



Audit of Wastewater System Operations

Collections

The City of Denton's wastewater collections infrastructure is generally maintained effectively. However, establishment of formal guidance for wastewater maintenance and repair, and water reclamation work orders would ensure compliance with City ordinance and Local and State requirements.

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Audit at a Glance

Why we did this Audit:

The City maintains about 530 miles of wastewater lines that transports wastewater to be treated and reused. It is critical that wastewater lines are effectively maintained to ensure wastewater does not impact public health and safety. This audit was included on the City's fiscal year 2021-22 Audit Plan as approved by the City Council.

What we Recommend:

Recommendations 1, 3, 4, & 5

Update maintenance and repair work order and construction project guidance to ensure all necessary documentation is created and retained.

Recommendation 2

Develop a process to ensure maintenance and repair work orders are closed timely.

What we Found:

This audit generally evaluated the City's wastewater collections line maintenance activities including, line repairs and construction projects. Our findings are summarized below:

Line Repairs. Wastewater line repairs are generally completed in a timely manner; however, there appear to be delays between the closure of a work order and completion of the related work.

In addition, while the Division has developed flowcharts to guide staff in the completion of repair work orders, this guidance does not contain information regarding some key requirements including right of way permits and street moratoriums. Similarly, there is not always clear guidance for staff on what documentation should be retained as part of each work order – potentially hindering quality review.

This quality issue is particularly prevalent for reuse water lines, which are unique in that they are pressurized lines that must be repaired by Wastewater Collection crews to prevent contamination.

Construction Projects. Water Utilities has generally established an effective process to identify and carry out small wastewater collection line construction projects; however, documentation of some critical steps in this process is not well maintained. Furthermore, the Department has not established effective processes to ensure proper communication with other construction project stakeholders such as the Streets and Public Works Inspections Divisions.

Finally, construction project costs for labor and materials are not adequately reconciled by Water Utilities to ensure new infrastructure value is accurately calculated. That being said, project capitalization timeliness has improved since the [Water System Operations: Distribution](#) audit due to a new workflow process implemented by the Finance Department.

Introduction

The Internal Audit Department is responsible for providing: (a) an independent appraisal¹ of City operations to ensure policies and procedures are in place and complied with, inclusive of purchasing and contracting; (b) information that is accurate and reliable; (c) assurance that assets are properly recorded and safeguarded; (d) assurance that risks are identified and minimized; and (e) assurance that resources are used economically and efficiently and that the City's objectives are being achieved.

The Internal Audit Department has completed a performance audit of the City's collections infrastructure projects and maintenance activities. We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Management Responsibility

City management is responsible for ensuring that resources are managed properly and used in compliance with laws and regulations; programs are achieving their objectives; and services are being provided efficiently, effectively, and economically.

Audit Objectives, Scope, and Methodology

The Internal Audit Department has completed an audit of the City's wastewater collections infrastructure projects and maintenance activities. This report is intended to provide assurance that the City's wastewater collections infrastructure is effectively constructed and maintained.

This report is the first phase in an audit project series covering wastewater system operations. Phase Two Reclamation is expected to be published in May 2022.

Audit fieldwork was conducted during January, February and March 2022. The scope of review varied depending on the procedure being performed. The following list summarizes major procedures performed during this time:

- Reviewed documentation to develop criteria including industry standards, best practices, policies, and procedures;

¹ The City of Denton Internal Auditor's Office is considered structurally independent as defined by generally accepted government auditing standard 3.56.

- Developed process narratives to identify current control activities in wastewater collections maintenance, repair, construction, and capitalization processes that were certified by Water Utilities and Finance Department staff;
- Interviewed Water Utilities and Finance Department staff and reviewed policies and procedures pertaining to wastewater collections projects;
- Reviewed a statistical sample² of 368 work orders to verify the timeliness and effectiveness of maintenance and repairs;
- Reviewed eight wastewater collections construction projects completed since March 2020 to analyze and verify the management and administration of those projects;
- Reviewed project closure and capitalization details of 22 construction projects completed since November 2018 to verify that the completed projects were closed timely and capitalized;
- Reviewed construction project documentation to determine compliance with street moratoriums and right of way permitting requirements; and
- Reviewed construction project records to verify that material and labor costs are regularly reconciled to ensure accurate cost allocation.

Department Background

The Water Utilities Department is in the process of developing a formal Asset Management Program. This includes taking proactive steps at initiating and planning for the full launch of an Asset Management Program to improve work management (i.e. work orders) functionality, process, and data to support financial and long-range capital planning. These steps include:

- Structuring a formal Asset Management Team;
- Hiring an Asset Management & Vertical Infrastructure Division Manager;
- Planning the execution of contract to define the City's Vision for an Asset Management Program;
- Performing an asset management maturity assessment; and
- Preparing a Water System Management Plan .

² This sample size provides with 95 percent confidence that the true population mean is within ± 5 percent of the sample estimate.

Implementation of a formal Asset Management Program is anticipated to yield the following benefits:

- Minimize operations and maintenance costs;
- Improve asset-related financial planning; and
- Reduce operating and financial risk.

Findings & Analysis

The City of Denton’s wastewater system currently consists of approximately 530 miles of wastewater lines that collect wastewater from the City’s customers. Wastewater is used water that contains substances such as human waste, food scraps, oils, soaps, and chemicals. The City’s Water Utilities Department and Wastewater Collections Division are responsible for ensuring the City’s wastewater system line network is effectively maintained to ensure wastewater does not contaminate natural watersheds or otherwise impact public health and safety. These activities are generally broken into three categories as shown in Figure 1:

Figure 1: Wastewater Collections Activities



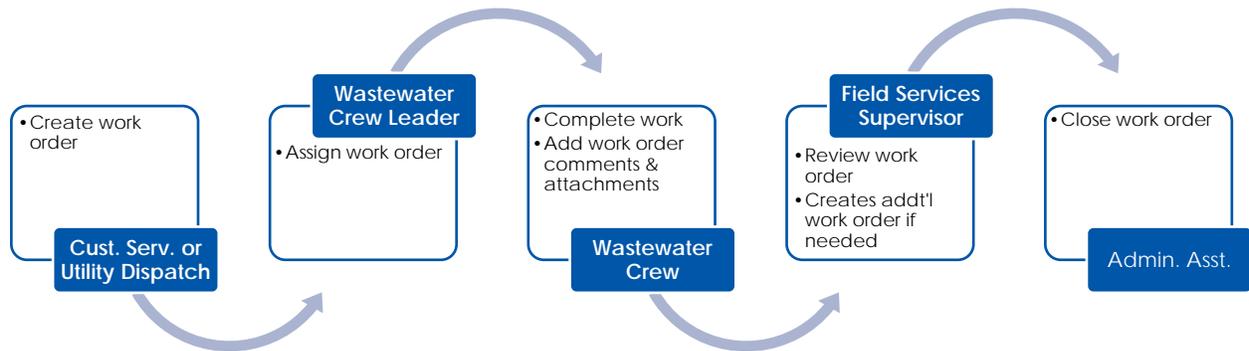
Between fiscal years 2018-19 and 2020-21, the Department completed 17 wastewater construction projects with a total capitalized value of \$4.14 million. In addition, during fiscal years 2019-20 and 2020-21, the Department completed over 11,000 work orders.

This audit generally evaluated the City’s wastewater collections maintenance, repair, and construction activities including capital improvement projects and wastewater line defects (i.e. from chokes or cracks).

Maintenance & Repair Work is Generally Completed Timely; Additional Guidance Would Further Ensure Effectiveness

Wastewater lines generally must be repaired if there are defects, cracks, or structural compromises in a line or manhole or if the line is choked or blocked. In addition, maintenance activities generally include inspecting and cleaning wastewater lines and manholes. The wastewater collections work order process is illustrated in Figure 2.

Figure 2: Wastewater Work Order Process



The Wastewater Collections Division is also responsible for performing repairs on reuse water lines. Reuse water is wastewater that has been treated at the City’s wastewater treatment plant that can be reused for non-potable water purposes.

What We Found

- Water Utilities has implemented a work order system to manage wastewater collection line maintenance and repair activities. Maintenance and repair activities are entered into the work order system and assigned to a Crew Leader based on the type of repair needed. The Crew Leader is then charged with adding the work order to their crew’s weekly schedule.
 - Typically, general maintenance work orders are completed within two weeks, and wastewater line emergencies are repaired immediately.
 - Work orders are assigned and completed on a first come, first-serve basis. There is no minimum timeline fixed for the completion of work orders and the work orders are completed as quickly as possible.

- The Wastewater Collections Division has separated the City’s wastewater lines into five basins. Crews are assigned to a basin, and closed-circuit televisions are used to observe and inspect the lines.
 - The Wastewater Collections Division has established a process to clean all lines on a five-year cycle and inspect all lines on a seven-year cycle. Additional work orders may be created based on inspection results if repairs are needed.

- Water Utilities has established flowcharts detailing needed steps in the wastewater collection line repair and maintenance process. However, these flowcharts do not specify the work order details that need to be recorded to

ensure work is completed effectively. Based on review of a sample of 368 maintenance and repair work orders, specific findings include:

- Wastewater Collections crews add comments to work orders that provide details of the completed work and any identified issues related to the wastewater line in the event that an additional work order needs to be created. All work orders reviewed appeared to contain adequate comments related to completed work.
 - Per the Department's practices, 188 of the reviewed work orders should have contained a video or photo attachment. Out of the 188, 15 work orders (eight percent) contained comments that a video was created but did not have a relevant attachment and related data could not be located in the Division's archives. Furthermore, the video or photo requirements for the remaining 180 work orders could not be determined due to lack of guidance.
 - Per state requirements, the Division must call 811 Line Locate at least two working days before beginning excavation if digging 16 inches or deeper. Based on review, 15 work orders did not contain documentation of the required line locate call being made.
- In addition, Denton Ordinance requires the Department to obtain a right of way – or ROW – permit for all planned repair or construction activities occurring in the City's right of way. Right of way permits are intended to ensure that the City's right of way is restored to the same or better condition after work is complete.
 - Based on review of the sample of maintenance and repair work orders and available data, 24 work orders required a ROW permit; however, seven did not contain evidence that a ROW permit had been obtained.
 - In addition, due to Water Utilities' contractor's workload, seven ROW permits issued to wastewater expired prior to completion of the Division's restoration activities as of March 2022. According to staff, the Department is in the process of preparing a solicitation for an additional contractor to help alleviate this issue.
 - Furthermore, out of the 24 work orders requiring a ROW permit containing asphalt, concrete, or sod restoration work, 15 work orders did not have an attached invoice as evidence that the needed restoration work had been completed.

- Based on review of the total population of 8,804 maintenance and repair work orders for the period October 1, 2019 through September 30, 2021, over 75 percent of work orders were completed on the same day as the work order was created; however, Wastewater Collections Division work orders do not appear to be closed timely.
 - Based on review, over 30 percent of work orders were closed more than 100 days after the repair work was completed, and about six percent of work orders are still open. Based on discussions with Water Utilities staff, work order closure delays are typically due to pending restoration work that is completed by external contractors. Table 1 details these results.

Table 1: Work Order Closure Time

Days Taken (Range)	Work Orders	Percent
0 Days	484	5.50%
1 – 7 Days	1,413	16.05%
8 – 99 Days	3,653	41.49%
100 Days or Greater	2,706	30.74%
N/A – Open	548	6.22%
Total:	8,804	100%

- Based on discussion with Water Utilities personnel, the open work orders still need to undergo the review process.
- Reuse water lines are under pressure unlike wastewater lines but must be repaired by Wastewater Collections crews instead of Water Distribution crews in order to prevent contamination of newly treated water.
 - According to Water Utilities personnel, the reuse water line used to divert effluent is mainly constructed of PVC material and repairs are not needed often, and preventative maintenance is not required. Based on review of Water Utilities work order system, only three work orders were required to be completed in the last three years.
 - Based on review, the three reuse repair work orders do not contain site pictures or required work order details such as line locates, right of way permits, street moratoriums, and restoration work.

Why It Matters

In general, the Water Utilities process flowcharts related to wastewater collections are comprehensive. However, the flowcharts do not detail the information and attachments need for each type of work order to assist Division management with ensuring activity quality and compliance with City and State requirements.

Development of standard operating procedures or checklists that specify work order completion expectations would help ensure that all work orders contain the information, attachments, permits, and verifications needed for quality review. In addition, this formal guidance would provide Water Utilities staff with institutional knowledge, facilitate consistency, and help navigate emergency situations.

While work orders are generally completed timely, there is often a delay between the completion of repair and maintenance work and the work order's closure. Establishment of a work order closure process would help ensure work order quality review and restoration work is completed timely.

Recommendations:

1. Develop standard operating procedures or checklists that detail wastewater collections work order requirements, including necessary field completion and required attachments. Ensure that reuse water line work orders include the same details required for other line repairs.

***Water Utilities Comments:** Water Utilities agrees with the recommendation and will continue efforts to improve on standard operating procedures (SOP) to include a detailed work order requirements document to ensure all work orders are completed to the same standards.*

2. Establish a process to periodically review open work orders to ensure proper oversight and timely closure.

***Water Utilities Comments:** Water Utilities will develop and implement a work order review process to confirm proper oversight and closure of open work orders.*

CIP Process Established; Project Documentation Needs Improvement for Quality Assurance

The Wastewater Collections Division's construction projects are considered capital improvement projects – or CIPs – when they involve replacement of wastewater collection lines for an entire street or block. The CIP process requires additional planning procedures compared to maintenance and repair activities and is summarized in Figure 3.

Figure 3: Wastewater CIP Process



Checking street moratorium and obtaining right of way – or ROW – permits are important steps in planning wastewater construction projects. City ordinance requires every party, external or internal, to apply for a ROW permit if they plan to engage in construction, excavation, or occupy a work area within or upon any right of way.

Additionally, the City’s Streets Department currently places a moratorium on streets that have recently been improved. These moratoriums are intended to prevent the accelerated deterioration that comes when a street is cut into and patched. Streets current practices state: “Utilities should request authorization to be able to construct in [moratorium] areas.” In general, construction activities are not permitted for projects under moratorium streets unless there is an emergency.

What We Found

- Water Utilities has established a documented CIP process flowchart for Wastewater Collections infrastructure detailing the processes summarized in Figure 3 above.
- Water Utilities construction projects are tracked and administered in a work order system and workflow system; however, project documentation is not consistently available. Based on review of eight wastewater collections construction projects, the following was noted:
 - Street moratorium check confirmations were not available for two projects;
 - A material list was not available for one project;

- ROW permits were not obtained for any projects; and
- The Division does not maintain documentation for walkthrough and punch list items, or final inspection reports.
- According to Water Utilities personnel, street moratoriums are checked by Water Utilities, but a documentation process has not been established to record street moratorium checks.
 - The Division does have a process for updating the workflow system when a moratorium check is complete; however, no results of this check (i.e. if there is a moratorium or not) are recorded as part of this process. In addition, based on review of the Division's workflow system, the moratorium check field for the majority of projects was updated on the same day and did not appear to be updated as part of the CIP process for each project.
- According to Water Utilities personnel, ROW permits are not required for in-house construction projects; however, based on discussion with Public Works Inspections staff, ROW permits are required for any work that falls within City ordinance criteria.
 - Similarly, per the Division's documented CIP process, there is no requirement to acquire a ROW permit.
 - In contrast, Water Utilities staff do generally obtain ROW permits for maintenance and repair work.

Why It Matters

Capital Improvement Projects are comprised of significantly more tasks compared to general wastewater maintenance and repair work orders and can take months to complete. Ensuring all necessary project documentation and information is recorded in the appropriate location will assist with record retention and maintaining compliance with applicable City and State law requirements.

The City requires all work in the right of way to be permitted in order to ensure that the safe passage of pedestrian and vehicular traffic is maintained to the greatest extent possible. It is important to ensure right of way permits are obtained properly and timely in accordance with City ordinance.

Additionally, newly improved streets are placed under a construction moratorium in an effort to preserve their useful life, as any excavation weakens the street's integrity. For this reason, non-emergency work on wastewater lines under moratorium streets should be minimized as much as possible and

emergency work should be clearly communicated. Without proper documentation or a formalized, consistent process for approving and recording construction on moratorium streets, it is unclear if all stakeholders were informed and approved of weakening the City's streets infrastructure.

Recommendations:

3. Ensure the Water Utilities CIP process is updated to reflect appropriate requirements related to ROW permits.

***Water Utilities Comments:** Water Utilities will review the established CIP Process documentation and ensure it is updated to reflect the requirements related to ROW permits.*

4. Ensure the street moratorium field for construction projects is reviewed and documented appropriately as part of the established CIP process.

***Water Utilities Comments:** Water Utilities Staff will identify opportunities to improve documentation standards and practices when verifying moratorium status.*

5. Develop a process to verify required documentation and information is attached to each CIP work order to assist with project data and record retention.

***Water Utilities Comments:** Water Utilities will develop and implement a process to verify all documentation is attached and requirements are completed to each CIP and related work order(s).*

Construction Project Material & Labor Costs Are Not Effectively Reconciled

Labor and material costs are major components of in-house wastewater construction project costs, which are ultimately capitalized as assets in the City's accounting records. Material usage and labor hours should be regularly reconciled to ensure project costs are accurate and labor and materials are used efficiently.

What We Found

- Material is generally obtained from the City's Warehouse for wastewater collections construction projects, with some exceptions when the material is obtained through the standard procurement process.

- According to Wastewater Collections Division personnel, materials needed for wastewater collections projects are generally determined before the start of construction and documented on a material list.
- The material list is approved and sent by the Field Service Supervisor to the Warehouse. Materials are then picked up by Wastewater crews from the Warehouse during construction as needed, and the Division is not charged until material is obtained. All reviewed material lists appeared to have been properly approved and sent to the Warehouse.
- According to Wastewater Collections Division personnel, Warehouse staff sends a monthly warehouse report to ensure that the material issued to Wastewater Collections is charged to the correct account and job code.
- Daily, each crew leader records labor hours in Cityworks in the work order of the project they worked upon.
 - Wastewater crew members fill their punch-in and punch-out times on a timesheet, and those hours are then recorded in Kronos by the Water & Wastewater Administrative Assistant. The Field Services Supervisor verifies the labor hours in Kronos and ensures that labor hours are accurately allocated to the assigned project.
 - Based on review of a random sample selection of 24 recorded work hour entries in the work order system and the City's timekeeping system for the reviewed projects, in 14 cases work hours were not appropriately logged in the work order system or accurately allocated to projects in the City's timekeeping system. The results are summarized in Table 2 below.

Table 2: Work Hour Entry Review

Results	No. of Entries	Percent
Accurately Recorded	10	41.6%
Difference Between Systems	7	29.2%
Unallocated	3	12.5%
Multiple Issues ³	3	12.5%
Incorrect Project Allocation	1	4.2%
Total:	24	100%

³ Work hour entries containing multiple issues included a difference between the recorded work hours among the work order system and the City's timekeeping system, and unallocated hours.

- The City generally owns the equipment used in wastewater line maintenance and construction projects, and a process is in place to record the equipment used for the assigned project.

Why It Matters

Inaccurately recording material and labor costs lead to inaccurate project cost estimation and reporting.

Specifically, reconciling materials used to those ordered for each project would ensure that material costs have been correctly recorded in each project. Additionally, it would also help identify any discrepancies between estimated project costs and costs associated with used materials. While only collecting materials when they are needed does provide some assurance that materials are not wasted, it does not completely ensure that all materials collected are needed and recorded for each project.

Similarly, effectively reconciling labor hours in the work order system to those in the City’s time keeping system would help Water Utilities ensure project costs are accurate.

Recommendation:

See recommendations no. 5 & 6 issued in [Audit Report 021 Water System Operations: Distribution](#).⁴

Water Utilities Comments: Refer to Audit Report 021 Water System Operations: Distribution.

Wastewater Collections Project Capitalization Timeliness Improved

Project closure and capitalization are the final steps of wastewater collections construction projects. Ideally, an asset should be capitalized when it is placed in service and the economic benefit of that asset is being received. Therefore, wastewater project closure requests should be communicated as soon as the project is complete to enable the Finance Department to initiate capitalization timely.

What We Found

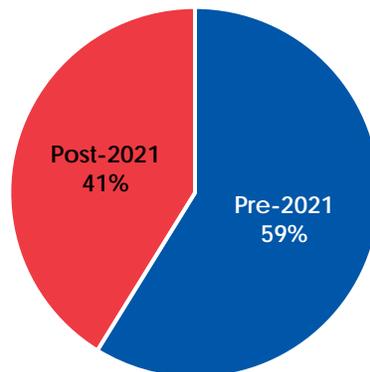
- After completing a project, Wastewater Collections Division staff is required to submit a project closure request to the Finance Department via a

⁴ Similar findings were reported in Audit Project 021 Water System Operations: Distribution; the findings have been notated but the related recommendations will not be re-issued.

workflow system. Prior to 2021, project closure requests were completed via a manual process on a physical form.

- Based on review of 22 wastewater collections construction projects completed since 2018, five projects were still considered open and were undergoing the final steps of the CIP process, and 17 projects had been closed.
- Of the 17 closed projects, all had been capitalized. For those completed prior to 2021 it took between 194 to 242 for the project to be capitalized after it was requested. After the Finance Department’s implementation of the workflow system closure request process, it took between zero to seven days for a project to be capitalized. A summary of project capitalization by year is illustrated in Figure 4.

Figure 4: Project Capitalization Year



- Additionally, the Finance Department has begun sending a monthly report to City Directors detailing open projects that potentially need to be closed.

Why It Matters

Timely capitalization of capital projects is crucial for effective record keeping per government accounting standards. As noted in [Audit Project 021 Water System Operations: Distribution](#), there have been previous issues related to communication between Water Utilities and the Finance Department during the project closure and capitalization process due to the manual request system; however, the implementation of the workflow system appears to have assisted with streamlining the process.

Recommendation: None

Appendix A: Management Response Summary

The following summarizes the recommendations issued throughout this report. The auditors found that staff and the Department were receptive and willing to make improvements to controls where needed. Management has provided their response to each recommendation.

<p>1</p> <p><i>Develop standard operating procedures or checklists that detail wastewater collections work order requirements, including necessary field completion and required attachments. Ensure that reuse water line work orders include the same details required for other line repairs.</i></p>	<p>Concur</p>	<p>Expected Completion: April 2023</p>
<p>Water Utilities Comments: Water Utilities agrees with the recommendation and will continue efforts to improve on standard operating procedures (SOP) to include a detailed work order requirements document to ensure all work orders are completed to the same standards.</p>		<p>Responsibility: Water Utilities</p>
<p>2</p> <p><i>Establish a process to periodically review open work orders to ensure proper oversight and timely closure.</i></p>	<p>Concur</p>	<p>Expected Completion: April 2023</p>
<p>Water Utilities Comments: Water Utilities will develop and implement a work order review process to confirm proper oversight and closure of open work orders.</p>		<p>Responsibility: Water Utilities</p>
<p>3</p> <p><i>Ensure the Water Utilities CIP process is updated to reflect appropriate requirements related to ROW permits.</i></p>	<p>Concur</p>	<p>Expected Completion: April 2023</p>
<p>Water Utilities Comments: Water Utilities will review the established CIP Process documentation and ensure it is updated to reflect the requirements related to ROW permits.</p>		<p>Responsibility: Water Utilities</p>
<p>4</p> <p><i>Ensure the street moratorium field for construction projects is reviewed and documented appropriately as part of the established CIP process.</i></p>	<p>Concur</p>	<p>Expected Completion: April 2023</p>
<p>Water Utilities Comments: Water Utilities Staff will identify opportunities to improve documentation standards and practices when verifying moratorium status.</p>		<p>Responsibility: Water Utilities</p>

5	<i>Develop a process to verify required documentation and information is attached to each CIP work order to assist with project data and record retention.</i>	Concur	Expected Completion: April 2023
<p>Water Utilities Comments: Water Utilities will develop and implement a process to verify all documentation is attached and requirements are completed to each CIP and related work order(s).</p>			<p>Responsibility: Water Utilities</p>