Pavement Management Program Budget Options Report

Capitol Asset & Pavement Services Inc

City of West Linn
Public Works Dept.

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EXECUTIVE SUMMARY

Capitol Asset & Pavement Services, Inc. was contracted by City of West Linn to determine the impact of funding levels on the network pavement condition. The Metropolitan Transportation Commission, MTC, Pavement Management Program (PMP) was used for this evaluation. This system strives to develop a maintenance strategy that first, will improve the overall condition of the street network to an optimal Pavement Condition Index (PCI) in the low to mid 80's and second, maintain it at that level.

The City last contracted to have the entire street network inspected in 2007. The 2007 analysis and report were key in conveying the condition of the City's road network and funding situation to the West Linn citizens and helpful in obtaining passage of the Road Maintenance Fee. The City Council agreed that a PCI level of 70 would be an acceptable level to attain. The City leveraged a road maintenance fee and from 2008-09 accomplished $1.775 million in overlay, reconstruction, slurry seal, and crack seal treatments. The PCI in 2007 was found to be 68.

A detailed visual inspection of the City of West Linn streets resulted in a calculated average PCI of 65. Using a 0-100 PCI scale, with 100 being the most favorable, a rating of 65 places the City's street network in the lower range of the 'Good' condition category. In order to determine GASB 34 Statement asset valuation and funding levels to maintain current infrastructure, the City's street network replacement value is estimated at $81.8 million. Using this estimate and the MTC program projections, an unrestricted funding level of $16.5 million over the next fiveyear period is needed to achieve a PCI in the low to mid 80's. Of this total, approximately $8.8 million is needed in the first year alone, primarily to repair streets in the 'fair' to 'poor' range, those streets with a PCI of 0-49, which is about 23 percent of West Linn's total network. The total budget needs amount of $16.5 million exceeds West Linn's current funding level by $15.7 million, thus creating a backlog in deferred maintenance.

In order to achieve and sustain the current PCI of 65 over a five-year period, an annual investment level of $600,000 per year would need to be allocated for a total of $3.0 million over the next five years. Using this budget amount, the cost of deferred maintenance backlog in 2014 would be $14.0 million. Utilizing the same analysis period of five years with West Linn's current maintenance and rehabilitation funding of $750,000 over a five analysis period (averaging $150,000 per year) shows the PCI decreasing by 6 points, to 59 in 2014-with deferred maintenance being over $15.0 million. Current funding allocation of $750,000 over five years is clearly insufficient to address all of the City of West Linn's future street maintenance needs.

In order to reach the PCI of 70 agreed up as being an acceptable level by the City council, the City would have to spend $1.2 million per year for the next 5 years, for a total of $6.0 million. This would allow for 78.4% of the street network to be in the 'good' condition category with deferred maintenance of just over $11.8 million in the year 2014. Continuing the same yearly funding level of $1.2 million per year over a ten (10) year period results in the PCI raising to 71 and the deferred maintenance backlog leveling off, reaching $11.9 million in 2019.

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Although the Pavement Condition Index currently is 65, the PCI is not the only critical indicator of the overall health of the paved street network. Based on the current funding levels the deferred maintenance backlog will continue to increase, which will place additional financial burden and funding requirements to maintain the street system in future years. A surface

First, how much it costs to repair and maintain a pavement depends on its current PCI. In the good category, it costs very little to apply preventive maintenance treatments such as crack and surface seals which can extend the life of a pavement by correcting minor faults and reducing further deterioration. Treatments of this sort are applied before pavement deterioration has become severe and usually cost less than $2.00/sq. yd. Half (53.4%) of the City of West Linn's street network would benefit from these relatively inexpensive, life-extending treatments.

Nearly one-quarter (23.4%) percent of the City of West Linn's street network falls into the 'Satisfactory' condition category. Pavements in this range show some form of distress caused by traffic load related activity or environmental distress that require more than a life-extending treatment. At this point, a well-designed pavement will have served at least 75 percent of its life with the quality of the pavement dropping approximately 40 percent. The street surface may require a chip seal application or a thin overlay. These treatments typically range in cost from $2.50 to $10.00/sq. yd.

The remaining 23.9 percent of the City of West Linn street network falls into the 'fair' or 'poor' PCI ranges. These pavements are near the end of their service lives and often exhibit major forms of distress such as potholes, extensive cracking, etc. At this stage, a street usually requires either a thick overlay or reconstruction. The costs for these treatments range from $10.00 to $60.00/sq. yd. One of the key elements of a pavement repair strategy is to keep streets in the good or satisfactory categories from deteriorating. This is particularly true for streets in the satisfactory range, because they are at the point where pavement deterioration accelerates if left untreated. On the other hand, the deterioration rate for pavements in the 'fair' to 'poor' range is relatively flat; the condition of these streets will not decline significantly if repairs are delayed. As more 'good' streets deteriorate into the 'satisfactory' and 'poor' categories, the price tag of deferred maintenance will continue to increase. The price tag of deferred maintenance backlog will stop increasing only when enough funds are provided to prevent streets from deteriorating into a worse condition category, or the whole network falls into the 'poor' category (i.e. can not deteriorate any further).

Future Expenditures for Pavement Maintenance

Assuming historic funding is allocated for pavement maintenance, we anticipate that the City of West Linn will spend $750,000 on pavement maintenance rehabilitation during the next five years (FY 2010-11 through FY 2014-15).

Table 2. Projected Pavement Budget for FY 2010-11 to FY 2014-15

	2010-11	2011-12	2012-13	2013-14	2014-15	Total
Current Funding	$150,000	$150,000	$150,000	$150,000	$150,000	$750,000

Budget Needs

Based on the principle that it costs less to maintain streets in good condition than bad, the MTC PMP strives to develop a maintenance strategy that will first improve the overall condition of the network to an optimal PCI somewhere between the low and mid 80's, and then sustain it at that level. The average PCI for the City of West Linn is 65, which is in the 'Good' condition category, and a significant area of the network suffers from load-related distresses. In addition, current funding strategies demonstrate there is a backlog in the first year of the scenario of $8.8

million in deferred maintenance. If these issues are not addressed, the quality of the street network will inevitably decline. In order to correct these deficiencies, a cost-effective funding and maintenance and rehabilitation strategy must be implemented.

The first step in developing a cost-effective maintenance and rehabilitation strategy is to determine, assuming unlimited revenues, the maintenance "needs" of the City of West Linn street network. Using the PMP budget needs module; street maintenance needs are estimated at $16.5 million over the next five years. If the City follows the strategy recommended by the program, the average network PCI will increase to 81. If, however, current pavement maintenance funding is exhausted and little or no maintenance is applied over the next five years, already distressed streets will continue to deteriorate, and the network PCI will drop to 56. The results of the budget needs analysis are summarized in the table below.[3]

Table 3. Summary of Results from Needs Analysis

Fiscal Years	2009-10	2010-11	2011-12	2012-13	2013-14	Total
PCI with Treatment	80	81	81	81	81	---
PCI, no Treatment	64	62	60	68	56	---
Budget Needs	$8,847,183	$2,774,364	$1,637,709	$2,079,796	$1,177,513	**$16,516,565**
Preventative Maintenance	$674,833	$45,373	$43,954	$21,526	$0	**$785,686**
Rehabilitation	$8,172,349	$2,728,990	$1,593,754	$2,058,269	$1,177,512	**$15,730,874**
Deferred Maintenance	$0	$0	$0	$0	$0	**$0**

Table 3 shows the level of expenditure required to raise the City of West Linn's pavement condition to an optimal network PCI of 80 and eliminate the current maintenance and rehabilitation backlog. The results of the budget needs analysis represent the ideal funding strategy recommended by the MTC PMP. Of the $16.5 million in maintenance and rehabilitation needs shown, approximately $786,000 or 5 percent is earmarked for preventive maintenance or life-extending treatments, while $15.7 million or 95 percent is allocated for the more costly rehabilitation and reconstruction treatments. The cost-effectiveness of preventive maintenance treatments is demonstrated in Figure 2, which compares the current condition of the network, and the maintenance needs estimated by the program. The portion of the network in good condition, 53 percent requires approximately $0.8 million of work over the next five years, whereas 23 percent in fair to poor condition needs $15.3 million in expenditures.

3 Actual program outputs are shown in Appendixes A through E

Figure 2. Cost-Effectiveness of Treatments

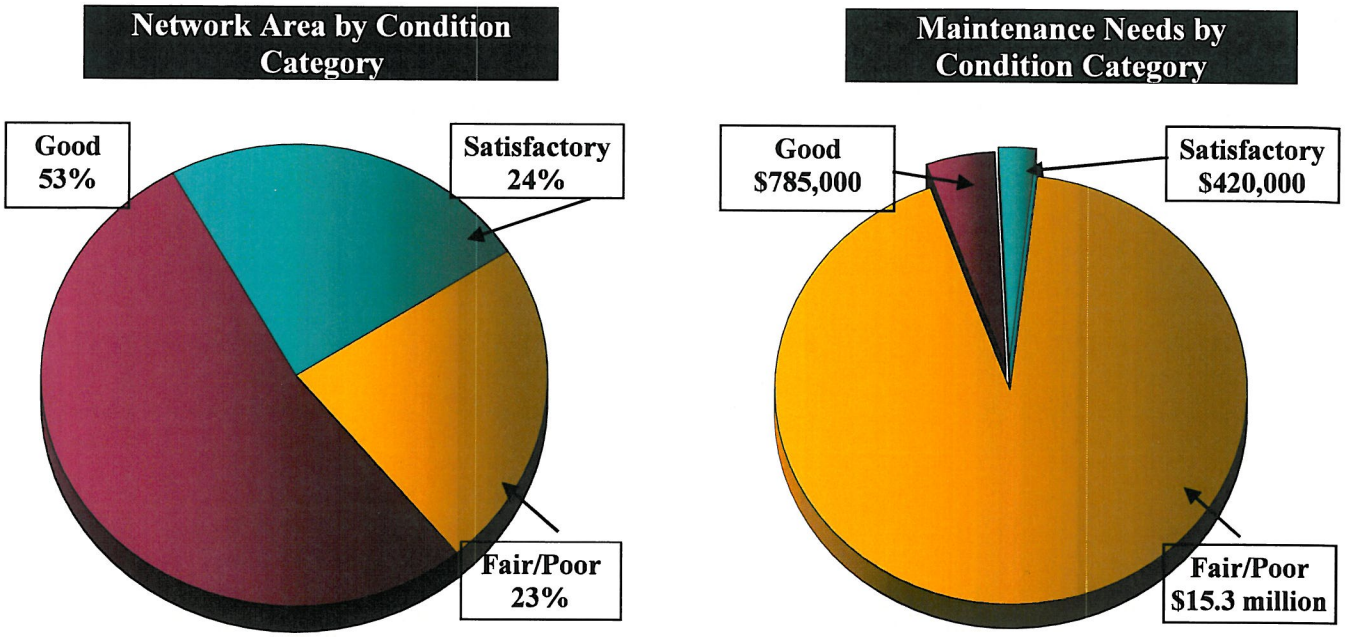
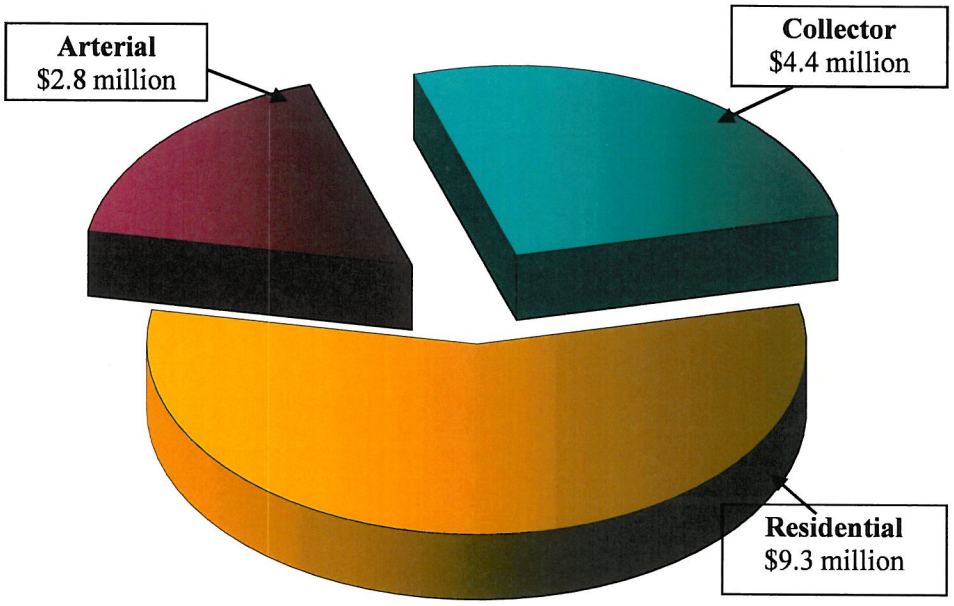


Figure 3 is based on the Budget Needs Predictive Module. The Pavement Management Program is recommending a funding level of $16.5 million over a five-year period. Figure 3 illustrates the funding distribution by street functional classification.

Figure 3. Budget Needs Funding
Distribution by Functional Classification



Budget Scenarios

Having determined the maintenance and rehabilitation needs of the City of West Linn's street network, the next step in developing a cost-effective maintenance and rehabilitation strategy is to conduct 'what-if' analyses. Using the PMP budget scenarios module, the impact of various budget scenarios can be evaluated. The program projects the effects of the different scenarios on pavement condition PCI and deferred maintenance (backlog). By examining the effects on these indicators, the advantages and disadvantages of different funding levels and maintenance strategies become clear. For the purpose of this report, the following scenarios were run for a five (5)-year period.

1. *Unconstrained (zero "deferred" maintenance)* — The annual amounts as identified in the budget needs analysis totaling $16.5 million were input into the budget scenarios module. This scenario shows the effects of implementing the ideal investment strategy (as recommended by the MTC PMP needs module). Because it is more cost-effective in the long run to eliminate the deferred maintenance backlog as quickly as possible, the bulk of the maintenance needs are addressed in the first year of the five-year program raising the PCI to 80. The preventive maintenance split for each year in the analysis period, as recommended by the budget needs module, was used.
2. *Current Investment Level Budget* — A five-year investment level of $750,000 (averaging $150,000 per year) was evaluated to determine the effects of continuing a current budget level. A 50% preventive maintenance split was used.
3. *Maintain Current PCI Investment Level Budget* — A five-year investment level of $600,000 per year for a five year total of $3.0 million was evaluated to determine the effects at this investment level. A 10% preventive maintenance split was used for the purpose of this analysis. This funding level sustains the current PCI of 65 over the duration of the five-year analysis period.
4. *Increase PCI by Five PCI Points Five and Ten Year Levels* — An investment level of $1.2 million in each year for a total of $6.0 million over five years was evaluated. This funding level increases the PCI by 5 points, to 70, over 5 years. Additionally, maintaining the yearly funding level of $1.2 million per year for a total of $6.0 million over ten years was evaluated for long-term maintenance strategies. A 10% preventive maintenance split was used for the purpose of these analyses.

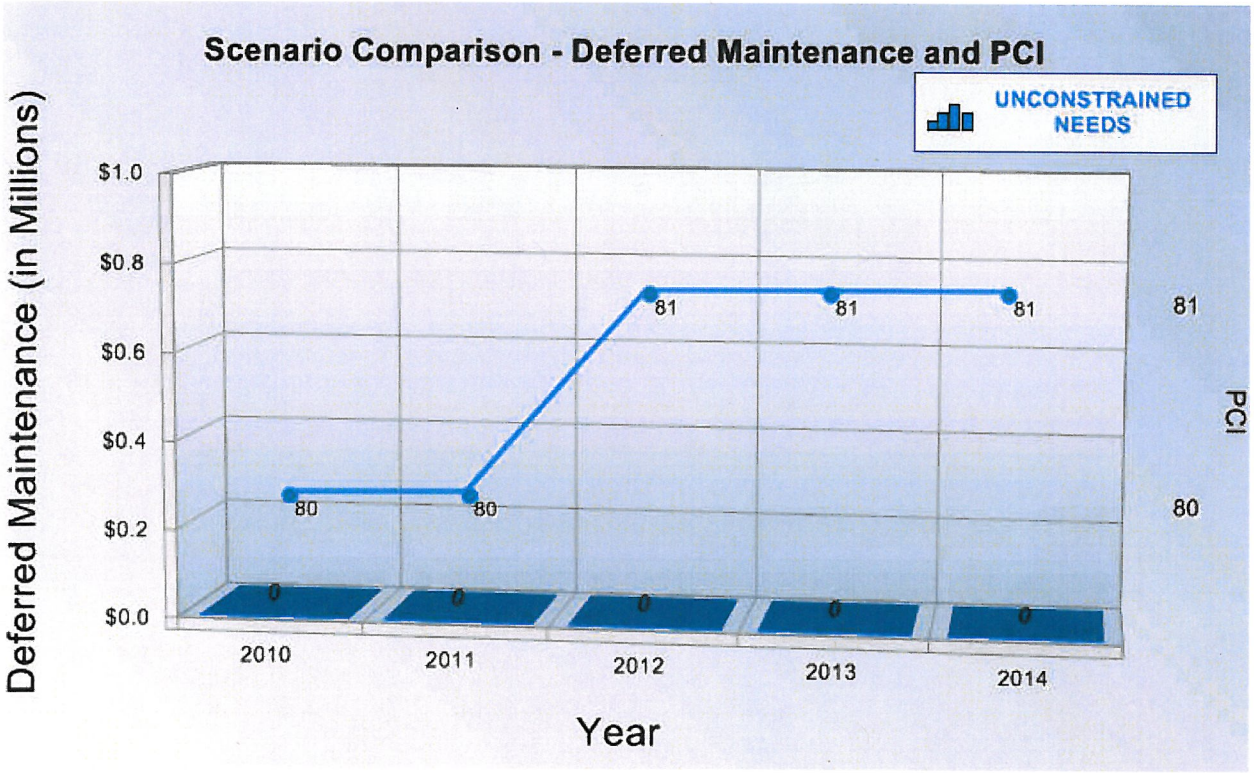
Scenario 1 — Unconstrained *(zero deferred maintenance)*

This scenario shows the effects of implementing the ideal investment strategy (as recommended by the MTC PMP needs module). Because it is more cost-effective in the long run to eliminate the deferred maintenance backlog as quickly as possible, the bulk of the maintenance needs are addressed in the first year of the five-year program raising the PCI to 81. The PCI remains at an optimal level over the entire time period, reaching 81 in 2014. By 2014, 92.0% of the network falls into the good condition category, a significant increase from the current level of 53.4% in good condition. These results are shown in both table 4 and figure 4.

Table 4. Summary of Results from Scenario 1 — Unconstrained

	2010	2011	2012	2013	2014	Total
Budget	$8,847,183	$2,774,364	$1,637,709	$2,079,796	$1,177,513	**$16,516,565**
Rehabilitation	$8,172,349	$2,728,990	$1,593,754	$2,058,269	$1,177,512	**$15,730,874**
Preventative Maintenance	$674,833	$45,373	$43,954	$21,526	$0	**$785,686**
Deferred Maintenance	$0	$0	$0	$0	$0	---
Surplus PM	$0	$0	$0	$0	$0	**$0**
Stop Gap	$0	$0	$0	$0	$0	**$0**
Network Remaining Life (years)	25.9	26.48	26.72	26.74	26.47	
PCI	80	80	81	81	81	

Figure 4. Summary of Results from Scenario 1 — Unconstrained



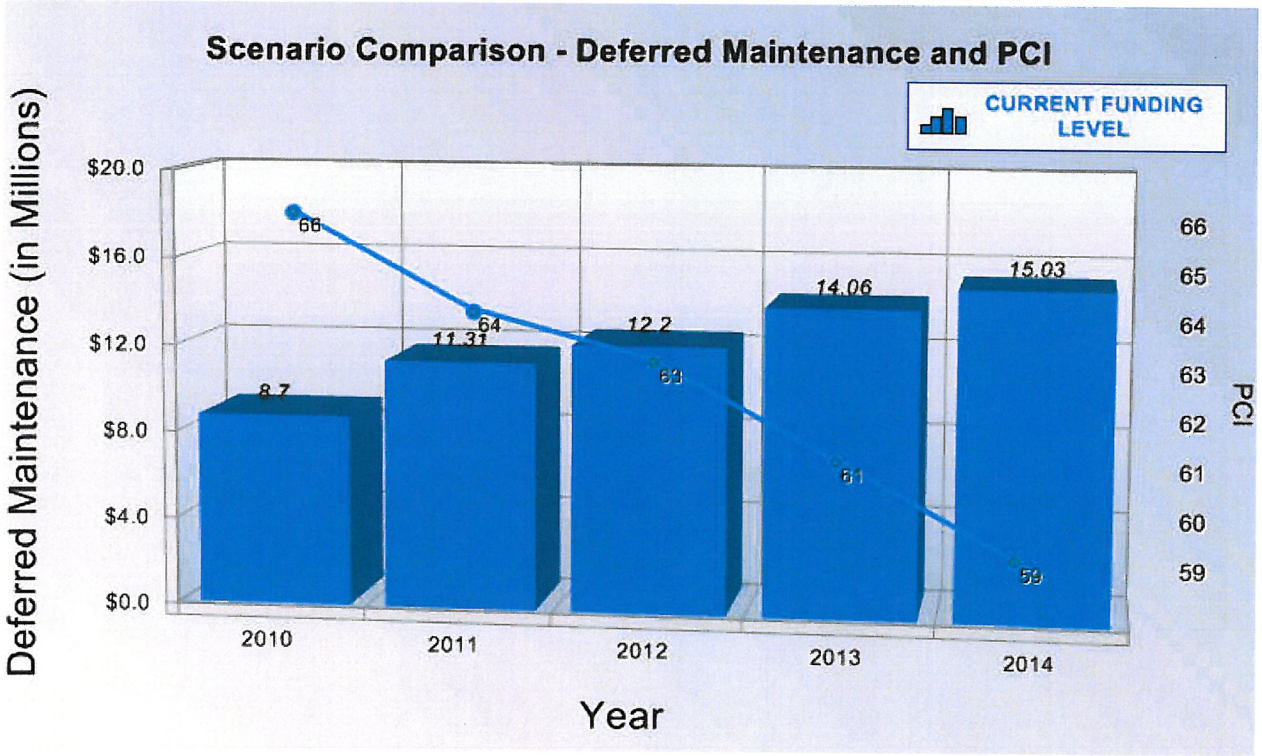
Scenario 2 — Current Investment Level Budget

This scenario shows the effects of the City's current budget strategy, an investment level of $750,000 over five years, averaging $150,000 per year. This investment level is insufficient to maintain the street network, as the PCI decreases by 6 points from the current level of 65, to 59 in 2014. Under this investment level, the deferred maintenance backlog grows from $8.7 million in 2009, to over $15.0 million in 2014. In 2014, 58.3% of the street network will be in the 'Good' condition category, up from 53.4% in 2009, and the portion of the street network in the 'Fair' and 'Poor' increases to 30.6%, from 23.9% in 2009. These results are illustrated in Table 5 and Figure 5.

Table 5. Summary of Results from Scenario 2 — Current Investment Level

	2010	2011	2012	2013	2014	Total
Budget	$150,000	$150,000	$150,000	$150,000	$150,000	**$750,000**
Rehabilitation	$74,699	$74,729	$74,827	$74,653	$74,372	**$373,280**
Preventative Maintenance	$74,933	$75,180	$75,164	$75,335	$75,126	**$375,738**
Deferred Maintenance	$8,697,550	$11,312,561	$12,202,535	$14,057,451	$15,032,872	---
Surplus PM	$67	$0	$0	$0	$0	**$67**
Stop Gap	$147,219	$43,042	$23,878	$31,534	$18,392	**$264,065**
Network Remaining Life (years)	19.08	18.68	18.25	17.82	17.32	
PCI	66	64	63	61	59	

Figure 5. Summary of Results from Scenario 2--Current Investment Level



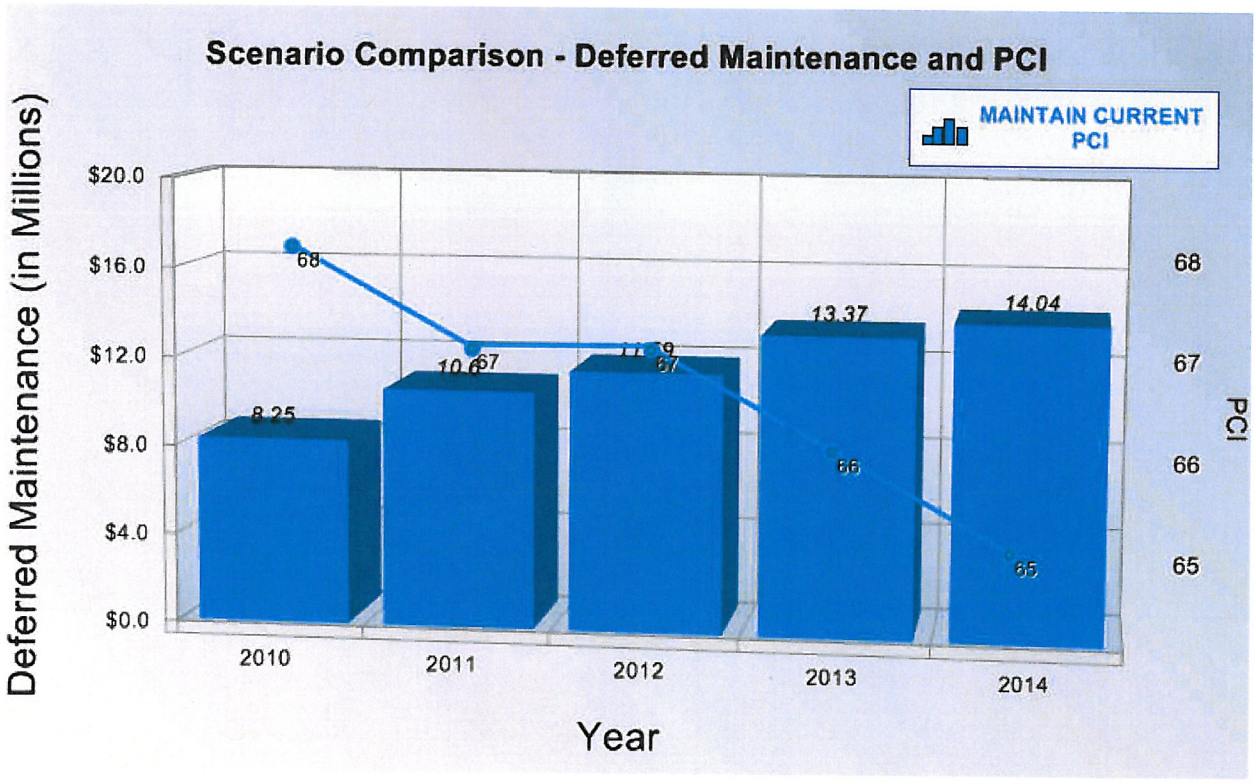
Scenario 3 — Maintain Current PCI Investment Level Budget

This scenario shows the effects an investment level of $600,000 per year for five years, totaling $3.0 million. This investment level maintains the street network PCI at the current level of 65 over the five year scenario. While the PCI level is stabilized, the deferred maintenance backlog still grows from $8.2 million in 2009, to almost $14.0 million in 2014. The percentage of the street network in the 'Good' condition category increases from the current level of 53.4%, to 72.9% in 2014. These results are illustrated in Table 6 and Figure 6.

Table 6. Summary of Results, Scenario 3 — Maintain Current PCI

	2010	2011	2012	2013	2014	Total
Budget	$600,000	$600,000	$600,000	$600,000	$600,000	**$3,000,000**
Rehabilitation	$532,057	$533,196	$537,584	$535,360	$533,027	**$2,671,224**
Preventative Maintenance	$67,795	$66,565	$62,007	$64,639	$66,641	**$327,647**
Deferred Maintenance	$8,247,329	$10,603,910	$11,586,454	$13,372,163	$14,043,457	---
Surplus PM	$0	$0	$0	$0	$0	**$0**
Stop Gap	$125,086	$38,951	$23,246	$28,996	$16,034	**$232,313**
Network Remaining Life (years)	20.21	20.31	20.47	20.51	20.51	
PCI	68	67	67	66	65	

Figure 6. Summary of Results from Scenario 3 — Maintain Current PCI



Scenario 4 — Increase PCI By Five PCI Points Five and Ten year Investment Level

These scenarios examine the investment level required to increase the current PCI of 65 by five (5) points, to 70 over a five year period, and the effects of continuing that funding over ten years. An annual budget level of $1.2 million in each year of the five-year period for a total of $6.0 million is required to raise the PCI to 70 over five years. Program outputs indicate that the cost of deferred maintenance after five years, in the year 2014, will total approximately $11.8 million and the PCI will increase to 70. The portion of the street network in Good condition increases, to 78.4% in 2014. Examining this funding level over a ten (10) year period shows that the PCI will reach 71 in 2017 and remain there through 2019 by maintaining a spending level of $1.2 million per year for a ten year total of $12.0 million. A PCI of 70, which is on the lower end of the the "good" condition category, is a relatively low service level to maintain. At this funding level, the rate of pavement deterioration begins to stabilize, with the unfunded maintenance and rehabilitation back-log dollar leveling off over the last 6 years of the scenario. The City will be in a better position to use more cost-effective preventative maintenance treatments, though additional increases in maintenance funding would be required to further reduce the deferred maintenance backlog. Summaries of these results are illustrated in figure 7.

Figure 7. Summary of Results from Scenario 6— Increase PCI By Five PCI Points Five and Ten Year Investment Level

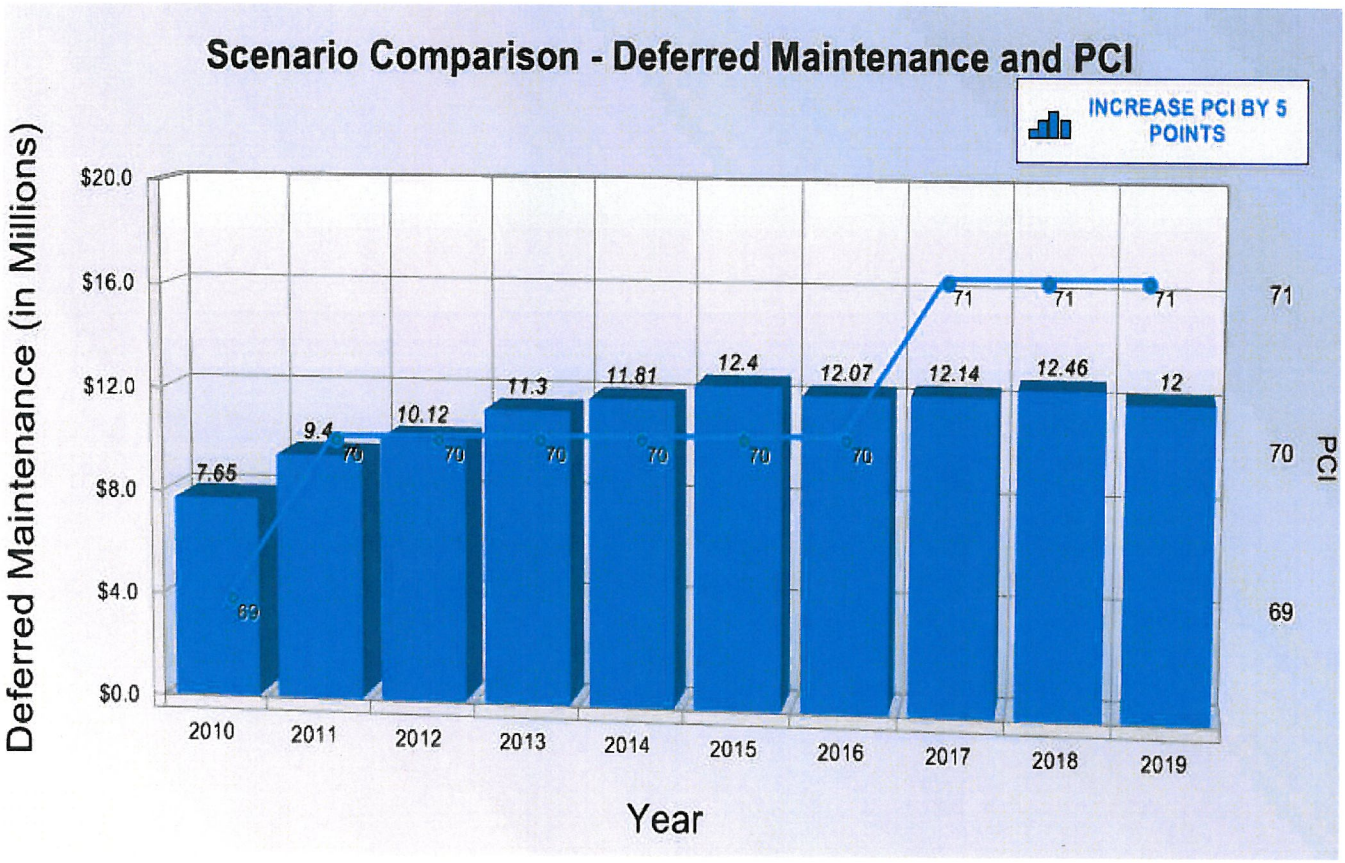
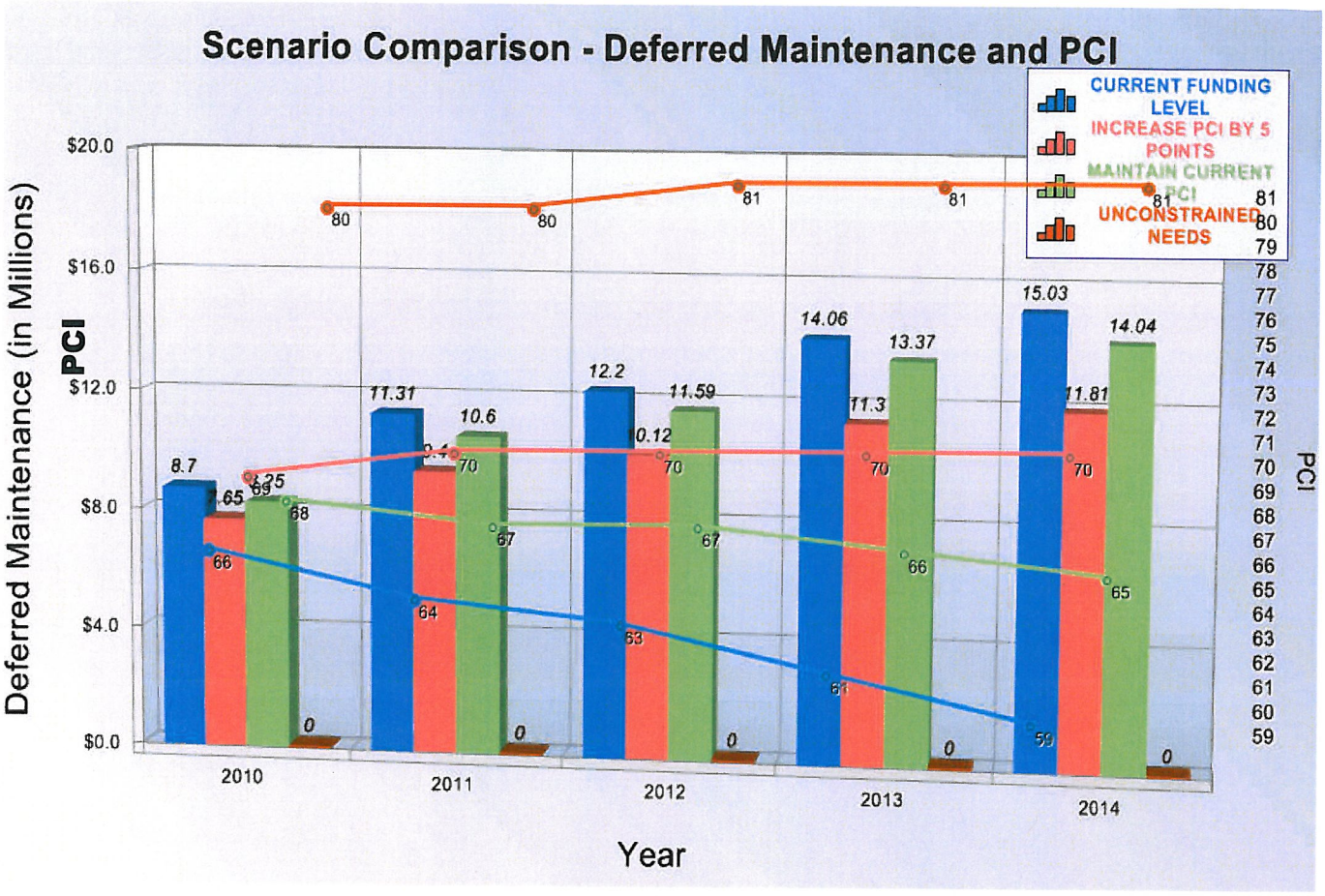


Figure 8. Comparison of funding levels on PCI and Deferred Maintenance



Recommendations

Of the various maintenance and funding options considered, the *ideal* strategy for the City of West Linn is presented in Scenario 1, with a five-year expenditure total of $16.5 million. Not only does this surface management plan improve the network PCI to an optimal level of 81, it also eliminates the entire deferred maintenance backlog in the first year. As examined scenarios deviate from this strategy, the cost to West Linn will increase in the long term. The amount of funds to be dedicated up front, approximately $8.8 million, may make this strategy unrealistic for the City of West Linn; however, this scenario can be used as a base line for comparing other scenarios.

The current five-year funding level totaling $750,000 will result in the current PCI decreasing by 6 points, to an average network PCI of 59 over the course of five years. The deferred maintenance price tag will increase to over $15.0 million under this scenario by the end of five years. 58.3% of the City's streets will be in the Good Condition Category following this funding strategy through 2014, an increase from the current level of 53.4% in Good Condition, though the portion of street network in Fair or Poor condition increases to 30.6% in 2014, from 22.9% in 2009.

A five-year (5) year annual budget scenario to maintain the City's current PCI at 65 of $600,000 per year for a total of $3.0 million sustains the network PCI over the course of the analysis period. At the conclusion of this analysis, the network PCI will remain at 65, which is the projected PCI based on the results of this funding level. In addition, 72.0% of the streets will be in the Good Condition Category with the deferred maintenance being $14.0 million in the year 2014.

A five-year funding level $1.2 million per year totaling $6.0 million will result in the current PCI increasing by 5 points, to an average network PCI of 70 over the course of five years. The deferred maintenance price tag will be in excess of $11.8 million under this scenario by the end of five years. 78.4% of the City's street will be in the Good Condition Category following this funding strategy through 2014. Continuing a funding level of $1.2 million per year over ten years increases the PCI further, to 71 at the end of ten years. The deferred maintenance backlog stabilizes as well, reaching $11.9 million in 2019. Under this funding level, 86.3% of the City's streets reach the Good Condition Category after the 10 year analysis period, and are maintained in good condition using relatively inexpensive preventative maintenance treatments. 10.7% of the street network would remain in Poor condition and would require an influx of additional money to reconstruct. Results for these scenarios are contained in Appendix C.

As demonstrated in the different scenarios, the City of West Linn needs to spend a significant amount of money on expensive rehabilitation and reconstruction projects. This will reduce the deferred maintenance backlog, increase the network PCI and allow money to be spent for less capital-intensive treatments such as chip seals, slurry seals, and thin overlays in the future.

The PMP Budget Needs Module is recommending $15.3 million for streets in the fair to poor condition category requiring extensive rehabilitation and reconstruction work which represents approximately 93% of the planning, estimated generated by the PMP. This result places the City in a challenging position to avoid exponential future street rehabilitation cost and the risk of substantial increase in already significant shortfall projection in the next 10 years. This conclusion is note worthy to the City Council. Unless funding is allocated to support an

increase in the City's street rehabilitation program, the City may lose the opportunity to utilize lower cost preventative maintenance and light overlay treatment options.

The City should seek to increase funding for road maintenance. Explore the feasibility of developing a local street maintenance fee dedicated solely to street maintenance and rehabilitation.

Preparation of a budget options report is just one step in using the MTC PMP to build an effective street maintenance program. Some additional steps that should be taken are:

- Link major street repairs with utility maintenance schedules to prevent damage to newly paved street surfaces.

- Obtain detailed subsurface information on selected sections before major rehabilitation projects are contracted. Costs for large rehabilitation projects are extremely variable and estimates can sometimes be reduced following project-level engineering analysis. It is possible that only a portion of a street recommended for reconstruction actually requires such heavy-duty repair.

- Evaluate the specific treatments and costs recommended by the PMP, and modify them to reflect the actual repairs and unit costs that you expect to use.

- Test other budget options with varying revenues and preventive maintenance and rehabilitation splits.

- Prepare a brief memo to City Officials outlining the recommended five-year maintenance program. The memo should include the amount of revenues available for pavement repair, a list of streets to be repaired, and the type of repair to be completed (listed in order of the year the treatment is scheduled), as well as any requests for specific budgetary actions.

In addition to performing cyclic pavement condition inspections, unit cost information for the applications of various maintenance and rehabilitation treatments should be updated annually in the PMP 'Decision Tree Module'. If this data is not kept current, the City runs the risk of understating actual funding requirements to adequately maintain the street network. It's recommended that the City develops a pavement inspection cycle that would allow for the inspection of 50% of Arterial streets, 50% of Collector streets, and 25% of residential streets annually.

The City of West Linn has completed the foundation work necessary to execute a successful pavement management plan. The street system is in good condition, indicating that the City has consistently applied sufficient funds necessary to maintain this monumental investment. At the current investment level, however, the street condition will continue to deteriorate. To improve the condition of the street system and reduce the maintenance backlog, additional revenues <u>and</u> support from various decision-making bodies are required.

As more 'good' streets deteriorate into the satisfactory and poor categories, the price tag of deferred maintenance will continue to increase. The price tag of deferred maintenance backlog will stop increasing only when enough funds are provided to prevent streets from deteriorating into a worse condition category, or when the whole network falls into the "poor" category (i.e.

can not deteriorate any further). At that time, the network would have to be replaced at a cost of $81.8 million.