



Illinois Department of Transportation

To: Kevin Marchek Attn: Dave Broviak
From: Jack Elston By: Michael Brand *MDS*
Subject: Pavement Design Approval
Date: December 17, 2018

Route: FAP 326 (IL 47) Job No.: P-93-027-17
Section: [(32-3) HB-1]ES Contract No.: 66H15
County: Grundy Target Letting: FY 2021
Limits: just north of Northbrook Drive (south of the I-55 interchange) to the south abutment of SN 032-0110 (north of the I-55 interchange)

We have reviewed the pavement design for the above referenced project which was submitted on November 2, 2018. The scope of the project involves reconstruction of the 0.65 mile long, 4-lane section of pavement.

The pavement design resulted in two pavement options: 13.25" Full-Depth HMA and 10.25" PCC. The life-cycle cost analysis of those options resulted in the PCC pavement being 12.6% less expensive (\$155,933/mile compared to HMA's cost of \$175,594/mile).

In summary, the approved pavement design is as follows:

10.25" PCC Pavement w/ 10.25" tied PCC Shoulders
4" HMA Stabilized Subbase
12" Improved Subgrade

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



Illinois Department of Transportation

Memorandum

RECEIVED

NOV 9 2018

To: Jack Elston Attn: Mike Brand
From: Kevin Marchek By: Dave Broviak *DB*
Subject: Pavement Design Review * *DSA*
Date: November 2, 2018

BUREAU OF
DESIGN & ENVIRONMENT

* FAI 55 (I-55) & FAP 326 (IL 47)
Section [(32-3) HB-1]ES
Grundy County
Job No. P-93-027-17
Contract No. 66H15

Attached for approval is a pavement design for IL 47 from just north of the Northbrook Drive intersection to the south abutment of existing SN 032-0110 (just north of the I-55 interchange) approximately 0.65 mile. Project construction is currently programmed for FY 2021.

The design considered only Jointed Plain Concrete Pavement (JPCP) and Full-Depth HMA pavement options within the improvement limits. These options are the most practical in order to:

- Match interchange ramps at the I-55 interchange. No ramp improvement is scheduled with this contract.
- Transition pavements at the existing IL 47 at Northbrook Drive intersection, at the proposed interchange structure, and at the SN 032-0110 approach. The improvement limit is 0.65 mile.

10.25 inches of JPCP with an annual life-cycle cost per mile of \$155,933 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 12.6 percent less than 13.25 inches of full-depth HMA pavement (\$175,594). This proposed design includes removing the existing pavement and constructing 12 inches of improved subgrade, 4 inches stabilized sub-base, underdrains, and 10.25 inches of JPCP. The design is for four lanes and the estimated new pavement quantity is 18,789 square yards.

This project is not suitable for the alternative pavement bidding process because the life cycle cost difference for both the designs are more than 10 percent. Calculations to determine pavement thicknesses and life-cycle costs are attached. Electronic files have also been emailed for review. Based on the overall costs of the various options, potential recycling savings were not considered to be significant to the design.

Jack Elston, Attn: Mike Brand
Page Two
November 2, 2018

The pavements were designed using Chapter 54 of the Bureau of Design and Environment manual, current as of October 2018. The following facts and assumptions were used in the design:

- Jointed Plain Concrete Pavement constructed with tied shoulder.
- Design Traffic was based on 2028 projections.
- Design Period of 20 years.
- Poor sub-grade.
- PG grade 70-22 for top lift of binder and the surface course.
- PG 64-22 for the lower binder lifts.
- Overlay of rubblized pavement was not considered because laying HMA on rubblized pavement would raise the profile; hence, tying back into the existing ramps at the intersection at Northbrook Drive and the SN 038-0110 approach would be cost prohibitive. Additionally, the inspection of the existing pavement did not identify "D" cracking.
- Unbonded overlay was not considered due to the age and condition of the existing hot-mix asphalt overlay.

If you have any questions, please contact Jacob Oyier at (815) 434-8575.

JO:dld



Illinois Department of Transportation

Memorandum

To: Dave Broviak
From: Dave Alexander *DSA* By: Jacob Oyier
Subject: Pavement Design Approval Request *
Date: October 25, 2018

* FAI 55 (I-55) & FAP 326 (IL 47)
Section [(32-3) HB-1]ES
Grundy County
Job No. P-93-027-17
Phase I
Contract No. 66H15

Attached for review is a pavement design for IL 47 from just north of the Northbrook Drive intersection to the south abutment of existing SN 032-0110 (just north of the I-55 interchange), approximately 0.65 mile. Project construction is currently programmed for FY 2021. Please provide any comments to Jacob Oyier.

The design considered only Jointed Plain Concrete Pavement (JPCP) and Full-Depth HMA pavement options within the improvement limits. These options are the most practical in order to:

- Match interchange ramps at the I-55 interchange. No ramp improvement is scheduled with this contract.
- Transition pavements at existing IL 47 at the Northbrook Drive intersection and at the SN 032-0110 approach.

JPC is the preferred pavement type based on life cycle cost in the attached analysis. Construction of JPC pavement has a life cycle cost 12.6% less than 13.25 inches of Full Depth HMA pavement. This proposed design includes removing the existing pavement and constructing a 12" improved subgrade, 4" stabilized sub-base, underdrains, and 10.25 inches JPC pavement. The design is for four lanes and the estimated new pavement quantity is 18,789 square yards.

The pavement was designed using Chapter 54 of the Bureau of Design and Environment manual, current as of October 2018. The following facts and assumptions were used in the design:

- Jointed Plain Concrete Pavement constructed with tied shoulder.
- Design Traffic was based on 2031 projections.
- Design Period of 20 years.

- Poor sub-grade.
- PG grade 70-22 for top lift of binder and the surface course.
- PG 64-22 for the lower binder lifts.
- Overlay of rubblized pavement was not considered because laying HMA on rubblized pavement would raise the profile; hence, tying back into the existing ramps at the intersection at Northbrook Drive and the SN 038-0110 approach would be cost prohibitive. Additionally, the inspection of the existing pavement did not identify "D" cracking.
- Unbonded overlay was not considered due to the age and condition of the existing hot-mix asphalt overlay.



QC/QA Review



Date



Studies & Plans Engineer



Date



October 22, 2018
R1 - November 7, 2018

Mr. Kevin Marchek, PE
Region Two Engineer
Illinois Department of Transportation
District 3 / Program Development
700 E. Norris Drive
Ottawa, IL 61350

Attention: Mr. Jacob Oyier, PE

Subject: FAI 55 (IS5) FAP 326 (IL 47)
Section [(32-3) HB-1] ES
Grundy County
Contract No. 66H15
Revised Final Pavement Design

Dear Mr. Oyier,

As you have requested, attached is the revised final pavement design (R1) reflecting your comments emailed on November 2, 2018 for IL 47 from just north of the Northbrook Drive intersection to the south abutment of existing SN 032-0110 (just north of the I-55 interchange), which results in a total approximate length of 0.65 miles.

JPCP is the preferred pavement type based on the life cycle cost in the attached analysis. According to the revisions, construction of the JPCP pavement has a life cycle cost 12.6 percent less than the 13.25 inches of full depth HMA pavement. This proposed design includes removing the existing pavement and constructing a 12" improved subgrade, 4" stabilized subbase, underdrains and 10.25 inches of JPC pavement. The design is for four lanes and the estimated new pavement quantity is 18,789 square yards.

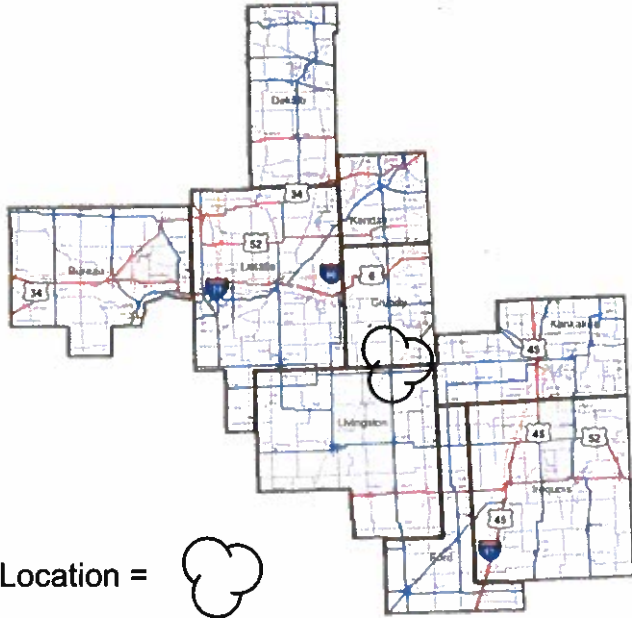
If you have any question, please do not hesitate to contact me.

Sincerely,

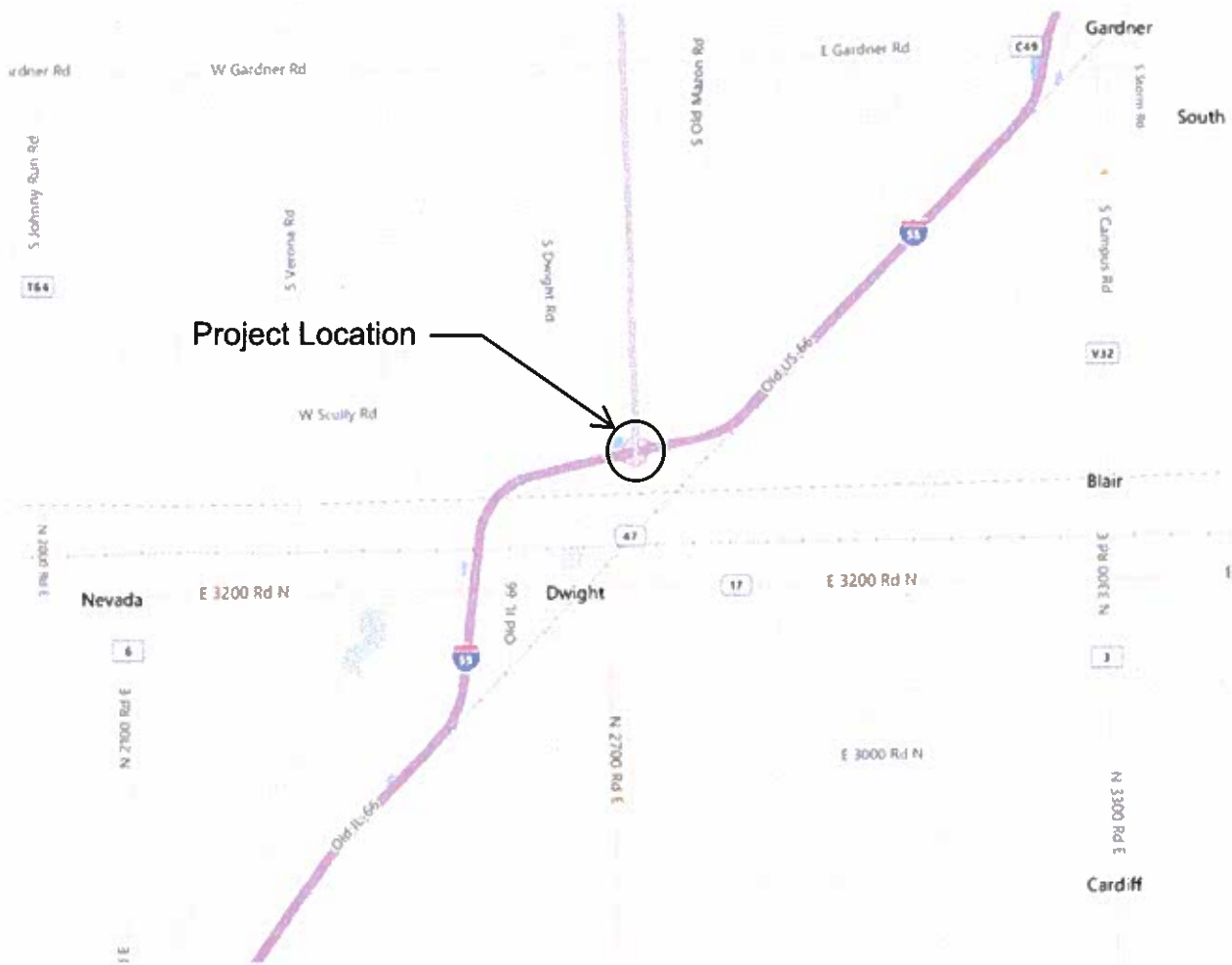
Magued Zaglama, PE, SE
Project Manager

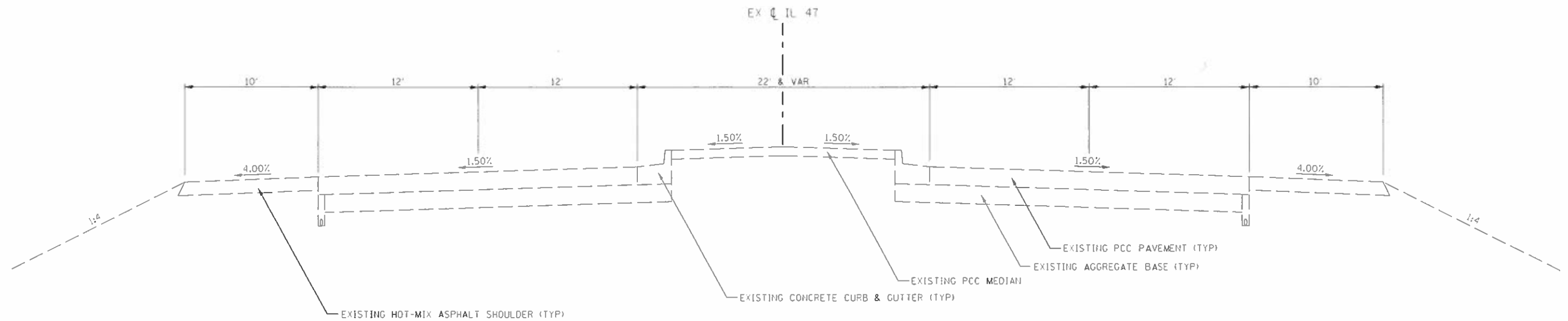
Project Location Map

FAP 326 (II 47)
Section [(32-3)HB-1]ES
Grundy County
Pavement Design
I-55/IL 47 Interchange in Dwight
Contract No. 66H15



Project Location = 





EXISTING TYPICAL SECTION
FAP 326 (IL 47)

MODEL: D:\dwg
FILE NAME: V:\3263 - I55 and IL 47 Interchange IB\dwg\DOT D3\CAO\CAO00 SP\SSA361\spkca01.dgn

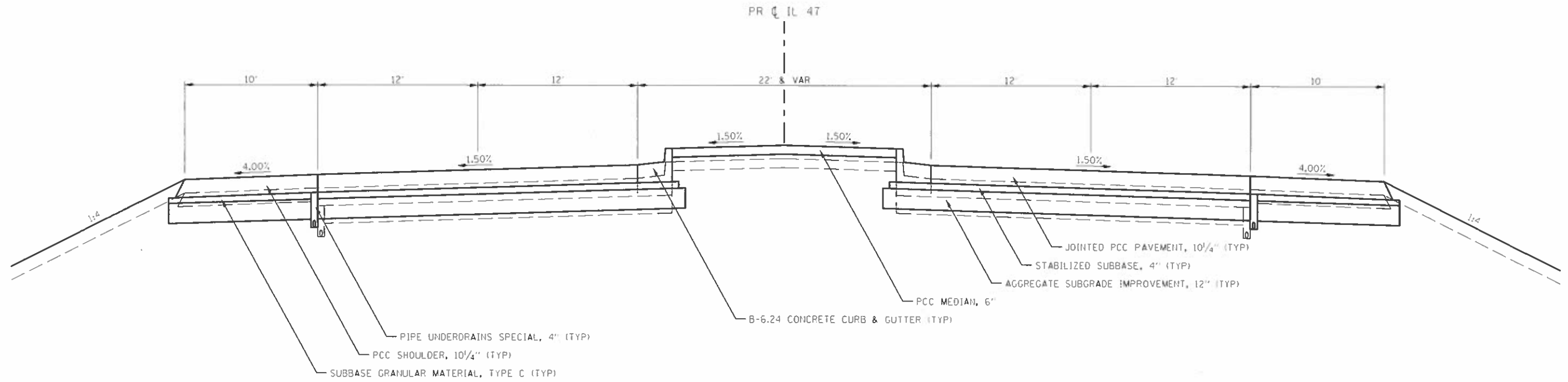
USER NAME	DESIGNED	REVISED
DRAWN	REVISION	
CHECKED	REVISION	
DATE	REVISION	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SCALE: N/A		SHEET 1 OF 1 SHEETS		STA. N/A TO STA. N/A	
------------	--	---------------------	--	----------------------	--

FAP 326 (IL 47)
EXISTING TYPICAL SECTION

RTE. NO.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326	[(32-3)HB-1]ES	GRUNDY		
CONTRACT NO.				
ILLINOIS FED. AID PROJECT				



PROPOSED JPCP TYPICAL SECTION
FAP 326 (IL 47)

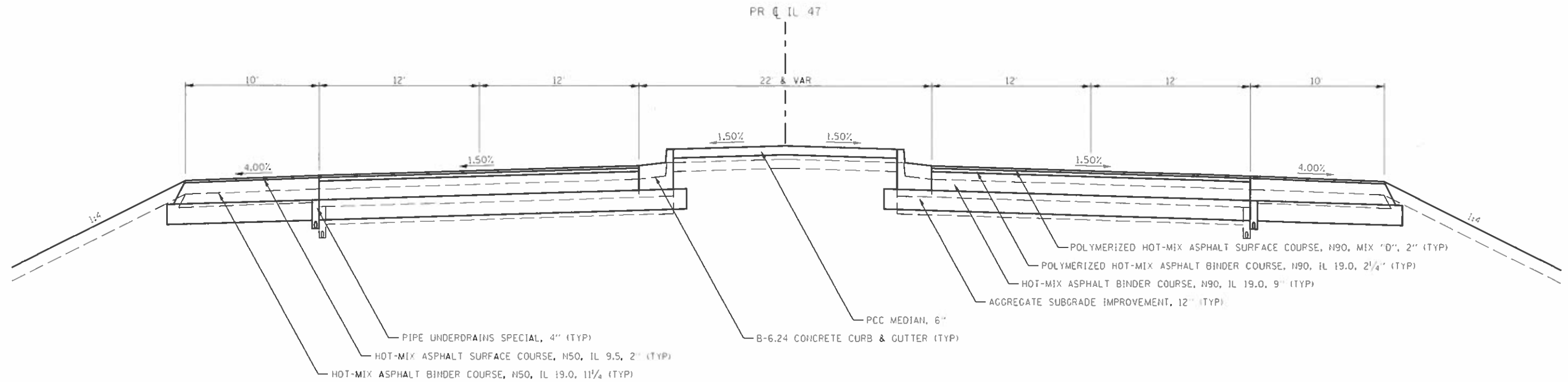
MODEL: Default
 FILE NAME: V:\43263 - I-55 and IL 47 Interchange (Bloomington) DOT D3INCADDICADD Sheets\383\ypcsh02.dgn

USER NAME = L7@ber	DESIGNED -	REVISED -
PLOT SCALE = 16.0000' / in.	DRAWN -	REVISED -
PLOT DATE = 8/28/2018	CHECKED -	REVISED -
	DATE -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

FAP 326 (IL 47)			
PROPOSED JPCP TYPICAL SECTION			
SCALE: N/A	SHEET 1	OF 1 SHEETS	STA. N/A TO STA. N/A

RTE. NO.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326	[(32-3)MB-1]ES	GRUNDY		
CONTRACT NO.				
ILLINOIS FED. AID PROJECT				



PROPOSED FULL DEPTH HMA TYPICAL SECTION
FAP 326 (IL 47)

MODEL: DELIWI
 FILE NAME: V:\4363 - 155 and IL 47 Interchange IBloom-DDT-D3\CAD\CADD Sheets\1363\363.dwg

USFR NAME = Zeller	DESIGNED -	REVISED -
	DRAWN -	REVISED -
PLOT SCALE = 16.0000' / 1"	CHECKED -	REVISED -
PLOT DATE = 10/19/2018	DATE -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

FAP 326 (IL 47)
PROPOSED FULL DEPTH HMA TYPICAL SECTION

SCALE: N/A | SHEET 1 OF 1 SHEETS | STA: N/A TO STA: N/A

RTE. NO. 326	SECTION [(32-3)MB-1]E5	COUNTY GRUNDY	TOTAL SHEETS	SHEET NO.
CONTRACT NO.				
ILLINOIS FED. AID PROJECT				

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: IL 47	Comments:	
Section:		
County: Grundy	Design Date: 06/27/18	LDZ <-- BY
Location: I-55/IL 47 Interchange in Dwight	Modify Date:	
Facility Type: Other Marked State Route		
# of Lanes = 4		
Road Class: I		
Subgrade Support Rating (SSR): Poor		
Construction Year: 2021		
Design Period (DP) = 20 years		

	ADT	Year
Current:	8,361	2018
Future:	14,053	2042

	Structural Design Traffic		
	Minimum ADT	Actual ADT	Actual % of Total ADT
PV =	0	7,439	65.0%
SU =	250	1,030	9.0%
MU =	750	2,976	26.0%
Struct. Design ADT =	11,444	(2031)	

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) = 14.16 (Actual ADT)	TF rigid (Actual) = 19.99 (Actual ADT)
TF flexible (Min) = 3.56 (Min ADT Fig. 54-2.C)	TF rigid (Min) = 5.02 (Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement		JPC Pavement	
Use TF flexible = 14.16		Use TF rigid = 19.99	
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)		Edge Support = Tied Shoulder or C.&G.	
HMA Mixture Temp. = 75.9 deg. F (Fig. 54-5.C)		Rigid Pavt. Thick. = 10.25 in. (Fig. 54-4.E)	
Design HMA Mixture Modulus (E _{HMA}) = 670 ksi (Fig. 54-5.D)			
Design HMA Strain (ε _{HMA}) = 56 (Fig. 54-5.E)			
Full Depth HMA Design Thickness = 13.25 in. (Fig. 54-5.F)		CRC Pavement	
Limiting Strain Criterion Thickness = 15.04 in. (Fig. 54-5.I)		Use TF rigid = 19.99	
Use Full-Depth HMA Thickness = 13.25 Inches		IBR value = 3	
		CRCP Thickness = 9.75 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 = 14.16		Review 54-4.03 for limitations and special considerations.	
HMA Overlay Design Thickness = 10.50 in. (Fig. 54-5.U)			
Limiting Strain Criterion Thickness = 10.88 in. (Fig. 54-5.V)			
Use HMA Overlay Thickness = 10.50 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)

	Min. Str. Design Traffic (Fig 54-2.C)		
Facility Type	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 Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
Class	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 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)					
	Rural			Urban		
Number of Lanes	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

Standard Design

ROUTE SECTION COUNTY LOCATION
 FAP 326 (IL 47)
 ((32-3)HB-1IES
 Grundy
 I-55/IL 47 Interchange in Dwight

FACILITY TYPE **NON-INTERSTATE**

PROJECT LENGTH **3523 FT ==>** 0.67 Miles
 # OF CENTERLINES **2 CL**
 # OF LANES **4 LANES**
 # OF EDGES **4 EP**
 LANE WIDTH - AVERAGE **12 FT**
 SHOULDER WIDTH HMA Inside **0 FT**
 HMA Outside **10 FT**
 Total Width of Paved Shoulders **20 FT**

Sh. = 7,829 sq yd

PAVEMENT THICKNESS (FLEXIBLE) **13.25 IN** **15.04 IN MAX**
 SHOULDER THICKNESS **13.25 IN** **Standard Design**
 POLICY OVERLAY THICKNESS **2.25 IN**

FLEX PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		3.56	14.16	14.16

HMA COST PER TON	UNIT PRICE
HMA SURFACE	\$101.12 / TON
HMA TOP BINDER	\$95.95 / TON
HMA LOWER BINDER	\$86.36 / TON
HMA BINDER (LEVELING)	\$85.00 / TON
HMA SHOULDER	\$79.48 / TON

Read Me!

OK
USE THESE PRICES
THE \$6.25 PRICE IS \$5.55 (NOT \$6.93)

INITIAL COSTS	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(13.25")	18,789	SQ YD	\$69.93 / SQ YD	\$1,313,870 -
HMA SURFACE COURSE	(2.00")	2,119	TONS	\$101.12 / TON	\$0
HMA TOP BINDER COURSE	(2.25")	2,419	TONS	\$95.95 / TON	\$0
HMA LOWER BINDER COURSE	(9.00")	10,045	TONS	\$86.36 / TON	\$0
HMA SHOULDER	(13.25")	5,809	TONS	\$79.48 / TON	\$461,702 -
CURB & GUTTER		0	LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C (TONS)		0	TONS	\$25.00 / TON	\$0
IMPROVED SUBGRADE: Aggregate		29,130	SQ YD	\$13.27 / SQ YD	\$386,555
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		0	SQ YD	\$0.00 / SQ YD	\$0
SHOULDER REMOVAL		0	SQ YD	\$0.00 / SQ YD	\$0

OK
PAVEMENT OVERLAY

Note: * Denotes User Supplied Quantity
 FLEXIBLE CONSTRUCTION INITIAL COST \$2,162,127
 FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE \$132,161

MAINTENANCE COSTS:	THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY			\$0.00 / LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	Surface Mix	\$11.40 / SQ YD
HMA OVERLAY PVMT	(2.25")	Surface Mix	\$12.15 / SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	\$8.54 / SQ YD
HMA BINDER MIX	(0.75")	Surface Binder Mix	\$3.62 / SQ YD
HMA OVERLAY SHLD (Year 30)	(2.25")	Shoulder Mix	\$10.01 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder Mix	\$8.90 / SQ YD
MILLING (2.00 IN)			\$2.75 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill Surf)		Surface Mix	\$81.08 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill Surf)		Shoulder Mix	\$78.65 / SQ YD

PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00")	Leveling Binder Mix	\$79.27 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00")	Shoulder Mix	\$78.65 / 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	\$2,872,668
FLEXIBLE TOTAL ANNUAL COST PER MILE	\$175,594

PCC PAVEMENT

JPCP

ROUTE FAP 326 (IL 47)
 SECTION ((32-3)HB-1)ES
 COUNTY Grundy
 LOCATION I-55/IL 47 Interchange In Dwight

FACILITY TYPE NON-INTERSTATE

PROJECT LENGTH 3523 FT ==> 0.67 Miles
 # OF CENTERLINES 2 CL
 # OF LANES 4 LANES
 # OF EDGES 4 EP
 LANE WIDTH - AVERAGE 12 FT
 SHOULDER WIDTH PCC Inside 0 FT
 PCC Outside 10 FT
 Total Width of Paved Shoulders 20 FT

PAVEMENT THICKNESS (RIGID) JPCP 10.25 IN TIED SHLD
 SHOULDER THICKNESS 10.25 IN

POLICY OVERLAY THICKNESS 2.50 IN

RIGID PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	5.02	19.99	19.99
Worksheet Construction Type is New Construction		The Pavement Type is	JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY UNIT	UNIT PRICE	COST
JPC PAVEMENT	(10.25")	18,789 SQ YD	\$52.85 / SQ YD	\$992,999
PAVEMENT REINFORCEMENT		0 SQ YD	\$22.00 / SQ YD	\$0
STABILIZED SUBBASE	(4.00")	21,138 SQ YD	\$18.00 / SQ YD	\$380,484
PCC SHOULDERS		7,829 SQ YD	\$44.01 / SQ YD	\$344,554
CURB & GUTTER		0 LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C		854 TONS	\$38.68 / TON	\$33,033
IMPROVED SUBGRADE: Aggregate		27,401 SQ YD	\$13.27 / SQ YD	\$363,611
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		0 SQ YD *	\$0.00 / SQ YD	\$0
SHOULDER REMOVAL		0 SQ YD *	\$0.00 / SQ YD	\$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST \$2,114,681
 RIGID CONSTRUCTION ANNUAL COST PER MILE \$129,261

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY			\$0.00 / LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")		
HMA POLICY OVERLAY PVMT	(2.50")		\$13.36 / SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	\$8.54 / SQ YD
HMA BINDER MIX	(1.00")	aling Binder Mix	\$4.83 / SQ YD
HMA POLICY OVERLAY SHLD	(2.50")	Shoulder Mix	\$11.13 / SQ YD
CLASS A PAVEMENT PATCHING			\$195.00 / SQ YD
CLASS B PAVEMENT PATCHING			\$210.00 / SQ YD
CLASS C SHOULDER PATCHING			\$116.00 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix	\$78.24 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")		Surface Mix	\$83.91 / 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 \$2,551,030
 RIGID TOTAL ANNUAL COST PER MILE \$155,933

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 8/28/18 3:35 PM

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	\$2,114,681	\$2,162,127
		ANNUAL COST PER MILE	\$129,261	\$132,161
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	\$436,349	\$710,541
		ANNUAL COST PER MILE	\$26,672	\$43,432
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	\$2,551,030	\$2,872,668
		ANNUAL COST PER MILE	\$155,933	\$175,594

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	----->	JPCP	\$155,933	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	HMA	\$175,594	12.6%

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE

10/19/18

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5							
	LONG SHLD JT R&S	100.00%	14,092	LIN FT	\$3.00	\$42,276	
	CNTR LINE JOINT R&S	100.00%	7,046	LIN FT	\$3.00	\$21,138	
	RNDM / THRM CRACK R&S	50.00%	7,751	LIN FT	\$3.00	\$23,253	
	PD PVMT PATCH M&F SURF	0.10%	19	SQ YD	\$81.08	\$1,540	
		PWF _n = 0.8626			PW = 0.8626 X	\$88,207	\$76,088
YEAR 10							
	LONG SHLD JT R&S	100.00%	14,092	LIN FT	\$3.00	\$42,276	
	CNTR LINE JOINT R&S	100.00%	7,046	LIN FT	\$3.00	\$21,138	
	RNDM / THRM CRACK R&S	50.00%	7,751	LIN FT	\$3.00	\$23,253	
	PD PVMT PATCH M&F SURF	0.50%	94	SQ YD	\$81.08	\$7,621	
		PWF _n = 0.7441			PW = 0.7441 X	\$94,288	\$70,159
YEAR 15							
	MILL PVMT & SHLD 2.00"	100.00%	26,618	SQ YD	\$2.75	\$73,200	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	188	SQ YD	\$79.27	\$14,903	
	HMA OVERLAY PVMT 2.00"	100.00%	18,789	SQ YD	\$11.40	\$214,275	
	HMA OVERLAY SHLD 2.00 "	100.00%	7,829	SQ YD	\$8.90	\$69,691	
		PWF _n = 0.6419			PW = 0.6419 X	\$372,069	\$238,817
YEAR 20							
	LONG SHLD JT R&S	100.00%	14,092	LIN FT	\$3.00	\$42,276	
	CNTR LINE JOINT R&S	100.00%	7,046	LIN FT	\$3.00	\$21,138	
	RNDM / THRM CRACK R&S	50.00%	7,751	LIN FT	\$3.00	\$23,253	
	PD PVMT PATCH M&F SURF	0.10%	19	SQ YD	\$81.08	\$1,540	
		PWF _n = 0.5537			PW = 0.5537 X	\$88,207	\$48,838
YEAR 25							
	LONG SHLD JT R&S	100.00%	14,092	LIN FT	\$3.00	\$42,276	
	CNTR LINE JOINT R&S	100.00%	7,046	LIN FT	\$3.00	\$21,138	
	RNDM / THRM CRACK R&S	50.00%	7,751	LIN FT	\$3.00	\$23,253	
	PD PVMT PATCH M&F SURF	0.50%	94	SQ YD	\$81.08	\$7,621	
		PWF _n = 0.4776			PW = 0.4776 X	\$94,288	\$45,032
HMA SD							
YEAR 30 NON-INTERSTATE							
	MILL PVMT & SHLD 2.00"	100.00%	26,618	SQ YD	\$2.75	\$73,200	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	376	SQ YD	\$79.27	\$29,806	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	78	SQ YD	\$78.65	\$6,135	
	HMA OVERLAY PVMT 2.25 "	100.00%	18,789	SQ YD	\$12.15	\$228,381	
	HMA OVERLAY SHLD 2.25 "	100.00%	7,829	SQ YD	\$10.01	\$78,402	
		PWF _n = 0.4120			PW = 0.4120 X	\$415,924	\$171,355
YEAR 35							
	LONG SHLD JT R&S	100.00%	14,092	LIN FT	\$3.00	\$42,276	
	CNTR LINE JOINT R&S	100.00%	7,046	LIN FT	\$3.00	\$21,138	
	RNDM / THRM CRACK R&S	50.00%	7,751	LIN FT	\$3.00	\$23,253	
	PD PVMT PATCH M&F SURF	0.10%	19	SQ YD	\$81.08	\$1,540	
		PWF _n = 0.3554			PW = 0.3554 X	\$88,207	\$31,347
YEAR 40							
	LONG SHLD JT R&S	100.00%	14,092	LIN FT	\$3.00	\$42,276	
	CNTR LINE JOINT R&S	100.00%	7,046	LIN FT	\$3.00	\$21,138	
	RNDM / THRM CRACK R&S	50.00%	7,751	LIN FT	\$3.00	\$23,253	
	PD PVMT PATCH M&F SURF	0.50%	94	SQ YD	\$81.08	\$7,621	
		PWF _n = 0.3066			PW = 0.3066 X	\$94,288	\$28,905
							\$710,541
ROUTINE MAINTENANCE ACTIVITY				2.67 Lane Miles	0.00	\$0	\$0
							MAINTENANCE LIFE-CYCLE COST \$710,541
45	YEAR LIFE CYCLE	CRF _n = 0.0407852				MAINTENANCE ANNUAL COST PER MILE	\$43,432

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE

10/19/18

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%	19	SQ YD	\$210.00	\$3,990	
		PWF _n = 0.7441			PW = 0.7441 X	\$3,990	\$2,969
YEAR 15							
	PAVEMENT PATCH CLASS B	0.20%	38	SQ YD	\$210.00	\$7,980	
		PWF _n = 0.6419			PW = 0.6419 X	\$7,980	\$5,122
YEAR 20							
	PAVEMENT PATCH CLASS B	2.00%	376	SQ YD	\$210.00	\$78,960	
	SHOULDER PATCH CLASS C	0.50%	39	SQ YD	\$116.00	\$4,524	
	LONGITUDINAL SHLD JT R&S	100.00%	14,092	LIN FT	\$3.00	\$42,276	
	CENTERLINE JT R&S	100.00%	7,046	LIN FT	\$3.00	\$21,138	
		PWF _n = 0.5537			PW = 0.5537 X	\$146,898	\$81,334
YEAR 25							
	PAVEMENT PATCH CLASS B	3.00%	564	SQ YD	\$210.00	\$118,440	
	SHOULDER PATCH CLASS C	1.00%	78	SQ YD	\$116.00	\$9,048	
		PWF _n = 0.4776			PW = 0.4776 X	\$127,488	\$60,889
YEAR 30 NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	752	SQ YD	\$210.00	\$157,920	
	SHOULDER PATCH CLASS C	1.50%	117	SQ YD	\$116.00	\$13,572	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	18,789	SQ YD	\$13.36	\$251,109	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	7,829	SQ YD	\$11.13	\$87,114	
		PWF _n = 0.4120			PW = 0.4120 X	\$509,715	\$209,996
YEAR 35 NON-INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	14,092	LIN FT	\$3.00	\$42,276	
	CENTERLINE JT R&S	100.00%	7,046	LIN FT	\$3.00	\$21,138	
	RANDOM CRACK R&S	50.00%	7,046	LIN FT	\$3.00	\$21,138	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	4,512	LIN FT	\$3.00	\$13,536	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	19	SQ YD	\$83.91	\$1,594	
		PWF _n = 0.3554			PW = 0.3554 X	\$99,682	\$35,425
YEAR 40 NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	94	SQ YD	\$210.00	\$19,740	
	LONGITUDINAL SHLD JT R&S	100.00%	14,092	LIN FT	\$3.00	\$42,276	
	CENTERLINE JT R&S	100.00%	7,046	LIN FT	\$3.00	\$21,138	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	6,768	LIN FT	\$3.00	\$20,304	
	RANDOM CRACK R&S	50.00%	7,046	LIN FT	\$3.00	\$21,138	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	94	SQ YD	\$83.91	\$7,887	
		PWF _n = 0.3066			PW = 0.3066 X	\$132,483	\$40,614
							\$436,349
	ROUTINE MAINTENANCE ACTIVITY		2.67	Lane Miles	\$0.00	\$0	\$0
							MAINTENANCE LIFE-CYCLE COST \$436,349
45	YEAR LIFE CYCLE	CRF _n = 0.0407852					MAINTENANCE ANNUAL COST PER MILE \$26,672