

Subdrain and Edgedrain System Maintenance and Operations Policy

City of Rochester Public Works 2016



Subdrain Operation and Maintenance Standard Operating Procedure

Table of Contents

Section	Topic	Page
1	Definitions	1
2	Purpose of Subdrain Operation Procedure	4
3	Routine Maintenance and Inspection Schedule	4
4	Problem Areas	6
5	Current Subdrain Distribution	6
6	List of Subdivisions and Streets with Subdrains	6
7	City Engineering Standards	7
8	Connection Permits	7
9	Background – Subdrain and Edgedrain	7
10	Benefits of Subdrain System	8
11	Backwater Flows from the Subdrain System	8
12	Subdrain Backups and System Capacity	10
13	GOPHER1 Locates	11
14	Documentation	11
15	Actions for Property Owners	11
16	Appendices	12
APPENDIX A	List of Subdivisions and Streets with Subdrains	
APPENDIX B	Subdrain PowerPoint Presentation to Council	
APPENDIX C	Subdrain Letter to Property Owners	
APPENDIX D	2002 North Park Letter to Property Owners	

1. Definitions – The below definitions are to be used with the Subdrain and Edgedrain System Maintenance and Operations Policy.

Atlas 14 - NOAA Atlas 14 contains the latest rainfall data for much of the United States, and generally replaces the older data published in NWS Technical Paper 40 (TP-40). Atlas 14 is used in Rochester for all City of Rochester Design Standards.

Backflow Preventer – A device to prevent backflow into a pipe, which could lead into a sump pit or drainage system. Most sump pumps have backflow preventers built in to prevent the backflow of water.

Calcite - or calcium carbonate, CaCO_3 , is a naturally occurring mineral, found in a variety of crystalline forms. Calcite is the main mineral creating limestone, waters in SE MN are naturally high in Calcite. The build-up of flowstone or calcite has been found in deep subdrains.

City Engineer – The Director of Public Works.

Connection Permit – A permit from Public Works that indicates or shows where connections into the public system exist.

Decorah Edge - The “Decorah Edge” is defined as the area in which the Decorah, Platteville, or Glenwood formation is the first encountered bedrock according to the “Bedrock Geology: Steele, Dodge, Olmsted and Winona Counties” data plate produced by the Minnesota Geological Survey – University of Minnesota in 2004, as modified by field investigation or more precise mapping; and having a depth to bedrock of less than twenty-five feet according to the “Depth to Bedrock: Steele, Dodge, Olmsted and Winona Counties” data plate produced by the Minnesota Geological Survey – University of Minnesota in 2004, as modified by field investigation, reliable well logs, or more precise mapping; and for which there are contiguous adjacent areas with the Cummingsville or higher formations as the first encountered bedrock. Typically Decorah Edge areas can have springs, seeps, and clay soils.

Developer – Person, company, or corporation that develops land for real estate purposes.

Developer’s Engineer – The engineer or consultant engineer firm or individual that prepared the subdivisions plans and specifications for development.

Edgedrains - (4” or 6” (inch) perforated PVC) that is buried approximately 4 feet below grade and located behind the curb. Services connections may be stubbed to this. Edgedrain installation has replaced the deeper subdrains from 2002 till the present. Access can be thru a cleanout or outlet into a catch basin, manhole, or outlet.

Foundation Backfill – Material that is used to fill in along the foundation walls of a property. It may consist of native soils or material brought into the site.

Footing Drain – The exterior foundation drainage system placed outside the foundation wall near the wall footing. This usually consists of a perforated plastic pipe that is backfilled and covered with gravel or special drain rock. The footing drain at a property might be connected to the houses sump pit. The footing drain could be piped to daylight if grade is present, left unconnected into a properties yard, or could be tied to the subdrain or edgedrain pipe. Any blockages in the drain could prevent water from draining properly.

Foundation Drain – This is the underdrain system that is located on the inside of the footings of the property, directly below the lower level floor. The foundation drain is typically connected to the inside of the sump pit. Older properties may not have footing or foundation drains present.

Gravity Drainage – Drainage that does not utilize a pump, or other device to aid in the flow of water. Storm Sewer systems are designed to flow by gravity, typically at a specified pipe slope dependent on size of the pipe and drainage area.

Groundwater – Water that collects or flows underground, typically within pore spaces of soils, rocks, and earth.

Right-Of-Way (ROW) - a Right-Of-Way easement is a roadway or pathway for travel through or along another's property. Road Right of Ways are platted and of a specified width, but vary depending on type of area or development.

Sanitary Service Lateral – This is the sewer service for a property, it is typically 4” in width and can be clay, PVC, and other types. Property owners are responsible for their service from their house to the public sewer main (most cases this extends into the public street).

Saturated Soils – Soils that have pore spaces or voids that are completely filled with water and can no longer accept or store water.

Seepage – Water moving thru porous material or a porous media. Seepage collections systems are designed to drain and help capture from saturated soils.

Seeps – A flow or leak of liquid through porous material or holes. This could be through soil, foundation walls, or other material.

Service Connection – Term used to describe where a service is connected to a public utility.

Sidewalk – That portion of the street between the curb line and the adjacent property line for the use of pedestrians.

Springs – Groundwater that leaves the ground at a rapid pace, much higher rate than a seep.

Storm Sewer System - Simply a drain or drain system that is designed to drain excess precipitation and snowmelt from impervious surfaces such as paved streets, parking lots, footpaths, sidewalks, and roofs. The storm sewer system is separate from the sanitary sewer system.

Storm Water - water that originates during precipitation events and snow/ice melt. Storm water can soak into the soil (infiltrate), be held on the surface and evaporate, or runoff and end up in nearby streams, rivers, or other water bodies (surface water).

Street Opening – General term used to describe construction work that requires the street be cut open in areas for repair or maintenance activities of underground utilities.

Subdrains - (4", 6", 8" (inch) perforated PVC) that is buried in the street right-of-way, drains water from soils during construction, usually installed beneath other utilities. These may have included a common service stub (thru gravity) in the same trench as sewer and water connections. Subdrains were installed in Rochester as early as the 1960's until 2002. Access is typically thru a manhole. Some older subdrains may be metal pipe material.

Subdrain Mineralization – Is the process of groundwater high in minerals that starts to settle out in the pipe forming a hardened deposit and accumulates over time. If the mineralization is left unchecked, it is possible to completely block the subdrain pipe.

Subdrain Service Lateral – The portion of the subdrain that extends from the Public Subdrain usually located in the street and serves the property. All subdrain service laterals are privately owned. Subdrain service laterals could be connected to subdrains or edgedrains. Many developers provided subdrain services during the time of utility construction.

Sump Pit – Lowest point in the lower level of a house, typically is a lined pit, intended to act as a water collection area.

Sump Pump – A mechanical device to pump water from the sump pit and out of the property. Sump pumps are available in a variety of sizes, types, and configurations.

TP-40 – Technical Paper 40, was the previous hydrologic data used for Storm Even Designations. Designs prior to 2010 meet TP-40 standards.

Other Definitions – Other definitions may be applicable to the Subdrain Policy not included within the definitions section. The definitions listed above shall precede definitions from other sources.

2. Purpose of Subdrain and Edgedrain System Maintenance and Operations Policy

It is the policy of the City of Rochester to design, operate and maintain a Subdrain Management System (hereinafter, the “Subdrain System”) that complies with City standards and addresses operational maintenance, as described below.

As of January 2016, the extensive subdrain system within Rochester’s City Limits is comprised of the following public and private components:

- 208,000 Linear Feet of Perforated Tile
- 500 Subdrain Manholes
- 100’s of Cleanouts for Edgedrain (not field verified)

The City intends to provide consistent, cost effective and efficient design, operation and maintenance of the public Subdrain System to ensure it will address the following needs:

- The intended design function.
- Design, operation and maintenance costs vs. benefits (i.e., economics).
- In-house staff vs. contractor availability/expertise to manage the System maintenance work in consideration of other infrastructure maintenance needs.

It is the City’s intent to inspect every subdrain manhole every year. It is the City’s intent to inspect approximately 20% of the subdrain pipes each year until data and trends are established that direct a different inspection schedule. This inspection from 2016-2020 will be performed by the City’s Contractor.

These procedures, when implemented, should extend the service life of various components of the Subdrain System and provide a cost effective maintenance approach.

While the City fully intends to meet the guidelines established in this Policy, there may be times when this will not be feasible. The City may be prevented from meeting the guidelines established herein when issues arise such as (but not limited to): budget constraints, competing interests and priorities that favor solutions for one objective over another, equipment failure, weather, and other emergencies. The City Engineer may, on a case by case basis, supersede provisions established within this Policy. Deviations from the goals established in this Policy will be documented.

The City will use this Policy to guide System design, operations and maintenance activities performed by its employees/equipment, private contractors/equipment, or a party other than the City.

3. Routine Maintenance and Inspection Schedule

Routine maintenance includes jetting of the lines to prevent the build-up of minerals and tree roots. Additionally, routine televising and visual inspection of manholes and pipe will be conducted to find potential issues. Since the first subdrains have been installed starting in the

1960's a variety of maintenance methods have been employed, but no formal schedule has been developed. The edgedrain systems are shallower systems which are less prone to mineral build up, but can be more prone to tree roots, damage from other utilities, or blockage if a line has a separation. Typically houses are not connected to edgedrain systems thru gravity, so the risk for a backup is much less.

The following schedule is the anticipated annual schedule for all subdrain maintenance:

Subdrain mains and manholes – Visual Inspection and documentation once per year indicating no ponding or pooling of water. To be performed in all subdivisions with subdrain systems.

Subdrain Outlets – Locations where the subdrains outlet or daylight should be inspected at a minimum once per year.

Subdrain service laterals privately owned – No inspection or maintenance from the City on privately owned service laterals.

Subdrain Jetting – Jetting of subdrain mains with known mineralization build up on at least an annual basis. Routine jetting of subdrain mains should minimize the amount of mineral build-up and maintain the conveyance capability of the subdrain pipe.

Edgedrain Inspections – There is currently no inspection system in place for edgedrains. There is limited information available on edgedrain cleanouts and their locations. Edgedrains do not have gravity connections from houses, so they pose less of a risk of backup. An inspection procedure will be developed for reviewing edgedrains in 2016 and implemented in 2017.

Street Opening Repairs – Repairs to subdrains using open trench methods may occur when jetting/rodding or other methods fail to repair or open the subdrain.

Scope of City's Responsibility - The City will maintain the components of the public System. This includes subdrain and edge components such as manholes, cleanouts, and connection points. Private property owners are responsible for the maintenance of their own Subdrain Service to the Public Subdrain.

Schedule – The City's goal is to comprehensively inspect 100% of its subdrain manholes each year.

Equipment – The equipment used to perform maintenance will depend upon the equipment available and its effectiveness as determined by qualified staff. Equipment may be City-owned, rented or contractor-provided.

Closed Circuit Television (CCTV) Inspection – The City's subdrain mains could be inspected by CCTV camera under the following conditions:

- At the time of new construction, whether a City Project or a City-Owner contract for

- new development, to determine acceptability,
- Prior to a street reconstruction project to determine if replacement during construction is warranted,
- In response to reports of System malfunction or failure, and
- Other situations as determined by the Manager of Infrastructure Maintenance.

City staff and the City's Contractor will utilize visual inspection and pole cameras to inspect subdrain manholes.

4. Problem Areas

Routine inspections will be used to determine subdrain system conditions and maintenance priorities. Infrastructure that receives a poor rating will be issued Work Orders (for projects to be completed by City employees) and completed according to the schedule noted above. If the City has insufficient capacity or capability to complete the maintenance project, then Contracts or Purchase Orders will be issued for external contractor work. The schedule for projects completed with external resources will depend on the complexity of the project, available funding, public safety, and whether they must be approved through the Capital Improvement Project budget process.

Additionally, City employees periodically receive reports from citizens and staff about malfunctioning System elements. When these reports are received, City staff will make an on-site inspection to determine whether:

- The concern is a public or private issue,
- The remedy can be managed through the Work Order system by in-house staff thru the contractors hired via contract,
- The project needs to be evaluated for inclusion in a future Capital Improvement Project budget.

Based on periodic assessment, maintenance condition ratings and completion schedules may be adjusted to account for changes in maintenance findings and workloads over time.

5. Current Subdrain and Edgedrain Distribution

As of January 2016, the City has mapped on its Geographic Information System (GIS) System, 138,969 feet (26.93 miles) of deep subdrain located in the approximate center of the street. 55,621 feet (12.12 miles) of edgedrain, located at a depth of about 3 - 4 feet below the surface. 39.05 miles and an estimated 3,968 services provided to homes. Updates to the GIS System will be made as new subdrains and edgedrains are installed, and also as existing systems are found and mapped. These numbers will be updated every January.

6. List of Subdivisions and Streets with Subdrains

Listing of Rochester Streets and Subdivision with subdrains see the Appendix sections. This list will be updated annually.

7. City Engineering Standards

City Engineering Standards 1005.13 indicates an edgedrain system must be installed on all streets unless the consulting engineer requests an exception and provides evidence why a subdrain / edgedrain is not needed. The Engineering Standard indicates the subdrain is to be a minimum 6" in diameter, and perforated PVC pipe, with cleanouts, and no bends greater than 22.5 degrees. Deep subdrains are no longer installed, this change occurred in 2002.

City Engineering Standards require a subdrain or edgedrain system is installed with every residential subdivision and every public street constructed. This has been included in the City standards since 1988. Not every subdivision has subdrain or edgedrains. This is due to the Developer and their Consultant choosing not to follow City Engineering Standards on installing edgedrains or the Developer and Consultant indicating that an edgedrain will not be beneficial to the Public.

City Ordinance 76.07 subd. 5 makes it illegal for a sump pump to be connected to the sanitary sewer system. Clean ground water or storm water pumped into the sanitary sewer system and downstream lift stations further adds to the cost of the treatment at the City's wastewater treatment plant. The City and City Council has not created an extensive program to follow up with residential or commercial properties that have clean water connections discharging to the sanitary sewer system.

8. Connection Permits

The Department of Public Works may have permits on file that indicates or shows where connections from private properties tie into the public system. Additionally, construction Plans and connection permits may indicate if service stubs were provided to properties. Connection Permits indicate if the property was connected to an existing subdrain service stub during the Sewer and Water Connection process (when the house was constructed).

Connection Permits generally do not show disconnection or show if a private service is functioning. The connection permit is a snapshot in time during construction. Connection permits are field verified and GPS'd. Property owners may request a copy of the connection permit for their property from Public Works.

9. Background – Subdrains and Edgedrains

The Subdrain System is not a storm sewer system that drains surface water collected in the street. The subdrain is typically a 4 (four), 6 (six), or 8 (eight) inch perforated plastic or corrugated metal pipe located within the street Right-Of-Way (ROW) either in the center of the street (typically 8 ft +/- bury) or installed behind the curb (boulevard area) at a shallow depth (typically 4 ft +/- bury). The purpose of the subdrain is to help drain sub surface soils of water and ground water during the time of utility and street construction, provide for an edge drainage system to protect subsurface water migration into the street / road section, and

provide an outlet for connection of additional drainage systems.

The subdrain drains the soils and water after the initial street construction activity, which extends the life and condition of the street. The subdrain can help prevent ground water from discharging to the sanitary sewer system, can prevent ground water from discharging across the sidewalk which can create icing conditions, and provides an outlet for property owners or businesses to connect to. The subdrain and edgedrain is typically installed prior to the phase of construction of houses in a residential development.

10. Benefits of Subdrains and Edgedrains:

Direct benefits to the City of Rochester and all of its Residents:

- Aids in construction of utilities and streets, this can lower the cost for developer and City projects
- Increases the life of utilities (dries out sub surface soils)
- Reduces major street repairs
- Reduces street replacement
- Prevents sidewalk hazards (ice and algae)
- Prevents nuisance conditions from sump pumps (wet yards)
- Prevents clean water from entering the sanitary sewer (which is sent to the Water Reclamation Plant for Treatment)
- In some cases prevents inflow and infiltration in aging sanitary sewer pipes.

Direct benefits to the house and property are listed below:

- A house directly connected thru a gravity system can have the house drain water thru gravity, therefore no sump pump is needed
- Freezing of sump pump lines does not occur
- Prevents ice from forming on the sidewalk and in street areas preventing nuisance conditions from forming
- Gravity is more reliable than electricity
- Can provide an additional level of protection to a property
- Allows properties to be built where high water ground water conditions and saturated soils exist.

11. Backwater Flows from the Subdrain System.

If the storm sewer system becomes overwhelmed with water, the subdrain connected thru gravity could become overwhelmed. This could lead to water entering into a property.

During the original street construction and planning by the Developer and the Developer's Engineer, they might have extended service connections to the Subdrain from the subdrain in the street, to the lot line of each building lot. Some subdivisions also have edgedrain that has service connections stubbed to each lot (standard practice starting in the early 2000's). The intent is to provide houses to have an outlet to discharge sub surface and ground water to.

Homebuilders will install a foundation drain system around the exterior or perimeter of the basement foundation and sometimes install a service lateral pipe from the home to the subdrain in the street right-of-way. In some cases the foundation drain is also connected by the homebuilder or plumber to the sump basket in the houses basement.

The decision on connecting a houses foundation drain to the subdrain in the street right-of-way was made solely by the owner of the house or by the builder of the house. When the homebuilder or plumber made the connection to the house they knew at the time whether this connection was made by gravity (backflows could occur), whether a backflow preventer was installed, or whether a mechanical pump (sump pump) was on-line. During the 1980's the City did not require or prohibit a connection between the foundation drain and the subdrain system in the street.

Some houses floor drains could be connected to the subdrain system (not allowed under the current plumbing code). Houses could have external connections from their yard going into the subdrain system (typically allowed as long as there is a connection permit for it).

The foundation drain for the house is installed by the homebuilder to collect surface water that percolates into the less compacted soil that was backfilled around the foundation walls of your home. The water collected by the foundation drain may drain away by gravity flow to the subdrain in the street or it may flow into the sump pump basket of the house, to be pumped out either into the subdrain or outside of the house into the lawn. When a sump pump discharges to the outside of the house, this typically meets code. It is illegal to have the sump pump discharge to the sanitary sewer system under City Ordinance 76.03 Supervision and Control of Storm Sewers. If the house has a direct connection between the subdrain in the street and foundation drain around the house, it is also usually connected to the sump pump basket. Then the interior lower level of the house can be subject to backwater flows from the subdrain system during high rainfall events, or if the subdrain simply becomes clogged.

Connection permits in some cases indicate that the homebuilder and their sewer and water contractor secured a permit to make a connection to the subdrain system. The City records do not indicate or provide evidence to show that the foundation drain or sump basket is directly connected by gravity or by a mechanical system to the subdrain system. Because the City has no record to show whether the houses foundation drain or sump pump is connected to the subdrain system, there is no way to predict if a property is subject to backwater flows from the subdrain system. The builder of the property may have the best source of information on how the foundation drains were installed and if they were connected to the subdrain system.

If the houses foundation drain or sump pump basket is not connected by gravity to the subdrain system in the street, or the edge drain, the house should not be subject to backwater or backflows from the subdrain system. Property owners can hire a licensed plumber to televise connections within the houses to determine if the foundation drains or the sump basket are connected to the subdrain system. Property owners must install a backflow valve to ensure

storm water / subdrain main water does not back up into their property.

12. Subdrain Backups and System Capacity

Most municipal / public storm sewers are designed to handle surface water flows that are associated with a 10-year design storm. In some cases, the public storm sewers may be designed to handle much higher storm events (a 25 or 50 year storm event). And in some older areas of the City, storm sewers may not handle a 10-year event. New rainfall intensity data (City standard to use since 2013) called Atlas 14 Data replaces the former TP 40 rainfall data for rainfall intensity. The 10-year design storm is a storm with a rainfall intensity that would be expected to occur 10 times in a 100-year period. It is common engineering practice to design the storm sewers to convey storm water flows up to a 10-year storm and then use the street (curb to curb) for storage of heavier rainfall events. It is not cost effective to upsize storm sewers after they are installed in a street to handle a greater than 10-year storm event. It is usually not cost-effective to design, construct, maintain, and replace storm sewers sized larger than for 10-year storm events.

During heavy rains, soils can become saturated, the more likely that foundation drains around homes begin to collect water and discharge it to the sump basket or to the subdrain system, or both. The more it rains over a period of time, the less rain that can infiltrate into the already saturated soils, causing more water to runoff of yards. This rate of runoff can be similar to impervious surfaces such as roofs, driveways, streets. As rainfall continues, these events can lead to the storm sewers reaching and exceeding their 10-year design conveyance capacity. When a sewer reaches this capacity, it can surcharge, which results in water backing up in storm sewers and any connections that leads into the storm sewers. A surcharged storm sewer can cause manholes to become flooded, streets to flood with water, storm sewer drains are unable to take additional water in, and in pressure events, the storm sewer manholes may become dislodged from structures.

During surcharge events, the subdrain mains immediately upstream become full of water. This causes the subdrains to not allow more water in them, and depending on the elevation of the surcharge event, water can backup the subdrain. For subdrains that are connected by gravity this will cause water to run back up the subdrain services, either causing water to saturate footing drains and/or to backup inside the houses sump pump basket. Some subdrains are not connected to storm sewers but discharge directly into drainage ways or ponds. If the outlets of the drains become blocked with debris or sediment this may prevent the subdrain from effectively draining.

Any house that is connected by gravity to the subdrain system could be subject to a backup. The subdrain could become clogged by tree roots or mineralization in a short time. There is no feasible way to fully protect each property that is connected to the subdrain by gravity. The City is also unaware of connections to the subdrain at some properties such floor drains located inside of a house.

13. GOPHER1 Locates

Public Subdrain mains and manholes are currently located thru the Minnesota GOPHER1 Utility Locate system by Public Works Utility Locaters. There are over 40 miles (208,000 linear feet) of subdrain installed within the City with multiple connections from houses. This includes subdrain and edge drain systems.

As new edgedrains are added to the City system, they will be mapped and included within the City's GIS Database.

14. Documentation

The City will document its inspection and maintenance activities for the subdrain system. The City will also document circumstances that limit its ability to comply with this Policy. A summary of inspection and maintenance activities will be prepared for each calendar year. This summary may be used to recommend future changes to this Policy. These records will be kept in accordance with the City's records retention schedule.

15. Actions for Property Owners

All properties that are connected to the subdrain system (whether in the street or the edge drain) need to take steps to protect their own property. The City thru this policy has attempted to reduce the risk of failure of the subdrain system. Property Owner action includes either disconnecting from the gravity system, installing a backflow preventer, or installing a sump pump to their existing subdrain outlet (mechanical system). Each property owner needs to make their own decision for disconnection from the subdrain system.

Homeowners and business owners are faced with a decision that needs to be evaluated in terms of what is best for your property.

Some options to evaluate include the following:

1. Homeowners can have a plumber or licensed sewer and water contractor disconnect the gravity flow foundation drain system located in the public Right-Of-Way. This would mean that the house would need to be re-plumbed. The sump pump discharge water would need to be directed outside to the properties lawn. By pumping or discharging water onto the lawn, this can create saturated lawn conditions, icing on the sidewalk, or if the discharge point is not away from the house, could cause the water to recycle back.
2. The homeowner may want to configure the gravity foundation drain system and sump pump plumbing to eliminate the backflow risks. This still allows the property to a direct connection of their sump pump discharge line to the subdrain system. The sump pump has a backwater valve that is designed to prevent backflow from the subdrain. A sump

pump discharge from the house to the subdrain system would exist through the foundation wall at a higher elevation than the current foundation drain or sump pump basket connection to the subdrain. The higher the elevation of the sump pump discharge line provides additional protection from the surcharged conditions that can occur in the subdrain system.

16. Appendices – See Appendix A, B, C, D, for Additional Information. Updates to this policy will be in Appendix Sections for future years.