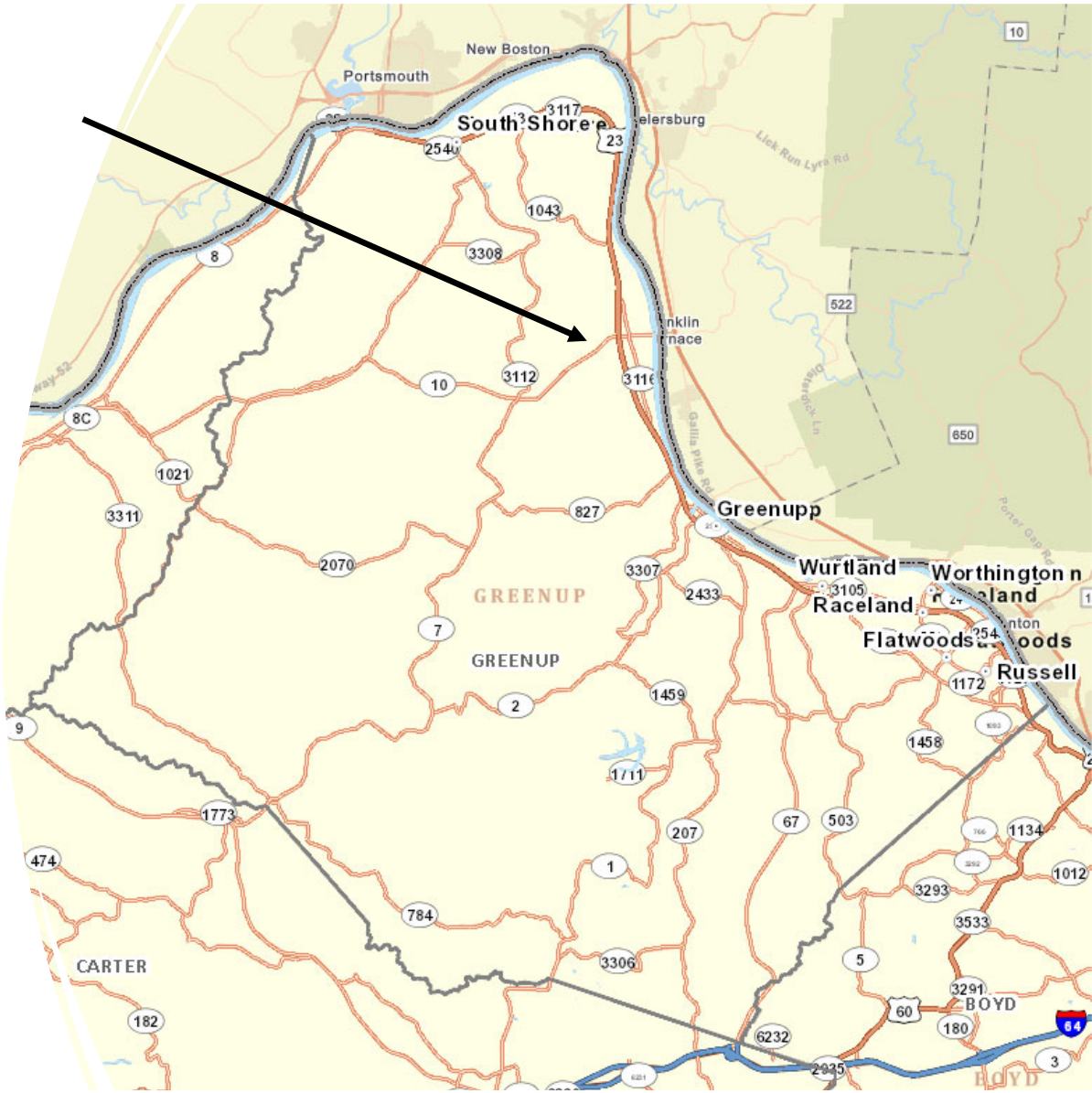
Incorporating RAP in Microsurfacing

KYTC – District 9 – Ashland Section

Project Location

- Greenup County, KY
- KY 10 (AA Highway – Greenup Spur)
- Priority B Route
- ADT: 7891 with Truck % 13.419
- Multiple truck lanes / passing lanes on this route (RAP test section utilized truck lane)



Project Scope

- Project set up as a double alt bidding option for microsurfacing or asphalt thinlay.
- Letting Date: 1/26/23
- Work began on 7/18/23 with thermo striping removal and pavement marker removal.

Contract Id 232080 **COMMONWEALTH OF KENTUCKY** County GREENUP

Contract Type PALT PAVEMENT (WITH ALTERNATES) **TRANSPORTATION CABINET** Primary Project Number MP04500102301

Estimate Nbr 0002 Period 07/29/2023 TO 08/12/2023

Contractor STRAWSER CONSTRUCTION INC

Project	MP04500102301		Fed/State Project Number		FD05 045 0010 008-013			Category			
LINE ITEM NUMBER	ITEM DESCRIPTION	ITEM NO.	UNIT	PLAN QTY	CURRENT QUANTITY	QUANTITY PAID THIS EST	QUANTITY PAID PREV. EST	QUANTITY PAID TO DATE	UNIT PRICE	AMOUNT PAID THIS EST	AMOUNT PAID TO DATE
Project	**MP04500102301**		**Fed/State Project Number**		**FD05 045 0010 008-013**			**Category**	**0001 ROADWAY**		
0005	TEMPORARY SIGNS	02562	SQFT	230.00	230.000		200.000	200.000	20.00		4,000.00
0010	MAINTAIN & CONTROL TRAFFIC	02650	LS	1.00	1.000		0.000	0.000	19,900.00		0.00
0015	PORTABLE CHANGEABLE MESSAGE SIGN	02671	EACH	2.00	2.000		2.000	2.000	835.00		1,670.00
0020	ARROW PANEL	02775	EACH	1.00	1.000		0.000	0.000	565.00		0.00
0025	PAVE STRIPING-THERMO-6 IN W	06542	LF	56,000.00	56,000.000		0.000	0.000	1.29		0.00
0030	PAVE STRIPING-THERMO-6 IN Y	06543	LF	41,000.00	41,000.000		0.000	0.000	1.29		0.00
0035	PAVE MARKING-THERMO STOP BAR-24IN	06568	LF	84.00	84.000		0.000	0.000	15.00		0.00
0040	PAVE MARKING-THERMO CROSS-HATCH	06569	SQFT	938.00	938.000		0.000	0.000	5.00		0.00
0045	PAVE MARKING-THERMO STR ARROW	06573	EACH	5.00	5.000		0.000	0.000	130.00		0.00
0050	PAVE MARKING-THERMO CURV ARROW	06574	EACH	20.00	20.000		0.000	0.000	150.00		0.00
0055	PAVE MARKING-THERMO COMB ARROW	06575	EACH	5.00	5.000		0.000	0.000	175.00		0.00
0060	REMOVE PAVEMENT MARKER TYPE V	06600	EACH	795.00	795.000		0.000	0.000	8.50		0.00
0065	CENTERLINE RUMBLE STRIPS	20458ES403	LF	21,000.00	21,000.000		0.000	0.000	0.30		0.00
0070	OVERBAND CRACK SEALING	23071EN	LB	18,000.00	18,000.000		0.000	0.000	1.80		0.00
0075	INSTALL RADAR PRESENCE DETECTOR TYPE A	26119EC	EACH	4.00	4.000		4.000	4.000	1,410.00		5,640.00
0080	INSTALL RADAR ADVANCE DETECTOR TYPE B	26120EC	EACH	2.00	2.000		2.000	2.000	1,410.00		2,820.00
8000	PAVE STRIPING REMOVAL-6 IN	06531	LF	0.00	0.000		0.000	0.000	0.61		0.00
Project	**MP04500102301**		**Fed/State Project Number**		**FD05 045 0010 008-013**			**Category**	**0003 MICROSURFACE**		
0115	PAVE STRIPING-TEMP PAINT-4 IN (MICROSURFACE)	06510	LF	100,000.00	100,000.000	44,352.000	29,215.000	73,567.000	0.19	8,426.88	13,977.73
0120	MICROSURFACING-LEVELING COURSE	21652EN	SQYD	113,630.00	113,630.000		0.000	0.000	1.96		0.00
0125	MICROSURFACING-SURFACE COURSE - TYPE D	24958EC	SQYD	100,483.00	100,483.000		0.000	0.000	2.20		0.00
Project	**MP04500102301**		**Fed/State Project Number**		**FD05 045 0010 008-013**			**Category**	**0004 DEMOBILIZATION**		
0130	DEMOBILIZATION	02569	LS	1.00	1.000		0.000	0.000	31,000.00		0.00
									SUBTOT	**$8,426.88**	**$28,107.73**
STOCKPILE ADJUSTMENTS		ITEM NUMBER	UNIT		ADJ. QUANTITY		EST NBR		UNIT PRICE		ADJUSTED AMOUNT
									SUBTOT	**$**	**$0.00**

Change Order #1

- Project required addition of thermo striping removal.
- Change Order removed Overband Crack Sealing (previously completed)
- Change Order addressed addition of microsurfacing RAP test strip and all additional costs of trial.

Mix Designs

Type II Mix Design

A COLAS COMPANY

Job Identifiers: Greenup County KY-10
KYTC 232080
Project No. / Contract ID: FD05 045 0010 008-013
Customer: Strawser Construction

Job Mix Formula

Component	Amount
Aggregate	100%
Cement	1.0% ± 0.5%
Tot. water (avg. agg moist. 3%)	9.0% ± 1.0%
Emulsion	11.7% ± 0.5%
Residual	7.8% ± 0.3%
Additive	0% ± 0.04%

Aggregate data

Supplier: Hanson Plum Run
Type: Type II

Sieve	% Passing	Spec
3/8 in.	100%	100
No. 4	94%	90-100
No. 8	75%	60-90
No. 16	49%	40-75
No. 30	31%	25-50
No. 50	19%	15-30
No. 100	12%	10-21
No. 200	8.0%	5-15

Soundness	LA Abrasion	Sand Eqv
1.9	28	76

Quant eff of moist
0%-98.5 lbs/cu. ft.
1%-95.3 lbs/cu. ft.
2%-91.1 lbs/cu. ft.
3%-88.0 lbs/cu. ft.
4%-85.7 lbs/cu. ft.
5%-85.1 lbs/cu. ft.
6%-85.9 lbs/cu. ft.

Moisture%
3%

Emulsion data

Supplier: Terry Asphalt
Type: CQS-1hP

Test on emulsion	Result	Spec
Residual solids, pct.	67.0	62.0 min.
Storage stability, pct.	0.7	1 max
Particle charge	Positive	Positive
Viscosity, Saybolt, 25°C, sec.	45	20 - 100
Sieve, pct.	0.01	0.10 max

Test on residue	Result	Spec
Penetration, 25°C, dmm	62	40-90
Ductility, 25°C, cm	50	40 min
Elastic recovery, 10°C, pct.	60	45 min
Solubility in TCE, pct.	99.8	97.5
Softening point, °C	62.5	60°C min.

Mixture performance data

Test	Result @ 7.8%	Spec
Mix time @ 77F (25C), TB113	145 seconds	Ctrl to 120 Sec. Min.
Mix time @ 104F (40C), TB113	45 seconds	Ctrl to 35 Sec. Min.
Cohesion @ 30min, TB139	17 N kg-cm	12 kg-cm Min.
Cohesion @ 60min, TB139	21 NS kg-cm	20 kg-cm or NS Min.
Wet stripping test, TB114	99%	Pass (90% Minimum)
WTAT 1 hour, TB100	174 g/m2	538 g/m2 Max
WTAT 6 day, TB100	483 g/m2	807 g/m2 Max
Lateral displacement, TB147	1.1%	5% Maximum
Excess asphalt/sand adhesion, TB109	27 g/ft2	50 g/ft2 Maximum
Schulze-Breuer and Ruck, TB144	0.9 g	2.0 g max

Type III Mix Design

A COLAS COMPANY

Job Identifiers: Greenup County KY-10
KYTC 232080
Project No. / Contract ID: FD05 045 0010 008-013
Customer: Strawser Construction

Job Mix Formula

Component	Amount
Aggregate	100%
Cement	1.0% ± 0.5%
Tot. water (avg. agg moist. 3%)	9.0% ± 1.0%
Emulsion	11.7% ± 0.5%
Residual	7.8% ± 0.3%
Additive	0% ± 0.04%

Aggregate data

Supplier: Hanson Plum Run
Type: Type III

Sieve	% Passing	Spec
3/8 in.	100%	100
No. 4	84%	70-100
No. 8	55%	45-70
No. 16	32%	28-50
No. 30	20%	19-34
No. 50	13%	12-25
No. 100	10%	7-18
No. 200	7.2%	5-15

Soundness	LA Abrasion	Sand Eqv
1.9	28	75

Quant eff of moist
0%-93.4 lbs/cu. ft.
1%-94.5 lbs/cu. ft.
2%-92.9 lbs/cu. ft.
3%-89.8 lbs/cu. ft.
4%-87.8 lbs/cu. ft.
5%-86.4 lbs/cu. ft.
6%-87.1 lbs/cu. ft.

Moisture%
3%

Emulsion data

Supplier: Terry Asphalt
Type: CQS-1hP

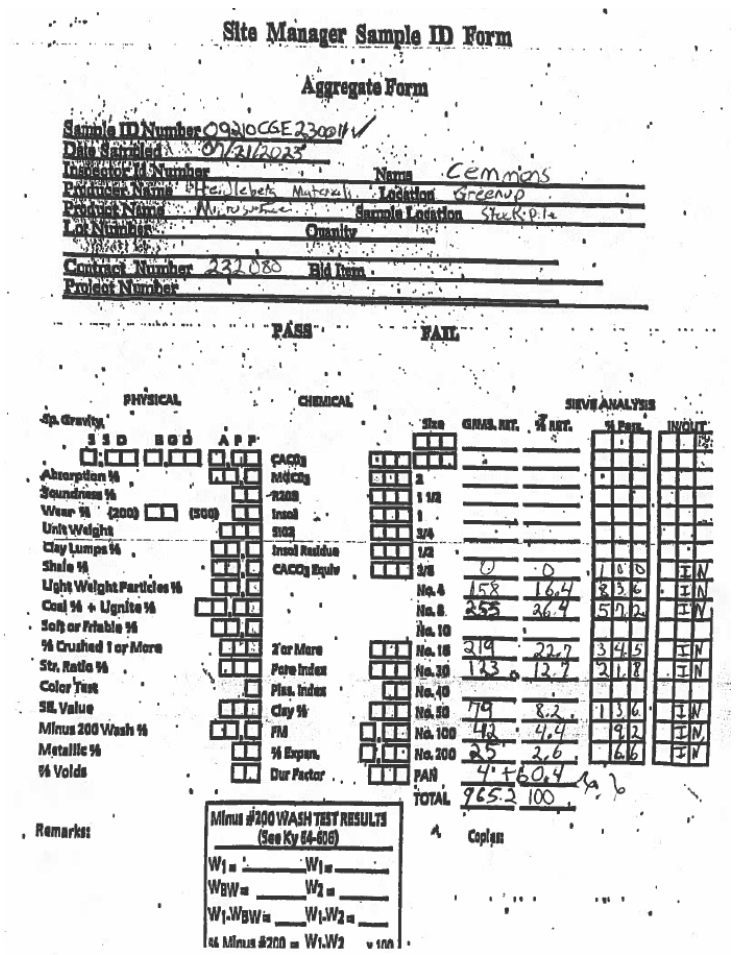
Test on emulsion	Result	Spec
Residual solids, pct.	67.0	62.0 min.
Storage stability, pct.	0.7	1 max
Particle charge	Positive	Positive
Viscosity, Saybolt, 25°C, sec.	45	20 - 100
Sieve, pct.	0.01	0.10 max

Test on residue	Result	Spec
Penetration, 25°C, dmm	62	40-90
Ductility, 25°C, cm	50	40 min
Elastic recovery, 10°C, pct.	60	45 min
Solubility in TCE, pct.	99.8	97.5
Softening point, °C	62.5	60°C min.

Mixture performance data

Test	Result @ 7.8%	Spec
Mix time @ 77F (25C), TB113	170	Ctrl to 120 Sec. Min.
Mix time @ 104F (40C), TB113	45 seconds	Ctrl to 35 Sec. Min.
Cohesion @ 30min, TB139	16 N kg-cm	12 kg-cm Min.
Cohesion @ 60min, TB139	20 NS kg-cm	20 kg-cm or NS Min.
Wet stripping test, TB114	99%	Pass (90% Minimum)
WTAT 1 hour, TB100	173 g/m2	538 g/m2 Max
WTAT 6 day, TB100	408 g/m2	807 g/m2 Max
Lateral displacement, TB147	1.5%	5% Maximum
Excess asphalt/sand adhesion, TB109	28 g/ft2	50 g/ft2 Maximum
Schulze-Breuer and Ruck, TB144	1.0 g	2.0 g max

Gradation Test of Aggregate



Site Manager Sample ID Form

Aggregate Form

Sample ID Number 0910CSE23001
Date Sampled 01/31/2023
Inspector's Name Cemmons
Producer's Name Heidelberg Materials
Location Greenup
Project Name Murphy Ave
Sample Location Steel Plt
Lot Number
Quantity
Contract Number 232080
Bid Item
Project Number

PASS FAIL

PHYSICAL
Sp. Gravity SSD BSD APP
Absorption %
Soundness %
Wear % (200) (500)
Unit Weight
Clay Lumps %
Shale %
Light Weight Particles %
Coal % + Lignite %
Soft or Friable %
% Crushed 1 or More
Str. Ratio %
Color Test
SE Value
Minus 200 Wash %
Metallic %
% Voids

CHEMICAL
CaCO3
MgCO3
R2O3
Insol
SiO2
Insol Residue
CaCO3 Equiv
1 or More
Pore Index
Plas. Index
Clay %
FM
% Expan.
Dur Factor

SIEVE ANALYSIS

Size	GRAD. RET.	% RET.	% PASS	IN/OUT
3				
1 1/2				
1				
3/4				
1/2				
3/8	0	0	100	IN
No. 4	158	16.4	83.6	IN
No. 8	255	26.4	57.2	IN
No. 16	219	22.7	34.5	IN
No. 30	123	12.7	21.8	IN
No. 40				
No. 50	79	8.2	13.6	IN
No. 100	42	4.4	9.2	IN
No. 200	25	2.6	6.6	IN
PAN	4+60.4			
TOTAL	965.2	100		

Remarks:

Minus #200 WASH TEST RESULTS (See Ky 64-605)
W1 = ____ W1 = ____
WBW = ____ W2 = ____
W1.WBW = ____ W1.W2 = ____
% Minus #200 = W1.W2 x 100

Copies:

Calibrations & Sampling

- Calibrations performed for all mix designs.
- All aggregates screened as shown.
- Liquid asphalt and aggregate passed all QA/QC tests.

Field Application of Microsurface

Mix Design for RAP in Microsurface

A COLAS COMPANY

Job Identifiers:	Greenup County KY-10
	KYTC 232080
Project No. / Contract ID:	FD05 045 0010 008-013
Customer	Strawser Construction

Job Mix Formula

Component	Amount
Aggregate	100%
Cement	1.0% ± 0.5%
Tot. water (avg. agg moist. 3%)	9.0% ± 1.0%
Emulsion	11.6% ± 0.5%
Residual	7.7% ± 0.3%
Additive	0% ± 0.04%

Aggregate data

Supplier: Barrett Medway

Type: Processed RAP Fines

Sieve	% Passing	Spec
3/8 in.	***100%***	*100*
No. 4	***98%***	*85-100*
No. 8	***77%***	*50-80*
No. 16	***58%***	*40-65*
No. 30	***40%***	*25-45*
No. 50	***24%***	*13-25*
No. 100	***16%***	-
No. 200	***12.7%***	*5-15*

Moisture%
3%

Emulsion data

Supplier: Terry Asphalt

Type: CQS-1hP

Test on emulsion	Result	Spec
Residual solids, pct.	**66.7**	*62.0 min.*
Storage stability, pct.	**0.01**	*1 max*
Particle charge	**Positive**	*Positive*
Viscosity, Saybolt, 25°C, sec.	**45**	*20 - 100*
Sieve, pct.	**0.00**	*0.10 max*

Test on residue	Result	Spec
Penetration, 25°C, dmm	**63**	*40-90*
Ductility, 25°C, cm	**82**	*40 min*
Elastic recovery, 10°C, pct.	**60**	*45 min*
Solubility in TCE, pct.	**99.8**	*97.5*
Softening point, °C	**62.5**	*60°C min.*

Mixture performance data

Test		Result @ 7.7%		Spec
Mix time @ 77F (25C), TB113		130		Ctrl to 120 Sec. Min.
Mix time @ 104F (40C), TB113		45		Ctrl to 45 Sec. Min.
Cohesion @ 30min, TB139		17N		12 kg-cm Min.
Cohesion @ 60min, TB139		21NS		20 kg-cm or NS Min.
Wet stripping test, TB114		99%		Pass (90% Minimum)
WTAT 1 hour, TB100		125		450 g/m2 Max
WTAT 6 day, TB100		156		650 g/m2 Max
Lateral displacement, TB147		1.6%		5% Maximum
Excess asphalt/sand adhesion, TB109		45		50 g/ft2 Maximum

Field Application of RAP in Microsurface

Questions?