# Columbia Winter Weather Response Late 2023 - Early 2024

General information
City Council: Pre-Council Oct. 2, 2023

Richard Stone
Engineering & Operations Manager
City of Columbia Public Works Department

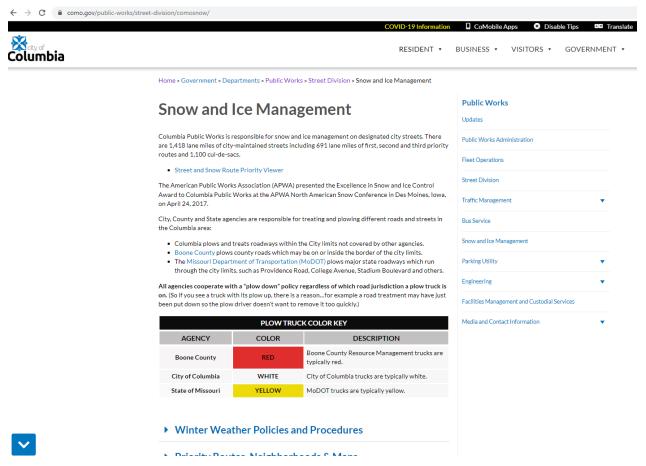
From a high level perspective, everything we do is centered on providing the best possibility for people to achieve safe travel.

That is home base.

The hierarchy of priority routes points first toward efficient travel from an emergency response perspective, then everything else follows from there.

- Equipment and other resources have been built towards first, second and third priority routes over last decade plus for the most efficient response possible with available resources.
- Any winter weather response for any agency is based on: available resources, establishing a plan before winter, and proper execution during winter.

#### www.CoMoSnow.com



Internally, we treat winter weather events as if the event is a disaster situation -- because that's what they are.

Public Works employs a systematic, equitable and methodical approach to winter weather.

Our plan has been carefully crafted with a focus on resource management, environmental stewardship, and resident safety. Our commitment lies in faithfully following the plan to achieve those goals.

The Incident Command System (ICS) is typically initiated if 2+ full shifts are expected.

Otherwise, email communication with information.

The ICS or email is sent to the Boone County Joint Communication Supervisors group at <a href="mailto:BCJCSupervisors@boonecountymo.org">BCJCSupervisors@boonecountymo.org</a>, with many others copied.

#### We do not control:

- Mother nature
- How other agencies respond (MoDOT and Boone County responses impact travel within and around the City)

#### We do control:

- Our resources
- Our planning
- How we react to what is happening

The ICS information is updated every 12 hours (on shift changes) or in response to major changes.

#### Example ICS information

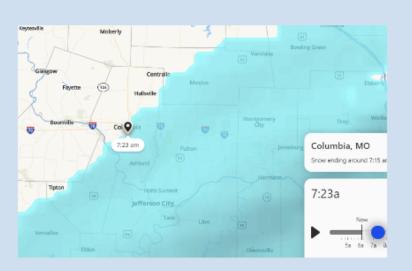


#### **INCIDENT BRIEFING (ICS 201)**

#### Snow and Ice Management

2. Incident Number: 1. Incident Name: 3. Date/Time Initiated: Winter storm beginning 3/10/2022 Update #3 Date: 03/10/22 Time: 07:00 4. Map/Sketch (include sketch, showing the total area of operations, the incident site/area, impacted and threatened

areas, overflight results, trajectories, impacted shorelines, or other graphics depicting situational status and resource



5. Situation Summary and Health and Safety Briefing (for briefings or transfer of command): Recognize potential incident Health and Safety Hazards and develop necessary measures (remove hazard, provide personal protective equipment, warn people of the hazard) to protect responders from those hazards.

Snow overnight, fluffy with some drifting. Light to heavy rates. Approximately 5 inches accumulation, all precipitation forecast to end by 0800. A 28 person crew will be focused on priority routes through the morning. Additional resources may be added through the day due to volume of snow fall. Projected temperatures to rise above freezing mid-afternoon with some possible sun later today. We anticipate transitioning to subward streets at some point with some resources around mid-day depending on progress along priority streets. Temperatures forecast to fall to around 10 overnight Friday to Saturday.

6. Prepared by: Name: Richard Stone Position/Title: Engineering & Operations Manager ICS 201, Page 1

Date/Time: 3/11/2022 07:00



#### **INCIDENT BRIEFING (ICS 201)**

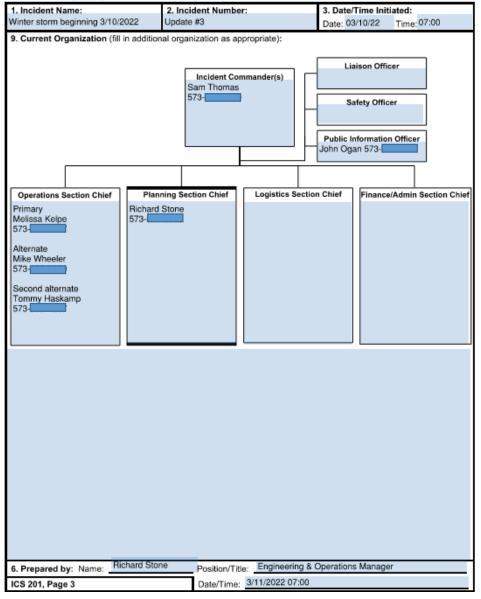
#### Snow and Ice Management

Incident Name:     Winter storm beginning 3/10/2022		2. Incident Number:	3. Date/Time Init	tiated:					
		Update #3	Date: 03/10/22	Time: 07:00					
7. Current and Planned Objectives: 28 person crew reports. Plow and treat 100 lbs per lane mile.									
8. Current and	d Planned Actions, Stra	tegies, and Tactics:							
		ed to respond to conditions							
0700-1632	26 person crew scheduled to respond to conditions.  Active snow through the day. Pavement temperatures above freezing. Pretreat priority route.								
1700	Pavement temperatures drop to freezing								
1900	23 person crew responding to conditions. Focus priority routes overnight.								
03/11/22	as person or an responsing to considering 1 ocus priority routes overnight.								
0330	approx 6 inch, light to heavy rate fluffy snow, consolidating								
0500	Medium rate. Consolidated to 5 inches accumulation.								
0600	Snow tapers to spitting around 0600								
0700	28 person crew reports								
6. Prepared by: Name: Richard Stone Position/Title: Engineering & Operations Manager									
ICS 201, Page 2 Date/Time: 3/11/2022 07:00									

#### Example ICS information

#### Columbia

#### INCIDENT BRIEFING (ICS 201) Snow and Ice Management





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1. Incident Name:		2. Incident Number:			3. Date/Time Initiated:		
Winter storm beginning 3/10/2022		Update #3			Date: 03/10/22 Time: 07:00		
10. Resource Summary:							
Resource	Resource Identifier	Date/Time Ordered	ETA	Arrived	Notes (location/assignment/status)		
9 - Tandem-axle trucks				X	1 additional available		
6 - single-axle trucks				X	1 additional available		
2 - Class 5 trucks				X	1 additional available		
5 - One-ton trucks				X	6 additional available		
1 - Loader				X	At salt dome; 1 additional available		
Motorgrader with wing plow				X	available		
2 - Skid steer				X	available		
3 - backhoe				X	available		
4-Fleet				X			
Sewer			day		additional resources to be contacted for availability - subwards		
Water			day		additional resources to be contacted for availability - subwards		
Parks			day		additional resources to be contacted for availability - subwards		
Trucks down					1981S-springs-out;1547-1T-front end, out;1534-1Tuseable if needed, front alignment;		
6. Prepared by: Name: Richard Stone Position/Title: Engineering & Operations Manager							
ICS 201, Page 4 Date/Time: 3/11/2022 07:00							

The ICS helps to provide information concerning the of status of our winter weather response to internal sources, to the emergency responders, and to the chain of command.

#### Stats:

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- Approximately 691 lane miles of First (337),
   Second (205) & Third Priority routes (149)

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   Second (205) & Third Priority routes (149)
- One salt dome with 5,000 tons of salt (currently full) – 1,500 refill during winter

#### Stats:

 Priority routes, generally continuous operation until near normal conditions.
 Intention is at least one bare wheel path at all times for First and Second, passable for Thirds nearly all time (operational decision)

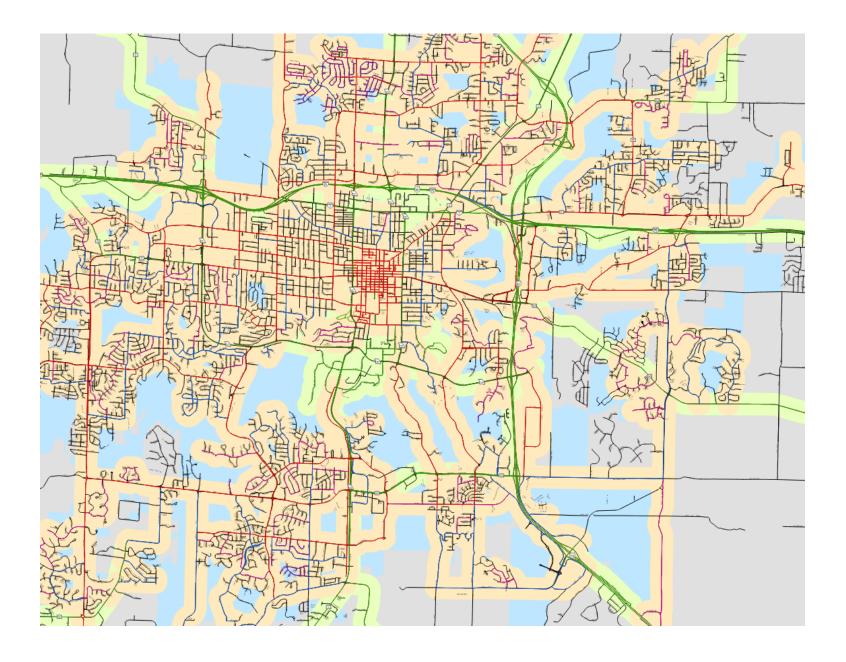
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 Third priority routes were added in 2018-2019 as a pilot program. We expanded them in 2019-2020, and they remain under evaluation.

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- We received generally positive feedback
- Upon review, we would like to have a priority road within a certain distance from any residence (around 1,000 feet currently, still under development)

800' buffer map from 2022 Winter Weather Response Report to Council



- 11 tandem-axle trucks, 9 single-axle trucks, 9 oneton trucks, 5 class five trucks
- 8-30 drivers per shift
- Additional support staff are available depending on conditions (truck operators, Fleet workers, internal communications/support staff, street inspectors)

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- One dedicated single-axle brine truck, and two one-ton trucks with brine tanks (which can be reconfigured if needed)
- Two shifts, changing at 7 a.m. and 7 p.m. We may adjust those times 3 hours in either direction, depending on potential winter event start times

#### Stats:

 Operationally, staff shortage continues to be the biggest threat for being able to successfully execute our planned approach.

#### Stats:

 Street Division: 44 full time employees, with 16 vacancies

12 of those vacancies occurred over a 7-month period.

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The approval of the Laborer position in the fiscal year 2023 budget cycle was helpful.

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We have had some success in filling vacancies, including some new employees that have earned CDLs.

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Recent pay structure modifications will likely help to attract and retain staff over time.

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We have been working with the Resource Opportunity Center, In2Action and other sources and continue to build on success with JobPoint.

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Those successes do not change the staffing situation we are faced with right now.

#### Stats:

 Ideally, in order to deliver at least the level of service we've had in years past, we must have at least 24 regularly scheduled personnel available per shift, with the ability to 'ramp up' for certain storms.

#### Stats:

 We have in the past and will continue to 'borrow' from other departments and divisions. However, those other departments and divisions are approximately 20-30% down themselves, making it harder to fill out rosters.

#### Stats:

 In winter weather events with 6 inches or more in accumulations, additional resources beyond standard crews are utilized. These include backhoes, loaders, and other equipment, as well as contract haulers and additional employees of other City departments.

 Operational decisions are based on what has happened, what is happening, and what is forecast to happen.

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- There is no "typical" storm, but FHWA (Federal Highway Administration) research offers guidelines for approaches to use under certain conditions.

Salt spread rates and additional information can be found on the MoDOT website at: <a href="https://epg.modot.org/index.php/133.5">https://epg.modot.org/index.php/133.5</a> Operator's Guide for Anti-Icing

				С	Continuou	s Operations Routes					
	Initial Operation					Subsequent Operations					
Pavement Temperature Range and Trend		Maintenance action	Salt spread rates					Salt spread rates			0
	Pavement surface at time of initial operatio		Pre-wetted se salt (lb/lane-n	olid nile) (gal	rine /lane- iile)	Maintenance action		Pre-wetted salt (lb/lane-		Brine (gal/lane- mile)	Comments
Above 32° F, steady or rising	Dry, wet, slush or light snow cover	None, see comments	-		-	None, see comments		-		-	Monitor pavement temperature closely for drops toward 32° and below.     Treat icy patches if needed with pre-wetted solid salt at 100 lb/lane-mile; plow if needed.
Above 32° F, 32° F or below is imminent; ALSO 15° to 32° F, remaining in range	Dry	Apply brine or pre- wetted salt	100			Plow as needed, reapply liquid of solid chemical when needed		100		44	1) Applications will need to be more frequent at lower temperatures and higher snowfall rates 2) It is not advisable to apply a straight brine at the indicated spread rate when the pavement temperature drops below 20°F
	Wet, slush, or light snov cover	Apply liquid or solid salt	100	4	44						3) Do not apply brine onto heavy snow accumulation or packed snow
0° to 15° F, remaining in range	Dry, wet, slush or light snow cover	Apply pre-wetted solid chemical	200		-	Plow as needed, reapply pre- wetted solid chemical when needed		200		-	Abrasives may be added to the salt to enhance traction at colder temperatures     Liquid calcium chloride may be used for pre-wetting solid sal colder temperatures
Below 0° F, steady or falling	Dry or light snow cover	Plow as needed	-			Plow and apply salt/abrasive mix as needed		-		-	1) 1 if pavement becomes slick apply salt/abrasive mix to enha traction. Salt will have limited melting power in this temperature range.     2) Pre-wet salt/abrasive mix with liquid calcium chloride.
Notes: SALT APPLICATIONS. 1) Time PLOWING. If needed, plow before salt		ss snow, slush, or ice it	removed and pay	vement is wet,	, slushy, o	r lightly snow covered wh	en treated.				ds occurring during storm.
		Initial Operation		C	ontinuou	s Operations Routes	quent Ope	rations			
Pavement Temperature Range and Trend	Pavement surface at time of initial operation		Salt spread rates					Salt spread rates			
			-wetted solid alt (lb/lane- mile)	Brine (gal/lane- mile)	Maintenance action			ed solid salt ne-mile) Heavier		(gal/lane- nile) Heavier	Comments
Above 32° E. steady or rising		one, see	_	-	None, se	e comments					1) Monitor pavement temperature closely for drops toward 32° F and below.  2) Treat slick patches if needed with pre-wetted salt at 100 lb/lane.

 Generally, 5 categories of types of events and then a matrix of what's happened, what's happening and what's forecast to happen.

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- There are always limitations on specific equipment, personnel and materials, but research provides a basis for decision making.

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- There are always limitations on specific equipment, personnel and materials, but research provides a basis for decision making.
- Prudent winter weather driving from the public is required at all times.

- lce -

- lce -

Special animal, handled based on knowns – First and Second Priorities, then neighborhoods, based on conditions.

- Snow -

#### Less than 4 inches of snow

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First, Seconds, Thirds (24/7 operation)

- Roads treated curb to curb
- Continuous operation
- Can tow vehicles from first and second priority routes at 2 inches of accumulation.

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First, Seconds, Thirds (24/7 operation)

Our intention is to not need to tow.
 We prefer outreach via press, text alerts, social media, notices and warnings, if possible, during a smaller event early in the season.

The priority road conditions we're trying to achieve within 24 to 36 hours after the end of an active event measuring 4 inches or less:



#### Less than 4 inches of snow

Neighborhoods will be treated during normal business hours after the first, second and third priority routes are operationally complete.

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Neighborhoods will be treated during normal business hours after the first, second and third priority routes are operationally complete.

Crews typically end winter weather operations in about 48 hours or less.

### 4 inches and greater of snow

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First, second and third priority routes

- Roads curb to curb
- Continuous operation
- Tow vehicles parked on first or second priority routes at 2 inches

### 4 inches and greater of snow

Our trucks will enter neighborhood streets after the First and Second priority routes are made passable, treated curb to curb.

Will have been addressing Third priorities deeper into neighborhoods during the initial response at a reduced level from First and Seconds.

### 4 inches and greater of snow

We may split our response, with some trucks still addressing some first and second priority route issues, while some are addressing neighborhood streets.

#### 4 inches and greater of snow

Normally, with up to 5 inches of accumulation, winter weather operations conclude within a timeframe of 72 to 84 hours. However, in more recent times, this has shortened to approximately 60 hours, temperaturedependent.

### 4 inches and greater of snow

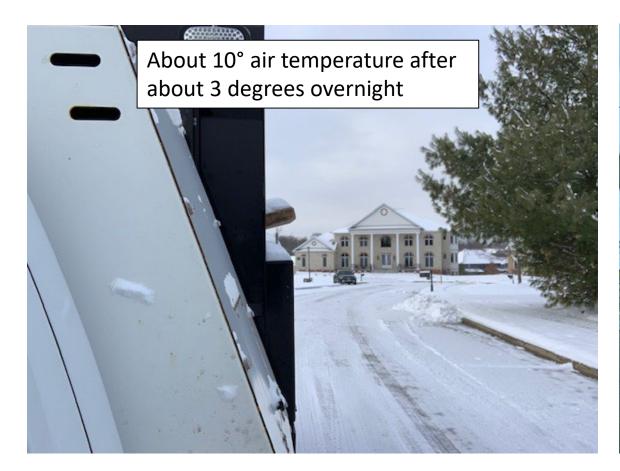
All streets are plowed to a passable condition.

Passable means that the road is able to be traveled by a front-wheel drive vehicle at slow speeds, utilizing reasonable winter weather driving techniques.

### Depending upon temperatures, roads may look like this:



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These photos were taken about four hours apart.

'Passable' = passable by a front wheel drive vehicle at slow speed utilizing reasonable winter weather driving

Past Council direction, based on a lot of factors. Resources and trying to limit impact to the environment are significant factors.

- Permit County/City/MU Hinkson TMDL (Total Maximum Daily Load) regulatory requirements
- Process provides long-term data monitoring.
- Will help inform decisions regarding weather response for all sources (private industry as well as government).

 Researchers nationwide are currently conducting studies on the impact of road treatments on waterways and exploring strategies to mitigate effects.



#### Hinkson Creek

Collaborative Adaptive Management

Chloride Task Force

 Our knowledge base is expanding, along with recommended improvements and modifications to response approach – Chloride Task Force recommendations complete – review process by CAM



#### Hinkson Creek

Collaborative Adaptive Management

Chloride Task Force

### Depending upon temperatures, roads may look like this:





These photos were taken about four hours apart.

Fluctuates some, but:

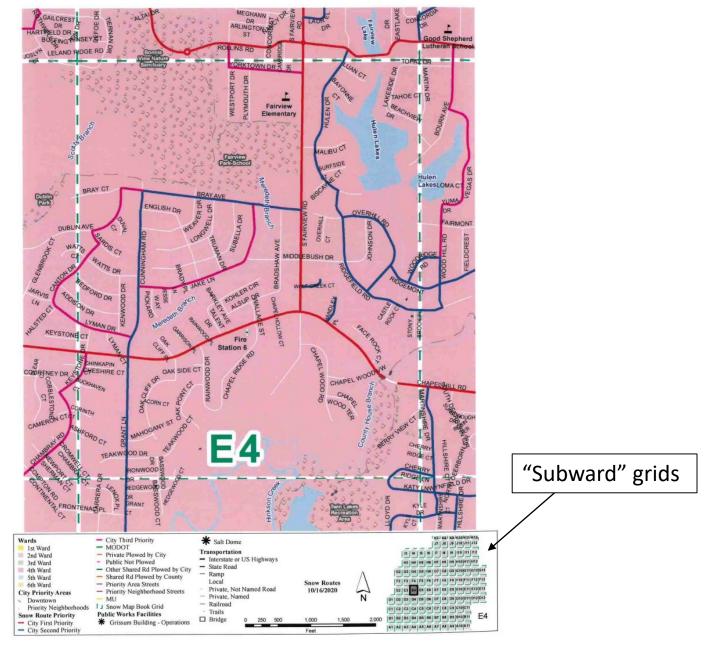
From a resource use perspective, about 1 ton of salt costs about the same as 1 ton of asphalt.

1 ton of asphalt covers about a 10 foot x 10 foot area 1.5 inches thick.

### 4 inches and greater of snow

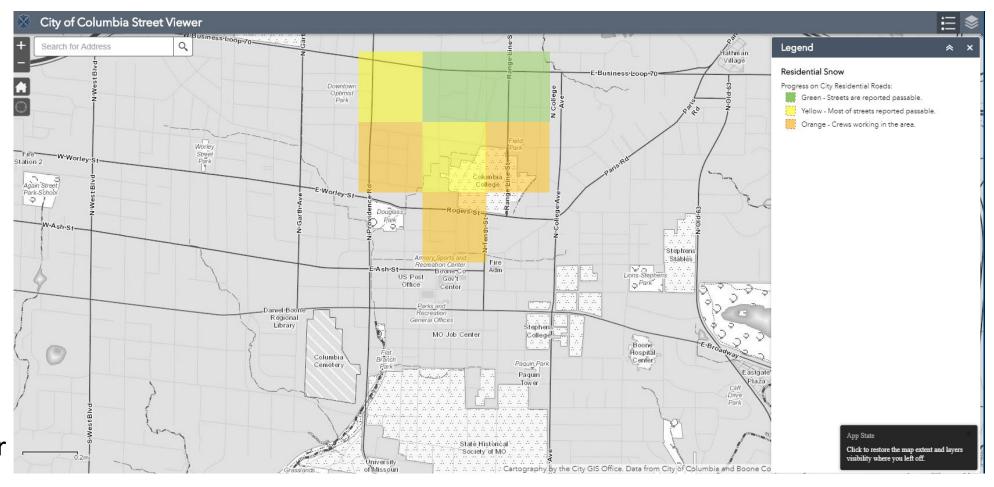
Operations for up to about 5 inches, typically 72-84 hours (recent past actually about 60 hours, temperature dependent).

- 1. Each driver and each inspector has a book showing the location of every street.
- 2. 'Subwards' are reported as 'complete' by driver. An inspector then confirms passable conditions.



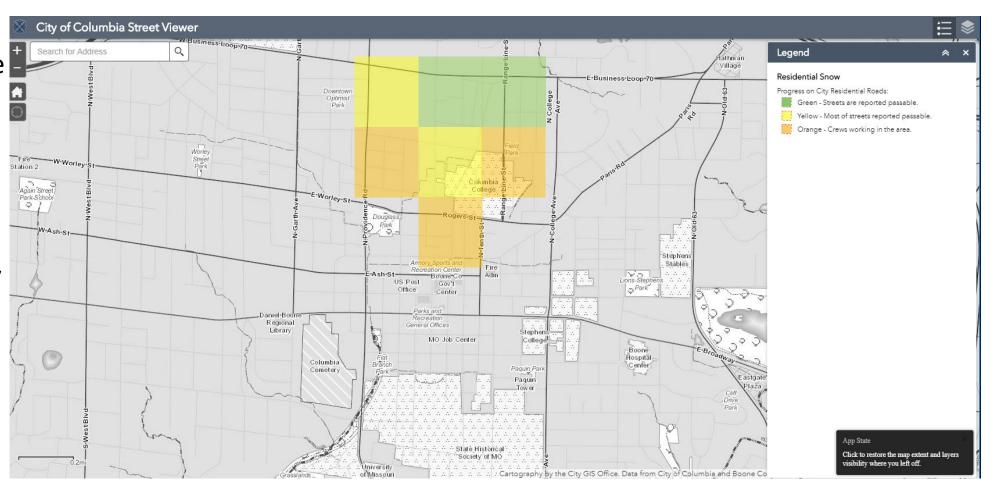
### Winter weather response progress can be found at <a href="CoMoSnow.com">CoMoSnow.com</a>.

- What is shown to the public is a combination of driver and inspector street reports.
- Over the years, we've received positive feedback from the public regarding their ability to track our progress.



#### Winter weather response progress can be found at <a href="CoMoSnow.com">CoMoSnow.com</a>.

• Historically, for one event, we will begin at the City limits and work inward, and then for the next event, we start at the City center and work outward.



Methodical approach.

Have a plan – work the plan.

### **Around 6 inches and greater of snow**

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Downtown removal may be triggered.

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Downtown removal may be triggered. The actual timing depends on what's happened before and what's coming, but will probably will occur at around 8 inches of accumulation.

#### **Around 6 inches and greater of snow**

Once downtown removal is triggered:

- Use personnel from other departments
- Employ multiple backhoes and loaders
- Contractor haul-off of snow
- Blockers are needed for streets

#### **Around 6 inches and greater of snow**

Downtown snow removal:

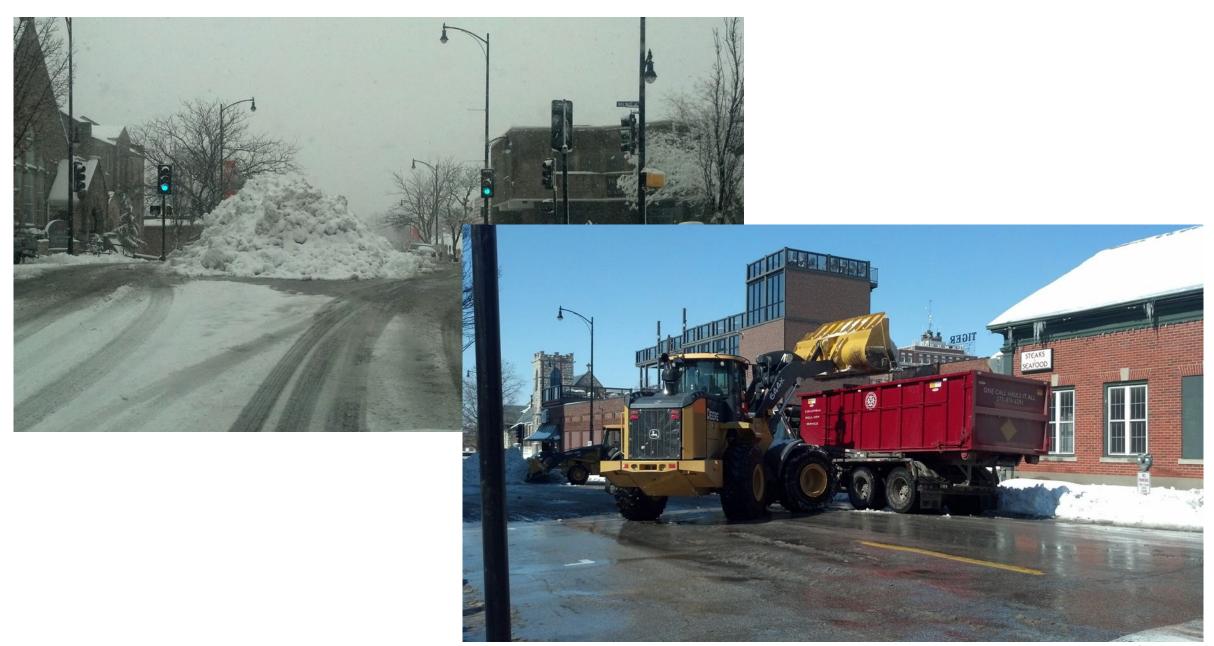
- Start at the north side of downtown (North 10th Street, Park Avenue and Rogers Street area) and move southward, snaking
- Backhoes pile the snow, loaders load it and traffic control blocks off the work area

#### **Around 6 inches and greater of snow**

Downtown snow removal:

- Considerably trickier at around 10"
- Full explanation requires a presentation of its own





#### **Around 6 inches and greater of snow**

Organized

#### **Around 6 inches and greater of snow**

Organized <u>- BUT -</u>

#### **Around 6 inches and greater of snow**

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A lot of pedestrians

#### **Around 6 inches and greater of snow**

Organized <u>- BUT -</u>

- A lot of pedestrians
- Drivers with interesting concepts regarding proper driving around heavy machinery

#### **Around 8 inches and greater of snow**

- Same response as before, in regard to first and second priority routes
- Will take longer overall, and also longer to get into neighborhoods

#### 12 inches and greater of snow

The start to address neighborhood streets will probably be delayed until about the third day after the end of the active snow.

#### 12 inches and greater of snow

The start to address neighborhood streets will probably be delayed until about the third day after the end of the active snow.

First and second priority routes are going to take at least two days.

#### 12 inches and greater of snow

Effective communication concerning emergency responses to and from critical locations is critical. Our ICS planner or designated liaison person will work internally to facilitate this communication process.

#### Long(er) term horizon:

 Evaluate each year what is the best way to examine first, second and third priority

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- Discuss whether additional parking modifications would improve our approach (internal structure, external communication, public sentiment/voluntary compliance, etc.)

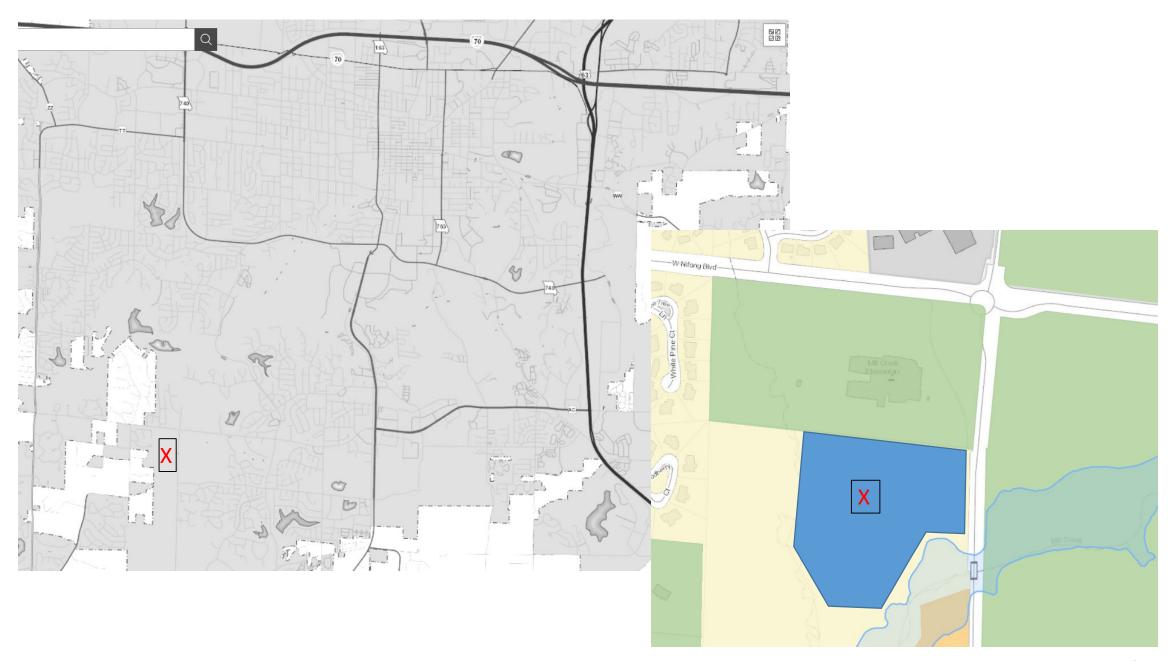
- Priority neighborhoods benefits and impacts. They require a local contact to coordinate the removal of parked cars from streets, improving our overall response time.
- It requires effort and collaboration from both our staff and local contacts.

- Based on Council direction have explored a pilot for subdivisions or neighborhoods expressing a desire to manage their own winter weather response.
- This has been explored, but no subdivision has yet taken steps to initiate a pilot program for this purpose.

### Long(er) term horizon:

 We are currently assessing the effectiveness of potassium acetate (currently being tested at the airport) and calcium-magnesium acetate for use by us – delivery and equipment modifications

- New municipal center with salt storage facilities on the south side of town is being planned.
- This new facility would be located off Sinclair Road near West Nifong Boulevard and would help improve response times City-wide.



### Long(er) term horizon:

 We are facing a potential long-term challenge with worker availability, which has led us to consider the use of contractors to bolster our winter weather response workforce.

- Exploring how to potentially equitably and methodically pursue contracting out some services.
- Possibilities include specific subwards, or potentially third priority routes.

#### Long(er) term horizon:

 Implementing a contractor-based approach is likely to have substantial financial impacts.

We have a "big storm" about once every three to seven years...

...exception:

Many years there are zero, or one, 4-inch snow events.

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Typically about 1-2% of days (over the last 25 years) retain more than four inches of accumulation.

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Typically about 1-2% of days (over the last 25 years) retain more than four inches of accumulation.

That's about four to eight days per year, on average, where snow accumulations stick around.

We prepare for and welcome those scenarios where we experience average or better conditions, but we also anticipate and plan for other possibilities.

Questions?