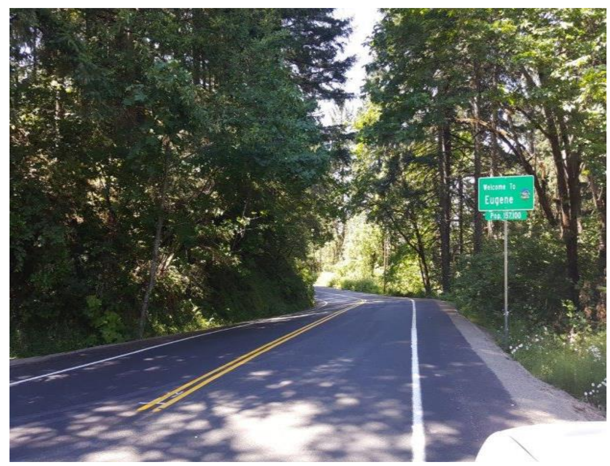
2017 PAVEMENT MANAGEMENT REPORT

An Update on Asphalt Pavement Conditions and Programs
(2016 Rating & Inventory Data)

GO Bonds
FIXING EUGENE'S STREETS



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ACCREDITED AGENCY A•P•W•A

Eugene

Cover Photos (top left – clockwise): GO BONDS, Trolley Rails in Willamette Street, Fox Hollow after Enhanced Street Repair Program, Durability Cracking in Concrete

EXECUTIVE SUMMARY

The annual Pavement Management Report is produced to update information and data regarding the City of Eugene's transportation system including improved streets, unimproved streets and off-street shared-use paths. This report provides surface descriptions and associated mileage, reviews current treatment programs and costs, and projects future treatment needs based on several funding scenarios.

The transportation system is a significant public asset. This asset is typically described in lane miles and/or centerline miles. Currently, Public Works manages 1356 lane miles (543 centerline miles) of streets, and approximately 45 centerline miles of off-street shared-use paths within the City limits. This report includes a breakdown of the street transportation system in terms of pavement type, level of improvement, and functional classification.

Street (and off-street shared-use paths) conditions data are collected by Public Works Maintenance staff through on-site inspections. Pavement distress information is collected and a Pavement Condition Index (PCI) score is generated. Formulas and methodology within MicroPaver helps establish efficient treatment requirements and identify financial implications of various response strategies. The Pavement Management System (PMS) also provides a detailed street inventory and condition trends using street condition data collected since 1987.

The City established a local gas tax in 2003 for a Pavement Preservation Program (PPP) due to the fact that street repair funding was not at a level to keep pace with rehabilitation needs. In 2007, it was reported that the anticipated backlog for rehabilitation needs would reach more than $282 million by 2016 (2007 Pavement Management Report). In 2008, a $35.9 million, five-year bond measure was approved by voters and another five-year bond for $43 million was approved by voters in 2012. Between these funding sources more than 126 streets in Eugene are identified to be repaired by 2018. The revenues from the local gas tax and the bond measures have helped reduce the backlog of street repair projects over the last 13 years. However, the City's current backlog is increasing financially due to new construction costs provided by Engineering Division as referenced in the table on page 13. Based on the 2015 ratings and reported in the 2016 Pavement Management Report the calculated backlog of repairs on improved asphalt streets was $79 million; as of the end of 2016 the current backlog has been calculated to be $92 million.

In addition to funding from the current street repair bond ending in 2018 and new rising constructions costs, other factors have contributed to the current and future backlogs:

- Since the beginning of the Pavement Preservation Program 2002, arterial and collector streets were the primary focus for preservation. Theses streets now are showing signs of deterioration beyond crack sealing and standard maintenance practices.

- According to the Construction Costs Forecast (ODOT, October 2012) costs will continue to increase at a steadier rate rather than with the volatility of recent years. Changes in costs for construction materials and labor will affect long-term backlog estimates.

- New construction techniques such as in-place recycling (also known as in-place cement treated base) which strengthens existing roadbed materials for reuse and lowers impacts to the environment have been successfully used in place of conventional reconstruction techniques resulting in additional cost savings.

EXECUTIVE SUMMARY – (*continued*)

Even though the backlog figure increases money-wise in 2016, the projected needed treatments for Arterials and Collectors beyond 2018 remain relatively steady. A significant impact to the increasing backlog is the declining condition of residential streets. The increase indicates that the local gas tax alone is insufficient to stabilize the backlog long term. It is also important to note that the backlog estimate is limited to improved asphalt streets. It does not take into account the repair needs for concrete streets, unimproved streets, sidewalks, off-street shared-used paths, or other elements of the transportation system.

The 2017 report uses three funding scenarios to project treatment needs and costs over a 10-year period. The analyses for all three scenarios use costs updated by Engineering in 2016 and are adjusted to include a 2% inflation factor. The last two scenarios, preventing the street system from falling into reconstructs and treating those that are at a reconstruct treatment signify the progress made because of bond measure funding for the pavement preservation program. Following is a summary of the analyses:

- Based on the projected funding (see table pg. 17), a $200 million backlog is projected in 10 years. Last year the projected backlog was $186 million in 10 years. The current street repair bond measure will end in 2019 decreasing pavement preservation from an average of $11.3 million to $3.3 million unless additional funding is approved.

- A funding level of $9.2 million annually is needed to prevent arterial and collector streets from falling into the reconstruct range and eliminate the reconstruct backlog for arterial and collector streets in 10 years.

- A funding level to $14.6 million annually is needed to prevent any street from falling into the reconstruct range and eliminate the total reconstruct backlog in 10 years. Residential streets account for approximately 66% (lane miles) of the system and over half of the current backlog is for the treatment of these streets.

SCOPE OF THIS REPORT

This report is made up of four primary sections:

Street Inventory: The street inventory is discussed including improvement status and functional classification definitions.

*Pavement Management System (PMS)***:** A brief history and description of the Pavement Management System used by the City, the selection process and conversion to MicroPaver system is discussed. Included in this section are the rating methodology, pavement inspection frequency, pavement conditions described by the Pavement Condition Index (PCI), specific distress definitions and the resulting reports.

Pavement Preservation Program (PPP): The Pavement Preservation Program is highlighted in this report, including Maintenance and Engineering Division roles, treatment types and estimated unit costs, project prioritization, sustainable construction, current treatment costs, projected funding, historical and projected funding graphs, unimproved streets, and off-street shared-use paths.

*Project*s: This section includes completed and future project lists and maps, including a list and map of the projects identified in the 2012 bond measure.

EUGENE'S STREET INVENTORY

The City of Eugene has jurisdictional responsibility for many different types and classifications of transportation facilities. Many factors such as age, development type, traffic loads, use, and future transportation needs affect the maintenance and rehabilitation planning for the system. The segment inventory component of the PMS allows a reporting of both centerline miles (intersection to intersection) and lane miles of each segment of the system. While commonly used in reporting distance, centerline miles do not relate equally across streets of different widths or different number of lanes. For this report, comparisons typically are shown both in centerline and 12 foot-wide lane miles unless otherwise noted.

Improvement Status

For purposes of establishing budget allocations and rehabilitation priorities, and performing maintenance activities based on established maintenance policies, the City of Eugene divides the street inventory into two distinct categories:

Improved streets are those which have been fully designed for structural adequacy, have storm drainage facilities provided which include curbs and gutters, and have either an asphalt concrete (AC) or a Portland cement concrete (PCC) surface. Typically, these streets were either fully improved when the area was developed and paid for by the developer, or were improved through a local improvement district (LID) and paid for in part by the abutting property owners. In some cases a street may have been fully improved while under state or county jurisdiction and then surrendered to the City. Improved streets receive the highest level of ongoing maintenance and are eligible for rehabilitation funding through Eugene's Capital Improvement Program (CIP) and Pavement Preservation Program (PPP).

Unimproved streets are those with soil, gravel, or asphalt mat surfaces that have typically evolved to their existing state, have not been structurally designed, and have few if any, drainage facilities and no curbs or gutters. Typically, an unimproved street must be fully improved through a local improvement district, funded in part by the abutting property owners before a higher level of service will be provided (see "City of Eugene Street Maintenance Policy and Procedure Manual" for levels of maintenance service). Unimproved streets receive a low level of ongoing maintenance limited primarily to emergency pothole patching (three inches or greater in depth) and minimal roadside ditch maintenance. To address the growing number of potholes on City streets, the City Council augmented the street repair budget with General Fund allocations for a total of $2.35 million from FY 2009 through FY 2011. Subsequently, Public Works has allocated $200,000 per year from Road Fund for enhanced street repairs. The Maintenance Division has addressed potholes by either filling individual potholes or by performing maintenance overlays over entire street segments. During the past eight years more than 100 unimproved streets, representing more than 31 lane miles, have been resurfaced as a temporary treatment. In addition, several unimproved streets have been brought up to full urban street standards through assessment projects, attributable in part to more flexible design standards.

The following tables categorize Eugene's Improved and Unimproved Street System in Centerline Miles and 12-foot Lane Miles by Pavement Type and by Functional Class.

IMPROVED SYSTEM	Asphalt (ACP)		Asphalt over Concrete (APC)		Concrete (PCC)		Gravel		Undeveloped		Total	
	Miles	12' Lane Miles	Miles	12' Lane Miles	Miles	12' Lane Miles	Miles	12' Lane Miles	Miles	12' Lane Miles	Miles	12' Lane Miles
Major Arterial	13.97	64.39	0.03	0.16	0.51	2.26	0	0	0	0	14.51	66.81
Minor Arterial	63.19	213.59	2.27	7.51	3.56	11.92	0	0	0	0	69.02	233.02
Major Collector	30.21	92.81	1.15	2.72	3.1	8.38	0	0	0	0	34.46	103.91
Neighborhood Collector	23.86	61.83	0.45	1.23	1.58	4.35	0	0	0	0	25.89	67.41
Residential	309.6	716.41	1.79	4.89	21.37	54.47	0	0	0	0	332.76	775.77
Total	440.83	1149.03	5.69	16.51	30.12	81.38	0	0	0	0	476.64	1246.92

UNIMPROVED SYSTEM	Asphalt (ACP)		Bituminous Surface (BST)		Concrete (PCC)		Gravel		Undeveloped		Total	
	Miles	12' Lane Miles	Miles	12' Lane Miles	Miles	12' Lane Miles	Miles	12' Lane Miles	Miles	12' Lane Miles	Miles	12' Lane Miles
Major Arterial	0	0	0	0	0	0	0	0	0	0	0	0
Minor Arterial	1.69	3.15	0	0	0	0	0	0	0	0	1.69	3.15
Major Collector	3.25	7.34	0	0	0	0	0	0	0	0	3.25	7.34
Neighborhood Collector	4.13	8.31	0	0	0	0	0	0	0	0	4.13	8.31
Residential	39.1	64.82	4.27	6.45	0.03	0.03	8.95	13	4.69	5.91	57.04	90.21
Total	48.17	83.62	4.27	6.45	0.03	0.03	8.95	13	4.69	5.91	66.11	109.01

Functional Classifications

The quantity and associated vehicle weight of traffic using streets is a critical factor affecting the rate at which pavement and roadbeds deteriorate. Eugene divides streets into five categories called functional classifications (FC), each representing a different volume and type of vehicular usage. The MicroPaver terminology for functional classification/section rank is identified as follows:

Major Arterial (FC-1) - (A): Major Arterials are usually four or more lanes and generally connect various parts of the region with one another within the city and with the “outside world”. They serve as major access routes to regional destinations such as downtowns, universities, airports, and similar major focal points within the urban area. Major Arterials typically carry an average of more than 20,000 vehicles per day. Major Arterials receive high priority maintenance.

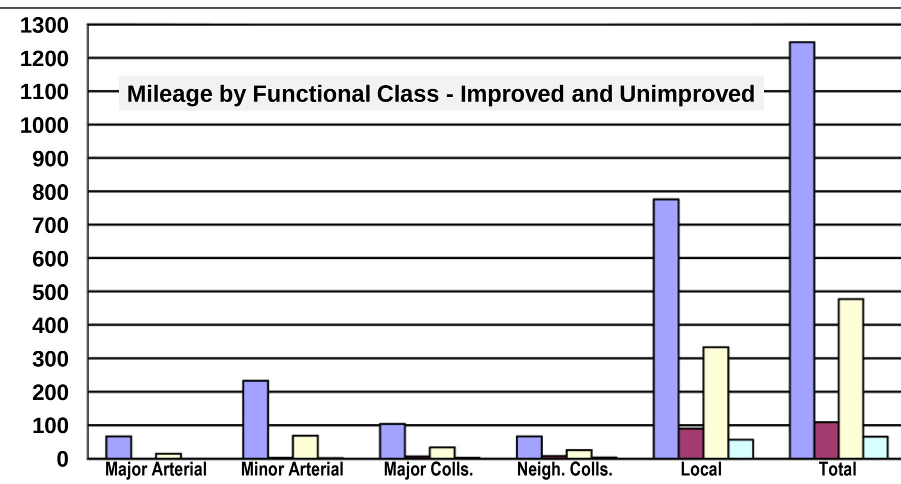
Minor Arterial (FC 2) - (B): Minor Arterials are typically two or three lanes. These streets provide the next level of urban connectivity below major arterials. In most cases their main role tends to be serving intra-city mobility. Minor Arterials carry between 7,500 and 20,000 vehicles per day. Minor Arterials receive priority maintenance.

Major Collector (FC-3) - (C): Major Collectors can be found in residential, commercial, and industrial areas. They typically carry between 2,500 and 7,500 vehicles per day. Major Collectors have a higher priority for maintenance than local streets.

Neighborhood Collector (FC-4) - (D): Neighborhood Collectors are found only in residential neighborhoods and provide a high degree of access to individual properties in a neighborhood. They typically carry between 1,500 and 2,500 vehicles per day.

Local (FC-5 - (E): Local streets provide access to individual properties along the roadway. They are narrow, slow-speed, and low-volume service facilities. They typically carry fewer than 1,500 vehicles per day, and receive low priority maintenance. Local streets are also referred to as Residential streets.

The following graph illustrates both centerline miles and lane miles by improvement type and functional classes.



	Major Arterial	Minor Arterial	Major Colls.	Neigh. Colls.	Local	Total
Improved 12' lane miles	67	233	104	67	776	1247
Unimproved 12' lane miles	0	3	7	8	90	109
Improved centerline miles	15	69	34	26	333	477
Unimproved centerline miles	0	2	3	4	57	66

PAVEMENT MANAGEMENT SYSTEM

A Pavement Management System (PMS) performs analysis of collected rating data and reports on the current and projected conditions of the street system. In addition, it is used to evaluate the effectiveness of planning and funding priorities, and provides guidance in the decision making process. The goal of the decision making process is to prevent pavement failures through judicious maintenance.

City of Eugene implemented MicroPaver in 2013. MicroPaver combines visual field inspection ratings, compiled under strict criteria, with computer tracking and condition analysis. Beginning in 2010 the rating methodology was revised to the WDOT's Extended (WSEXT) method, collection of deterioration values by area, lineal footage thus keeping the program consistent with industry standards. This also allowed for smoother transition to MicroPaver with the ability to migrate three years of rating data with some modifications. With this migrated condition data, rating the entire asphalt street system the last three years plus construction history we are able to perform an analysis with rational accuracy to report financial needs and road conditions. There will be some variation in the outcomes of the analysis due to slight differences in rating and calculation methodology but overall the data is consistent.

Pavement Inspection Frequency

Two predominant work efforts required to maintain the PMS are updating the street inventory and performing the annual inspection of surface conditions.

City streets are divided into segments based on their Functional Classification (FC), pavement type, and geometric design. Segments are the basic unit for evaluating streets and surface conditions. A segment is defined as a portion of a street with a beginning and ending description. Changes in geometric features are used as a guide for determining segments. Examples of geometric differences are surface type, segment width, surface age, and extent of past rehabilitations.

Field inspections are conducted by pavement raters who walk each individual street segment evaluating the pavement surface for signs of distress. City arterial and collector streets are inspected annually; residential streets inspections are completed in a three-year cycle; and off-street shared-use path inspections are completed in a two-year cycle.

Staff performed inspections on the entire street system using MicroPaver for the first three years after implementation 2013-2015. Inspection data was evaluated for accuracy with the assistance from an outside consultant in 2014. It was determined that three years of street inspection provided an accurate baseline in MicroPaver for analysis. In 2015 staff completed inspections of shared-use paths. In 2016, staff returned to the standard inspection cycle inspecting arterial and collector streets plus two residential areas, South Hills and Coburg. Staff managed to inspect all concrete residential streets as well as alleys.

Pavement Condition Index (PCI), Deduct Values, and Distresses

Pavement distresses are dependent on pavement type and are rated by severity and extent. MicroPaver provides a numerical value calculated internally based on deduct values for the distresses rated per street segment. MicroPaver defines this value as Pavement Condition Index (PCI) which will be the term used throughout this report.
A street with a PCI of 100 represents a new or recently rehabilitated street. This PCI value is the basis used to analyze the surface treatment needs. Distress data are collected using ACER Tablets and then uploaded to the pavement management software. MicroPaver method rates severities and all their extents for up to 20 different distresses. As the condition of a streets' surface begins to deteriorate, the PCI decreases. Asphalt distresses typically observed are alligatoring, longitudinal and transverse cracks, rutting, and raveling. Distresses in concrete streets typically observed and rated include cracks per panel, raveling, joint spalling, faulting, and crack sealing. Descriptions of some common distresses are shown below:

Alligator Cracking: When the asphalt begins to crack in all direction it is called alligator cracking.

Longitudinal Cracking/Transverse Cracking: These are cracks that run parallel to the roadway centerline (longitudinal) and perpendicular to the roadway center line (transverse). These distresses usually divide the piece into different sections and which are caused by repeated traffic loading. The low-severity cracks are not considered serious to the overall function and safety of the road. Medium to high-severity cracks are usually caused by heavy traffic loads and environmental factors and can become very serious distresses. The picture below shows longitudinal cracking.

Rutting: When the traffic of the street becomes heavy for long periods of times the asphalt begins to sink into the wheel path of the vehicles causing a rut. When there is a rut it is usually a long length of the road and is 1 to 2 feet wide and there are almost always two ruts, one for each wheel path of the vehicle. The severity of the rut is rated on the average rut depth from ¼" – over ¾" in depth.

Joint Spalling: Spalling is the deterioration of the edges of a concrete slab within 2 feet (0.6m) of the joint. The edges get chipped off concrete slabs causing spalling. Spalling is caused by heavy traffic loads and environmental factors.

Raveling: The roads, mainly asphalt, over time become worn out and rough not smooth as when they were first put in, often due to age and the effects of UV rays. Raveling measures the severity of the roughness and coarseness of the top layer of the street.

Faulting: Faulting is the difference in elevation across the slab. One side may be leaning up more over the other side. Causes are soft foundations, heavy traffic, poor construction, and environmental damage.

How Pavement Management System Information is Used

The primary purpose of maintaining a PMS is to collect and analyze information relating to street system condition and deterioration trends. With this vital information Public Works managers ensure the most cost-effective maintenance or rehabilitation strategies are identified and performed at the optimum time.

Each year the PMS is used to generate several reports requested by other agencies as well as statistical data requested within our own agency. The following is a sample of reports produced with PMS data:

- Pavement Preservation Project List
- Crack Seal Program
- Five-Year Surface List – five-year moratorium for street cutting
- ODOT Oregon Mileage Report
- City of Eugene Public Infrastructure Table
- Annual Insurance Marketing Report
- Transportation Service Profile

PAVEMENT PRESERVATION PROGRAM

Street preservation and rehabilitation, capital improvements, off-street shared-use path projects, and maintenance efforts make up Eugene's Pavement Preservation Program (PPP). Additionally, the City has budgeted funding for Maintenance Operations to repair portions of the unimproved street system through the Enhanced Street Repair Program. Both PW Maintenance and PW Engineering have important roles within the PPP.

PW Maintenance Roles

Maintenance Division Surface Technical team completes the pavement rating, budget and street life analysis, resulting in a proposed list of projects which is forwarded to Engineering for field testing and final grouping. Surface Technical staff is responsible for producing this report. Operations staff is responsible for the preventative maintenance of all City streets (including concrete streets) and off-street shared-use paths. Preventative maintenance designed to extend the life of the transportation asset is of highest priority. Fully improved asphalt streets receive the highest level of maintenance. Maintenance activities are performed to mitigate hazardous conditions and to extend the useful life of the street. The goal of preventative maintenance is to prevent a street's PCI from slipping from preventative maintenance or minor rehabilitation into a reconstruction category.

PW Engineering Roles

The Engineering Division typically receives projects proposed for preservation from the Maintenance Division three years in advance of the planned construction. Engineering then performs field investigations to confirm the need for treatment, and reviews historic data on construction and maintenance of the streets. Streets are then prioritized for detailed pavement testing and design recommendations based on the available funding and the assessed condition of the streets. The pavement testing and design reports identify whether a street needs to be reconstructed or rehabilitated (overlaid) and the range of treatment options available. If a street is determined to be a full reconstruct, it is typically deferred until funding is identified and available, such as street repair bond measures.

The Engineering Division is responsible for capital project management including design, stakeholder coordination and communication, contract administration, and construction management. For analysis and reporting of projected backlogs, the Engineering Division has provided construction costs based on historic and current road projects.

Treatment Types and Estimated Costs

For the purpose of reporting projected backlogs the Engineering Division provides construction costs based on historic and present road projects. Treatments reflected in the backlog analysis are limited to three types; slurry seal, overlay, and reconstruction and reporting is based on a system wide approach, not at the project level performed by Engineering. Each functional class has an estimated unit cost for overlay and reconstruction treatments. For local streets (FC-5) an additional maintenance option, slurry seal, is considered.

Slurry Seal: The slurry seal option allows for a cost-effective treatment to seal the surface and restore the skid resistance of local street segments, which do not carry high traffic loads. This treatment is not used on streets which require strengthening or reconstruction. Typical slurry seal costs include street cleaning, removal of vegetation, minor base repairs (dig-outs), sealing of cracks, and application of an emulsified asphalt aggregate mixture to the entire paved surface. Associated costs include replacement of striping and pavement markings, and other work needed to return the street to normal operation.

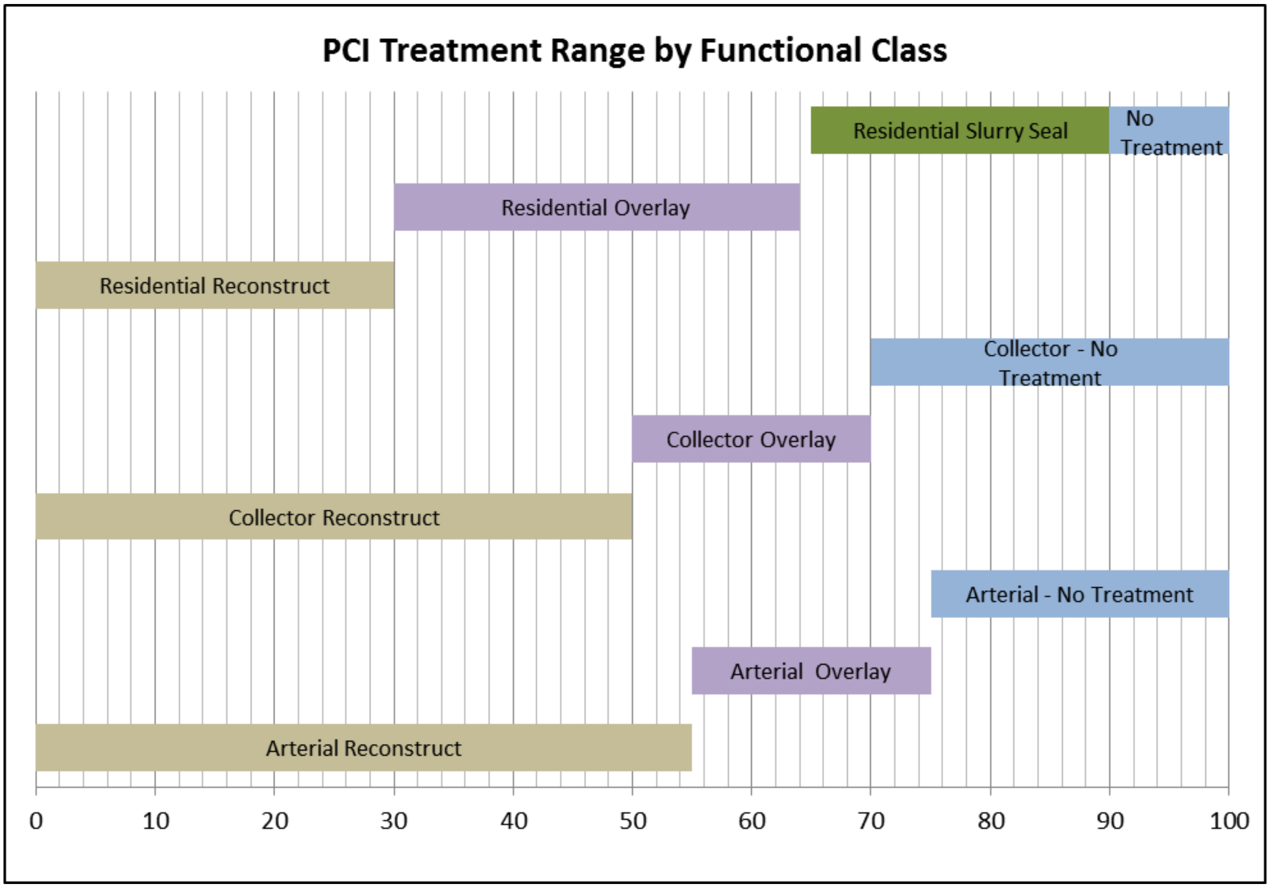
Overlay: Typical overlay rehabilitation costs include milling of existing pavement to a moderate depth to remove existing cracking and increase strength of the structural section. Isolated areas of severely distressed pavement are removed and replaced including a new aggregate base. Associated costs include replacement of striping and pavement markings, adjustment of manholes, and other work needed to return the street to normal operation.

Reconstruct: Typical street reconstruction costs include removal of the existing pavement and base structural section and replacement with a new structural section which will meet a 20-year design life. Isolated areas of curb and gutter are replaced where they would not be suitable to contain new paving or have severe drainage problems.

The following table identifies the estimated costs for the various treatment types including costs to upgrade curb ramps to comply with The American with Disabilities Act (ADA). The slurry seal treatment is exempt from ADA requirements.

Treatment – Functional Class Improved System	12’ Lane Mile Cost		
	Updated Eng. 2006 cost	Updated Eng. 2011 cost	Updated Eng. 2016 cost
Overlay - FC 1 & 2	$215,000	$243,000	$336,000.00
Overlay - FC 3 & 4	$184,000	$214,000	$311,000.00
Overlay - FC 5	$169,000	$195,000	$255,000.00
Re-Const - FC 1 & 2	$765,000	$724,000	$892,000.00
Re-Const - FC 3 & 4	$677,000	$679,000	$884,000.00
Re-Const - FC 5	$505,000	$505,000	$649,000.00
Slurry Seal - FC 5	$19,000	$25,000	$44,000.00

The following graph identifies the trigger points (PCI) for each treatment based on Functional Class.



Project Prioritization

Selecting streets or street segments for treatment is done through a process involving analysis, testing, and staff experience. Using the data produced by MicroPaver, and combining this information with estimated revenues allows staff to approximate backlogs and group potential street segments for consideration for treatment under the Pavement Preservation Program.

Streets are not prioritized on a “worst first” basis. Public Works’ main objective is to keep street segments from slipping into the reconstruction category, which typically costs four to five times more per lane mile than rehabilitation. By rehabilitating (overlaying) a street before it significantly deteriorates, 15 to 20 years of useful life can be added to a street at a substantial cost savings over reconstruction. Once a street has deteriorated to the point that it must be reconstructed, the opportunity for preventive street maintenance (overlay) is lost. For these reasons, streets that are categorized as overlay projects receive the highest priority for corrective treatment. If at some point in the future there are additional funds available, or if the majority of overlay projects have been addressed, reconstruction projects will be scheduled.

A prioritized list of 32 street repair projects to be funded by a local bond measure was approved by Eugene voters in 2008. The list, approved by City Council, was developed by staff based on citizen input, information about needed street rehabilitation and reconstruction from the pavement management system, and equitable geographic distribution of projects throughout the community. Subsequently, a 12 member Street Repair Review Panel (SRRP) was formed to document the use of the bond proceeds. In 2011, City Council approved the addition of 22 streets selected in the same manner and recommended by the citizen review panel to be repaired.

In 2012, a second five-year bond measure was approved by Eugene voters with a prioritized list of 76 street repair projects (Exhibit A) and additional funding to support bicycle and pedestrian improvement projects. The list was developed using the same criteria as above and approved by City Council.

Sustainable Construction

Since 2008, Eugene has been in the forefront of sustainable construction and paving practices, some of which include paving with warm mix asphalt (WMA), using reclaimed asphalt pavement (RAP), and full depth reclamation (FDR). Production of warm mix asphalt is a “green” solution for the environment with noticeable reduced energy consumption and greenhouse gas emissions. Exposure to fuel emissions, fumes, and odors are reduced for asphalt producers, construction workers and the public. Benefits of paving with WMA are the ability to extend the paving season in colder weather, longer haul distances, and better road performance. Warm mix asphalt is identical to conventional hot mix asphalt, except that through a special mixing process it is produced at a temperature approximately 50 to 100 degrees cooler than conventional hot mix asphalt. This mixing process for asphalt aids in compaction during paving, assists in preventing premature aging and slowing the aging process of asphalt. In Eugene, all asphalt producers have retrofitted their plants to produce warm mix asphalt.

Council set goals in 2011 for waste reduction by requiring that the quantity of materials placed in landfills be reduced. In addition to using WMA, Public Works conducted two pilot projects specifying that reclaimed asphalt shingles (RAS) be used as a binder in the asphalt mix, thereby keeping this material from entering the waste stream. The City continues to use warm mix asphalt and in-place recycling techniques to improve the quality, environmental footprint, and cost efficiency of the street bond projects. Key terms in sustainable construction practices:

In-Place Recycling: A process in which a large piece of equipment called a reclaimer pulverizes and mixes the existing base rock and a portion of subgrade soils with dry cement and water to create a cement-treated base. This process greatly reduces the use of virgin materials and trucking that are needed using conventional remove-and-replace construction techniques.

Full Depth Reclamation: When applicable, partial or full-depth reclamation (FDR) is used as a cost and time-saving alternative to traditional reconstruction. Associated costs include replacement of striping and pavement markings, adjustment of manholes, and other work needed to return the street to normal operation.

Crack Seal: Placing specialized materials into cracks in unique configurations to keep water and other matter out of the crack and the underlying pavement layers. Crack sealing can be used for two different reasons in pavement maintenance. One is a treatment to seal the cracks in order to prevent moisture intrusion into the pavement. The other is preparatory work to other treatments, such as overlays, and slurry seals.

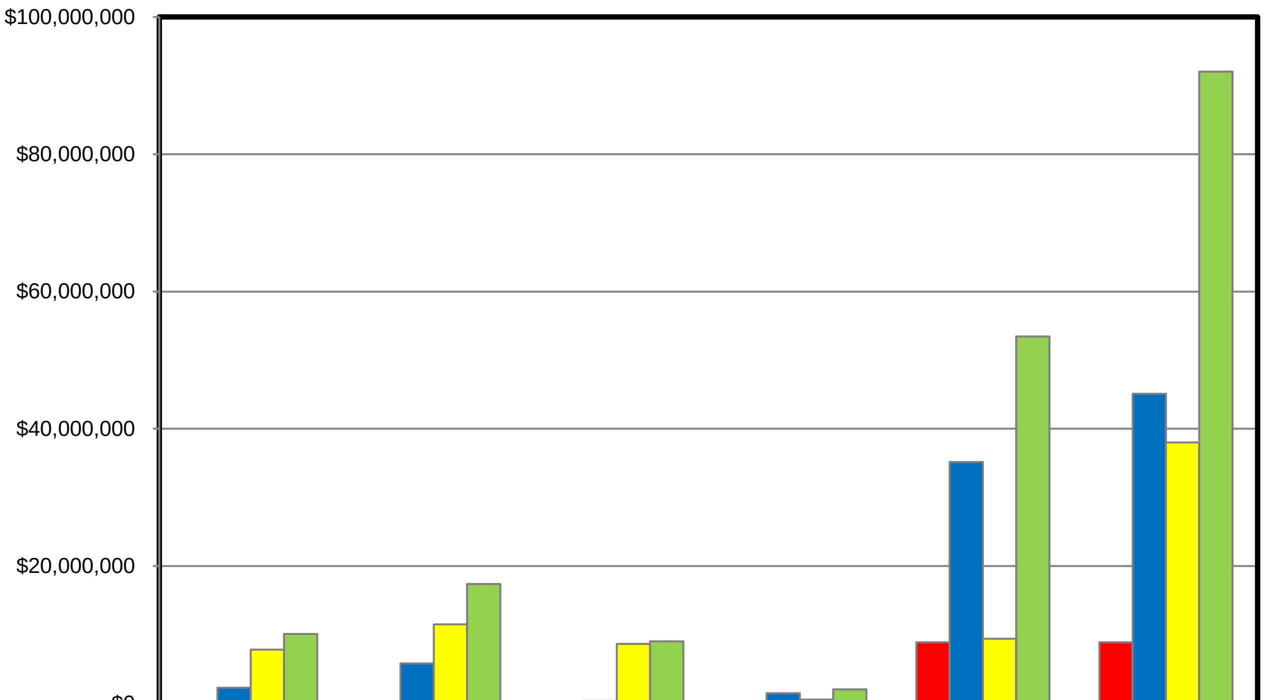
Reclaimed Asphalt Pavement (RAP): The term given to removed and/or reprocessed pavement materials containing asphalt and aggregates. These materials are generated when asphalt pavements are removed for reconstruction, resurfacing, or to obtain access to buried utilities. When properly crushed and screened, RAP consists of high-quality, well-graded aggregates coated by asphalt cement that can be reused as a substitute for a portion of virgin materials in asphalt and aggregate base.

Recycled Asphalt Shingles (RAS): A primary reason for the high potential value of recycled shingles is that they contain ingredients that hot mix asphalt (HMA) producers purchase to enhance their paving mixtures including asphalt cement (or AC "binder") and mineral aggregate. Asphalt shingles also contain a fibrous mat made from organic felt (cellulose) or fiberglass that can also be valuable as fiber in some asphalt paving mixes.

Current Treatment Costs

This chart provides detail of the current cost for treatment of the entire improved system excluding concrete streets at the end of the 2016 rating period. The total estimated treatment cost backlog at the end of 2016 is $92 million up from $79 million reported in 2015.

Treatment Costs By Functional Class 2016 Year End



	Major Art	Minor Art	Coll	Neigh. Coll	Local	Total
Slurry	$0	$0	$0	$0	$8,902,000	$8,902,000
Overlay	$2,264,000	$5,846,000	$369,000	$1,477,000	$35,149,000	$45,105,000
Reconst	$7,834,000	$11,526,000	$8,675,000	$572,000	$9,414,000	$38,021,000
Total	$10,098,000	$17,372,000	$9,044,000	$2,049,000	$53,465,000	$92,028,000

Projected Funding for Pavement Preservation Program FY16 through FY22

From the inception of the Pavement Preservation Program (PPP), Eugene has been faced with the challenge of securing adequate, sustainable funding for this program. Currently there are several sources that contribute funding for pavement rehabilitation and reconstruction projects. The primary source of ongoing revenue is the City's local motor vehicle fuel tax ("gas tax"), which is currently levied at 5 cents per gallon. The reimbursement component of Transportation System Development Charges (SDCs) have historically generated close to $800,000 per year for PPP projects. In the current economic environment, building permit activity continues to be low, reducing the level of this funding stream. The cumulative effect of these factors is that PPP annual revenues, which were once projected at $4.2 million per year, are now projected to level out at approximately $3.3 million per year

In 2008, voters approved a $35.9 million dollar bond measure dedicated to 32 street preservation projects and shared-use path rehabilitation work. Based on numerous economic factors construction bids were significantly less than anticipated allowing 22 streets to be added to the original 32 streets approved by voters.

In 2012, voters approved a second $43 million bond measure dedicated to 76 street preservation projects plus $516,000 annually to support bicycle and pedestrian projects. The measure will generate approximately $8 million annually for FY14 through FY18.

With the funding identified approximately 112 lane miles of City streets and will be repaired. To date approximately 3 miles of off-street shared-use paths have been repaired.

Projected Funding Sources Pavement Preservation Projects FY16 through FY22

Fiscal Year	Local Gas Tax Note 1	SDC Note 2	Bond Note 3	Other Note 4	Total Funding
FY16 (actual)	$3,050,845	$501,878	$6,934,842	$62,755	$10,550,320
FY17 (est.)	$2,880,000	$317,600	$8,290,000	$23,000	$11,510,600
FY18 (est)	$3,000,000	$316,300	$8,900,000	$23,000	$12,239,300
FY19 (est)	$3,000,000	$316,300	$6,220,000	$23,000	$9,559,300
FY20 (est)	$3,000,000	$316,300	$0	$23,000	$3,339,300
FY21 (est)	$3,000,000	$316,300	$0	$23,000	$3,339,300
FY22 (est)	$3,000,000	$316,300	$0	$23,000	$3,339,300

Notes:

1) Local Motor Vehicle Fuel Tax (gas tax) revenues are assumed at the 5-cent level throughout the forecast period.

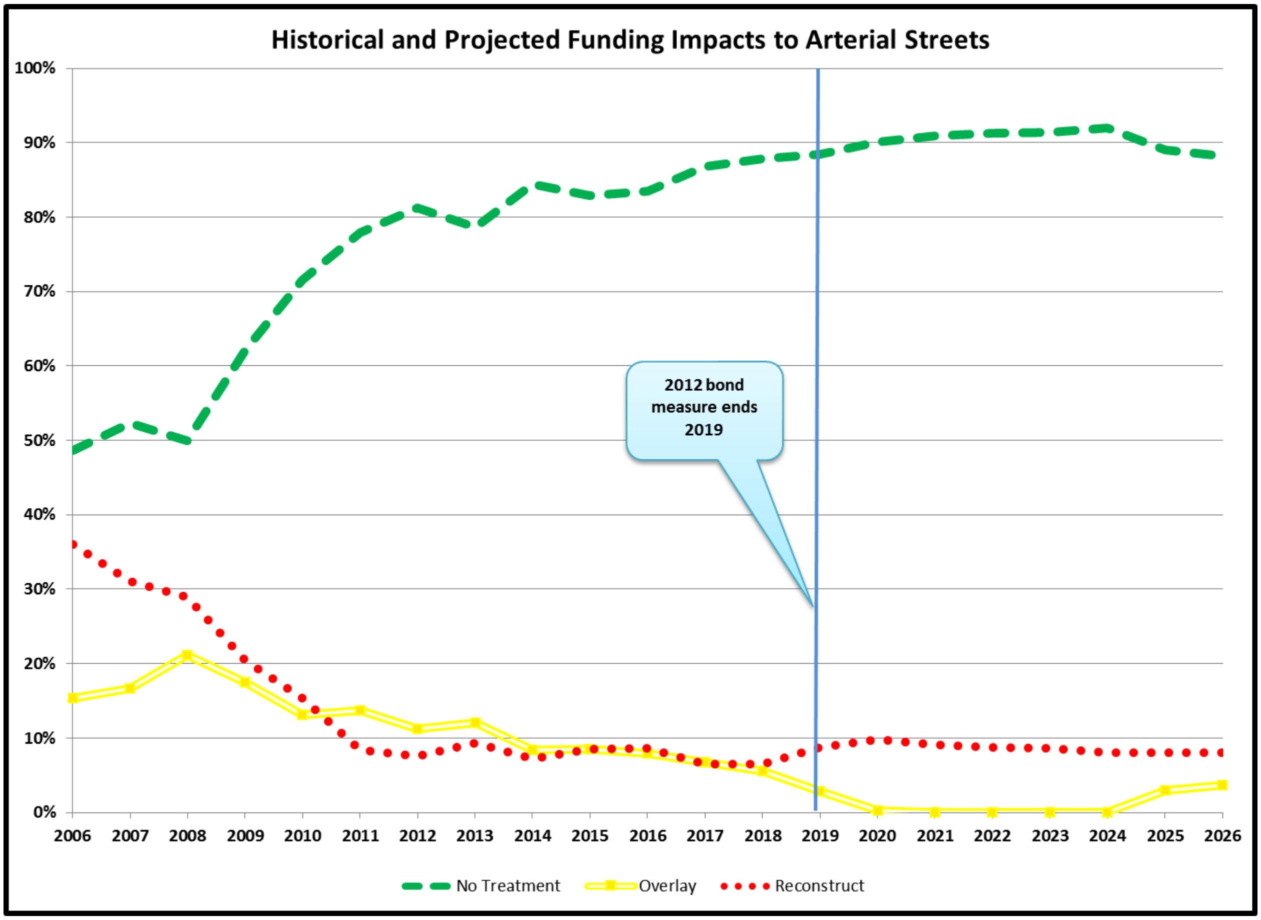
2) SDC reimbursement revenue is projected to maintain low level of activity through the forecasted period.

3) November 2008 voters passed a five year bond measure for pavement preservation backlog.
November 2012 voters passed a second five year bond measure starting FY15.

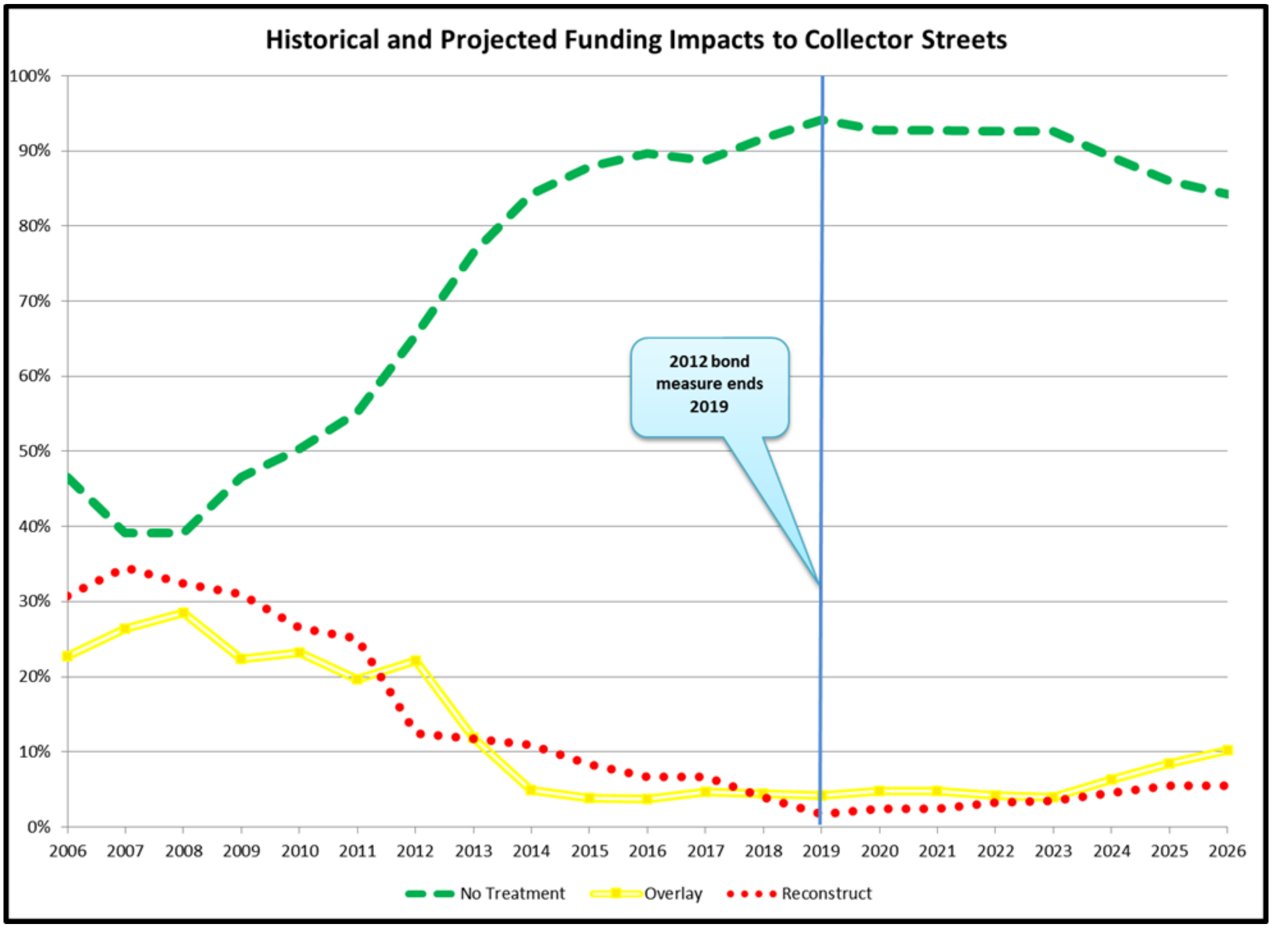
4) "Other" revenue generally includes investment interest, permit fees and other miscellaneous resources.
The estimate year's does not include reimbursements from other agency.

Historical and Projected Funding Outcomes

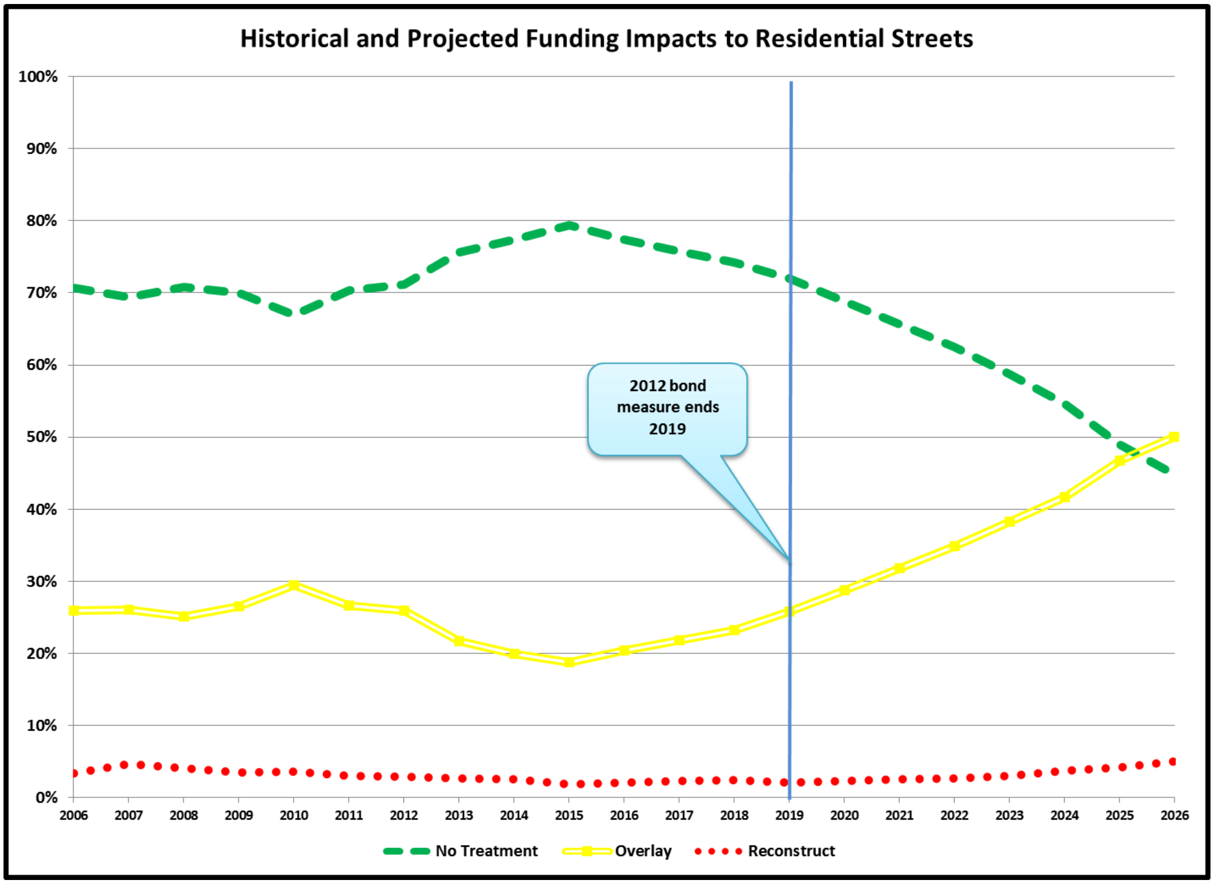
Using the PMS software, an analysis for a 10-year period (2016 through 2026) has been completed based on the current funding, including the 2012 bond measure. The PMS software evaluates the deterioration of each segment based on individual PCI ratings. The software then projects when to apply the necessary treatment at the proper time. When possible, the system applies a less expensive treatment earlier in the degradation curve to prevent the street from falling into an overlay or reconstruct range. In the following four graphs this projected evaluation includes historical data to present a more comprehensive view of the street system. The graphs show the impact of past and current funding over a 20-year period (2006 to 2026). Each graph indicates the **percentage** of streets that fall within a specific treatment range (reconstruct, overlay and no treatment). Plotting the percentages of streets within a treatment range over time visually demonstrates the overall condition of streets within that class. This is useful when deciding how to allocate funds in future years.



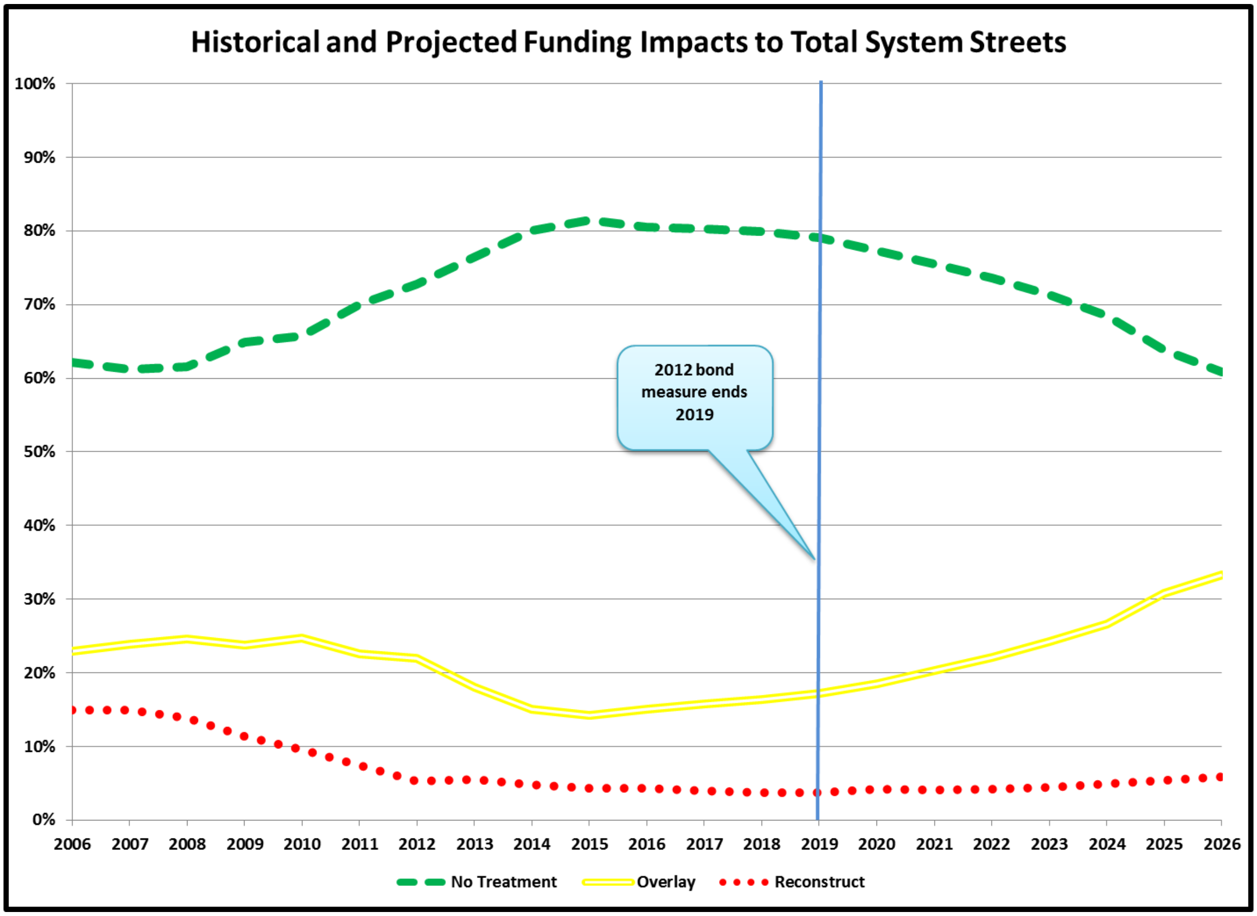
Arterial streets have been a major focus of the Pavement Preservation Program since 2002; as a result the percentage of arterial streets within the reconstruct treatment range steadily declined and remains stable during the bond periods. This stabilization provided an opportunity for funding to be allocated towards street preservation and allowing funds to be directed primarily to the collector system with a small portion dedicated to the residential system. With the local gas tax the City is able to maintain the Arterial system.



Similar to arterial streets, reconstruction and overlay treatment needs have decreased since 2008 as a result of completed and upcoming projects. Analysis indicates a stable collector system with minimal increase in both overlay and reconstruct treatments. As with the arterial system, once the bond ends in 2019 it is projected that streets which have previously been treated will begin to show expected deterioration.



Residential (Local) streets make up 62% of the total street system backlog in 10 years. To date residential streets have not been adequately funded to keep them from deteriorating. The 2012 bond measure identifies approximately 15 centerline miles for repair, less than 5% of the functional class. The percentage of streets within the overlay treatment range continues to increase. Looking back, the percentage of residential streets within the no-treatment range has been dropping and is projected to continue so that by 2026, over 50% of residential streets will require treatment.



This graph of the combined arterial, collector and residential streets reflects the impacts to the overall street system due to insufficient funding for residential street treatments as well as a treatment strategy that includes reconstruction and overlay treatment. The percentage of streets needing "no treatment" declines, while streets requiring a "reconstruct" treatment increases.

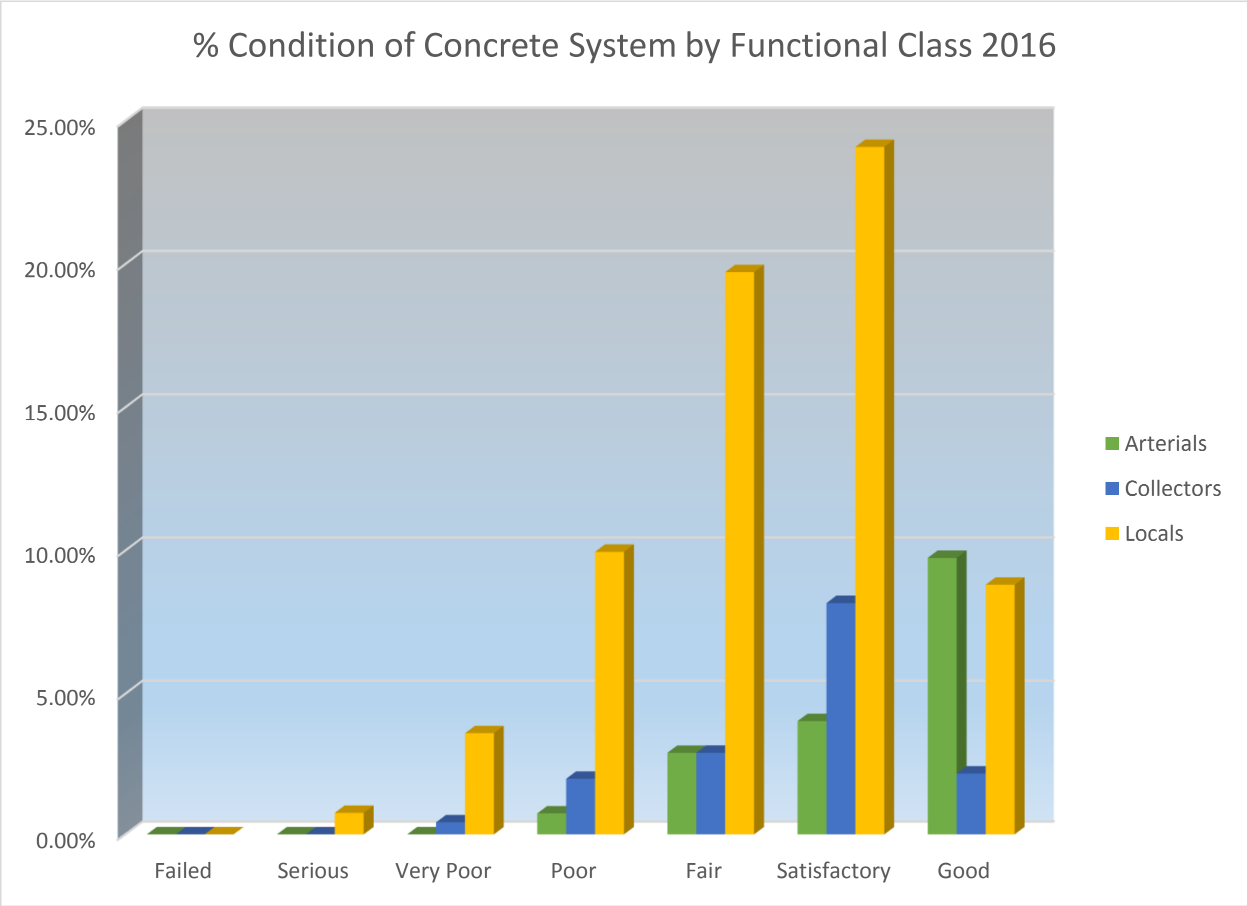
Concrete Improved Street System

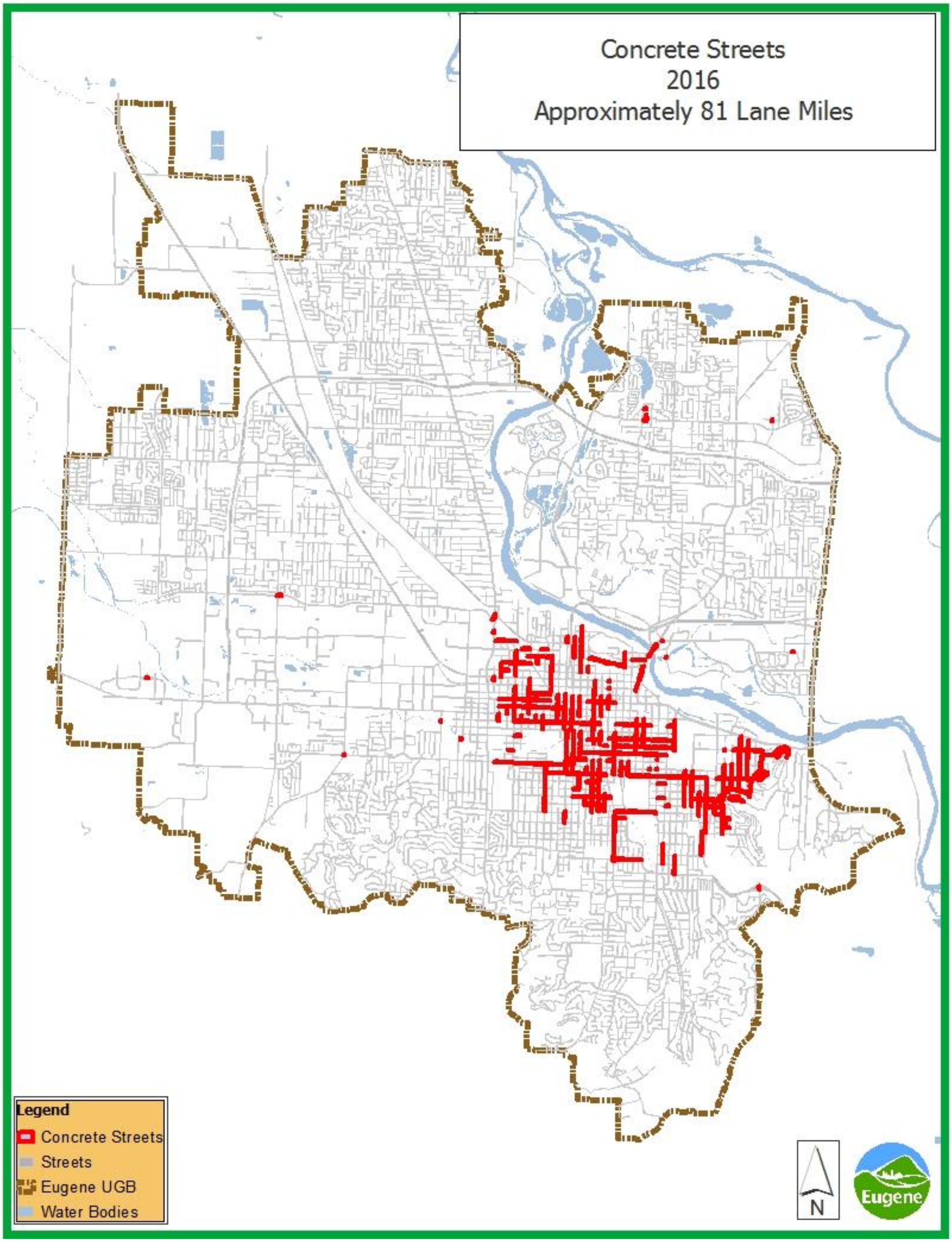
Of the 543 centerline miles of streets 30 centerline miles (81 lane miles) are concrete. In 2015 staff were able to refine concrete street inventory data so condition inspections could be completed. Unlike asphalt streets, concrete streets require panel counts plus an average width and length of the panel for the calculation of PCIs. Concrete segments are best evaluated when defined as a city block. Historical concrete designs for typical city blocks contained 66 panels, 3 columns of panels within a block length, or 33 panels with 2 columns.

Concrete streets like bike paths are built for a life of 50 or more years until complete reconstruction. Deterioration of concrete streets occur within individual panels with many panels in a street not requiring repair. Due to these unique factors for concrete streets, analyses which predict future needs of this system tend to be less accurate then asphalt surfaces. However like unimproved streets and bike paths we can provide a current condition of this system.

Past repair for these streets were primarily provided by City maintenance crews which consisted of panel replacements for the worst deteriorated panels. Historical construction data indicate that 60% of concrete streets are over 70 years in age. Based on past maintenance repairs these streets over time may have had a majority of panels replaced.

With the gas tax and bonds the City has contracted several concrete projects during this funding period. Approximately 2 miles or 7 lane miles have been repaired, this includes reconstructing asphalt intersections to a concrete surface for their durability to handle heavy traffic.




Concrete Streets
2016
Approximately 81 Lane Miles
Legend
Concrete Streets
Streets
Eugene UGB
Water Bodies
N
Eugene

Unimproved Street System

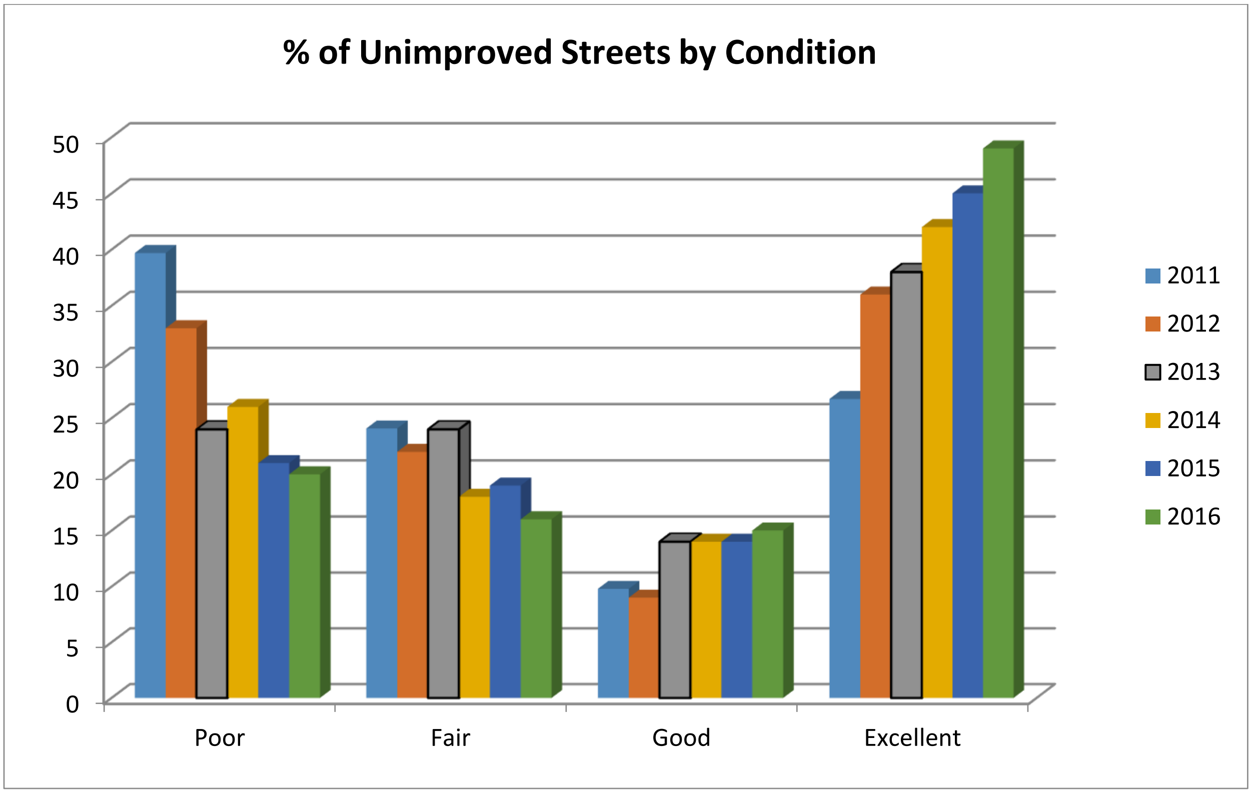
The City's transportation system consists of 543 centerline miles of improved and unimproved streets. The unimproved portion of this total includes 52 centerline miles (90 lane miles) of asphalt and bituminous surface streets. This section of the report is intended to describe the overall condition of unimproved asphalt streets, potential treatment needs, associated rehabilitation costs, along with a projected backlog repair cost for addressing this classification of street. It is important to note that any treatment short of being brought up to full urban street standards should be considered temporary. The estimated cost to improve this classification to meet the urban street standards is approximately $60 million. In addition, the following backlog figure is separate from the improved street backlog figure.

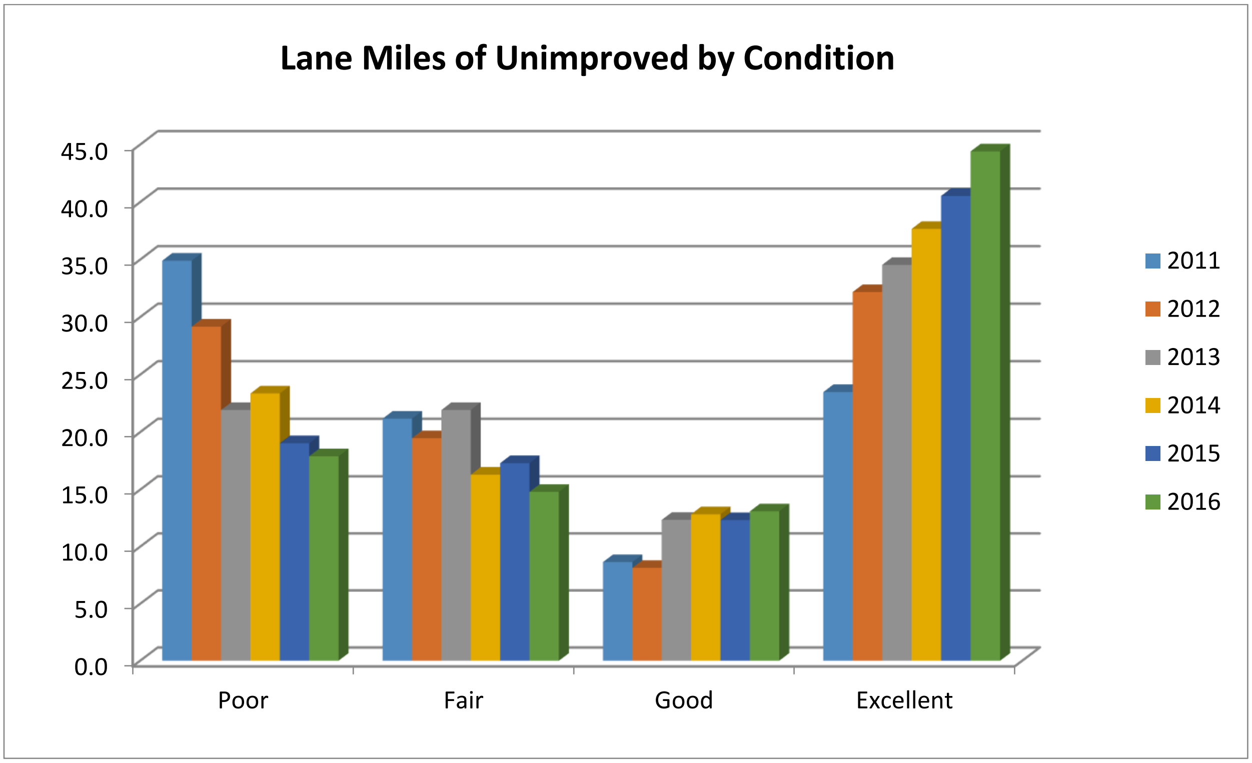
Based on 2016 rating data of the unimproved street system there is a backlog of temporary repair projects, typically maintenance overlays, totaling an estimated $3.62 million, up from $3.32 million reported in 2015. The increase is due to rising construction costs and deteriorating conditions. The following charts and graphs indicate that 64 percent of the system falls into a no treatment category, up from 59 percent reported in 2015, due in large part to recent maintenance overlay and FDR treatments completed over the past several years. More than 100 unimproved streets have benefited from full or partial treatment since 2008. Twenty percent of the system falls into the "poor" category. As funding allows, Public Works Maintenance plans on spending $200,000 annually to address a portion of these streets.

2016 Unimproved Asphalt Street
Condition and Rehabilitation Report
(2016 Rating Data)

PCI	Lane Miles	% of System	Condition	Rehabilitation Cost	Unit Cost/SQFT *	Treatment **
0-10	1.6	1.80%	Poor	$312,810	$3.00	FDR
11 20	5.90	6.5%	Poor	$929,352	$2.50	FDR or 2"HMAC
21-30	10.4	11.5%	Poor	$984,802	$1.50	1.5"-2" HMAC
31-40	5.0	5.6%	Fair	$476,535	$1.50	1.5"-2" HMAC
41-50	5.1	5.6%	Fair	$482,976	$1.50	1.5"-2" HMAC
51-60	1.6	1.8%	Fair	$151,774	$1.50	1.5"-2" HMAC
61-65	3.1	3.4%	Fair	$290,289	$1.50	1.5"-2" HMAC
66-70	3.3	3.6%	Good	$0	$0.00	No Treatment
71-80	3.7	4.1%	Good	$0	$0.00	No Treatment
81-85	6.1	6.8%	Good	$0	$0.00	No Treatment
86-90	3.8	4.2%	Excellent	$0	$0.00	No Treatment
91-100	40.6	45%	Excellent	$0	$0.00	No Treatment
			Total Rehabilitation	**$3,628,529**	* Unit cost based on recent project costs	** Example treatments. Actual treatment would need further analysis.
	90.1	100.00%				

The following graphs are a visual representation of the information provided on the preceding page.



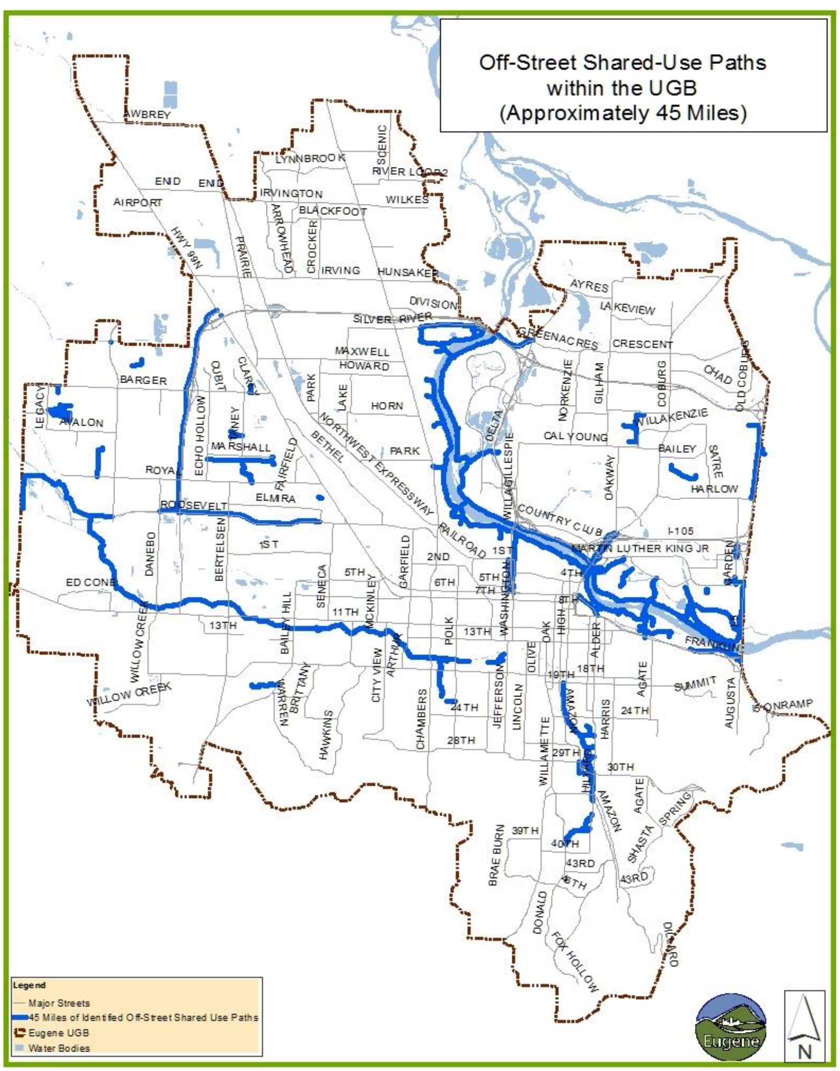


Off-Street Shared-Use Paths

Shared-use paths are used by a variety of non-motorized users, including pedestrians, cyclists, skaters, and runners. Shared-use paths are typically wider than an average sidewalk and paved (asphalt or concrete).

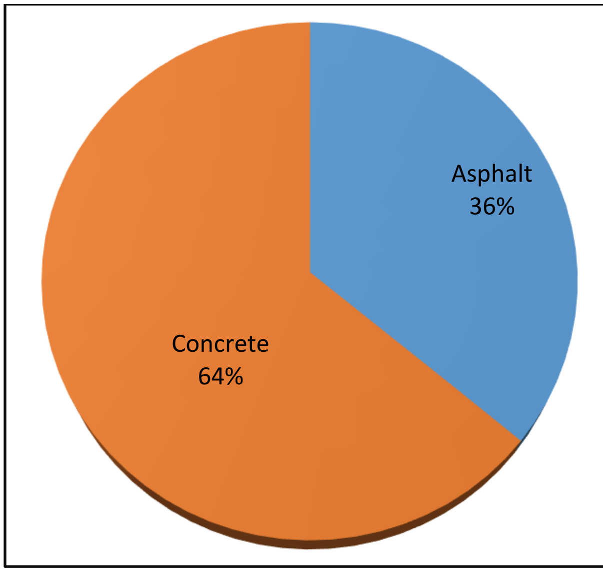
There are approximately 45 miles of shared-use paths within city limits identified by the PWE Transportation Planning section. In 2015, staff converted 44 miles of shared-used paths and rated the conditions using MicroPaver. Shared-use path analysis in last years' report was based on 2011 surveys using the WSEXT rating methodology. With updated information a current representation of this infrastructure may be shown in the following graphs and charts. An important note is the increase of shared-use paths in a condition above a 90 PCI, in 2011 approximately 19 miles were in this range and in 2015, 30 miles are in this range.

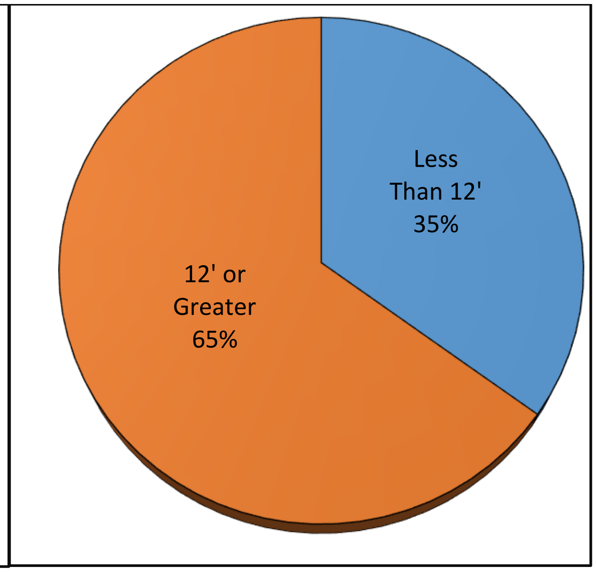
The City standards for shared-use paths require a concrete structure no less than six inches deep and 12 feet wide. Paths designed, constructed or reconstructed to current standards are expected to have a 50 year life.



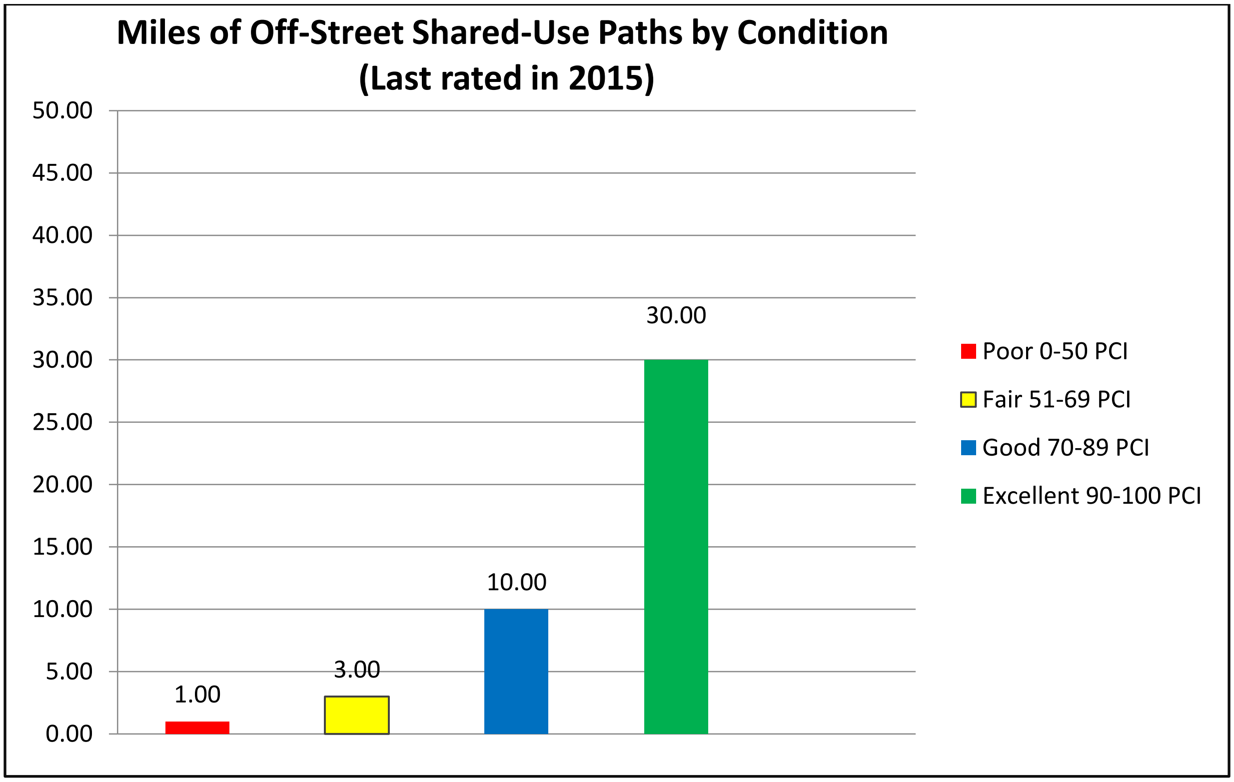
The following graphs show the division of 2015 surface types and widths within the system.

Off-Street Shared-Use Path Surface Type: Off-Street Shared-Use Path Existing Widths:





The following graph shows the path condition in 2015 for the system.



Shared-use path projects have been historically funded by state and federal grants and more recently by voter-approved bond measures. There is currently no long-term funding identified specifically for shared-use paths. The following is a list of completed and current projects, including shared-use paths funded by the bond measures.

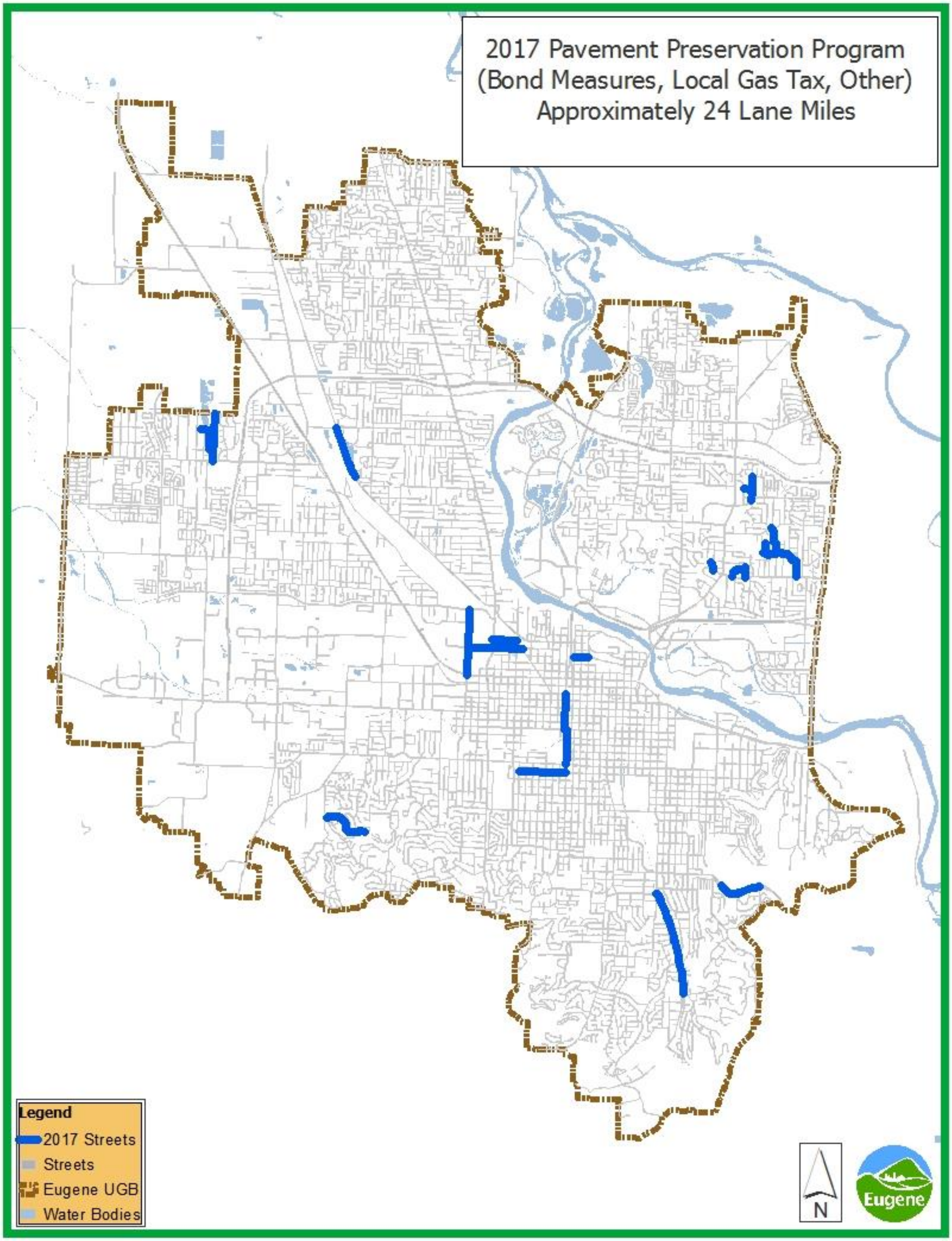
Name	**Fiscal Year**	**Funding**
Fern Ridge Chambers - City View	2004	STP-U
Garden Way Bike Path	2005	STP-U
Monroe Bikeway	2006	STP-U
N Bank Path Club Rd 3000'W	2006	STP-U
West Bank Trail	2007	Transportation Enhancement (TE) Funds
Delta Ponds Bridge	2007	Various Federal Funds
Amazon: SEHS - 31st Bike Path	2009	PBM
Fern Ridge Path Rehab/Westmoreland Connector	2010	PBM
South Bank Path Rehab	2011	PBM
West Bank Trail Extension	2011	STP-U/TE
Fern Ridge: Chambers - Arthur	2012	ODOT Rapid Readiness Funds
W Bank: Greenway - Copping	2012	PBM
Amazon/Willamette River Path Connectors	2012	State Urban Trail Funds
North Bank Path: DeFazio Bridge to Leisure Ln.	2012	STP-U
Fern Ridge: Terry - Greenhill	2013	STP-U/TE
South Bank Path - Riverplay to DeFazio Bridge	2013	PBM
South Bank Path - Knickerbocker Bridge to Franklin Blvd	2015	
Fern Ridge Path - Commerce to Connector Path	2016	LGT

Project Funding Abbreviations
PBM – Paving Bond Measure
LGT – Local Gas Tax/SDC/Other
STP-U – Surface Transportation Funds-Urban (Federal)
TE – Transportation Enhancement (Federal)

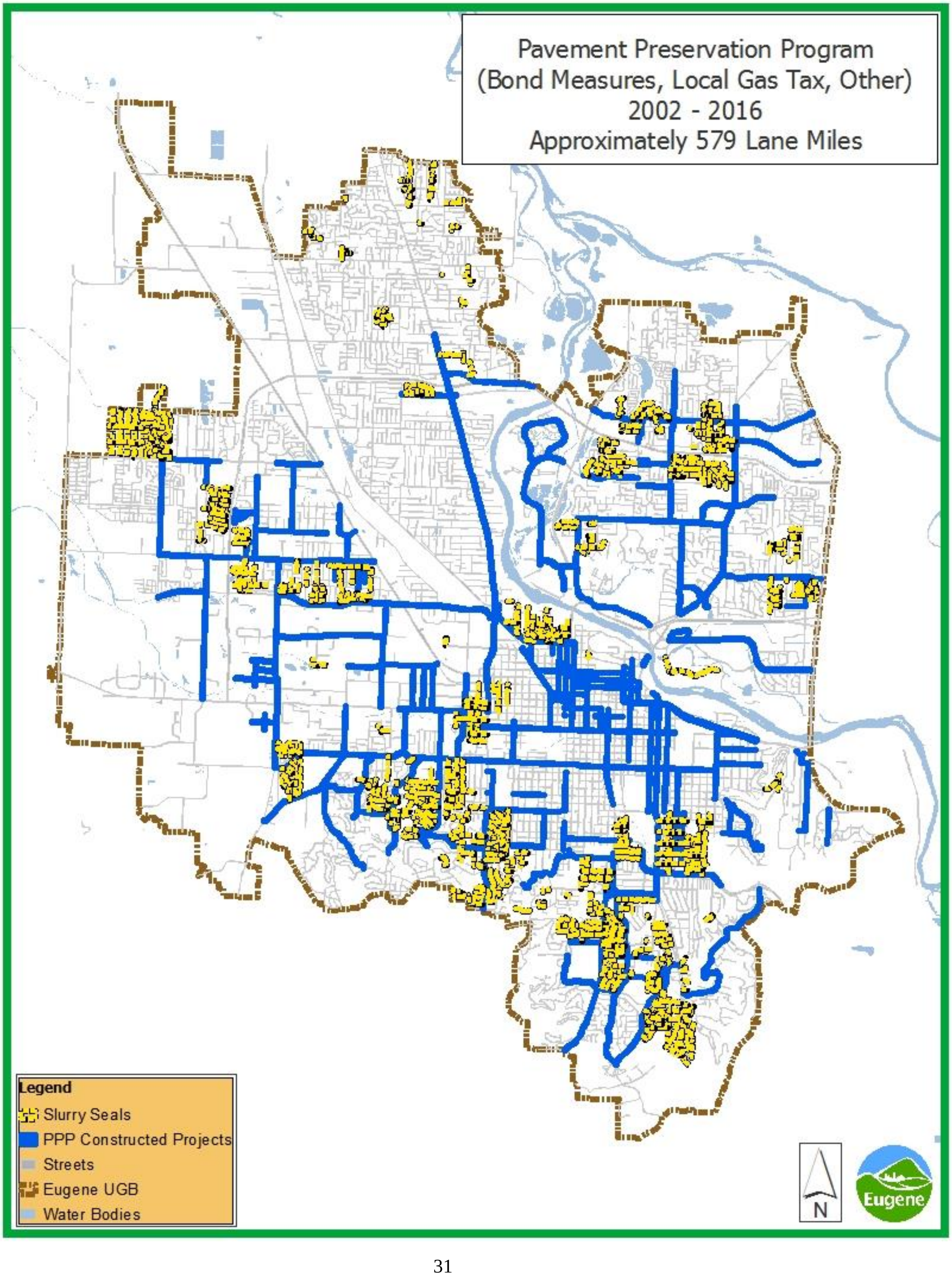
Scheduled Street Projects for 2017

2017 Project Name and Limits	*Lane Miles*	*Funding*
1st Ave (Blair to West End)	0.79	PBM
2nd Ave (Blair to Garfield)	1.67	PBM
30th Ave (Overpass @ Spring to Agate)	3.12	PBM
Best Ln (Willakenzie to Kentwood)	0.67	PBM
Calvin St (Western to Harlow)	0.45	PBM
E. Amazon Pkwy (Hilyard to Dillard)	3.10	PBM
Garfield St (Roosevelt to 6th)	2.30	PBM
Ione Ave (Best to Adkins)	0.17	PBM
Jefferson St (8th to 18th)	2.17	PBM
Leigh St (North End to Western)	0.30	PBM
Lydick Wy (Tomahawk to Harlow)	0.37	PBM
Pioneer Ct (Pioneer Pike to North End)	0.18	PBM
Satre St (Bailey to Western)	0.75	PBM
Tomahwak Ln (Harlow to 580’ North)	0.49	PBM
Western Dr (Calvin St to Monroe Middle School)	0.75	PBM
3rd Ave (Washington to Lincoln)	0.48	LGT
19th Ave (Tyler to Jefferson)	1.3	LGT
Cody Ave (Golden Gardens to Blue Heron)	0.29	LGT
Danebo Ave (Jessen Dr to Burnett)	0.45	LGT
Golden Gardens St (Jessen to Barger)	1.34	LGT
Wilshire Ln (Wilshire to Timberline)	1.37	LGT

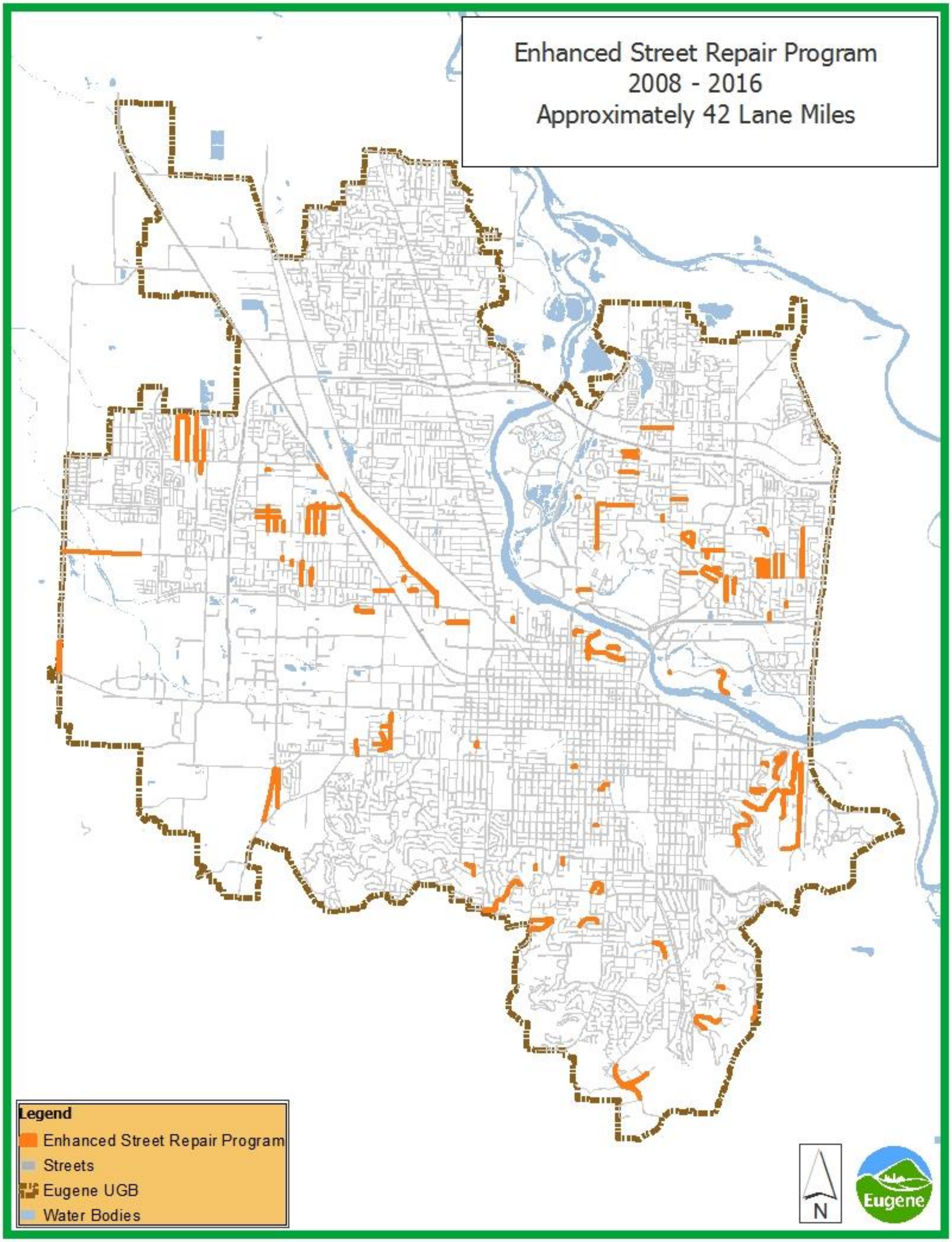
The following map illustrates the Pavement Projects scheduled for 2017.

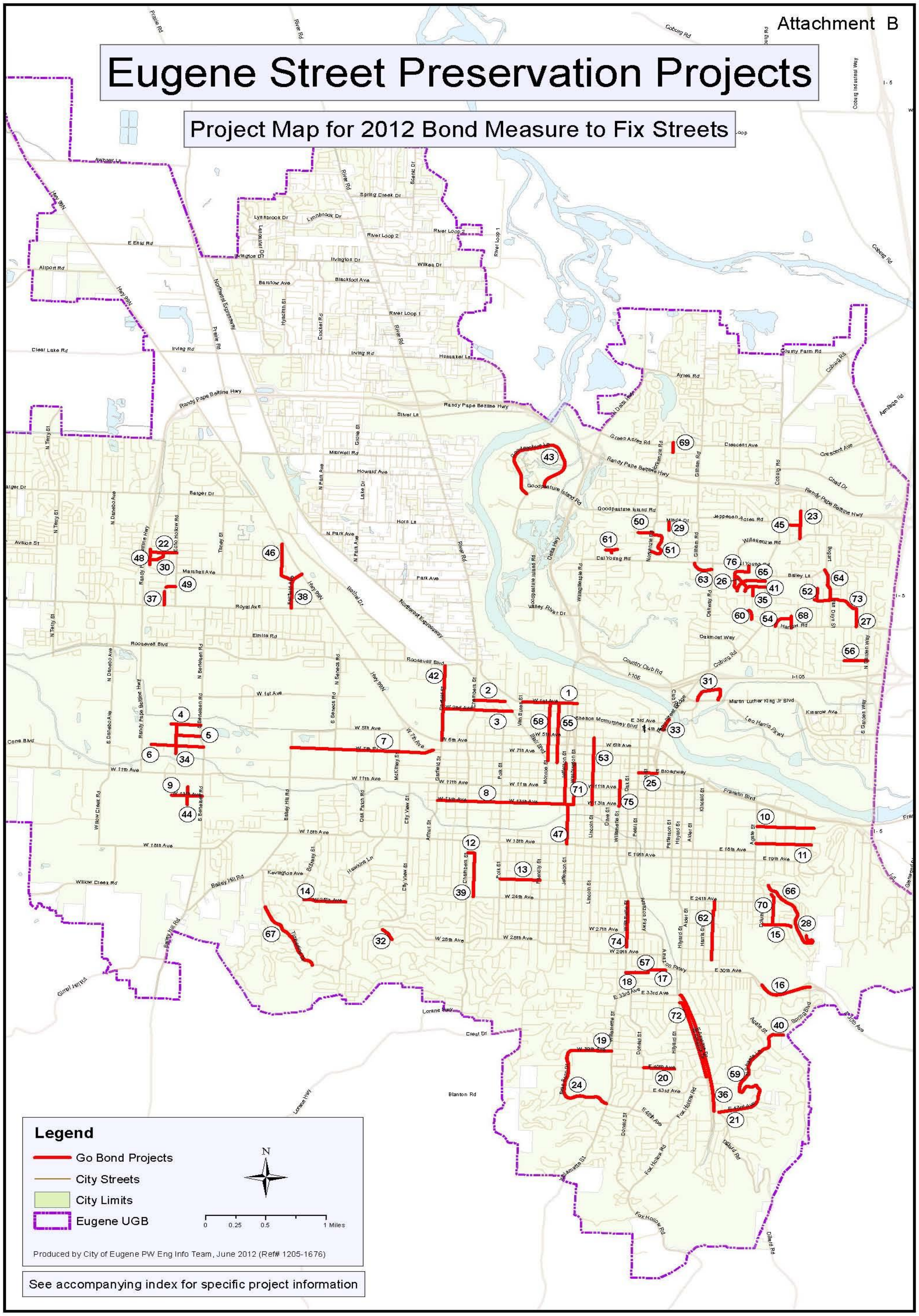


The following map illustrates Pavement Preservation Projects since inception of the program 2002 - 2016.



The following map illustrates the Enhanced Street Repair Program 2008-2016.





Attachment B
Eugene Street Preservation Projects
Project Map for 2012 Bond Measure to Fix Streets
Legend
Go Bond Projects
City Streets
City Limits
Eugene UGB
N
0 0.25 0.5 1 Miles
Produced by City of Eugene PW Eng Info Team, June 2012 (Ref# 1205-1676)
See accompanying index for specific project information

Exhibit A

Project List for 2012 Bond Measure to Fix Streets

Map #	Street Name	Limits
1	01ST AVE	WASHINGTON ST - VAN BUREN ST
2	01ST AVE	BLAIR BLVD - WEST END
3	02ND AVE	BLAIR BLVD - GARFIELD ST
4	05TH AVE	BERTELSEN RD - WEST END
5	06TH AVE	BERTELSEN RD - COMMERCIAL ST
6	07TH AVE	BERTELSEN RD - OSCAR ST
7	07TH PL	7TH AVE/HWY 99 - BAILEY HILL RD
8	13TH AVE	WASHINGTON ST - GARFIELD ST
9	13TH AVE	BERTELSEN RD - COMMERCE ST
10	15TH AVE	FAIRMOUNT BLVD - AGATE ST
11	17TH AVE	FAIRMOUNT BLVD - AGATE ST
12	19TH AVE	FILLMORE ST - CHAMBERS ST
13	22ND AVE	FRIENDLY ST - POLK ST
14	25TH AVE	HAWKINS LN - BRITTANY ST
15	27TH AVE	COLUMBIA ST - SPRING BLVD
16	30TH AVE	SPRING OVERPASS - AGATE ST
17	30TH AVE	MILL ST (WEST) - FERRY ST (EAST)
18	30TH AVE	MILL ST - WILLAMETTE ST
19	39TH AVE	WILLAMETTE ST - 100' EAST OF DENSMORE RD
20	40TH AVE	HILYARD ST - DONALD ST
21	43RD AVE	N SHASTA - DILLARD RD
22	AVALON ST	ECHO HOLLOW RD - JUHL ST
23	BEST LN	WILLAKENZIE RD - KENTWOOD DR
24	BRAE BURN DR	39TH AVE - WILLAMETTE ST
25	BROADWAY	MILL ST - PEARL ST
26	BUFF WAY	WOODSIDE DR - FORRESTER WAY
27	CALVIN ST	WESTERN DR - HARLOW RD
28	CAPITAL DR	SPRING BLVD - 50' N OF CRESTA DE RUTA ST
29	CARMEL AVE	MINDA DR - 400' SOUTH OF MINDA DR
30	CASCADE DR	AVALON ST - JUHL ST
31	CENTENNIAL LP	MLK, JR BLVD (EAST) - MLK, JR BLVD/CLUB RD
32	CITY VIEW ST	28TH AVE - 29TH AVE
33	COBURG RD	SS FERRY ST BRIDGE - 50' S OF EWEB ON/OFF RAMP
34	COMMERCIAL ST	5TH AVE - SOUTH END
35	CORYDON ST	FORRESTER WAY - TANDY TURN
36	EAST AMAZON DR	HILYARD ST - DILLARD RD
37	ELIZABETH ST	KNOOP AVE - ROYAL AVE
38	FAIRFIELD AVE	WS HWY 99 - ROYAL AVE
39	FILLMORE ST	19TH AVE - 24TH AVE
40	FIRLAND BLVD	SPRING BLVD - AGATE ST
41	FORRESTER WAY	COBURG RD - WS DRWY 1033
42	GARFIELD ST	ROOSEVELT - 6TH AVE
43	GOODPASTURE LOOP	GOODPASTURE IS RD (EAST INTERSECTION) - GOODPASTURE IS RD (WEST INTERSECTION)
44	INTERIOR ST	NORTH END OF CUL DE SAC - SOUTH END OF IMPROVED SECTION

Exhibit A

Map #	Street Name	Limits
45	IONE AVE	BEST LN - ADKINS ST
46	JACOBS DR	HWY 99N - FAIRFIELD AVE
47	JEFFERSON ST	8TH AVE - 18TH AVE
48	JUHL ST	NS ADDR 1424 - SOUTH END
49	KNOOP AVE	ECHO HOLLOW RD - ELIZABETH ST
50	LARKSPUR AVE	NORKENZIE RD - 640 FEET WEST OF NORKENZIE RD
51	LARKSPUR LOOP	NORKENZIE RD (N) - NORKENZIE RD (S)
52	LEIGH ST	NORTH END - WESTERN DR
53	LINCOLN ST	5TH AVE - 13TH AVE
54	LYDICK WAY	TOMAHAWK LN - HARLOW RD
55	MADISON ST	1ST AVE - 8TH AVE
56	MAHLON AVE	GARDEN WAY - HONEYSUCKLE LN
57	MILL ST	30TH AVE (NORTH) - 30TH AVE (SOUTH)
58	MONROE ST	1ST AVE - BLAIR BLVD
59	NORTH SHASTA LOOP	FIRLAND - 43RD AVE
60	PIONEER CT	PIONEER PIKE - NORTH END
61	PIPER LN	CHASA ST - FIR ACRES DR (INCL CUL-DE-SAC)
62	POTTER ST	24TH AVE - 29TH AVE
63	ROLAND WAY	OAKWAY RD - CAL YOUNG RD
64	SATRE ST	BAILEY LN - WESTERN DR
65	SHARON WAY	COBURG RD - ES DRWY 1023
66	SPRING BLVD	FAIRMOUNT BLVD - CAPITAL DR
67	TIMBERLINE DR	WARREN ST - WINTERCREEK DR
68	TOMAHAWK LN	HARLOW RD - 580' NORTH OF HARLOW RD
69	TULIP ST	CRESCENT AVE - HOLLY AVE
70	VAN NESS ST	23RD AVE - 27TH AVE
71	WASHINGTON ST	8TH AVE - 13TH AVE
72	WEST AMAZON DR	ES HILYARD - SS FOX HOLLOW
73	WESTERN DR	CALVIN ST - WEST END/MONROE MIDDLE SCHOOL
74	WILLAMETTE ST	24TH AVE - 29TH AVE
75	WILLAMETTE ST	10TH AVE - 13TH AVE
76	WOODSIDE DR	CAL YOUNG RD - SHARON WAY