JUNE 4, 2024

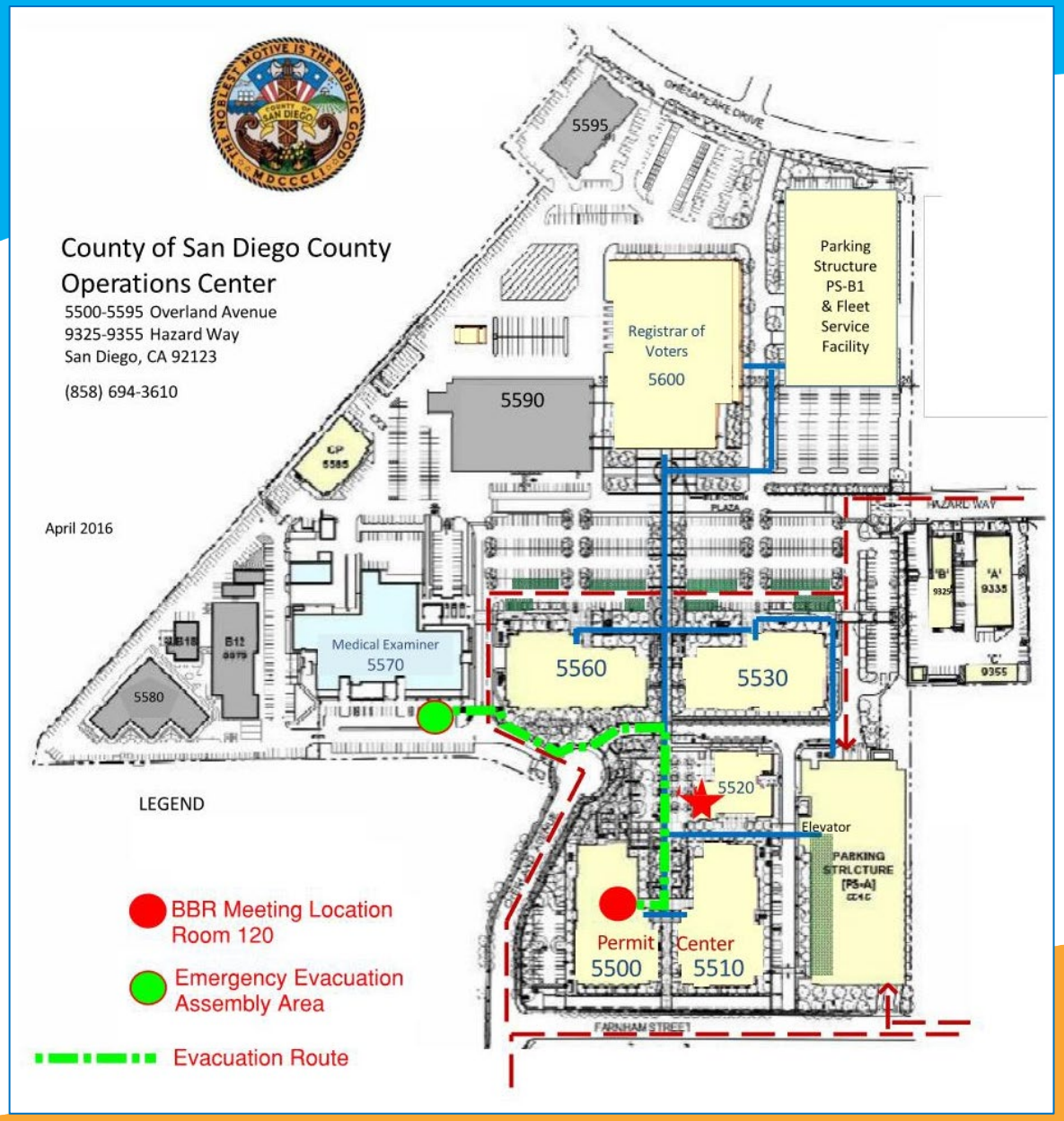
WORKING GROUP MEETING

AGENDA

- 1) Sign-In /Meeting Overview
- 2) Public Comments
- 3) Welcome Message
- 4) Key Presentation
- 5) Interactive Poll Recap
- 6) Industry/Organization Updates
- 7) Regional Paving Forecast
- 8) Subcommittee Update
- 9) Next Working Group Meeting / Close

BUILDING BETTER ROADS San Diego County

BUILDING LOGISTICS AND SAFETY

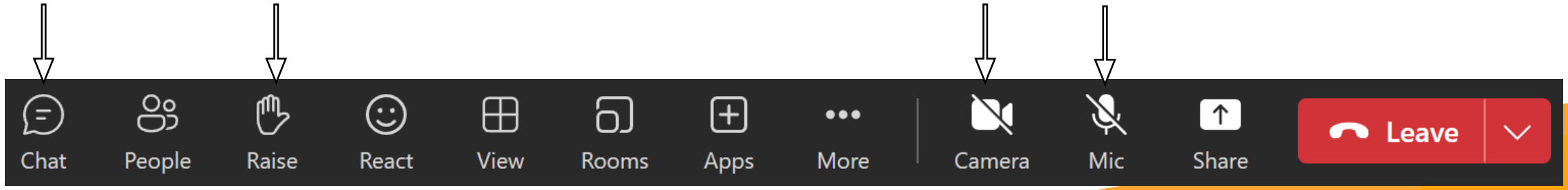


- Room and Building Exits
- Restroom Location
- Evacuation Plan

BUILDING BETTER ROADS
San Diego County

TEAMS MEETING ETIQUETTE/ SIGN IN

- Mute Microphone unless presenting
- Turn Camera off unless presenting
- Use Chat window or Raise Hand for questions
- Please enter your Name, Company/Agency, E-mail in Chat



San Diego County
BUILDING BETTER ROADS

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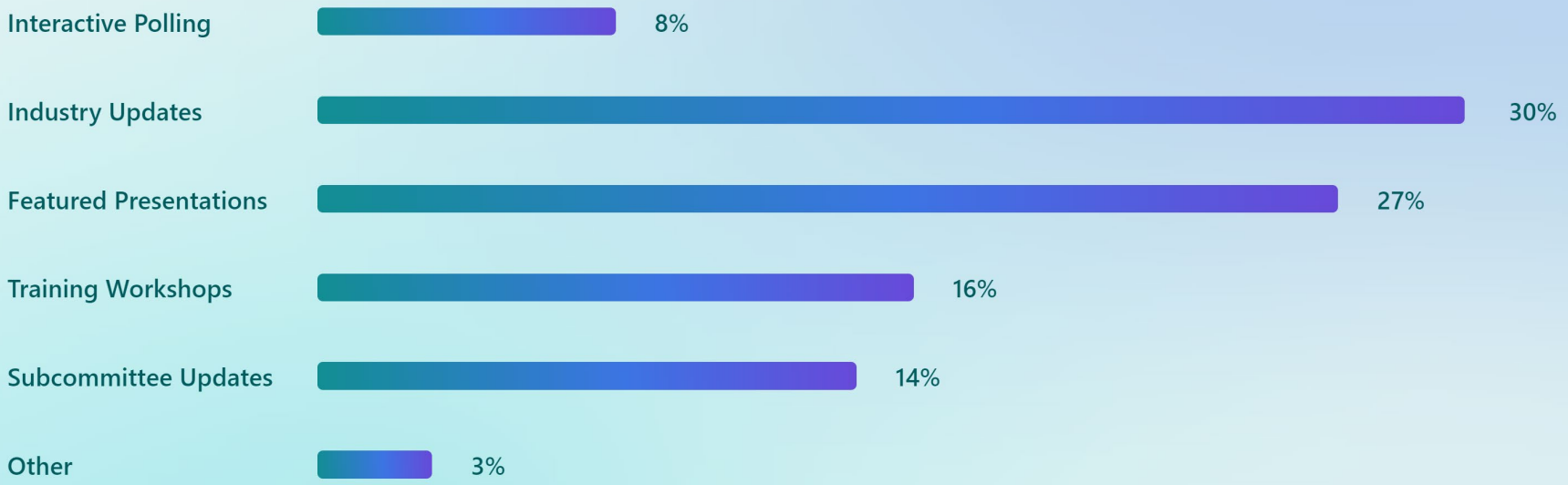
BUILDING BETTER ROADS San Diego County

INTERACTIVE POLL RECAP

40 responses submitted

Which meeting segments covered in 2023 did you find most beneficial?



1 of 5

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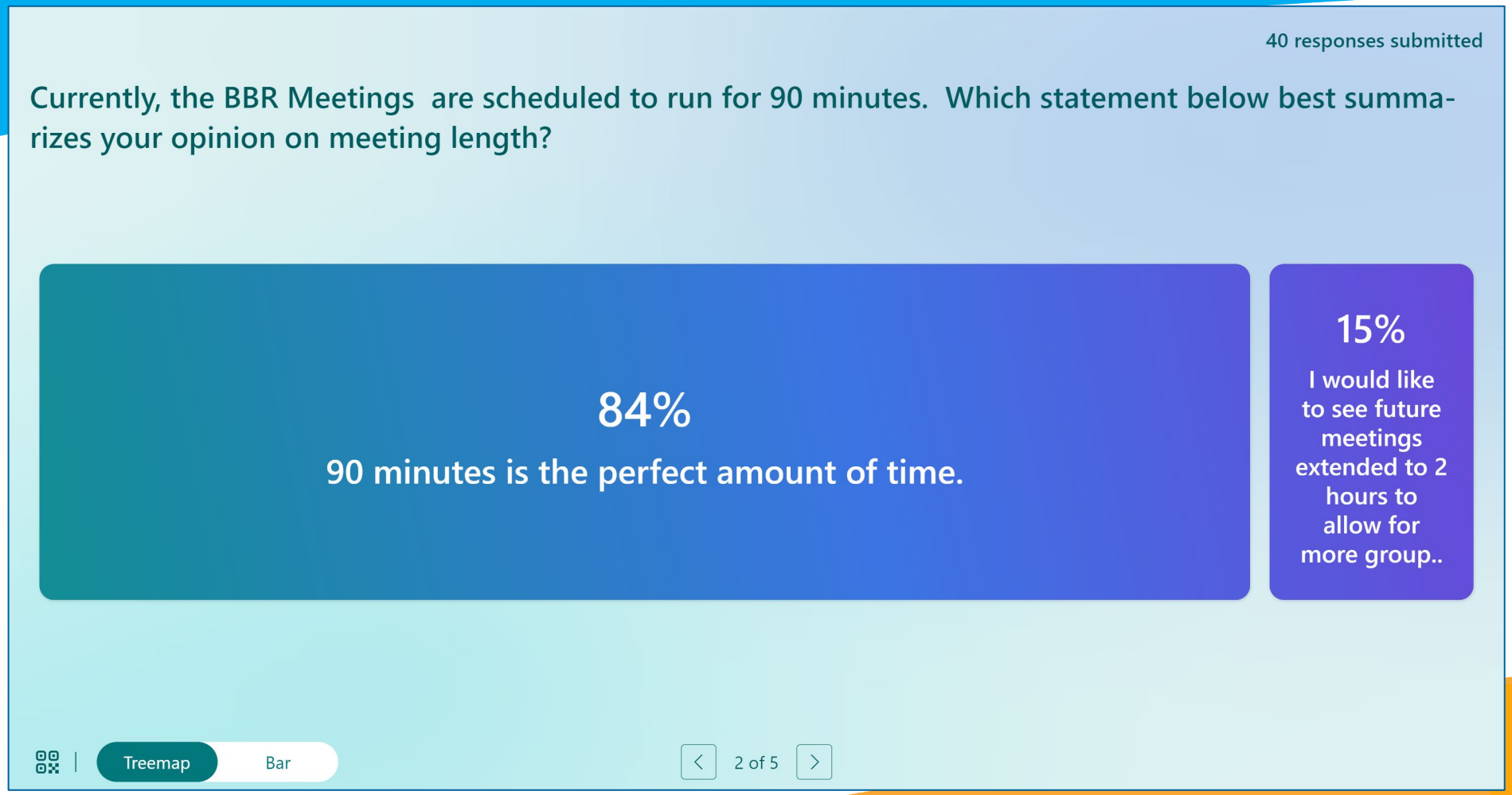
INTERACTIVE POLL RECAP



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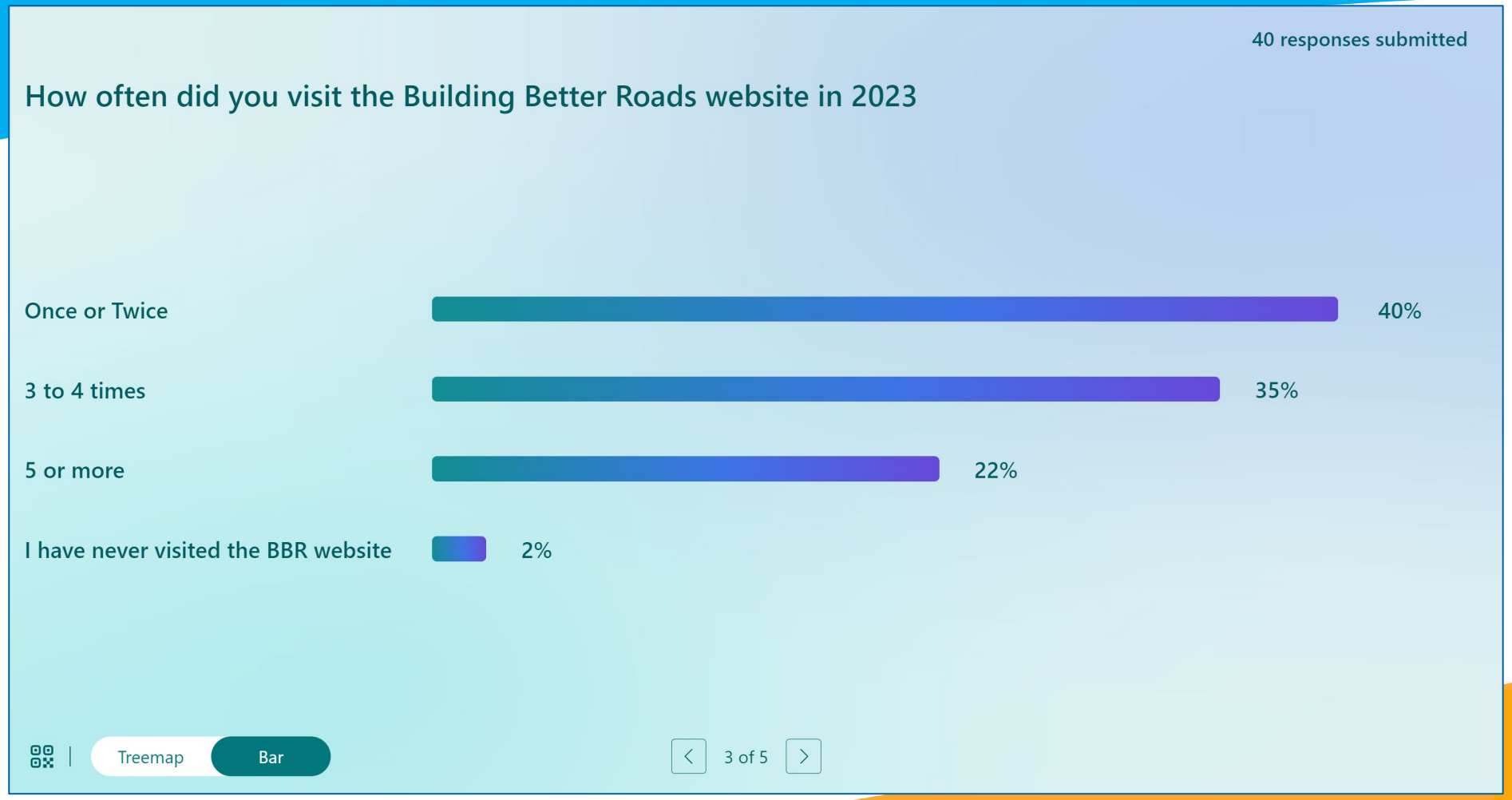
San Diego County

INTERACTIVE POLL RECAP



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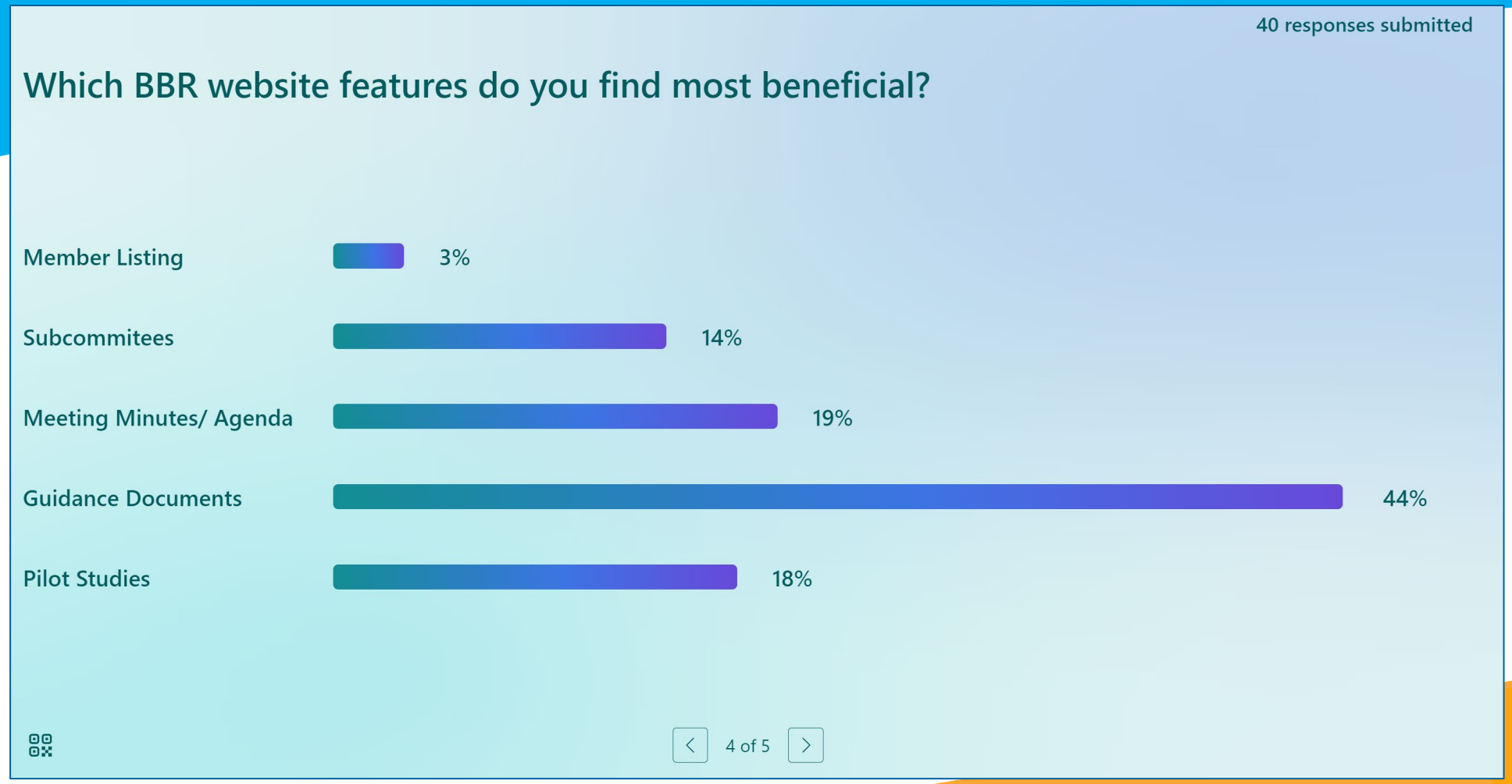
INTERACTIVE POLL RECAP

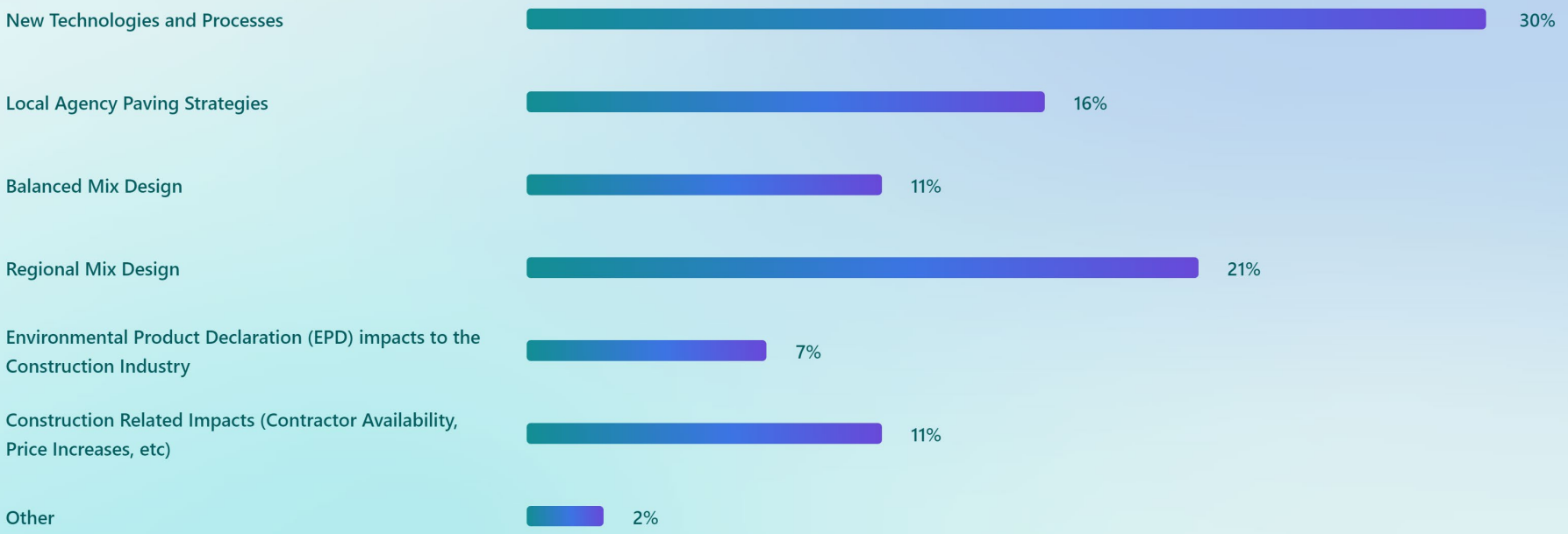


BUILDING BETTER ROADS San Diego County

INTERACTIVE POLL RECAP

40 responses submitted

What topics would you like the BBR to focus on in 2024



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BUILDING BETTER ROADS San Diego County

CALAPA UPDATE

The California Asphalt Pavement Association

Asphalt Industry Update

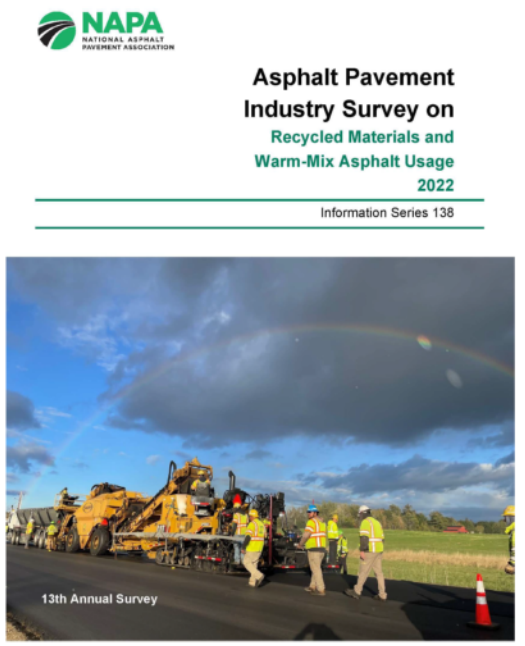
June 4, 2024
Building Better Roads Working Group Meeting

CalAPA®

San Diego County
BUILDING BETTER ROADS

NAPA RAP & WMA Annual Usage Report

- 2022 Construction Season
  - RAP Totals: 98.1 million tons
    - 26.9 million barrels of liquid asphalt binder
    - 93 million tons of aggregate
    - $4.6 billion value
  - RAP Avg Usage: 22% (CA Avg Usage: 17%)



Free Download: https://go.asphaltpavement.org/is-138

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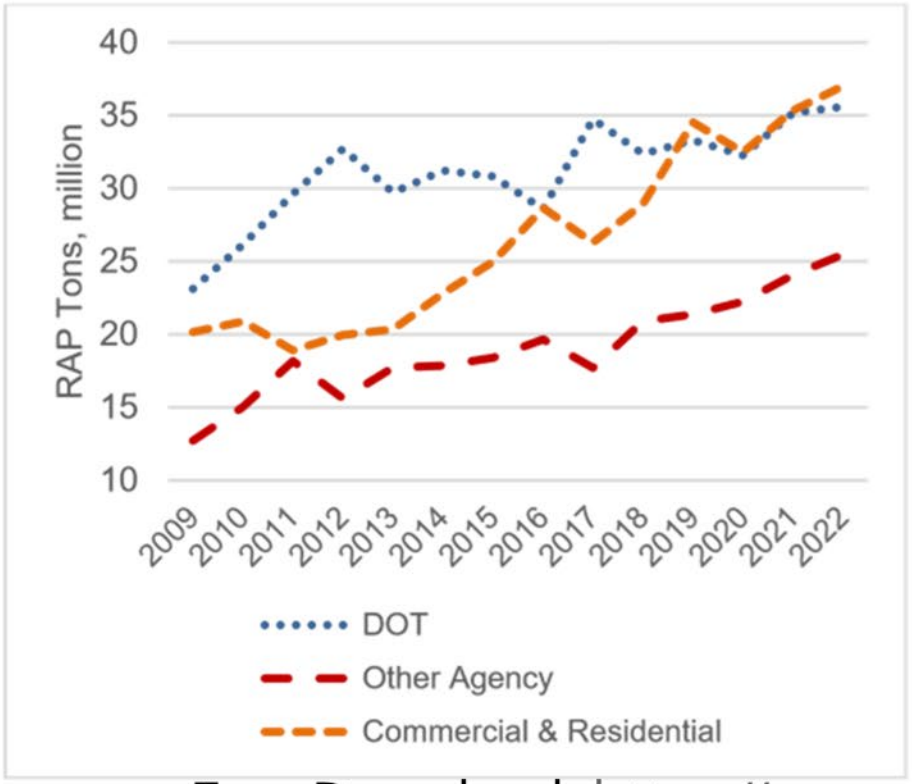
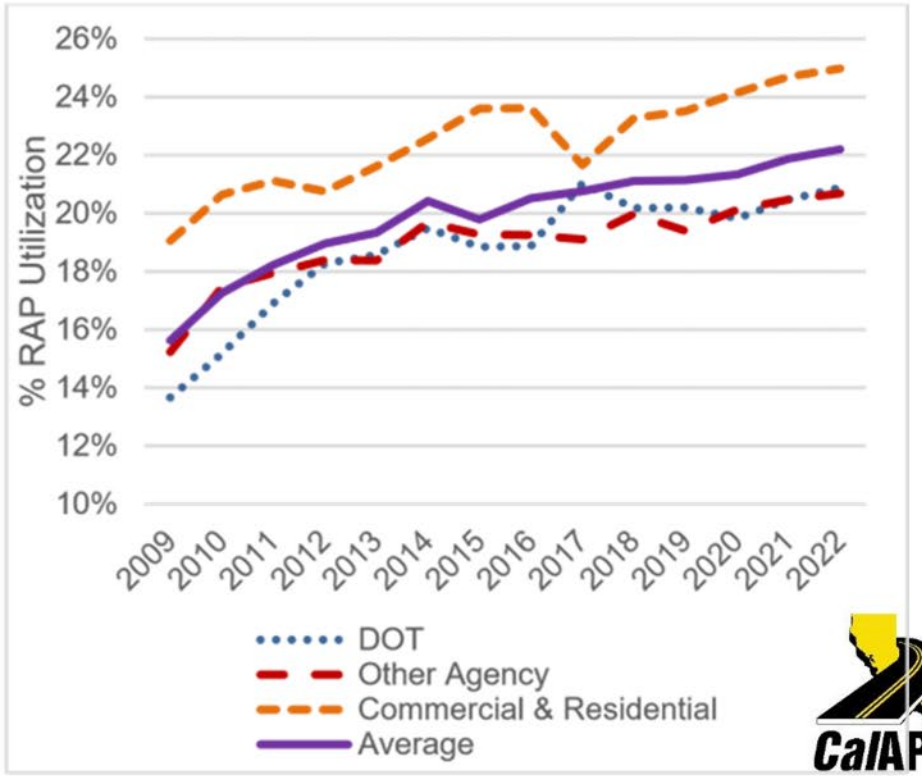
San Diego County BUILDING BETTER ROADS

How Much RAP Do We Use?



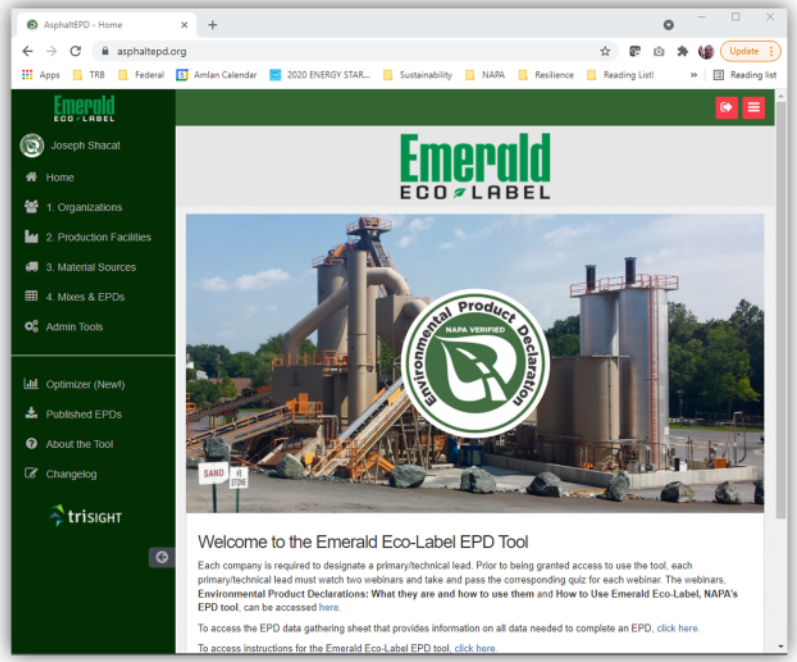


Free Download: https://go.asphaltpavement.org/is-138

Environmental Product Declarations (EPDs)

- ***Providing quantified environmental data using predetermined parameters and, where relevant, additional environmental information (ISO 14025)***

- Caltrans submission requirement by 2026.



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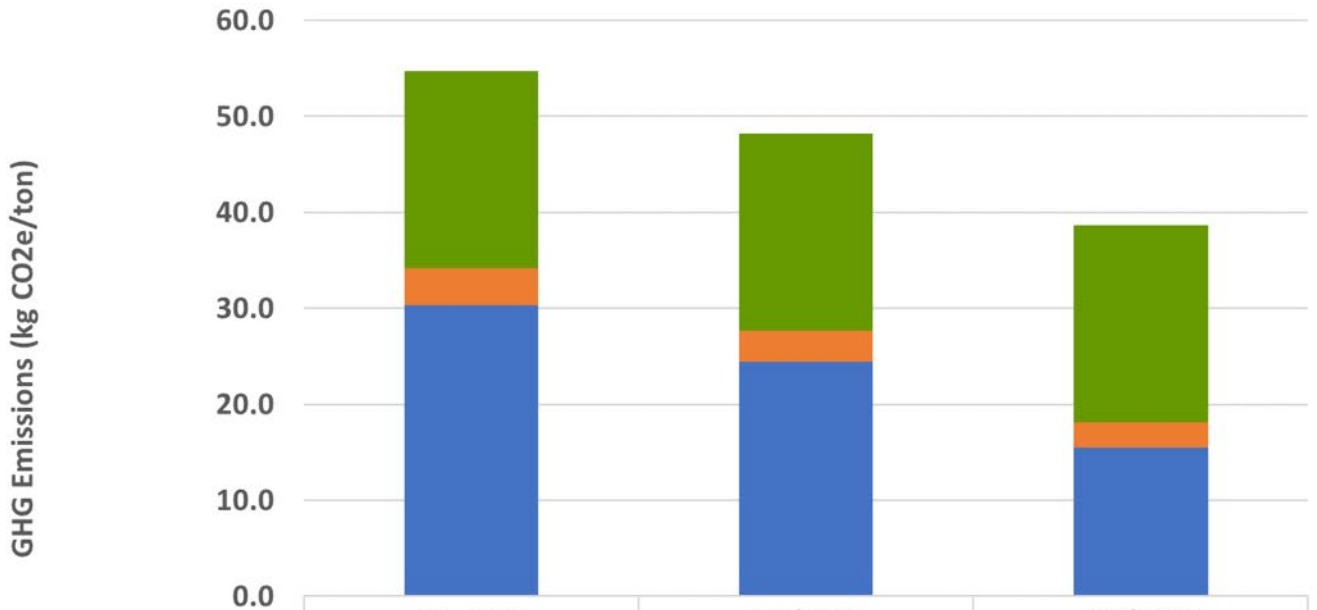
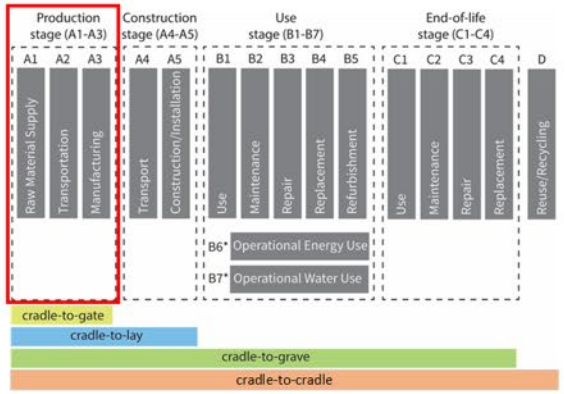
San Diego County BUILDING BETTER ROADS

What we have learned: RAP in HMA



	No RAP	20% RAP	50% RAP
Total (A1-A3)	54.7	48.2	38.6
Plant Operations (A3)	20.5	20.5	20.5
Transportation (A2)	3.8	3.3	2.6
Materials (A1)	30.3	24.4	15.5



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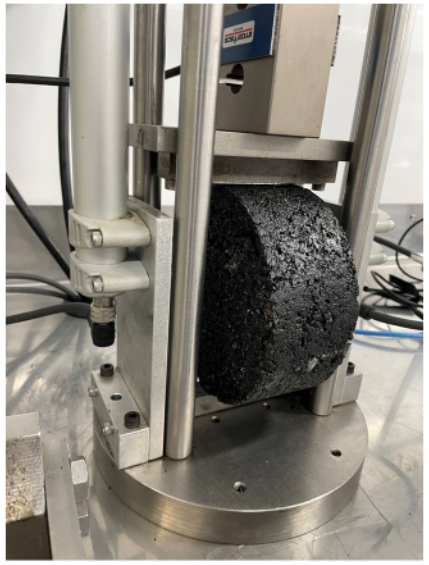
San Diego County BUILDING BETTER ROADS

Caltrans – Emerging Initiatives

- Balanced Mix Design
  - Working Group formed
  - 5-7 year workplan
  - Design mixes to meet project mix criteria for rutting and cracking potential.
  - New Test methods and requirements



- Continuing Efforts:
  - High RAP Usage in mixes
  - Acceptance Change: Post-Plant Gradation
  - Fog seals re-introduced into Caltrans specifications
  - 100% RAP in slurry seals and chip seals

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Specification Updates

- 2023 Caltrans Standards Available Online
  - https://dot.ca.gov/programs/design/july-2023-ccs-standard-plans-and-standard-specifications
- 2024 Greenbook Available to Order
  - https://greenbookspecs.org/
- City and County Pavement Improvement Center (CCPIC)
  - http://www.ucprc.ucdavis.edu/ccpic/

Greenbook Asphalt Task Force

- 1:00pm 1st Wednesday of the month
- Specification development efforts:
  - HMA mix design with gyratory compactor (Sponsor: Orange County)
  - RAP content verification in HMA
  - Fiber use in HMA
  - Emulsions specification updates

CalRecycle 2024 Tire Conference

- June 19-20, 2024
- Holiday Inn Downtown Arena – Sacramento, CA
- https://calrecycle.ca.gov/

2024 CALIFORNIA TIRE CONFERENCE
DRIVING TOWARD A CIRCULAR ECONOMY

CalRecycle

CalAPA®

San Diego County BUILDING BETTER ROADS

Building Better Roads

CalCIMA Updates

Cameron Richardson & Tony Limas

June 4th, 2024
County of San Diego Operations Center

CALCIMA
California Construction and Industrial Materials Association

BUILDING BETTER ROADS
San Diego County

Major Updates

- CalCIMA New Hire Cameron Richardson – Director of Technical Affairs
- Greenbook: AB 2953 Implementation and Agency Adoption
- Caltrans High RAP/RAS Pilot Projects & NSSP
- RAP in RHMA-G
- Caltrans Standard Specifications Process
- Section 39 Test Method Version Review
- Greenbook Committee – RAP update and Superpave
- Caltrans: Low-Carbon Transportation Materials (LCTM) Grants Program

CALCIMA
California Construction and Industrial Materials Association

San Diego County
BUILDING BETTER ROADS

CalCIMA Events

Top Golf – Happy Hours

July 18th 4-6pm

Northern California: Roseville
Southern California: Ontario

2024 Education Conference

Meritage Resort and Spa – Napa, CA

October 28th-31st

Contact: Abi Hague ahague@calcima.org

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279-400-9255

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916-712-5605

BUILDING BETTER ROADS San Diego County

CALCIMA
California Construction and Industrial Materials Association

BUILDING BETTER ROADS San Diego County

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BUILDING BETTER ROADS San Diego County

REGIONAL PAVING FORECAST CITY OF SAN DIEGO

- FY budget of $5.65 Billion
- Includes $104.6 Million for resurfacing
- 25 % increases in milage
- Includes design and planning for FY 2026 (105 Miles)
- FY 24 Project included:
  - 2, $30M Paving JOCs
  - 7 Slurry Seal projects ranging from $4.7M - $7.2M ($46M Total)
  - 4 Overlay Projects ranging from $6.4M to $12.6M ($30M Total)

BUILDING BETTER ROADS San Diego County

REGIONAL PAVING FORECAST COUNTY OF SAN DIEGO

In Construction

- FY 22-23- 71.91 Miles $30.0M
  - ACO North – 25.30 Miles, $13.6M
  - ACO South- 16.01 Miles, $9.6M
  - Pavement Seal- 30.60 Miles, $6.8M

Advertisement/ Award

- FY 23-24 (Opened 5/30/24- Award Pending)
  - Pavement Seal- 22.16 Miles, $6.2M
- FY 22-23 (Advertisement Late June 2024)
  - ACO East – 19.74 Miles, $13.2M
- Total- 41.90 Miles, $19.4M

Planned

- FY 23-24
  - AC Overlay(3 Projects) – 95.96 Miles, $55M
- FY 24-25
  - AC Overlay (3 Projects)- 84.27 Miles, $42M
  - Pavement Seal- 17.61 Miles, $6M
- Total- 197.84 Miles, $103M

COUNTY OF SAN DIEGO
PUBLIC WORKS

BUILDING BETTER ROADS
San Diego County

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BUILDING BETTER ROADS San Diego County

BBR SUBCOMMITTEES

SUSTAINABILITY

- AB 2953 Compliance
- High RAP HMA
- Waste Plastic Use in HMA

INNOVATION

- Non-Destructive Testing of HMA
- Regional Mix Designs

https://www.sandiegocounty.gov/BBR

BUILDING BETTER ROADS San Diego County

County of San Diego Building Better Roads Subcommittee: High RAP

County of San Diego Building Better Roads Subcommittee: High RAP

Introduction

1880: Simple radio waves discovered.

2019: 5G is deployed worldwide

~ 140-year progression from simple radio waves to being able to work entirely remote.

~1900's: Use of RAP is implemented in HMA mixes.

~1930's: Marshall Mix Design Method was invented

~1950's: Hveem Mix Design Method was implemented

~1980's: SuperPave Mix Design Method was invented. Implemented by FHWA in the 90's.

- Technology in our space moves relatively slow.
- Some agencies still requiring the use of virgin mixes and mix designs utilizing Marshall/Hveem.
- Technology has progressed in our space to allow to produce quality materials through alternate methods.

County of San Diego Building Better Roads Subcommittee: High RAP

What is our goal?

To produce sustainable, long lasting, high performing pavements with elevated* levels of RAP which meet current County Section 39 Standards.

What is the RAP target?

Increase RAP content utilized in HMA mixtures from 25% to 40% (by aggregate replacement)

How are we going to get there?

Mix trials, verification testing, pilot programs

**High RAP/RAM is a relative term. Various agencies use elevated RAP contents ranging from 40-100% recycled asphalt pavement.*

County of San Diego Building Better Roads Subcommittee: High RAP

The Plan

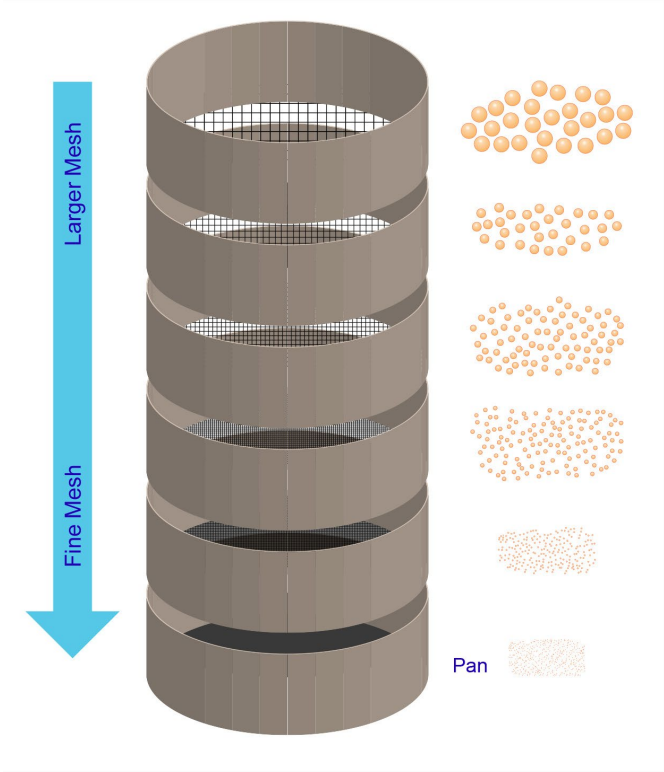
Research!

- Met with industry experts.
- What was learned:
  - This is doable! City/Agencies use elevated RAP/RAM every day! City of LA uses 50% RAP.
  - Fractionating RAP helps, but not necessary.
  - Know your RAP – gradation, average AC%, binder grade of recovered binder
  - Recycling agents or rejuvenators are a must.
  - NAPA Recycling Agents in High RAM Mixtures Guidance Document – available for all to use.

Make Mix and Test!

- Chose plant produced mix. High production temperatures are crucial for accurate test data of binder.

County of San Diego Building Better Roads Subcommittee: High RAP



The Fun Stuff! Test Data!
Gradation of Recovered Aggregate

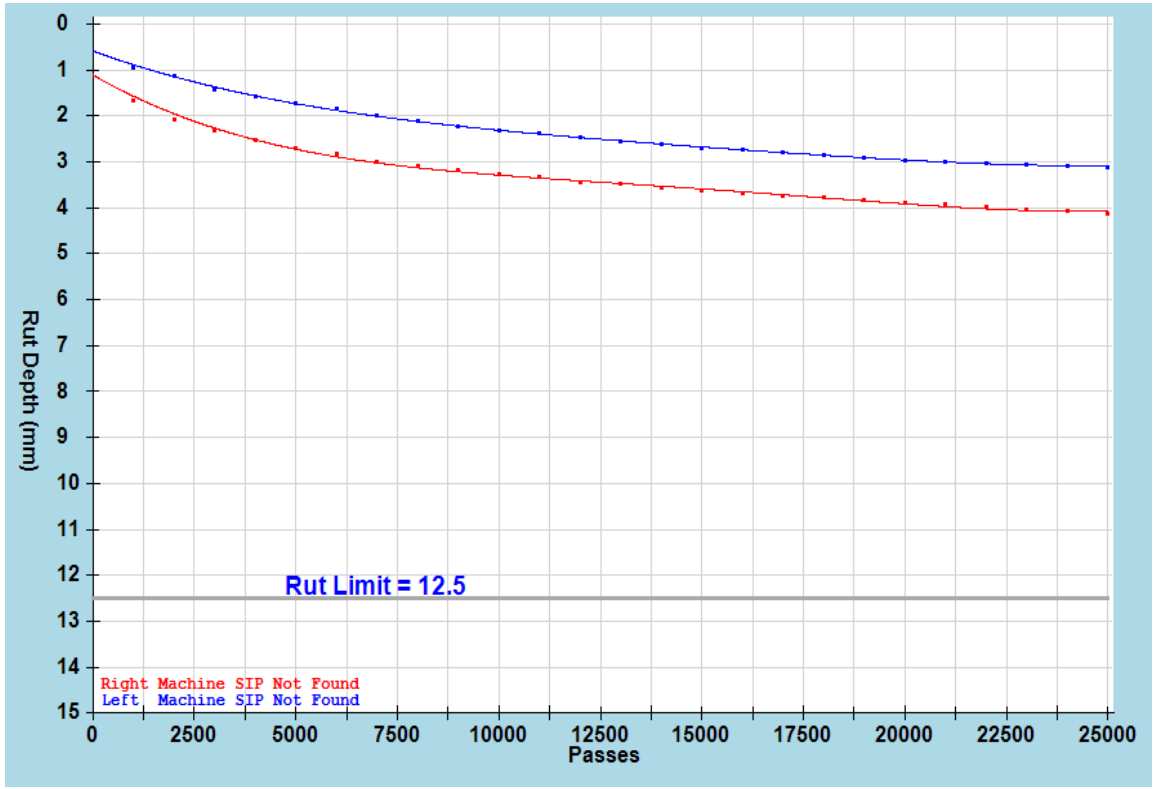
Mix ID	53417195			
Mix Type	3/4" SP - 40% RAP*			
Base Binder	64-16			
Target Binder Grade	70-10			
		Target Gradation (Cold Feed)		
Sieve	**Target Value**	**Post Plant Gradation w/ recycling agent**	**Post Plant Gradation w/o recycling agent**	**Specification Range**
1"	100	100	100	100
3/4"	95	93	91	90-100
1/2"	75	77	77	69-81
3/8"	66	70	70	--
No .4	49	46	45	44-54
No. 8	35	31	31	30-40
No. 16	24	23	22	--
No. 30	17	17	16	13-21
No. 50	12	13	12	--
No. 100	8	9	9	--
No. 200	5.7	7	7	3.7-7.7

County of San Diego
Building Better Roads
Subcommittee: High RAP

The Fun Stuff! Test Data!

Volumetrics and Asphalt Content

Asphalt Content		
Target AC% (TWM)	5.0% TWM	Specification Range - 4.7 - 5.5% TWM
RAP AC% (TWM)	5.25% TWM	
AC% mix w/ recycling agent	5.03% TWM	
AC% mix w/o recycling agent	4.83% TWM	
Air Voids and Volumetrics		
Target Air Voids	4.0%	Specification Range - 2.5 - 5.5%
AV's w/ recycling agent	3.9%	
AV's w/o recycling agent	4.2%	
VMA w/ Recycling Agent	13.5%	Specification Range – 12.5 – 15.5
VMA w/o Recycling Agent	13.3%	



County of San Diego Building Better Roads Subcommittee: High RAP

The Fun Stuff! Test Data!

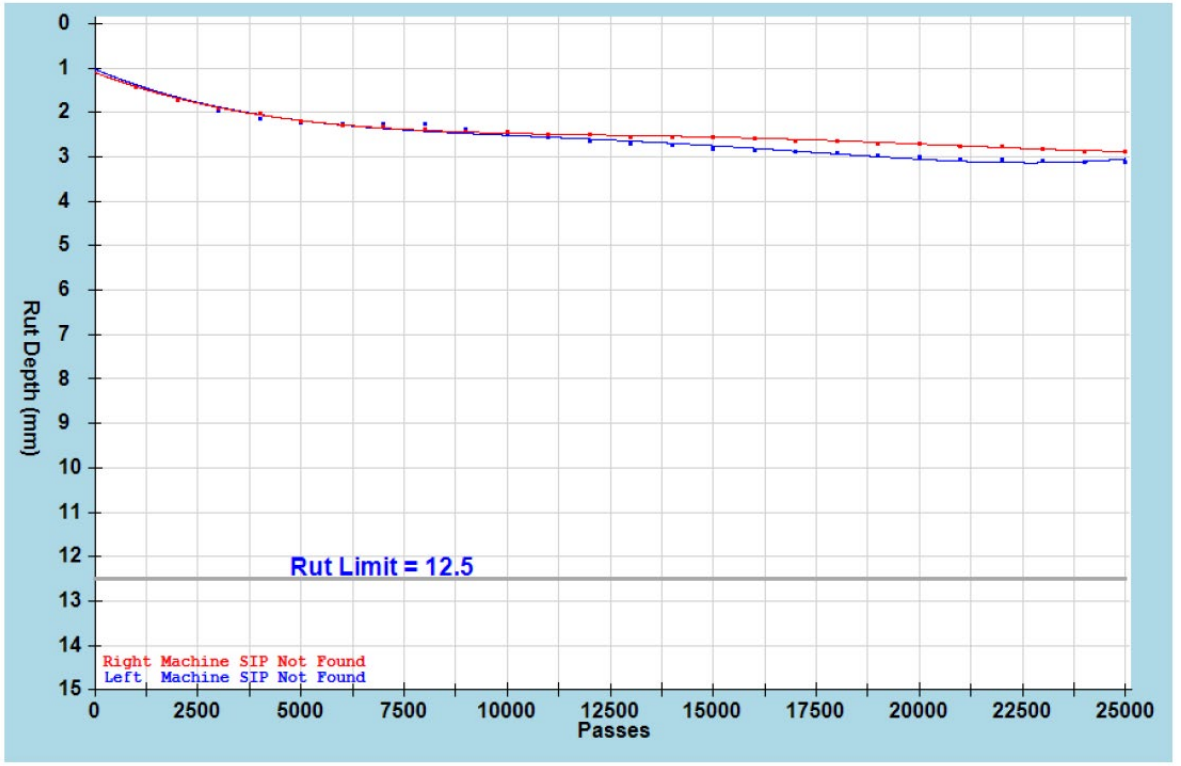
HWT– with Recycling Agent

4.14mm at 25k passes

Specification 12.5mm max @ 20k passes

*X axis: No of passes

Y axis: Rut depth in mm.



County of San Diego Building Better Roads Subcommittee: High RAP

The Fun Stuff! Test Data!

HWT– without Recycling Agent

2.82mm at 25k passes

Specification12.5mm max @ 20k passes

*X axis: No of passes

Y axis: Rut depth in mm.

County of San Diego Building Better Roads Subcommittee: High RAP

The Fun Stuff! Test Data!

Tensile Strength Ratio

With Recycling Agent	Without Recycling Agent	Specification
Dry Strength – 202 psi	Dry Strength – 229 psi	Dry Strength – 100 – 300
Wet Strength 138 psi	Wet Strength – 152 psi	Wet Strength – 70 Min

County of San Diego Building Better Roads Subcommittee: High RAP

Understanding Testing Parameters

- Binder grade testing is important.
- Evaluation criteria utilized amongst various DOT's: Delta Tc (ΔT_c).

Definition

Delta Tc is a thermal cracking test (TC). It simulates thermal stress. The delta T –c (ΔT_c) value is used to assess the performance and susceptibility of asphalt binders to thermal cracking. Binder is tested in a Pressure Aged Vessel (PAV) from 20-40 hours. Simulating "some time" of aging on the road.

Defined as the difference between the temperature at which the asphalt binder exhibits a certain stiffness (S value, typically measured in Megapascal MPa) and the temperature at which it reaches a certain relaxation time.

Lower Negative ΔT_c

Indicates larger difference between the two temperatures, suggesting that the binder has a greater discrepancy between stiffness and relaxation properties and is typically associated with poorer performance in resisting thermal cracking.

Higher Negative ΔT_c

Indicates a smaller difference between to two temperatures, suggesting that the binder's stiffness and relaxation properties are more balanced and is typically associated with better performance and resisting thermal cracking. Being closer to zero (0) suggest the binder is more capable of maintaining flexibility and resisting cracking at low temperatures.

County of San Diego Building Better Roads Subcommittee: High RAP

Agency	ΔT_c Requirement, °C	PAV Aging Duration, hrs.	Status
Florida DOT	≥ -5.0	20	Current
Utah DOT	≥ -2.0	20	Current[2]
PANYNJ	≥ -5.0	40	Current
Vermont DOT	≥ -5.0	40	Current
Maryland DOT	≥ -5.0	40	Current
Kansas DOT	≥ -5.0	40	Current
Ontario MTO	≥ -5.0	20	Current
Texas DOT	≥ -6.0[4]	20	Current[4]
Oklahoma DOT	≥ -6.0	20	2020[3]
Delaware DOT	≥ -5.0	40	2020[3]

[1] Consult Asphalt Institute web site for current asphalt binder specification database (www.asphaltinstitute.org)
[2] Only applies to binders with ≥ 92°C temperature spread; BBR creep stiffness ≥ 150 MPa
[3] Applies to project tendered for bid beginning 1/1/2020
[4] Only applies to Balanced Mix Design projects. For comparison, TxDOT requirement is shown using ΔT_c computed by $\Delta T_c = T_{c,S} - T_{c,m}$.; actual requirement is $\Delta T_c \leq 6$°C using the equation $\Delta T_c = T_{c,m} - T_{c,S}$. (41)

County of San Diego Building Better Roads Subcommittee: High RAP

The Fun Stuff. Test Data!

ΔTc

Mix Type	3/4" SP - 40% RAP (by total aggregate replacement)	
Base Binder	64-16	
Target Binder Grade	70-10	
ΔTc Testing	**Source: Recoverd Binder - RAP**	**Specification**
PG Grade	82-10	N/A
True Grade	86.5-14.9	N/A
Stiffness, Mpa @ -6°C	340	300 Max
Critical Temperature, °C	-4.7	N/A
Bending Beam Rheometer	0.262	.300 Min
M-Value @ -6°C	-1.6	N/A
ΔTc	**-3.1**	N/A
ΔTc Testing	**Source: Recoverd Binder - Mix w/o recycling agent**	**Specification**
PG Grade	76-16	N/A
True Grade	78.8-18.3	N/A
Stiffness, Mpa @ -6°C	228	300 Max
Critical Temperature	-8.9	N/A
Bending Beam Rheometer M-Value @ -6°C/@-12°C	0.284	.300 Min
Critical Temperature, °C	-4.3	N/A
ΔTc	**-4.6**	N/A
ΔTc Testing	**Source: Recoverd Binder - Mix w/ recycling agent**	**Specification**
PG Grade	70-16	N/A
True Grade	71.2-21.1	N/A
Stiffness, Mpa @ -6°C	162	300 Max
Critical Temperature	-11.8	N/A
Bending Beam Rheometer M-Value @ -6°C	0.316	.300 Min
Critical Temperature, °C	-8.3	N/A
ΔTc	**-3.5**	N/A

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BUILDING BETTER ROADS San Diego County

- Thank You!

San Diego County

BUILDING

BETTER ROADS

MEETING ADJOURNED