2012 Pavement Management Plan

Maintenance and
Rehabilitation Planning

Baker City Public Works - March 2012

PROVIDING...

- Recommendations for the most cost effective treatments
- Budget cost estimated to maintain a serviceable pavement condition
- Analysis of effects of varied funding levels
- Quantifiable date and projections
- A means to track pavement performance over time

Introduction

To: The Public Works Advisory Committee
From: Gary Van Patten, Assistant Public Works Director
Date: March 15, 2012

Subject: 2012 Pavement Management Plan

This report again spotlights the historical data and proposed preventative maintenance activities for the community's transportation infrastructure. The program, first started in the early 1980's has been, within the confines of the revenue available, successful in gaining the greatest useful life for our streets. Eighty seven percent of the system was constructed at least twenty five years ago. When considering that the design life of most of those streets was about twenty five years, the fact that they are still functioning, albeit at a lower level, I believe is a testament to the program. The community's transportation system, based on today's replacement cost, has a value in excess of one hundred million dollars. Our streets are a critical element for the health and well being of our community.
The preventative maintenance projects outlined in the 2011 Pavement Management Plan were completed as planned. The 'E' Street Thin Overlay and Sidewalk Improvement Project enhanced the high profile area near the Baker High School. Pedestrians no longer have to compete with vehicles as they move between the High School parking lot and the stadium. The pavement condition rating for the street section moved from the "Fair" category to the "Very Good" category.
We are proposing to forego the continuation of the 'E' Street overlay project this year and hold those dollars in reserve in order to be able to fund multiple blocks next year. Completion of the Resort Street paving will allow us to capitalize on having another paving project in the city to leverage more favorable bid results.

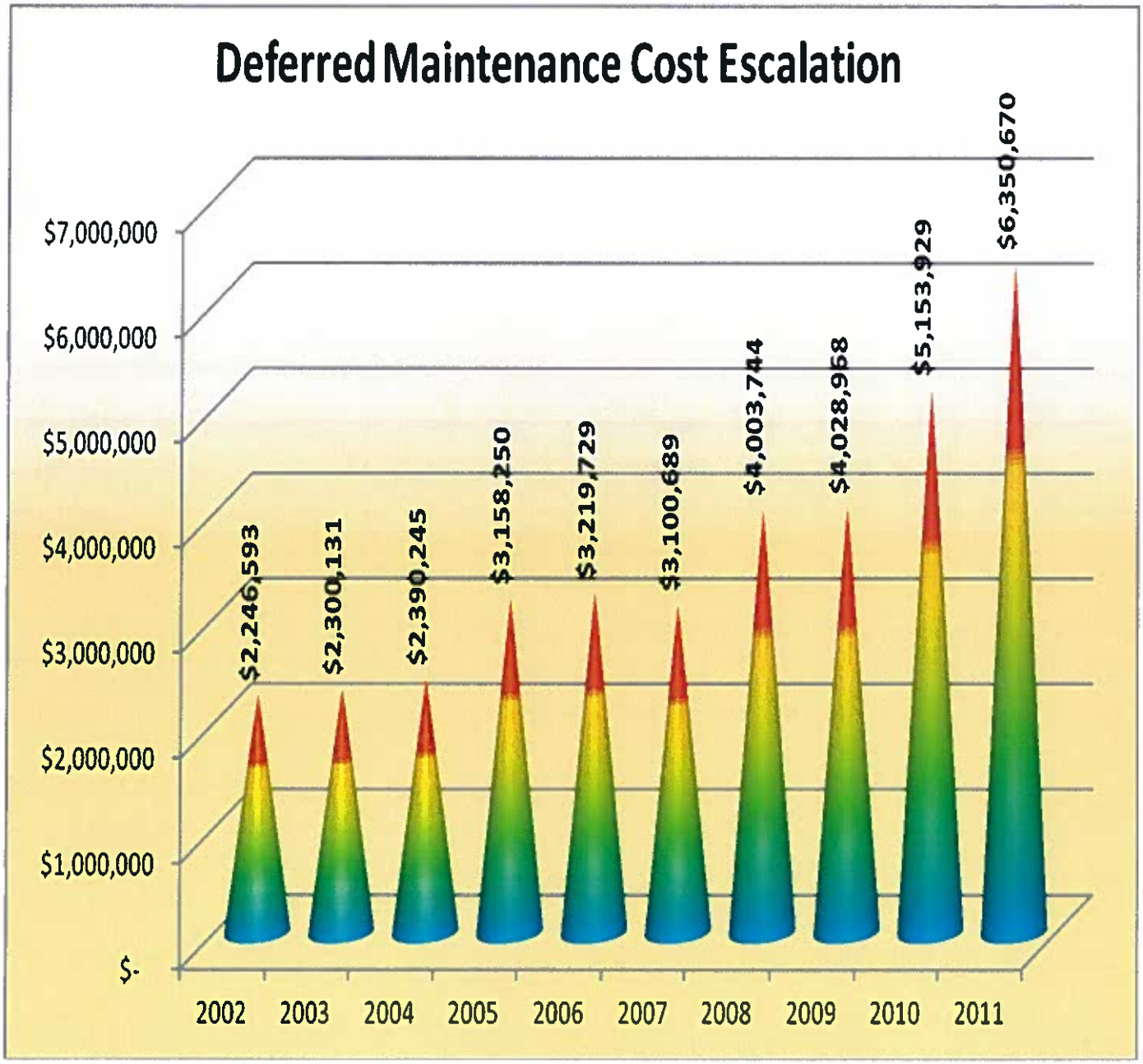
The 2011 Chip Seal program treated 60,665 square yards of pavement. Selection criteria were mostly weighted toward higher traffic routes. Most of the streets were located in the central area of town north and east of the UPRR, west of Main Street and south of Campbell Street.

This year's Chip Seal Project is proposing to treat approximately 85,825 square yards. We are planning to test a couple of blocks with a double chip seal applied over a pavement fabric similar to what is used with our overlays. While initially more expensive, we will be monitoring the performance and life cycle cost of such an application. We will also be doing a test application of fog seal treatment over a short section of our single chip seal. Many agencies do this routinely. We try to stay abreast of techniques and products that may work better for Baker City.

Our chip seal selection criteria will focus on the more critical elements of the system. The pavement condition index (PCI) also comes into play. Each of the tools in our preventative maintenance tool box has a range of PCI's that the procedure is designed to benefit. As an example, applying a chip seal to a street with areas of instability and evidence of structural deficiency, defined as "poor" in our rating system, would be considered reactive maintenance. Any expectations of such a stop-gap measure would need to be tempered with the knowledge that it was not a recommended treatment. Baker City has no shortage of streets with a PCI that is appropriate for chip seal applications, but they are not our most deteriorated streets. Page 13 has more information regarding the various types of preventative maintenance procedures.

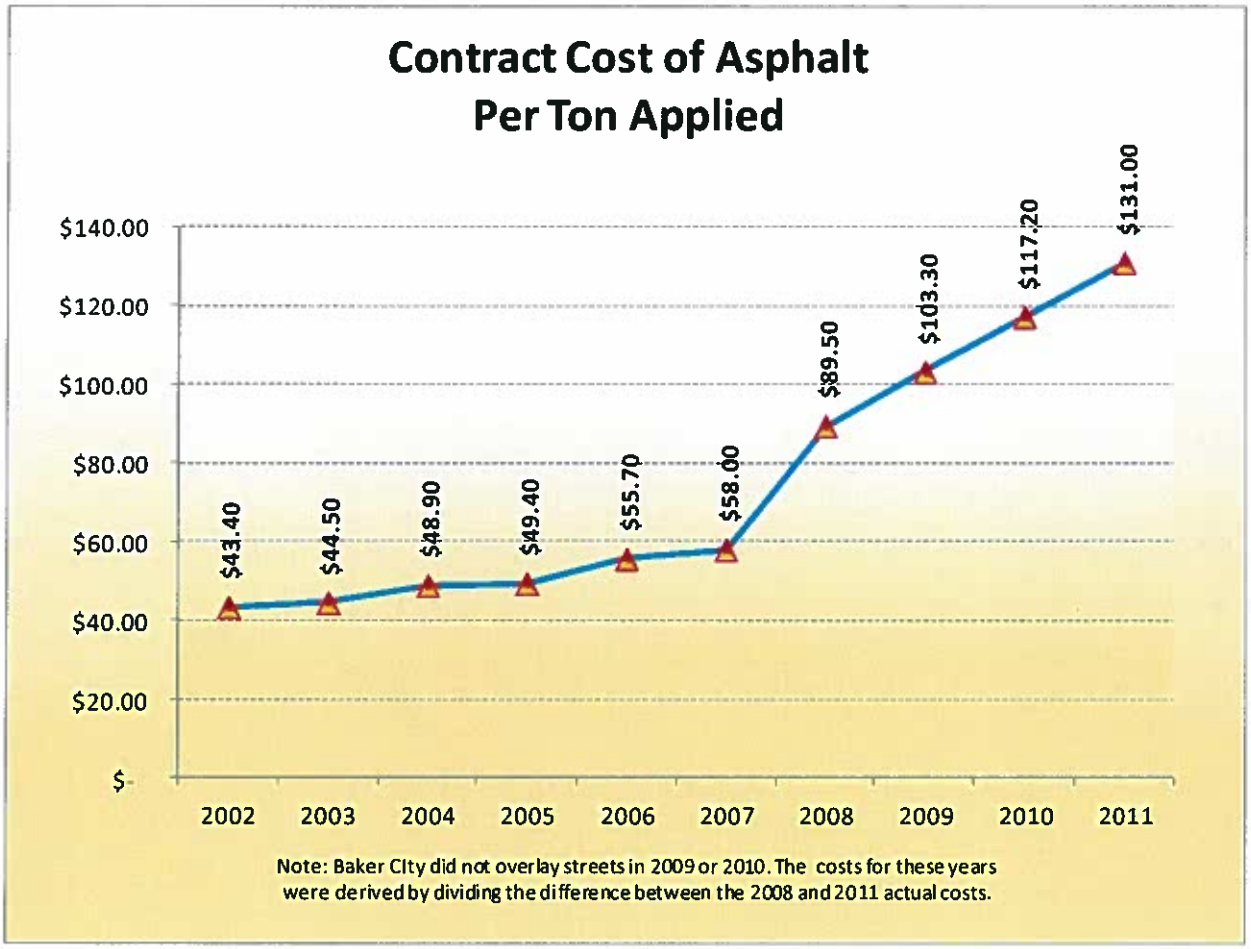
Introduction Cont'd

This introduction quantifies the deferred street maintenance activities for the system. The graph below illustrates the approximate cost to treat every street with the recommended treatment for its category in each of the last 10 years. The graph further demonstrates the level of maintenance needed but not funded for each of those years. As you can see, those deferred maintenance costs have continued to climb.



Introduction Cont'd

Also shown is the ever increasing cost of asphalt application, a major contributor to the escalating cost of overlays. Not shown by graph, but still tied to the asphalt cost, are the costs of fog seal and chip seal oils, all of which are directly related to our dwindling purchasing power.



We are not the only community that is building a backlog of deferred maintenance. I believe all communities are facing the same issues as Baker City. The ever escalating cost of asphalt and asphalt products, being applied to aging systems, along with stagnate revenue streams have pretty much made it a universal problem. The basic philosophies first applied more than thirty years ago still apply. We continue to try to keep the "Good Streets Good". However, as noted over the last decade, the overall integrity of the system is moving toward eventual failure.

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Crack Patching in Preparation for Chip seal 2011

Overall Pavement Management Plan

Maintain Baker City's existing transportation system at the highest level possible with the funds available.

Program Objectives [1]

1. Keep most of Baker City's paved streets in the "Very Good" or "Good" category.
2. Do not allow any street to remain in the "Poor" category for more than two years.
3. Do not allow any paved street to deteriorate below the "Poor" category.
4. Increase the percentage of streets in the "Very Good" category.
5. Monitor deterioration patterns. Recognize future needs and plan to minimize their impact.

Review of Achievements Toward Program

1. The program continues to meet objective number one. Currently 65% of Baker City's paved streets are in the "Very Good" or "Good" category. Our analysis shows that band-aid treatments, like the single chip seal, temporarily elevate or maintain ratings on streets that are showing a steady decline.

2. There are currently five street sections in the "Poor" category. The largest section is Resort Street which is scheduled for replacement in 2013.

3. We are seeing a downward trend in pavement conditions with overall system deterioration which is beginning to overwhelm the resources available and increase sections in the "Poor" category with deterioration causing the first section in 20 years to fall to the "Very Poor" level. Clifford Street is the first street section in Baker City's pavement management system to fall into the "Very Poor" category since 1991.

4. Maintaining this goal has largely influenced by community growth and the addition of new subdivision streets or grant assisted street projects such as 'D' Street or Birch Street in the recent past. Without new construction, additions to the "Very Good" category are the result of overlays or a chip seal of a higher level "Good" Street. Raising the percentage by adding new streets is more indicative of current community growth than success with the "Pavement Management Plan". New streets incorporated into the system add to the overall maintenance responsibilities. More than three miles (61236.9 yd^2) of pavement have been added to the system during the last ten years.

5. We continue to monitor deterioration patterns in the street system. Current and future needs have been identified in past reports. We continue to systematically set priorities and utilize resources to provide the best use of the taxpayer dollar.

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1 For those who are unfamiliar with the program, a detailed explanation of the pavement rating system is provided beginning on page 10.

Overall Pavement Management Plan Cont'd

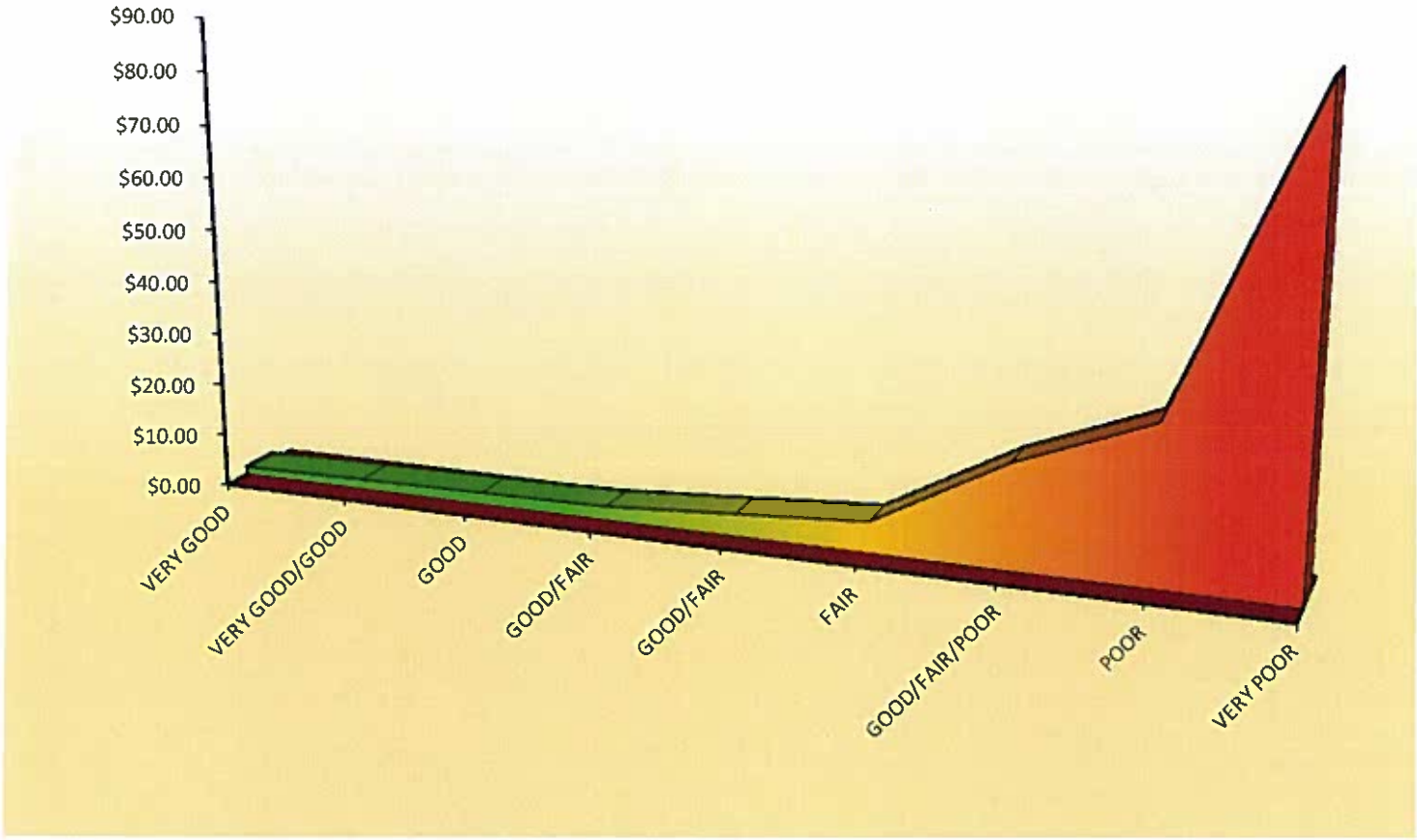
2012 Maintenance Tasks[2]

Continuing our focus on program objectives 1-4, maintenance tasks for 2012 will consist of chip sealing approximately 4 miles (85,825 square yards) of city streets.

Selection criteria for these streets primarily consists of the following: Collector streets with a rating of less than 94 that have not received a chip seal treatment since the program was reinstated and local streets with ratings in the mid-fair to low-good categories with higher anticipated traffic demands such as streets located in the downtown corridor or near schools or government buildings.

2 See page 13 for a detailed explanation of maintenance procedures

2012 Maintenance Curve



STREET CATEGORY	COST PER SQUARE YARD	TYPE OF MAINTENANCE
VERY GOOD	$1.56	FOG SEAL (NO PREP)
VERY GOOD/GOOD	$1.98	1/4"-10 SINGLE CHIP (NO PREP)
GOOD	$2.35	FOG SEAL (INCLUDING PATCHING)
GOOD/FAIR	$2.76	3/8"-1/4" SINGLE CHIP SEAL (SOME PREP)
GOOD/FAIR	$4.42	DOUBLE CHIP SEAL (SOME PATCHING)
FAIR	$6.11	DOUBLE CHIP SEAL (CONSIDERABLE PATCHING)
GOOD/FAIR/POOR	$20.00	THIN OVERLAY (MINOR PATCHING)
POOR	$30.00[3]	THIN OVERLAY (CONSIDERABLE PATCHING)
VERY POOR	$90.00[3]	REBUILD

This graph represents the very foundation upon which the Pavement Management Plan was developed. Maintaining streets in the "Fair" and above categories provides the citizens of Baker City with the most cost effective transportation system.

3 Added cost for required ADA compliance is not included in these estimated amounts.

2012 Maintenance Task Estimate

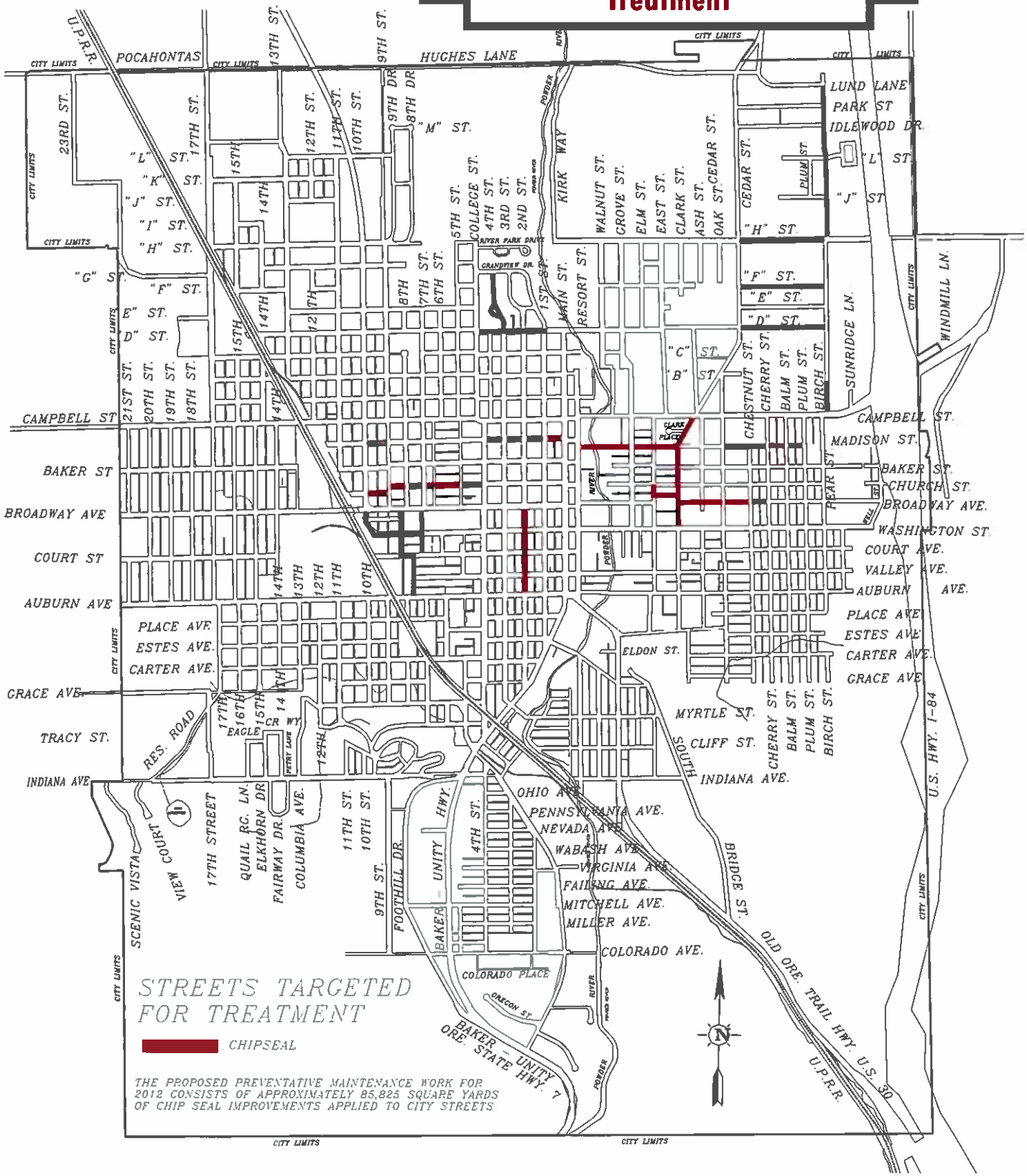
RECOMMENDED TREATMENT	MILEAGE	SQUARE YARDS	ESTIMATED COST PER SQUARE YARD	TOTAL COST
ASPHALT THIN OVERLAY				
Application	.05	1,301	$37.28	$48,515
Prep, Patch, Miscellaneous				$26,026
Stormwater System Construction				$16,866
ADA Required				$22,752
Asphalt Thin Overlay Sub Total				**$114,159**[4]
CHIP SEAL				
Application To City Streets		85,825	2.10	$180,233
Prep & Patch City Streets		85,825	.71	$ 60,936
2012 CHIP SEAL SUB TOTAL				**$241,169**
TECHNICAL SERVICES/ENGINEERING (10%)				$24,117
ADMINISTRATION (8.1%)				$21,488
CONTINGENCY (6%)				$17,206
2012 Chip Seal Total Estimated Cost				**$303,980**

Revenue for this work comes from the Surface Transportation Program (STP), the Serial Maintenance Levy (now a portion of the tax base).

Note: Crack filling and asphalt crack patching necessary to prep streets for treatment are now funded in the street maintenance department of the street fund and not the preventative

4 The thin overlay cost shown reflects the amount proposed to be reserved in order to complete multiple blocks next year in concert with the Resort

2012 Street Selected for Treatment



Annual Street Condition Ratings Mileage[5]

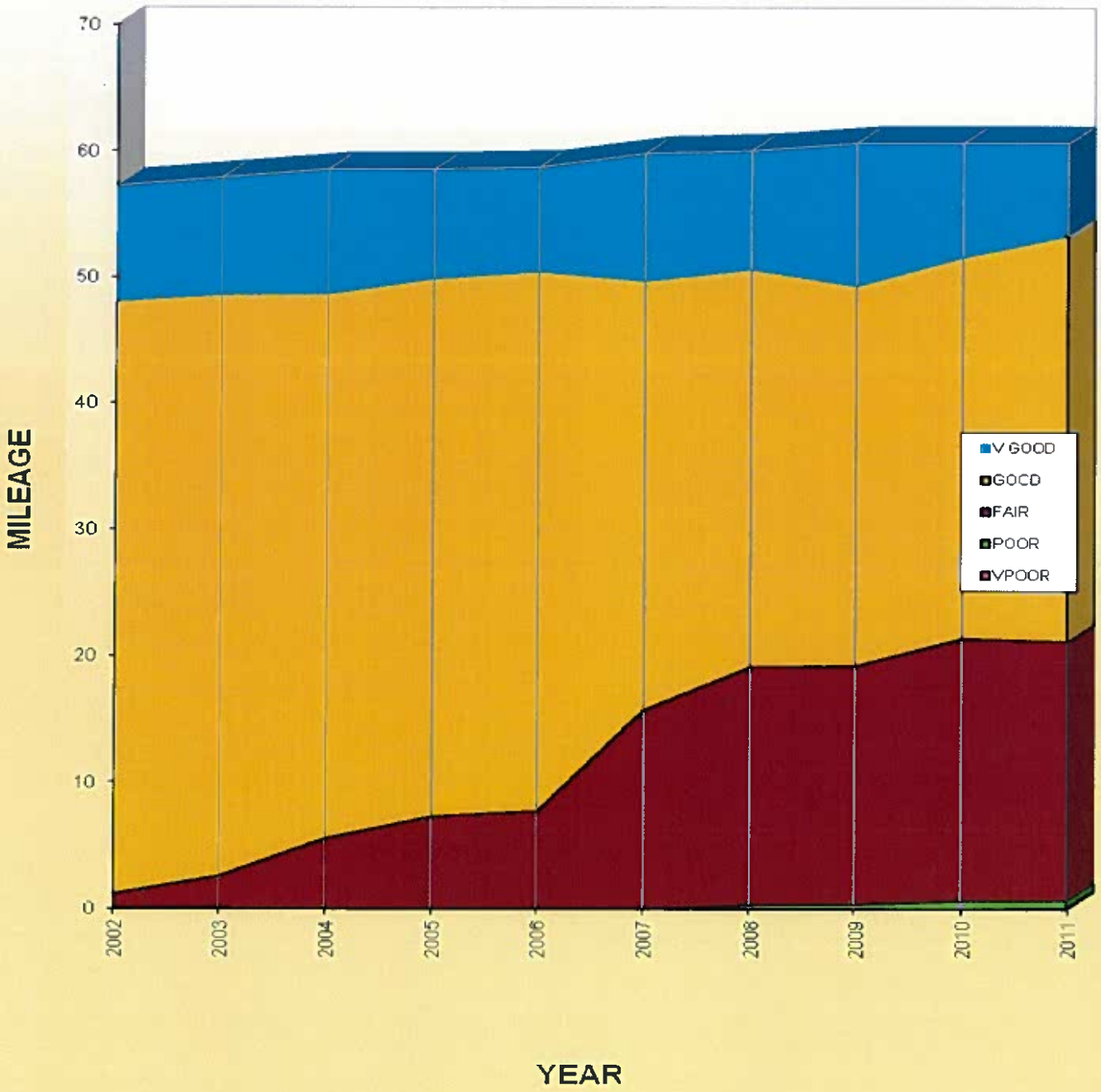
	Very Good	Good	Fair	Poor	Very Poor	Total Miles Asphalt Streets	Double Chip Gravel	Collector Gravel	Local Gravel	Total Miles Gravel Streets	Total Miles Unopened Streets	Total Miles All Streets
2011	7.38	32.13	20.44	.58	.08	60.61	.82	1.01	7.81	9.64	11.47	81.72
2010	9.09	30.18	20.71	0.63	0.00	60.61	0.82	1.01	7.81	9.64	11.47	81.72
2009	11.39	30.05	18.81	0.36	0.00	60.61	0.82	1.01	7.81	9.64	11.47	81.72
2008	9.46	31.46	18.80	0.28	0.00	60.00	0.82	1.14	8.06	10.02	11.70	81.72
2007	10.16	33.93	15.69	0.00	0.00	59.78	0.82	1.14	8.06	10.02	11.70	81.50
2006	8.33	42.69	7.67	0.00	0.00	58.69	0.82	1.14	7.95	9.91	11.80	80.40
2005	8.72	42.54	7.25	0.00	0.00	58.51	0.82	1.14	7.95	9.91	11.98	80.40
2004	9.93	43.06	5.52	0.00	0.00	58.51	0.82	1.14	7.95	9.91	11.98	80.40
2003	9.35	45.96	2.54	0.00	0.00	57.85	0.82	1.27	7.95	10.04	11.98	79.87
2002	9.21	46.84	1.13	0.00	0.00	57.18	0.82	1.27	7.95	10.04	11.98	79.20
2000	7.30	47.20	2.76	0.00	0.00	57.26	NEW CATEGORY ADDED IN 2002	1.77	8.19	9.96	11.98	79.20
1999	6.18	49.81	1.16	0.00	0.00	57.15		1.77	8.19	9.96	11.98	79.09
1998	6.81	48.78	0.90	0.00	0.00	56.49		2.10	8.19	10.29	12.13	78.91
1997	5.33	50.72	0.17	0.00	0.00	56.22		2.18	8.24	10.42	12.00	78.64
1996*	6.04	49.38	0.55	0.00	0.00	55.97		2.18	8.24	10.42	12.00	78.39
1995	5.58	48.34	1.41	0.00	0.00	55.33		4.50	6.20	10.70	12.28	78.31
1994	6.85	45.34	2.88	0.00	0.00	55.07		4.50	6.20	10.70	12.54	78.31
1993	7.20	43.04	3.98	0.00	0.00	54.22		4.77	6.20	10.97	12.56	77.75
1992	6.95	44.09	2.66	0.00	0.00	53.70		5.22	6.20	11.42	13.08	78.20
1991	6.45	39.00	7.37	0.02	0.14	52.98		5.87	6.33	12.20	13.00	78.18
1990	6.84	38.31	5.47	1.05	1.31	52.98		5.87	6.33	12.20	13.00	78.18
1989	6.62	36.04	6.57	1.98	1.30	52.51		5.94	6.93	12.87	12.77	78.15

Due to weather conditions in 2001, the annual street inspection was not fully completed. Partial inspection showed some degradation.

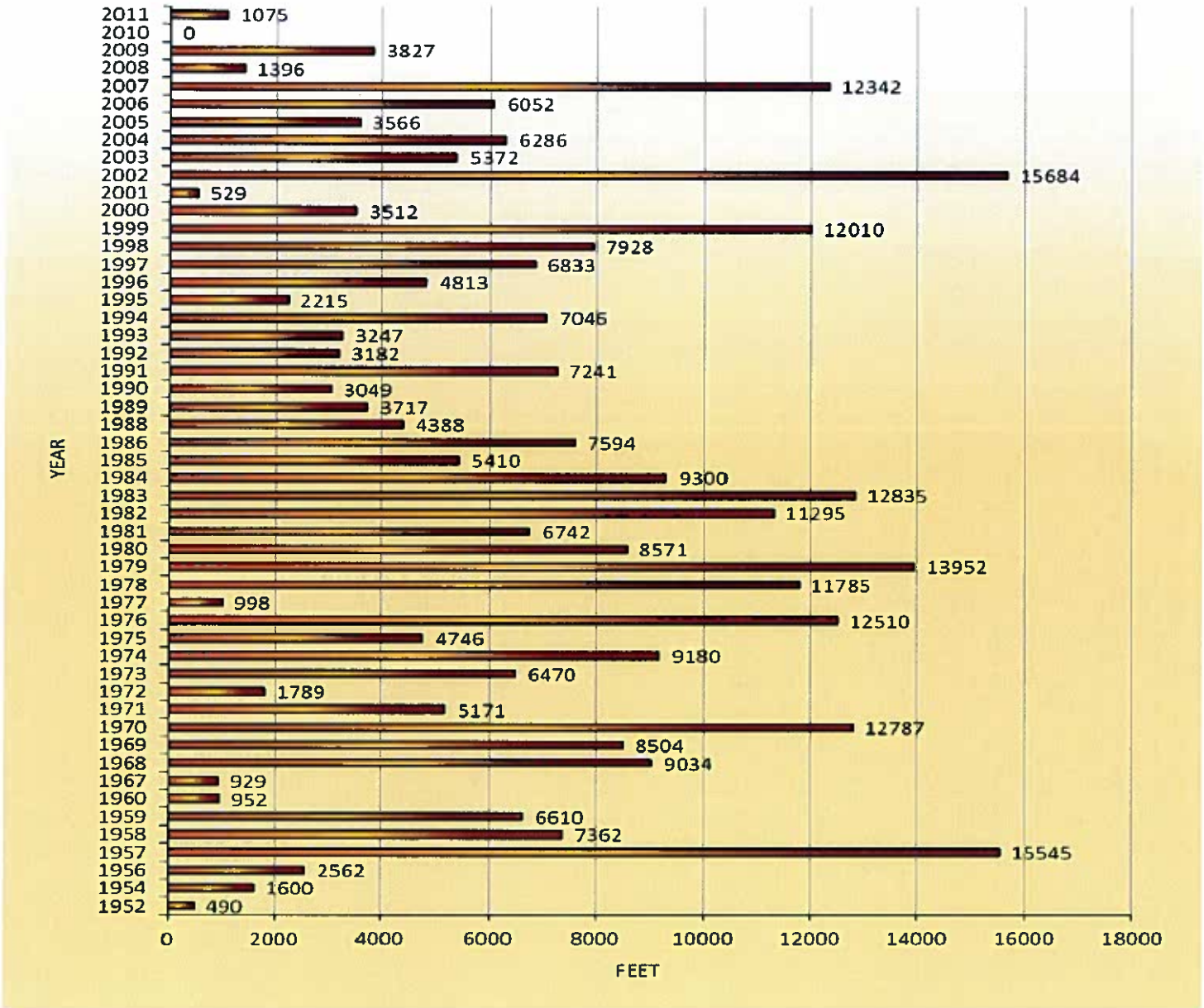
* In order to conform to the 1996 Transportation Plan, some gravel streets were reclassified.

5 See page 12 for a detailed explanation of rating categories.

2011 Annual Asphalt Condition Ratings

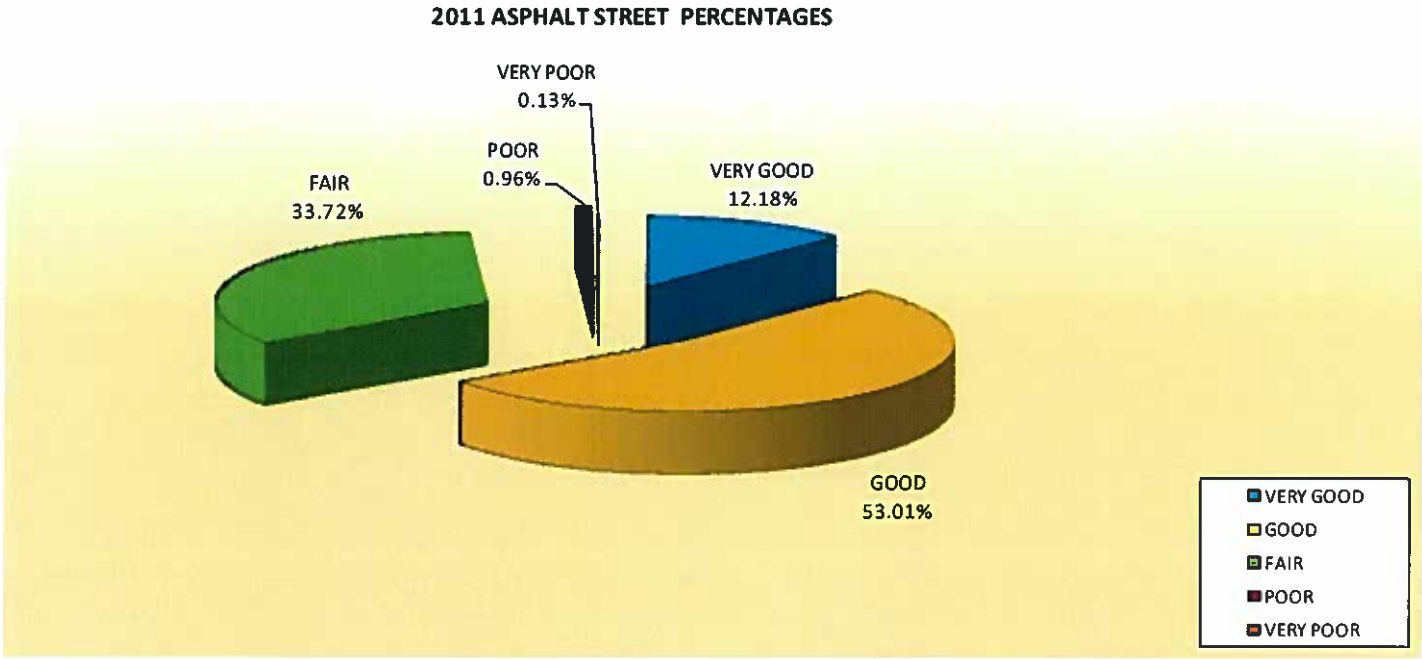


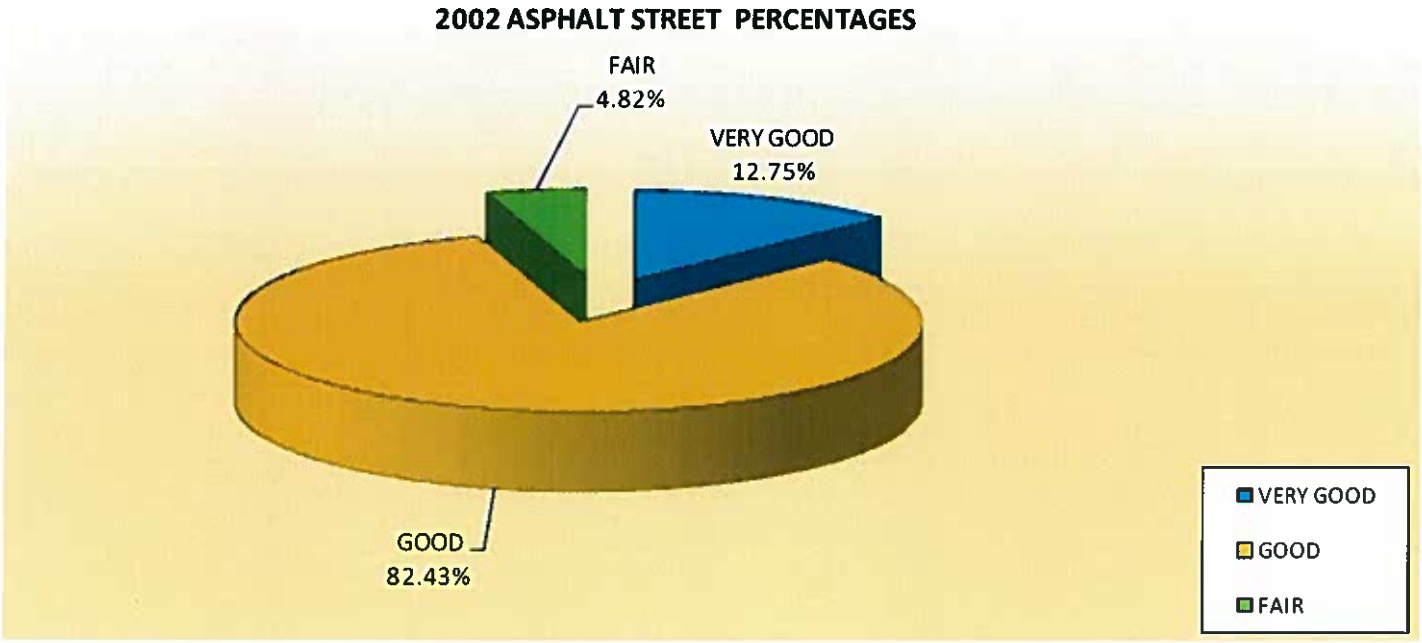
Age of Current Asphalt Wearing Surface



This chart shows how many feet of new asphalt (thin overlay or original construction) was applied each year. The absence of a year or years indicates new asphalt was not applied. The bar labeled 1957 has 15,545 feet (2.94) miles of newly constructed or paved streets that were constructed that year. Those streets have not had any substantial asphalt surface treatment for 54 years. The average asphalt life expectancy for a street is 20—25 years, depending on the time of construction. NOTE: Chip seals and fog seals are not considered substantial street surface treatments for the purpose of this illustration.

2011 vs. 2002
Asphalt Streets
Condition Ratings





The street treatment budget in the year 2002 was $488,565. Treatment tasks accomplished that year included 50 days of crack fill application and placing a thin overlay on 3.34 miles of city streets. Ten years later, we are proposing to apply approximately 85,825 square yards of chip seal, at an estimated total cost of $303,980, while holding approximately $114,159 in reserve for the 2013 overlay project.

Program Background

In the fall of each year, usually in the beginning of October, a City of Baker City engineering technician drives along each paved city street and conducts an inspection. During this inspection the following items are analyzed: the street's ride quality, surface cracking, trench settlement, drainage issues, and any other items that affect the street's structural integrity are noted.

It is through this inspection that each street is rated. This rating assists in determining what maintenance techniques, if any, will be recommended for that street.

Each street is placed into a category by visually rating the defects found in each section of pavement. A street starts with a rating value of 100. The number of defects found, based on the visual inspection, are subtracted from 100 to arrive at the rating. Each category has a bracket of values. The rated street is placed in the appropriate category based upon the rating value. There are five categories, ranging from "Very Good" to "Very Poor", used to report a street's condition.

Sample Pavement Rating Form

1111

ASPHALT PAVEMENT RATING FORM DATE ____________

STREET	ZONE	ROUTE	LENGTH
Clifford - From Washington Street South	NE	317	402

Defects

Cracks

TYPE	RATING INSTRUCTIONS	RATING	COMMENTS
Transverse	Rate 0 - 10 (10= Major Crack at 25' Intervals)	2	
Longitudinal	Rate 0 - 5 (5= Joint Cracks Full Length of Block)	3	
Alligator	Rate 0 - 60 (60= 100% of Road Surface)	25	may be low
Shrinkage	Rate 0 - 60 (60= 100% of Road Surface)	10	
Subtotal crack defects rating (cannot exceed 60)			40

other defects

TYPE	RATING INSTRUCTIONS	RATING	COMMENTS
Trench Settlement or Bad Patching	Rate 0 - 10	4	ww trench settling
Pot Holes	Rate 0 - 5 (5 = Five per Block)	2	
Deficient Drainage	Rate 0 - 5	2	Root heave
Base Failure	Rate 0 - 5	3	low ?
Other Defects	Rate 0 - 10 Corrugations [ ] Raveling [X] Rutting [ ]	3	
Subtotal other defects rating (cannot exceed 40)			14

overall ride quality

TYPE	INSTRUCTIONS	QUANTITY	RATING	COMMENTS
Transverse Crack	1 Noticeable/50'=15		2	
Patch or Settlement	1 Noticeable/100'=10	5	12	
Subtotal Ride Quality Rating (maximum 20)			14	
[illegible]				3
[illegible]				57

suggested maintenance

Overlay	DCH	Crackfill 1st Priority	Crackfill 2nd Priority	Asphalt Crackfilll	Grind and Overlay	Fog Seal	Patching
X		X					X

condition rating

Possible Points	-	Defects	=	Rating	2010 Rating
100	-	57	=	43	47

Categories

Very Good	Good	Fair	Poor	Very Poor
100 - 98	97 - 89	88 - 70	69 - 45	44 - 0

Other Comments: ____________

Ride Quality Conversion Chart

Ride Quality	Defect Rating
1 - 6	1
7 - 12	2
13 - 17	3
18 - 20	4

Definition of Pavement Condition Categories

Very Good

Definition	Rating Range
Stable, no more than an occasional crack, excellent ride qualities. These streets usually have been constructed or overlaid recently. Recommended treatments are fog seal or ¼"-#10 chip seal to prevent oxidation and possibly minor crack filling. Currently 12.18% of Baker City's asphalt streets are in this category.	100 - 98

Good

Definition	Rating Range
Stable, good ride qualities. Distress characteristics may include: grey or light-colored appearance (due to oxidation), some transverse and longitudinal cracking, and possibly isolated trench settlement. Recommended treatments are crack filling, fog seal, chip seal, and possibly thin overlay. Currently 53.01% of Baker City's asphalt streets are in this category. In 2010 49.79% of asphalt streets were in this category. 2009 saw that percentage at 49.58% .	97 - 89

Fair

Definition	Rating Range
Generally stable, though minor areas of structural weakness may be evident. Ride qualities are good to fair. Distress characteristics may include: transverse, longitudinal, and occasional alligator cracking; trench settlement; or drainage deficiencies. Recommended treatment is extensive patching and chip seal application or thin overlay. Currently 33.72% of Baker City's asphalt street are in this category.	88 - 70

Poor

Definition	Rating Range
Areas of instability with evidence of structural deficiency. Ride qualities range from fair to poor. Distress characteristics may include transverse, longitudinal, alligator, and shrinkage cracking. Trench settlement and drainage deficiencies will also be evident. If the street base is in such condition that rehabilitation is possible, an overlay is recommended; otherwise street reconstruction is necessary. The first two treatments would require extensive crack filling and patching. 0.96%, 17,799.2 square yards, of Baker City's paved streets fell to this category in 2010, compared to 14,5592.1 square yards last year.	69 - 45

Very Poor

Definition	Rating Range
Many areas of instability with obvious structural deficiencies. Ride qualities are very poor. Distress characteristics will mostly be alligator and shrinkage cracking with potholes, extensive trench settlement, and drainage deficiencies. Cost of continually maintaining the pavement in acceptable condition exceeds available maintenance funds. Recommended treatment is to perform emergency maintenance only, and to schedule reconstruction as soon as possible. One Baker City street is the first to fall into this category since 1991 (.08% - 1,251 square yards).	44 - 0

Street Maintenance Procedures

Crack Fill

This work consists of filling existing narrow cracks with a hot liquid asphalt compound or emulsified asphalt sealer (CRF). This seals the crack and keeps moisture from penetrating the asphalt and street base. Wide cracks are filled with a ¼" mix of hot asphalt compacted into and overlapping the cracks, then sealant is applied to the surface to effectively fill the crack.

Thin Overlay

This work consists of placing a thin asphalt mat, generally one and one half inch thick, on an existing asphalt street. An asphalt pre-level mat may be applied prior to the top mat with a motor grader or paving machine. Patching, crack filling, and other rehabilitation work are completed in preparation for this procedure. A fog seal or ¼"-#10 chip seal is applied within two years of the overlay work in order to seal the new asphalt. "Fair" or "Good" category streets with solid bases are generally targeted for thin overlays.

1/4"-10" Single Chip Seal

This work consists of an application of emulsified asphalt and a single layer of graded aggregate. Aggregate is usually ¼"-#10. Patching and crack filling are not generally necessary for this work. Streets in the "Very Good" and "Good" categories are targeted for this treatment.

3/8"-1/4" Single Chip Seal

This work consists of an application of emulsified asphalt and a single layer of graded aggregate. Aggregate is usually ⅜"-¼" in size. Patching and crack filling are done in preparation for this work. Streets in the "Fair" and "Good" categories are traditionally single chip sealed using this procedure.

Double Chip Seal

This work is similar to the single chip seal. Usually a ⅜"-¼" chip aggregate is applied, loose rock swept up, then a ¼"-#10 chip aggregate is applied over the ⅜"-¼" layer. Extensive patching is completed prior to any chip seal application. This procedure is generally used on streets in the "Fair" to "Good" categories.

Fog Seal

This work consists of an emulsified asphalt coating applied to the existing asphalt surface. The coating seals and rejuvenates the existing asphalt. This process is a preventative maintenance procedure which extends the operational life of the street. "Good" and "Very Good" streets are fog sealed, as well as any newly constructed or overlaid streets. Products used in the past have included CRF with a sand blotter, and GSB-88.

Street Condition
"Very Good"

Distress characteristics are minimal, usually consisting of no more than an occasional crack.

Indiana Avenue 17th to Columbia

Constructed in 2002, followed by a fog seal treatment in 2003, this section of Indiana Avenue continues to maintain its rating with a 98 score for 3 consecutive years.

Indiana Avenue provides an alternate connection from the west side of our city to the south side. It also provides access to Quail Ridge Golf Course and residential developments in the area.

'E' Street 8th to 10th

E Street was originally constructed in 1954. It was placed in the "Fair" pavement condition category in 2008. A 2011 overlay of 'E' Street has returned it to this category with a rating of 100. An added benefit of this project was enhanced pedestrian safety with addition of sidewalks .

Street Condition
"Good"

Distress characteristics may consist of transverse or longitudinal cracking, lighter coloring and isolated trench settlement.

Washington Avenue 1st to 2nd

Holding its own in the "Good" category, Washington Avenue 1958. It has been the recipient of several preventative treatments in the past including an overlay in 1992 and two chip seals with the most recent being in 2011. This portion of Washington resides in the downtown corridor and is home to several local businesses.

17th Street 'B' to Pocahontas

Another "Good" category mainstay, 17th from 'B' to Pocahontas was originally constructed in 1973. It provides a vital link for truck traffic from the north and west sides of town to south Baker and Highway 7. It also provides local access to medical, retail, and industrial businesses and services. This street has been the recipient of many preventative maintenance treatments including fog seals in 1991, 1996, and 2003, a thin overlay in 2002 and most recently a chip seal in 2008.

Street Condition
"Fair"

Distress characteristics may include transverse, longitudinal, and occasional alligator cracking, trench settlement, drainage deficiencies and/or poor ride quality.

Auburn Avenue Birch to Pear

Constructed in 1983, followed by a fog seal treatments in 1985, 1989, 1993, and 2004, this section of Auburn Avenue has experienced a rapid decline in ratings from 90 in 2007 to the current 2011 rating of 82.

It is often necessary to defer preventative maintenance for lower traffic residential streets in order to provide for maintaining the more highly used arterial and collector streets.

Cliff Street Elm to East

Cliff Street was originally constructed in 1978. It was placed in the "Fair" pavement condition category in 2008. The treatment history for this street includes fog seals in 2004, 1994, 1989, 1985, and 1979.

Distress characteristics mostly consist of alligator and shrinkage cracking with potholes, extensive trench settlement, as well as drainage deficiencies.

Street Condition "Poor"

Resort Street Bridge to Washington

This portion of Resort Street continues to be a perennial dweller at the bottom of the street ratings. It continues to be the focus grant funded reconstruction efforts. The 2011 and 2010 ratings were 57, down from 63 in 2009 and 68 in 2008. This street provides a vital traffic route in our downtown corridor, and serves as the primary alternate street when Main Street is closed for community events throughout the year. Continued deterioration without substantial surface treatment would create a hindrance and possible hazard to those using this street while going about their day to day downtown area business or pleasure activities.

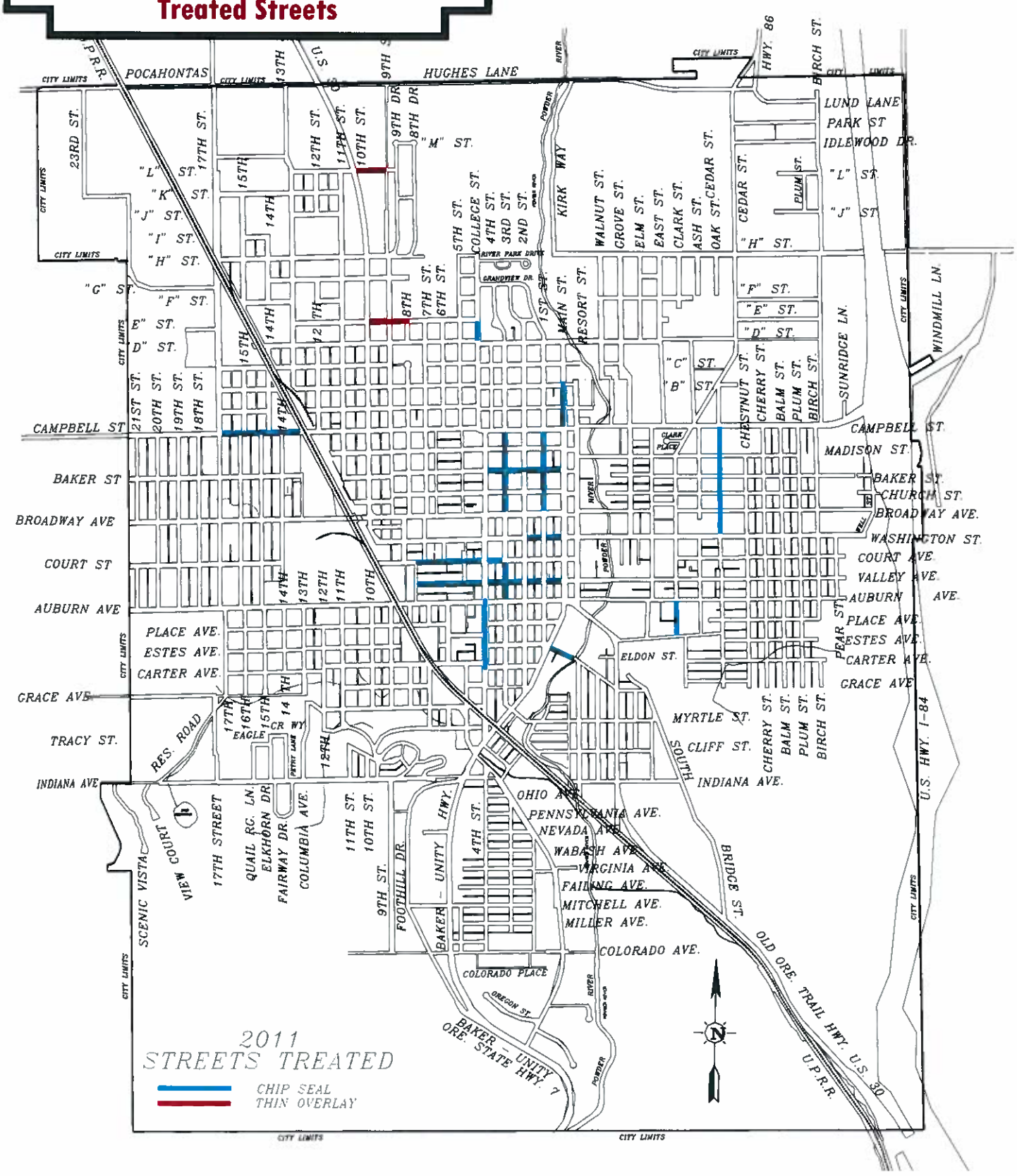
Street Condition "Very Poor"

Distress characteristics will mostly be alligator and shrinkage cracking with potholes, extensive trench settlement, and drainage deficiencies.

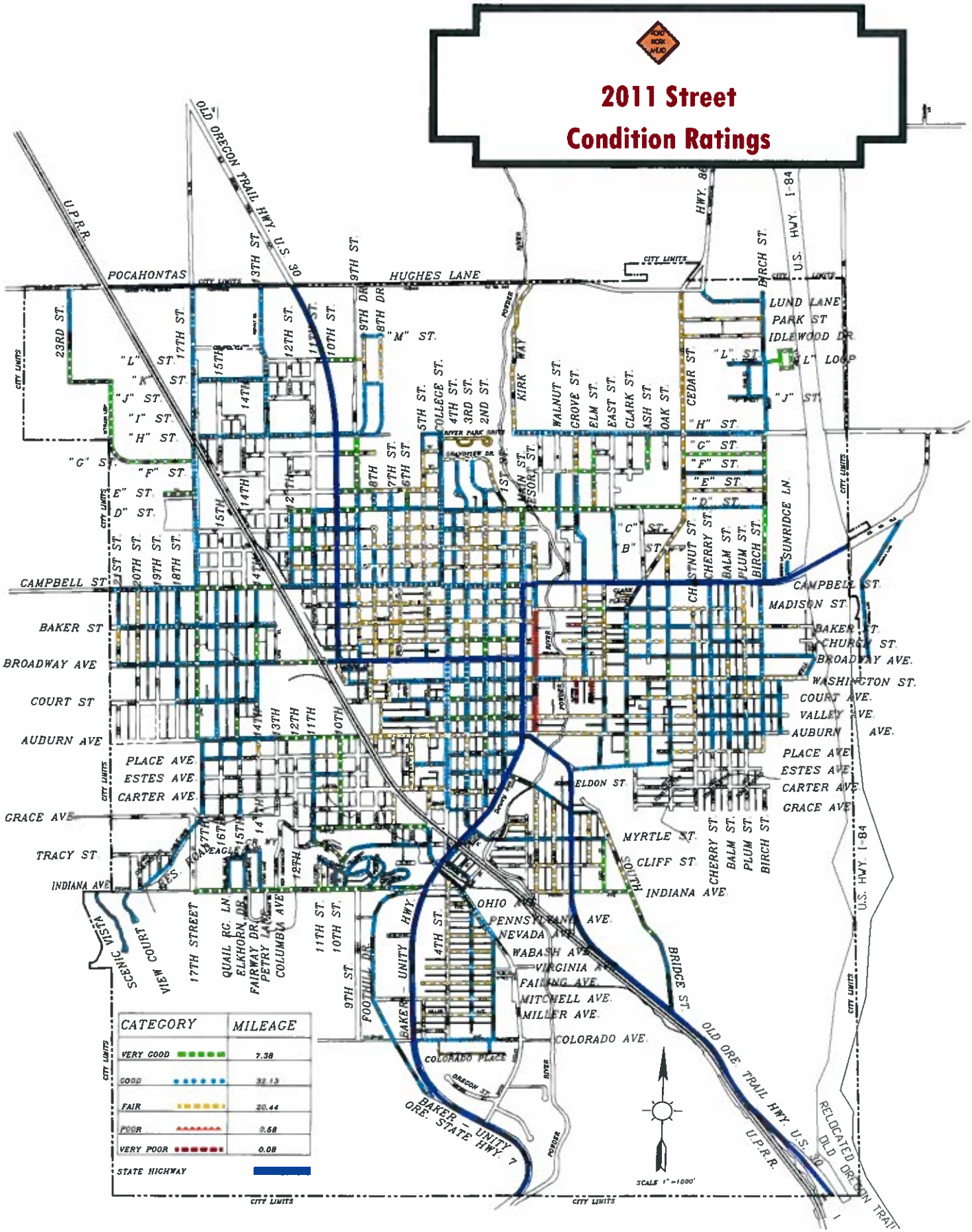
Clifford Street South of Washington

Clifford Street was originally constructed in 1975. It gained the infamous distinction of becoming the first street in the "Very Poor" category since 1991 by rating a 43 in 2011, down from 47 in 2010. Clifford Street provides local access to 13 residences and terminates at a cul-de-sac approximately 402 feet south of Washington Avenue.

2011
Treated Streets



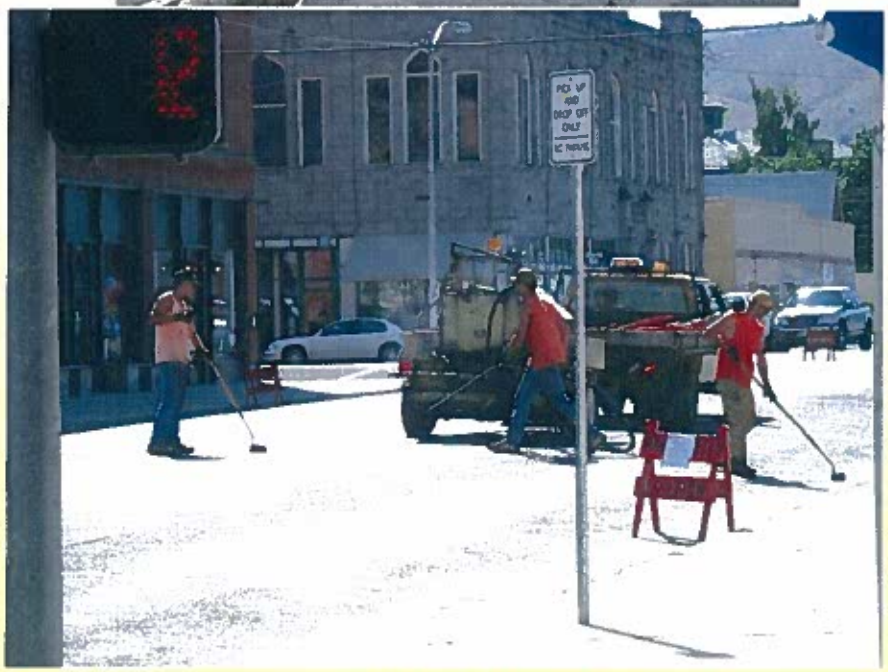
2011 Street Condition Ratings



Temporary Access—In & Out

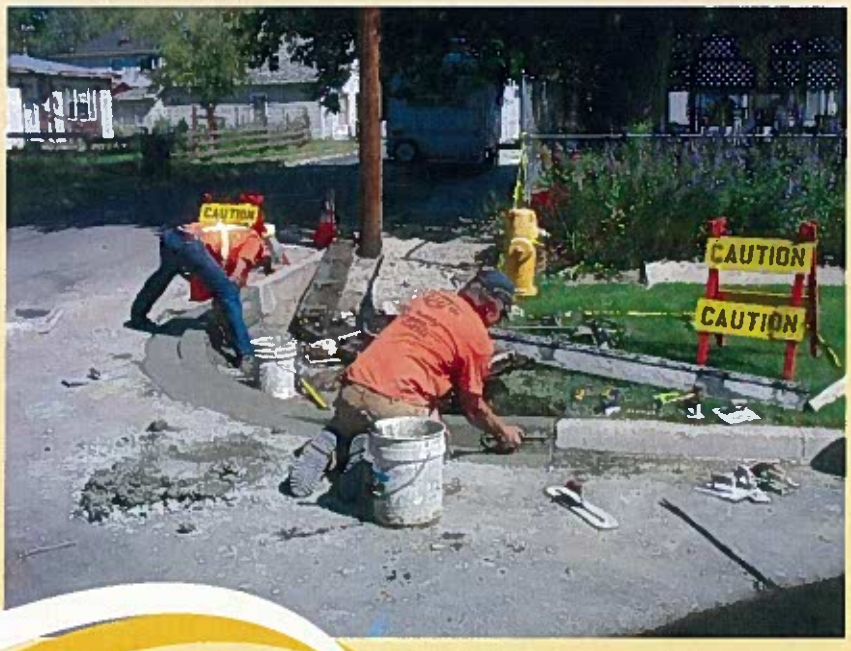
Sidewalk Construction—'E' Street

Chip Seal Prep—Washington Street



'D' Mix Crack Patching—1st Street

Thin Overlay Design Work—'E' Street



Curb Replacement—5th & Church

Maintenance and Rehabilitation Planning

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