

2016-2017
**STATE
OF OUR
STREETS
REPORT**



CONTENTS

EXECUTIVE SUMMARY

A Work in Progress	1
Keeping Auburn Moving	2
The State of our Streets	2
Next steps?	3

PROJECT SPOTLIGHT AND ROADWAY PRESERVATION PROGRAMS

2017 Project Roster	4
2016 Project Roster	6

PRESERVATION PROGRAMS OVERVIEW

Arterial Street Preservation Program	7
Arterial Street Preservation funding	8
Planned Arterial Street Preservation Projects	9
Moving Forward	9
Local Street Preservation Program	10
Local Street Preservation Funding	10
Planned Local Street Preservation Projects	11
Moving Forward	11

APPENDIX

Map 1 2017 Roadway Construction Projects	Appendix 1
Map 2 2016 Roadway Construction Projects	Appendix 2
Map 3 Arterial & Collector Pavement Conditions	Appendix 3
Map 4 Planned Preservation Projects	Appendix 4
Map 5 Local Street Pavement Conditions	Appendix 5
Map 6 Citywide Ride Quality Rating	Appendix 6
Pavement Inventory & Rating	Appendix 7
How will the City Improve in the Future?	Appendix 8
What Do the Numbers Mean?	Appendix 8
Auburn's Street Selection Process	Appendix 9

EXECUTIVE SUMMARY

This report is to document the progress of the Arterial and Local Street Pavement Preservation Programs for the City, including reporting on the updated pavement condition ratings that were collected in the Summer of 2017, provide a current overview of the programs, and provide recommendations on program needs and challenges. City owned paved alleyways and gravel roads are maintained by the Maintenance & Operations Division and are not included in this report.

A WORK IN PROGRESS

Streets are classified based on the type of traffic they are intended to support. Major streets that are intended to support a large amount of traffic traveling to neighboring jurisdictions, to state highways and across the City of Auburn (City) are typically classified as arterial streets. Streets that are intended to support a moderate amount of traffic and connect neighborhoods and industrial/commercial areas to arterial streets or to other neighborhoods and industrial/commercial areas are generally classified as collector streets. Streets that are intended to support a low volume of traffic and connect local residences and businesses to an arterial or collector street are generally classified as local streets.

The City manages the pavement infrastructure through two separate programs, the Arterial Streets Preservation Program and Local Streets Preservation Program. The Arterial Street Preservation Program is currently funded at approximately \$1.6 to \$1.8 million annually, and covers the Arterial and Collector roadways in the City. These major streets consist of approximately 69 centerline miles (201 lane miles) of Arterials and 34 centerline miles (71 lane miles) of Collectors roadways. The Local Street Preservation Program is funded at approximately \$1.5 to \$2.3 million annually, and is responsible for the non-arterial roadways, consisting of approximately 146 centerline miles (292 lane miles) of residential and non-residential local streets.

The goal for the preservation programs is to maintain the entire street network at a Pavement Condition Index (PCI) Score of 70 or greater on a 1-100 basis with 100 being new pavement. An average score of 70 was chosen because it provides for the most cost effective balance for the long term preservation of the roadway system where the majority of streets are at or above 70. The PCI of a street is an estimated measure of the amount of visible cracking, rutting and roughness of a particular segment of roadway. Every street in the network is rated periodically, and those scores are used to indicate when a particular street is in need of some sort of preservation, rehabilitation, or reconstruction. Please see Appendix A for more detail. The City's street system was rated in the Summer of 2017, and the results showed an overall increase in the pavement condition versus the 2013 pavement rating survey. An increase in pavement condition rating was expected as a result of all the investments made into the street system network since 2013. The City worked on several miles of streets in our network with City and grant funds used to complete much needed work.

The pavement rating data is the best metric to approximate the overall street system health, and helps inform decisions on when and where to invest to keep the City's streets in good condition. The other metrics used in rating the City's pavements are rutting, and roughness. These are used to help prioritize and differentiate between candidate streets during a selection process (please see Appendix A for more detail).

KEEPING AUBURN MOVING

It is anticipated that further improvements to the street network will be realized after a number of grant funded paving projects are completed over the next several years through the year 2020. The City has been successful in securing federal grants to help the Arterial Street Preservation program improve the condition of many of the City's major Arterials and this additional funding represents a major investment in the City's Federally classified roadway infrastructure. The City has also completed the reconstruction of past problematic streets in the City's street system, specifically B Street NW between 37th St NW and S 277th St; West Main Street between West Valley Highway and the Interurban Trail; and S 277th Street between Auburn Way N and L St NE. These streets were all previously in failing conditions and the City pooled funding and secured federal grants to address these major roads. Additionally, 2017 saw two other major grant funded paving projects be completed: Auburn Way North Preservation Project Phase I, and Lake Tapps Parkway Preservation Project; as well as the City Funded 2017 Local Street Reconstruction and Preservation Project.

THE STATE OF OUR STREETS

Arterial and Collector Street Preservation Program

The State of the Arterial and Collector Streets has improved with the investment in the infrastructure from these programs. In the next few years, many of the largest and most used corridors will be preserved, and the City will continue to see overall system improvement (see Table 1 below for recent pavement condition rating scores). The grant funding that has been secured through 2020 will help the City leverage existing funding and complete additional work that could not have otherwise been done. However in the long term, if budget levels continue at the current level of funding (approximately \$1.6-1.8M/ year not including grant funding) the Pavement Management Database models predict that the City will lose ground as more of the Arterial and Collector streets that are in poor condition slide into the failure category and other streets that are currently in good condition degrade into fair condition. There are several major projects that will need to be completed within the next ten years for the City to maintain the condition of the network at its current average. Failing Arterial and Collector streets are extremely expensive to replace and will require several years' worth of budget, at the current funding levels, to complete the reconstruction of a single project street. While many of the other major streets degrade into fair condition and will be in need of preservation.

Local Street Preservation Program

The State of Our Local Streets is improving steadily and shows that the City has adequately funded this portion of the preservation program. The Local Street Preservation Program provides for rebuilding as many streets with the available funding, and uses any remaining funds to preserve, by overlay, other streets in the Local Street Network. The backlog of local streets that need to be reconstructed is decreasing. If funding continues at its current level, the Local Street Preservation Program will have completed reconstruction of all streets that are currently rated as failing over the next 10 to 13 years, however a number of streets that are rated in poor condition that are not being worked on will begin to fail within that time frame and will need to be reconstructed as well.

TABLE 1
PAVEMENT RATING DATA BY
ROAD CLASSIFICATION

		2013	2013	2015	2017	
	Centerline Miles	Lane Miles	Average Weighted PCI			PCI Change
All Streets in System	249	564	61	65	70	+5
Arterial & Collector Streets Combined	103	272	55	60	63	+3
Arterial Streets	69	201	55	59	61	+2
Collector Streets	34	71	57	64	70	+6
Local Streets	146	292	67	69	77	+8

NEXT STEPS?

In the next three to four years, the Street Preservation Programs will continue to deliver quality projects, and improve the street system health. In the next five to ten years, the road map to success will include pursuing additional funding for the Arterial and Collector Preservation Program which may include:

- Continuing to compete for grant funding as available;
- Consider options for additional funding as needed; and
- Revising the City's pavement management goals.

The Pavement Management Database model predicts that the Arterial and Collector street system will need to be funded at approximately \$3.5M to \$3.9M annually to simply maintain the existing condition of the street network. The condition of the Arterial roads has improved slightly since 2013 due to the additional funding obtained through grants from 2013 to 2017. The models indicate that the condition of the street system will degrade faster than we can preserve it after the current secured grant funds have been expended.

Currently, the Local Street Preservation is funded appropriately to improve the street network condition steadily. The Local Street Preservation fund will continue to rebuild as many streets that are identified as failing as funding allows and use any additional funds to do thin overlay treatments on streets that are in fair condition. The program has achieved an average rating that exceeds the program goal of 70 PCI and is currently at 77 PCI. Therefore the program will be transitioning to continue to maintain the network at or above the average of 70 PCI.



28th Street SE Improvements Before



28th Street SE Improvements After

PROJECT SPOTLIGHT AND ROADWAY PRESERVATION PROGRAMS

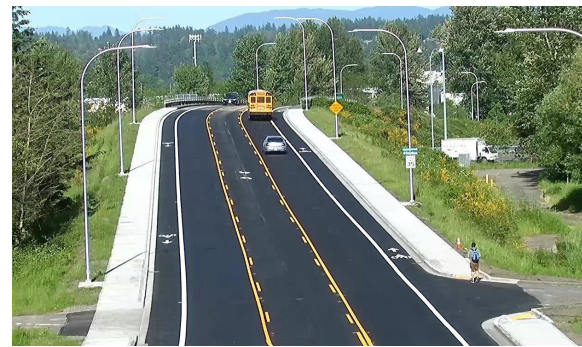
The City had several major paving projects in construction in 2016 and 2017, which were funded by the Local Street Preservation fund, Arterial Street Preservation fund, and other sources of City funds, as well as federal grant funds. are shown in the Appendix, *Map 1 | 2017 Roadway Construction Projects Map*.

2017 PROJECT ROSTER

2017 was an incredibly busy year for roadway work in the City as we were able to address several of the worst streets. Overall, 9.48 lane-miles of pavement were reconstructed and 15.36 lane-miles of pavement were overlayed in 2017. This was a highly successful year of executing long standing plans for repairing and restoring the City of Auburn Streets. The major projects that were completed during 2017:

West Main Street Multi-Modal Corridor and ITS Improvements Project

This project was a multiyear project that rebuilt and repurposed the existing four lane section of W Main St between W Valley Highway and the Interurban Trail. The project rebuilt 1.38 lane miles of pavement. The four lane roadway was narrowed down to accommodate two through lanes, a two-way turn lane, and bike lanes in each direction. The project also provided Intelligent Transportation System (ITS) improvements along W. Main Street., West Valley Hwy, 15th Street SW, and C Street SW. This work was funded by Arterial Streets funds, federal grant funding, and Arterial Preservation funds. Construction of this project started in 2016, and was completed in the summer of 2017.



West Main Street

S 277th Street Corridor Capacity & Non-motorized Trail Improvement Project

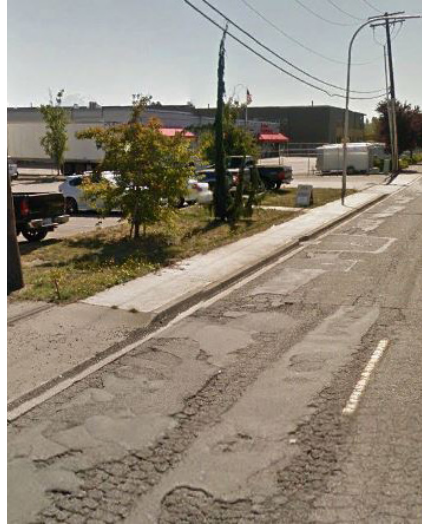
This project was a multiyear project and completed the widening and reconstruction of 2.92 lane miles of S 277th Street from the intersection of Auburn Way North to L Street NE, including the construction of a pedestrian trail, relocation of the floodway along S 277th Street, as well as installing a fish passage structure. This work was funded by Arterial Street funds, developer contributed funds, federal and Transportation Improvement Board grant funds, and Arterial Preservation funds.



South 277th Street Corridor

B Street NW Reconstruction Project

The B Street NW Reconstruction Project rebuilt 1.64 lane miles of B Street NW between 37th Street NW and 49th Street NW vicinity, replaced sanitary sewer main along 49th Street SW and installed new sewer main along B Street NW. This Project also repaired damaged sidewalk, curb and gutter, upgraded several driveways to be compliant with ADA requirements, replaced curb ramps to be compliant with ADA requirements, and addressed drainage issues along the corridor. This work was funded by Arterial Preservation funds.



B Street NW Before



B Street NW After

Lake Tapps Parkway Preservation Project

The purpose of this project was to rehabilitate and preserve the existing pavement on Lake Tapps Parkway between the Western City Limit near 8th Street E and Lakeland Hills Way. The project completed a grind and overlay of 7.11 lane miles of pavement, upgraded eight curb ramps to meet current ADA standards, and upgraded vehicle detection loops. This work was funded by Arterial Preservation funds and federal grant funds.

Auburn Way N Preservation Project, Phase 1

The Auburn Way North Preservation Project (22nd Street NE to 45th Street NE) included grinding and overlaying 7.25 lane miles of asphalt pavement, replacement of curb/gutter and concrete flatwork, upgraded 26 curb ramps to meet current ADA standards, construction of storm drain pipe and structures, removal and replacement fire hydrant assemblies, installation of a new traffic signal at 37th Street NE, modifications to existing traffic and pedestrian signals, channelization, installation of induction loops, traffic control, right-of-way restoration, and signage. This work was funded by Arterial Preservation funds and federal grant funds.

M Street SE Utility Improvement Project

The M Street SE Improvements (3rd St SE to East Main St) project constructed roadway and utility improvements on M Street SE from 3rd Street SE to East Main Street. Project improvements included 0.62 lane miles of new asphalt concrete pavement, cement concrete sidewalks and curb and gutter, installation of new storm drainage and sanitary sewer pipes, new water services, and ITS improvements. This work was funded by Arterial Preservation funds, Water Utility funds, Sewer Utility funds, and Storm Utility funds.

2017 Local Street Reconstruction and Preservation Project

The 2017 Local Street Reconstruction and Preservation Project included constructing street, storm drainage, and water main improvements – including excavation of existing roadway pavement and subgrade; 1.38 lane miles of reconstructed asphalt roadway pavement and subgrade; 1.00 lane miles of street overlay; curb and gutter reconstruction; driveway reconstruction; partial sidewalk reconstruction; replaced 16 curb ramps; installed new storm drainage collection, conveyance, treatment and infiltration systems; water main and residential service replacement; and other appurtenances. This work was funded by Local Street Preservation funds, Water Utility funds, and Storm Utility funds.

2016 PROJECT ROSTER

The City had two major paving projects in 2016, and several others that involved significant pavement restoration, as shown in the Appendix, *Map 2 | 2016 Roadway Construction Projects Map*:

Auburn Way South Flooding Improvements, Phase 2 Project

The purpose of this project was to relieve stormwater flooding issues on Auburn Way South near the State Route 18 underpass by diverting stormwater flows from the flooding area to the existing storm drainage ponds located at 21st Street SE (near D Street SE) and 17th Street SE (west of A St SE). This project constructed a new storm line on 17th Street SE between A Street SE and K Street SE to divert stormwater to the pond on 17th Street SE. This project also replaced the deteriorate water main and sewer line on 17th Street SE between A Street SE and K Street SE, rebuilt the north half of the roadway and grind and overlayed the entire roadway which preserved 1.22 lane miles of roadway, replaced a total of 23 curb ramps, and expanded the existing storm pond on 17th Street SE to accommodate the increase in storm drainage flows. This work was funded by the Water, Sewer and Storm Utility funds.

2016 Local Street Pavement Reconstruction Project

This project reconstructed 1.18 lane miles of Local Streets including; 21st Street NE between I Street NE and Auburn Way N; F Street SE between East Main St and 4th Street SE; and 25th Street SE between M Street SE and R Street SE; as well as thin overlayed 1.40 lane miles of streets in the West Hill area. The Project also installed 2,741 lineal feet of 12-inch and 8-inch water mains, 2,589 lineal feet of 12-inch stormwater drainage main, new water services for 70 residents along the project streets, and replaced a total of 41 curb ramps at the project sites so they are compliant with the Americans with Disabilities Act (ADA) requirements. This work was funded by the Local Street Preservation Program and Water Utility funds.

30th Street NE Storm Improvement Project, Phase 1A

This project replaced a 30-inch storm drainage line with a 42-inch line between the North west corner of the Auburn Airport and Auburn Way N. This project rebuild the trench limit, patched pavement and overlayed the full width of 30th Street NE – preserving 1.38 lane miles of roadway, and replaced a total of 6 curb ramps. This work was funded by the Storm Drainage Repair Program and Arterial Preservation Program funds.

The City had several projects in 2016 delayed for various reasons as indicated below. Also, the order in which the federally funded grant projects will be delivered was updated to reflect the regional funding availability through the Puget Sound Regional Council. The Auburn Way North Preservation project, Phase 1 was moved from 2016 to 2017 because the initial bids in 2016 came in higher than the available budget. B Street NW was delayed in 2016 due to the need for additional funding to complete the project. To address this, the project was re-designed to use an innovative method of construction to rebuild the roadway at a much cheaper cost than estimated in 2016.



PRESERVATION PROGRAMS OVERVIEW

ARTERIAL STREET PRESERVATION PROGRAM

The Arterial and Collector Preservation program is responsible for maintaining the overall condition of approximately 103 centerline miles (272 lane miles) of roadway that are vital to the City. These roads carry the vast majority of citizens, goods and services to and from the Regional Growth Center and connect the community to the greater Puget Sound Region. The Arterial Street Preservation Program has focused almost exclusively on preservation treatments given the lack of funding to complete much needed major reconstruction projects. However, favorable bids on several past projects, and the successful acquisition of federal grant funds generated sufficient capacity in the existing budget to program the reconstruction of B Street NW between 37th Street NW and 300 feet north of 49th Street NW, which was the worst arterial street segment in the network. Additionally other grant funds were secured for two other major reconstruction projects in the City that were constructed in 2017: The S 277th Street Corridor Capacity & Non-motorized Trail Improvements Project; and the West Main Street Multi-Modal Corridor and ITS Improvements Project. The Arterial and Collector Street Pavement Condition Indexes as of 2017 are shown in the Appendix, *Map 3 | Arterial & Collector Pavement Conditions Map*.

The goal of the Arterial Preservation program is to improve the Arterial and Collector network to an average PCI of 70 (out of 100 scale rating). The current condition of the Arterial and Collector roadway network is in fair condition (PCI Rating of 61). Over the next several years, the City has secured federal grant funding for several projects, which will help leverage existing city funds to better improve the health of the arterial street system.



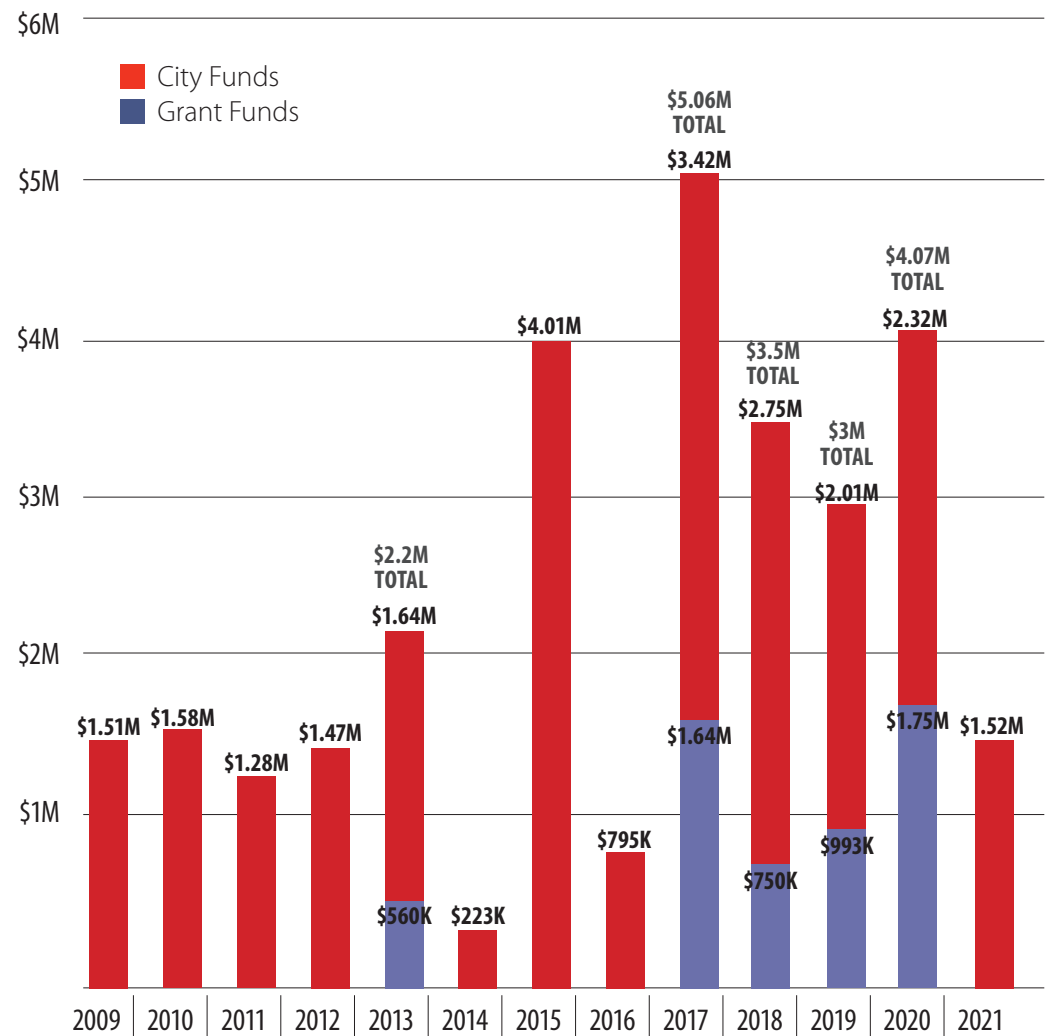
Pavement Rating Vehicle with laser data collector

ARTERIAL STREET PRESERVATION FUNDING

The Arterial Street Preservation Program is funded by a 1% utility tax, which has supported annual budgets of approximately \$1.8 Million since 2008. Figure 1 below shows the Arterial funding since the inception of the preservation program.

The City has successfully obtained federal grant funding for seven major preservation projects leveraging City funds for preserving our arterial system through 2020. The seven grant funded projects include the Auburn Way North Preservation phase 1, phase 2 and phase 3 projects; A Street SE Preservation Project; 15th Street NW/NE Preservation Project; South 277th Street Preservation Project; and Lake Tapps Parkway Preservation Project. Federal grant funds are subject to competitive selection and cannot be relied upon as a stable source of funding beyond the currently funded projects. Also, there are a limited number of streets that are federally classified, and thus eligible for grant funding - limiting our potential for more grants in the future. The grant administrators in the region continue to discuss if preservation projects are the best use of their funds and are considering reprogramming the money to roadway capacity projects. The amount of City funding in the Arterial Preservation Program has remained relatively unchanged, and at its current level is insufficient to complete the reconstruction work needed to, not only reach the average system PCI goal of 70, but also maintain the current PCI rating of 61.

FIGURE 1 | ARTERIAL STREET FUNDING THROUGH THE YEARS



PLANNED ARTERIAL STREET PRESERVATION PROJECTS

TABLE 2 | FUTURE GRANT FUNDED STREET PROJECTS

Year	Project Title	From	To	105 Funding	Grant Funding	Total Project Investment
2018	15th Street NW/NE and Harvey Rd Preservation Project (Originally 2017)	SR167	8th St NE	\$1,525,000	\$815,000	\$2,533,500
2018	S 277th Street Preservation Project	SR167	Auburn W N Vicinity	\$662,380	\$662,380	\$1,324,760
2019	A Street SE Preservation Project	East Main St	17th St SE	\$882,000	\$882,000	\$1,764,000
2020	Auburn Way North Preservation Project Phase 2	8th St NE Vicinity	22nd St NE	\$618,280	\$889,720	\$1,508,000
2020	Auburn Way North Preservation Project Phase 3	SR18	8th St NE Vicinity	\$975,000	\$975,000	\$1,950,000
2021	Lakeland Hills Way Preservation Project*	Lake Tapps Parkway	Pierce County Line	\$352,000*	\$748,000*	\$1,200,000*
TOTALS				\$5,014,660	\$4,972,100	\$9,986,760

The grant funded street reconstruction and preservation projects that start in 2018 and are expected to be completed through 2020, are detailed below in *Table 2 | Future Grant Funded Street Projects*, and City Funded projects are shown in *Table 3 | City Funded Arterial Street Projects* below. All of the future Arterial Preservation project streets are shown on *Map 4 | Planned Preservation Projects*

Staff will be conducting street selection processes for the Arterial Street Preservation Program to identify additional streets that need to be addressed and to prepare a long range plan to meet those needs in budget years 2019 and 2020. Those streets will be prioritized and packaged each year. Additionally staff will be applying for additional federal grants in 2018 for potentially funding a project in 2021.

TABLE 3 | CITY FUNDED ARTERIAL STREET PROJECTS

Year	Project Title	From	To	105 Funding	Total Project Investment
2018	2018 Citywide Patch and Overlay Project	Various	Locations	\$1,700,000	\$2,550,000
2018	2018 Arterial Crack Seal Project	Various	Locations	\$200,000	\$200,000
TOTALS				\$1,900,000	\$2,750,000

MOVING FORWARD

The City anticipates several issues that will need to be addressed and managed in the future. The pavement management database predicts the arterial system needs to be funded between \$3.4M to \$3.9M per year to maintain the current condition (PCI of 61) of Arterial/Collector roadways. If City funding levels remain at the current level of \$1.6 to \$1.8 million per year, the condition of the arterial and collector street system will begin to lose ground faster than can be preserved, once the available grant funding has been expended in 2020.

Another concern, is that as the City continues to improve the streets that can be preserved by conventional methods (i.e. grind and overlay), there are more and more Arterial and Collector streets that are in various states of disrepair and will need to be reconstructed in the next several years. Many of the Arterial and Collector streets do not have adequate pavement structure to withstand the current level of traffic loading that uses them, so preserving these roads by overlay treatments only may not result in good long term performance. The lack of adequate pavement structure for these major roads likely contributes to an accelerated decline in pavement condition. The cost of rebuilding one of these roadways would require combining several years of funding in the Arterial and Collector Program at the current funding levels. Additional funding will need to be identified and prioritization of reconstruction of these major roadways will be needed to address the larger issues within the Arterial and Collector street network.

Future pavement ratings and additional testing measures will become necessary in the next couple of years as well. System wide, the pavement rating survey results are one of the most useful tools to track the general condition of the street system as a whole, however a need for more advanced testing will be needed to evaluate the arterial and collector streets for their structural integrity.

LOCAL STREET PRESERVATION PROGRAM

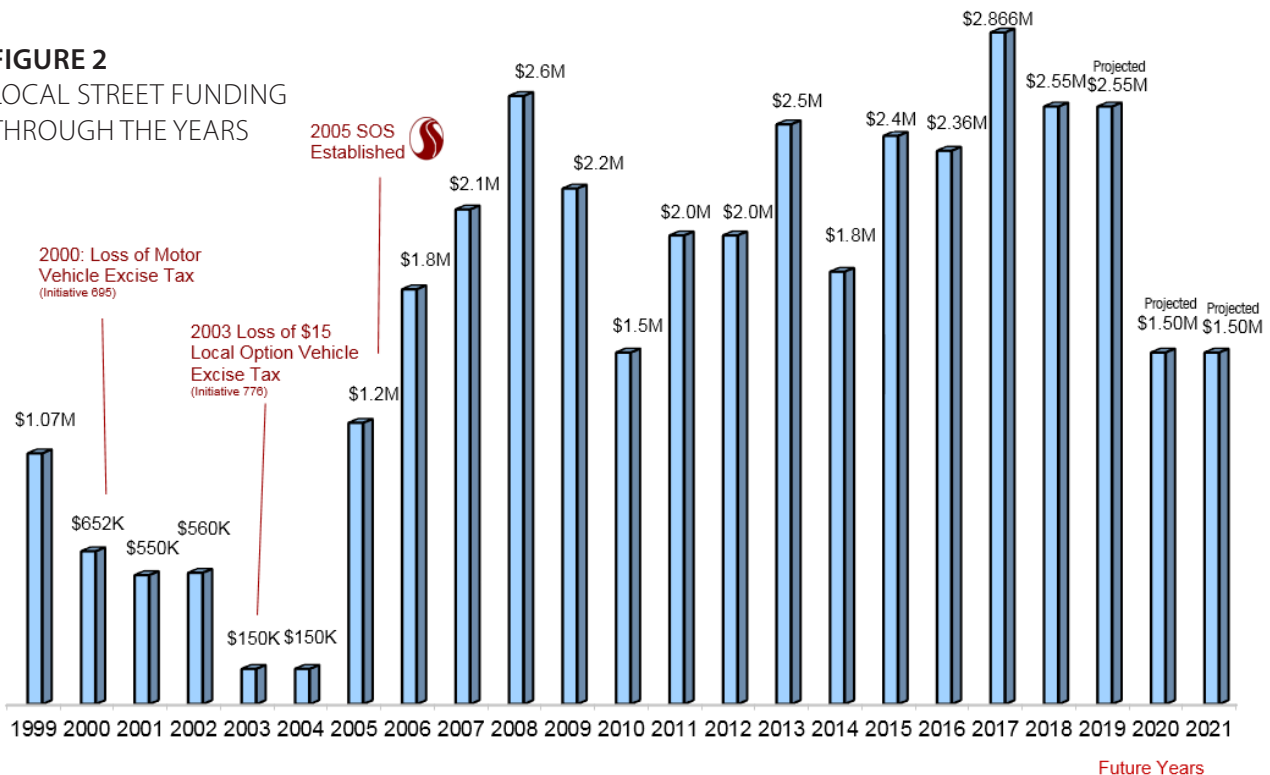
The Local Street Preservation Program is responsible for maintaining the pavement on approximately 146 centerline miles (292 lane miles) of roadways throughout the City. Each year that number grows with the construction of development driven projects. In the beginning years of the Local Street Preservation Program, formerly the “Save Our Streets Program”, the program focused on preserving streets that were in fair to poor condition. In 2009, after making significant progress on these roads, the City refocused the program to rebuilding streets that were in very poor to failing condition.

The goal of the Local Street Preservation Program is to improve the Local Street system to an average PCI rating of 70 (out of 100 scale rating). As of 2017, the Local Street Preservation Program achieved its goal with an average PCI of 77. In reaching and exceeding this goal, the focus for this program continues to rebuild the local roadways that are in very poor to failed condition (PCI 0 to 25) as funding allows, and to maintain the average PCI level of 70 on the rest of the local street network. The Local street Pavement Condition Index scores are shown graphically in the Appendix, *Map 5 | Local Street Pavement Conditions Map*. The Pavement Management Database models indicate that \$2.4M in needed annually to maintain the system at the goal of an average PCI of 70 or better. Local Street Improvements that are scheduled for 2018 and 2019 are also shown in the Appendix, *Map 4 | Planned Preservation Projects*.

LOCAL STREET PRESERVATION FUNDING

In 2004 the public expressed concern over the condition of local streets, however funding for local streets had dropped dramatically in the preceding years and the City could not afford to make the needed improvements (see *FIGURE 2* below). In response to the situation, the City proposed a funding measure which was approved by Auburn citizens in the November 2004 General Election. The original funding measure allowed the City’s property tax levy to generate additional revenue for a dedicated local street fund which was used solely to fund a local street preservation and improvement program, formerly called the Save Our Streets (SOS) Program. At the end of 2012, the practice of funding the SOS Program from property taxes ended. In 2013, the City Council earmarked sales taxes from new construction to be dedicated to the Local Street Preservation Program, and all property taxes were retained in the General Fund.

FIGURE 2
LOCAL STREET FUNDING
THROUGH THE YEARS



In 2005, the City had approximately 59 miles of local streets that were in need of repair (this mileage included streets that were later annexed into the City in 2008). Since 2005, the Program has improved the condition of 52 miles of those City streets, however as time passes other streets in the network age and their condition continues to deteriorate. In the next few years, additional streets will need to be maintained and/or rebuilt to keep the street system healthy.

PLANNED LOCAL STREET PRESERVATION PROJECTS

Projects in design or construction using Local Street Preservation Program funds are included below in *Table 4*.

TABLE 4 | CITY FUNDED LOCAL STREET PROJECTS

Year	Project Title	From	To	103 Funding	Total Project Investment
2018	2018 Citywide Patch and Overlay Project	Various	Locations	\$850,000	\$2,550,000
2018	2018 Local Street Reconstruction Project	Various	Locations	\$1,700,000	\$1,900,000
2019	2019 Local Street Reconstruction Project	Various	Locations	\$1,680,000	\$3,545,000
2019	2019 Annual Pavement Project - TBD	Various	Locations	\$320,000	TBD
TOTALS				\$1,900,000	\$2,750,000

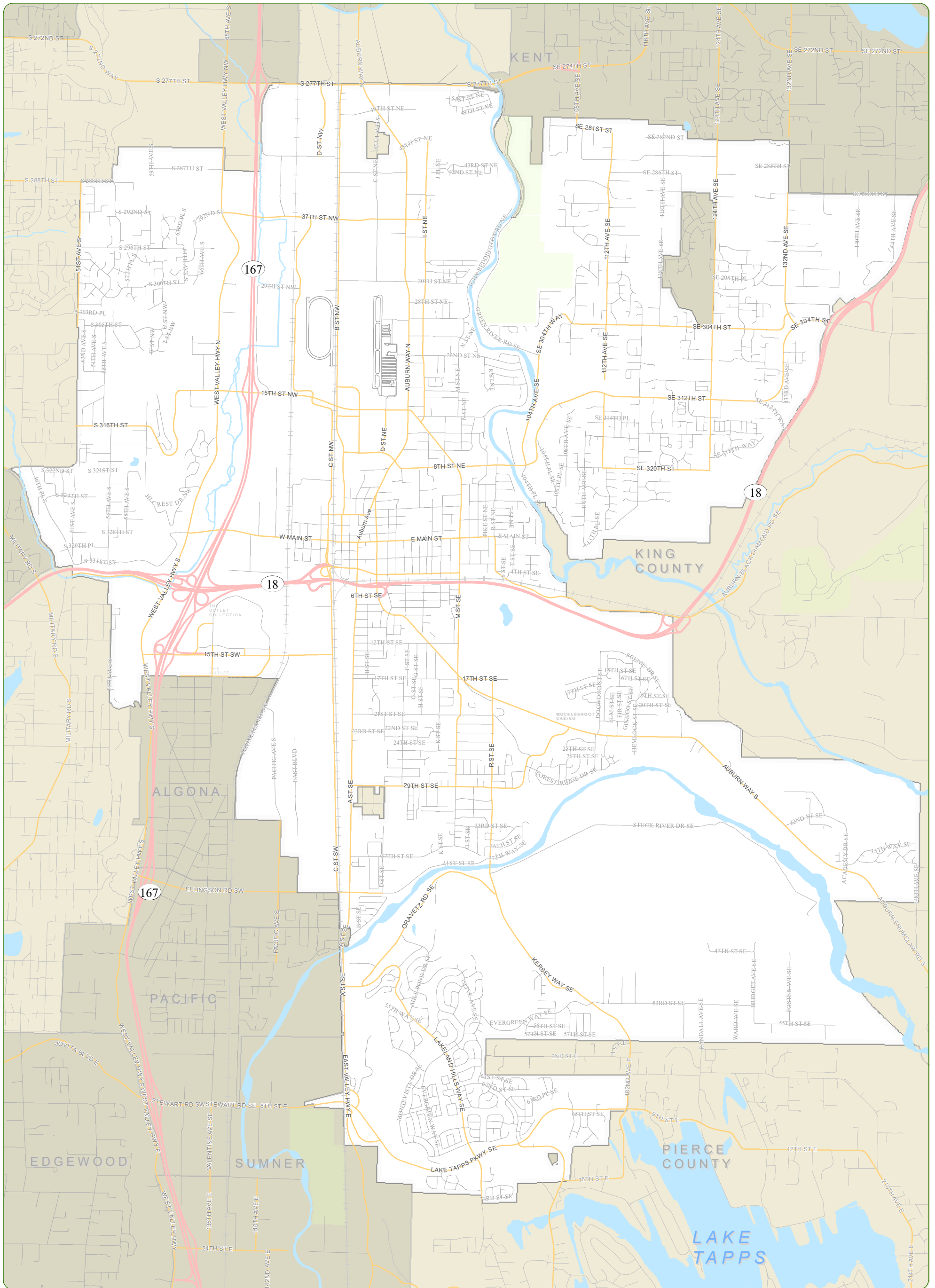
MOVING FORWARD

The list of Local Streets that need to be reconstructed is shrinking and will be prioritized to align with the City's limited funding for associated public utility improvements. A lot of progress has been made on street reconstructions over the past several years under the Local Street preservation program. The program will transition its focus to a more balanced approach of rebuilding one or two local streets annually and preserving more segments of streets than in prior years. This more balanced approach between street reconstruction and street preservation overlays will continue to maintain and potentially continue to improve the condition of the Local Street network overall.

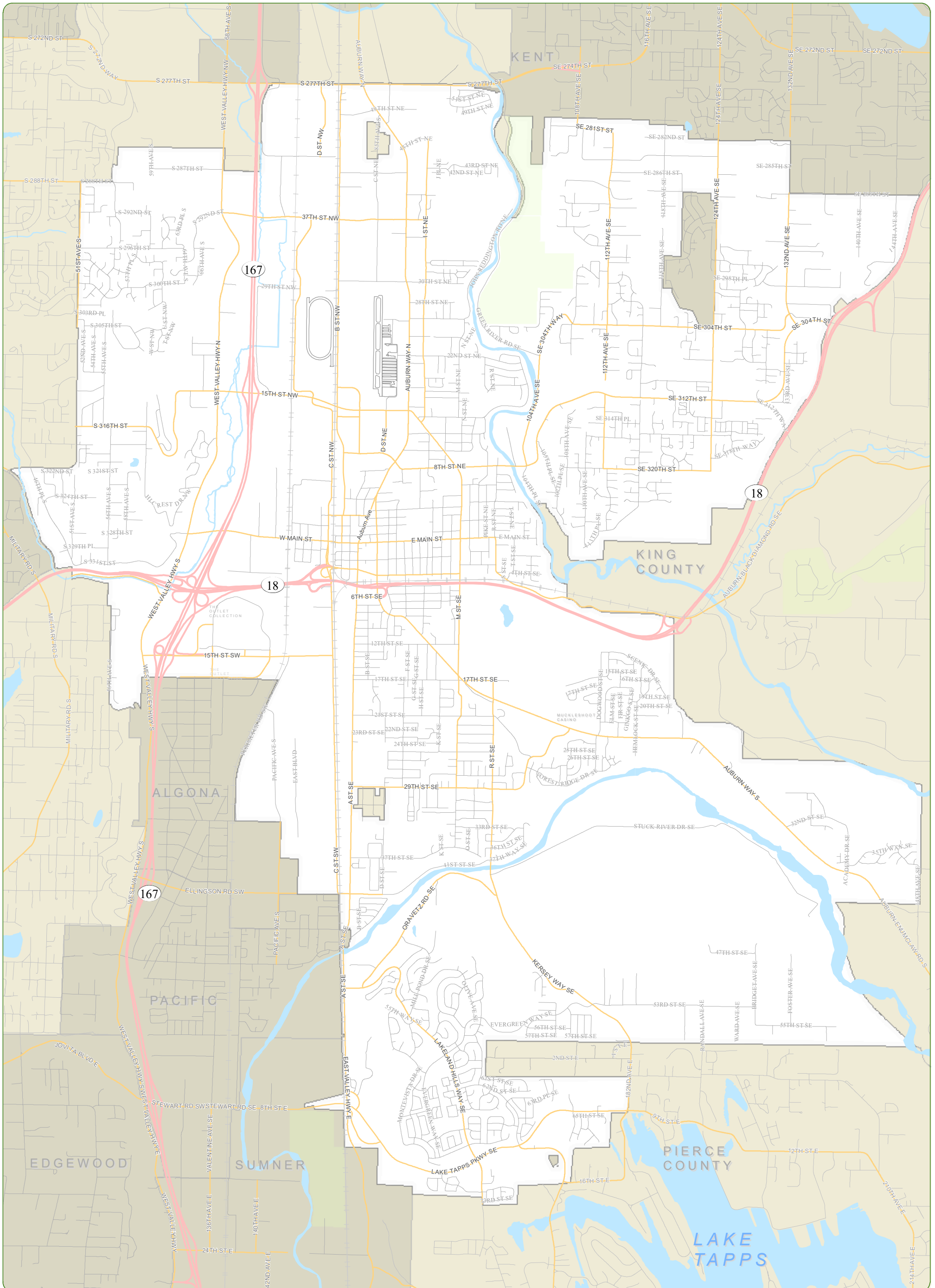


APPENDIX

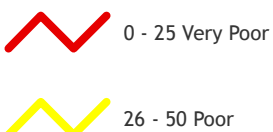
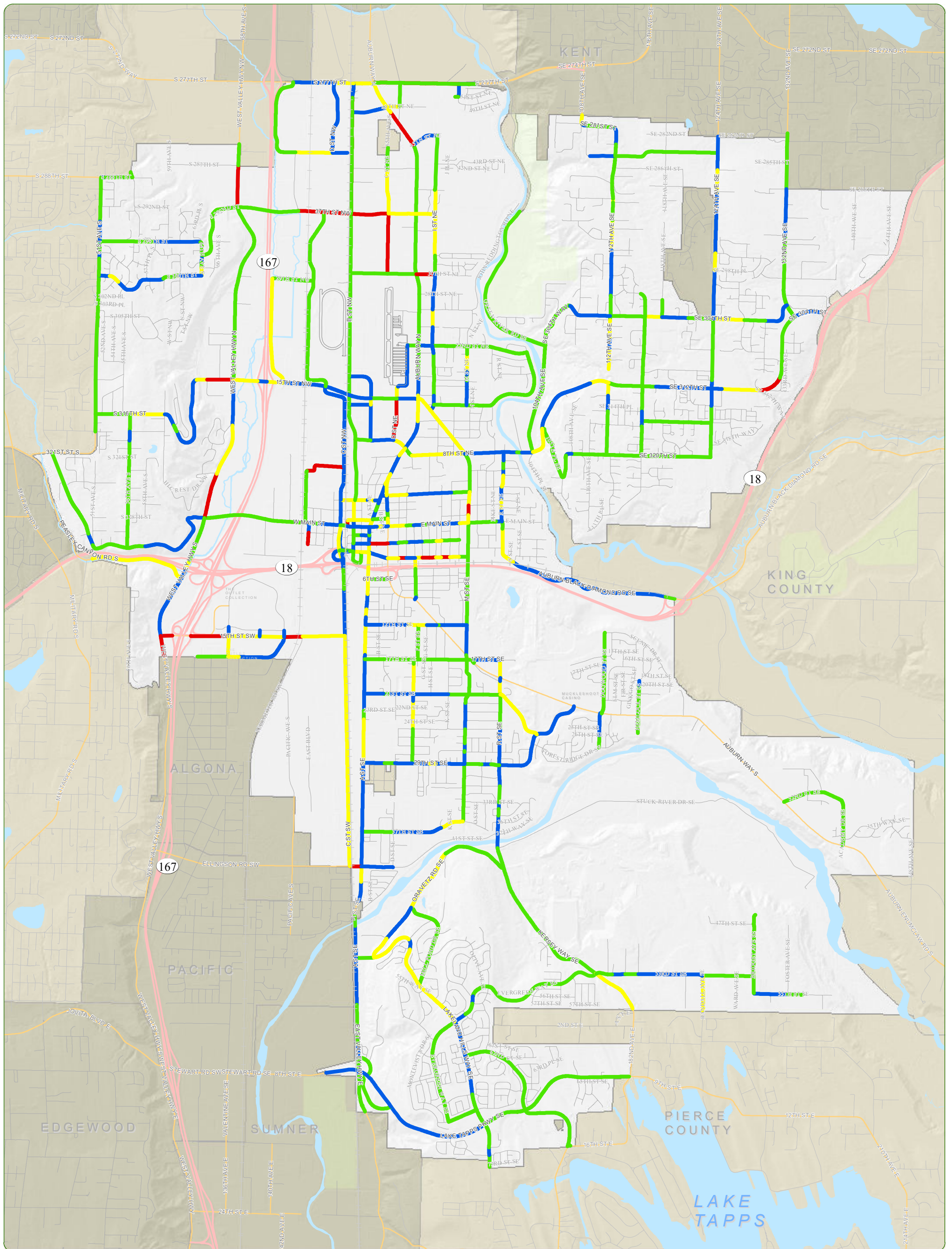
MAP 1 | 2017 ROADWAY CONSTRUCTION PROJECTS



MAP 2 | 2016 ROADWAY CONSTRUCTION PROJECTS



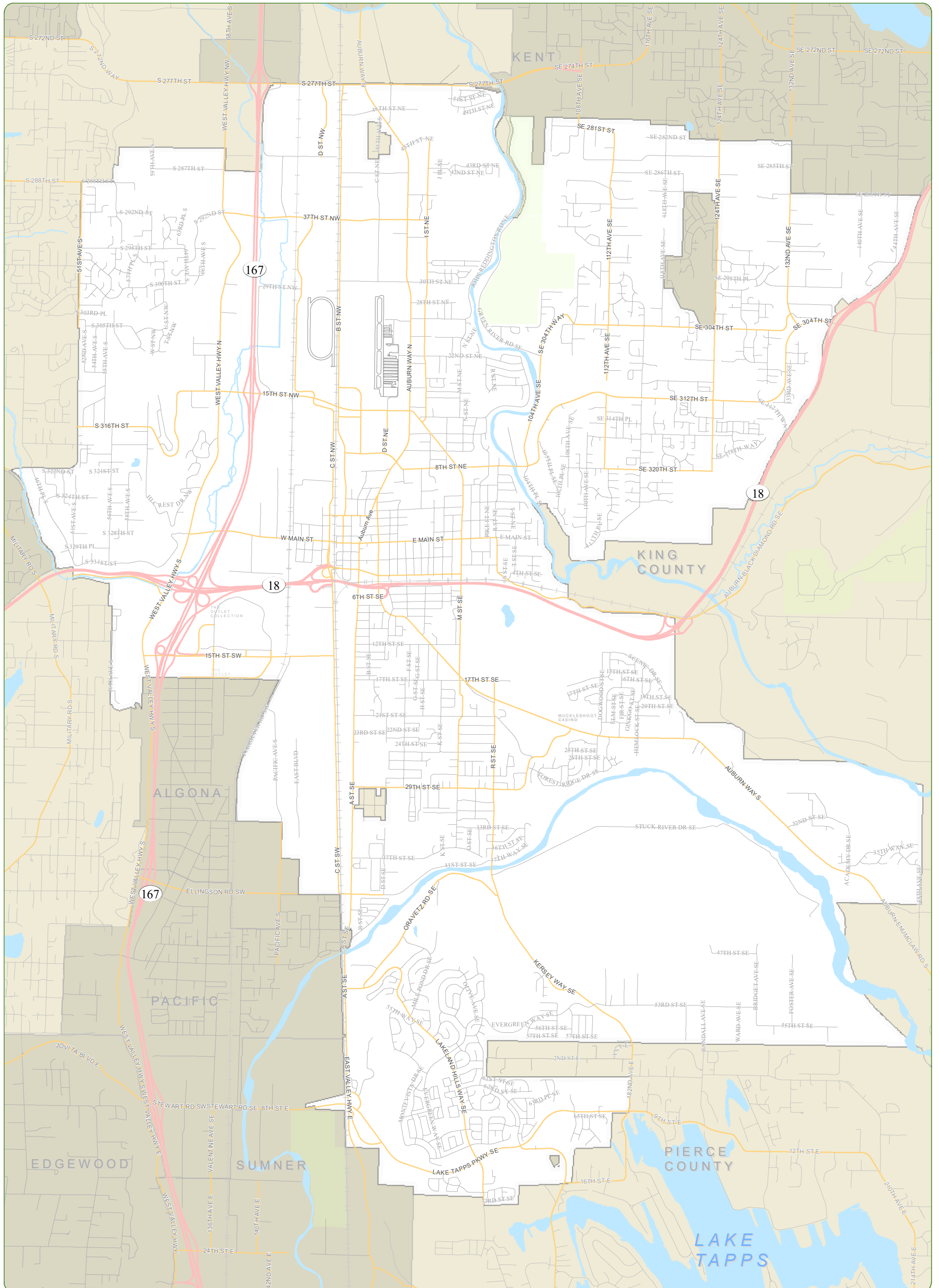
MAP 3 | ARTERIAL & COLLECTOR PAVEMENT CONDITIONS



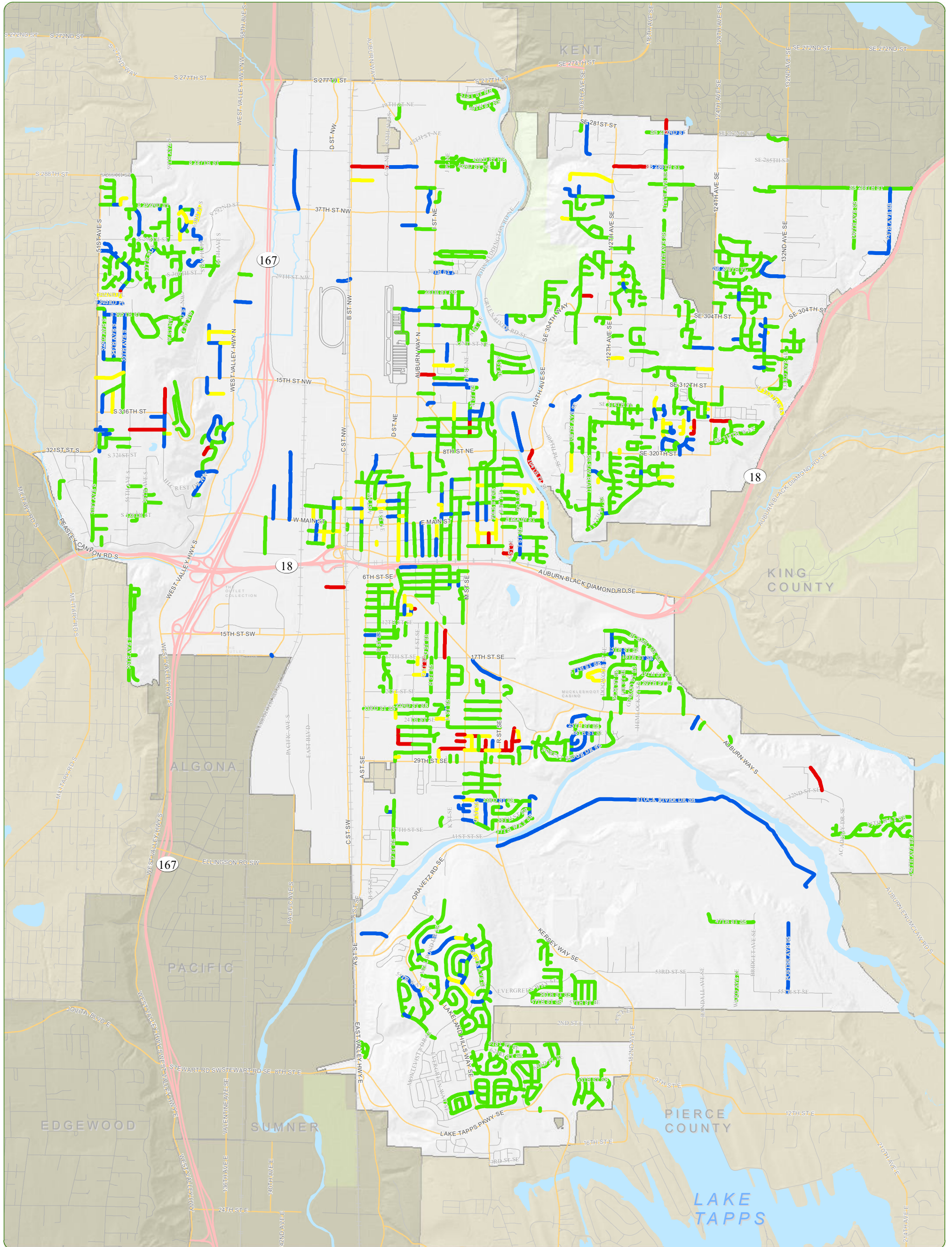
Information shown is for general reference purposes only and does not necessarily represent exact geographic or cartographic data as mapped. The City of Auburn makes no warranty as to its accuracy.

Printed On: 3/27/2018
Map ID: 5975

MAP 4 | PLANNED PRESERVATION PROJECTS



MAP 5 | LOCAL STREET PAVEMENT CONDITIONS



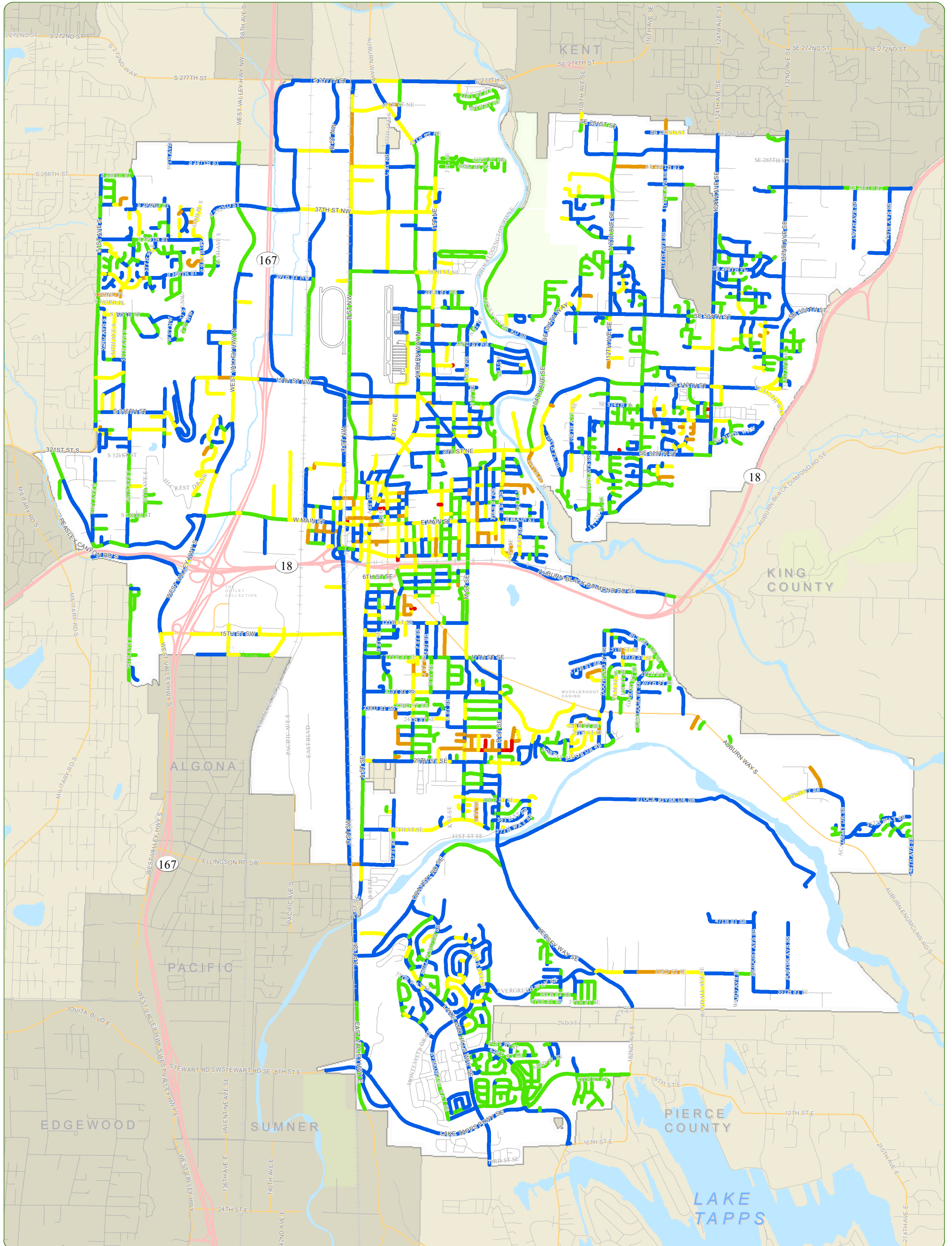
 0 - 25 Very Poor

 26 - 50 Poor

Information shown is for general reference purposes only and does not necessarily represent exact geographic or cartographic data as mapped. The City of Auburn makes no warranty as to its accuracy.

Printed On: 3/23/2018
Map ID: 5976

MAP 6 | CITYWIDE RIDE QUALITY RATING



- 0 - 20 Very Poor // Uncomfortable with constant bumps or depressions
- 20 - 40 Poor .. Uncomfortable with frequent bumps or depressions

Printed On: 3/6/2018
Map ID: 5974

Information shown is for general reference purposes only and does not necessarily represent exact geographic or cartographic data as mapped. The City of Auburn makes no warranty as to its accuracy.

PAVEMENT INVENTORY & RATING

Pavement condition surveys that are conducted by the consulting service providers every few years use a semi-autonomous process where technicians drive over each road in the street system to rate the condition. The vehicle is equipped with high grade Global Positioning System (GPS) equipment as well as a laser measuring device to measure the depth of rutting present in each lane and to measure the roughness of the ride. All of this is done as one of the technicians visually rates each segment of pavement based on the amount of surface distress that is present, the amount of damage and distress is called the Pavement Condition Index (PCI), while the GPS is used to tie all of the data collected in the field to the street network maps of the City of Auburn's Geographic Information System (GIS). The PCI ratings, rut depths, and roughness of ride are all measures that help to determine when a stretch of pavement is due for rehabilitation or replacement. The three metrics are used to rate a pavement segment as very good, good, fair, poor, or very poor. A good condition pavement is smooth with few defects while a poor condition pavement is characterized by cracking, patching, rutting and roughness. Pavement segments are prioritized for rehabilitation based on the condition survey, along with input from several of the City's departments to determine which streets are packaged into a particular street project.

A caveat to street ratings is that there are always several streets that do not receive any pavement treatments between when pavement ratings are completed, and these streets show an increase in PCI scoring despite not having work done on them. There are always variations between ratings that can result in a several PCI point increase from one rating to the next. Different pavement rating technicians will look at a segment of pavement and have differing opinions about the condition of the roadway. Also something as simple as an overcast day may affect the way a pavement is rated visually, because the flat light makes it difficult to see hairline cracking, and other distresses.

The pavement rating process has been automated to record a lot of the distresses that factor into a pavement score, however there are several distresses that are continue to be rated visually by a technician. That makes the process somewhat subjective and dependent upon a person's judgment. Ratings can be skewed by something



Pavement Rating Vehicle with laser data collector

as simple as rating pavements during an overcast day while the low light level makes it much more difficult to distinguish pavement distresses (such as hairline cracking) that would normally be seen in full daylight. Additionally, there will always be variation in what different pavement rating technicians see and how they quantify severity of different pavement distresses. Additionally the way pavement rating services rate chip seal streets has changed. They modified their protocol for the way they performed their survey to be more consistent with industry standards and practice. The pavement rating service no longer factors in pavement "raveling" as a distress in chip seal pavements. The existing chip seal pavements were rated more harshly than they should have been in 2013, and showed a large increase in PCI rating (approximately 15 PCI points) in 2017 as a result of that different rating methodology.

The City of Auburn, like most cities, utilizes a Pavement Management Database to track pavement condition, manage the street system, and model overall system performance. In the case of the Arterial and Collector Street conditions, we are aware that many of our aging Arterial and Collector Streets, while constructed to the standards at the time, are inadequate for the amount of vehicle loading that they carry today. Having more accurate information allows us to make better projections of future conditions and budget needs for long range planning.

HOW WILL THE CITY IMPROVE IN THE FUTURE?

Additional testing methods to test the strength of the pavements in the network will be used to determine the structure of the pavements in the street system. These tests may include:

- **Falling Weight Deflectometer testing** to test pavement strength and subsoil bearing capacity.
- **Ground Penetrating Radar** to determine network pavement thicknesses on a mass scale. The City has learned expensive lessons on recent projects where the project was intended to grind and overlay a section of roadway only to discover that the pavement was extremely thin, and needed to be completely rebuilt instead. This could have been planned for if we had known the pavement structure in advance of the project.
- **Core sample testing** for streets to determine if the pavement structure is adequate for the existing pavement loading. Core samples are collected with a special drill that allows a cylindrical sample of the pavement to be extracted from the roadway. This is especially useful because we will be able to excavate to see what the underlying pavement foundation consists of.

Additionally, the use of a pavement rating service provider that employs a fully automated pavement rating process would be beneficial to have all of the load related pavement distresses rated objectively, and would provide City staff with a data set that can be relied upon. Using a more objective pavement rating method would create more assurance in the data set, and be a more reliable starting point in the street selection process. The City needs to be able to focus energy on the correct projects at the correct times to maximize the use and benefit of available funding.

WHAT DO THE NUMBERS MEAN?

Pavement Condition Index (PCI)

The City measures pavement condition using the PCI for each street in the network. PCI values represent pavement condition based on a scale from 0 to 100 with 100 being newly constructed pavement and 0 indicating a pavement that has failed. The City's goal for the Arterial Street Preservation Program and Local Street Preservation Program is to reach and maintain a PCI at or above 70.

PCI values generally indicate surface condition and are useful in indicating the best time to repair the pavement. The most cost effective time to preserve pavements is when the PCI ratings are in the 60-70 range, because the pavement repair typically requires relatively less expensive treatments that preserve the existing pavement and extend the useful life of the pavement. Additionally, pavement condition tends to diminish at an accelerated rate after they have reached a PCI range of 50-60. Pavements with moderate to low PCI values usually require more expensive rehabilitative treatments. Pavements with very low PCI values are often unsalvageable and have to undergo a very expensive rebuild.

International Roughness Index (IRI)

The International Roughness Index (IRI) was developed by the World Bank in the 1980s. IRI is used to define the characteristic ride of a traveled wheel path and constitutes a standardized roughness measurement. The commonly used units are inches per mile (in/mi) or meters per kilometer (m/km). The IRI is based on a standardized vehicle's accumulated suspension motion (in inches, mm, etc.) divided by the distance traveled by the vehicle during the measurement (in/mi, m/km, etc.).

Roughness is an important pavement characteristic because it affects not only ride quality but also vehicle delay costs, fuel consumption and maintenance costs; also, the general public perception of a good road is one that provides a smooth ride. The citywide map showing the ride quality rating that was collected in 2017 for all of the streets in the City is shown in the Appendix, *Map 6 – Citywide Ride Quality Rating*. In the pavement rating surveys that were completed in 2013 and 2017, IRI data was collected and recorded on a zero to one hundred scale. Several State agencies actually use IRI as a parameter for street selection for improvement projects. The City of Auburn has not established an official policy on the use of IRI data for managing the street system; however, the roughness of a roadway segment can be a tie breaker between similarly

rated streets (PCI rating) to be included in a project. Ride quality is a frequent comment that we receive from our citizens, so having this data helps to be able to track and anticipate issues that may arise in the future. Additionally, in the future after we have conducted more pavement rating surveys and have a chance to analyze the trends in pavement roughness, then IRI may become a factored metric in the street selection process for the City. *Table 5* below shows how the numerical ratings correspond with the rider experience.

TABLE 5 | IRI RATINGS

Rating	Rank	Description
80-100	Excellent	Very Smooth
60-80	Good	Smooth with a few bumps or depressions
40-60	Fair	Comfortable with intermittent bumps or depressions
20-40	Poor	Uncomfortable with frequent bumps or depressions
0-20	Very Poor	Uncomfortable with constant bumps or depression

Pavement Rut Depth Measurement

The City's pavement rating service provider measured pavement Rut Depth with an automated laser rut measuring device. The rut depth is measured for each street in the network, and then averaged over the length of each street segment. Pavement rutting can create safety issues if the depth of the rut is deep enough to interrupt the flow of water across the cross slope of the road. These issues directly affect a vehicles ability to handle and stop in normal traffic situations. The Washington State Department of Transportation considers a rut depth of greater than 0.5-inch to be a maximum threshold before it triggers a pavement maintenance operation to be performed. The maximum threshold value makes sense for WSDOT since the highway system has a much greater average speed limit and standard cross slope for a highway is 2%. The City of Auburn Arterial roads typically have a range of speeds between 30 mph and 45 mph, with a Standard design cross slope of 3%. A 3% cross slope and the lower speeds of City streets results in much lower risk of hydroplaning, however standing water negatively affects a vehicle's ability to stop. Although the City does not have a policy on the use of rut depth as a trigger to preserve roadways, the data is useful to monitor and track the condition of roads. If an otherwise intact piece of pavement is showing extreme rutting, then that is an indication that either the pavement subgrade is failing or the roadway is extremely overloaded by heavy vehicles. These instances would be clear indications that something needs to be done to correct these rutting issues, and could serve as proper justification for including a particular street in a project.

AUBURN'S STREET SELECTION PROCESS

The City contracts with service providers to rate Auburn's street system periodically and rates each street segment as discussed in the previous section. Since the repair costs for the overall system far exceeds what the City can fund in any given year, the City then prioritizes, narrows and selects a limited number of streets for each of the annual street preservation programs.

There are many factors the City considers when determining which streets to rebuild and or rehabilitate each year. Staff uses the Pavement Management Database to produce a list of street segments that are in the PCI range for the type of project that is being programmed: a reconstruction or preservation project. It is worth pointing out that the pavement ratings alone do not determine which streets will be included in a particular project; they are simply a tool that focuses staff on streets that are an issue. The engineering staff performs a site review of perspective streets that may be shortlisted for inclusion into a project. With all of the moving parts involved with the street selection process; between the street issues, utility priorities, maintenance and operation requirements, traffic volumes, and budgets to balance; the priority of a particular stretch of street being included in a project rises and falls with consideration of each of these parameters. The underlying message is that the PCI of a street is not the only factor used in street selection, but is one of a host of deliberations that occur to package a project together. City staff confirm the ratings, compile site specific data, take pictures, etc. Next staff will estimate the rough cost to do the work at each site. One of the most important factors the City considers when choosing which streets to rebuild or improve is City owned Utility input. If there is a need to improve a utility along with improving the street, then staff takes into account the availability of Utility funds and balances the budgetary needs of both City programs. If the City Utilities have a long range plan to improve their infrastructure in the street but lack immediate funding, then that would be a suitable reason to delay working on a particular roadway. Replacing the utility mains at the same time as street restoration is much more economical and disturbs the neighboring residences only once. Additionally, it prevents newly reconstructed or treated roadway surfaces from being damaged by trenching to replace underground utilities.

The City's Maintenance and Operations Division are consulted during street selection processes, because they have knowledge about problem streets where excessive

resources are being spent on temporary repairs. Streets that require more regular maintenance, streets with significant drainage issues and streets with poor ride quality are all given a high level of priority. Additionally the volume of vehicles per day, number of businesses and residents being served by a street are also factors in street selection. Other deliberations include coordination with third party utility companies and with private development projects when selecting streets to improve each year. Finally, the cost of the improvements need to be right sized for the available preservation budget, and will limit the amount of pavement work that can be accomplished in a given year. *Table 6* below shows the various pavement preservation treatments used for different PCI ranges, and the typical life span and approximate cost of each treatment type.

TABLE 6 | PAVEMENT PRESERVATION TREATMENTS

Pavement Condition	Typical Treatment	Typical Life of Treatment	Typical Cost **
PCI 90-100 LIKE-NEW CONDITION	No Treatment Needed	N/A	N/A
PCI 70-89 GOOD CONDITION	Seal Cracks – Cracks are sealed with liquid asphalt to prevent water from penetrating the pavement and weakening the base material that forms the foundation for the pavement.	2-4 years	\$0.75 per square yard
PCI 50-69 FAIR CONDITION	Patching and Overlay – Broken pavement is replaced (patched) to renew the load carrying ability of the existing pavement. Then the road is overlaid with a thin layer of pavement (1.5 – 2 inches) to preserve the existing pavement and provide a smooth driving surface.	15-20 years	\$30 to \$41 per square yard
	Chip Seal – A thin layer of liquid asphalt is sprayed over the entire pavement surface and then covered with a thin layer of aggregate. Chip seals typically do not last as long as a thin overlay nor do they provide as smooth of a driving surface.	3-10 years	\$8 to \$12 per square yard
PCI 25-49 POOR CONDITION	Extensive Patching and Overlay – Same treatment as above only more extensive patching is typically required. (Some streets in this condition require a thicker overlay of 2 inches or greater).	15-20 years	\$40 to \$46 per square yard
	Double Chip Seal – A thin layer of liquid asphalt is sprayed over the entire pavement surface and then covered with a thin layer of aggregate, then this process is repeated a second time. Based on experience, the City has found that double chip seals typically last longer than single chip seals, especially when the existing pavement is in poor condition.	3-10 years	\$10 to \$17 per square yard
PCI 0-24 VERY POOR CONDITION	Rebuild Pavement – Existing pavement is completely removed and a new road is constructed.	20-30 years	\$143 to \$293 per square yard

**Life of treatment will vary based on the traffic volume and type of vehicles that use the street, the structure of the pavement and underlying soil, the age of the existing pavement, and the amount of vehicle turning/stopping movements on the street.*

***The typical cost of pavement treatments are based on recent bid history from City projects and other jurisdictions that were done in 2016 and 2017.*