CITY OF KIRKLAND
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MEMORANDUM

To: David Ramsay, City Manager

From: Daryl Grigsby, Public Works Director
Ray Steiger, P.E., Capital Projects Manager

Date: January 9, 2009

Subject: STATE OF THE STREETS REPORT

RECOMMENDATION:

It is recommended that the City Council review and discuss the 2008 State of the Streets report.

BACKGROUND AND DISCUSSION:

In 2002 and 2005, City Staff presented Council with reports that summarized the City's Pavement Management System (PMS), the roadway network pavement condition, and made recommendations for funding of the City's Annual Street Preservation Program. Using information presented in the reports, and after discussions with Staff, Council established budgets for the Annual Street Preservation Program. Additionally, based on the 2005 report, Council approved the purchase of a commercial grade asphalt paving machine for use by City maintenance personnel to supplement the Annual Preservation Program, and they established an annual sidewalk repair program of $200,000.

In the spring/summer of 2008 the City's pavement ratings were updated again using the same visual inspection and the standard rating process that is employed by many other agencies throughout the region. This rating process evaluates all of the same attributes that were evaluated in 2002 and 2005 thus allowing internally consistent and comparable results from year to year. This year's report, "2008 State of the Streets" (Attachment A), summarizes where the City roadway network was previously, examines the status of where the network is today, and looks forward under various funding and repair strategies to where the pavement ratings are likely to be in the future. Also included in this year's report are summary maps graphically depicting the roadway condition, the proposed preservation program, and a survey of approximately 75 individuals throughout the community regarding their opinions on the City's street maintenance program.

The overall Pavement Condition Index (PCI) for the City's street network after the 2008 assessment was 65;this compares to a PCI of 70 and 67 in the 2005 and 2002 reports respectively. As a point of reference, a newly paved roadway has a PCI of 100, and over time the PCI decreases depending on environmental and other factors (Figure A). The PCI of the overall network is a combination of all roadways (150 miles of City streets) and their respective PCI's, and is used to examine the overall "health" of the network. Other factors need to be considered such as the type of road with a low PCI (an arterial must keep a higher PCI than a local access road), however the PCI is a good benchmark to use for comparisons. An industry accepted ideal PCI is in the range of a PCI of 85.

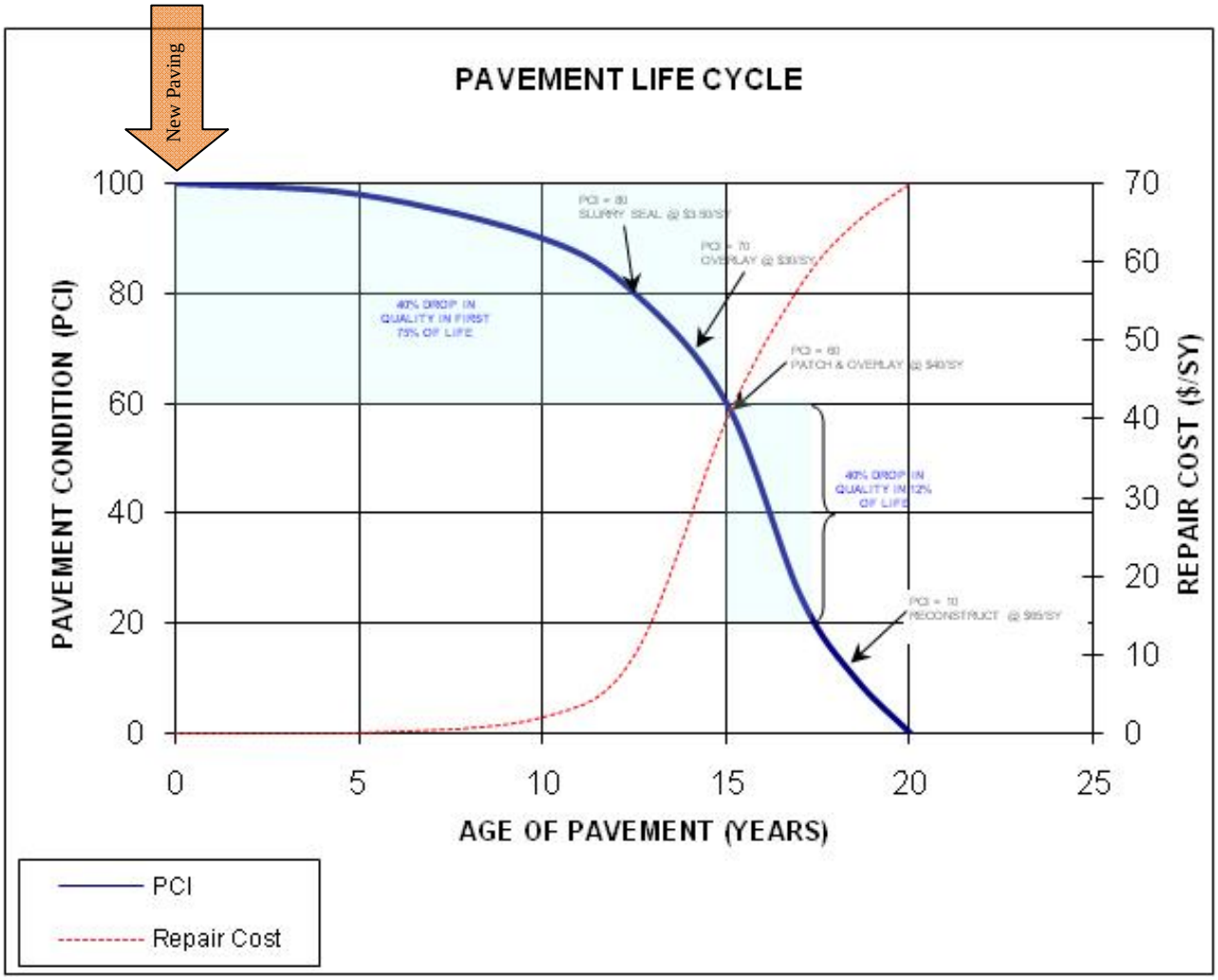


Figure A

A slight degradation of City's PCI since 2005 was anticipated based on a funding level slightly below optimum, however the degradation was accelerated by the reduced purchasing power of the established budget. Analysis done for the 2005 report anticipated an approximate 4% inflation rate, however as has been seen through the City's own experience since that time, the actual inflation rate for asphalt has been significantly above 4%; for the 2002-2007 period, a 12% inflation factor was seen (Figure B). These two factors, budget and inflation, overshadowed maintenance improvements brought about by the purchase of the paving machine.

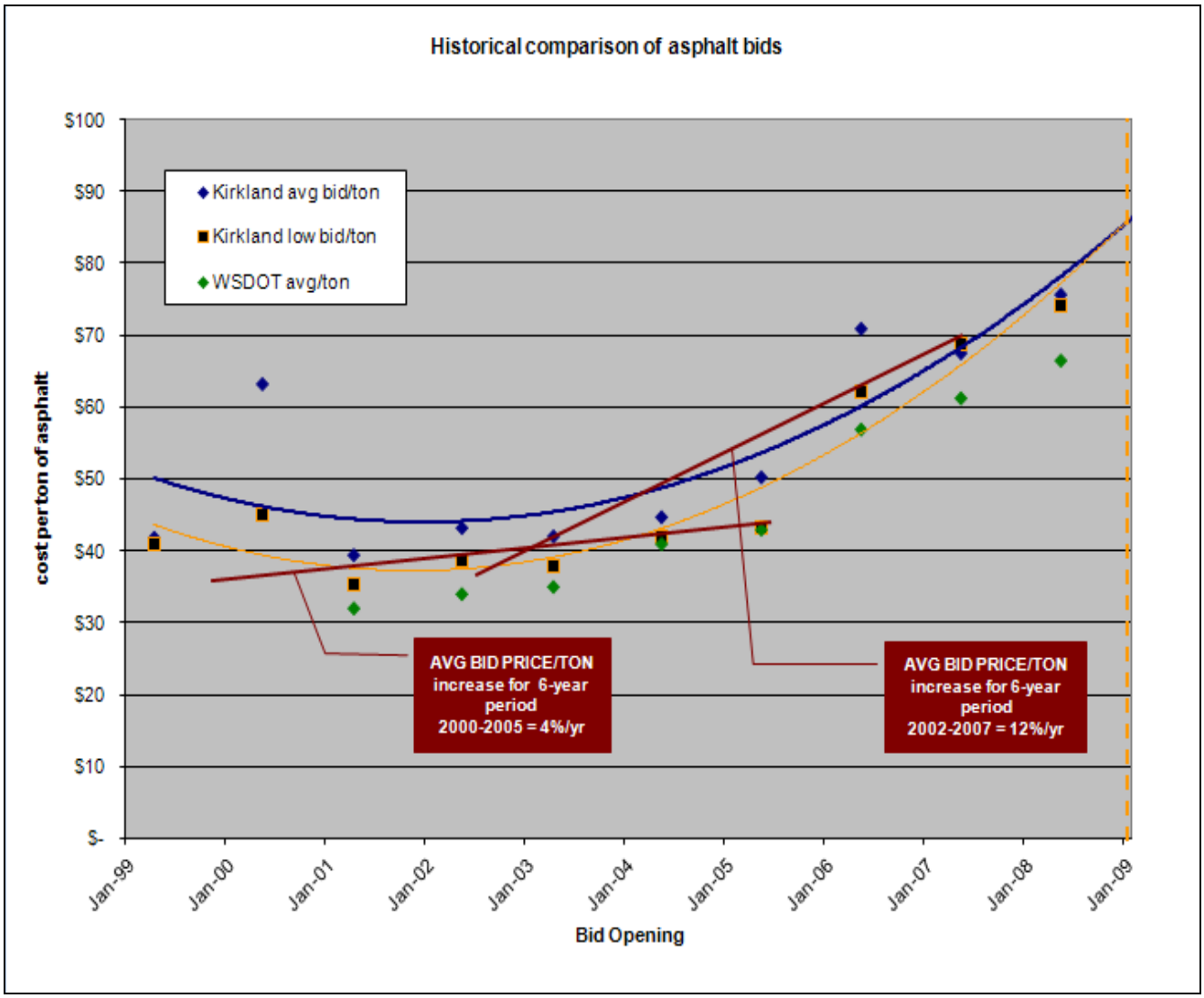


Figure B

A second attribute that is looked at through the PMS is the deferred maintenance of the network – the estimated repair cost in current dollars to bring the whole system to a PCI of 85. In 2005 the deferred maintenance of the City's street network was approximately $9,000,000, whereas today replacement of the network would cost an estimated $15,500,000. The cost per ton of asphalt has increased from approximately $42 in 2005 to $80 in 2008; this factor alone would likely double the cost of deferred maintenance calculated in 2005, the fact that deferred maintenance has *not* doubled indicates that this attribute of the system is being improved and that the annual preservation program is moving forward to arrest the degradation of this infrastructure. However, more remains to be done.

The annual street preservation program is one category of the City's transportation program. Other categories are building the capacity network to comply with concurrency under GMA, other maintenance programs, and building the non-capacity (or non-motorized) network. Approximately $7.4 million of funding is annually available for the transportation system from a number of sources and for the 2009-2014 CIP were targeted as shown in Figure C.

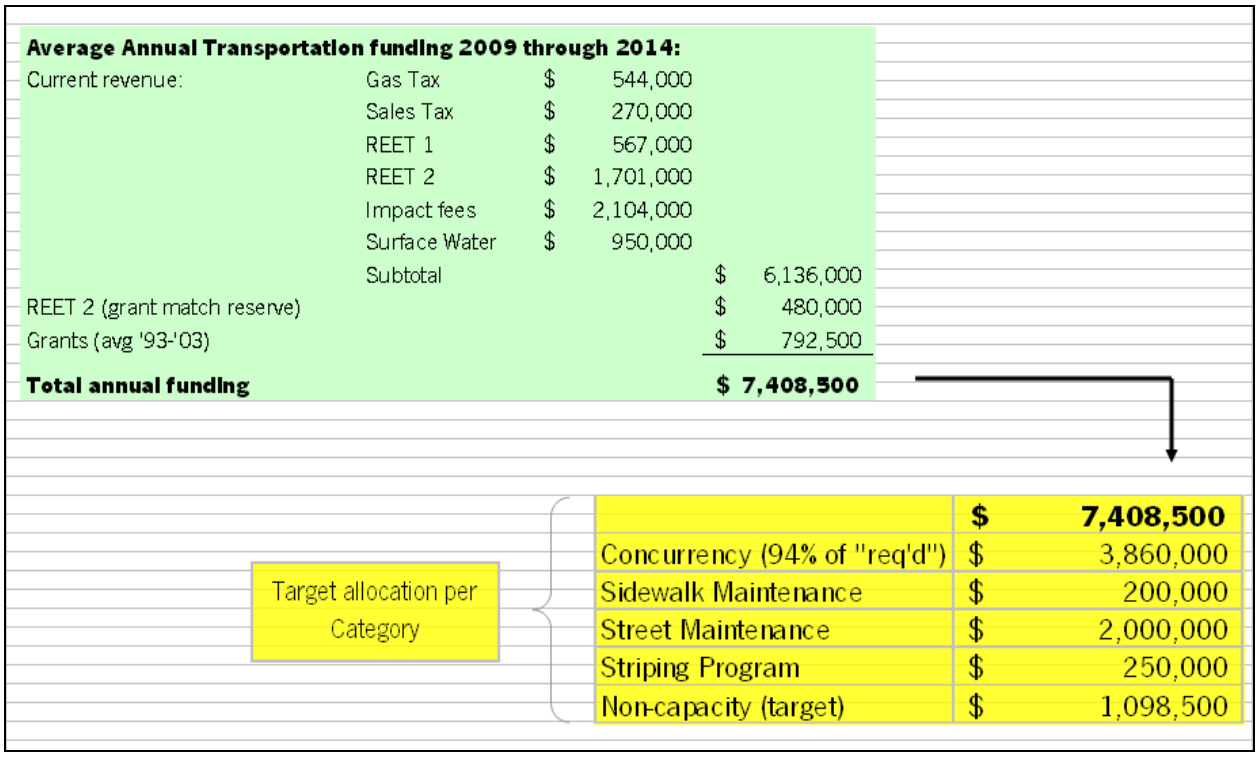


Figure C

For the 2008 State of the Streets report, a number of scenarios were modeled using the PMS to examine the impact of various annual funding levels on the City's overall street network; those scenarios and their required ten year spending amounts are as follows:

- Scenario 1: 2009-2014 CIP Budget (10 year funding $24.5M or avg spending $2.45M per yr)
- Scenario 2: Maintain Current PCI of 65 ($60M)
- Scenario 3: Increase Current PCI to 70 ($77M)
- Scenario 4: No Increase in Deferred Maintenance ($94M)
- Scenario 5: Budget Needs Analysis – Increase PCI to 85 ($240M)

All of the scenarios utilize higher funding levels than previous preservation programs, 2008's budget was $2.2M including the CIP and operations and maintenance components, and all have varying outcomes over the next ten year period. A comparison of the scenario's effects on PCI and deferred maintenance are show below graphically in Figure D and Figure E.

Comparison of Scenarios

Pavement Condition Index (PCI)

The figure below illustrates the change in PCI over 10 years for each budget scenario. With unlimited funding ("Budget Needs" scenario), the pavement network reaches an optimal PCI of 85 after 5 years. The current budget projects a decrease in the network PCI over the 10 year period.

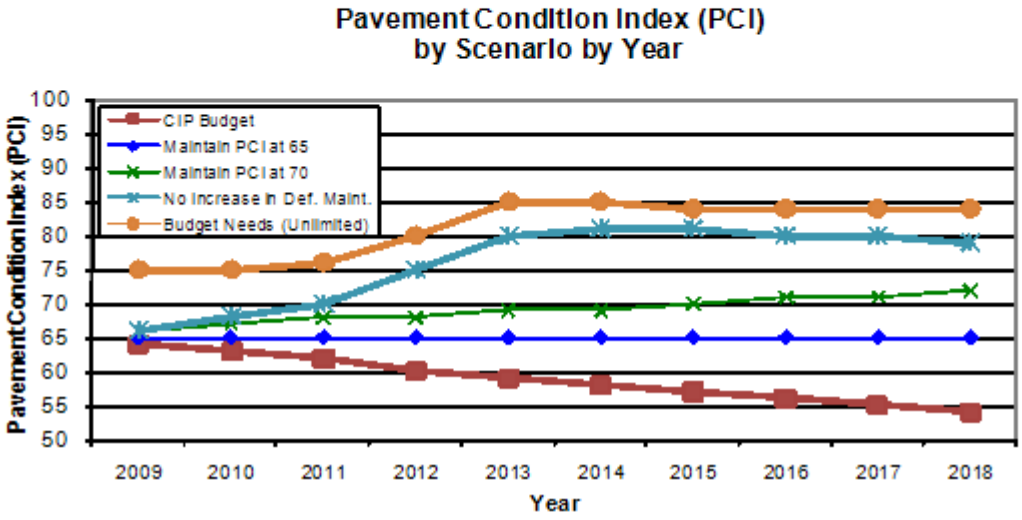


Figure D

Deferred Maintenance

The figure below illustrates the deferred maintenance accumulated over 10 years for each budget scenario. With unlimited funding, the deferred maintenance is zero. The deferred maintenance with the other scenarios, increases dramatically after 2011.

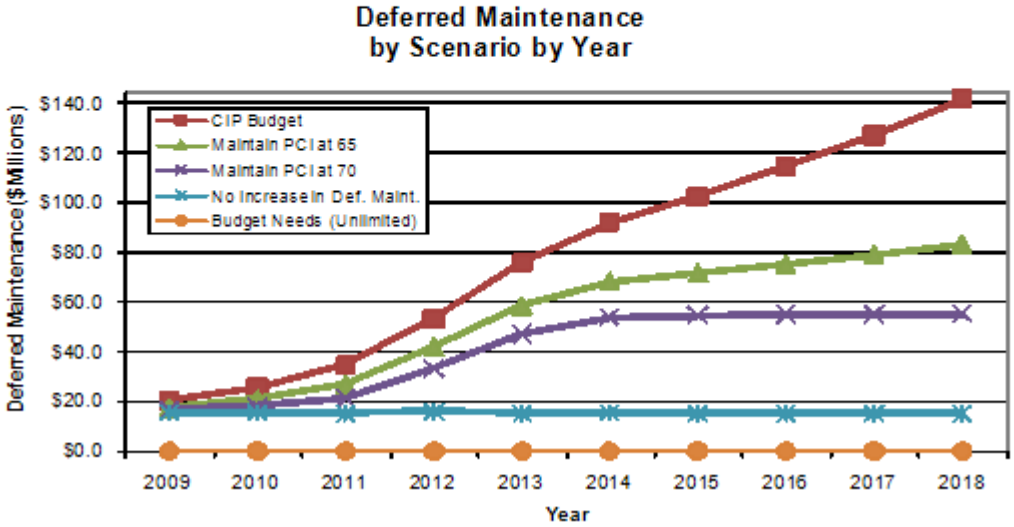


Figure E

Given the pressure on available local funding for the various categories in the City's transportation system, it seems unlikely that increases beyond the current 2009-2014 CIP (Scenario 1) are available and are not recommended at this time by Staff.

Staff is however pursuing additional street preservation funding through the PSRC as a component of the anticipated Federal Stimulus package. Kirkland has included $3,000,000 for the annual street preservation program in its 2009 request for federal funding; this request along with approximately 450 projects representing $3.5 billion worth of local agency Puget Sound region transportation needs are being submitted to Olympia this month. Although not an ongoing source of revenue and only available to be used on Federally classified routes (some collector streets and above in Kirkland), infrastructure maintenance remains a key component in the overall Federal stimulus package and identifying the Kirkland needs at a regional level is critical. Staff is also continuing to work with other local agencies in a collective effort to identify overall regional transportation needs while establishing reporting consistency; as related to asphalt preservation, that will mean that repair strategies for one jurisdiction are identified and estimated similarly in other jurisdictions.

Also included within this report are the results of a focus group survey that was undertaken in the Fall of 2008 (Attachment D) as a follow up to the February 2008 Community Survey. The 2008 Community Survey indicated that, along with a few other services, the City's "Street Maintenance" performance was less than the importance of the service provided and as such presented an opportunity for improvement.

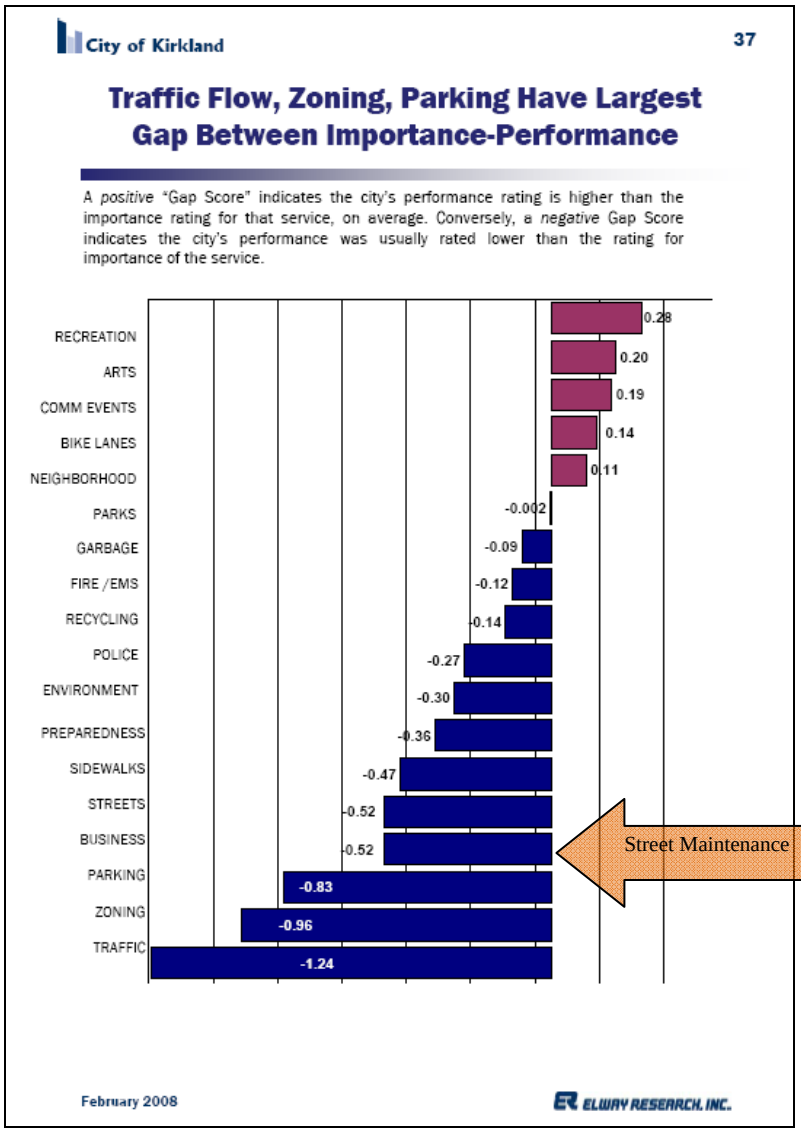


Figure F

In order to better understand the specifics of the community's concern or their "Gap Score" as identified in the 2008 Community Report, street maintenance was broken into a number of specific elements. The elements were then included in an electronic survey which was emailed to a number of community members, and they were asked to respond. Nearly 75 respondents provided feedback in the two week response period. Using the same gap analysis that was employed in the February 2008 Community Survey, staff assembled the responses and a summary is included herein.

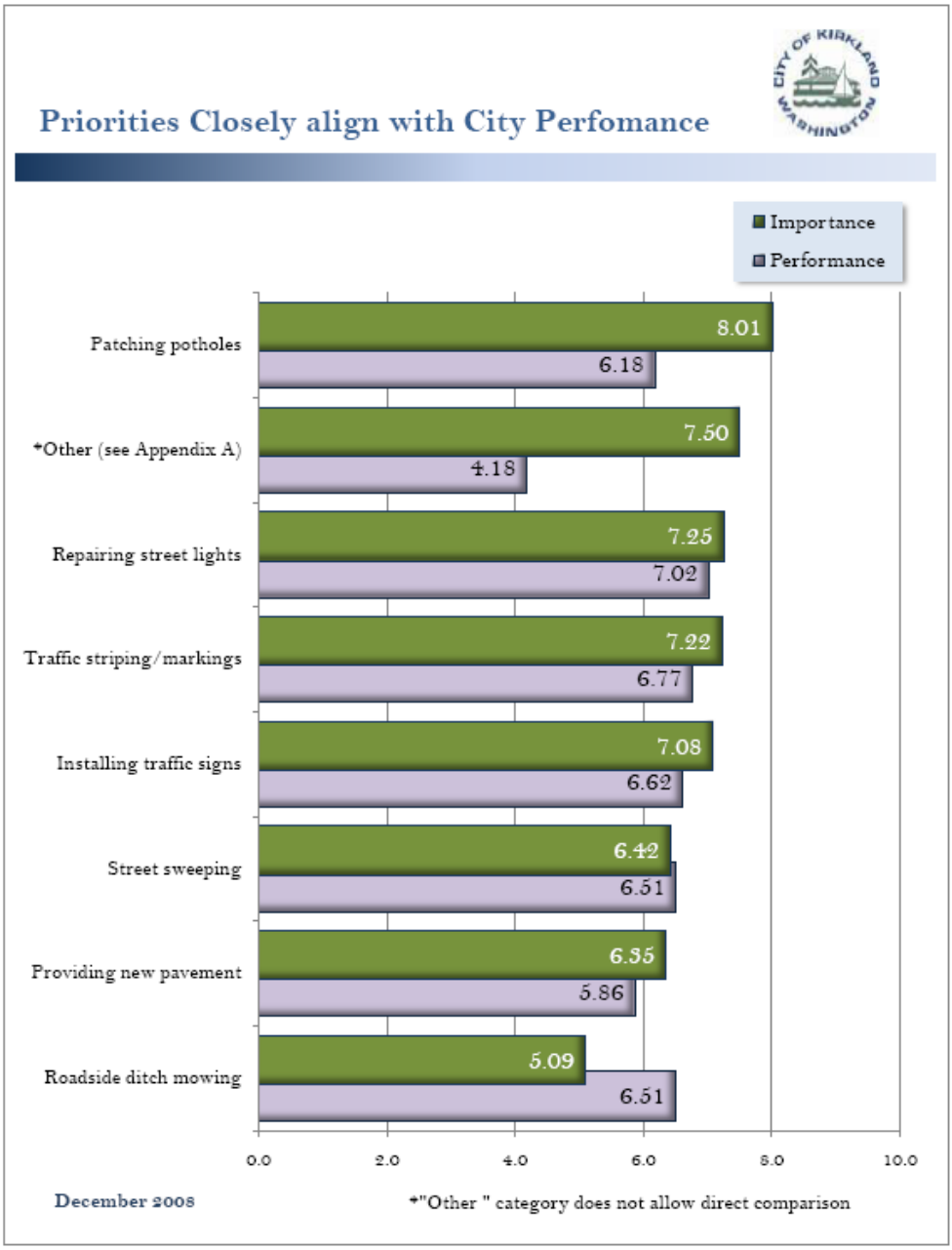


Figure G

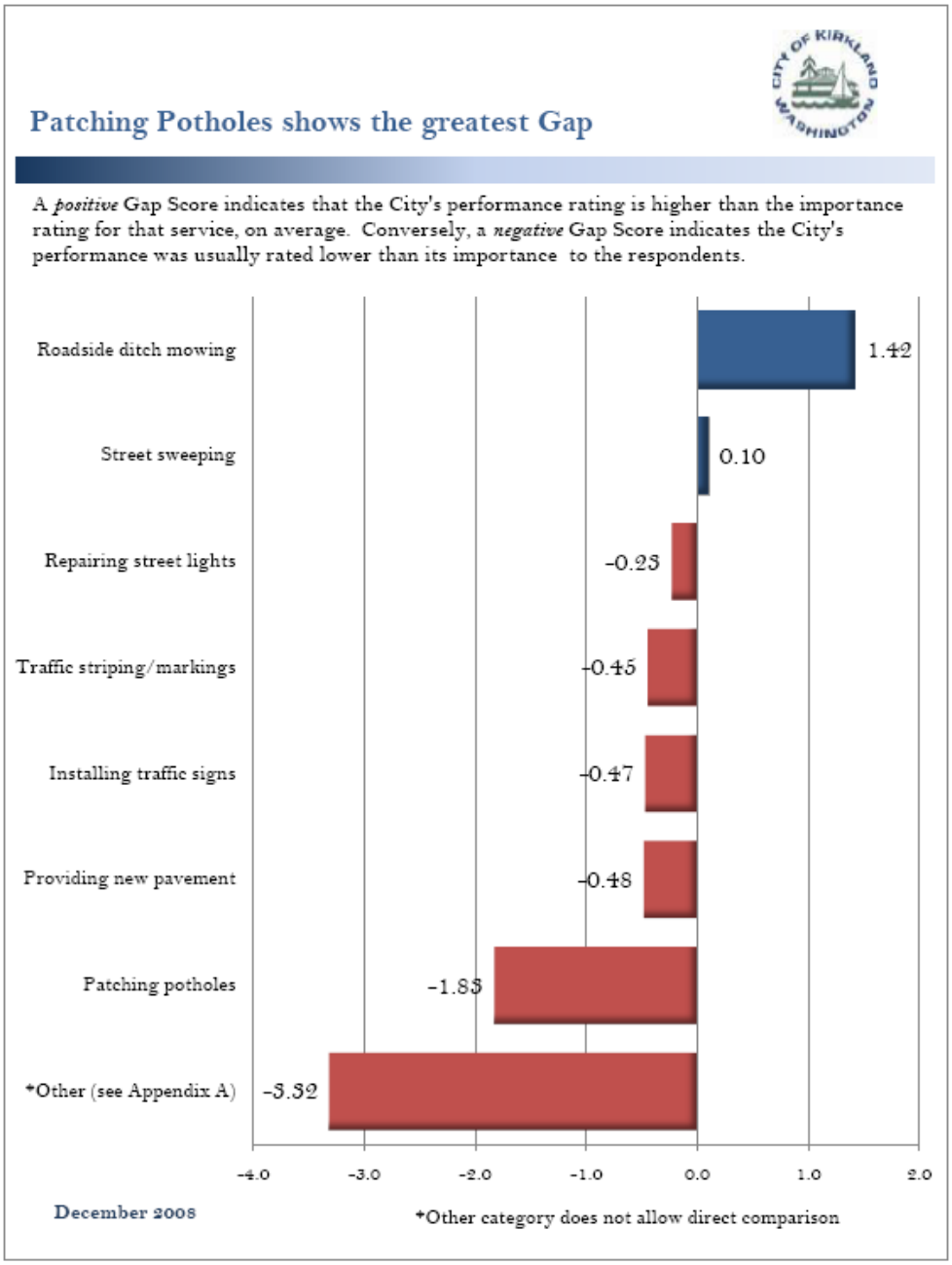
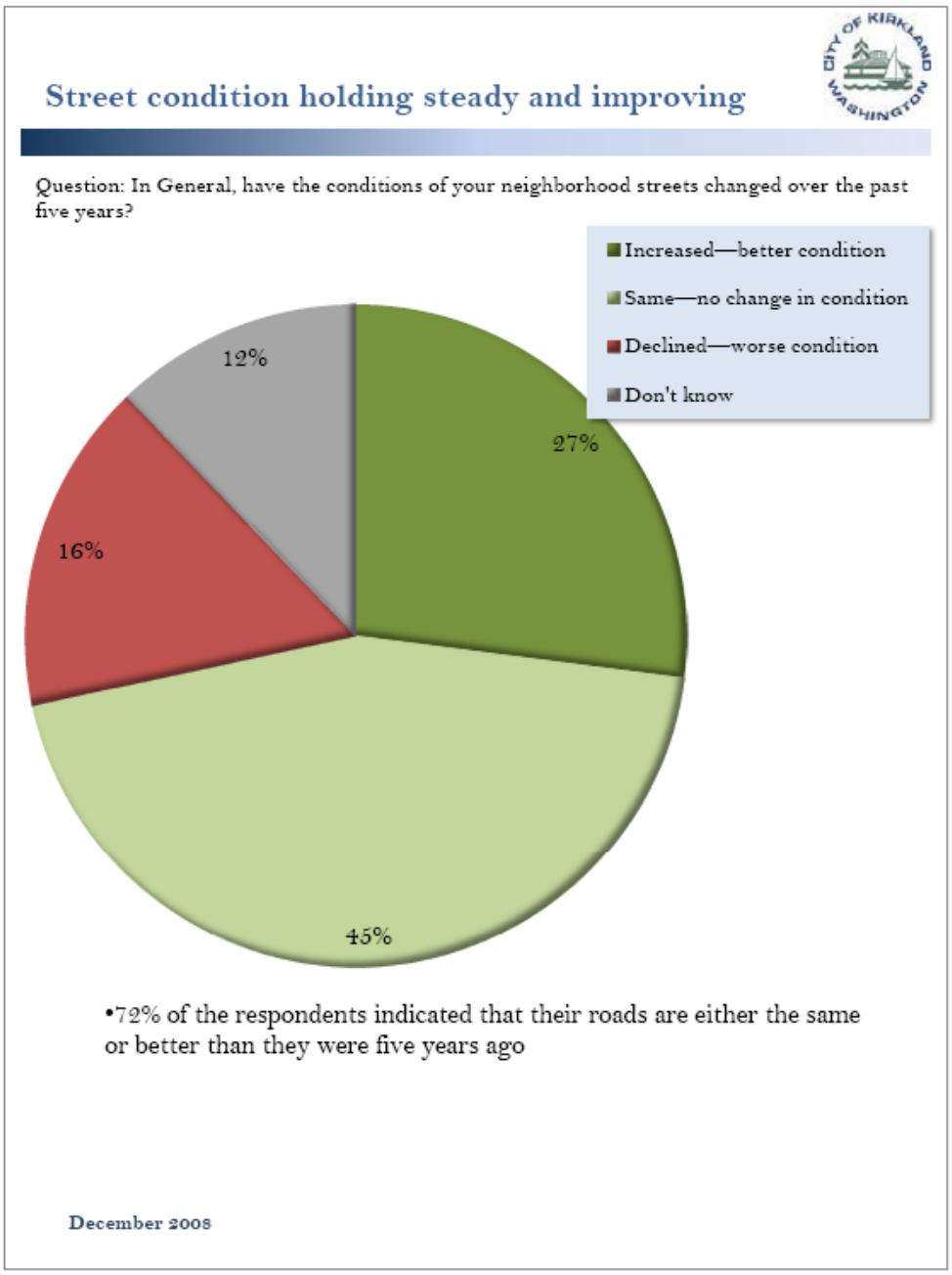


Figure H

The Community's characterization of street maintenance includes a number of areas, and this survey pointed out specific areas where City resources appear to be allocated appropriately as measured by their feedback, however patching potholes and some specific "other" situations appear to be where improvements can be made. Finally, and despite the overall PCI declining since 2005, a subjective response that was received as a part of the survey shows a continued favorable perspective of the City's street network (Figure I).



Staff will be available to discuss the 2008 State of the Streets report and to answer questions that Council may have on January 20, 2009.

ATTACHMENT A

CITY OF KIRKLAND
STREET PRESERVATION PROGRAM

2008 STATE OF THE STREETS

DECEMBER 2008

PREPARED BY:
DEPARTMENT OF PUBLIC WORKS

CONSULTANT:
PAUL SACHS

Introduction

In 2002 and 2005, City Staff presented Council with reports that summarized the City's Pavement Management System (PMS) and made recommendations for funding of the City's Street Preservation Program. In spring-summer 2008 the City's pavement ratings were updated using a visual inspection and standard rating process employed throughout the region. This rating process evaluates all of the same attributes that were evaluated in 2002 and 2005, thus allowing an internally consistent process. This report, "2008 State of the Streets", takes a look back at where the City was in 2005, examines the status of where we are today and projects forward to where our pavement ratings are going.

This report summarizes the recommendations of the City's Pavement Management System (PMS) and compares the costs of the recommended repair program to the City's current budget, and other scenarios, to improve overall maintenance and rehabilitation practices. It also assesses several alternate funding strategies and their effect on the City's overall pavement condition over the next ten years.

Pavement Management

The Pavement Management System (PMS) is a tool that assists in making the most efficient use of pavement maintenance funds. The 150 centerline miles of streets maintained by the City of Kirkland represent a significant public investment—the replacement cost of this network is estimated at nearly $153 million. The Public Works Department uses the PMS database to store pavement condition data, identify street segments in need of preventive maintenance or rehabilitation, prioritize projects, and to forecast funding needs in order to maintain desired pavement performance levels. Through the maintenance of the PMS, the City is ensuring compliance with State law requiring "stronger accountability to ensure that cost-effective maintenance and preservation is provided for ... transportation facilities" in order to obtain State funding (RCW 46.68).

Rating Methodology

Pavement condition ratings are a fundamental component of the PMS. Kirkland utilizes the Washington State DOT method for objectively rating the pavement condition based on factors including cracking, patching, weathering, and rutting. From this condition data, the PMS computes a Pavement Condition Index (PCI), which ranges from 0 to 100. A PCI of 100 represents a newly constructed road with no distresses; a PCI below 10 corresponds to a failed road requiring complete reconstruction. Table 1 below shows condition categories and corresponding PCI ranges that will be used throughout this report.

Table 1. Pavement Condition Index

Condition Category	Pavement Condition Index (PCI)
Excellent	86 to 100
Very Good	71 to 85
Good	56 to 70

Fair	41 to 55
Poor	26 to 40
Very Poor	11 to 25
Failed	0 to 10

What Affects Pavement Ratings

Many factors contribute to the decline of pavement conditions and therefore pavement ratings.

Pavement Age – As soon as a street is paved it begins aging. Over time, asphalt concrete pavement becomes more brittle, smaller aggregate gets washed away and breaks down over time. Typical signs of distresses due to aged pavement is cracking, raveling, weathering and other non-load rated distresses.

Weather – Just as the weather outside wears the paint on your house, it can also rapidly accelerate the distresses observed in pavements. Rain, snow & studded tires, freeze/thaw, thermal expansion, UV rays all play a part in aging an asphalt concrete pavement surface.

Traffic Loading & Traffic Counts – The number of passenger cars has far less of an impact on pavements than the number of heavy trucks and buses. The majority of pavement damage is accredited to heavy trucks and busses. When designing a pavement sections, loads created by vehicles are commonly converted to an equivalent load. Typically, the equivalent load used is an "equivalent single axle load" (ESAL) and that equates to 18,000 lbs. An excerpt from an online pavement resource organization explains the relationship between axle weight and pavement damage:

From *www.pavementinteractive.org*:

"The relationship between axle weight and inflicted pavement damage is not linear but exponential. For instance, a 10,000 lbs single axle needs to be applied to a pavement structure more than 12 times to inflict the same damage caused by one repetition of an 18,000 lbs single axle. Similarly, a 22,000 lbs single axle needs to be repeated less than half the number of times of an 18,000 lbs single axle to have an equivalent effect.

- *An 18,000 lbs single axle does over 3,000 times more damage to a pavement than an 2,000 lbs single axle.*
- *A 30,000 lbs single axle does about 67 times more damage than a 10,000 lbs single axle.*
- *A 30,000 lb single axle does about 11 times more damage than a 30,000 lb tandem axle.*

Heavy trucks and buses are responsible for a majority of pavement damage. Considering that a typical automobile weighs between 2,000 and 7,000 lbs (curb weight), even a fully loaded large passenger van will only generate about 0.003 ESALs while a fully loaded tractor-semi trailer can generate up to about 3 ESALs (depending upon pavement type, structure and terminal serviceability).

The impact of the amount of passenger cars has a very minimal affect on pavement damage. However, increased bus and large truck traffic will greatly impact pavement damage. Over recent years there has been an increase in development and construction activities within Kirkland. Along with these increases comes an increase in large trucks and construction equipment adding more loads and damage to the City's streets. Added to this loading, a strong economy with vibrant development and construction leads to significantly more utility work within the roadway surface. Patching and small isolated paving projects also contribute to road damage and more rapid degradation.

Sub-base/Pavement Section – The material on which a pavement section is built needs to have the strength capable of supporting the pavement section and the load of the vehicles that transmit into it. In Kirkland there are several areas around town where poor underlying soils exist. Roads that are placed on these soils will quickly show signs of damage and ultimately fail, particularly where roadway sections are improperly designed.

Water – Water, whether from rainfall, ice, water main breaks, high water table, or storm runoff can be detrimental to pavements. If water is allowed to enter the sub-base, it can quickly make the materials that support the pavement unable to support loads. Water can easily enter the pavement through cracks in the asphalt, cracks in damaged curb and gutter or a leaky storm or water system. The combination of these water related factors will further increase the severity of the distresses observed in pavements.

Why Rate Pavements and Have a Pavement Management System

A functional pavement management system is key to identifying which road segments need treatment and preparing a plan for their treatment. Having an accurate assessment of your pavements helps identify what funding levels are needed to maintain or achieve a certain pavement condition. Over time if pavements are rated on a regular interval, a historical record will be created that will allow one to see how past pavement treatments are performing and how quickly pavement ratings are declining.

Maintenance Strategies

The City's Annual Street Preservation Program utilizes a variety of maintenance techniques including structural patching, overlay, slurry seal, and crack seal. These pavement treatments are often divided into two categories: *rehabilitation* and *preventive maintenance*.

Rehabilitation

The City's pavement rehabilitation program consists of two treatment methods, depending on roadway conditions.

An *asphalt overlay* is the application of 1.5" to 2.5" of asphalt concrete to the existing surface. Pavements with a PCI between 50 and 70 (upper end of "fair" to "good" condition categories) often

are treated with an *overlay*. Isolated areas of structural patching are commonly needed on these streets (see Figure 1 below). Pavements with a PCI between 25 and 50 ("poor" to "fair" condition) usually require a significant amount of patching prior to receiving an overlay. Depending on the functional classification of the street, this method can extend the life of the pavement by 15 to 20 years. About half of the streets in Kirkland are in condition categories where an overlay would be the appropriate treatment.

Figure 1. Overlay Candidate (PCI ~ 50)

Figure 2. Reconstruction Candidate (PCI = 14)

"Failed" pavements have deteriorated to a point that they require complete *reconstruction*. Pavement failure may be due to inadequate pavement structure, weak subgrade, drainage problems, or the pavement may simply have reached the end of its service life. Less than two percent of the pavement in Kirkland falls into this category. Figure 2 above illustrates a failed pavement (5th Pl S in the Moss Bay neighborhood). Figure 3 illustrates a street reconstructed in 2004 (NE 83rd St east of 120th Ave NE).

Figure 3. 2004 Reconstruction Project - NE 83rd Street (PCI Before Reconstruction = 7, 2008 PCI = 95)

Routine and Preventive Maintenance

Routine and preventive maintenance treatments allow the City to manage the pavement network in a cost-effective manner by preserving the streets that are in good condition. The City employs two different methods for preventive maintenance: crack sealing and slurry sealing.

Crack sealing involves grinding, or "routing", cracks (Figure 4) and filling them with a rubberized asphalt material. This prevents water from infiltrating into the pavement layers. The presence of water reduces the strength of the pavement base layers which results in structural damage and ultimately will lead to pavement failure.

Figure 4.
Crack Seal Candidate

A *slurry seal* provides a new wearing surface for pavements that are in good structural condition (no rutting or significant cracking) but are worn and weathered. Slurry sealing involves spreading a thin mixture of asphalt emulsion and aggregate over the entire roadway surface (Figure 5).

Figure 5. Slurry Seal
The pavement on the right would benefit from a slurry seal treatment. It is generally in "good condition" but is aging and beginning to lose aggregate and asphalt binder.

Pavement Life Cycle

Figure 6 (below) shows pavement performance and approximate repair costs over the life of a typical pavement. This figure illustrates two important concepts: 1) pavements generally remain in good condition for many years and then deteriorate rapidly, and 2) repair costs increase significantly as the pavement condition decreases. By performing preventive maintenance such as slurry sealing and crack sealing in a timely manner, the pavement's useful life is extended (Figure 7) and rehabilitation costs are reduced.

Figure 6. Pavement Performance Curve

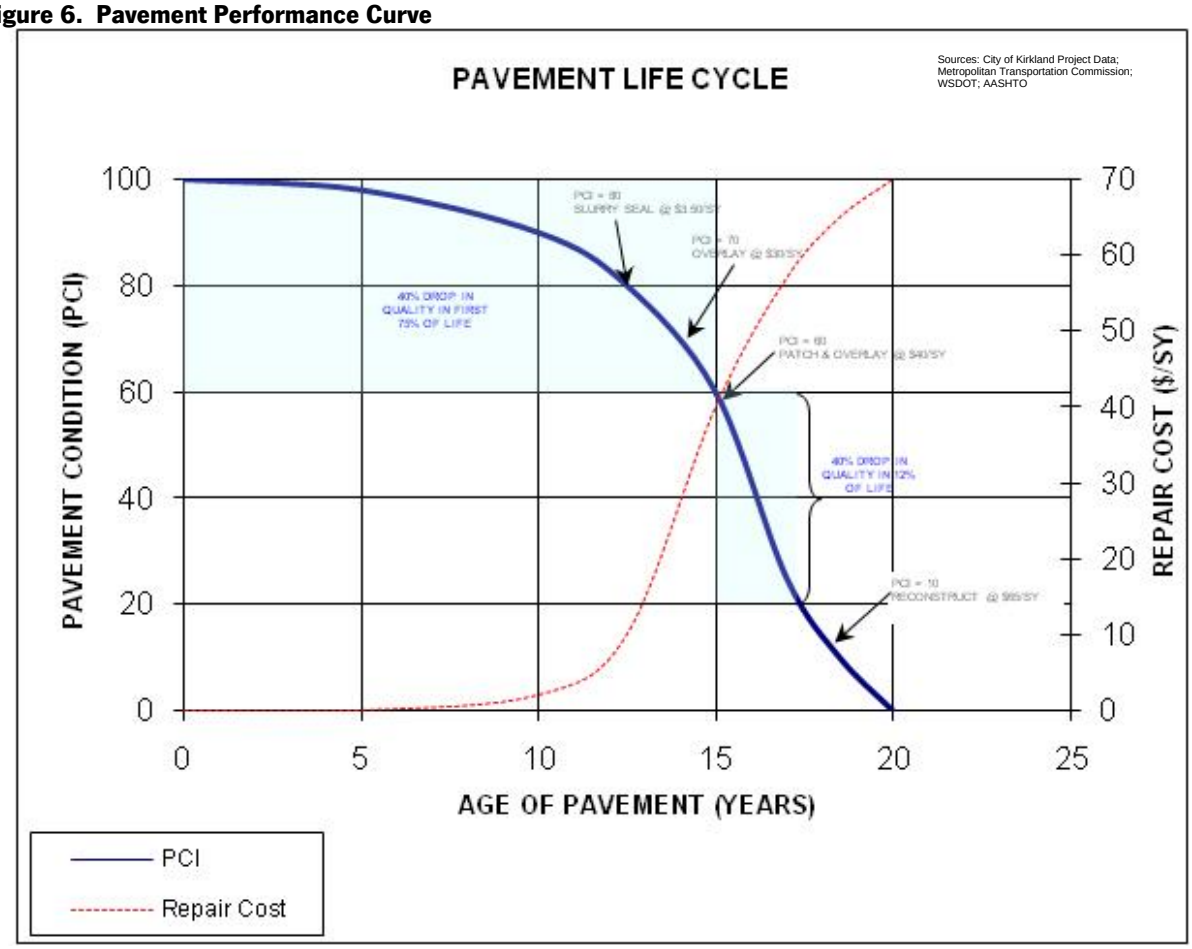
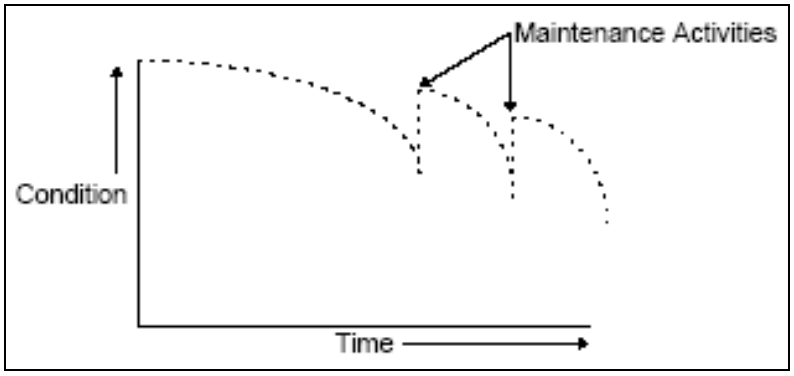


Figure 7. Pavement Performance Curve with Preventive Maintenance



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Kirkland's Comprehensive Maintenance Approach

The Street Preservation Program includes the annual street overlay and slurry seal projects done through the CIP, as well as crack sealing, structural patching, and small-scale paving projects performed by City maintenance staff. Actual project priorities are established through the consideration of numerous factors including volume and type of traffic, upcoming City and development projects, and proximity to similar maintenance projects.

Kirkland's comprehensive approach to street maintenance also addresses issues beyond the pavement itself, such as the following:

- Areas of broken curb and gutter are also replaced prior to the asphalt overlay. Replacing curb and gutter significantly increases the cost to overlay a street, however, not doing so contributes to pavement deterioration by allowing water to enter into and weaken pavement structure.

- To the extent possible, areas of broken sidewalk that pose an immediate hazard to the public are removed and replaced (Figure 8). Funding for this element comes primarily from the annual sidewalk repair program, established by the Council in 2006.

Figure 8. Curb, Gutter, and Sidewalk Rehabilitation

- In addition to the non-pavement work listed above, direction from the Department of Justice regarding the Americans with Disabilities Act (ADA) requires installing ADA-compliant sidewalk ramps on all roadway rehabilitation projects (Figure 9).

- City and franchise utilities are notified of the planned project areas in advance so utilities may be installed or upgraded prior to resurfacing, thus reducing the occurrence of trenching and patching newly resurfaced streets. (This work is funded by the utilities and does not impact the Street Preservation Program budget.)

Figure 9. Sidewalk Ramp Replacement

Kirkland's Pavement Condition Ratings

A Look Back at 2005

Beginning in 1990, Kirkland has conducted pavement condition surveys of its street network every three to four years. In the 2004 survey, Kirkland's average Pavement Condition Index was 70. In the 2005 State of the Streets report that was presented to Council, conclusions and recommendations were summarized as follows:

- The results of the 2004 pavement condition survey indicated a need for additional funding in order to maintain the condition of Kirkland's street network.
- The City's streets with the highest traffic volumes also had the lowest PCIs.
- The analysis showed the need to fund sidewalk and ADA improvements separately from the Street Preservation budget.
- In order to maintain the PCI at the 2004 average of 70, an average annual investment of $2 million would be required.

As a result of the 2005 report conclusions, and after consideration of limited transportation funding, Council directed staff to make changes in street and sidewalk maintenance programs which include:

- The Annual Sidewalk Maintenance Program was created to help offset increasing costs of repairing damaged or broken sidewalk throughout the City. This program has an annual budget of $200,000.
- Council authorized the purchase of a paving machine in 2005 to help increase pavement repair efficiencies and allow street crews to pave smaller residential streets/parking lots.
- The Annual Street Preservation Project budget was increased from $1.5M annually to $1.8M annually in the 2006-2011 CIP. (Figure 10)

The results of these changes are now able to be measured and are discussed further in this overall 2008 pavement condition assessment. The actual PCI in 2008 has dropped to 65. (Figure 10)

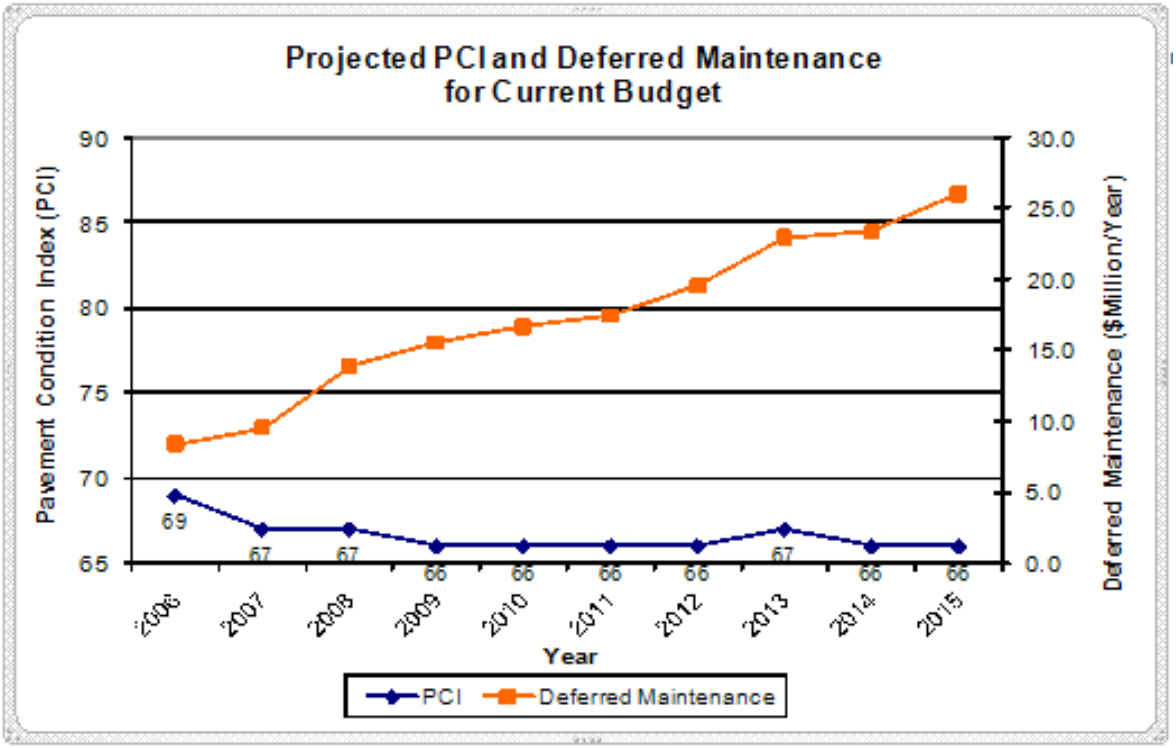
Figure 10. Budget Approved as Result of 2005 State of the Streets Report

Budget Approved in 2005 (2006-2011 CIP)
($18 Million / 10 years; 4% Inflation Rate)

This scenario is the from the 2005 State of the Streets Report. It represents the approved budget from the 2006-2011 CIP, purchase of a paving machine, and creation of an annual sidewalk maintenance program.

Summary of Results

Year	Budget ($)	Rehabilitation ($)	Preventive Maintenance ($)	Deferred Maintenance ($)	PCI
2006	1,800,000	1,400,000	400,000	8,400,000	69
2007	1,800,000	1,400,000	400,000	9,600,000	67
2008	1,800,000	1,400,000	400,000	13,900,000	67
2009	1,800,000	1,400,000	400,000	15,600,000	66
2010	1,800,000	1,400,000	400,000	16,700,000	66
2011	1,800,000	1,400,000	400,000	17,500,000	66
2012	1,800,000	1,400,000	400,000	19,600,000	66
2013	1,800,000	1,400,000	400,000	23,000,000	67
2014	1,800,000	1,400,000	400,000	23,400,000	66
2015	1,800,000	1,400,000	400,000	26,100,000	66
	$18,000,000	10 Year Total			



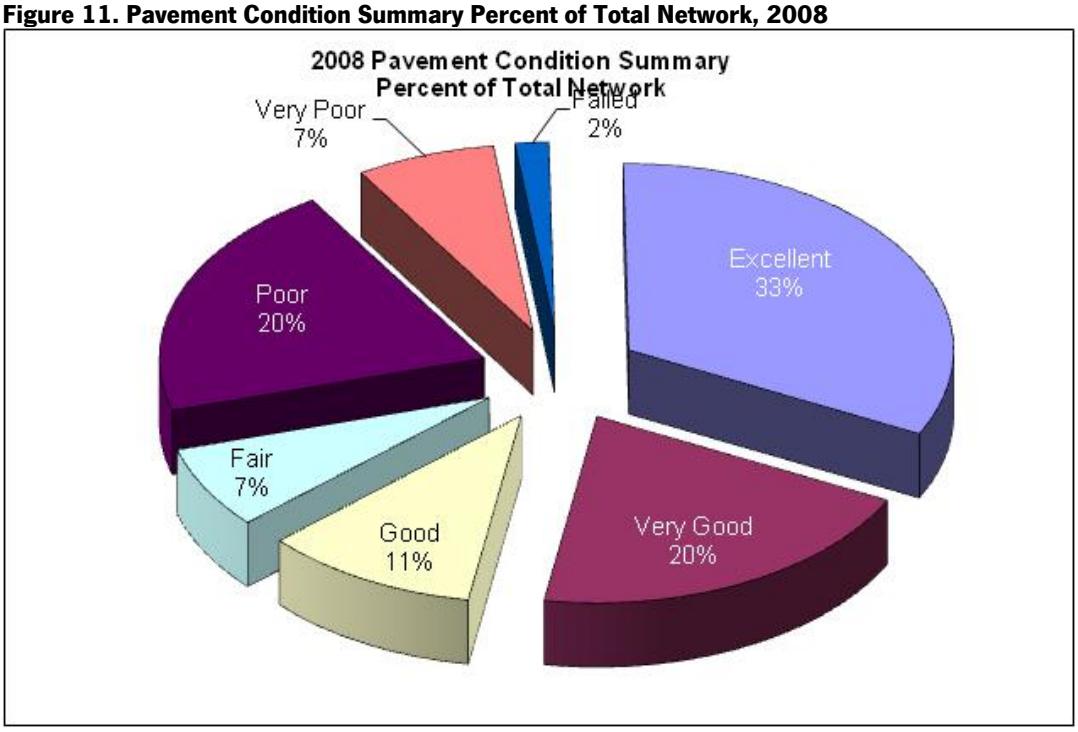
Conclusion:

The network PCI averages 66 over 10 years; deferred maintenance costs increase to $26 million (by 2015).

Current Pavement Condition (2008 Survey)

In spring/summer 2008 the most recent pavement condition survey was completed. Kirkland's current average Pavement Condition Index was anticipated to be in the approximately 67 range, however the actual PCI is 65. A summary of the current condition of the City's street network is shown in Figure 11. Over half of Kirkland's street network falls in the Excellent or Very Good pavement condition category.

Figure 11. Pavement Condition Summary Percent of Total Network, 2008



From 2004 Survey to 2008 Survey

The city-wide average PCI in 2004 was 70, and now the 2008 average PCI is 65. As anticipated by Figure 10, although the budget approved in the 2006-2011 CIP increased the annual Street Preservation Project budget to $1.8 million a year, a decline in the city-wide average PCI from 70 to 66 was expected, however, not until nearly 2010. The 2008 pavement rating is 2 points lower than where it was projected to be at this time and one primary reason for this appears to be the accelerated rise in costs. All of the scenarios used in earlier projections were estimated using a 4% inflation factor.

Inflation – In 2004 the inflation rate used when creating and evaluating different budget scenarios was 4 percent. Over the last four years, as more accurate data was collected based on recent project prices a more realistic inflation rate of 11 percent was calculated. The rate of inflation that is used during budget scenario analyses has a major impact on the long term pavement condition index and deferred maintenance. "Deferred maintenance" refers to maintenance activities that

should be performed in the current year but, due to insufficient funds, are put off until a later year. The larger the inflation rate, the less preventative maintenance and rehabilitation can be performed on the streets and the more gets moved into the "deferred maintenance" category. Figure 14 below illustrates overlay costs over the last decade. Since 2005, the cost of asphalt has risen significantly. The increased price in asphalt affects the overall overlay project costs.

Figure 14. Overlay Costs

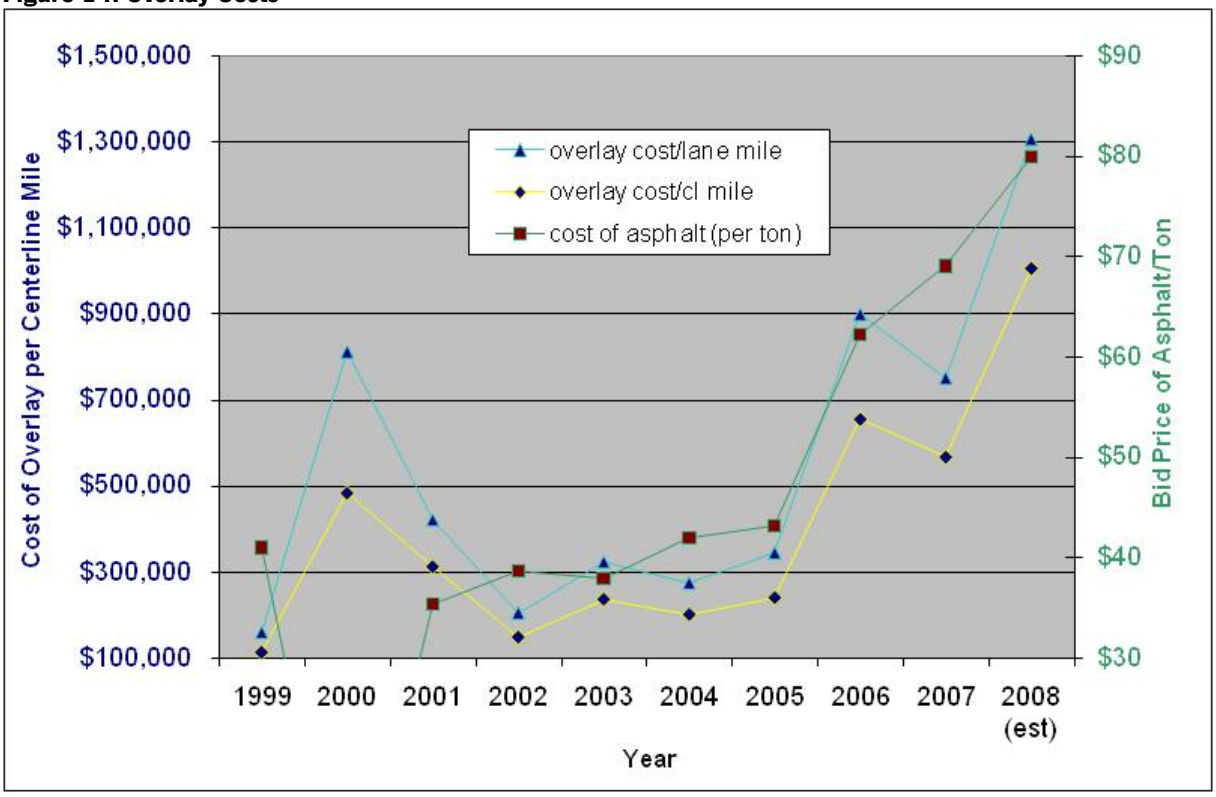


Figure 12 illustrates the current condition of the City's street network compared to the condition of the network in 2001 and 2004. Since 2001, a larger percentage of streets moved into the "Very Good" and Excellent" condition categories, however more streets slipped into the "Poor" and "Very Poor" condition.

Figure 12. Pavement Condition Summary Percent of Total Network

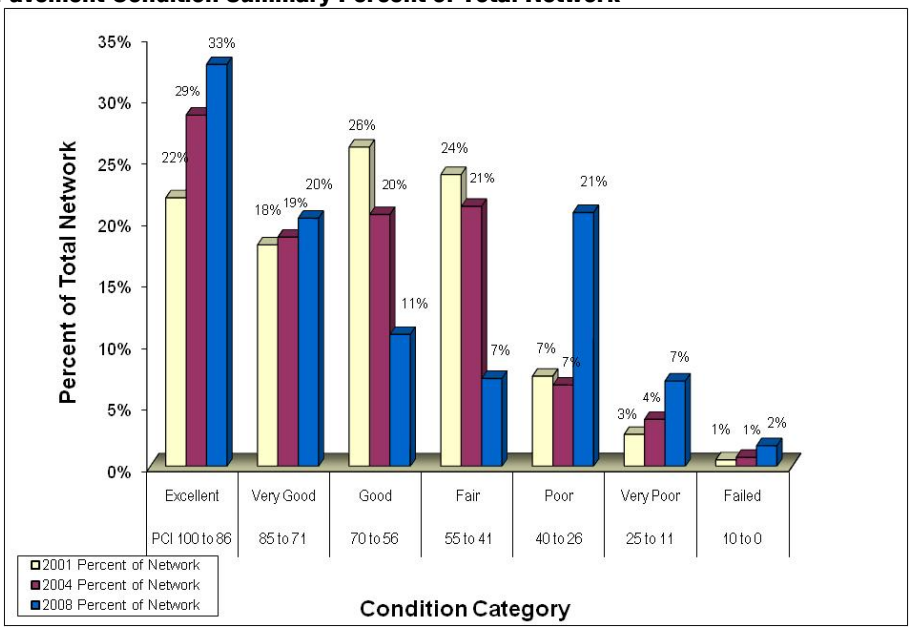


Figure 13 illustrates the average pavement condition for each street functional classification and how it has changed over the last two surveys in 2004 and 2001. By paving some of the minor arterials including State Street, NE 70th Street and portions of 132nd Ave NE over the last few years, the Street Preservation Program has been able to increase the PCI of the minor arterial street classification. However the major arterial street classification, which in 2001 and 2004 was in the bottom end of the "Good" condition category has slipped into the "Fair" condition category, despite recent paving of portions of NE 124th Street in 2008. This is a good example of streets that are hitting the steep decline area shown in the "Pavement Life Cycle" figure (Figure 6 above). Table 2 shows the average condition rating for the City street network over the past several years.

Figure13. Pavement Condition by Functional Classification

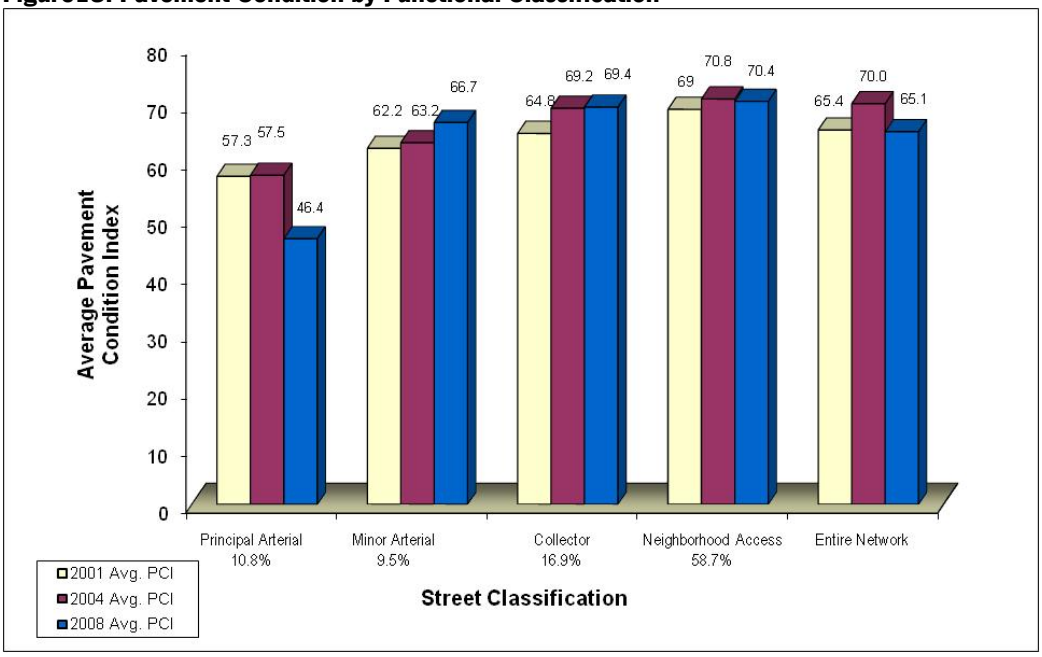


Table 2. Average Pavement Condition by Functional Classification, 1990-2008

	Overall Condition Index (OCI)*					PCI		
Street Functional Classification	1990	1992	1994	1997	1999	2001	2004	2008
Arterial	79	84	73	66	69	57	60	55
Collector	81	83	79	71	75	62	69	69
Neighborhood Access	81	85	67	74	78	71	71	70
Street Preservation Budget	$210K	$500K	$800K	$850K	$850K	$750K	$1.4M	$1.8M

** Prior to 2001, the City used a PMS that calculated pavement condition in a different manner than that currently used. A discussion of various PMS condition indices appears later in this report.*

Attachments B and C consist of two maps of pavement ratings for all the City of Kirkland streets. The first map (Attachment B) shows the ratings from 2004 and second map (Attachment C) shows ratings from 2008. As you can see there is more orange and yellow on the 2008 map than there is on the 2004. The changes in colors represent the overall decline in PCI. Between the 2004 survey and 2008 survey there have been many factors that have influenced our Street Preservation Program. A few of those factors are described in detail below.

Paver Purchase – As mentioned above, in 2005 Council approved the purchase of a paver. The paver has been a useful asset to the street department and to the overall street preservation project. Since the paver was purchased, the street department has completed a number of in-house projects, a few of which are listed below (Table 3). One of the most notable projects in which the street department utilizes the new paver is structural patching of most streets identified for overlay in the Annual Street Preservation Project. Having the structural patching completed prior to the overlay contractor paving saves time and money from the Street Preservation Project.

Figure 15. Waverly Park Parking Lot

Table 3. In-House Paving Projects Completed Since Paver Purchase

Location	Description	Year
12th Ave btwn. Market St & 1st St.	Half-street Overlay	2005
City-Wide	Structural Patching on Overlay Streets	2006-2008
112th Ave NE	Asphalt Sidewalk	2006
122nd Ave NE	Asphalt Sidewalk/Path	2006
NE 120th St @ 106th Ave NE	Half-street overlay	2008

130th Ave NE @ NE 87th St	Paving of Cul-De-Sac	2008
Waverly Park Parking Lot	2" Repave of Parking Lot	2008

Annual Sidewalk Maintenance Project – in the 2006-2011 CIP the Annual Sidewalk Maintenance project was created to help address the aging and failing sidewalk panels throughout the City. Over time, as more broken and offset panels are replaced, we anticipate seeing a reduction in the amount of damaged sidewalk that will require repairs as part of the Annual Street Preservation Project.

Pavement Maintenance Funding

The average pavement condition, centerline miles, and annual pavement maintenance budget for other local cities are listed in Table 4 (below).

Table 4. Comparison of Street Preservation Programs

City	Centerline Miles	Lane Miles	PCI [1]	OCI [2]	Pavement Maintenance Budget
Kirkland	147	355	65		$1,800,000
Redmond	135	332		85	$1,000,000
Bellevue	390	942		83	$5,500,000
Bothell	118	264	68		$630,000
Olympia	206	500	78		$2,025,000

1. Bothell and Olympia calculates the PCI similar to Kirkland

2. Bellevue and Redmond use a PMS that produces a different score, called the "Overall Condition Index"

When comparing pavement condition between cities, it is important to note that there is a great deal of variability in these ratings. While the condition index produced by a PMS is valuable for tracking an agency's performance over time, it isn't necessarily an accurate method for comparing performance *between* agencies. One obvious problem with comparing condition scores is that the street networks vary drastically from agency to agency. In particular, some agencies have more land development activity and therefore have newer roads. Also, the traffic volumes and percentage of trucks and buses vary in each jurisdiction. Another difficulty in comparing with other cities arises from the lack of standardization among pavement management systems, for example:

- The various PMS platforms used by area agencies use different algorithms for calculating the condition index
- Agencies may rate their pavements based only on a single "predominant" distress observed, or as Kirkland does, the rating can be based on the percentage and severity of all distresses present
- Each agency may modify the weight given to certain distresses when computing overall condition index

Impacts of Future Funding Levels

Using inputs developed by the City's engineering staff and consultant, the PMS can predict the effects of different budget scenarios on the PCI and deferred maintenance. By examining the effects on these indicators, the advantages and disadvantages of different funding levels and maintenance strategies become clear.

The following ten-year budget scenarios were analyzed:

Scenario 1: 2009-2014 CIP Budget ($24.5M)
This scenario uses the proposed 2009-2014 CIP budget and the current Street Maintenance Operating budget over the ten (10) year planning horizon (2009-2018). With this scenario it assumes an average of $400,000 of the Street Maintenance Operating budget is allocated for routine and preventative maintenance.

Scenario 2: Maintain Current PCI of 65 ($60M)
This scenario identifies the minimum funding level required to maintain the average network PCI at the current level of 65 over the next ten years.

Scenario 3: Increase Current PCI to 70 ($77M)
This scenario identifies the minimum funding level required to increase the average network PCI from its current level of 65 to 70 over the next ten years.

Scenario 4: No Increase in Deferred Maintenance ($94M)
This scenario identifies the minimum funding level required to keep the deferred maintenance at current levels over the next ten years.

Scenario 5: Budget Needs Analysis ($240M)
This scenario identifies annual funding levels needed to achieve a desired performance level—in this case a street network average PCI of 85 is considered optimal. Deferred maintenance in this scenario would be zero.

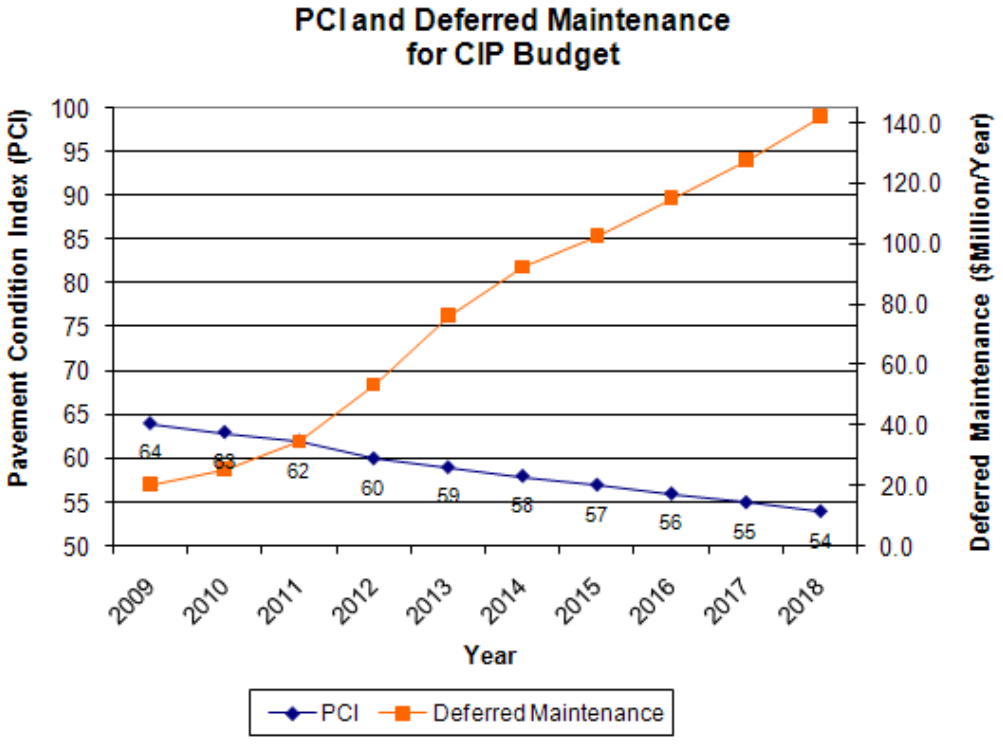
Each one of these scenarios used the updated inflation rate of 11%. The results of these scenarios are shown in detail on pages 16-20. A summary of the five scenarios is shown on page 21.

Scenario 1: CIP Budget (2009-2014 CIP)
($24.5 Million / 10 years; 11% Inflation)

This scenario includes the 2009-2014 CIP and a portion of the Street Maintenance Operating Budget. The CIP accounts for an annual budget of $2,000,000*, and it is estimated that $200,000 of that budget will be used to fund a slurry seal program (preventitve maintenance). In addition to the 2.0 M, an average of $400,000 of the Street Maintenance Operating budget is allocated for routine & preventive maintenance. (*In 2011 the proposed CIP budget is $2,500,000.)

Summary of Results

Year	Budget ($)	Rehabilitation ($)	Preventive Maintenance ($)	Deferred Maintenance ($)	PCI
2009	2,400,000	1,800,000	600,000	20,300,000	64
2010	2,400,000	1,800,000	600,000	25,600,000	63
2011	2,900,000	2,300,000	600,000	34,500,000	62
2012	2,400,000	1,800,000	600,000	53,300,000	60
2013	2,400,000	1,800,000	600,000	76,000,000	59
2014	2,400,000	1,800,000	600,000	92,200,000	58
2015	2,400,000	1,800,000	600,000	102,700,000	57
2016	2,400,000	1,800,000	600,000	115,000,000	56
2017	2,400,000	1,800,000	600,000	127,500,000	55
2018	2,400,000	1,800,000	600,000	142,100,000	54
	$24,500,000	10 Year Total			



Conclusion:

The average network PCI degrades to 54 and the deferred maintenance costs increase to over $142 million.

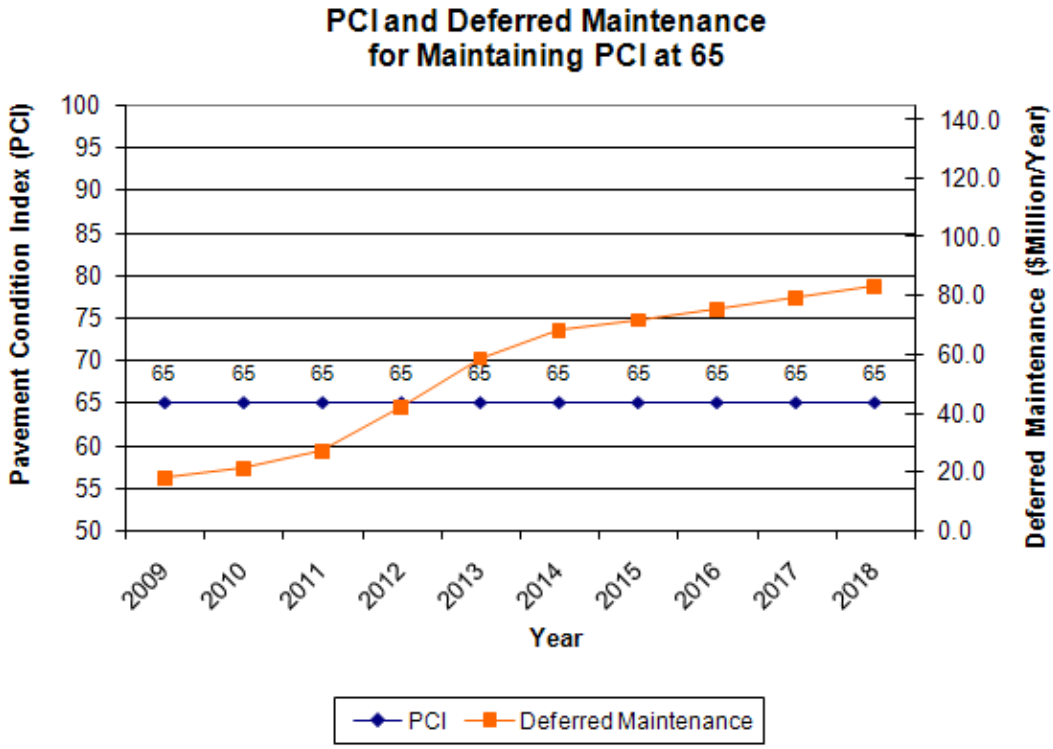
Scenario 2: Maintain PCI at 65

($60 Million / 10 years; 11% Inflation Rate)

This scenario is the budget needed to increase the current PCI to 70. Annual preventive maintenance is assumed at 5% of the total budget.

Summary of Results

Year	Budget ($)	Rehabilitation ($)	Preventive Maintenance ($)	Deferred Maintenance ($)	PCI with Treatment
2009	5,000,000	4,750,000	250,000	17,700,000	65
2010	5,000,000	4,750,000	250,000	21,000,000	65
2011	5,500,000	5,225,000	275,000	27,100,000	65
2012	5,500,000	5,225,000	275,000	42,100,000	65
2013	6,500,000	6,175,000	325,000	58,600,000	65
2014	6,500,000	6,175,000	325,000	68,300,000	65
2015	6,500,000	6,175,000	325,000	71,700,000	65
2016	6,500,000	6,175,000	325,000	75,200,000	65
2017	6,500,000	6,175,000	325,000	79,100,000	65
2018	6,500,000	6,175,000	325,000	83,300,000	65
	$60,000,000	10 Year Total			



Conclusion:

The average network PCI is maintained at 65 over 10 years and the deferred maintenance costs increase to over $83 million.

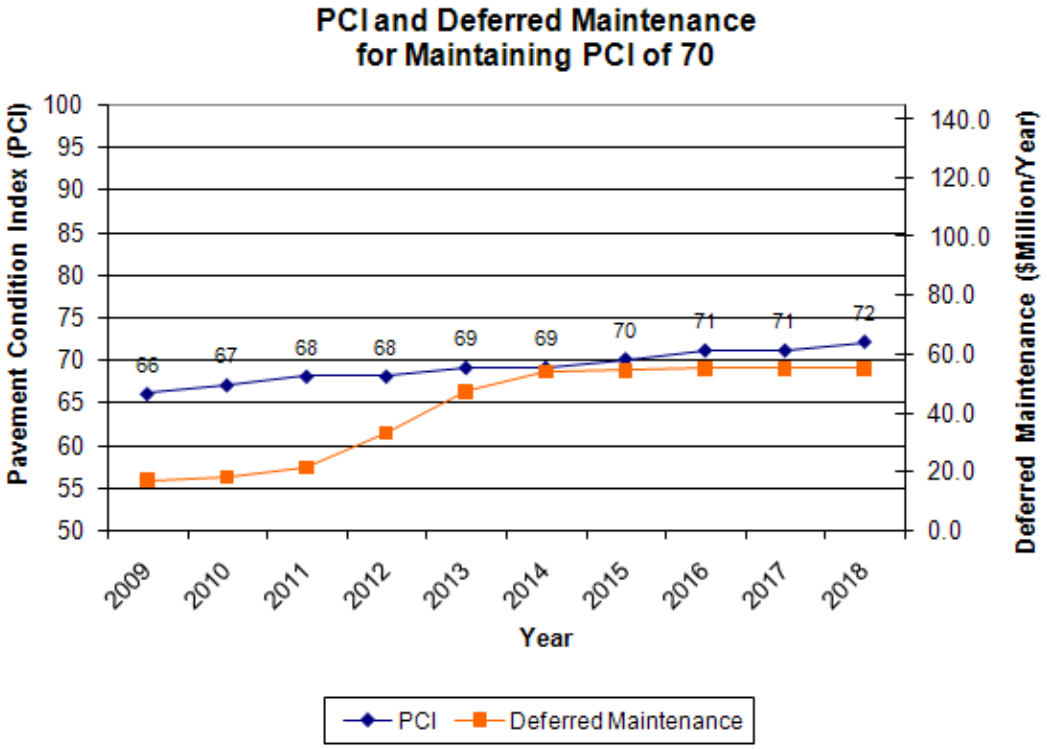
Scenario 3: Increase PCI to 70

($77 Million / 10 years; 11% Inflation Rate)

This scenario is the budget needed to increase the current PCI to 70. Annual preventive maintenance is assumed at $370,000.

Summary of Results

Year	Budget ($)	Rehabilitation ($)	Preventive Maintenance ($)	Deferred Maintenance ($)	PCI with Treatment
2009	6,000,000	5,630,000	370,000	16,700,000	66
2010	7,000,000	6,630,000	370,000	17,800,000	67
2011	8,000,000	7,630,000	370,000	21,200,000	68
2012	8,000,000	7,630,000	370,000	33,100,000	68
2013	8,000,000	7,630,000	370,000	47,100,000	69
2014	8,000,000	7,630,000	370,000	54,100,000	69
2015	8,000,000	7,630,000	370,000	54,600,000	70
2016	8,000,000	7,630,000	370,000	54,900,000	71
2017	8,000,000	7,630,000	370,000	55,100,000	71
2018	8,000,000	7,630,000	370,000	55,200,000	72
	$77,000,000	10 Year Total			



Conclusion:

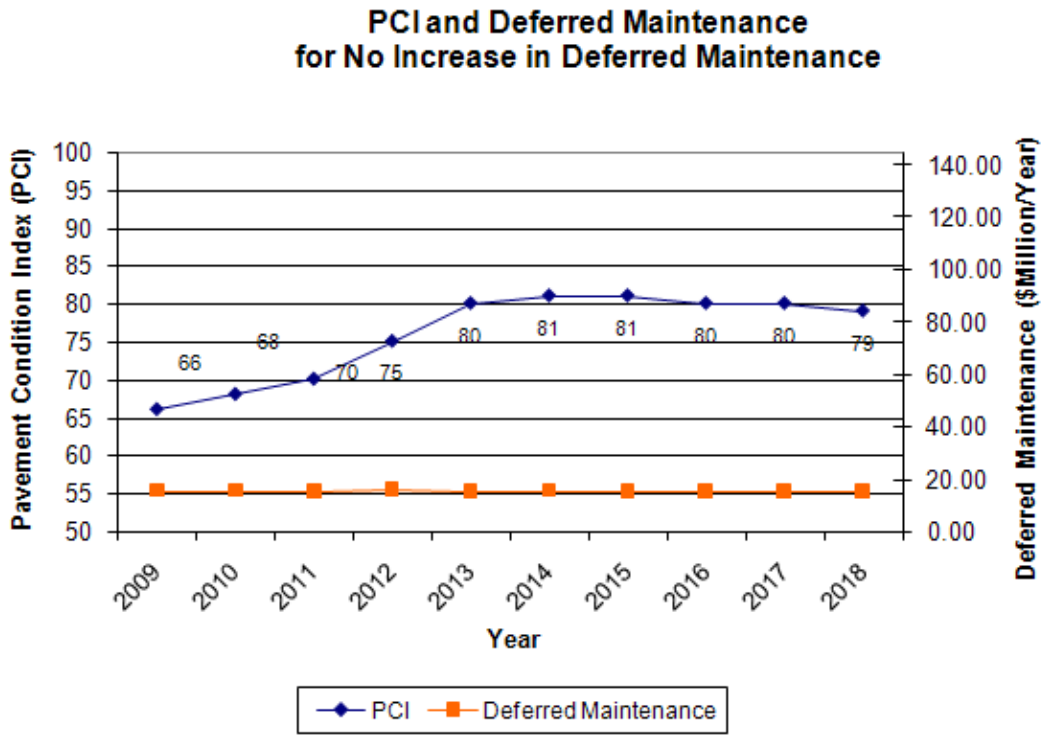
The average network PCI increases to 70 over 10 years and the deferred maintenance costs increase to over $55 million.

Scenario 4: No Increase in Deferred Maintenance
($94 Million / 10 years; 11% Inflation Rate)

This scenario is the budget needed to keep deferred maintenance from increasing over ten years. Annual preventive maintenance is assumed at 5% of the total budget.

Summary of Results

Year	Budget ($)	Rehabilitation ($)	Preventive Maintenance ($)	Deferred Maintenance ($)	PCI
2009	7,000,000	6,650,000	350,000	15,700,000	66
2010	8,000,000	7,600,000	400,000	15,700,000	68
2011	11,500,000	10,925,000	575,000	15,300,000	70
2012	18,500,000	17,575,000	925,000	16,100,000	75
2013	21,000,000	19,950,000	1,050,000	15,300,000	80
2014	11,000,000	10,450,000	550,000	15,700,000	81
2015	4,500,000	4,275,000	225,000	15,500,000	81
2016	4,000,000	3,800,000	200,000	15,600,000	80
2017	4,000,000	3,800,000	200,000	15,400,000	80
2018	4,500,000	4,275,000	225,000	15,500,000	79
	$94,000,000	10 Year Total			



Conclusion:

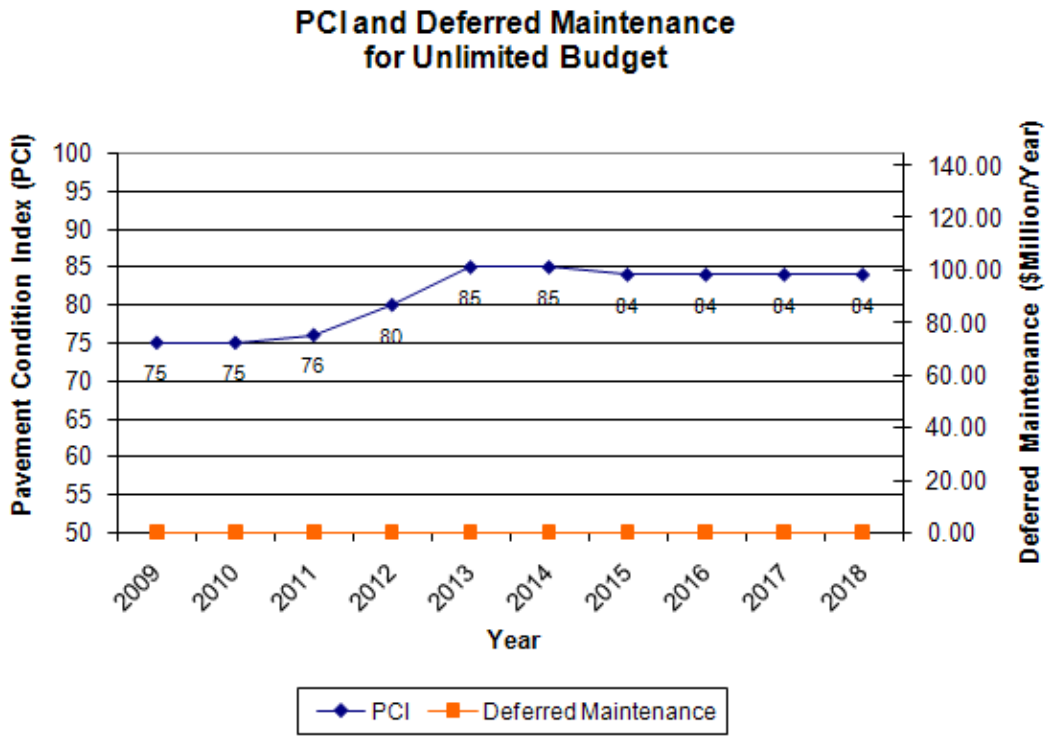
The deferred maintenance costs is maintained at $15.5 million over 10 years and the average network PCI increases to 79.

Scenario 5: Budget Needs Analysis
($240 Million / 10 years; 11% Inflation Rate)

This pavement network *needs* analysis uses the City's defined maintenance strategies to recommend a budget for reaching and maintaining a target PCI of 85.

Summary of Results

Year	Budget ($)	Rehabilitation ($)	Preventive Maintenance ($)	Deferred Maintenance ($)	PCI
2009	24,000,000	24,000,000	0	0	75
2010	24,000,000	24,000,000	0	0	75
2011	24,000,000	24,000,000	0	0	76
2012	24,000,000	24,000,000	0	0	80
2013	24,000,000	24,000,000	0	0	85
2014	24,000,000	24,000,000	0	0	85
2015	24,000,000	24,000,000	0	0	84
2016	24,000,000	24,000,000	0	0	84
2017	24,000,000	24,000,000	0	0	84
2018	24,000,000	24,000,000	0	0	84
	$240,000,000	10 Year Total			



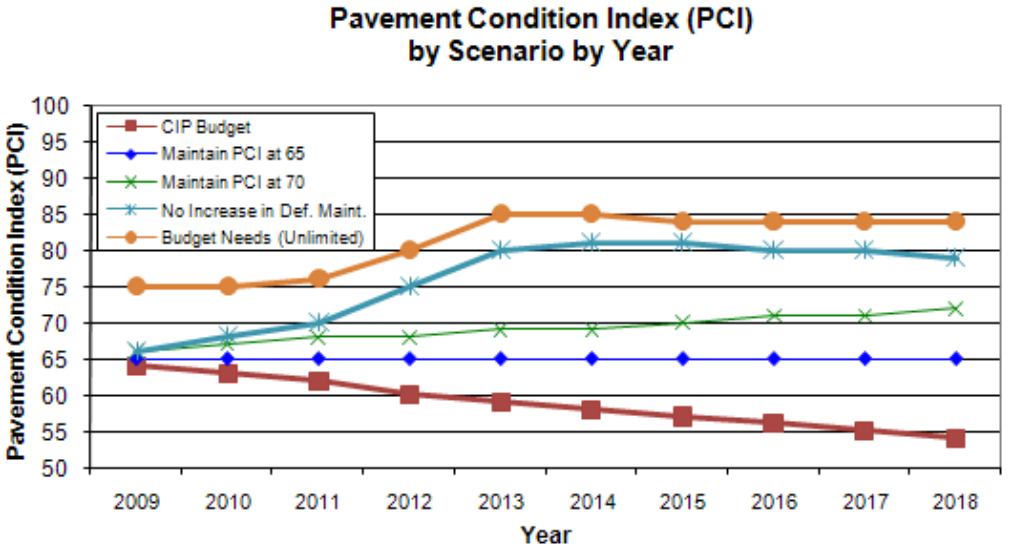
Conclusion:

The average network PCI reaches 85 after 5 years and the deferred maintenance becomes zero.

Comparison of Scenarios

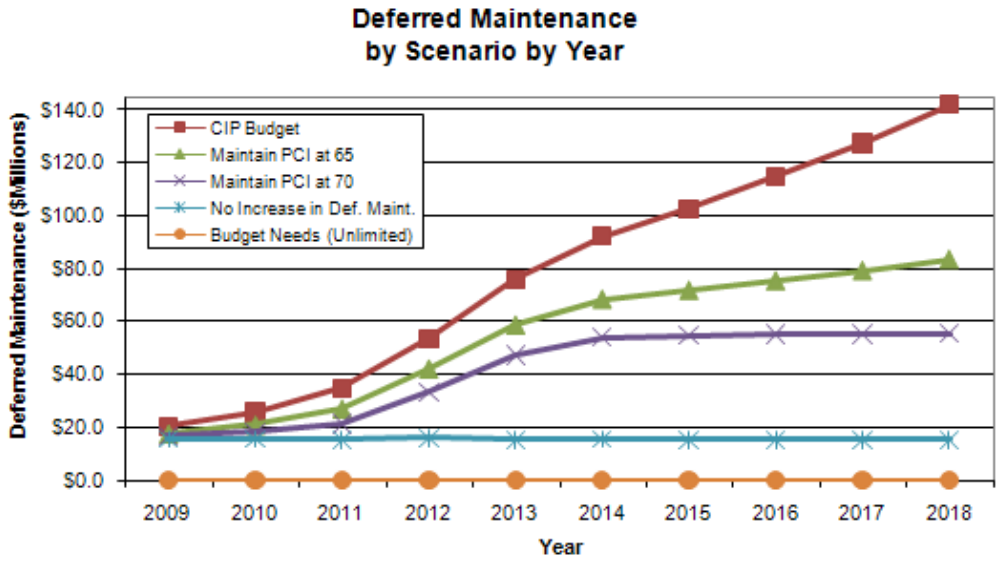
Pavement Condition Index (PCI)

The figure below illustrates the change in PCI over 10 years for each budget scenario. With unlimited funding ("Budget Needs" scenario), the pavement network reaches an optimal PCI of 85 after 5 years. The current budget projects a decrease in the network PCI over the 10 year period.



Deferred Maintenance

The figure below illustrates the deferred maintenance accumulated over 10 years for each budget scenario. With unlimited funding, the deferred maintenance is zero. The deferred maintenance with the other scenarios, increases dramatically after 2011.



Conclusions

The results of the 2008 pavement condition survey indicate a need for additional funding in order to maintain the condition of Kirkland's street network. The existing funding level will result in a rapid decline in the performance of the street network.

Another important factor revealed in the 2004 condition survey and reiterated by the 2008 condition survey is that, as shown in Figure 13, the City's streets with the highest traffic volumes also have the lowest PCIs. Over the last few years some of these higher traffic volume streets have been rehabilitated in effort to avoid more costly repairs later (for example NE 70th Street and 132nd Ave NE in 2007, and portions of NE 124th Street in 2008). However, many of these streets still require rehabilitation in the next few years in order to maintain mobility and safety standards. These streets in general are more costly perform maintenances activities on due to increase traffic control, limited working days and hours, and more coordination with residences, businesses, other utilities and agencies (e.g. WSDOT).

The current budget scenarios run used a more representative inflation rate of 11%. Due to the larger inflation rate, it becomes more and more difficult with realistic funding to maintain the current PCI. The larger inflation rate also results in an increased amount of deferred maintenance because each year, less maintenance can be performed due to the decreased value of the dollar.

The annual street preservation budget of $24.5 million over 10 years will result in a 17% decrease (from 65 to 54) in the average network Pavement Condition Index.

Appendices

Glossary

Asphalt Concrete	A mixture of aggregate (rock) and asphalt binder compacted into a uniform layer.
Crack Seal	A preventive maintenance remedy where pavement cracks are sealed to prevent damage to the underlying structure of the roadway due to water infiltration.
Deferred Maintenance	Maintenance activity which, as identified by stated maintenance strategy should be carried in the current year, but is not funded. The maintenance activity therefore gets "differed" to a later year.
Grinding	Process performed in preparation for an overlay that removes the top layer of asphalt concrete to create a smooth transition to existing gutter or adjacent pavement or to remove shallow cracks from thick asphalt concrete. Also referred to as "milling" or "planing".
Overlay	Rehabilitative maintenance remedy that involves placement of a 1.5" to 2" layer of asphalt concrete pavement over the top of the existing roadway. Work includes structural patching and grinding as needed. Also referred to as "resurfacing".
Pavement Condition Index (PCI)	An objective measurement of pavement grade or condition based on established criteria including cracking, rutting, weathering, and patching.
Pavement Management System (PMS)	A systematic process that provides, analyzes, and summarizes pavement information for use in selecting and implementing cost-effective pavement construction, rehabilitation, and maintenance programs.
Preventive Maintenance	Maintenance activity performed on streets that are in good condition. Remedies, which include crack sealing and slurry sealing, are intended to extend the pavement life by protecting the existing pavement structure.
Reconstruct	Construction of the equivalent of a new pavement structure which usually involves complete removal and replacement of an existing pavement structure including new and/or recycled materials.
Rehabilitate	Pavement rehabilitation is required to extend the useful life of the existing pavement structure. The prevailing rehabilitative remedy

used in Kirkland is an asphalt overlay. The lowest life cycle cost is obtained by rehabilitating the pavement in the early stages of distress to reduce the need for extensive pavement repair and thicker overlays.

Routine Maintenance Regular day-to-day maintenance, performed by City forces, intended to preserve pavement in adequate operating condition.

Slurry Seal A pavement maintenance remedy in which liquid or emulsified asphalt is mixed with suitable aggregate and applied to the pavement surface.

References

A Guide For Local Agency Pavement Managers, Washington State Department of Transportation, December 1994.

Pavement Condition Report, City of Seattle Pavement Engineering & Maintenance Section, June 8, 2004.

Pavement Interactive Website, http://www.pavementinteractive.org/index.php?title=Pavement_Interactive:About

Draft King County Report

Proposed Pavement Preservation Cost Estimating Methodology

A) Purpose

The purpose of this report is to inform and solicit comments from the King County Project Evaluation Committee (KCPEC) on the proposed methodology to develop a 30 year, planning level pavement preservation cost estimate for King County arterials and residential streets. This report also includes example worksheets showing how the methodology is used to develop a pavement preservation cost estimate. Finally, using the proposed methodology described in this report and for discussion purposes only, an example King County pavement preservation cost estimate is provided. The PSRC is interested in using this effort by KCPEC to better estimate pavement preservation needs in Transportation 2040. Rather than relying on the programmatic estimates used in the previous regional transportation plan, the PSRC would like to use a data based effort built on available pavement condition information to estimate regional preservation needs.

B) Summary of Results

Using the proposed methodology suggested in this report, it is estimated that it will cost King County local jurisdictions at least $3 billion to preserve their existing arterials and residential streets during the 30 year time span of Transportation 2040. The estimated cost only includes pavement preservation needs and does not include sidewalk improvements, intersection improvements and bridge preservation costs. The PSRC's 2007 Destination 2030 update estimated that King County local jurisdictions preservation needs at about $2.6 billion between 2007 and 2030.

The KCPEC estimate is based on a two phased, pavement preservation strategy. Phase one includes pavement preservation projects to bring all local jurisdiction federal functional classified arterials up to a PCI 100 level. In addition, it is assumed that local jurisdictions will provide at least a thin overlay ("repair" pavement preservation project category) to the approximately 10,000 lane miles of residential streets in King County. Phase two assumes that local jurisdictions will have to revisit their arterials with at least a thin overlay or "repair" pavement preservation project after Phase one projects. Because of the low traffic and truck volumes on residential streets, Phase two assumes that there will be no additional pavement preservation projects on residential streets.

C) Background

Over the past five years, city and county public works staff has met regularly to discuss local transportation needs. In 2007, a concerted effort was made to compile local needs based on information in local adopted Six Year Transportation Improvement Programs. This was shared with the Public Works Directors in a draft report titled, *"Local Transportation Funding Needs in King County"* which included local project lists. The public works directors agreed that the report was a good beginning, but it did not show the

complete transportation needs picture. They specifically asked King County staff to work with the King County Project Evaluation Committee (KCPEC) to discuss how to better describe the extent of local transportation needs, including pavement preservation needs. Local transportation needs are often underreported; this leads to misunderstandings by agencies and elected officials about the true extent of our transportation problems. This can also negatively impact the amount of funding that is made available to address these needs. This, in turn, increases the financial burden on local governments which are attempting to maintain their infrastructure while providing transportation improvements to support growth.

KCPEC members concluded that it was necessary to have accurate and up-to-date local transportation needs information to help decision makers understand the magnitude of the local transportation funding challenges, provide input for updating PSRC's regional transportation plan, and provide useful information for the upcoming the PSRC grant process. KCPEC asked for updated local transportation needs that included a request that King County staff develop a data based, planning level methodology to estimate King County pavement preservation needs.

The following discussion outlines a planning level, pavement preservation cost estimating methodology that can be use to develop a regional pavement preservation cost estimate.

D) Developing a Planning Level Pavement Preservation Cost Estimating Methodology for King County Arterials and Residential Streets

The following information was used to develop a regional pavement preservation cost estimate for King County arterials and residential streets:

1. Pavement condition index (PCI) information for King County cities, and unincorporated King County federal functional classified arterials.
2. Pavement preservation project categories and associated PCI ranges.
3. Per square yard costs for the pavement preservation project categories.
4. A methodology to calculate a regional pavement preservation cost using the PCI, project descriptions and average per unit cost for pavement preservation project categories.

1. Pavement Condition Index

The proposed pavement preservation methodology is based on pavement condition index (PCI) information provided by the Washington State Department of Transportation (WSDOT). A PCI is based on a visual survey of the pavement and a numerical value between 0 and 100 and defines the pavement condition with 100 representing an excellent pavement. In April 2003 the legislature passed the transportation efficiencies bill. This legislation established planning and efficiency goals for the state and local transportation network. Among the provisions of the bill, there is a requirement for cities to report pavement condition data for their arterials beginning with the 2003-2005 biennium (RCW 46.68.113).

To meet this reporting requirement WSDOT's Highways & Local Programs (H&LP), working in partnership with the Association of Washington Cities, established a split between large and small cities based on a population threshold of 22,500. This is the threshold at which the large cities assume a greater maintenance responsibility for city streets that are also state highways. It was determined that large cities had sufficient resources to survey their street networks and report the results while small cities would need assistance to accomplish this reporting requirement. To assist the small cities, H&LP arranged with the WSDOT Materials Laboratory to use their automated data collection van to survey the state's small cities and forward the results of the survey to H&LP for analysis and reporting.

King County staff obtained the state's latest King County PCI cities data from WSDOT's 2007 biennial Arterials Condition Report. King County Roads Division provided PCI information for unincorporated King County arterials. King County is waiting for segment detail from one more jurisdiction to complete its analysis for that city.

2. Pavement Preservation Project Categories

The following table shows the pavement preservation project categories and the associated PCI ranges for each category. It should be understood that the PCI is a visual assessment of roadway conditions based upon the failure modes that a technician can see on the surface and may not accurately indicate the condition of the underlying base of the pavement structure. However, for the purposes of estimating future roadway preservation costs, the PCI rating is the most scientific basis we have available for condition assessment without expending considerable additional costs to perform more detailed estimates.

An arterial with a PCI score below 50 indicate that the arterial may be a candidate for rehabilitation or reconstruction. This arterial may require additional pavement testing to determine the subsurface condition of the roadway where it is apparent that underlying sub-grades are not supporting the flexible pavement. For the purposes of this planning level estimate, however, using the PCI will provide a more accurate and scientific basis for indication of the condition of a roadway. This information, coupled with the actual bidding experience from jurisdictions that provided cost data for each type of project category, will allow us to gain a more complete and accurate summary of the needs of the system within the County.

Table 1. Pavement Preservation Project Categories and PCI Ranges

Project Categories	Project Description	PCI Range
Routine Maintenance	**Routine maintenance** activities are performed to maintain a safe traffic condition and include pothole patching, patching around utility structures, and crack sealing. Routine maintenance is often reactive to calls or reports by street maintenance crews with the goal of keeping the roadway driving surface safe.	71-100
Repair	**Repair** activities are performed to preserve or extend the life of an existing pavement structure that is deemed structurally sound. This work when done within the initial 10 year life of a new pavement helps to prevent potholes from occurring. These activities may mean placing a new surface (2 inches or less) on an existing road way to provide a better all weather surfaces, a better riding surface, and to extend or renew the pavement life. It can also be deep patching or spot repairs, pre-leveling of ruts, crack sealing, and seal coatings.	50-70
Rehabilitation	Indicates that the road way segment maybe a candidate for **rehabilitation** work generally consists of the preparatory work activities and either thin or thick overlay. Rehab is appropriate when only a small percentage of the roadway segment is damaged. Preparatory work is that work essential to assure the integrity of the foundation of the roadbed to support a flexible pavement and to assure a smooth riding surface once the overlay is done. Preparatory work may involve digging out defective asphalt, base and sub base. A rehab project typically extends the roadway life between 10 – 15 years.	25 - 49
Reconstruction	Indicates that the road way segment may be a candidate for **reconstruction** when a majority of the pavement or underlying base course has failed and can no longer serve as competent foundation for flexible pavements like asphalt. A rebuild typically extends the life of a roadway between 20-25 years.	Less than 25

3. Pavement Preservation Project per Unit Cost Averages

The following table shows the per square yard unit costs for the four pavement preservation project categories from responding jurisdictions. Using this information, an average cost for each category was developed. It should be noted that these cost represent only the pavement portion of the roadway and does not include costs associated with sidewalks and intersection improvements.

Table 2. Project Categories, Per Square Yard Cost Estimates

Preservation Projects	Bothell	Auburn	Seattle	Renton	Kent	King County	Issaquah	Bellevue	Kirkland	Average
Routine Maintenance	$1.84	$2.80	$1.18	$2.30	$1.75	$4.03	$0.46	*	*	$2.05
Repair	$15.00	$10.00	$83.00	$16.00	$12.50	$18.00	$11.00	$29.97	*	$20.69
Rehabilita-tion	$35.00	$35.00	$162.50	$23.00	$36.00	$56.00	$23.00	*	$26.30	$46.31
Reconstruc-tion	$115.00	$154.00	$205.00	*	$123.00	$133.00	*	*	*	146.00

* Information not provided

4. Calculating Pavement Preservation Costs for Federal Functional Classified Principal, Minor and Collector Arterials in Large and Small Cities

Large City Arterials: Information on pavement width and segment length is included in the large cities' PCI reports. The following is an example of the methodology used to calculate a square yard cost for a large city preservation project for a large city:

1. (Pavement width) x (segment length) = Square feet of segment length.
2. (Square feet of segment length)/9 = Number of square yards of segment.
3. (Number of square yards of segment) x (Average per unit cost of preservation project) = Project cost for segment.

Small City Arterials: Information on the pavement width and the number of lanes is not provided for small cities, only the centerline feet length is provided. For small cities, a cost per lane mile is used to determine preservation project cost. The following is the methodology used to calculate preservation project cost per lane mile:

1. (Average lane width (12 feet)) x 5280 feet = 63,360 square feet per lane mile.
2. (63,360 square feet per lane mile)/9 = 7040 square yards per lane mile.
3. (7040 square yards per lane mile) x (Average per unit cost of preservation project) = Lane mile cost.
4. (Average lane mile cost x Lane Miles) x (Number of lanes per arterial segment) = Project cost per segment[1].

Calculating Preservation Cost for Local Roads: There is no PCI information for most of the local roads in King County. While local roads carry relatively low traffic volumes from neighborhoods to the arterial system, it is assumed that jurisdictions will probably have to "repair" these local roads at least once during the 30 years (the time span for Transportation 2040). The local road lane miles for King County jurisdictions and in unincorporated King County is estimated at 10,000 lane miles. The total calculated cost to preserve local roads is:

- 7040 square yards per lane mile x average pavement preservation cost = Repair cost per lane mile
- (Local Lane Miles) x (Cost per lane mile) = Local Lane mile improvement cost.

E) Developing a 30 year Planning Level Pavement Preservation Cost Estimate King County Arterials and Residential Streets

The following two phased strategy was used to calculate a 30 year planning level pavement preservation cost estimate for King County arterials and residential streets (see Table 3).

Phase One

Phase one pavement preservation strategy for arterials and residential streets:

[1] Information on the number of lanes per arterial is not provided for small cities, this calculation assumes five lanes for principal arterials, three lanes for minor arterials, two lanes for collector arterials

- Identify PCI for federal functional classified principal, minor and collector arterials. Based in the PCI, determine the appropriate pavement preservation project category and cost needed to bring that arterial to a PCI 100 level. (Attachment A shows an example work sheet to determine pavement preservation costs for a large city with a population over 22,500. Attachment B shows an example work sheet to determine pavement preservation costs for a small city with a population less than 22,500)
- Assume that jurisdictions will apply a thin overlay (pavement preservation project category "repair") on their residential streets at least once during the next 30 years.

Based on this methodology, it will cost approximately **$2.2 billion** (2007 dollars) to bring King County arterials and residential streets up to excellent condition (PCI 100).

Phase Two

Phase two pavement preservation strategy for arterials and residential streets:

- After the completion of Phase 1, it is assumed that King County jurisdictions will have to revisit their arterials with at least one more round of "repair" pavement preservation projects during the 30 year timeframe of the regional plan. Phase 2 is estimated to cost King County jurisdictions another **$804 million** (2007 dollars).
- It is assumed that because of the light traffic volumes on residential streets, jurisdictions will not have to overlay their residential streets in Phase 2.

F) Analysis

Based on the proposed KCPEC methodology and the basic 30 year phased pavement preservation strategy, it is estimated that King County and its jurisdictions will need a minimum of **$3.0 billion** (2007 dollars) to preserve its arterials and residential streets during the 30 year span of Transportation 2040. This estimate does not include costs associated with sidewalk and intersection improvements, it also does not include bridge preservation costs. It should be noted that the purpose of Table 3 is to develop a planning level, pavement preservation cost estimate for the King County region. This information is provided to the KCPEC group to show how a regional cost estimate is proposed to be developed and should not be used as an indicator of actual city needs.

Staff reviewed PSRC worksheets that were used to develop local needs estimates for the 2007 Destination 2030 Update. According to the worksheets, the PSRC estimated King County local jurisdictions preservation needs at about **$2.6 billion** (2006 dollars) between 2007 and 2030. The PSRC information did not include bridge preservation as part of it $2.6 billion cost estimate. However, it is unclear if the PSRC's preservation numbers excluded sidewalk and intersection improvement cost as part of the overall preservation cost estimates.

It should also be noted that the $2.6 billion PSRC's preservation estimate does not include the preservation portion of, what the PSRC calls, "backlog" needs. According to PSRC staff, the backlog number was a product of a survey of cities and counties where the PSRC asked for specific information on costs to get assets up to some acceptable standard. This

number was assembled from all survey responses and missing values were estimated. The backlog information included a combined maintenance and preservation costs estimate and a separate capital project costs estimate. Staff was unable to separate out the backlog preservation number from the PSRC's maintenance and preservation backlog cost estimate.

Table 3. 30 Year Pavement Preservation Cost Estimate for King County Cities and Unincorporated King County.

	EXMPLE ONLY - 30 Year Pavement Preservation Needs						
	Phase 1					Phase 2	Totals
Jurisdiction	Cost Ests for Fed Functional Arterials Needing "Routine Maintenance" PCI 71 - 100	Cost Ests for Fed Functional Arterials Needing "Repair" PCI 50 - 70	Cost Ests for Fed Functional Arterials Needing "Rehab" PCI 25 - 49	Cost Ests for Fed Functional Arterials Needing "Reconstruction" PCI < 25	Cost Est. for "Repair" Cost for Residential Streets (non arterials)	"Repair" Project on Principal, Minor, & Collector Arterials	
Algona	$84,801	$911,943	$600,251	$0	$3,581,170	$2,035,354	$7,213,518
Auburn	$2,173,031	$6,336,993	$12,746,020	$59,520,842	$32,026,720	$40,021,138	$152,824,744
Beaux Arts	$5,487	$0	$0	$0	$713,322	$86,265	$805,075
Bellevue	$3,822,249	$6,150,224	$9,529,924	$11,629,143	$80,474,413	$50,632,665	$162,238,618
Black Diamond	$29,625	$1,573,569	$403,341	$0	$6,186,980	$2,052,498	$10,246,013
Bothell	$1,870,520	$5,777,292	$8,631,242	$5,002,009	$29,857,638	$29,220,894	$80,359,595
Burien	$471,102	$6,894,297	$2,670,523	$2,712,680	$25,606,818	$13,226,515	$51,581,934
Carnation	$0	$0	$0	$0	$2,110,852		$2,110,852
Clyde Hill	$67,643	$547,914	$287,011	$0	$4,512,856	$1,358,392	$6,773,817
Covington	$53,957	$1,699,776	$1,566,530	$0	$14,179,102	$2,943,530	$20,442,895
Des Moines	$411,697	$1,257,444	$1,457,849	$5,022,011	$24,517,910	$6,775,575	$39,442,485
Duvall	$56,476	$0	$0	$0	$9,593,458	$569,674	$10,219,608
Enumclaw	$121,082	$1,589,017	$3,051,356	$0	$13,247,416	$4,172,873	$22,181,744
Federal Way	$1,842,795	$3,263,606	$2,003,901	$508,404	$70,415,111	$22,829,686	$100,863,504
Hunts Point	$31,779	$0	$0	$0	$262,037	$320,559	$614,376
Issaquah	$537,914	$2,443,008	$2,891,130	$5,788,180	$44,735,505	$7,651,918	$64,047,654
Kenmore	$361,675	$1,654,411	$122,431	$0	$16,246,282	$4,156,701	$22,541,498
Kent	$4,483,737	$4,885,035	$6,156,889	$12,205,632	$69,760,019	$54,618,386	$152,109,699
Kirkland	$776,919	$10,608,342	$9,365,194	$7,358,773	$29,813,965	$23,676,477	$81,599,671
Lake Forest	$62,745	$758,556	$1,165,232	$0	$13,247,416	$3,823,543	$19,057,492
Maple Valley	$591,085	$368,178	$475,585	$0	$30,250,693	$2,993,428	$34,678,969
Medina	$111,216	$659,013	$0	$0	$2,591,253	$1,780,847	$5,142,328
Mercer Island	$107,784	$164,243	$342,848	$668,800	$15,591,190	$8,045,602	$24,920,467
Milton	$29,714	$1,389,617	$141,622	$4,645,155	$4,556,529	$2,410,482	$13,173,119
Newcastle	$81,346	$1,586,701	$3,800,910	$0	$9,608,016	$4,104,427	$19,181,400
Normandy Park	$84,568	$798,490	$1,612,105	$0	$6,987,648	$2,371,367	$11,854,177
Northbend	$39,961	$551,204	$1,429,075	$1,508,122	$5,721,137	$1,806,003	$11,055,501
Pacific	$39,510	$916,354	$2,597,895	$0	$4,047,013	$2,474,908	$10,075,680
Redmond	$2,090,295	$3,479,435	$5,290,645	$5,542,841	$27,251,827	$27,725,324	$71,380,368
Renton	$2,398,992	$6,670,313	$10,256,430	$36,198,510	$40,411,898	$40,594,642	$136,530,786
Sammamish	Waiting for info				$30,964,015	$0	$30,964,015
SeaTac	$656,480	$2,541,603	$4,372,549	$9,515,826	$15,198,134	$7,116,450	$39,401,043
Seattle	$11,144,499	$59,739,474	$91,136,881	$70,297,086	$354,267,931	$222,896,717	$809,482,587
Shoreline	$895,013	$2,222,359	$2,676,229	$7,967,836	$37,806,087	$13,580,249	$65,147,774
Skykomish	$2,867	$0	$89,187	$1,653,888	$567,746	$302,991	$2,616,680
Snoqualmie	$26,997	$23,298	$86,556	$1,830,003	$9,701,185	$593,457	$12,261,495
Tukwila	$385,263	$7,348,514	$4,802,773	$3,071,451	$12,184,711	$13,814,236	$41,606,948
Woodinville	$155,184	$1,700,766	$1,849,965	$8,872,381	$13,684,144	$5,348,779	$31,611,219
Yarrow Point	$10,810	$179,819	$149,365	$0	$815,226	$355,558	$1,510,779
Unincorp KC	$14,274,821	$14,375,050	$11,539,011	$83,597,996	$342,394,752	$175,388,948	$641,570,578
Totals	**$50,391,640**	**$161,065,859**	**$205,298,454**	**$345,117,569**	**$1,455,690,124**	**$803,877,058**	**$3,021,440,703**

$2,217,563,645

Table of Contents

ATTACHMENT B

N

Note: PCI data is based on 2004 pavement condition survey.

Legend

- City Limits
- Street

PCI

- 0 - 10 (Failed or No Data)
- 11 - 25 (Very Poor)
- 26 - 40 (Poor)
- 41 - 55 (Fair)
- 56 - 70 (Good)
- 71 - 85 (Very Good)
- 86 - 100 (Excellent)

City of Kirkland - Department of Public Works

Street Preservation Program

2004 Pavement Condition Ratings

0 1,000 2,000 4,000 Feet

1 inch equals 2,000 feet

REVISION DATE: October 8, 2008
\\SRV-FILE01\Data\Pw\Street Systems\SPP_PMS\PMS\State of the Streets\2008\2004 PCI Rating.mxd

ATTACHMENT C

N

Note: PCI data is based on 2008 pavement condition survey.

Legend

- City Limits
- Street

Pavement Condition Index

- 0 - 10 (Failed or No Data)
- 11 - 25 (Very Poor)
- 26 - 40 (Poor)
- 41 - 55 (Fair)
- 56 - 70 (Good)
- 71 - 85 (Very Good)
- 86 - 100 (Excellent)

City of Kirkland - Department of Public Works

Street Preservation Program

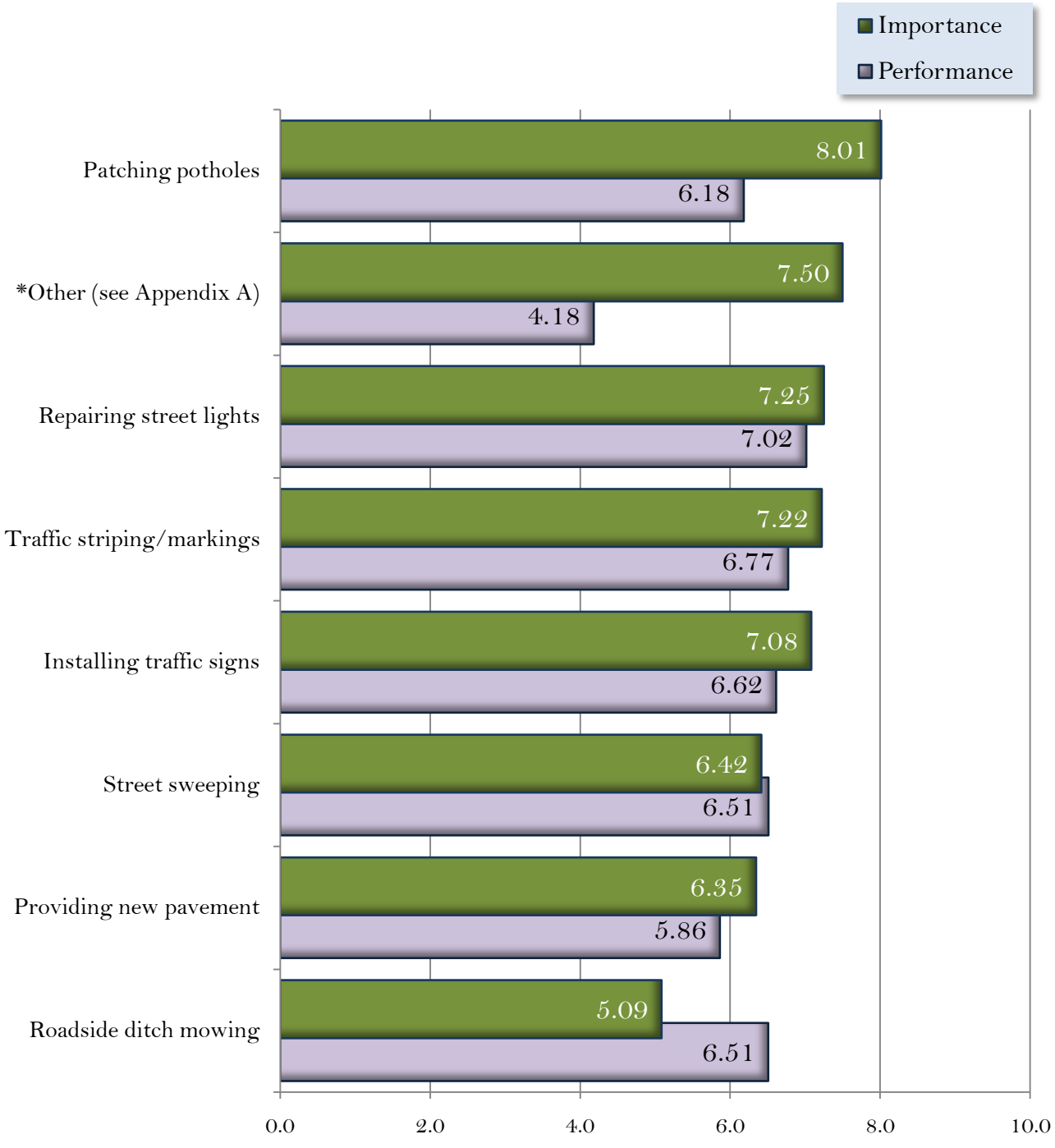
2008 Pavement Condition Ratings

0 1,000 2,000 4,000 Feet

1 inch equals 2,000 feet

REVISION DATE: October 8, 2008
\\SRV-FILE01\Data\Pw\Street Systems\SPP_PMS\PMS\State of the Streets\2008\2008 PCI Rating.mxd

Priorities Closely align with City Perfomance

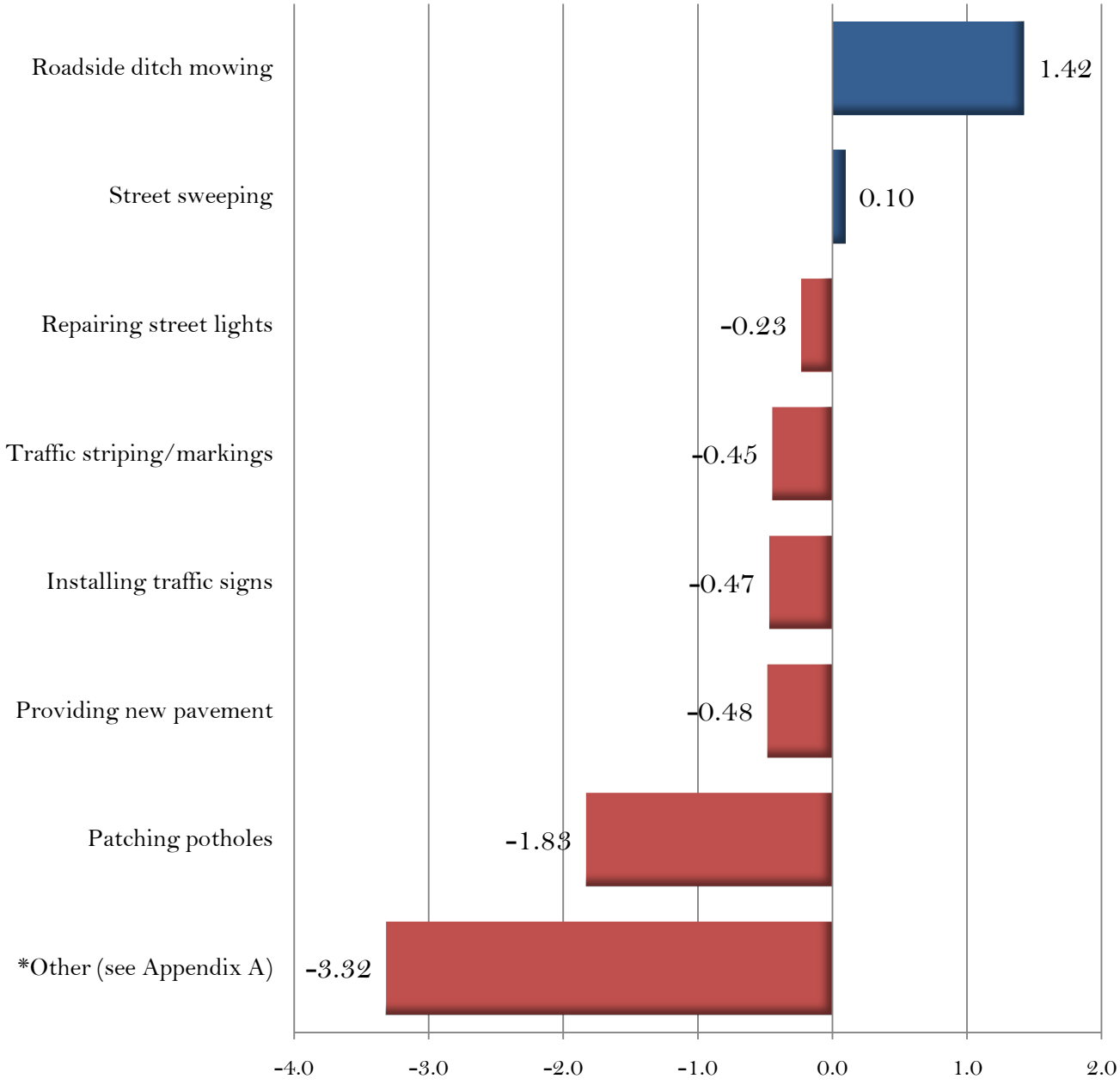


December 2008

*"Other " category does not allow direct comparison

Patching Potholes shows the greatest Gap

A *positive* Gap Score indicates that the City's performance rating is higher than the importance rating for that service, on average. Conversely, a *negative* Gap Score indicates the City's performance was usually rated lower than its importance to the respondents.

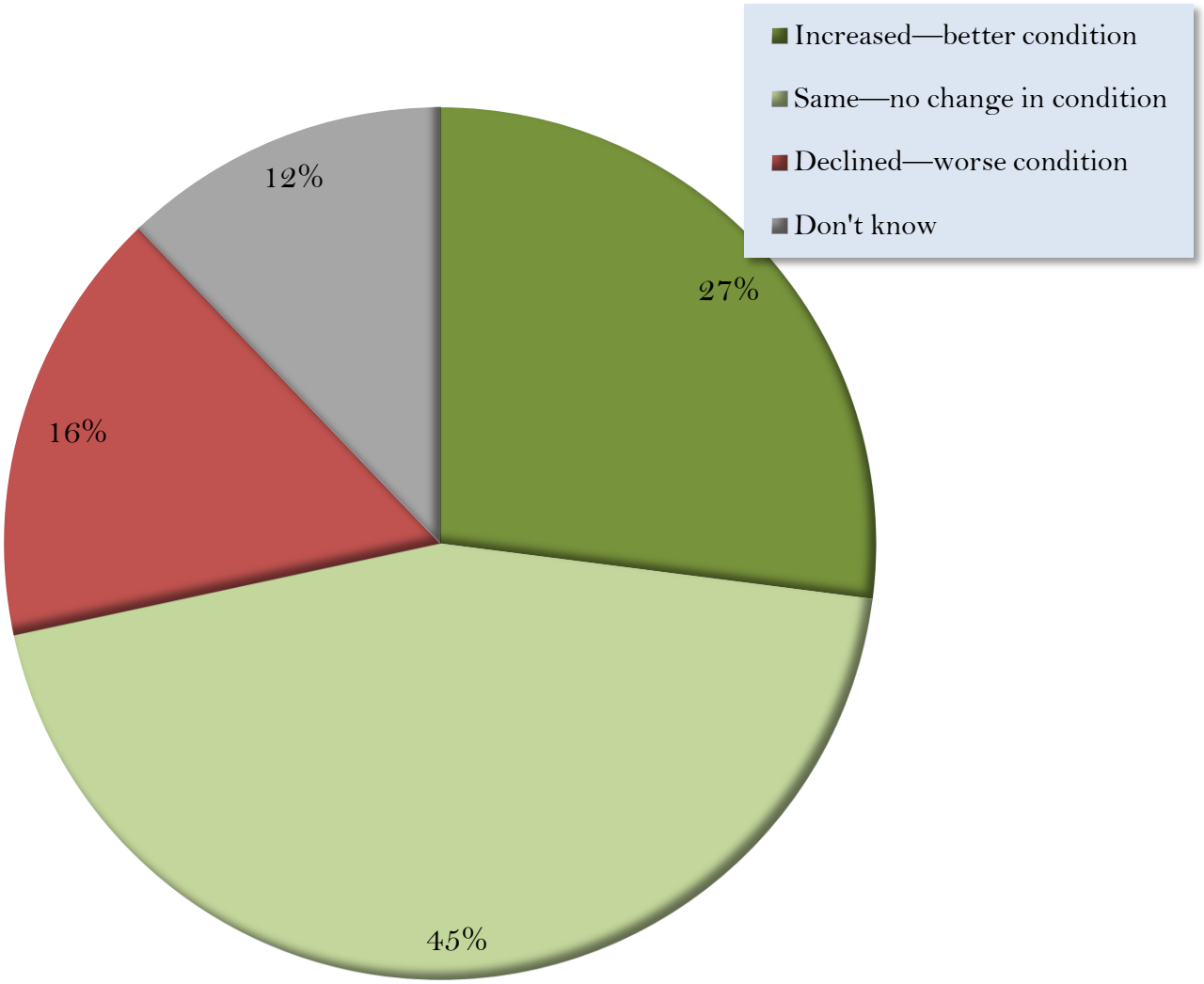


December 2008

*Other category does not allow direct comparison

Street condition holding steady and improving

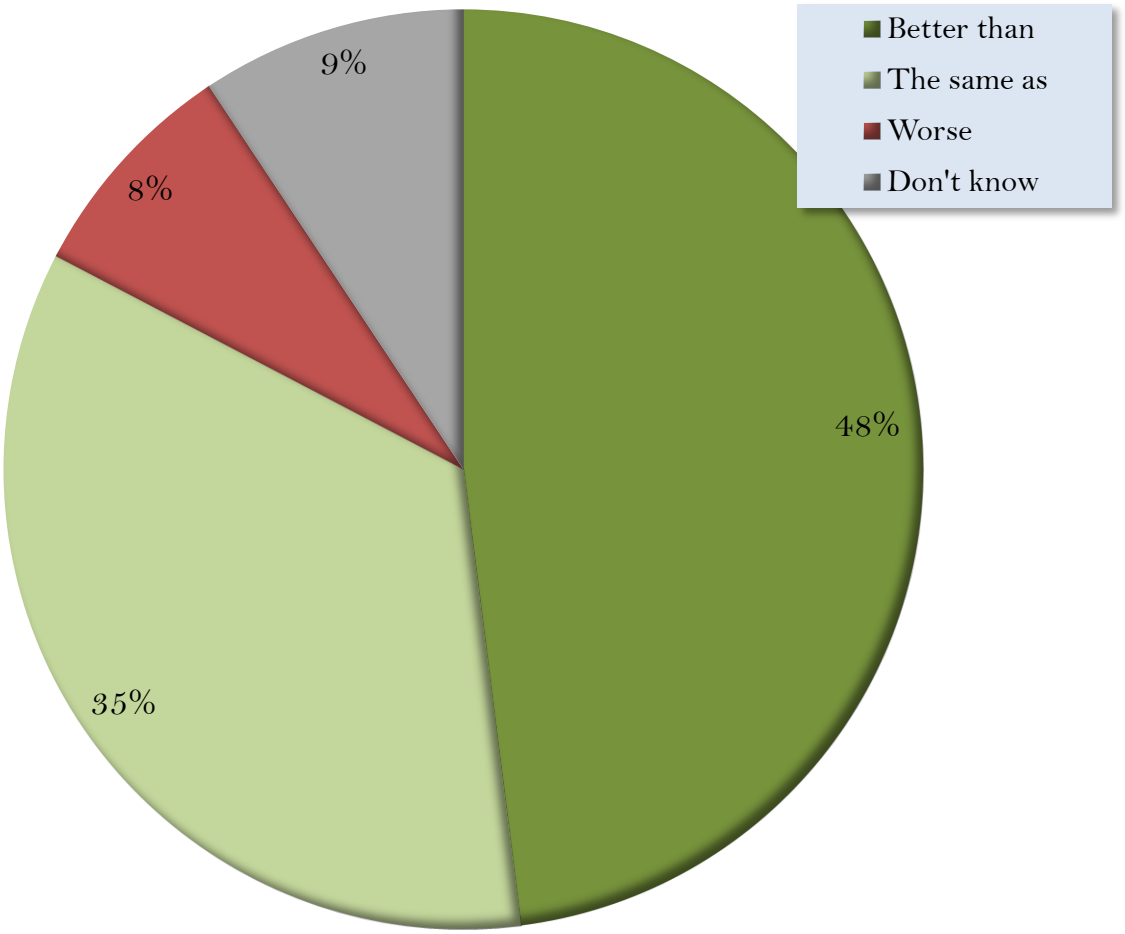
Question: In General, have the conditions of your neighborhood streets changed over the past five years?



•72% of the respondents indicated that their roads are either the same or better than they were five years ago

Kirkland Streets compare favorably in the region

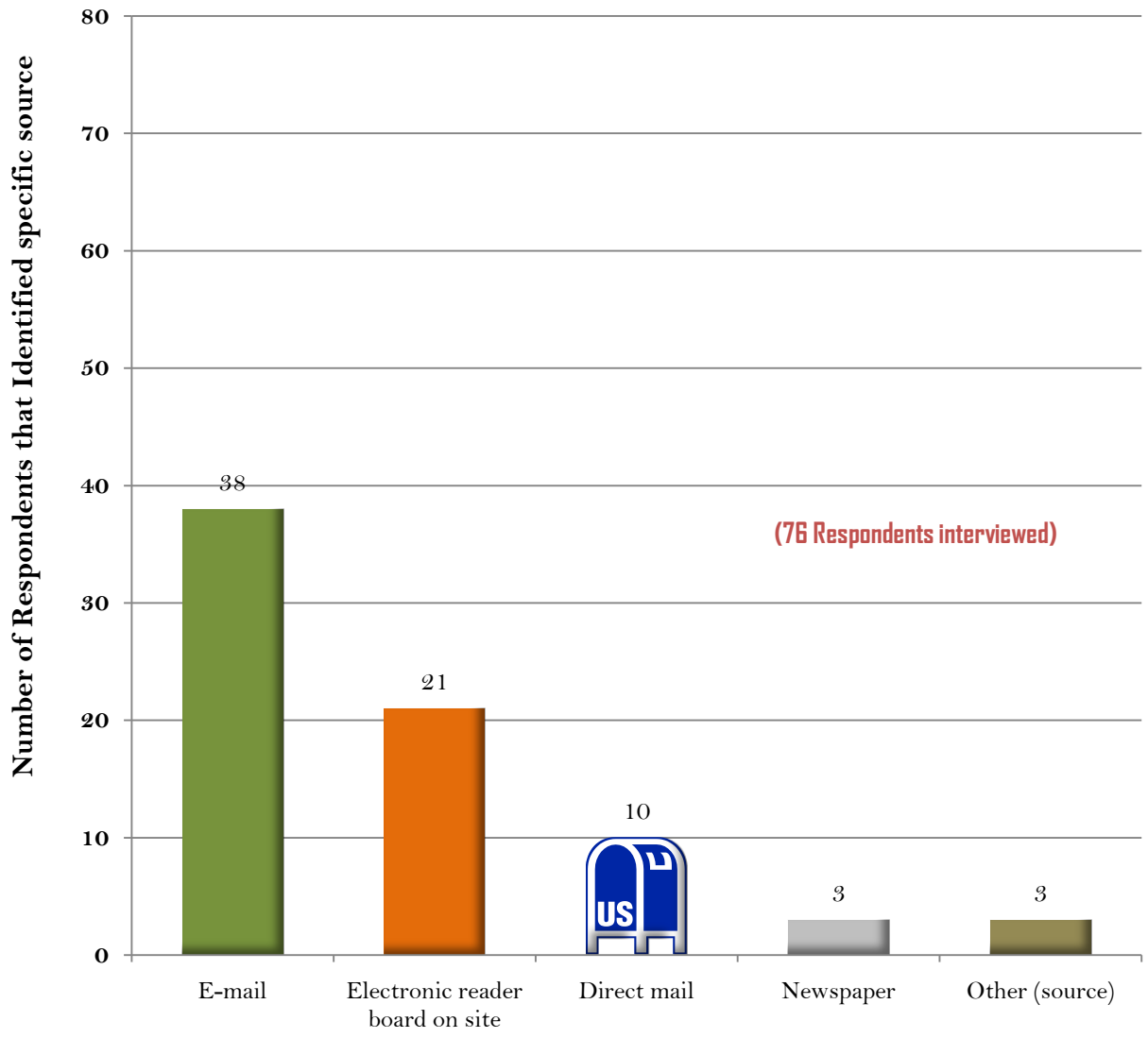
Question: In General, how would you rate neighborhood streets compared to other Cities?



•83% of the respondents indicated that their roads are either the same or better than those in other Cities

Email is favored for construction notification

Question: How best would you like to be notified of road construction and detours?



December 2008

Appendix A
(responses to "other" choices)

Question: ***With "1" being most important and "10" being least important, please rate the (importance of the) following street maintenance services:***

(For this exibit the survey values are switched: 10 is most important and 1 is least important)

Rating	Comments received under the "other" Category
10	Need to do a sweep now, before the heavy rains come and clog drains
10	Providing convenient sidewalk network around Houghton Village and
10	Pedestrian Safety
10	Complete sidewalks along 122 Ave NE between 85th St and 80th St
10	I hate to see filthy stormwater that is dumped on public and private land
10	Other Patching utility access vaults correctly
9	City stated won't sweep street at night when cars are gone
9	Adding new sidewalks
8	Repair the area east of 116 NE on NE 124th just before the signal
7	Trimming branches and bushes around signs so they are readable
5	Receptacles should be in place at bus stops to reduce litter
4	Trimming bushes, vines encroaching on roadway sidewalks
1	Round abouts and speed humps
1	Crosswalks

Question: ***With "10" being excellent and "1" being poor, how would you rate the City's performance on the following services?"***

Rating	Comments received under the "other" Category
10	Thanks for taking my calls about burned out lights in our neighborhood,
10	Mowing Watershed pedestrian path is great.
8	Pedestrian Safety
8	Crosswalks
4	Trimming bushes, vines encroaching on roadway sidewalks
1	Street sweeping by my condo along Kirkland Ave happens at 5-6am and
1	No patrols of running red lights
1	Our contaminant filled stormwater is dumped on both public and private
1	Adding new sidewalks
1	Maintaining centerline and fire hydrant reflective bumps
1	Round abouts and street humps

Appendix A
(responses to "other" choices)

Question: ***What concerns do you have with the roadways within Kirkland city limits? Please select all that apply.***

Comments received under the "other" Category

Specific locations

116th)
Traffic light badly needed at 3rd and Kirkland Ave
128 St and Totem Lake Blvd up hill side
St. onto 108th Ave NE
124th St between 124th Ave and 405 is crumbling!
116th between 42nd Place & 60th really bad surface.
98th St along causeway needs to be illuminated at night
Crosswalk illumination still seems less than ideal on 85th & by Pool.

Streets (general)

Dead animals left for days bloating and distracting
Centerline and fire hydrant reflective bumps damanged and not replaced
Potholes
Need to do a better/more frequent job of roadside ditch mowing
Their pollutants are dumped into our wetlands. Poor stewardship!
Please sweep streets more frequently
property over growth
Bad intersections and poorly timed lights
came up with them?
Too many round abouts and street humps

Non-motorized (general)

Crosswalks
Pedestrian Safety
Poor sidewalk system!
Condition of sidewalks
Adding new Sidewalks

Positive

You are doing a great job!!!!
I think the St. Dept. does a great job!

Street Maintenance Survey

76 Responses

With "1" being most important and "10" being least important, please rate the following street maintenance services
(For this exibit the survey values are switched: 10 is most important and 1 is least important)

	Most Important									Least Important	
Description	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**Importance**
Roadside ditch mowing	1	6	4	5	11	12	16	6	4	4	5.09
Providing new pavement	10	8	9	7	10	9	8	7	2	2	6.35
Street sweeping	6	9	11	6	20	8	2	6	1	3	6.42
Installing traffic signs	15	11	12	4	8	9	8	0	1	3	7.08
Traffic striping/markings	11	12	15	11	12	2	2	3	2	2	7.22
Repairing street lights	21	12	6	7	7	6	4	3	4	2	7.25
*Other (see Appendix A)	6	2	1	1	1	0	1	0	0	2	7.50
Patching potholes	36	11	8	1	3	0	2	2	6	3	8.01

#1: Other Need to do a sweep now, before the heavy rains come and clog drains
#1: Other Providing convenient sidewalk network around Houghton Village and Houghton Center malls
#1: Other Pedestrian Safety
#1: Other Complete sidewalks along 122 Ave NE between 85th St and 80th St
#1: Other I hate to see filthy stormwater that is dumped on public and private land
#1: Other Patching utility access vaults correctly
#2: Other City stated won't sweep street at night when cars are gone
#2: Other Adding new sidewalks
#3: Other Repair the area east of 116 NE on NE 124th just before the signal
#4: Other Trimming branches and bushes around signs so they are readable
#5: Other Receptacles should be in place at bus stops to reduce litter
#7: Other Trimming bushes, vines encroaching on roadway sidewalks
#10: Other Round abouts and speed humps
#10: Other Crosswalks

With "10" being excellent and "1" being poor, how would you rate the City's performance on the following services?

	Excellent									Poor			
Description	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**Performance**	**Gap Score**	
Roadside ditch mowing	10	4	8	10	3	14	7	2	2	1	6.51	1.42	Roadside ditch mowing
Providing new pavement	7	4	7	11	7	11	6	5	4	4	5.86	-0.48	Providing new pavement
Street sweeping	14	11	10	6	5	9	6	4	1	8	6.51	0.10	Street sweeping
Installing traffic signs	10	9	10	7	4	13	3	3	4	2	6.62	-0.47	Installing traffic signs
Traffic striping/markings	8	9	18	10	4	11	2	3	4	2	6.77	-0.45	Traffic striping/markings
Repairing street lights	14	8	9	11	4	5	3	1	3	4	7.02	-0.23	Repairing street lights
*Other (see Appendix A)	2	0	2	0	0	0	1	0	0	6	4.18	-3.32	*Other (see Appendix A)
Patching potholes	5	8	11	10	6	7	8	5	4	2	6.18	-1.83	Patching potholes

#10: Other Thanks for taking my calls about burned out lights in our neighborhood, and then coming to fix them.
#10: Other Mowing Watershed pedestrian path is great.

	Gap Score	
#8: Other Pedestrian Safety	-3.32	*Other (see Appendix A)
#8: Other Crosswalks	-1.83	Patching potholes
#4: Other Trimming bushes, vines encroaching on rroadway sidewalks	-0.48	Providing new pavement

#1: Other Street sweeping by my condo along Kirkland Ave happens at 5-6am and wakes me up every time!	-0.47	Installing traffic signs
#1: Other No patrols of running red lights	-0.45	Traffic striping/markings
#1: Other Our contaminant filled stormwater is dumped on both public and private lands.	-0.23	Repairing street lights
#1: Other Adding new sidewalks	0.10	Street sweeping
#1: Other Maintaining centerline and fire hydrant reflective bumps	1.42	Roadside ditch mowing
#1: Other Round abouts and street humps		

What concerns do you have with the roadways within Kirkland city limits? Please select all that apply.

Descripton	Number	Other coments
Discolored pavement	4	Dead animals left for days bloating and distracting
Unattended medians or planter strips	12	You are doing a great job!!!!
Debris in roadway	21	Industrial traffic on residential streets (Trucks to the transfer station on 116th)
Poor roadway illumination at night	23	Centerline and fire hydrant reflective bumps damanged and not replaced
Dull or worn paint markings	24	Potholes
Other (see Appendix A)	26	Need to do a better/more frequent job of roadside ditch mowing
Bumpy pavement	36	Crosswalks
Poor intersection visibility (seeing vehicles)	40	Their pollutants are dumped into out wetlands. Poor stewardship!
		Traffic light badly needed at 3rd and Kirkland Ave
		128 St and Totem Lake Blvd up hill side
		Please sweep streets more frequently
		Crosswalk illumination still seems less than ideal on 85th & by Pool.
		Pedestrian Safety
		Poor sidewalk system!
		Intersections in neighborhoods cross traffic view obstructed by private property over growth
		98th St along causeway needs to be illuminated at night
		Bad intersections and poorly timed lights
		Condition of sidewalks
		I think the St. Dept. does a great job!
		Once Google opens, I have no idea how I will be able to turn from NE 53rd St. onto 108th Ave NE
		Adding new Sidewalks
		124th St between 124th Ave and 405 is crumbling!
		Potholes
		Those stupid median circles are a big joke and a hazard - what consultant came up with them?
		116th between 42nd Place & 60th really bad surface.
		Too many round abouts and street humps

In general, have the conditions of your neighborhood streets changed over the past five years?

Description	Number	%
Increased—better condition	20	27%
Same—no change in condition	33	45%
Declined—worse condition	12	16%
Don't know	9	12%

In general, how would you rate neighborhood streets compared to other cities?

Description	Number	%
Better than	36	48%
The same as	26	35%
Worse	6	8%
Don't know	7	9%

How best would you like to be notified of road construction and detours?

Description	Number	%
E-mail	38	51%
Electronic reader board on site	21	28%
Direct mail	10	13%
Newspaper	3	4%
Other (source)	3	4%

E-mail and reader board

Phone for afected people not everyone has a computer

KirklandViews.com

General Street Preservation FAQ

1. **NE 124th Street from 124th Ave NE to 116th Ave NE (over I-405) is in poor condition. Why is this not scheduled for resurfacing?**
   Answer: NE 124th Street from 124th Ave NE to 116th Ave NE currently is not identified as a street recommended by the City's pavement management system for resurfacing. The street is in "very poor" condition and is in need of reconstruction. This section of roadway lies within the Washington State Department of Transportation (WSDOT) right-of-way. Although the "City Streets as Part of State Highways" guidelines state the City is responsible for maintenance activities on this street, a permit and coordination with the WSDOT is still required. Resurfacing this street would require a significant portion of the Annual Street Preservation Program budget to do the associated repairs, taking that money away from several other streets that could benefit from it more.

   The City Street Department recently did some temporary patching to portions of the overpass and will continue to do pavement repair and patching until enough money can be budgeted to do the full repairs that are required in this section.

   There is also an existing CIP project scheduled to begin in Spring 2009 at the NE 124th Street/124th Avenue NE intersection. Portions of that intersection will be resurfaced as part of that project.

2. **116th Ave NE from NE 60th Street to the southern City limits is in poor condition. When will this be resurfaced?**
   Answer: 116 AVE south of NE 60th St. currently is not identified as a street recommended by the City's pavement management system for resurfacing. The street is in "very poor" condition and is in need of reconstruction. In addition to not being a street recommended by the City's PMS, here are a few additional reasons why 116th Ave NE has not been resurfaced yet.

   Currently there is no sewer in the 116th from NE 60th Street south to the location where they were working a few years ago. There is a very good chance that sewer will get installed within the next few years in this location.

   Also, there is a future capital improvement project identified for 116th Ave NE that will add sidewalks in this location. Resurfacing the road will be included in that future project. This project is currently in the design phase and the dates for construction have not yet been determined. (There are significant storm water and environmental issues that need to be addressed on this project.)

   However in the meantime, our City crews are planning to do some extensive pavement repair in the next year or so that will make the ride a bit smoother for everyone until the future capital improvement project goes to construction.

3. **What is involved in scheduling streets for surface treatment and how does the City pick which streets will be overlaid or slurry sealed?**
   Answer: Many factors are involved when scheduling streets for a surface treatment. The City's pavement management system (PMS) software identifies streets recommended for receiving treatment (slurry seal, crack seal, overlay, etc.) based on the City's current street preservation budget and the pavement conditions of the City streets. These recommendations give City Staff a base point to start at when planning for the Annual Street Preservation Project.

   City staff takes the raw recommendations and tries to maximize contiguous sections and minimize "stand-alone" segments by joining adjacent segments and looking for

other nearby segments that will require overlay/seal within next 3-5 yrs. Staff also attempts to schedule projects in the same vicinity each year in order to save construction costs by not having a contractor relocating equipment throughout the City.

After Staff has optimized the project list, it is distributed both internally (Capital Improvements, Development Services, Public Works Maintenance, etc.) and externally (WSDOT, BNSF, PSE, Northshore Utility District, etc.) to minimize the number of potential conflicts. Some treatments end up being postponed due to upcoming capital improvements, development activities, maintenance activities or other agency projects.

4. **What is a Pavement Management System?**
   Answer: "A systematic method for routinely collecting, storing and retrieving the kind of decision-making information needed (about pavements) to make maximum use of limited maintenance (and construction) dollars". As defined by the American Public Works Association (APWA).

5. **What are pavement condition ratings and how does the City rate its pavements?**
   Answer: Every few years the City visually rates the existing pavement condition. All streets are visually surveyed (walking survey) for distresses every three to four years. Data is collected according to WSDOT/NWPMA criteria. Kirkland uses the Metropolitan Transportation Commission (MTC) pavement management system software for calculating the pavement condition index.

6. **What are some of the different street preservation techniques utilized by the City of Kirkland?**
   Answer:

   Crack Seal - Cracks are cleaned and filled with a rubberized asphalt material to prevent water from infiltrating into the pavement layers and further deteriorating the roadway. The presence of water reduces the strength of the pavement base layers which results in structural damage and ultimately will lead to pavement failure. Crack Sealing often occurs prior to constructing a Slurry Seal or Asphalt Overlay, but is also a very cost-effective method of preventative maintenance.

   Structural Patching – Structural Patching occurs in smaller areas where the pavement is severely distressed and damaged or have failed completely. The City's Street Crew or contractor will grind or dig out and remove the damaged pavement and poor subgrade and repair the area with a new pavement section. Structural Patching often occurs prior to constructing a Slurry Seal or Asphalt Overlay and will prevent premature failure of the new surface that will be applied.

   Slurry Seal - Another cost-effective preventative maintenance treatment that prolongs the pavement life without the dust, loose rock, and rough surface that makes Chip Seals so unpopular. Slurry Seal is a thick, cold liquid mixture of asphalt and fine rock (pre-mixed) that is applied to the existing asphalt surface. Depending on weather conditions, Slurry Seal generally requires about six hours to thoroughly cure (dry). Thus, parking and vehicular access to and from streets is restricted on the date of surface seal application. Slurry Seals typically extend the life of the pavement surface by 7-10 years.

   Asphalt Overlay - This treatment involves placement of a new layer of pavement on the street generally between 1 1/2 and 3 inches thick. Prior to paving, a six-foot wide section of the street along the edge of the curb and gutter is ground down to allow for the new pavement to conform to the curb and gutter.

   While parking and access to and from streets are restricted during both the grinding

and paving operations, traffic controls are typically established by the contractor in lieu of closing streets altogether. Asphalt Overlays are used on streets that exhibit light to moderate stress related failures and like Slurry Seals, require failed pavement sections to the repaired prior to the treatment, although more costly than Surface Seal treatments. Because water is detrimental to all pavement repair treatments, it is also required that you not wash vehicles or water lawns on the date work is scheduled. Pavement overlay will generally extend the life of a street between 15-20 years. See below for Frequently Asked Questions on Asphalt Overlay construction.

Reconstruction - In cases where isolated Structural Patching alone is not adequate to repair severely failed roadways, reconstruction is necessary to remove and replace all or part of the roadway section. Although street reconstructions are the lengthiest and most disruptive method of treatment, vehicular access to and from streets is generally maintained throughout the work via contractor established traffic controls. A reconstructed street is intended to produce a roadway structure that will last 30-50 years and a surface that will last between 15-20 years.

7. **Why are certain streets selected for treatment when there are other streets in the City in far worse condition?**
   Answer: Maintaining streets on a "worst-first" basis is not a cost-effective method of preserving street networks. If all of the street preservation dollars are spent towards repairing streets in the "Very Poor" or "Failed" condition, streets in the "Very Good" to "Fair" condition will slide into a poor condition, making it very costly to rehabilitate those streets. Whereas if most of the street preservation dollars are spent preserving "Good" to "Fair" streets with a few "Very Poor" or "Failed" streets, many more streets can be rehabilitated, keeping the overall City's Pavement Condition Ratings acceptable.