MODOT Field Office UPDATE

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Columbia, MO
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Roadmap

1) Seal Coat Changes
2) UBAWS Changes
3) Bit. Base & Bit. Pavement Changes
4) Asphalt Mix Placed - 2014
5) Use of Recycled Materials - 2014

Seal Coat Changes

Seal Coat Changes

Aggregate - Percent Passing					
Grade	**A1**	**A2**	**B1**	**B2**	**C**
1/2"	100	100	100	100	100
3/8"	97 – 100	100	95 – 100	100	95 – 100
1/4"	---	97 – 100	---	95 – 100	---
No. 4	0 – **25**	---	0 – **30**	---	0 – 35
No. 8	---	0 – 30	---	0 – 30	---
No. 200	0 – 1.0	0 – 1.5	0 – **2.0**	0 – 2.5	0 – **2.0**

Seal Coat Changes

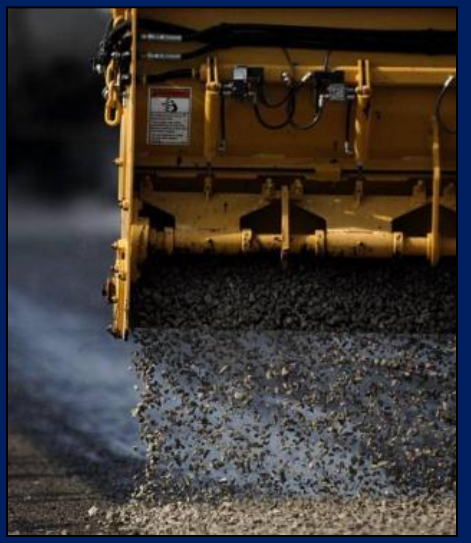
- Central Office approval of designs
  - Submitted 2 weeks prior to use
- Binder application rates specified

Grade	A1	A2	B1	B2	C
Target Binder Application Rate, gal/sy[a]	0.38	0.28	0.38	0.28	0.38

[a]Corrections to the rate listed may be included in the plans

Seal Coat Changes

- Calibrate equipment prior to use
  - Aggregate spreader
  - Distributor
- Thoroughly cleaned or swept
  - Remove all dirt, packed soil, or any other foreign material



Seal Coat Changes

- Payment
- Aggregate paid by SY
- Asphalt binder paid per gallon

Line No.	Item Description	Approx. Quantity and Units	Unit Price Dollars	Unit Price Cts	Bid Amount Dollars	Bid Amount Ct
Section 0001	Roadway - J5S3009B					
	Alt Group					
0010	4091048 EMULSIFIED ASPHALT, SEAL COAT	221,940.000 GAL				
0020	4094001 SEAL COAT AGGREGATE, GRADE A1	584,062.000 SQYD				

UBAWS Changes

Experiencing Performance Issues

UBAWS Changes

- Increase minimum asphalt content

Asphalt Content, %			
	Type A	Type B	Type C
Original	5.0 – 5.8	4.8 – 5.6	4.6 – 5.6
NEW	**5.3** - 5.8	**5.1** - 5.6	**4.9** - 5.6

UBAWS Changes

- Increased Film Thickness
  - From 9.0 to 10.0 microns

UBAWS Changes

- Changed asphalt binder requirements
- Require PG76-22
- If MCSR Grading used the Elastic Recovery requirements shall not be waived

UBAWS Changes

- **Changed Type B Gradation**

Sieves	Original % Passing	NEW % Passing
3/4 in.		100
1/2 in.	100	97 – 100
3/8 in.	75 – 100	75 – 100
No. 4	25 – 38	25 – 41
No. 8	19 – 27	17 – 27
No. 16	15 – 23	23 max.
No. 30	10 – 18	18 max.
No. 50	8 –13	13 max.
No. 100	10 max.	10 max.
No. 200	4.0 – 6.0	4.0 – 6.0

UBAWS Changes

- **Changed Type C Gradation**

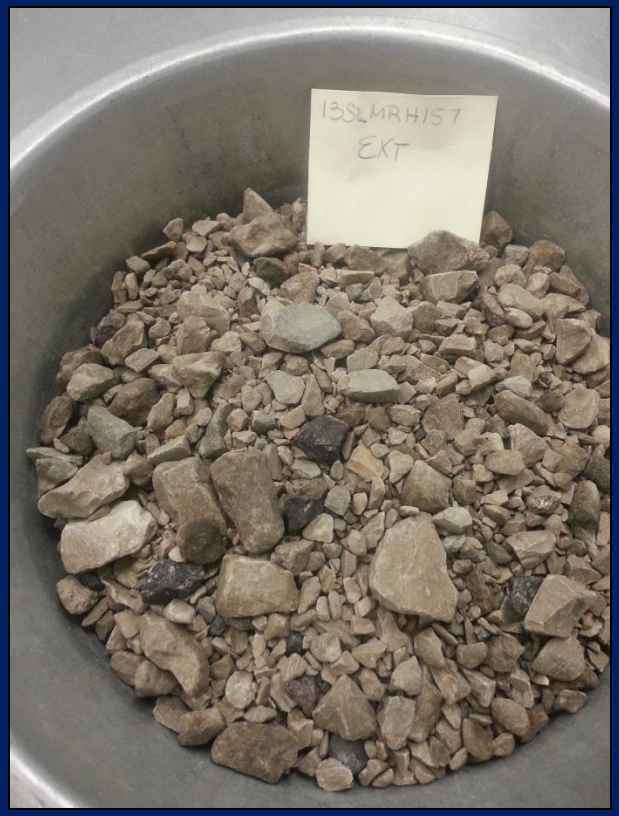
Sieves	Original % Passing	NEW % Passing
3/4 in.	100	100
1/2 in.	75 – 100	**85** – 100
3/8 in.	50 - 80	50 – 80
No. 4	25 – 38	25 – **41**
No. 8	19 – 27	**17** – 27
No. 16	**15** – 23	23 max.
No. 30	**10** – 18	18 max.
No. 50	**8** – 13	13 max.
No. 100	6 – 10	10 max.
No. 200	4.0 – 6.0	4.0 – 6.0

Bit. Base & Bit. Pavement Changes

Bit. Base & Bit. Pavement Changes

- RAS Gsb = 2.600
  - Same as Surface Leveling
  - Use more realistic value
- Apply 0.98 correction to RAP Gse to determine Gsb
  - Use more realistic value

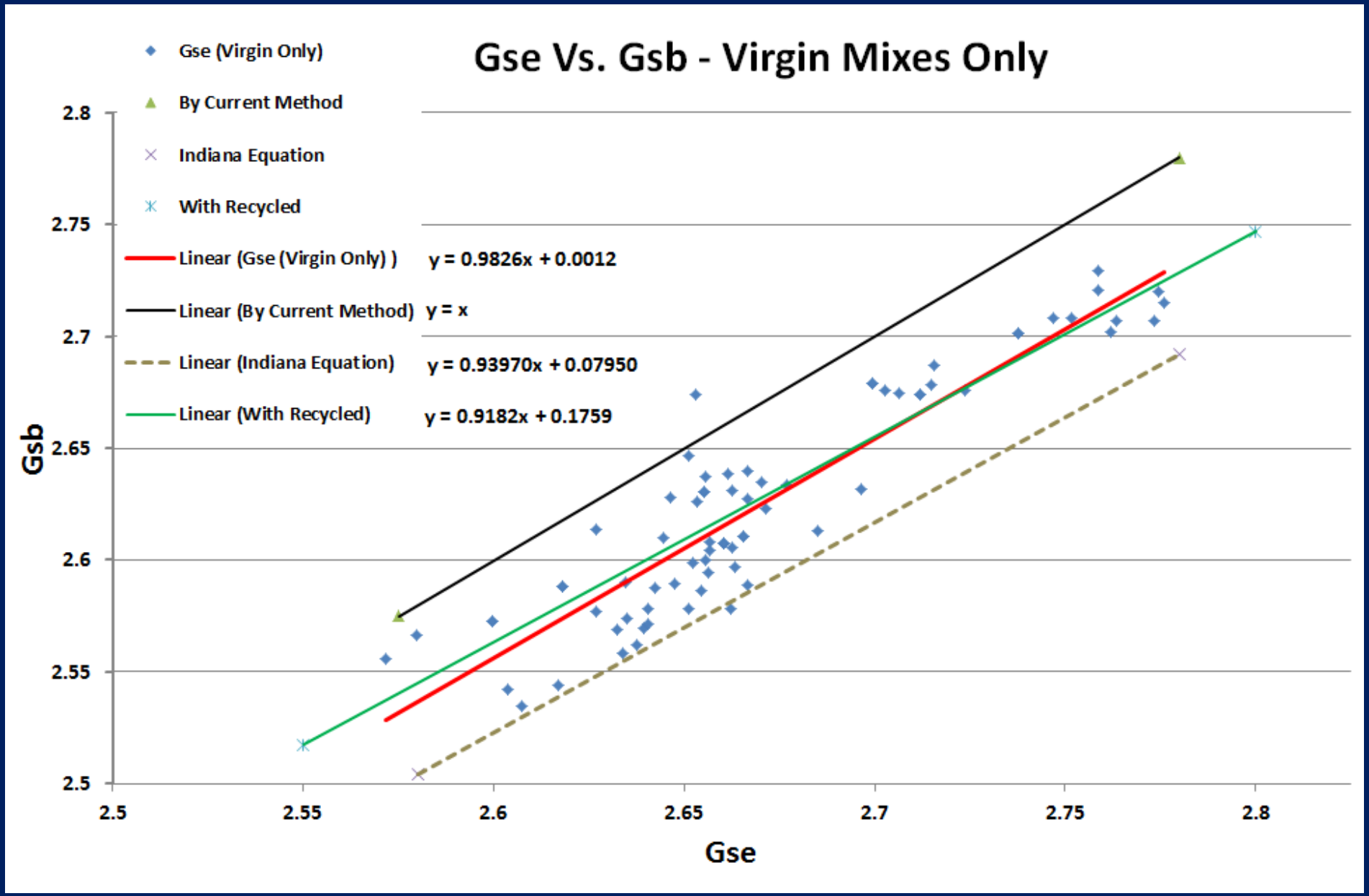
Options



- Use Extracted Aggregate
- Assume AC Absorption

$$Gsb\ (RAP) = \frac{Gse(RAP)}{\frac{Pba \times Gse(RAP)}{100 \times Gb} + 1}$$

- Find Original Mix Design
- Determine Correction for the RAP Gse


Gse Vs. Gsb - Virgin Mixes Only
Gse (Virgin Only)
By Current Method
Indiana Equation
With Recycled
Linear (Gse (Virgin Only))
y = 0.9826x + 0.0012
Linear (By Current Method)
y = x
Linear (Indiana Equation)
y = 0.93970x + 0.07950
Linear (With Recycled)
y = 0.9182x + 0.1759
Gsb
Gse
2.5
2.55
2.6
2.65
2.7
2.75
2.8

Appropriate PG Grade

- Increase RAP & RAS Usage
  - Reducing Low Temp. grading

New Asphalt Binder Table

Binder Options	Percent Effective Virgin Binder Replacement		
	RAP	RAS	RAP and RAS Combination
Contract Grade Virgin Binder Shall be Used	0 – 20	0 – 10	RAP + (2*RAS) ≤ 20
Virgin Binder Shall be Softened One Grade[a]	21 – 40	11 – 20	20 < RAP + (2*RAS) ≤ 40
Blend Chart[b]	0 – 100	N/A	N/A
Extraction and Grading of Binder from Final Mixture[c]	0 - 100		

Bit. Base & Bit. Pavement Changes

- Increase VMA by 0.5% when over 40% binder replacement
- Added Dust to Binder Ratio for BP-1 & BP-2
- Specifying 0.8 to 1.6

Asphalt Mix Placed From 2010 to 2014

- Hot Mix Asphalt
- UBAWS

Total Hot Mix Asphalt From 2010 to 2014

- Resurfacing and full depth quantities (tons)

Year	Surface Leveling	Low Type Mixes	Superpave Mixes	Total
2010	678,050	1,398,821	1,556,915	3,633,786
2011	1,469,996	1,434,395	1,130,933	4,035,324
2012	942,996	1,341,570	1,401,375	3,685,941
2013	542,814	1,365,244	1,216,293	3,124,351
2014	444,475	1,126,051	1,493,384	3,063,910

- *Low Type Mixes = BP-1, BP-2, BP-3 & Bit. Base*
- *Superpave = SP048, SP095, SP125, SP190 & SP250*

Total UBAWS From 2010 to 2014

- Resurfacing quantities (square yards)

Year	Type A	Type B	Type C	Total
2010	272,578	460,075	3,216,186	3,948,839
2011	490,429	188,611	4,245,611	4,924,651
2012	---	336,672	2,569,657	2,906,329
2013	32,259	9,578	1,787,135	1,828,972
2014	127,785	163,291	1,653,290	1,944,366

Future Resurfacing Quantities

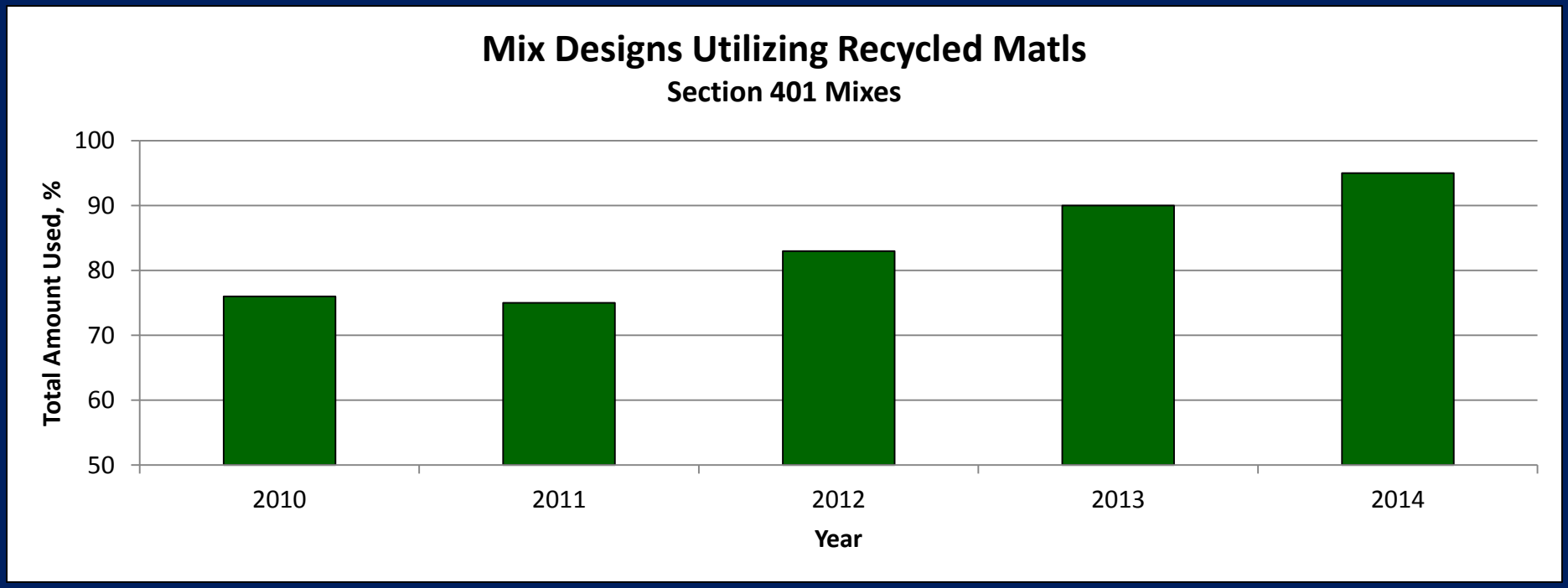
District	FY 2015		FY 2016	
	Miles	Tons	Miles	Tons
NW	216.6	315,403	80.6	76,584
NE	92.9	193,430	81.9	196,900
KC	78.0	230,514	80.9	300,350
CD	253.1	294,294	251.6	541,597
SL	125.4	450,489	44.6	203,674
SW	414.1	653,560	229.4	549,611
SE	227.6	439,293	71.2	297,230
Total	1,407.7	2,577,008	840.2	2,165,947

- *Fiscal years 2017, 2018 & 2019 are not fully programmed*

MoDOT's use of Recycled Materials

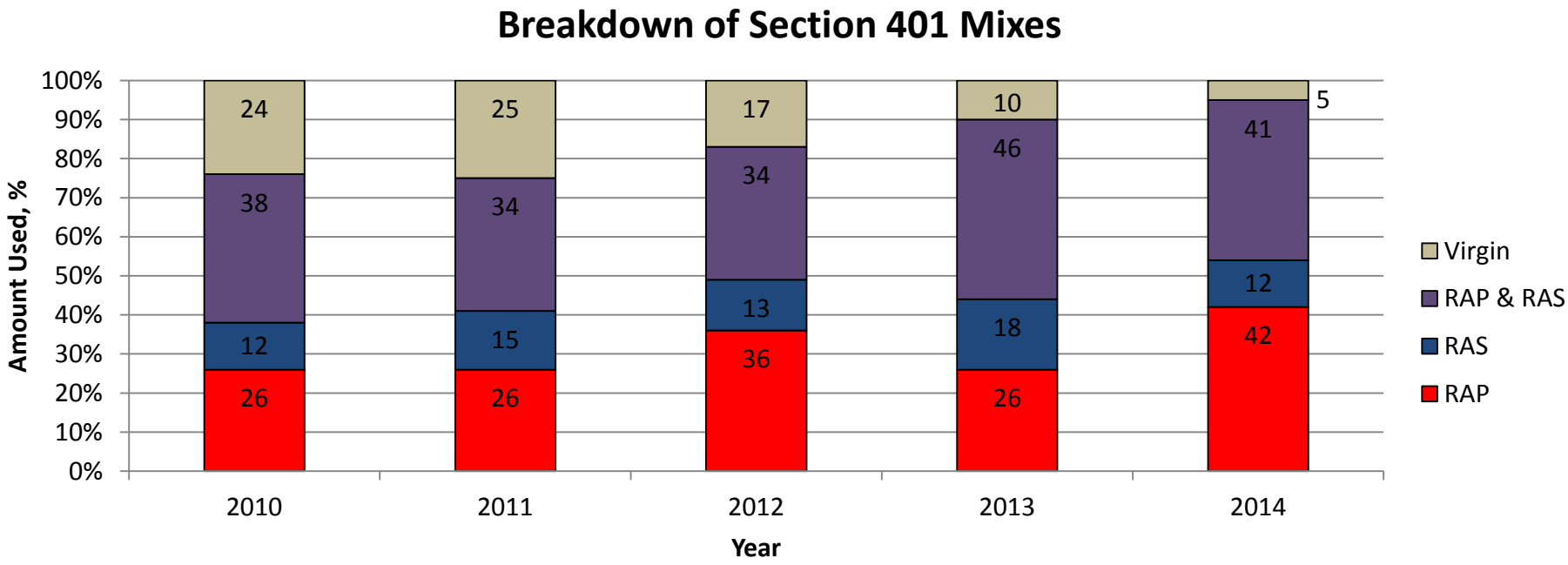
Mixes Using Recycled Materials

Year	BP-3	BP-2	BP-1	Bit. Base	Total
2010	83%	81%	77%	71%	76%
2011	100%	74%	79%	66%	75%
2012	100%	85%	82%	81%	83%
2013	100%	90%	92%	85%	90%
2014	89%	95%	92%	100%	95%



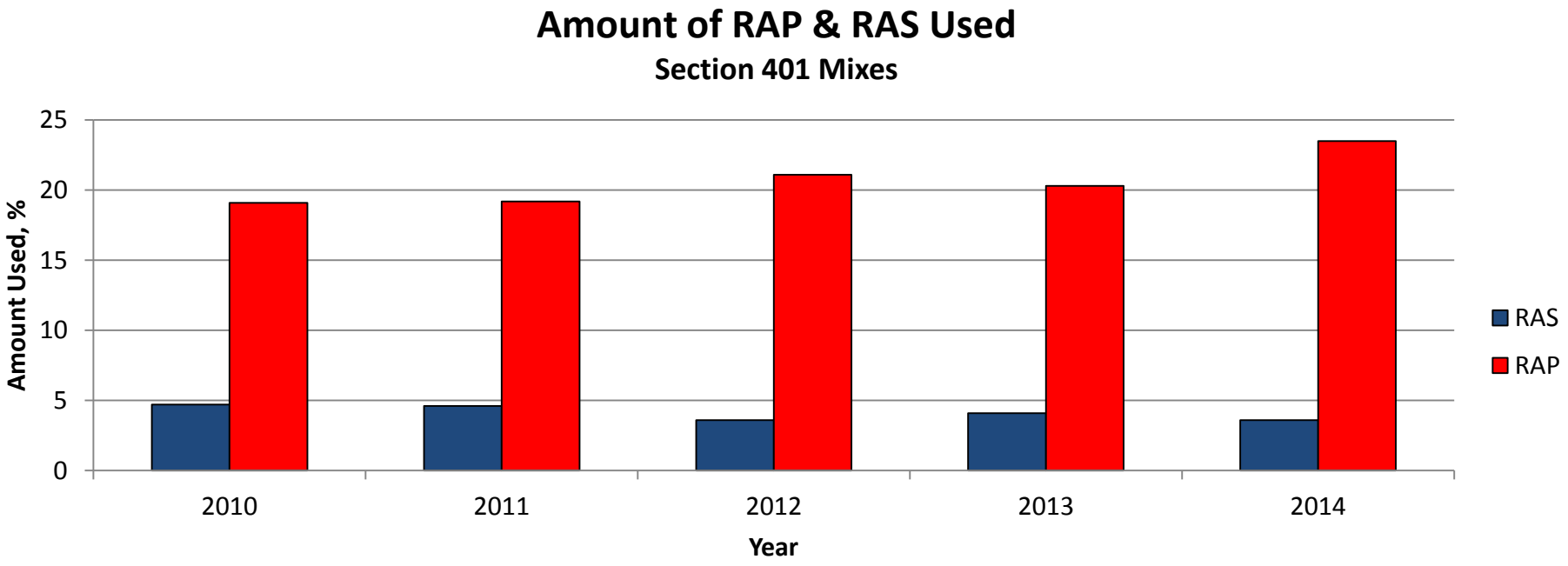
Breakdown – Section 401

Year	RAP	RAS	RAP & RAS	Virgin
2010	26%	12%	38%	24%
2011	26%	15%	34%	25%
2012	36%	13%	34%	17%
2013	26%	18%	46%	10%
2014	42%	12%	41%	5%



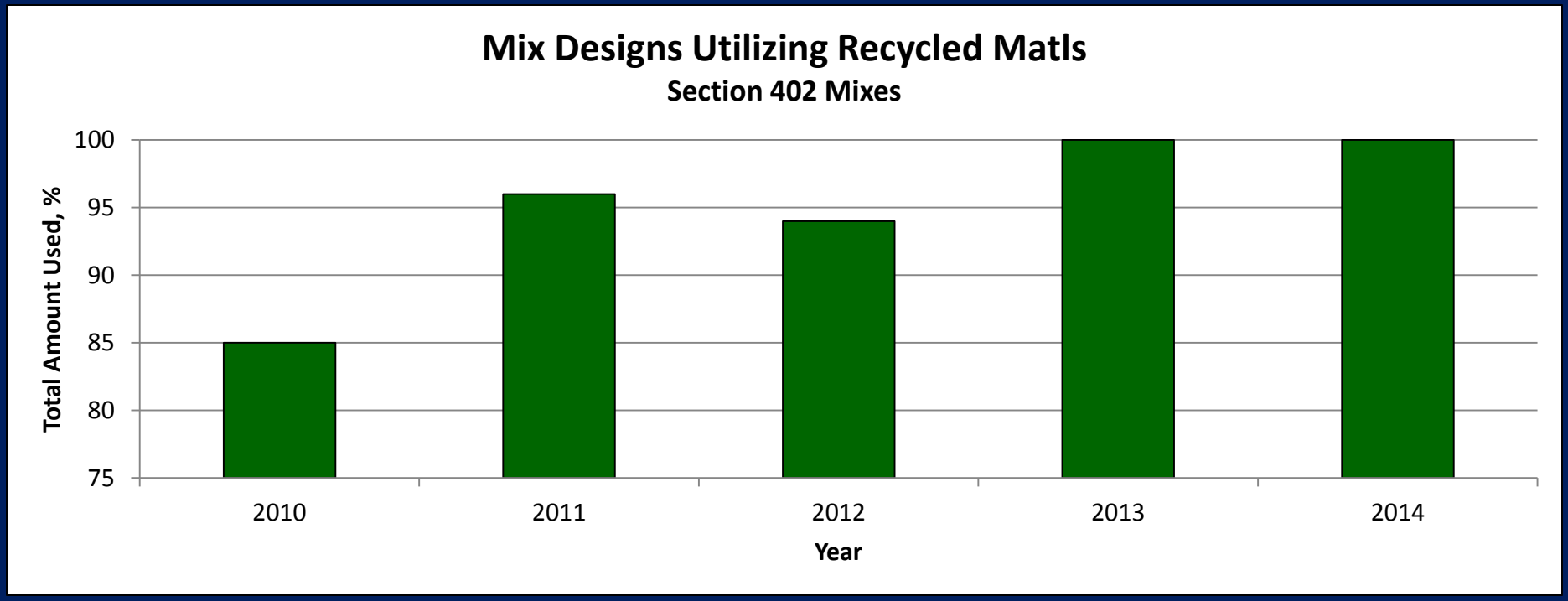
Amount of RAP & RAS – Section 401

Year	RAS	RAP
2010	4.7%	19.1%
2011	4.6%	19.2%
2012	3.6%	21.1%
2013	4.1%	20.3%
2014	3.6%	23.5%



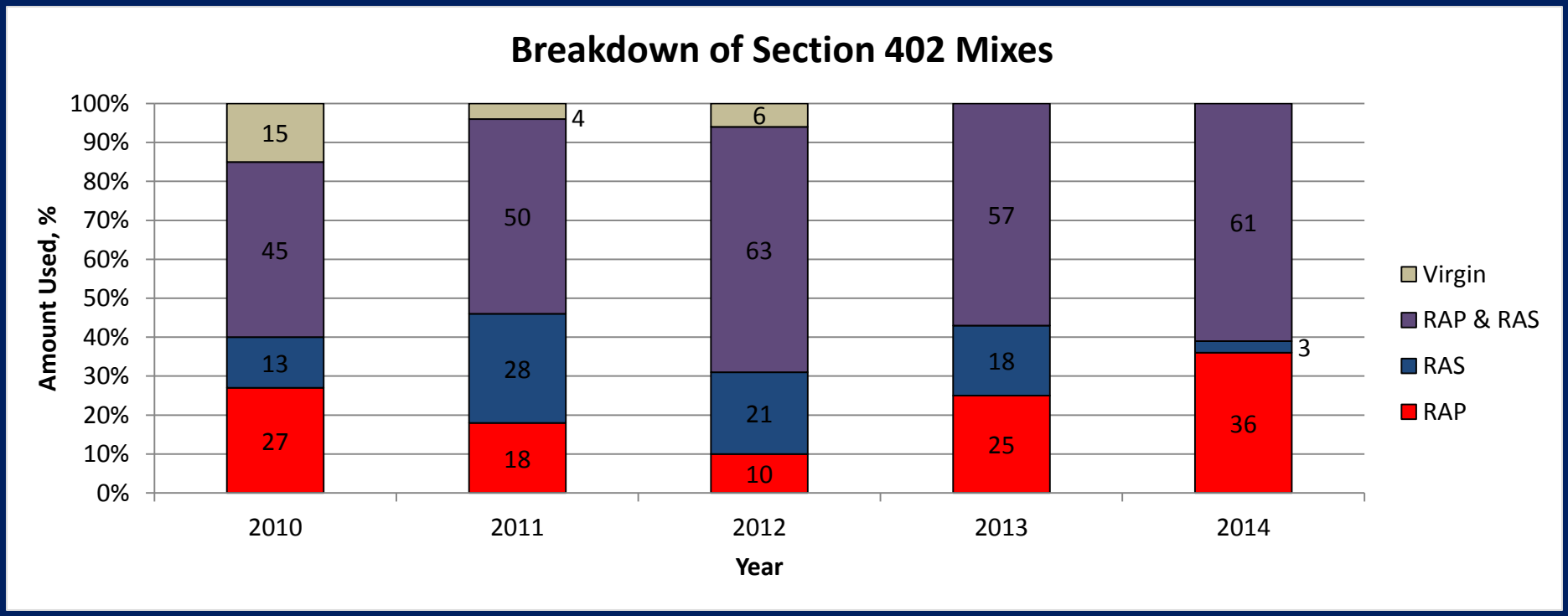
Mixes Using Recycled Materials

Year	SL
2010	85%
2011	96%
2012	94%
2013	100%
2014	100%



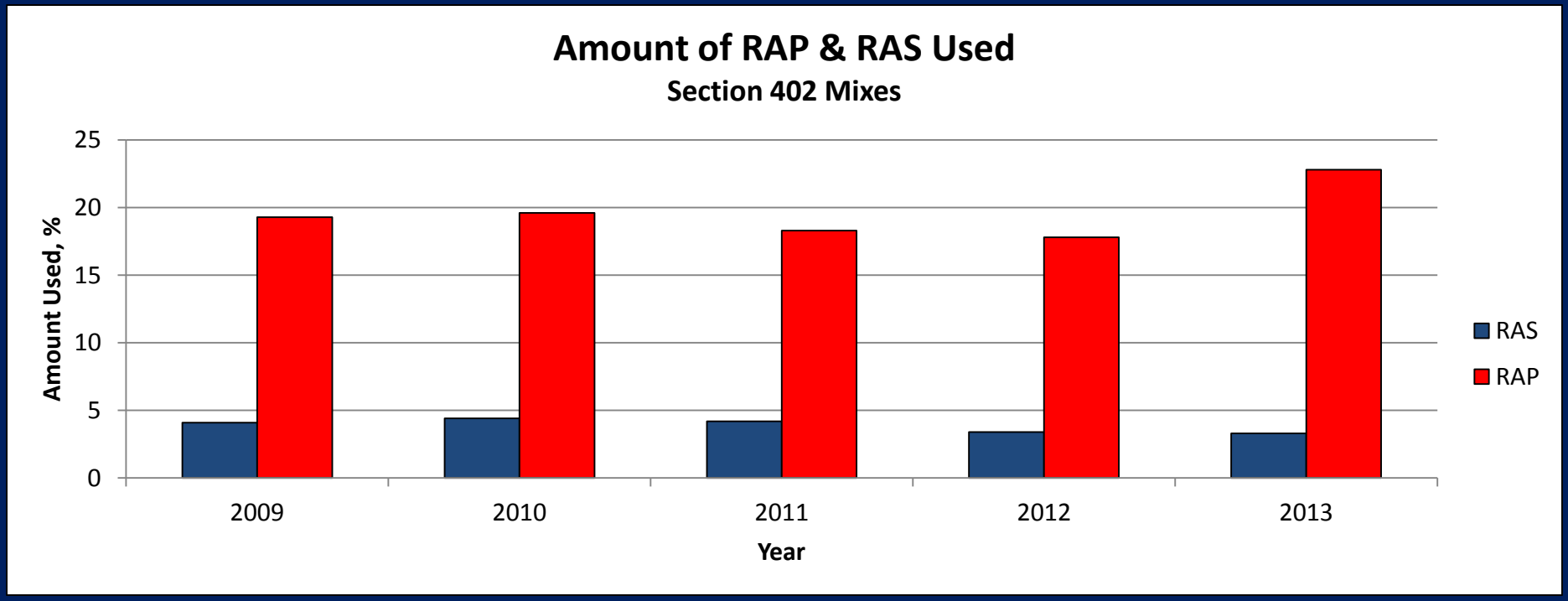
Breakdown – Section 402

Year	RAP	RAS	RAP & RAS	Virgin
2010	27%	13%	45%	15%
2011	18%	28%	50%	4%
2012	10%	21%	63%	6%
2013	25%	18%	57%	0%
2014	36%	3%	61%	0%



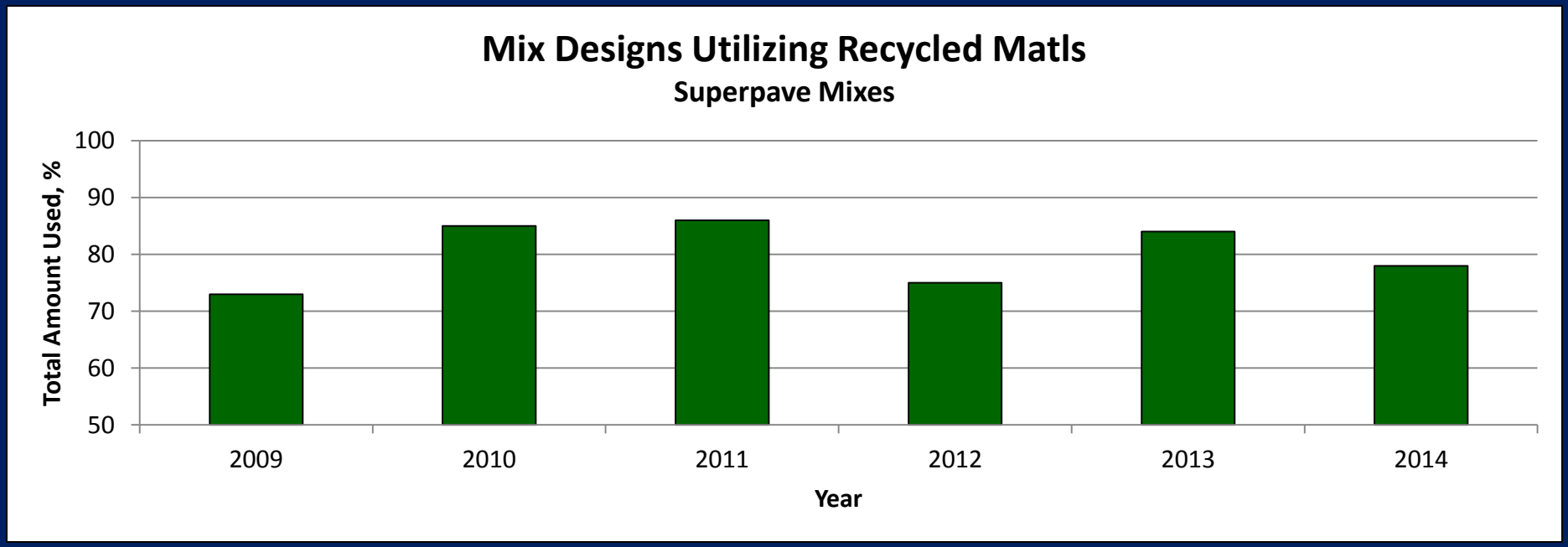
Amount of RAP & RAS – Section 402

Year	RAS	RAP
2010	4.1%	19.3%
2011	4.4%	19.6%
2012	4.2%	18.3%
2013	3.4%	17.8%
2014	3.3%	22.8%



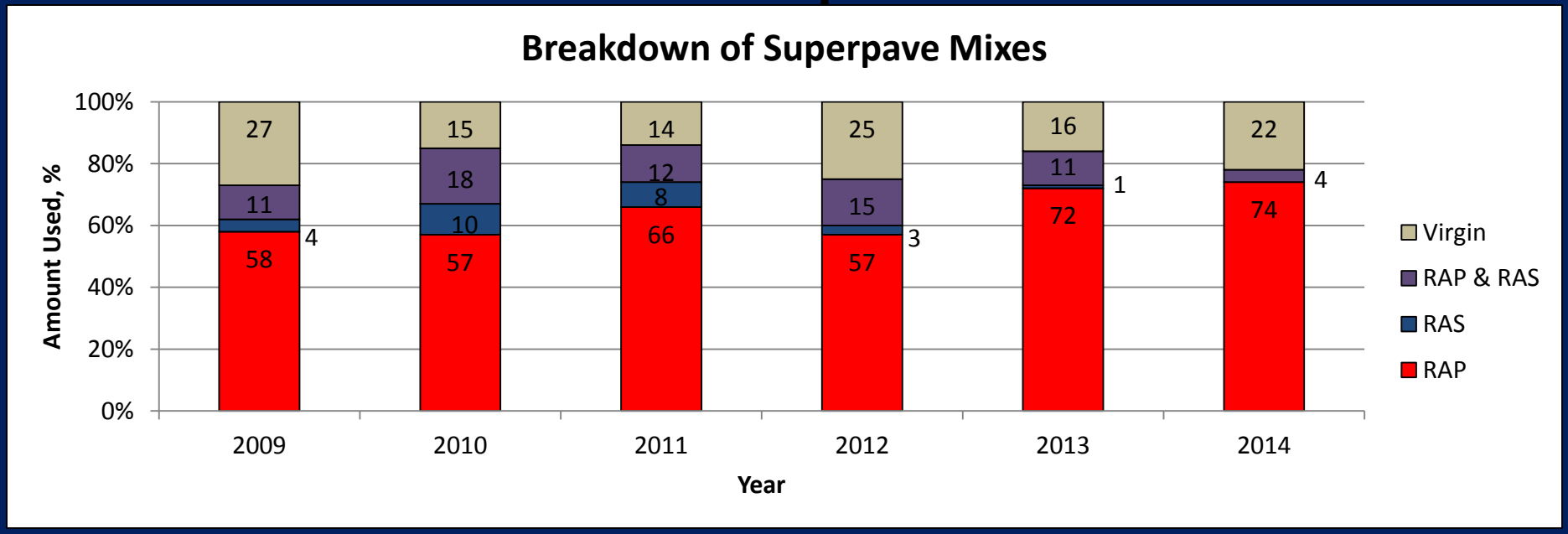
Mixes Using Recycled Materials

Year	SP048	SP095	SP125	SP190	SP250	Total
2009	---	56%	78%	70%	73%	73%
2010	---	82%	78%	93%	85%	85%
2011	100%	73%	86%	93%	86%	86%
2012	75%	64%	69%	92%	75%	75%
2013	100%	68%	84%	93%	84%	84%
2014	100%	54%	82%	91%	100%	78%



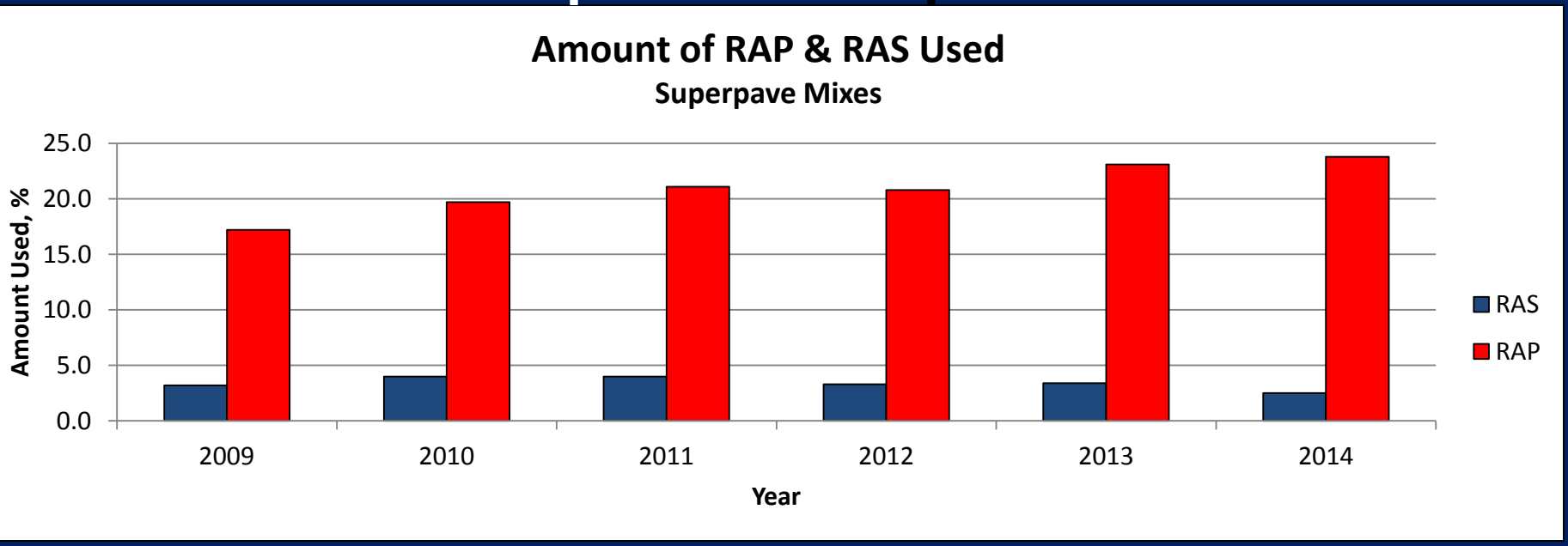
Breakdown of Superpave Mixes

Year	RAP	RAS	RAP & RAS	Virgin
2009	58%	4%	11%	27%
2010	57%	10%	18%	15%
2011	66%	8%	12%	14%
2012	57%	3%	15%	25%
2013	72%	1%	11%	16%
2014	74%	0%	4%	22%



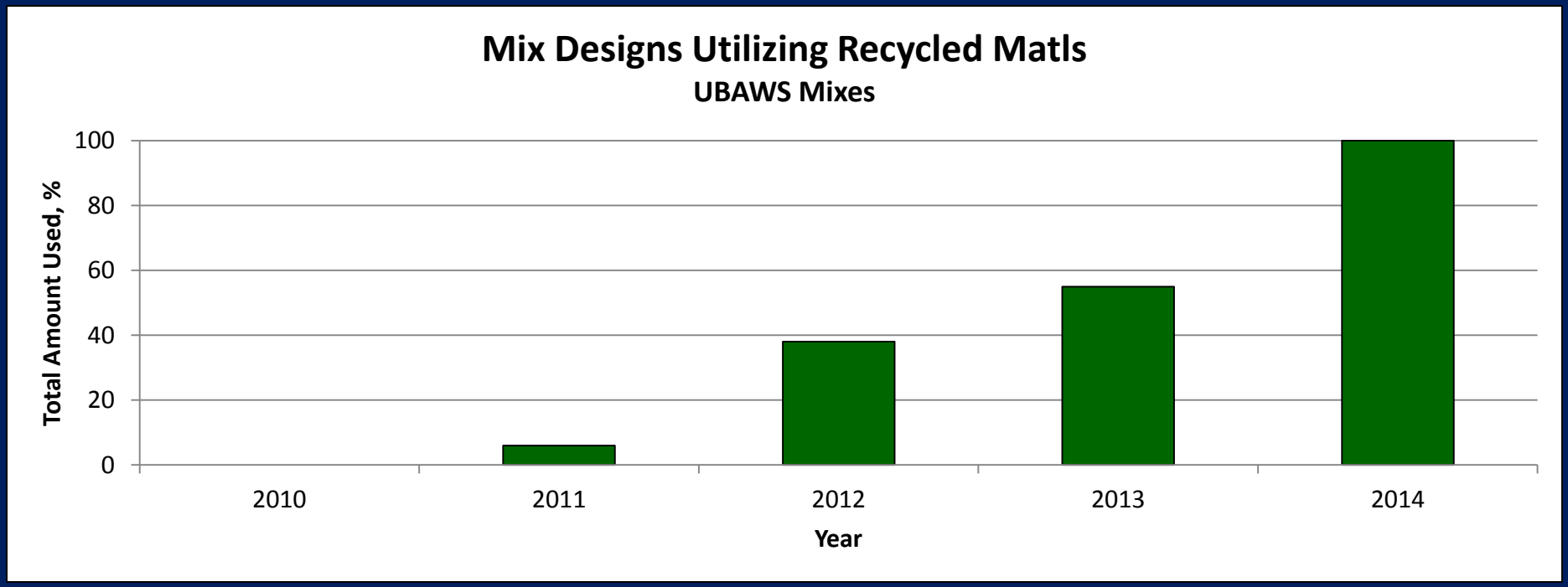
Amount of RAP & RAS - Superpave

Year	RAS	RAP
2009	3.2%	17.2%
2010	4.0%	19.7%
2011	4.0%	21.1%
2012	3.3%	20.8%
2013	3.4%	23.1%
2014	2.5%	23.8%



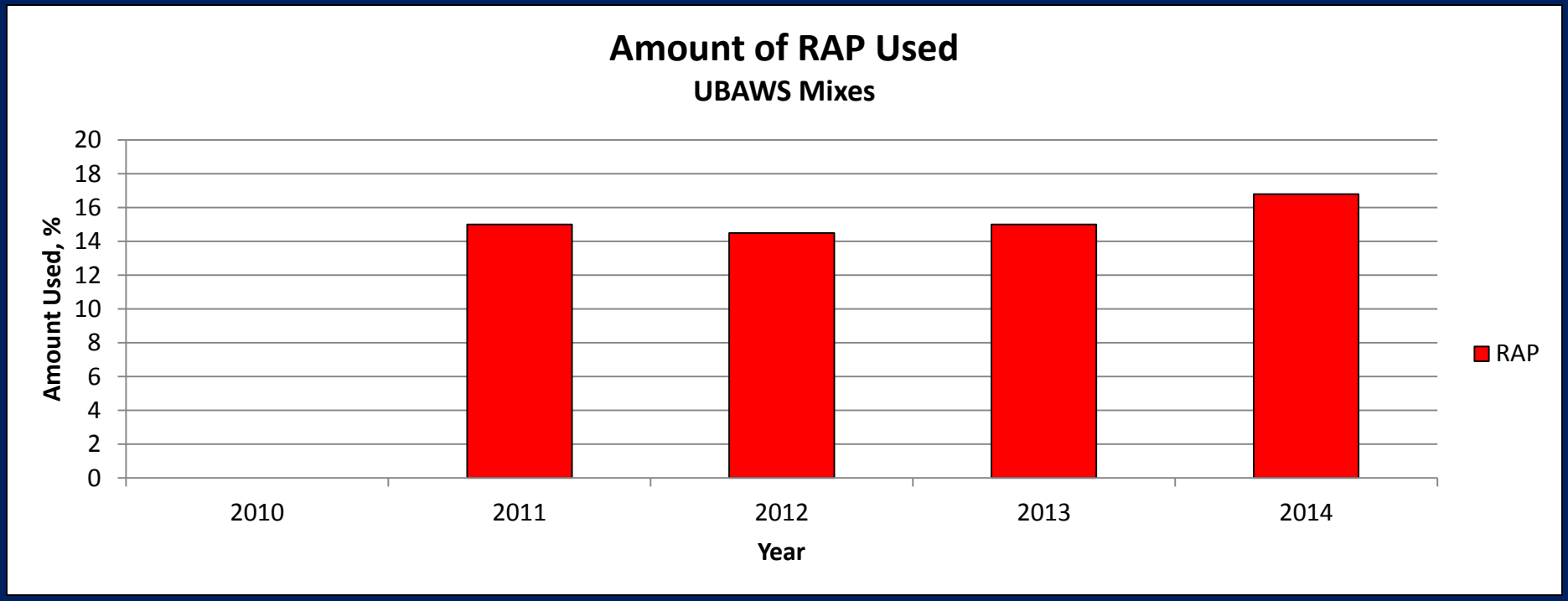
Mixes Using Recycled Materials

Year	UBAWS
2010	----
2011	6%
2012	38%
2013	55%
2014	100%



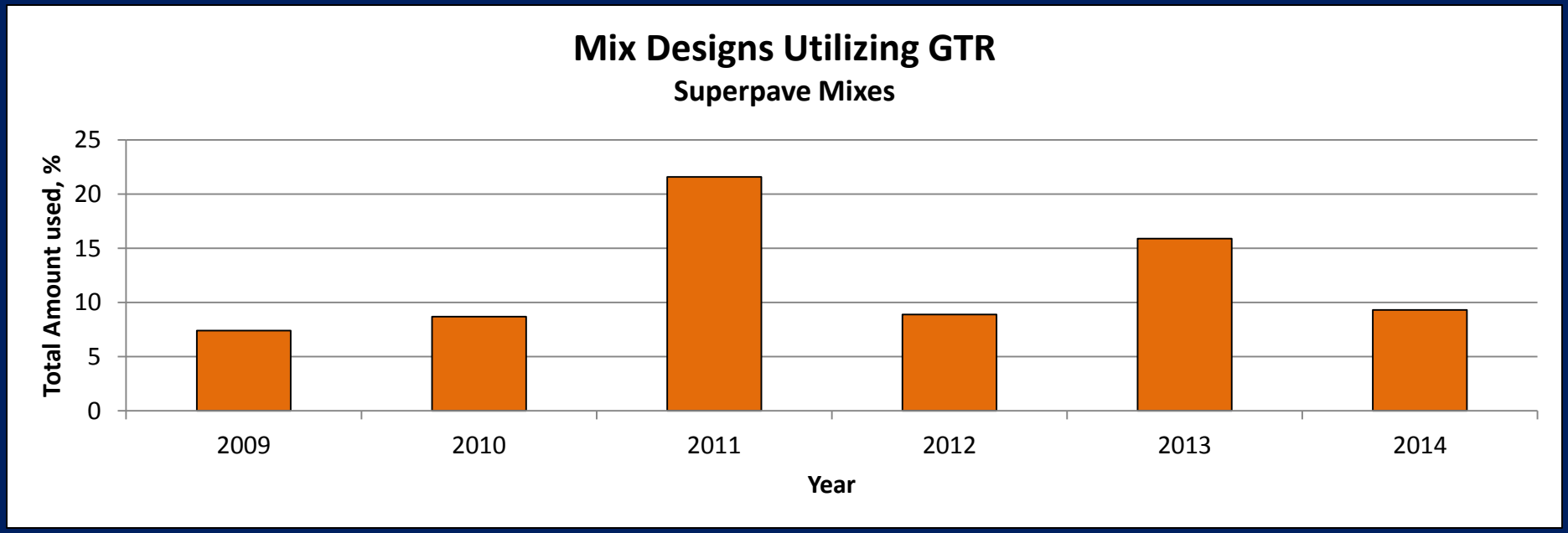
Amount of RAP – UBAWS

Year	RAP
2010	----
2011	15.0%
2012	14.5%
2013	15.0%
2014	16.8%



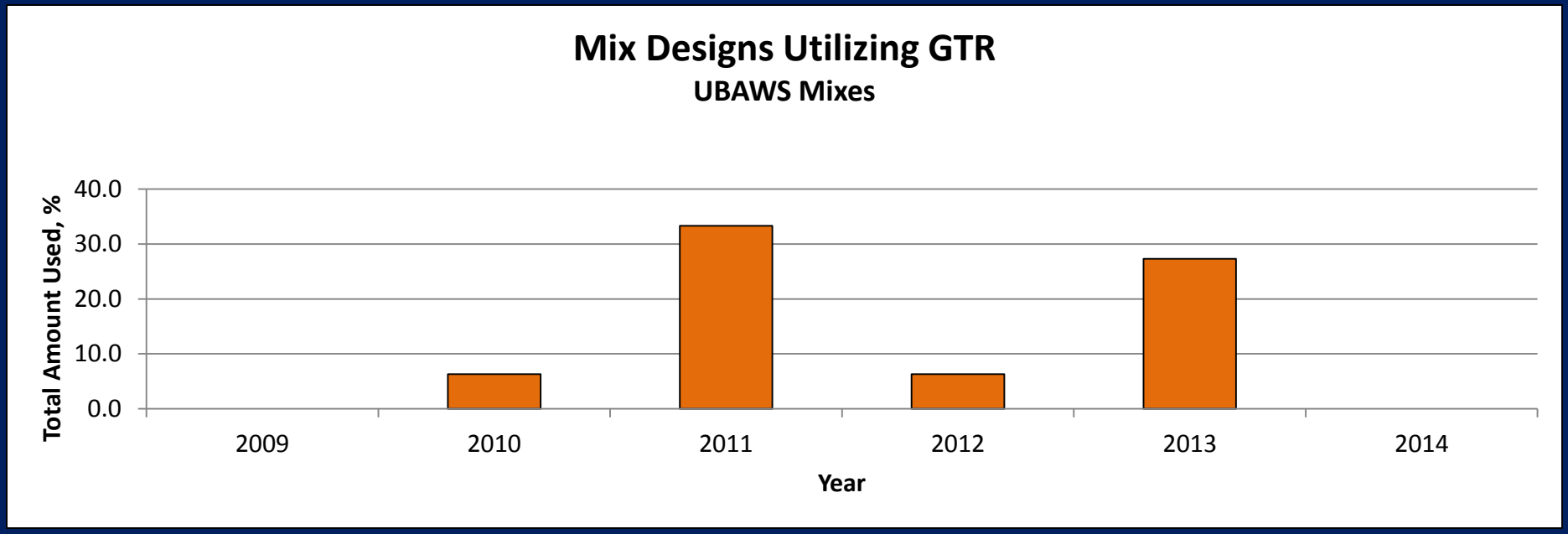
Superpave Mixes Utilizing GTR

Year	Total
2009	7.4%
2010	8.7%
2011	21.6%
2012	8.9%
2013	15.9%
2014	9.3%



UBAWS Mixes Utilizing GTR

Year	Total
2009	0%
2010	6.3%
2011	33.3%
2012	6.3%
2013	27.3%
2014	0%



Questions

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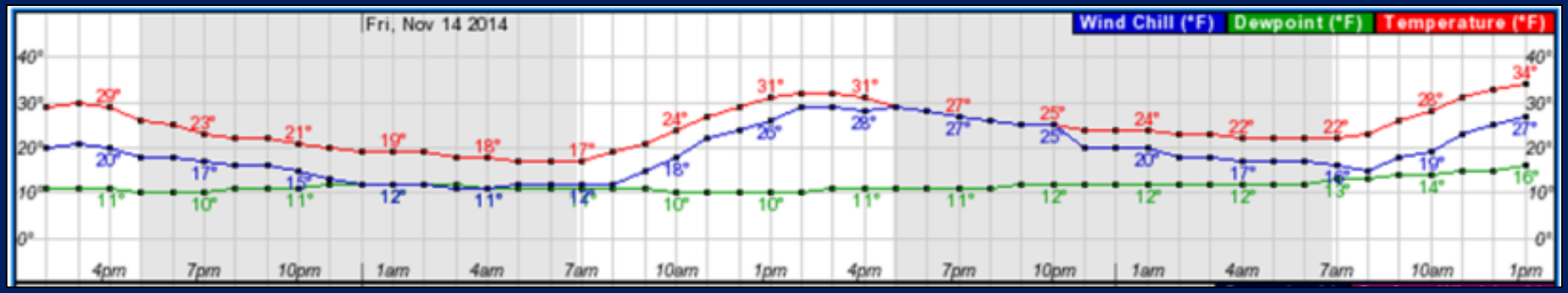
Seal Coat Changes

- Micro-Deval requirements

- Grade B1 & B2 ⟶ Max. 20% added
- Eliminated requirement for light weight agg.

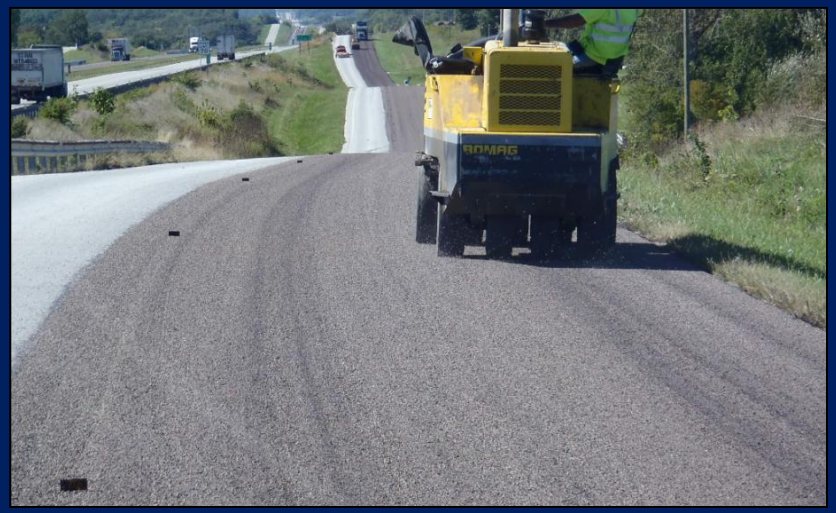
Seal Coat Changes

- Weather forecast
- No placement when ambient temperature falls below 40 deg. F within 24 hours of construction



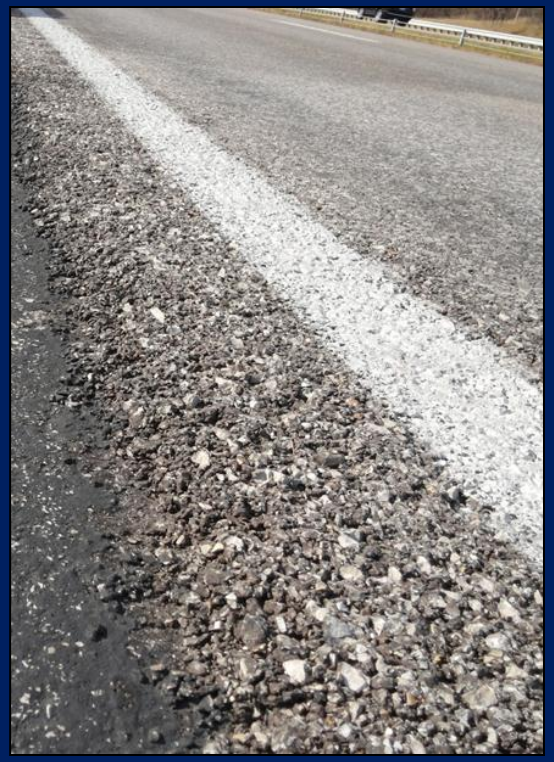
Seal Coat Changes

- Basis of acceptance
- Minimal Bleeding
  - < 2 SF Individual Area
  - < 10 SF in 50 ft. of 2-lane roadway
- No continued or ongoing tracking
- Smooth Joints / No Gaps
- No o less than 14 days after completion



UBAWS Changes

- Changed thickness of Type B
  - From 5/8 inch to 3/4 inch



Why use 0.98 correction factor?

The Issue

- Difficult to obtain the actual Gsb for RAP
- Use RAP Gse to calculate Combined Gsb

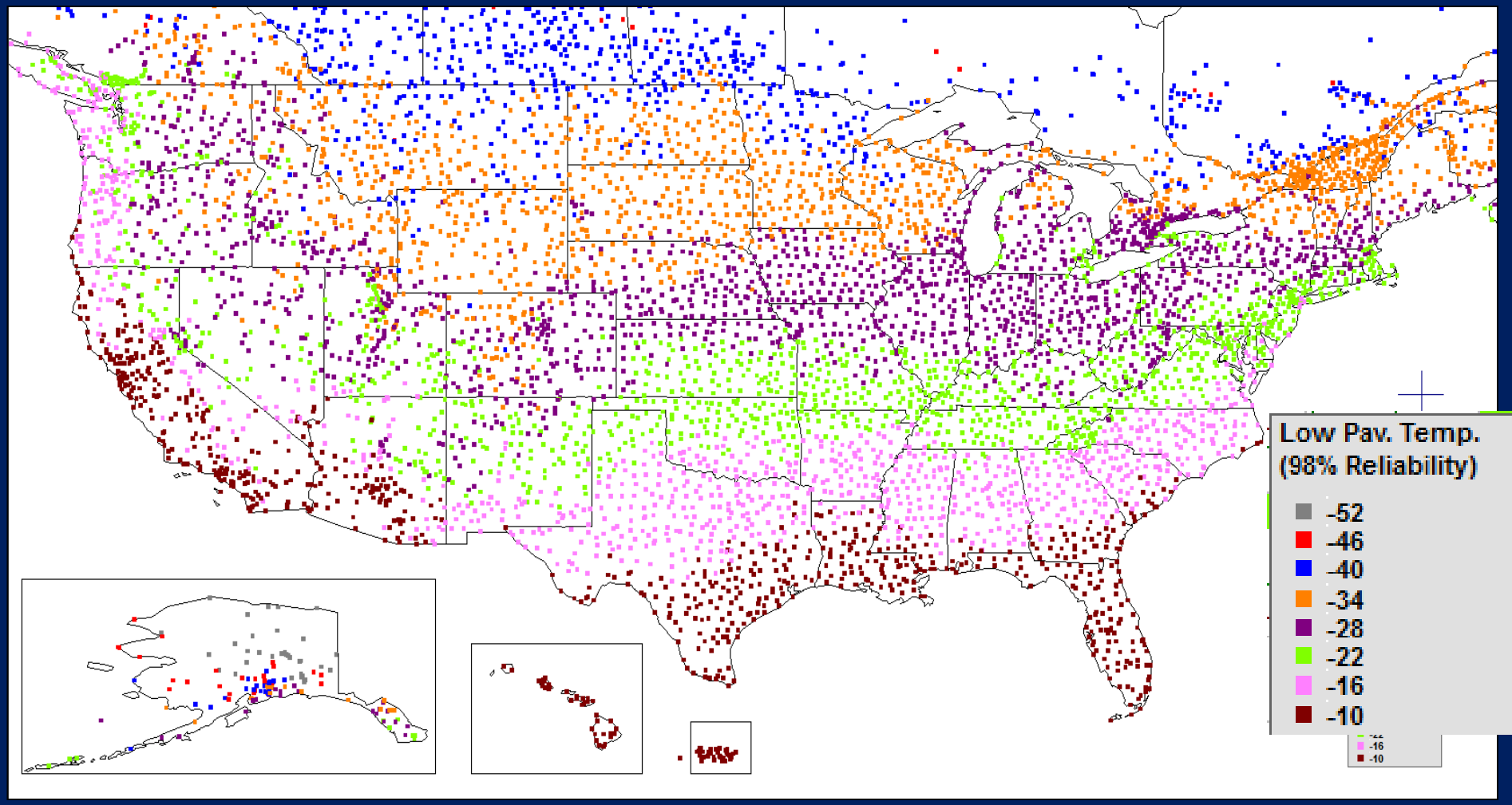
- Inflates VMA values
- Leads to drier asphalt mixes

RAP Gse => RAP Gsb

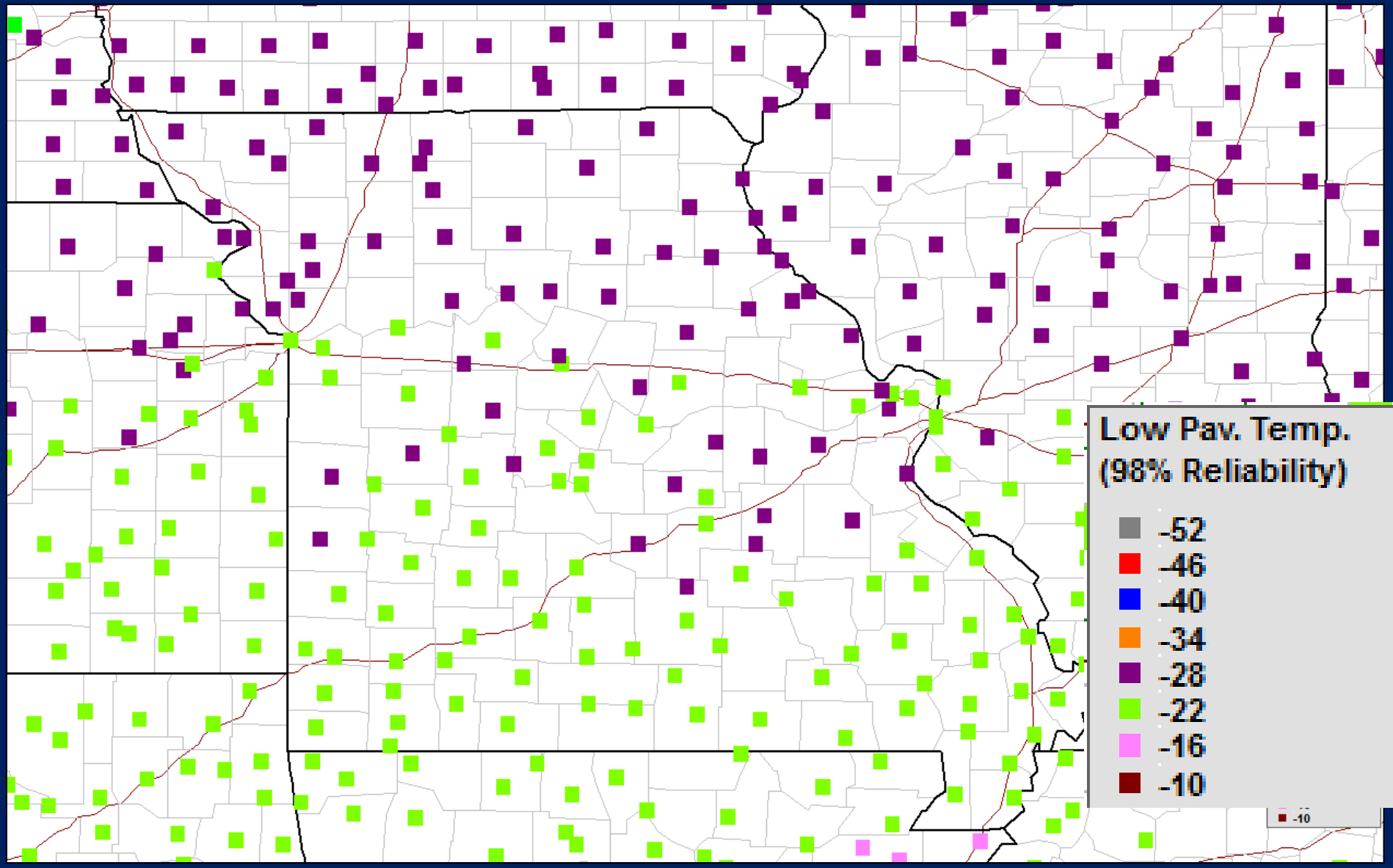
$$Gse = \frac{100 - Pb}{\frac{100}{Gmm} - \frac{Pb}{Gb}}$$

$$VMA = 100 - \frac{Gmb \times Ps}{Gsb\ (Combined)}$$

LTPPBind Program



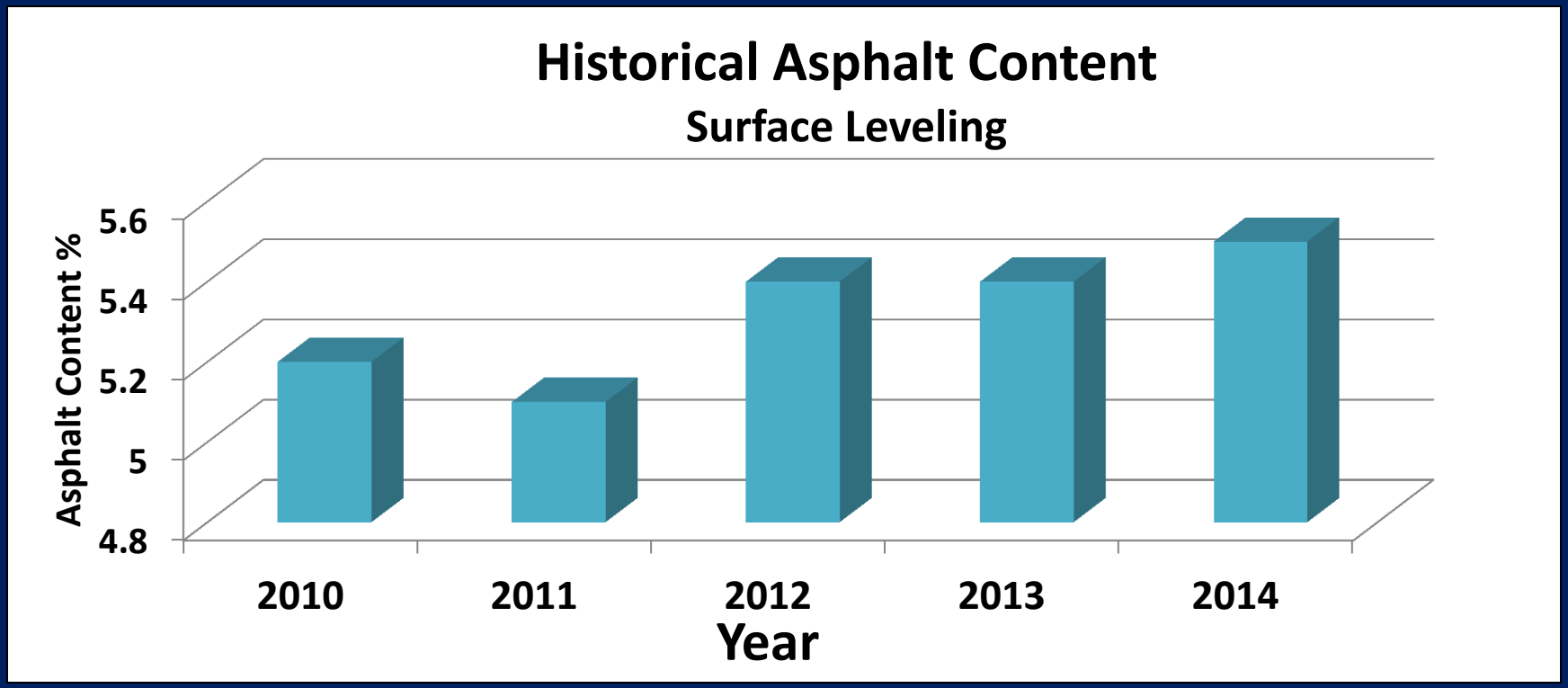
Close-Up of Missouri



Surface Leveling Changes

Surface Leveling Changes

- Continue with JSP from last year
- Apply 0.98 correction to RAP Gse
- Phase out using Virgin Aggregate Gsb for RAP Gsb
  - By June 2015

Surface Leveling Mixes

Year	2010	2011	2012	2013	2014
Va	4.1	4.1	3.5	3.5	3.5
VMA	14.3	14.2	14.5	14.7	14.8
Total AC	5.2	5.1	5.4	5.4	5.5