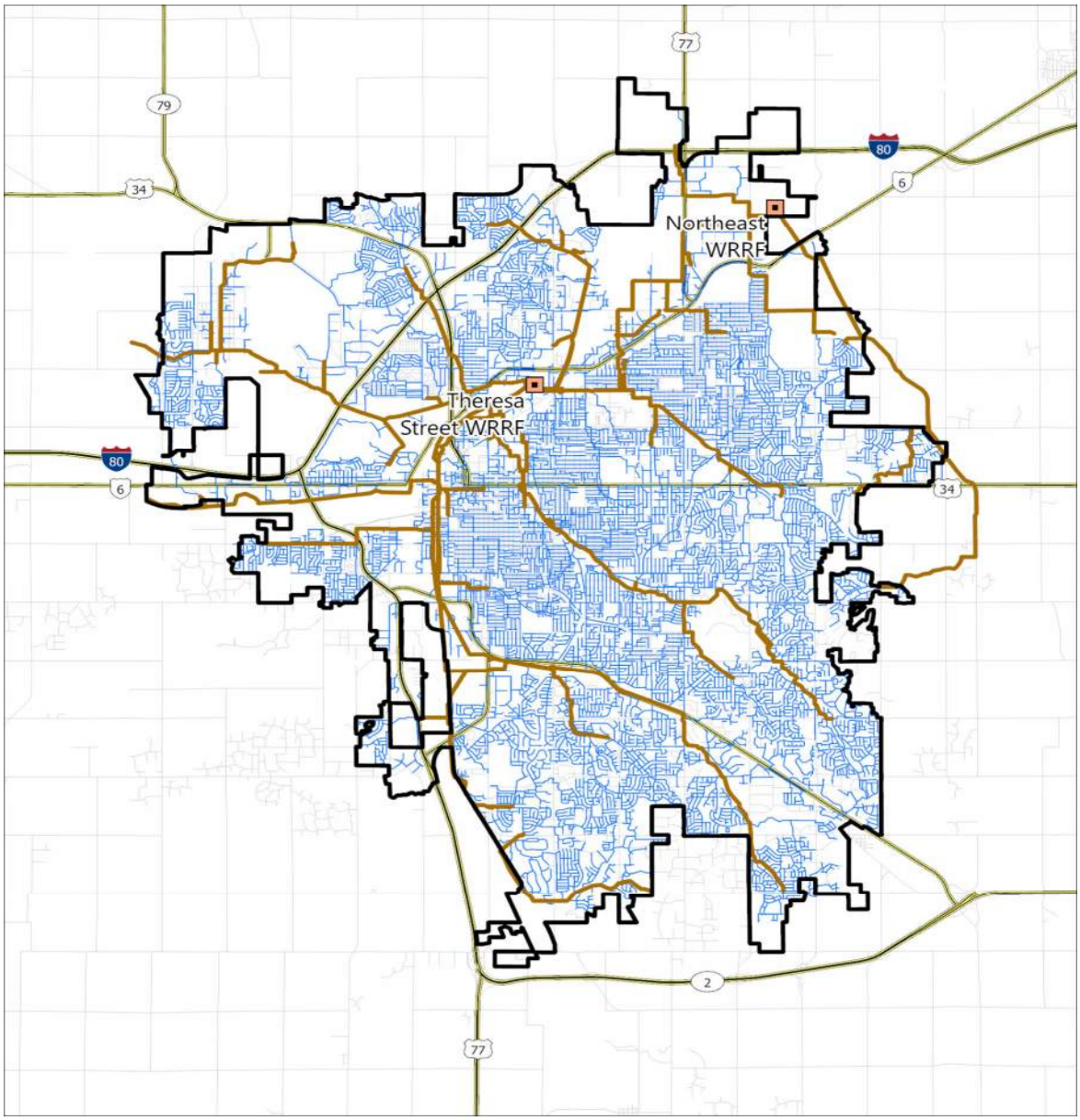
LINCOLN
Transportation and Utilities

**Sewer System Management Plan 2026 Update**

# Sewer System Management Plan




December 2025 / FINAL

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# CHAPTER 1 INTRODUCTION AND BACKGROUND

## 1.1 Introduction

The City of Lincoln's (City) Sewer System Management Program (SSMP) generally describes the City's sanitary sewer system operation and maintenance procedures, including the City's Standard Operating Procedures (SOP's). The SSMP combines preventive, predictive, and corrective maintenance strategies with current best management practices. The SSMP has been prepared to aid the City of Lincoln to effectively manage their sanitary sewer collection system.

## 1.2 Organization

The City of Lincoln's Wastewater System Division (Division) includes Wastewater Collection, Water Resource Recovery Facilities, and Sanitary Engineering sections and are under the Lincoln Transportation and Utilities (LTU) Department. The division is responsible for maintaining, repairing, and operating the City's sanitary sewer collection system and water resource recovery facilities. Shown in Figure 1 is the Organizational Chart.

## 1.3 Mission, Goal, and Actions

The Division's mission is to provide vital wastewater services to the citizens and customers of Lincoln, ensuring the highest possible levels of public health, economic growth, environmental quality, and fiscal responsibility for the community.

### 1.3.1 Wastewater Collection Section - Mission

The mission of the Wastewater Collection section is to provide continuous and reliable wastewater collection service to the public through a comprehensive maintenance program and expansion of the wastewater collection system as needed, thereby providing sufficient capacity for existing and future development.

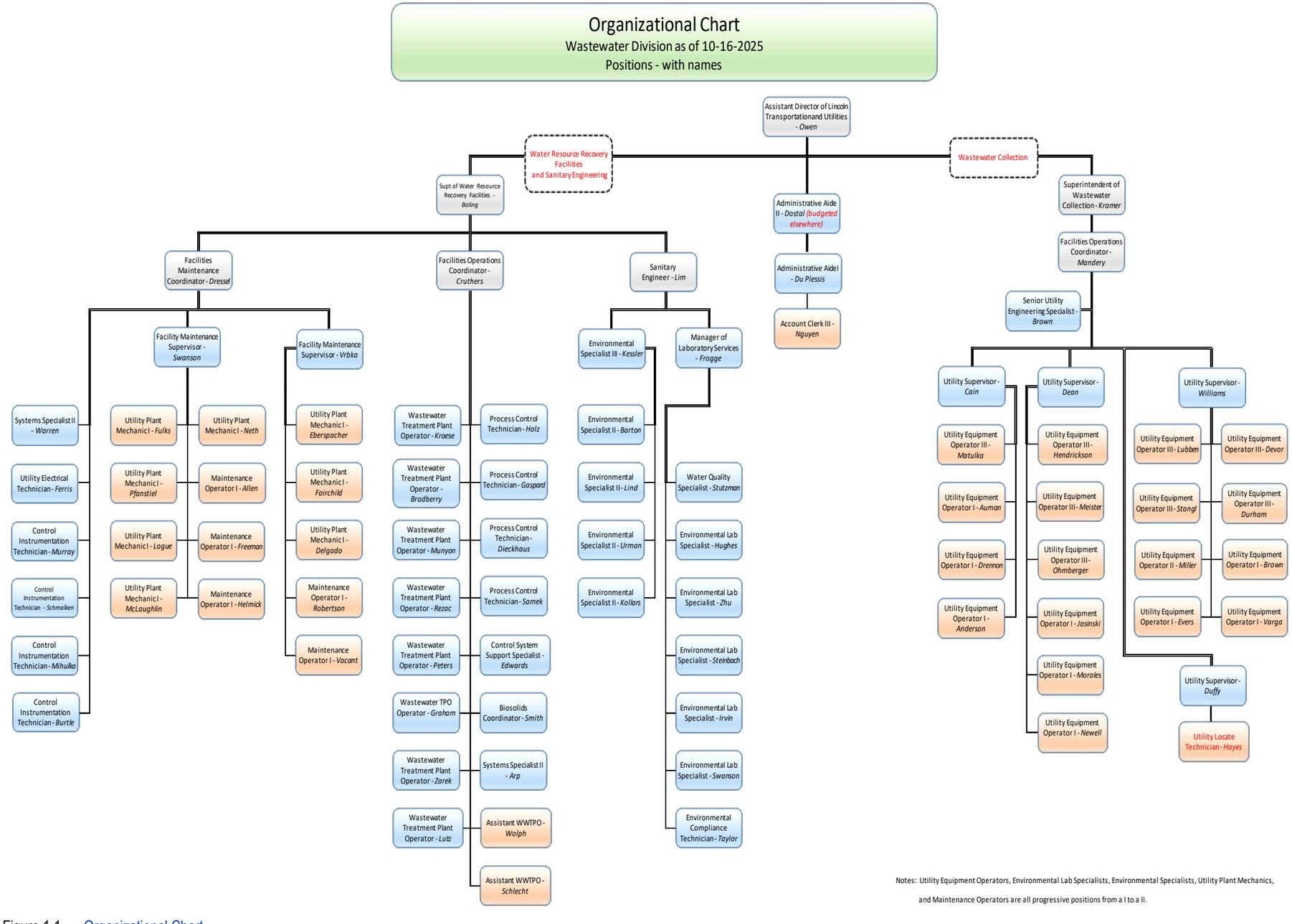



Figure 1.1 Organizational Chart

### 1.3.2 Wastewater Collection Section - Goals

The primary goal of the Wastewater Collection Section is to minimize stoppages in the sanitary sewer lines. A stoppage in a wastewater line occurs when flow is obstructed due to debris accumulation, grease buildup, sedimentation, root intrusion, or structural defects/failure. Once a stoppage develops, system performance can rapidly deteriorate, leading to significant operational, environmental, and financial consequences. Figure 1.2 shows the total stoppages occurring in the system per year.

One of the most effective means to prevent stoppages is through preventive asset maintenance and inspections. The United States Environmental Protection Agency and the American Society of Civil Engineers released a report on Optimization of Collection System Maintenance Frequencies and System Performance. Based on the results from a survey of 42 responding municipalities, the report tabulated the average maintenance frequencies for different categories of activities for the entire collection system. Per the report, the average annual frequency for CCTV pipe inspection is 6.7 percent, pipe cleaning (jetting) is 29.9 percent, and manhole inspections is 19.2 percent.

Currently, the City of Lincoln's sanitary sewer collection system has approximately 22,180 sanitary sewer segments and 20,035 sanitary sewer manholes for a total of 42,215 assets. When the EPA maintenance frequencies are applied to the City's sanitary sewer assets, around 8,000 sanitary sewer segments and 4,000 sanitary manholes, or approximately 28 percent of the sanitary sewer assets, should receive some form of maintenance activity on an annual basis. The City has elected to implement an asset maintenance goal of 25 percent for their system. Currently, only 19 percent of the sanitary sewer system assets are being maintained on a yearly basis. In relation, as seen in Figure 1.2, the City of Lincoln has experienced an increasing trend of stoppages in recent years. This trend correlates with the sanitary sewer system experiencing a significant increase in total wastewater pipeline mileage due to ongoing development throughout the City. The size and complexity of the system have grown, staffing levels dedicated to preventive maintenance have not increased proportionally.

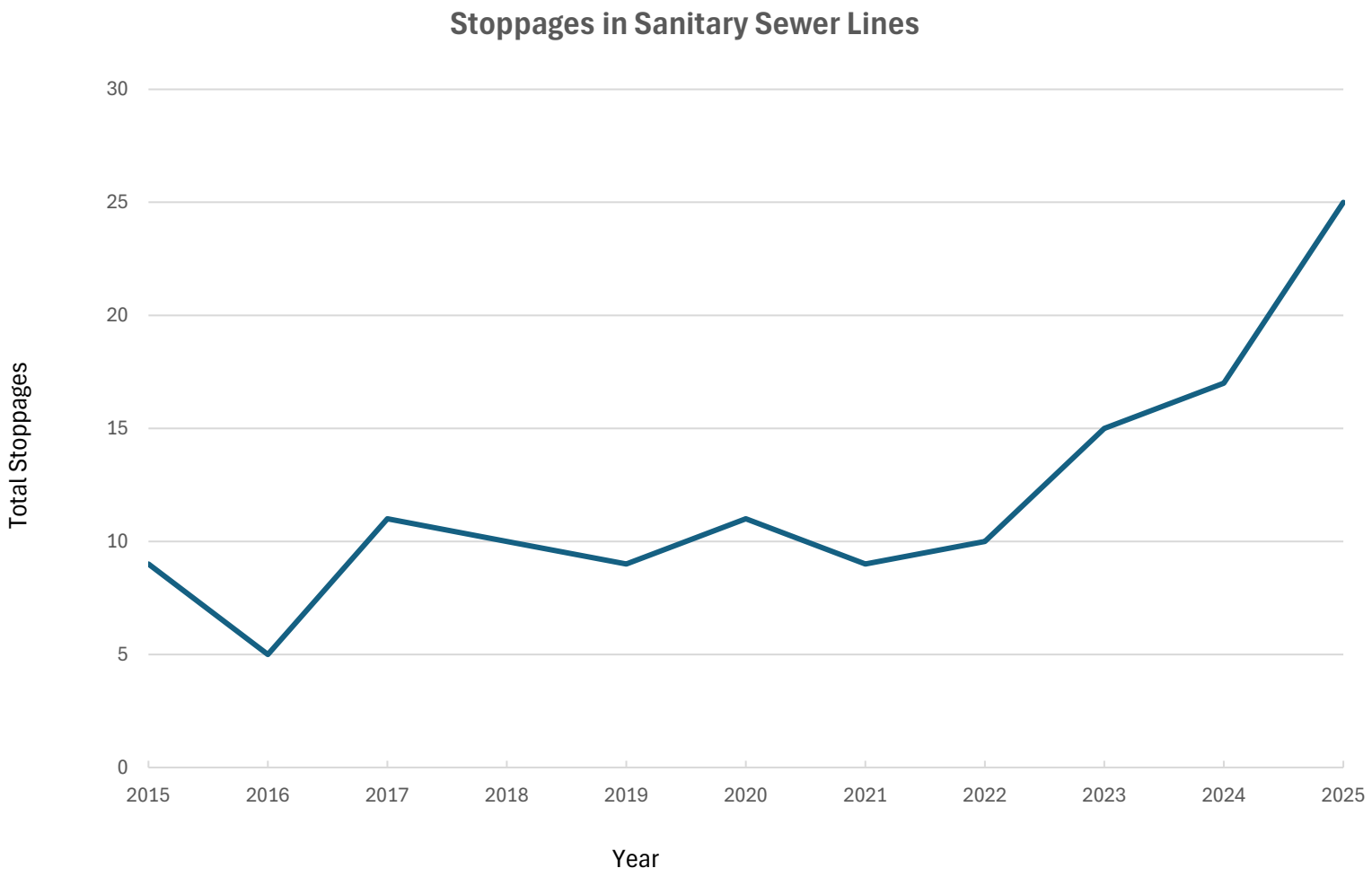



Figure 1.2 Number of Stoppages in Sewer Lines

### 1.3.3 Actions

The following yearly actions are taken in order to achieve the preventive maintenance and inspection goal as well as the stoppage goal while conforming to the mission statements:

- Video inspect 100 miles of pipeline.
- Perform 500 miles of pipeline jetting.
- Perform 100 miles of pipeline root control.
- Perform 100 spot repairs.
- Replace 1,000 feet of pipeline.
- Rehabilitate 10,000 feet of pipeline.
- Repair/replace 100 manholes.
- Properly abandon service taps no longer needed.
- Properly make new service taps required.
- Handle 200 customer service calls.
- Perform 2,500 sanitary sewer locates.
- Comply with Federal, State, and local regulations.
- Develop a 6-year Capital Improvement Plan.
- Manage approximately $2 million dollars of rehabilitation projects.
- Manage approximately $5 million dollars of new pipeline projects.

## 1.4 Background

### 1.4.1 History

The City of Lincoln has been operating a wastewater collection system since 1888. The original collection system collected and conveyed the wastewater from the City to Salt Creek. The first water resource recovery facility (WRRF) in Lincoln began operation in 1923 and was operated by Sanitary Improvement District No. 1. In 1957, the Sanitary Improvement District No. 1, deeded the original water resource recovery facility to the City. This water resource recovery facility was located at 24th and Theresa Streets, where the Theresa Street Water Resource Recovery Facility still exists to this day. Since then, the collection system has grown, and as a result, a second water resource recovery facility has been constructed on the northeast side of the City. This water resource recovery facility is identified as the Northeast Water Resource Recovery Facility.

The City's wastewater collection system is considered a sanitary sewer system only and is not a combined sanitary/storm sewer system. That means the flows conveyed in the wastewater collection system are derived from residential, commercial, and industrial wastewater sources. Storm water from sources such as street runoff, roof drains and similar sources are not directed to the wastewater collection system. Separate facilities are provided to handle stormwater flows.

### 1.4.2 Sanitary Sewer Service Area and Population

The City's sanitary sewer service area currently encompasses 89.82 square miles as shown in Figure 3. The historical population data for the City is presented in Table 1.1 below.

Table 1.1 Historical Population From 1880 to 2020

| Year | Population | Year | Population[1] |
|---|---|---|---|
| 1880 | 13,003 | 1960 | 128,521 |
| 1890 | 55,154 | 1970 | 149,518 |
| 1900 | 40,169 | 1980 | 171,932 |
| 1910 | 43,973 | 1990 | 191,972 |
| 1920 | 54,948 | 2000 | 225,581 |
| 1930 | 75,933 | 2010 | 258,379 |
| 1940 | 81,984 | 2020 | 291,082 |
| 1950 | 98,884 | 2025 | 309,129 |

Notes:
(1) Population data for 1880 to 2020 from the 2030 Comp Plan, 2040 Comp Plan and Censuses. For 2025, the population was estimated based on 2020 and a projected growth rate of 6.2% (in accordance with 2050 Comp Plan for Lancaster County).

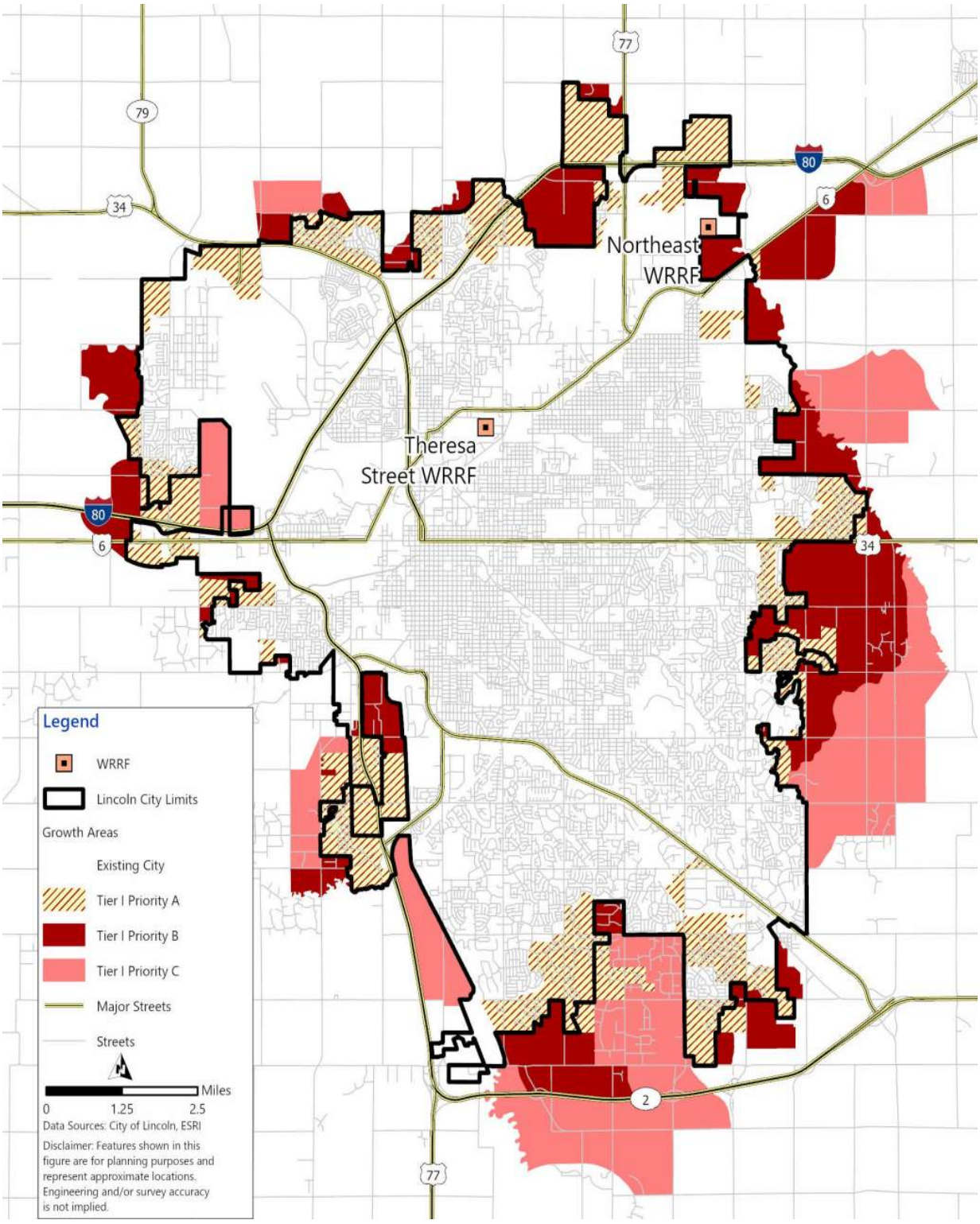



Figure 1.3 Existing and Future Tier I Service Area

### 1.4.3 Condition and Age of Collection Facilities

As of November 2025, the City's collection system included over 1,152 miles of sanitary sewer piping. Table 1.2 presents historical length of sanitary sewer pipe in the City's system for the years 1880 through 2025. As shown in Table 1.2, there are over 500 miles of pipe potentially over 50 years old, and over 200 miles of pipe potentially over 100 years old. The older sections of the collection system are considered to be outdated with respect to materials of construction and current construction techniques. These sewers are monitored on a regular basis to confirm their structural conditions and to check that the inflow and infiltration (I&I) rates are within acceptable limits.

The sewer system is comprised of several sizes of sewers; the largest sewers, which collect and convey the wastewater from the tributary areas to the WRRF facilities are called trunk sewers. The trunk sewer system for the City is shown in Figure 1.4. In addition to the wastewater collection piping, there are also 15 wastewater lift stations located throughout the system as shown in Figure 1.5. These lift stations are strategically located to either serve a low-lying area, or to pump the collected wastewater across one of the many streams or creeks located throughout the City.

Table 1.2 Historical Length of Sanitary Sewer Pipe Installed

| Year | Miles of Sewer Pipe in System[1, 2] | Percentage Increase in Pipe Miles[3] | Miles of Sewer Pipe per Population in 1000s |
|---|---|---|---|
| 1880 | 37 | - | 2.85 |
| 1890 | 201 | 443.2% | 3.64 |
| 1900 | 201 | 0.0% | 5.00 |
| 1910 | 201 | 0.0% | 4.57 |
| 1920 | 203 | 1.0% | 3.69 |
| 1930 | 284 | 39.9% | 3.74 |
| 1940 | 307 | 8.1% | 3.74 |
| 1950 | 372 | 21.2% | 3.76 |
| 1960 | 486 | 30.6% | 3.78 |
| 1970 | 567 | 16.7% | 3.79 |
| 1980 | 651 | 14.8% | 3.79 |
| 1990 | 697 | 7.1% | 3.63 |
| 2000 | 857 | 23.0% | 3.80 |
| 2010 | 994 | 13.7% | 3.85 |
| 2020 | 1,137 | 14.59% | 3.91 |
| 2025 | 1,152 | 1.14% | 3.73 |

Notes:
(1) Actual values from City used for 1980 to 2025.
(2) 1880 to 1970 values are estimated and correspond to the percentage population change for that period.
(3) Length was not increased due to negative population trends.

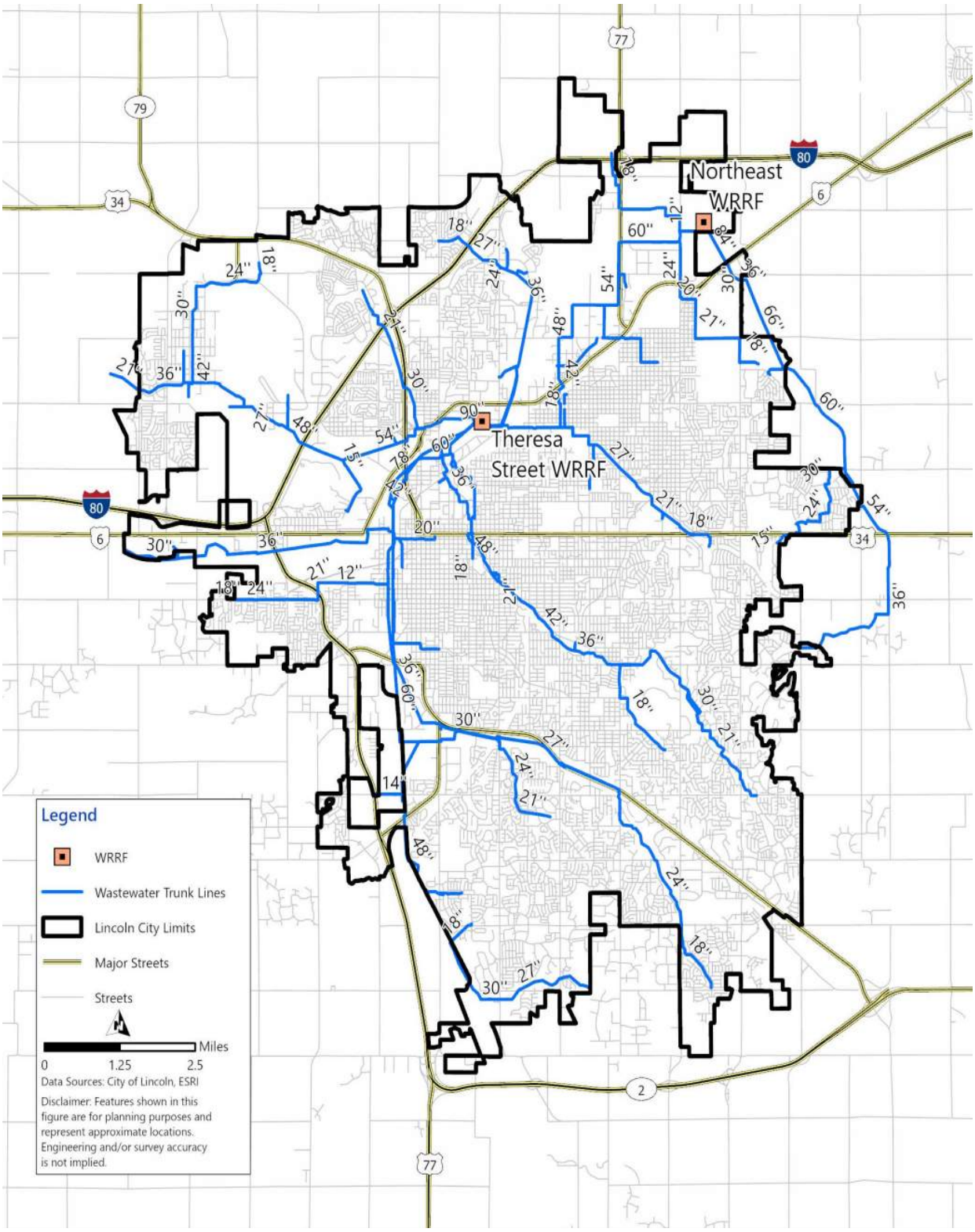



Figure 1.4 Wastewater Trunk Sewer System

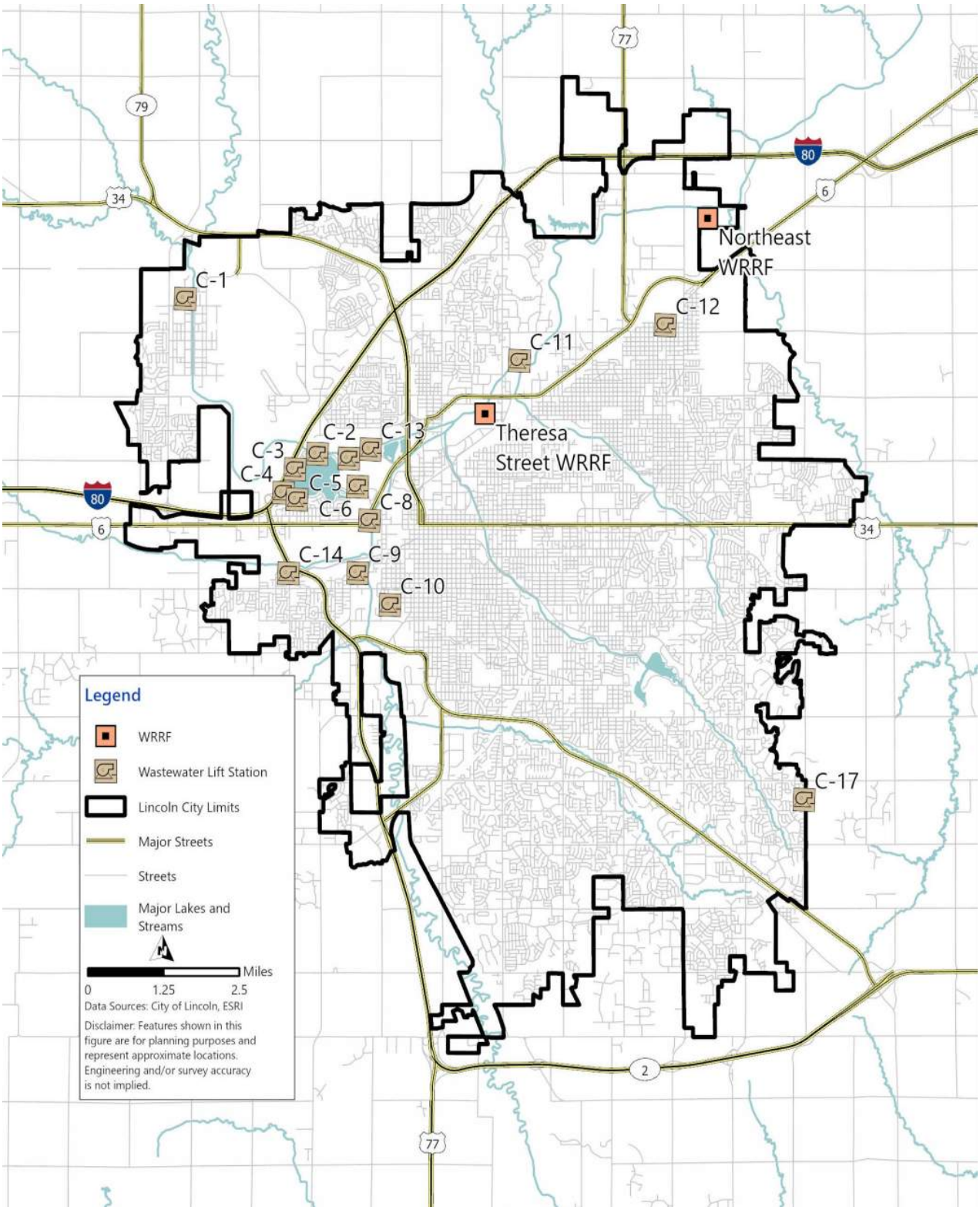



Figure 1.5 Wastewater Lift Stations

## 1.5 Reference Material

During the course of preparing this SSMP update, several related studies, reports, memorandums, improvement plans, and other documents prepared for the City of Lincoln, were used, referenced and incorporated into this work. The following list includes but is not limited to the documents that were incorporated into the preparation of this update.

- Title 17 of the City of Lincoln's Municipal Code.
- Title 119 - Nebraska Department of Environment and Energy.
- 2050 Comprehensive Plan.
- 2040 Comprehensive Plan.
- 2030 Comprehensive Plan.
- Update of the Wastewater Facilities Master Plan, 2015.
- City of Lincoln, Wastewater Data.

## 1.6 Acknowledgments

LTU was an integral partner in the development of this SSMP. To that end, acknowledgments are given to:

- Mr. Brian Kramer, P.E., Superintendent of Wastewater Collection.
- Mr. Todd Boling, Superintendent of Water Resource Recovery Facilities.
- Mr. Chin Lim, P.E., Sanitary Engineer.
- Mr. Mike Mandery, Assistant Superintendent of Wastewater Collection.
- Mr. Aaron Dressel, Facilities Maintenance Coordinator.

# CHAPTER 2 REGULATORY ENVIRONMENT

## 2.1 National

Nationally, Sanitary Sewer Overflows (SSO's) have been in the regulatory spotlight since 1995, when the United States Environmental Protection Agency (USEPA) formed the Sanitary Sewer Overflow Federal Advisory Subcommittee (SSO Subcommittee). The purpose of the SSO Subcommittee is to examine the need for national consistency in permitting and enforcement of SSO's.

From 1985 to 1999, the SSO Subcommittee met 12 times to discuss policy issues associated with SSO's. In 1999, the SSO Subcommittee supported basic principles requiring the following:

1. Capacity, management, operation, and maintenance (CMOM) programs for municipal sanitary sewer collection systems.
2. A prohibition of SSO's, which includes a closely circumscribed framework for raising a defense for unavoidable discharges.
3. Reporting, public notification, and record keeping requirements for municipal sanitary sewer collection systems and SSO's.

The recommendations of the SSO Subcommittee were then incorporated into the proposed "SSO Rule," which was published in the Federal Register in January 2001. For a variety of reasons, however, the proposed SSO Rule has yet to be formally adopted by the USEPA on a national level.

## 2.2 State of Nebraska

Although the State of Nebraska does not specifically have an SSO policy, SSO's are considered to be a violation of the NPDES discharge permit as follows.

> *As defined in Title 119 - Nebraska Department of Environment and Energy, a POTW is defined as: "093 - Publicly owned treatment works (POTW), means a treatment works as defined by Section 212 of the Clean Water Act, which is owned by a state or municipality. This definition includes any devices and systems used in the storage, treatment, recycling and reclamation of municipal sewage or industrial waste of a liquid nature. It also includes sewers, pipes and other conveyances only if they convey wastewater to a POTW Treatment Plant."*

The City of Lincoln's discharge permit specifies the quality of the effluent leaving the POTW's. This permit does not authorize the discharge through outfalls from the POTW's that includes any untreated influent wastewater.

Although the permit does not specifically state the requirements for reporting SSO's and/or them being violations of the permit, SSO's have to be considered violations of the permit based on the following pacts:

1. The definition of a POTW above, and
2. The POTW is permitted to discharge only treated wastewater.

In addition, the State of Nebraska requires that the City of Lincoln to monitor, record, and report the occurrence of any SSO's every six months.

## 2.3 Local

The City of Lincoln has a comprehensive sewer use ordinance which regulates the use of the wastewater collection system, which is located in Title 17.58, Title 17.60, and Title 17.62 of the City of Lincoln's Municipal Code. A copy of this ordinance can be found in the City's website.

In August 2017, the City enacted ordinance 20525 which amended Title 24.12 Section 1101.6, which mandates that subsoil drain discharge must be directed to an approved water course, the front street curb or gutter, an alley, or a concrete gutter that discharges into an alley as well as defines the minimum specifications of sumps and their pumps. This works in conjunction with section 17.58.030 which prohibits any discharge of stormwater, surface water, groundwater, roof runoff, or subsurface drainage to any wastewater collector.

## 2.4 Definitions

Sanitary Sewer Overflow (SSO) - SSO is defined as any overflow release, discharge, or diversion of untreated or partially treated wastewater from a sanitary sewer system. SSO's include overflows out of manholes onto city streets, sidewalks, parks, and other locations. Backups into buildings caused by conditions in the sanitary sewer system are also considered SSO's. SSO's that reach the waters of the United States are point source discharges and are prohibited under Section 301 of the Clean Water Act. SSO's that do not reach the waters of the United States may violate NPDES permit conditions requiring proper operation, maintenance, and capacity of treatment facilities and associated conveyance infrastructure per the federal regulations 40 CFR 122.4I(e).

Basement Backup - Basement backups can be due to either public or private issues. If the backup is due to conditions in the publicly owned sections of the sanitary sewer collection system piping, the City will resolve the issue. If the problem is caused by a defect in the private line serving the property, the City will inform the property owner, and it is their responsibility to resolve.

Stoppage - A City of Lincoln Wastewater definition for any time there is an SSO or Basement Backup or a blockage in the line that is the responsibility of the City.

Private Line Trouble (PLT) - PLT is when an SSO or basement backup that is caused by blockage or other issues within the private property owner's service line. Such service line issues are considered PLT and are the responsibility of the private property owner. Shown in Figure 2.1 is an example of where the private line ties into the public system and the figure delineates where the property owner's responsibility begins.

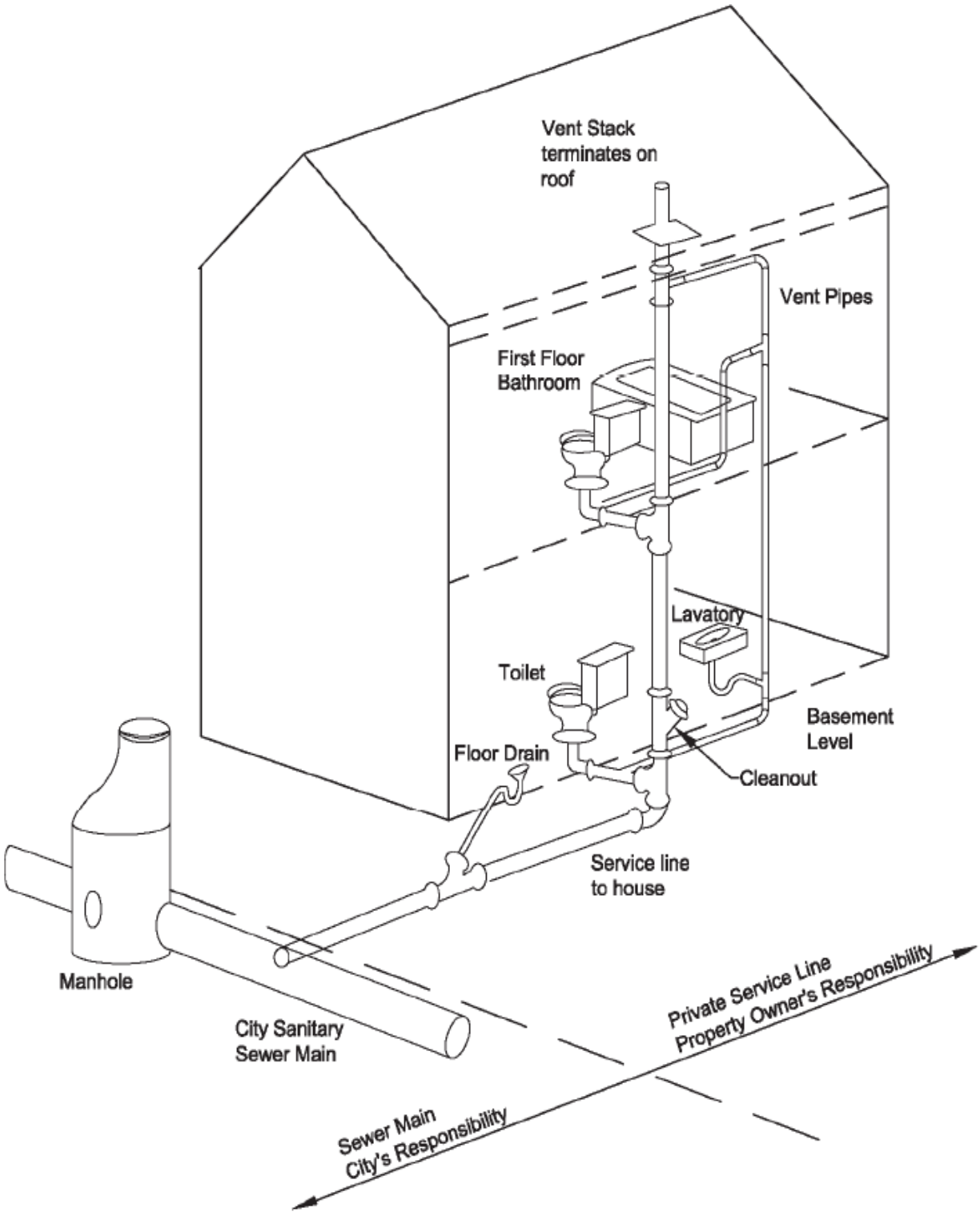



Figure 2.1 Typical Residential Service Connection

# CHAPTER 3 COLLECTION SYSTEM MANAGEMENT

## 3.1 Training

The City of Lincoln's training program provides a mechanism for educating employees and establishing their technical competence. The City of Lincoln utilizes a combination of in-house skill training and the purchase of specialized training through State and National Associations Conferences and vendor training to enhance skills for performing daily work duties.

Safety training is obtained in conjunction with the City's Safety Training Coordinator. The City of Lincoln expects employee to adhere to all of the City's safety policies including but not limited to these specific procedures.

- Confined Space Entry.
- Vehicle Operation Policy.
- Respiratory Protection Program.
- Excavation Safety Policy and Program.
- Injury Reporting Policy.
- Personal Protective Equipment (provided for the employee).
- First Aid, CPR and AED (First aid supplies are available in office areas and vehicles).

The Collection System Section maintains appropriate safety equipment including but not limited to the following:

- Personal Protective Equipment (PPE).
- Respirators.
- Filters.
- Harnesses.
- Tripods.
- Hoists.
- Fire extinguishers.
- Self-contained breathing apparatus.
- Lights.
- Barricades.
- Signage.
- Ventilation Fans.
- Atmospheric monitors.
- Magnetic lifting device.

## 3.2 Staffing

The City currently operates and maintains the collection system. This work includes:

- Sewer cleaning.
- Inspection by visual and CCTV methods.
- Condition assessment.
- Construction as required to keep the sanitary sewer system in good operating condition.

The responsibilities and personnel requirements for each of the operations and maintenance components are generally described in Table 3.1.

Table 3.1 Collection System Staffing Levels

| Component | Staffing | Equipment | Responsibilities(1) |
|---|---|---|---|
| Sewer Cleaning | 4 crews of 2 people, and 1 supervisor | 4 jetting trucks,<br>1 combination jetting and vacuum truck | 70% line jetting/cleaning<br>30% root treatment |
| Sewer Inspection | 3 crews of 2 people, and 1 supervisor | 3 internal CCTV inspection vans | 80% CCTV older/existing system<br>20% CCTV newer system<br>Acoustical assessments |
| Construction | 1 crew of 5 people, and 1 supervisor | 1 mini excavator,<br>1 backhoe, and<br>2 dump trucks | 100% repair/replacement of existing pipe, manholes, spot repairs, CIPP lining of small diameter pipes |
| Administration | 4.5 people | | Manage CIP program, construction management, one call, supervision |

Notes:
(1) Approximate percentage of time spent on each task.

The Collection System Superintendent and Assistant Superintendent oversee the use of the cleaning and inspection equipment, as well as management of the Capital Improvements Project (CIP) program. Sewer cleaning crews are assigned a specific area of the collection system on a weekly basis and are responsible for cleaning those lines. Other crews begin each week assigned with their specific tasks. Crews report back data on a daily basis, through entries on their timecards, denoting progress, problems incurred, and other items of significance. This data includes lines cleaned, root controlled or televised, inconsistencies between the maps and the actual in ground sewer line locations, manhole status, items of note, etc. The data is then entered into the asset management system database. Mapping errors, if found, are then submitted to the mapping and Geographic Information System (GIS) staff.

### 3.2.1 SOP for Equipment Operator Performance Evaluation

The City utilizes an SOP for equipment operator performance evaluations. This SOP is intended to be dynamic and should be updated and revised as new information and equipment is employed.

# EQUIPMENT OPERATOR PERFORMANCE EVALUATION

Timing of yearly evaluations is kept track of by clerical staff. They will forward the rating information approximately one and one-half (1 ½) months before it is due.
The employee performance evaluation is important for the employee as well as the supervisor. It is a chance to give honest feedback both directions about the past year and set goals for the upcoming year.

**Supervisor**

- The supervisor fills out name and classification on the employee performance evaluation comments page and forwards to crew leader if applicable.
- Supervisor fills out comments on page one of the employee performance evaluation comment pages.
- Supervisor numerically rates the employee on the form provided, using the job description and scoring guide as cross references.
- Supervisor fills out routing slip and gives back to clerical staff.
- Supervisor will fill in the upper section of the Career Development, Succession Planning, and Position Review Checklist.

**Utility Equipment Operator III**

- UEO III fills out comments in provided space, keeping in mind the items on page one of the employee performance evaluation comments, then returns it to the supervisor.

**Administrative Aid**

- Reviews draft for finalization. Distributes final information to Superintendent of Wastewater Collection/Division Manager.

**Superintendent of Wastewater Collection/Division Manager**

- Fills out comments in spaces provided and returns to clerical staff.
- Signs the Career Development, Succession Planning, and Position Review Checklist.
- The form will come back to the clerical staff and be given to the rating supervisor to meet and go over with employee.

**Supervisor**

- Schedule a meeting request with the employee. Attach the pdf. evaluation with the schedule request.
- The meeting between the supervisor and employee needs to be held in private and behind a closed door. It can be done at one of the offices at the Collection shop or arrangements can be made to use a room at the Administration Building. The meeting should be scheduled to not disrupt the normal flow of work activities during the day. Scheduling first thing in morning, around lunch, or end of day are the best times. When setting up the meeting, inform the employee that the meeting is about the yearly evaluation.

- At the start of the meeting, restate the purpose of the meeting then hand the employee their evaluation packet which include the rating form, the employee performance evaluation comments, rating guide and job description. Allow the employee time to read and digest the information, usually 10-15 minutes.
- Ask if they have any questions or specific areas or ratings on the forms they would like to discuss. Dialog through the questions. Ask if they have any more.
- Use the meeting as an opportunity to address performance issues while providing an environment that encourages open dialogue toward improvement in the future.
- Ask employee to sign and date the form and point out that they can make any comments they would like to on the form.
- Ask the employee to see their driver's license, write down the number and expiration date.
- Reiterate your positive comments to the employee.
- Let the employee know they will be receiving a copy of the evaluation in about a week.
- You will also need to review the Career Development, Succession Planning, and Position Review with the employee. The employee and supervisor should sign and date after the opportunity to fill in the form is completed.
- Return the packet back to clerical staff.

**Helps for the evaluation process**

- Read the rating evaluation guide page.
- Keep a page on each employee where you can write down items throughout the year that you can refer to.
- Create a spreadsheet that mimics the ratings form so that as you enter ratings numbers it will automatically tally the total.

## 3.3 Customer Service

### 3.3.1 Service Call Program

Service call management includes both assessing the call and resolving the problem. Service calls are received by various means (e.g., phone calls, e-mail, other City of Lincoln Departments, and occasionally in person). During work hours, staff assess the call and determines the appropriate action to take. During non-working hours, the telephone answering service contacts the on-call staff who will then ascertain the service call and respond accordingly. For specific directions, refer to the SOP for Service Calls in this section.

Once it is determined that a service call is needed, field personnel respond to the site and perform an investigation. If the investigation points to a PLT then the property owner is responsible, and the City will provide general guidance on a recommended course of action. If it is determined that the City's sanitary sewer is at fault, then immediate corrective action is taken to relieve the problem and restore flow. Information about the service call is entered into the asset management program. Work orders are generated to discover the problem, if the City was at fault, and permanent corrective action is identified and scheduled.

#### 3.3.1.1 SOP for Service Calls

The City has SOPs in place for Service Call activities. This SOP is intended to be dynamic and should be updated and revised as new information and equipment is employed.

# SERVICE CALLS

Wastewater is a 24 hours a day, 7 days a week operation, The purpose of the service call SOP is to respond to any sanitary sewer issue 24 hours a day, 7 days a week. One employee is required to be available to receive any call during nonbusiness hours. A second employee will be called if needed to respond to a service call. Generally there are four types of calls that may require a service response: odor, private line troubles, sewer main obstructions, and SSOs (sanitary sewer overflows). When the call is received the employee should ask questions that will help determine the type of service call and what action needs to be taken. Other types of emergency calls will be referred to the appropriate utility, while non emergency calls will be handled during business hours.

**Receiving Call from Answering Service**

- Write down this basic information from the answering service.
  - Name
  - Number
  - Address
  - Note time of call
  - Note reason for call

**Making the Servie Call**

- Dial the number and ask for the person who called the answering service
- Introduce yourself
- Confirm the information from the answering service
- Find out type of building or location of issue
- Start asking the common questions.
- Common Questions to ask caller:
  - Can you describe what is happening?
  - How long has the issue been going on?
  - Does the back up occur only when you are running water or is it continuous?
  - Are any neighbors having back up issues?
  - Is the odor inside or outside the home?
  - Is the water clean or dirty?
  - Is sewage running onto the ground?
  - Is sewage running into a storm inlet or waterway?
- You need to continue asking questions until you have sufficeint information to determine what type of service call it is and the approriate response.

# ODOR

An odor call is usually where a person is smelling sanitary sewer but cannot see any liquid. Responding to an odor call will be the judgment of the responding on-call employee. Ask several questions: What does the odor smell like? Where is the odor coming from? If the odor

is inside the building, have the floor drains been maintained and contain water in the P- trap? Do you live near something that may cause this odor? Are there any signs of sewer overflowing from a clean-out pipe or manhole? Collect as much information regarding what may be the cause of the odor prior to deciding to respond to the service call. If there is enough information to justify responding to the service call or the caller would prefer someone to investigate the odor concern, follow these instructions.

- Use the collection on call sheet to recruit a 2nd person to run the jet.
- Before leaving the shop on after hour calls. Contact the Theresa Street Operator @ 402-441-7964 prior to opening the overhead door.
- Follow the Jet Cleaning SOP to arrive on site
- Once on site , contact the property owner, intorduce yourself and investigate the odor.
- Determine if it is confined to inside or outside the property.
- If inside, examine floor and sink drains add water.
- If outside, inspect the upstream and downstream manholes for surcharge and adjacent catch basins.
- Inform property owner of findings.
- Record all required service call information onto crew card, complete the service summary inspection form in detail and include all observation notes.
- Get back into the truck and turn off safety lights and directional arrows.
- Drive back to the collection shop.
- Turn in crew card.

## Private Line Trouble (PLT)

A PLT is where a building is having a backup that is caused by an obstruction in their service line and not the City main. The distinction between a PLT and City sewer main obstruction may be hard to determine on the phone as most property owners do not have a means to investigate the City main to check for proper operation. The difference between a PLT and sewer main obstruction often can not be made until an on site investigation is done. When responding to a PLT, follow these instructions.

- Use the collection on call sheet to recruit a 2nd person to run the jet.
- Before leaving the shop on after hour calls. Contact the Theresa Street Operator @ 402-441-7964 prior to opening the overhead door.
- Follow the Jet Cleaning SOP to arrive on site
- Once on site inspect the upstream and downstream manholes for surcharge.
- If no surcharge exists, then it is a PLT
- Contact the property owner, introduce yourself, and explain your findings that the problem is in their service line. Explain to them that the main will be jetted to verify that there is not an obstruction in the main.
- Continue to follow the Jet Cleaning SOP.
- After jetting the line, re-contact property owner and inform them that there was no obstruction (stoppage) in the City main.

- Record all required service call information onto crew card and service summary inspection form, include all observation notes.
- Get back into the truck and turn off safety lights and directional arrows.
- Drive back to the collection shop.
- Turn in crew card.

## Sewer Main Obstruction

A sewer main obstruction is where a blockage is occuring in the City main and backing sewer up into the system. The obsructions can occur for a variety of reasons or combination of them, roots, grease, poor design, a misplaced utility bore and debris. Often the obstruction is first identified by a property owners calling with sewage in their basement. Bad obstructions may affect more then one property owner. Identifying that you have an obstruction on the phone will be diffucult as most callers do not have a means to investigate the City main to check for proper operation. The distinction between a PLT and sewer main obstruction often can not be made until an on site investigation is done. When responding to a sewer main obstruction, follow these instructions.

- Use the collection on call sheet to recruit a 2nd person to run the jet.
- Before leaving the shop on after hour calls. Contact the Theresa Street Operator @ 402-441-7964 prior to opening the overhead door.
- Follow the Jet Cleaning SOP to arrive on site
- Once on site inspect the upstream and downstream manholes for surcharge.
- If surcharge exists, then there is likely a sewer main obstruction.
- Continue to follow the Jet Cleaning SOP, until the obstruction is cleared.
- Contact affected property owner(s) and inform them that there was an obstruction (stoppage) in the city main, and the obstruction has been removed.
- Ask to observe (if possible) any damage that may have occurred to the property and personal belongings.
- Take pictures and record any items of value that were affected by the backup.
- If the owner wishes to file a claim they should be instructed to follow the instructions on the Lincoln Wastewater System Filling of Claims card, which you hand to them.
- Record all required service call information onto crew card and the Lincoln Wastewater System Service/Inspection Summary Sheet form, include all observation comments and damaged personal belongings.
- Get back into the truck and turn off safety lights and directional arrows.
- Drive back to the collection shop
- Turn in crew card.

## Sanitary Sewer Overflows

If at any time, while responding to a call and investigating a PLT or sewer main obstruction you witness sewage overflow from a manhole or dwelling onto the ground, street or storm sewer then there is a sanitary sewer overflow in progress. The Environmental Public Health Division, 402-441-8000, should be contacted as well as the Facilities Operations Coordinator, 402-416-8244. If the Facilities Operations Coordinator cannot be reached, then use the collection on-call sheet to call other appropriate staff. Continue efforts to break the sanitary sewer obstruction. Remain on site until the Environmental Public Health personnel and Facilities Operations Coordinator arrive on site.

## Other

Sometimes a caller will be confused about what utility they are having an issue with. If that can be determined through questioning, then give the caller the correct phone number to call. See the Collection on-call sheet for numbers.

## 3.4 Public Information and Education Program

The City of Lincoln uses a variety of outlets for providing information and education to customers. The outlet(s) used to disseminate information is often based on the type of information and the targeted audience. The City routinely uses the outlets listed below to help provide its citizens with the most up-to-date information possible:

- City of Lincoln Public Relations Coordinator.
- City of Lincoln Website, including a Property Owner Information section of the Wastewater System site. (https://app.lincoln.ne.gov/city/ltu/wastewater/property-owner/)
- City of Lincoln Cable TV Channel.
- Local Media (TV and Newspaper).
- Neighborhood / Town Hall Meetings.
- City of Lincoln City Council Agenda.
- Public Open House.
- Personal Visits / Phone Calls.
- Door Hangers.
- Sign Postings.
- Customer Mailings.
- Community Events.

The City of Lincoln has had good community relations regarding issues with the operation and maintenance of the sanitary sewer collection system. Types of information and education provided to the customers as requested are as follows:

- How the sanitary sewer system works.
- Sanitary sewer ordinances.
- Construction repairs and rehabilitation projects.
- Industry pretreatment requirements.
- Service lateral connection location.
- Location of sewer mains.
- Capacity of mains.
- Sewer use rates.
- Grease handling information.
- Grease disposal pamphlet.

# CHAPTER 4 ASSET MANAGEMENT

## 4.1 Overview

Asset management is critical to the mission of the LTU Wastewater Collection section. With over 1,152 miles of sanitary sewers, 20,035 manholes, and 15 lift stations the section is responsible for a large amount of capital assets that are vital to protecting public health and safety as well as the environment. To maximize the utility of the existing assets and minimize capital improvement costs, an effective asset management strategy is key and can be broken up into 3 broad parts.

- Knowing the existing assets.
- Determining the current condition of the existing assets.
- Categorizing and prioritizing work for existing assets, as well as planning for capital improvements.

## 4.2 Information Management and GIS

To track existing assets, the City of Lincoln uses Beehive software (Asset Management System) to manage information on the sanitary sewer collection system. As-built drawings and related records, as well as all new work are entered into the Beehive system. The system also provides for preventive maintenance planning, corrective actions, and asset classification and history. The software provides visualization of the system, records, and report within the software as well as the ability to export to other software platforms such as Microsoft Excel, PowerBI, and ESRI ArcMap GIS software. Visualizations can also be used to generate maps for staff use.

The Foreman's maps are another source of information available to City staff. Foreman's maps illustrate the entire sanitary sewer collection system and are updated yearly. The maps are available in hard copy or electronic format. The updated hard copy maps are distributed to the majority of the collection staff and put in each of the collection system maintenance vehicles. Additionally, electronic versions of the maps are overlaid with Google Earth and installed as PDFs on tablets and smart phones for portable use.

## 4.3 Field Investigations

To determine the current conditions of the assets, LTU performs regular pipe and manhole inspections as well as flow monitoring.

### 4.3.1 Pipe Inspection

Planned CCTV inspections are generally performed on a rotating 12-year schedule, following the cleaning of the pipe segment. In the event of a stoppage, CCTV inspection may be used to view the cause of the stoppage. After the stoppage is removed, the line is re-inspected using the CCTV crawler to assess the condition of the pipe and to aid in determining the cause of the stoppage. In certain instances, the City may contract with specialty Contractors to televise and clean larger sewers.

All newly constructed sewer lines are required to be CCTV inspected by the City prior to final acceptance. This occurs after the line has been installed for 30 days and other inspection tests have been completed.

The other tests include air, joint, deflection, and other construction acceptance and/or visual inspection tests. This information is required to ensure that the line has no construction defects and is installed per the construction plans and specifications. This process also sets the baseline for the data recorded into the asset management system.

#### 4.3.1.1 SOP for Pipe Inspection

The City has SOPs in place for Television Inspection activities, Portable CCTV Inspection activities, and Acoustic Assessment SOP. These SOPs are intended to be dynamic and should be updated and revised as new information and equipment is employed.

# CCTV INSPECTION

The purpose of televising the sanitary sewer system is to provide a conditional assessment of the sanitary sewer.

**Personal Protective Equipment (PPE) Required**

- Approved Safety Vest
- Safety Boots
- Gloves
- Hard Hat

**Equipment Check**

- Check with Supervisor for any immediate assignments.
- Perform a weekly safety inspection on equipment and submit to Supervisor.
- Prior to leaving the shop, walk around TV van inspecting the condition of the vehicle.
- Check the oil, tires, and lights
- Check generator oil level
- Secure all TV Van equipment: Cameras, Transporters, and Tools.
- Check that PPE is either on your person or in the van.

**Drive to work assignment location**

- Prior to driving, check mirrors and buckle up.
- Crew member #2 will assist with backing if needed.
- Upon arrival to the work assignment location, put on all PPE's
- Start generator and power to the K-2 System for the transporter and camera.
- Review operational aspects and functionality.
- Power surge protection equipment
- Start computer
- Open data collection software

**Main Duties:**

- Crew Member #1: The main duties for crew member #1 are to maintain all records by using a computer with CCTV Video Capture software and a wireless card installed for data collection. This consists of entering data into video capture software, retrieving old records from asset management software that would be useful during inspection of the line segments or manhole inspection.
- Crew Member #2: The duties of crew member #2 deals with all outside work regarding placement of camera into line segment and assisting crew member #1 in inspection log data recording. Maintain a safe work zone on the job site and around the TV inspection vehicle.

**Television Inspection**

- Crew Member #1 & #2: Position the necessary traffic signs and/or arrow board if needed.
- Crew Member #1: Positions the truck on the manhole so the reel with the TV cable is aligned with the center of the MH. Turn on all safety and caution lights.
- Crew Member #2: Assist in "spotting" crew member #1 with backing the TV van on the manhole.
- Crew Member #2: Place traffic cones around truck and manhole. Position traffic signals, signs, and arrow board if needed.
- Crew Member #1: Opens CCTV video capture software to appropriate pipe segment and/or manhole, prepare inspection data log sheet of the line segment (manhole numbers, plat identification and other recommended information) or manhole inspection (plat identification and manhole number) to be completed.
- Crew Member #2: Remove manhole cover using proper ergonomics or mechanical lift and measure depth of manhole. Visually inspect manhole for defects. Remove the transporter from truck using the crane and prepare to lower the unit into manhole.
- Crew Member #1: Begin recording.
    - Inspection of manhole should be first
    - Inspection of pipe segment should be second
- Crew Member #2: Lower transporter into manhole using the crane. Makes sure transporter is facing the correct direction. As per Crew Member #1 instructions. (i.e. with the flow or against the flow if it is a reverse set up.)
- Crew Member #1: Drive transporter to the preset position for TV inspection.
- The preset position for the CPR is 8' and the ultra-shorty III is 9.5"
- Crew Member #2: Set cable protection tube (tiger tail) or roller into manhole. Set top roller onto manhole ring. Retract excess cable until line is taut. Set outside mechanical counter to zero. Place rear transmission in neutral.
- Crew Member #1: Set preset distance on video data display.
- Both crew members will begin the TV inspection and data entry of that segment from the control room. Crew Member #1 will record the data on the lap top computer using CCTV Video Capture software while Crew Member #2 drives the transporter through the pipe and operates the pan & tilt camera & calls out the defects and footage services and wyes' to Crew Member #1.

**TV Inspection Completion:**

- Crew Member #1: Completes the task and finalizes the TV inspection of the pipe segment in the video inspection software. Engages reel transmission to retrieve equipment from the pipe segment.
- Crew Member #2: places the transporter in the neutral position & pulls it back with the TV cable reel to the starting MH.

- Crew Member #1 & #2: Remove the transporter from manhole, and place manhole cover back on the manhole. Next, check for mechanical problems while washing transporter, then places transporter back into TV truck and secure. Pick up all cones, signs and arrow board if used.
- Consult map and drive to next location.

## Evaluation Point

**If this is an IDLA situation (Immediate Dangerous to Life and Health) call 911 immediately. Provide the operator with your situation and location.**

An evaluation point is when the normal work tasks are no longer applicable or are being conducted. Something has occurred to stop the standard operating procedure. When an evaluation point arises follow these steps:

- Survey what has happened.
- What are the immediate hazards now that work has stopped (what can go wrong)?
- Are there new hazards not associated with the current SOP and are different PPE's needed?
- Should all work stop, and a clear solution be defined?
    - Examine the "what if" consequences.
    - Should additional assistance or instruction be identified?

# PORTABLE CCTV INSPECTION

The purpose of televising the sanitary sewer system is to provide a conditional assessment of the sanitary sewer.

**Personal Protective Equipement (PPE) Required**

- Approved Safety Vest
- Safety Boots
- Gloves

**Equipment Check**

- Check with Supervisor for any immediate assignments.
- Prior to leaving the shop, walk around towing vehicle and trailer inspecting the condition of the vehicle and trailer.
- Check that PPE is either on your person or in the truck.
- Check truck and generator oil, fuel, lights and tires.
- Secure all MARK 3 equipment: Cameras, Transporters, and Tools.
- Make sure a flash drive is plugged into the USB port on the reel by the power switch and configured to send video files to the flash drive. If a flash drive is not available, you can use the internal hard drive.
- To designate where your files will be stored press the blue menu button on the keyboard and scroll to setup. From here you can select your record storage device (internal or external).

**Drive to Work Assignment Location**

- Prior to driving, check mirrors and buckle up.
- Crew member #2 will assist with backing if needed.
- Upon arrival to the work assignment location, put on all PPE's

**Main Duties:**

- Crew Member #1: The duties for crew member #1 will set-up the inspection using MARK 3 equipment and operating the camera equipment to complete TV inspection of manholes and line segments.
- Crew Member #2: The duties of crew member #2 will be all work regarding placement of camera into line segment, maintain a safe work zone on the job site and around the TV inspection equipment.

**Television Inspection**

- Crew Member #1 & #2: Find a safe location to park truck and trailer close to desired manhole and position the necessary traffic signs and/or arrow board if needed and turn on all safety and caution lights.

- Crew Member #2: Assist crew member #1 in transporting MARK 3 equipment off the trailer and to the desired manhole so the reel with the TV cable is aligned with the center of the MH.
- Crew Member #2: Place traffic cones around equipment and manhole.
- Crew Member #2: Start generator and turn on the power switch on MARK 3 equipment.
- Crew Member #1: The screen will automatically go to the CUES MAIN MENU. From there scroll down to "SET UP INSPECTION" and press enter. Select "CREATE?" as your action and press enter. Now enter the pipe ID and manhole numbers.
- Crew Member #2: Remove manhole cover using proper ergonomics or mechanical lift. Visually inspect manhole for defects. Prepare to lower transporter into manhole.
- Crew Member #1: Begin recording by pressing the record/pause button on the keyboard.
    - Inspection of manhole should be first
    - Inspection of pipe segment should be second
- Crew Member #2: Lower transporter into manhole. Makes sure transporter is facing the correct direction. As per Crew Member #1 instructions. (i.e. with the flow or against the flow if it is a reverse set up.)
- Crew Member #1: Drive transporter to the preset position for TV inspection.
- The preset position for the CPR is 7' (or proper preset footage for applicable transporter).
- Crew Member #2: Set cable protection tube (tiger tail) or roller into manhole. Set top roller onto manhole ring. Retract excess cable until line is taut. Set outside mechanical counter to zero. Place rear transmission in neutral.
- Crew Member #1: Set preset distance on video data display (CTRL+D). You can change preset distance by going to (CONFIGURE REELS?) from the main menu.
- Crew Member #1: Drives transporter through pipe to observe the defects and laterals.

**TV Inspection Completion:**

- Crew Member #1: Complete the task by pressing the stop button on the keyboard to end the video inspection.
- Crew Member #1: Place the transporter in the neutral position.
- Crew Member #2: Put reel in gear and set reel speed dial to retrieve equipment.
- Crew Member #1 & #2: Remove the transporter from manhole, and place manhole cover back on the manhole. Next, check for mechanical problems while washing transporter, then place transporter back onto trailer and secure it.
- Pick up all cones, signs and arrow board if used.
- Consult map and drive to next location.

**Retrieving Data from MARK 3:**

- If the Mark 3 was configured to save video files to the flash drive, you can disconnect the flash drive.
- If the videos were recorded on the internal hard drive, you will need to move them to the flash drive.

- To do this press the blue menu button on the keyboard. Scroll down to file management and press the blue menu button.
- In file management you can hit "Copy video from internal" and select the file you wish to transfer to the flash drive.
- After transferring the desired files is complete, you can disconnect the flash drive.

**Adding Mark 3 Videos and Observations to Granite:**

- Input flash drive into USB port of your workstation.
- Open GraniteNet Advanced.
- Use the search bar on the top left of the screen to search for the line segment or manhole to start a task.
- Highlight the line segment or manhole and click new task.
- Below the line segment or manhole that you searched for. Make sure the one labeled "CCTV of" is the only one selected with a red check mark.
- Click start task.
- Fill out information on the page that pops up and hit save. Make sure to fill out all mandatory fields on both inspection and node tabs.
- Go to collection data gallery and click the green add button to import video from the flash drive.
- Using the add button in the inspection observation list to input the defects that you identify in the video. Make sure to pause video with the defect pictured before making your observation.
- After adding all observations, you can click stop task.
- To complete inspection, click accept task (make sure you are on the inspection tab).

# Evaluation Point

**If this is an IDLA situation (Immediate Dangerous to Life and Health) call 911 immediately. Provide the operator with your situation and location.**

An evaluation point is when the normal work tasks are no longer applicable or are being conducted. Something has occurred to stop the standard operating procedure. When an evaluation point arises follow these steps:

- Survey what has happened.
- What are the immediate hazards now that work has stopped (what can go wrong)?
- Are there new hazards not associated with the current SOP and are different PPE's needed?
- Should all work stop, and a clear solution be defined?
    - Examine the "what if" consequences.
    - Should additional assistance or instruction be identified?

# ACOUSTIC ASSESSMENT INSPECTION

The purpose of acoustics of the sanitary sewer system is to provide a conditional assessment of the sanitary sewer.

**Personal Protective Equipment (PPE) Required**

- Approved Safety Vest
- Safety Boots
- Gloves
- Hard Hat

**Equipment Check**

- Check with the Supervisor for any immediate assignments.
- Perform a weekly safety inspection on equipment and submit it to the supervisor.
- Prior to leaving the shop, walk around the assigned vehicle inspecting the condition of the vehicle.
- Check the oil, tires, and lights.
- Secure all equipment and Tools.
- Check that PPE is either on your person or in the vehicle.
- Prior to driving, check mirrors and buckle up.
- Confirm that the acoustic assessment equipment is fully charged.

**Drive to work assignment location**

- Prior to driving, check mirrors and buckle up.
- Crew member #2 will assist with backing if needed.
- Upon arrival to the work assignment location, put on all PPE's
- Remove the SL-RAT System from the transport case.
- Review operational aspects and functionality.
- Start acoustic assessment equipment.
- Open data collection software

**Main Duties:**

- Position the necessary traffic signs and/or traffic cones and arrow board, if needed.
- Crew member #1 positions the truck on the upstream manhole to protect open the manhole. Crew member #2 positions the truck on the downstream manhole to protect open manhole. Turn on all safety and caution lights.
- Confirm the correct location of line segment on the foreman's map.
- Open Beehive asset management software to the confirmed pipe segment to be completed.
- Safely place the SL-RAT equipment on the upstream and downstream manholes.
- Identify the correct line segment footage to input on the receiver.

- Crew member #2 starts the transmitter unit.
- Crew member #1 starts the receiver unit.
- Acoustic test will begin once receiver unit initiates testing.
- Crew Member #1 collects the Acoustic Assessment data and notes the assessment score.
    - Crew Member #1 Creates an event in Beehive recording the line segment score, test number and equipment hours.

**Acoustic Inspection Completion:**

- Crew member #1 and #2 places manhole cover back on the manhole. Pick up all cones, signs and arrow board if used.
- Consult map and drive to next location.

# Evaluation Point

**If this is an IDLA situation (Immediate Dangerous to Life and Health) call 911 immediately. Provide the operator with your situation and location.**

- An evaluation point is when the normal work tasks are no longer applicable or are being conducted. Something has occurred to stop the standard operating procedure. When an evaluation point arises follow these steps:
- Survey what has happened.
- What are the immediate hazards now that work has stopped (what can go wrong)?
- Are there new hazards not associated with the current SOP and are different PPEs needed?
- Should all work stop, and a clear solution be defined?
    - Examine the “what if” consequences.
    - Should additional assistance or instruction be identified?
    - Upon arrival at the work site put on all PPE’s.

### 4.3.2 Manhole Inspection

New manholes are inspected to confirm construction methods match the construction plans and specifications. An air vacuum test is performed to measure the tightness of the manhole. Visual inspection is performed to look at the general construction and for any infiltration of water. The manhole invert is especially scrutinized for laminar flow and ability to access the incoming and outgoing lines with maintenance and inspection equipment.

Existing manholes are inspected for structural integrity, water infiltration, invert performance, insect infestation, hydrogen sulfide presence, manhole ring and lid condition, GPS location, and surrounding vegetation. A pole mounted camera system with 360-degree capabilities is used during the inspection process to record the interior of the manhole and help develop the conditional assessment of the manhole. Data acquired is entered into the asset management system. Items that need repair are identified and assigned to the construction crews to repair. Such repairs include reconstructing inverts and replacing or raising riser and rings/lids. More comprehensive repairs, such as complete relining of the manhole structure, can be performed by either City crews, or contracted out.

#### 4.3.2.1 SOP for Manhole Inspection

The City has SOPs in place for televising manholes to provide a conditional assessment of the manhole. This SOP is intended to be dynamic and should be updated and revised as new information and equipment is employed.

# SPiDER INSPECTION

The purpose of televising a manhole is to provide a conditional assessment of the manhole.

**Personal Protective Equipment (PPE) Required**

- Approved Safety Vest
- Safety Boots
- Gloves

**Equipment Check**

- Check with Supervisor for any immediate assignments.
- Make sure you have all equipment necessary to perform a Spider inspection.
- Secure all CCTV Van equipment: Cameras and Tools.
- Check that PPE is either on your person or in the van.
- Prior to leaving the shop, walk around CCTV van inspecting the condition of the vehicle.

**Drive to Work Assignment Location**

- Crew member #2 will assist with backing if needed.
- Upon arrival to the work assignment location, put on all PPE's
- Review operational aspects and functionality.

**Main Duties:**

- Crew Member #1: The main duties for crew member #1 are to maintain all records by using an iPad with CCTV Video Capture software and a wireless card installed for data collection. This consists of entering data into video capture software, retrieving old records from asset management software that would be useful during inspection of the line segments or manhole inspection.
- Crew Member #2: The duties of crew member #2 deals with all outside work regarding placement of camera over the manhole while assisting crew member #1 in inspection log data recording. Maintain a safe work zone on the job site and around the CCTV inspection vehicle.

**Equipment Startup**

- Install two fully charged batteries into the SPiDER and push the power button.
- Start tablet and connect to SPiDER WIFI in the tablet settings.
- If prompted for password by tablet, please enter password as "SPIDER@CUES".
- Open the SPiDER user interface using google chrome app.
- Replace the batteries every four hours.

**Spider Inspection Procedure**

- Open the manhole.
- Using green paint mark the outflow inside the manhole.
- Install plywood safety cover over open manhole.
- Erect the tripod over covered manhole.
- Clean all 4 SPiDER camera lens well.
- Mount SPiDER on tripod by using the push pin tethered to the carbon fiber pole.
- Level tripod and add a carbon fiber extension pole.
- Enter the Project, Manhole Number, Cover Type and Operator Field using the tablet to unlock the "Start Recording" button.
- Turn on the lighting to default 30% if it is a standard 4-6-foot-wide manhole. LED intensity should be increased if applicable.
- Raise the SPiDER as high as possible.
- Block any sun glare from appearing inside the manhole to minimize loss of point cloud using the supplied light diffuser (back side of operator facing the sun).
- Deploy the SPiDER using the drill at speed 1 and full trigger pull for approximately 6 feet/min descent.
- Add a carbon fiber pole, as needed, for every 4 feet descent.
- Continue to deploy the SPiDER until you reach the bottom of the manhole (ideally 6 inches from bottom) and the channel is clearly visible in the tablet.
- Press "Stop Recording".
- Lights will flash 3 times and turn off to indicate the SPiDER has stopped recording. If so, raise the SPiDER at drill speed 2 out of the manhole. NOTE: If the lights do not flash, then the unit is still recording, and the batteries must be removed. If the lights flash 10 times, it means less than 10% recording space remains on the SPiDER. If the SPiDER flashes continuously, the SPiDER is out of hard drive space.
- Store the equipment, remove the SPiDER, close the manhole and proceed to the next manhole.

**Connection SPiDER to PPA**


**Performing Inspections using Granite/SPiDER Software**

- Open SPiDER software by using a web browser and searching for http://pwsql02/SPiDERViewer/Startup?returnUrl=%2fSPiDERviewer
- Log in or register to create an account.
- Using the SPiDER software click on inspections.
- Check the manhole you are reviewing and hit download.
- Select custom and only download the 360 video and META file. The file might come up as an insecure file. Click continue to download.
- Go to the downloads folder using file explorer.
- Right click on the folder you just downloaded and click extract all files.
- Open GraniteNet Advanced.
- Use the search bar on the top left of the screen to search for the manhole.
- Select the manhole and click new task.
- Under the manhole that you searched for, make sure the one labeled “CCTV of” is the only one selected with a red check mark.
- Click start task.
- Fill out information on the page that pops up and hit save. Make sure to fill out all-mandatory fields on both inspection and node tabs.
- Go to collection data gallery and click the green add button to download the 360-degree video from the extracted file in the download folder in file explorer.
- Using the add button in the inspection observation list, input the defects that you identify from the video and SPiDER software.
- Make sure to pause video with the defect pictured before making your observation.
- Use SPiDER software to get depth and clock position for observations using the guide below.
- Once you are done adding observations click stop task.
- Click accept task.
- Click more on the next page that pops up and pick the name of the person that reviewed the manhole.
- On the next screen click continue.
- In the SPiDER software open the inspection. On the right side of the screen scroll to the bottom and click reviewed to finish the inspection.
- After completing the inspection, it’s recommended to delete the video files from the downloads folder to conserve hard drive space.

**Marking Defect Points in SPiDER Software Guide**

- Open SPiDER software and open an inspection.
- Once the model is being shown you can switch to view the interior using a drop-down menu on the bottom of the screen.
- Use left and right mouse buttons to move the camera around the manhole.
- Mark a point on the rim and name it zero. Under type put it as zero point. This will be the reference to calculate depth.
- Using a linear point double click two points on each side of the rim to get your cover diameter (CD).
- Mark a single point at the top of the outflowing invert to get your depth and 6 o'clock reference.
- Make sure to mark it 6 o'clock in the "type" drop-down menu.
- Using a linear point make a point on each side of the barrel to get your manhole barrel diameter (MHBD)
- Proceed to use the point cloud to mark all the defects in the manhole.

### 4.3.3 Flow Monitoring

In addition to the manual field investigations, the City has set up flow monitors in manholes at key locations to automatically gather data on how much flow is passing through those locations. The City currently has 30 flow monitors set up as shown in Figure 4.1. These monitors allow for long term data collection to establish how the system is operating as well as assisting with planning considerations. It can also indicate more immediate potential concerns such as unusually high or low flows that can merit sending out a crew to investigate. This can allow the City to minimize or even prevent impacts to property owners. The City also has the capability of setting up temporary flow monitors for locations that need to be monitored during special conditions.

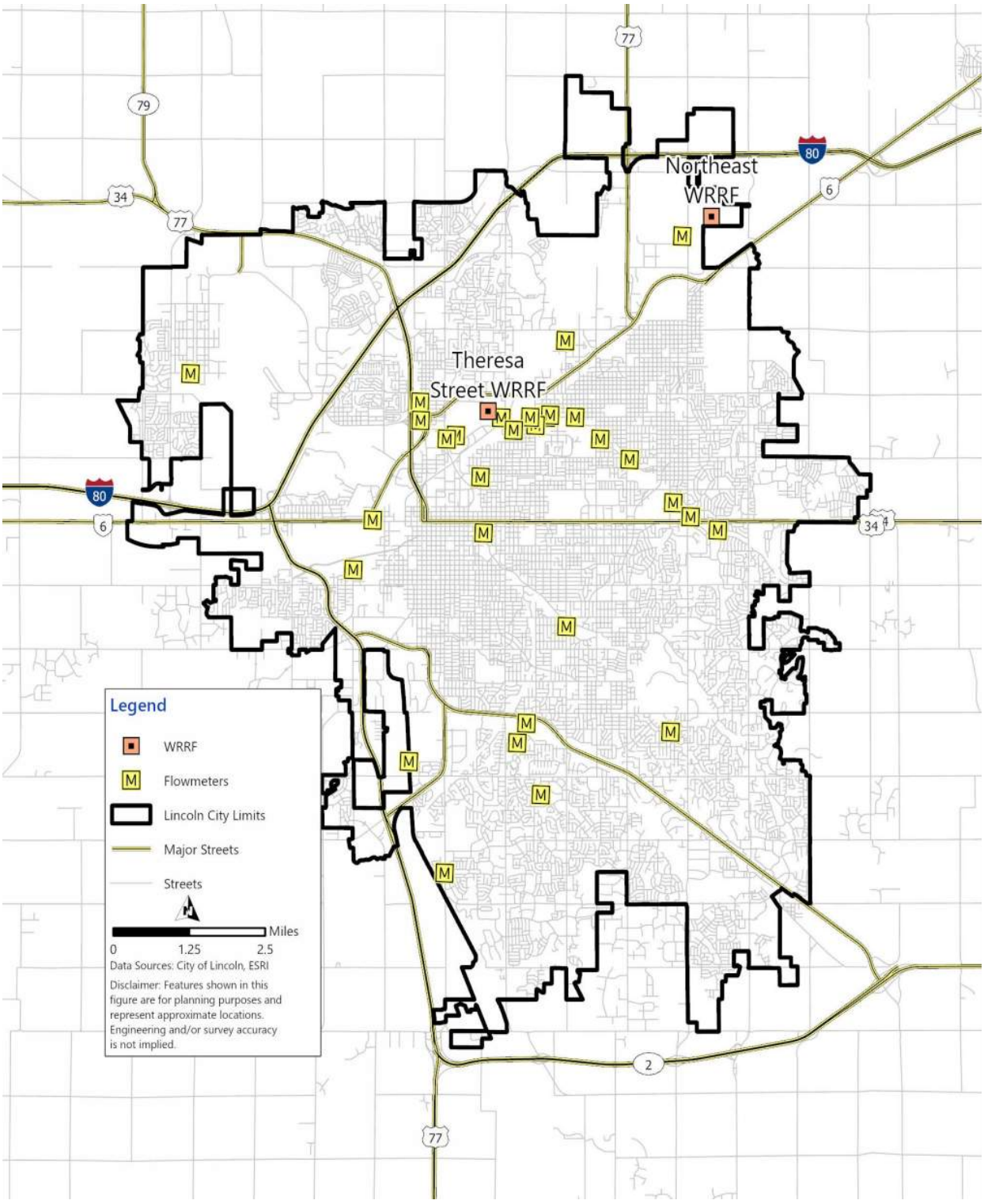



Figure 4.1 Permanent Flow Monitor Locations

## 4.4 Field Data Assessment

While routine cleaning and visual inspection are used to assess the condition of manholes and surface facilities, CCTV video inspections are the primary method used to assess the condition of the sewer mains. In addition to the scheduled video inspections, observations made from routine cleaning and monitoring are also used as part of the assessment process and may suggest when a video inspection is warranted.

The condition assessment determines and records the following data into the asset management system:

- Pipe diameter.
- Pipe material.
- Length of pipe.
- Segment identification.
- Low spots.
- Grease build-up.
- Root intrusion.
- Sediment accumulation and encrustation.
- Structural condition, including cracks and holes.
- Joint alignment and movement.
- Reverse slope.
- Obstructions.
- Protruding services.
- Service locations.
- Prior repairs.
- Deformations in line.

This information is recorded by location, noting the distance from the starting manhole. This Pipe condition information is then used to derive an aggregate score for the condition of the asset. When placing a maintenance or repair item into the asset management program, City staff estimate the timing of the repair requirement based on the potential of SSO. Those needs with a lower risk of causing an SSO are placed on a lower priority than those with a higher potential of causing an SSO and will impact the scoring of the asset. The scores are then used to determine both short and long-term maintenance strategies including increased cleaning, root treatment, sewer line repair, replacement, and rehabilitation. The condition assessment also helps to establish the cleaning frequency and any root control measures needed.

## 4.5 Planning

Once it has been determined that work may be needed to repair an asset based on the scores generated, the City has a CIP Review Team that performs an analysis on the asset to determine how to proceed. The flow chart for making a repair decision is shown in Figure 4.2 and will result in one of 3 options:

- Do not repair.
- Generate a City Work Order for repair, see Section 4.5.1.
- Generate a CIP Work Order for repair or replacement, see Section 4.5.2.

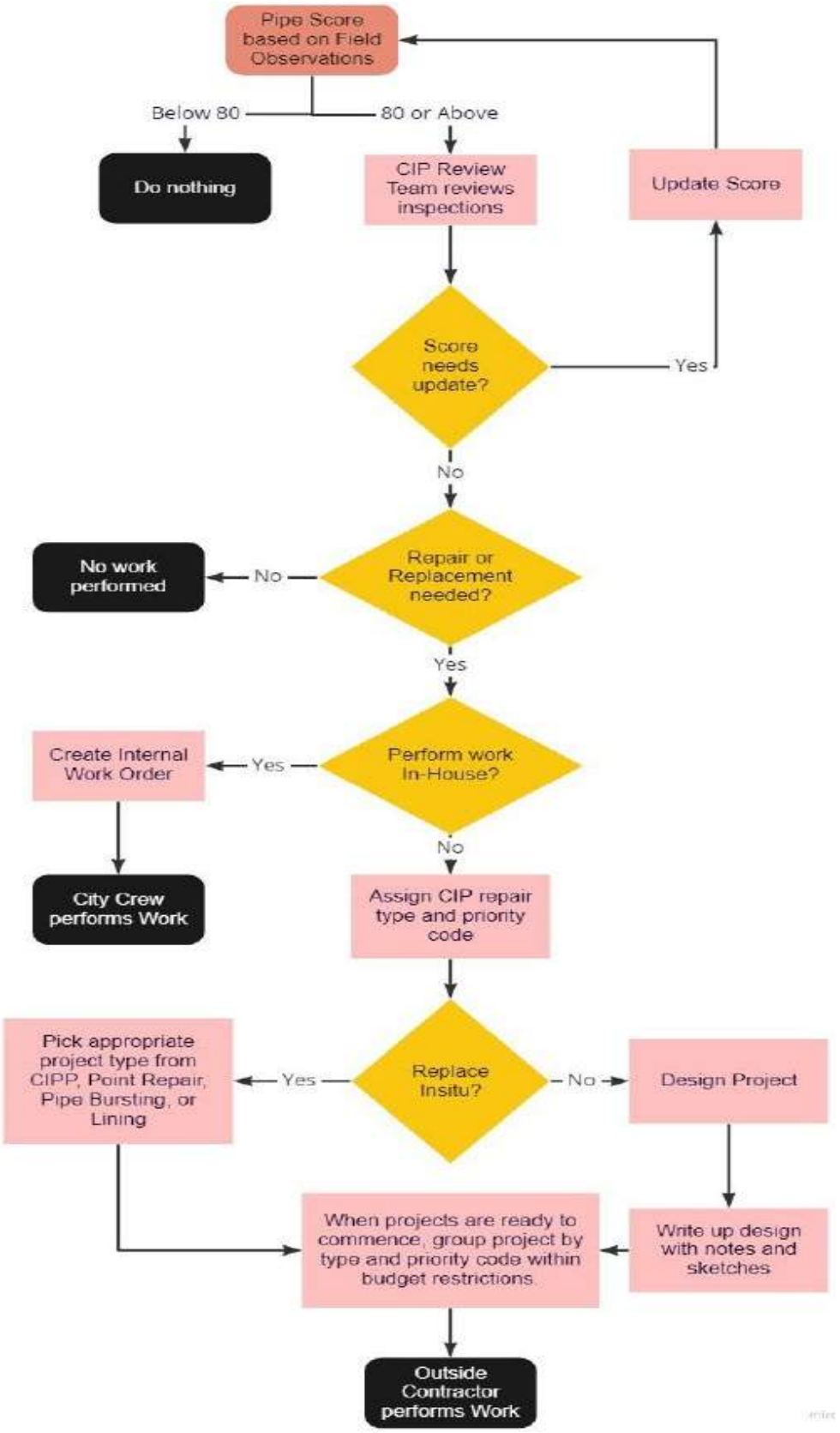



Figure 4.2 CIP Decision Flow Chart

### 4.5.1 Generate a City Work Order for Repair

For smaller repairs the City has a construction crew that can perform repair or replacement of existing pipes, manholes, spot repairs, and CIPP lining of small diameter pipes. The City will generate a City Work Order, and a crew will be assigned to perform the work in accordance with City created SOPs to guide/direct the repair process.

#### 4.5.1.1 General SOPs

Any work that the City performs may have circumstances that require application of one or more generally applicable SOPs in addition to the ones for the work directly. These general SOPs include Emergency Street Closure, One Call, and Confined Space Entry and Fall Protection. These SOPs are intended to be dynamic and should be updated and revised as new information and equipment is employed.

# Emergency Street Closure

**Notification**

- Identify and secure location with temporary traffic control.
- Identify the necessary street closures or street restrictions required.
- Contact Engineering Services Senior Traffic Technician to provide a traffic control plan and install permeant traffic control devices.
    - Shane Dostal 402-525-7850
- Contact Traffic Engineering to issue press release and notify to Emergency Services
- Contact 811 (One Call) for Emergency Locate

**Prior to Shop**

- Identify necessary equipment required to complete repair
- Identify necessary materials required to complete repair
- Identify necessary man power required to complete repair

**Personal Protective Equipment (PPE) Required**

- Approved Safety Vest
- Safety Boots
- Gloves
- Hard Hat
- Safety Glasses
- Ear Protection

**Equipment Check**

- Prior to leaving shop check tools, supplies and equipment.
- Do a walk around of the truck & check the tires lights & condition of the vehicle.
- Check that PPE is either on your person or in the equipment/vehicle.

**Drive to work assignment location**

- Prior to driving, check mirrors, buckle up and obey all city policies and traffic laws.

**On Site**

- Put on PPE.
- Check traffic control devices.
- Contact property owners if necessary.
- Complete Repair

**Paperwork**

- Once back at the shop, the crew leader/supervisor needs to fill out his daily report, if not already completed on site.
- Turn in the repair sheet; noting that the repair was completed and what day it was

completed so this can be filed.
- Fill out crew card and daily log for the day.

## Evaluation Point

**If this is an IDLA situation (Immediate Dangerous to Life and Health) call 911 immediately. Provide the operator with your situation and location.**

An evaluation point is when the normal work tasks are no longer applicable or are being conducted. Something has occurred to stop the standard operating procedure. When an evaluation point arises follow these steps:

- Survey what has happened.
- What are the immediate hazards now that work has stopped (what can go wrong)?
- Are there new hazards not associated with the current SOP and are different PPE's needed?
- Should all work stop and a clear solution be defined?
    - Examine the "what if" consequences.
    - Should additional assistance or instruction be identified?

# 811 LOCATING - FOR SANITARY AND STORM

Wastewater is a member of the State One-Call system. The One Call System is a link between people who want to excavate and the underground facility owner/operator. Wastewater is responsible for locating our own sanitary lines as well as storm lines. Wastewater lines are marked in dark green and storm lines are marked in lite green.

## Personal Protective Equipement (PPE) Required

- Approved Safety Vest
- Safety Boots
- Gloves

## Ticket Review

- Locate tickets (see sample attached) are received via computer or supervisor, you need to do the following:
- Sort Ticket by:
    - Emergency tickets - these are your highest priority - we try to locate within the hour
    - Meet tickets - meet the requestor on the appointment date, time, and address location
    - Priority tickets - we try to locate within the day, but we must be there by the time stated
    - Regular tickets - work into your schedule based upon the work to begin date.
- Review tickets with Foreman's maps of Wastewater and Storm Sewer the GIS/One Call Lite mapping system.
- If no utilities are within area on ticket, then it can be cleared.
- Then sort tickets according to addresses to make the route the most efficient and in accordance with type of ticket.
- Printing of aerials of ticket areas if needed.

## Equipment Check

- Electronic device for data collection and GIS maps.
- Check quantity of one call supplies located in truck, green paint and flags.
- Check that PPE is either on your person or in the truck.
- Do a quick safety check of truck condition.

## Drive to work assignment location

- Prior to driving, check mirrors and buckle up

## Locating

- Put on PPE
- Read ticket locating instructions carefully, if you do not understand, call contact person on the ticket for more information.

- Compare locating instructions to Foreman's maps and aerial to determine where utilities need to be located.
- Mark the utility location either by paint or flags in accordance with the "Recommended Marking Guidelines" on attached pages.
- Once the area is marked, complete the locate ticket by marking appropriate boxes, and comment if applicable.
- If area was clear (meaning no sanitary or storm sewers within the location area) then call contact person and notify them. Record time, date, person spoke to, or if message was left.
- If you have trouble locating storm sewer then contact street maintenance for assistance.

**Meet Tickets**
- Wait to locate until the meet person explains what is needed.
- Follow locating procedure.
- Record conversation with meet person about what area to locate, include names.
- Wait at the meet for 10 minutes past the scheduled time on the locate ticket, if no one shows after that amount of time, then leave and put no show on the ticket.

**Emergency Tickets**
- Usually, you are called directly from the one call center about the emergency
- General rule is to respond within an hour or sooner if possible.
- The ticket will follow and is not always available to take to site
- Upon arrival to site mark the area you have been instructed to do on the ticket and if the ticket initiator is there, ask to clarify what needs located.
- Follow locating procedure.
- Record conversation with emergency person about what area to locate, include names.

**Ticket Finishing**
- Fill out actions taken on bottom of ticket and return to Lance.

# Evaluation Point

**If this is an IDLA situation (Immediate Dangerous to Life and Health) call 911 immediately. Provide the operator with your situation and location.**

An evaluation point is when the normal work tasks are no longer applicable or are being conducted. Something has occurred to stop the standard operating procedure. When an evaluation point arises follow these steps:

- Survey what has happened.
- What are the immediate hazards now that work has stopped (what can go wrong)?

- Are there new hazards not associated with the current SOP and are different PPEs needed?
- Should all work stop, and a clear solution be defined?
    - Examine the “what if” consequences.
    - Should additional assistance or instruction be identified?

# CONFINED SPACE ENTRY and FALL PROTECTION

The Standard Operating Procedure for entering a confined space shall follow the City of Lincoln Confined Space Entry Policy. The purpose of the confined space entry policy is to prevent personal injury and illness of Lincoln Employees and Contractors, while performing duties in permit-required spaces as per 29CFR 1910.146. Because confined spaces offer limited means of entry or exit and may contain hazards, employees shall comply with The City of Lincoln Confined Space Entry Policy - Executive Order 050310.

The City of Lincoln Wastewater System requires an entry permit to enter all wastewater structures. A confined space is any space that has the following characteristics:

- Large enough and so configured that an employee can bodily enter and perform assigned work
- Has limited or restricted means for entry or exit
- It is not designed for continuous human occupancy
- Materials that could engulf workers
- Internal structure or contents that could trap or asphyxiate workers
- Hazards with the atmosphere and other possible recognizable hazards

A permit confined space is any confined space that has one or more of the following characteristics:

- Contains or has known potential to contain a hazardous atmosphere
- Contains material with the potential for engulfing of an entrant
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or a floor that slopes downward and tapers to a smaller cross section
- Contains any other recognized serious health hazard

Confined spaces encountered in the field include:

- Manholes
- Siphon Structures
- Tanks
- Trenches
- Tunnels/Piping
- Crawl Spaces

NOTE:

- All sanitary sewer manholes are permit required confined spaces
- All sanitary sewer siphon structures are permit required confined spaces
- All tanks, tunnels, and pipping associated with the sanitary sewer system are permit required confined spaces

Harness inspection and fall protection check lists are included with the SOP and should be completed prior to a confined space entry. The inspection will include:

- Harness Inspection Guidelines
- Lanyard Inspection
- Inspection Checklist – Fall Protection Equipment
- www.millerfallprotection.com

## Evaluation Point

**If this is an IDLH situation (Immediate Dangerous to Life and Health) call 911 immediately. Provide the operator with your situation and location.**

An evaluation point is when the normal work tasks are no longer applicable or are being conducted. Something has occurred to stop the standard operating procedure. When an evaluation point arises follow these steps:

- Survey what has happened.
- What are the immediate hazards now that work has stopped (what can go wrong)?
- Are there new hazards not associated with the current SOP and are different PPEs needed?
- Should all work stop, and a clear solution be defined?
    - Examine the "what if" consequences.
    - Should additional assistance or instruction be identified?

#### 4.5.1.2 SOPs for Specific Repairs

The City has SOPs in place for specific repairs of sewer assets that they will utilize a City crew for. These SOPs are intended to be dynamic and should be updated and revised as new information and equipment is employed.

- Main Repairs - for point repairs of sewer pipe directly.
- Repair Liner Main Repairs - for sewer repairs with Cured-in-Place Pipe Liners.
- Replace Manhole Frame and Cover - for damaged, missing, or otherwise defective manhole frames and covers.
- Adjusting Manhole to Grade - for adjusting the elevation of a manhole frame and cover to align with the surface it is in.

# MAIN REPAIRS

**Personal Protective Equipment (PPE) Required**

- Approved Safety Vest
- Safety Boots
- Gloves
- Hard Hat
- Safety Glasses

**Equipment Check**

- Prior to leaving shop check tools, supplies and equipment.
- Do a walk around of the truck, dump truck and hoe & check the tires lights & condition of the vehicle.
- Check that PPE is either on your person or in the equipment/vehicle.

**Drive to work assignment location**

- Prior to driving, check mirrors, buckle up and obey all city policies and traffic laws.

**Site Survey**

- Visit site of repair to determine process by which repair will be completed and look for special circumstances, such as trees, patios, gardens, landscaping, fences, driveways, overhead power lines, mailboxes or other items that will be an obstruction to the project.
- Contact property owner and/or occupants to discuss the special circumstances and involve them in the process, explaining the need for the work and how you plan to perform the repair.
- Mark out area or repair or excavation.
- Plan for any traffic lane closures and schedule with traffic operations.
- Plan staging areas for equipment

**Contact One Call**

- Once repair area is marked in white, notify One Call via computer or phone
- One Call requires 48 hours' notice prior to digging.
- The utilities will either locate their lines or notify WW that the area is clear.
- Once all utilities have located or contacted WW or after 48 hours then digging can commence.

**Materials**

- PVC pipe — size and length of repair
- Couplers PVC to existing pipe material — quantity 2
- Service repair material, 4" pipe, fittings and PVC saddle or wye, 4 couplers
- Stainless steel straps — 2 for each coupler and saddle, minimum of 4.

- Epoxy, cleaner, primer, glue and rags
- Utility work ahead sign — qty 2
- Shoring
- Plywood
- Ladder

**On Site**

- Put on PPE
- Put in place traffic control devices
- Check locations of flagged utilities
- Check for overhead power lines.
- Place down plywood to protect landscaping, if necessary
- Contact property owners if necessary

**Excavation**

- Position hoe at excavation site for maximum range and start digging
- Position dump truck so that it can be filled with dirt.
- Position vehicles at least 3 feet away from edge of trench.
- Once the hole is a greater depth than 4 feet, shoring must be installed for entry.
- When the approximate depth of main is reached, install shoring and ladder to probe for main.
- Once main is discovered, remove what is possible with the backhoe/excavator or hydro excavator.
- Over excavate unsuitable material as needed to provide stable working conditions and bedding for pipe.
- Remove what is left by shovel.
- Once the digging by hand starts, heavy equipment should be moved farther away from excavation.
- Have a plan for the excess dirt and debris.

**Repair**

- The main needs to be dug out (4”-6”) just a little below the bottom of the pipe and at least six to eight inches (6"-8") past both ends of the break.
- Dig completely around the pipe at each end so you will have room to get the breaker (clay and cast iron) or saw (all other material) around it.
- Take out the broken pieces of the pipe, severing it (2”-3”) past visible break or cracking.
- Ensure clean and straight ends of existing pipe.
- Measure and cut a piece of replacement piping.
- Ensure the proper fit.
- Put couplers on each end and slide into place.
- If there is no service connection on the new pipe, you can tighten all the straps on the

coupler now.

**Service Connections**

- If you must connect a service, you should only tighten down the straps on the clay tile pipe and leave the PVC side loose.
- Depending on the service connection, you may need to use either your tee saddle or your wye saddle.
- If you are using a tee saddle, set it on top of the pipe and make a mark in the center of the hole of the saddle.
- Remove your saddle and center your mark and drill a four-inch (4") hole using your four-inch (4") hole saw drill bit. If you chose to use a wye saddle, you need to set it on top of the pipe and mark the outside edge of the oval tap hole.
- Now remove your saddle and enter on the larger "round" end of the mark and drill a four-inch (4") hole with your drill. Now you will need to use a saw and remove the remainder of your marked area.
- Depending upon the situation of the repair, it may work better to glue your saddle on later, but if it works out, you can now glue your saddle in place, making sure to line up the tap hole with the hole on the saddle.
- Use two of your hose clamp straps and tighten the saddle in place.
- On shorter repairs, it may be necessary to cut down the length of the saddle being used to fit between the couplers.
- Now roll your pipe so that your saddle is pointed in the direction needed.
- You will need to decide what fitting and pipe will work best to reconnect the service
- Once you have everything you think you will need, you should "dry" fit the pipe and fittings together and make sure that your connection is going to work properly.
- If everything fits in its place, you can begin gluing your pipe together.
- Clean, primer and glue each joint if needed.
- Make sure to have an idea of how you need to get your pipe in place. It may work best to put your connection all together and connect it to the main with the tap upright and then roll the main so that your connection goes into place.
- Once you have your service connected, tighten down any loose straps and install two more straps on each coupler. One will go on the PVC side of the coupler and the other on the clay side of the coupler.
- Once straps are tightened down, dump one bag of sack concrete mix on each coupler and using a shovel, jab the dry mix under the couplings.

**Backfilling**

- You will need to put some crushed rock around the main now.
- If the repair is small enough, you can fill buckets with rock from the shop and dump them around the main.
- For larger repairs, you may need to get some rock in the back of a dump truck and dump it in place.
- Whichever method you use, make sure that you only cover the pipe about halfway first

and then hand spade the rock under the main to get a good base.

- Once you have a good base, you can cover the pipe with at least six inches (6") of rock. Make sure to get plenty of rock around any service connections as well.
- With the repair completed, you now need to measure from the up manhole to the point where the repair starts and ends along with the measurement of the tap location and the address of the house it serves. Now you can begin backfilling.
- Put the compaction plate on the backhoe and get it in place to backfill.
- You need to place plywood along the edge of the trench opposite of the side you will be dumping the dirt from. This will help to prevent dirt from spilling over and make the cleanup easier.
- Maneuver the dump truck into place so that you can just raise the box to dump the dirt in the trench.
- Dump the dirt in approximately one-foot (1') lifts - and no more than three foot (3') lifts so that you will get good compaction. Be careful not to tamp too hard around the main and services. Backfill the trench, leaving it down about two inches (2") from ground level. Haul off any extra dirt and load up enough compost from the shop to fill the remaining two inches (2").
- Shovel or dump the compost in the trench to bring it slightly above grade level to allow for some settlement.

**Leaving the site**

- Rake all the large clumps out of the graded compost and remove them.
- Throw some grass seed on the composted area and rake it in lightly.
- Contact property owners if necessary
- Load up all tools and equipment and trash into truck
- Take down lane closure material and working signs.
- Review site and surrounding area for anything left behind or out of place.
- Remove PPE if warranted, buckle up, and drive to next site or shop

**Paperwork**

- Once back at the shop, the crew leader/supervisor needs to fill out his daily report, if not already completed on site.
- Fill out new tap ticket for the home in which the service was being connected.
- Turn in the repair sheet; noting that the repair was completed and what day it was completed so this can be filed.
- Fill out crew card and daily log for the day.

## Evaluation Point

**If this is an IDLA situation (Immediate Dangerous to Life and Health) call 911 immediately. Provide the operator with your situation and location.**

An evaluation point is when the normal work tasks are no longer applicable or are being conducted. Something has occurred to stop the standard operating procedure. When an evaluation point arises follow these steps:

- Survey what has happened.
- What are the immediate hazards now that work has stopped (what can go wrong)?
- Are there new hazards not associated with the current SOP and are different PPEs needed?
- Should all work stop, and a clear solution be defined?
    - Examine the "what if" consequences.
    - Should additional assistance or instruction be identified?

# REPAIR LINER MAIN REPAIR

The purpose of the repair liner repair is to provide for the reconstruction of a portion of the sanitary sewer main, without excavation, by forming a new pipe within an existing deteriorated pipe, which has generally maintained its original shape. This will be accomplished by the installation of a resin impregnated flexible fiberglass mat, by means of pushing or pulling into the existing sewer main utilizing a pressure apparatus positioned at a manhole or similar access point. Curing shall be accomplished by means of ambient temperature, which will cure the resin impregnated fiberglass mat into a hard, impermeable cured-in-place-pipe (CIPP). When cured, REPAIR LINER extended over a selected area of the main is a continuous, tight-fitting, corrosion resistant and watertight (CIPP) pipe-within-a-pipe.

## Personal Protective Equipment (PPE) Required

- Approved Safety Vest.
- Safety Boots.
- Gloves.
- Hard Hat.
- Safety Glasses.

## Equipment Check

- Prior to leaving shop check tools, supplies and equipment.
- Do a walk around of the truck and check the tires, lights and condition of the vehicle.
- Check that PPE is either on your person or in the equipment/vehicle.

## Drive to work assignment location

- Prior to driving, check mirrors, buckle up and obey all city policies and traffic laws.

## Site Survey

- Visit site of repair to determine process by which repair will be completed taking notice of any special circumstances that will be an obstruction to the project.
- Contact property owner and/or occupants to discuss the special circumstances and involve them in the process, explaining the need for the work and how you plan to perform the repair.
- Plan for any traffic lane closures and schedule with traffic operations.
- Identify staging areas for equipment repair work.
- Locate and open all access points to identify accessibility for the patch work to be done.
- Schedule Service Crew and TV crew to be on site the day of the repair.

## Materials

- Resin Kit(s) - Check the size and length of kit to match the repair as well as seasonal kit based on the time of year.
- 48” packer - Check the diameter of the packer to match the inside diameter of the pipe being repaired.

- Push Rods (5'each) - Check the amount of push rods needed according to the distance from the manhole to the repair location in the main or use the 75' push air hose if applicable.
- Pull Cable.
- Flex Adaptor.
- Air Regulator.
- Electric Air Compressor (3.7cfm @ 40psi) with 150psi tank.
- Confined space entry equipment.
- Utility work ahead sign — qty 2.
- Portable Work Shelter.

**On Site**

- Put on PPE.
- Put in place traffic control devices.
- Contact property owners if necessary.

**Preparation for Repair**

- Clean the main with jet flusher to remove any grit, roots or solid materials.
- Set-up for confined space entry.
    - IMPORTANT: TO PREVENT PERSONAL INJURY AND ILLNESS TO CITY OF LINCOLN EMPLOYEES. STANDARD OPERATING POCEDURES AND THE CONFINED SPACE ENTRY POLICY SHOULD BE FOLLOWED WHILE PERFORMING DUTIES IN PERMIT-REQUIRED CONFINED SPACES.
- TV the main with CCTV to verify the main is clean and record the distance of the repair from the manhole by placing a tape mark on the TV cable.
- Authorized entrant enters the manhole to make sure the slack is out of the TV cable and a tape mark is placed at the edge of the manhole wall at the invert or if applicable mark the cable at the manhole rim.
- Authorized entrant exits the manhole.
- Remove the TV camera from the main.
- Lay out TV camera and cable on the ground to mark the packer and push rods to the length needed for the repair.
- Set wheels on packer approximately 2" less than the inside diameter of the main.
- Attach flex adaptor to the packer.
- Assemble the appropriate number of push rods to the flex adaptor making sure that each connection is locked in place and/or sealed with tape.
    - IMPORTANT: Tape all connections that do not have a locking mechanism to prevent accidental disconnection in the pipe.
- Place the camera head at the center of the packer or other position marks (if applicable) and transfer measurement from the camera cable to the assembled push rods.
- Pre-inflate the packer inside appropriate size pipe at 28 PSI and blow off the regulator relief valve. Allow packer to sit for 5 minutes.
- Check push rods to verify that there are no obstructions to restrict air flow.

- Allow two hours for patch to cure.
- Deflate the packer.

**"Dry Run"**

- Slide the protective sleeve over the packer. Use the vinyl tape to secure the protective sleeve to the ends of the packer in such a way that it does not restrict inflation or water flow on Flow-thru-packer.
- Push the packer without a patch from the manhole through to the point to be repaired. This verifies that the packer can reach the damaged area. DO NOT INFLATE THE PACKER! Pull the packer out of the main using the pull cable.
- Inspect the packer to verify that the protective sleeve has not been damaged. If the sleeve has been damaged, you may need to repeat the cleaning and TV inspection process.

**Repair**

- Remove the packer from the push rods and pull cable.
- Designate a location where the fiberglass shall be impregnated or "wet out" with resin.
    - NOTE: The portable work shelter may be need if weather conditions would affect the wet-out process.
- The impregnation shall be done using a plastic work surface and spatulas found in the repair liner repair kit.
- Put on both pair of gloves found in the repair liner repair kit.
- Lay out the plastic work surface.
- Unfold the fiberglass mat and position it with the woven side (bright shiny surface) down.
- Remove the clip from the resin bag and mix thoroughly until resin has consistent color (about 1 minute).
    - IMPORTANT: Once the contents of the bag are mixed they must be applied to the patch and the packer and the packer must be inserted into the main to the marked repair. Please refer to the "working time" on the resin cure chart found in the repair liner repair kit to coordinate working time and effort needed to make the repair liner repair.
- Cut off one corner of the bag and pour about 75% of the contents onto the fiberglass mat.
- Use the spatula provided to spread the resin evenly and liberally to coat the surface of the mat.
- Flip the mat over and pour the remaining resin on the back side of the mat and spread out evenly.
- Scrape off excess resin with spatula.
- Fold the right edge over 12" then fold the left edge over 13" to provide a 1" overlap.
- Center the wetted mat on the protected packer.
- Tightly roll the wetted mat around the protected packer over lapping as you go.
- Secure the wetted mat to the protected packer using the nylon cable ties provided by the manufacturer. DO NOT USE COMMON ZIP TIES AS THEY MAY CAUSE THE EXPANSION OF THE PACKER TO MALFUNCTION?

- For a 24" repair mat-Position one tie in the middle of the fiberglass mat and position the remaining 2 ties 1" from the end of the fiberglass mat. For a 48" repair mat-Position one tie in the middle of the fiberglass mat, position 2 ties 1" from each end of the fiberglass mat and position the remaining 2 ties equally spaced between the middle tie and the end tie on both sides.
- Cut off any excess (tails) from the ties.
- Reconnect the packer to the push rods and pull cable.
- Make sure that each connection is tapped to lock the push rods and in place.
- Introduce the packer into the main and position the fiberglass patch at the point to be repaired as marked on the push rods as was done during the "dry run".
- Using the air regulator, slowly inflate the packer to 28 PSI. The nylon ties will release at approximately 15-20 PSI allowing the wetted mat to be pressed against the inner surface of the pipe at the point of the repair.
    - IMPORTANT: If the main is badly damaged then care must be taken when inflating the packer to avoid further damage to the main and possible packer failure. Full pressure may not be needed.
    - Leave the packer in place under maintained pressure allowing the patch 1-3 hours of curing time.
    - Check the flow of the main at the upstream manhole every 15 minutes to ensure water is flowing through the packer and water is not backing up into the manhole.
- Deflate the packer and remove from the main using the pull cable.
- Inspect the point of the repair with the TV camera.

**Clean Up**

- Upon acceptance of the installation work, return the project area affected by the operations to the original condition.
- Contact property owners if necessary.
- Load up all tools and equipment and trash into truck.
- Take down lane closure material and working signs.
- Review site and surrounding area for anything left behind or out of place.
- Remove PPE if warranted, buckle up, and drive to next site or shop.

**Paperwork**

- Once back at the shop, the crew leader/supervisor needs to fill out his daily report, if not already completed on site.
- Turn in the repair sheet; noting that the repair was completed and what day it was completed so this can be filed.
- Fill out crew card and daily log for the day.

## Evaluation Point

**If this is an IDLA situation (Immediate Dangerous to Life and Health) call 911 immediately. Provide the operator with your situation and location.**

An evaluation point is when the normal work tasks are no longer applicable or are being conducted. Something has occurred to stop the standard operating procedure. When an evaluation point arises follow these steps:

- Survey what has happened.
- What are the immediate hazards now that work has stopped (what can go wrong)?
- Are there new hazards not associated with the current SOP and are different PPE's needed?
- Should all work stop and a clear solution be defined?
    - Examine the "what if" consequences.
    - Should additional assistance or instruction be identified?

# Replacing Manhole Frame and Cover

## Personal Protective Equipment (PPE) Required

- Approved Safety Vest
- Safety Boots
- Gloves
- Hard Hat
- Safety Glasses
- Ear Protection

## Equipment Check

- Prior to leaving shop check tools, supplies and equipment.
- Do a walk around of the truck & check the tires lights & condition of the vehicle.
- Check that PPE is either on your person or in the equipment/vehicle.

## Materials

- Manhole frame and/or cover
- Mortar Mix
- Kent Seal
- Utility Work Ahead Sign
- Compost
- Grass Seed

## Loading Supplies

- Drive to storage yard.
- Load frame and/or cover onto truck using proper lifting tools.

## Drive to work assignment location

- Prior to driving, check mirrors, buckle up and obey all city policies and traffic laws.

## On Site

- Put on PPE.
- Put in place traffic control devices.
- Contact property owners if necessary.

## Replacing Manhole Ring and Lid

- Excavate around perimeter of manhole structure to expose the manhole frame.
    - If manhole is in pavement:
        - Saw cut a 4’x4’ square around the manhole lid as describe on LSP 61.
        - Break concrete inside 4’x4’ square with concrete breaker.
        - Remove broken paving.
        - Order concrete from concrete supplier.
- Remove manhole cover using the proper equipment.

- Remove manhole frame using the proper equipment.
- Install safety manhole cover over open manhole.
- Prep the seating ring by removing small imperfections and old mortar off the mating surface. The use of a hammer drill with an appropriate bit may be needed for removing mortar from existing surface. Ensure all surfaces are clean prior to installing sealing material.
- Install sealing material on existing surface.
- Remove safety manhole cover from open manhole.
- Install sealing material on new surface for manhole assembly.
- Set manhole frame onto new surface.
- Tap down the frame to settle into sealing material
- Set manhole lid onto frame.
- Cement mortar the flange of the manhole assemble as shown on LSP 200
    - If manhole is in pavement:
        - Pour concrete in utility cut as shown on LSP 61.
        - Screed and finish wet concrete.
        - Cure concrete as directed in the Standard Specifications
- Backfill the excavation, leaving it down about two inches (2") from ground level. Haul off any extra dirt.
- Shovel or dump the compost in the trench to bring it slightly above grade level to allow for some settlement.
- Rake all the large clumps out of the graded compost and remove them.
- Throw some grass seed on the composted area and rake it in lightly.
- Contact property owners if necessary
- Load up all tools and equipment and trash into truck
- Take down lane closure material and working signs.
- Review site and surrounding area for anything left behind or out of place.
- Remove PPE if warranted, buckle up, and drive to next site or shop

**Paperwork**

- Once back at the shop, the crew leader/supervisor needs to fill out his daily report, if not already completed on site.
    - Fill out Sanitary Manhole Inventory form on location and inventory items used.
    - Turn in the repair sheet; noting that the repair was completed, what day it was completed and manhole inventory ticket number so this can be filed.
    - Fill out crew card and daily log for the day.

# Evaluation Point

**If this is an IDLA situation (Immediate Dangerous to Life and Health) call 911 immediately. Provide the operator with your situation and location.**

An evaluation point is when the normal work tasks are no longer applicable or are being conducted. Something has occurred to stop the standard operating procedure. When an

evaluation point arises follow these steps:

- Survey what has happened.
- What are the immediate hazards now that work has stopped (what can go wrong)?
- Are there new hazards not associated with the current SOP and are different PPE's needed?
- Should all work stop and a clear solution be defined?
    - Examine the "what if" consequences.
    - Should additional assistance or instruction be identified?

# ADJUSTING MANHOLE TO GRADE

## Personal Protective Equipment (PPE) Required

- Approved Safety Vest
- Safety Boots
- Gloves
- Hard Hat
- Safety Glasses
- Ear Protection

## Equipment Check

- Prior to leaving shop check tools, supplies and equipment.
- Do a walk around of the truck & check the tires lights & condition of the vehicle.
- Check that PPE is either on your person or in the equipment/vehicle.

## Materials

- Manhole adjusting riser/brick
- Mortar Mix
- Speedcrete
- Kent Seal
- Utility Work Ahead Sign
- Compost
- Grass Seed
- Water

## Loading Supplies

- Drive to storage yard.
- Load riser assembly onto truck using the truck mounted crane and gripper.

## Drive to work assignment location

- Prior to driving, check mirrors, buckle up and obey all city policies and traffic laws.

## On Site

- Put on PPE.
- Put in place traffic control devices.
- Contact property owners if necessary.

## Adjusting the Manhole

- Excavate around manhole structure to expose a 6” excavation around parameter.
- Remove manhole cover using the proper equipment.
- Remove manhole frame using the proper equipment.
- Install safety manhole cover over open manhole.

- Inspect manhole frame and cover for defects, replace if necessary.
- Prep the seating ring by removing small imperfections and old mortar off the mating surface. The use of a hammer drill with an appropriate bit may be needed for removing mortar from existing surface.
- Use a string line or straight edge to measure the height from the mating surface to grade elevation. This will determine the size of the riser or brick you will need to use.
- Install sealing material on existing surface.
- Remove safety manhole cover from open manhole.
- Install new manhole riser or brick onto manhole structure.
- Install sealing material on new surface for manhole assembly.
- Set manhole frame onto new surface.
- Tap down the frame to settle into sealing material
- Set manhole lid onto frame.
- Cement mortar the flange of the manhole assemble as shown on LSP 200
- Backfill the trench, leaving it down about two inches (2") from ground level. Haul off any extra dirt.
- Shovel or dump the compost in the trench to bring it slightly above grade level to allow for some settlement.
- Rake all the large clumps out of the graded compost and remove them.
- Throw some grass seed on the composted area and rake it in lightly.
- Contact property owners if necessary
- Load up all tools and equipment and trash into truck
- Take down lane closure material and working signs.
- Review site and surrounding area for anything left behind or out of place.
- Remove PPE if warranted, buckle up, and drive to next site or shop

**Paperwork**

- Once back at the shop, the crew leader/supervisor needs to fill out his daily report, if not already completed on site.
- Turn in the repair sheet; noting that the repair was completed and what day it was completed so this can be filed.
- Fill out crew card and daily log for the day.

## Evaluation Point

**If this is an IDLA situation (Immediate Dangerous to Life and Health) call 911 immediately. Provide the operator with your situation and location.**

An evaluation point is when the normal work tasks are no longer applicable or are being conducted. Something has occurred to stop the standard operating procedure. When an evaluation point arises follow these steps:

- Survey what has happened.
- What are the immediate hazards now that work has stopped (what can go wrong)?
- Are there new hazards not associated with the current SOP and are different PPEs needed?
- Should all work stop, and a clear solution be defined?
    - Examine the “what if” consequences.

Should additional assistance or instruction be identified?

### 4.5.2 Generate CIP Work Order for Repair or Replacement

If the work required exceeds the City's capacity to perform, a CIP Work Order will be generated. To get the process started, the work required is reviewed to determine if it will just follow the existing in-situ assets or will require an alternative. In-situ work will follow the existing asset and so will not require any additional design work. If the work cannot just replace in-situ then a replacement will need to be designed by the City's engineering department, which will include at least a written-up design with notes and sketches as necessary. For more complex projects a full plan set and specifications may need to be developed by the City's engineering department or an outside consultant as necessary. Once CIPs are ready, the City will group projects by type and priority in an effort to combine smaller projects into one larger project for outside contractors to perform.

# CHAPTER 5 SEWER MAINTENANCE

## 5.1 Overview

Preventive sanitary sewer maintenance activities are critical to performance of the sanitary sewer collection system infrastructure assets. Without adequate maintenance, large repairs, unexpected failures, backups and SSOs will occur, leading to a loss of service and property damage. There are many different assets with various types of preventive maintenance recommended for the wastewater collection system. Higher frequency cleaning of gravity sewers, for example, should be scheduled in areas with a history of overflows, stoppages, FOG, root issues, and odor control problems. Force mains and air release valves should be inspected and cleaned as needed to maintain pump station efficiency and prevent pumping issues that may cause backups. Maintenance of electrical and mechanical components of the pump stations is also a critical component of preventive maintenance. Each component of the collection system should be inspected, cleaned, and televised on a schedule determined by condition and maintenance needs.

An effective cleaning, inspection, and assessment program is an integral part of maintaining optimal operation of a City's wastewater collection system. It is essential for keeping the sanitary sewer system in good repair to minimize stoppages, I&I, and other potential deficiencies that can result in poor performance and potential SSOs. Additionally, understanding the current conditions and workings of the wastewater collection system allows for optimizing the effectiveness of the human and financial resources available.

In order to calculate the required staffing to maintain an optimal level of service for the system, the American Water Works Association (AWWA) Utility Benchmarking data was utilized. This data assists in quantifying a utility's staffing needs for planned maintenance. Time charged for maintenance work includes all the time spent responding to a maintenance work order, including travel, obtaining tools and parts, and completing the work. According to the AWWA Utility benchmarking data, the following formula can be utilized to calculate the total planned linear maintenance per 100 miles of pipe for the system:

$$\text{Planned linear maintenance to distribution system length } (\text{h}/100 \text{ miles of pipe}) = \frac{\text{Total time for planned maintenance} \times 100}{\text{Total miles of distribution system piping}}$$

The total planned linear maintenance hours per 100 miles of pipe are calculated and compared to the AWWA key performance indicator (KPI) target. For the City of Lincoln that target is 3,517 hours per 100 miles of pipe (75th percentile for planned linear maintenance for collection systems). Figure 5.1 compares the total stoppages, calculated planned linear maintenance hours for the current City of Lincoln Sanitary Sewer Staff, and the AWWA KPI target of 3,517 hours/100 miles of pipe. This imbalance between system growth and available maintenance staffing has created challenges in maintaining the sanitary sewer system. To adequately perform CCTV pipe and manhole inspections, pipe cleaning (jetting), and meet all goals discussed in Section 1.3 of the report, additional staffing is needed.

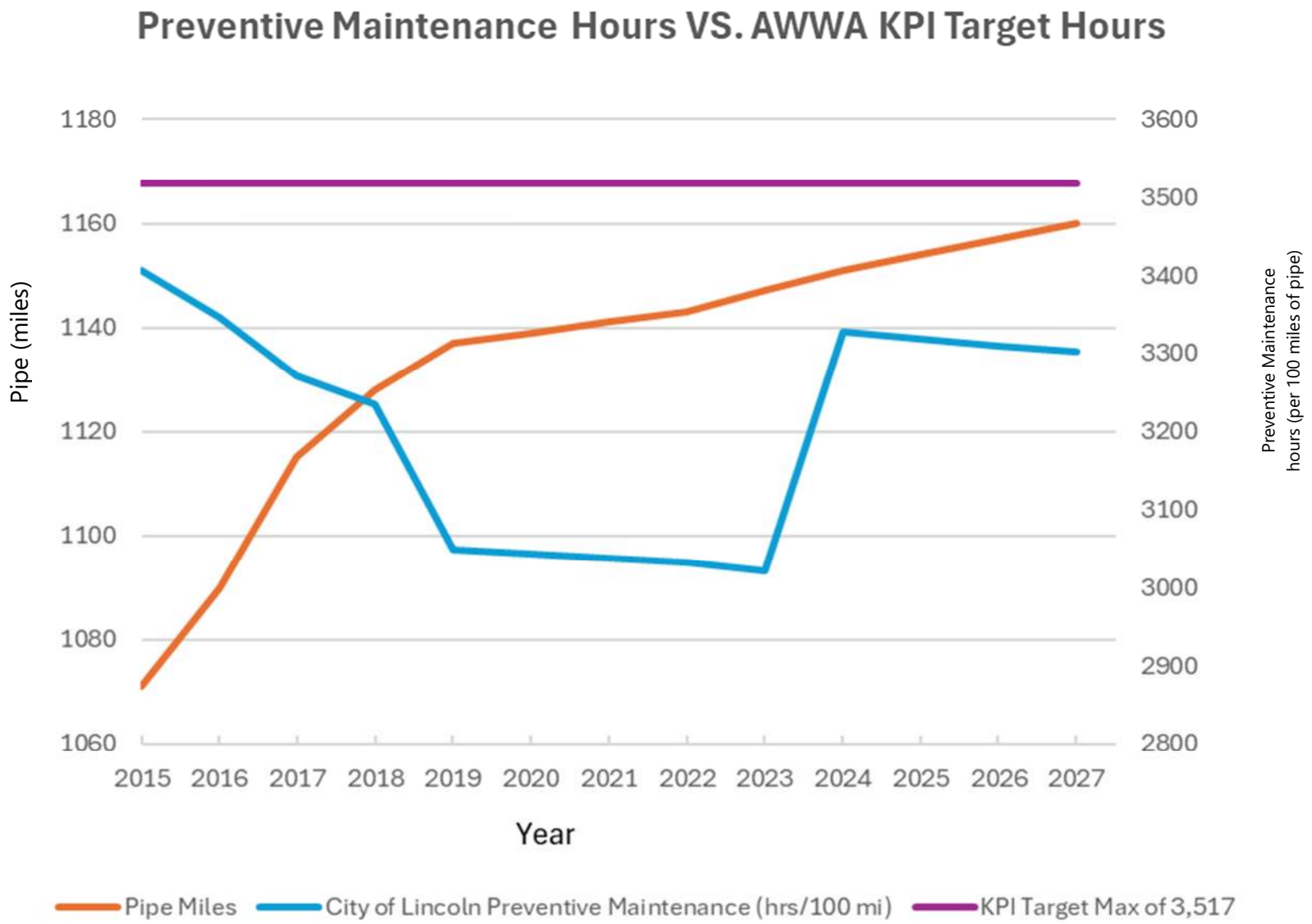



Figure 5.1 Preventive Maintenance Hours Vs. AWWA KPI Target Hours

Cleaning includes jetting (pressure cleaning) to remove grease buildup, scale, roots, and other debris in the pipe. Cleaning crews also provide root treatment at identified sewer sections to inhibit root growth in pipes and/or mechanically remove roots by using a root saw. During the routine videoing of the sanitary sewer system, crews operating the video equipment look for leaking pipe joints, obstructions, or excessive deposits, as well as other pipe defects. In addition, when a leaking or defective service lateral is identified, the service address is determined and verified. In the past, when service lateral issues were identified, a letter was sent to the property owner describing the problem and requiring that the service lateral be fixed within 180 days. At the end of the 180-day period, the service lateral was then re-inspected to determine if the repairs have been made. Currently, the City is not sending letters, and this policy is under consideration by City leaders.

In addition to performing cursory inspections of manholes when accessed for other work, dedicated manhole inspections are performed. These inspections look for damage to the structure itself as well as the frame, cover, and any connections to the manhole. Crews will look for cracks, leaks, excessive deposits, as well as other defects and record the severity of the issue.

The data that is collected is entered into the asset management system. The cleaning, inspection, and assessment program includes sewer cleaning, CCTV inspection of piping, visual inspection and classification of the manhole structures and their flow channels, an evaluation of the condition of the pipes and manholes. Results from the assessment program are used to categorize the cleaning and inspection frequencies, and to identify any needed repairs or rehabilitation. This data is also used to develop the sewer rehabilitation portion of the CIP program.

The City's preventive maintenance program is based on a prioritization system. Emergency response is always a top priority; however, other unplanned maintenance may need to be scheduled prior to routine maintenance and repairs.

## 5.2 Pipe Cleaning

The primary activity of the sewer maintenance staff is sanitary sewer line cleaning. During the line cleaning process, the crews also inspect the manholes and other appurtenances. Any deficiencies are noted and entered into the asset management system.

### 5.2.1 Cleaning Frequencies

Currently, over 90 percent of the sanitary sewer system is on a six year or less cleaning frequency. The cleaning frequencies are entered in the asset management system and kept updated as the sewers are cleaned. Also located in the asset management system is a listing of priority cleaning locations that may need special attention due to a history of grease build up, roots, blockages, or other problems. Shown in Table 5.1 below is the current sewer system cleaning frequencies.

Table 5.1 Current Sanitary Sewer Cleaning Frequencies

| Frequency | Percent of System |
|---|---|
| More than once per year | 0.4 percent |
| Every Year | 38.4 percent |
| Every 3 Years | 51.7 percent |
| Every 4 to 6 Years | 5.6 percent |
| Not scheduled to be cleaned | 3.9 percent |

### 5.2.2 SOPs For Cleaning

The City has SOPs in place for sewer cleaning activities. These cleaning SOPs include Combination Sewer Cleaning, Jet Flushing, and Jet Flushing with Easement Machine. These SOPs are intended to be dynamic and should be updated and revised as new information and equipment is employed. At this time, the City contracts with specialized firms for cleaning lines that are over 15-inches in diameter. The SOPs for cleaning are as follows:

# COMBINATION SEWER CLEANER

The purpose of the combination sewer cleaner is to clean and vacuum large diameter sewer lines of grease, roots, and other debris as needed. Generally the lines are cleaned, by a two man crew, a basin at a time, starting at the top or highest point and working down toward the bottom of the basin. Lines are cleaned by shooting the jet nozzle up the line against the direction of flow and then pulling it back slowly to clean the line and vacuuming the material collected in the manhole as needed.

## Personal Protective Equipement (PPE) Required

- Approved Safety Vest
- Safety Boots
- Gloves
- Eye protection
- Hard Hats required when working around the vacuum hose boom.

## Equipment Check

- Prior to leaving shop check tools, supplies and equipment.
- Do a walk around of the Recycler & check the tires lights & condition of the vehicle.
- Check that PPE is either on your person or in the truck.
- Verify on foreman's map area to cleaned
- Note any special instructions use of low pressure, roots present, blowback pr.
- Check the water level of the debris body of the truck.
- Check freshwater tanks.
- Grease maintenance of the recycler machine weekly.

## Drive to work assignment location

- Prior to driving, check mirrors and buckle up.
- Fill up the water tank and debris body with non-Potable water as needed.

## Recycler Cleaning

- Put on PPE.
- Crew member #1: Pulls truck close to downstream manhole.
- Crew member #2: Gets out and directs driver in backing up truck to approximately 6 feet from the manhole.
- Crew member #1: Note any special instructions for this pipe segment: use of low pressure, roots present, blowback notifications, turn on vehicle safety lights and directional arrows.
- Crew member #2: Set out safety cones or other direction devices if the situation warrants.
- Crew member #1: Gets out, opens manhole using proper ergonomics, visually inspects manhole for defects and readies the truck for cleaning. Use the remote control to operate the combination sewer machine.

- Crew member #2: Walks to upstream manhole with pick and cones, opens manhole using proper ergonomics, visually inspects manhole for defects and secure with cones. Do not leave open manhole unattended.
- Crew member #1: Place manhole guide onto manhole ring as needed to eliminate unnecessary wear of jet hose. Lower vacuum hose down into manhole and place it in the manhole channel. Lower nozzle into the line being cleaned, so that it is against the flow. Turn the water pump on. Turn vacuum pump on as needed to remove debris and keep the necessary amount of recycled water in the debris tank. Check to see if crew member #2 is at the upstream manhole. Use radio or hand signal to indicate you are about to start.
- Crew member #2: Look for crew member #1 signal or radio call and return signal or call.
- Crew member #1: Upon receiving the go ahead form crew member #2, turn the pressure control knob up to approximately 1500 psi or higher as needed. The jet nozzle should take off and start proceeding up the line. Look to Crew member #2 for a signal that the jet nozzle has reached the upper manhole.
- Crew member #2: Wait for the nozzle to reach the manhole and signal back to crew member #1.
- Crew member #1: Push the remote lever forward to bring back the hose, traveling at no faster than 2 ft/sec.
- Crew member #2: Close the manhole lid, pick up tools and walk back to truck.
- Crew member #1: Once the hose is back, turn off the water pump. Turn off the vacuum pump when debris has been collected from the manhole channel. Remove the jet hose and vacuum hose. Set vacuum boom to traveling position.
- Crew member #2: Remove manhole guide and put into truck if used.
- Crew member #1: Put lid back onto manhole
- Crew member #2: Pick up cones.
- Write down information onto crew cards, include observation notes.
- Get back into truck, turn off safety lights and directional arrows.
- Proceed to next line segment.
- Record any needed repairs to the manholes.
- Complete event into asset management software.
- Remove debris from the debris body as needed.

# JET FLUSHING 15" AND SMALLER LINES

The purpose of jet flushing is to clean the sanitary sewer lines of grease, roots, and other debris. Generally the lines are cleaned, by a two man crew, a basin at a time, starting at the top or highest point and working down toward the bottom of the basin. Lines are cleaned by shooting the jet nozzle up the line against the direction of flow and then pulling it back slowly to clean the line.

**Personal Protective Equipement (PPE) Required**

- Approved Safety Vest
- Safety Boots
- Gloves
- Eye protection

**Equipment Check**

- Prior to leaving shop check tools, supplies and equipment.
- Do a walk around of the jet flusher & check the tires lights & condition of the vehicle.
- Check that PPE is either on your person or in the truck.
- Verify on foreman's map area to cleaned
- Note any special instructions use of low pressure, roots present, blowback pr.
- Check water level of truck.

**Drive to work assignment location**

- Prior to driving, check mirrors and buckle up.
- Fill up water tank if required and make notation onto time card.

**Jet Cleaning**

- Put on PPE.
- Crew member #1: Pulls truck close to downstream manhole.
- Crew member #2: Gets out and directs driver in backing up truck to approximately 6 feet from manhole.
- Crew member #1: Note any special instructions for this particular line: use of low pressure, roots present, blowback notifications, turn on vehicle safety lights and directional arrows.
- Crew member #2: Set out safety cones, turn on safety lights and direction devices if the situation warrants.
- Crew member #1: Gets out, opens manhole using proper ergonomics, visually inspects manhole for defects and readies the truck for cleaning.
- Crew member #2: Walks to upstream manhole with pick and cones, opens manhole using proper ergonomics, visually inspects manhole for defects and secure with cones. Do not leave open manhole unattended.

- Crew member #1: Put manhole guide onto manhole to eliminate unnecessary wear of jet hose. Lower nozzle into line being cleaned, so that it is against the flow. Turn on pressure valve and pull on pump valve. Check to see if crew member #2 is at the upstream manhole. Use radio or hand signal to indicate you are about to start.
- Crew member #2: Look for crew member #1 signal or radio call, and return signal or call.
- Crew member #1: Upon receiving the go ahead form crew member #2, turn on water handle, pull out pump and hit switch to throttle up the pressure to approximately 1100psi. The jet nozzle should take off and start proceeding up the line. Look to Crew member #2 for a signal that the jet nozzle has reached the upper manhole.
- Crew member #2: Wait for the nozzle to reach the manhole and signal back to crew member #1.
- Crew member #1: Insert the grit catcher into the line and flip the switch to reverse to bring back the hose, traveling at no faster than 2 ft/sec.
- Crew member #2: Close the manhole lid, pick up tools and walk back to truck.
- Crew member #1: Once the hose is back, turn off the pressure valve and pump.
- Crew member #2: Remove grit catcher and dump into bucket.
- Crew member #1: Pull hose out of the line.
- Crew member #2: Remove manhole guide and put into truck
- Crew member #1: Put lid back onto manhole
- Crew member #2: Pick up cones.
- Complete event into asset management software.
- Get back into truck, turn off safety lights and directional arrows.
- Proceed to next line segment.
- Fill out field inspection form for any manholes needing repairs.

# JET FLUSHING with EASEMENT MACHINE

The purpose of the easement machine is to clean the sanitary sewer lines of grease, roots, and other debris in remote areas where access is difficult with a jet flusher truck. The easement machine is an extension of the jet flusher truck and consists of a jet crew and an easement machine crew. Lines are cleaned by shooting the jet nozzle from the easement machine up the line against the direction of flow and then pulling it back slowly to clean the line.

## Personal Protective Equipement (PPE) Required

- Approved Safety Vest
- Safety Boots
- Gloves
- Eye protection

## Equipment Check

- Perform service inspection on easement machine to motor oil, fuel, tire pressure, and hydraulic fluid.
- Do a walk around of the utility truck and trailer. Check the tires lights & condition of the vehicle and trailer.
- Check that PPE is either on your person or in the truck.
- Verify on foreman's map area to be cleaned
- Note any special instructions use of low pressure, roots present, blowback pr.

## Drive to work assignment location

- Prior to driving, connect easement trailer to utility truck.
- Load easement machine onto trailer and secure to trailer with chains and binders.

## Jet Cleaning

- Contact property owner prior to work start up and give notice of the work that is being done on their property to prevent incident with children and pets.
- Put on PPE.

Crew member #1: Unload easement machine and drive to the downstream manhole. Avoid steep slopes and uneven surfaces to prevent a rollover and injury. Park the easement machine about one foot from manhole. Take care to avoid damage to grass or land scaping.

Crew member #2: Pulls jet truck near the downstream manhole as possible.

Crew member #3: Gets out and directs driver in backing up truck if needed to position jet truck to allow jet hose to be pulled to the easement machine.

Crew member #2: Note any special instructions for this pipe segment: use of low pressure,

roots present, blowback notifications, turn on vehicle safety lights and directional arrows.

Crew member #3: Set out safety cones or other direction devices if the situation warrants.

Crew member #1&3: Pull hose from jet truck to easement machine and connect to machine.

Crew member #1: Opens manhole using proper ergonomics, visually inspects manhole for defects and readies the truck for cleaning.

Crew member #3: Walks to upstream manhole with pick and cones, opens manhole using proper ergonomics, visually inspects manhole for defects and secure with cones. Do not leave open manhole unattended.

Crew member #2: Look for crew member #3 signal or radio call and return signal or call.

Crew member #1: Put manhole guide onto manhole to eliminate unnecessary wear of jet hose. Pull out engagement knob to free reel. Push in on reel lever to lower nozzle into manhole, so that it is against the flow.

Crew member #1: Look for crew member #3 signal or radio call and return signal or call.

Crew member #2: Upon receiving the go-ahead form crew member #1, turn on water handle, pull out pump and hit switch to throttle up the pressure to approximately 1100psi.

Crew member #1: When water begins to spray from jet nozzle push in reel lever to propel nozzle up the sewer main. Adjust the speed of the reel with the speed dial located left of the reel lever. The jet nozzle should take off and start proceeding up the line. Look to Crew member #2 for a signal that the jet nozzle has reached the upper manhole.

Crew member #3: Wait for the nozzle to reach the manhole and signal back to crew member #1.

Crew member #1: Once the nozzle has reached the upstream manhole pull the reel lever out to bring the nozzle back to the manhole, traveling at no faster than 2 ft/sec.

Crew member #3: Close the manhole lid, pick up tools and walk back to truck.

Crew member #1: Once the nozzle is back, signal to crew member #2 to turn off the pressure valve and pump.

Crew member #1: Pull hose out of the line. Disconnect jet hose from easement machine.

Crew member #3: Walk end of jet hose back to jet truck so that it does not get caught on anything.

Crew member #2: Remove manhole guide and return to truck.

Crew member #1: Put lid back onto manhole.

Crew member #1: Drive easement machine back to utility truck and trailer.

Crew member #1&3: Load easement machine onto trailer and secure with chains and binders.

Crew member #3: Pick up cones.

- Complete event in asset management software.
- Get back into truck, turn off safety lights and directional arrows.
- Proceed to next line segment.
- Fill out field inspection report form for any manholes needing repairs.

## 5.3 Fats, Oils and Grease (FOG)

Fats, Oils and Grease, otherwise known as "FOG", can be a significant cause of sewer blockages that lead to SSOs. Specific areas in the collection system with FOG issues are to be identified for more frequent cleaning as required. Identification of FOG "trouble spots" and their causes is usually based on blockage history, line investigation, and inspection of FOG dischargers such as restaurants and food processing facilities. Once identified, FOG trouble spots can be addressed through targeted outreach, priority cleanings, and additional regulation. The wastewater collection system FOG program includes the following elements:

Performed by City of Lincoln Collection System Staff:

- Identification - Identify areas or line segments of your wastewater collection system subject to FOG stoppages.
- Sewer Cleaning - Establish a prioritized preventive cleaning schedule for each area (and all sources of grease) or line segment with FOG problems. An interim high-frequency cleaning program can be the first step in addressing the problem.
- Outreach - Establish an outreach program to educate and inform businesses, industries, and citizens about how to reduce FOG discharges and the costs and impacts of FOG in the wastewater collection system.

Performed by the City of Lincoln Health Department:

- Source Control - Develop and implement source control measures for each area of the wastewater collection system identified with FOG problems.
- Facility Inspection - Inspect grease-producing facilities, with priority given to previously identified problem areas.

The following are allowed under Title 17 of the Municipal Code:

- Legal Authority - The City has the legal authority to prohibit discharges of excessive grease to the collection system.
- Enforcement - The City has the legal authority to inspect and enforce the sewer use ordinance.

## 5.4 Root Control

Roots can be a significant cause of sewer blockages in some areas of the sanitary sewer system, potentially leading to SSOs and other problems. Problem areas with root intrusion are identified and maintained as needed. Roots often occur at pipe joints, where the pipe is cracked, or where service connections enter the pipe.

The City of Lincoln uses both mechanical methods and chemicals to control roots in the wastewater collection system. When a crew encounters roots during routine cleaning, a hydraulic saw is attached to the jetter and used to cut and remove the roots. The severity of the problem is recorded on the daily log, and if necessary, the pipe section is placed on the list for priority cleaning. Cutting a tree's roots is like pruning the tree and stimulates root growth into the system. Consequently, mechanical treatment must be repeated every year or two, which is factored into the cleaning schedules.

When areas with re-occurring root problems are identified, the City will apply root killing foam to the pipe segment per the Chemical Root Control SOP. Vaporooter is the current foam being used by the City of Lincoln to control roots in the sewer system. Vaporooter is comprised of two active ingredients, metam sodium, which penetrates root cells destroying the root on contact without harming the plants and trees above ground, and Dichlobenil, which bonds to pipe walls, joints, and cracks to inhibit new root growth.

The foam is applied in the pipes using root foam application equipment. This foam application equipment is attached to the City's cleaning equipment. When attached to the cleaning equipment, the foaming system automatically mixes the two ingredients, a foaming agent, water, and air to deliver the chemical in a dense foam form that fills the pipe and coats the roots.

### 5.4.1 SOP for Chemical Root Control

The City has SOPs in place for Chemical Root Control activities. This SOP is intended to be dynamic and should be updated and revised as new information and equipment is employed.

# JET FOAMING - CHEMICAL ROOT CONTROL

The purpose of chemical root control is to destroy roots that have infiltrated into the sanitary sewer lines and inhibit future growth between treatments. Root lines are identifed and prioritized based on the severity of the root problem. Lines are treated by shooting the foaming nozzle up the line to the target manhole and then pulling it back slowly dispersing the foam into the line. Generally the lines are chemically treated by a two man crew.

## Personal Protective Equipement (PPE) Required

- Approved Safety Vest
- Safety Boots
- Chemical Resistant Gloves
- Eye protection
- Respiratory Protection-properly fit tested approved respirator with organic vapor cartidge

## Equipment Check

- Prior to leaving shop check tools, supplies and equipment.
- Do a walk around of the jet flusher & check the tires lights & condition of the vehicle.
- Check that PPE is either on your person or in the truck.
- Verify on foreman's map the designated sewer mains to foam
- Note any special instructions.
- Check water level of truck.

## Loading Chemicals

- IMPORTANT: Sanafoam Vaporooter is a restricted pesticide. You must read and follow all label instructions. See Section 8 of the Material Safety Data Sheet for Exposure Control/Personal Protection
- Dichlobenil
    - Using the wash down hose or other filtered water source; add five gallons of water to the dichlobenil tank.
    - Identify the notch in the foil pouch and carefully open the top of the foil pouch. DO NOT OPEN THE INNER POUCH.
    - Place the open end of the foil pouch in the loading chamber and allow the inner water-soluble packet to slide out of the foil pouch and into the dichlobenil mixing tank.
    - Allow two minutes for water soluble packet to dissolve.
    - From the manual mode screen press the "Agitator Control' button to automatically mix the dichlobenil and water for thirty seconds.
    - Repeat as necessary to ensure the dichlobenil is adequately mixed.
    - Return to 'AUTO' setting by pressing the 'Manuel Mode Selected' button.
- Metam-Sodium
    - Remove empty metam sodium container from foaming machine.

- Remove lid from new metam sodium container and install on empty container.
- Insert draw tube, quick disconnect cap assembly on new container and tighten well.
- Pierce the top of the container handle with a flat head screwdriver and turn to vent.
- Place container inside equipment with label facing out.
- Snap male connection in quick connect.
- Dispose of empty container according to label.

**Drive to work assignment location**

- Prior to driving, check mirrors and buckle up.
- Fill up water tank if required and make notation onto timecard.

**Jet Foaming**

- Put on PPE.
- Crew member #1: Pulls truck close to downstream manhole.
- Crew member #2: Gets out and directs driver in backing up truck to approximately 3 feet from manhole.
- Crew member #1: Note any special instructions for this pipe segment: turn on vehicle safety lights and directional arrows.
- Crew member #2: Set out safety cones or other direction devices if the situation warrants.
- Crew member #1: Attach the two-stage foaming nozzle to a skid that will position the nozzle in the center of the pipe and above the current flow line, open the manhole using proper ergonomics, visually inspects manhole for defects and readies the truck for foaming.
- Crew member #2: Walks to target manhole with pick and cones, opens manhole using proper ergonomics, visually inspects manhole for defects and secure with cones. Do not leave open manhole unattended.
- Crew member #1: Put manhole guide onto manhole to eliminate unnecessary wear of jet hose. Lower nozzle into line being foamed and position the two-stage nozzle body fully inside the pipe to be treated. Turn on pressure valve and pull-on pump valve. Check to see if crew member #2 is at the upstream manhole. Use radio or hand signal to indicate you are about to start.
- Crew member #2: Look for crew member #1 signal or radio call and return signal or call.
- Crew member #1: Upon receiving the go-ahead from crew member #2, turn on water handle, pull out pump and hit switch to throttle up the pressure to approximately 1100psi. The nozzle should take off and start proceeding up the line. Look to Crew member #2 for a signal that the nozzle has reached the upper manhole.
- Crew member #2: Wait for the nozzle to reach the manhole and signal back to crew member #1.
- Crew member #1: Close jetter ball valve or in some cases move the three-way valve to “Foam” setting. Increase the truck RPM to provide a minimum of 10cfm and 105psi as determined during initial setup of the jet set commander.
- Crew member #1: Ensure power inverter is on and the TSC is booted up to the main screen.

- Crew member #1: Ensure truck RPM is set at the calibrated foaming level of 1200psi as determined during installation.
- Crew member #1: Position wash-down hose in exit manhole to ensure hose is rinsed during retrieval.
- Crew member #1: Ensure three-way valve is set to Vaporooter foaming position or two-way jetter valve is closed.
- Crew member #1: Press the 'Foam Mode' button once, it will change from red and read "FOAM". The system will initiate a sequence of diagnostics and remix the dichlobenil. After approximately thirty seconds the system will begin to produce foam.
- Crew members #1& #2: Wait three minutes for foam to fully purge the water from the hose. Foam will begin to fill the pipe and enter the target manhole.
- Crew member #2: Signal crew member #1 to start hose retrieval.
- Crew member #1: Retrieve hose at the labeled retrieval rate for the diameter of pipe being treated.
- Crew member #1: Press 'Wash Pump Start' button to begin flow of water to rinse jetter hose as it exits the manhole.
- IMPORTANT: Low chemical flow alarm indicates one or both chemicals are empty.
    - Stop the hose retrieval and press "Alarm Reset" to clear alarm.
    - Press the "Foam Mode" button once to activate the "Flush" mode.
    - After 10 seconds press the button again to turn the unit off.
    - Follow instructions for loading chemical.
    - Press "Foam Mode" button to restart foaming.
    - Wait approximately 1 minute or until PSI reading is correct for operating conditions.
    - Resume hose retrieval at calibrated rate.
- Crew member #2: Close the manhole lid, pick up tools and walk back to truck.
- Crew member #1: When approximately one hundred feet of hose remains in the pipe press the 'Foam Mode' button which will change yellow and read "FLUSH".
- Crew member #1: Pause retrieval of jet hose. The flush mode terminates the foam production and pumps water only to clean out the lines in the jet set commander unit. After 15 seconds of "FLUSH" mode press the 'Foam Mode' button which will change from yellow to red and read "OFF".
- Crew member #1: Reduce truck engine RPM to idle speed, open Jetter valve and engage truck's water pump.
- Crew member #1: Continue the hose retrieval process at calibrated rate. The water will purge the foam from the hose and fill the remainder of the pipe segment. The purging process should be timed to ensure the last of the foam is out when the nozzle exits the treated line and enters the manhole.
- IMPROTANT: Do not remove nozzle from the manhole until all remaining foam is purged and clear water is coming out of the nozzle.
- Crew member #1: Once the hose is back, turn off the pressure valve and pump.
- Crew member #1: Adjust the variables described above to ensure the foam is fully purged when the nozzle reaches the manhole.

- Crew member #1: Pull hose out of the line.
- Crew member #2: Remove manhole guide and put into truck
- Crew member #1: Put lid back onto manhole
- Crew member #2: Pick up cones.
- Complete event into asset management software.
- Get back into truck, turn off safety lights and directional arrows.
- Proceed to next line segment.
- Fill out repair form for any manholes needing repairs.

# Evaluation Point

**If this is an IDLA situation (Immediate Dangerous to Life and Health) call 911 immediately. Provide the operator with your situation and location.**

An evaluation point is when the normal work tasks are no longer applicable or are being conducted. Something has occurred to stop the standard operating procedure. When an evaluation point arises follow these steps:

- Survey what has happened.
- What are the immediate hazards now that work has stopped (what can go wrong)?
- Are there new hazards not associated with the current SOP and are different PPE's needed?
- Should all work stop, and a clear solution be defined?
    - Examine the "what if" consequences.
    - Should additional assistance or instruction be identified?

## 5.5 Inflow and Infiltration Control

I&I of ground and surface waters into the sanitary sewer reduces the capacity of the sewers to convey sanitary flows to the treatment systems. They can also increase the overall volume of flow to the WRRFs, increasing operating costs. Additionally, if the problem becomes severe enough, it can lead to backups and sanitary sewer overflows.

One of the tools the City can use to locate where I&I may be a concern is their flow monitoring data. The City has sub-basin information about the system and can predict based on these records what range of wastewater flows are expected. In areas where the flow monitors show higher than expected flows through a pipe, especially after wet weather events or snow melts, that the upstream segments of that sewer will need to be reviewed for I&I.

One of the sources for I&I is connections from sumps or other non-wastewater flows such as downspouts or driveway drains into the sanitary sewers. The 2017 City ordinance addressing sumps removed a source of these flows and there have been previous ordinances to address removing the connections from downspouts and driveway drains.

In addition to the private sources for I&I, there can be many sources within the sewers themselves such as leaking pipe joints, cracked pipes, etc. To determine the location of these, the City performs smoke testing by injecting harmless "smoke" into the sewers and observes where the smoke escapes. This allows the City to determine the sources of the I&I to develop a plan to address them. The City has been performing a small amount of smoke testing, but due to the positive results in data collection that it has provided, there are plans to expand the smoke testing and I&I control programs.

## 5.6 Maintenance Records

Information from cleaning and inspections, including any findings, are entered into the asset management system, and, if needed, entered into the CIP. This information is also used for long term preventive maintenance planning.

The following information relating to the cleaning and inspection tasks is collected:

- Date and location of cleaning activity.
- Specific lines cleaned.
- Equipment used.
- Identity of cleaning crew.
- Presence of root, grease, or debris.
- Problems identified or other follow up actions necessary.
- Conditional assessment of structural integrity of pipe.

# CHAPTER 6 PUMP STATION AND FORCE MAIN MAINTENANCE

## 6.1 Overview

The other main component of the wastewater collection system are the lift stations and force mains that are installed. The City currently has fifteen collection system lift (pumping) stations, C-1 through C-14, and C-17, and their associated force mains that serve the collection system in Lincoln. Lift Station C-16 was decommissioned. The need for a lift station is generally dependent on site specific topographic criteria such as serving a low-lying area or the need to transport the wastewater across a river, stream, or creek. The lift stations are maintained by Lincoln Wastewater Staff. A summary of the lift stations is presented in Table 6.1 below. Of the sixteen wastewater lift stations, there are only five stations (C-6, C-7, C-8, C-9, C-11) that serve 300 or more acres. A detailed summary of each lift station and their routine maintenance schedule is located in Appendix A.

Table 6.1 Summary of Wastewater Lift Stations

| Lift Station | Location | Service Area (ac) | Basin Served |
|---|---|---|---|
| C-1 | NW 44th & West Cuming | 7 | Oak Creek |
| C-2 | 952 N. Lakeshore Drive | 4 | Oak Creek |
| C-3 | 412 W. Lakeshore Drive | 20 | Oak Creek |
| C-4 | 52 W. Lakeshore Drive | 54 | Oak Creek |
| C-5 | 1721 Surfside Drive | 70 | Oak Creek |
| C-6 | 550 W. Industrial Lake Dr. | 300 | Oak Creek |
| C-7 | 1598 East Lakeshore Dr. | 300 | Oak Creek |
| C-8 | West “P” Street & Sun Valley Blvd | 1,042 | West “O” Street |
| C-9 | West “E” Street & SW 6th Street | 1,389 | Middle Creek |
| C-10 | 3rd & Rose Street | 43 | Salt Creek |
| C-11 | 3700 N 31st Street & Salt Creek | 2,000 | Little Salt Creek |
| C-12 | 66th & Burlington Ave. | 10 | Havelock |
| C-13 | NW 3rd & W. Charleston | 10 | Oak Creek |
| C-14 | South Coddington & West Millstone Rd. | 37 | Middle Creek |
| C-15 | HWY 77 & Denton | N/A | Decommissioned |
| C-16 | Waterford | N/A | Decommissioned |
| C-17 | 9760 Forest Glen Rd | 54 | Antelope Creek 30 |

## 6.2 Telemetry

At the present time, all of the lift stations communicate with the Lincoln Wastewater SCADA system via a fiber optic communication system, Allo Fiber. The system provides alarms to SCADA for power loss, pump

overloads, high wetwell level, and in some cases, seal failure, high sump pump pit levels, and alternate power activation. Eventually, flow measuring instrumentation will be added to the pumping stations so that remote monitoring can occur (through SCADA) along with logging of historical flow data in the SCADA file server.

## 6.3 Inspection Maintenance and Repairs

Inspection, maintenance, and repairs that are performed on the lift stations are recorded in the asset management system. If a problem or maintenance issue is encountered, personnel also report it to their supervisor. The problems are rated as they are inserted into the asset management system. The repairs with a higher rating are corrected before routine maintenance items.

Repairs and replacement of equipment including pump rebuilding, motor rewinds, pipe and valve repairs, repairs to motor control centers, controls, SCADA, HVAC, and similar equipment are generally contracted out to various vendors and contractors. In general, any replacement parts that are difficult to acquire are kept in stock, other parts are obtained from vendors or the manufacturer's service center. Whether repairs are made by vendors or by LTU Staff, they are recorded and tracked in the asset management system.

### 6.3.1 Mechanical and Electrical Maintenance

The size of the pump station and its related equipment determine its specific mechanical and electrical maintenance needs. The Manufacturer's Operation and Maintenance (O&M) manuals are referenced to determine routine maintenance as well as for troubleshooting.

All mechanical and electrical maintenance activities are generated and tracked by the asset management staff. Work orders are generated by the asset management system are kept open until the maintenance has been completed. Any problems or maintenance issues noted by crews are reported to the supervisor for resolution.

### 6.3.2 Force Main Maintenance

Air release valves located on force mains and pump stations are maintained on a regular schedule to assure that they are functioning correctly. LTU staff inspects and maintains the air release valves semi-annually by back flushing the valves with clean water using a pressure greater than the discharge pressure of the pumps. All air release valves, and valves located in valve vaults are inspected for signs of corrosion, connection point leakage, or improper operating characteristics.

Capacity and discharge head in the pump stations are reviewed annually, following confirmation that the pumps are in good working order. Changes in capacity and discharge head are evaluated to determine whether cleaning of the force main is warranted. The pressure on the discharge side of the pump is used to determine the need for force main cleaning. If the backpressure is more than 25 percent greater than the expected total operating head, the force main is identified for cleaning.

Cleaning of the City's force mains is uncommon as the velocity as the force mains have been designed and are operated to maintain a self-cleansing velocity. In the event that a force needs to be cleaned the City will contract with pipe cleaning company to perform the work.

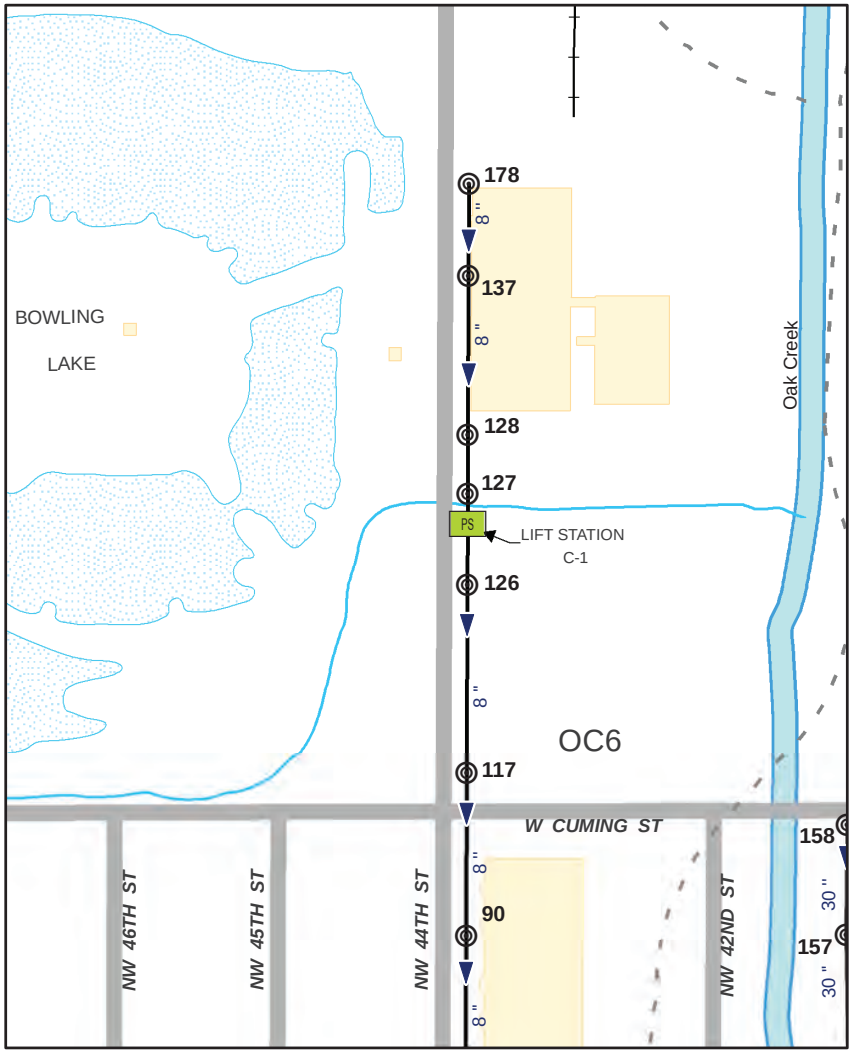
## 6.4 Corrosion and Odor Control

The dissolved oxygen content of the wastewater may be depleted in the collection system, pump station wetwells, and the force mains. In addition, the wastewater may contain sulfides and other constituents. These sulfides and other conditions may lead to corrosion in the piping, valves, concrete, and other areas and surfaces of the pump station. To minimize the effects of corrosion the City requires minimum and maximum velocity in the design of the collection system and controls the liquid level in the wetwells. Additionally, the City requires that the pump stations wetwells and receiving manholes be designed to minimize hydraulic disturbances. The pump station wetwells are periodically cleaned to minimize the deposition of solids and grease buildup which may lead to odors and the release of sulfides.

APPENDIX A

# LIFT STATION INFORMATION AND ROUTINE MAINTENANCE SCHEDULES

# Map Location for Lift Station C-1
# NW 44th & West Cuming Street

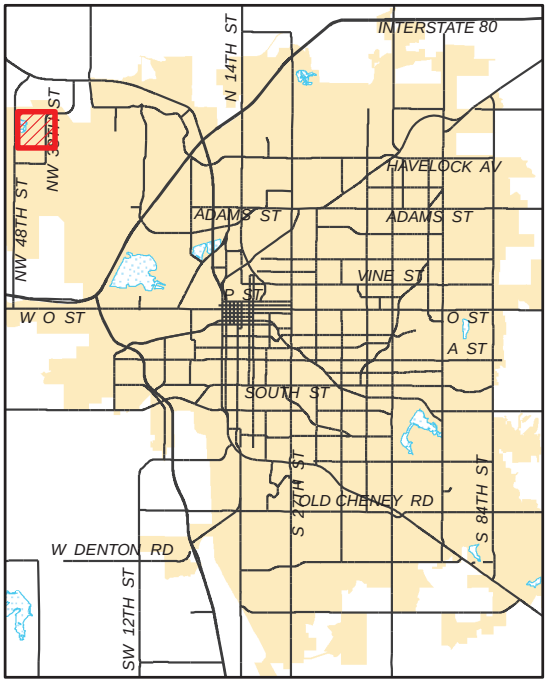




CITY OF LINCOLN NEBRASKA

## *Aerial*


## *Overview Map*



# Information Fact Sheet for Lift Station C-1
# Location: NW 44th & West Cummings


**Description:** Lift Station C-1 is a small duplex submersible pump station. The station serves two warehouse facilities and a Police Dog Training facility located in the industrial park of the Lincoln Airport authority. Originally, the station was designed as a pneumatic ejector pumping system, it has been redesigned as a wetwell-mounted submersible station. The controls and control cabinet are in good condition.

**Deficiencies:** There are currently no significant deficiencies with this pumping station.
**Drainage Basin:** Oak Creek
**Current Service Area:** 7 acres
**Avg Daily Flow gpm/cfs/acre:** not available
**Peak Flow gpm/cfs/acre :** not available
**Configuration:** Duplex
**Equipment:**

| EquipId | Manufacturer/Description | Rated Capacity | HP/Volts/Amps |
|---|---|---|---|
| RWPS-C101 | Flygt Model CP-3085.180 | 250 gpm, 20 TDH | 2.5/230/7.4 |
| RWPS-C102 | Flygt Model CP-3085.180 | 250 gpm, 20 TDH | 2.5/230/7.4 |
| LC-1 | Level Controller | | |
| MBP-C101 | Main Breaker Panel | | |
| MCC-C101 | Motor Control Center | | |

**Standby Power:** None
**Remote Monitoring:** Yes, Power Off, Pump Overload, High Level, Seal Failure, Allo Fiber

# Scheduled Maintenance and Information

240V/3/30A Service  Connected HP-5.0

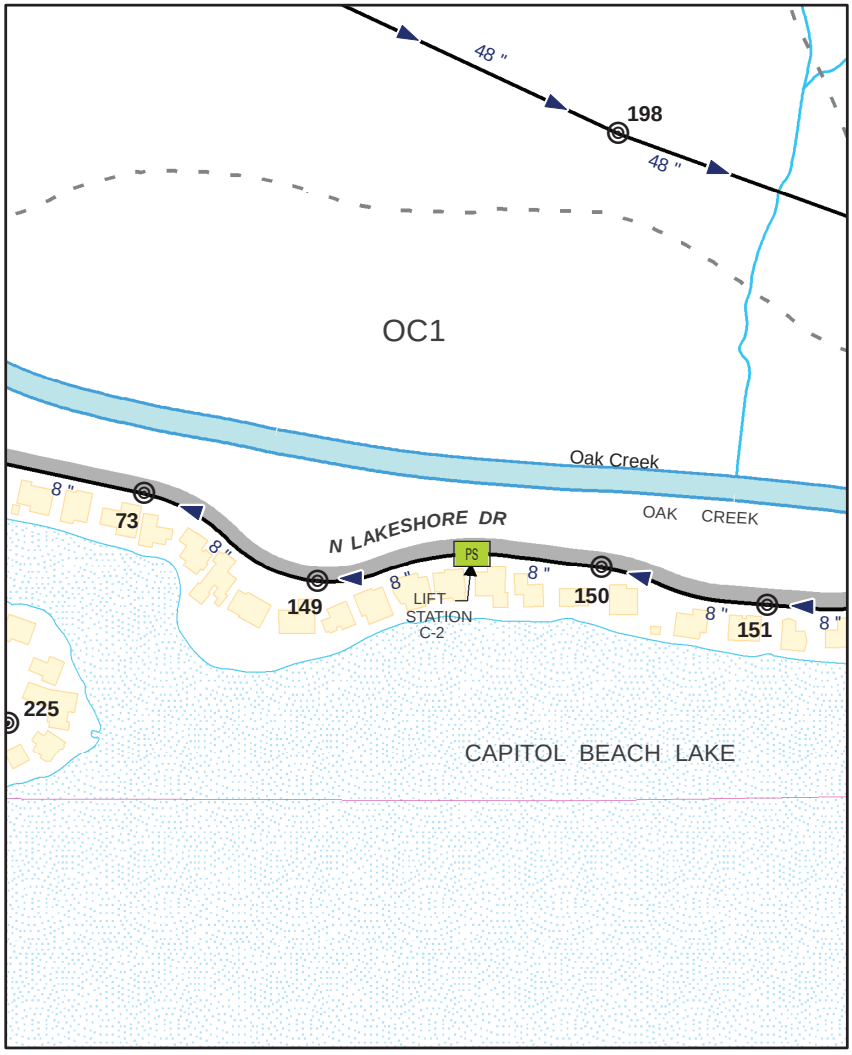
RWPS-C101 / Raw Wastewater Submersible Pump 2.5 HP 250 GPM @ 20' TDH
Flygt-CP-3085.182
Volts / Amps- [240]/480-[7.4]/3.7

RWPS-C102 / Raw Wastewater Submersible Pump 2.5 HP 250 GPM @ 20' TDH
Flygt-CP-3085.182
Volts / Amps- [240]/480-[7.4]/3.7

Station monitored by Allo Fiber.

| **C01** | **Scheduled Maintenance Tasks** | |
|---|---|---|
| MCC-C101 | Motor Control Center | MCC-C101 / ANNUAL PANEL CLEANING |
| PLC-C101 | PLC Cabinet at C01 | PLC-C101 / ANNUAL PANEL CLEANING |
| PLC-C101 | PLC Cabinet at C01 | PLC-C101 / QUARTERLY TELEMETERING ALARM VARIFICATION |
| LC-C101 | Level Controller | LC-C101 / MONTHLY BLOW DOWN & MAINTENANCE |
| RWPS-C101 | Raw Wastewater Submersible Pump RWPS-9C | RWP-C101 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| RWPS-C101 | Raw Wastewater Submersible Pump RWPS-9C | RWPS-C101 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| RWPS-C102 | Raw Wastewater Submersible Pump RWPS-10C | RWPS-C102 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| C-1 | Sanitary Lift Station (NW44 & W. Cumings) | C-1 / REMOVE DEBRIS & GRIT BUILDUP IN STATION WETWELL |
| FP-LS | Group of Fire Extinguishers, Liftstation | LIFTSTATION ANNUAL FIRE EXTINGUISHER INSPECTION |
| C-1 | Sanitary Lift Station (NW44 & W. Cumings) | LIFT STATION SYSTEM ROUNDS/WEEKLY INSPECTION |
| C-1 | Sanitary Lift Station (NW44 & W. Cumings) | WEEKLY BUILDING & EQUIPMENT INSPECTION |

# Map Location for Lift Station C-2
# 952 North Lakeshore Drive

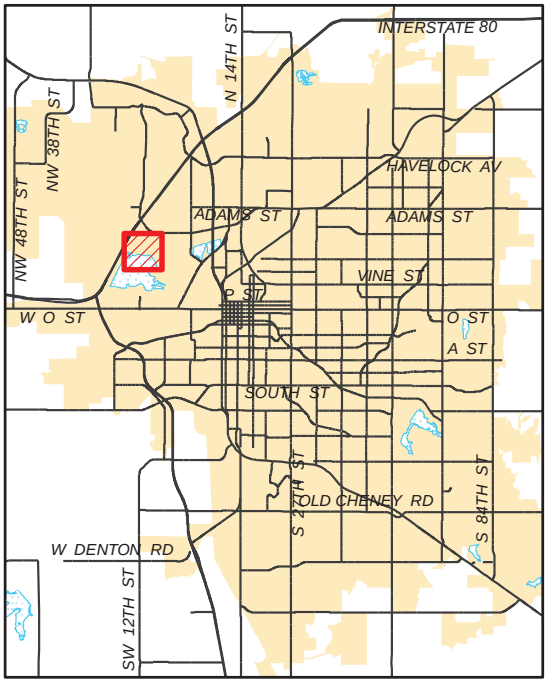




CITY OF LINCOLN NEBRASKA

## *Aerial*


## *Overview Map*



# Information Fact Sheet for Lift Station C-2
# Location: 952 North Lakeshore Drive


**Description:** Lift Station C-2 is located on the north side of Capital Beach Lake behind the south curb line of North Lakeshore Drive. The station serves approximately 12 homes located around the lake perimeter. The station is equipped with only one submersible pump (simplex) and the wetwell has an overflow pipe that allows wastewater to enter the downstream collection system if the wetwell level gets too high. Due to the location of this station, the potential for additional service area is limited.

**Deficiencies:** The station has been reliable, and no service interruptions have been experienced. Plants and shrubbery around the station have been the only nuisance.

**Drainage Basin:** Oak Creek
**Current Service Area:** 4 acres
**Avg Daily Flow gpm/cfs/acre:** Not available
**Peak Flow gpm/cfs/acre :** Not available
**Configuration:** Simplex
**Equipment:**

| EquipId | Manufacturer/Description | Rated Capacity | HP/Volts/Amps |
|---|---|---|---|
| RWPS-1C | Flygt Model CP-3085.181 | 100 gpm, 20 TDH | 2/230/6.4 |
| MCC-C201 | Motor Control Center | | |
| MTF-1 | Mercury Tilt Float Switch | | |
| SG-1 | Electrical Switch Gear | | |

**Standby Power:** None
**Remote Monitoring:** Yes, Power Off, Pump Overload, High Level, Seal Failure, Allo Fiber
**Planned Capital Improvements**: None planned. Future improvements funded through capital outlay budget(s).

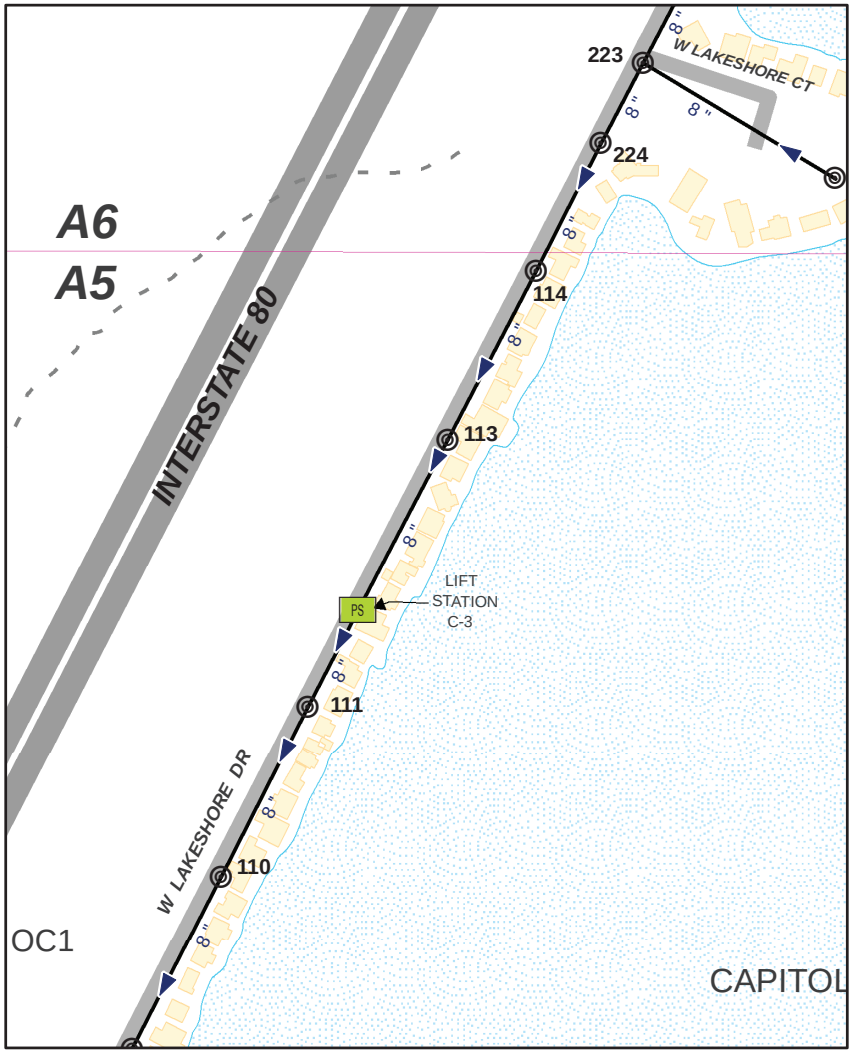
# Scheduled Maintenance and Information

240V/3/30A Service Connected HP-2.0
RWPS-C201 / Raw Wastewater Submersible Pump 2.0 HP 100 @ 20' TDH
Flygt-CP-3 085.181
Volts / Amps- [240]/480-[6.4]/3.2

Station monitored by Allo Fiber.

| **C02** | **Scheduled Maintenance Tasks** | |
|---|---|---|
| MCC-C201 | Motor Control Center | MCC-C201 / ANNUAL PANEL CLEANING |
| PLC-C201 | PLC Cabinet at C02 | PLC-C201 / ANNUAL PANEL CLEANING |
| PLC-C201 | PLC Cabinet at C02 | PLC-C201 / QUARTERLY TELEMETERING ALARM VARIFICATION |
| RWPS-C201 | Raw Wastewater Submersible Pump RWPS-1C | RWPS-C201 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| C-2 | Sanitary Lift Station (952 N. Lakeshore) | C-2 / REMOVE DEBRIS & GRIT BUILDUP IN STATION WETWELL |
| C-2 | Sanitary Lift Station (952 N. Lakeshore) | LIFT STATION SYSTEM ROUNDS/WEEKLY INSPECTION |
| C-2 | Sanitary Lift Station (952 N. Lakeshore) | WEEKLY BUILDING & EQUIPMENT INSPECTION |

# Map Location for Lift Station C-3
# 412 West Lakeshore Drive

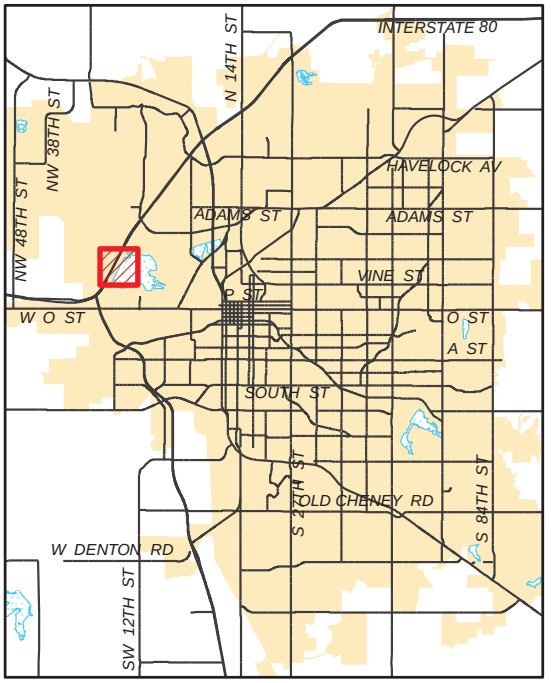




CITY OF LINCOLN NEBRASKA

## *Aerial*


## *Overview Map*



# Information Fact Sheet for Lift Station C-3
# Location: 412 West Lakeshore Drive

**Description:** Lift Station C-3 is a submersible simplex pump station located on the west side of Capital Beach Lake behind the east curbline. The lower portion of the station is made of precast concrete while the upper portion, above the operating water level is made of steel.

**Deficiencies:** The station is experiencing corrosion problems in the control panel and the access hatch. There is a large maple tree adjacent to the station and the roots from this tree have intruded into the surrounding vitrified clay sewer line. These roots have been responsible for plugging of the sewer line and property damage to the house shown in the background of the photograph above. The Wastewater Division is currently working with the homeowner and the tree has since been removed.

**Drainage Basin:** Oak Creek
**Current Service Area:** 20 acres
**Avg Daily Flow gpm/cfs/acre:** Not available
**Peak Flow gpm/cfs/acre :** Not available
**Configuration:** Simplex
**Equipment:**

| EquipId | Manufacturer/Description | Rated Capacity | HP/Volts/Amps |
|---|---|---|---|
| RWPS-2C | Flygt Model CP-3085.181 | 120 gpm, 10 TDH | 2/230/6.6 |
| MCC-C301 | Motor Control Center | | |
| MTF-2 | Mercury Tilt Float Switch | | |
| SG-2 | Electrical Switch Gear | | |
| TM-C301 | Telemetering Panel (OL-49-693) | | |

**Standby Power:** None.
**Remote Monitoring:** Yes, Power Off, Pump Overload, High Level, Seal Failure, Allo Fiber

# Scheduled Maintenance and Information

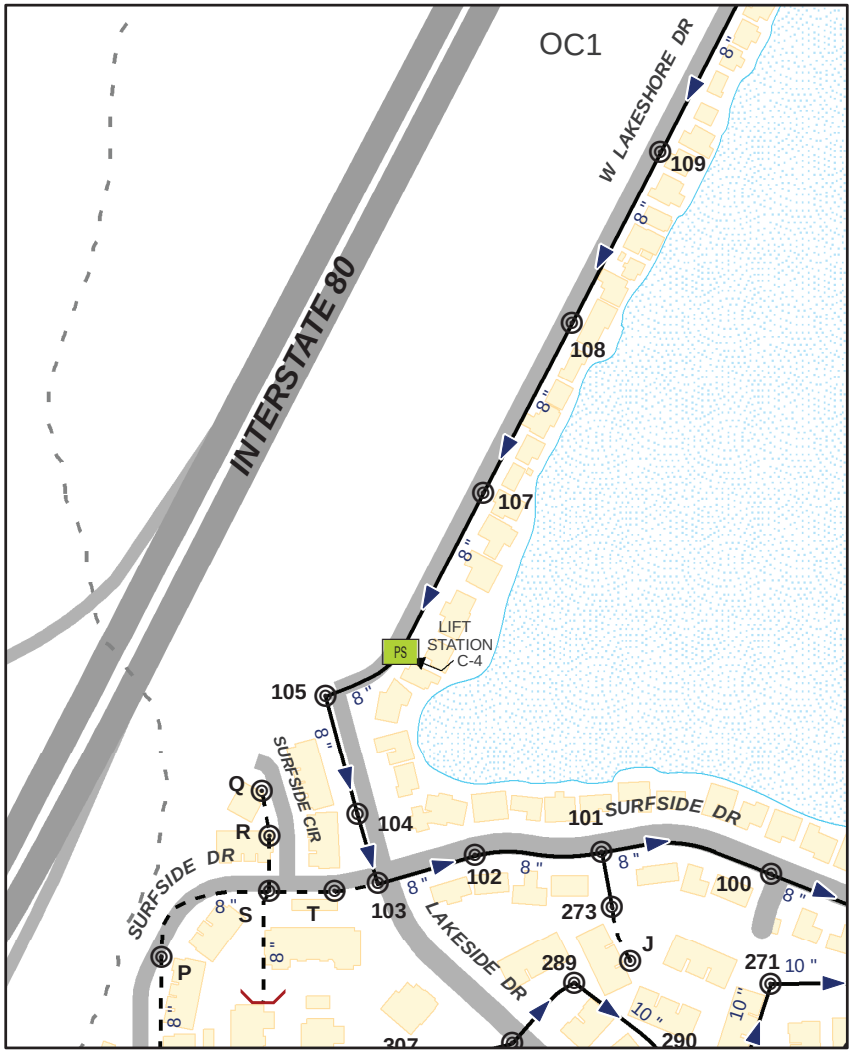
240V/3/30A Service  Connected HP-2.0

RWPS-C101 / Raw Wastewater Submersible Pump 2.0 HP 120 @ 10' TDH
Flygt-CP-3085.183-2260
Volts / Amps- [240]/480-[6.6]/3.3

Station monitored by Allo Fiber.

| **C03** | **Scheduled Maintenance Tasks** | |
|---|---|---|
| MCC-C301 | Motor Control Center | MCC-C301 / ANNUAL PANEL CLEANING |
| PLC-C301 | PLC Cabinet at C01 | PLC-C301 / ANNUAL PANEL CLEANING |
| PLC-C301 | PLC Cabinet at C01 | PLC-C301 / QUARTERLY TELEMETERING ALARM VARIFICATION |
| RWPS-C301 | Raw Wastewater Submersible Pump RWPS-2C | RWPS-C301 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| C-3 | Sanitary Lift Station (412 W. Lakeshore) | C-3 / REMOVE DEBRIS & GRIT BUILDUP IN STATION WETWELL |
| C-3 | Sanitary Lift Station (412 W. Lakeshore) | LIFT STATION SYSTEM ROUNDS/WEEKLY INSPECTION |
| C-3 | Sanitary Lift Station (412 W. Lakeshore) | WEEKLY BUILDING & EQUIPMENT INSPECTION |

# Map Location for Lift Station C-4
# 52 West Lakeshore Drive

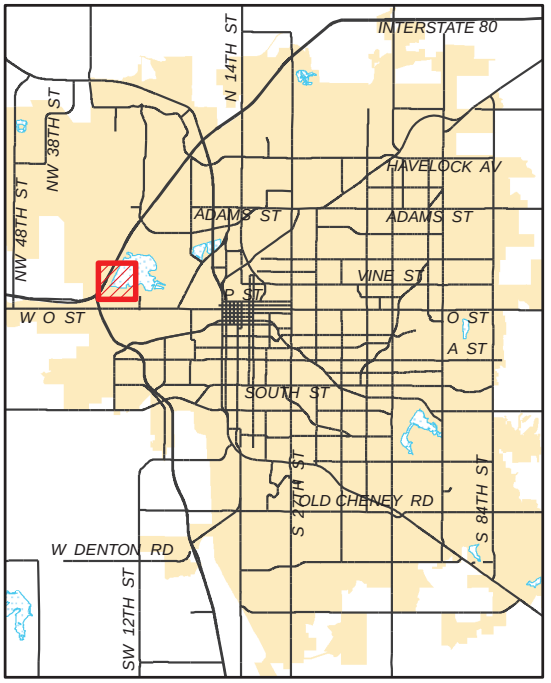




CITY OF LINCOLN NEBRASKA

## *Aerial*


## *Overview Map*



# Information Fact Sheet for Lift Station C-4
# Location: 52 West Lakeshore Drive


**Description:** Lift Station C-4 is a simplex pumping station located on the west side of Capital Beach Lake behind the east curb of West Lakeshore Drive. The submersible pump has been replaced with a Flygt Model CP-3085.

**Deficiencies:** The have been no operating problems associated with this station.

**Drainage Basin:** Oak Creek
**Current Service Area:** 54 acres
**Avg Daily Flow gpm/cfs/acre:** Not available
**Peak Flow gpm/cfs/acre :** Not available
**Configuration:** Simplex
**Equipment:**

| EquipId | Manufacturer/Description | Rated Capacity | HP/Volts/Amps |
|---|---|---|---|
| RWPS-3C | Flygt Model CP-3085.181 | 150 gpm, 14 TDH | 2/230/6.8 |
| MCC-C401 | Motor control Center | | |
| MTF-3 | Mercury Tilt Float Switch | | |
| SG-3 | Electrical Switch Gear | | |

**Standby Power:** None
**Remote Monitoring:** Yes, Power Off, Pump Overload, High Level, Seal Failure, Allo Fiber

# Scheduled Maintenance and Information

240V/3/60A Service  Connected HP-2.0

RWPS-C401 / Raw Wastewater Submersible Pump  2.0 HP 150 @ 14' TDH
Flygt-CP-3 085.181
Volts / Amps- [240]/480-[6.4]/3.2

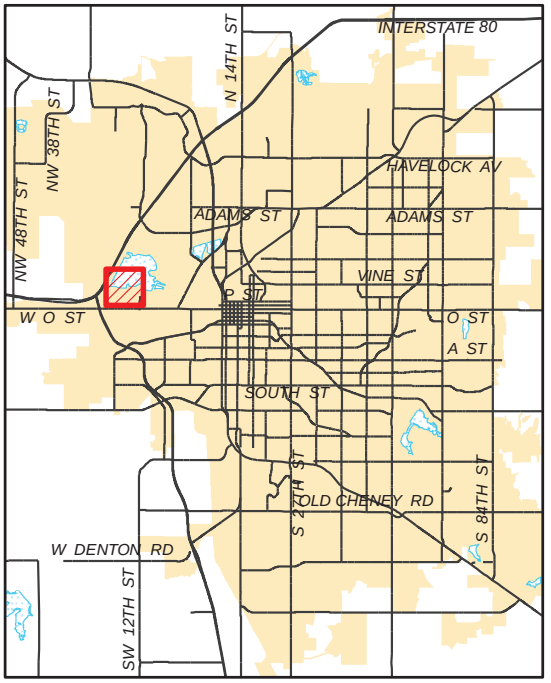
Station monitored by Allo Fiber.

| **C04** | **Scheduled Maintenance Tasks** | |
|---|---|---|
| MCC-C401 | Motor Control Center | MCC-C401 / ANNUAL PANEL CLEANING |
| PLC-C401 | PLC Cabinet at C04 | PLC-C401 / ANNUAL PANEL CLEANING |
| PLC-C401 | PLC Cabinet at C04 | PLC-C401 / QUARTERLY TELEMETERING ALARM VARIFICATION |
| RWPS-C401 | Raw Wastewater Submersible Pump RWPS-3C | RWPS-C401 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| C-4 | Sanitary Lift Station (52 W. Lakeshore) | C-4 / REMOVE DEBRIS & GRIT BUILDUP IN STATION WETWELL |
| C-4 | Sanitary Lift Station (52 W. Lakeshore) | LIFT STATION SYSTEM ROUNDS/WEEKLY INSPECTION |
| C-4 | Sanitary Lift Station (52 W. Lakeshore) | WEEKLY BUILDING & EQUIPMENT INSPECTION |

# Map Location for Lift Station C-5
# 1721 Surfside Drive


## *Aerial*


## *Overview Map*



# Information Fact Sheet for Lift Station C-5
# Location: 1721 Surfside Drive

**Description:** Lift Station C-5 is a duplex pumping station located on the south curbline of Surfside Drive adjacent to Capital Beach Lake. A new above ground panel was installed in 2025. The station has provided reliable service.

**Deficiencies:** The station tends to get covered with snow and ice from street snowplowing during the winter months which can create extra work when station entry is required.

**Drainage Basin:** Oak Creek
**Current Service Area:** 70 acres
**Avg Daily Flow gpm/cfs/acre:** Not available
**Peak Flow gpm/cfs/acre :** Not available
**Configuration:** Duplex
**Equipment:**

| EquipId | Manufacturer/Description | Rated Capacity | HP/Volts/Amps |
|---|---|---|---|
| RWPS-C501 | Flygt Model CP-3085.092-0007U | 150 gpm, 15 TDH | 3/230/8.7 |
| RWPS-C502 | Flygt Model CP-3085.092-0007U | 150 gpm, 15 TDH | 3/230/8.7 |
| LC-5 | Level Controller | | |
| MCC-C501 | Motor Control Center | | |
| MTF-4 | Mercury Tilt Float Switch | | |
| SC-4 | Electrical Switch Gear | | |

**Standby Power:** None
**Remote Monitoring:** Yes, Power Off, Pump Overload, High Level, High Sump, Allo Fiber

# Scheduled Maintenance and Information

240V/3/60A Service  Connected HP-6.0

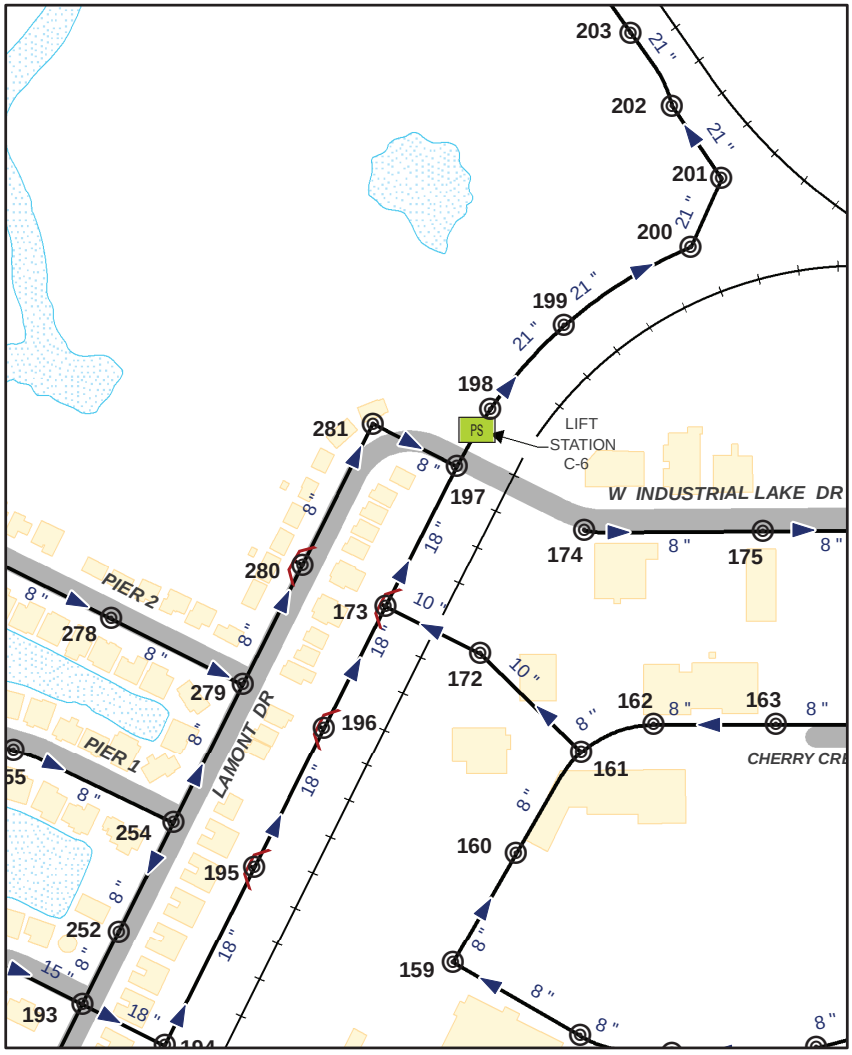
RWPS-C501 / Raw Wastewater Submersible Pump  3.0 HP 150 GPM @ 15' TDH
Flygt-CP-3085.092-0007U
Volts / Amps- [240]/480-[8.7]/4.4

RWPS-C502 / Raw Wastewater Submersible Pump 3.0 HP 150 HP @ 15'
Flygt-CP-3085.092-0475
Volts / Amps- [240]/480-[8.7]/4.4

Station monitored by Allo Fiber.

| **C05** | **Scheduled Maintenance Tasks** | |
|---|---|---|
| MCC-C501 | Motor Control Center | MCC-C501 / ANNUAL PANEL CLEANING |
| PLC-C501 | PLC Cabinet at C05 | PLC-C501 / ANNUAL PANEL CLEANING |
| PLC-C501 | PLC Cabinet at C05 | PLC-C501 / QUARTERLY TELEMETERING ALARM VARIFICATION |
| RWPS-C501 | Raw Wastewater Submersible Pump | RWPS-C502 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| RWPS-C502 | Raw Wastewater Submersible Pump | RWPS-C502 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| C-5 | Sanitary Lift Station (1721 Surfside) | C-5 / REMOVE DEBRIS & GRIT BUILDUP IN STATION WETWELL |
| C-5 | Sanitary Lift Station (1721 Surfside) | LIFT STATION SYSTEM ROUNDS/WEEKLY INSPECTION |
| C-5 | Sanitary Lift Station (1721 Surfside) | WEEKLY BUILDING & EQUIPMENT INSPECTION |

# Map Location for Lift Station C-6
# 550 West Industrial Lake Drive

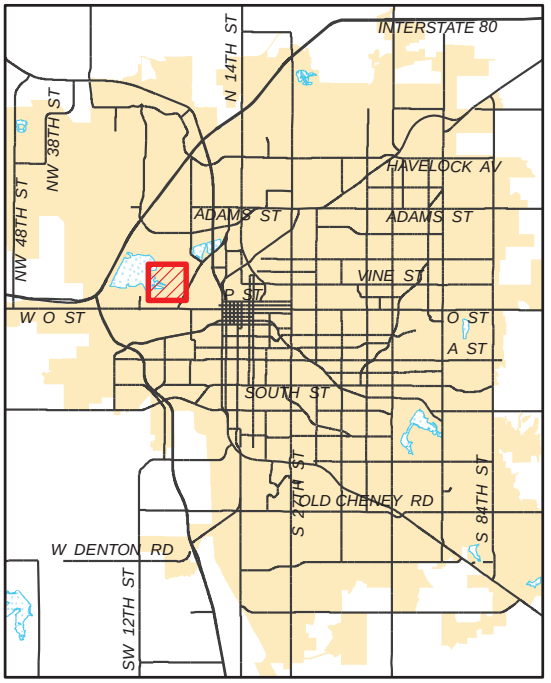




CITY OF LINCOLN NEBRASKA

## *Aerial*


## *Overview Map*



# Information Fact Sheet for Lift Station C-6
# Location: 550 West Industrial Lake Drive

**Description:** Lift Station C-6 was constructed in 1978 and is located on the east side of Capital Beach Lake on West Industrial Lake Drive. The station is equipped with a separate drywell accommodating 2 dry pit submersible pumps. Standby generation is also provided. Lift Stations C-2, C-3, C-4, and C-5 are all located in a sequential manner around Capital Beach upstream of Lift Station C-6. The 8" forcemain from Station C-6, in turn, pumps directly to Lift Station C-7. The wastewater pumps were replaced in 2024. The wetwell is equipped with a mixer. Electrical and PLC panel were replaced in 2024. New entry door installed in 2025.

**Deficiencies:** The main priority at the present time is to repair exterior deficiencies in the lift station structure such as masonry, exposed metals. There have been a few complaints associated with generator noise when in operation. Currently C-6 is in design for an electrical upgrade replacing all electrical panels, wiring and PLC cabinets.

**Drainage Basin:** Oak Creek
**Current Service Area:** 300 acres
**Avg Daily Flow gpm/cfs/acre:** Not available
**Peak Flow gpm/cfs/acre :** Not available
**Configuration:** Wetwell/Drywell
**Equipment:**

| EquipId | Manufacturer/Description | Rated Capacity | HP/Volts/Amps |
|---|---|---|---|
| RWP-C601 | Flygt Model CT 3102.180 | 350 gpm, 18 TDH | 3.4/460/5 |
| RWP-C602 | Flygt Model CT 3102.180 | 350 gpm, 18 TDH | 3.4/460/5 |
| AHU-C601 | Air Handling Unit | | |
| AHU-C602 | Air Handling Unit | | |
| APG-C601 | Auxiliary Power Generator | 105KW/131KVA | 480/3 |
| ETS-1 | Electric Transfer Switch | | |
| FS-1 | Fuel Storage Tank (diesel) | 150 gal | |
| HWH-1C | Water Heater | | |
| LC-6 | Level Controller | | |
| MCC-C601 | Motor Control Center | | |
| MXR-C601 | Mechanical Mixer (MM-1C) | | |
| PPMS-1 | Power Panel Metering Station | | |
| SG-5 | Electrical Switch Gear | | |
| SUP-C601 | Sump Pump | | |
| UH-C601 | Unit Heater | | |

**Standby Power:** Yes, EquipID APG-C601, 50KW, Olympian Model: 95A047675S, Caterpillar Diesel, Fuel Tank 200 gal.
**Remote Monitoring:** Yes, Power Off, Pump Overload, High Level, High Sump, Alternate Power, Allo Fiber
**Planned Capital Improvements**: No improvements planned at the present time.

## Scheduled Maintenance and Information

480V/3/225A Service Connected HP-6.8

RWP-C601 / Raw Wastewater Pump 3.4 HP HP 350 @ 18' TDH
Flygt-NT-3102.181.0202
Volts / Amps- 240/[480]-10/[5]

RWP-C602 / Raw Wastewater Pump 3.7 HP HP 350 @ 18' TDH
Flygt-NT-3102.181-1725
Volts / Amps- 240/[480]-10/[5]

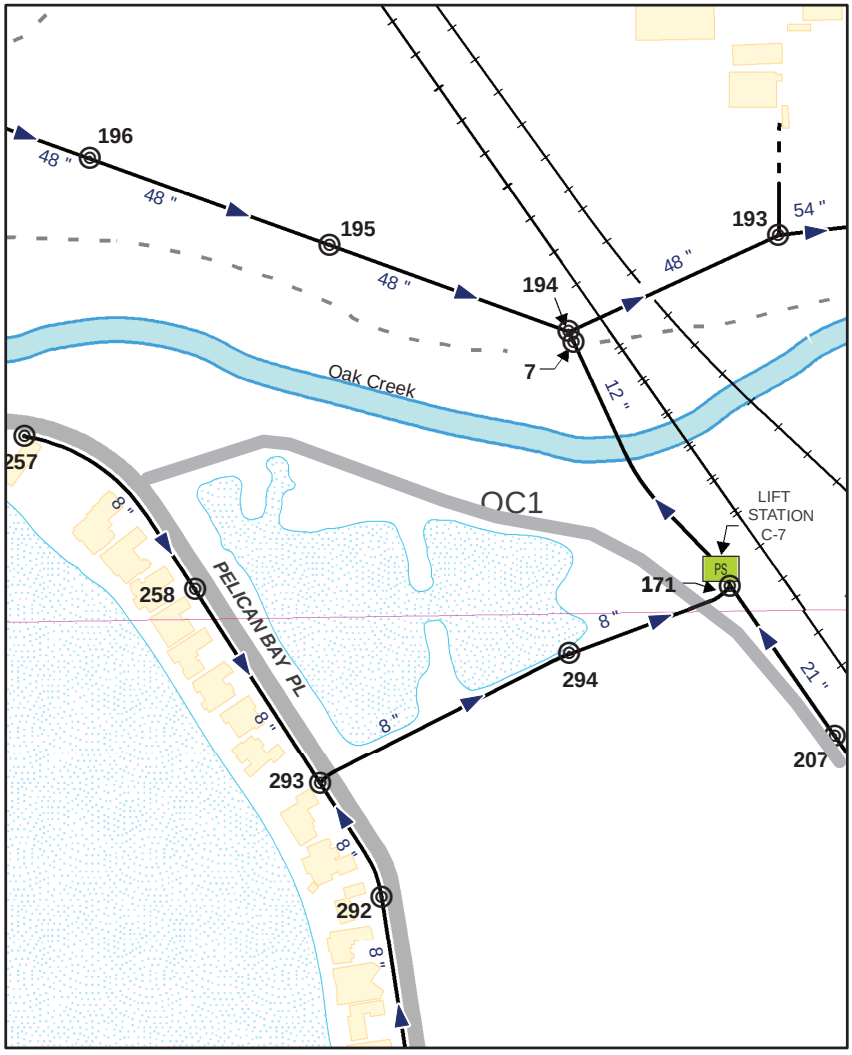
Station monitored by Allo Fiber.

# Auxiliary Power Generator

APG-C601 Olympian/Caterpillar D40P3 40 kW .8PF / 62.5kVA/[50]kVA / 277/[480]
Fuel – Diesel Fuel @ 3.8 Gal./Hr. Tank Capacity – 300Gal. / 79 Hrs.

| **C06** | **Scheduled Maintenance Tasks** | |
|---|---|---|
| APG-C601 | Auxiliary Power Generator | APG-C601 / ANNUAL PANEL CLEANING |
| MCC-C601 | Motor Control Center | MCC-C601 / ANNUAL PANEL CLEANING |
| PLC-C601 | PLC Cabinet at C07 | PLC-C601 / ANNUAL PANEL CLEANING |
| PLC-C601 | PLC Cabinet at C07 | PLC-C601 / QUARTERLY TELEMETERING ALARM VERIFICATION |
| APG-C601 | Auxiliary Power Generator | APG-C601 / ANNUAL ENGINE MAINTENANCE |
| AHU-C601 | Air Handling Unit | AHU-C601 / MONTHLY VENTILATOR MAINTENANCE |
| AHU-C602 | Air Handling Unit | AHU-C602 / MONTHLY VENTILATOR MAINTENANCE |
| UH-C601 | Unit Heater | UH-C601 / ANNUAL HEATER START UP |
| LC-C601 | Level Controller | LC-C601 / MONTHLY BLOW DOWN & MAINTENANCE |
| RWP-C601 | Raw Wastewater Pump (RWP-3C) | RWP-C601 / SEMI-ANNUAL PUMP INSPECTION & MAINTENANCE |
| RWP-C601 | Raw Wastewater Pump (RWP-3C) | RWP-601 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| RWP-C602 | Raw Wastewater Pump | RWP-C601 / SEMI-ANNUAL PUMP INSPECTION & MAINTENANCE |
| RWP-C602 | Raw Wastewater Pump | RWP-601 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| SUP-C601 | Sump Pump | SUP-C601 / ANNUAL SUMP PUMP MAINTENANCE/OIL CHANGE |
| SUPP-C601 | Sump Pump Pit | SUPP-C601 / QUARTERLY PUMP & PIT INSPECTION |
| C-6A | Sanitary Lift Station (550 W. Industrial) | C-6A / REMOVE DEBRIS & GRIT BUILDUP IN STATION WETWELL |
| C-6 | Sanitary Lift Station (550 W. Industrial) | C-6 / STRUCTURE ROOF INSPECTION |
| C-6 | Sanitary Lift Station (550 W. Industrial) | LIFT STATION SYSTEM ROUNDS/WEEKLY INSPECTION |
| C-6 | Sanitary Lift Station (550 W. Industrial) | WEEKLY BUILDING & EQUIPMENT INSPECTION |
| FST-C601 | Fuel Storage Tank (Diesel) | FST-C601 / DIESEL FUEL TANK INSPECTION & MAINTENANCE |

# Map Location for Lift Station C-7
# 1598 East Lakeshore Drive





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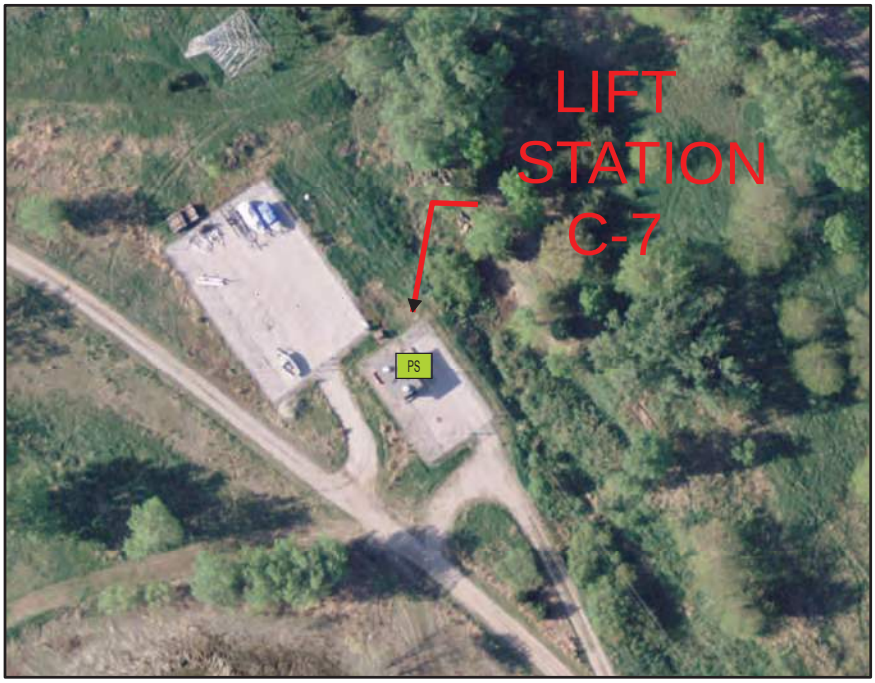
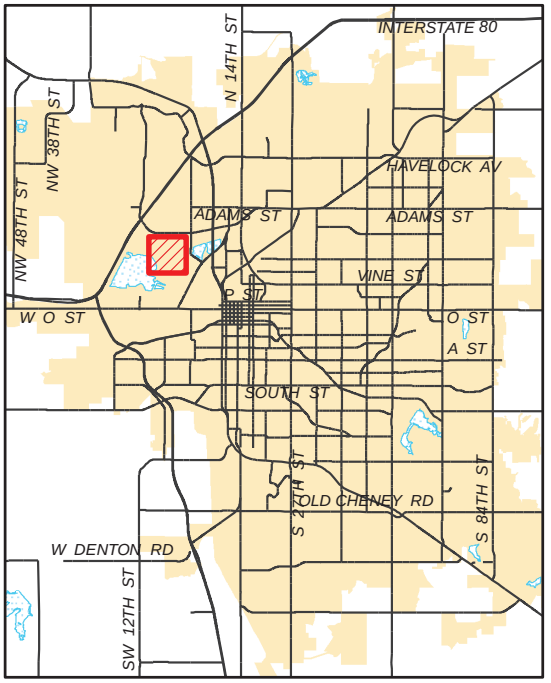
## *Aerial*




## *Overview Map*



# Information Fact Sheet for Lift Station C-7
# Location: 1598 East Lakeshore Drive

**Description:** Lift Station C-7 (C-6 is an identical design) was built in the early 70's. Lift Station C-6 pumps directly to lift station C-7 which in turn pumps all flows across Oak Creek to the interceptor. This station is a duplex station with separate drywell and wetwell housing 2 dry pit submersible pumps rated at 350 gpm each. Standby power (50 KW) is provided at this station. Electrical & PLC panels were replaced in 2024. A new entry door was installed in 2025. The existing mechanical mixer was replaced with a titus diffused air system.

**Deficiencies:** The lift station is in good condition and performing satisfactorily. The wetwell was provided with a dividing wall. This dividing wall essentially reduces the operating volume of the lift station. It is recommended that this dividing wall be removed. There has been some concern about vagrants who camp or sleep outdoors near the station and possible vandalism that could occur.

**Drainage Basin:** Oak Creek
**Current Service Area:** 300 acres
**Avg Daily Flow gpm/cfs/acre:** Not available
**Configuration:** Wetwell/Drywell
**Equipment:**

| EquipId | Manufacturer/Description | Rated Capacity | HP/Volts/Amps |
|---|---|---|---|
| RWP-C701 | Flygt Model CT 3102.180 | 350 gpm, 18 TDH | 6.8/460/5 |
| RWP-C702 | Flygt Model CT 3102.180 | 350 gpm, 18 TDH | 6.8/460/5 |
| AHU-C701 | Air Handling Unit (wetwell) | | |
| AHU-C702 | Air Handling Unit | | |
| APG-C701 | Auxiliary Power Generator | 50kw (62.5KVA) | |
| ETS-2 | Electric Transfer Switch | | |
| FS-2 | Fuel Storage Tank | 300 gal. (diesel) | |
| HWH-2C | Hot Water Heater | | |
| LC-7 | Level Controller | | |
| MCC-C701 | Motor Control Center | | |
| MXR-C0702 | Air Diffused Mixer | | |
| PPMS-2 | Power Panel Metering Station | | |
| SG-6 | Electrical Switch Gear | | |
| SUP-C701 | Sump Pump | | |
| TF-C701 | Tube Fan | | |
| UH-C701 | Unit Heater | | |
| UH-C702 | Heating Ventilating Unit | | |

**Standby Power:** Yes, EquipID APG-C701, 50KW, Olympian Model: D40P-40kw/50kw, Caterpillar Diesel, Fuel Tank 300 gal.
**Remote Monitoring:** Yes, Power Off, Pump Overload, High Level, High Sump, Alternate Power, Allo Fiber
**Planned Capital Improvements**: No capital improvements are currently planned.

## Scheduled Maintenance and Information

480V/3/225A Service Connected HP-13.6

RWP-C701 / Raw Wastewater Pump 3.7 HP HP 350 @ 18' TDH
Flygt-NT-3102.181-1725
Volts / Amps- 240/[480]-10/[5]

RWP-C702 / Raw Wastewater Pump 3.4 HP HP 350 @ 18' TDH
Flygt-NT-3102.181
Volts / Amps- 240/[480]-10/[5]

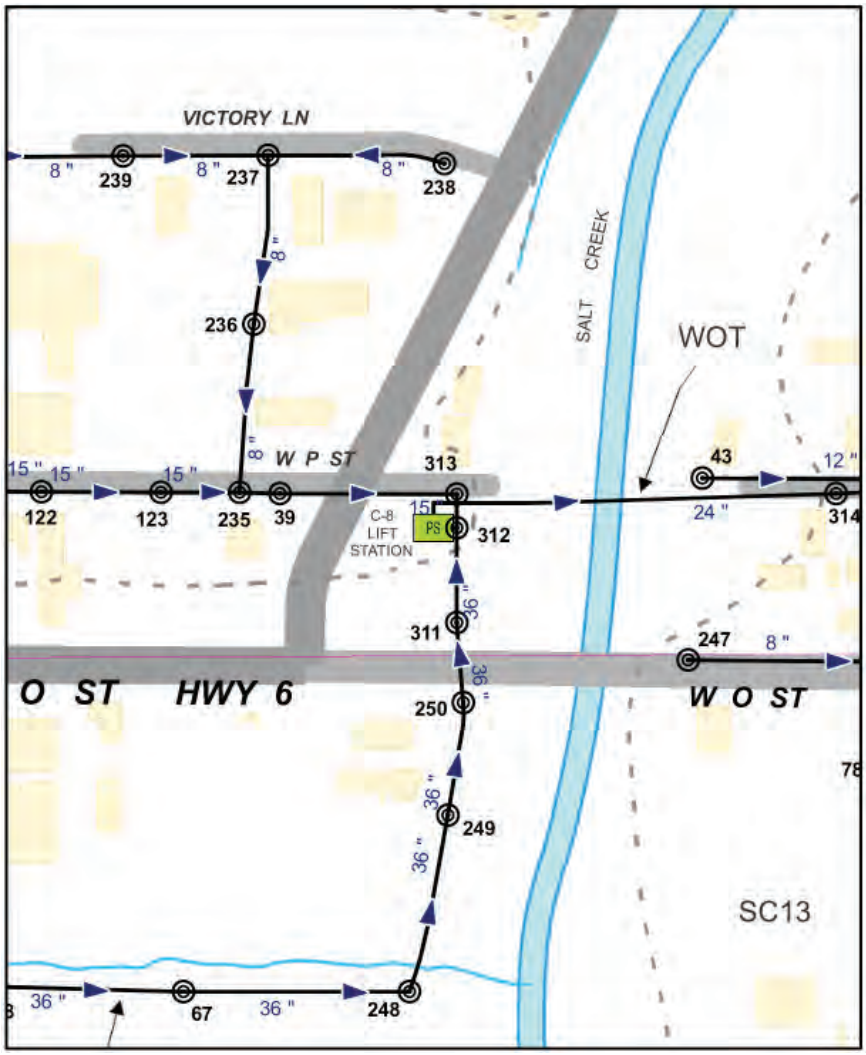
Station monitored by Allo Fiber.

# Auxiliary Power Generator

APG-C701 Olympian/Caterpillar D40P3 40 kW .8PF / 62.5kVA/[50]kVA / 277/[480]
Fuel – Diesel Fuel @ 3.8 Gal./Hr. Tank Capacity – 300Gal. / 79 Hrs.

| **C07** | **Scheduled Maintenance Tasks** | |
|---|---|---|
| APG-C701 | Auxiliary Power Generator | APG-C701 / ANNUAL PANEL CLEANING |
| MCC-C701 | Motor Control Center | MCC-C701 / ANNUAL PANEL CLEANING |
| PLC-C701 | PLC Cabinet at C07 | PLC-C701 / ANNUAL PANEL CLEANING |
| PLC-C701 | PLC Cabinet at C07 | PLC-C701 / QUARTERLY TELEMETERING ALARM VERIFICATION |
| APG-C701 | Auxiliary Power Generator | APG-C701 / ANNUAL ENGINE MAINTENANCE |
| AHU-C701 | Air Handling Unit | AHU-C701 / MONTHLY VENTILATOR MAINTENANCE |
| AHU-C702 | Air Handling Unit | AHU-C701 / MONTHLY VENTILATOR MAINTENANCE |
| UH-C702 | Heating Ventilating Unit | UH-C701 / ANNUAL HEATER START UP |
| UH-C702 | Heating Ventilating Unit | UH-C702 / ANNUAL HEATER START UP |
| LC-C701 | Level Controller | LC-C701 / MONTHLY BLOW DOWN & MAINTENANCE |
| MXR-C701 | Mechanical Mixer (MM-2C) | MXR-C701 / SEMI-ANNUAL MIXER MAINTENANCE |
| RWP-C701 | Raw Wastewater Pump | RWP-C701 / SEMI-ANNUAL PUMP INSPECTION & MAINTENANCE |
| RWP-C701 | Raw Wastewater Pump | RWP-C701 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| RWP-C702 | Raw Wastewater Pump (RWP-6C) | RWP-C702 / SEMI-ANNUAL PUMP INSPECTION & MAINTENANCE |
| RWP-C702 | Raw Wastewater Pump (RWP-6C) | RWP-C702 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| SUP-C701 | Sump Pump | SUP-C701 / ANNUAL SUMP PUMP MAINTENANCE/OIL CHANGE |
| SUPP-C701 | Sump Pump Pit | SUPP-C701 / QUARTERLY PUMP & PIT INSPECTION |
| C-7A | Station Wetwell | C-7A / REMOVE DEBRIS & GRIT BUILDUP IN STATION WETWELL |
| C-7 | Sanitary Lift Station (1598 E. Lakeshore) | C-7A / STRUCTURE ROOF INSPECTION |
| C-7 | Sanitary Lift Station (1598 E. Lakeshore) | LIFT STATION SYSTEM ROUNDS/WEEKLY INSPECTION |
| C-7 | Sanitary Lift Station (1598 E. Lakeshore) | WEEKLY BUILDING & EQUIPMENT INPSECTION |
| FST-C701 | Fuel Storage Tank (Diesel) | FST-C701 / DIESEL FUEL TANK INSPECTION & MAINTENANCE |

# Map Location for Lift Station C-8
# Sun Valley Blvd & West P Street





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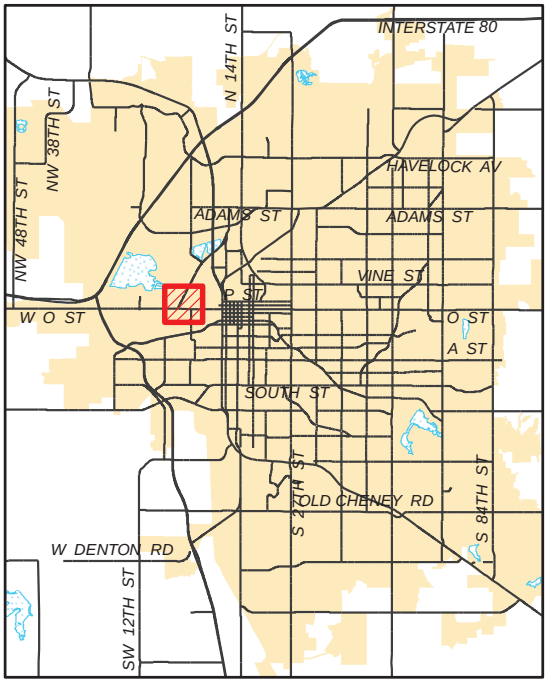
## *Aerial*


## *Overview Map*



# Information Fact Sheet for Lift Station C-8
# Location: Sun Valley Blvd & West "P" Street


**Description:** Lift Station C-8 was built in 2015 and is located west of Salt Creek, just north of west "O" Street. It serves the West "O" street and Burlington Northern Railroad Yards. In 199x, the 8" discharge force main across Salt Creek was reconstructed due to corrosion of the original pipe. A standby power generator was installed in 2015. In 2024, the tanks and pumps were replaced. A new grinder was installed in 2024. A titus diffused air mixing system will be installed in October 2025.

**Deficiencies:** The lift station reliable and in good condition, one drawback is ferros chloride is dumped directly in the wet well at this site and can cause corrosion on the submersible pumps.

**Drainage Basin:** West "O" Street
**Current Service Area:** 1,042 acres
**Avg Daily Flow gpm/cfs/acre:** 264 gpm, 0.00132 cfs/acre
**Peak Flow gpm/cfs/acre :** 944 gpm, 0.00472 cfs/acre
**Configuration:** Wetwell/Drywell
**Equipment:**

| EquipId | Manufacturer/Description | Rated Capacity | HP/Volts/Amps |
|---|---|---|---|
| RWPS-C0802 | Flygt 3202.095 | 2670 gpm, 35 TDH | 35/480/42 |
| RWPS-C0803 | Flygt 3202.095 | 2670 gpm, 35 TDH | 35/480/42 |
| APG-C801 | Auxiliary Power Unit | 100KW/125KVA | 240V |
| LC-8 | Level Controller | | |
| MCC-C801 | Motor Control Center | | |
| MCC-C802 | Motor Control Center | | |
| PV-2 | Power Ventilator | | |
| SG-7 | Electrical Switch Gear | | |
| SUP-C801 | Sump Pump | | |
| MXR-0801 | Air Diffused Mixer | | |
| GNDR-CO801-GR | Channel Monster Grinder | 1725 rpm | 460V |
| UH-C801 | Unit Heater | | |

**Standby Power:** Yes, EquipID APG-C801, 100 KW, Cummins/Onan 100ENBA Generator Set, Natural Gas, fuel rate 1,482 CF/Hr.

**Remote Monitoring:** Yes, Power Off, Pump Overload, High Level, High Sump, Alternate Power, Allo Fiber

**Planned Capital Improvements**: There is some discussion and planning efforts to consider construction of a new lift station which would serve both the Middle Creek and West "O" Street drainage basins. The project is identified in the Capital Improvements Program in later years. As the service area in west Lincoln increases, it may be more economical to serve this area with one larger station. This would be in what is now the Burlington RR Yards.

# Scheduled Maintenance and Information

240V/3/200A Service  Connected HP-70

RWP-C0801 / Raw Wastewater Pump  35 HP 2670 GPM @ 35' TDH
Flygt 3202.095
Volts / Amps- 480V/3PH/42A

RWP-C0802 / Raw Wastewater Pump  35 HP 2670 GPM @ 35' TDH
Flygt 3202.095
Volts / Amps- 480V/3PH/42A

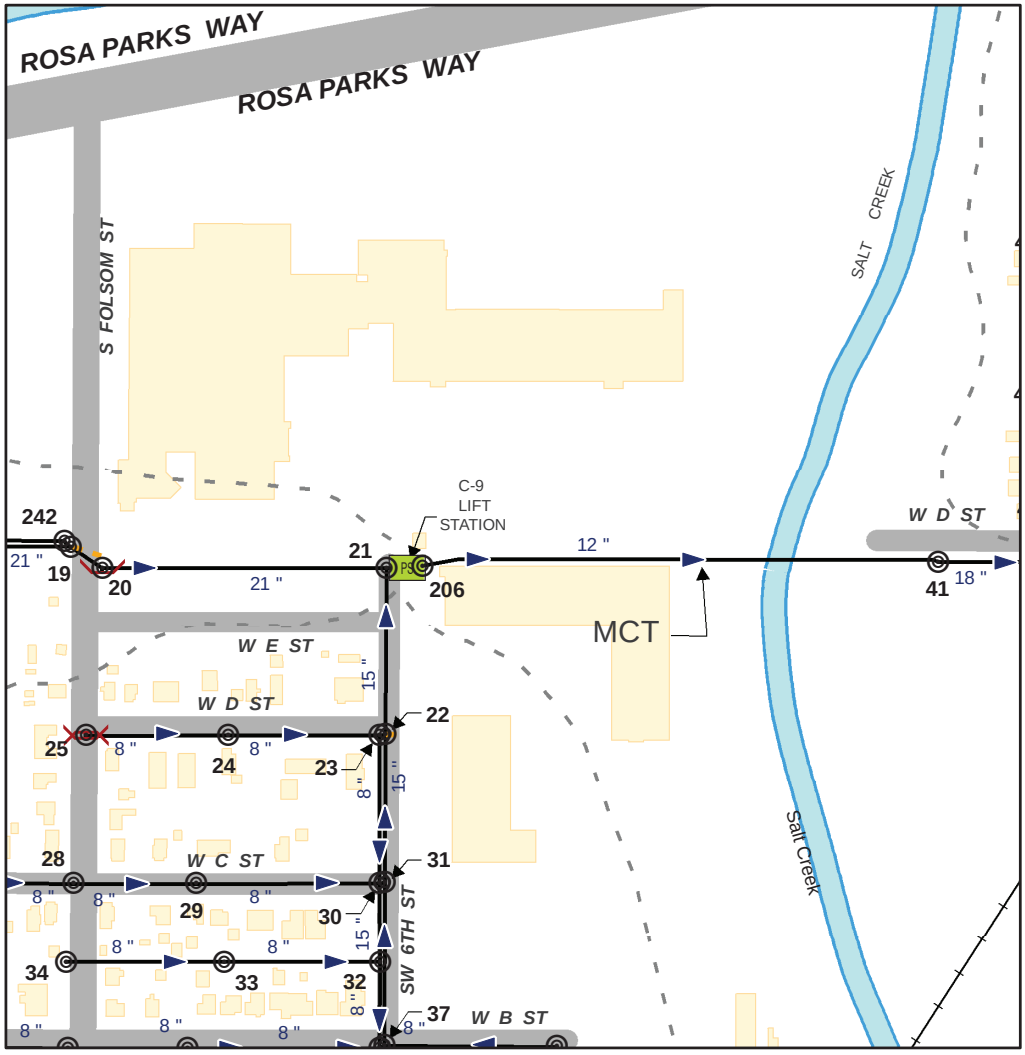
Station monitored by Allo Fiber.

## Auxiliary Power Generator

APG-C801  Olympian/Oman 100ENBA  100 kW .8PF /125kVA/[100]kVA / 120/[240]
Fuel – Natural Gas @ 1482 CuFt./Hr.  Tank Capacity

| C08 | Scheduled Maintenance Tasks | |
|---|---|---|
| APG-C801 | Auxiliary Power Generator | APG-C801 / ANNUAL PANEL CLEANING |
| MCC-C801 | Motor Control Center | MCC-C801 / ANNUAL PANEL CLEANING |
| MCC-C802 | Motor Control Center | MCC-C802 / ANNUAL PANEL CLEANING |
| PLC-C801 | PLC Cabinet at C08 | PLC-C801 / ANNUAL PANEL CLEANING |
| PLC-C801 | PLC Cabinet at C08 | PLC-C801 / QUARTERLY TELEMETERING ALARM VERIFICATION |
| APG-C801 | Auxiliary Power Generator | APG-C801 / ANNUAL ENGINE MAINTENANCE |
| PV-C801 | Power Ventilator | PV-C801 / MONTHLY VENTILATOR MAINTENANCE |
| UH-C801 | Unit Heater (E) | UH-C801 / ANNUAL HEATER START UP |
| LC-C801 | Level Controller | LC-C801 / MONTHLY BLOW DOWN & MAINTENANCE |
| RWP-C801MO | Raw Wastewater Pump Motor | RWP-C801MO / ANNUAL MOTOR INSPECTION AND LUBE |
| RWP-C802MO | Raw Wastewater Pump Motor | RWP-C802MO / ANNUAL MOTOR INSPECTION AND LUBE |
| RWP-C801 | Raw Wastewater Pump (RWP-7C) | RWP-C801 / SEMI-ANNUAL PUMP INSPECTION & MAINTENANCE |
| RWP-C801 | Raw Wastewater Pump (RWP-7C) | RWP-C801 / ANNUAL PUMP IMPELLER CHECK & INSPECTION |
| RWP-C802 | Raw Wastewater Pump (RWP-8C) | RWP-C802 / SEMI-ANNUAL PUMP INSPECTION & MAINTENANCE |
| RWP-C802 | Raw Wastewater Pump (RWP-8C) | RWP-C802 / ANNUAL PUMP IMPELLER CHECK & INSPECTION |
| SUP-C801 | Sump Pump | SUP-C801 / ANNUAL SUMP PUMP MAINTENANCE/OIL CHANGE |
| SUPP-C801 | Sump Pump Pit | SUPP-C801 / QUARTERLY PUMP & PIT INSPECTION |
| C-8A | Station Wetwell | C-8A / REMOVE DEBRIS & GRIT BUILDUP IN STATION WETWELL |
| C-8 | Sanitary Lift Station (W.P.& Salt Creek) | C-8 / STRUCTURE ROOF INSPECTION |
| C-8 | Sanitary Lift Station (W.P.& Salt Creek) | LIFT STATION SYSTEM ROUNDS/WEEKLY INSPECTION |
| C-8 | Sanitary Lift Station (W.P.& Salt Creek) | WEEKLY BUILDING & EQUIPMENT INSPECTION |

# Map Location for Lift Station C-9
# West E Street & SW 6th Street

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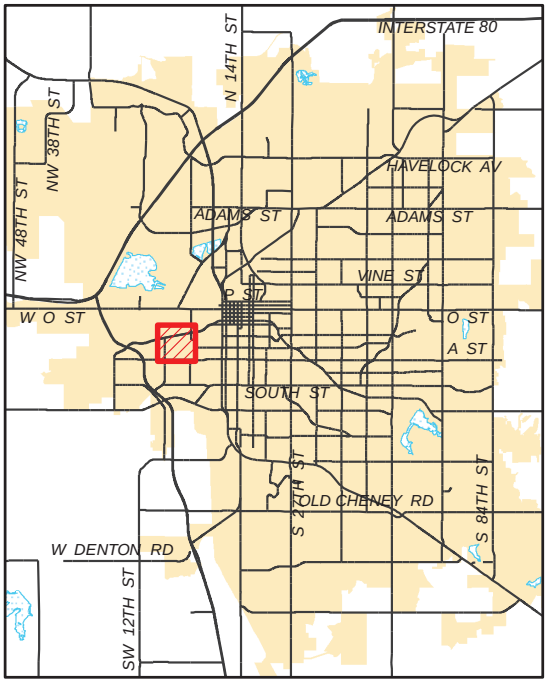
## *Aerial*


## *Overview Map*



# Information Fact Sheet for Lift Station C-9
# Location: West "E" Street & SW 6th Street

**Description:** Lift Station C-9 was built in 1964 and is located on the west bank of Salt Creek. The station went through a renovation in 2014 and the drywell ws converted into the wetwell with three new 45HP flygt model NP3202 submersible pumps. Much of the discharge piping in the drywell has been replaced with reinforced fiberglass pipe. The HVAC system, electrical control wiring, and valves have also been replaced. The original 150 KW standby diesel driven generator housed interior to the building has been replaced with a 200 KW outdoor unit in 2014. The 12" discharge force main (approx. 1100 L.F.) which crosses Salt Creek, was reconstructed in 1997 using HDPE pipe material. Mechanically, the station is in good condition. Two (2) VFDs were replaced in 2025. One (1) pump was rebuilt in 2025.

**Deficiencies:** The predominant operating problem has been clogging of the suction piping on the pumps. The plugging problems have been attributed to excessive debris discharged into the collection system from the NE. State Correctional Center on West Pioneers Ave. To help prevent pump plugging from debris, a grinder system is scheduled to be installed later this year (2006). This project also involved restoration of concrete walls (hydrogen sulfide corrosion) in the station wetwell.

**Drainage Basin:** Middle Creek
**Current Service Area:** 1,389 acres
**Avg Daily Flow gpm/cfs/acre:** 646 gpm, 0.00119 cfs/acre
**Peak Flow gpm/cfs/acre :** 3,229 gpm, 0.00594 cfs/acre
**Configuration:** Wetwell/Drywell
**Equipment:**

| EquipId | Manufacturer/Description | Rated Capacity | HP/Volts/Amps |
|---|---|---|---|
| RWP-C0901 | Flygt Model NP 3202.095 | 2100 gpm, 28 TDH | 45/480/55 |
| RWP-C0902 | Flygt Model NP 3202.095 | 2100 gpm, 28 TDH | 45/480/55 |
| RWP-C0903 | Flygt Model NP 3202.095 | 2100 gpm, 28 TDH | 45/480/55 |
| AC-C901 | Air Compressor Unir | | |
| APG-CO901 | Cummings DSGAE 1410506 | 200KW/200KVA | 480V/3PH/400A |
| ARV-C901 | Air Relief Valve | | |
| CHKV-C901 | Check Valve | | |
| CHKV-C902 | Check Valve | | |
| CHKV-C903 | Check Valve | | |
| FIT-C901 | Flow Meter | | |
| ETS-3 | Electric Transfer Switch | | |
| FS-3 | Fuel Storage Tank (diesel) | 415 gal./28.0GPH | |
| GDR-C901 | Grinder | | |
| LC-9 | Level Controller | | |
| MCC-C901 | Motor Control Center | | |
| PRV-1C | Power Roof Ventilator | | |
| PRV-2C | Power Roof Ventilator | | |
| SG-8 | Electrical Switch Gear | | |
| SUP-C901 | Sump Pump | | |
| UH-C901 | Unit Heater (E) | | |

**Standby Power:** Yes, EquipID APG-CO901, 200KW, Cummings Model DSGAE 1410506 Diesel, Fuel Tank 415 gal.

**Remote Monitoring:** Yes, Power Off, Pump Overload, High Level, High Sump, Alternate Power, Low Flow, Allo Fiber

**Planned Capital Improvements**: There is some discussion and planning efforts to consider construction of a new lift station which would serve both the Middle Creek and West "O" Street drainage basins. The project is identified in our Capital Improvements Program in later years. As the service area in west Lincoln increases, it may be more economical to serve this area with one larger station. This would be in what is now the Burlington RR Yards.

## Scheduled Maintenance and Information

RWP-C0901 / Raw Wastewater Pump 45 HP 2100 @ 28' TDH
Flygt-NP 3202.095
Volts /PH/Amps- 480/3/55

RWP-C0902 / Raw Wastewater Pump 45 HP 2100 @ 28' TDH
Flygt -NP 3202.095
Volts /PH/Amps- 480/3/55

RWP-C0903 / Raw Wastewater Pump 45 HP 2100 @ 28' TDH
Flygt – NP 3202.095
Volts/PH/Amps- 480/3/55

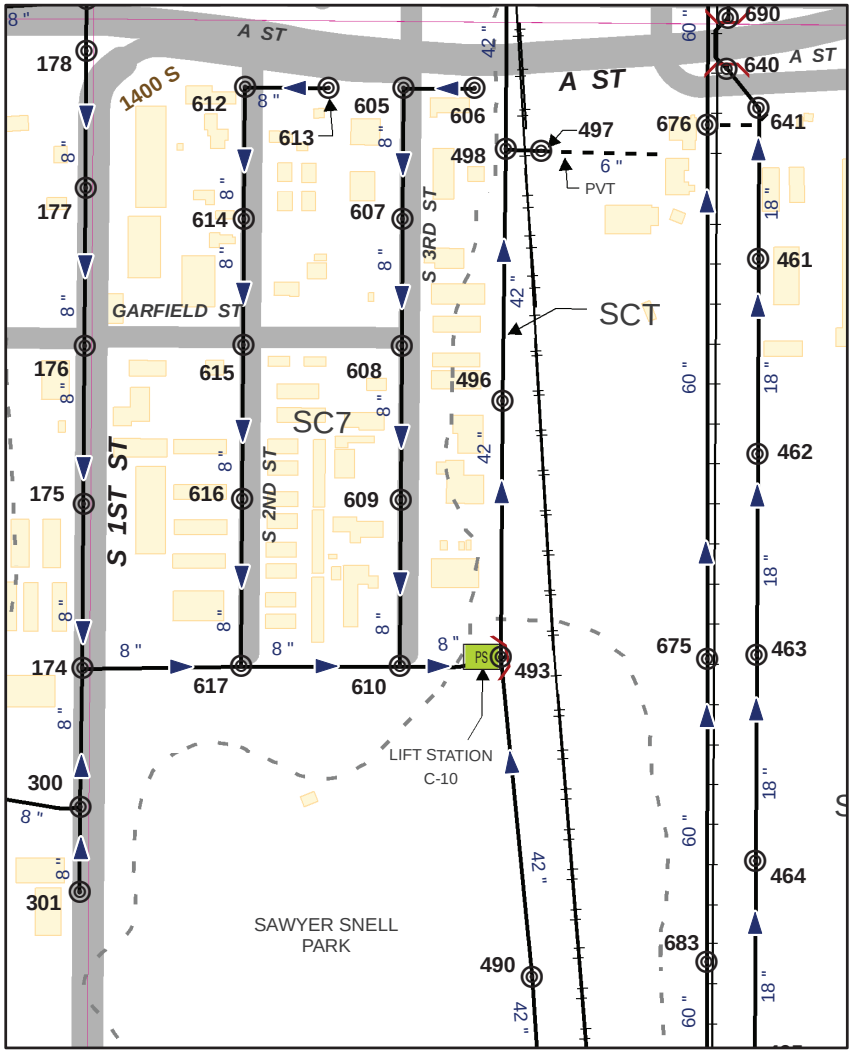
Station monitored by Allo Fiber.

# Auxiliary Power Generator

APG-C901 Cummings DSGAE 1410506 200 kW 480V 3PH
Fuel – Diesel Fuel @ 28 Gal./Hr. Tank Capacity – 415Gal. / 28/ Hrs.

| C09 | Scheduled Maintenance Tasks | |
|---|---|---|
| APG-C0901-EG | 2-YEAR_Engine maintenance & load test | 2-YEAR_Engine maintenance & load test |
| APG-C0901-EG | 6-MONTH_Engine maintenance | 6-MONTH_Engine maintenance |
| APG-C0901-EG | 5-YEAR_Fuel injector & turbo inspection | 5-YEAR_Fuel injector & turbo inspection |
| APG-C0901-EG | WEEKLY_Clean & inspection | WEEKLY_Clean & inspection |
| APG-C0901-EG | YEARLY_Engine maintenance | YEARLY_Engine maintenance |
| APG-C0901-EG | 3-YEAR_Battery replacement | 3-YEAR_Battery replacement |
| APG-C0901-GN | YEARLY_Alternator maintenance | YEARLY_Alternator maintenance |
| APG-C0901-GN | YEARLY_Panel cleaning | YEARLY_Panel cleaning |
| ARV-C0901-VA | 6-MONTH_Clean & inspection | 6-MONTH_Clean & inspection |
| ARV-C0902-VA | 6-MONTH_Clean & inspection | 6-MONTH_Clean & inspection |
| ARV-C0903-VA | 6-MONTH_Clean & inspection | 6-MONTH_Clean & inspection |
| ARV-C0904-VA | 6-MONTH_Clean & inspection | 6-MONTH_Clean & inspection |
| ETS-C0901-EL | YEARLY_Switch maintenance | YEARLY_Switch maintenance |
| FIT-C0901-IN | YEARLY_Lift station flow meter calibration | YEARLY_Lift station flow meter calibration |
| FST-C0901-TA | 6-MONTH_Diesel fuel tank inspection & maintenance | 6-MONTH_Diesel fuel tank inspection & maintenance |
| GNDR-C0901-CP | YEARLY_Panel cleaning | YEARLY_Panel cleaning |
| GNDR-C0901-GR | 3-MONTH_Maintenance | 3-MONTH_Maintenance |
| HVAC-C0901-HV | 2-MONTH_Filter Change and Inspection | 2-MONTH_Filter Change and Inspection |
| LC-C0901-IN | YEARLY_ Probe and Tube Cleaning | Yearly_ Probe and Tube Cleaning |
| MCC-C0901-MC | YEARLY_Panel cleaning | YEARLY_Panel cleaning |
| PLC-C0901-SD | YEARLY_PLC cleaning & maintenance | YEARLY_PLC cleaning & maintenance |
| PLC-C0901-SD | 3-MONTH_Telemetering alarm varification | 3-MONTH_Telemetering alarm varification |
| ROOF-C0901-RF | YEARLY_Structure roof inspection | YEARLY_Structure roof inspection |
| RWPS-C0901-PU | YEARLY_Submersible pump maintenance | YEARLY_Submersible pump maintenance |
| RWPS-C0902-PU | YEARLY_Submersible pump maintenance | YEARLY_Submersible pump maintenance |
| RWPS-C0903-PU | YEARLY_Submersible pump maintenance | YEARLY_Submersible pump maintenance |
| SUP-C0901-PU | YEARLY_Sump pump maintenance & oil change | YEARLY_Sump pump maintenance & oil change |
| SUPP-C0901-MI | 3-MONTH_Pump & pit inspection | 3-MONTH_Pump & pit inspection |
| UPS-C0901-EL | 2-YEAR_Replace back-up batteries | 2-YEAR_Replace back-up batteries |
| UPS-C0901-EL | 2-YEAR_Replace back-up batteries | 2-YEAR_Replace back-up batteries |
| XFMR-C0901-EL | YEARLY_Cleaning & inspection | YEARLY_Cleaning & inspection |
| XFMR-C0902-EL | YEARLY_Cleaning & inspection | YEARLY_Cleaning & inspection |
| XFMR-C0903-EL | YEARLY_Cleaning & inspection | YEARLY_Cleaning & inspection |
| XFMR-C0904-EL | YEARLY_Cleaning & inspection | YEARLY_Cleaning & inspection |

# Map Location for Lift Station C-10
# S. 3rd & Rose Street





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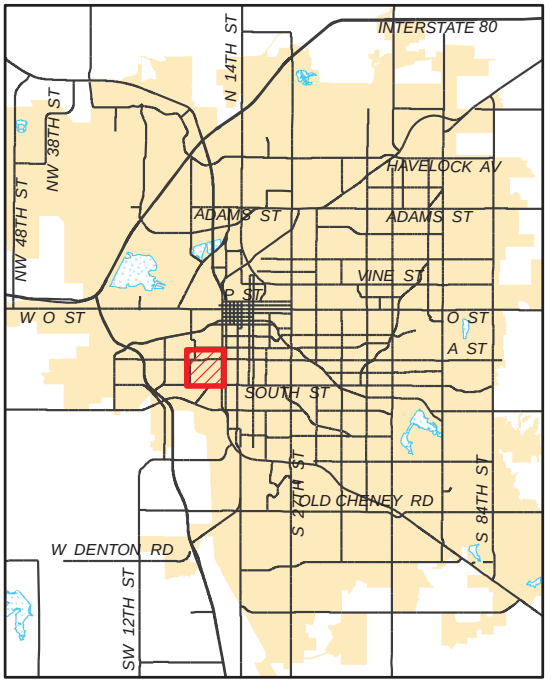
## *Aerial*


## *Overview Map*



# Information Fact Sheet for Lift Station C-10
# Location: 3rd & Rose Street


**Description:** Lift Station C-10 is a duplex pumping station located just south of 3rd & "A" Street and serves several square block areas of largely industrial/commercial buildings.

**Deficiencies:** Control Panel needs to be replaced in the upcoming year (2026).

**Drainage Basin:** Salt Creek
**Current Service Area:** 43 acres
**Avg Daily Flow gpm/cfs/acre:** Not available
**Peak Flow gpm/cfs/acre :** Not available
**Configuration:** Duplex
**Equipment:**

| EquipId | Manufacturer/Description | Rated Capacity | HP/Volts/Amps |
|---|---|---|---|
| RWPS-4C | Flygt Model CP-3085.180 | 170 gpm, 20 TDH | 3/230/9.6 |
| RWPS-5C | Flygt Model CP-3085.180 | 170 gpm, 20 TDH | 3/230/9.6 |
| MCC-C1001 | Motor Control Center | | |
| MTF-5 | Mercury Tilt Float Switch | | |
| SG-9 | Electrical Switch Gear | | |

**Standby Power:** No
**Remote Monitoring:** Yes, Power Off, Pump Overload, High Level, Seal Failure, Allo Fiber

# Scheduled Maintenance and Information

240V/3/20A Service  Connected HP-4.4

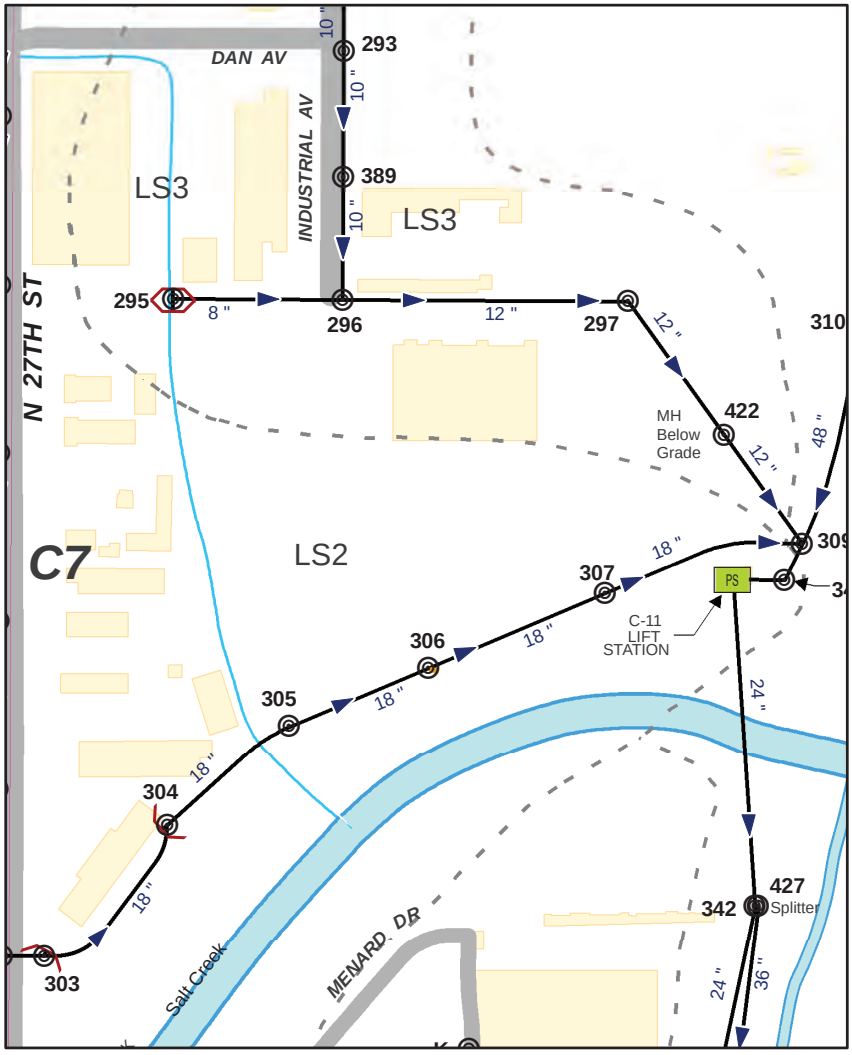
RWPS-C1001 / Raw Wastewater Submersible Pump 2.2 HP 170 GPM@ 20' TDH
Flygt-CP-3085.181
Volts / Amps- [240]/480-[9.6]/4.8

RWPS-C1002 / Raw Wastewater Submersible Pump 2.2 HP 170 GPM@ 20' TDH
Flygt-CP-3085.181
Volts / Amps- [240]/480-[9.6]/4.8

Station monitored by Allo Fiber.

| **C01** | **Scheduled Maintenance Tasks** | |
|---|---|---|
| MCC-C1001 | Motor Control Center | MCC-C1001 / ANNUAL PANEL CLEANING |
| PLC-C1001 | PLC Cabinet and PLC | PLC-C1001 / ANNUAL PLC CLEANING & MAINTENANCE |
| PLC-C1001 | PLC Cabinet at C10 | PLC-C1001 / QUARTERLY TELEMETERING ALARM VERIFICATION |
| LC-C1001 | Level Controller | LC-C1001 / MONTHLY BLOW DOWN & MAINTENANCE |
| RWPS-C1001 | Raw Wastewater Submersible Pump RWPS-4C | RWPS-C1001 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| RWPS-C1002 | Raw Wastewater Submersible Pump RWPS-5C | RWPS-C1002 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| C-10 | Sanitary Lift Station (3rd & Rose) | C-10 / REMOVE DEBRIS & GRIT BUILDUP IN STATION WETWELL |
| C-10 | Sanitary Lift Station (3rd & Rose) | LIFT STATION SYSTEM ROUNDS/WEEKLY INSPECTION |
| C-10 | Sanitary Lift Station (3rd & Rose) | WEEKLY BUILDING & EQUIPMENT INSPECTION |

# Map Location for Lift Station C-11
# 3700 N. 31st Street & Salt Creek





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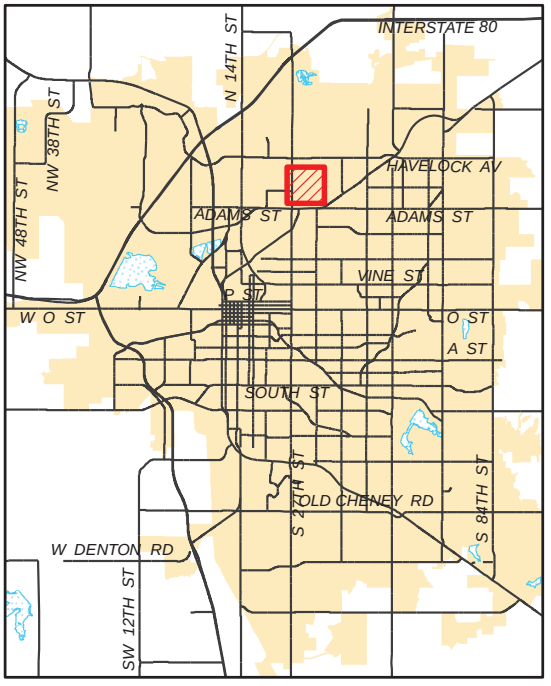
## *Aerial*


## *Overview Map*



# Information Fact Sheet for Lift Station C-11
# Location: 3700 North 31st Street & Salt Creek

**Description:** Lift station C-11 was constructed in 1997 and is the largest remote wastewater pumping station. The station has a separate drywell housing, 2 Flygt dry pit submersible pumps were installed in 2006 replacing the original pumps, there are provisions to add two additional pumps. Mechanically the station is in good condition. A 200-kw generator and automatic transfer switch were installed in 1997 for emergency standby power. A new flow metering structure and 36" outlet sanitary sewer has been constructed to accommodate increased flows and provide capacity for the future. The service area for this station is rapidly growing to the north and the potential for additional growth is high.

**Deficiencies:** The wetwell has experienced accumulation of grease and debris. A wetwell mixer needs to be installed soon.

**Drainage Basin:** Little Salt Creek
**Current Service Area:** 2,900 acres
**Avg Daily Flow gpm/cfs/acre:** gpm, 0.00119 cfs/acre
**Peak Flow gpm/cfs/acre :** gpm, 0.00594 cfs/acre
**Configuration:** Wetwell/Drywell
**Equipment:**

| EquipId | Manufacturer/Description | Rated Capacity | HP/Volts/Amps |
|---|---|---|---|
| RWP-C1101 | Flygt 3202.180 | 3000 gpm, 19 TDH | 60/480/72 |
| RWP-C1103 | Flygt 3202.180 | 3000 gpm, 19 TDH | 60/480/72 |
| AC-C1101 | Air Compressor Unit | | |
| AC-C1102 | Air Compressor Unit | | |
| APG-C1101 | Auxiliary Power Unit | 200KW/250KVA | 480V |
| AT-1C | Air Compressor Tank | | |
| ELT-1 | Emergency Line Transfer | | |
| ETS-4 | Electric Transfer Switch | | |
| FS-4 | Fuel Storage Tank (diesel) | 200 gal. | |
| HVU-C1101 | Heating Ventilating Unit | | |
| LC-11 | Level Controller | | |
| LSFM-C1101 | Flow Meter | | |
| LSTC-C1101 | Traveling Crane | | |
| MCC-C1101 | Motor Control Center | | |
| PRV-3C | Power Roof Ventilator | | |
| PRV-4C | Power Roof Ventilator | | |
| PRV-5C | Power Roof Ventilator | | |
| PRV-6C | Power Roof Ventilator | | |
| PRV-7C | Power Roof Ventilator | | |
| SG-C1101 | Sluice Gate | | |
| SG-C1102 | Sluice Gate | | |
| SWGR-C1101 | Electrical Switch Gear | | |
| SUP-C1101 | Sump Pump | | |
| SUP-C1102 | Sump Pump | | |

**Standby Power:** Yes, EquipID APG-C1101, 200KW, Cummins/Onan Model: 200DGFC, Diesel, Fuel Tank 200 gal.

**Remote Monitoring:** Yes, Power Off, Pump Overload, High Level, High Sump, Alternate Power, Allo Fiber

**Planned Capital Improvements**: Following the installation of the new dry-pit submersible pumps and controls, the lift station will be adequately upgraded for the foreseeable future.

## Scheduled Maintenance and Information

480V/3/400A Service Connected HP-120.0

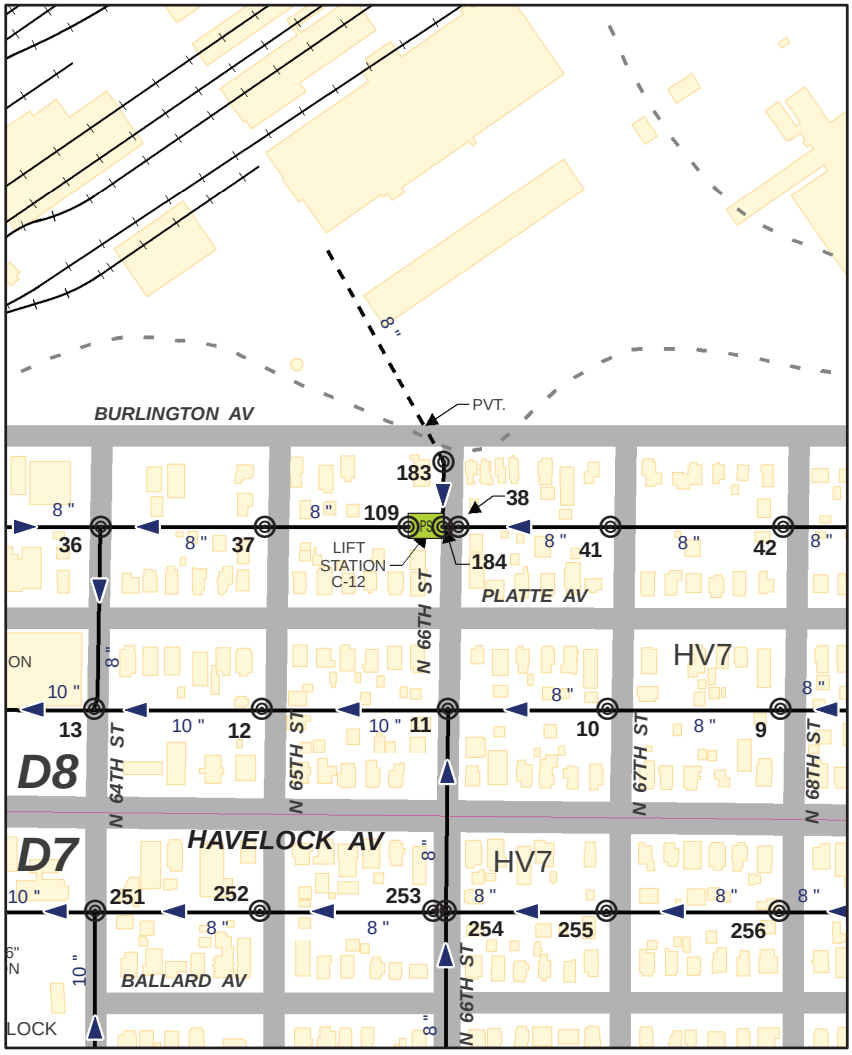
RWP-C1101 / Raw Waste Pump Flygt 3202 60 HP 3000 @ 19' TDH
Flygt-3202.180
Volts / Amps-480V/72A

RWP-C1103 / Raw Waste Pump Flygt 3202 60 HP 3000 @ 19' TDH
Flygt-3202.180
Volts / Amps-480V/72A

Station monitored by Allo Fiber.

| C11 | Scheduled Maintenance Tasks | |
|---|---|---|
| AC-C1101 | Air Compressor Unit | AC-C1101 / ANNUAL AIR COMPRESSOR OIL CHANGE |
| AC-C1102 | Air Compressor Unit | AC-C1102 / ANNUAL AIR COMPRESSOR OIL CHANGE |
| OHC-C1101 | Traveling Crane | LSTC-C1101 / ANNUAL MAINTENANCE FOR CRANE |
| APG-C1101 | Auxiliary Power Generator | APG-C1101 / ANNUAL PANEL CLEANING |
| HCU-C1101 | Harmonic Correction Unit | HCU-C1101 / ANNUAL PANEL CLEANING |
| MCC-C1101 | Motor Control Center | MCC-C1101 / ANNUAL PLC CLEANING & MAINTENANCE |
| PLC-C1101 | PLC Cabinet and PLC | PLC-C1101 / ANNUAL PLC CLEANING & MAINTENANCE |
| PLC-C1101 | PLC Cabinet at C11 | PLC-C1101 / QUARTERLY TELEMETERING ALARM V |
| RWP-C1101DR | Raw Waste Pump-1 VFD | RWP-C1101DR/MONTHLY VFD CABINET FILTER CLE |
| RWP-C1103DR | Raw Waste Pump-3 VFD | RWP-C1103DR/MONTHLY VFD CABINET FILTER CLE |
| UPS-C1101 | UPS battery back-up SCADA PLC | UPS-C1101 / REPLACE BACK-UP BATTERIES |
| APG-C1101 | Auxiliary Power Generator | APG-C1101 / ANNUAL ENGINE MAINTENANCE |
| AMU-C1101 | Air Makeup Unit (storage room) | AMU-C1101 / MONTHLY FILTER CHANGE MAINTENANCE |
| HVU-C1101 | Heating Ventilating Unit | HVU-C1101 / MONTHLY FILTER CHANGE MAINTENANCE |
| HVU-C1101 | Heating Ventilating Unit | HVU-C1101 / ANNUAL HEATER START UP |
| PRV-C1101 | Power Roof Ventilator (OP Floor) | PRV-C1101 / MONTHLY FILTER CHANGE MAINTENANCE |
| PRV-C1101 | Power Roof Ventilator (OP Floor) | PRV-C1101 / ANNUAL VENTILATOR MAINTENANCE |
| PRV-C1102 | Power Roof Ventilator (OP Floor) | PRV-C1102 / MONTHLY VENTILATOR MAINTENANCE |
| PRV-C1102 | Power Roof Ventilator (OP Floor) | PRV-C1102 / ANNUAL VENTILATOR MAINTENANCE |
| PRV-C1103 | Power Roof Ventilator (Wetwell) | PRV-C1103 / MONTHLY VENTILATOR MAINTENANCE |
| PRV-C1103 | Power Roof Ventilator (Wetwell) | PRV-C1103 / ANNUAL VENTILATOR MAINTENANCE |
| PRV-C1104 | Power Roof Ventilator (West) | PRV-C1104 / MONTHLY VENTILATOR MAINTENANCE |
| PRV-C1104 | Power Roof Ventilator (West) | PRV-C1104 / ANNUAL VENTILATOR MAINTENANCE |
| PRV-C1105 | Power Roof Ventilator (Bathroom) | PRV-C1105 / MONTHLY VENTILATOR MAINTENANCE |
| PRV-C1105 | Power Roof Ventilator (Bathroom) | PRV-C1105 / ANNUAL VENTILATOR MAINTENANCE |
| PWV-C1101 | Power Wall Ventilator/Control Room | PWV-C1101 / MONTHLY INSPECTION AND MAINTENANCE |
| PWV-C1102 | Power Wall Ventilator /Storage Room | PWV-C1102 / MONTHLY INSPECTION AND MAINTENANCE |
| MMS-C1101 | Methane Monitoring System (CH4MS) | MMS-C1101 / BI-MONTHLY METHANE MONITORING |
| RWP-C1101 | Raw Waste Pump Flygt 3202 | RWP-C1101 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| RWP-C1103 | Raw Waste Pump Flygt 3202 | RWP-C1103 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| SUP-C1101 | Sump Pump | SUP-C1101 / ANNUAL SUMP PUMP MAINTENANCE |
| SUP-C1102 | Sump Pump | SUP-C1102 / ANNUAL SUMP PUMP MAINTENANCE |
| SUP-C1101 | Sump Pump Pit | SUPP-C1101 / QUARTERLY PUMP & PIT INSPECTION |
| C-11A | Station Wetwell | C-11A / REMOVE DEBRIS & GRIT BUILDUP IN STATION |
| C-11 | Sanitary Lift Station (3700 N. 31st) | C-11 / STRUCTURE ROOF INSPECTION |
| C-11 | Sanitary Lift Station (3700 N. 31st) | LIFT STATION SYSTEM ROUNDS/WEEKLY INSPECT |
| PWBFP-C1101 | Backflow Preventer (1-1/2”) | PWBFP-C1101 / ANNUAL BACK FLOW PREVENTER |
| C-11 | Sanitary Lift Station (3700 N. 31st) | WEEKLY BUILDING & EQUIPMENT INSPECTION |
| FST-C1101 | Fuel Storage Tank (Diesel) | FST-C1101 / DIESEL FUEL TANK INSPECTION & MA |
| ARV-C1101 | Air Relief Valve for Discharge Manifold | ARV-C1101 / SEMI ANNUAL CLEAN & INSPECTION |
| SG-C1101 | Raw Wastewater Sluice Gate | SG-C1101 / ANNUAL SLUICE GATE MAINTENANCE |
| SG-C1102 | Raw Wastewater Sluice Gate | SG-C1102 / ANNUAL SLUICE GATE MAINTENANCE |
| SG-C1103 | Flow Diversion Gate | SG-C1103 / ANNUAL SLUICE GATE MAINTENANCE |

# Map Location for Lift Station C-12
# 66th & Burlington Ave

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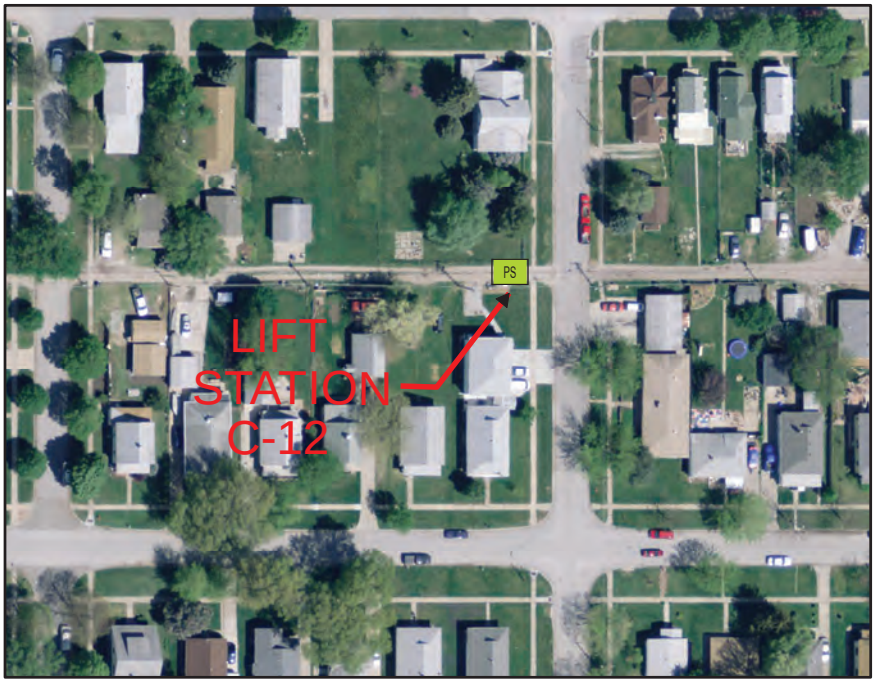
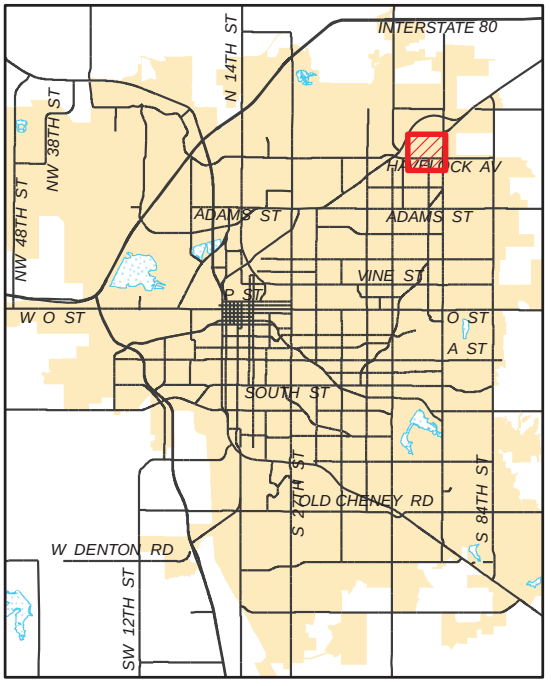
## Aerial




## Overview Map



# Information Fact Sheet for Lift Station C-12
# Location: 66th & Burlington Avenue


**Description:** Lift Station C-12 is in a Havelock alley near 66th & Burlington Avenue. This station has a very small 3 block service area. New pumps and controls were installed in 2002.

**Deficiencies:** Alley access only and access cover rated for truck loads.
**Drainage Basin:** Havelock
**Current Service Area:** 10 acres
**Avg Daily Flow gpm/cfs/acre:** Not available
**Peak Flow gpm/cfs/acre :** Not available
**Configuration:** Simplex
**Equipment:**

| EquipId | Manufacturer/Description | Rated Capacity | HP/Volts/Amps |
|---|---|---|---|
| RWPS-6C | Flygt Model DP-3085 | 157 gpm, 14 TDH | 3/230/6.8 |
| MCC-C1201 | Motor Control Center | | |
| MTF-6 | Multi-Trode Level Sensor | | |
| SG-11 | Electrical Switch Gear | | |

**Standby Power:** No
**Remote Monitoring:** Yes, Power Off, Pump Overload, High Level, Allo Fiber

# Scheduled Maintenance and Information

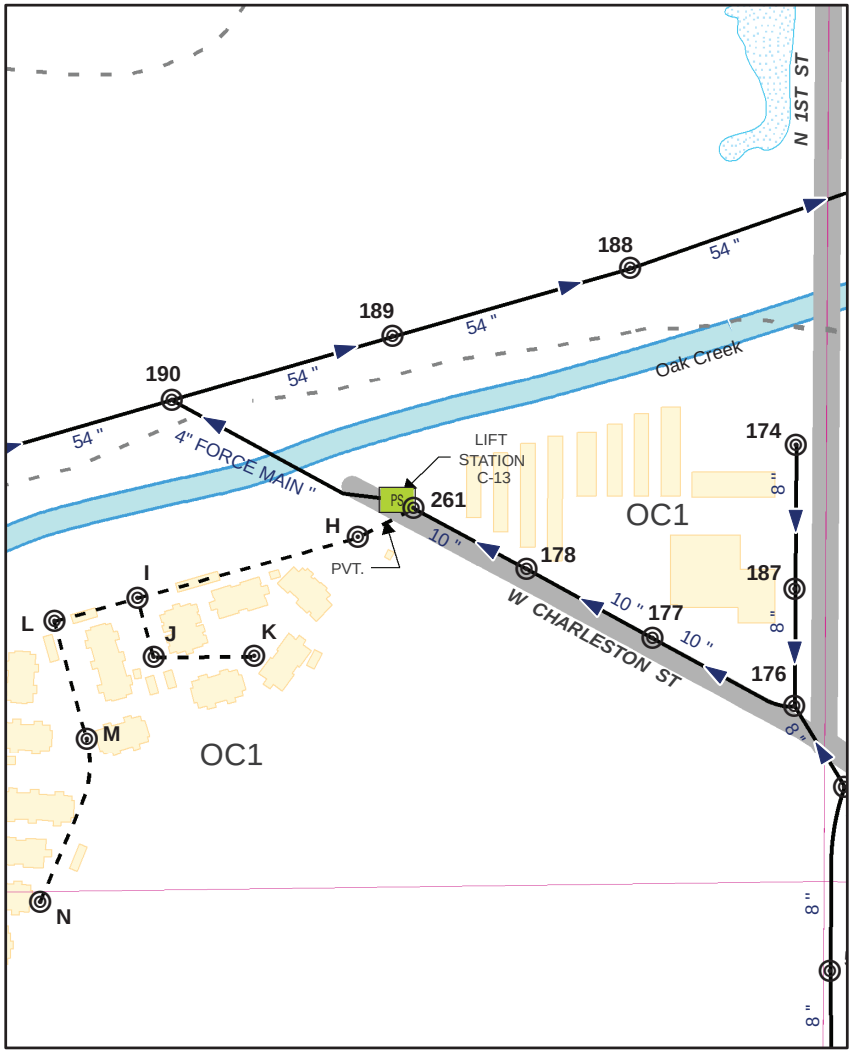
240V/3/30A Service  Connected HP-3.0

RWPS-C1201 / Raw Wastewater Submersible Pump 3.0 HP  157 @ 14' TDH
Flygt-3085.182.0455
Volts / Amps- [240]/480-[8.7]/4.4

Station monitored by Allo Fiber.

| **C12** | **Scheduled Maintenance Tasks** | |
|---|---|---|
| MCC-C1201 | Motor Control Center | MCC-C101 / ANNUAL PANEL CLEANING |
| PLC-C1201 | PLC Cabinet at C01 | PLC-C101 / ANNUAL PANEL CLEANING |
| PLC-C1201 | PLC Cabinet at C01 | PLC-C101 / QUARTERLY TELEMETERING ALARM VARIFICATION |
| LIT-C1201 | Level Controller | LC-C101 / MONTHLY BLOW DOWN & MAINTENANCE |
| RWPS-C1201 | Raw Wastewater Submersible Pump RWPS-9C | RWP-C101 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| C-12 | Sanitary Lift Station (66 & Burlington) | C-12 / REMOVE DEBRIS & GRIT BUILDUP IN STATION WETWELL |
| C-12 | Sanitary Lift Station (66 & Burlington) | LIFT STATION SYSTEM ROUNDS/WEEKLY INSPECTION |
| C-12 | Sanitary Lift Station (66 & Burlington) | WEEKLY BUILDING & EQUIPMENT INSPECTION |

# Map Location for Lift Station C-13
# NW 3rd & West Charleston





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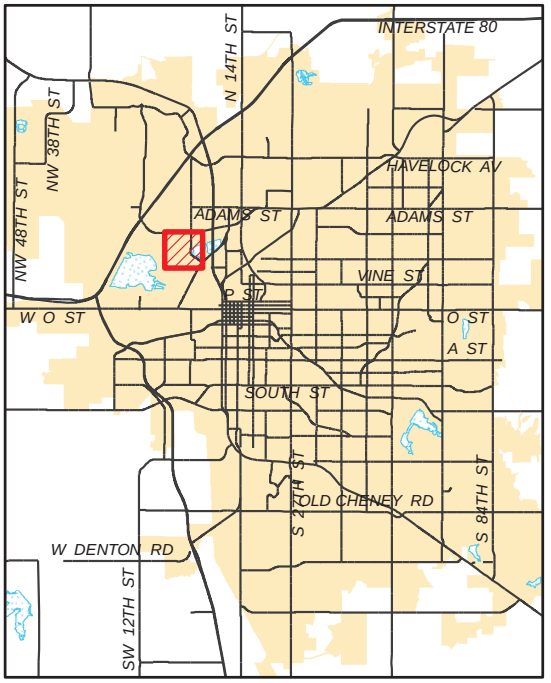
## *Aerial*


## *Overview Map*



# Information Fact Sheet for Lift Station C-13
# Location: NW 3rd & West Charleston

**Description:** Lift Station C-13 is a duplex station located near Oak Lake on West Charleston Street. The station serves a complex of apartments. The station has recently undergone improvements with new pumps, piping, and control panel. The precast barrel of the station has also been raised.

**Deficiencies:** There is some concern about station capacity with the potential of additional apartment complexes in the area.

**Drainage Basin:** Oak Creek
**Current Service Area:** 10 acres
**Avg Daily Flow gpm/cfs/acre**gpm, Not available
**Peak Flow gpm/cfs/acre :** Not available
**Configuration:** Duplex
**Equipment:**

| EquipId | Manufacturer/Description | Rated Capacity | HP/Volts/Amps |
|---|---|---|---|
| RWPS-7C | Flygt Model NP-3127.180.7861 | 281 gpm, 63.4 TDH | 10/230/26 |
| RWPS-8C | Flygt Model NP-3127.180.7861 | 281 gpm, 63.4 TDH | 10/230/26 |
| MCC-C1301 | Motor Control Center | | |
| MTF-9 | Mercury Tilt Float Switch | | |
| SG-12 | Electrical Switch Gear | | |

**Standby Power:** No
**Remote Monitoring:** Yes, Power Off, Pump Overload, High Level, Seal Failure, Allo Fiber

# Scheduled Maintenance and Information

480V/3/30A Service  Connected HP-20.0

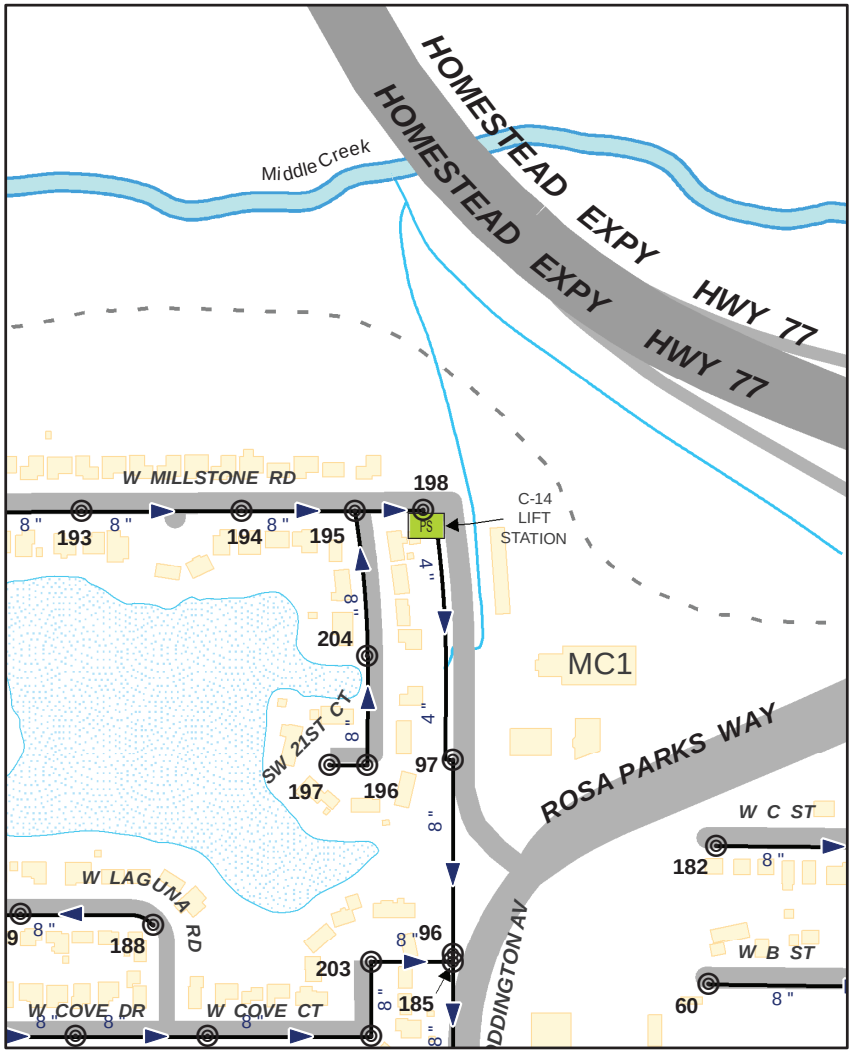
RWPS-C1301 / Raw Wastewater Submersible Pump 10 HP  281 @ 63.4' TDH
Flygt - 3127.180.7861
Volts / Amps- 240/[480]-26/[13]

RWPS-C1302 / Raw Wastewater Submersible Pump 10 HP  281 @ 63.4' TDH
Flygt – 3127.180.7861
Volts / Amps- 240/[480]-26/[13]

Station monitored by Allo Fiber.

| **C13** | **Scheduled Maintenance Tasks** | |
|---|---|---|
| MCC-C1301 | Motor Control Center | MCC-C101 / ANNUAL PANEL CLEANING |
| PLC-C1301 | PLC Cabinet at C13 | PLC-C101 / ANNUAL PANEL CLEANING |
| PLC-C1301 | PLC Cabinet at C13 | PLC-C101 / QUARTERLY TELEMETERING ALARM VARIFICATION |
| LIT-C1301 | Wetwell Level Sensing Probe | LC-C101 / MONTHLY BLOW DOWN & MAINTENANCE |
| RWPS-C1301 | Raw Wastewater Submersible Pump | RWP-C1301 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| RWPS-C1302 | Raw Wastewater Submersible Pump | RWP-C1302 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| C-13 | Sanitary Lift Station (3 & W. Charleston) | C-13 / REMOVE DEBRIS & GRIT BUILDUP IN STATION WETWELL |
| C-13 | Sanitary Lift Station (3 & W. Charleston) | LIFT STATION SYSTEM ROUNDS/WEEKLY INSPECTION |
| C-13 | Sanitary Lift Station (3 & W. Charleston) | WEEKLY BUILDING & EQUIPMENT INSPECTION |

# Map Location for Lift Station C-14
# Coddington Mills, SW 21st & W. Milestone Road





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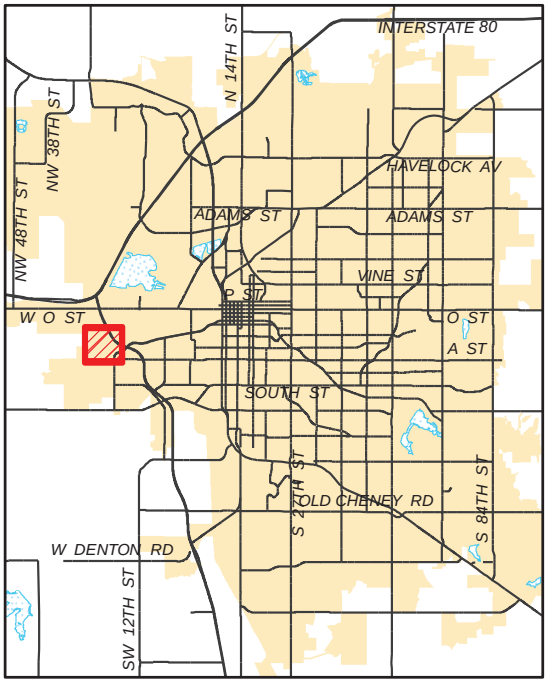
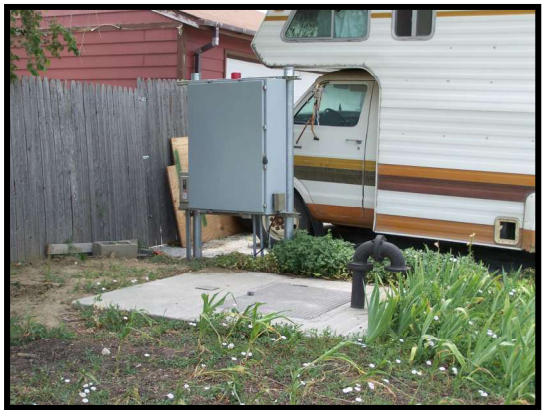
## *Aerial*


## *Overview Map*



# Information Fact Sheet for Lift Station C-14
# Location: Coddington Mills




**Description:** Operation and maintenance of lift station C-14 was assumed by the Lincoln Wastewater system in 1999. The station was privately built to serve the Coddington Mills housing development which surrounds a small lake (originally a sand pit). Equipment in the duplex station has been totally replaced since take-over by City staff. At the present time, the station is adequately sized for service area.

**Deficiencies:** The station is prone to receiving relatively high amounts of biodegradable grease and constant background infiltration from the collection system. Cracked vitrified clay pipe is common around the circumference of the lake. There are no other known deficiencies currently.

**Drainage Basin:** Middle Creek
**Current Service Area:** 37 acres
**Avg Daily Flow gpm/cfs/acre:** Not available
**Peak Flow gpm/cfs/acre :** Not available
**Configuration:** Duplex Submersible
**Equipment:**

| EquipId | Manufacturer/Description | Rated Capacity | HP/Volts/Amps |
|---|---|---|---|
| RWPS-14C | Flygt Model CP 3085.182-436 | 100 gpm, 22.8 TDH | 2.2/230/6.7 |
| RWPS-15C | Flygt Model CP 3085.182-436 | 100 gpm, 22.8 TDH | 2.2/230/6.7 |
| MCC-C1401 | Motor Control Center | | |

**Standby Power:** None
**Remote Monitoring:** Yes, Power Off, Pump Overload, High Level, Seal Failure, Allo Fiber
**Planned Capital Improvements**: None identified at this time.

# Scheduled Maintenance and Information

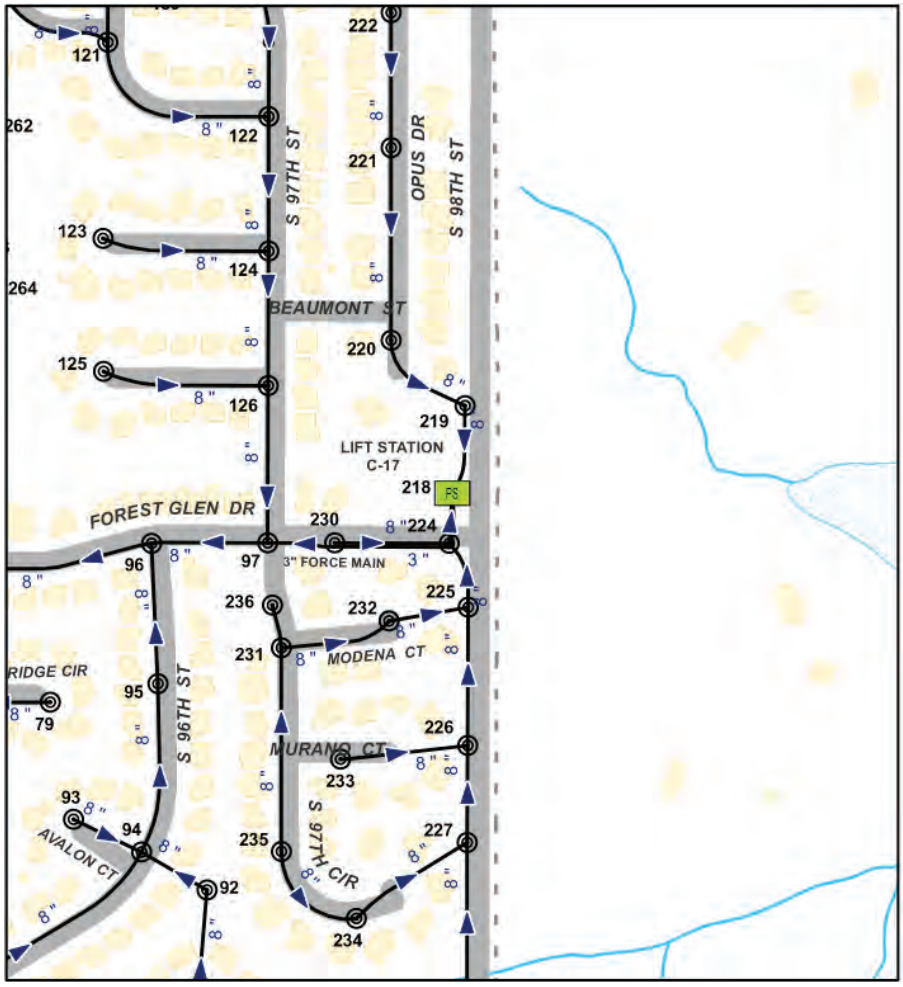
240V/3/30A ServiceConnected HP-4.4

RWPS-C1401 / Raw Wastewater Submersible Pump 2.2 HP 100 @ 22.8' TDH
Flygt - 3085.182.1975
Volts / Amps- [240]/480-[6.7]/3.4

Station monitored by Allo Fiber.

| **C14** | **Scheduled Maintenance Tasks** | |
|---|---|---|
| MCC-C1401 | Motor Control Center | MCC-C1401 / ANNUAL PANEL CLEANING |
| PLC-C1401 | PLC Cabinet at C14 | PLC-C1401 / ANNUAL PANEL CLEANING |
| PLC-C1401 | PLC Cabinet at C14 | PLC-C1401 / QUARTERLY TELEMETERING ALARM VERIFICATION |
| LIT-C1401 | Wetwell Level Sensing Probe | LIT-C1401 / MONTHLY CALIBRATION AND CLEANING |
| RWPS-C1401 | Raw Wastewater Submersible Pump RWPS-14C | RWPS-C1401 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| RWPS-C1402 | Raw Wastewater Submersible Pump RWPS-15C | RWPS-C1401 / ANNUAL SUBMERSIBLE PUMP MAINTENANCE |
| C-14 | Sanitary Lift Station (Coddington Mills) | C-14 / REMOVE DEBRIS & GRIT BUILDUP IN STATION WETWELL |
| C-14 | Sanitary Lift Station (Coddington Mills) | LIFT STATION SYSTEM ROUNDS/WEEKLY INSPECTION |
| C-14 | Sanitary Lift Station (Coddington Mills) | WEEKLY BUILDING & EQUIPMENT INSPECTION |

# Map Location for Lift Station C-17
# Forest Glen Dr and S 98th St





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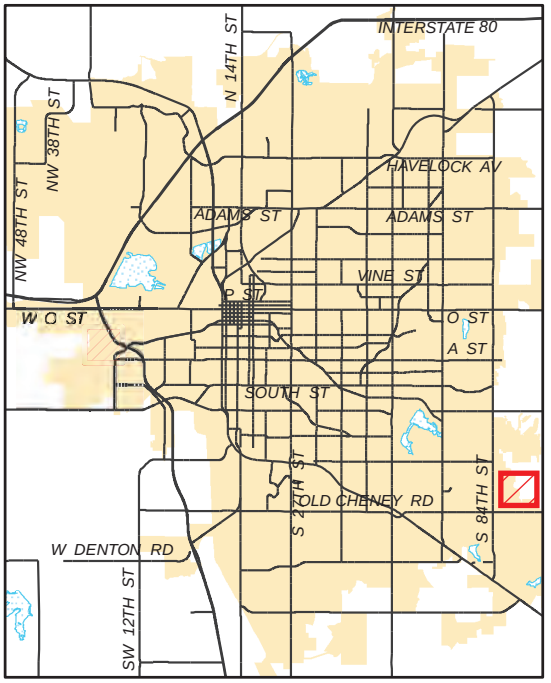
## *Aerial*


## *Overview Map*



# Lift Station C17 – 9760 Forest Glen Road
# Scheduled Maintenance and Information

**Description:** This lift station is located at 9760 Forest Glen Rd. and was built in 2016. Privacy slats were installed.

**Deficiencies:** There is concern that this lift station may not be large enough to service this growing area.

**Drainage Basin:** Antelope Creek 30
**Current Service Area:** 54 acres
**Avg Daily Flow gpm/cfs/acre:** Not available
**Peak Flow gpm/cfs/acre :** Not available
**Configuration:** Duplex submersible
**Equipment:**

| | | | |
|---|---|---|---|
| APG-C1701-EG | Auxiliary Power Generator - Engine | 2200cc | 12VOLT |
| APG-C1701-GN | Auxiliary Power Generator - Engine | | 240 single phase |
| RWPS-C1701-DR | Raw Waste Pump Submersible VFD | | |
| RWPS-C1701-IN | Moisture Monitoring Device Mini Cas | | |
| RWPS-C1701-PU | Raw Waste Pump Submersible | | FLygt MP3085.891 |

**Standby Power:**
**Remote Monitoring:**
**Planned Capital Improvements**:

| C17 | Scheduled Maintenance Tasks | |
|---|---|---|
| FeatureName | Note | FeatureName |
| APG-C1701-EG | WEEKLY_Clean & inspection | APG-C1701-EG |
| APG-C1701-EG | YEARLY_Engine maintenance | APG-C1701-EG |
| APG-C1701-EG | 3-YEAR_Battery replacement Group 34 Battery | APG-C1701-EG |
| APG-C1701-GN | WEEKLY_Clean & inspection | APG-C1701-GN |
| APG-C1701-GN | 3-YEAR_Battery replacement | APG-C1701-GN |
| APG-C1701-GN | 3-YEAR_Battery replacement | APG-C1701-GN |
| APG-C1701-GN | WEEKLY_Clean & inspection | APG-C1701-GN |
| RWPS-C1701-PU | YEARLY_Submersible pump maintenance | RWPS-C1701-PU |