City of Medford
Public Works Department
Pavement Management Strategy

Developed by the City of Medford Public Works Operations Division
April 2008

Executive Summary

The existing street infrastructure maintained by the City of Medford, valued in excess of 250 million dollars, not including the cost of right-of-way, is the most valuable asset the City owns. Therefore, maintaining our most valuable asset in a cost-effective way is and should be a very high priority for the Public Works Department.

The objective of this report is to discuss the existing process that the City uses to prioritize projects, identify its deficiencies, and provide recommendations on how to improve the process in order to make the system more efficient and cost-effective. The following recommendations will allow the Public Works Department to optimize its available resources and protect our citizens' investment in the most cost-effective way.

- Approximately 10-12 percent of the entire street system requires pavement preservation such as fog, slurry, micro, or scrub seals annually. The annual budget needed for this activity is approximately $1.8M - $2M per year in the 2010-11 biennium and will require increases in future years to keep pace with increasing construction costs.
- Approximately 20 lane-miles of roadway require major rehabilitation such as mill and fill 2" or greater or complete reconstruction. The funding needed for this activity is approximately $6-$7M. We are currently reconstructing approximately 2 lane-miles per year which will address the 20 lane-mile backlog in 10 years **providing** funds are directed to the appropriate streets.
- Set the street maintenance budget to meet the program needs rather than adjusting the program to meet the budget.
- Implement a Pavement Management System and inventory the City street system by January 1, 2009.
- Increase the minimum design standards to require a minimum of 4" of asphalt pavement in order to extend the life of the pavement and minimize premature pavement failure.
- Develop an implementation plan.
- Monitor pavement performance of the plan by conducting the initial pavement condition survey by July 1, 2009 and conducting biannual surveys thereafter for arterials and collectors only.
- Additional funding is required to implement this strategy. An estimated 15% increase in the street utility fee would be required to fund the pavement preservation portion of the strategy in the 2010-11 biennium. Additional adjustments will be required based on future construction costs. **The initial fee increase would be approximately $0.57/mo for a single family residence.**

Implementation of these specific goals will help us to achieve our ultimate goal of having the best city street system in Oregon.

Introduction

The City of Medford street system infrastructure is a $250M asset which should be maintained in the most cost-effective manner. The street system is the largest single asset the City of Medford owns; more than ten times the value of all City owned buildings.

The Public Works Operations Division is responsible for maintaining the City's street system. A significant part of our mission is to maintain pavements to the optimum level with the funding that is available. **All streets deteriorate** over time. Medford's street infrastructure is currently deteriorating faster than it is being maintained.

A pro-active pavement management approach will require the system be maintained at an optimum point rather than at the point of failure. This means that the system should receive minor surface treatments such as a fog seal or slurry seal every 5 to 7 years rather than a 2" overlay every 10 to 15 years or complete reconstruction every 20 to 25 years. The average cost of slurry seal is about $1 per square yard, while the cost of 2" overlay or reconstruction averages $11 and $36 per square yard respectively. Timely intervention with appropriate maintenance will result in the lowest life-cycle costs.

There are approximately 587 lane-miles of street in the City street system and currently only approximately 3 percent of the system is maintained each year with the budget available. Unfortunately, this strategy has been in place for a number of years, and as a result, a significant backlog of deferred maintenance has accumulated.

The proposed new strategy that is outlined in this document will provide a significant change in philosophy and will detail not only how the 10 percent per year goal can be met, but also how the backlog will be addressed.

Definitions

For clarity, the following definitions will aid in the understanding of this strategy. While there is some disagreement within the pavement management community as to what construction methods fall under which definitions, the descriptions below apply to the City of Medford.

Lane-mile is one lane of street, one mile long, regardless of lane width. A standard residential street, one mile long, is two lane-miles; two lanes, each one mile long. For cost estimating purposes in this report, a lane-mile is defined as 8,213 square yards (14'wide x 1 mile long).

Reconstruction is a process by which a street is completely rebuilt. The existing asphalt pavement and base is removed and replaced with new asphalt and base. South Peach Street and the Jackson Street Improvement projects are examples of street reconstruction. This work is typically contracted out through the Engineering Division. Costs for reconstruction in 2006/2007 averaged in excess of $295,000 per lane-mile.

Rehabilitation is a process by which the existing pavement remains in place. Isolated areas of failure are reconstructed and an asphalt overlay is placed over the existing pavement. The 8th Street and Main Street projects are examples of recent pavement rehabilitation. This work is typically either contracted out through the Operations Division or performed by Operations Division personnel. Costs for contracted work in 2006/2007 averaged $135,000 per lane-mile and costs for work performed by City forces averaged $45,000 per lane-mile.

Preservation is a process by which some type of sealer or surface treatment, other than an asphalt overlay, is placed over the existing pavement. Currently Public Works uses a process called slurry seal. Slurry seal work is typically contracted out through the Operations Division. Costs for this work vary from approximately $4,000 to $40,000 per lane-mile, depending on the type of treatment.

The Current Strategy

The current strategy addresses the worst pavement first. As a result the City addresses 20 to 30 percent of needed maintenance on an annual basis. The philosophy underlying the current strategy is **to evaluate the condition of pavements, rank them in order based on their condition, and then rehabilitate as many as the budget will allow by working on the streets that are in the worst condition first**. The practice of "worst first" (continually addressing only those roads in the poorest condition) is a failing strategy because reconstruction and rehabilitation are the most expensive ways to restore serviceability.

If we continue to only address 30% of the system eventually we will need to rebuild the remaining 70%. In 2007 dollars the cost of reconstructing 70% of the street system would be approximately $121,000,000.

In addition to the rehabilitation work, a comparatively small amount of pavement preservation utilizing slurry seal surface treatments is performed each year.

The Operations Division currently has an annual budget of $1,115,000 for pavement maintenance. These funds are broken down by activity as shown in Table 1 below.

Budget Item	Amount budgeted	Lane-Miles Budgeted per Year	Estimated Life	Budget per Lane-Mile	Budget per lane-mile per year
Asphalt Overlays – Contracted	$625,000	5.1	15	$123,000	$8,000
Asphalt Overlays – City Forces	$400,000	7.6	15	$53,000	$3,600
Slurry Seal - Contracted	$90,000	6.13	5	$15,000	$2,900
Total	**$1,115,000**	**18.83 Lane-Miles**			

Table 1

There are three main conclusions that can be drawn from the above table:

1. The annual budget for contract and City forces overlay is 7 times and 4.5 times higher than the budget for slurry seal respectively.
2. Currently only 21 lane-miles per year are being addressed, 19 lane-miles in the maintenance program and 2 lane-miles of reconstruction, while the rate of deterioration is 3 to 5 times higher than what is being maintained. In order to maintain the system in the most cost-effective way a minimum of 58 lane-miles per year (10% of the system) must

be maintained. Therefore, the maintenance backlog is increasing approximately 37 lane-miles per year. Additionally, the system has been growing at a rate of approximately 17 lane-miles per year over the last five years. Although it is anticipated that the growth rate will decrease for the next few years, it is clear that with the current strategy we are falling farther and farther behind.

3. The City is currently spending 92 percent of the maintenance budget on pavement rehabilitation (overlays) and only 8 percent on pavement preservation (slurry seal).

The typical pavement deterioration curve below shows how our reactive (rehabilitation) approach is more expensive than a proactive (preservation) approach.

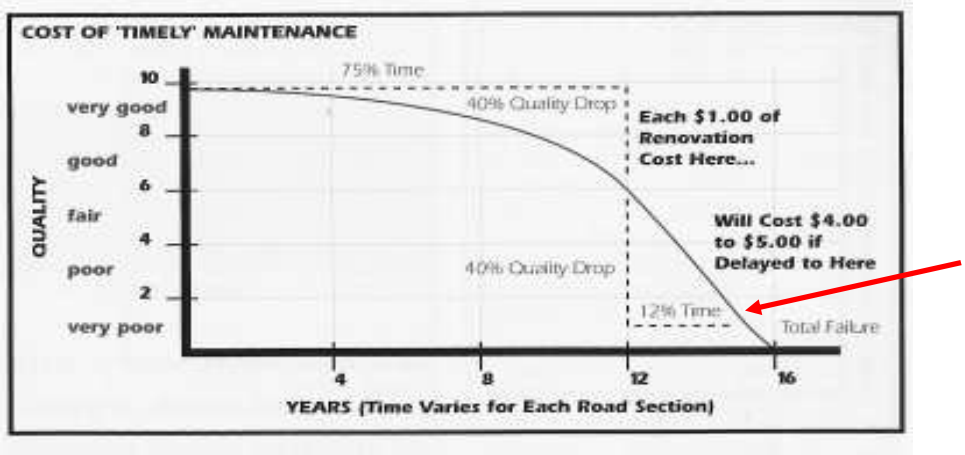

Figure 1

We currently rehabilitate pavements in this area of their life cycle curve.

The Proposed Strategy (Pro-active)

The proposed strategy makes more efficient use of resources and maximizes the return on investment. The proposed pavement management strategy is based on Financial Consequence-based Pavement Management (FCPM) originally developed by the Nevada Department of Transportation (NDOT). Implementation of FCPM allowed NDOT to significantly improve the condition of its entire system in five years and NDOT has some of the best quality roads in the country.

The philosophy is **to select pavement maintenance projects based on the financial consequences of delaying a project rather than based on the condition of the pavement.** This concept will shift the emphasis from rehabilitation of pavements that are in the worst condition (worst first) to preservation of the good pavements, in order to keep them in good condition while systematically dealing with the backlog of poor pavements.

There are seven steps to developing the FCPM strategy.

Step 1
Gain support of upper management.

Step 2
Develop an inventory of the entire street system.

Step 3
Divide the system into three categories based on the amount of traffic each category carries.

Step 4
Establish pavement performance models based on previous experience.

Step 5
Prioritize projects based on rate of deterioration and the cost escalation of delaying the project.

Step 6
Select the most cost effective pavement maintenance treatment for each street section.

Step 7
Monitor pavement performance and make improvements based on long-term pavement performance.

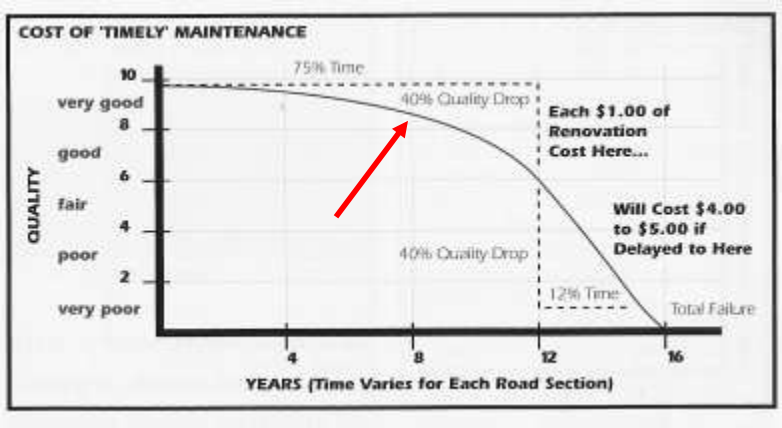

Figure 2 Source: American Public Works Association

With the new pro-active strategy we will preserve pavements while they are still in this area of their life cycle curve, requiring less expensive treatments.

The concept is to maintain the system at the optimum point rather than at the failure point. As a result we can minimize the long-term cost of maintaining the system while improving the pavement condition significantly. We simply need more cost effective maintenance tools in our toolbox, to utilize on pavements.

The Toolbox

As previously stated, the current strategy only utilizes two tools; asphalt overlay and slurry seal. The asphalt overlay is a pavement rehabilitation technique where the slurry seal is a pavement preservation technique. The overlay is applied at a point on the pavement life cycle curve as shown in Figure 1 and the slurry seal is applied at a point on the pavement life cycle curve as shown in Figure 2.

Currently, approximately 92 percent of the available funds are being spent on overlays. It is recommended that we shift the focus from **rehabilitation** to **preservation** and, correspondingly, shift the budget emphasis from overlays to significantly more slurry seals along with some additional and more cost effective tools. The additional pavement treatments that make sense for the City of Medford are:

- Fog and/or rejuvenating seals
- Scrub seal with a slurry seal over it
- Scrub seal with micro surfacing over it
- Scrub cape seal with micro surfacing
- Scrub cape seal with slurry seal

Each of these treatments is more fully described in Appendix A.

The full toolbox is shown in Table 2 below.

Pavement Treatment	**Cost per Lane-Mile**	**Estimated Life**	**Cost per Year**
Asphalt overlays – City forces	$45,000 ($5.50/sy)	15	$3,000
Asphalt overlays – contracted	$135,000 ($16.50/sy)	15	$9,000
Scrub cape seal w/micro	$40,000 (4.90/sy)	12	$3,333
Scrub cape seal w/slurry	$37,000 (4.50/sy)	10	$3,700
Scrub seal w/micro	$33,000 ($4.00/sy)	9	$3,666
Scrub seal w/slurry	$29,000 ($3.50/sy)	8	$3,625
Slurry Seal - residential	$8,500 ($1.03/sy)	5	$1,700
Fog/rejuvenating seal	$4,100 ($0.50/sy)	3	$1,367

Table 2

Remaining Service Life

The concept of remaining service life (RSL) is another method of determining if enough roadways are being maintained. The concept is that if no treatments were done in a given year, each lane-mile of the system will age by one year. With 587 lane-miles of streets in the system, each year the system ages 587 lane-mile-years. Correspondingly, assuming no increase to the size of the system, 587 lane-mile-years of rehabilitation is needed annually to maintain the status quo. Table 3 shows what is scheduled for the current biennium. Table 4 shows an example of how much more can realistically be achieved using the proposed "new tools" with the same amount of funding.

2007-2009 Biennium

Activity	Amount budgeted	Lane-Miles Budgeted per year	Estimated Life	Lane-mile-years	Budget per Lane-Mile
Asphalt Overlays – City Forces	$400,000	7.6	15	112.5	$53,000
Asphalt Overlays – Contracted	$625,000	5.1	15	76.5	$123,000
Slurry Seal - Contracted	$90,000	6.13	5	30.65	$15,000
Total	**$1,115,000**	**18.83**		**189**	

Table 3

Activity	Amount budgeted	Lane-Miles Planned per Year	Estimated Life	Lane-mile-years	Cost per Lane-Mile
Asphalt Overlays – Contracted	$0	0	15	0	$123,000
Asphalt Overlays – City Forces	$225,000	4.25	15	63.75	$53,000
Scrub Cape Seal w/micro	$200,000	5	12	60	$40,000
Scrub Cape Seal w/slurry	$0	0	0	0	$37,000
Scrub Seal w/micro	$198,000	6	9	54.0	$33,000
Scrub Seal w/slurry	$232,000	8	8	64.0	$29,000
Slurry Seal	$200,000	13.33	5	66.67	$15,000
Fog/rejuvenating Seal	$60,000	14.6	3	43.8	$4,100
Total	**$1,115,000**	**51.18**		**352.22**	

Table 4

Implementation Strategy

The current biennial budget has been determined and contracts are already in place for asphalt overlays and slurry seals, with the work to be done in the spring of 2008. Between now and July 1, 2009, Public Works will be working through Steps 1-6 (described above) in order to create a FCPM strategy. Therefore, the long range plan begins with the 2009-2011 biennium. It is estimated that at the end of FY 2009 there will be 610 lane-miles of pavements in the City street system. Beginning with the 2009-2011 budget cycle the goal is to treat a minimum of 10 percent of the street system per year and add a minimum of 610 lane-mile-years to the system.

Since the basic concept is *to select pavement maintenance projects based on the financial consequences of delaying a project rather than based on the condition of the pavement* it is critical to know the **rate of deterioration** of each pavement. The faster the rate of pavement deterioration, the sooner it will reach the lower portion of its life cycle curve, (see Figure 1), resulting in the requirement of more expensive rehabilitation treatments. **These are the financial consequences we are trying to avoid.** The following information is required in order to implement FCPM:

Pavement Service Age

For the purposes of pavement maintenance, the age of a pavement is the number of **years of service since the last treatment** rather than the number of years since the street was originally constructed. An estimated breakdown of the City of Medford street system age is shown in Figure 3 below.

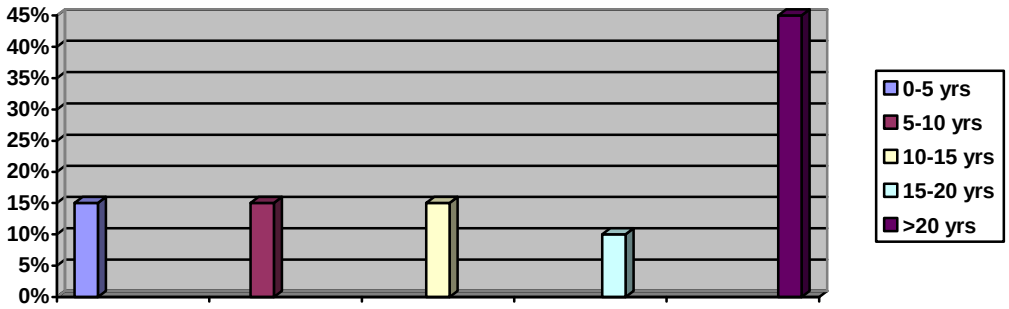

Figure 3

Traffic Loading

The City of Medford Engineering Division routinely performs traffic counts on all streets that are classified as arterials and collectors. Additional counting is also performed on selected residential streets. This data is compiled on a traffic volume map which is updated every two years. The most recent traffic volume map update was 2006. For the purposes of pavement maintenance, every street section will be placed into one of three deterioration categories based on the traffic load it carries as shown in Table 3 below.

Rate of Deterioration	Traffic Volume	Weighting factor
Rapid	**> 10,000 ADT**	5
Moderate	**4,000 – 10,000 ADT**	3
Slow	**< 4000 ADT**	1

Table 3

Prioritizing Projects

Project priorities will be established by multiplying the service age and the weighting factor as shown in Table 4. The street segments with the highest score are the highest priority.

Street Segment	Rate of Deterioration Weighting Factor	Pavement Service Age	Raw Score	Ranking
Street 1	Rapid - **5**	8 years	40	1
Street 2	Slow -**1**	25 years	25	3
Street 3	Moderate - **3**	11 years	33	2
Street 4	Rapid - **5**	2 years	10	4

Table 4

This simple analysis can be used to develop the preliminary project list for any given year. However, in addition to the numerical analysis, it is **critical** to validate the above analysis based on a field condition survey using the significant experience and knowledge of the Public Works staff. Once the preliminary project lists are generated, the Public Works staff will then review that data to determine which projects should be done based on their knowledge of the widely variable field conditions such as quality of original construction, quality of the street section subgrade, history of previous maintenance, etc.

This strategy will get the program started; however, a measurement tool is necessary to determine if we are making a difference.

Pavement Management System

A computerized pavement management system (PMS) can provide the tools necessary to determine whether or not we are improving the street system. There are many very powerful PMS systems on the market today. In fact, the Operations Division has previously invested in software that is no longer supported by the vendor.

In February of 2007, the Operations Division launched a new work management software system, CarteGraph WorkDirector. CarteGraph has a pavement management module available which has the ability to directly connect to the new work order software and the GIS map. The CarteGraph PMS tool will provide an inventory of every street segment and track its service age and maintenance history. The PMS also has the capability of tracking pavement condition based on field inspections in accordance with standardized inspection criteria. This will allow us to track pavement condition ratings for any given section of street. Additionally, any time a work order was generated for preservation or rehabilitation of a given street, the software will automatically transfer that information into the PMS tool and put the information on the GIS map.

Pavement condition inspections are the “examination of the motor oil” approach as opposed to the “change the oil” approach. They are the only objective method to measure success or failure of the proposed pavement preservation strategy. **The pavement condition inspections can be done by trained City staff and are only recommended for arterial and collector streets.** This should provide an adequate measurement of how the program is working without investing a great deal of time and money in conducting inspections of residential streets. Funds for a PMS are included in the current budget.

The Backlog

The current "worst first" strategy allows the City to maintain approximately 3.6% of the street system. Since we should be maintaining a minimum of 10% it is clear that a significant backlog of deferred maintenance is being created. The exact quantity of the backlog and the condition of those streets cannot be quantified without a pavement management system as noted above. Once that system is in place, we can better determine which streets are in need of reconstruction and which are in such bad condition that they should be allowed to deteriorate until reconstruction is necessary. It is estimated that there are approximately 20 lane-miles that fall into these two categories. This figure must be verified in order to determine a budget and schedule for completing the work. The PMS will also provide prioritization tools for the various pavement preservation treatments.

The Public Works Department completes approximately 2 lane-miles of street reconstruction per year. Most of this effort has targeted the ***"17 transportation projects list"***. The history of the 17 transportation projects list will not be reviewed here; however it should be noted that some of those projects may not have been developed to address streets that needed to be reconstructed due to the condition of the pavement; some were needed to increase capacity, provide better connectivity, provide better pedestrian access, etc.

10 Year Implementation Plan

A **SAMPLE** 10-year implementation plan is included as Appendix B. The 10 year plan assumes a steady growth rate of 10 additional lane-miles of pavement per year and a construction cost escalation factor of 2 percent per year. This plan is representative of the types of treatments that need to be applied; however, it is not currently possible to determine exactly what treatments will need to be done to which streets. Therefore, the implementation plan will need to be created **after** an overall street inventory is completed including traffic loadings, service age, and arterial and collector street condition ratings.

Funding Requirements

Pavement Preservation

This pro-active pavement management strategy requires additional funding. The current budget for pavement maintenance is $1.15M per year. Preliminary estimates indicate that an additional $750,000 per year is required in order to begin a proactive pavement preservation program in FY2010. Additional adjustments may be required in future years based changes in construction costs.

Pavement maintenance is funded from the Street Utility Fee. Appendix C provides pertinent sections of the Municipal Code for reference. Exclusive of the 17 transportation projects surcharge, the Street Utility Fee is currently $3.05/mo for a single family residence. The fee will increase on March 1, 2008 to $3.40 and again on March 1, 2009 to $3.77. ***This previously approved increase does not include funding for this program.*** An additional increase of approximately 15% on March 1, 2010 is required. This proposed adjustment will increase the street utility fee for a single family residence to $4.34/mo, an increase of $0.57/mo.

Major Rehabilitation/Reconstruction

Funding for major rehabilitation/reconstruction is adequate at this time. It is estimated that 20 lane-miles need major work, again, this figure must be verified. If this figure is correct, and 2 lane-miles per year are completed, then this backlog work should be eliminated within ten years. Funding levels should be established such that 10% of the streets in need of major reconstruction can be completed each year.

Additional Issues

Excessive Street Crown

The current practice of overlaying streets with or without edge grinding is increasing the cross slope of the roadway from the centerline to the gutter. This slope is commonly termed the crown of the roadway, and a limited number of new layers of asphalt can be added before the crown becomes excessive and the curb depth becomes too shallow. The problem with excessive crown is it impacts the drivability and safety of the roadway, and the shallow curb depth can contribute to standing water on the pavement and localized puddling and flooding. Once these conditions develop, the only appropriate solution is to reconstruct the street to correct the geometry of the street section. The costs associated with street reconstruction were discussed previously and should be avoided.

Thicker Pavement Design Standards

The current City of Medford minimum design standards for street construction are as follows:

Residential streets ---------- 3” of asphalt
Collector streets ---------- 4” of asphalt
Arterial streets ---------- 5” of asphalt

The current standard for base material requires that the design thickness be calculated based on actual bearing capacity of the existing subsoil as tested by geotechnical engineers. This results in varying base material thickness requirements. Many developers choose to use default bearing values rather than do the geotechnical engineering. The default bearing values generate a base thickness of 18” for residential streets, 24” for collector streets, and 26” for arterial streets. This is a good design standard and it should remain in place. However, this standard was recently implemented. For many years significantly thinner base and asphalt sections were allowed and street failures that are occurring now are a result of previously inadequate design standards.

It is recommended that the pavement thickness minimums be increased as follows:

Residential streets ---------- **4**” of asphalt
Collector streets ---------- **5**” of asphalt
Arterial streets ---------- **6**” of asphalt

Increasing the minimum pavement thickness design standards from 3" of asphalt pavement to 4" will increase the total project cost by approximately 10 percent. **However, the addition of one inch of asphalt pavement will double the load carrying capacity of the pavement and can potentially provide twice as much service life.**

Inspection

Higher design standards alone will not ensure quality constructed streets; a high level of construction inspection is critical. Even in the midst of rapid growth, the City has made great strides in recent years to improve the quality of its street construction inspection. However, similar to the design standards, this has not always been the case and street failures are occurring as a result of inadequate inspection. We must continue to provide an adequate number of highly trained staff to ensure projects are constructed in conformance with the established standards.

Appendix A

Surface Treatments

Fog and rejuvenating seal

A fog seal is a light application of a slow-setting asphalt emulsion diluted with water and applied with a distributor truck. Fog seals cover small cracks and surface voids, reduce raveling, and enrich dry pavements. A fog seal is an inexpensive way to rejuvenate and seal pavement surfaces. Fog seals are often applied on a routine schedule (typically every three to five years) to prolong pavement life.

Slurry seal

A slurry seal is a mixture of aggregate, emulsion and mineral fillers which is mixed cold and placed by the same machine. The slurry is designed to seal pavements, restore uniform texture and color and provide good skid resistance.

Micro-surfacing

Micro-surfacing is a mixture of dense-graded aggregate, polymer modified asphalt emulsion, water, mineral fillers, and other additives. The polymer modified emulsion and other additives allow micro-surfacing to cure more quickly so it can be placed in greater depths – from 3/8" to 1 ½" per pass. Micro-surfacing is designed to be stronger and to provide superior durability to slurry seal.

Scrub seal

A scrub seal is a more advanced multi-stage process. A distributor truck sprays a polymer modified emulsion across an entire lane. Next, a broom sled scrubs the emulsion into the voids and cracks. A second layer such as a slurry seal or micro surfacing is then applied.

Scrub cape seal

This is a three layer system that begins with a scrub seal. The scrub seal is followed by a chip seal. A chip seal is an asphalt emulsion (in this case provided by the scrub seal) which is immediately covered by a single layer of uniformly sized stone chips placed by a chip spreader. The chip seal is then rolled to seat the aggregate and swept to remove any loose chips. The final layer is either slurry seal or micro-surfacing.

APPENDIX B If rate increase does not happen till 3/1/10 program would not begin until FY2011

SAMPLE Pavement Preservation 10-Year Plan

This plan assumes steady system growth of 10 lane-miles per year and a construction cost escalation of 2 percent per year

FY2010

Goals: 61 lane-miles and 610 lane-mile-years

Activity	Budget	Annual Lane-Miles	Approx. Square yards	Estimated Life	Lane-Mile-Years	Cost per Lane-Mile
Asphalt Overlays – City Forces	$95,500	2	16,427	15	30	$47,750
Asphalt Overlays – Contracted	$0	0	0	15	0	$143,263
Scrub Cape Seal w/micro	$208,080	5	41,067	12	60	$41,616
Scrub Cape Seal w/slurry	$0	0	0	10	0	$38,495
Scrub Seal w/micro	$343,330	10	82,133	9	90	$34,333
Scrub Seal w/slurry	$784,472	26	213,547	8	208	$30,172
Slurry Seal	$256,447	29	238,187	5	145	$8,843
Fog/rejuvenating Seal	$110,916	26	213,547	3	78	$4,266
TOTAL	**$1,798,745**	**98**			**611**	

FY2011

Goals: 62 lane-miles and 620 lane-mile-years

Activity	Budget	Annual Lane-Miles	Approx. Square Yards	Estimated Life	Lane-Mile-Years	Cost per Lane-Mile
Asphalt Overlays – City Forces	$97,410	2	16,427	15	30	$48,705
Asphalt Overlays – Contracted	$0	0	0	15	0	$146,128
Scrub Cape Seal w/micro	$212,242	5	41,067	12	60	$42,448
Scrub Cape Seal w/slurry	$471,179	12	98,560	10	120	$39,265
Scrub Seal w/micro	$0	0	0	9	0	$35,020
Scrub Seal w/slurry	$769,386	25	205,333	8	200	$30,775
Slurry Seal	$243,536	27	221,760	5	135	$9,020
Fog/rejuvenating Seal	$108,783	25	205,333	3	75	$4,351
TOTAL	**$1,902,536**	**96**			**620**	

FY 2012

Goals: 63 lane-miles and 630 lane-mile-years

Activity	Budget	Annual Lane-Miles	Approx. Square Yards	Estimated Life	Lane-Mile-Years	Cost per Lane-Mile
Asphalt Overlays – City Forces	$99,358	2	16,427	15	30	$49,679
Asphalt Overlays – Contracted	$298,102	2	16,427	15	30	$149,051
Scrub Cape Seal w/micro	$173,189	4	32,853	12	48	$43,297
Scrub Cape Seal w/slurry	$120,151	3	24,640	10	30	$40,050
Scrub Seal w/micro	$0		0	9	0	$35,720
Scrub Seal w/slurry	$941,728	30	246,400	8	240	$31,391
Slurry Seal	$312,809	34	279,253	5	170	$9,200
Fog/rejuvenating Seal	$124,274	28	229,973	3	84	$4,438
TOTAL	**$2,069,610**	**103**			**632**	

FY 2013

Goals: 64 lane-miles and 640 lane-mile-years

Activity	Budget	Annual Lane-Miles	Approx. Square Yards	Estimated Life	Lane-Mile-Years	Cost per Lane-Mile
Asphalt Overlays – City Forces	$202,691	4	32,853	15	60	$50,673
Asphalt Overlays – Contracted	$0	0	0	15	0	$152,032
Scrub Cape Seal w/micro	$441,632	10	82,133	12	120	$44,163
Scrub Cape Seal w/slurry	$0	0	0	10	0	$40,851
Scrub Seal w/micro	$546,517	15	123,200	9	135	$36,434
Scrub Seal w/slurry	$640,375	20	164,267	8	160	$32,019
Slurry Seal	$168,917	18	147,840	5	90	$9,384
Fog/rejuvenating Seal	$113,178	25	205,333	3	75	$4,527
TOTAL	**$2,113,310**	**92**			**640**	

FY2014

Goals: 65 lane-miles and 650 lane-mile-years

Activity	Budget	Annual Lane-Miles	Approx. Square Yards	Estimated Life	Lane-Mile-Years	Cost per Lane-Mile
Asphalt Overlays – City Forces	$51,686	1	8,213	15	15	$51,686
Asphalt Overlays – Contracted	$155,072	1	8,213	15	15	$155,072
Scrub Cape Seal w/micro	$495,511	11	90,347	12	132	$45,046
Scrub Cape Seal w/slurry	$0	0	0	10	0	$41,668
Scrub Seal w/micro	$743,263	20	164,267	9	180	$37,163
Scrub Seal w/slurry	$653,183	20	164,267	8	160	$32,659
Slurry Seal	$191,439	20	164,267	5	100	$9,572
Fog/rejuvenating Seal	$73,882	16	131,413	3	48	$4,618
TOTAL	**$2,364,037**	**89**			**650**	

FY2015

Goals: 66 lane-miles and 660 lane-mile-years

Activity	Budget	Annual Lane-Miles	Approx. Square Yards	Estimated Life	Lane-Mile-Years	Cost per Lane-Mile
Asphalt Overlays – City Forces	$52,720	1	8,213	15	15	$52,720
Asphalt Overlays – Contracted	$158,174	1	8,213	15	15	$158,174
Scrub Cape Seal w/micro	$459,474	10	82,133	12	120	$45,947
Scrub Cape Seal w/slurry	$425,016	10	82,133	10	100	$42,502
Scrub Seal w/micro	$0		0	9	0	$37,906
Scrub Seal w/slurry	$999,370	30	246,400	8	240	$33,312
Slurry Seal	$244,085	25	205,333	5	125	$9,763
Fog/rejuvenating Seal	$70,650	15	123,200	3	45	$4,710
TOTAL	**$2,409,489**	**92**			**660**	

FY2016

Goals: 67 lane-miles and 670 lane-mile-years

Activity	Budget	Annual Lane-Miles	Approx. Square Yards	Estimated Life	Lane-Mile-Years	Cost per Lane-Mile
Asphalt Overlays – City Forces	$53,774	1	8,213	15	15	$53,774
Asphalt Overlays – Contracted	$161,337	1	8,213	15	15	$161,337
Scrub Cape Seal w/micro	$468,664	10	82,133	12	120	$46,866
Scrub Cape Seal w/slurry	$433,516	10	82,133	10	100	$43,352
Scrub Seal w/micro	$386,645	10	82,133	9	90	$38,665
Scrub Seal w/slurry	$849,464	25	205,333	8	200	$33,979
Slurry Seal	$199,173	20	164,267	5	100	$9,959
Fog/rejuvenating Seal	$48,042	10	82,133	3	30	$4,804
TOTAL	**$2,600,616**	**87**			**670**	

FY2017

Goals: 68 lane-miles and 680 lane-mile-years

Activity	Budget	Annual Lane-Miles	Approx. Square Yards	Estimated Life	Lane-Mile-Years	Cost per Lane-Mile
Asphalt Overlays – City Forces	$54,850	1	8,213	15	15	$54,850
Asphalt Overlays – Contracted	$164,564	1	8,213	15	15	$164,564
Scrub Cape Seal w/micro	$478,037	10	82,133	12	120	$47,804
Scrub Cape Seal w/slurry	$486,405	11	90,347	10	110	$44,219
Scrub Seal w/micro	$394,378	10	82,133	9	90	$39,438
Scrub Seal w/slurry	$693,163	20	164,267	8	160	$34,658
Slurry Seal	$253,946	25	205,333	5	125	$10,158
Fog/rejuvenating Seal	$73,504	15	123,200	3	45	$4,900
TOTAL	**$2,598,847**	**93**			**680**	

FY2018

Goals: 69 lane-miles and 690 lane-mile-years

Activity	Budget	Annual Lane-Miles	Approx. Square Yards	Estimated Life	Lane-Mile-Years	Cost per Lane-Mile
Asphalt Overlays – City Forces	$55,947	1	8,213	15	15	$55,947
Asphalt Overlays – Contracted	$167,855	1	8,213	15	15	$167,855
Scrub Cape Seal w/micro	$536,358	11	90,347	12	132	$48,760
Scrub Cape Seal w/slurry	$0		0	10	0	$45,103
Scrub Seal w/micro	$603,399	15	123,200	9	135	$40,227
Scrub Seal w/slurry	$919,134	26	213,547	8	208	$35,351
Slurry Seal	$259,025	25	205,333	5	125	$10,361
Fog/rejuvenating Seal	$99,966	20	164,267	3	60	$4,998
TOTAL	**$2,641,683**	**99**			**690**	

FY2019

Goals: 70 lane-miles and 700 lane-mile-years

Activity	Budget	Annual Lane-Miles	Approx. Square Yards	Estimated Life	Lane-Mile-Years	Cost per Lane-Mile
Asphalt Overlays – City Forces	$0	0	0	15	0	$57,066
Asphalt Overlays – Contracted	$0	0	0	15	0	$171,213
Scrub Cape Seal w/micro	$497,350	10	82,134	12	120	$49,735
Scrub Cape Seal w/slurry	$368,041	8	65,708	10	80	$46,005
Scrub Seal w/micro	$820,622	20	164,269	9	180	$41,031
Scrub Seal w/slurry	$721,167	20	164,269	8	160	$36,058
Slurry Seal	$211,364	20	164,269	5	100	$10,568
Fog/rejuvenating Seal	$101,965	20	164,269	3	60	$5,098
TOTAL	**$2,720,509**	**98**			**700**	

Appendix C

4.751 Creation of utility; purpose

There is hereby created a Street Utility Fund ("the Fund") for the purpose of providing for the operation and maintenance of city streets. The Council hereby finds, determines and declares the necessity of providing operation and maintenance of the city's streets and related facilities as a comprehensive Street Utility, with such operation and maintenance to include such activities as are necessary in order that streets and related facilities may be properly operated and maintained and that the health, safety and welfare of the city and its inhabitants may be safeguarded.

4.757 Moneys to be paid in Street Utility Fund

All fees collected by the city, including the pedestrian-scale street light fee, and such other moneys as might be available to the city for the purposes of this ordinance shall be paid into the Street Utility Fund. Such revenues shall be used for the purposes of the operation and maintenance of the street network of the city. It shall not be necessary that the operations and maintenance expenditures from the Fund specifically relate to any particular property from which the fees for said purposes were collected. To the extent that the fees collected are insufficient to properly operate and maintain streets, the cost of the same may be paid from such other city funds as may be determined by the City Council, but the City Council may order the reimbursement to such fund if additional fees are thereafter collected. All amounts on hand in the Street Utility Fund shall be invested by the Chief Financial Officer in investments proper for city funds. The fees paid and collected by virtue of this ordinance shall not be used for general or other governmental or proprietary purposes of the city, except to pay for the equitable share of the cost of accounting, management and government which is attributable to the Fund, which shall not exceed 5% of the gross revenues of the Fund during any fiscal year. Other than as described above, the fees and charges shall be used solely to pay for the cost of operation, administration, maintenance, repair, improvement, renewal, replacement and reconstruction of the streets of the city and costs incidental thereto.

4.761 Imposition of Utility Fee

Subject to the provisions of Section 4.763, there is hereby imposed upon the responsible party for each and every developed lot or parcel of land within the city a monthly street utility fee calculated as follows:

Monthly Fee = Number of Units x Chargeable Daily Trip-Ends per unit x Charge per Trip-End.

The units and chargeable daily trip-ends per unit shall be taken from Table 3.1 in Chapter 3 of this code. Effective March 1 of the following years, the Charge per Trip-End shall be as follows:

2008 - $0.618

2009 - $0.655

This fee is deemed reasonable and is necessary to pay for the operation, and maintenance of streets within the city. The Charge per Trip-End specified in this section shall be paid monthly

beginning April 1 of the effective year. Charges accrued prior to March 1 of the effective year and billed prior to April 1 of the same year shall be computed at the rate of the previous year.

On August 1, 1998, the charge per trip-end was increased by $0.077 per trip end. Further increases occurred on March 1, 2001 ($0.054/trip-end), March 1, 2002 ($0.073/trip-end), and March 1, 2003 ($0.074/trip-end).

These increases were intended to provide funding for the City's 17-Transportation Project list, adopted by the City Council in 1998. When sufficient funds have been collected to complete these projects, the charge per trip-end shall be reduced by $0.278.

4.763 Determination of Utility Fee

The City Engineer shall determine the fee for each utility account in accordance with the category of use and the chargeable trip-ends for that category as set forth in Table 3.1, which is found in Chapter 3 of this code. Categories of use shall be assigned according to the principles and definitions contained in Sections 3.814 and 3.816 of this code. An appeal of a decision regarding the determination of category of use shall be filed in writing with the City Recorder within 30 days after the date of mailing of the first utility bill that is sent following any initial classification or any new classification. The appeal shall be determined as provided in Section 3.814(3) and 3.819 of this Code.