



2017

APWA Excellence in Snow and Ice Control Award Submittal



City of Columbia, Missouri
Public Works Department
1/31/2017

CITY OF COLUMBIA

The City of Columbia is considered to be a full-service city which means that we provide the basic city services of police, fire, street maintenance, health and parks & recreation. Other services such as water, electric, sewer, solid waste, airport and transit are provided, too. The City of Columbia encompasses 65.51 square miles and is located along Interstate 70 between Kansas City and Saint Louis. Recent population data from 2010 Census show 108,500 people call Columbia their home.

Our network of streets includes over 1360 lane miles of streets. The Street Division provides maintenance on 1358 lane miles of paved streets and 4.5 lane miles of gravel roads. Maintenance not only includes roadway surfaces, but also includes winter weather response, street sweeping, sidewalks, pedways, and mowing public right-of-ways.

The allocated budget for street maintenance in 2017 is approximately 7.6 million dollars of which \$607,000 is dedicated to snow and ice control. Columbia's average yearly snowfall is around 25 inches as tracked and reported by the National Weather Service.

The City of Columbia Public Works Department is recognized by the American Public Works Association as an accredited agency. Columbia is committed to providing a quality transportation system to those who live, work and play in our City.



Figure 1 City Hall Columbia, Missouri

CITY OF COLUMBIA SUPERINTENDENT OF STREETS

Samuel Thomas is the Superintendent of Street Maintenance for the City of Columbia. Sam's career began in 1993 for the City of Columbia as a temporary laborer in the Traffic Division. Sam's hard work, dedication to public service and commitment to excellence has allowed him to advance to his current position. Sam now leads 45 employees in his current role as the Superintendent of Street Maintenance. During snow fight operations Sam is busy coordinating response activities, directing staff, as well as hands on monitoring of conditions in the field.



Figure 2 Sam Thomas, Superintendent of Streets

CITY OF COLUMBIA SNOW AND ICE CONTROL

Street Maintenance personnel are tasked with snow and ice control on over 1360 lane miles of streets during inclement weather. Maintenance personnel are responsible for plowing snow and treating 275 lane miles of first priority streets and 191 lane miles of second priority streets. The City's downtown area are split into two districts, north and south, and maintenance personnel are responsible for plowing and treating this area as well.

The network of streets in our downtown district is important to many who work and visit shops and businesses in this area. Few places exist downtown to pile snow as it is plowed from the roadway. We recognize this and have made provisions to reduce impacts to this area. When snowfall accumulations reach about 5 inches or more, we find it necessary to remove snow from the downtown district. With the assistance of our Solid Waste Department and a private contractor we plow and push snow towards each intersection. Snow is then loaded into dump trucks and roll-off containers and hauled to a storage site where it is left to melt.

Whenever snow accumulates more than 2 inches on the roadway, any vehicle parked on a designated priority snow route must be moved off of the roadway immediately per City Ordinance 14-304. By removing vehicles from priority snow routes, plows are able to quickly and efficiently make roads passable by a front wheel drive vehicle. These designated priority routes allow traffic to move through the city and this is where our snow fighters initially focus their efforts during every storm.

Snow and ice control response in residential areas is determined by the amount of accumulating snow received. If snowfall is 4 inches or greater, maintenance personnel will plow and treat residential areas in continuous operation after the priority routes are determined to be safe and passable. If snowfall accumulation is less than 4 inches, maintenance personnel will plow and treat residential streets during normal business hours.

In mid-Missouri, no ice event is exactly the same. Many factors come into play such as air and pavement temperatures, precipitation types and duration, and temperatures following the event. Generally speaking an ice event is considered by policy as a winter event of less than four inches of snow. That means crews will focus efforts on 1st and 2nd priority routes exclusively to combat freezing precipitation. After considering all factors an operational decision is made regarding treatment of residential streets.

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In addition to city streets, snow fighters also plow and treat special pedestrian sidewalks and city owned parking lots in the downtown district. Snow fighters are also responsible for the lot at the Compressed Natural Gas (CNG) fueling station which the City owns and maintains for both City use and private customers.



Figure 3 CNG Fueling Station

1. MATERIALS AND HANDLING

The City of Columbia uses a variety of materials to combat snow and ice. Materials used include road salt, beet juice, salt brine, liquid calcium chloride and manufactured sand. Materials are stored at our Salt Storage Facility located at 1101 Big Bear Boulevard. Road salt is stored in a dome structure designed to contain and protect 5000 tons of salt. Two 4,000 gallon tanks are on site to hold beet juice and salt brine. Liquid calcium chloride is housed in a 10,500 gallon tank. Manufactured sand is protected from the weather in a clear span.

In 2013 the City purchased a salt brine maker. Salt brine is manufactured on site at the Salt Storage Facility using a combination of salt brine and beet juice. A mixture of salt brine and beet juice is mixed and tested until a reading of 23.3% salinity is achieved. We use this salt brine mixture when pavement temperatures are forecasted to remain above 15 degrees Fahrenheit.

Salt brine is used to pretreat roads and bridges within the City. In advance of a storm when conditions allow, pretreatment of all bridge decks with our salt brine mixture takes place. Maintenance staff also pretreats known problem areas such as certain hills, curves and intersections. Pretreatment normally takes place about 24 hours ahead of the arrival of frozen precipitation. We have two (2) one ton trucks, each equipped with a 300 gallon tank, to pretreat bridge decks and roads with salt brine. A single tandem axle truck outfitted with a 1500 gallon tank is also available and used when pretreatments are applied. We have experienced that salt-brine is an effective anti-icing treatment when applied properly.

Although the City has not received an Excellence in Storage award for materials storage, the City is cognizant of the importance of proper storage and handling of all anti-icing materials and takes appropriate steps to protect our environment as well as our materials.



Figure 4 Salt Storage Facility

2. EQUIPMENT

The City of Columbia has a variety of equipment in its fleet used for snow and ice control. A breakdown of our fleet includes twelve (12) one ton pick-ups, of which four are compressed natural gas (CNG) equipped with plows and spreaders; nine (9) single axle dump trucks equipped with plows and spreaders; twelve (12) tandem axle dump trucks equipped with plows and spreaders, of which one (1) is CNG; one (1) tandem axle brine applicator truck; two (2) one ton brine applicator trucks; one (1) motorgrader with wing plow; four (4) backhoes and two (2) twelve foot push boxes; two (2) skidsteers; one (1) rubber tire loader to load salt; one (1) rubber tire loader with push box; three (3) snow blowers; one (1) garden tractor with front blade and drop box spreader used for public sidewalk plowing; and three (3) salt buggies to spread salt on public pedways.

Each vehicle and equipment is equipped with a two way radio so drivers and equipment operators can communicate with each other as well as crew leaders.

Two trucks assigned to our downtown district are outfitted with a rubber cutting edge on the plow. The rubber cutting edge mitigates damage to our brick street district as well as the numerous brick crosswalks in this area.

Most of the fleet is equipped with ground speed control which allows the driver to adjust the rate of salt applied within preset low and high parameters. Our preferred application rate for road salt does not exceed 300 pounds per lane mile.

Our rubber tire loader is equipped with an on board weighing system purchased from Load-rite. This system allows operations to track the amount of salt used during snow and ice events.

Automatic Vehicle Locators or AVL's are installed in all fleet vehicles. The AVL allows crew leaders to monitor location and progress of each truck as they combat ice and snow. AVL's have enhanced our ability to assist other first responders as we can easily see which vehicle is near a reported safety concern. We can also report on mileage, monitor driver speed, and progress when trucks are treating residential areas.



Figure 5 Loading spreader at salt storage facility

3. TRAINING

Annually in the fall maintenance personnel from many departments attend one day training in-house for the upcoming inclement weather season. Our snow and ice fight team consists of all maintenance staff in the Street Division. Personnel from Solid Waste, Sewer Maintenance, Parks & Recreation, Water & Light and Engineering also have assignments during our snow season. Solid Waste, Sewer Maintenance, Parks & Recreation and Water & Light personnel assist in our operations as plow truck drivers. Engineering staff are tasked with inspecting residential areas to confirm the streets are in a passable condition after they are plowed and treated.

This one day training is identified as a dry snow run. Training begins with a video presentation on snow plowing techniques. Basic instructions on how to clear a residential street, multi-lane collector and adjusting your plow are presented. A brief safety discussion led by our managing engineer is included.

Snow routes are discussed in detail during the dry snow run. The superintendent of streets and supporting crew leaders will go over all changes to priority routes in detail. Current constructions projects and their potential impacts to traffic are identified and discussed as well.

During the dry snow run drivers are able to review updated first and second priority route books. Becoming familiar with the route is important so following the presentations, drivers head out in their trucks to drive their assigned routes. We utilize staff from other departments to assist in our snow and ice response activities. We pair new staff and staff from other departments with experienced snow fighters as they learn their routes.

Pre-trip and post-trip inspection check lists are used by operations staff. The inspection check lists serve as a guide to help keep our fleet in good running condition and our drivers safe. Drivers report on fluid levels, safety equipment, and exterior and interior controls and accessories. Defects are reported immediately and repairs made, if possible, by our own fleet mechanics.

Other important items discussed are the location of our salt storage facility and fueling stations and how they work.

Public pedways and city owned parking lots are also part of our snow and ice control response activities. During the dry snow run maintenance staff has the opportunity to become familiar with pedways and parking lots we are responsible for treating. These areas are identified in simple list form and are posted with the first and second priority route books.



Figure 6 Dry Snow Run Training



Figure 7 Dry Snow Run Training

4. COMMUNITY OUTREACH

The City of Columbia recognizes the importance of establishing communication between Public Works Staff and our citizens prior to, during and the days after a storm event. We have found the best way to insure that the most accurate and up to date information is released is to channel public communication through our Public Information Officer (PIO).

Our PIO's responsibility is to provide updates through social media on our Public Works Facebook Page and Twitter accounts. Local news media routinely run stories and our PIO handles the majority of these interview and media requests.

The City's website, www.comosnow.gov, contains up to date information regarding storm response and policies. Citizens can follow links to local and state road condition maps, read about designated snow routes and find information about how trash collection is handled during winter weather events.

All incoming phone calls to the City are routed through a central Contact Center. Public Works Admin Staff meet with staff in the City's Contact Center each year to answer any questions they may have regarding snow and ice control policies and public comments.

Additionally, City Council, Mayor and the City Manager receive updates from Public Works Staff at 7am and 7pm during continuous operations. These updates provide a summary of progress, conditions and other concerns related to our response activities.

The City of Columbia coordinates a meeting each year in the fall which we call our Snow Conference. We invite representatives from all jurisdictions within the County which include the University of Missouri, Columbia Public Schools, local rural school districts, MoDOT, EMS services, law enforcement, fire personnel. The Snow Conference is an opportunity for agencies to share information about their response efforts, discuss operational changes and learn from each other.

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Figure 8 Invitation to local news media outlets

5. Technical

Embedded within our Information Technology Department is the City's GIS Division. Public Works staff works closely with the city's GIS Division for support with mapping, AVL's and GIS applications.

The GIS Division maintains mapping of all roadways for the city. Our snow priority routes pass through all areas of the city from the most central parts to the fringes of our city limits. The city is divided into 6 wards and each is represented by a city council person. The city is further divided into sub-districts which serve as a guide for our snow fighters when plowing and treating roads that are not a designated priority route.

With guidance from our GIS Division, the City entered into an agreement with Zonar to provide Automatic Vehicle Locators (AVL) for city vehicles. AVL's are installed in all vehicles and equipment used for snow fighting. The AVL allows crew leaders to monitor location and progress of each truck as they combat ice and snow. AVL's have enhanced our ability to assist other first responders as we can easily see which vehicles are near a reported incident. We can also report on mileage, and monitor driver speed and progress when trucks are treating residential areas.

The GIS Division developed a progress map which is viewable on our website, www.comosnow.gov. This map is in use when crews are working in residential areas plowing and treating roadways. Crew leaders update the map as each sub-district is reported as in-progress or complete.

"Load-rite" software and related on-board scale weighing technology is used by the City of Columbia to track material usage. "Load-rite" software allows crew leaders to give an accurate report on granular road salt used during a specific time frame. This information is useful in prompting staff when it is appropriate to procure additional materials as well as tracking costs associated with snow and ice events.

Field Personnel utilize infrared thermometers to measure pavement temperatures throughout the city. Pavement temperatures play an important role in our decision making during each event. As pavement temperatures drop we may use products such as liquid calcium chloride which has a lower effective temperature than granular materials.

The City of Columbia has contracted Weather or Not to provide twice daily weather forecasts and storm alerts.

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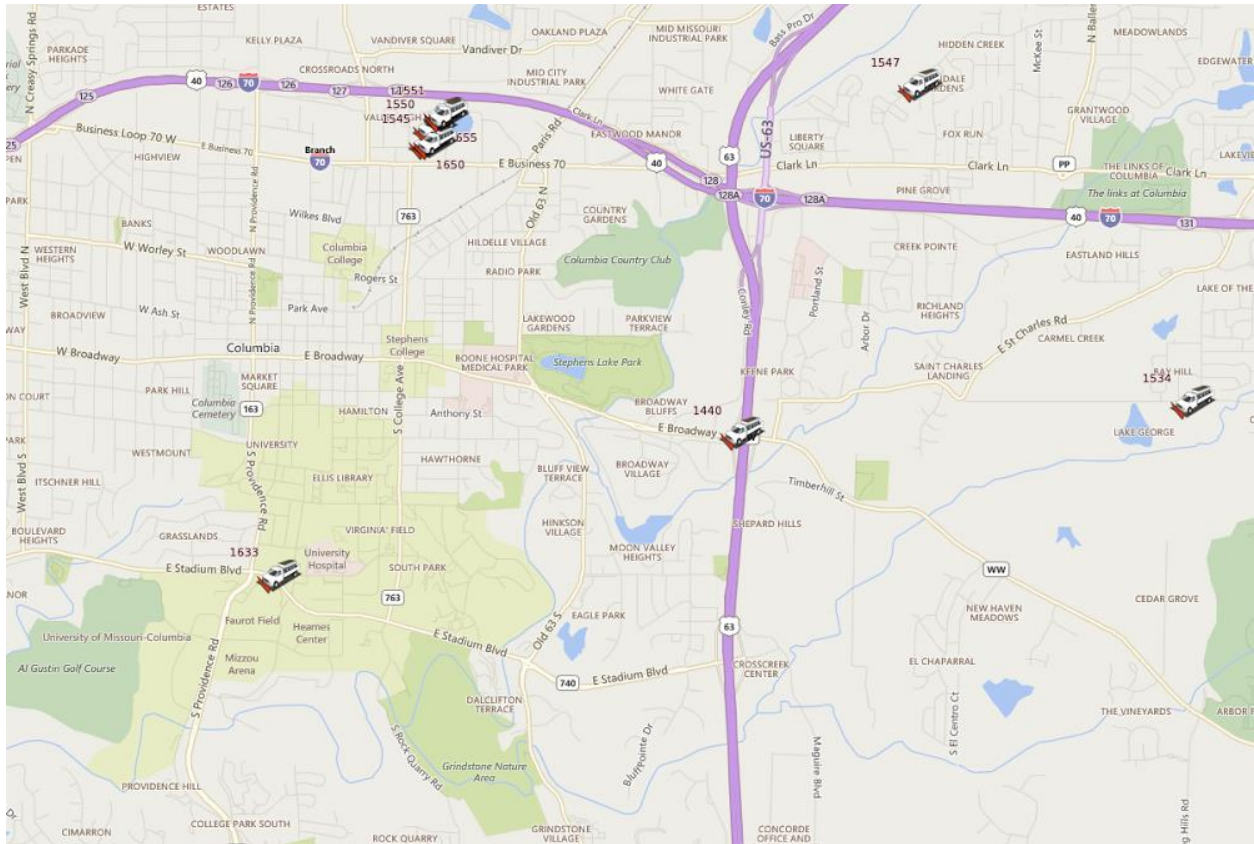


Figure 9 GPS Monitoring of fleet

6. Environmental

The City of Columbia is conscious of our environment and we do several things which reduce the impact to our environment from our operations.

Our salt storage facility was designed in a way to provide safe storage and containment of materials and reduce impacts from storm water runoff. The salt dome safely houses 5000 ton of granular salt in an enclosed, locked storage facility. Additional structures on site store and protect other materials such as manufactured sand, liquid calcium chloride, brine, beet juice and related brine making equipment. The green space surrounding the salt storage facility was landscaped and a detention basin constructed which collects storm water runoff from our lot. Salt water grass was introduced to the landscape around the detention basin providing habitat for birds and insects while enhancing the aesthetic appearance of our facility.

The City of Columbia has incorporated the use of Beet juice in its material stockpile to combat snow and ice. The product we use, "Beet55", is environmentally friendly, and water soluble. We combine "Beet55" with salt brine to reduce the corrosiveness of the mixture.

Our drivers are trained to be conscious of salt application when treating roads. Material spreaders are calibrated to allow a maximum dispense rate of 300 pounds per lane mile. Drivers have the ability to increase and reduce salt dispensation within pre-set parameters.

Cleanup after each storm extends equipment life and reduces our environmental impact. Mechanical sweeping of all streets is a continuous year round operation in the City of Columbia. Our fleet of four street sweepers head out each morning, sweeping debris from our roadways. Spreaders are emptied, washed and sprayed with a salt neutralizing product and stored immediately following each storm. Trucks and plows are also washed and sprayed with a salt neutralizing product.



Figure 10 Evaporator pond at Salt Storage Facility



Figure 11 Liquid Calcium Chloride Storage



Figure 12 Beet55, Brine and Brine Maker



Figure 13 Beet Juice and Brine Mixture



Figure 14 Brine Applicator

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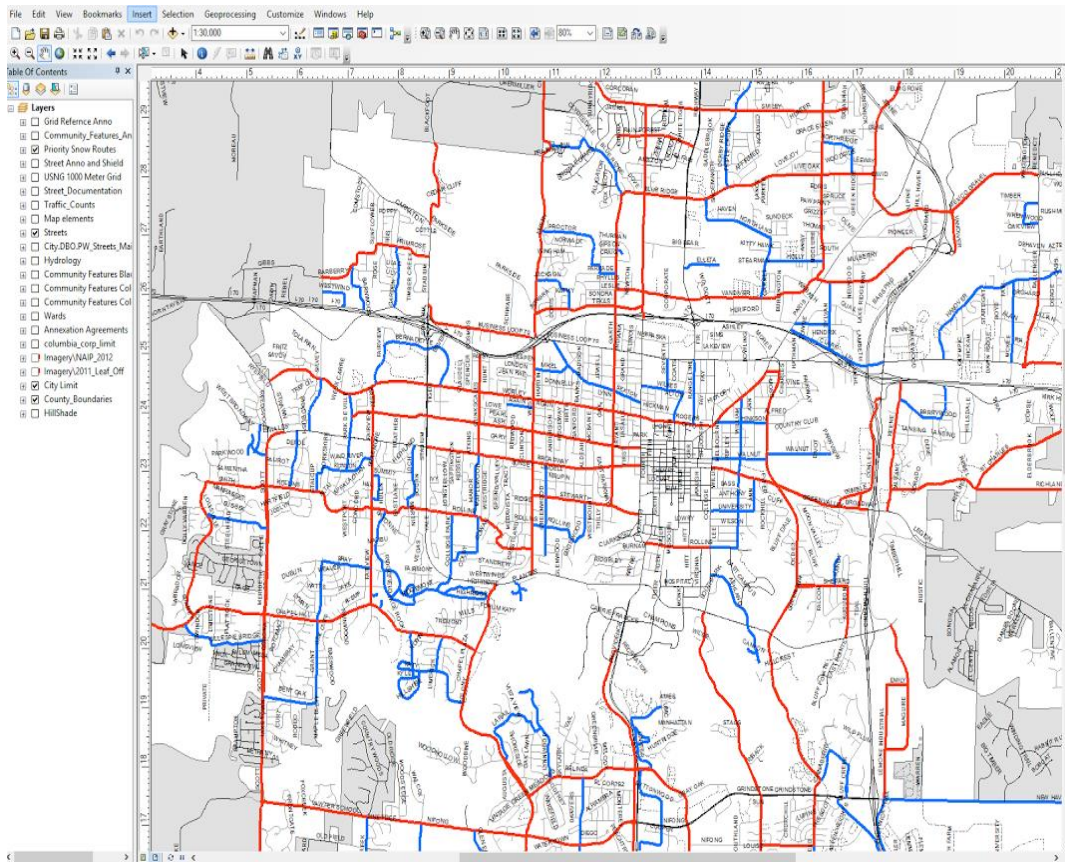


Figure 15 Priority Route Map

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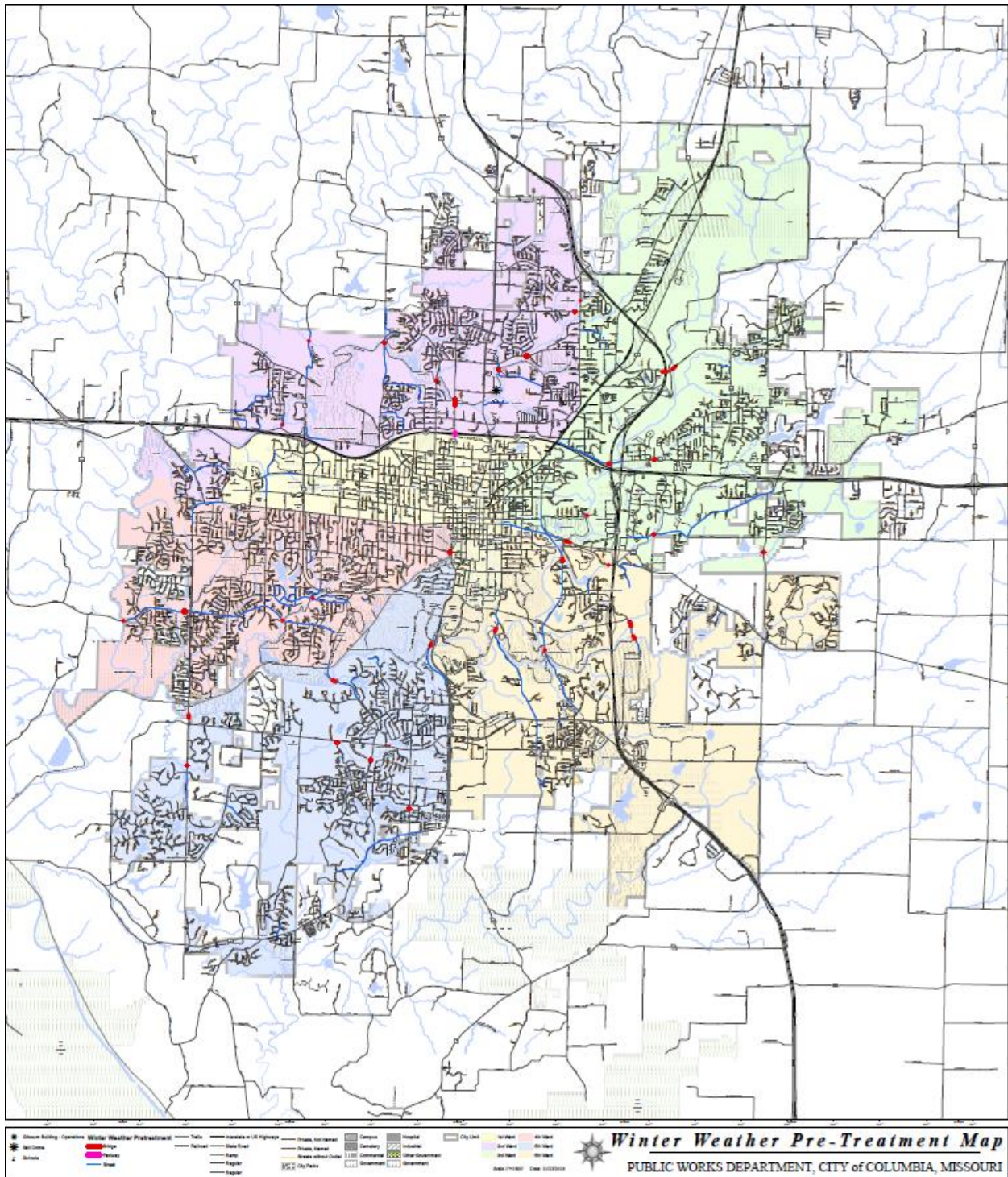


Figure 16 Winter Weather Pre-Treatment Map



Figure 17 Push box for snow removal



Figure 18 Snow blowers, salt buggies and garden tractor for sidewalk and pedway snow and ice control