



# Snow and Ice Removal Plan

City of South Lake Tahoe Department of Public Works

The purpose of this plan is to convey policy and operational procedures for snow and ice control on public streets under the jurisdiction of the City of South Lake Tahoe. This plan will provide a uniform approach to snow removal, priorities, and procedures to be used in removing the accumulation of snow and ice on City streets, rights of way, and public property



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## Mission Statement

The mission of the City of South Lake Tahoe Public Works Department is to operate and maintain the transportation network while ensuring that the network functions as safely and efficiently as possible. During wind, snow, and ice events, the Public Works Department conducts sanding operations, snow removal operations, anti/de-icing, and selected road closures to mitigate hazardous travelling conditions and allow safer passage for vehicles, pedestrians, and bicyclists, to the extent possible

## Introduction

### Overview

The City of South Lake Tahoe lies at an elevation of 6,237 feet above sea level on the eastern side of the Crystal Range of the Sierra Nevada. The proximity of the City to the lee side of the range provides orographic impact often resulting in significant snowfall from storm tracks originating from the Pacific Ocean.

The registered population of the City (2019) is 21,939.

The City's roadway and paved trail network consist of the following Quantities:

- 129 centerline miles of roadway
- 255 lane miles of roadway
- 14.5 miles of Class 1 paved bike trails

### Purpose

The purpose of this plan is to convey operational procedures for snow and ice control on municipal streets and paved assets under the jurisdiction of the City of South Lake Tahoe. This plan will provide a uniform understanding of the priorities, and procedures used in managing and removing the accumulation of snow and ice on City streets, rights of way and public property.

### Plan Considerations

In developing the plan for how to best undertake winter maintenance activities, the city considers several factors including, but not limited to the following:

- Public safety.
- The desire to maintain a safe and efficient streets and trail network.
- The ability to deliver emergency services.
- Weather conditions including temperature and snowfall amounts.
- Protection of City property and personal property.
- Environmental impacts.
- The amount of funds available for these activities.
- The number and availability of personnel for these activities.
- Effectively allocating limited resources.

### Objective

The snow and ice removal objectives of the city are to:

- Assist police, fire, and emergency medical services in fulfilling their duties as needed.
- Provide safe conditions for pedestrians and motorists' travel.
- Provide safe school bus route access for the School District.
- Provide safe public access to City facilities.
- Provide active and operating storm drain and pump systems during storm events.
- Provide cost effective snow and ice removal from public streets to the taxpayer.
- Reduce, to the best extent possible, economic losses to the city and businesses that can result from workers not being able to get to their jobs during storm events.

## City Policies

*The following city codes address snow operations and the responsibility of the residents and visitors.*

**City Code § 7.05.560 Maintenance of sidewalks and walkways.**

*It shall be the duty of all owners, and their tenants, of real property within the city whose property borders, is adjacent to, or is in a city right-of-way encompassing any improved sidewalk or walkway to maintain the sidewalk or walkway in a safe condition for its use by pedestrians and other members of the public. The duty created by this section shall include the duty to keep the sidewalk or walkway substantially free and clear of all dirt, sand, gravel, filth, rubbish, ice and snow. (Ord. 1023 § 1 (Exh. A); Ord. 1041 § 1 (Exh. A). Code 1997 § 26-50)*

**City Code § 7.05.570 Snow maintenance.**

*During a snow event, owners and their tenants shall ensure that the sidewalk or walkway as set forth in SLTCC 7.05.560 herein is substantially free and clear of snow and ice within the following time frames:*

- 1. Within 12 hours after the end of a snow event.*
- 2. Within each 24-hour period during a snow event if such event is of a duration greater than 24 hours.*
- 3. Whenever the accumulation of snow and/or ice creates a condition that is dangerous to property or to persons using the sidewalk or walkway in a reasonable manner and whenever such condition interferes with the public convenience in and the use of said sidewalk or walkway area. (Ord. 1041 § 1 (Exh. A). Code 1997 § 26-51)*

**City Code § 7.05.440 Owners'/occupants' responsibilities.**

*It shall be the responsibility of residents, property owners, occupants, and/or their agents for snow removal of any berm across any encroachment, including but not limited to driveways, sidewalks, parking lots and other uses for ingress or egress areas used to access the property, pursuant to SLTCC 7.05.230(C). (Ord. 998 § 1; Ord. 1041 § 1 (Exh. A); Ord. 1055 § 1 (Exh. B). Code 1997 § 26-40.2)*

**City Code § 7.05.500 Dumping of snow in right-of-way prohibited.**

*Snow may not be dumped, deposited, placed, or pushed into a city street. Snow removed from private property may not be piled so as to block or cover a fire hydrant, snow pole, street sign, culvert inlets and outlets, or other drainage structures. Violations of this section shall be deemed an infraction, punishable by a fine. (Ord. 906 § 2; Ord. 998 § 1; Ord. 1041 § 1 (Exh. A); Ord. 1055 § 1 (Exh. B). Code 1997 § 26-46)*

**Mailboxes and other improvements in the right of way**

City Code prohibits the placement of permanent and/or temporary improvement adjacent to right of way.

**City Code § 7.05.520 Placement of permanent and/or temporary improvements adjacent to right-of-way.**

*No person shall place, construct, or maintain any permanent or temporary improvement or other obstruction on any parcel of real property in the city upon which snow is or may be placed for purposes of city snow removal operations, unless otherwise provided herein. "Permanent or temporary improvements or other obstructions" shall include, but not be limited to, fences, walls, signs, trash enclosures and containers, landscape materials, irrigation systems, lighting fixtures, motor vehicles and/or trailers, driveway marker poles, mailboxes, and other similar improvements.*

*The provisions of this section shall not apply when one or more of the following conditions have first been met:*

- A. The improvement or obstruction is set back pursuant to SLTCC 6.10.210 through 6.10.280 (Article VI, Fences and Walls Design Standards);*

- B. *Where a fence or wall has been constructed, said improvement has been marked at intervals not less than 10 feet with distinctively colored stakes or poles a minimum of eight feet in height with a reflector facing traffic affixed to the topmost portion thereof. Said stakes or markers shall be made of either wood or plastic and shall be put in place by the property owner not later than November 1st of each year and shall remain in place until May 1st of the following year. Any person electing to utilize this procedure shall additionally file with the director of public works or his/her designee a certificate executed by a licensed engineer that the fence, wall, or barrier can withstand the storage of snow on, in and around it in an amount equal to or greater than a pile eight feet in height without damage to the fence or wall;*
- C. *Whenever driveway marker poles are erected to delineate a driveway, such markers have been located within the boundaries of private property and do not in any way protrude into the street right-of-way. Such markers shall be made of plastic or wood material, be a minimum of eight feet in height, and shall have a reflector facing traffic affixed to the topmost portion thereof;*
- D. *Any damage sustained to any permanent or temporary improvement or other obstruction not meeting the requirements of subsections (A) through (D) of this section which is the result of snow removal operations shall be the sole responsibility of the property owner and the city shall bear no liability whatsoever therefor. (Ord. 906 § 2; Ord. 998 § 1; Ord. 1041 § 1 (Exh. A); Ord. 1055 § 1 (Exh. B). Code 1997 § 26-47)*

**City Code § 7.05.540 Mailboxes.**

*All mailboxes shall be placed in accordance with the rules and regulations of the United States Postal Service, but no box shall be so placed within the road right-of-way as to endanger the life or safety of the traveling public or interfere with snow removal operations. A permit is not required for the placing of mailboxes. The city is not liable in the event of damage to any box placed in the street right-of-way. It shall be the responsibility of the resident/property owner and/or their agents to clear snow and snow berms to enable U.S. Postal Service employees' access to mailboxes.*

*No mailbox shall be so placed within the road right-of-way as to endanger the life or safety of the traveling public. The city is not liable in the event of damage to any mailbox placed in the street right-of-way. Persons must remove obstructions, including, but not limited to, vehicles, trash cans, and snow, that impede safe and efficient delivery.*

*Damage to snow removal vehicles caused by mailbox supports will be borne by the resident if the mailbox is not placed pursuant to this section.*

*Residents are responsible for clearing and maintaining mailbox access for delivery and ensuring that the mailbox is not placed in the public right-of-way. (Ord. 998 § 1; Ord. 1041 § 1 (Exh. A); Ord. 1055 § 1 (Exh. B). Code 1997 § 26-48.1)*

**Parking**

Parking within certain streets during snow removal activities is not allowed, and the owner is subject to a **fine of \$200.00 and the vehicle may be towed. The owner will also be liable for towing and storage fees.** City Code Sections 7.05.420;450 & 460 define parking during snow removal operations.

**City Code § 7.05.420 Obstructing snow removal equipment prohibited.**

*It shall be unlawful for any person to park, abandon, or otherwise leave unattended any vehicle or trailer, as defined in Section 670 of the California Vehicle Code, on any city right-of-way at any time or in any manner*

*which will obstruct or hinder any city employee or city contractor during the snow season or which will leave any vehicle in such a position that it is subject to damage by city employees or city contractors engaged in snow removal operations. This provision shall not prohibit the stopping of passenger vehicles for periods of time sufficient to load or discharge passengers from such vehicles. Owners of vehicles parked in violation of this article shall be subject to citation or towing. Owners of vehicles parked in violation of this article shall also be held liable for any damage to snow removal equipment which may occur due to contact with said vehicle. The city of South Lake Tahoe shall not be liable for damage to any vehicles or property parked in violation of this article. Snow removal operations shall be deemed completed at such time as the full width of the street right-of-way has been restored. (Ord. 906 § 2; Ord. 998 § 1; Ord. 1041 § 1 (Exh. A); Ord. 1055 § 1 (Exh. B). Code 1997 § 26-40)*

**City Code § 7.05.450 Vehicles parked/stopped during snow removal operations – Violation and declared nuisance.**

*Any vehicle which is found to be stopped, parked, abandoned, or otherwise left unattended in violation of SLTCC 7.05.420 is hereby declared to be an obstruction to the snow removal operations and is an infraction punishable by a fine which shall be set forth in a duly adopted resolution of the city council. Such violation is hereby declared to be an obstruction of the public streets which shall constitute a nuisance, which may be abated in accordance with SLTCC 7.05.460. (Ord. 906 § 2; Ord. 998 § 1; Ord. 1041 § 1 (Exh. A); Ord. 1055 § 1 (Exh. B). Code 1997 § 26-41)*

**City Code § 7.05.460 Vehicles parked/stopped during snow removal operations – Removal to abate nuisance.**

*In the event any vehicle is stopped, parked, abandoned or left unattended in violation of SLTCC 7.05.420 and 7.05.450, any police officer or other city employee granted authority to issue citations pursuant to SLTCC 1.10.010 is hereby authorized to remove or cause to be removed any such vehicle and to have such vehicle towed or otherwise removed to any public or private garage or parking area and to have such vehicle stored in such garage or parking area at the owner's expense until claimed by the owner. (Ord. 906 § 2; Ord. 998 § 1; Ord. 1041 § 1 (Exh. A); Ord. 1055 § 1 (Exh. B). Code 1997 § 26-42)*

## Operational Goals

### Level of Service:

It is the expectation of our citizens that the City will keep all the city streets sufficiently passable during and following a winter weather event. To accomplish this, the City will provide, to the extent reasonably possible, effective, and efficient measures consistent with generally accepted snow removal standard practices to restore mobility.

Due to the many variables associated with winter weather, each event is unique. Factors that influence when and what measures we use include: air and pavement temperatures, wind speed and direction, precipitation rate and type, snow density, time of onset, storm duration, and traffic activity. Availability of equipment, personnel and materials are also key factors that affect the effectiveness of snow fighting efforts.

Snow and ice control measures are directed to achieving and maintaining relatively safe traffic movement on public streets within a reasonable timeframe. Therefore, efforts are first concentrated on the main arterials, collectors, and school and hospital streets that carry most of the traffic. Residential and other low-volume streets and cul-de-sacs are secondary. Level of service is more accurately detailed in the *Storm Category Section* herein.

### Operational Period:

Depending on storm severity and need, the typical operational period for snow removal is 12-hour shifts. For lower severity storms, often one 8 or 12-hour shift is all that is required. For storms in the higher intensity ranges, the operations typically call for continuous 12 hour shifts until the operation has been deemed complete.

### Pedestrian Walkways and Paved Bicycle Trails:

Typically, the city strives to have all paved walkways, sidewalks, and bicycle trails on city property and/or under city maintenance responsibility cleared within 12 hours post storm. For general sidewalk snow removal (non-city responsibility), *City Code section 7.05.560 and 7.05.570 will* be enforced.

## Storm Attributes

Although each storm is different, there are some basic attributes of storm prediction that allow the department to pre-plan operations accordingly. Operational services may be affected by weather and human based attributes such as air and pavement temperatures, visibility, precipitation rate and type, snow/water ratio, snow density, time of onset, storm duration, equipment and resource availability, and traffic activity.

**Intensity:** *Intensity* is provided via two parameters. **visibility** (probability that the surface visibility is 1/2, 1/4, or 1/8 of a mile or less in winter precipitation); and **precipitation rate** (probability the winter precipitation rate is at least 1, 2 or 3" per hour). See Table below.

Snowfall Intensity Table									
Snowfall Intensities as a Function of Prevailing Visibility for Type I Holdover Time Guidelines. (May also be used with Types II, III and IV fluids.)									
Ref: FAA HOT Guidelines for Winter 2006-2007, Table 1B.									
Time of Day	Temperature		Visibility (Statute Miles)						
	(°C)	(°F)	≥ 2.5	2.0	1.5	1.0	0.75	0.5	≤ 0.25
Day	colder/ equal -1°C	colder/ equal 30°F	Very Light	Very Light	Light	Light	Moderate	Moderate	Heavy
	warmer than -1°C	warmer than 30°F	Very Light	Light	Light	Moderate	Moderate	Heavy	Heavy
Night	colder/ equal -1°C	colder/ equal 30°F	Very Light	Light	Moderate	Moderate	Heavy	Heavy	Heavy
	warmer than -1°C	warmer than 30°F	Very Light	Light	Moderate	Heavy	Heavy	Heavy	Heavy

This table may be employed in estimating snow intensities for use with Type I, II, III, and Type IV Holdover Time Guidelines

Heavy = Caution - no holdover time guidelines exist

### Precipitation Rate:

Snow will often accumulate at a rate of 0.5 inches an hour. Snow falling at over 1 inch per hour may lead to moderate to heavy disruption of transportation and travel. More than 2 inches per hour will invariably lead to significant disruption of transportation and travel.

### Snow-to-Liquid Ratios:

Snow quality, such as 'light and fluffy' or 'heavy and wet', are defined by the snow-to-liquid ratio. The snow to liquid ratio is highly dependent upon air and surface temperature.

- A ratio of **less than 10:1 will be very heavy wet snow**. Depending on depth, this snow will be very hard to move in significant quantity making plowing operations very difficult and may significantly compromise equipment. Heavy wet snow will increase operational timeline significantly and likely

- produce drainage issues in low lying and obstructed or ice dam areas. Upon re-freeze, heavy rutting, icing, and solid impenetrable berms may occur.
- A ratio of **10:1 to 15:1 will be moderately heavy snow**. Depending on depth, this snow will be hard to move in significant quantity making plowing operations difficult and may compromise equipment. Operational timelines will increase significantly. Upon re-freeze, moderate rutting, icing and solid berms may occur.
- A ratio of **15:1 to 20:1 is light to moderate weight snow**. Very conducive for efficient plow operations. Moderate to heavy rutting or icing is not expected. Berms may occur but are manageable. Extended operational periods are diminished.
- A ratio of **greater than 20:1 will be incredibly light snow**. Very conducive to highly efficient plowing operations. Equipment is not compromised. Pushback or widening may not be required. Rutting is not expected. Some icing and slick roads are expected. Berms will be very manageable. Extended operational periods are diminished significantly.

## Storm Categories

The city categorizes winter storms into five levels of intensity and operational significance. The categories listed below have been developed by the City of South Lake Tahoe based on many years of plowing operations. The categories are based on predictions for one 24-hour operational period. Operational procedures and service levels for predicted multi-day events will be determined and categorized by the total predicted snowfall over the event timeline. The following presents information concerning the severity, and the general service level for each.

- **Category One** (Less than 3") are very minor storms and as such, operations are scaled back to provide mostly snow and ice control on **Priority 1 and 2** roadways via plow mounted sanding trucks. Graders, loaders, and blowers are not typically utilized, nor are plowing operations initiated on **Priority 3 and 4** roadways unless warranted. **Category One** operations typically occur during daylight hours and may require one 8-hour or one 12-hour shift.
- **Category Two** (3" to 24") are minor to moderate storms for our region typically providing light to moderate wind, minor visibility issues, and moderate accumulation rates. **Category Two** operations will likely require multiple 12-hour operational shifts. Operations will provide snow and ice control on all **Priority 1,2,3 & 4** roadways. Likelihood of delayed service into residential zones due to the amount of snow to push and re-accumulation rates. Snow density and accumulation rates may dictate that travel lane width may be reduced for some time and only one travel lane width may be cleared on local roadways until such time the arterials and collector class roadways are safe and additional passes can be made. Some roads may be closed due to safety.
- **Category Three** (24" to 36") are considered moderate to major storms for our region. Moderate to high winds are likely with reduced visibility and rapid snowfall accumulation. Transportation and driving will be compromised and restrictions for travel will likely be in place. Schools and public facilities are likely to be closed. Likelihood of delayed service to residential zones increases due to the amount of snow to push and re-accumulation rates. Plow gates may not be able to contain some or all the snow, and snow berms are almost certain. Potential for equipment failure increases significantly. Operations will provide snow and ice control on all **Priority 1,2,3 & 4** roadways with a higher priority given to arterials and collector class roadways. Priority 3 & 4 roadways may see considerable delay in service as operations may focus on specific arterial and collector class roadways serving medical and public safety facilities and corridor specific travel. Certain roadways may be closed due to safety concerns. Lane widths will be compromised until pushback and/or blowing occurs. **Category Four** operations will require continuous 12-hour operational shifts.



- **Category Four** (36" to 72") are considered major storms for our region with heavy snowfall accumulation rates, high winds, near zero visibility, structural damage, and avalanche potential. Power outages and utility failures may be likely. Transportation and driving will be compromised and restrictions for travel will certainly be in place. Schools and public facilities are likely to be closed. Services into residential zones will certainly be delayed due to the amount of snow to push and re-accumulation rates. Potential for equipment failure increases significantly. Operations will provide snow and ice control on all **Priority 1 & 2 roadways only** until they are safe enough to warrant travel into **Priority 3 & 4** roadways unless requested by public safety services. **PLOW CUTOFF GATES WILL NOT BE UTILIZED ON FIRST AND SECOND PASS ON ALL ROUTES.** Expect extended delayed service to residential areas. Operations may focus on specific arterial and collector class roadways serving medical and public safety facilities. **Many roadways may be closed due to safety concerns.** Street signs, traffic signs and controls may be buried until post storm clean up. Lane widths will be compromised for some time, and local roads may only have a single travel lane until pushback and/or blowing occurs. *Category Four* operations require continuous 12-hour operational shifts.

## Priorities

### Scope of Responsibility:

The City of South Lake Tahoe Public Works Operations staff is responsible for snow and ice control on municipal streets within the city limits.

- The federal highway segments and portions of state routes within the city limits are handled by the California Department of Transportation (Caltrans) District 3.
- The city does not remove snow and ice from private streets, parking lots or driveways.
- The city is not responsible for snow and ice control on sidewalks or paved trails except those immediately abutting or within municipal facilities or properties.
- Airport runway, parking areas, and accessory areas are handled by the Airport division of Public Works.
- City parking lots, sidewalks and paved bike trails are handled by the Parks & Recreation Department.

### Zones:

The city has eight plowing zones:

- Gardner Mountain
- Tahoe Keys
- Tahoe Island
- Tahoe Sierra
- Al Tahoe
- Bijou
- Heavenly
- Stateline

During snow/ice storm events, calls from the Police and Fire Departments regarding accidents, medical or other emergency situations are given **top priority**. Upon request, the Public Works Operations Division will aid as necessary which may delay service in a particular zone.

Because of the high priority assigned to snow and ice control, almost all other Public Works operations become secondary to snow removal activities.

**PRIORITY 1 - Arterial - 16.50 total lane miles not including turn lanes, shoulders and pull outs.**

Arterial class roadways are intended to provide links across several neighborhoods or parts of the city and typically connect the city to adjacent jurisdictions. Arterial Roads are categorized as **Priority 1** roadways for snow removal. The following roadways are classified as Arterial:

- Lake Tahoe Blvd. – City Limits to Hwy 89/50
- Al Tahoe Blvd. – Pioneer Trail to Hwy 50
- Heavenly Village Way – Hwy 50 to Montreal Road
- Park Avenue – Pine Blvd to Hwy 50
- Pine Blvd. – Park Ave. to Stateline Ave.
- Pioneer Trail – City limits to Hwy 50
- Saddle Road – Wildwood Rd. to Keller Rd.
- Ski Run Blvd. – Saddle Rd. to Hwy 50
- Wildwood Ave – Saddle Rd to Needle Peak Rd.

Note: US Hwy 50 and State Hwy 89 are not controlled nor maintained by the City of South Lake Tahoe.

**PRIORITY 2 - Collector – 41.58 total lane miles not including turn lanes, shoulders, parking zones and pull outs.**

Collector Class Roads are intended to link neighborhoods to arterial streets. Collector Class roadways are categorized as **Priority 2** roadways for snow removal. The following streets are classified as collector:

- 10TH Street – Julie Ln. to Hwy 89
- 12TH Street – Hwy 89 to Tahoe Island Dr.
- 15TH Street – Hwy 89 to Venice Dr.
- 3RD Street – Hwy 50 to Washington Avenue
- 3RD Street – Hwy 50 to South Ave. \* **Priority Plowing - Hospital**
- Ala Wai Blvd. – Tahoe Keys Blvd. to Monterey Dr.
- Alameda Ave. – Oakland Ave. to Bellevue Ave.
- Bellevue Ave. – El Dorado Ave. to Lakeview Ave.
- Blackwood Rd. – Pioneer Tr. to Glenwood Way.
- Chonokis Rd. – Pioneer Tr. to Montreal Rd.
- D St. – Lake Tahoe Blvd. to Hwy 50
- El Dorado Ave. – Oakland Ave to Bellevue Ave.
- Fairway Ave. – Johnson Blvd. to Glenwood Way.
- Fresno Ave. El Dorado Ave. to Lakeview Ave.
- Glenwood Way. – Pioneer Tr. to Fairway Ave.
- Herbert Ave. – Blackwood Rd to Lloyd Ave.
- Johnson Blvd. – Al Tahoe Blvd to Hwy 50 \***Priority Plowing - Police Dept.**
- Julie Ln. – Lake Tahoe Blvd. to 13<sup>th</sup> St.
- Keller Rd. – Saddle Rd. to Pioneer Tr.
- Lakeshore Blvd – Park Ave to Stateline Ave.
- Lakeview Ave. – Berkeley Ave. to Hwy 50
- Lily Ave. – .07M W/Bellevue Ave. to Bellevue Ave.
- Los Angeles Ave. – Argonaut Ave. to Hwy 50
- Lyons Ave – Hwy 50 to Rufus Allen Blvd.
- Martin Ave - CL .03M N/Barbara Ave. to O'Malley Dr.
- Montreal Rd. – Chonokis Rd. to NV Stateline
- Needle Peak Rd. – Ski Run Blvd. to Wildwood Ave.
- Oakland Ave. – S End to Lakeview Ave.

- O'Malley Dr. – Martin Ave. to Carson Ave.
- Park Ave. – Beach Rd. to Pine Blvd.
- Rubicon Trail – Hwy 50 to 707' S of Springwood Dr.
- Rufus Allen Blvd. – Lyons Ave. to Hwy 50
- Silver Dollar Ave. – Hwy 50 to Springwood Dr.
- Ski Run Blvd. – Hwy 50 to Ski Run Marina
- South Ave. – Melba to 3<sup>rd</sup> St. \* **Priority Plowing - Hospital**
- Springwood Dr. – Silver Dollar Ave. to Rubicon Trail
- Stateline Ave. – Lakeshore Blvd. to Hwy 50
- Tahoe Island Dr. – Washington Ave to 12<sup>th</sup> St.
- Tahoe Keys Blvd. – Hwy 50 to Ala Wai Blvd.
- Tamarack Ave. – Blackwood Rd. to Pioneer Tr.
- Thirteenth St. – Julie Ln. to Eloise Ave.
- Treehaven Dr. - END .04M W/Fremont Ave to Johnson Blvd.
- Venice Dr. – 15<sup>th</sup> St. to Tahoe Keys Blvd.
- Washington Ave. – Tahoe Island Dr. to Tahoe Keys Blvd.
- Wildwood Ave. – Pioneer Tr. to Lake Tahoe Blvd.

### **PRIORITY 3 & 4 Local Class roads – 196.65 total lane miles**

Local Class Roads (residential) are intended to provide access to individual properties within neighborhoods. Local classified roads are categorized as **Priority 3** roadways for snow removal except for local roads containing cul-de-sacs and/or dead ends, in which case those roads are categorized as **Priority 4** roadways for snow removal.

Local class roads are defined as all roads within the city not included above as Arterial and Collector classification (Priority 1 & 2).

Snow and ice removal operations on bicycle trails, sidewalks, and parking lots may also be contained within Priority 3&4 operations. Once all roads have been cleared, staff will begin the process of removing snow and ice from certain trails, sidewalks, and parking lots that operate year-round and are under the specific maintenance function of the city.

Note: Class II bicycle lanes within certain city streets may not be useable until such time the city completes pushback, widening, and snow blowing activities.

The city does not typically place traction abrasives on trails and sidewalks. Icing may be present, and caution is urged when using the trails and walks.

### **Unmaintained Roads within the City:**

There are roads within the city that are either owned by other agencies, private, or not maintained by the city. The roads/areas described below **are not maintained by the city**.

- Adams Way
- Barbara Ave – El Dorado County
- Bijou Wagon Road – Private
- Bijou Street – Private
- Freel – Dirt Road – Private
- Emerald Bay Road (aka G Street Parallel to Hwy 50) - Caltrans
- Glen Road (upper portion) – Private Dirt Road
- Hamm Lane – Private
- Lighthouse Shores – Private

- Link Road – Private
- Lupine Way
- Nebelhorn Court
- Osgood Avenue – Ski Run to Sonora – Private
- Ski Run Blvd (above Saddle Road)
- Tahoe Meadows Subdivision - Private
- Tahoe Verde Mobile Home Park
- Van Sickle Road
- US Hwy 50 - Caltrans
- US Hwy 89 – Caltrans
- Viking Way - LTUSD

The current paved roadway area for the city totals approximately 19,473,215 square feet and the 254.73 lane mile distance translates to the distance from roughly South Lake Tahoe to Santa Cruz California.

## Pre-Season

### Season

The City of South Lake Tahoe considers November through April as snow season. Typically, the city will have all permanent and seasonal staffing in place prior to November 1<sup>st</sup>.

### Pre-Season Route Inspection

Beginning late August, Streets Division staff begins inventorying the zones and patterns for any issues that may present problems for snow fighting operations. Some of the issues that may occur are:

- Raised manholes or valve boxes
- Broken curb & gutter, damaged drop inlets
- Missing or damaged snow stakes
- Missing or damaged fire hydrant signage
- Damaged roadways (areas where peeling or raveling of the pavement may occur with snowplow blade pressure).
- New construction (familiarization and marking of such)

In addition to the inspection of physical assets, the department also issues notices to business and homeowners who are parking and/or placing items within the right-of-way or snow storage easements. This advanced warning provides owners the ability to move the items prior to being cited during snow removal operations.

### Pre-Season Storm Water Infrastructure Cleaning

In addition to the route inspection, the Streets Division will clean and service critical storm water infrastructure in an effort to minimize flooding and/or issues related with seasonal onset of heavy rain or rain on snow events.

### Pre-Season Equipment Inspection and Maintenance

Beginning in August, the city's Fleet Services Division will begin inspection and pre-season maintenance on all snow removal equipment.

**Materials and Supply** In addition to the route and equipment inspections in August, staff will begin the purchasing of supplies required for the season. Supplies may include but not be limited to: Plow chains, cutting blades, hydraulic

fluids and lines, equipment parts, tires, abrasives (sanding), snow staking supplies, signage supplies, and other materials required for safe and effective operations.

### **Operator Training**

In September and October, prior to the start of the Snow Season all personnel will be trained or refreshed on the operations of the equipment and the routes. The snow fighters will become familiar with the zones and patterns and will make several “dry runs” before the onset of snow to familiarize themselves with areas of concern. Snow fighters will be shown where snow can be pushed and safely stockpiled and where it cannot. All snow fighters will be sufficiently trained prior to deployment.

The city relies on a ratio of permanent employees and seasonal workers to create the snow fighter’s workforce. The permanent employees are responsible for training the new seasonal employees. Training typically encompasses several weeks prior to the onset of snow.

## **Coordination**

### **Inter-Department/Division Coordination**

Snow removal operations are not limited to just the City’s operations group. The Department of Public Works is the responsible department regarding snow removal; however, the department relies on other departments and divisions for successful operations. The Public Works Director may authorize the use of additional resources when conditions warrant and may also institute a change of policy and procedure during emergency conditions.

### **Fleet Services Division**

The Fleet Services Division directly supports the operation by maintaining and repairing snow removal equipment. Due to the size of the graders, loaders, and rotary blowers, many repairs are completed in the field at the location of breakdown often in somewhat dreadful conditions.

The Division maintains an inventory of backup equipment to be ready for implementation to keep the operations running. The Division also maintains all public safety equipment and vehicles throughout the event.

The Fleet Services Division staff work the same continuous 12 hour shifts as the snow fighters throughout the event timeline.

### **Community Service Officers**

Snow removal operational efficiency relies on the ability of the operator to be able to move freely within the roadways during operations, particularly during heavy intensity events. One of the most important aspects of an efficient operation is the clear uninterrupted travel way for the snow fighters. Parked vehicles or obstructions in the travel way compromise the operator’s ability to clear the travel lane quickly and effectively. For each vehicle parked, the operator must navigate clearly around the vehicle while pushing snow and trying to avoid damage. Often, the operator will need to back up several times thus delaying service to the remaining roadways. This process of navigating parked vehicles or obstructions becomes extremely difficult in deep snow or packed/rutted roadways.

The City’s Community Service Officers (CSO) provide the Public Works Division with the help to clear obstructions in the right of way. Many times, the CSO will be able to contact owners and resolve the issue so that the next pass of the plow is uninterrupted or the CSO may ticket and solicit towing of the vehicle.

The Community Service Officers play a key role in the success of the operation.

### **Public Safety – Fire and Police**

The Fire and Police Departments are critical towards an effective and safe operation. Often, the police and fire personnel are the “eyes” of the operation. Relaying information about road conditions, accidents, closures, and obstructions to plow operators. The police department also assists the Public Works Department with accident or damage investigation.

### **City Manager’s Office (Press Information Officer)**

Before, during, and after operations, it is critical clear and concise information be provided to the public regarding preparation, operations, conditions, and clean up. The Public Works Department works closely with the city’s Public Information Officer (PIO) to update social media and news platforms as needed before, during, and after the event.

### **Cal Trans & El Dorado County**

In some areas of the city, the roadways intersect State or County roadways. Pre-season coordination with the respective agencies define responsibility regarding intersection plowing, snow storage, abrasives control, snow hauling etc.

## **Anti-Icing and Sanding Operations**

### **Anti-Icing Operations:**

This is a new operational procedure for the City of South Lake Tahoe and is used sparingly, and only on Arterial and Collector class roadways. Anti-icing is a pre-storm treatment applied to the roadway prior to the onset of a storm, providing temperatures are conducive. The treatment consists of a spray application of water and salt brine and must be applied. The brine adheres to the road surface prior to the onset of moisture effectively lowering the freeze point of the treated area. This prevents snow from bonding to the pavement early in the storm cycle.

Storm prediction regarding temperature, humidity, duration, and intensity dictates whether or not anti-icing operations are implemented. The Streets Manager will use the above-mentioned weather information along with the State of California, Department of Transportation (Caltrans), to determine optimal application conditions. Once it is concluded the conditions are appropriate, vehicles with a mounted distribution tank will begin to apply the mixture to most arterial and some collector class roadways prior to the onset of the storm.

Studies by El Dorado County and Caltrans have shown that the pre-storm use of brine allows for up to 4 times less salt to be used to remove ice once it has formed on roadways. Through proper application of brine as a pre-storm treatment, less rock salt may need to be added to the sand mix in the future. El Dorado County utilizes an application of 20 gallons per mile, using a 23.5% salt mix in brine solution. This brine mix has been shown to be effective in the prevention of ice as a pre-treatment, and to assist with deicing in quantities lower than currently used in the rock salt added to the sand mix. Increased use of brine will result in less salt applied overall. The use of brine has been studied and developed with support from the Tahoe Regional Planning Agency and Lahontan Regional Water Quality Control Board as an effective way of reducing the need for sand and rock salt in traction and deicing operations for public safety.

### **Sanding Operations:**

Sanding operations are very important in providing safety to key micro-zones of the city. Plow blade pressure can provide an icy glaze on roadways and snow melt re-freeze provides dangerous icy conditions. Scale of ice conditions vary according to temperature and humidity conditions.

Sanding is really nothing more than applying an abrasive material to the roadway surface that helps with the traction of vehicles at icy or glazed sections of the roadway. A salt and sand mixture (abrasive) are applied to the sanding patterns which may include hills, curves, poor drainage areas, bridges, and public facilities and access points.

Sanding operations are mostly a continuous operation throughout a storm cycle, and the operation can be modified to adapt to changing conditions, police or fire request, special events, accidents, etc..

While public safety is paramount in sanding operations, the City is aware that traction sand has been identified as a significant contributor to fine sediment particles (FSP) in urban runoff, which are the primary pollutant impacting the clarity of Lake Tahoe. Under the Lake Tahoe Total Maximum Daily Load (TMDL) and the City's Pollutant Load Reduction Plan (PLRP), the City carefully controls the application of abrasives by focusing on sanding at key intersections, steep road segments, areas with drainage issues and areas critical to public safety (busy intersections, near schools, major tourist thoroughfares to the Heavenly California Base Lodge). Based on sand specification refinements developed by El Dorado County and Caltrans, the City switched from volcanic cinder abrasives prone to pulverization to a more durable washed granitic sand in order to protect the water quality in Lake Tahoe. Targeted and strategic spot sanding, the use of washed granitic sand, and deployment of the Epoke sander to allow for carefully controlled application of wetted sand to ensure reduced bounce and scatter are all part of the City's effort to both provide for public safety while controlling a major source of FSP that has been shown to impair the clarity of Lake Tahoe.

To recover traction sand abrasives in accordance with the Lake Tahoe TMDL and PLRP, the City continues to aggressively sweep spot sanding locations as soon as possible after abrasive application once the roadways are generally free of snow and ice. The City utilizes regenerative air sweepers to recover sand between storms to reduce the amount of traction sand that can be pulverized by vehicle travel and mobilized during runoff events. Sweeper recovery amounts, locations and effectiveness is a major part of the TMDL compliance process.

## Plowing Operations

### Plowing Operations:

Each plowing operation is subject to the storm severity category, and the roadway priority procedures as to the method. Once a plowing operation has been instituted, the operators will plow their assigned zone and route unless otherwise directed. All eight (8) plow zone operations will begin at the same time with one operator responsible for each zone. The time to complete a zone/route is dependent upon multiple factors; air and pavement temperatures, visibility, precipitation rate and type, snow/water ratio, snow density, time of onset, storm duration, equipment and resource availability, and traffic activity.

During the initial pass, the operator will make every effort to push all snow to the curb or edge of pavement allowing the maximum travel lane widths. In the event of Category 3, 4, and 5 events, the initial pass may only provide reduced travel lanes or in extreme cases, one travel lane.

During the event's operational timeline which may be multiple continuous 12-hour shifts, the operator(s) will make repeated passes through the zone/route pushing back the snow and widening the travel lane at each pass if conditions warrant. Once all streets are opened-up and travel lanes have been established, then the

push-back operation is implemented. The objective of the push back operation is to push the snow back as far as possible to allow storage space in the right-of-way for future storms. Often, this operation pushes the snow onto shoulders and/or snow storage easements.

### **Rotary Operations:**

Once the right-of-way is at capacity for snow storage, the city begins utilizing rotary snowblowers to cut the snowbanks from the edge of the travel way. The resulting vertical cut of the banks allows for full use of the paved travel lanes. The rotary machines cut and blow the snow onto the adjacent snow storage easements parallel to the right of way. The snow storage easements vary city wide but are typically 15' to 20' in width beyond the right of way line.

The rotary operation is a continuous 12-hour shift operation and typically begins after all roads have been plowed.

The rotary operations are extremely slow, with moving speeds of only 1 to 3 mph. Depending on storm severity, it takes much longer to cut banks and widen the travel ways than it does to plow them. All eight (8) snow removal zones are subject to cutting and widening, though the city only owns and operates 5 blowers. Additionally, the machines are quite noisy, and this noise can be disturbing to some, but due to the size and scale of the operation, the slow speed, and the limited equipment resources, the operation cannot be limited to just daytime hours.

Complicating the rotary process, is the consequence of buried debris and materials left in the shoulder/edge of pavement area which jam or break the cutting blades and drivetrain forcing repair. In heavy winters, our operators have hit buried cars, snowmobiles, shopping carts, trash cans, signposts, mailboxes, stakes, logs, downed trees, and many other elements that unfortunately take the machine out of service for some time, and considerably delay service to the remaining zones.

### **Cut off Gates and Driveways:**

The City's graders are equipped with cut off gates. Cut off gates are not required by law or code and are provided as a courtesy by the City of South Lake Tahoe to help reduce the impact of a storm on the property owner's driveway encroachment. The cut off gate allows the operator to lower the gate attempting to restrict snow from creating berms while plowing adjacent to driveway approaches or access points.

Maintenance of a private access or driveway shall be the responsibility of the property owner. The city plow operator(s) cannot go onto private property to clear, push, or remove snow. To provide for an efficient operation, plow operators will not drop the cutoff gate at driveways which are not marked and maintained according to city standard (see *City Code Section 7.05.520 (C)* below).

Unfortunately, there is no feasible technique, skill, or equipment to prevent the possible creation of berms in front of driveways and access points when plowing. The cut off gates serve to minimize berms as much as possible, but not eliminate them. Berms are inevitable when managing snow removal. Too many variables exist to ensure that the plow does not leave a berm. Location of driveway, proximity to next driveway, width of driveway, proximity to intersections and snow push storage areas, depth of snow, snow density and water equivalent, etc. all contribute to berm potential.

**Note:** As storm severity increases, the higher the likelihood of berms at driveway and access locations. Category 3, 4, & 5 storms all will likely result in the creation of minor to major berms.