Snow and Ice Control Annual Report (2022/2023)

Winter Overview

The City of Calgary (The City) is committed to the provision of a safe, customer focused, efficient and sustainable transportation system that supports mobility choices. The Mobility Business Unit (Mobility) partners with Calgary Parks & Open Spaces, Calgary Transit, Fleet Services and Emergency Management & Community Safety to deliver the winter operations services Calgarians receive and is committed to a well-maintained road, transit, sidewalk and pathway system in winter for all travel modes**.** City of Calgary staff and contractors support the delivery of safe winter driving, cycling and walking conditions through The City's Snow and Ice Control (SNIC) Program.

Spotlight on the 2022 / 2023 SNIC Program

Above Average Snowfall

- The total amount of snowfall for the 2022/2023 winter season was 156 cm, above the average accumulations for the prior 4 winter seasons. There were 28 total snow events compared to 32 for the previous winter season.
- There were 5 snow events totaling over 10cm of accumulation with two events of over 20cm.

Performance

- SNIC Performance targets were achieved by completing Priority 1 routes within 18 hours (100% of events) and Priority 2 routes within 36 hours (95% of events). This resulted in a combined completion measure of 98%. No snow route parking bans were activated during the 2022/23 winter season. From October 2022 to April 2023, Mobility received 11,300 SNIC service requests (SRs).

Service Highlights

- The City continued with the Snow and Ice Control Policy update project to formally update winter service standards and policy objectives with an anticipated return to Council in 2023. Pilot projects to support the project were initiated with the intention to embed in the future policy.
- Council approved report C2022-105 to increase trouble service response resources up to $2 million over four years, drawing from the Snow and Ice Control reserve fund during major winter Snow and Ice Control events where a snow emergency has not been declared, and report back with an update on this enhanced service opportunity as part of the Snow and Ice Control Policy review report back to Council in Q2 2023.

Budget

- 2022/2023 SNIC expenditures for roadways and various mobility infrastructure totalled $46 million. The SNIC Reserve balance increased to $14.8 million due to operational savings and a favourable winter budget in 2022/2023.
- For the 2023 fiscal year, SNIC expenditures for the first half of the year were below the allocated budget. A total of $20.7 million was spent with $33.6 million remaining for SNIC operations for the rest of 2023.

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Introduction

The City's SNIC Program Plan (Program Plan) provides detailed plans and strategies to meet the expectations set out in Council's SNIC Policy. The SNIC Policy and the Program Plan support the response to changing weather patterns, funding levels, innovation, best practices and lessons learned. The SNIC Policy and Program Plan are established to address normal winter weather conditions, with strategies to address extreme winter conditions and snow emergencies. Trained personnel and the required resources are deployed to provide safe mobility on city infrastructure during the SNIC season.

Background

The aim of the SNIC Policy is to provide reasonable winter driving conditions for vehicles/cycles that are properly equipped for winter driving and are operated in a manner consistent with good winter driving habits. Council and Administration remain committed to the delivery of winter services within a policy framework that is efficient, inclusive and fiscally responsible. Extreme winter conditions and snow emergencies are addressed in the plan as they are likely to occur. Council and Administration are aware that response to extreme winter weather conditions requires a systematic approach with stakeholder awareness and collective commitment to a safe and well-maintained road system for all travel modes.

The City also initiated a review of the Snow and Ice Control policy to formally update winter service standards and policy objectives.

Average snow clearing response times are projected to decrease from 24 hours to 18 hours for Priority 1 routes. Service enhancements will start in the Fall of 2022 and contribute to improved reliability for transit service and the active mobility network in addition to aligning with desired citizen service expectations. Funding will support the addition of more available resources and equipment during significant snowfall events for improved response to citizen inquiries and services in residential communities.

These investments will be used to make permanent enhancements for snow and ice control services related the pedestrian priority clearing routes including over 550 km of pathways and 500 km of sidewalks, all cleared within 24 hours.

Seven Day Plan

Our winter response during the 2022/23 winter season was delivered through the Seven Day Plan. This plan allows us to quickly address the impact of any snow event on the mobility of our citizens and communicate the level of service. The plan is a systematic response that addresses high volume and high-risk transportation assets first and then moves to lower volume and lower risk assets. If another snow event occurs prior to completing the plan, our response resets back to Day One.

Over the 2022/23 SNIC season, Calgary received 156 cm of snow. Snow Event #1 started on October 24, 2022 with 14 cm of snow. The Seven Day Plan was activated 28 times in 2022/23 which was 4 fewer events compared to the previous winter. Table 1 shows snow fall comparison for the last five SNIC seasons.

Winter Season Snowfall (cm)					
Month	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**
September	1.8	34.4	0	0	0
October	48.4	15.8	27.9	4.2	24.2
November	27.9	43.4	18.2	3.8	29.4
December	14.9	20.5	39.6	25.5	26.1
January	10.2	3.9	7.7	3.7	22.4
February	33.8	21.5	33.8	32.5	32.1
March	8.2	28.8	9.9	11.0	18.1
April	16.9	22.4	7.8	43.1	3.7
May	7.7	0	0	1	0
Totals	**170**	**191**	**145**	**125**	**156**

Table 1: Season comparison 2018-2023

3-1-1 Service Requests

During the 2022/23 winter season, Mobility received 11,300 service requests (SRs). Table 2 shows the historical data from the past five seasons.

Historical 3-1-1 Data					
	2018/19	**2019/20**	**2020/21**	**2021/22**	**2022/23**
Total SNIC SRs	8,787	6,840	12,497	3,750	11,300

Table 2: SRs from 2018-2023

Snow and Ice Control Materials

Our team uses four main SNIC materials: road salt (sodium chloride), sanding chips, calcium chloride brine and sodium chloride brine.

Sanding chips are six-millimetre rock particles which contain up to three per cent salt. The liquid brines help the material stick to the road surface and are also used as an anti-icing agent applied directly to the road surface.

As anti-icing agents, sodium chloride brine and calcium chloride brine perform over different temperature ranges. The sodium chloride brine is used during warmer winter temperatures whereas calcium chloride brine is used during colder winter temperatures.

Studies have shown that without pre-wetting, only 46 per cent of the material applied to a roadway will stay in the middle third of the roadway. However, if the material is pre-wet, 78 per cent will stay in the middle third of the roadway. This practice increases the efficiency of the sanders, reduces costs and helps minimize our impact on the environment.

A five-season comparison of SNIC material consumption is shown in Table 3. Road salt usage during the 2022/23 SNIC season was 59,884 tonnes, which is lower than the past 5 year average. Sanding chip consumption during the 2022/23 SNIC season was 58,004 tonnes, or 34 per cent higher compared to the past five winter seasons.

SNIC Material Consumption					
SNIC Season	**Road Salt/NaCl (tonnes)**	**Sanding Chips (tonnes)**	**Calcium/Sodium Chloride Brine (litres)**	**Snow Days**	**Snowfall (cm)**
2018/19	70,177	46,477	1,144,593	62	169
2019/20	79,857	21,585	345,942	69	191
2020/21	48,637	26,528	28,308	55	145
2021/22	51,229	39,544	58,030	52	125
2022/23	59,884	58,004	74,249	47	156
Average	**61,957**	**38,428**	**330,225**	**57**	**157**

Table 3: Five-year comparison of SNIC materials consumption, snow days and total snow fall

The City has initiated several trials to evaluate new materials that could potentially decrease long-term usage of road salt materials and these trials will continue. The City continues to use Beet 55 as an anti-icing and de-icing agent on pedestrian cycling infrastructure for Priority 1 and 2 routes. Beet 55 is a trademarked liquid organic accelerator alternative to other anti-icing and de-icing products. When this is blended with salt brine at 65% salt brine and 35% Beet 55, the freezing point will be lower than by using pure salt brine but higher than by using calcium chloride at 30% concentration.

Snow Storage Sites

The City has three snow storage sites to manage snow removed from roadways. These sites are found in Table 4 below:

Site	Address	Capacity (cubic metres)
Highfield	1320-50 Ave. S.E.	~600,000
Spring Gardens	1025-32 Ave. N.E.	494,100
Pumphouse	2140 Pumphouse Ave. S.W.	55,805

Table 4: Snow Storage Sites

As an alternative to removing and storing snow, Roads Maintenance reviewed the effectiveness of Mechanical Snow Melter equipment. However, it was determined that the resulting water from the melting process would not meet environmental guidelines for discharging into the storm water system.

Budget Review 2022/2023

The graph in Figure 1 shows our SNIC budget and actual expenditures compared to snow fall and snow days for the past five seasons.

Budget expenditures for the 2022/2023 winter season totalled $38.4 million including contributions to the Snow and Ice Control Reserve. Expenditures by category were as follows: Equipment (25%), Labour (37%), Materials (23%) and Contractors (12%). Equipment and labour costs are the primary winter season costs and are typically proportional to snow fall. When crews are not working on snow clearing, they work on environmental control, winter sweeping, depot maintenance pothole repairs and service requests.

The current balance in the SNIC Reserve (end of 2022) is $14.8 million and subject to change due to evolving operational needs.

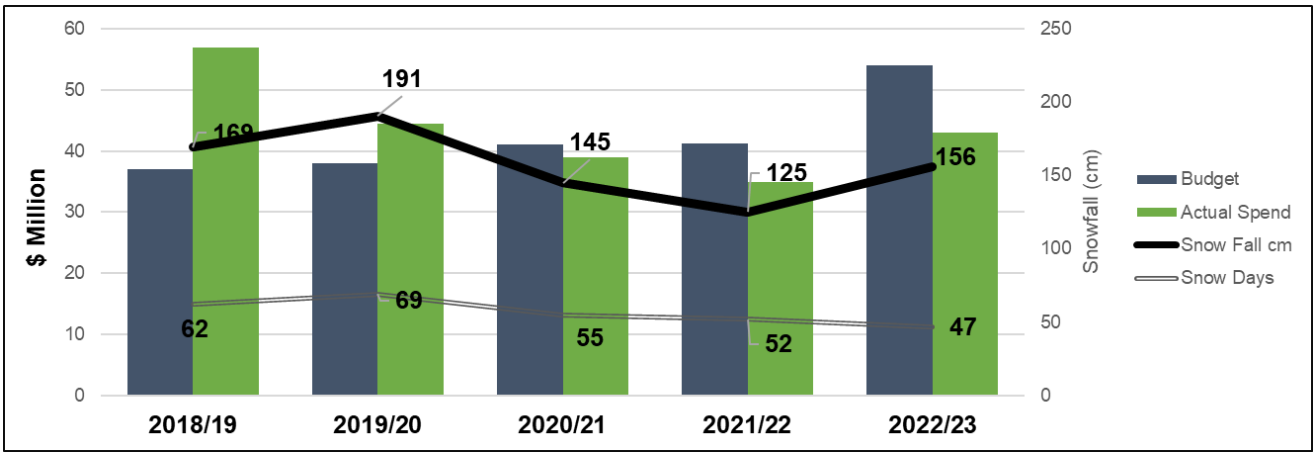

Figure 1: Expenditures and snow days 2018-2023

SNIC Budget Details

The tables below show the annual SNIC budget and actual cost for the winter season of 2022/2023 for Mobility.

	For the period of October 2022 to December 31 2022	
Activity	Budget	Actual
Snow Removal P1 and P2	635,479	184,542
Snow Removal Residential	100,408	63,980
Ploughing P1 and P2	981,969	733,205
Sanding and Salting P1 and P2	17,035,062	16,342,461
Residential Sanding and Ploughing	1,488,887	1,948,627
Transit SNIC LRT Stations*	0	0
Transit SNIC Bus Zones*	0	(709)
Snow Dump Site Maintenance	37,057	0
Separate Bikeways	243,462	97,359
Snow Fencing	138,250	12,188
Anti Icing	162,586	286,254
Material Handling and Storage	285,991	137,786
Sidewalk SNIC Clearing	4,119,028	1,534,199
Winter Supplementary Work**	1,570,933	1,410,569
Winter Operations	**26,799,111**	**22,750,462**
SNIC Reserve ***		2,557,500
2022 TOTAL	**26,799,111**	**25,307,962**

Table 5: 2022 SNIC expenditures and budget

	For the period of October 2022 to December 31 2022	
Activity	**Actual**	**Recovery**
Transit SNIC LRT Stations	245,313	245,313
Transit SNIC Bus Zones	873,282	873,282

Table 6: Calgary Transit - 2022 SNIC activity expenditures versus recovery

	For the period of January 2023 to April 30 2023		Fiscal Year 2023
Activity	Budget	Actual	Budget
Snow Removal P1 and P2	1,239,404	1,209,954	2,478,811
Snow Removal Residential	248,633	462,739	497,262
Ploughing P1 and P2	805,457	1,252,541	1,610,910
Sanding and Salting P1 and P2	15,596,903	10,677,766	31,242,149
Residential Sanding and Ploughing	1,925,924	2,796,348	3,851,849
Transit SNIC LRT Stations*	0	(45,642)	0
Transit SNIC Bus Zones*	0	0	0
Snow Dump Site Maintenance	62,056	5,181	124,114
Separate Bikeways	177,310	150,342	354,622
Snow Fencing	90,589	12,933	181,179
Anti-Icing	205,056	69,583	410,115
Material Handling and Storage	242,458	145,078	484,921
Sidewalk SNIC Clearing	4,375,682	1,339,815	8,783,197
Winter Supplementary Work**	2,106,527	2,582,456	4,213,063
Winter Operation	27,075,999	20,659,095	54,232,193
SNIC Reserve Transfer			
2023 Total (Jan-April)			54,232,193
2022/23 Season Total		45,967,057	

Table 7: 2022 SNIC expenditures and budget

	Year to Date – For the period of January 2023 to April 30 2023	
Activity	**Actual**	**Recoveries**
Transit SNIC LRT Stations	229,921	275,563
Transit SNIC Bus Zones	1,130,371	1,130,371

Table 8: Calgary Transit 2023 YTD expenditures and recoveries

Table 9 below shows the SNIC expenditures on pathways and sidewalks during the 2022/23 winter season.

For the period of October 2022 to December 31 2022			
Sidewalk SNIC Clearing	**Department**	**Budget**	**Expenditures**
	Mobility	4,119,028	1,534,199
	2022 Total	**4,119,028**	**1,534,199**
For the period of January 2023 to May 31 2023			
Sidewalk SNIC Clearing	**Department**	**Budget**	**Expenditures**
	Roads	4,375,682	1,339,815
	2023 Total	4,375,682	1,339,815
2022/23 Season Total		**8,494,710**	**2,874,013**

Table 9: SNIC expenditures on pathways and sidewalks during the 2022/2023 SNIC season

SNIC Policy Metrics

The SNIC program service levels are based on the Council approved SNIC Policy. In 2022, The City initiated a formal process to update the policy to ensure it is meeting citizen expectations, provides clear direction to Administration and achieves desired levels of service. The purpose of the policy is to:

- Maintain reasonable conditions on roadways and sidewalks to minimize hazards and economic loss to the community
- Ensure safe access for emergency vehicles providing Fire, Police and Emergency Medical Services
- Provide guidelines for management and operating personnel to handle winter maintenance operations
- Outline citizens' responsibilities regarding sidewalk snow and ice control on private property

To align with the approved SNIC service levels outlined in the SNIC Policy, three Key Performance Indicators (KPIs) were identified (See Figure 3: Roads Maintenance KPIs and Performance Achieved).

Designation	Response Time
Priority 1 Routes	Through lane ploughed and sanded completed within 24 hours of the end of snowfall (100% sanded/salted and 90% ploughed)
Priority 2 Routes	Through lane ploughed and sanded; completed within 48 hours of the end of snowfall (100% sanded/salted and 90% ploughed)
Priority 3 Routes	Within 4 days after Priority 2 routes complete (sanded and ploughed when temperature conditions allow)
Priority 4 Routes	Within 4 days after Priority 2 routes complete (sanded and ploughed when temperature conditions allow)

Figure 3: SNIC service levels

2022/2023 Snow Route Parking Bans

A Snow Route parking ban may be considered when snow accumulation of 10 centimetres or greater is forecast. Snow routes include major roadways and most bus routes. A major advisory is issued when a snow event is expected in the forecast. This advisory is meant to serve as a warning that parking bans may soon be in effect on snow routes. Vehicles should be moved as quickly as possible following the notice. Vehicles that remain parked on these roads during the ban are subject to enforcement, up to and including a parking tag and tow. Business Improvement Areas (BIAs) and the downtown core have overnight bans (9 pm. to 6 am.).

During the 2022/23 winter season, no snow route parking bans were activated.

Personnel, Equipment and Infrastructure

The Mobility Business Unit commits personnel, material, equipment, infrastructure, capital and operational funds to SNIC operations as follows:

- 421 personnel working rotating shifts, available 24/7 throughout the season
- Material, including equipment consumables (i.e. plough blades) and snow remediation substances (salt, de-icing liquids and abrasives).

The various machinery and equipment include:

- 78 City owned tandem trucks and 16 leased trucks equipped to plough and apply materials
- 27 graders
- 9 snow blowers
- 11 smaller single axle trucks equipped to plough and apply materials in residential areas such as cul-de-sacs where tandems are unable to work
- 9 front-end loaders
- 8 Leased Articulating Tractors (Holder C70)

SNIC Contractors and Hired Equipment

The City retains services from contractors to augment City personnel and equipment for SNIC operations. The Maintenance Division and Calgary Parks & Open Spaces, in conjunction with the Supply Management Division, has contracts to provide the following SNIC services:

- Transit Trouble Spots: 219 lane-km
- District Trouble Spots: 504 lane-km
- 1200 Priority bus pads
- 958 km of sidewalks
- 2431 traffic islands and medians
- 19 km of walkways and pedestrian bridges
- 165 miscellaneous locations, including stairs
- 136 traffic calming curb locations

The Mobility Maintenance Division also works closely with the Fleet Services Business Unit to maintain and coordinate equipment used for SNIC. Fleet Services maintains a rental equipment tender and hired truck contract that is reviewed every two and six years respectively.

Additional Information

Please visit The City's Snow and Ice Control webpage at Calgary.ca/snow for more information on winter operations, SNIC clearing updates and Snow Route parking bans.