City of Syracuse Winter Weather Operations

February 2022

Office of Accountability, Performance & Innovation

Conor Muldoon; Joanna Bailey

Syracuse Snow

City of Syracuse Snowfall

Syracuse, NY (along with several other cities in upstate NY) generally receives a lot of snow during the winter.

We are considered one of the snowiest cities in the United States and regularly are in the top 10 cities in total accumulation.

A large part of operations during the year is how we handle snow clearance and safety to improve the accessibility of emergency services, public services, work and school.

City	Snowfall this season (inches)	Average snowfall to date (inches)	Above or below average snow (inches)
Buffalo, NY	73.8	66.4	7.4
Rochester, NY	62	64.7	-2.7
Anchorage, AK	54.6	52.7	1.9
Erie, PA	52.4	74	-21.6
Grand Rapids, MI	52.3	56.3	-4
Syracuse, NY	47	83.4	-36.4
Akron, OH	41.5	29.5	12
Flint, MI	41.4	33.9	7.5
Boulder, CO	39.7	48	-8.3
Fargo, ND	39.3	32.1	7.2
Cleveland, OH	39.2	39.7	-0.5
Binghamton	39.1	50.6	-11.5
South Bend, IN	37.9	45.7	-7.8
Lansing, MI	37.4	33.5	3.9
Boston, MA	37.4	28.6	8.8
Ann Arbor, MI	34.3	39.2	-4.9
Minneapolis, MN	33.9	32.2	1.7
Worcester, MA	32.8	42.5	-9.7
Spokane, WA	32	34.7	-2.7
Green Bay, WI	30.5	33.9	-3.4
Providence, RI	30.1	22	8.1
Billings, MT	28.9	33.9	-5
Detroit, MI	28.6	28.5	0.1
Fort Collins, CO	28.1	27.5	0.6
Manchester, NH	28		
Lakewood, CO	26	31	-5

Data collected by Golden Snow Globe Award. Top 25 Cities in United States with totals as of 2/8/2022.

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City of Syracuse Fleet

We operate different vehicles throughout snow events in Syracuse.

- 16 large snow plow fleet vehicles
- ~20 small trucks to plow smaller side streets
- 40 plow operators
- 5 vendor sidewalk vehicles

We are responsible for plowing 407 road miles and ~100 miles of sidewalks.

120 miles of our streets are priority streets (roads that service hospitals and schools, and major roadways that serve the business corridor and hilly terrains).

City of Syracuse Snow Routes and Prioritization

The City of Syracuse has 3 route prioritizations:
- Emergency / Rush routes
- Regular routes
- Neighborhood squares

New York State DOT is responsible for servicing major highways within City boundaries.

Syracuse University clears the streets around their university, although the City can assist if needed.

While plowing, operators also report illegally parked car locations that prevent them from getting down the road without inflicting damage to personal property.
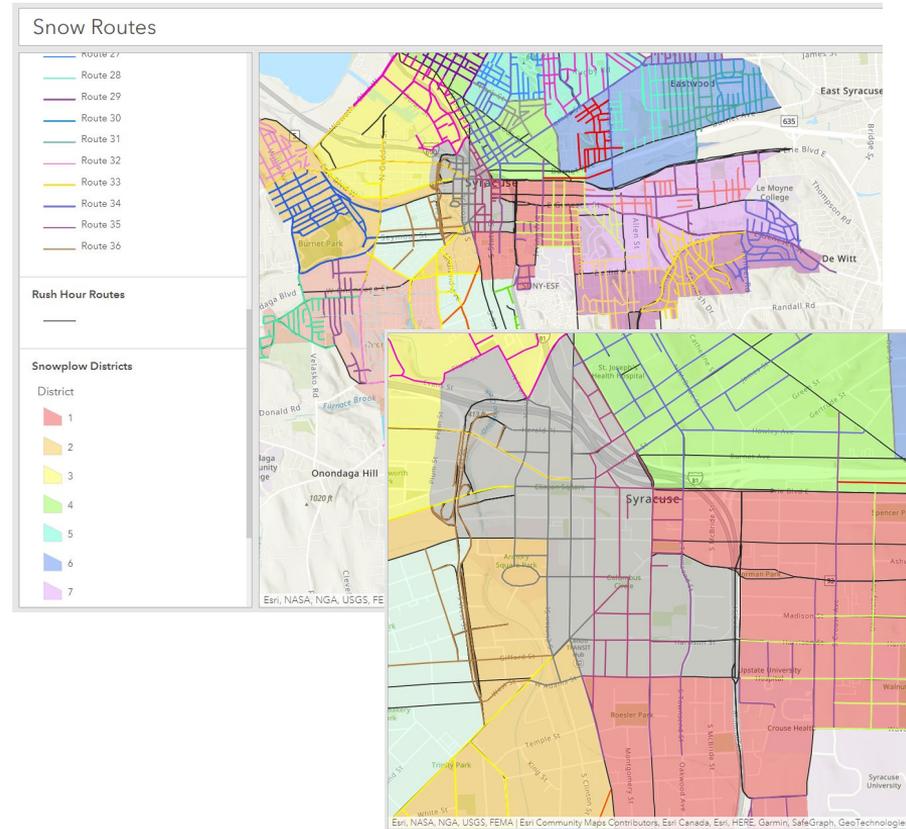
Previous In-House Tracker Efforts
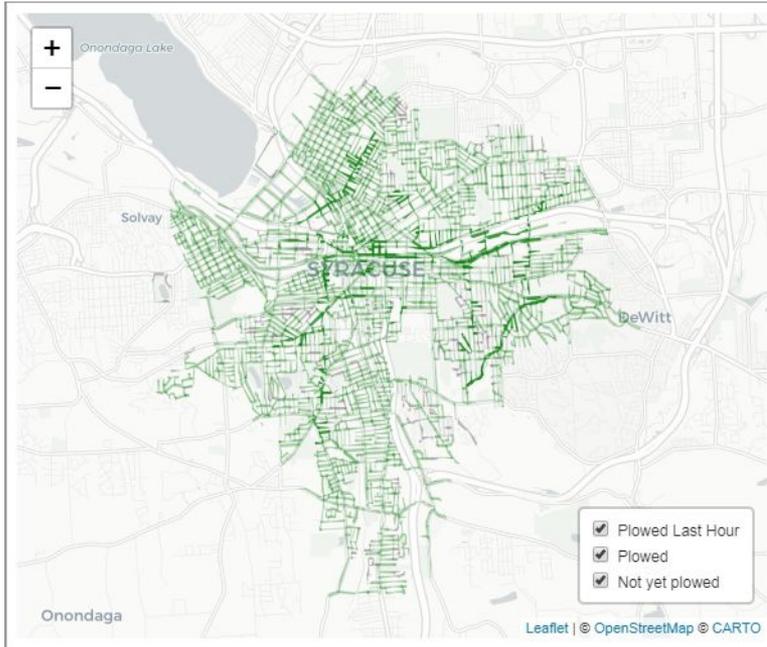
In 2018, the Office of Accountability, Performance and Innovation developed a proof of concept snow plow tracking map that identified the last time a street was plowed.

This was very well received and provided a communication to the public giving insight into how we service streets during a snow event.

Challenges with our In-House Tracker

However, there were several issues with this map:
- The map was built entirely in-house with only a 1 or 2 staff possessing the capability to debug and fix things that break, requiring many late night hours
- The GPS system we used did not ping often enough to reliably track plows

In the Winter of 2020-2021, we did not have a viable snow plow map as:
- Street segments plowed were not showing up on the map
- Street segments were skipped, making it difficult to understand what route the plow was taking

Upgrading our Sensor Technology

In the beginning of 2021, DPW and IT began meeting with other AVL vendors to upgrade our sensors. One of the main upgrades we asked for were faster pings to generate a more accurate map.

The City purchased **Samsara** sensors, which provided more information about the plows, including location, fuel, maintenance, and safety information.

We upgraded the ping rate to avoid the issue of "floating plows", skipping segments in the public facing map.

Samsara also allows the ability to track plow up / plow down, which we will be implementing in future iterations for a more accurate measure of streets plowed.
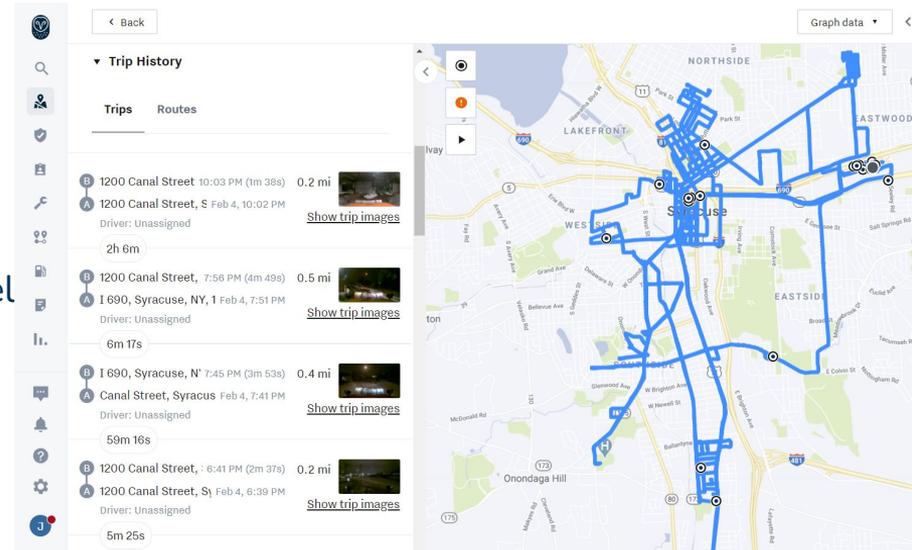
Winter Weather Operations

Finding the Right Solution

In Summer 2021, we started looking at what other cities in the country were using to track snow plow progress.

We found several cities such as Baltimore County and Columbus, Ohio using **ArcGIS** and **GeoEvent** to power their plow tracking tools, so we reached out to ESRI to determine if this was a viable option for the City of Syracuse.
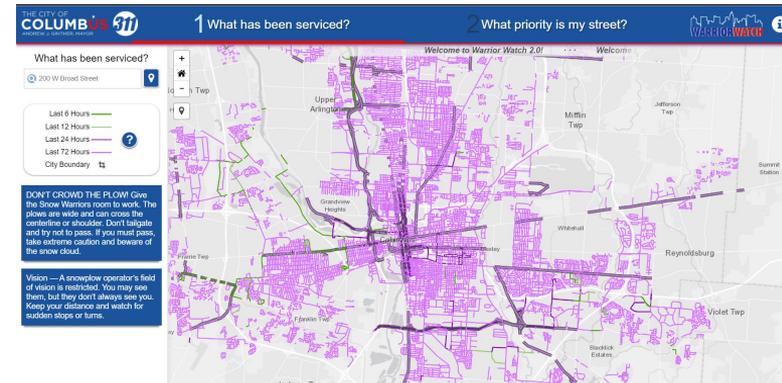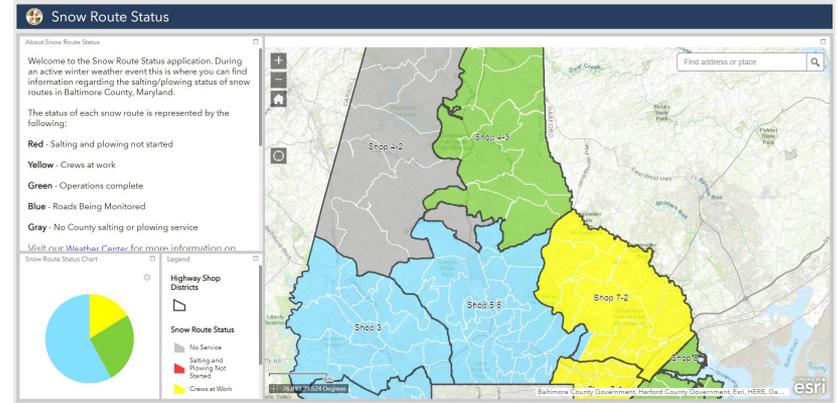
Velocity & Winter Weather Operations

ESRI informed us of a new tool, **Winter Weather Operations** launching in Winter 2021 that runs through **Velocity**, which does not require ArcGIS Enterprise and does not run through GeoEvent.

This tool included the public facing map that was unavailable through our sensor vendor and also provided internal fleet management and performance management tools.

The tool created the layers, and we had full customization control over what metrics we showed and how the tool looked.

Velocity and the Winter Weather Operations was the right path forward for what we needed and aligned with our skills and desired outcomes.

Velocity & Winter Weather Operations - Loading Data

It was a seamless pull to get the Samsara GPS pings into Velocity using the Samsara API.

We uploaded the list of our fleet vehicles in an Excel template provided to us by the WWO tool.

We then uploaded our street segment layer into the tool and the solution walked through how to update the file (combine or split segments, identify priority segments, and generate segment length and unique IDs for each segment) so it had the needed information to deploy the solution.

Velocity & Winter Weather Operations - Creating Analytics

We generated several analytics within Velocity to create the layers we use to draw the public facing map and calculate the metrics in the internal dashboard.

These analytics:
- Assign the GPS pings to our street network
- Records the time the segment was last touched
- Shares the last time served for each segment to a public layer
- Stores the historic GPS locations
- Stores the material used
- Calculates the distance traveled
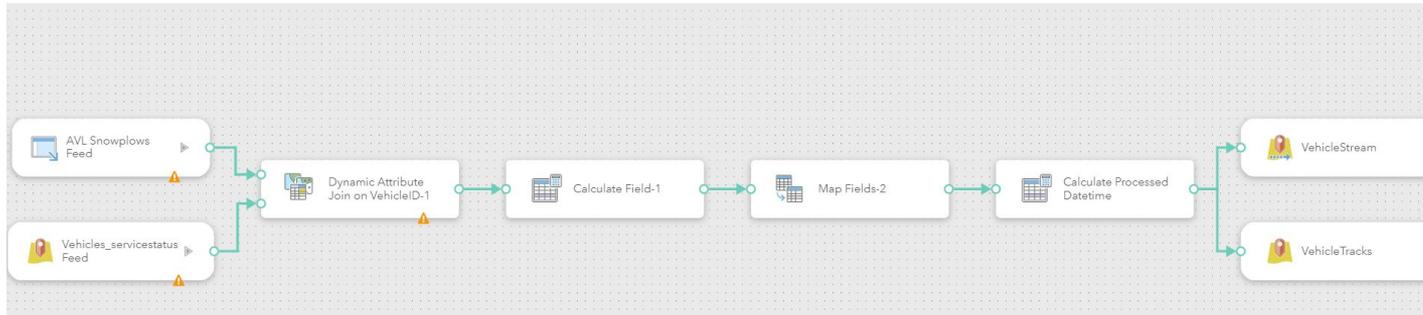
Velocity & Winter Weather Operations - Building Apps

The public facing map we use is an **ArcGIS Instant App** which is fully customizable in how we want it to look and what information we want to share.

We can choose the color scheme, time buckets, refresh interval, and what additional layers we want to add (in this case, the illegally parked cars).
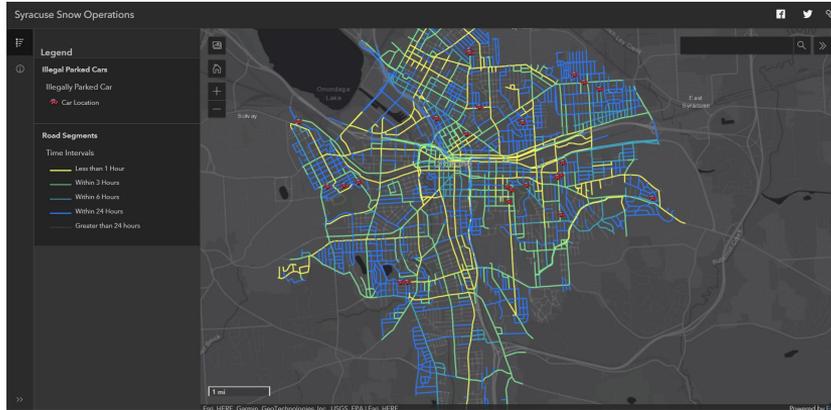
The internal Winter Operations Center is a fully customizable **ArcGIS Experience Builder App.**

We can choose what tabs to show (events, vehicles, and current event vs whole season) as well as what metrics / maps we want to include.

We only turn on this tool during active winter events.

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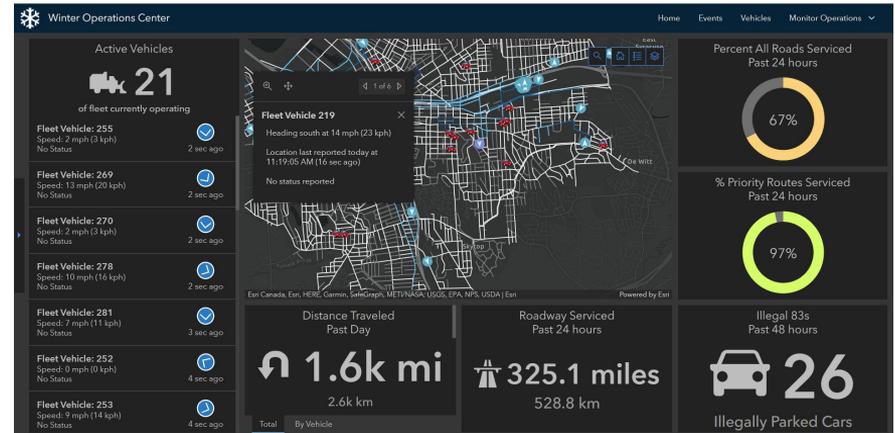
Public Facing Map
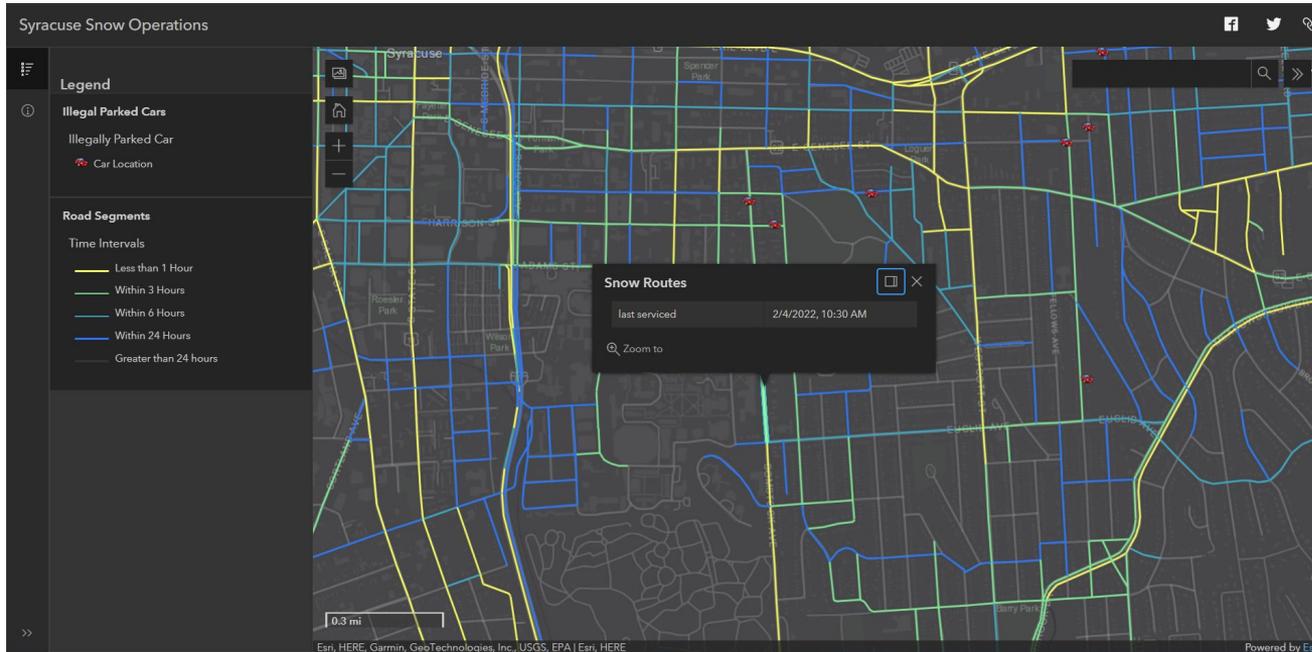
The public map shows:
- Time each street segment was last plowed
- Locations of illegally parked cars (communicating to residents why their street had not been plowed yet.)
- Address search bar

The colors work from the brightest (yellow) representing the most recent plow, while the darkest (blue / gray) is the oldest or not yet plowed.

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Internal Dashboard - Current Event

The internal dashboard has been developed with our DPW stakeholders to ensure the metrics reflected are useful for them.

We currently include:
- distance traveled
- % of priority routes serviced
- % of regular routes serviced
- number of illegally parked cars.

These are all filterable by priority route and by vehicle.

There is also a map that shows more recent time intervals and shows the location of the live trucks.

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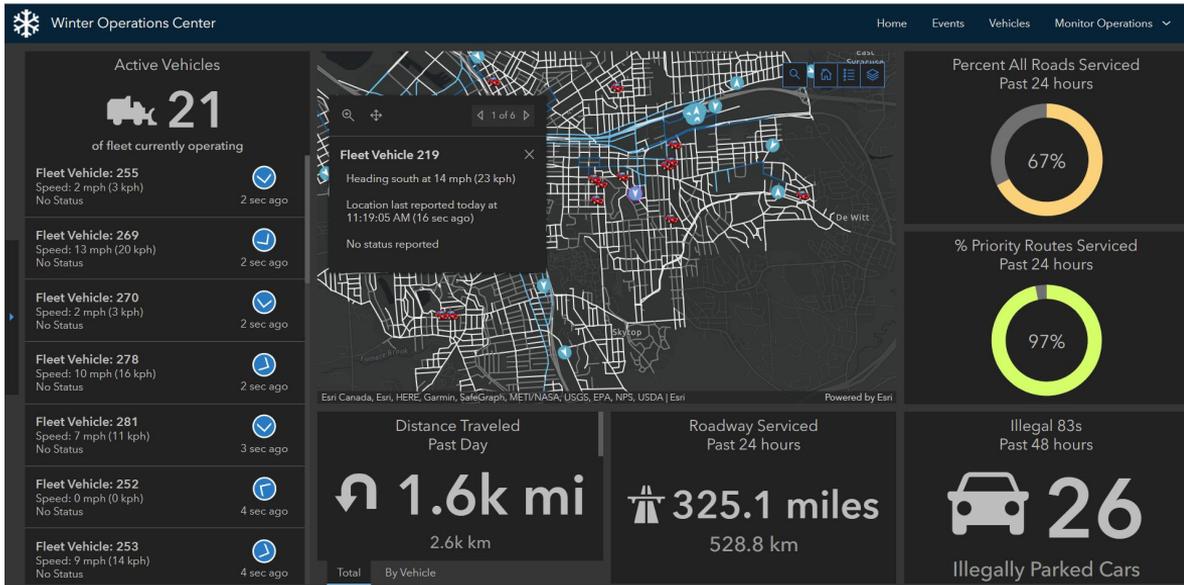
Internal Dashboard - Vehicles & Events

The Events tab contains all the snow events we have in our organization and allows our snow ops team to start and end events.

This also can show snowfall for each event and duration of snow events.
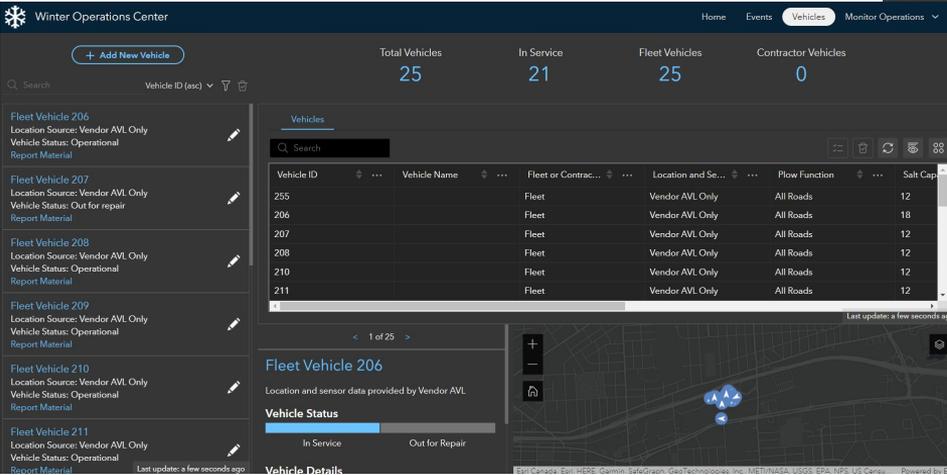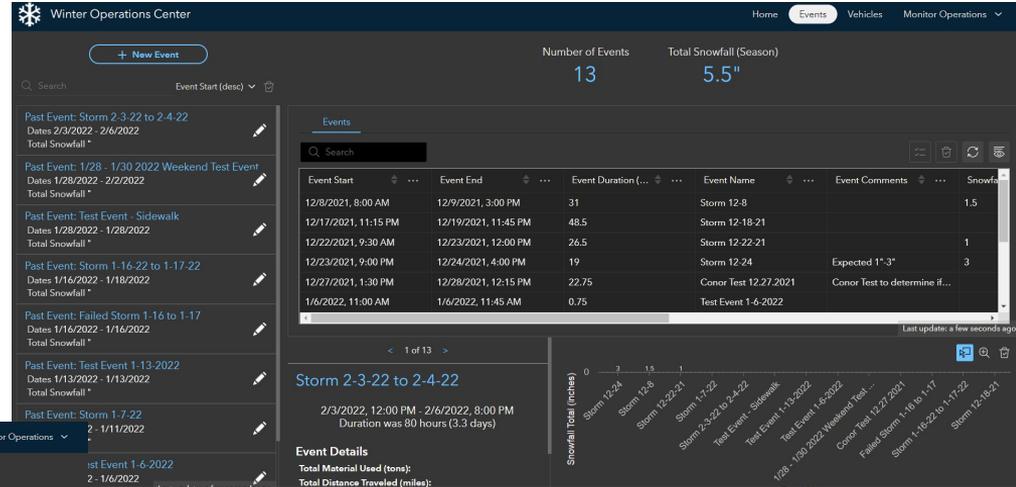
The Vehicles tab functions to keep track of our fleet and which vehicles are out for repair vs operational.

It allows our fleet manager to add / remove vehicles and update information about the vehicles.

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Internal Dashboard - Current Season

The current season tab shows all historical GPS locations of all vehicles, shows the total distance traveled, and summarizes each of the events in the season.

This tab also allows you to figure out bread crumb paths of vehicles by filtering for events, vehicles, speed, road name / priority, and time frame.
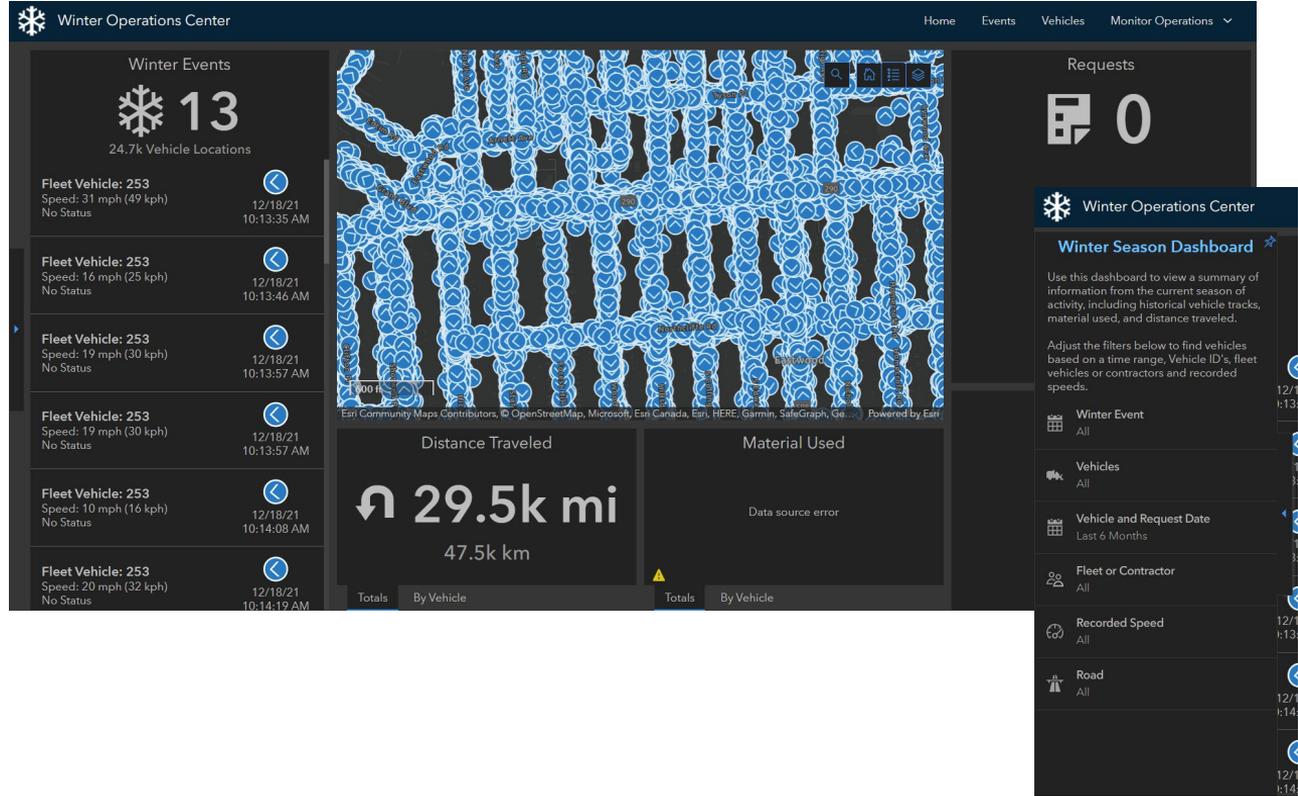
Future Updates

This tool is an out-of-the-box service that provides many different layers you can include, such as additional information on vehicles and requests (similar to CityLine).

As this lives in our ArcGIS organization, we have full control over the Winter Operations Center and the public facing map. This tool is an iterative design and after every storm there are new requests for different metrics or tools from senior staff and our snow operations team.

Future updates for our tools this season include
- Adding a sidewalk clearance public facing map and internal metrics
- Creating a historic tool that allows operations to see what the public facing map / WWO looked like at a given time during a past snow event
- Cleaning / updating street segment layer
- Timing metrics (i.e., time to complete xx% of routes)

SRP V3.3:
2021- 2022
CLEARANCE MAP

0 0.25 0.5   1 Miles

Snow Removal Route
New
Winter Trails
Parks
SCSD Parcels

SMTC
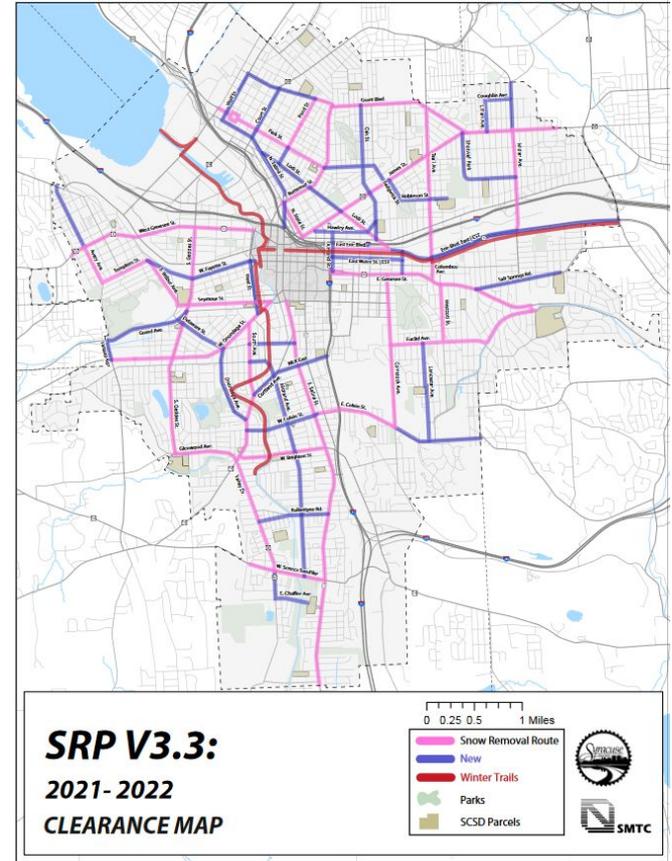
Questions?

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