AUDIT OF ROADWAY QUALITY MANAGEMENT

ABSTRACT

Roadway improvement resources appear to be used equitably throughout the City; however, documentation of roadway quality controls is lacking. This audit recommends improvements to increase assurance over roadway quality and provides suggestions to more efficiently provide roadway services.

City Auditor's Office

CITY OF DENTON

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Executive Summary

Honorable Mayor and members of the City Council,

The City Auditor's Office has completed a performance audit of the roadway quality management process. This was a scheduled audit on the FY 19 audit plan approved by the City Council. The Streets Division of the Public Works Department is currently responsible for maintaining and improving a little under 1,400 lane miles of roadway. Between fiscal years 2014 and 2018, an average of $11 million dollars was expended annually from the Streets Improvement Fund.

The following are our salient findings:

- The Street division has planned rehabilitative activities and roadway improvements based on needs for these services. This planning process results in ensuring sound decisions for appropriately maintaining street infrastructure.
- The controls over ensuring the quality of contractor and in-house road rehabilitation projects for meeting established standards need improvement. We verified that about 1.63 lane miles of road were overlaid instead of being fully reconstructed as indicated by Overall Condition Index (OCI) guidelines and consultant's recommendation (see Table 4). We did not find appropriate documentation for deviating from these guidelines and recommendations. Evidence for approval of these actions was not available. Furthermore, without retaining design standards or materials testing results provided by the geotechnical engineer, compliance with the City's quality standards cannot be assured after the project is complete. Similarly, there was no reviewable documentation of Field Services Supervisor's inspections to assure compliance with standards.
- The current practice of accounting proceeds of multiple General Obligation (GO) bond issues in one GO Streets fund hinders the tracking of project expenditures back to bond series. More consistent and precise accounting of each bond series' proceeds may increase transparency and accountability.
- Thirty-nine overlay work orders were completed on street segments with an inspected OCI less than 30 indicating a need for reconstruction. This is because low OCI indicates the integrity of the underlying layers of the roadway may be failing. The OCI score was raised from under 30 (street in poor condition) to 85 (a street in very good condition) with overlay activity, which is much limited to reconstruction. This action could provide misleading information for future need for maintenance or improvements on these segments.

Management has concurred with 9 of 12 recommendations made in this report and partially concurred with the remaining three. Management's response is attached to this report in Appendix A. We appreciate staff's cooperation during the audit. Please contact the City Auditor if you have any questions or need more information.

Sincerely,

Umesh Dalal, City Auditor

Introduction

The City Internal Auditor is responsible for providing: (a) an independent appraisal 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 City Auditor's Office has completed a performance audit of the roadway quality management process. We conducted this performance audit in accordance with generally accepted government auditing standards with the exception of standard 4.18 regarding documentation of audit staff's continuing professional education.[1] 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

This report is intended to provide assurance on the City's ability to:

- Maintain and improve the City's roadway network economically and efficiently; and
- Properly record and safeguard one of the City's largest and most valuable assets (streets) by evaluating the effectiveness of controls over:
    - The quality assurance process of street improvements; and
    - The management and monitoring of pavement condition.

Audit fieldwork was conducted during March and April of 2019. 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;
- Developed a process narrative to identify current control activities, which was certified by the Streets Superintendent;
- Evaluated the methodology and functionality of Streets' pavement management system;
- Reviewed the documentation associated with all fiscal year 2018 Streets' purchase orders to determine if applicable bidding laws were followed;

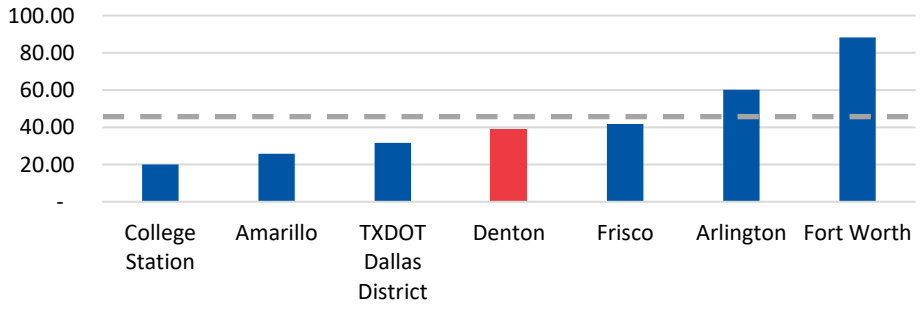
[1] This report was amended on February 15, 2022 to disclose this exception, the details of which were communicated to the City Council in a Staff Report publicly issued on February 11, 2022.

- Analyzed Streets' work orders completed during 2016-2018;
- Investigated the implementation of the 2012 and 2014 street rehabilitation bond programs; and
- Interviewed City staff and observed some meetings to better understand Streets' project clearance process.

Background Information

The City of Denton's Streets Division of the Public Works Department is currently responsible for maintaining and improving a little under 1,400 lane miles of roadway. Between fiscal years 2014 and 2018, an average of $11 million dollars was expended annually from the Streets Improvement Fund. In addition to these monies, citizens approved $44 million of bond issues via election in 2012 and 2014 to fund the rehabilitation of certain streets throughout the City. Compared to similar organizations, the Division's staffing level is about average by lane miles.

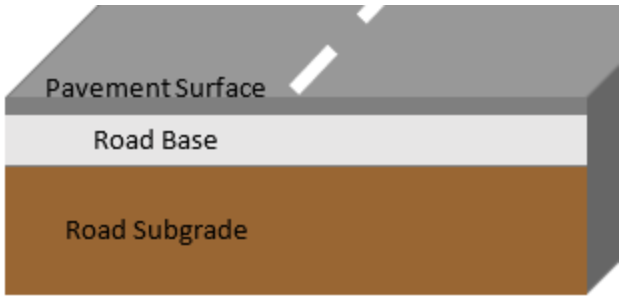
Figure 1: Staffing Comparison – Lane Miles per Full Time Equivalent



No matter how well constructed, a roadway will deteriorate over time due to the effects of traffic loads and the environment. Roadway maintenance and improvements are used to slow down or reset this deterioration process. Generally, there are three different classifications of roadway maintenance and improvements that are further described below. Each of these maintenance and improvement techniques are useful at different points in the pavement's life cycle and typically cost decreasing amounts of money from rehabilitative to corrective to preventative techniques.

Rehabilitative improvements repair portions of an existing pavement to reset the deterioration process. The City uses asphalt overlays and concrete panel replacements to rehabilitate the pavement surface of a road. An overlay involves milling away the existing pavement surface and then laying new asphalt to repave the roadway. Similarly, a panel replacement removes the existing concrete pavement and replaces it with a new panel.

The reconstruction of a roadway involves the stabilizing and compacting of the naturally occurring material, called the subgrade. Additionally, a base layer, typically made of compacted aggregate material, may be added on top of the subgrade to further improve the structure's integrity. Finally, the pavement surface is lain to protect these underlying pavement layers (see Picture 1).



***Picture 1**: Simplified Roadway Cross Section*

Corrective maintenance helps to slow the rate of deterioration by repairing localized failures of the underlying layers. Specifically, the City repairs potholes, utility cuts, and base failures through the use of patching and level ups. Patching and level ups involve replacing an area of the pavement surface with new material after repairing an underlying deficiency. While patching is a maintenance technique, it weakens the pavement's surface and cannot fully replicate the integrity of the original road's structure. These weaknesses can only be corrected through rehabilitative improvements such as milling and overlay techniques.

Preventative maintenance and improvements help to slow the rate of deterioration by addressing minor deficiencies on the pavement surface caused by the passage of time. Specifically, the City utilizes crack sealing and micro sealing techniques to prolong the useful life of a pavement. Crack sealing is the process of individually filling cracks along the pavements surface to prevent the entry of water, weeds, rocks, etc.; a similar technique, called joint sealing, may be used for concrete pavements. These techniques help to prevent the deterioration of the roads underlying layers. Micro sealing is the process of adding a thin layer of asphalt to an existing pavement surface, extending the useful life of that surface; this technique is also considered a roadway improvement.

What Works Well?

Throughout this report, the City's controls over the quality assurance of roadway rehabilitation and pavement condition management and monitoring have been compared to the City's policies and procedures and pavement management best practices compiled by Pavement Interactive. Pavement Interactive is a curated information resource for the pavement community, which provides a reference on common pavement topics, methods, and practices. Pavement Interactive was developed by the Pavement Tools Consortium, a partnership between several state Department of Transportations,[2] the Federal Highway Administration, and the University of Washington, as part of their effort to further develop and use computer-based pavement tools.

Street Design Standards Address Critical Design Parameters

According to Pavement Interactive, there are three fundamental design parameters to consider during street construction or rehabilitation: 1) subgrade characteristics, 2) traffic loads, and 3) environmental factors. Pavement design standards must be met to provide the pavement useful life expected by the owning agency. The auditors found the following:

- Pavement standards were designed by an engineering consultant based on a 20-year useful life for asphalt streets and 40-year useful life for concrete streets and codified in the Transportation Design Criteria Manual.
- Design standards are based on street classifications (i.e. arterial, collector, etc.) which are determined by traffic loads.
    - Standards define street minimum and maximum grading, minimum subgrade stabilization depth, minimum pavement thickness, and minimum steel bar reinforcement size.
- City Ordinance requires all street improvements to comply with the street design specifications contained in the Transportation Design Criteria Manual.

The Pavement Management System Provides for Equitable Use of Resources

Pavement Interactive defines a pavement management system as the "concept of providing pavements and maintaining them in acceptable condition" and identifies five key components of a management system. These components include: 1) pavement condition survey, 2) pavement information database, 3) pavement analysis scheme, 4) decision criteria, and 5) implementation. The auditors found the following:

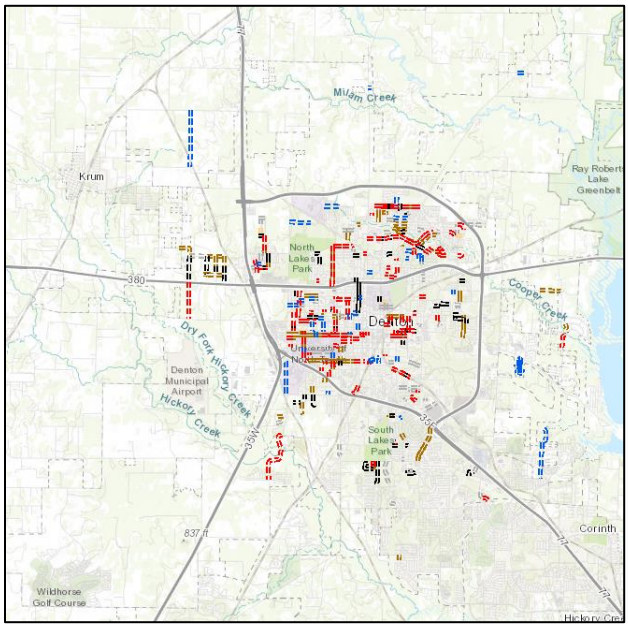
- The City of Denton hires a consultant about every five to six years to identify an overall condition index (OCI) number for each street segment (similar to a block). The most recent consultant used a pavement assessment methodology that conforms to best practices and was similar to that of benchmark municipalities.

[2] The Texas Department of Transportation was a part of this Consortium.

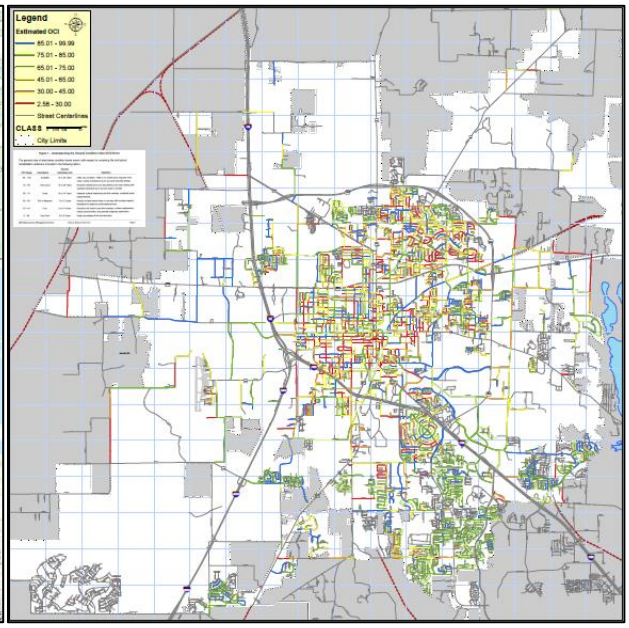
- The OCI is based on the size of visible pavement distresses, road roughness, and – for collectors[3] and above – the street's structural integrity based on samples of the underlying layers of roadway.

- The inspected OCI of each street segment is maintained in the City's pavement management software. This software depreciates the OCI as time passes based on the pavement's subgrade strength and traffic load. In addition, it accounts for maintenance and improvement activities completed by the Division.

- This estimated OCI is then used to determine when and where maintenance and improvement techniques should be used based on guidelines provided by the pavement management survey consultant. This practice helps to ensure resources are used equitably throughout the City.
  - Similarly, the Streets Division typically identifies street segments with very-low OCIs to be targeted as part of street rehabilitation bond programs.
  - Pictures 2 and 3 below compare planned roadway improvement activities to the current condition of the City's roadway network based on the estimated OCI. These pictures illustrate a connection between planned rehabilitative activities and roadway improvement needs based on estimated OCI.



Picture 2: *Planned Improvements*



Picture 3*: Road Quality*

[3] "Collector streets" collect the associated traffic from residential and rural streets, commercial streets, or industrial streets.

Coordination Between Streets & Utilities is Improving

Utility lines are typically placed alongside or under the City's roadways; however, this means that it is frequently necessary to remove sections of roadway for a utility to perform work on their assets. Therefore, agencies should coordinate their maintenance and improvement activities to most efficiently and effectively provide both utility and roadway services to residents. The auditors found the following:

- The City has developed a process to clear street improvement projects (i.e. micro seals, overlays, and reconstructs) through the City's Water Utilities Department and Atmos Energy.[4] Clearing a project may require the utility to replace or repair their utility lines before Streets can begin their work.
    - The Wastewater Department uses an algorithm to identify necessary repair actions to take before clearing a street project. This algorithm takes into account planned repairs, repair history, current inspection information, choke or clog history, and a pipe-risk index.[5]
    - The Water Department determines necessary repair actions manually based on pipe age and breakage rates. Water is currently developing a similar algorithm to Wastewater's which should further improve effectiveness.
    - After clearance, roadway improvement activities are performed, and the corresponding street segments are placed under a moratorium, as determined by Streets Division practices, for the periods defined in Table 1.

Table 1: Moratorium Periods

Improvement	Moratorium
Micro Seal	3 Years
Overlay	7 Years
Reconstruct	12 Years

- In addition to this clearance process, monthly coordination meetings are held to help facilitate communication between City departments and external utilities. At these meetings scheduling and status information about each entity's current projects is discussed.

- There has not always been a focus on the coordinated scheduling of utility and street projects; however, this has recently been changing as the Water, Wastewater, and Streets Divisions have developed their own construction schedules. While these scheduling efforts are still being integrated and refined, they should increase efficiency moving forward.

[4] These utilities accounted for about 97% of all utility street cuts in 2018.

[5] Wastewater pipe-risk is based on breakage rates, tree root density, and other factors.

Opportunities for Improvement

Between 2016 and 2018, the City's Streets work order system – Cartegraph – recorded a total cost of almost $19.7 million; street maintenance and improvement techniques made up about 77% of these expenditures, which are broken out by activity type in Table 2. These activities are paid through several funding sources including general obligation bond revenues and the Streets Improvement Fund operations and maintenance budget.

Table 2: Maintenance & Improvement Cost Breakdown (2016-2018)

Preventative Techniques	**Total Cost**
Crack Sealing	$171,000
Micro Sealing	$1,743,000
All:	*$1,914,000*
Corrective Techniques	**Total Cost**
Level Ups	$214,000
Potholes	$412,000
Utility Cuts	$1,004,000
Base Failures	$1,945,000
All:	*$3,575,000*
Rehabilitative Techniques	**Total Cost**
Mill & Overlays	$3,988,000
Reconstructs	$5,691,000
All:	*$9,679,000*
All Techniques	*$15,168,000*

Roadway Rehabilitation Quality Cannot Always be Assured

According to Pavement Interactive, there are generally three components to quality assurance[6] consisting of, 1) quality control (QC), performed by those doing the work; 2) independent assurance (IA), performed by an unrelated third-party; and 3) quality acceptance (QA), performed by the owning agency. Acceptance activities include the sampling, testing, and assessment of test results to determine whether construction meets the design specifications.

Inspectors monitor and observe the construction of roads and typically file daily reports for their supervisors to review as part of the acceptance process. Pavement Interactive specifies that inspectors must be in a separate chain of command from the crews who are building the roads to ensure appropriate segregation of duties. If this is not possible, compensating controls should be designed to ensure quality standards are met. A well-designed quality assurance process decreases the likelihood that street improvements do not meet their expected useful life, which would require more maintenance faster than expected.

[6] Quality assurance is defined as those planned and systematic actions necessary to provide confidence that a product or facility will perform satisfactorily in service, including continued evaluation of all activities in the process.

What We Found?

- Quality control activities (i.e. street construction activities) may be performed by either in-house Streets Division crews or contractor crews. Both types of crews are required to conform to the City's Transportation Design Criteria Manual.

Controls Over Contractor Crews

- A third-party civil engineer provides construction plans or design minimums for contracted reconstructs.

- A separate third-party geotechnical engineer tests the quality of rehabilitation construction materials upon request of the City.

- Field Services Supervisors record inspection results in their personal project journals and verbally communicate any project issues to Streets upper management and contractor crew leaders. Inspection reports are not physically documented.

- Contracted work orders are closed by the Project/Construction Coordinator after the submitted invoice has been reviewed by the Field Services Supervisor.

Controls Over In-House Crews

- A third-party geotechnical engineer typically provides design minimums for in-house rehabilitations; design decisions are occasionally made by Field Services Supervisors when a geotechnical engineer is not engaged.

- Typically, the same third-party geotechnical engineer tests the quality of rehabilitation construction materials upon request of the City.

- Field Services Supervisors record inspection results in their personal project journals and verbally communicate any project issues to Streets upper management and in-house crew leaders. Inspection reports are not physically documented.

- In-house work orders are then closed by the Field Services Supervisor or the Crew Leader.

Available Documentation of Quality

- OCI maintenance guidelines promulgated by the City's pavement survey consultant suggest the following maintenance and improvement techniques (see Picture 4).

OCI Range	Description	Relative Remaining Life	Definition
85 – 100	Excellent	15 to 25 Years	Like new condition – little to no maintenance required when new; routine maintenance such as crack and joint sealing.
75 – 85	Very Good	12 to 20 Years	Routine maintenance such as patching and crack sealing with surface treatments such as seal coats or slurries.
65 – 75	Good	10 to 15 Years	Heavier surface treatments and thin overlays. Localized panel replacements.
45 – 65	Fair to Marginal	7 to 12 Years	Heavy surface-based inlays or overlays with localized repairs. Moderate to extensive panel replacements.
30 – 45	Poor	5 to 10 Years	Sections will require very thick overlays, surface replacement, base reconstruction, and possible subgrade stabilization.
0 – 30	Very Poor	0 to 5 Years	High percentage of full reconstruction.

***Picture 4**: OCI Guidelines*

- These definitions were used to develop the criteria shown in Table 3. These criteria were applied to the average inspected OCI of about $11.4 million of street improvement projects to target projects for review.[7] Maintenance techniques were not reviewed because they are generally localized projects that do not impact the OCI of the whole street segment.

Table 3: Targeted Review Criteria

Improvement Activity	Project Average Inspected OCI
Micro Seal	Below 45
Mill & Overlay	Below 30
Reconstruct	Above 50

- Based the criteria in Table 3, we selected no micro seal projects, 9 mill & overlay projects, and 15 reconstruction projects[8] for targeted review. These selected projects totaled about $2.1 million dollars (i.e. 18% of street improvement project work order costs); about half of this amount was spent via contract. After reviewing the available supporting documentation for these projects, we found the following:
  - About $141,000 of rehabilitative activities on 1.63 lane miles of roadway had documentation that supported an alternative action being taken – specifically the road was overlaid instead of reconstructed. There was no management approval of these unsupported actions documented.
    - About 87% of these unsupported expenditures were made in contradiction to the opinion issued by the geotechnical engineering company. The remaining amount appear to have been overlaid in response to pressure from residents, however, they were scheduled to be reconstructed as part of the bond program.

Table 4: Summary of OCI Rehabilitation Exceptions Documentation (2016-2018)

Audit Determination[9]	Reconstruct Amount	Overlay Amount	Total Amount
Unsupported	$0	$141,000	$141,000
Lack of Design Standards	$197,000	$102,000	$299,000
Supported	$1,619,000	$44,000	$1,663,000
All OCI Exceptions:	*$1,816,000*	*$287,000*	*$2,103,000*

  - Relevant materials testing results prepared by the City's geotechnical engineer could not be provided for three of fifteen reconstruction projects and seven of nine overlay projects about $443,000.
  - Quality inspection documentation could not be provided for any of these projects.

[7] A project was determined by matching multiple street segment street names, activities completed, and dates completed.

[8] Two of these reconstruct projects used mill & overlay activity codes, however, we were able to verify that they were reconstructed.

[9] An activity was determined to be unsupported if there was documentation that a different action had been recommended. Those projects identified as part of a bond program or bond program "connectors" were determined to be supported.

Why Does It Matter?

Table 5 summarizes the controls currently being performed to ensure the quality of contractor and in-house road rehabilitation projects meets standards; the current control deficiencies exist:

a. Field Services Supervisors occasionally make decisions contrary to geotechnical engineer design recommendations (QC step in Table 5). Justification or support for these decisions is not adequately documented (see Table 4).

b. Design standards and materials testing results prepared by the geotechnical engineer are not always retained by the Division (IA step in Table 5).

c. The Field Services Supervisor's quality inspections of contractor and in-house rehabilitation projects are not documented in a reviewable form (QA step in Table 5).

Table 5: Quality Assurance Controls over Road Rehabilitations

Step	Control Activity	Contractor	In-House
QC	Design Standards	Civil Engineer	Geotechnical Engineer or Field Services Supervisor
	Crew Supervision	Crew Leaders	Crew Leaders
IA	Materials Testing	Geotechnical Engineer	Geotechnical Engineer
QA	Quality Inspections	Field Services Supervisor	Field Services Supervisor
	Quality Acceptance	Field Services Supervisor	Field Services Supervisor or Crew Leaders
	*Risk Level: **	High	High

*Risk that roadway improvements will not comply with the City's standards.

Adequate Assurance of Compliance
Some Assurance of Compliance
Little Assurance of Compliance

We verified that about 1.63 lane miles of road were overlaid instead of being fully reconstructed as indicated by OCI guidelines and a geotechnical engineer's recommendation. While there may be justification for these decisions there is not documentation available to show appropriate approval of these actions. Furthermore, without retaining design standards or materials testing results provided by the geotechnical engineer, compliance with the City's quality standards cannot be assured after the project is complete. Similarly, there is no reviewable documentation of Field Services Supervisor's inspections, meaning there is little assurance that standards are being met.

These documentation issues prevent independent determination of a rehabilitation project's compliance with the City's standards. If projects are not constructed to standards, they may not meet the expected useful life – potentially costing the City more money more quickly than expected. Without more complete documentation, our Office cannot provide assurance on the quality of rehabilitation projects, even if the activity aligns with OCI guidelines.

Recommendations (High Priority):

1. Develop a standardized process for recording and approving design adjustments to in-house street rehabilitation projects. While not all projects need to have engineered design minimums, adjustments to these minimums need to be approved by Streets management.

   Public Works Comments: *Staff will implement process controls for deviation from recommendations. This will include written documentation escalated and signed by*

management to approve the deviation. SOPs (standard operating procedures) will be created and all employees will be trained on the process.

2. Develop a record retention system to store inspection reports and geotechnical reports for each street rehabilitation project according to the Texas State Library and Archives Commission's regulations.

   Public Works Comments: *Staff will establish SOPs (standard operating procedures) for record retention. Cartegraph, our internal work order system, can be structure so that all pertinent documents to the specific job are stored in the system and reports can be run to retrieve the data.*

3. Require Streets Field Services Supervisors to submit periodic inspection reports as part of the quality acceptance decision-making process for street rehabilitation projects.

   Public Works Comments: *Standardized inspection documentation will be created and implemented. These documents will be specific to the work being performed, (mill and overlay, micro seal, reconstruction, etc.), archived in the Cartegraph system, and tied to the work order. SOPs (standard operating procedures) will be created and all employees will be trained.*

Changes to Street GO Bond Administration Could Further Enhance Transparency

In order to facilitate the rehabilitation of the City's roadway network, citizens approved $44 million of general obligation (GO) bond issues via election in 2012 and 2014 to fund the rehabilitation of streets throughout the City. The use of GO bonds is intended to increase transparency as only those expenditures authorized via the bond election can be funded with GO revenues.

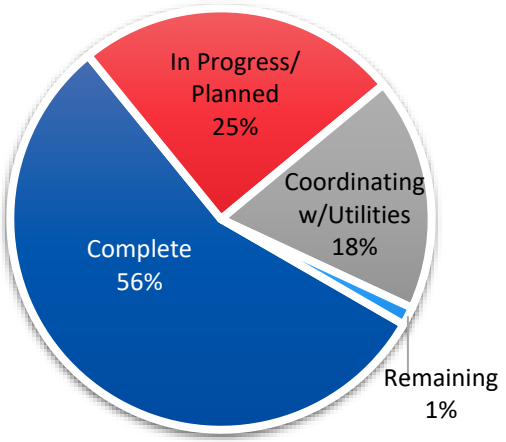
What We Found?

Bond Program Planning

- When developing street propositions for GO bond elections, the Streets Division has typically identified street segments with very-low OCIs as rehabilitation targets and advertised these areas as part of the election materials.
    - The Division's progress on completing these areas is monitored by the City's Bond Oversight Committee, which is composed of five Denton citizens who are appointed by the City Council. As of April 2019, the rehabilitation of about 56% of lane miles identified in the 2012 and 2014 bond programs has been completed. Figure 2 shows the current status of these lane miles in more detail.[10]

[10] Appendix B details the street segments that are remaining (i.e. no progress has been made towards their rehabilitation).

Figure 2: 2012 & 2014 Street Rehabilitation Bond Program Status



Status	Segments	Lane Miles
Complete	226	72.8
In Progress/Planned	99	32.4
Coordinating w/Utilities	72	23.4
Remaining	6	1.8
All:	403	130.4

- Street segments near or in between the very-low OCI segments with higher OCIs – called "connectors" – were not included as part of the bond program in these advertised materials.[11]
    - However, current Division practices typically include these connectors in rehabilitation projects, especially if the segments are all located in one neighborhood or will be disturbed by utilities.
    - While not all rehabilitation costs are part of bond programs, about 35% of our $2.1 million of projects targeted for documentation review (i.e. Table 4)[12] were "connectors" and about 41% were identified as part of the bond program in the advertised materials.

Bond Program Accounting

- General obligation bond funds from different elections are currently co-mingled in one fund by business unit. For example, the revenues from $44 million of 2012 and 2014 approved bond issues are recorded in one GO Streets fund; GO revenues and associated expenditures for a separate business unit, such as Parks, are recorded in a separate fund

- Street project descriptions do not always clearly specify the street segments included in the project's scope. Additionally, project numbers are not always included in Cartegraph. These practices hinder the tracking of bond expenditures to specific rehabilitation work.

Why Does It Matter?

Bond Program Planning

As mentioned previously, selecting street segments to be targeted as part of a bond program using the very-low OCI criteria is an appropriate practice that helps ensure resources are used equitably throughout the City. However, not considering connectors in bond program planning requires the Streets Division to spend more money than anticipated on these projects to remain effective; not planning for these connectors means either:

I. Money from the operational fund must be spent to supplement the bond program; or

[11] According to staff, planning for the 2019 GO election will consider street connectors when identifying streets for rehabilitation.

[12] This information is included for reference and should not be taken as a reflection of all Streets rehabilitation activities.

II. General obligation bond revenues must be spent to rehabilitate fewer lane miles.

Bond Program Accounting

The City's current project accounting method is appropriate for tracking expenses related to each street rehabilitation and provides adequate transparency to the Bond Oversight Committee; however, consistent and specific project documentation would facilitate tracking GO bond fund expenditures. Similarly, accounting for both the 2012 and 2014 bond revenues in one GO Streets fund hinders the tracking of project expenditures back to bond series. More consistent and precise accounting of bond revenues and expenditures would further enhance transparency and accountability.

Recommendations:

4. Consider including street connectors in bond program proposals in the future to better estimate costs and provide greater transparency to residents.

   Public Works Comments: *Staff will recommend implementing this practice to the Bond committee. The ultimate decision is left up to the committee. Staff will follow Bond Committee and City Council direction.*

5. Develop a process to consistently document the street segments included in each project.

   Public Works Comments: *Staff will restructure the intake portion of the workorder system to more efficiently tie street segments together on larger jobs. SOPs (standard operating procedures) will be created and all employees will be trained in the new process.*

6. Finance should consider accounting for each general obligation bond series in a separate fund.

   Finance Comments: *The consolidation of bond funds was implemented in 2014 to streamline the tracking of project costs and expenses of bond proceeds. Among other benefits, consolidation limits the number of funds necessary to account for project construction costs. The City's Bond Counsel approved of consolidation, and the City's annual external audits have approved capital projects expenditures related to bond related projects.*

   Following the approval of a new bond program, staff will consider all options for bond fund accounting.

Data Issues Impede Pavement Monitoring Effectiveness

As mentioned previously, a pavement management system typically has five components including a pavement information database. This database should allow the user to view and manipulate pavement data in a meaningful way. The City's database is stored in its Cartegraph system which contains two types of pavement information: 1) street asset information by segment and 2) maintenance and improvement work order information.

What We Found?

Street Segment Asset Information

- Street segment asset information is generally complete and accurate; however, the installed date of most assets was not up-to-date.

- This data is currently stored in the City's geographic information system (GIS). According to staff, Streets is working with Technology Services to link this data to Cartegraph.

- Certain work order activities increase the OCI of the associated asset. These point increases are set by the City's OCI consultant based on their professional judgment.
  - We believe these point increases are generally appropriate with the exception of overlay work orders, which may result in overestimating the overlays effectiveness – especially for lower OCI assets. Table 6 shows the point increases.

Table 6: Street Asset OCI Updates by Work Order Activity

Activity	OCI Increased To
Reconstruct	100
Overlay	85

Activity	OCI Increased By
Micro Seal	10%
Crack Seal	7%

- Visual inspection and analysis of estimated OCI data found that about 228 work orders completed between 2016 and 2018 did not properly update the asset's OCI.
  - After communicating this information to staff, they found that there were issues in Cartegraph's update formula. This issue has since been corrected – increasing the City's roadway network's average estimated OCI by about half a point.

Work Order Information

- The Cartegraph work order system had 6,847 completed work orders recorded at the beginning of our audit period. These work orders finished construction between May 2015 and February 2019, and about 56% appear to be directly related to street maintenance or improvements. The auditors found:
  - A total of 83 different work order activity codes are recorded in the City's work order data. Some of these activities are obsolete, duplicates of other activities, or steps in a different activity's process. These redundancy issues appear to have improved over time from 68 activity codes in 2016 to 49 in 2018; however, they still complicate attempts to analyze activity costs over this period.
  - Over 5% of completed work orders do not have a construction start date, however, only one work order was missing a construction stop date. It is unclear why these start dates are omitted.
  - Almost 7% of completed work orders do not have any related cost information; of these work orders, 163 (about 2% of completed work orders) were directly related to street maintenance or improvements.

Why Does It Matter?

Without installed date information, the Division is not able to conduct analysis on the useful life of pavements to identify potential issues in the City's standards or pavement quality. In addition, without consistent work order information such as activity, cost, start dates, and stop dates, the City cannot conduct effective cost analysis.

Similarly, 39 overlay work orders were completed on street segments with an inspected OCI less than 30, which would indicate a reconstruction is more appropriate, typically because the integrity of the underlying layers of the roadway are failing. If the underlying integrity of these segments was failing, increase the OCI to 85 – or very good condition – could lead to the segment not receiving needed maintenance or improvements.

In summary, without capturing adequate data, the City cannot effectively monitor the condition of its roadway network. While the deficiencies noted previously do not prevent monitoring, the effectiveness of the Division will be enhanced through more accurate, consistent, and complete data entry and analysis.

Recommendations:

7. Include up-to-date installed date information in the Cartegraph system.

   Public Works Comments: *Staff will work with IT to update the installed date for older infrastructure pulling information from GIS. While the install date is important it is not vital. With regular pavement studies the street condition is evaluated at that time and a maintenance plan is established on the current condition.*

8. Consider adjusting the amount of OCI points added to a street segment for overlays. Increasing the OCI by a percentage, similarly to micro seals and crack seals, may be more appropriate for lower OCI streets than increasing the OCI to a flat 85 which is the current practice.

   Public Works Comments: *Staff will discuss the recommendation with the Pavement survey contractor. All performance curves and OCI adjustments after completion of work is a base line set by pavement analysis company. This company will be conducting another survey in the next fiscal year and will reevaluate at that time.*

9. Provide training for crew leaders entering work order information into the Cartegraph system. The training's content should be focused on generating data that will be useful for the Division when analyzing the cost of work orders and useful life of assets and should be informed by management's needs.

   Public Works Comments: *Staff will create SOPs (standard operating procedures) and all employees will be trained on the process of work order entry.*

Potential Cost Savings May Exist in the Purchasing Process

In order to protect its residents from misappropriation or malfeasance of municipal funds, Texas state law requires different bidding requirements at differing levels of purchases.[13] These requirements are summarized in Table 7; however, it should be noted that there are some exceptions, which are outlined in Texas Local Government Code Section 252.002.

Table 7: Texas Purchasing Law Summary

Greater than $50,000	• Invite competitive sealed bidding • Award a contract to the lowest responsible bidder
Between $3,000 & $50,000	• Acquire at least three quotes • Contact at least two historically underutilized businesses (HUB)
Less than $3,000	• None

What We Found?

- During 2018, a total of $14.9 million dollars purchase orders were issued from the Streets Improvements Fund. About $14.5 million of this amount was covered under a contract. The remaining $408,868 were spent as shown in Table 8.

- Based on a review of available documentation, the Division purchased two commodities – totaling $40,977 – without obtaining three quotes or having adequate exception documentation.
    - Documentation showed that $31,117 of this amount was spent on purchases of lime after the previous contract had expired. A new contract was executed later that year.
    - The other $9,860 for railroad signal maintenance may be a sole source exception, however, there is not adequate documentation to verify this conclusion.

- We identified one commodity that had a relevant historically underutilized business; a quote was not obtained from this vendor and there was no documentation that they were contacted.

- Eight purchase orders issued during 2018 were for the rental of signs and barricades to mark road construction areas. These purchases – made for different constructions sites – total more than $50,000.

[13] Texas Local Government Code prohibits the use of "separate, sequential, or component purchases" as a means of avoiding bidding requirements.

Table 8: Streets Improvement Fund Purchases without a Contract

Commodity	Compliant?	Total Purchases
Sign & Barricade Rentals	Contract Needed	$89,894
Materials Disposal	HUB Quote Missing	$50,000
Sampling	Yes	$50,000
Guard Rails	Yes	$49,000
Backhoe Rental	Yes	$38,743
Patching Material	Yes	$35,700
Lime	Quotes Needed	$31,117
Skid Steer Loader Rental	Yes	$30,032
Signal Maintenance	Quotes Needed	$9,860
Heavy Equipment Purchase	Yes	$8,371
Professional Service	Exempt	$7,500
Light Tower Rental	Yes	$4,700
Tree Trimming	Yes	$2,950
Training	Yes	$1,000
	All:	$408,868

Why Does It Matter?

Without proper documentation, we cannot determine if the City has completely complied with Texas law for about $40,977 of purchases; however, these issues have been addressed in a separate audit of Procurement. This being said, departments are responsible for obtaining quotes when purchases are between $3,000 and $50,000 according to the City's Materials Management & Payment Procedures Manual – meaning the Streets Division must ensure compliance with Texas law regarding historically underutilized businesses.

Finally, sign and barricade rentals totaled more than $50,000, which is a violation of state law. The City should contract for these purchases in order to comply with state law going forward. In addition, the City may be able to save money on these expenditures through the contracting process.

Recommendations:

10. Check the Texas State Comptroller's website for related historically underutilized businesses when obtaining quotes for purchases between $3,000 and $50,000.

    Public Works Comments: *Staff has been trained on the correct process for properly quoting jobs. Continued education will continue as other Purchasing procedures are updated.*

11. Contract for the rental of signs and barricades to mark road construction sites.

    Public Works Comments: *Contract was approved by City Council June 18th.*

Current Management Structure Indicates Redundancy

Responsibility should be assigned to discrete units of an organization to operate in an efficient and effective manner according to the Government Accountability Office's Standards for Internal Control. During the audit period, Streets was a division of Capital Projects under the operations

side of the department; the Traffic and Drainage divisions were also a part of Capital Projects' operations.

What We Found?

- The Traffic and Drainage Divisions are managed by a single operations manager who reports to the Deputy Director of Operations.

- Differently, the Streets Division has two levels of upper management, a Streets Operations Manager and a Streets & Traffic Superintendent.
    - The two upper management positions of the Streets Division have similar competency requirements.
    - The Streets & Traffic Superintendent does not provide managerial support or supervision for the Traffic Division.

Why Does It Matter?

Managerial redundancy typically increases the complexity of high-level decision making, decreasing the efficiency of the division. Similarly, the City may be paying more than necessary in salary to provide managerial support and supervision for the Streets Division.

As of May 2019, the employee currently holding the Streets & Traffic Superintendent position has elected to retire from the City. Streets Division management has stated that they do not intend to fill this position, which would functionally alleviate the redundancy identified.

Recommendations:

12. Revise the Streets Operations Manager and Streets & Traffic Superintendent job descriptions to more accurately reflect current job responsibilities. Consideration should be given to the job responsibilities assigned to the Construction Projects Manager and Field Services Supervisors so as not to create managerial redundancy. If total job responsibilities do not warrant two positions, they should be combined into one.

    Public Works Comments: *Duplicate level of Supervision was eliminated with the retirement of the Streets Superintendent.*

Appendix A: Management Response Summary

The following summarizes the recommendations issued throughout this report. Based on management's request, our Office has designated recommendations 1, 2, and 3 to be high priority. The auditors found that staff and the Division was receptive and willing to make improvements to controls where needed. Management has provided their response to each recommendation.

1	*Develop a standardized process for recording and approving design adjustments to in-house street rehabilitation projects.*	**Concur**	Expected Completion: 1st Quarter 2020
Public Works Comments: Staff will implement process controls for deviation from recommendations. This will include written documentation escalated and signed by management to approve the deviation. SOPs (standard operating procedures) will be created and all employees will be trained on the process.			Responsibility: Daniel Kremer
2	*Develop a record retention system to store inspection reports and geotechnical reports for each street rehabilitation project according to the Texas State Library and Archives Commission's regulations.*	**Concur**	Expected Completion: 1st Quarter 2020
Public Works Comments: Staff will establish SOPs (standard operating procedures) for record retention. Cartegraph, our internal work order system, can be structured so that all pertinent documents to the specific job are stored in the system and reports can be run to retrieve the data.			Responsibility: Daniel Kremer
3	*Require Streets Field Services Supervisors to submit periodic inspection reports as part of the quality acceptance decision-making process for street rehabilitation projects.*	**Concur**	Expected Completion: 1st Quarter 2020
Public Works Comments: Standardized inspection documentation will be created and implemented. These documents will be specific to the work being performed, (mill and overlay, micro seal, reconstruction, etc.), archived in the Cartegraph system, and tied to the work order. SOPs (standard operating procedures) will be created and all employees will be trained.			Responsibility: Daniel Kremer
4	*Consider including street connectors in bond program proposals in the future to better estimate costs and provide greater transparency to residents.*	**Concur**	Expected Completion: Fall 2019
Public Works Comments: Staff will recommend implementing this practice to the Bond committee. The ultimate decision is left up to the committee. Staff will follow Bond Committee and City Council direction.			Responsibility: Daniel Kremer
5	*Develop a process to consistently document the street segments included in each project.*	**Concur**	Expected Completion: 1st Quarter 2020
Public Works Comments: Staff will restructure the intake portion of the workorder system to more efficiently tie street segments together on larger jobs. SOPs (standard			Responsibility: Daniel Kremer

operating procedures) will be created and all employees will be trained in the new process.

6	*Finance should consider accounting for each general obligation bond series in a separate fund.*	**Partially Concur**	Expected Completion: N/A
Finance Comments: The consolidation of bond funds was implemented in 2014 to streamline the tracking of project costs and expenses of bond proceeds. Among other benefits, consolidation limits the number of funds necessary to account for project construction costs. The City's Bond Counsel approved of consolidation, and the City's annual external audits have approved capital projects expenditures related to bond related projects. Following the approval of a new bond program, staff will consider all options for bond fund accounting.			Responsibility: Finance
7	*Include up-to-date installed date information in the Cartegraph system.*	**Partially Concur**	Expected Completion: Ongoing
Public Works Comments: Staff will work with IT to update the install date for older infrastructure pulling information from GIS. While the install date is important it is not vital. With regular pavement studies the street condition is evaluated at that time and a maintenance plan is established on the current condition.			Responsibility: Daniel Kremer
8	*Consider adjusting the amount of OCI points added to a street segment for overlays.*	**Partially Concur**	Expected Completion: 2nd Quarter 2020
Public Works Comments: Staff will discuss the recommendation with the Pavement survey contractor. All performance curves and OCI adjustments after completion of work is a base line set by pavement analysis company. This company will be conducting another survey in the next fiscal year and will reevaluate at that time.			Responsibility: Daniel Kremer
9	*Provide training for crew leaders entering work order information into the Cartegraph system.*	**Concur**	Expected Completion: 1st Quarter 2020
Public Works Comments: Staff will create SOPs (standard operating procedures) and all employees will be trained on the process of work order entry.			Responsibility: Daniel Kremer
10	*Check the Texas State Comptroller's website for related historically underutilized businesses when obtaining quotes for purchases between $3,000 and $50,000.*	**Concur**	Expected Completion: 6/7/2019
Public Works Comments: Staff has been trained on the correct process for properly quoting jobs. Continued education will continue as other Purchasing procedures are updated.			Responsibility: Daniel Kremer
11	*Contract for the rental of signs and barricades to mark road construction sites.*	**Concur**	Expected Completion: 6/18/2019

	Public Works Comments: Contract was approved by City Council June 18th.		Responsibility: Daniel Kremer
12	*Revise the Streets Operations Manager and Streets & Traffic Superintendent job descriptions to more accurately reflect current job responsibilities.*	**Concur**	Expected Completion: 6/28/2019
	Public Works Comments: Duplicate level of Supervision was eliminated with the retirement of the Streets Superintendent.		Responsibility: Daniel Kremer

Appendix B: Remaining Bond Program Street Segments

The street segments listed below were identified for rehabilitation as part of the 2012 and 2014 bond program, however, we found no evidence that the rehabilitation process had begun. They are included here as reference for the Streets Division.

Table 9: Remaining Street Segments

Bond Year	Seg ID	Street	Route Back	Route Ahead	Lane Miles
2012	116-3	Bowling Green St	Georgetown Dr	Vanderbilt St	0.6807
	116-4	Bowling Green St	Vanderbilt St	Auburn Dr	0.3659
	407-7	Highland Park Rd	Willowcrest Loop	Willowcrest Loop	0.2155
	666	Oakhurst St	Bentoaks Dr	Oakhurst St	0.1355
	829	Sheraton Pl	Sheraton Rd	Buckingham Dr	0.2604
	959	Williams Ln	Buckingham Dr	Royal Acres Dr	0.1736