
PROJECT REPORT

**Indian Summer Residential Community
Pavement Maintenance and Repair Prioritization Plan (2014 – 2017)**
August 30, 2013

Prepared For:

Vantage Community Management
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Olympia, WA 98506

Prepared By:

PAVEMENT SERVICES, INC.
3835 NE Tillamook Street
Portland, Oregon 97212
(503) 235-0377



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TABLE OF CONTENTS

PROJECT BACKGROUND INFORMATION..... 1
OBJECTIVES 1
METHODOLOGY 1
PAVEMENT CONDITION SURVEY..... 1
STREET MAINTENANCE AND REHABILITATION TREATMENTS 4
MAINTENANCE & REPAIR PRIORITIZATION 12
SUMMARY 15

PROJECT BACKGROUND INFORMATION

Indian Summer Residential Community (ISRC) is a master planned community in Olympia, Washington that accommodates an assortment of single-family homes, town homes and condominiums. The community is bound by the Yelm Highway to the north, Chehalis Western Trail and Rainier Road to the east, electric transmission lines to the south and a greenbelt to the west consisting of farmland and undeveloped forestland. Indian Summer also incorporates a nature preserve and a golf course.

The Indian Summer street system currently consists of approximately 5 miles of residential two-lane streets. The typical street consists of a 32-foot wide asphalt pavement plus 7-foot wide concrete sidewalks with integrated curb and gutter on both sides of the street.

Construction and development at Indian Summer began in 1993. From 1993 to present, Indian Summer was developed street-by-street to its current state. We understand initial construction started at Yelm Highway and continued southeast along Troon Lane to the intersection with Prestwick Lane. Development proceeded northwest along Prestwick Lane and Kinsale Lane to form a circular route back to Yelm Highway. The most recent development occurred in The Links, which is located at the southernmost point of the Indian Summer property between the Chehalis Western Trail and Rainier Road.

Pavement Services, Inc. (PSI) was retained to perform a pavement condition survey of ISRC streets. This survey was specific to the asphalt pavement surfaces of the ISRC street system. Sidewalks, curb, gutter, drainage facilities, and other infrastructure elements were not surveyed as a part of this project. No pavement coring or other testing was included in the scope of this project.

OBJECTIVE

The objective of this project was to assess the current condition of the ISRC street system and to develop a prioritized 4-year pavement maintenance and repair plan.

METHODOLOGY

PSI assessed pavement condition of discrete pavement sections using the Pavement Condition Index (PCI) method in general conformance with the American Society for Testing and Materials (ASTM) Test Method D 6433-11, *Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys*.

The PCI calculation was performed using the US Army Corps of Engineering software *MicroPAVER*. *MicroPAVER* is a pavement management system (PMS) that inventories pavement sections, stores condition survey data, generates PCI, and allows for advanced budget analysis and prediction of future pavement conditions.

We then created an annual maintenance and repair plan for the four-year period from 2014 to 2017 using the computed PCI, pavement distress types, and logical grouping of pavement sections.

PAVEMENT CONDITION SURVEY

2013 Pavement Condition Survey Results

PSI conducted the 2013 PCI survey in early July on 852,348 SF of roadway pavements. The distribution of the pavement surface conditions by PCI category is summarized in Table 1.

Table 1 - Summary of Pavement Surface Conditions by Area

PCI Ranges	Rating Category	Pavement Area	Rating Subcategory	Pavement Area
86-100	Good	852,348	I: 96-100	47,904
			II: 91-95	665,098
			III: 86-90	139,346
71-85	Satisfactory	--		
56-70	Fair	--		
41-55	Poor	--		
26-40	Very Poor	--		
11-25	Serious	--		
0-10	Failed	--		
Area (Ft ²)		852,348		
Average PCI		92		

During the 2013 pavement condition survey, we found the all but one section of the pavements are in GOOD condition with the remainder in SATISFACTORY condition. The overall PCI for the Indian Summer streets is 92. PCI values for each section are listed in Appendix A, Table A.1, and are shown spatially in Figures A.1 and A.2.

PSI defined pavement sections at ISRC in conformance with ASTM D-6433. This method uses distinguishing characteristics such as construction type, traffic, maintenance, street use (e.g. cul-de-sac or main roadway), and observable condition variations to define pavement sections.

Pavement Deterioration and Maintenance Activities

Maintenance and repair (M&R) activities are typically triggered by the condition or PCI of a pavement. Recognized PCI levels that trigger maintenance are in Figure 1. There are three categories of M&R: localized, global, and major.¹ Localized and global maintenance are both types of routine and preventive maintenance. Preventative maintenance is used to maintain pavements that have a high PCI. This range is commonly from 70 to 100. Major M&R includes both rehabilitation and reconstruction. Rehabilitation activities occur at a PCI of 70 or lower and include activities such as thin overlay or resurfacing. Pavements that reach the critical PCI require major M&R. Critical PCI is the point at which the rate of PCI loss increases with time and the application of preventive maintenance is no longer cost effective¹.

It is important that the PCI rating not be confused with the structural capacity of a pavement. For example, a pavement surface may rate high (PCI 70 to 100) but have underlying soil conditions that could result in pavement failure under heavy loads. On the other hand, a pavement may be rated as fair (PCI 55 to 70) due to a highly distressed surface but be structurally sound. The PCI is a tool that is used to help evaluate the best timing for application of M&R treatments. PCI does not define structural life but rather it aids in distinguishing the functional or service life of the pavement.

¹ *Pavement Management for Airports, Roads, and Parking Lots*, Shahin, M.Y. Second Edition, 2005

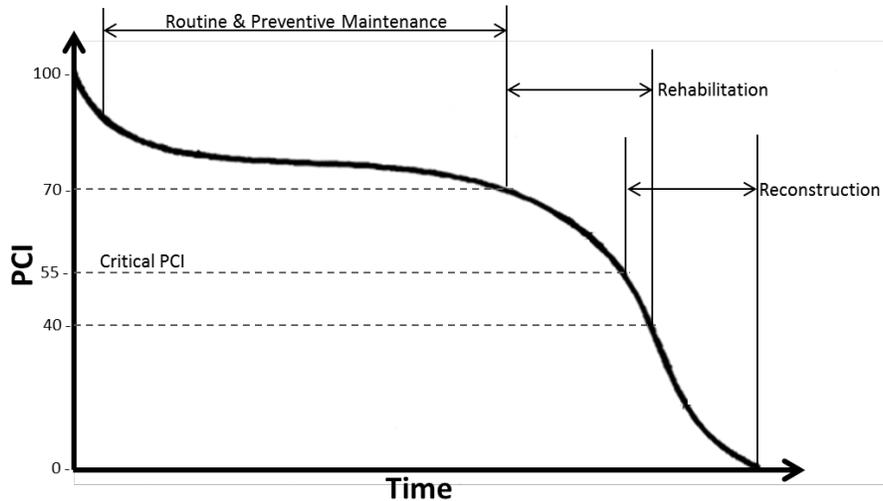


Figure 1. Maintenance Activity by Condition

Once a pavement reaches the critical PCI, major M&R activities such as grind and inlay or reconstruction activities are planned. A structural analysis is required to determine if the existing structure can support the current and forecasted traffic loading. We have assumed that the pavements at ISRC were designed and constructed to achieve a 20-year structural life in accordance with the City of Olympia Engineering Design and Development Standards that are based on a 20-year design life.²

Future Pavement Conditions Surveys

For high quality and beneficial pavement management, PSI recommends that a survey be conducted on a regular cycle, which could coincide with the Community's reserve study. Indian Summer has a reserve study update with a site visit accomplished every three years and an update without a site visit each intervening year. This study contains several infrastructure items including the current condition of the streets and their remaining life. Performing a pavement condition survey at least every five years or in conjunction with the reserve study site visit and update, ISRC or its supporting engineer can review and revise the current multi-year maintenance recommendations. The benefit of updating the maintenance recommendations after a pavement condition survey is that it is then possible to monitor the rate of deterioration or the presence of localized areas requiring work other than preventative maintenance.

Remaining Life until Major M&R

The 2013 pavement condition survey established the current condition of the ISRC pavements and defined the predominant pavement distress types observed on the street system. Armed with this information, PSI forecast an approximate number of years until a major M&R activity will be required.³ M.Y. Shahin defines a major M&R activity as one that will bring the PCI of the pavement back to 100. This may include removal and replacement (grind & inlay) of several inches of asphalt concrete (AC) or, alternatively, placement of an AC overlay directly on existing pavement surface.

Since the average current pavement condition of ISRC streets is 92, we know that the rate of deterioration of the AC pavements is slow. We attribute the slow rate of deterioration to the low average daily traffic,

² City of Olympia 2013 Engineering Design and Development Standards, Chapter 4: Transportation Text & Drawings
<http://olympiawa.gov/city-services/building-permits-and-inspections/~media/Files/PublicWorks/technicalservices/Chapter4-TransportationFINAL.pdf>
<http://olympiawa.gov/city-services/building-permits-and-inspections/~media/Files/PublicWorks/technicalservices/Chapter4-Transportation-DrawingsFINAL.pdf>

³ *Pavement Management for Airports, Roads, and Parking Lots*, Shahin, M.Y. Second Edition, 2005

minimal heavy loading by large multi-axle vehicles and the high quality of the initial construction. The general method used to determine the service life until major M&R was performed by using equations 1 and 2 shown below.

We initially ran the analysis using a PCI of 55 as the trigger value for major M&R. This is the point at which preventive maintenance costs increase significantly and rehabilitation activities become more cost effective. At a trigger value of 55, the estimated remaining service life of ISRC pavements exceeded all reasonable estimates (see Table A.1). We decided to run a second analysis using a value of 70 as the trigger for M&R. A trigger PCI of 70 better agrees with our observation of the existing pavement conditions at Indian Summer. Specifically, we know that over the past 20 years, Indian Summer residents have been accustomed to pavements that are at a high condition level. The results of our second analysis, using a trigger value of 70, provided estimated service lives that are in better agreement with our experience in the region.

Our method of analysis was to calculate the difference between the Current PCI and the PCI that triggers major M&R to determine the intermediate PCI (eq. 1).

$$PCI_I = PCI_C - PCI_M \quad \text{eq. 1}$$

PCI_I = Intermediate PCI

PCI_C = Current PCI

PCI_M = PCI value that triggers major M&R/ Critical PCI, 70

Second, the intermediate PCI was divided by a deterioration rate of 1.5 PCI points per year, to calculate an initial estimate of the remaining years until major M&R (eq. 2).

$$Y_I = \frac{PCI_I}{D} \quad \text{eq. 2}$$

Y_I = Initial estimated remaining years until major M&R

PCI_I = Intermediate PCI

D = Pavement deterioration rate (# PCI Points/Year), 1.5

Finally, with an initial number of years until major M&R, the pavement condition index percentage of distress caused by load, climate, and other mechanisms were reviewed and a final remaining life until major M&R was selected.

Based on the slow rate of deterioration of Indian Summer's streets, the majority of the pavements are not due for major M&R activity for another 10 years. These values are all dependent on the community's ability to continue to perform routine maintenance such as crack sealing, patching, and our recommendations for surface treatments. Table A.1 in Appendix A presents the recommended remaining life until major M&R for each section and the remaining life calculated using the trigger PCI of 55.

STREET MAINTENANCE AND REHABILITATION TREATMENTS

PSI selected M&R treatments and their associated timing to meet the objective of maintaining the pavement condition index at 92. The selected treatments are described below.

Routine Maintenance

We recommend that ISRC perform routine maintenance on an annual basis. Maintenance activities such as crack sealing, patching and patch replacement help to minimize the amount of water that penetrates the pavement surface. Preventing water from penetrating the pavement surface is important because water can cause subsurface damage that may lead to pavement failures. By sealing cracks, replacing old heavily distressed patched or replacing localized areas of deteriorating pavement Indian Summer will aid in maintaining a high pavement condition and longer life.

We understand that Indian Summer currently performs crack sealing on all new cracks. These cracks are both longitudinal or transvers and occur due to factors such as climate and usually do not indicate a structural issue. In comparison, there are cracks that occur from the bottom of the pavement and propagate upwards. These are called alligator cracking or fatigue cracking, and will eventually require full depth patching to remove the distressed area. We recommend that ISRC continue sealing cracks as well as sealing any unsealed cracks or cracks around patches or utilities.

In addition to crack sealing, it is important to perform patching. Currently, ISRC does patch repairs to localized areas of distress such as depressions, tree root damage, or alligator cracking. In areas where a significant amount of patching is required, we recommend placing the patch from the centerline to the curb, or the full width of the road. This will increase the life of the patch and eliminate any joints within the wheel paths.

Localized Rehabilitation

Indian Summer pavements are generally in good condition; however, the PSI rating team identified several areas with more severe distress. The following discussion outlines our maintenance recommendations for these areas:

Fairway Lane

A depression is located in the pull out near the mailboxes on Fairway Lane (Figure 2). The depression occurs where the paving joint of the roadway and the pull out area meet. Currently, the depression is only causing a decreased ride quality. If the depression becomes more severe, PSI recommends ISRC remove the pavement in the affected area, properly compact the base or subgrade material, and replace with new AC.



Figure 2. Depression on Fairway Lane near mailboxes

Prestwick Lane along Greenside Court

Multiple cracks have formed transversely across the street. The cracks appear to have formed above a buried storm sewer. We recommend repairing the smaller width cracks ($\frac{1}{4}$ to 1 inch) with crack sealant. We recommend patching areas where secondary cracks or alligator cracking have formed. The distressed area should be removed, the base or subgrade properly compacted, and the area patched with new AC. Figure 3 shows an example of a crack that should be repaired with a patch.



Figure 3. Transverse cracking on Prestwick Lane

Turnberry Lane between Prestwick Lane and Carnoustie Court

This area has the most pavement distress within the Indian Summer community. Two areas between Prestwick Lane and Carnoustie Court have had patch repairs made in attempt to mitigate fatigue cracking that is still present beyond the existing patches.

We understand that Patch 1 south of Carnoustie Court on Turnberry Lane was originally placed to remove fatigued pavement. New alligator cracking has appeared on both ends of the patch as well as to the east of the patch. PSI recommends that ISRC remove the pavement across the full width of the street, properly compact the base or subgrade, and replace with new asphalt. The repair should begin approximately 10 feet south of the catch basin located on the east side of the road and extend 10 feet south of the driveway to House 6443 (Figure 5).



Figure 4. Patch 1 south of Carnoustie Court on Turnberry Lane



Figure 5. Recommended repair boundaries

Patch 2 is located south of Patch 1, in front of House 6442 on Turnberry Lane. This area has alligator cracking around the perimeter of the patch. PSI recommends that ISRC remove the pavement from the curb to the road centerline, properly compact the base or subgrade, and replace with new AC. The repair should begin approximately 10 feet north of the driveway to House 6442 and extend to the south end of the driveway (Figure 7).



Figure 6. Patch 2 North of Prestwick Lane on Turnberry Lane



Figure 7. Recommended repair boundaries

Intersection of Prestwick Lane and Turnberry Lane

At the intersection of Prestwick Lane and Turnberry Lane, the pavement has alligator cracking and other signs of accelerated distress around the in-street appurtenances. PSI recommends that ISRC remove the pavement, recompact the base or subgrade, and replace the pavement around the utilities. Using the survey marker as the center point, the repairs should be made approximately 8 feet north-south and 8 feet east-west from the marker (Figure 9). Extend the pavement repair at least two feet beyond the areas of distress.



Figure 8. Distressed pavement at the intersection of Prestwick Lane and Turnberry Lane

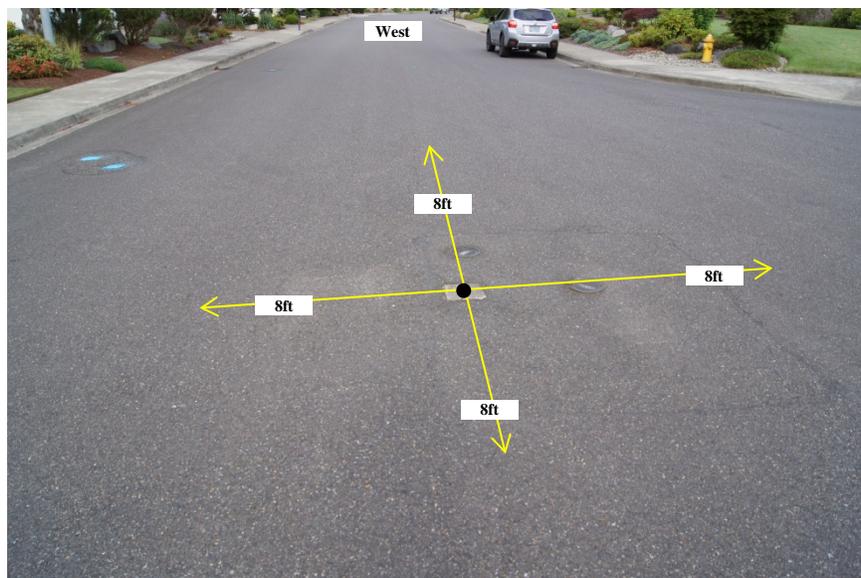


Figure 9. Recommended repair boundaries

At the intersection of Prestwick Lane and Turnberry Lane there is alligator cracking near the northwest curb. We recommend that ISRC remove the pavement, recompact base or subgrade materials, and place and compact new AC. The repair should be approximately 3 feet wide by 6 feet long, or extend at least one foot beyond the area of distress.

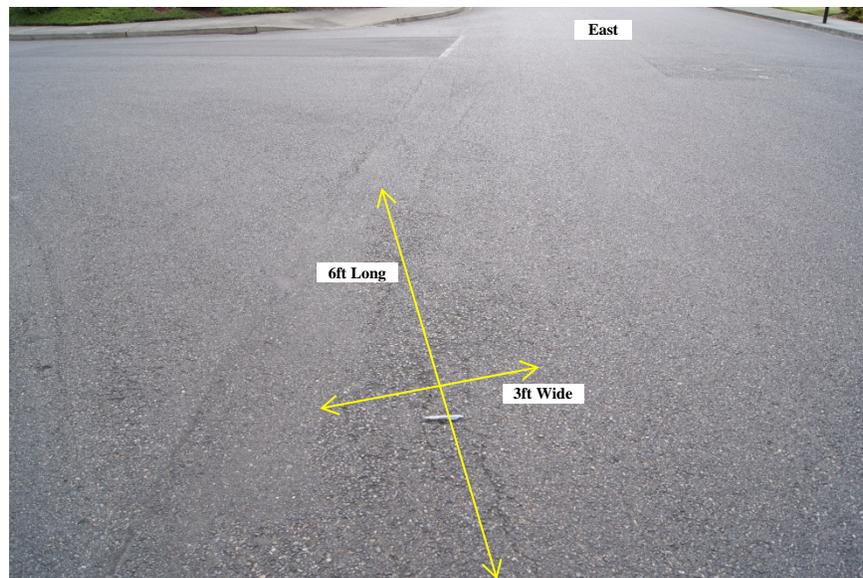


Figure 10. Alligator cracking near the northwest curb at Turnberry Lane and Prestwick Lane

Troon Lane near the 9th Hole

Along the east side of Troon Lane near the 9th hole of the Indian Summer golf course, roots from an adjacent tree (Figure 11) are causing cracking and a bump in the pavement. If possible, without damaging the health of the tree, we recommend that the roots be cut back, recompact the base or subgrade, and replace the pavement.



Figure 11. Tree Roots on Troon Lane

Preparation for Pavement Maintenance

We recommend preparing existing pavements prior to the application of any surface treatments or other maintenance work. Six to twelve months prior to applying the surface treatment, conduct crack sealing and patching, and correct any other issues affecting the ride quality or pavement performance. Immediately prior to applying the surface treatment, sweep the pavement of loose rock, dirt, and debris and cover utility inlets and survey markers (Figure 12) with heavy paper or roofing felt to prevent the surface treatment from obstructing these utilities for future use.



Figure 12. Example of a survey marker

Maintenance and Rehabilitation Recommendations

There are many types of M&R treatment options available for asphalt pavements including cape seal, chip seal, fog seal, microsurfacing, rejuvenator, slurry seal, thin overlays, or thin bonded wearing course. The selection of a surface treatment option should be based upon the expected service life of the treatment balanced against the cost of the treatment. Typically, lower cost surface treatments such as fog seal provide a service life of only 2-3 years. Conversely, higher cost surface treatments, such as microsurfacing or thin overlays, provide a longer service life. Based on our experience with a wide variety of surface treatments western Washington, we believe that there are several that would be well suited for the ISRC streets in their current condition.

A relatively inexpensive fog seal is a candidate for pavement preservation at Indian Summer. A fog seal is light application of diluted asphalt emulsion without aggregate. This treatment is appropriate for good condition pavements exhibiting only light weathering. The approximate cost is \$0.75/yd² with an expected performance period of 2 to 3 years. Successive fog seal applications can preserve and extend pavement life for a number of years.

A rejuvenating fog seal (rejuvenator) should also be considered for use at IRSC. These products, such as Reclamite and GSB-88, are similar to traditional fog seals, with the addition of rejuvenating oil that softens and penetrates the AC pavement surface to a depth of approximately 1/4 inch. The rejuvenating properties of these products restore certain components of asphalt mixtures lost during the aging and oxidation process. Rejuvenators may be applied with standard asphalt distributors similar to those used for fog seals. The expected performance of a rejuvenating fog seal is an extension of the life of a good pavement by about 3 to 5 years. The approximate cost of these products is \$0.75 to \$1.50/yd²

Lastly, we considered the use of slurry seal as a surface treatment to effectively preserve ISRC streets. A slurry seal consists of a mixture of aggregate, asphalt emulsion, and filler, blended according to a specified formula. The aggregate must be clean, crushed, durable, properly graded, and uniform. Fine aggregate mixtures are used for maximum crack penetration and sealing in low-density/low-wear traffic areas. Slurry seal can extend the life of a pavement that is in a good condition by about 5 to 7 years and typically costs between \$1.50 to \$2.00/yd².

Based on the existing high condition of the existing pavements at Indian Summer and the need to select a surface treatment to slow the oxidation and weathering of the existing AC pavements, we recommend the use of a rejuvenating fog seal on all ISRC pavements. A rejuvenating fog seal offers a cost effective method to preserve ISRC streets that exhibit a low level of structural defects such as alligator cracking and minimal environmental distresses such as weathering or raveling.

MAINTENANCE & REPAIR PRIORITIZATION

We prioritized M&R projects based upon the PCI, observed distresses and pavement use. The following table (Table 2) shows pavement sections grouped by year and recommended work type to create a four-year maintenance and repair plan. The projects are also shown on maps in Appendix B.

Table 2 - Summary of Maintenance Recommendation

PROJECT YEAR 2014 ¹					
Road Name	Section ID	Area (Ft ²)	Work Description	Estimated Cost	Total Cost
PRESTWICK LN	1	39,840	Rejuvenating Fog Seal	\$5,533	
PRESTWICK LN	2	48,640	Rejuvenating Fog Seal	\$6,756	
PRESTWICK LN	3	56,000	Rejuvenating Fog Seal	\$7,778	
PRESTWICK LN	4	9,536	Rejuvenating Fog Seal	\$1,324	
PRESTWICK LN	5	40,160	Rejuvenating Fog Seal	\$5,578	
KINSALE LN	1	90,304	Rejuvenating Fog Seal	\$12,542	
ALL OF INDIAN SUMMER			Crack Seal		\$39,511
PROJECT YEAR 2015 ¹					
Road Name	Section ID	Area (Ft ²)	Work Description	Estimated Cost	Total Cost
TROON LANE	1	9,600	Rejuvenating Fog Seal	\$1,333	
TROON LANE	2	9,760	Rejuvenating Fog Seal	\$1,356	
TROON LANE	3	158,550	Rejuvenating Fog Seal	\$22,021	
TURNBERRY LN	1	33,504	Rejuvenating Fog Seal	\$4,653	
TURNBERRY LN	2	61,536	Rejuvenating Fog Seal	\$8,547	
					\$37,910
PROJECT YEAR 2016 ¹					
Road Name	Section ID	Area (Ft ²)	Work Description	Estimated Cost	Total Cost
ASHBOURNE ALLEY 1	1	10,400	Rejuvenating Fog Seal	\$1,444	
ASHBOURNE ALLEY 2	1	3,500	Rejuvenating Fog Seal	\$486	
ASHBOURNE LN	1	36,352	Rejuvenating Fog Seal	\$5,049	
BERWICK LN	1	7,800	Rejuvenating Fog Seal	\$1,083	
BIRKDALE LN	1	14,430	Rejuvenating Fog Seal	\$2,004	
CARNOUSTIE CT	1	5,278	Rejuvenating Fog Seal	\$733	
FAIRWAY LN	1	28,080	Rejuvenating Fog Seal	\$3,900	
MUIRFIELD LN	1	14,820	Rejuvenating Fog Seal	\$2,058	
PORT STEWART LN	1	14,016	Rejuvenating Fog Seal	\$1,947	
ST GEORGE CT	1	3,640	Rejuvenating Fog Seal	\$506	
STONEHAVEN LN	1	25,090	Rejuvenating Fog Seal	\$3,485	
					\$22,695
PROJECT YEAR 2017 ¹					
Road Name	Section ID	Area (Ft ²)	Work Description	Estimated Cost	Total Cost
ASHDOWN	1	25,216	Rejuvenating Fog Seal	\$3,502	
ASHDOWN	2	9,600	Rejuvenating Fog Seal	\$1,333	
PRESTWICK LN	6	45,760	Rejuvenating Fog Seal	\$6,356	
SOUTHERNESS LN	1	38,304	Rejuvenating Fog Seal	\$5,320	
TENBY LN	1	8,632	Rejuvenating Fog Seal	\$1,199	
WISELY LN	1	4,000	Rejuvenating Fog Seal	\$556	
ALL OF INDIAN SUMMER			Crack Seal		\$18,266
Total Project Cost Year 2014 - 2017					\$118,382
NOTE: 1. Rejuvenating Fog Seal approximate unit cost is estimated to be \$1.25 per square yard.					

Cost Comparison

A cost comparison was used to evaluate the effectiveness of a strategy of relatively frequent applications of a rejuvenating fog seal for delaying the need for grind/inlay compared to a strategy of allowing deterioration to proceed unimpeded until grind/inlay is required. Fairway Lane was selected for this analysis because its current age was representative of the average overall age of the entire Indian Summer pavement network.

Our analysis compared the net present value (NPV) of the two strategies over an analysis period of 22 years. NPV is the discounted monetary value of expected net benefits of the alternatives being compared. NPV was calculated for two alternatives, rejuvenating fog seal and a two inch overlay using equation 3⁴. The input values to our life cycle cost analysis are in Table 3 and the results of our analysis are in Table 4.

$$NPV = Initial\ Cost + \sum_{k=1}^n Rehab\ Cost_k \left[\frac{1}{(1+i)^{n_k}} \right] \quad eq. 3$$

NPV = Net present value

n = Year of expenditure, 25 years

i = discount rate, 4%

Table 3 – Life Cycle Cost Analysis Input Values

Project:	Fairway Lane
Area (SY):	3,120
Current Age:	14
Current PCI:	90
Rejuvenating Fog Seal:	\$ 1.25/ SY
2" Overlay:	\$ 20.00/ SY

Table 4 – Life Cycle Cost Analysis Results

Fairway Lane Age	Maintenance Year	Alternative 1		Alternative 2	
		2" Overlay	NPV	Rejuvenating Fog Seal	NPV
14	0	--	--	\$3,900	\$3,900
26	12	--	--	\$3,900	\$2,635
29	15	\$62,400	\$34,649	--	--
36	22	--	--	\$62,400	\$26,330
		Option 2 Total NPV	\$ 34,649	Option 1 Total NPV	\$ 32,865

The results show that Indian Summer would reap a cost savings by applying a strategy of relatively frequent applications of a preventive maintenance treatment, such as a rejuvenating fog seal. By applying the rejuvenating fog seal twelve-year increments, we estimate that the ISRC could benefit by delaying the need for an overlay by seven years. This delay would result in a monetary benefit to ISRC of \$1,784 in terms of net present value. Note that this analysis is an estimate and it is not possible to predict the actual outcome due to unforeseen circumstances such as increased traffic loading, weather, subsurface issues, and other circumstances.

⁴ Federal Highway Administration *Life-Cycle Cost Analysis in Pavement Design*. Publication No. FHWA-SA-98-079. September 1998

SUMMARY

The overall pavement condition of the streets at Indian Summer Residential Community is GOOD. These pavements are displaying early signs of aging such as weathering and minor longitudinal cracking. Now is the time to begin a regular program of preventive maintenance to preserve and extend the life of the Indian Summer pavement system.

In the tables and drawings contained in this report, we present a four-year maintenance and repair plan that can be used as the foundation of a pavement preservation program. Using approximate unit costs based on our experience in the region, we developed estimates that can be used for budgeting street pavement maintenance over the period 2014 to 2017.

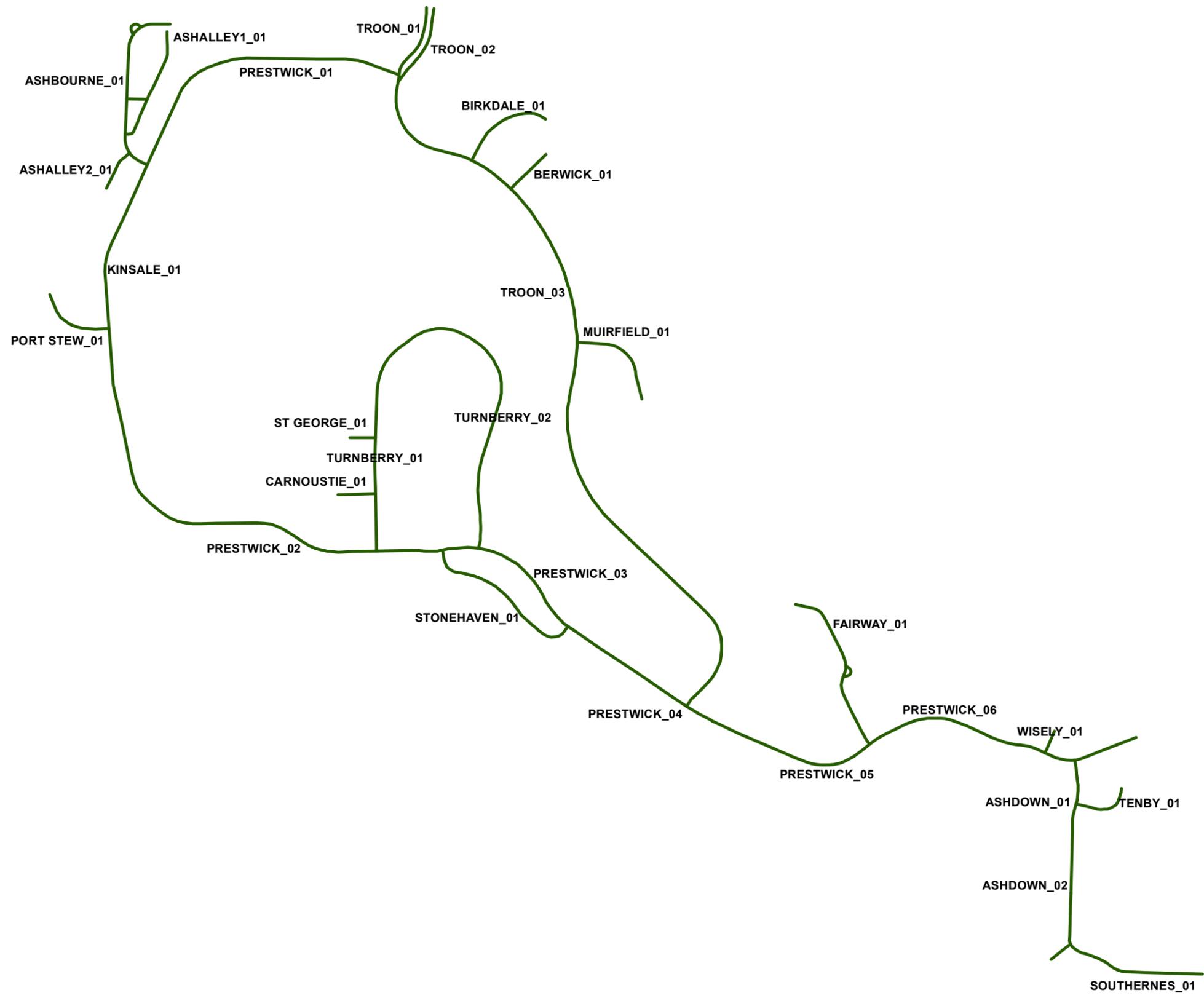
We recommend that Indian Summer continue the practice of sealing cracks on a yearly basis. We further recommend that ISRC begin a maintenance schedule that includes a rejuvenating fog seal as a surface treatment to preserve the current condition of the pavements.

Establishing a condition survey cycle every three years will provide up-to-date information and allow the most cost-effective use of maintenance and rehabilitation dollars.

APPENDIX A
DETAILED SECTION PCI &
REMAINING LIFE UNTIL MAJOR M&R

Table A.1 – Indian Summer Residential Community Detailed Section Information

Branch ID	Section ID	Road Name	PCI	Recommended Remaining Life Until Major M&R	Remaining Life Until Major M&R using Critical PCI=55
ASHALLEY1	1	ASHBOURNE ALLEY 1	93	18	25
ASHALLEY2	1	ASHBOURNE ALLEY 2	93	18	25
ASHBOURNE	1	ASHBOURNE LN	94	15	26
ASHDOWN	1	ASHDOWN LN	95	18	27
ASHDOWN	2	ASHDOWN LN	100	18	30
BERWICK	1	BERWICK LN	91	15	24
BIRKDALE	1	BIRKDALE LN	90	15	23
CARNOUSTIE	1	CARNOUSTIE CT	94	15	26
FAIRWAY	1	FAIRWAY LN	90	15	23
KINSALE	1	KINSALE LN	92	15	25
MUIRFIELD	1	MUIRFIELD LN	87	15	21
PORT STEW	1	PORT STEWART LN	88	15	22
PRESTWICK	1	PRESTWICK LN	94	15	26
PRESTWICK	2	PRESTWICK LN	88	15	22
PRESTWICK	3	PRESTWICK LN	92	15	25
PRESTWICK	4	PRESTWICK LN	93	15	25
PRESTWICK	5	PRESTWICK LN	91	15	24
PRESTWICK	6	PRESTWICK LN	95	18	27
SOUTHERNES	1	SOUTHERNESS LN	99	18	29
ST GEORGE	1	ST GEORGE CT	95	15	27
STONEHAVEN	1	STONEHAVEN LN	94	15	26
TENBY	1	TENBY LN	92	18	25
TROON	1	TROON LANE	86	10	21
TROON	2	TROON LANE	89	10	23
TROON	3	TROON LANE	92	15	25
TURNBERRY	1	TURNBERRY LN	92	10	25
TURNBERRY	2	TURNBERRY LN	91	15	24
WISELY	1	WISELY LN	94	18	26

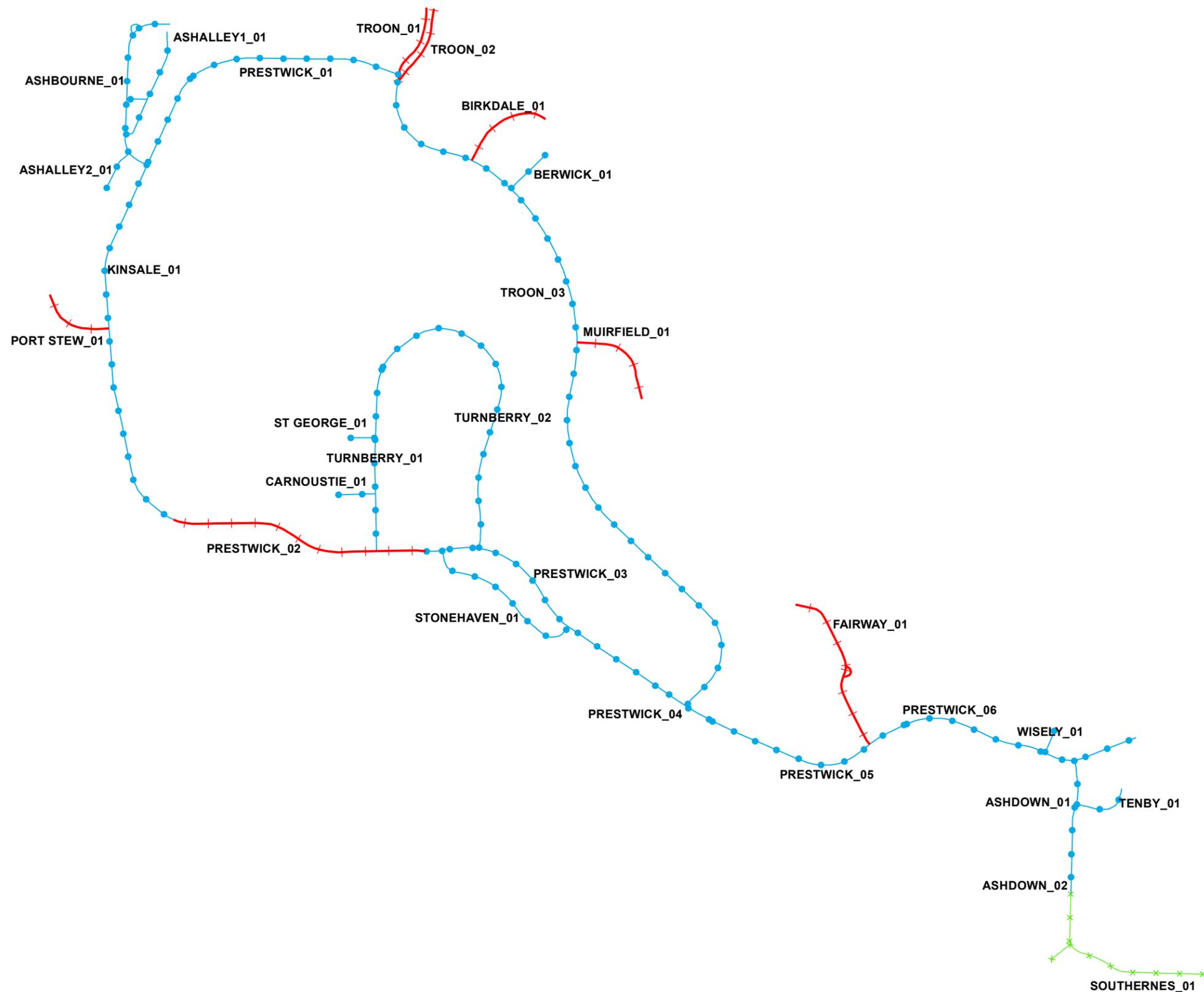


Legend

- 86 - 100 Good
- 71 - 85 Satisfactory
- 56 - 70 Fair
- 41 - 55 Poor
- 26 - 40 Very Poor
- 11 - 25 Serious
- 0 - 10 Failed

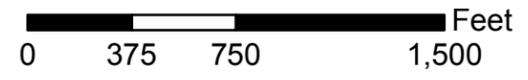


<i>Figure A.1</i>	
<i>Pavement Condition Index</i>	
<i>PCI Rating Year 2013</i>	
<i>Indian Summer Residential Community</i>	
<i>Olympia, Washington</i>	
	PAVEMENT SERVICES, INC. INNOVATIVE PAVEMENT SOLUTIONS
Date: 07/31/2013	
Job No: 13058	
1 of 2	



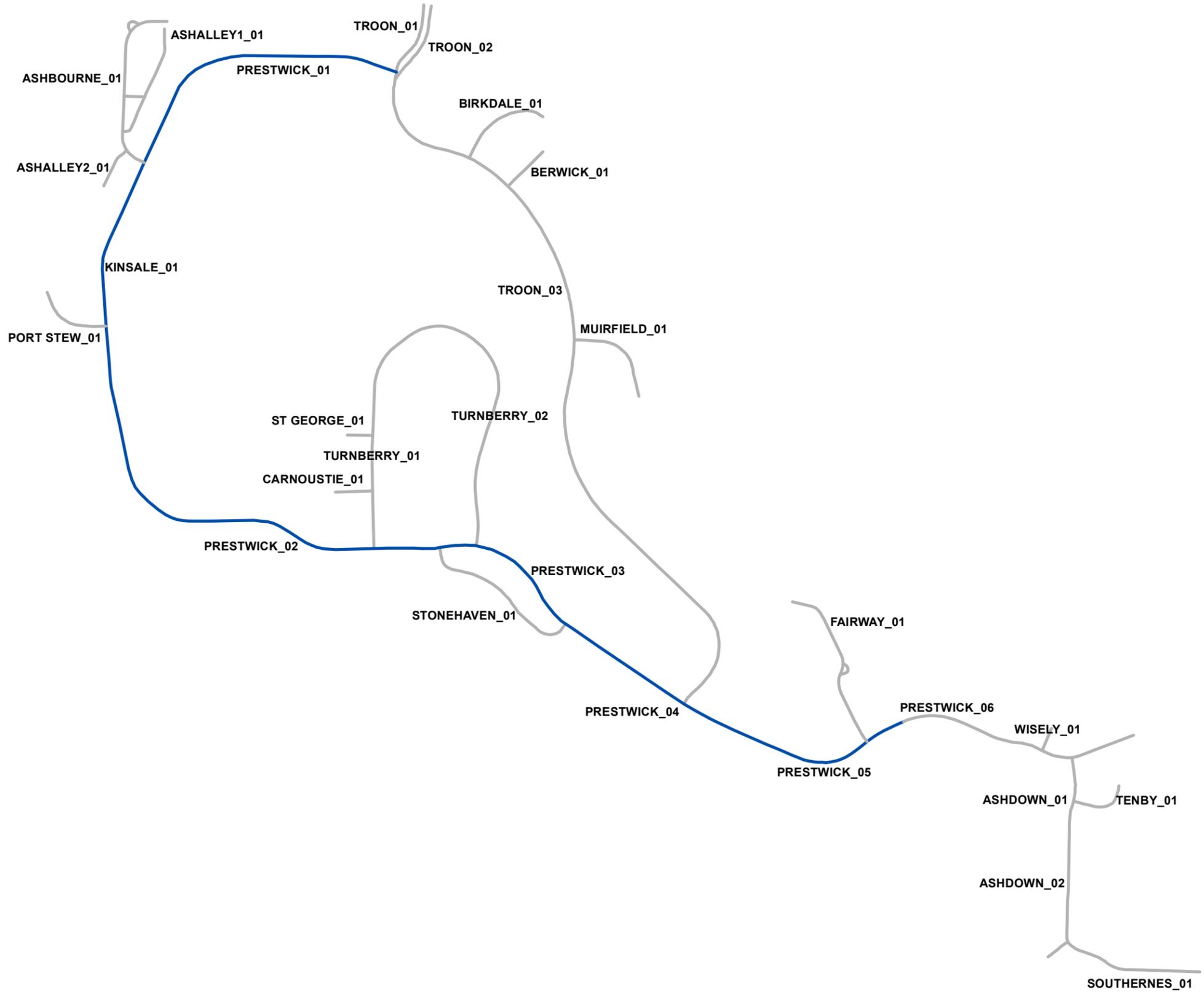
Legend

- ✕-✕-✕ Good I: 96 - 100
- Good II: 91 - 95
- +—+—+ Good III: 86 - 90



<i>Figure A.2</i>	
<i>PCI with Subcategories</i>	
<i>PCI Rating Year 2013</i>	
<i>Indian Summer Residential Community</i>	
<i>Olympia, Washington</i>	
	PAVEMENT SERVICES, INC. INNOVATIVE PAVEMENT SOLUTIONS
Date: 07/31/2013 Job No: 13058	
2 of 2	

APPENDIX B
MAINTENANCE & REPAIR RECOMMENDATION MAPS



Legend

- No Road Maintenance
- Rejuvenating Fog Seal

0 375 750 1,500 Feet

Figure B.1

M&R Recommendations
Projects for Year 2014

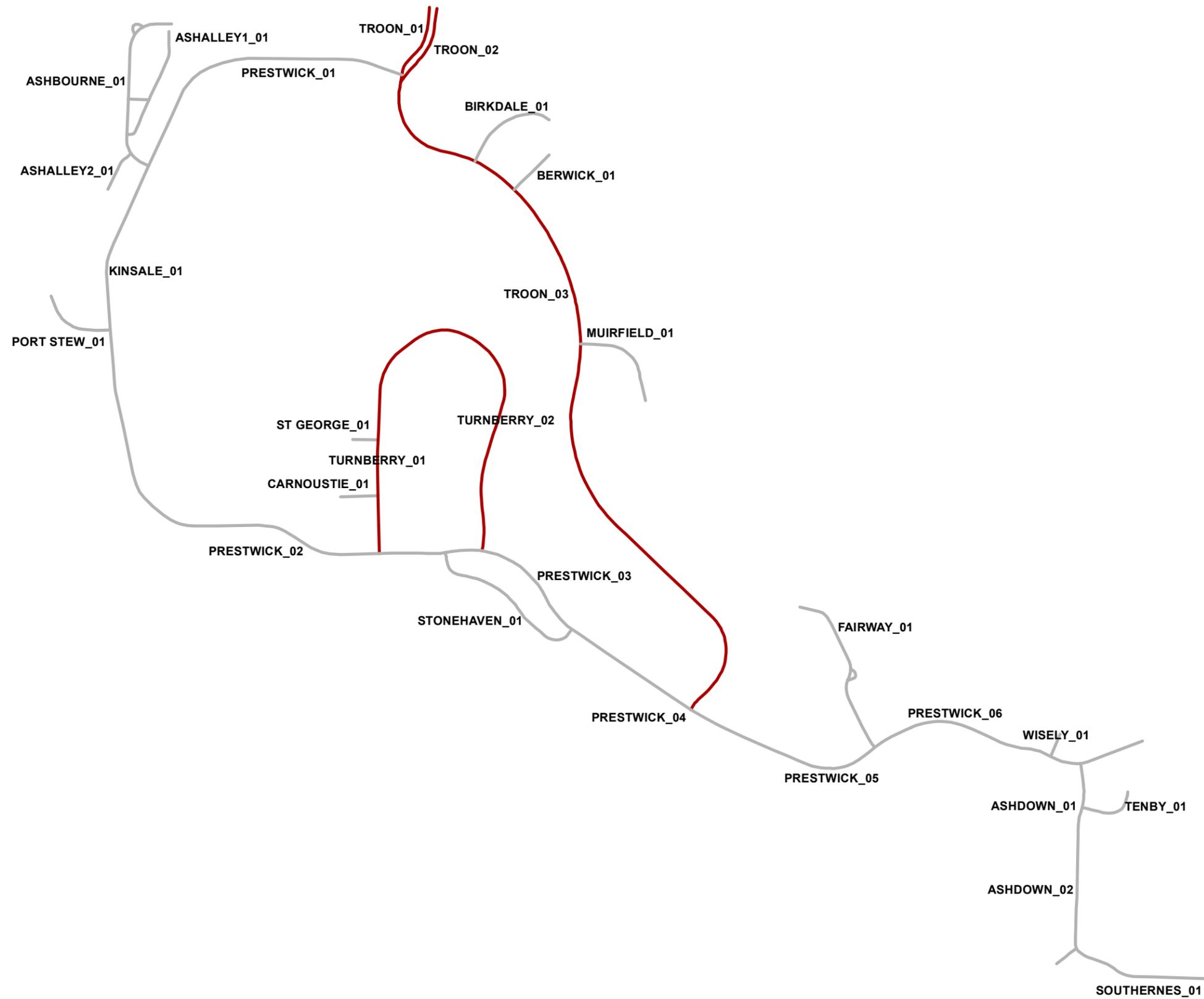
Indian Summer Residential Community
Olympia, Washington



PAVEMENT SERVICES, INC.
INNOVATIVE PAVEMENT SOLUTIONS

Date: 07/31/2013
Job No: 13058

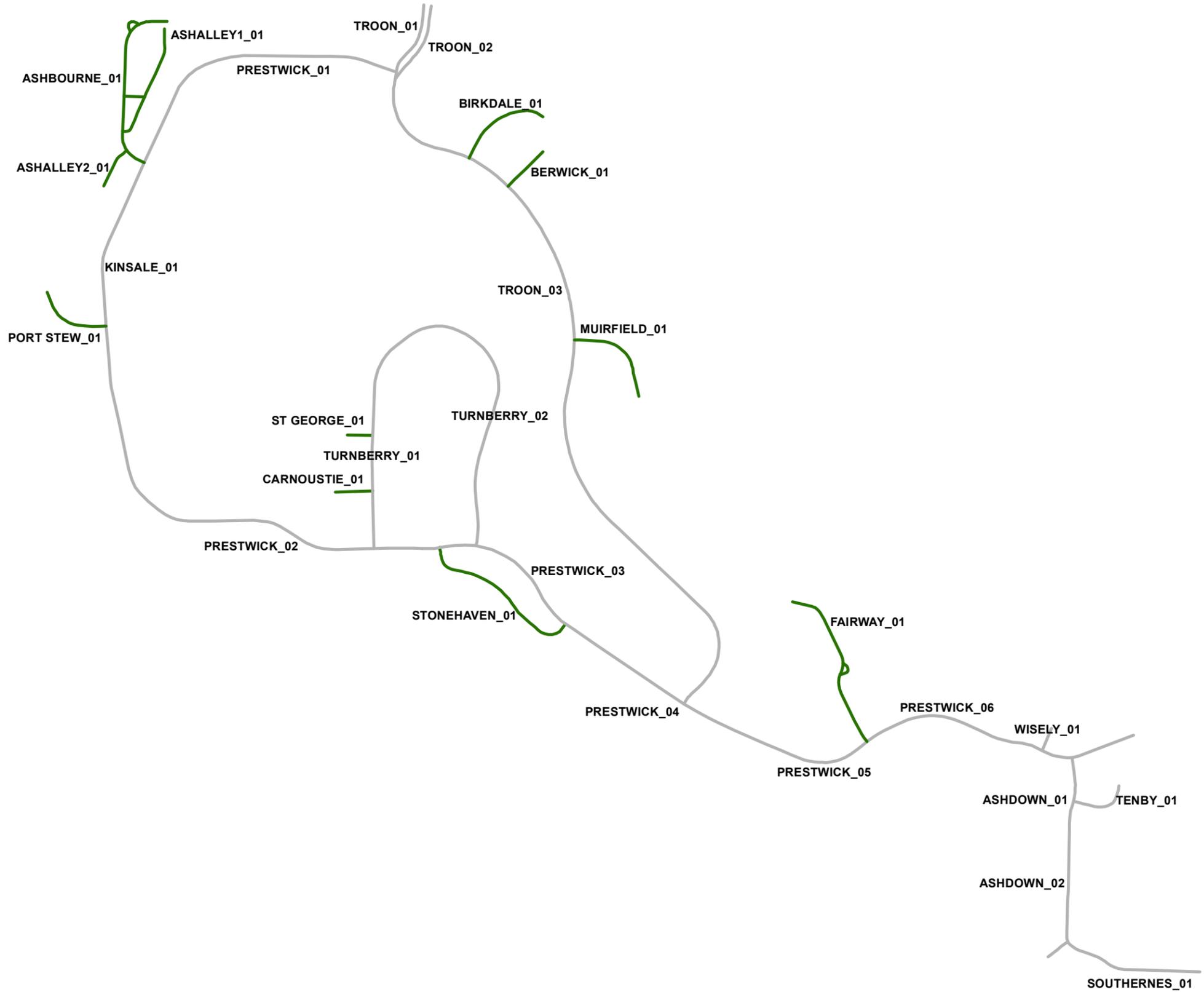
1 of 4



Legend

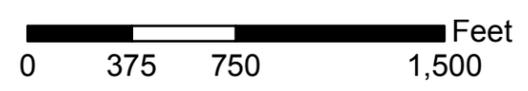
-  No Road Maintenance
 -  Rejuvenating Fog Seal
- 0 375 750 1,500 Feet
- 

<i>Figure B.2</i>	
<i>M&R Recommendations</i> <i>Projects for Year 2015</i>	
<i>Indian Summer Residential Community</i> <i>Olympia, Washington</i>	
	PAVEMENT SERVICES, INC. INNOVATIVE PAVEMENT SOLUTIONS
Date: 07/31/2013 Job No: 13058	
2 of 4	

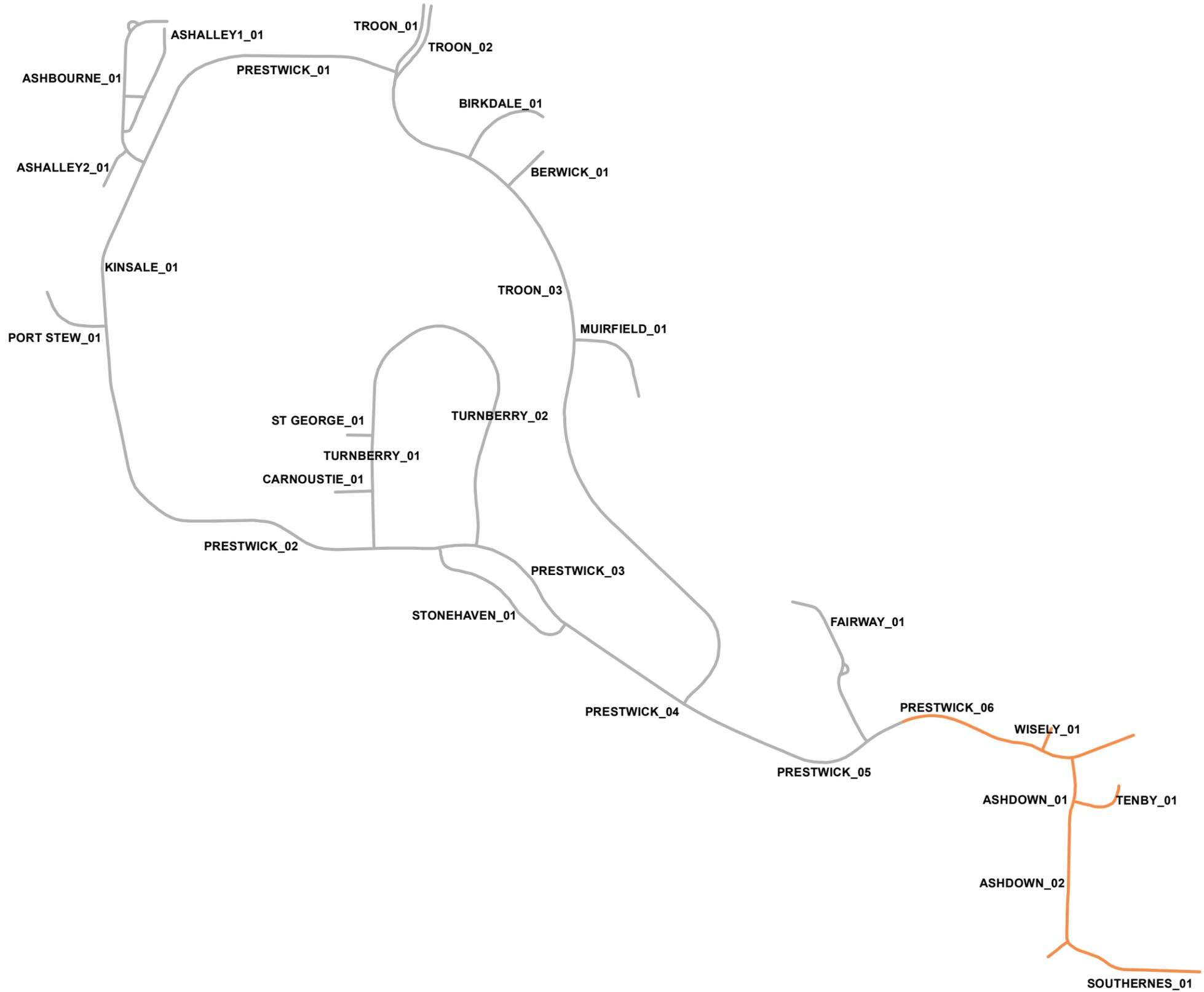


Legend

- No Road Maintenance
- Rejuvenating Fog Seal

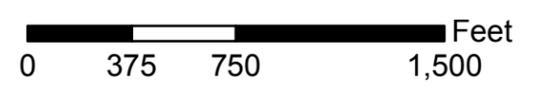


<i>Figure B.3</i>	
<i>M&R Recommendations</i>	
<i>Projects for Year 2016</i>	
<i>Indian Summer Residential Community</i>	
<i>Olympia, Washington</i>	
	PAVEMENT SERVICES, INC. INNOVATIVE PAVEMENT SOLUTIONS
Date: 07/31/2013	
Job No: 13058	
3 of 4	



Legend

-  No Road Maintenance
-  Rejuvenating Fog Seal



<i>Figure B.4</i>	
<i>M&R Recommendations</i>	
<i>Projects for Year 2017</i>	
<i>Indian Summer Residential Community</i>	
<i>Olympia, Washington</i>	
	PAVEMENT SERVICES, INC. INNOVATIVE PAVEMENT SOLUTIONS
Date: 07/31/2013	
Job No: 13058	