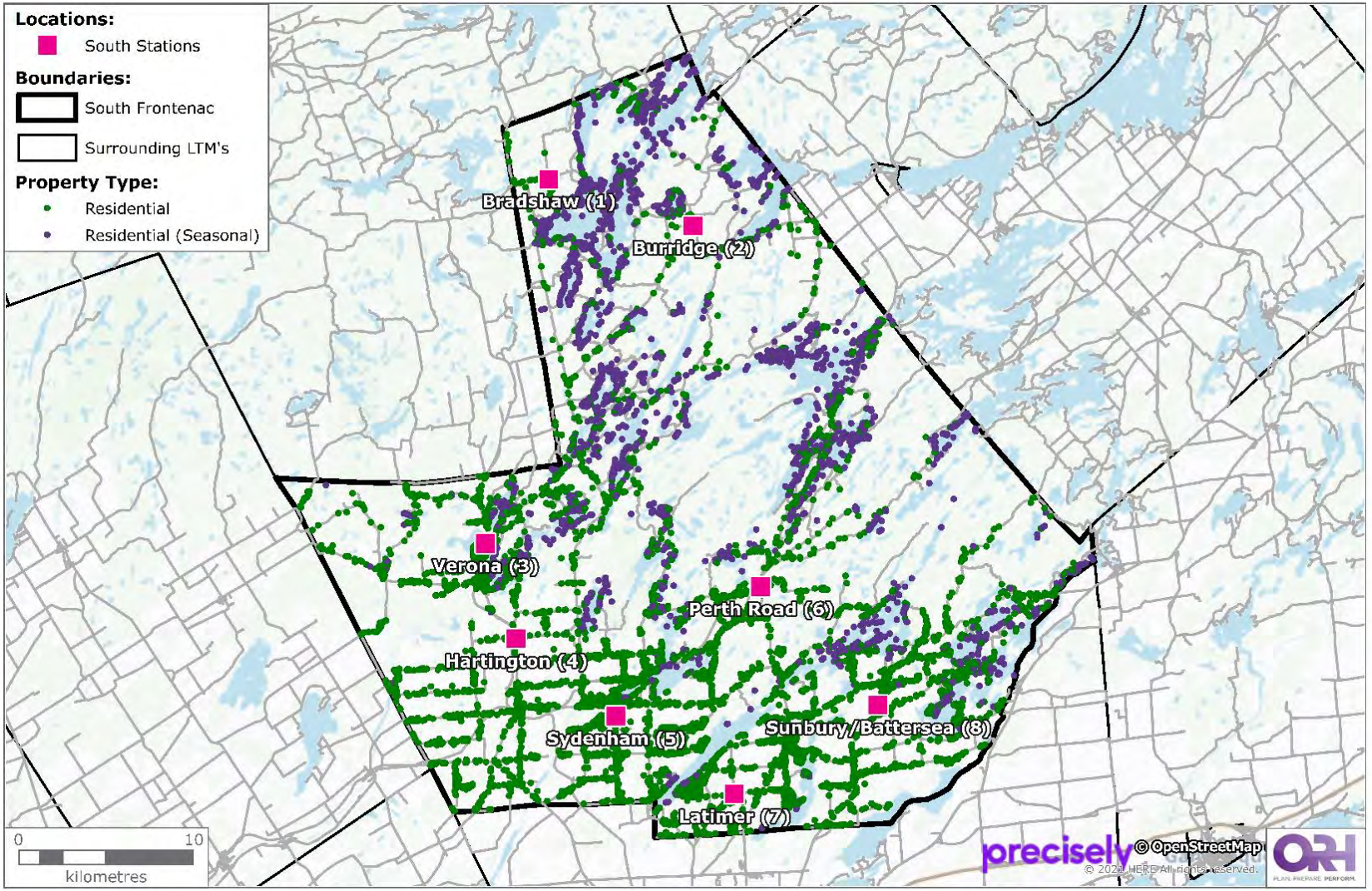
- Based on the modelling methodology, ORH calculated the proportion of residential properties that are within 5, 8 and 13 kilometres driving distance of current stations, for CFFR, SFFR and the combined area.
- Maps showing the residential properties and stations in the three geographies are provided in the subsequent pages.

Distance (Km)	Central	South	Overall
5	36.0%	42.4%	40.6%
8	58.9%	68.6%	65.8%
13	87.9%	87.9%	87.9%

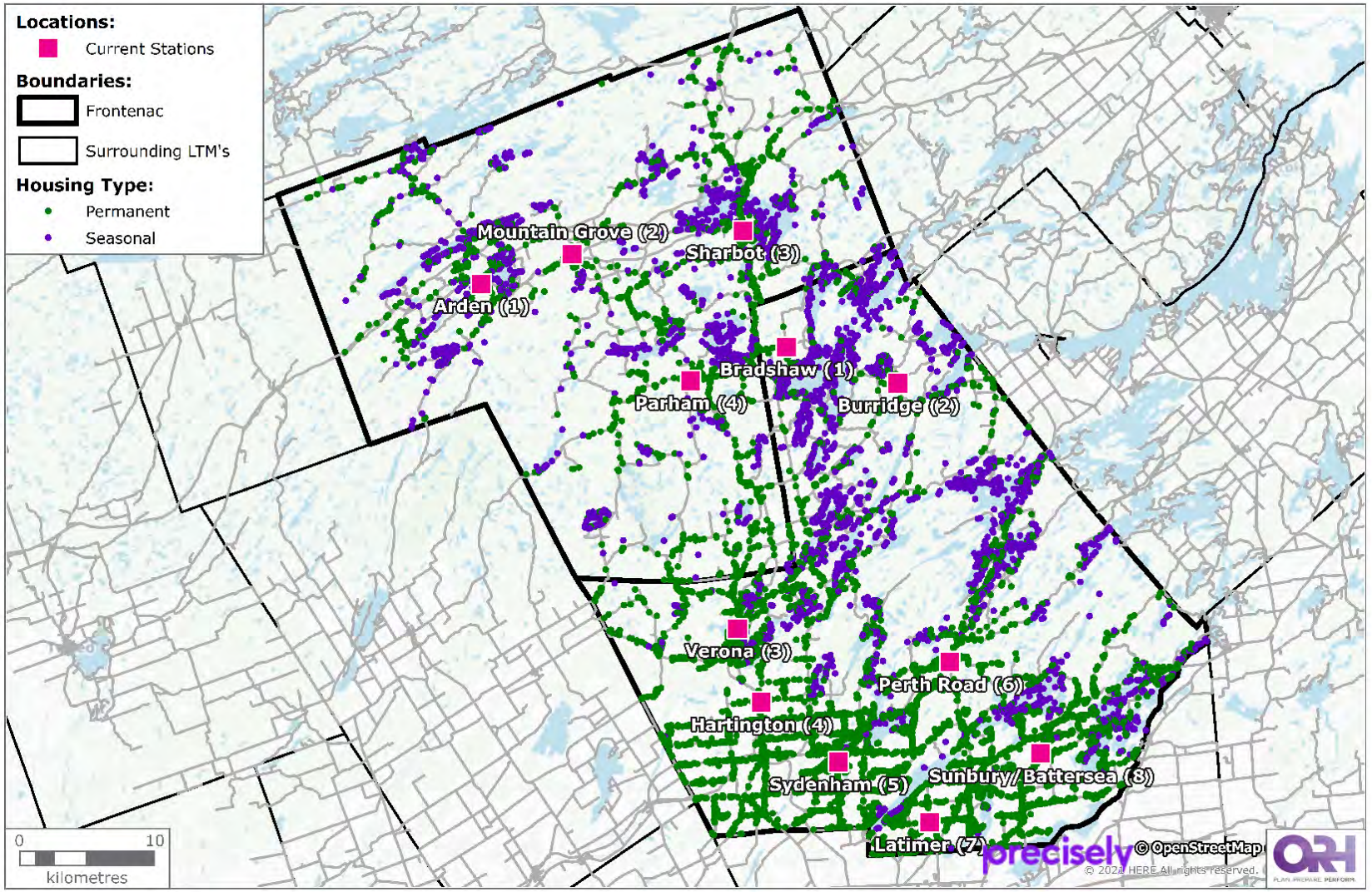
Residential Coverage: Central



Residential Coverage: South



Residential Coverage: Combined



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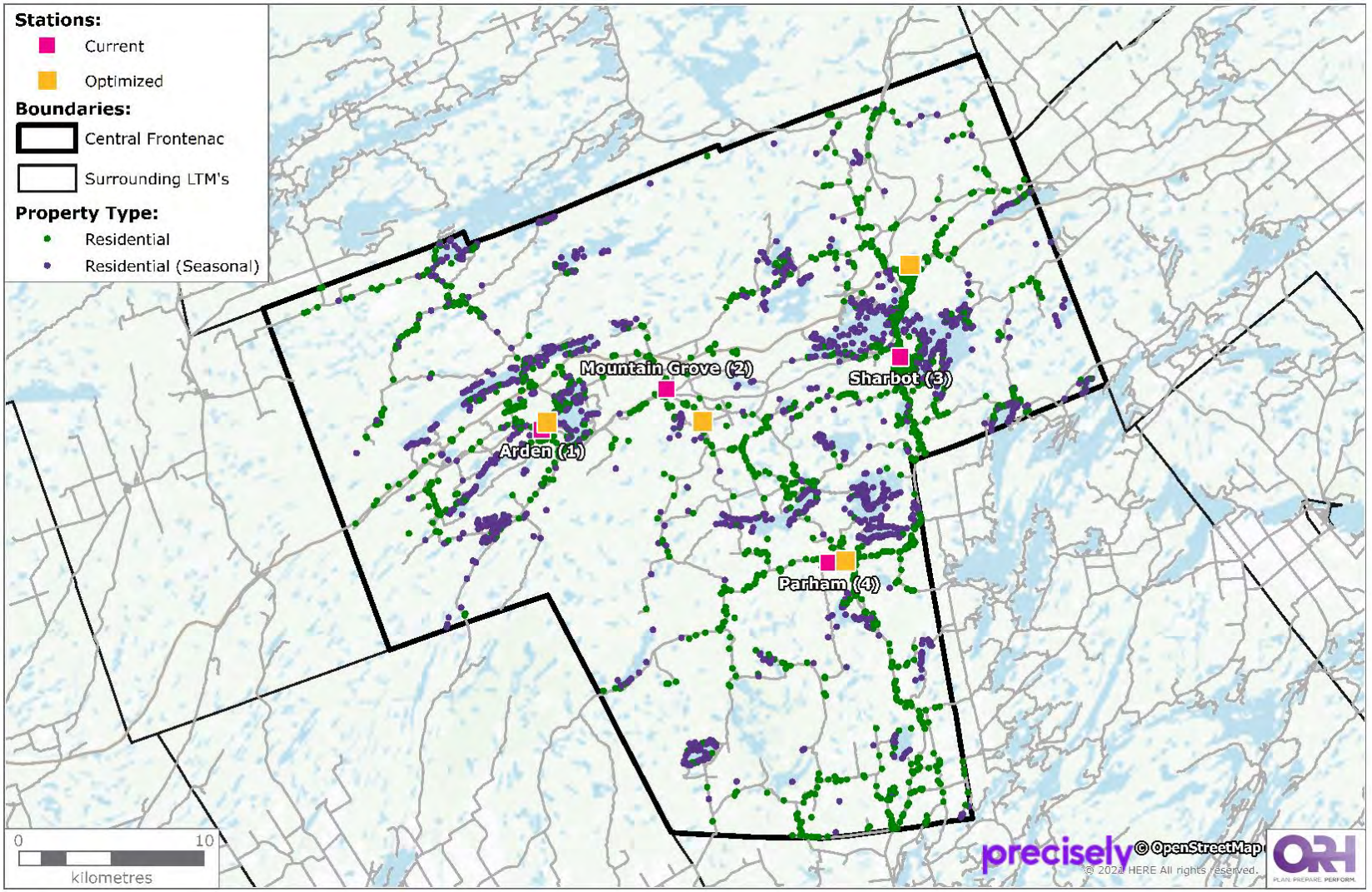
Optimizing Coverage Area-wide

Optimizing Coverage Area-wide

- The first optimization runs evaluated the optimal sites to locate stations within each township. To commence, the modelling considered maintaining the same number of stations as currently located.
- The only constraint was that Stations 6 and 8 in SFFR (Perth Road and Sunbury/Battersea) were fixed at their respective locations.
  - All subsequent modelling runs also fixed these sites.
- ORH modelled three options: CFFR (4 stations), SFFR (8 stations) and both townships in combination (12 stations).
- For each option, ORH compared optimal locations and coverage to the current position.

Optimizing Central: Locations



Optimizing Central: Coverage Results

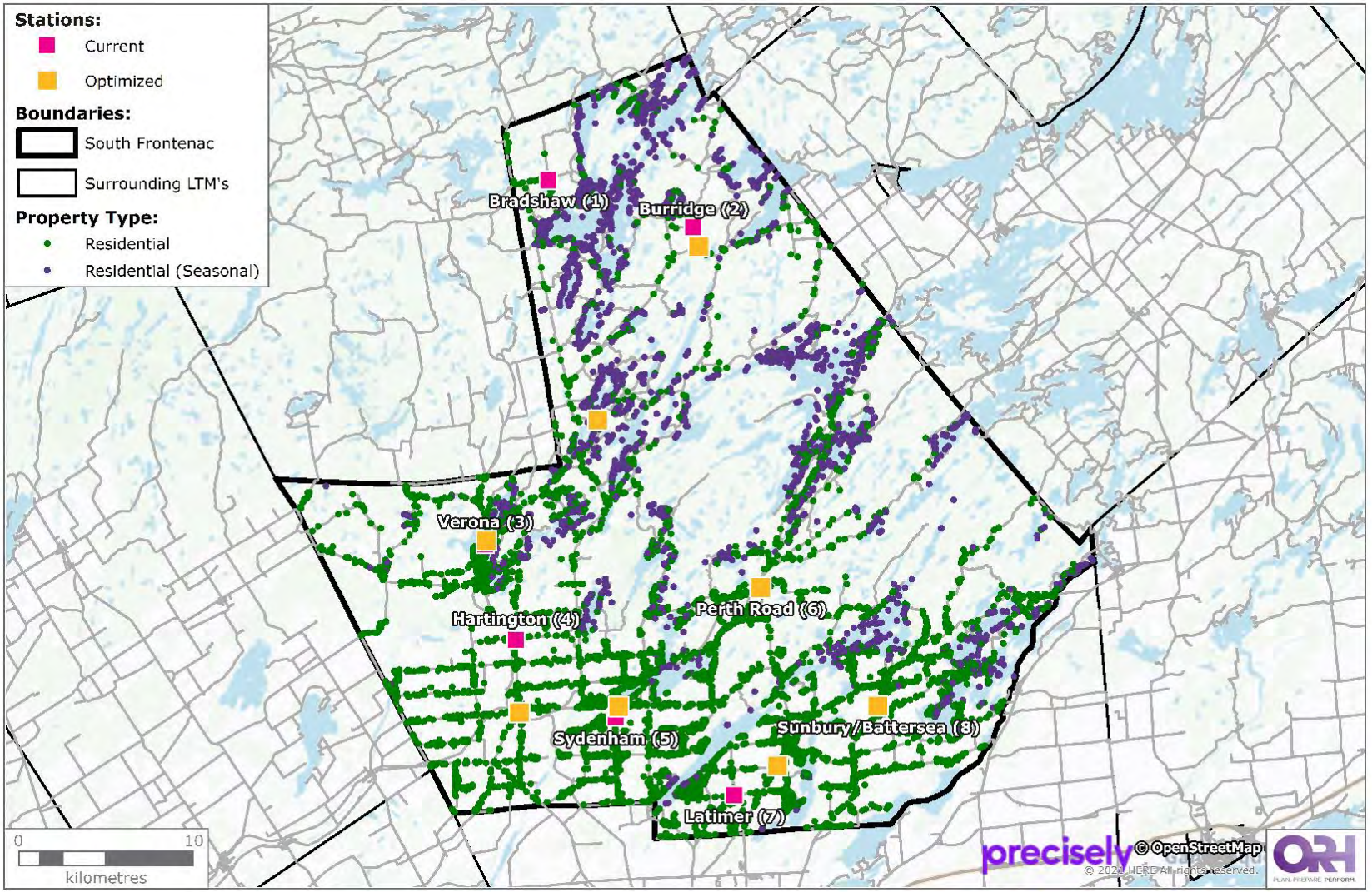
Road Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	24.7%	47.5%	84.2%	36.4%	61.5%	86.3%	31.6%	55.8%	85.4%
Optimized	27.2%	56.9%	91.1%	36.4%	61.5%	86.3%	32.6%	59.6%	88.3%
Difference	2.5%	9.4%	6.9%	0.0%	0.0%	0.0%	1.0%	3.8%	2.9%

Housing Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	36.0%	58.9%	87.9%	42.4%	68.6%	87.9%	40.6%	65.8%	87.9%
Optimized	35.1%	61.8%	93.4%	42.4%	68.6%	87.9%	40.3%	66.6%	89.4%
Difference	-0.9%	2.9%	5.5%	0.0%	0.0%	0.0%	-0.3%	0.8%	1.5%

Optimizing South: Locations



Optimizing South: Coverage Results

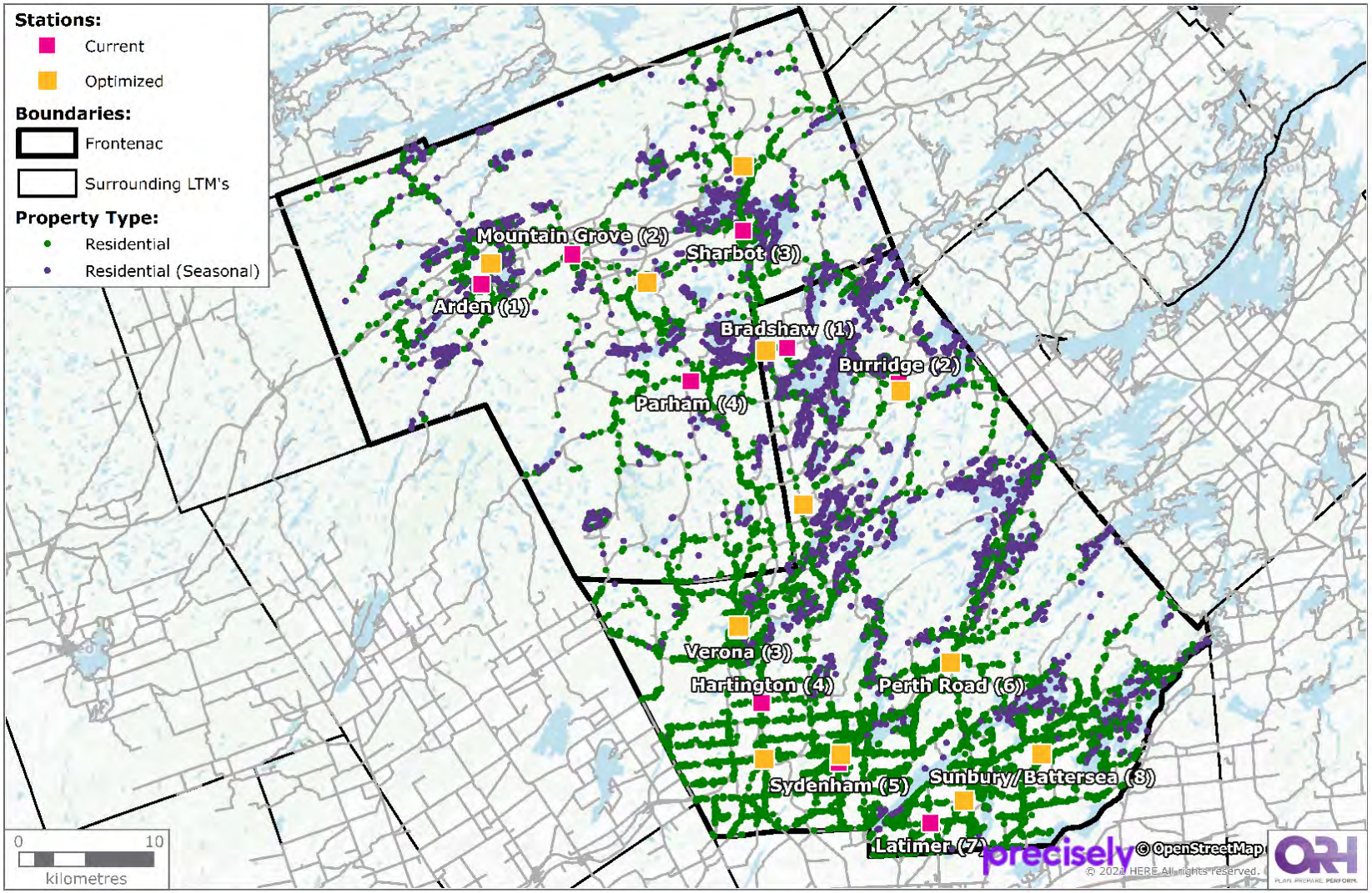
Road Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	24.7%	47.5%	84.2%	36.4%	61.5%	86.3%	31.6%	55.8%	85.4%
Optimized	24.3%	47.7%	84.0%	39.0%	67.8%	89.3%	33.0%	59.5%	87.1%
Difference	-0.4%	0.2%	-0.2%	2.6%	6.3%	3.0%	1.4%	3.7%	1.7%

Housing Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	36.0%	58.9%	87.9%	42.4%	68.6%	87.9%	40.6%	65.8%	87.9%
Optimized	35.4%	59.0%	87.9%	43.2%	71.3%	90.2%	41.0%	67.8%	89.5%
Difference	-0.6%	0.1%	0.0%	0.8%	2.7%	2.3%	0.4%	2.0%	1.6%

Optimizing CF+SF: Locations



Optimizing CF+SF: Coverage Results

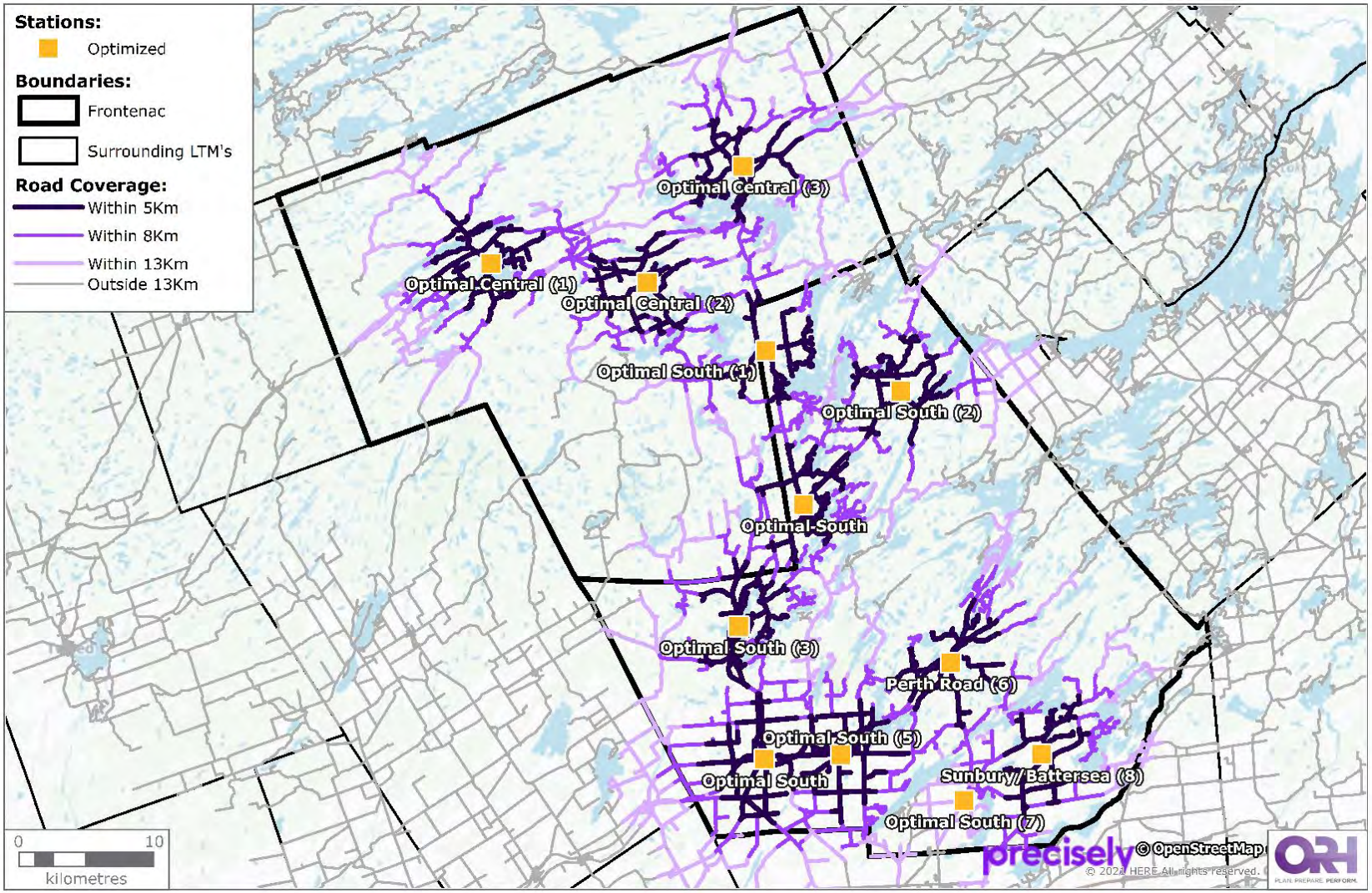
Road Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	24.7%	47.5%	84.2%	36.4%	61.5%	86.3%	31.6%	55.8%	85.4%
Optimized	24.2%	47.6%	83.9%	42.0%	71.6%	88.1%	35.3%	64.9%	87.9%
Difference	-0.5%	0.1%	-0.3%	5.6%	10.1%	1.8%	3.7%	9.1%	2.5%

Housing Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	36.0%	58.9%	87.9%	42.4%	68.6%	87.9%	40.6%	65.8%	87.9%
Optimized	32.8%	60.3%	93.2%	46.0%	76.3%	89.5%	42.2%	71.8%	90.5%
Difference	-3.2%	1.4%	5.3%	3.6%	7.7%	1.6%	1.6%	6.0%	2.6%

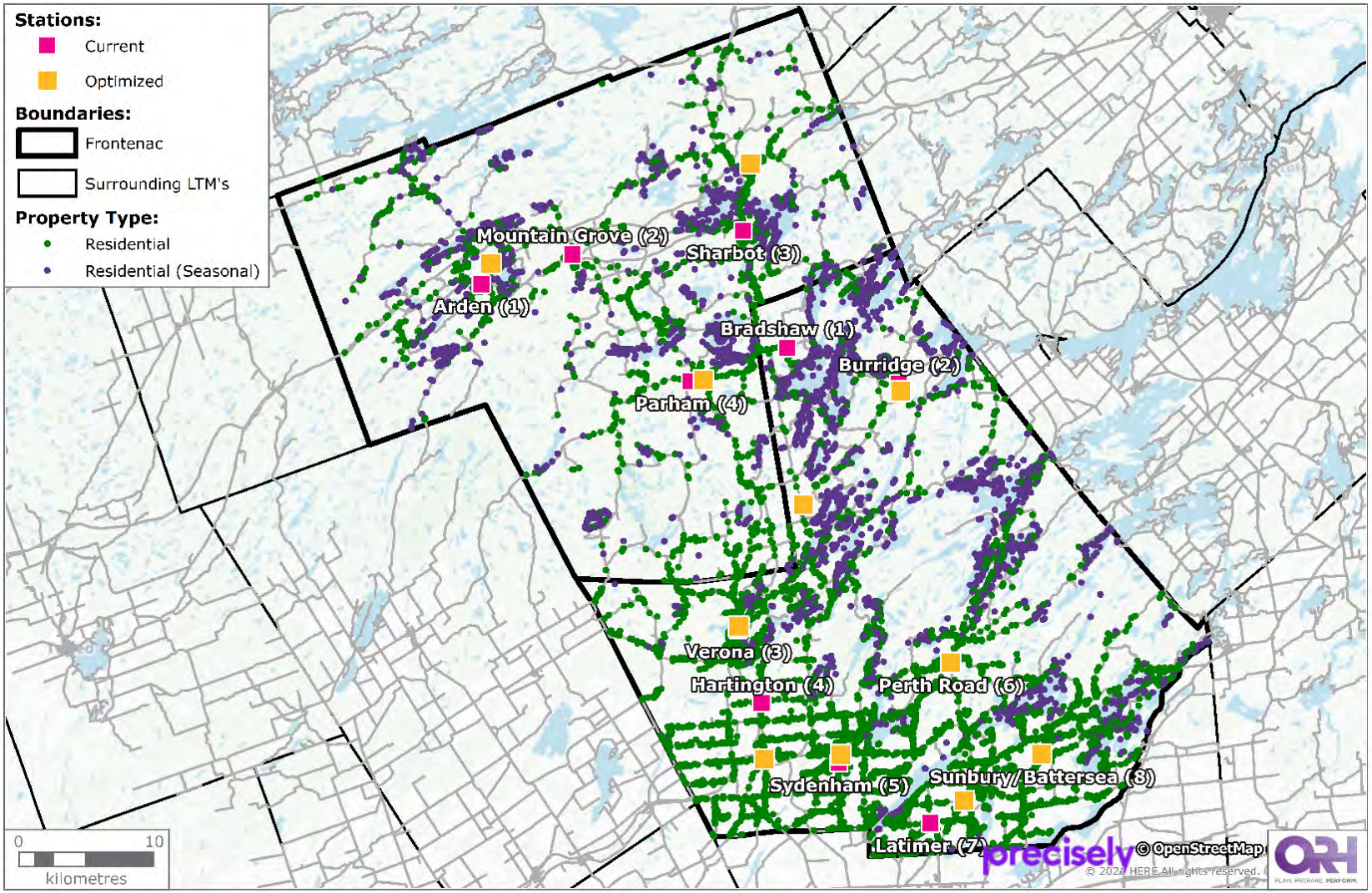
Optimizing CF+SF: Road Coverage



Optimizing Coverage: Fewer Stations

- Following the same approach for the combined (Central + South) run, ORH optimized the configuration for 11 or 10 stations across the townships, with the objective of identifying whether current coverage could be maintained with fewer sites, if these were optimally located.
- These optimization runs were conducted area-wide, with the same objective as before, that is, to maximize coverage to residential addresses and roads, with SFFR Stations 6 & 8 ‘fixed’ at current sites.

Optimizing CF+SF: 11 Locations



Optimizing CF+SF: Coverage (11 Stns)

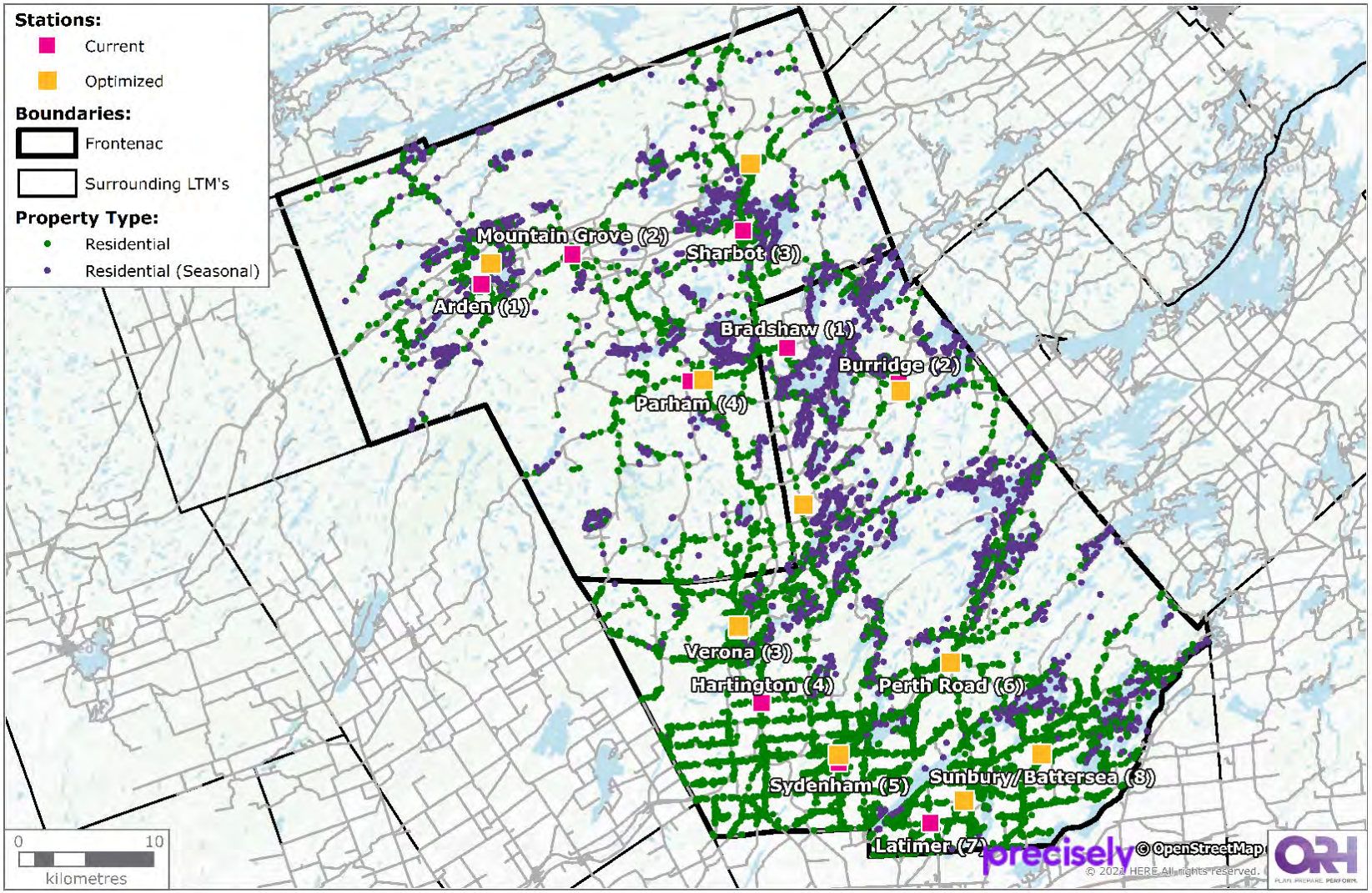
Road Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current 12	24.7%	47.5%	84.2%	36.4%	61.5%	86.3%	31.6%	55.8%	85.4%
Optimized 11	22.2%	46.6%	88.1%	39.4%	68.4%	87.6%	32.3%	59.4%	87.8%
Difference	-2.5%	-0.9%	3.9%	3.0%	6.9%	1.3%	0.7%	3.6%	2.4%

Housing Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current 12	36.0%	58.9%	87.9%	42.4%	68.6%	87.9%	40.6%	65.8%	87.9%
Optimized 11	34.8%	55.2%	91.5%	42.7%	72.0%	88.8%	40.5%	67.2%	89.5%
Difference	-1.2%	-3.7%	3.6%	0.3%	3.4%	0.9%	-0.1%	1.4%	1.6%

Optimizing CF+SF: 10 Locations



Optimizing CF+SF: Coverage (10 Stns)

Road Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current 12	24.7%	47.5%	84.2%	36.4%	61.5%	86.3%	31.6%	55.8%	85.4%
Optimized 10	22.2%	46.6%	88.1%	33.6%	62.1%	86.6%	28.9%	55.7%	87.2%
Difference	-2.5%	-0.9%	3.9%	-2.8%	0.6%	0.3%	-2.7%	-0.1%	1.8%

Housing Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current 12	36.0%	58.9%	87.9%	42.4%	68.6%	87.9%	40.6%	65.8%	87.9%
Optimized 10	34.8%	55.2%	91.5%	37.2%	67.4%	87.9%	36.5%	63.9%	88.9%
Difference	-1.2%	-3.7%	3.6%	-5.2%	-1.2%	0.0%	-4.1%	-1.9%	1.0%

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Specified Options

Specified Options

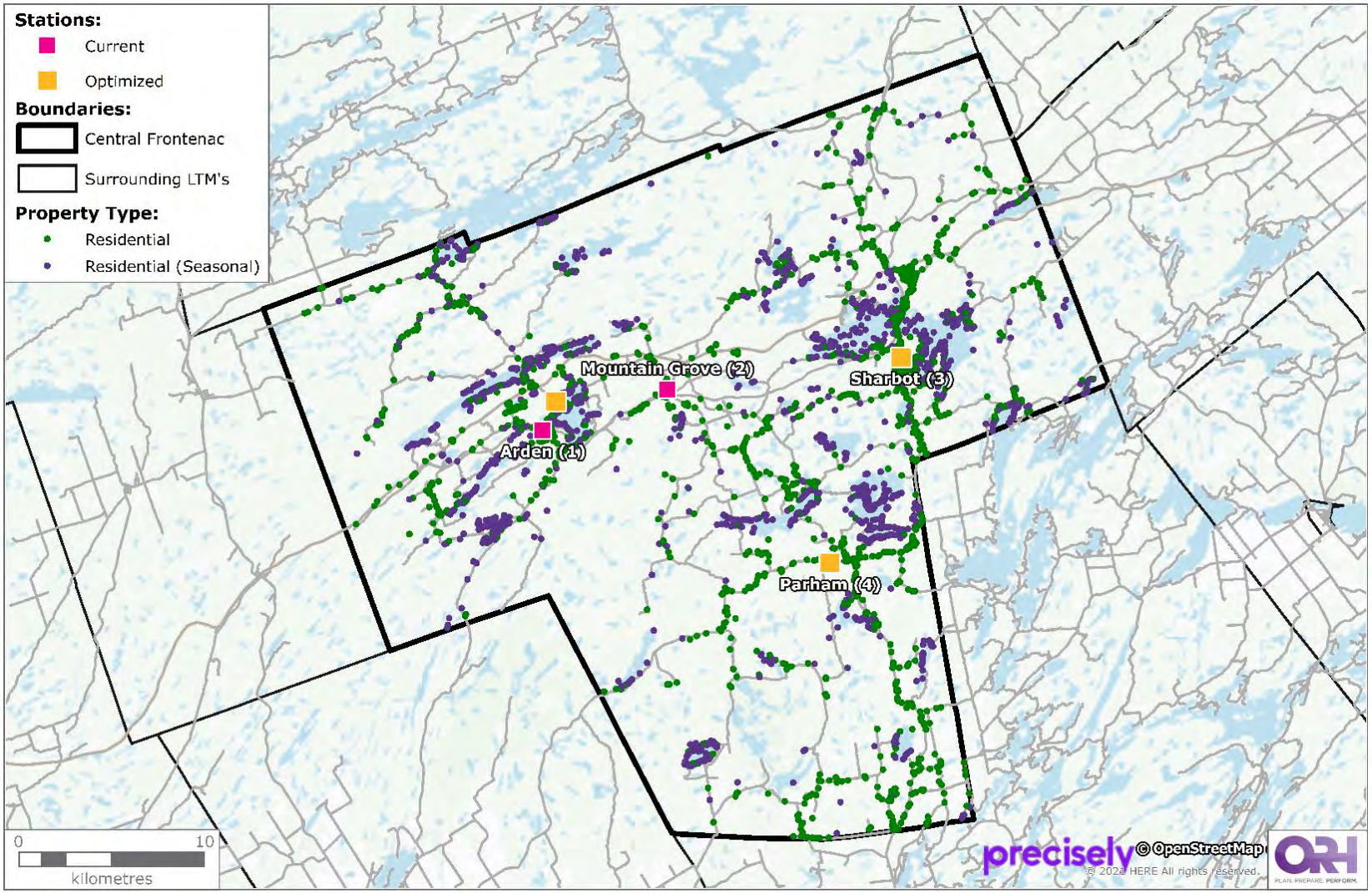
- Following the area-wide optimization modelling, CFFR and SFFR specified options of interest for ORH to examine.
- In each case, where optimization was required, the same objectives were used, however more constraints were applied to develop feasible options.
- For all options, ORH has reported the coverage statistics in the same manner as the area-wide optimization, comparing the results to the current station locations.
- When considering the ideal replacement site for a single station, ORH produced a site-search map to determine the optimal within its local area.

Central: Combining Stations 1 & 2

Central: Combining Stations 1 & 2

- CFFR specified an option to potentially combine Stations 1 (Arden) and 2 (Mountain Grove) at one site.
- ORH identified the optimal location with CFFR Stations 3 and 4 fixed at their current sites.
  - Same approach as township-wide optimization.
  - Compare locations and coverage to current position.

Central: Combining Stations 1 & 2



Central: Combining Stations 1 & 2

Road Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current 4	24.7%	47.5%	84.2%	36.4%	61.5%	86.3%	31.6%	55.8%	85.4%
Optimized 3	20.2%	38.9%	81.6%	36.4%	61.5%	86.3%	29.7%	52.2%	84.4%
Difference	-4.5%	-8.6%	-2.6%	0.0%	0.0%	0.0%	-1.9%	-3.6%	-1.0%

Housing Coverage

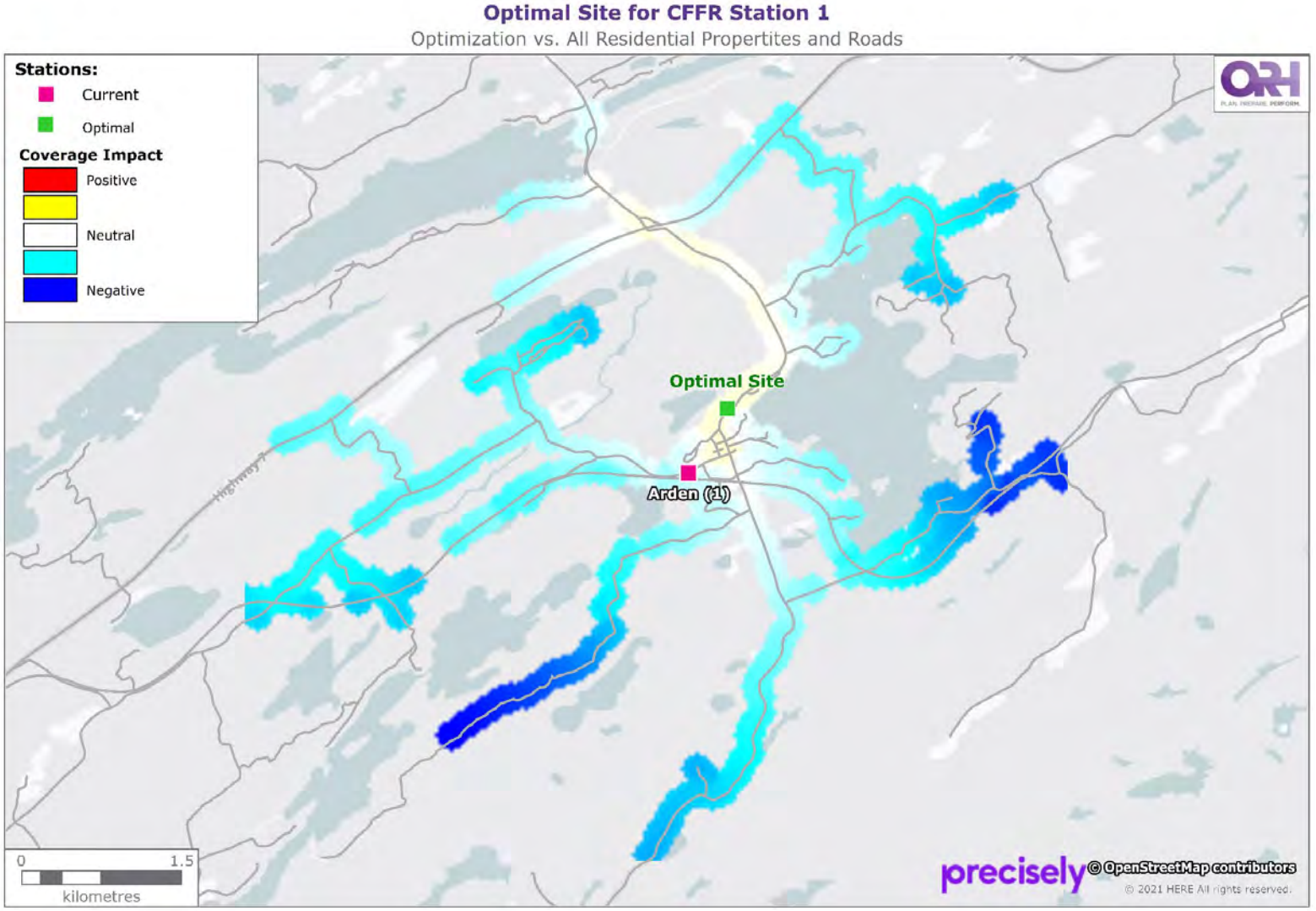
Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current 4	36.0%	58.9%	87.9%	42.4%	68.6%	87.9%	40.6%	65.8%	87.9%
Optimized 3	38.0%	54.3%	86.3%	42.4%	68.6%	87.9%	41.1%	64.6%	87.4%
Difference	2.0%	-4.6%	-1.6%	0.0%	0.0%	0.0%	0.5%	-1.2%	-0.5%

Central: Optimizing Station 1

Central: Optimizing Station 1

- CFFR specified an option to potentially relocate Station 1 (Arden) to a new site.
- ORH identified the optimal location with all other CFFR and SFFR stations fixed at their current sites.
  - Same approach as township-wide optimization.
  - Produced a site-search map for the optimal location.
  - Compared coverage to current position.

Central: Optimizing Station 1



Central: Optimizing Station 1

Road Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	24.7%	47.5%	84.2%	36.4%	61.5%	86.3%	31.6%	55.8%	85.4%
Optimized	25.3%	47.6%	84.6%	36.4%	61.5%	86.3%	31.8%	55.8%	85.6%
Difference	0.6%	0.1%	0.4%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%

Housing Coverage

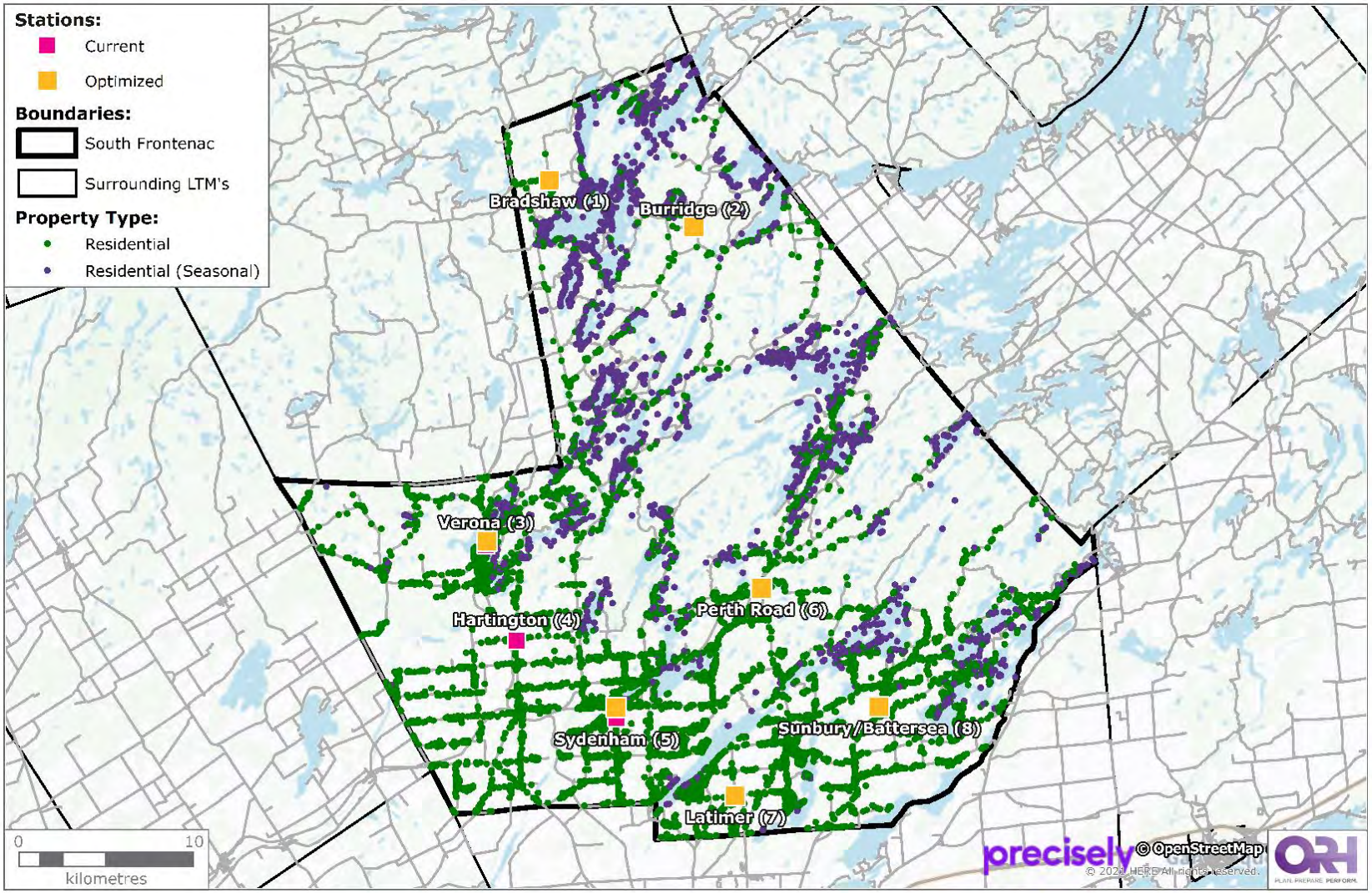
Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	36.0%	58.9%	87.9%	42.4%	68.6%	87.9%	40.6%	65.8%	87.9%
Optimized	37.8%	59.2%	88.2%	42.4%	68.6%	87.9%	41.4%	65.9%	87.9%
Difference	1.8%	0.3%	0.3%	0.0%	0.0%	0.0%	0.8%	0.1%	0.0%

South: Stations 3, 4 and 5

SF Stations 3, 4 & 5

- SFFR specified an option to potentially combine Stations 3 (Verona), 4 (Hartington) and 5 (Sydenham) at one or two optimal sites in South Frontenac.
- ORH identified the optimal location with all other SFFR stations fixed at their current sites.
  - Same approach as township-wide optimization.
  - Compare locations and coverage to current position.

SF Stations 3, 4 & 5: Two Locations



SF Stations 3, 4 & 5: Two Locations

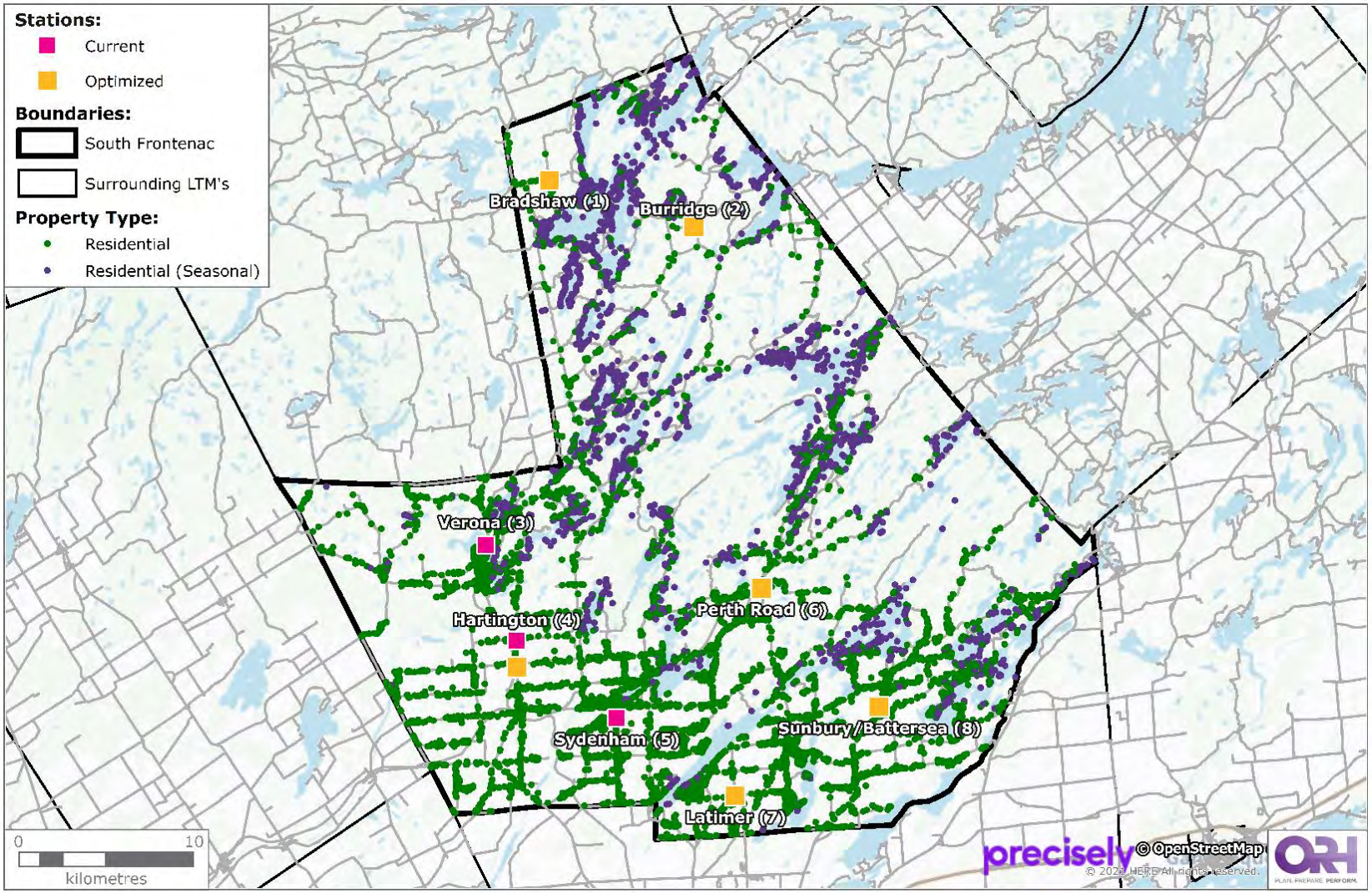
Road Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current 8	24.7%	47.5%	84.2%	36.4%	61.5%	86.3%	31.6%	55.8%	85.4%
Optimized 7	24.8%	47.7%	84.3%	31.8%	57.7%	85.5%	28.9%	53.6%	85.0%
Difference	0.1%	0.2%	0.1%	-4.6%	-3.8%	-0.8%	-2.7%	-2.2%	-0.4%

Housing Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current 8	36.0%	58.9%	87.9%	42.4%	68.6%	87.9%	40.6%	65.8%	87.9%
Optimized 7	36.1%	59.2%	87.9%	37.9%	66.2%	87.3%	37.3%	64.2%	87.4%
Difference	0.1%	0.3%	0.0%	-4.5%	-2.4%	-0.6%	-3.3%	-1.6%	-0.5%

SF Stations 3, 4 & 5: One Location



SF Stations 3, 4 & 5: One Location

Road Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current 8	24.7%	47.5%	84.2%	36.4%	61.5%	86.3%	31.6%	55.8%	85.4%
Optimized 6	24.3%	44.6%	78.5%	26.2%	50.4%	80.8%	25.4%	48.1%	79.9%
Difference	-0.4%	-2.9%	-5.7%	-10.2%	-11.1%	-5.5%	-6.2%	-7.7%	-5.5%

Housing Coverage

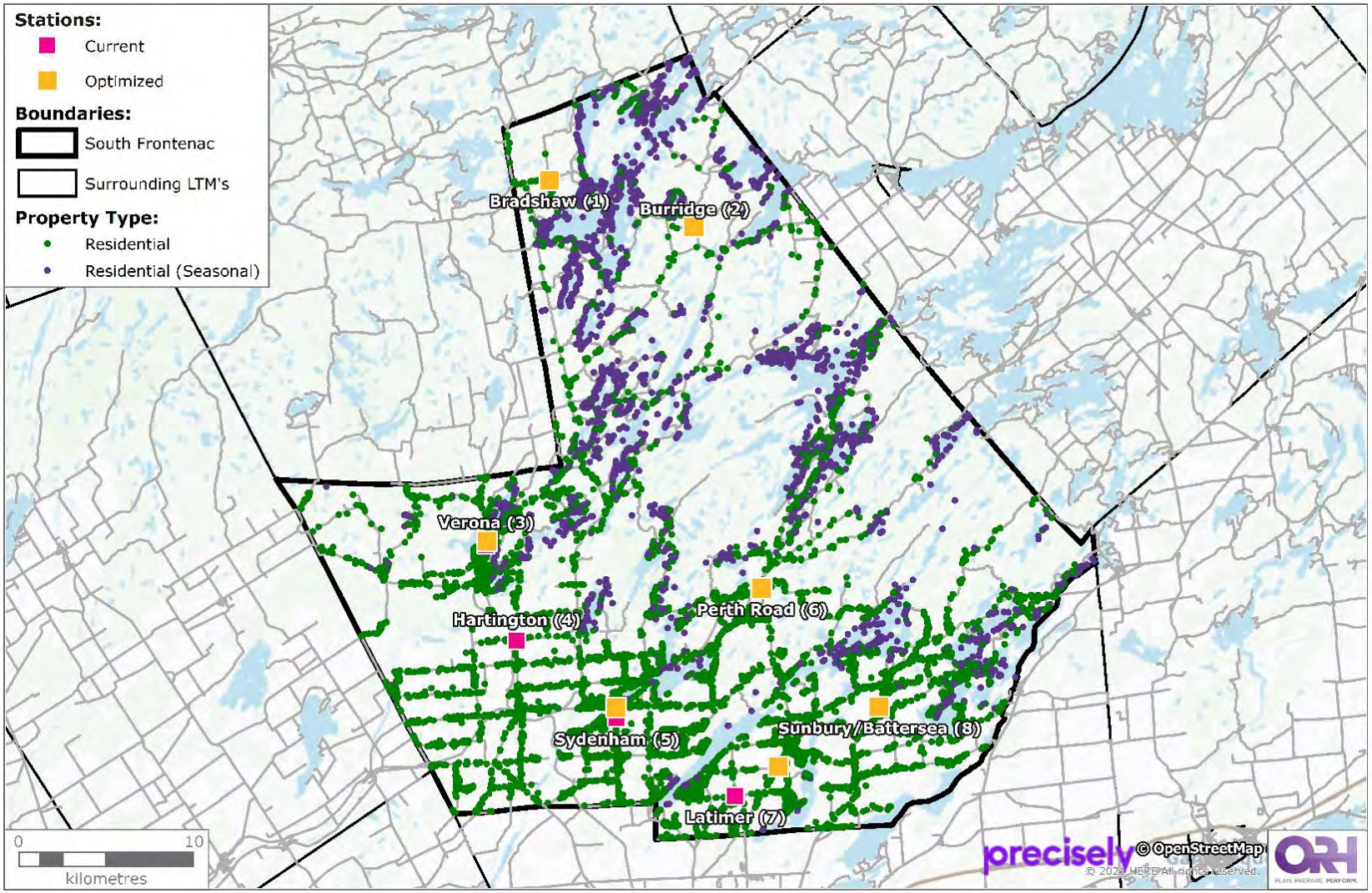
Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current 8	36.0%	58.9%	87.9%	42.4%	68.6%	87.9%	40.6%	65.8%	87.9%
Optimized 6	35.5%	56.7%	84.2%	25.9%	54.0%	83.0%	28.5%	54.8%	83.3%
Difference	-0.5%	-2.2%	-3.7%	-16.5%	-14.6%	-4.9%	-12.1%	-11.0%	-4.6%

South: Stations 3, 4, 5 and 7

SF Stations 3, 4, 5 & 7

- SFFR specified an option to potentially combine Stations 3 (Verona), 4 (Hartington), 5 (Sydenham) and 7 (Latimer) at three optimal sites in South Frontenac.
- ORH identified the optimal location with all other SFFR stations fixed at their current sites.
  - Same approach as township-wide optimization.
  - Compare locations and coverage to current position.

SF Stations 3, 4, 5 & 7: Locations



SF Stations 3, 4, 5 & 7: Coverage

Road Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current 8	24.7%	47.5%	84.2%	36.4%	61.5%	86.3%	31.6%	55.8%	85.4%
Optimized 7	24.8%	47.7%	84.3%	32.4%	57.6%	85.5%	29.3%	53.5%	85.0%
Difference	0.1%	0.2%	0.1%	-4.0%	-3.9%	-0.8%	-2.3%	-2.3%	-0.4%

Housing Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current 8	36.0%	58.9%	87.9%	42.4%	68.6%	87.9%	40.6%	65.8%	87.9%
Optimized 7	36.1%	59.2%	87.9%	39.1%	65.9%	87.3%	37.5%	64.0%	87.4%
Difference	0.1%	0.3%	0.0%	-4.3%	-2.7%	-0.6%	-3.1%	-1.8%	-0.5%

South: Closing Station 4

South: Closing Station 4

- Based on the optimization modelling for combining Stations 3, 4 and 5 (and 7) in South Frontenac, SFFR specified an option to potentially remove Hartington (Station 4), while leaving all other SFFR stations in their current locations.
- No optimization modelling was required here, so ORH compared the coverage for with and without Hartington station.

South: Closing Station 4

Road Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	24.7%	47.5%	84.2%	36.4%	61.5%	86.3%	31.6%	55.8%	85.4%
No Station 4	24.7%	47.5%	84.2%	31.4%	57.1%	84.6%	28.6%	53.1%	84.5%
Difference	0.0%	0.0%	0.0%	-5.0%	-4.4%	-1.7%	-3.0%	-2.7%	-0.9%

Housing Coverage

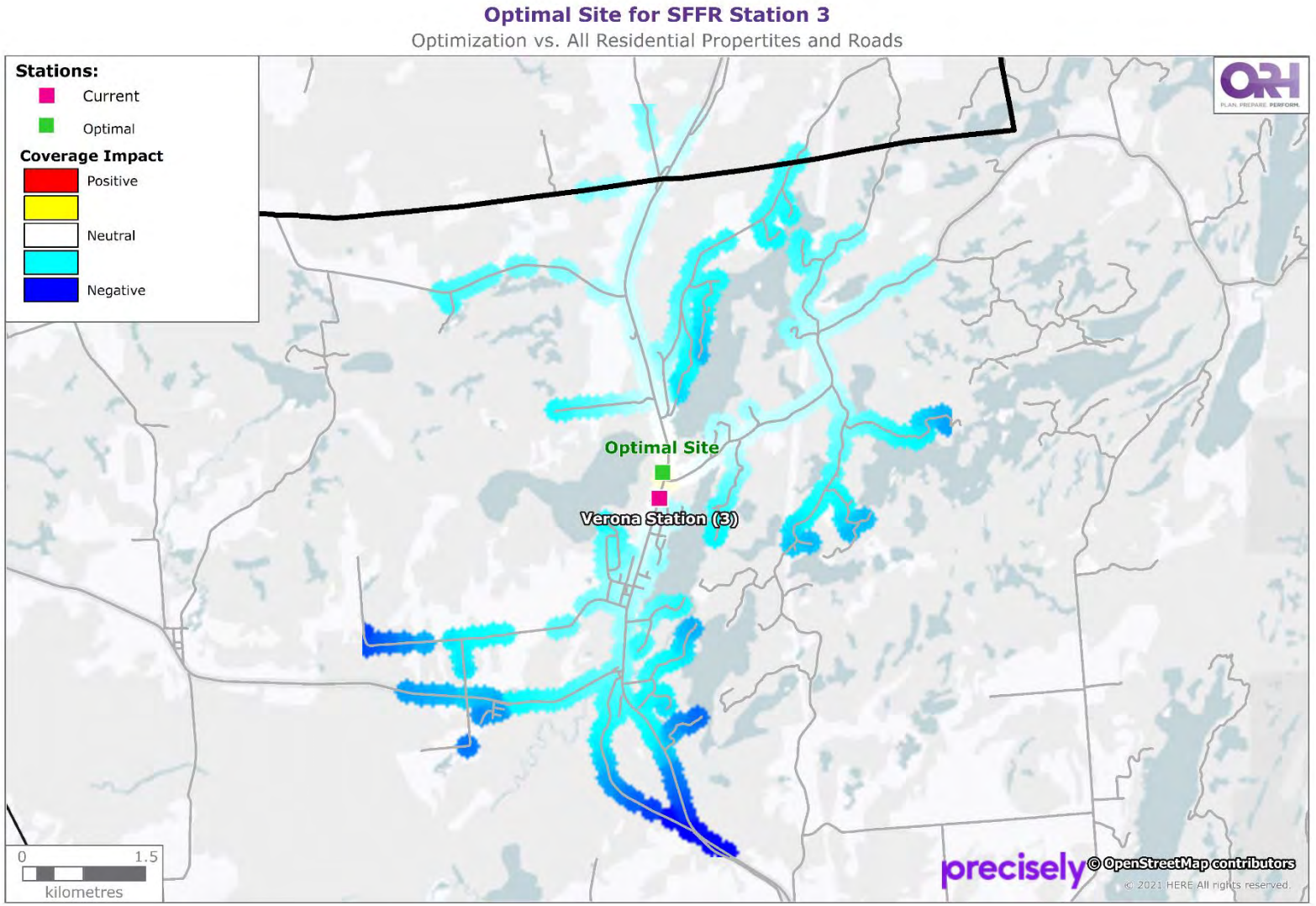
Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	36.0%	58.9%	87.9%	42.4%	68.6%	87.9%	40.6%	65.8%	87.9%
No Station 4	36.0%	58.9%	87.9%	37.6%	65.7%	86.3%	37.1%	63.8%	86.7%
Difference	0.0%	0.0%	0.0%	-4.8%	-2.9%	-1.6%	-3.5%	-2.0%	-1.2%

South: Optimizing Station 3

South: Optimizing Station 3

- SFFR specified an option to potentially relocate Station 3 (Verona) to a new site.
- ORH identified the optimal location with all other SFFR and CFFR stations fixed at their current sites.
  - Same approach as township-wide optimization.
  - Produced a site-search map for the optimal location.
  - Compared coverage to current position.

South: Optimizing Station 3



South: Optimizing Station 3

Road Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	24.7%	47.5%	84.2%	36.4%	61.5%	86.3%	31.6%	55.8%	85.4%
Optimized	24.8%	47.7%	84.3%	36.4%	61.6%	86.4%	31.6%	55.9%	85.5%
Difference	0.1%	0.2%	0.1%	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%

Housing Coverage

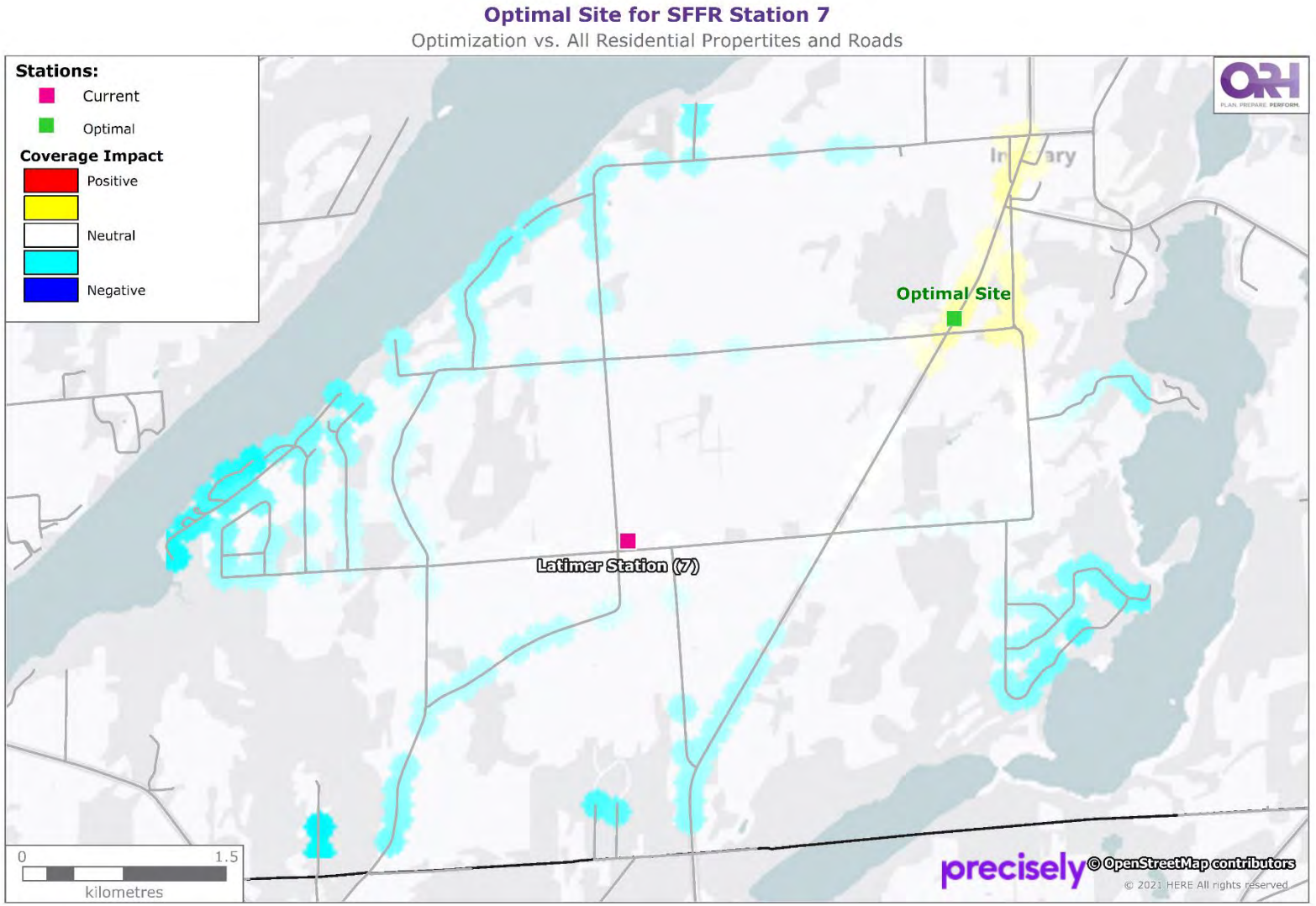
Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	36.0%	58.9%	87.9%	42.4%	68.6%	87.9%	40.6%	65.8%	87.9%
Optimized	36.1%	59.2%	87.9%	42.2%	68.8%	88.1%	40.5%	66.1%	88.0%
Difference	0.1%	0.3%	0.0%	-0.2%	0.2%	0.2%	-0.1%	0.3%	0.1%

South: Optimizing Station 7

South: Optimizing Station 7

- SFFR specified an option to potentially relocate Station 7 (Latimer) to a new site.
- ORH identified the optimal location with all other SFFR and CFFR stations fixed at their current sites.
  - Same approach as township-wide optimization.
  - Produced a site-search map for the optimal location.
  - Compared coverage to current position.

South: Optimizing Station 7



South: Optimizing Station 7

Road Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	24.7%	47.5%	84.2%	36.4%	61.5%	86.3%	31.6%	55.8%	85.4%
Optimized	24.7%	47.5%	84.2%	37.0%	61.4%	86.3%	31.9%	55.7%	85.4%
Difference	0.0%	0.0%	0.0%	0.6%	-0.1%	0.0%	0.3%	-0.1%	0.0%

Housing Coverage

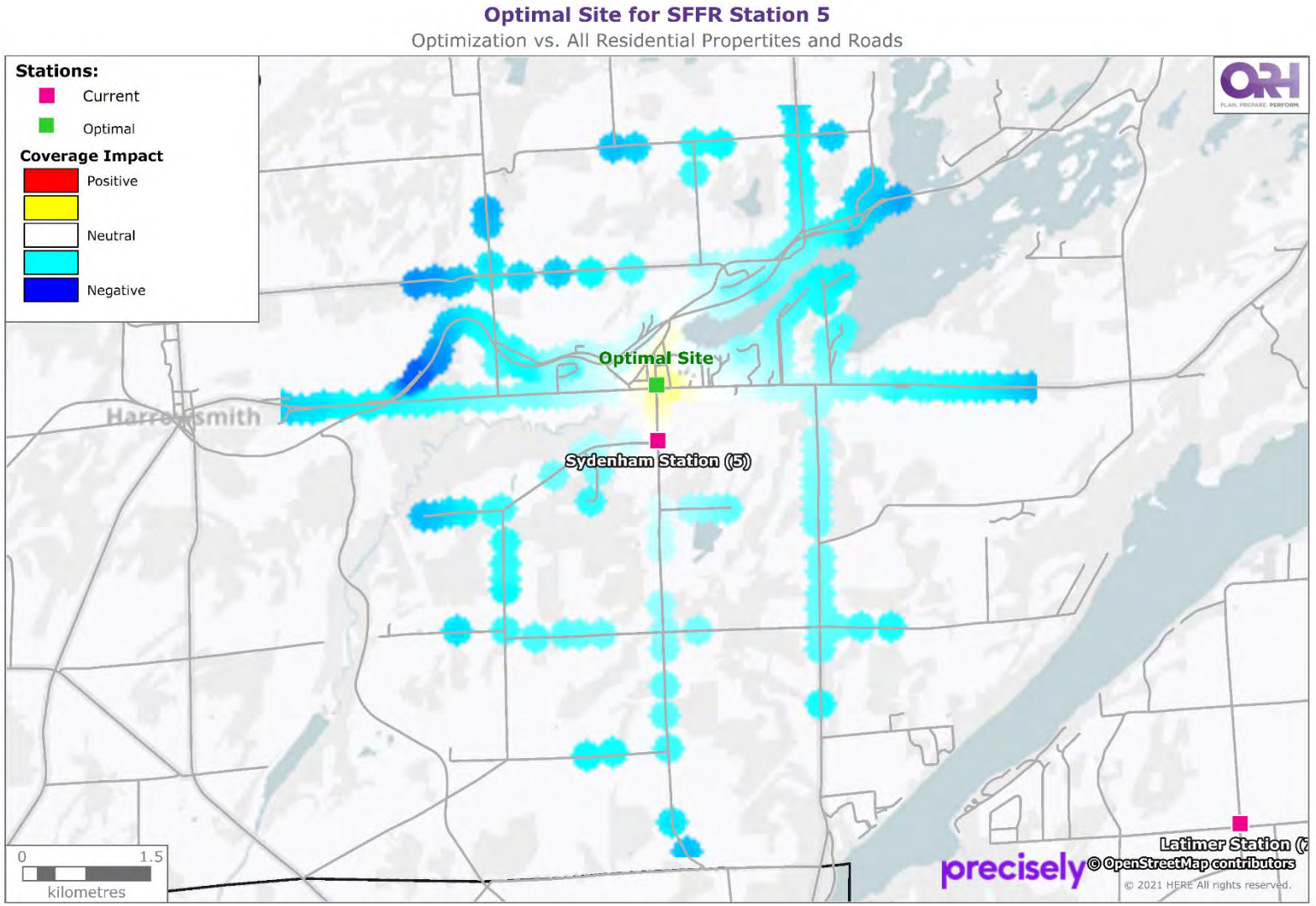
Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	36.0%	58.9%	87.9%	42.4%	68.6%	87.9%	40.6%	65.8%	87.9%
Optimized	36.0%	58.9%	87.9%	42.6%	68.3%	87.9%	40.7%	65.6%	87.9%
Difference	0.0%	0.0%	0.0%	0.2%	-0.3%	0.0%	0.1%	-0.2%	0.0%

South: Optimizing Station 5

South: Optimizing Station 5

- SFFR specified an option to potentially relocate Station 5 (Sydenham) to a new site.
- ORH identified the optimal location with all other SFFR and CFFR stations fixed at their current sites.
  - Same approach as township-wide optimization.
  - Produced a site-search map for the optimal location.
  - Compared coverage to current position.

South: Optimizing Station 5



South: Optimizing Station 5

Road Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	24.7%	47.5%	84.2%	36.4%	61.5%	86.3%	31.6%	55.8%	85.4%
Optimized	24.7%	47.5%	84.2%	36.7%	61.6%	86.5%	31.8%	55.8%	85.5%
Difference	0.0%	0.0%	0.0%	0.3%	0.1%	0.2%	0.2%	0.0%	0.1%

Housing Coverage

Deployment	Central			South			Overall		
	5Km	8Km	13Km	5Km	8Km	13Km	5Km	8Km	13Km
Current	36.0%	58.9%	87.9%	42.4%	68.6%	87.9%	40.6%	65.8%	87.9%
Optimized	36.0%	58.9%	87.9%	42.7%	68.9%	88.2%	40.8%	66.1%	88.0%
Difference	0.0%	0.0%	0.0%	0.3%	0.3%	0.3%	0.2%	0.3%	0.1%

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Summary

Summary

- ORH analyzed incident and GIS data to build an understanding of the townships and develop inputs for the optimization and coverage models.
- Area-wide optimization runs were followed by a series of specific options for CFFR and SFFR. In all scenarios, the residential properties and road network coverage was compared to the current position.
- In general, the stations are closely aligned to optimal sites, so there are limited opportunities for providing large coverage gains without significant investment in new station locations across the townships.

Recommendations: Central

- In CFFR, Station 1 (Arden) is recognized as requiring investment and the modelling has indicated that it is important to maintain a site in this area. The optimal location is northeast of the current station with improved access to Highway 7, and this should be considered if an opportunity arises to rebuild in a new location.

Recommendations: South

- There are three stations in SFFR that might require renovating or rebuilding in the near future.
- ORH's modelling has identified that:
  - Station 3 (Verona) is well-located and a rebuild should be in the near vicinity of the current site. An option to co-locate with OPP should be considered.
  - Station 7 (Latimer) could be relocated closer to Inverary, however this would only provide a small gain in coverage.
  - Station 5 (Sydenham) is also well-located, so is not a priority to relocate. When renovation is required, an alternative site on Rutledge Rd would be optimal.

Recommendations: Combined

- From the area-wide optimization runs, there were limited opportunities arising for combining sites in CFFR and SFFR to produce a more efficient service.
- One area to potentially explore would be between Parham (CFFR) and Bradshaw (SFFR), where an optimal site was identified, however this would need to meet the requirements for both services. This could be explored subject to future population growth in the area.

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