City of Medford

Public Works Department

2011 Pavement Management Report

Executive Summary

The annual Pavement Management Report is produced to provide updated information and data regarding the City of Medford's street transportation system. This report provides detailed information on street pavement conditions, reviews current programs and costs, and projects future needs.

The street transportation system is conservatively estimated to represent a $250 million public asset. This asset can be described in both lane miles and centerline miles. Public Works manages 681 lane miles of improved streets, representing 270 centerline miles. This report includes a breakdown of the street transportation system in terms of pavement type and functional classification. Comparative statistical data includes both lane and centerline miles.

Street condition data is collected by a consulting firm using a mobile laser road surface testing vehicle on arterials and collectors every two years and on residential streets every four years. This data collection cycle was selected due to the relatively long life cycle of pavements and the relatively high cost of collecting the data. An Overall Condition Index (OCI) score generated through the condition survey provides the data utilized in analysis. The analysis helps in establishing efficient maintenance methods and identifies financial implications of various strategies. Additional benefits of the Pavement Management System (PMS) include a street inventory and condition trends as additional condition survey data is collected.

In April of 2008 the Public Works Department developed and published a new pavement management strategy. The new pavement management strategy is based on Financial Consequence-based Pavement Management. The new strategy focuses on ***keeping the good streets in good condition*** rather than the historical approach of ***fixing the worst streets first***. Pavements are treated as assets and maintenance decisions will be based on the financial impacts of those decisions in order to insure the lowest life cycle cost of the asset.

Implementation of the strategy required additional resources in the FY 10/11 Biennium dedicated to pavement preservation. It was estimated that an additional $750,000 per year beginning in FY10 is required to maintain the pavement network at its current condition.

The City Council approved a Street Utility Fee rate increase which took effect on March 1, 2010. This rate increase and increases in the state gas tax revenue resulted in the addition of $500,000 to the pavement preservation program budget in FY11.

At the time the strategy was developed, the work plan for the FY 08/09 biennium had been established and initiated. Therefore the first opportunity to begin implementation of the strategy was the FY 10/11biennium.

Public Works began the initial steps of implementation of the new pavement management strategy in early 2009. The following items have been accomplished:

- Gain the support of upper management – City Manager and City Council are fully aware, and are in support of, the program.

- Development of the PMS and creation of a pavement inventory.

- Completion of the initial pavement condition survey.

- Council approval of a portion of the requested rate increase.

- Completed Fog Seal treatment on 66 street sections by contract. Fog Seal treatments have not been used prior to 2010 but provide significant benefit at low cost. This work will be done by City forces in the future.

- Developed specifications for Scrub Cape Seal to be constructed summer of 2011. This surface treatment has not been used before but is a viable alternative to asphalt overlay at approximately 50% of the cost.

Scope

This report describes the street system under City jurisdiction. It includes definitions of pavement types and street functional classifications. The new Pavement Management System (PMS) used by the City is discussed. Components of the PMS, such as pavement inspection frequency, pavement conditions that are described in the Overall Condition Index (OCI) and analysis of the data produced by the PMS are addressed. Outlined are the typical types of preservation treatments, the current unit costs for each treatment and the OCI trigger points for each type of treatment, and the process of developing network priority ranking.

Several funding scenarios are explored through the analysis models in the PMS. Current funding levels, funding to maintain the average network OCI at current levels, no funding, current funding plus or minus 50%, and others were examined. These analyses provide information regarding condition trends and rehabilitation needs. The analysis reveals if the street system remains at the present level of serviceability or is declining at current funding levels.

Network Condition & Pavement Management System

Network Condition

"Network Condition" provides a synopsis of pavement conditions by street classification.

CarteGraph Pavement View software is the database used for the Pavement Management System (PMS). The street segment inventory and initial pavement condition survey were completed in 2010. The field condition surveys were conducted using a mobile laser road surface testing vehicle.

The contract with Infrastructure Management Services (IMS) allows the City to have them perform pavement condition surveys on arterials and collectors every two years and on residential streets every four years through 2020. This will provide repeatable comparative data over time.

Road surface testing vehicle performing pavement condition assessment on West Jackson Street near Jackson Elementary School. October 2010.

Table 1 categorizes Medford's street system in centerline miles and 14-foot wide lane miles by pavement type and functional class.

	Asphalt			Concrete			Total	
Functional Class	Centerline Miles	14' Lane Miles		Centerline Miles	14' Lane Miles		Centerline Miles	14' Lane Miles
Arterial	38.42	140.65		0	0		38.42	140.65
Collector	39.03	102.33		0.31	0.83		39.34	103.16
Industrial	8.53	21.72		0.09	0.27		8.62	21.99
Residential	182.06	412.15		1.43	3.26		183.49	415.41
Total	**268.04**	**676.85**		**1.83**	**4.36**		**269.87**	**681.21**

Table 1 *Table does not include streets that are unimproved.

Each pavement segment is given an Overall Condition Index (OCI) on a 0 to 100 scale based on the condition data collected in the field. These ratings are critical to determining the optimum time to perform maintenance on any given segment and in determining what type of maintenance is appropriate for a segment. In addition, average OCI ratings can be developed and reviewed over time to determine if the condition of the entire network is improving, remaining status quo, or declining. **The average OCI rating for Medford's pavement network is 74.**

A comparison of agencies with similar sized street networks is shown below:

*Santa Clara, CA	82
*Concord, CA	78
Medford, OR	**74**
Eugene, OR	72
Bend, OR	70
*San Mateo County, CA	67
*Vallejo, CA	54

* 2007 data. Each analysis varies slightly (some agencies place higher weighting on ride and a lower weighting on surface distress, etc)

2010 Average OCI Ratings by Functional Class

For the purposes of the PMS, the Medford street network is broken down into four functional classes: arterial, collector, industrial and residential. Each of these classes has distinct performance characteristics that generate different types of maintenance treatments. The Key Performance Measures reported in the 12/13 Budget document are shown below:

Functional Class	OCI
Arterial	70.8
Collector	74.2
Residential	75.8

Good-Fair-Poor Distribution Charts

The chart below describes in general terms the condition of pavements. This basic chart provides a snapshot of the condition of the City of Medford street network as of October 2010.

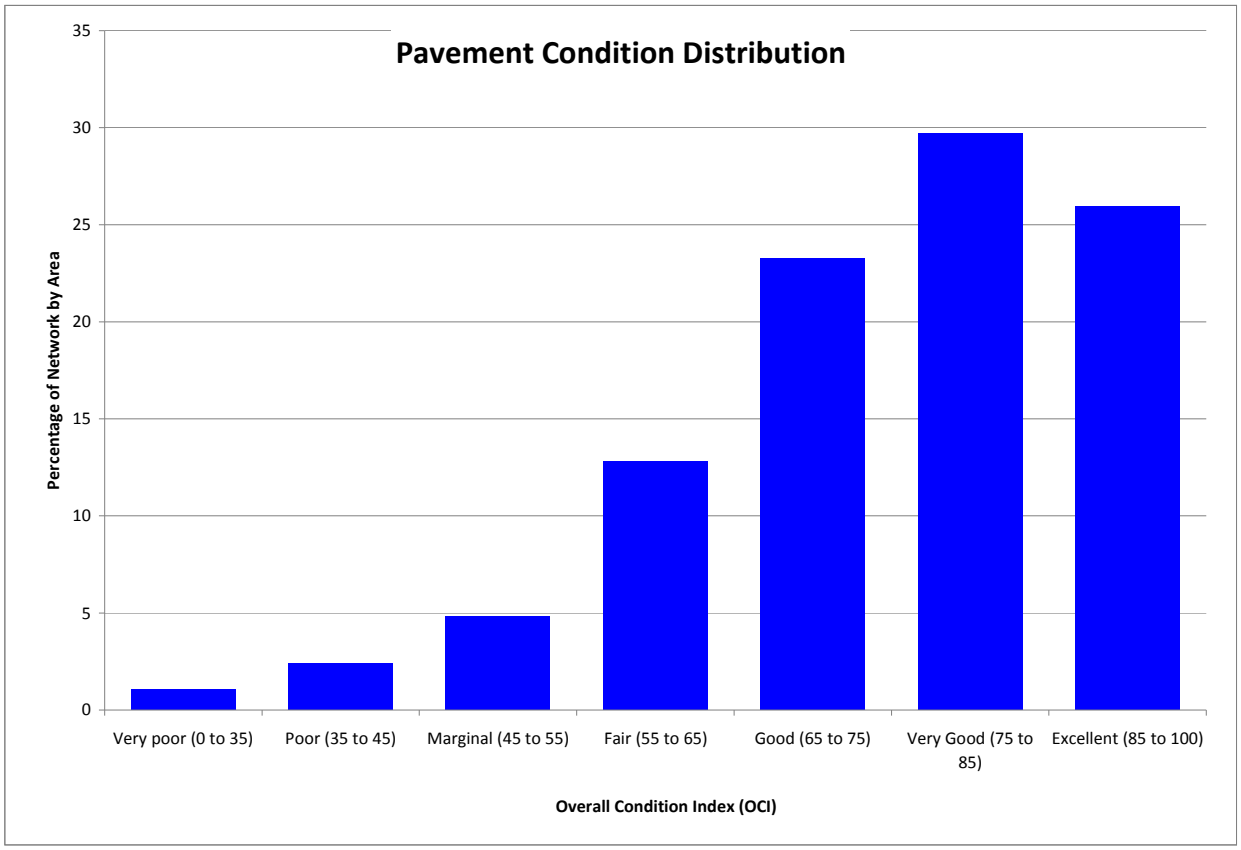

Chart 1

As shown in Chart 1 the majority of the street network is Good to Excellent (OCI 65 – 100). Approximately 79% of the entire network falls into these categories. As time passes the tall bars to the right of the chart move to the left and the farther left they go the more costly the required maintenance activity becomes.

Analysis models indicate that if no street maintenance is performed over the next five years the average network OCI will drop from 74 to 64. At that point the estimated cost to return the network to an OCI of 74 is estimated to be $2.25M more than the cost would be to maintain the OCI at 74 over the same five years.

Under the **"Fix the Worst Streets First"** strategy most maintenance dollars are spent on streets in the Poor and Marginal categories where the unit costs for required maintenance are the highest and as a result, a relatively small number of streets are maintained. Applying effort to the streets in the Good to Excellent categories, where the unit costs for required maintenance are lower, allows a much larger number of streets to be maintained and to **"Keep the Good Streets Good"**; to keep the tall bars to the right of center of the chart for a much longer period of time which results in the lowest life cycle cost.

Chart 2 shows the Good-Fair-Poor distribution with the street system broken down by functional class.

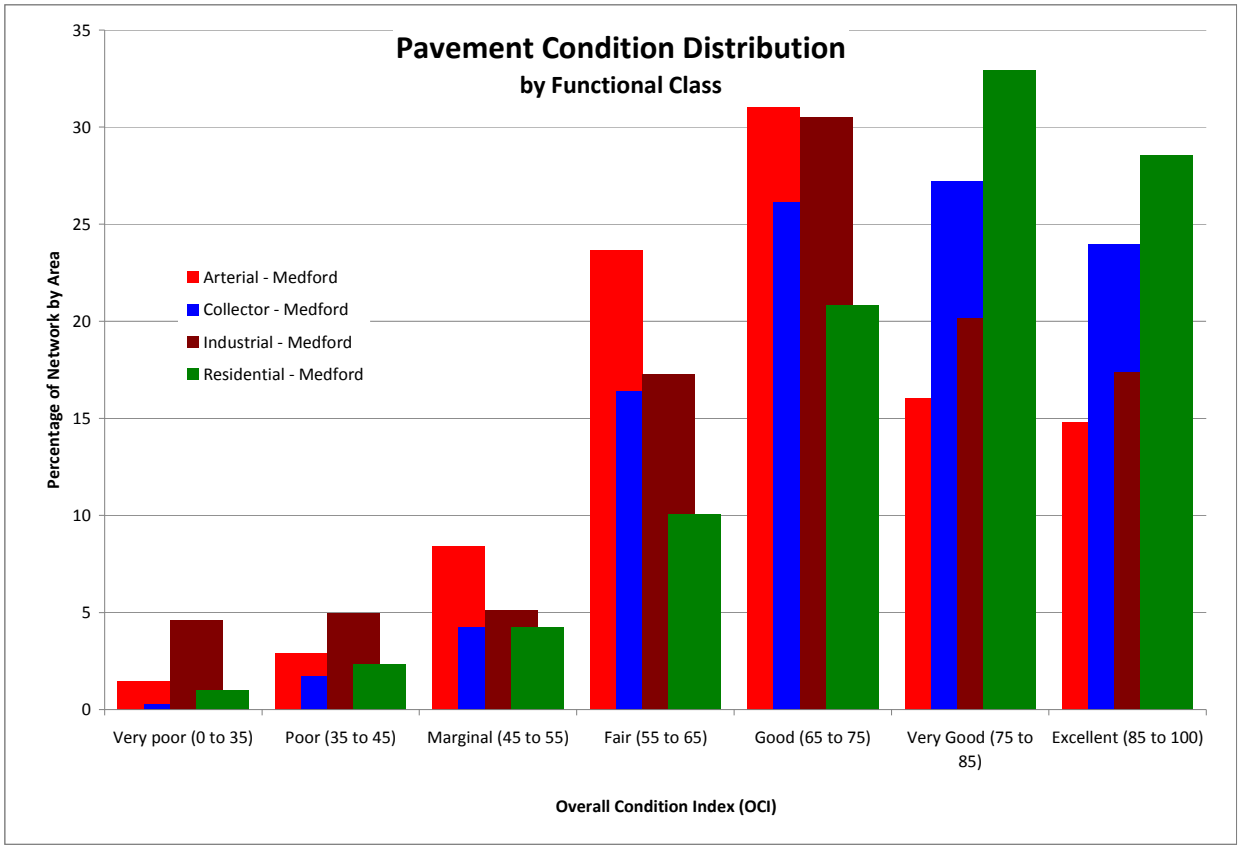

Chart 2

Chart 2 indicates that approximately 82% of the residential streets are in the Good to Excellent range (OCI 65 – 100), while approximately 77% of the collectors and only 63.5% of the arterials fall into that range. This trend indicates that the implementation of the use of Slurry Seals (approximately 10 years ago) on residential streets, combined with an aggressive residential overlay program, has been successful in keeping the residential street system in great shape. However, this trend also indicates that maintenance on arterials and collectors needs to be increased in order to keep them in the Good to Excellent range.

Figure 1 illustrates the strategy of **"Keeping the Good Streets Good"** by applying less expensive maintenance treatments to a larger number of streets that are in the Good to Excellent range thereby extending pavement life.

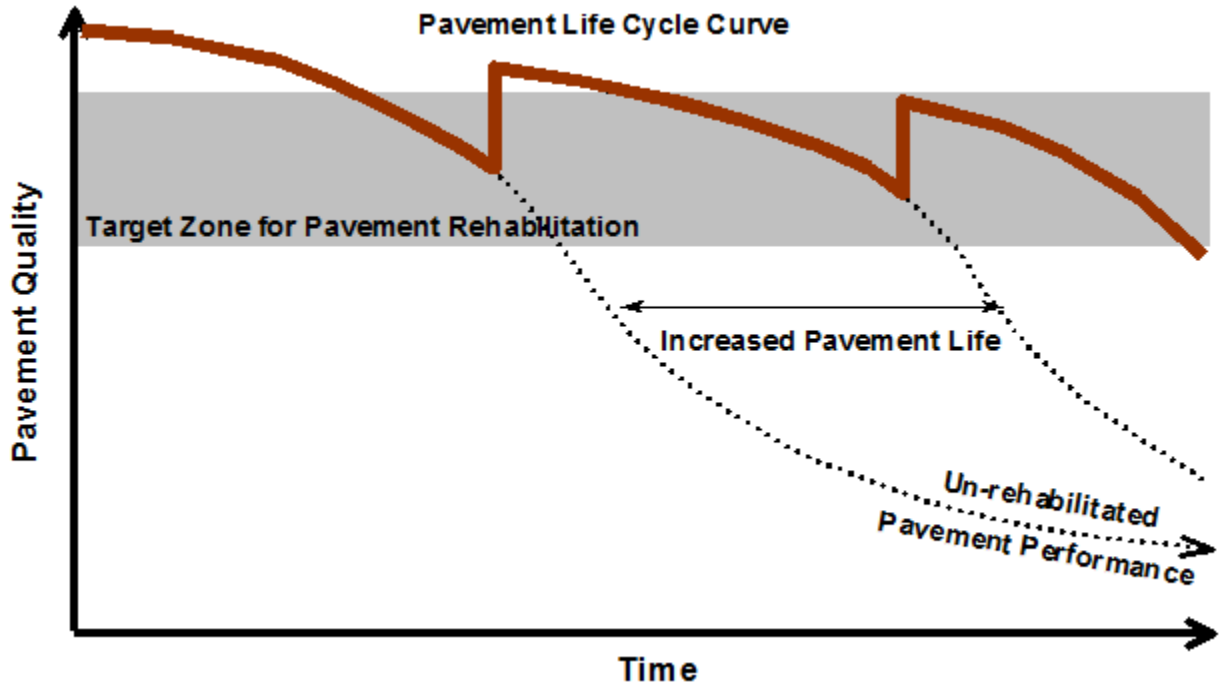

Figure 1

Pavement Management System

One of the key concepts in Financial Consequence-based Pavement Management is prioritizing projects based on the rate of deterioration and the cost escalation of delaying maintenance on any given street. The rate at which a street deteriorates is a result of the original construction, the current condition of the pavement, pavement age, maintenance history, and traffic loading. The PMS contains performance models that take into account these factors and are based on previous experience and pavement performance curves. Performance models have been developed for each functional class: arterial, collector, industrial, and residential.

The PMS includes OCI trigger points at which the various types of maintenance treatments should be applied. The trigger points and associated costs for that maintenance activity are shown below.

Maintenance Activity OCI Trigger Points

Maintenance Activity	OCI Range		Cost per Sq. Yd.
Full Reconstruction	0	25	$50.00
Partial Reconstruction	25	35	$30.00
Moderate Overlay	35	55	$14 - $17
Thin Overlay	45	65	$10 - $14
Surface Treatment	55	80	$1 - $7
No Treatment	80	100	None

While certain OCI values are used as trigger points for corresponding maintenance activities, OCI alone cannot be used for priority ranking. For example, a residential cul-de-sac with an OCI of 70 may not need any maintenance for several years because its rate of deterioration is much slower due to lower traffic volumes. However an arterial street with an OCI of 70 today may have an OCI of 60 two years from now because it is deteriorating more rapidly.

Additionally, a street segment that is about to move across an OCI threshold that will cause a need for a more expensive treatment gets a higher ranking. For example, if a segment has an OCI of 35-40 and can be fixed with a moderate overlay ($17/sy), that segment should be a high priority for maintenance before it falls below the OCI 35 threshold, at which point it would need partial reconstruction ($30/sy).

Each pavement section is given a Network Priority Ranking (NPR) based on a 0 to 100 scale; which essentially becomes the maintenance activity priority list. Several factors are used to make up the NPR including: OCI, Functional Class, type of distresses found (structural or surface defects), traffic volume, and the OCI related to the maintenance activity trigger point thresholds.

The analysis of the models clearly demonstrates that in the short term, focus must shift from residential streets to arterial and collector streets in order to prevent significant financial impacts in the future as these streets continue to deteriorate. However, the residential street maintenance program cannot be neglected because at 415 lane miles it is the largest portion of the network.

Current Pavement Maintenance Program

The end of one fiscal budget and the beginning of the next splits the street maintenance season in half. The FY11 Street Maintenance Plan, shown in Appendix A, draws on funds from both FY11 and FY12. The 12/13 Biennium budget for pavement maintenance is $3.2M which represents an increase of $1M from the original 10/11 budget. However, a budget adjustment added $0.5M to the 10/11 budget so the $3.2M represents a $0.5M increase over the *adjusted* 10/11 budget.

Public Works required IMS to include the streets planned for maintenance in 2011 to be included in the first year of the analysis. The analysis indicates that virtually all available funds should be spent on arterials and collectors in the first five years of the program. However, the residential street maintenance program must be continued to avoid increased costs in the future.

The Fog Seal program started in 2010 is not shown in the 2011 Street Maintenance Plan. It is managed outside of the PMS and is strictly based on pavement age. The goal is to Fog Seal all streets at a pavement age of 5 -6 years. In 2010 the Fog Seal program was completed by a contractor at a cost of approximately $1.20/sy. In the future this work will be performed by City forces and it is estimated that it can be done for less than $0.70/sy.

The 2012 and 2013 Pavement Maintenance Plans have not yet been finalized. All computer-generated work plans are carefully reviewed and edited as necessary to account for local knowledge and conditions.

Future Needs

Several funding scenarios were examined using the models in the PMS. Models were reviewed for current funding levels, funding to maintain the average network OCI at current levels, no funding, current funding plus or minus 50%, and others. One of the key goals of the Pavement Management Strategy (April 2008) is:

- **Set the street maintenance budget to meet the program needs rather than adjusting the program to meet the budget.**

In order to meet this goal it is necessary to adjust the budget and prioritize projects based on maintaining the overall network OCI at its current value of 74; to maintain the City of Medford street network in the same overall condition it is in today.

The Pavement Management Strategy provided a preliminary estimate of $3.6 - $4M per biennium starting in the 10/11 biennium to maintain the street network in its current condition. It also identified the need for rate adjustments in the future to match changing costs. The implementation of a portion of the needed rate increase and increased gas tax funds, increased the 10/11 pavement maintenance budget to $2.75M. This amount is $0.85M - $1.25M less than the maintenance funding needed to keep street pavements at their current condition into the future.

The PMS analysis based on maintaining the network OCI at 74 indicates a budget need in the 12/13 biennium of $4.25M and $4.4M in the 14/15 biennium.

Using the funds available, the 12/13 street maintenance budget is $3.2M. This is $1.05M less than the budget needed to maintain the street network in its current condition as indicated by the PMS analysis. ***An additional $1.05M in additional street maintenance funding is needed in the 12/13 biennium and an additional $0.15M in the 14/15 biennium in order to prevent deterioration of the overall condition of the street system.***

Chart 1 indicates that 3% of the street network is in Very Poor (OCI < 35) condition. Streets in this category need major reconstruction. This current backlog is listed in detail in Appendix B. **The goal is to not only maintain the network OCI at 74 but to also maintain the backlog at or below the current level of 3%.**

Public Works does not have the resources to address the backlog of streets needing reconstruction. The estimated construction cost for full reconstruction of the current backlog is $2.5M - $3.5M, excluding design and project administration costs.

Appendix A

2011 Street Maintenance Plan

Street	From	To	Functional Class	Maintenance Activity
Acacia	Pomona	Sparta	Residential	Thin Overlay
Alley A - 29	E. of Summit, N. of Main			Pave
Alley C-31	N. of E. Main, E. of Front			Thin Overlay
Alley F - 14	E. of McAndrews St., N. of Queen Anne			Pave
Alley F - 2	E. of Genessee, S. of Sherman			Thin Overlay
Alley F - 3	E. of Geneva, N. of Minnesota			Pave
Alley G - 3	N. of E. 9th St, E. of Tripp			Pave
Alley G - 4	E. of Tripp St, N. of E. 9th St			Pave
Amber Cir.	Siskiyou	cul-de-sac	Residential	Thin Overlay
Arrowhead	Coker Butte	S. End	Residential	Slurry Seal
Asher	Brookside	cul-de-sac	Residential	Slurry Seal
Bailey	Delta Waters	Leonard	Residential	Slurry Seal
Bentley	Stonebrook	cul-de-sac	Residential	Slurry Seal
Biddle Rd	E. Jackson	400' N. of Morrow	Arterial	Scrub Cape Seal
Brookside	Springbrook	Roberts	Residential	Slurry Seal
Brookside	Roberts	Stonebrook	Residential	Slurry Seal
Cardinal	Lear	Hwy 62	Collector	Thin Overlay
Carmel Cir.	Wabash	cul-de-sac	Residential	Slurry Seal
Center Dr.	Stewart	1450' S. of Stewart	Arterial	Moderate Overlay
Cheltenham	Delta Waters	Shasta	Residential	Thin Overlay
College way	Wabash	N. Keene Way	Residential	Thin Overlay
Cottage	E. Main	E. 10th St	Collector	Moderate Overlay
Coventry	Perri	Cul-de-sac	Residential	Slurry Seal
Covina	Crater Lake Ave	Grand	Residential	Slurry Seal
Crater Lake Ave	S. of Covina	N. of Roberts East	Arterial	Scrub Cape Seal
Dakota	S. Columbus	Plum	Collector	Thin Overlay
Delta Waters	Springbrook East	Bailey	Collector	Scrub Cape Seal
Dover Ridge	Hollyhock	Skyhawk	Residential	Slurry Seal
E 10th St.	S. Central	S. Riverside	Collector	Scrub Cape Seal
Eastwood	Eastwood	cul-de-sac	Residential	Thin Overlay
Elm	Hwy 99	cul-de-sac	Residential	Thin Overlay
Flower	Wabash	N. Keene Way	Residential	Slurry Seal
Fordham	Wabash	cul-de-sac	Residential	Slurry Seal
Grand	Crater Lake Ave	Corona	Residential	Slurry Seal
Grand	Corona	W. End	Residential	Thin Overlay
Hartell	Hondeleau	Arrowhead	Residential	Slurry Seal
Highland Dr.	Greenwood	200' S. of Siskyou	Collector	Thin Overlay

Highland Dr.	100' N. of Syskiyou	E. Main	Collector	Moderate Overlay
Hill Way	Wabash	N. Keene Way	Residential	Thin Overlay
Hillcrest	E. McAndrews Rd.	Monterey	Collector	Moderate Overlay
Hollyhock	Crater Lake Ave	Springbrook	Residential	Slurry Seal
Hondeleau	Dover Ridge	Springbrook	Residential	Slurry Seal
Husker Butte	Mallard	Springbrook	Residential	Slurry Seal
Lara Cir.	Perri	cul-de-sac	Residential	Slurry Seal
Laurel	W. 13th	W. 11th	Residential	Thin Overlay
Lear Way	Delta Waters	Cardinal	Collector	Thin Overlay
Mallard	Husker Butte	Hondeleau	Residential	Slurry Seal
Maple	Central	Niantic	Residential	Moderate Overlay
Mary St	E. Jackson	Saling	Residential	Slurry Seal
Mary St	Saling	Stevens	Residential	Slurry Seal
Minnesota	Crater Lake Ave	Geneva	Residential	Thin Overlay
Mountain Glen	Perri	cul-de-sac	Residential	Slurry Seal
N. Columbus	W. McAndrews	W. Main	Arterial	Scrub Cape Seal
N. Grape	W. 6th	W. 4th	Residential	Thin Overlay
Oakwood	Richmond	Groveland	Residential	Slurry Seal
Oakwood	Windsor	200' W. of Richmond	Residential	Thin Overlay
Obispo	Grandview	Suzanna	Residential	Slurry Seal
Paloma	120' N. of Patrick	120' N. of Orinda	Residential	Thin Overlay
Perri	Obispo	N. Keene Way	Residential	Slurry Seal
Perri	N. Keene Way	Temple	Residential	Slurry Seal
Plum	Stewart	Winchester	Residential	Thin Overlay
Pomona	Tahitian	Acacia	Residential	Thin Overlay
Poplar Dr.	E. McAndrews Rd.	Morrow Rd.	Collector	Moderate Overlay
Powell	Perri	Temple	Residential	Slurry Seal
Richmond	Oakwood	E. Main	Residential	Slurry Seal
Robin Way	Arrowhead	E. End	Residential	Slurry Seal
Ruhl Way	Valley View	N. Modoc	Residential	Thin Overlay
S. Central	E. 10th St	Bank	Arterial	Scrub Cape Seal
S. Grape	W. 8th St	W. 10th St	Residential	Slurry Seal
Shannesy	Stonebrook	Asher	Residential	Slurry Seal
Sheffield	Perri	cul-de-sac	Residential	Slurry Seal
Skyhawk	Dover Ridge	Viewcrest	Residential	Slurry Seal
Sparta	Tahitian	Acacia	Residential	Thin Overlay
Springbrook	Hondeleau	100' N. of Hollyhock	Collector	Slurry Seal
Springbrook	200' N. of Windermere	100' S. of Blackthorn	Collector	Thin Overlay
Stevens	Biddle Rd	Crater Lake Ave	Arterial	Scrub Cape Seal
Stewart	W. of RXR	Holly St.	Arterial	Scrub Cape Seal
Stillwater	Perri	cul-de-sac	Residential	Slurry Seal
Stockel	Powell	cul-de-sac	Residential	Slurry Seal
Superior Ct.	Biddle	Cardley	Residential	Slurry Seal
Suzanna	Crater Lake Ave	Obispo	Residential	Slurry Seal

Tabby Ln.	Woodrow	cul-de-sac	Residential	Slurry Seal
Temple	Crater Lake Ave	170' E. of Powell	Residential	Slurry Seal
Temple	Powell	N. Keene Way	Residential	Moderate Overlay
Temple	Roberts	N. Keene Way	Residential	Thin Overlay
Tripp	E. Main	E. 10th St	Residential	Moderate Overlay
Viewcrest	Hollyhock	Hondeleau	Residential	Slurry Seal
W. 12th St.	S. Holly	S. Grape	Residential	Thin Overlay
W. 13th St	King	Park	Residential	Thin Overlay
W. 2nd St.	Summit	Oak	Residential	Moderate Overlay
W. 8th St	Jeanette	Lewis	Residential	Thin Overlay
Westport	Perri	cul-de-sac	Residential	Slurry Seal
Woodrow	Crater Lake Ave	Wabash	Residential	Thin Overlay
Young	Powell	cul-de-sac	Residential	Slurry Seal

Appendix B

This list is directly from the PMS and has not been reviewed in the field by PW staff

OCI	Street	From	To
34.55	W 2ND ST	ROSE AV	OAK ST
23.27	KING ST	DAKOTA AV	W 14TH ST
30.85	KING ST	W 14TH ST	W 13TH ST
32.63	N HOLLY ST	W 4TH ST	W 5TH ST
34.99	N FIR ST	W 6TH ST	W MAIN ST
26.5	S FIR ST	W 8TH ST	W MAIN ST
16.17	S FRONT ST	E 8TH ST	E MAIN ST
17.26	N FRONT ST	E 4TH ST	E 5TH ST
27.96	APPLE ST	E 4TH ST	E 5TH ST
33.58	MINNESOTA AV	CRATER LAKE AV	GENEVA ST
32.22	JOY CR	cul-de-Sac	JOY ST
30.41	CREEKSIDE CR	cul-de-Sac	STATE ST
25.96	N BERKELEY WY	E MCANDREWS RD	COLLEGE WY
31.4	MAPLE ST	N BARTLETT ST	NIANTIC ST
34.85	SANDPIPER DR	PEEBLER WY	DOVE LN
34.15	PEEBLER WY	DOVE LN	SANDPIPER DR
34.74	EATON DR	HAWAIIAN AV	SNOWCREST DR
33.16	COLLEGE WY	N KEENE WAY DR	WABASH AV
33.53	CLOUDCREST DR	CHERRY LN	MISSION HILLS DR
33.45	HILLCREST RD	MARIPOSA TR	STANFORD AV
32.18	E MAIN ST	GENESSEE ST	TRIPP ST
32.76	TRIPP ST	E 8TH ST	E MAIN ST
29.66	WOODLAWN DR	S MODOC AV	WINDSOR AV
28.08	LA LOMA DR	YVONNE RD	KARI CR
31.78	KINGSLEY DR	GRUMMAN DR	W End
31.38	E MAIN ST	CORNING CT	GENEVA ST
31.45	ARROWHEAD DR	ROBIN WY	HOLLYHOCK DR
33.4	MALLARD LN	HONDELEAU LN	PEARL EYE LN
31.43	INDUSTRY DR	S End	ENTERPRISE DR
31.26	ENTERPRISE DR	W End	INDUSTRY DR
29.83	ENTERPRISE DR	E End	INDUSTRY DR
23.42	FLORENCE AV	MT ECHO DR	MEDFORD HEIGHTS LN
27.47	KING ST	W 13TH ST	W 13TH ST
30.02	E JACKSON ST	N BARTLETT ST	N BARTLETT ST
34.26	WOLF RUN DR	EAGLE TRACE DR	HIGHCREST DR