Castle Pines Parkway and Monarch Boulevard Improvements

SUMMARY OF COSTS		
Approach		
Rehabilitation	$	4,977,185
Reconstruction	$	22,113,288
Total	**$**	**27,090,473**
Roadway		
Castle Pines Parkway	$	15,521,248
Monarch Boulevard	$	11,569,225
	$	**27,090,473**

	Rehab Area (SF)	Rehab Cost		Cost / SF
Castle Pines Parkway	352026	$3,277,910		$9.31
Monarch Boulevard	163549	$1,699,275		$10.39

	Recon Area (SF)	Recon Cost		Cost / SF
Castle Pines Parkway	494739	$12,243,338		$24.75
Monarch Boulevard	496741	$9,869,950		$19.87

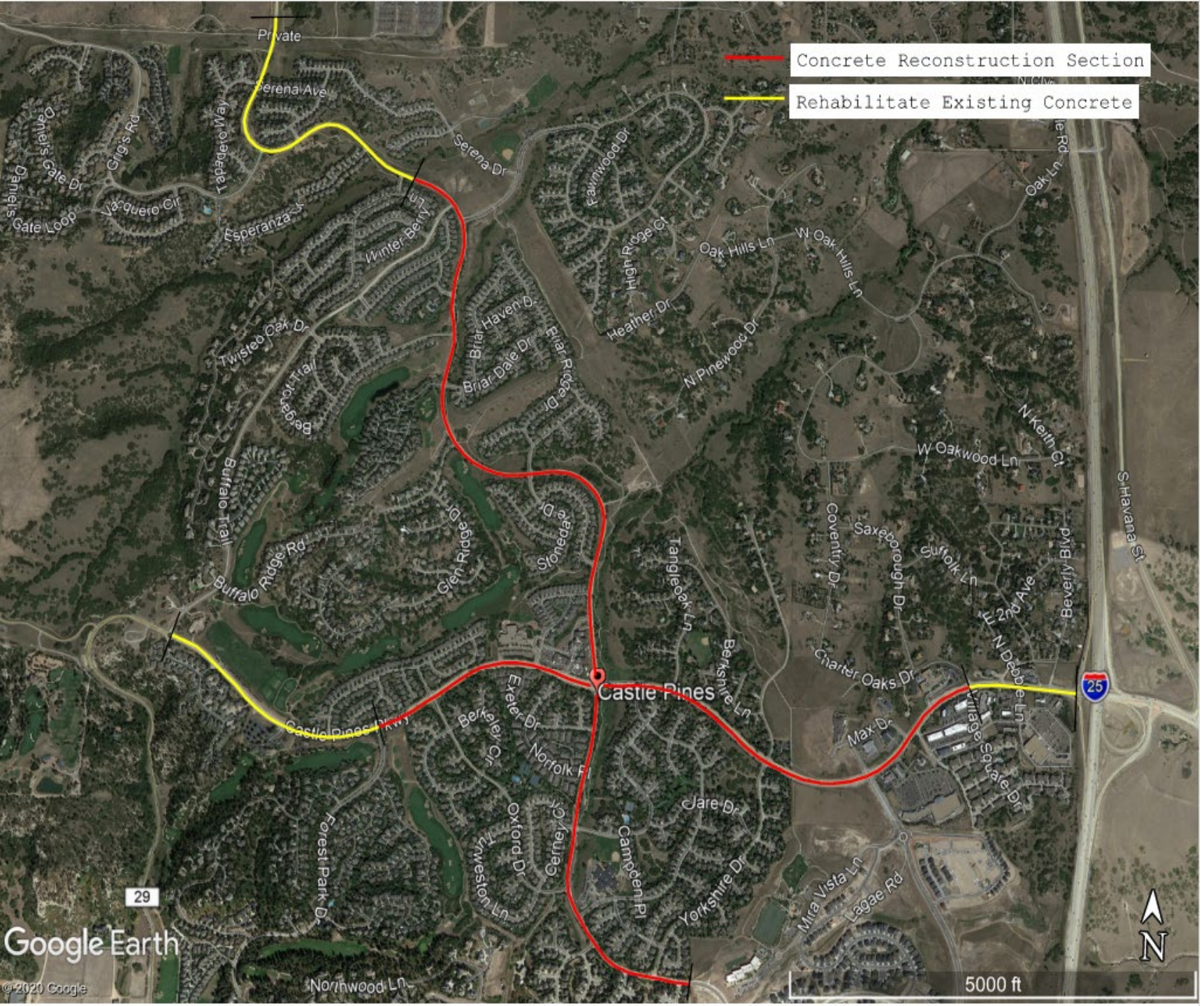
DRAFT - Castle Pines Parkway and Monarch Boulevard Cost Breakdown - July 08, 2020						
Item No.	CDOT Item No.	Item Description	Units	Unit Costs	Castle Pines Parkway Total Costs	Monarch Boulevard Total Costs
1	202-00210	Removal of Concrete Pavement (8 Inch)(Isolated Panel)	SY	$15.00	$9,000	$3,000
2	202-00210	Removal of Concrete Pavement (8 Inch)	SY	$13.00	$691,145	$689,158
3	202-00212	Removal of Concrete Pavement (8 Inch)(Special) (Ramp Apron, Valley Pan, Etc)	SY	$15.00	$54,300	$52,638
4	202-00195	Removal of Median Cover	SY	$24.26	$239,881	$0
5	202-00200	Removal of Sidewalk	SY	$27.55	$48,217	$55,794
6	202-00203	Removal of Curb and Gutter	LF	$7.00	$294,506	$224,753
7	202-00206	Removal of Concrete Curb Ramp	SY	$19.83	$34,698	$40,151
8	202-00250	Removal of Pavement Marking	SF	$3.61	$0	$0
9	202-05004	Sawing Concrete	LF	$5.00	$67,305	$41,610
10	203-0000	Unclassified Excavation	CY	$23.69	$580,130	$548,988
11	210-04011	Adjust Manhole	EA	$589.01	$72,617	$94,558
12	210-04051	Adjust Valve Box	EA	$165.32	$20,381	$26,539
13	304-06000	Aggregate Base Course (Class 6)	TON	$25.00	$732,668	$693,338
14	306-01000	Reconditioning (Subgrade)	SY	$3.30	$484,185	$458,194
15	412	Diamond Ground Surface Finish	SY	$5.00	$183,500	$83,221
16	412-00600	Concrete Pavement (8 Inch)(Isolated Panel)	SY	$60.00	$36,000	$12,000
17	412-00800	Concrete Pavement (8 Inch)	SY	$44.00	$2,339,260	$2,332,536
18	412-00801	Concrete Pavement (8 Inch)(Special) (Ramp Apron, Valley Pan, Etc)	SY	$60.00	$217,200	$210,554
19	412-15050	Cross Stitching	EA	$40.00	$50,000	$10,000
20	412-16000	Cleaning and Sealing Concrete Pavement Joints	LF	$3.25	$200,213	$101,660
21	608-00000	Concrete Sidewalk	SY	$63.91	$111,845	$129,421
22	608-00010	Concrete Curb Ramp	SY	$127.82	$223,690	$258,842
23	609-21010	Curb and Gutter Type 2 (Section I-B)	LF	$30.85	$537,220	$0
24	609-21020	Curb and Gutter Type 2 (Section II-B)	LF	$23.00	$567,122	$738,473
25	610-00010	Median Cover Material (Decorative)	SF	$15.00	$1,335,063	$0
26	627-00001	Pavement Marking Paint	GAL	$154.50	$0	$0
					$0	$0
		Lump Sum and Force Account Items		Sub-Total	$9,130,146	$6,805,426

27	625-00000	Construction Surveying (Centerline Profile As-Built)	LSUM	5.00%	$456,507	$340,271
28	626-00000	Mobilization	LSUM	10.00%	$913,015	$680,543
29	630-10005	Traffic Control	LSUM	10.00%	$913,015	$680,543
30	212-01200	Landscape Restoration	F/A	5.00%	$456,507	$340,271
31	700-70380	F/A Erosion And Sediment Control	F/A	5.00%	$456,507	$340,271
32	700-70010	F/A Minor Contract Revisions	F/A	20.00%	$1,826,029	$1,361,085
					$0	$0
33		Survey and Design Fee's	LSUM	15.0%	$1,369,522	$1,020,814
					$0	$0
			70.00%	LS & F/A Total	$6,391,102	$4,763,799
				Total Cost	$15,521,248	$11,569,225
				TRUE	$27,090,473	

Unit pricing is based on Castle Pines Parkway and Monarch Boulevard being completed together, seperations of the quantities will increase unit pricing.

Castle Pines Parkway & Monarch Boulevard Analysis

Tuesday, July 14, 2020



Recommended Approach

Concrete Pavement Reconstruction

Concrete Pavement Rehabilitation

Castle Pines Parkway

Buffalo Trail to Forest Park Dr.

Concrete pavement rehabilitation

- Panel Replacement (<1%)
- Cross-stitch longitudinal joints that have separated
- Cross-stitch longitudinal cracks
- Diamond Grind
- Re-seal Joints

Castle Pines Parkway

Forest Park Dr. to Village Square Drive (Excluding Monarch Intersection)

Concrete pavement reconstruction

- Joint deterioration
- Faulted joints/ lack of load transfer
- Areas that do not show deterioration are small & should be included in reconstruction for constructability reasons

Monarch Blvd.

Shoreham Cir. to Winterberry Pl. (Excluding Castle Pines Int.)

Concrete pavement reconstruction

- Joint deterioration
- Longitudinal cracking
- Faulted joints
- Hairline surface cracking throughout most of roadway
- Areas that do not show deterioration are small & should be included in reconstruction for constructability reasons

Monarch Boulevard

Winterberry Pl. to North End

Concrete pavement rehabilitation

- Panel Replacement (<1%)
- Cross-stitch longitudinal joints that have separated
- Diamond Grind
- Re-seal Joints

Concrete Pavement Longevity

	Segment		Construction Year	Age in 2020	Years Beyond Design Life*	Recommended Treatment
Castle Pines Parkway						
	Buffalo Trail	Forest Park Dr.	1988 (est.)	32	12	Rehabilitation
	Forest Park Dr.	Village Square Terrace	1984	36	16	Reconstruction (excl. Monarch intersection)
	Village Square Terrace	Beverly Blvd	*Data Needed*			Rehabilitation
	Beverly Blvd	Frontage Road	2005	15	N/A	Rehabilitation (limited)
Monarch Boulevard						
	Shoreham Circle	Winterberry Place	1985/1986	35-36	15-16	Reconstruction (excl. Castle Pines intersection)
	Winterberry Place	North End	1988 (est.)	32	12	Rehabilitation

*Design life assumed to be 20 years based on typical practice in the 1980's. Design life for the I-25 & Castle Pines Interchange (Beverly Blvd to Frontage Road) constructed by CDOT may have been 30 years.

Reconstruction Areas

Concrete Pavement Section Designed:

8” Concrete Pavement
4” Aggregate Base

Features of New Concrete Pavement:

- Dowel bars in all transverse joints (reduce faulting)
- Tie bars in all longitudinal joints (hold lanes together)
- Silicone joint sealant in all joints (keep water out of joints)
- Smoothness grinding (as needed for smoothness)

Design Assumptions:

- 40-year design (original design was 20 years)
- 5% truck traffic to account for trash trucks, school buses, etc.
- Subgrade R-value of 6 (low support value)

PavementDesigner.org

DESIGN SUMMARY REPORT FOR
JOINTED-PLAIN CONCRETE PAVEMENT (JPCP)
DATE CREATED:
Tue Jun 23 2020 12:07:29 GMT-0600 (Mountain Daylight Time)

Project Description

Project Name:	Town of Castle Pines	Owner:	Town of Castle Pines	Zip Code:	
Designer's Name:	Sarah Sanders	Route:	Castle Pines Pkwy and Monarch Blvd		
Project Description:	Reconstruction section for Castle Pines Pkwy and Monarch Blvd				

Design Summary

	Doweled	Undoweled		Doweled	Undoweled
Recommended Design Thickness:	8.00 in.	8.00 in.	Maximum Joint Spacing:	15 ft.	15 ft.
Calculated Minimum Thickness:	7.81 in.	7.81 in.			

Pavement Structure

SUBBASE
Calculated Composite K-Value of Substructure: 149 psi/in

Layer Type	Resilient Modulus	Layer Thickness
JOINTED PLAIN CONCRETE SURFACE		
Granular Base	25,000 psi	4 in
SUBGRADE		

CONCRETE				SUBGRADE	
28-Day Flex Strength:	650 psi	Edge Support:	Yes	R-Value:	6
Modulus of Elasticity:	4000000 psi	Macrofibers in Concrete:	No	Calculated MRSG Value	2,662 psi

Project Level

TRAFFIC		GLOBAL	
Spectrum Type:	Major Arterial	Reliability:	90 %
Design Life:	40 years	% Slabs Cracked at End of Design Life:	10 %
USER DEFINED TRAFFIC			
Trucks Per Day:	1,350	Avg Trucks/Day in Design Lane Over the Design Life:	510
Traffic Growth Rate %:	2 % per year	Total Trucks in Design Lane Over the Design Life:	7,445,866
Directional Distribution:	50 %		
Design Lane Distribution:	50 %		

Design Method

The PCA design methodology from StreetPave, was used to produce these results.

Concrete Pavement Construction

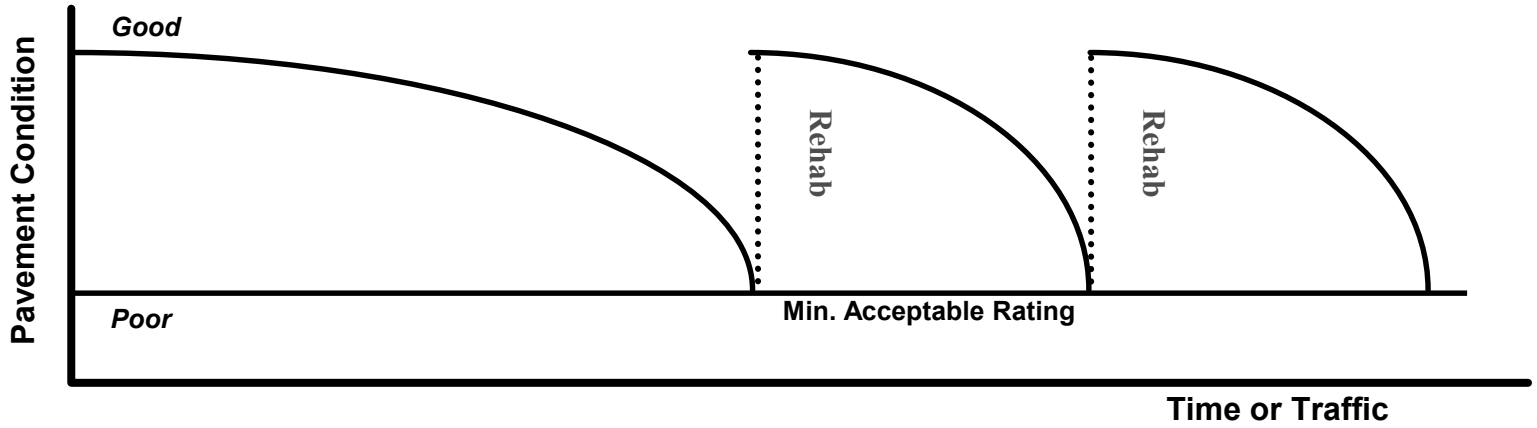
New Concrete Pavement Designed to Withstand…

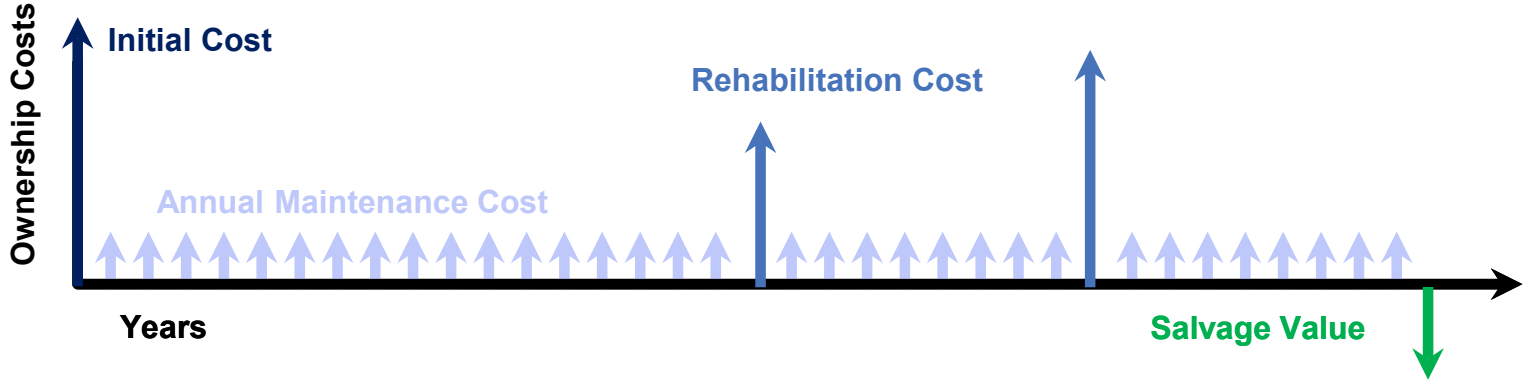
Deicing Chemicals

Joint Faulting

Dowel Bars to prevent up & down movement (and associated noise) across joint

Pavement Condition & Ownership Costs





Initial Cost

- Cost to construct project

Annual Maintenance Cost

- Annual cost to keep the pavement at a given level of service
- Assume $640/lane-mile for concrete (based on CDOT data)

Rehabilitation Cost

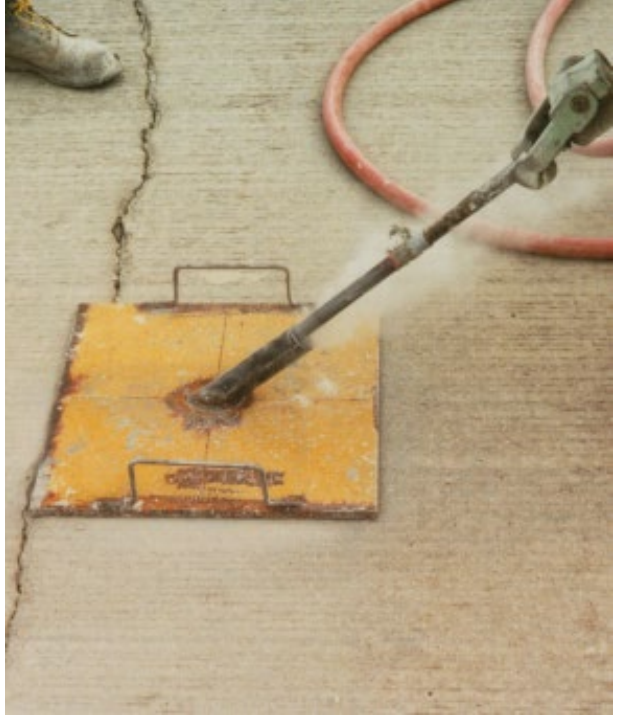
- Cost to replace panels & diamond grind pavement

Salvage Value

- Value of the pavement at the end of its life

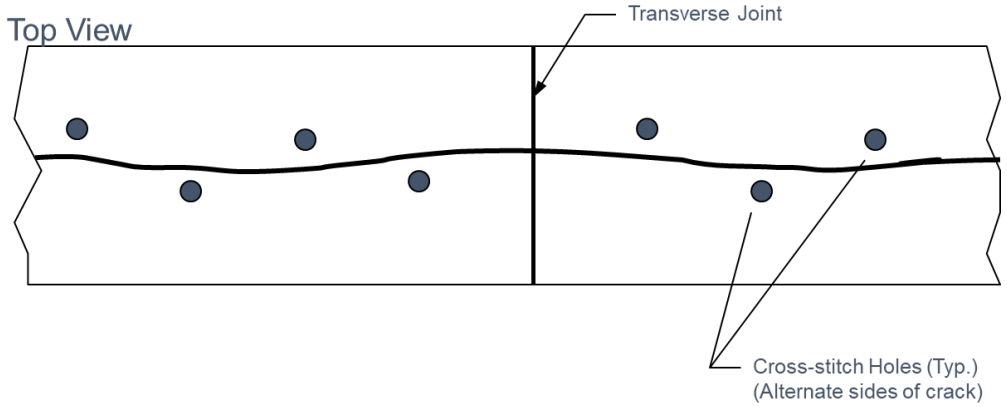
Panel Replacement

- Replace individual slabs
- Include dowel bars



Cross-Stitching

- Holes are drilled angled through the joint or crack. Tie bars are epoxied into place.
- Used in areas with no tie bars, to prevent further widening of joints or cracks



Diamond Grinding

- Improve smoothness and skid resistance of the pavement
- Can be done day or night in lane closures
- Lanes can be reopened immediately following completion

Joint Resealing

- Remove any existing sealant
- Place new backer rod and sealant
- Prevents spalling and joint distress
- Fill and seal wide joints for bicyclist safety

Thank You!