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2025 Condition Survey of High RAP Pilot Projects on El Dorado 49, San Bernardino 215, and San Joaquin 26

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2025 Condition Survey of High RAP Pilot Projects on El Dorado 49, San Bernardino 215, and San Joaquin 26

AUTHORS

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Partnered Pavement Research Center (PPRC) Strategic Plan Element Number 4.92 (TO-005): Continued Support for Implementation of Performance Related Tests and Specifications for Balanced Mix Design, Increased Recycling of Asphalt Mixes, and Integration of Mix Design and Structural Design (DRISI Task 4214)

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16. ABSTRACT Three pilot projects were constructed using hot mix asphalt (HMA) with higher percentages of recycled asphalt pavement (RAP) (25% to 40%) and recycled asphalt shingles (RAS) used at 0% or 3%. The three projects were paved between 2021 and 2022 on State Route 49 in El Dorado County (ED 49), State Route 215 in San Bernardino County (SBD 215), and State Route 26 in San Joaquin County (SJ 26). Two and a half to three years later, pavement condition surveys were conducted to observe surface distresses. On ED 49, the 3% RAS mix exhibited 6% low-severity wheelpath alligator cracking, often with mild pumping. The other mixes on ED 49 exhibited lower levels of alligator and total cracking. No alligator cracking was observed on SBD 215, which includes a cement-treated base not present in the other pilot projects. On SJ 26, all test sections exhibited some form of cracking, though mostly of low severity. Among the mixes, the 25% RAP/3% RAS mix showed the most alligator cracking on SJ 26 (around 7% of the wheelpath), while the 0% RAP/0% RAS control mix showed the most transverse cracking and the highest total cracking.		
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PROJECT OBJECTIVES

This project is a continuation of PPRC Project 4.64, Continued Development of Guidelines for Determining Binder Replacement in High RAP/RAS Content Mixes. The objective of this project, PPRC Project 4.79, Guidance, Tests, and Specifications for High Recycled Asphalt Pavement/Recycled Asphalt Shingle Contents in Hot Mix Asphalt (HMA) and Rubberized Hot Mix Asphalt (RHMA) Mixes, is to develop guidelines for determining binder replacement rates in high RAP/RAS content mixes without the need for binder extraction and performance-related tests for use in routine mix design and construction quality control/quality assurance. This will be achieved through the following tasks:

- Task 1: Update literature review to include recently completed research.
- Task 2: Complete testing of high recycled asphalt pavement (RAP) and RAP/RAS mixes to determine their performance properties.
- Task 3: Complete testing of extracted and recovered RAP, RAP/RAS, and RAP/RAS/virgin binder blends to assess the effectiveness of different recycling agents.
- Task 4: Complete investigation into the use of fine aggregate matrix mix testing to assess the fatigue performance of mixes and to predict binder properties.
- Task 5: Investigate the long-term aging effects of high RAP and RAP/RAS mixes using different laboratory-aging protocols.
- Task 6: Monitor the field performance of high RAP and RAP/RAS mixes and use the results to evaluate laboratory-aging protocols.
- Task 7: Prepare a research report with recommendations for the use of RAP and RAP/RAS as a binder replacement, and, if applicable, recommendations for accelerated wheel-load testing.

The results presented in this technical memorandum contribute to Task 6 by presenting the results of visual surface distress surveys conducted on three pilot projects about three years after construction.

This technical memorandum is being completed under PPRC Project 4.92, Continued Support for Implementation of Performance Related Tests and Specifications for Balanced Mix Design, Increased Recycling of Asphalt Mixes, and Integration of Mix Design and Structural Design. PPRC 4.92 is Task Order 5 of Agreement 65A1056.

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LIST OF ABBREVIATIONS

AC	Asphalt concrete
APCS	Automated pavement condition survey
EA	Expenditure authorization
HMA	Hot mix asphalt
LWP	Left wheelpath
RWP	Right wheelpath
RAP	Recycled asphalt pavement
RAS	Recycled asphalt shingles
RA	Recycling agent
RHMA	Rubberized hot mix asphalt

CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS				
Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
in.	inches	25.40	millimeters	mm
ft.	feet	0.3048	meters	m
yd.	yards	0.9144	meters	m
mi.	miles	1.609	kilometers	km
AREA				
in ²	square inches	645.2	square millimeters	mm ²
ft ²	square feet	0.09290	square meters	m ²
yd ²	square yards	0.8361	square meters	m ²
ac.	acres	0.4047	hectares	ha
mi ²	square miles	2.590	square kilometers	km ²
VOLUME				
fl. oz.	fluid ounces	29.57	milliliters	mL
gal.	gallons	3.785	liters	L
ft ³	cubic feet	0.02832	cubic meters	m ³
yd ³	cubic yards	0.7646	cubic meters	m ³
MASS				
oz.	ounces	28.35	grams	g
lb.	pounds	0.4536	kilograms	kg
T	short tons (2000 pounds)	0.9072	metric tons	t
TEMPERATURE (exact degrees)				
°F	Fahrenheit	(F-32)/1.8	Celsius	°C
FORCE and PRESSURE or STRESS				
lbf	pound-force	4.448	newtons	N
lbf/in ²	pound-force per square inch	6.895	kilopascals	kPa
APPROXIMATE CONVERSIONS FROM SI UNITS				
Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
mm	millimeters	0.03937	inches	in.
m	meters	3.281	feet	ft.
m	meters	1.094	yards	yd.
km	kilometers	0.6214	miles	mi.
AREA				
mm ²	square millimeters	0.001550	square inches	in ²
m ²	square meters	10.76	square feet	ft ²
m ²	square meters	1.196	square yards	yd ²
ha	hectares	2.471	acres	ac.
km ²	square kilometers	0.3861	square miles	mi ²
VOLUME				
mL	milliliters	0.03381	fluid ounces	fl. oz.
L	liters	0.2642	gallons	gal.
m ³	cubic meters	35.31	cubic feet	ft ³
m ³	cubic meters	1.308	cubic yards	yd ³
MASS				
g	grams	0.03527	ounces	oz.
kg	kilograms	2.205	pounds	lb.
t	metric tons	1.102	short tons (2000 pounds)	T
TEMPERATURE (exact degrees)				
°C	Celsius	1.8C + 32	Fahrenheit	°F
FORCE and PRESSURE or STRESS				
N	newtons	0.2248	pound-force	lbf
kPa	kilopascals	0.1450	pound-force per square inch	lbf/in ²

*SI is the abbreviation for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised April 2021)

1 INTRODUCTION

1.1 Background of Study

The California Department of Transportation (Caltrans) is interested in finding, developing, and implementing approaches to reduce life cycle cost and improve life cycle environmental performance. Two approaches under investigation that offer the potential to advance these goals are the use of increased amounts of recycled asphalt pavement (RAP) and the use of recycled asphalt shingles (RAS) in hot mix asphalt (HMA) materials. Caltrans is investigating the performance of high RAP content mixes—mixes containing more than 25% RAP binder replacement—with and without the use of recycling agents (RA). The University of California Pavement Research Center (UCPRC) has been investigating the use of higher percentages of RAP in HMA through laboratory testing of laboratory-prepared and field-sampled materials, observations of construction, and mechanistic-empirical simulations based on the performance-related test properties for the mixes.

Previous and ongoing research at the UCPRC, working with Caltrans and industry, has identified potential concerns regarding the use of highly aged, stiff RAP. Research is underway at the UCPRC to study the impact of different RAP sources, varying RAP content, and the addition of recycling agents to restore the properties of highly aged RAP on the performance-related properties of binders and mixes. Limited work had been done on binder replacement from RAS in California by the UCPRC, Caltrans, and industry prior to the pilot study presented in this technical memorandum. Limited previous work by the UCPRC indicated poor results because of the lack of blending of the RAS and virgin binders due to the very heavy oxidation of the RAS source used (1).

This technical memorandum presents observations and data from condition surveys conducted by the UCPRC on three high RAP/RAS pilot projects on State Route 49 in El Dorado County (ED 49), paved in November 2021; State Route 215 in San Bernardino County (SBD 215), paved in August 2022; and State Route 26 in San Joaquin County (SJ 26), paved in September 2022. Additional information regarding the construction of these pilot projects and laboratory testing of these mixes can be found in the following technical memoranda:

- *RAP and RAS in HMA Pilot Project on ED 49: Material Testing, Observations, and Findings* (Technical Memorandum: UCPRC-TM-2022-04) (2)
- *RAP and RAS in HMA Pilot Project on SBD 215: Material Testing, Observations, and Findings* (Technical Memorandum: UCPRC-TM-2023-02) (3)
- *RAP and RAS in HMA Pilot Project on SJ 26: Material Testing, Observations, and Findings* (Technical Memorandum: UCPRC-TM-2023-03) (4)

1.2 Report Structure

This technical memorandum includes the following chapters:

- Chapter 2 details the pilot project locations, site descriptions, test section layouts, and paving dates.
- Chapter 3 presents the field surface condition survey results.
- Chapter 4 provides a summary of this initial review.

2 SITE INFORMATION

This chapter reviews the pilot project and subsection locations and mix types provided in the project specifications. Included in this section are notes from previous reports regarding paving dates, the pavement condition before construction, and, where possible, the surface condition immediately after construction. Figure 2.1 shows a map of California with the locations of the three pilot projects in El Dorado, San Joaquin, and San Bernardino counties.



Figure 2.1. Map of California with three pilot projects.

2.1 El Dorado 49 (ED 49)

The first high RAP pilot project, ED 49-PM9.6/14.2, was paved in November 2021 under Expenditure Authorization (EA) 03-2G1004. The existing pavement structure of ED 49 at the time of construction consisted of variable thickness HMA, ranging from 0.20 to 1.4 ft. thick, above an unknown thickness of aggregate base. State Route 49 includes sections that were originally stagecoach and wagon roads and

then county roads before becoming designated as part of the state highway system in 1921. Many parts have varying “non-engineered” underlying structures from their original construction and from realignments, cross-slope, and other changes since then. The ED 49 test sections are in the Sierra Nevada foothills south of Placerville, an area with some steep grades and sharp horizontal curves. At postmile (PM) 12.8, ED 49 crosses Weber Creek at an elevation of about 1,650 ft. and climbs to 2,000 ft. by PM 13.8, an average grade of 6.6%. This project involved milling the existing surface to remove 0.15 ft. of pavement surface and repaving the same thickness with new HMA.

The pilot project included four mixes: a control mix with no RAP or RAS, a mix with a typical amount of RAP, a mix with RAS, and a mix with a typical amount of RAP and RAS. Table 2.1 provides the subsection locations and paving dates. The control mix with no RAP or RAS has a PG 64-16 binder.

Table 2.1. ED 49 Pilot Project Test Section Mix Types, Postmiles, Lanes, and Paving Dates

ED 49 Test Subsections ^a	Postmile Limits		Lane Number	Lane Direction	Paving Date
	Begin	End			
0% RAP and RAS	13.100	13.289	1	NB and SB	Nov 2, 2021
3% RAS	13.289	13.478	1	NB and SB	Nov 3, 2021
10% RAP ^b	13.478	13.668	1	NB and SB	Nov 2, 2021
10% RAP and 3% RAS	13.668	13.857	1	NB and SB	Nov 3, 2021

^a Percentages of RAP and RAS are by weight of aggregate.

^b The 10% RAP mix was used throughout the rest of the project, between PM 9.6 and PM 14.2.

The ED 49 construction report states that, before construction, the pavement had load-related fatigue cracking in the wheelpaths and age-related transverse and block cracking. Some of the damage had been addressed through crack sealing and digout patching. As described in a previous technical memorandum, “the sections were milled prior to placement of the test section material. It could be seen after milling that the existing asphalt varied in thickness. In some locations near the edges of the traveled way, the pre-overlay milling removed all the asphalt and left granular material and subgrade visible. In other locations, remnants of full-depth digouts remained with thicker asphalt than the area outside of the wheelpaths...Extensive cracking remained in the milled asphalt, indicating that the cracks had been full-depth and there is a likelihood of reflective cracking occurring in the new overlays placed as part of this project.” (2)

2.2 San Bernardino 215 (SBD 215)

The second high RAP pilot project on SBD 215 was paved in late July and early August 2022 under EA 08-1M1104. The existing thickness of HMA ranged from 0.93 to 1.09 ft. and was supported by 0.65 ft. of cement-treated base. The other two pilot projects have aggregate bases, which is more common under HMA surfaces. SBD 215 test sections are about three miles south of the Interstate 15/Interstate 215 merge before climbing the mountain grade toward the Cajon Pass. From the south, the sections start after the University Parkway overcrossing at PM 11.7, just before the Devil Creek Diversion Channel at PM 12.8, and end just after the Little League overcrossing at PM 14.9 in the city of San Bernardino. At PM 12.8, SBD 215 crosses the Devil Creek Diversion Channel at an elevation of about 1,500 ft. and climbs to 1,800 ft. by PM 15.0, an average grade of 2.6%. This project involved milling the existing surface to remove 0.2 ft. of pavement surface and repaving the same thickness with new HMA.

The pilot project included six mixes: a control mix with no RAP, a mix with a currently typical amount of RAP, and four mixes with increasing RAP aggregate contents intended to meet binder replacement rates of 25%, 30%, 35%, and 40%. Table 2.2 shows the subsection locations and their paving dates. The control mix with no RAP or RAS has a PG 64-28M binder.

Table 2.2. SBD 215 Pilot Project Test Section Mix Types, Location Lane and Postmiles, and Paving Dates

SBD 215 Test Subsections ^a	Postmile Limits		Lane Number	Lane Direction	Paving Date
	Begin	End			
23% RAP ^b	12.6	13.0	1	NB and SB	Jul 29, 2022
0% RAP	13.0	13.4	1	NB and SB	Aug 8, 2022
25% RAP	13.4	13.8	1	NB and SB	Aug 8, 2022
30% RAP	13.8	14.2	1	NB and SB	Aug 9, 2022
35% RAP	14.2	14.6	1	NB and SB	Aug 10, 2022
40% RAP	14.6	15.0	1	NB and SB	Aug 11, 2022

^a Percentages of RAP and RAS are by weight of aggregate.

^b The 23% RAP mix was used throughout the rest of the project, between PM 10.0 and PM 17.2.

The SBD 215 construction report states that before construction, Lane 1 in both directions exhibited negligible cracking distress but had rut depths up to 1/2 in. where the test sections were placed, based on the automated pavement condition survey (APCS) data. As described in a previous technical memorandum, “the existing pavement had nearly zero cracking distress in Lane 1 in both directions prior to placement of the overlay but had rut depths of 10 to 12 mm in Lane 1 in both directions where the test sections were placed and nearly 20 mm in Lane 2 in both directions...Nearly 25% of the Lane 2 wheel path was cracked in the southbound direction as well” (3).

2.3 San Joaquin 26 (SJ 26)

The third high RAP pilot project on SJ 26-PM8.0/17.8 was paved in September 2022 under EA 10-1J2004. The existing pavement structure of SJ 26 at the time of construction consisted of 0.20 ft. of RAC atop 0.74 ft. of AC above 1.90 ft. of aggregate base. The SJ 26 test sections are in the central valley town of Linden, east of Stockton, an area with little to no grade change throughout the project. The elevation of Linden along State Route 26 around the test sections ranged between 80 and 90 ft., rising eastward toward the foothills. This project involved milling the existing surface to remove 0.20 ft. of pavement surface and repaving the same thickness with new HMA.

The pilot project included seven mixes: a control mix with no RAS or RAP, a mix with 25% RAP, a mix with 30% RAP, a mix with 35% RAP, a mix with 40% RAP, a mix with 25% RAP and 3% RAS, and a mix with 12% RAP, which was the nominal mix used to pave the overall project.

Table 2.3 provides the subsection locations and their paving dates. The control mix with no RAP or RAS has a PG 64-28M binder.

Table 2.3. SJ 26 Pilot Project Test Section Mix Types, Location Lane and Postmiles, and Paving Dates

SJ 26 Test Subsections ^a	Postmile Limits		Lane Number	Lane Direction	Paving Date
	Begin	End			
25% RAP	8.0	8.2	1	EB	Sep 27, 2022
30% RAP	8.2	8.4	1	EB	Sep 27, 2022
35% RAP	8.4	8.6	1	EB	Sep 28, 2022
40% RAP	8.6	8.8	1	EB	Sep 29, 2022
25% RAP and 3% RAS	8.8	9.0	1	EB	Sep 29, 2022
0% RAP and RAS	9.0	9.2	1	EB	Sep 29, 2022
12% RAP ^b	9.2	9.4	1	EB	Sep 26, 2022

^a Percentages of RAP and RAS are by weight of aggregate.

^b The 12% RAP mix was used throughout the rest of the project, between PM 8.0 and PM 17.8.

The SJ 26 construction report states that before construction, the pavement had rutting and load-related fatigue cracking in the wheelpaths and age-related transverse and block cracking. Some of the rutting damage had been addressed through micro milling. As described in a previous technical memorandum, “automated pavement condition survey (APCS) data for fatigue cracking (alligator A + B)...show that the previous treatment in 2014 had reduced fatigue cracking from approximately 50% of the wheelpath, but by the time of construction in 2022 it had reached more than 10% again. The previous treatment was a 0.1 ft. (30 mm) thin overlay, which indicates that the wheelpath cracking present in 2022 was reflective cracking (4).

APCS data shows that more than 10% of the wheelpath had rutting greater than 1/4 in. (6 mm) in 2018 and approximately 5% of the wheelpaths had rutting greater than 1/4 in. (6 mm) in 2022. This finding indicates that the rutting had been reduced by district maintenance forces using micromilling, and it was not allowed to reach 1/2 in. (12.5 mm).

3 CONDITION SURVEYS

This chapter presents the condition surveys collected after about three years after construction. The precise time between construction and the date of the condition survey is provided. Before the pilot projects were constructed, these pavements sections exhibited varying levels of load-related fatigue cracking in the wheelpaths as well as age-related cracking, with ED 49 and SJ 26 exhibiting amounts of cracking that warranted rehabilitation. SBD 215 did not exhibit significant cracking but exhibited rutting; SJ 26 also had rutting. All the pilot projects included milling of the existing surface to remove 0.15 ft. or 0.20 ft. of pavement surface and repaving of the same thickness with new asphalt concrete.

Overlays atop cracked material should retard reflective cracking and delay the need for more intensive interventions. The visual assessment of the pavement after three years is expected to show a surface with little to no distresses at this early stage of life.

3.1 Methodology

3.1.1 FHWA Distress Identification Manual

The Federal Highway Administration *Distress Identification Manual for the Long-Term Pavement Performance Program* was used to conduct visual condition surveys on the pavement surfaces (5). As shown in Appendix A, a worksheet was developed to collect data regarding the major distresses in asphalt pavement, including rutting and cracking, pumping, drainage, and patching.

The types of cracking are divided into alligator, longitudinal, transverse, thermal, and block cracking. Only alligator cracking originates specifically from traffic loading. The other cracking types are not load-related. In the following figures the cracking is separated into two categories: (1) alligator cracking and (2) other cracking. Other cracking in this review includes longitudinal and transverse cracking combined. Thermal and block cracking would have been included with the other non-load-related cracks type, but there was no thermal or block cracking observed in these surveys.

Cracking is defined by its length and severity. The length is measured, and the severity is rated by width. Crack widths less than 1/4 in. are low severity, indicated by a 1 on the worksheet. Widths between 1/4 in. and 3/4 in. are moderate severity, indicated by a 2. Widths greater than 3/4 in. are high severity, indicated by a 3. An 8 ft. long crack that is 1/2 in. in width would be labeled as “8/2.”

The comments note minor imperfections not covered by the distress manual, such as pieces of wood in the pavement surface or the effects of falling equipment from vehicles such as gouges and burn scars.

3.1.2 Traffic Closure and Survey

The condition surveys were conducted under a full lane closure with traffic control administered by the local Caltrans maintenance facility. The condition surveys for ED 49 and SJ 26 were each conducted in one day, and the condition survey for SBD 215 required one day for each direction.

With traffic control established, the sections were driven at about 20 mph with a video camera collecting images of the pavement surface. After collecting videos, the sections were surveyed by foot. The survey data for each pilot project is provided in Appendix B, Appendix C, and Appendix D.

3.2 El Dorado 49 (ED 49)

The ED 49 pilot project was paved on November 2 and 3, 2021, and the condition survey was conducted on December 19, 2024, 3.1 years after construction. Appendix B includes the survey data from each test section. Table 3.1 presents the summary of the condition surveys for each test section of ED 49. Figure 3.1 shows the cracking on each test section separated by alligator cracking and all other cracking combined. With a section length of 1,000 ft. and 2,000 ft. of wheelpath length, 20 ft. of cracking represents 1% wheelpath cracking.

Overall, the sections exhibited mild pumping coming through low-severity cracking, mostly load-related alligator cracking, shown in Figure 3.2, with some longitudinal and transverse cracking. Each mix exhibited at least some alligator cracking in one direction or the other. The 3% RAS mix in the northbound direction, going uphill, showed the most cracking and was the only section to suffer from rutting.

The 3% RAS mix between PM 13.289 and PM 13.478 exhibited the most cracking in this pilot project, with 124 ft., or 6% of the wheelpath length, of alligator cracking. Although slight, the 3% RAS mix was the only section to have rutting over a couple of feet in length, at approximately PM 13.35 southbound. The 3% RAS mix cracking and rutting are shown in Figure 3.3.

The 3% RAS and 10% RAP mix between PM 13.668 and PM 13.857 had the least alligator cracking, only 16 ft., or 0.8% of the wheelpath, but it had the most other cracking with 10 ft. of longitudinal cracking and 3.5 ft. of transverse cracking.

The 10% RAP mix between PM 13.478 and PM 13.668 had 42 ft., or about 2%, of wheelpath alligator cracking. The 0% RAP mix between PM 13.100 and PM 13.289 had about 23 ft., or 1%, of wheelpath alligator cracking.

Table 3.1. Condition Survey Summary of ED 49

Mix Type and Direction	Postmile		Rutting		Cracking: Length (ft.) or Area (ft²) and Severity (1-3)					Pumping: Extent	Drainage: Inadequate	Patching: Extent	Comments
	Start	End	Depth	Length	Alligator	Longitudinal	Transverse	Thermal	Block				
0% RAP, NB	PM 13.100	PM 13.289											No distress
0% RAP, SB	PM 13.289	PM 13.100			20/1, 3.3/2		2/1			mild			
3% RAS, NB	PM 13.289	PM 13.478			118/1		1.6/1			mild			Mild pumping from small cracks
3% RAS, SB	PM 13.478	PM 13.289	1/4"	1.6	5.6/1	1/1	1.6/1			mild			Mild pumping from small cracks
10% RAP, NB	PM 13.478	PM 13.668								very mild			Mild pumping in RWP
10% RAP, SB	PM 13.668	PM 13.478			42/1		0.7/1			mild			Distress primarily in LWP
3% RAS 10% RAP, NB	PM 13.668	PM 13.857				6.6/1	0.8/1			mild			In both WPs
3% RAS 10% RAP, SB	PM 13.857	PM 13.668			16/1	3.3/1	2.6/1			mild			Mild pumping from small cracks

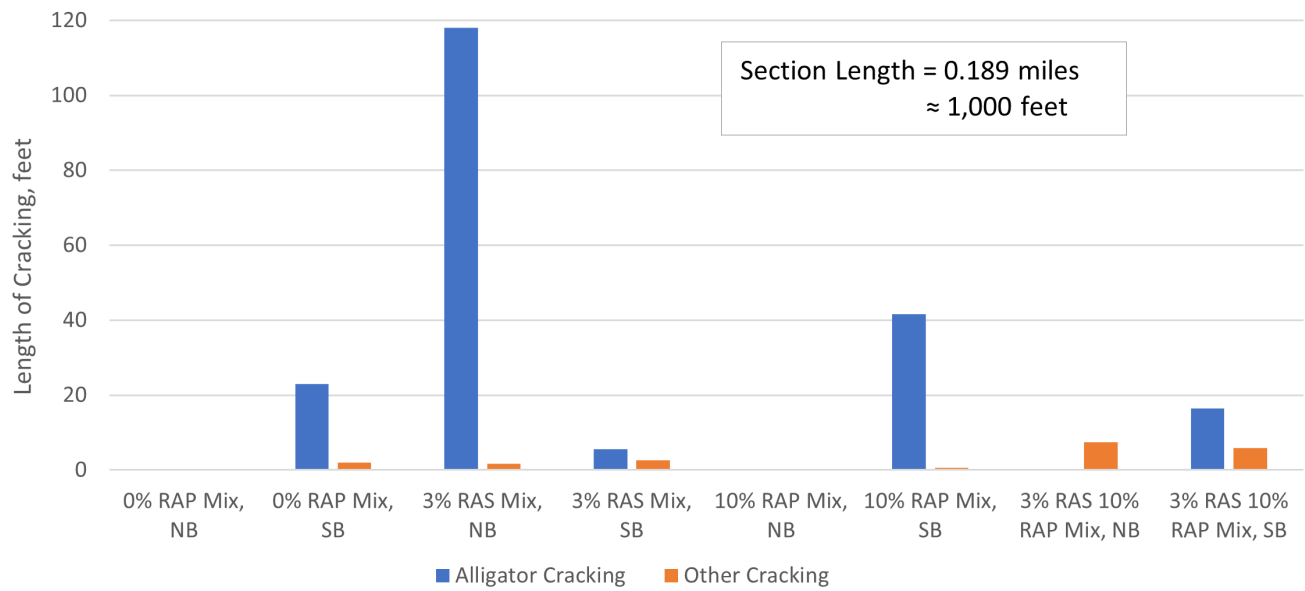


Figure 3.1. Alligator cracking and other cracking on ED 49.



Figure 3.2. Alligator cracking with mild pumping (evident throughout project).

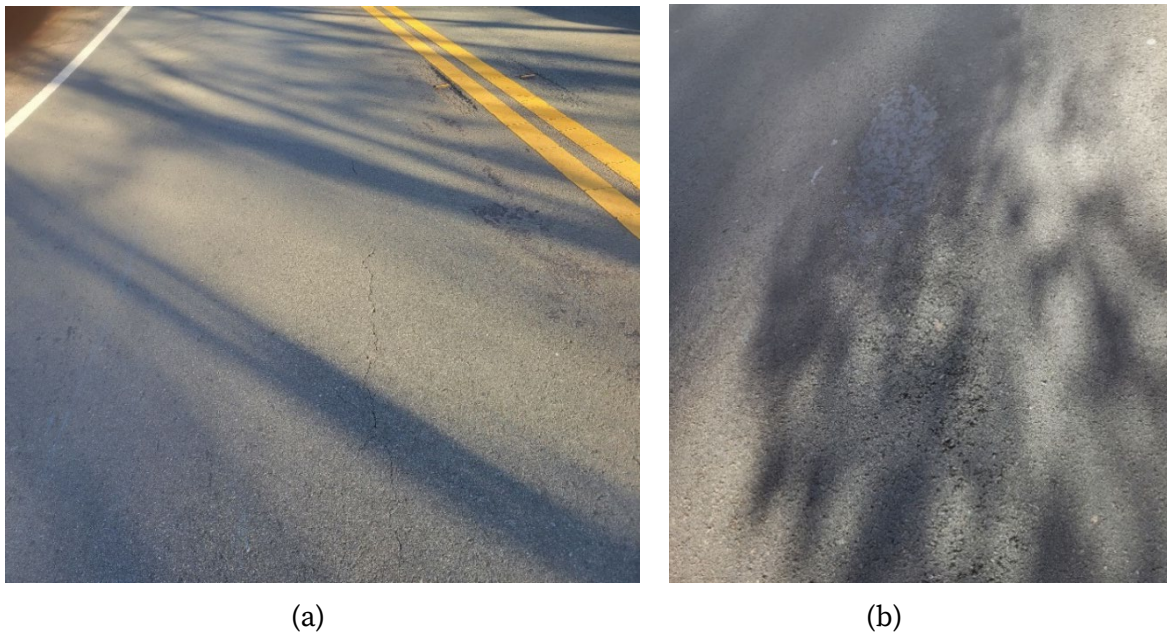


Figure 3.3. (a) Cracking and (b) rutting within the 3% RAS mix.

3.3 San Bernardino 215 (SBD 215)

The SBD 215 high RAP pilot project was paved between August 8 and 11, 2022, and the condition surveys were conducted on June 20 and 25, 2025, 2.9 years after construction. Appendix C includes the survey data from each test section. Table 3.2 presents the summary of the condition surveys for each test section of SBD 215. Figure 3.4 shows the cracking on each test section separated by alligator cracking and all other cracking combined. With a section length of 2,110 ft. and 4,220 ft. of wheelpath length, 42 ft. of cracking represents 1% wheelpath cracking.

The SBD 215 sections exhibited no load-related alligator cracking. It has some low-severity longitudinal and transverse cracking. These test sections were in very good condition, perhaps aided by the cement-treated base (CTB) which would be expected to limit alligator cracking if the CTB is in good condition. Only the 30% RAP mix between PM 13.8 and PM 14.2 exhibited over 100 ft. of total cracking. In the northbound direction, approximately between PM 14.08 and PM 14.17, the 30% RAP mix had three low-severity longitudinal cracks totaling 110 ft.

The 40% RAP mix had three low-severity transverse cracks between PM 15.00 and PM 14.99, shown in Figure 3.5 and Figure 3.6. Of transverse cracks in the 40% RAP mix, 25 ft. of the 26 ft. are in the northbound direction. The 40% RAP mix was the only mix with cracking in both directions.

The 35% RAP mix, shown in Figure 3.7, looked very good with only 8 ft. of low-severity longitudinal and transverse cracks in the northbound direction and some slight aggregate loss and pumping, shown in Figure 3.8. The 23% RAP mix is also performing well, with only 8 ft. of low-severity transverse cracking.

Both the 0% RAP mix between PM 13.0 and PM 13.4 and the 25% RAP mix between PM 13.4 and PM 13.8 had no cracking and, in general, no distresses. Two recurring surface irregularities were wood pieces in the surface and burn lines, shown in Figure 3.9 and Figure 3.10.

Table 3.2. Condition Survey Summary of SBD 215

Mix Type and Direction	Postmile		Rutting		Cracking: Length (ft.) or Area (ft²) and Severity (1-3)					Pumping: Extent	Drainage: Inadequate	Patching: Extent	Comments
	Start	End	Depth	Length	Alligator	Longitudinal	Transverse	Thermal	Block				
23% RAP, NB	PM 12.6	PM 13.0											Very good condition
23% RAP, SB	PM 13.0	PM 12.6					8/1						Very small transverse cracks
0% RAP, NB	PM 13.0	PM 13.4											Small pieces of wood in surface
0% RAP, SB	PM 13.4	PM 13.0											Couple of gouges and pre-cracks
25% RAP, NB	PM 13.4	PM 13.8											Some minor gouges
25% RAP, SB	PM 13.8	PM 13.4											Very good condition
30% RAP, NB	PM 13.8	PM 14.2				110/1				< 0.1			Longitudinal cracks
30% RAP, SB	PM 14.2	PM 13.8											Very good condition
35% RAP, NB	PM 14.2	PM 14.6				3.3/1	5/1						Very small cracks
35% RAP, SB	PM 14.6	PM 14.2								0.1			Slight raveling, good condition
40% RAP, NB	PM 14.6	PM 15.0					25/1						Few small transverse cracks
40% RAP, SB	PM 15.0	PM 14.6					1/1						Good condition

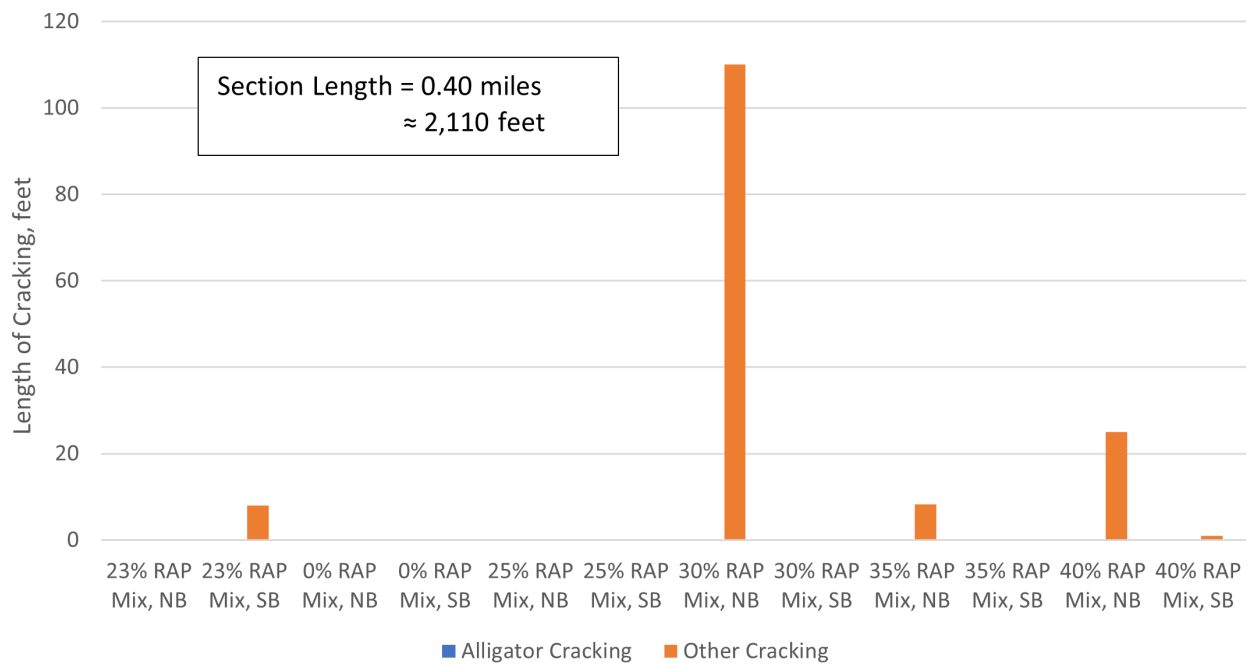


Figure 3.4. Alligator cracking and other cracking on SBD 215.

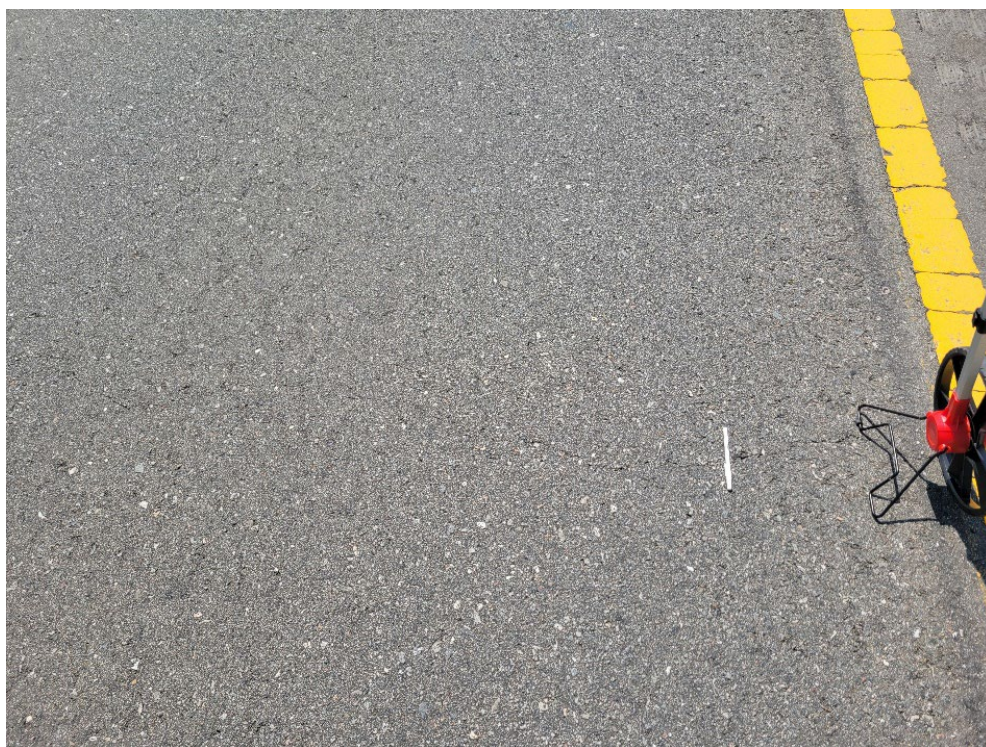


Figure 3.5. Transverse crack near SBD 215 northbound at PM 14.99.



Figure 3.6. Transverse crack near SBD 215 northbound at PM 15.00.



Figure 3.7. SBD 215 northbound at PM 14.20 (start of the 35% RAP mix).



Figure 3.8. Slight aggregate loss at PM 14.21 and pumping at PM 14.40 in the 35% RAP mix southbound.



Figure 3.9. Small pieces of wood on the surface in various locations.



Figure 3.10. Burn marks on surface in southbound direction between PM 14.0 and PM 15.0.

3.4 San Joaquin 26 (SJ 26)

The SJ 26 pilot project was paved between September 26 and 29, 2022, and the condition survey was conducted on April 16, 2025, 2.6 years after construction. Appendix D includes the survey data from each test section. Table 3.3 presents the summary of the condition surveys for each test section of SJ 26. Figure 3.11 shows the cracking on each test section separated by alligator cracking and all other cracking combined. With a section length of 1,055 ft. and 2,110 ft. of wheelpath length, 21 ft. of alligator cracking represents 1% wheelpath cracking.

The SJ 26 sections exhibited load-related alligator cracking, longitudinal cracking, and transverse cracking. These test sections were in fair condition as most of the cracking was low severity, though there was some moderate severity transverse cracking in the sections with 35% RAP mix and 40% RAP mix.

The 25% RAP mix between PM 8.0 and PM 8.2 exhibited the least total cracking, with the least transverse cracking, 2 ft., only 7 ft. of longitudinal cracking, and 18 ft., or 1%, of alligator cracking in the wheelpaths. Figure 3.12 shows the beginning of the eastbound test sections and the transverse cold joint at PM 8.0.

Figure 3.13 provides an example of both a clean and dusty pavement surface that existed throughout the SJ 26 test sections. The dust on the pavement surface likely comes from farmland adjacent to the highway. Figure 3.14 provides an example of transverse cracking in the 40% RAP mix, and Figure 3.15 shows low-severity alligator cracking with low-severity pumping.

The 12% RAP mix, 30% RAP mix and 35% RAP mix all had between 55 ft. and 71 ft. of total cracking. The 35% RAP mix contained all three crack types found, with 7 ft., or 0.3% of the wheelpaths, with alligator cracking, 34 ft. of longitudinal cracking, and 13 ft. of transverse cracking. The 30% RAP mix had 33 ft. of both longitudinal and transverse cracking, and the 12% RAP mix had 71 ft. of transverse cracking only.

The 40% RAP mix, the 25% RAP 3% RAS mix, and the 0% RAP mix were the three mixes that exhibited hundreds of feet of total cracking—198 ft., 289 ft., and 341 ft., respectively.

Two mixes, the 25% RAP 3% RAS mix and the 0% RAP mix, were worse than the 40% RAP mix in terms of alligator cracking, with 44 ft., or 2%. Two different mixes, the 30% RAP mix and the 35% RAP mix, were worse than the 40% RAP mix in terms of longitudinal cracking. However, the 40% RAP mix was only second to the 0% RAP mix in terms of the most transverse cracking, with 118 ft. (versus 279 ft.).

The 25% RAP 3% RAS mix exhibited the most alligator cracking among the test sections, with 161 ft., or 7.6% of the wheelpath.

The 0% RAP mix contains the most total cracking with 341 ft. and the most transverse cracking with 279 ft. However, it had only 62 ft., or 3% of the wheelpath, with alligator cracking and no longitudinal cracking. Interestingly, the 0% RAP mix had more cracking than either the 40% RAP mix or the 25% RAP 3% RAS mix.

Transverse (and possibly reflective) cracks were seen outside the high RAP test section, in the 12% RAP mix used throughout the rest of the project. The level of cracking after 2.5 years may suggest a structural deficiency.

Table 3.3. Condition Survey Summary of SJ 26

Mix Type and Direction	Postmile		Rutting		Cracking: Length (ft.) or Area (ft²) and Severity (1-3)					Pumping: Extent	Drainage: Inadequate	Patching: Extent	Comments
	Start	End	Depth	Length	Alligator	Longitudinal	Transverse	Thermal	Block				
25% RAP, EB	PM 8.0	PM 8.2	0.2"	46'	18/1	7/1	2/1			mild			Mild pumping in LWP cracks, mild rut
30% RAP, EB	PM 8.2	PM 8.4				33/1	33/1			mild			Transverse cracks, mild pumping, mild LWP segregation
35% RAP, EB	PM 8.4	PM 8.6			7/1	34/1	5.3/1 & 8.2/2			mild/mod.			Some cracking, transverse and longitudinal
40% RAP, EB	PM 8.6	PM 8.8			44/1	30/1	79/1 & 46/2			mild			Alligator and transverse cracking, pumping
25% RAP 3% RAS, EB	PM 8.8	PM 9.0			161/1	10/1	118/1						Significant low-severity alligator and transverse cracking
0% RAP, EB	PM 9.0	PM 9.2			62/1		279/1						Significant transverse cracking, alligator
12% RAP, EB	PM 9.2	PM 9.4					71/1						Transverse cracking

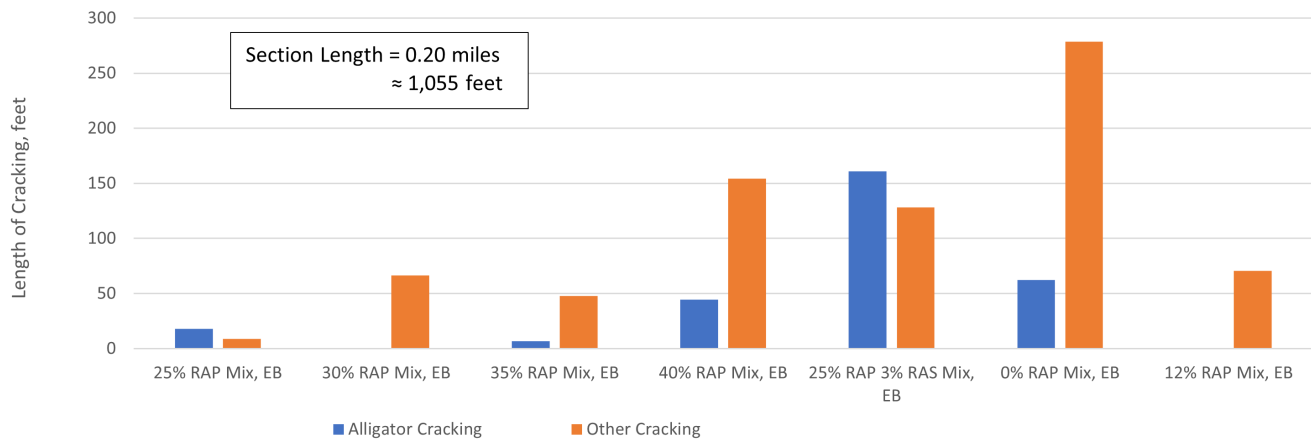
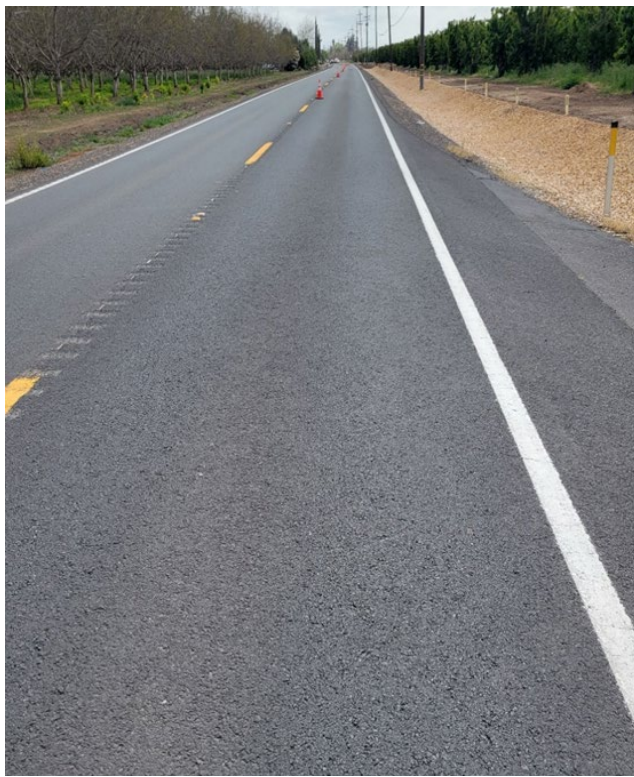


Figure 3.11. Alligator and other cracking on SJ 26.



Figure 3.12. Transverse cold joint at beginning of SJ 26 test sections eastbound at PM 8.0.



(a)



(b)

Figure 3.13. Examples of clean (a) and dusty (b) pavement surfaces on SJ 26.



Figure 3.14. Example of transverse cracking in the 40% RAP mix at PM 8.78.



(a)



(b)

Figure 3.15. Examples of low-severity alligator cracking with mild pumping in (a) the 40% RAP mix and (b) the 25% RAP 3% RAS mix.

4 SUMMARY AND CONCLUSIONS

4.1 Summary

Caltrans is investigating the performance of high RAP content mixes, with mixes containing 25% to 40% RAP. The UCPRC has been investigating the use of higher percentages of RAP in HMA through laboratory testing of laboratory-prepared and plant-sampled materials, observations of construction, and mechanistic-empirical simulations using the performance-related test properties for the mixes. Previous and ongoing research has identified potential concerns regarding using highly aged, stiff RAP.

This technical memorandum presented the condition survey observations conducted by the UCPRC from three pilot projects on State Route 49 in El Dorado County (ED 49), State Route 215 in San Bernardino County (SBD 215), and State Route 26 in San Joaquin County (SJ 26). The pilot projects were constructed in 2021 and 2022 and surveyed in 2024 and 2025, about three years after construction.

4.2 Conclusions

ED 49 is located in the Sierra foothills, in the Low Mountain pavement climate region, at an elevation where snow can occur. This project was the only pilot project removing and replacing 0.15 ft. of surface material, the other two removed and replaced 0.20 ft. The construction report indicated that reflective cracking should be expected, but it is still too early to suggest reflective cracking is imminent for all the mixes. However, the 3% RAS mix already has 6% wheelpath alligator cracking. Although it is low severity, evidence of pumping suggests that structural damage may accelerate with the material loss from unbound layers.

The 3% RAS 10% RAP mix has very low levels of alligator, longitudinal, and transverse cracking. Compared with the 10% RAP mix with no RAS, the 3% RAS 10% RAP mix exhibited less than half the alligator cracking and less total cracking. The 0% RAP mix had the least cracking among the four mixes constructed, including the others with RAP and/or RAS. The 0% RAP and 0% RAS control section mix has a PG 64-16 binder.

SBD 215 is located in the Inland Empire, in the Inland Valley pavement climate region. These test sections were the only ones with a cement-treated base. According to the construction report, the pavement surface exhibited little cracking distress, but rutting was a problem. The SBD 215 mixes do not include RAS, only varying levels of RAP. These test sections are in very good condition, with no alligator cracking and a few longitudinal and transverse cracks. The section with the most cracking was the 30% RAP mix northbound, with 110 ft. of longitudinal cracking over the 2,100 ft. long section. The 23% RAP mix, 35% RAP mix, and 40% RAP mix all had a few low-severity transverse cracks; the most was 25 ft. of transverse cracking in the 40% RAP mix. The 0% RAP and 0% RAS control section mix has a PG 64-28M binder.

SJ 26 lies in the central valley, in the Inland Valley pavement climate region. According to the construction report, the pavement had rutting and load-related fatigue cracking in the wheelpaths and age-related transverse and block cracking. Some rutting damage had been addressed through micro milling. The test sections exhibited load-related alligator, longitudinal, and transverse cracking. However, the test sections were in fair condition as most of the cracking was low severity. Some moderate severity transverse cracking was present in the sections with the 35% RAP mix and 40% RAP mix.

Interestingly, the 0% RAP mix on the SJ 26 project had more total cracking than either the 40% RAP mix or the 25% RAP 3% RAS mix. The 25% RAP 3% RAS mix exhibited the most alligator cracking among the test sections, with 161 ft., equating to 7.6% wheelpath cracking. The 0% RAP and 0% RAS control section mix has a PG 64-28M binder.

After three years in service, some of these high RAP mixes and the control mixes now exhibit levels of distress that suggest that future maintenance may be required in the next several years. This distress will be assessed in the 2026 condition survey.

4.3 Future Work

Two additional high RAP pilot projects have been paved, one near Ojai, CA, on Ventura 150 (PM 13.3/19.0 [EA 07-3237U4]) in September 2024 and the other near Pittsburg, CA, on Contra Costa 4 (PM R14.3/24.3 [04-2K7204]) in April 2025. All five pilot projects plan to be visually assessed in 2026. Another round of condition surveys plans to be conducted on these three pilot projects in a few more years after the 2026 survey.

For these high RAP projects, with varying amounts of RAP and RAS, we can study the aging properties of these binders after some time. This would require one day traffic control for each site to conduct material sampling and some weeks to complete the binder analysis.

REFERENCES

1. Alavi, M. Z., Jones, D., He, Y., Chavez, P., and Liang, Y. 2017. *Investigation of the Effect of Reclaimed Asphalt Pavement and Reclaimed Asphalt Shingles on the Performance Properties of Asphalt Binders: Phase 1 Laboratory Testing* (Research Report: UCPRC-RR-2016-06). Davis and Berkeley, CA: University of California Pavement Research Center. <https://escholarship.org/uc/item/5jq4m661>.
2. Harvey, J.T., Buscheck, J., Brotschi, J., Rahman, M., Mateos, A., and Jones, D. 2023. *RAP and RAS in HMA Pilot Project on ELD 49: Material Testing, Observations, and Findings* (Technical Memorandum: UCPRC-TM-2022-04). Davis and Berkeley, CA: University of California Pavement Research Center. <https://doi.org/10.7922/G2X065DD>.
3. Harvey, J.T., Buscheck, J., Brotschi, J., Rahman, M., Mateos, A., and Jones, D. 2025. *RAP and RAS in HMA Pilot Project on SBD 215: Material Testing, Observations, and Findings* (Technical Memorandum: UCPRC-TM-2023-02). Davis and Berkeley, CA: University of California Pavement Research Center. <https://doi.org/10.7922/G2Z036JS>
4. Harvey, J.T., Buscheck, J., Brotschi, J., Rahman, M., Mateos, A., and Jones, D. 2026. *RAP and RAS in HMA Pilot Project on SJ 26: Material Testing, Observations, and Findings* (Technical Memorandum: UCPRC-TM-2023-03). Davis and Berkeley, CA: University of California Pavement Research Center.
5. Miller, J.S., Bellinger, W.Y. 2003. *Distress Identification Manual for the Long-Term Pavement Performance Program (Fourth Revised Edition)* (FHWA-RD-03-031). Washington, DC: Federal Highway Administration.
<https://www.fhwa.dot.gov/publications/research/infrastructure/pavements/ltpa/reports/03031/03031.pdf>.

APPENDIX A BLANK FIELD SURVEY WORKSHEET

The following is a blank worksheet used to conduct the field condition surveys. The following appendices present the digitized version of the field worksheets collected for the three pilot projects.

[illegible]

APPENDIX B FIELD WORKSHEETS FROM ED 49

Appendix B contains the worksheets from field condition surveys on ED 49. The first four worksheets are for the northbound direction, shown with increasing postmiles, and the second four worksheets are for the southbound direction, shown with decreasing postmiles. These data are collected in metric units and converted to US standard units for presentation in this technical memorandum.

Visual Assessment Field Worksheet (Flexible)											 	
Project No: 4.92 BMD				Project Description:		ED49NB High RAP - 0% RAP Mix						
Route No: ED 49		Post Mile: 13.100 to 13.289		Date: 12/19/2024		Assessor: Irwin Guada						
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc	
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitudinal ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent	
PM12.99												
+186m = PM 13.11											START A	
+439											Cores (5) taken	
+489											END A	
Sum A											no distress	

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 < 6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 	
Project No: 4.92 BMD				Project Description:		ED49NB High RAP - 3% RAS Mix						
Route No: ED 49		Post Mile: 13.289 to 13.478		Date: 12/19/2024		Assessor: Irwin Guada						
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc	
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitudinal ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent	
+439											START C	
494 <-> 507				13m/1					mild			
514 - 517				3/1					mild			
675,680									mild			
692 - 696				4/1					mild			
700 - 703				3/1					mild			
721 - 725				4/1					mild			
726						0.5/1			mild			
727 - 738				9/1					mild			
786	795	GROUNDING SCRAP BOTH DIRECTIONS									PM 13.49°	
796											END C	
Sum C				36/1		0.5/1			mild		mild pumping from small cracks	

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 < 6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 				
Project No:		4.92 BMD		Project Description:		ED49NB High RAP - 10% RAP Mix					Assessor:		Irwin Guada		
Route No:		ED 49		Post Mile:		13.478 to 13.668		Date:		12/19/2024		Assessor:		Irwin Guada	
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)					Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc			
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent				
796												START B			
796 - 808									very mild			CL or RWP			
827 - 834									mild			RWP			
883									mild			RWP			
940, 944												Cores 4 + 4			
971 - 972									mild			RWP			
1098												END B			
Sum B									very mild			very mild pumping in RWP			

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 				
Project No:		4.92 BMD		Project Description:		ED49NB High RAP - 3% RAS & 10% RAP Mix					Assessor:		Irwin Guada		
Route No:		ED 49		Post Mile:		13.668 to 13.857		Date:		12/19/2024		Assessor:		Irwin Guada	
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)					Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc			
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent				
1098												START D			
1237 - 1252						0.25/1			mild			CL			
1265									mild			LWP			
1270 - 1272					2/1				mild			RWP			
1342- 1350									mild			LWP			
1350 - 1354									mild			BWP			
1374 - 1383									mild			LWP			
1389									mild			LWP			
1402												END D			
Sum D					2/1	0.25/1			mild			in both WPs			

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 		
Project No:		4.92 BMD		Project Description:		ED49SB High RAP - 3% RAS & 10% RAP Mix							
Route No:		ED49		Post Mile:		13.857 to 13.668		Date:		12/19/2024		Assessor:	
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)					Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc	
Longitudinal	Lateral	Depth	Length	Alligator ²	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent		
0												NO REFERENCE	
0												START D	
0-3				3/1									
0-4													
10-12				2/1									
-20													
22						0.1 - CL							
30-32													
40						0.5 LWP							
41					0.5/1							LWP	
54-58					0.5/1								
126						0.2 RWP						reflective	
135-137													
155													
162-166													
165-168												SCRAPE	
189												34/8	
260												CORES 4+4	
304												END D	
Sum D				5/1	1/1	0.8/1						mild pumping from small cracks	

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
 If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 		
Project No:		4.92 BMD		Project Description:		ED49SB High RAP - 10% RAP Mix							
Route No:		ED49		Post Mile:		13.668 to 13.478		Date:		12/19/2024		Assessor:	
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)					Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc	
Longitudinal	Lateral	Depth	Length	Alligator ²	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent		
304												START B	
312-317				5/1									
403-410				7/1									
480												SCRAPE	
530-532													
569-570													
575						0.2 RWP							
575-579													
582				0.5/1									
588													
606				0.2/1									
608												END B	
Sum B				12.7/1		0.2/1						distress primarily in LWP	

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
 If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)										 		
Project No: 4.92 BMD				Project Description: ED49SB High RAP - 3% RAS Mix						 		
Route No: ED49		Post Mile: 13.478 to 13.289		Date: 12/19/2024		Assessor: Irwin Guada						
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc	
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent	
608												START C
609						0.2/1			mild LWP			
609 - 618									mild LWP			
627 - 630									mild LWP			
634									mild LWP			
638												CORES 4+4
644 - 656									mild BWP			
661 - 663									mild BWP			
663 - 674									mild LWP			
675					0.3/1				mild LWP			
675 - 678									mild LWP			
683 - 684									mild LWP			
685						0.3/1						reflective
689 - 696									mild BWP			
701 - 723									mild RWP			
725				0.2/1					mild LWP			
731 - 735				0.5/1					mild RWP			
735 - 742				1.0/1					mild RWP			
800												scraped
817		6	0.5									bleeding within rut
834 - 844									mild LWP			
870 - 877									mild LWP			
870									mild RWP			
920												END C
Sum C		6	0.5	1.7/1	0.3/1	0.5/1			mild			mild pumping from small cracks

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
 If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 				
Project No:		4.92 BMD		Project Description:		ED49SB High RAP - 0% RAP Mix									
Route No:		ED49		Post Mile:		13.289 to 13.100		Date:		12/19/2024		Assessor:		Irwin Guada	
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)					Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc			
Longitudinal	Lateral	Depth	Length	Alligator ²	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent				
920												START A			
936				1/2											
961				1/1 RWP		0.4 LWP									
964						0.2 RWP									
964 - 966									mild RWP						
1013									mild RWP						
1083									mild LWP						
1111									mild LWP						
1119															
1121 - 1127				1/1 LWP								UPPER NO PUMP			
1206 - 1212				4/1					mild RWP			LOWER PUMP			
1222												END A			
Sum A				1/2 & 6/1		0.6/1			mild						

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 < 6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
 If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

APPENDIX C FIELD WORKSHEETS FROM SBD 215

Appendix C contains the worksheets from field condition surveys on SBD 215. The first six worksheets are for the northbound direction, and the following six worksheets are for the southbound direction. For both surveys, the visual survey was conducted walking against traffic and so the longitudinal locations increase as the postmiles decrease and vice versa. These data are collected in metric units and converted to US standard units for presentation in this technical memorandum.

Visual Assessment Field Worksheet (Flexible)											 			
Project No:		4.92 BMD High RAP		Project Description:		SBD215NB High RAP - 23% RAP (Mix Q)					Assessor:		IRWIN GUADA	
Route No:		SBD 215 NB		Post Mile:		12.6 to 13.0		Date:		6/25/2025				
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)					Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc		
Longitudinal	Lateral	Depth	Length	Alligator ²	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent			
3222.5												START		
3278.0 - 3359.6												Grind		
3291.0												Hot Joint ?		
3389.06 - 3540.6												Grind		
3507.1 - 3523.23												Bridge		
3575.9									Bugger			RWP		
3750.0												END		
n Mix Q (23% RAP)												Very Good Condition		

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.

If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 				
Project No:		4.92 BMD High RAP		Project Description:		SBD215NB High RAP - 0% RAP (Mix E)		Date:		6/25/2025		Assessor:		IRWIN GUADA	
Route No:		SBD 215 NB		Post Mile:		13.0 to 13.4		Date:		6/25/2025		Assessor:		IRWIN GUADA	
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc				
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent				
2596															
2711.4									Gouge			CL			
2763									Small Piece of WOOD IN HMA			LWP (12:02)			
2768									Wood In HMA						
2853									Wood In HMA			LWP			
2882									Wood In HMA			LWP			
2892									Wood In HMA			LWP			
2898												3x 4" ϕ cores			
2959									Wood In HMA			RWP			
3032									Wood In HMA			LWP			
3039.5												Grind			
3053												3x 4" ϕ cores			
3054.23												Cold Joint?			
3065.6												Grind CL			
3222.5												END			
m Mix E (0% RAP)									Small pieces of wood in surface			Very good condition			
Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 < 6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.															
If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.															

Visual Assessment Field Worksheet (Flexible)											 				
Project No:		4.92 BMD High RAP		Project Description:		SBD215NB High RAP - 25% RAP (Mix F)		Date:		6/25/2025		Assessor:		IRWIN GUADA	
Route No:		SBD 215 NB		Post Mile:		13.4 to 13.8		Date:		6/25/2025		Assessor:		IRWIN GUADA	
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc				
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent				
1983												START			
2089.5											Gouge	LWP			
2115.8											Small Goop				
2186.3															
2196.3												(11:29)			
2383.0												Grind			
2413.1 / 2454.6												Bridge			
2465											1' Gouge	LWP			
2505.0											0.1' Gouge	LWP			
2596												END			
m Mix F (25% RAP)									Some minor gouges			Very good condition			
Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 < 6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.															
If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.															

Visual Assessment Field Worksheet (Flexible)											 	
Project No:		4.92 BMD High RAP		Project Description:		SBD215NB High RAP - 30% RAP (Mix G)						
Route No:		SBD 215 NB		Post Mile:		13.8 to 14.2		Date:		6/25/2025		
Assessor:		IRWIN GUADA										
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc	
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent	
1322.40											START	
1330.7 / 1331.8											Hot Joint ?	
1340.4											3x 4"φ Cores	
1341 / 1345					3.5/1						LETW (Left Edge of Travel Way)	
1370 / 1380					10/1							
1423.5 / 1466.1											Bridge	
--> 1482.6					20/1							
1749.8											3x 4"φ Cores CL	
1778.7									< 0.1		mild pumping	
1784											Loop Detector	
1835		Black Splotch									RWP	
1983											END	
m Mix G (30% RAP)					33.5/1				< 0.1		A few longitudinal cracks	

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 < 6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
 If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 	
Project No:		4.92 BMD High RAP		Project Description:		SBD215NB High RAP - 35% RAP (Mix H)						
Route No:		SBD 215 NB		Post Mile:		14.2 to 14.6		Date:		6/25/2025		
Assessor:		IRWIN GUADA										
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc	
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent	
666.70											START (10:55)	
754.45						0.3/1					LWP	
785						0.3/1					CL	
817.2						1.0/0					Partial joint L	
826.7										0.2 x 0.2	RWP	
1214.3					1/1						LWP Gouge (Scrape)	
1241											LWP Detector	
1322.4											END (11:09)	
m Mix H (35% RAP)					1/1	1.6/1					A few very small cracks	

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 < 6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
 If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 	
Project No:		4.92 BMD High RAP		Project Description:		SBD215NB High RAP - 40% RAP (Mix I)						
Route No:		SBD 215 NB		Post Mile:		14.6 to 15.0		Date:		6/25/2025		
Assessor:		IRWIN GUADA										
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc	
Longitudinal	Lateral	Depth	Length	Alligator ³	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent	
PM15.0 = 0.0												
0.6						3.5/1						
6.0											Grind End	
12.3						2.5/1					(10:39am)	
15.75						1.5/1					LWP	
98.3											3x 4" ϕ Cores LWP	
164.3											Loop Detector	
248.9											Stick in CL	
271.8											Spring in LWB	
417.9											3x 4" ϕ Cores RWP	
428											Grind Start	
438.7 - 530.4											PCC Start/End	
666.7											END	
m Mix I (40% RAP)						7.5/1					A few small transverse cracks	

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 < 6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
 If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 	
Project No:		4.92 BMD High RAP		Project Description:		SBD215SB High RAP - 40% RAP (Mix I)						
Route No:		SBD 215 SB		Post Mile:		15.0 to 14.6		Date:		6/20/2025		
Assessor:		IRWIN GUADA										
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc	
Longitudinal	Lateral	Depth	Length	Alligator ³	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent	
662												
761						0.3/1						
762											Grind	
778											Bridge	
809											Loops & Traffic Counter	
977											Bridge	
931											(12:55)	
187											Loop Detector	
1235											Little League Overcrossing	
1360											(13:01)	
m Mix I (40% RAP)						0.3/1					Good Condition	

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 < 6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
 If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 	
Project No:		4.92 BMD High RAP		Project Description:		SBD215SB High RAP - 35% RAP (Mix H)						
Route No:		SBD 215 SB		Post Mile:		14.6 to 14.2		Date:		6/20/2025		
Assessor:		IRWIN GUADA										
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc	
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent	
14.2 = 0.0											Sign for Little League Rd NEXT EXIT	
52m											(12:37)	
78m										Light Ravel	RWP	
277 - 290											FIRE MARK: Outside Shoulder	
325									0.1		RWP & LWP	
382											4" φ CORE RWP	
504										Light Ravel		
662											END	
m Mix H (35% RAP)									0.1		Slight Ravelling, Good Condition	

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 	
Project No:		4.92 BMD High RAP		Project Description:		SBD215SB High RAP - 30% RAP (Mix G)						
Route No:		SBD 215 SB		Post Mile:		14.2 to 13.8		Date:		6/20/2025		
Assessor:		IRWIN GUADA										
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc	
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent	
0.0 = PM13.8 = 1332m from Mix F Worksheet											Cold Joint	
160											Loop Detector	
											(12:14)	
417											Bridge @ PM14.09	
463											Bridge	
692											END (12:24)	
m Mix G (30% RAP)											Very Good Condition	

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 				
Project No:		4.92 BMD High RAP		Project Description:		SBD215SB High RAP - 25% RAP (Mix F)									
Route No:		SBD 215 SB		Post Mile:		13.8 to 13.4		Date:		6/20/2025		Assessor:		IRWIN GUADA	
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)					Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc			
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent				
664															
703												Grind			
732 - 777												Bridge			
894, 903, 911, 919, 927, 935, 943, 951, 960, 967, 985													1' black "zigzag" line		
1031											Gouge	RWP			
1171												1' black "zigzag" line on White CL			
1280															
1282															
1332												END, Cold Joint?			
m Mix F (25% RAP)													Good Condition		

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 < 6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 				
Project No:		4.92 BMD High RAP		Project Description:		SBD215SB High RAP - 0% RAP (Mix E)									
Route No:		SBD 215 SB		Post Mile:		13.4 to 13.0		Date:		6/20/2025		Assessor:		IRWIN GUADA	
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)					Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc			
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent				
PM13.0 = 0.0m												Cod Joint			
9												Grind End			
67										Gouge		RWP			
177												Not a crack. Joint?			
409										Gouge		LWP			
443												Cold Joint?			
664												END			
m Mix E (0% RAP)												A couple of gouges and pre-cracks	Very good condition		

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 < 6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 				
Project No:		4.92 BMD High RAP		Project Description:		SBD215SB High RAP - 23% RAP (Mix Q)		Date:		6/20/2025		Assessor:		IRWIN GUADA	
Route No:		SBD 215 SB		Post Mile:		13.0 to 12.6		Date:		6/20/2025		Assessor:		IRWIN GUADA	
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc				
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent				
0								15 meters South of CMS Board in Northbound Direction							
93						0.3/1						LEP - Left Edge of Pavement			
127												Grinding			
143 - 160												Bridge			
186															
340						2.0/0									
382												Cold Joint?			
429												Gouge			
455												Gouge			
641												Grind Start			
652												END			
n Mix Q (23% RAP)						2.3/1						Very minor transverse cracks			

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
 If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

APPENDIX D FIELD WORKSHEETS FROM SJ 26

Appendix D contains the worksheets from field condition surveys on SJ 26. The seven worksheets are for the northbound direction. These data were collected in metric units and converted to US standard units for presentation in this technical memorandum.

Visual Assessment Field Worksheet (Flexible)											 				
Project No:		4.92 BMD High RAP		Project Description:		MIX K 25% RAP		Date:		4/16/2025		Assessor:		IRWIN GUADA	
Route No:		SJ26 EB only		Post Mile:		8.0 to 8.2		Date:		4/16/2025		Assessor:		IRWIN GUADA	
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc				
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent				
PM 8.0												PM 8.0 MARKER			
+ 0.0				0.5/1					mild			LWP			
0 - 14		<= 4mm	14m									BWP, slight bleeding in rut			
29 - 42				5m/1					mild			LWP			
145						0.3/1						LWP			
209						0.2/1						LWP			
210					1/1				mild						
236 - 240					1/1				mild						
276						0.2/1									
316												GRIND STARTS			
323												SECTION END			
m MixK (25% RAP)		4	14	5.5/1	2/1	0.7/1			mild			mild pumping in LWP cracks, mild rut			
Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm. If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.															

Visual Assessment Field Worksheet (Flexible)											 	
Project No:		4.92 BMD High RAP		Project Description:		MIX L 30% RAP						
Route No:		SJ26 EB only		Post Mile:		8.2 to 8.4		Date:		4/16/2025		
Assessor:		IRWIN GUADA										
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc	
Longitudinal	Lateral	Depth	Length	Alligator ²	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent	
PM 8.0 --> 323.28											START SECTION	
337											GRIND ENDS	
374 - 377											LWP segregation	
389						0.1/1						
400						0.1/1					CL	
424						1.0/1					LWP & CL	
446 - 463					10m/1				mild		LWP	
458						2.0/1					LWP CL	
478 - 484											LWP segregation	
495						2.0/1					LWP CL	
506						2.0/1						
534						3.0/1					RWP	
541 - 546											LWP segregation	
594									mild		CL	
597 - 598									mild		CL	
624									mod		START GRIND	
644											SECTION END	
m MixL (30% RAP)											transverse cracks, mild pumping, mil	
					10/1	10.2/1			mild			

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.

If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 				
Project No:		4.92 BMD High RAP		Project Description:		MIX M 35% RAP		Date:		4/16/2025		Assessor:		IRWIN GUADA	
Route No:		SJ26 EB only		Post Mile:		8.4 to 8.6		Date:		4/16/2025		Assessor:		IRWIN GUADA	
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc				
Longitudinal	Lateral	Depth	Length	Alligator ²	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent				
DM 8.0 + 646.22												SECTION STARTS			
+646									mod						
+652						0.2/1									
662 - 668												BWP segregation			
663						0.3/1									
665,45						2.5/2						RWP --> CL			
668												GRIND END			
682						0.5/1						RWP			
686 - 696					10/1										
710												CORES (2)			
706 - 711									mild CL						
754 - 762				2/1					mild LWP						
785 - 791									mild CL						
791					0.5/1				mild LWP						
815												SCRAPED RWP, EP			
823						0.2/1						CL			
838						0.2/1									
913						0.2/1						LWP			
940 - 949												RWP, LWP segregation			
960												GRIND START			
969												SECTION ENDS			
m MixM (35% RAP)					2/1	10.5/1	1.6/1 & 2.5/2			mild/mod		some cracking, transverse and longit			

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 < 6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
 If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 				
Project No:		4.92 BMD High RAP		Project Description:		MIX N 40% RAP		Date:		4/16/2025		Assessor:		IRWIN GUADA	
Route No:		SJ26 EB only		Post Mile:		8.6 to 8.8		Date:		4/16/2025		Assessor:		IRWIN GUADA	
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc				
Longitudinal	Lateral	Depth	Length	Alligator ²	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent				
PM 8.0 + 969.24												SECTION STARTS			
970 - 977												AGG LOSS ≤ 0.1 m ²			
972 - 982															
979						1.5/1						RWP			
983 - 986				3/1											
1000						1/1						LWP			
1001						1/1						RWP			
1004 - 1010				2.5/1					mild			LWP			
1008						1/1									
1015 - 1018				3/1								LWP			
1019						1/1						RWP			
1031						1/1						LWP			
1032 - 1041					9/2							LWP			
1034						3.0/1						LWP CL			
1039						1.0/1						LWP			
1040						3.0/1						CL --> BWP			
1044						3.0/2						RWP --> CL			
1052						3.7/2						FULL			
1060						3.6/2									
1065						3.7/2						FULL			
1072						2.0/1						RWP --> CL			
1086						2.0/1									
1100 - 1105												BWP segregation			
1108 - 1130									mild			LWP, CC			
1125						1/1						RWP			
1138						1/1						RWP			
1151						1/1						EP			
1161						1/1						RWP			
1171						2.5/1						RWP CL			
1170 - 1174												RWP segregation			
1187									mild			LWP			
1237 - 1243									mild			RWP segregation			
1248 - 1254				5/1					mild			LWP, Next to BG AGRI			
1272- 1273									mild			LWP			
1293												END SECTION			
m MixN (40% RAP)					13.5/1	9/2	24/1 & 14/2		mild			Alligator & Transverse Cracking, pum			

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 	
Project No:		4.92 BMD High RAP		Project Description:		MIX O 25% RAP 3% RAS						
Route No:		SJ26 EB only		Post Mile:		8.8 to 9.0		Date:		4/16/2025		
Assessor:		IRWIN GUADA										
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc	
Longitudinal	Lateral	Depth	Length	Alligator ²	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent	
PM 8.0 1293.06											SECTION START	
5, 1312, 1322, 1339						0.1/1					RWP/EP	
1312						0.1/1					RWP/EP	
1322						0.1/1					RWP/EP	
1339						0.1/1					RWP/EP	
1351 - 1354					3/1				mild		LWP	
1354						1.0/1					RWP	
1370											CORES 3	
1445						0.5/1					LWP	
1455						1.0/1					RWP	
1458 - 1464				6/1							RWP	
1464 - 1469				5/1					mild		RWP	
1469 - 1484				15/1					No		RWP	
1478						1/1					RWP --> EP	
1480						1/1						
1482						1/1						
1484						1/1						
1486						1/1						
1489						1/1						
1496						1/1						
1486 - 1491				5/1					No		RWP	
1502						1.5/1					RWP --> EP	
1510						1.5/1					RWP --> EP	
1517						1.5/1					RWP --> EP	
1519						1.5/1					RWP --> EP	
1525						1.5/1					RWP --> EP	
1532						1.5/1					RWP --> EP	
1538						1.5/1					RWP --> EP	
1531 - 1547				11/1							LWP	
1567						3.7/1					FULL	
1567 - 1573				7/1							RWP	
1583						2/1					LWP CL	
1604											SECTION END	
1604.46											PM 9.0	
xO (25% RAP/3% RAS)				49/1	3/1	36.1/1					Significant low severity alligator and	

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.

If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 	
Project No:		4.92 BMD High RAP		Project Description:		MIX J 0% RAP						
Route No:		SJ26 EB only		Post Mile:		9.0 to 9.2		Date:		4/16/2025		
Assessor:		IRWIN GUADA										
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)					Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc
Longitudinal	Lateral	Depth	Length	Alligator ¹	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent	
PM 9.0 + 00 = PM 8.0 + 1604.46												PM 9.0 MARKER
1625						1/1						RWP - EP
1637												CORES TAKEN (2)
1654						2.5/1						RWP --> CL
1658						1/1						RWP
1661						1/1						RWP
1660 - 1664				4/1								RWP
1684						1/1						RWP
1702						1/1						RWP
1710						1/1						RWP
1713						2/1						RWP
1716						2/1						RWP
1721						2/1						RWP
1715 - 1716				2/1								LWP
1726						3.5/1						FULL
1729				1/1								RWP
1735						2/1						CL
1739						2/1						RWP, LWP
1742						1/1						RWP
1748						3.5/1						FULL
1752						3.5/1						FULL
1754						2/1						RWP CL
1758						1.5/1						RWP
1764 - 1774				10/1								LWP
1767						3.0/1						RWP CL
1770						3.0/1						RWP CL
1774						3.0/1						RWP CL
1778						2/1						RWP CL
1781						3.0/1						RWP CL
1784						3.5/1						FULL
1788						3.5/1						FULL
1791						1.5/1						RWP
1799						2/1						RWP CL
1803						3.0/1						RWP CL
1808						1.5/1						RWP
1812						2/1						RWP CL
1817						3.0/1						RWP CL
1819 - 1821				2/1								LWP
1820						2/1						RWP
1822						2/1						RWP
1829						2/1						RWP
1833						2/1						RWP
1856						0.5/1						LWP
1865						3.5/1						FULL
1885						2/1						RWP
1888						2/1						RWP
1910						1.5/1						RWP
1927												GRIND START
												SECTION END
um Mix J (0% RAP)				19/1		85/1						Significant transverse cracking, alliga

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

Visual Assessment Field Worksheet (Flexible)											 	
Project No:		4.92 BMD High RAP		Project Description:		MIX P 12 - 15% RAP						
Route No:		SJ26 EB only		Post Mile:		9.2 to 9.4		Date:		4/16/2025		
Assessor:		IRWIN GUADA										
Location (Distance)		Rutting		Cracking - measure length ¹ or area ² and severity (1-3)				Pumping	Drainage	Patching	Comments - Critical issues, Patch length, Samples taken, etc	
Longitudinal	Lateral	Depth	Length	Alligator ²	Longitude ¹	Transvers ¹	Thermal ²	Block ²	Extent	Inadequate	Extent	
8.0 + 1927.27											SECTION START	
1932											GRIND END	
2001											BINDER BUGGER RWP	
1998 - 2017											SCRAPE LWP	
2029						0.5/1					ETW --> EP	
2153						0.5/1					ETW --> EP	
2157						0.5/1					ETW --> EP	
2276						0.5/1					ETW --> EP	
2283						0.5/1					ETW --> EP	
2296						0.5/1					ETW --> EP	
2035						2/1					RWP	
2175						3.5/1					RWP - LWP	
2177						3/1					RWP - CL	
2184						1/1					RWP	
2189						1/1					RWP	
2194						1/1					RWP	
2246 - 2267											RWP GRIND	
2289						1/1					RWP --> EP	
2301						1/1					RWP --> EP	
2312						1/1					RWP --> EP	
2308						2/1					RWP --> EP	
2315											SECTION END	
2315											SIGN FOR LINDEN	
2319						2/1					RWP EP	
2326 - 2353											RWP GRIND	
m MixP (12% RAP)						21.5/1					Transverse cracking	

Longitudinal distance from single Start, Lateral distance from Right Edge of Section; Cracking Severity: 1 <6mm, 2 = 6 to 19mm, 3 > 19mm; Pumping extent: 1 < 13mm, 2 > 12mm.
If Drainage is inadequate, note reason in Comments; Patching extent is full width or partial width or just the wheelpath, with the length noted in comments.

