



Illinois Department of Transportation

To: Kevin Marchek Attn: Wayne Phillips
From: Maureen M. Addis *MA MOS*
Subject: Pavement Design Approval
Date: October 28, 2017

Route: I-55 Job No.: P-93-025-14
Section: (53-5) R&I Contract No.: 66B64
County: Livingston Target Letting: FY 2018
Limits: 1.7 miles South of IL 116 to 0.6 miles North of IL 23 (around Pontiac)

We have reviewed the two pavement designs for the above referenced project which were submitted on August 8, 2017. The scope of the project involves replacing and reconstructing the existing pavement; as well as removing the mainline structures carrying I-55 over an abandoned railroad and lowering the grade of the roadway. The cross-section of I-55 will be two 12' lanes in each direction with 10' outside shoulders and 8' inside shoulders (6' paved, 2' aggregate).

Removal & Replacement: The design for the three segments to be removed and replaced (total 2.5 miles in length) resulted in two pavement options: 11" PCC and 15.25" Full-Depth HMA. The life-cycle cost analysis of these options resulted in the PCC pavement being 11.9% less expensive (\$218,768 per mile compared to HMA at \$244,701 per mile) and thus the preferred option.

Reconstruction: In the remainder of the project without vertical profile restrictions (total 3.7 miles in length), the design resulted in three pavement options: 11" PCC, 15.25" Full-Depth HMA, and an 11" HMA overlay of rubblized CRCP. The life-cycle cost analysis of these options resulted in the rubblization option being 52.8% less expensive than the next closest option (\$142,388 per mile compared to PCC at \$217,552 per mile) and thus the preferred option.

In summary, the approved pavement designs are as follows:

Removal & Replacement

11" PCC Pavement
Tied PCC Shoulders
4" HMA Stabilized Subbase
12" Improved Subgrade

Reconstruction

11" HMA overlay of Rubblized CRC
HMA Shoulders

If you have any questions, please contact Mike Brand at (217) 782-7651.



Illinois Department of Transportation

To: Maureen Addis Attn: Mike Brand
From: Kevin Marchek By: Dave Broviak
Subject: Pavement Design
Date: August 8, 2017

A handwritten signature in blue ink, likely of Mike Brand, written over the 'Attn: Mike Brand' line.

FAI 55 (I-55)
Section (53-5) R&I
Livingston County
Job No. P-93-025-14
Contract No. 66B64

Attached for approval are two pavement designs for I-55 from 1.7 miles south of IL 116 to 0.6 mile north of IL 23 with a total length of approximately 6.2 miles. Project construction is currently programmed for FY 2018.

The first design (total 2.5 miles) considered only Jointed Plain Concrete Pavement (JPCP) and full depth HMA pavement options at three locations: the IL 116 and IL 23 interchanges and the I-55 Vermilion River Bridge and adjacent CH 27 overhead structure (SN 053-0130). These options are the most practical in order to:

- Maintain a minimum 16' clearance under overhead structures.
- Match interchange ramps.
- Transition pavements at existing I-55 mainline Vermilion River structures.
- Remove an I-55 structure over an abandoned railroad and lower the I-55 vertical curve north of the IL 116 interchange.

Eleven inches of JPCP with an annual life-cycle cost per mile of \$218,768 is the preferred pavement type based on life-cycle cost in the attached mechanistic pavement design analysis. The annual life-cycle cost per mile for the JPCP option is 11.9 percent less than 15.25" of full depth HMA pavement (\$244,701). This proposed design includes removing the existing pavement and constructing a 12" improved subgrade, 4" stabilized sub-base, underdrains and 11" of JPCP. The design is for four lanes and the estimated new pavement quantity is 70,400 square yards.

The second design (total 3.7 miles) considered JPC, full depth HMA, and HMA overlay of rubblized CRC pavements. An 11" HMA overlay of rubblized CRCP with an annual life-cycle cost per mile of \$142,388 is the preferred pavement type based on life-cycle cost in the attached mechanistic pavement design

analysis. The annual life-cycle cost per mile for the rubblization option is 52.8 percent less than 11" of JPCP (\$217,552) and 72.5 percent less than 15.25" of full depth HMA pavement (\$245,553). The design is for four lanes and the estimated new pavement quantity is 104,192 square yards.

This project is not suitable for the alternative pavement bidding process because the life cycle cost difference for both the designs is more than 10 percent. Calculations to determine pavement thicknesses and life-cycle costs and the Roadway Geotechnical Report Pavement Rubblization Study are attached. Electronic files have also been emailed for review. For the full depth options, the potential cost savings of recycling the existing pavement was not considered in the unit prices due to the existing pavement showing signs of D-cracking. Based on the overall costs of the various options, potential recycling savings were not considered to be significant to the design.

The pavements were designed using Chapter 54 of the Bureau of Design and Environment Manual, current as of August 2017. The following facts and assumptions were used in the design:

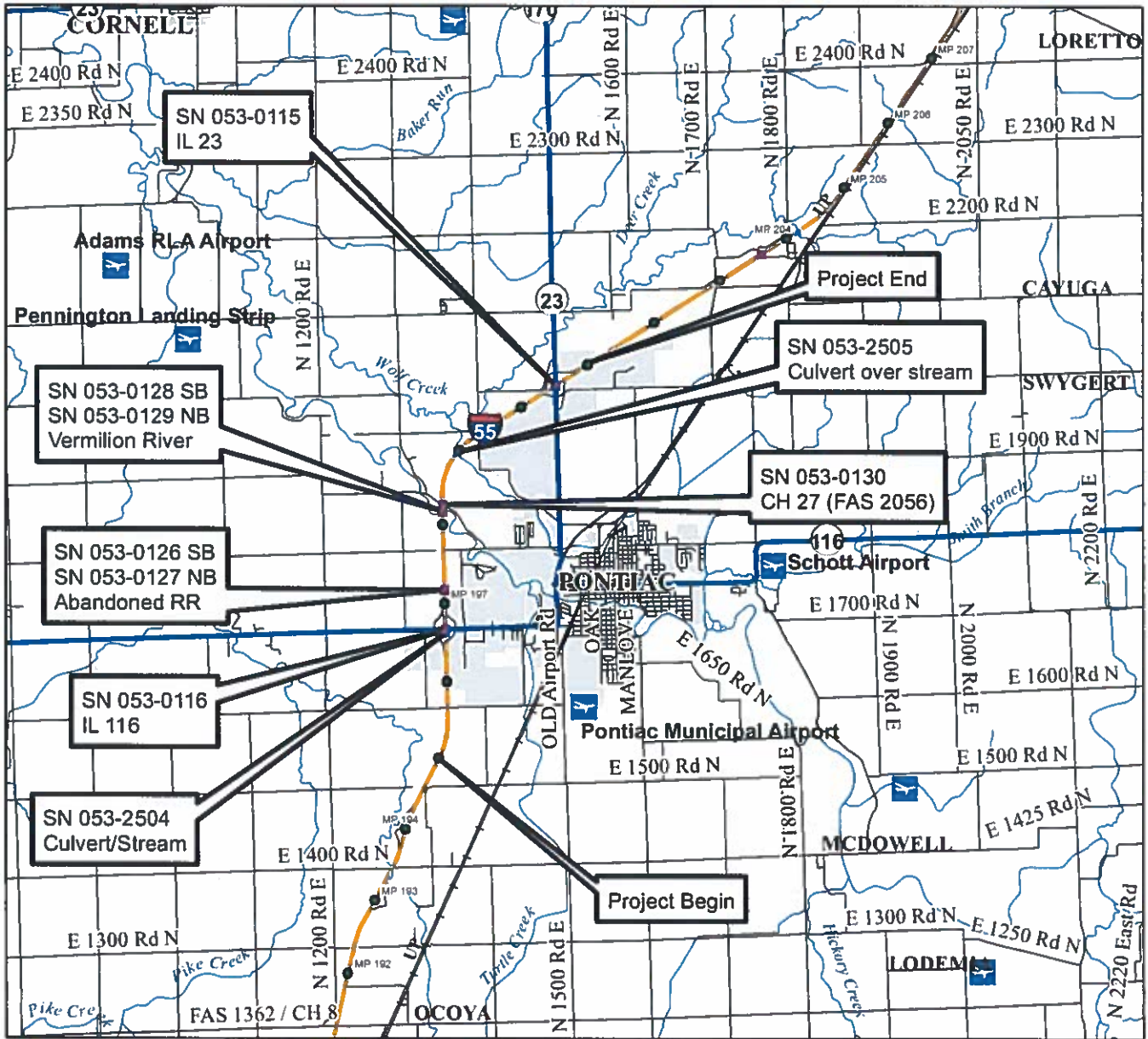
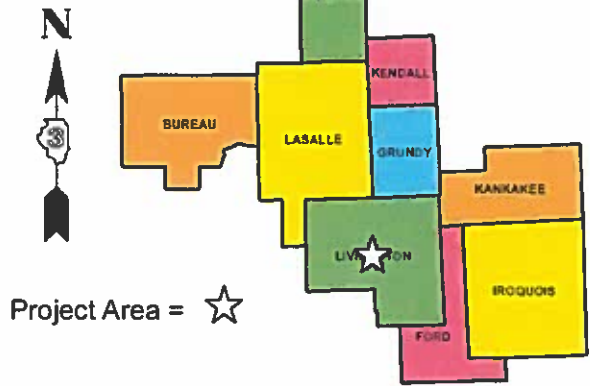
- Jointed Plain Concrete Pavement constructed with tied shoulder.
- Design traffic was based on 2038 projections.
- Design period of 20 years.
- Poor subgrade.
- PG 76-28 for the top lift of binder and the surface course.
- PG 64-22 for the lower binder lifts.
- Roadway Geotechnical Report Pavement Rubblization Study supports Rubblization Method 1.
- Unbonded overlay was not considered due to the age and condition of the existing hot-mix asphalt overlay and the existence of D-cracking in the existing CRCP.

If you have any questions, please contact Mr. Ted Fultz at 815-434-8469.

JO:jw

Project Location Map

FAI 55 (I-55)
 Section (53-5)R&I
 Livingston County
 Rubblization
 1.7 miles south of IL 116 to
 0.6 mile north of IL 23
 Phase I Job No: P-93-025-14
 Contract No.66B64



D3# 3254

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: FAI 55	Comments:		
Section: (53-5)R&I	Design Date: 07/10/2017	J. OYIER	<- BY
County: LIVINGSTON	Modify Date:		<- BY
Location: 1.7 MI S OF IL 116 TO 0.6 MI N OF IL 23			ADT
			Year
			Current: 23,061
			Future: 27,479
Facility Type: Interstate or Freeway	# of Lanes = 4		
	Road Class: I		
Subgrade Support Rating (SSR): Poor			
Construction Year: 2018			
Design Period (DP) = 20 years			

Structural Design Traffic			
Minimum ADT	Actual ADT	Actual % of Total ADT	% of ADT in Design Lane
PV = 0	17,436	69.0%	P = 32%
SU = 500	1,011	4.0%	S = 45%
MU = 1500	6,823	27.0%	M = 45%
Struct. Design ADT = 25,270		(2028)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT		RIGID PAVEMENT	
Cpv = 0.15		Cpv = 0.15	
Csu = 132.5		Csu = 143.81	
Cmu = 482.53		Cmu = 696.42	
TF flexible (Actual) = 30.85	(Actual ADT)	TF rigid (Actual) = 44.09	(Actual ADT)
TF flexible (Min) = 7.11	(Min ADT Fig. 54-2.C)	TF rigid (Min) = 10.05	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement	JPC Pavement
Use TF flexible = 30.85	Use TF rigid = 44.09
PG Grade Lower Binder Lifts = PG 76-28 (Fig. 53-4.R)	Edge Support = Tied Shoulder or C.&G.
HMA Mixture Temp. = 76.5 deg. F (Fig. 54-5.C)	Rigid Pavt Thick. = 11.00 in. (Fig. 54-4.E)
Design HMA Mixture Modulus (E _{HMA}) = 650 ksi (Fig. 54-5.D)	
Design HMA Strain (ε _{HMA}) = 45 (Fig. 54-5.E)	
Full Depth HMA Design Thickness = 15.50 in. (Fig. 54-5.F)	
Limiting Strain Criterion Thickness = 15.25 in. (Fig. 54-5.I)	
Use Full-Depth HMA Thickness = 15.25 inches	

CRC Pavement	
Use TF rigid = 44.09	
IBR value = 3	
CRCP Thickness = 11.00 in. (Fig. 54-4.M)	

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC	Unbonded Concrete Overlay
Use TF flexible = 30.85	Review 54-4.03 for limitations and special considerations.
HMA Overlay Design Thickness = 12.75 in. (Fig. 54-5.U)	
Limiting Strain Criterion Thickness = 11.00 in. (Fig. 54-5.V)	
Use HMA Overlay Thickness = 11.00 inches	JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

Facility Type	Min. Str. Design Traffic (Fig 54-2.C)		
	PV	SU	MU
Interstate or Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

ADT	Class Table for One-Way Streets	
	ADT	Class
0 - 3500		II
>3501		I

ADT	Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
	ADT	Class
0 - 749		IV
750 - 2000		III
>2000		II

Number of Lanes	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

LSC Design

ROUTE **FAI 55**
 SECTION **(53-5)R&I**
 COUNTY **LIVINGSTON**
 LOCATION **1.7 MI S OF IL 116 TO 0.6 MI N OF IL 23**

FACILITY TYPE **INTERSTATE**

PROJECT LENGTH **13200 FT == >** 2.50 Miles
 # OF CENTERLINES **2 CL**
 # OF LANES **4 LANES**
 # OF EDGES **4 EP**
 LANE WIDTH - AVERAGE **12 FT**
 SHOULDER WIDTH HMA Inside **6 FT**
 HMA Outside **10 FT**
 Total Width of Paved Shoulders **32 FT**

PAVEMENT THICKNESS (FLEXIBLE) **15.25 IN** **15.25 IN MAX**
 SHOULDER THICKNESS **15.25 IN** HMA_LSCD LSC Design
 POLICY OVERLAY THICKNESS **2.00 IN**

FLEX PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		7.11	30.85	30.85

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HMA	COST PER TON	UNIT PRICE
HMA SURFACE		\$101.00 / TON
HMA TOP BINDER		\$87.28 / TON
HMA LOWER BINDER		\$75.17 / TON
HMA BINDER (LEVELING)		\$87.28 / TON
HMA SHOULDER		\$81.12 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(15.25")	70400	70,400 SQ YD	\$72.07 / SQ YD	\$5,073,476 ~
HMA SURFACE COURSE	(2.00")	1.0069	7,940 TONS	\$101.00 / TON	\$0
HMA TOP BINDER COURSE	(2.25")	1.0217	9,063 TONS	\$87.28 / TON	\$0
HMA LOWER BINDER COURSE	(11.00")	1.0677	46,303 TONS	\$75.17 / TON	\$0
HMA SHOULDER	(15.25")	46933	40,081 TONS	\$81.12 / TON	\$3,251,376 ~
CURB & GUTTER			0 LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C (TONS)			0 TONS	\$20.71 / TON	\$0
IMPROVED SUBGRADE:	Aggregate Width = 87.1'	127,722	SQ YD	\$13.03 / SQ YD	\$1,664,218
Earthexcavation		49,276	CU YD *	\$17.83 / CU YD	\$878,590
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		70,400	SQ YD	\$10.90 / SQ YD	\$767,360
SHOULDER REMOVAL		46,933	SQ YD	\$10.81 / SQ YD	\$507,346
				FLEXIBLE CONSTRUCTION INITIAL COST	\$12,142,366
				FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	\$198,091

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	1.0069	Surface Mix 2.00	\$11.39 / SQ YD
HMA OVERLAY PVMT	(2.00")	1.0069	2.00	\$11.39 / SQ YD
HMA SURFACE MIX	(2.00")	1.0069	Surface Mix 2.00	\$11.39 / SQ YD
HMA BINDER MIX	(0.00")	1.0139	aling Binder Mix 0.00	\$0.00 / SQ YD
HMA OVERLAY SHLD (Year 30)	(2.00")		Shoulder Mix 2.00	\$9.09 / SQ YD
HMA OVERLAY SHLD	(2.00")		Shoulder Mix 2.00	\$9.09 / SQ YD
MILLING (2.00 IN)			2.00	\$2.75 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill Surf)		Surface Mix 2.00	\$81.06 / SQ YD

PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder Mix	2.00	\$78.84	/ SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Leveling Binder Mix	2.00	\$79.53	/ SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder Mix	2.00	\$78.84	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$3.00	/ LIN FT
CENTERLINE JOINT ROUT & SEAL				\$3.00	/ LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL	(100% Rehab = 110.00' / Station / Lane)			\$3.00	/ LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST	\$14,999,365
FLEXIBLE TOTAL ANNUAL COST PER MILE	\$244,701

PCC PAVEMENT

JPCP

ROUTE **FAI 55**
 SECTION **(53-5)R&I**
 COUNTY **LIVINGSTON**
 LOCATION **1.7 MI S OF IL 116 TO 0.6 MI N OF IL 23**

FACILITY TYPE **INTERSTATE**

PROJECT LENGTH **13200 FT == > 2.50 Miles**
 # OF CENTERLINES **2 CL**
 # OF LANES **4 LANES**
 # OF EDGES **4 EP**
 LANE WIDTH - AVERAGE **12 FT**
 SHOULDER WIDTH PCC Inside **6 FT**
 PCC Outside **10 FT**
 Total Width of Paved Shoulders **32 FT**

PAVEMENT THICKNESS (RIGID) **JPCP 11.00 IN TIED SHLD**
 SHOULDER THICKNESS **11.00 IN**

POLICY OVERLAY THICKNESS **3.75 IN**

RIGID PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		10.05	44.09	44.09
Worksheet Construction Type is	Reconstruction	User Override Pavement Type is		JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
JPC PAVEMENT	(11.00")	70,400	SQ YD	\$58.84 / SQ YD	\$4,142,336
PAVEMENT REINFORCEMENT		0	SQ YD	\$22.00 / SQ YD	\$0
STABILIZED SUBBASE	(4.00")	79,200	SQ YD	\$18.00 / SQ YD	\$1,425,600
PCC SHOULDERS		46,933	SQ YD	\$44.00 / SQ YD	\$2,065,052
CURB & GUTTER		0	LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C	(~ 3.48")	5,522	TONS	\$21.00 / TON	\$115,962
IMPROVED SUBGRADE:	Aggregate Width = 82.0'	120,267	SQ YD	\$13.03 / SQ YD	\$1,567,079
Earth Excavation		53,216	CU YD *	\$17.83 / CU YD	\$948,833
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		70,400	SQ YD	\$10.90 / SQ YD	\$767,360
SHOULDER REMOVAL		46,933	SQ YD	\$10.81 / SQ YD	\$507,346

Note: * Denotes User Supplied Quantity
 RIGID CONSTRUCTION INITIAL COST **\$11,539,568**
 RIGID CONSTRUCTION ANNUAL COST PER MILE **\$188,257**

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 / LANE-MILE / YEAR
HMA POLICY OVERLAY	(3.75")		3.75	
HMA POLICY OVERLAY PVMT	(3.75")	1.0130	3.75	\$19.73 / SQ YD
HMA SURFACE MIX	(1.50")	1.0052	1.50	\$8.53 / SQ YD
HMA BINDER MIX	(2.25")	1.0182	2.25	\$11.20 / SQ YD
HMA POLICY OVERLAY SHLD	(3.75")	Shoulder Mix	3.75	\$17.04 / SQ YD
CLASS A PAVEMENT PATCHING				\$195.00 / SQ YD
CLASS B PAVEMENT PATCHING				\$144.16 / SQ YD
CLASS C SHOULDER PATCHING				\$177.89 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix	1.50	\$78.23 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 1.50")		Surface Mix	1.50	\$78.23 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$3.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$3.00 / LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				\$3.00 / LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)			\$3.00 / LIN FT

RIGID TOTAL LIFE-CYCLE COST **\$13,409,799**
 RIGID TOTAL ANNUAL COST PER MILE **\$218,768**

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : **7/10/17 3:35 PM**

				JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH		\$11,539,568	\$12,142,366
		ANNUAL COST PER MILE		\$188,257	\$198,091
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH		\$1,870,231	\$2,856,999
		ANNUAL COST PER MILE		\$30,511	\$46,609
TOTAL	LIFE-CYCLE COST	PRESENT WORTH		\$13,409,799	\$14,999,365
		ANNUAL COST PER MILE		\$218,768	\$244,701

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	=====>	JPCP	\$218,768	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	HMA	\$244,701	11.9%

FULL-DEPTH HMA PAVEMENT
 HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
 Figure 54-7.C
 LIMITING STRAIN CRITERION DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5							
	LONG SHLD JT R&S	100.00%	52,800	LIN FT	\$3.00	\$158,400	
	CNTR LINE JOINT R&S	100.00%	26,400	LIN FT	\$3.00	\$79,200	
	RNDM / THRM CRACK R&S	50.00%	29,040	LIN FT	\$3.00	\$87,120	
	PD PVMT PATCH M&F SURF	0.10%	70	SQ YD	\$81.06	\$5,674	
	PWFn =	0.8626		PW =	0.8626 X	\$330,394	\$285,001
YEAR 10							
	LONG SHLD JT R&S	100.00%	52,800	LIN FT	\$3.00	\$158,400	
	CNTR LINE JOINT R&S	100.00%	26,400	LIN FT	\$3.00	\$79,200	
	RNDM / THRM CRACK R&S	50.00%	29,040	LIN FT	\$3.00	\$87,120	
	PD PVMT PATCH M&F SURF	0.50%	352	SQ YD	\$81.06	\$28,534	
	PWFn =	0.7441		PW =	0.7441 X	\$353,254	\$262,854
YEAR 15							
	MILL PVMT & SHLD 2.00"	100.00%	117,333	SQ YD	\$2.75	\$322,666	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	704	SQ YD	\$79.53	\$55,986	
	HMA OVERLAY PVMT 2.00"	100.00%	70,400	SQ YD	\$11.39	\$801,895	
	HMA OVERLAY SHLD 2.00 "	100.00%	46,933	SQ YD	\$9.09	\$426,410	
	PWFn =	0.6419		PW =	0.6419 X	\$1,606,957	\$1,031,445
YEAR 20							
	LONG SHLD JT R&S	100.00%	52,800	LIN FT	\$3.00	\$158,400	
	CNTR LINE JOINT R&S	100.00%	26,400	LIN FT	\$3.00	\$79,200	
	RNDM / THRM CRACK R&S	50.00%	29,040	LIN FT	\$3.00	\$87,120	
	PD PVMT PATCH M&F SURF	0.10%	70	SQ YD	\$81.06	\$5,674	
	PWFn =	0.5537		PW =	0.5537 X	\$330,394	\$182,931
YEAR 25							
	LONG SHLD JT R&S	100.00%	52,800	LIN FT	\$3.00	\$158,400	
	CNTR LINE JOINT R&S	100.00%	26,400	LIN FT	\$3.00	\$79,200	
	RNDM / THRM CRACK R&S	50.00%	29,040	LIN FT	\$3.00	\$87,120	
	PD PVMT PATCH M&F SURF	0.50%	352	SQ YD	\$81.06	\$28,534	
	PWFn =	0.4776		PW =	0.4776 X	\$353,254	\$168,716
YEAR 30							
	HMA_LSCD INTERSTATE						
	MILL PVMT & SHLD 2.00"	100.00%	117,333	SQ YD	\$2.75	\$322,666	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	1,408	SQ YD	\$79.53	\$111,972	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	469	SQ YD	\$78.84	\$36,974	
	HMA OVERLAY PVMT 2.00"	100.00%	70,400	SQ YD	\$11.39	\$801,895	
	HMA OVERLAY SHLD 2.00 "	100.00%	46,933	SQ YD	\$9.09	\$426,410	
	PWFn =	0.4120		PW =	0.4120 X	\$1,699,917	\$700,343
YEAR 35							
	LONG SHLD JT R&S	100.00%	52,800	LIN FT	\$3.00	\$158,400	
	CNTR LINE JOINT R&S	100.00%	26,400	LIN FT	\$3.00	\$79,200	
	RNDM / THRM CRACK R&S	50.00%	29,040	LIN FT	\$3.00	\$87,120	
	PD PVMT PATCH M&F SURF	0.10%	70	SQ YD	\$81.06	\$5,674	
	PWFn =	0.3554		PW =	0.3554 X	\$330,394	\$117,417
YEAR 40							
	LONG SHLD JT R&S	100.00%	52,800	LIN FT	\$3.00	\$158,400	
	CNTR LINE JOINT R&S	100.00%	26,400	LIN FT	\$3.00	\$79,200	
	RNDM / THRM CRACK R&S	50.00%	29,040	LIN FT	\$3.00	\$87,120	
	PD PVMT PATCH M&F SURF	0.50%	352	SQ YD	\$81.06	\$28,534	
	PWFn =	0.3066		PW =	0.3066 X	\$353,254	\$108,292
							\$2,856,999
	ROUTINE MAINTENANCE ACTIVITY		10.00	Lane Miles	0.00	0	\$0
							MAINTENANCE LIFE-CYCLE COST \$2,856,999
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE \$46,609

JOINTED PLAIN CONCRETE PAVEMENT
 UNBONDED JOINTED PLAIN CONCRETE OVERLAY
 Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH	
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	70	SQ YD	\$144.16	\$10,091		
		PWFn = 0.7441			PW = 0.7441 X	\$10,091	\$7,509	
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	141	SQ YD	\$144.16	\$20,327		
		PWFn = 0.6419			PW = 0.6419 X	\$20,327	\$13,047	
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	1,408	SQ YD	\$144.16	\$202,977		
	SHOULDER PATCH CLASS C	0.50%	235	SQ YD	\$177.89	\$41,804		
	LONGITUDINAL SHLD JT R&S	100.00%	52,800	LIN FT	\$3.00	\$158,400		
	CENTERLINE JT R&S	100.00%	26,400	LIN FT	\$3.00	\$79,200		
		PWFn = 0.5537			PW = 0.5537 X	\$482,381	\$267,083	
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	2,112	SQ YD	\$144.16	\$304,466		
	SHOULDER PATCH CLASS C	1.00%	469	SQ YD	\$177.89	\$83,430		
		PWFn = 0.4776			PW = 0.4776 X	\$387,896	\$185,261	
YEAR 30								
	INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	2,816	SQ YD	\$144.16	\$405,955		
	SHOULDER PATCH CLASS C	1.50%	704	SQ YD	\$177.89	\$125,235		
	HMA POLICY OVERLAY 3.75" (PVMT)	100.00%	70,400	SQ YD	\$19.73	\$1,388,706		
	HMA POLICY OVERLAY 3.75" (SHLD)	100.00%	46,933	SQ YD	\$17.04	\$799,519		
		PWFn = 0.4120			PW = 0.4120 X	\$2,719,415	\$1,120,363	
YEAR 35								
	INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	52,800	LIN FT	\$3.00	\$158,400		
	CENTERLINE JT R&S	100.00%	26,400	LIN FT	\$3.00	\$79,200		
	RANDOM CRACK R&S	50.00%	26,400	LIN FT	\$3.00	\$79,200		
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	16,896	LIN FT	\$3.00	\$50,688		
	PD PVMT PATCH M&F HMA SURF 1.50"	0.10%	70	SQ YD	\$78.23	\$5,476		
		PWFn = 0.3554			PW = 0.3554 X	\$372,964	\$132,545	
YEAR 40								
	INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	352	SQ YD	\$144.16	\$50,744		
	LONGITUDINAL SHLD JT R&S	100.00%	52,800	LIN FT	\$3.00	\$158,400		
	CENTERLINE JT R&S	100.00%	26,400	LIN FT	\$3.00	\$79,200		
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	25,344	LIN FT	\$3.00	\$76,032		
	RANDOM CRACK R&S	50.00%	26,400	LIN FT	\$3.00	\$79,200		
	PD PVMT PATCH M&F HMA SURF 1.50"	0.50%	352	SQ YD	\$78.23	\$27,538		
		PWFn = 0.3066			PW = 0.3066 X	\$471,114	\$144,423	
							\$1,870,231	
	ROUTINE MAINTENANCE ACTIVITY				10.00 Lane Miles	\$0.00	\$0	\$0
	MAINTENANCE LIFE-CYCLE COST						\$1,870,231	
45	YEAR LIFE CYCLE	CRFn = 0.0407852	MAINTENANCE ANNUAL COST PER MILE			\$30,511		

PROJECT AND TRAFFIC INPUTS (Enter Data in Gray Shaded Cells)

Route: FAI 55	Comments:	
Section: (53-5)R&I	Design Date: 07/10/2017	J. OYIER
County: LIVINGSTON	Modify Date:	
Location: 1.7 MI S OF IL 116 TO 0.6 MI N OF IL 23		
Facility Type: Interstate or Freeway	# of Lanes = 4	
Road Class: I	Subgrade Support Rating (SSR): Poor	
Construction Year: 2018	Design Period (DP) = 20 years	

	<-- BY	ADT	Year	
Current:		23,061	2018	
Future:		27,479	2038	

Structural Design Traffic			
Minimum ADT	Actual ADT	Actual % of Total ADT	% of ADT in Design Lane
PV = 0	17,436	69.0%	P = 32%
SU = 500	1,011	4.0%	S = 45%
MU = 1500	6,823	27.0%	M = 45%
Struct. Design ADT = 25,270		(2028)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT		RIGID PAVEMENT	
Cpv = 0.15	Csu = 132.5	Cpv = 0.15	Csu = 143.81
Cmu = 482.53	TF flexible (Actual) = 30.85 (Actual ADT)	Cmu = 696.42	TF rigid (Actual) = 44.09 (Actual ADT)
TF flexible (Min) = 7.11 (Min ADT Fig. 54-2.C)		TF rigid (Min) = 10.05 (Min ADT Fig. 54-2.C)	

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement	JPC Pavement	
Use TF flexible = 30.85	Use TF rigid = 44.09	
PG Grade Lower Binder Lifts = PG 76-28 (Fig. 53-4.R)	Edge Support = Tied Shoulder or C.&G.	
HMA Mixture Temp. = 76.5 deg. F (Fig. 54-5.C)	Rigid Pavt Thick. = 11.00 in. (Fig. 54-4.E)	
Design HMA Mixture Modulus (E _{HMA}) = 650 ksi (Fig. 54-5.D)		
Design HMA Strain (ε _{HMA}) = 45 (Fig. 54-5.E)		
Full Depth HMA Design Thickness = 15.50 in. (Fig. 54-5.F)	CRC Pavement	
Limiting Strain Criterion Thickness = 15.25 in. (Fig. 54-5.I)	Use TF rigid = 44.09	IBR value = 3
Use Full-Depth HMA Thickness = 15.25 inches	CRCP Thickness = 11.00 in. (Fig. 54-4.M)	

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC	Unbonded Concrete Overlay
Use TF flexible = 30.85	Review 54-4.03 for limitations and special considerations.
HMA Overlay Design Thickness = 12.75 in. (Fig. 54-5.U)	
Limiting Strain Criterion Thickness = 11.00 in. (Fig. 54-5.V)	
Use HMA Overlay Thickness = 11.00 inches	JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

Facility Type	Min. Str. Design Traffic (Fig 54-2.C)		
	PV	SU	MU
Interstate or Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)						
Number of Lanes	Rural			Urban		
	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

LSC Design

ROUTE **FAI 55**
 SECTION **(53-5)R&I**
 COUNTY **LIVINGSTON**
 LOCATION **1.7 MI S OF IL 116 TO 0.6 MI N OF IL 23**

FACILITY TYPE **INTERSTATE**

PROJECT LENGTH **19536 FT == >** 3.70 Miles
 # OF CENTERLINES **2 CL**
 # OF LANES **4 LANES**
 # OF EDGES **4 EP**
 LANE WIDTH - AVERAGE **12 FT**
 SHOULDER WIDTH HMA Inside **6 FT**
 HMA Outside **10 FT**
 Total Width of Paved Shoulders **32 FT**

PAVEMENT THICKNESS (FLEXIBLE) **15.25 IN** **15.25 IN MAX**
 SHOULDER THICKNESS **15.25 IN** HMA_LSCD LSC Design
 POLICY OVERLAY THICKNESS **2.00 IN**

FLEX PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		7.11	30.85	30.85

[Read Me!](#)

HMA	COST PER TON	UNIT PRICE
HMA SURFACE		\$101.66 / TON
HMA TOP BINDER		\$86.07 / TON
HMA LOWER BINDER		\$73.99 / TON
HMA BINDER (LEVELING)		\$101.66 / TON
HMA SHOULDER		\$81.20 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(15.25")	104192	104,192 SQ YD	\$71.21 / SQ YD	\$7,419,408 ~
HMA SURFACE COURSE	(2.00")	1.0069	11,751 TONS	\$101.66 / TON	\$0
HMA TOP BINDER COURSE	(2.25")	1.0217	13,413 TONS	\$86.07 / TON	\$0
HMA LOWER BINDER COURSE	(11.00")	1.0677	68,528 TONS	\$73.99 / TON	\$0

HMA SHOULDER	(15.25")	69461	59,320 TONS	\$81.20 / TON	\$4,816,782 ~
CURB & GUTTER			0 LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C (TONS)			0 TONS	\$20.71 / TON	\$0
IMPROVED SUBGRADE:	Aggregate	Width = 87.1'	189,029 SQ YD	\$13.03 / SQ YD	\$2,463,048
Earthwork			78,759 UNITS	\$17.83 / UNITS	\$1,404,273
Reserved For User Supplied Item			0 UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL			104,192 SQ YD	\$10.90 / SQ YD	\$1,135,693
SHOULDER REMOVAL			69,461 SQ YD	\$10.81 / SQ YD	\$750,873

Note: * Denotes User Supplied Quantity
 FLEXIBLE CONSTRUCTION INITIAL COST \$17,990,077
 FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE \$198,305

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	1.0069	Surface Mix 2.00	\$11.46 / SQ YD
HMA OVERLAY PVMT	(2.00")	1.0069	2.00	\$11.46 / SQ YD
HMA SURFACE MIX	(2.00")	1.0069	Surface Mix 2.00	\$11.46 / SQ YD
HMA BINDER MIX	(0.00")	1.0139	aling Binder Mix 0.00	\$0.00 / SQ YD
HMA OVERLAY SHLD (Year 30)	(2.00")		Shoulder Mix 2.00	\$9.09 / SQ YD
HMA OVERLAY SHLD	(2.00")		Shoulder Mix 2.00	\$9.09 / SQ YD
MILLING (2.00 IN)			2.00	\$3.00 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill Surf)		Surface Mix	2.00	\$81.39 / SQ YD

PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder Mix	2.00	\$79.09 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Leveling Binder Mix	2.00	\$81.39 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder Mix	2.00	\$79.09 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$3.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$3.00 / LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL	(100% Rehab = 110.00' / Station / Lane)			\$3.00 / LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST	\$22,276,347
FLEXIBLE TOTAL ANNUAL COST PER MILE	\$245,553

PCC PAVEMENT

JPCP

ROUTE **FAI 55**
 SECTION **(53-5)R&I**
 COUNTY **LIVINGSTON**
 LOCATION **1.7 MI S OF IL 116 TO 0.6 MI N OF IL 23**

FACILITY TYPE **INTERSTATE**

PROJECT LENGTH **19536 FT == > 3.70 Miles**
 # OF CENTERLINES **2 CL**
 # OF LANES **4 LANES**
 # OF EDGES **4 EP**
 LANE WIDTH - AVERAGE **12 FT**
 SHOULDER WIDTH PCC Inside **6 FT**
 PCC Outside **10 FT**
 Total Width of Paved Shoulders **32 FT**

PAVEMENT THICKNESS (RIGID) **JPCP 11.00 IN TIED SHLD**
 SHOULDER THICKNESS **11.00 IN**

POLICY OVERLAY THICKNESS **3.75 IN**

RIGID PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		10.05	44.09	44.09
Worksheet Construction Type is	Reconstruction	The Pavement Type is		JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
JPC PAVEMENT	(11.00")	104,192	SQ YD	\$58.85 / SQ YD	\$6,131,699
PAVEMENT REINFORCEMENT		0	SQ YD	\$22.00 / SQ YD	\$0
STABILIZED SUBBASE	(4.00")	117,216	SQ YD	\$18.00 / SQ YD	\$2,109,888
PCC SHOULDERS		69,461	SQ YD	\$44.00 / SQ YD	\$3,056,284
CURB & GUTTER		0	LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C	(~ 3.48")	8,173	TONS	\$21.00 / TON	\$171,633
IMPROVED SUBGRADE:	Aggregate Width = 82.0'	177,995	SQ YD	\$13.03 / SQ YD	\$2,319,275
Earthwork		72,928	UNITS	\$17.83 / UNITS	\$1,300,313
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		104,192	SQ YD	\$10.90 / SQ YD	\$1,135,693
SHOULDER REMOVAL		69,461	SQ YD	\$10.81 / SQ YD	\$750,873

Note: * Denotes User Supplied Quantity
 RIGID CONSTRUCTION INITIAL COST **\$16,975,658**
 RIGID CONSTRUCTION ANNUAL COST PER MILE **\$187,123**

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 / LANE-MILE / YEAR
HMA POLICY OVERLAY	(3.75")		3.75	
HMA POLICY OVERLAY PVMT	(3.75")	1.0130	3.75	\$19.63 / SQ YD
HMA SURFACE MIX	(1.50")	1.0052	1.50	\$8.58 / SQ YD
HMA BINDER MIX	(2.25")	1.0182	2.25	\$11.04 / SQ YD
HMA POLICY OVERLAY SHLD	(3.75")	Shoulder Mix	3.75	\$17.05 / SQ YD
CLASS A PAVEMENT PATCHING				\$195.00 / SQ YD
CLASS B PAVEMENT PATCHING				\$150.00 / SQ YD
CLASS C SHOULDER PATCHING				\$145.00 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix	1.50	\$78.54 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 1.50")		Surface Mix	1.50	\$78.54 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$3.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$3.00 / LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				\$3.00 / LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)			\$3.00 / LIN FT

RIGID TOTAL LIFE-CYCLE COST **\$19,736,190**
 RIGID TOTAL ANNUAL COST PER MILE **\$217,552**

RECONSTRUCTION - HMA OVER RUBBLIZED PAVEMENT

PAVEMENT OVERLAY THICKNESS (FLEXIBLE) **11.00** IN **11.00** IN MAX **HMA_LSCD** Maintenance Schedule
 SHOULDER OVERLAY THICKNESS **7.75** IN

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
HMA OVERLAY REMOVAL	3.25	104,192	SQ YD	\$4.23 / SQ YD	\$440,732
RUBBLIZING PCC PAVEMENT		104,192	SQ YD	\$2.50 / SQ YD	\$260,480

HMA OVERLAY (TOTAL)	11.00	104,192	SQ YD	\$51.99 / SQ YD	\$5,417,394 ~	
HMA SURFACE COURSE	2.00	1.0069	104,192	SQ YD	\$11.46 / SQ YD	\$0
HMA TOP BINDER COURSE	2.25	1.0217	104,192	SQ YD	\$11.08 / SQ YD	\$0
HMA LOWER BINDER COURSE	6.75	1.0530	104,192	SQ YD	\$29.45 / SQ YD	\$0

HMA SHOULDER	7.75	30,146	TONS	\$81.20 / TON	\$2,447,873 ~
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Earthwork		3,622	CU YD	* \$17.83 / CU YD	\$64,572
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
EARTHWORK		0	CU YD	\$0.00 / CU YD	\$0

Note: * Denotes User Supplied Quantity

	RUBBLIZED CONSTRUCTION INITIAL COST	\$8,631,051
	RUBBLIZED CONSTRUCTION ANNUAL COST PER MILE	\$95,140

	RUBBLIZED MAINTENANCE LIFE-CYCLE COST	\$4,286,270
	RUBBLIZED MAINTENANCE ANNUAL COST PER MILE	\$47,248

	RUBBLIZED TOTAL LIFE-CYCLE COST	\$12,917,321
	RUBBLIZED TOTAL ANNUAL COST PER MILE	\$142,388

RECONSTRUCTION - PCC UNBONDED OVERLAY

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 7/10/17 4:21 PM

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	\$16,975,658	\$17,990,077
		ANNUAL COST PER MILE	\$187,123	\$198,305
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	\$2,760,532	\$4,286,270
		ANNUAL COST PER MILE	\$30,429	\$47,248
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	\$19,736,190	\$22,276,347
		ANNUAL COST PER MILE	\$217,552	\$245,553

LIFE-CYCLE COST ANALYSIS: SUPPLEMENTAL DESIGNS

			PCC Unbonded	Rubblized
CONSTRUCTION	INITIAL COST	PRESENT WORTH	\$8,960,496	\$8,631,051
		ANNUAL COST PER MILE	\$98,772	\$95,140
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	\$2,760,532	\$4,286,270
		ANNUAL COST PER MILE	\$30,429	\$47,248
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	\$11,721,028	\$12,917,321
		ANNUAL COST PER MILE	\$99,999,999	\$142,388

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

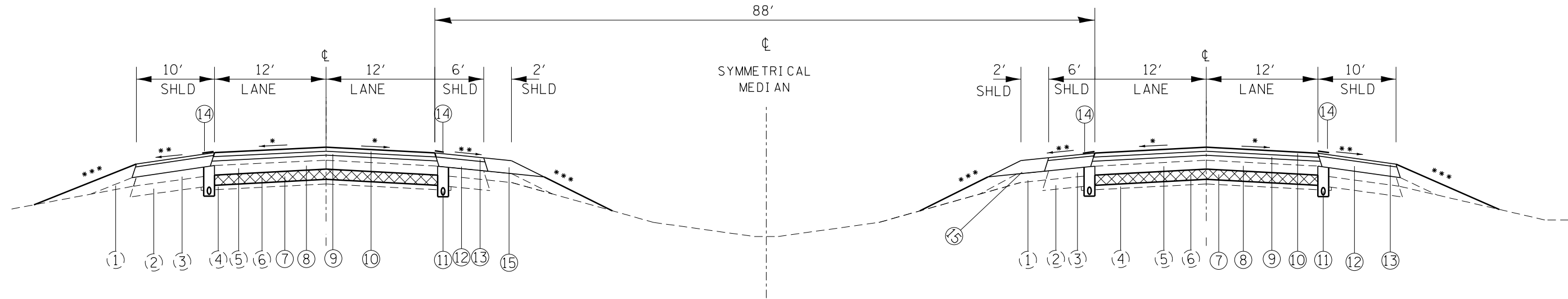
LOWEST COST OPTION	=====>	Rubblized	\$142,388	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	JPCP	\$217,552	52.8%
	TYPE / PERCENTAGE	HMA	\$245,553	72.5%

FULL-DEPTH HMA PAVEMENT
 HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
 Figure 54-7.C
 LIMITING STRAIN CRITERION DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5							
	LONG SHLD JT R&S	100.00%	78,144	LIN FT	\$3.00	\$234,432	
	CNTR LINE JOINT R&S	100.00%	39,072	LIN FT	\$3.00	\$117,216	
	RNDM / THRM CRACK R&S	50.00%	42,979	LIN FT	\$3.00	\$128,937	
	PD PVMT PATCH M&F SURF	0.10%	104	SQ YD	\$81.39	\$8,464	
	PWFn =	0.8626		PW =	0.8626 X	\$489,049	\$421,858
YEAR 10							
	LONG SHLD JT R&S	100.00%	78,144	LIN FT	\$3.00	\$234,432	
	CNTR LINE JOINT R&S	100.00%	39,072	LIN FT	\$3.00	\$117,216	
	RNDM / THRM CRACK R&S	50.00%	42,979	LIN FT	\$3.00	\$128,937	
	PD PVMT PATCH M&F SURF	0.50%	521	SQ YD	\$81.39	\$42,402	
	PWFn =	0.7441		PW =	0.7441 X	\$522,987	\$389,151
YEAR 15							
	MILL PVMT & SHLD 2.00"	100.00%	173,653	SQ YD	\$3.00	\$520,959	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	1,042	SQ YD	\$81.39	\$84,804	
	HMA OVERLAY PVMT 2.00"	100.00%	104,192	SQ YD	\$11.46	\$1,194,560	
	HMA OVERLAY SHLD 2.00 "	100.00%	69,461	SQ YD	\$9.09	\$631,709	
	PWFn =	0.6419		PW =	0.6419 X	\$2,432,032	\$1,561,029
YEAR 20							
	LONG SHLD JT R&S	100.00%	78,144	LIN FT	\$3.00	\$234,432	
	CNTR LINE JOINT R&S	100.00%	39,072	LIN FT	\$3.00	\$117,216	
	RNDM / THRM CRACK R&S	50.00%	42,979	LIN FT	\$3.00	\$128,937	
	PD PVMT PATCH M&F SURF	0.10%	104	SQ YD	\$81.39	\$8,464	
	PWFn =	0.5537		PW =	0.5537 X	\$489,049	\$270,775
YEAR 25							
	LONG SHLD JT R&S	100.00%	78,144	LIN FT	\$3.00	\$234,432	
	CNTR LINE JOINT R&S	100.00%	39,072	LIN FT	\$3.00	\$117,216	
	RNDM / THRM CRACK R&S	50.00%	42,979	LIN FT	\$3.00	\$128,937	
	PD PVMT PATCH M&F SURF	0.50%	521	SQ YD	\$81.39	\$42,402	
	PWFn =	0.4776		PW =	0.4776 X	\$522,987	\$249,782
HMA_LSCD							
YEAR 30							
	INTERSTATE						
	MILL PVMT & SHLD 2.00"	100.00%	173,653	SQ YD	\$3.00	\$520,959	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	2,084	SQ YD	\$81.39	\$169,608	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	695	SQ YD	\$79.09	\$54,971	
	HMA OVERLAY PVMT 2.00"	100.00%	104,192	SQ YD	\$11.46	\$1,194,560	
	HMA OVERLAY SHLD 2.00 "	100.00%	69,461	SQ YD	\$9.09	\$631,709	
	PWFn =	0.4120		PW =	0.4120 X	\$2,571,807	\$1,059,550
YEAR 35							
	LONG SHLD JT R&S	100.00%	78,144	LIN FT	\$3.00	\$234,432	
	CNTR LINE JOINT R&S	100.00%	39,072	LIN FT	\$3.00	\$117,216	
	RNDM / THRM CRACK R&S	50.00%	42,979	LIN FT	\$3.00	\$128,937	
	PD PVMT PATCH M&F SURF	0.10%	104	SQ YD	\$81.39	\$8,464	
	PWFn =	0.3554		PW =	0.3554 X	\$489,049	\$173,800
YEAR 40							
	LONG SHLD JT R&S	100.00%	78,144	LIN FT	\$3.00	\$234,432	
	CNTR LINE JOINT R&S	100.00%	39,072	LIN FT	\$3.00	\$117,216	
	RNDM / THRM CRACK R&S	50.00%	42,979	LIN FT	\$3.00	\$128,937	
	PD PVMT PATCH M&F SURF	0.50%	521	SQ YD	\$81.39	\$42,402	
	PWFn =	0.3066		PW =	0.3066 X	\$522,987	\$160,325
							\$4,286,270
ROUTINE MAINTENANCE ACTIVITY				14.80 Lane Miles	0.00	0	\$0
							\$4,286,270
45	YEAR LIFE CYCLE	CRFn = 0.0407852	MAINTENANCE LIFE-CYCLE COST				\$47,248

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH	
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	104	SQ YD	\$150.00	\$15,600		
		PWFn = 0.7441			PW = 0.7441 X	\$15,600	\$11,608	
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	208	SQ YD	\$150.00	\$31,200		
		PWFn = 0.6419			PW = 0.6419 X	\$31,200	\$20,026	
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	2,084	SQ YD	\$150.00	\$312,600		
	SHOULDER PATCH CLASS C	0.50%	347	SQ YD	\$145.00	\$50,315		
	LONGITUDINAL SHLD JT R&S	100.00%	78,144	LIN FT	\$3.00	\$234,432		
	CENTERLINE JT R&S	100.00%	39,072	LIN FT	\$3.00	\$117,216		
		PWFn = 0.5537			PW = 0.5537 X	\$714,563	\$395,636	
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	3,126	SQ YD	\$150.00	\$468,900		
	SHOULDER PATCH CLASS C	1.00%	695	SQ YD	\$145.00	\$100,775		
		PWFn = 0.4776			PW = 0.4776 X	\$569,675	\$272,080	
YEAR 30								
	INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	4,168	SQ YD	\$150.00	\$625,200		
	SHOULDER PATCH CLASS C	1.50%	1,042	SQ YD	\$145.00	\$151,090		
	HMA POLICY OVERLAY 3.75" (PVMT)	100.00%	104,192	SQ YD	\$19.63	\$2,044,917		
	HMA POLICY OVERLAY 3.75" (SHLD)	100.00%	69,461	SQ YD	\$17.05	\$1,184,455		
		PWFn = 0.4120			PW = 0.4120 X	\$4,005,662	\$1,650,280	
YEAR 35								
	INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	78,144	LIN FT	\$3.00	\$234,432		
	CENTERLINE JT R&S	100.00%	39,072	LIN FT	\$3.00	\$117,216		
	RANDOM CRACK R&S	50.00%	39,072	LIN FT	\$3.00	\$117,216		
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	24,998	LIN FT	\$3.00	\$74,994		
	PD PVMT PATCH M&F HMA SURF 1.50"	0.10%	104	SQ YD	\$78.54	\$8,168		
		PWFn = 0.3554			PW = 0.3554 X	\$552,026	\$196,181	
YEAR 40								
	INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	521	SQ YD	\$150.00	\$78,150		
	LONGITUDINAL SHLD JT R&S	100.00%	78,144	LIN FT	\$3.00	\$234,432		
	CENTERLINE JT R&S	100.00%	39,072	LIN FT	\$3.00	\$117,216		
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	37,498	LIN FT	\$3.00	\$112,494		
	RANDOM CRACK R&S	50.00%	39,072	LIN FT	\$3.00	\$117,216		
	PD PVMT PATCH M&F HMA SURF 1.50"	0.50%	521	SQ YD	\$78.54	\$40,919		
		PWFn = 0.3066			PW = 0.3066 X	\$700,427	\$214,721	
							\$2,760,532	
	ROUTINE MAINTENANCE ACTIVITY				14.80 Lane Miles	\$0.00	\$0	\$0
	MAINTENANCE LIFE-CYCLE COST						\$2,760,532	
45	YEAR LIFE CYCLE	CRFn = 0.0407852	MAINTENANCE ANNUAL COST PER MILE			\$30,429		

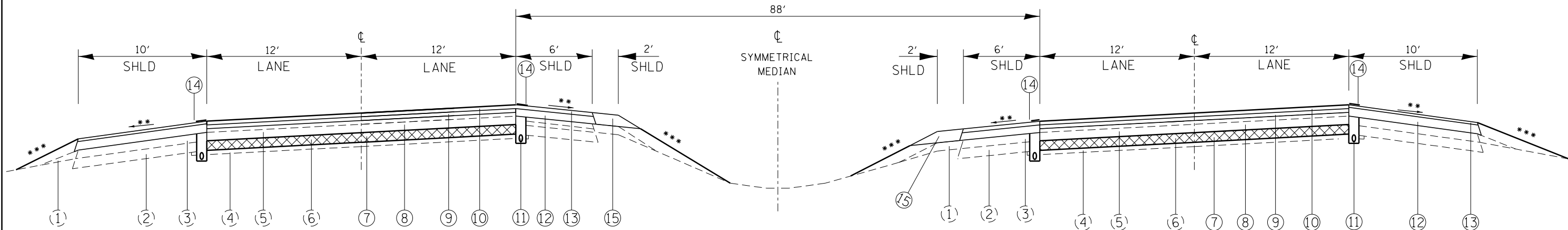


SOUTH BOUND

EXISTING / PROPOSED TYPICAL SECTION

NORTH BOUND

STA 20+34.08 TO STA 84+00
 STA 152+65 TO STA 181+28.15
 STA 199+00 TO STA 296+50



EXISTING / PROPOSED SUPERELEVATION TYPICAL SECTION

STA 20+75.38 TO STA 51+68.43
 STA 198+27.05 TO STA 248+06.31

PROPOSED

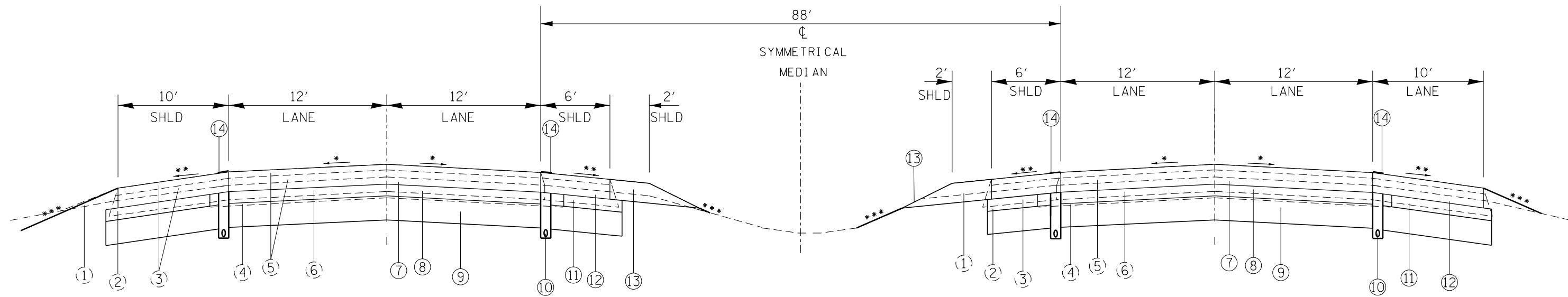
EXISTING

- ① EXISTING AGGREGATE WEDGE
- ② EXISTING STABILIZED SHOULDER, 8"
- ③ EXISTING HMA SURFACE SHOULDER, 3 1/4"
- ④ STABILIZED SUB-BASE, 4"
- ⑤ EXISTING HMA SURFACE, 3 1/4"
- ⑥ EXISTING CRC PAVEMENT, 9"

- * 1.5% PAVEMENT CROSS SLOPE
- ** 4.0% SHOULDER CROSS SLOPE
- *** GRADING TO MATCH EXISTING FORESLOPE (1:5 AND VARIES)

- ⑦ RUBBLIZED CRC PAVEMENT (METHOD I RECOMMENDED)
- ⑧ HOT-MIX ASPHALT BINDER COURSE, N90, IL-19.0, 7" (4" BOTTOM LIFT, 3" TOP LIFT)
- ⑨ POLYMERIZED HOT MIX ASPHALT BINDER COURSE, N90, IL-19, 2 1/4"
- ⑩ POLYMERIZED HOT-MIX ASPHALT SURFACE COURSE, N80 SMA SURFACE, 2"
- ⑪ PIPE UNDERDRAINS SPECIAL, 4" (TYP)
- ⑫ HOT-MIX ASPHALT BINDER COURSE, N50, IL-19.0, 6 1/4" (4" BOTTOM LIFT, 2 1/4" TOP LIFT)
- ⑬ HOT MIX ASPHALT SURFACE MIX C, N50 1 1/2"
- ⑭ SHOULDER RUMBLE STRIP
- ⑮ AGGREGATE SHOULDER (GRADING AND SHAPING SHOULDERS)

FILE NAME =	USER NAME = oyster_jo	DESIGNED - J.O	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	TYPICAL SECTIONS HMA OVERLAY OF RUBBLIZED CRCP				F.A.I. RTE. 55	SECTION (53-5)R&I	COUNTY LIVINGSTON	TOTAL SHEETS	SHEET NO.
pw:\IL\084EBIDINTEG.illinois.gov\PIWIDOT\Documents\IDOT Offices\District 3\Projects\0366B64\0366B64-shr-typical.dgn					REVISIONS	SCALE:	SHEET	OF	SHEETS	STA.	TO	STA.	CONTRACT NO. 66B64
PLOT SCALE = 100.0000' / 1".					CHECKED -	REVISIONS							
PLOT DATE = 7/25/2017					DATE -	REVISIONS	ILLINOIS FED. AID PROJECT						



SOUTH BOUND

EXISTING / PROPOSED TYPICAL SECTION

NORTH BOUND

STA 84+00 TO STA 152+65
 STA 181+28.15 TO STA 199+00
 STA 296+50 TO STA 348+00

EXISTING

- ① EXISTING AGGREGATE WEDGE
- ② EXISTING STABILIZED SHOULDER, 8"
- ③ EXISTING HMA SURFACE SHOULDER, 3/4"
- ④ STABILIZED SUB-BASE, 4"
- ⑤ EXISTING HMA SURFACE, 3/4"
- ⑥ EXISTING CRC PAVEMENT, 9"

- * 1.5% PAVEMENT CROSS SLOPE
- ** 4.0% SHOULDER CROSS SLOPE
- *** GRADING TO MATCH EXISTING FORESLOPE (1:5 AND VARIES)

PROPOSED

- ⑦ JPCP, 11" (TYP)
- ⑧ STABILIZED SUB-BASE, 4" (TYP)
- ⑨ AGGREGATE SUBGRADE IMPROVEMENT, 12" (TYP)
- ⑩ PIPE UNDERDRAINS SPECIAL, 4" (TYP)
- ⑪ SUBBASE GRANULAR MATERIAL, TYPE C (TYP)
- ⑫ PCP SHOULDER, 11" (TYP)
- ⑬ AGGREGATE SHOULDER (GRADING AND SHAPING)
- ⑭ SHOULDER RUMBLE STRIP

FILE NAME =	USER NAME = oyster_jo	DESIGNED -	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	TYPICAL SECTIONS JPCP				F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
p:\11\084EBIDINTEG\illinois.gov\PWIDOT\Documents\DOT Offices\District 3\Projects\0366B64\0366B64-shd-typical.dgn		CHECKED -	REVISED -		55	(53-5)R&I	LIVINGSTON						
PLOT SCALE = 100.0000' / in.		DATE - 02/10/16	REVISED -		CONTRACT NO. 66B64				ILLINOIS FED. AID PROJECT				
PLOT DATE = 7/25/2017					SCALE:	SHEET OF SHEETS	STA. TO STA.						