



Illinois Department of Transportation

Memorandum

To:	Jose Dominguez	Attn: Ojas Patel
From:	LaDonna R. Rowden	By: Charles Wienrank
Subject:	Pavement Design Approval	
Date:	June 30, 2022	

Route: US 41
Contract No.: 62L32
County: Lake
Location: at IL 176

The Pavement Selection Committee met on June 15, 2022, to review the pavement designs for the above referenced project. The scope of the project is as follows:

US 41 – Reconstruction to increase the vertical clearance at the IL 176 structure. Increase the lengths of deceleration lanes and provide acceleration lanes.

IL 176 (West of IL 43 to east of US 41) and IL 43 - Reconstruction to provide additional turn lanes. Widening and Resurfacing at the east project limits.

Washington Ave/Shagbark Rd/Skokie Valley Rd/Access Rd –Reconstruction of existing roadways to/from IL 176 and construction of a new access road to provide access to US 41 due to the closure of the east frontage road.

The life-cycle cost analysis for US 41 favored full-depth hot-mix asphalt (HMA) pavement over jointed plain concrete pavement (JPCP) by more than 10%. The life-cycle cost analysis for Washington Ave/Shagbark Rd/Skokie Valley Rd/Access Rd. did not favor either pavement type by more than 10%. However, the district prefers HMA since the life-cycle cost analysis favors HMA pavement by 6.8% and it would match the existing pavement type. The Committee agreed with the district's recommendation.

IL 176 and IL 43 are considered high-stress segments since the design lane MU ADT exceeds 200 vehicles at the IL 176/IL 43 intersection and at others along IL 176. Therefore, the pavement designs will be classified as special designs per BDE Figure 54-1.A. A mechanistic-flexible pavement design is recommended for consistency and ease of future maintenance as the surrounding roadway network is HMA surfaced.

J. Dominguez
June 30, 2022
Page 2

The approved pavement designs for the project are as follows:

US 41

13.75" Full-Depth HMA
12" Aggregate Subgrade Improvement

IL 176

10.5" Full-Depth HMA
12" Aggregate Subgrade Improvement

IL 43

9.75" Full-Depth HMA
12" Aggregate Subgrade Improvement

Washington Ave. / Shagbark Rd / Skokie Valley Rd / E. Access Road

9.5" Full-Depth HMA
12" Aggregate Subgrade Improvement

If you have any questions, please contact Charles Wienrank at (217) 782-0570.

CW:pk

cc: John Senger



Illinois Department of Transportation

Memorandum

To: LaDonna Rowden Attn: Charles Wienrank
From: Jose Dominguez By: Ojas Patel
Subject: Pavement Analysis* Date: May 25, 2022

*Route: US 41 Contract No.: 62L32
Limits: at IL 176 Job No.: P-91-874-09
Section: 2020-144-W&R Current target: 06CY23
County: Lake

We have completed the pavement analysis for the above captioned location. Review by the Central Office is required since the total pavement area for reconstruction/widening exceeds 4,750 Square Yards. The following is the scope of the project:

US 41 – Reconstruction to increase the vertical clearance at the IL 176 structure. Increase the lengths of deceleration lanes and provide acceleration lanes.

IL 176 (West of IL 43 to east of US 41) and IL 43 - Reconstruction to provide additional turn lanes. Widening and Resurfacing at the east project limits.

Washington Ave/Shagbark Rd/Skokie Valley Rd/Access Rd – Reconstruction of existing roadways to/from IL 176 and construction of a new access road to provide access to US 41 due to the closure of the east frontage road.

A 20-year pavement analysis was performed on the above segments. We recommend a mechanistic-flexible pavement design for US 41 as the life cycle cost analysis favors HMA pavement by 12.5%. The life cycle cost analysis for Washington Ave/Shagbark Rd/Skokie Valley Rd/Access Rd does not favor either pavement by more than 10%. However, since the scope of work of the project is “less than 2 lane-miles in length” an alternate bid does not need to be considered according to the BDE Manual 54-1.04. A mechanistic flexible pavement design is recommended since the life cycle cost analysis does favor HMA pavement by 6.8% and also matches the existing pavement type.

IL 176 and IL 43 are considered “High Stress” segments since the design lane MU ADT exceeds 200 vehicles. As such, this pavement design will be classified as a “Special Design” per BDE Figure 54-1.A. A mechanistic-flexible pavement design is recommended for consistency and ease of future maintenance as the surrounding roadway network is HMA surfaced. The recommended pavement is:

US 41

Reconstruction¹⁰

HMA Shoulder

13 ¾" Full Depth HMA

2" Polymerized HMA Surface Course, SMA, 9.5, Mix "F", N80¹

2 ¼" Polymerized HMA Binder Course, IL-19.0, N90²

9 ½" HMA Base Course, IL-19.0, N90³

12" Aggregate Subgrade Improvement⁹

IL 176

Reconstruction¹⁰

PCC Curb and Gutter/Portions Shoulder

10 ½" Full Depth HMA

2" Polymerized HMA Surface Course, SMA, 9.5, Mix "F", N80¹

2 ¼" Polymerized HMA Binder Course, IL-19.0, N90²

6 ¼" HMA Base Course, IL-19.0, N90⁴

12" Aggregate Subgrade Improvement⁹

IL 176 (Sta. 133+66 to 138+27)

Widening¹⁰

PCC Curb and Gutter/ HMA Shoulder

10 ½" Full Depth HMA

2" Polymerized HMA Surface Course, SMA, 9.5, Mix "F", N80¹

8 ½" HMA Base Course, IL-19.0, N90⁵

12" Aggregate Subgrade Improvement⁹

IL 176 Resurfacing¹⁰

Cold Milling of HMA Pavement

2" minimum (more if necessary)

2" Polymerized HMA Surface Course, SMA, 9.5, Mix "F", N80¹

IL 43

Reconstruction¹⁰

PCC Curb and Gutter/Portions Shoulder

9 ¾" Full Depth HMA

2" Polymerized HMA Surface Course, SMA, 9.5, Mix "F", N80¹

2 ¼" Polymerized HMA Binder Course, IL-19.0, N90²

5 ½" HMA Base Course, IL-19.0, N90⁶

12" Aggregate Subgrade Improvement⁹

Washington Ave. / Shagbark Rd / Skokie Valley Rd / E. Access Road

Reconstruction¹⁰

PCC Curb and Gutter

9 ½" Full Depth HMA

2" HMA Surface Course, Mix "D", IL 9.5, N70⁷

7 ½" HMA Base Course, IL-19.0, N70⁸

12" Aggregate Subgrade Improvement⁹

¹Designer Note 1: Use pay item **40605026, POLYMERIZED HOT-MIX ASPHALT SURFACE COURSE, SMA, 9.5, Mix "F", N80** paid for in tons.

²Designer Note 2: Use pay item **40603240, POLYMERIZED HMA BINDER COURSE, IL-19.0, N90** paid for in tons.

³Designer Note 3: Use pay item **35501322, HOT-MIX ASPHALT BASE COURSE, 9 1/2"**, paid for in square yards.

⁴Designer Note 4: Use pay item **35501309, HOT-MIX ASPHALT BASE COURSE, 6 1/4"**, paid for in square yards.

⁵Designer Note 5: For widening of six feet or less use pay item **35600710 HOT-MIX ASPHALT BASE COURSE WIDENING, 8 1/2"** paid for in square yards. For widening of greater than six feet use pay item **35501318 HOT-MIX ASPHALT BASE COURSE, 8 1/2"** paid for in square yards.

⁶Designer Note 6: Use pay item **35501306, HOT-MIX ASPHALT BASE COURSE, 5 1/2"**, paid for in square yards.

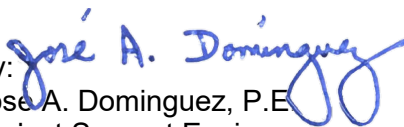
⁷Designer Note 7: Use pay item **40604062, HMA SURFACE COURSE, MIX D, IL-9.5, N70** paid for in tons.

⁸Designer Note 8: Use pay item **35501314, HOT-MIX ASPHALT BASE COURSE, 7 1/2"**, paid for in square yards.

⁹Designer Note 9: Use pay item **30300112, AGGREGATE SUBGRADE IMPROVEMENT, 12"** paid for in square yards.

¹⁰Designer Note 10: Refer to the District One, Bureau of Materials' "Hot-Mix Asphalt – Mix Selection" tables to determine the corresponding HMA mix table requirements for the plans.

If you have any questions or need additional information, please contact Ojas Patel, Pavement Engineer, at (847) 705-4550.

By: 
José A. Dominguez, P.E.
Project Support Engineer

Scope of Proposed Work

US 41 at IL 176 Proposed Improvements

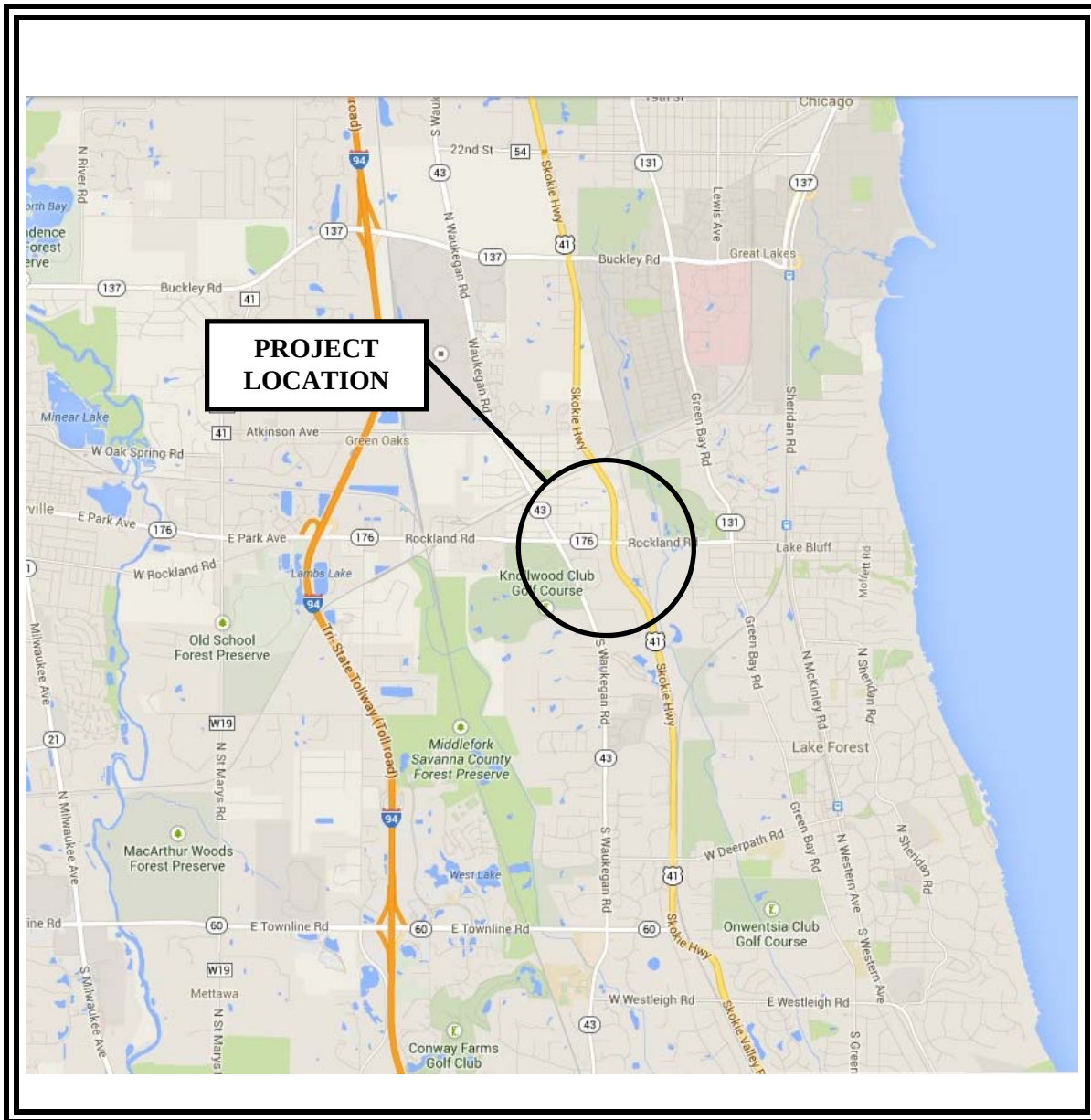
This project is composed of improvements to the existing interchange configuration to improve safety, reduce congestion, and improve mobility. The improvements include acceleration and deceleration lanes to and from U.S. Route 41; elevation adjustments to U.S. Route 41 to increase vertical clearance and sight distances; improved US 41 intersections at West Washington Avenue to properly accommodate all vehicles and eliminate confusing operations; widening of Skokie Valley Road and Shagbark Road; additional through lanes and turn lanes at the signalized Illinois Route 176 and Illinois Route 43, Shagbark Road; and Skokie Valley Road intersections; and traffic signal modernization.

The project will substantially improve the existing roadways as follows:

- **New Pavement** - The new construction will provide new pavement, thus improving the driving surface compared to the existing pavement.
- **Deceleration/Acceleration Lanes** – Lengths of existing deceleration lanes will be increased and acceleration lanes will be added on U.S. Route 41 at the West Washington Avenue intersections, increasing safety and increasing operational performance. Increasing the length of existing deceleration lanes and adding acceleration lanes will require removal of the existing unnamed frontage roads located within the northwest and northeast quadrants of U.S. Route 41 at Illinois Route 176 and the removal of the unnamed frontage road within the IDOT right-of-way on the east side of U.S. Route 41 north of West Washington Avenue.
- **Reestablishing Access Control** – Removal of the unnamed access road located east of U.S. Route 41 and north of West Washington Avenue reestablishes access control along U.S. Route 41.
- **Additional Capacity** - One additional through lane in each direction will be added to Illinois Route 176 between Illinois Route 43 and Skokie Valley Road.
- **Auxiliary Turn Lanes** - Additional auxiliary turn lanes to create better capacity, increasing safety, and increasing operational performance at the following intersections: Illinois Route 176 at Illinois Route 43; Illinois Route 176 at Clover Lane; Illinois Route 176 at Shagbark Road; Illinois Route 176 at Skokie Valley Road; Illinois Route 43 at Carriage Park Avenue; and Illinois Route 43 at West Washington Avenue.
- **Profile Adjustments** - Lowering the profile of U.S. Route 41 at the Illinois Route 176 underpass to increase and improve vertical clearance and sight distance, and increase safety.
- **Shifting the concrete median barrier and wider median shoulders on the outside of the horizontal curve** – Shifting the concrete median barrier and providing wider median shoulders varying from 9.5 feet to 28.6 feet in width on the outside of the horizontal curves improves sight distance for northbound vehicles north of West Washington Avenue and southbound vehicles south of Illinois Route 176.

- New Access Road – Removal of the existing frontage road on the east side of U.S. Route 41 north of West Washington Avenue requires a new access road consisting of an extension of West Washington Avenue to the east which then curves north along the Union Railroad right-of-way, which re-establishes access to the By The Way Motel, Rockland Mobile Home Park, and other businesses located north of West Washington Avenue.
- Drainage - Utilizing the existing storm sewer system with extensions and adjustment of existing drainage structures; regrading/reestablishing existing ditches and swales; regrading/reestablishing/maintaining existing outlets; maintaining/replacing existing cross road culverts and construction of new cross road culverts; construction of new storm sewers; construction of new ditches; providing stormwater detention with a detention pond and Illinois Route 176 and oversized storm sewers; reconstruct Pump Station 37 and improvements to Pump Station 41.
- Pedestrian and Bicycle Accommodations - The proposed improvement includes new and relocated sidewalk; relocated North Shore Bike Path and Lake Forest Bike Path to accommodate roadway widening; and new multi-use path along the west side of Illinois Route 43 north of Illinois Route 176 to the north project limits.

REGIONAL LOCATION MAP



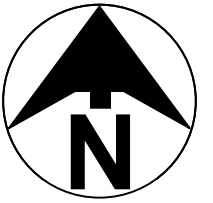
Route: U.S. Route 41
Limits: At Illinois Route 176
County: Lake

D-91-451-20





Roadway
Reconstruction
Limit,(TYP)



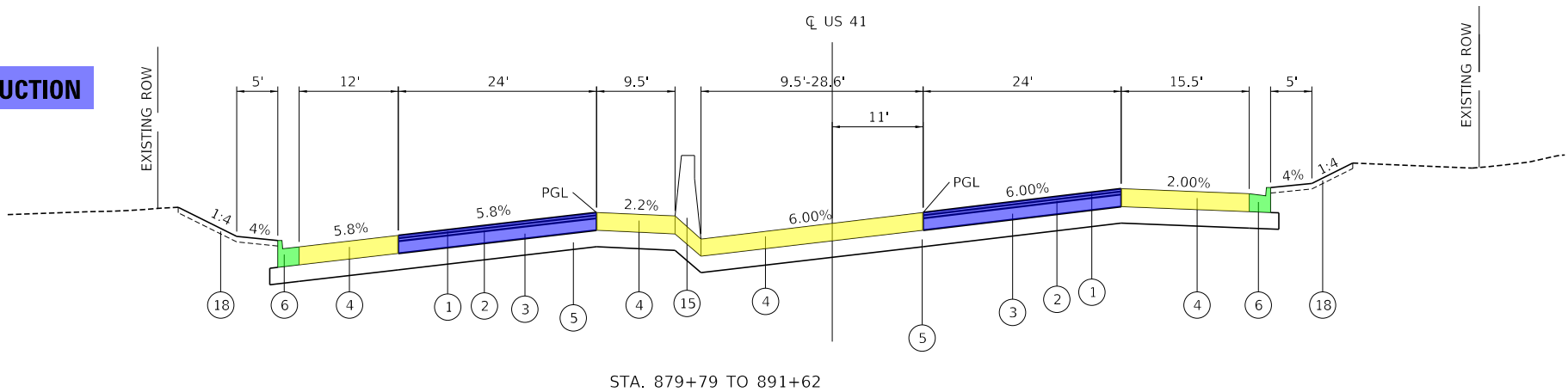
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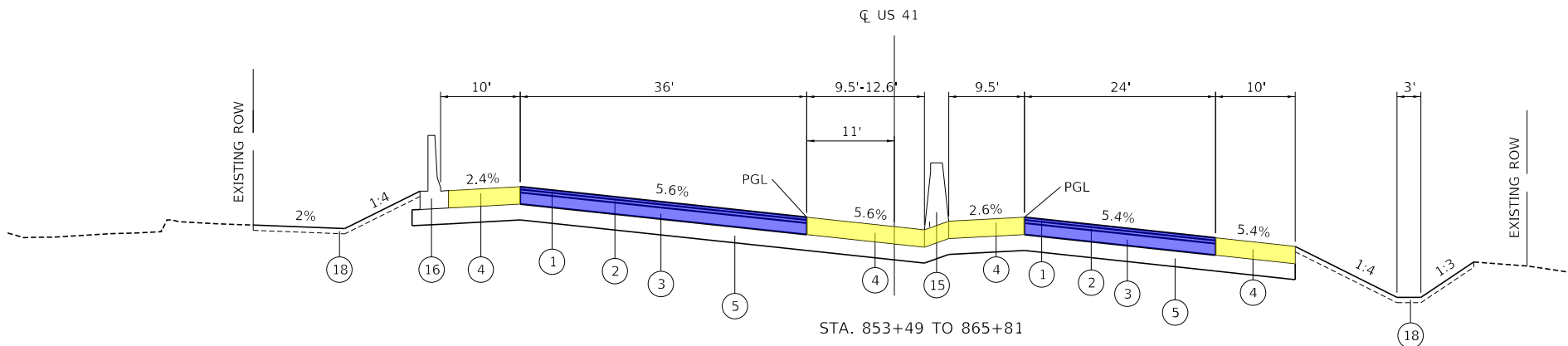
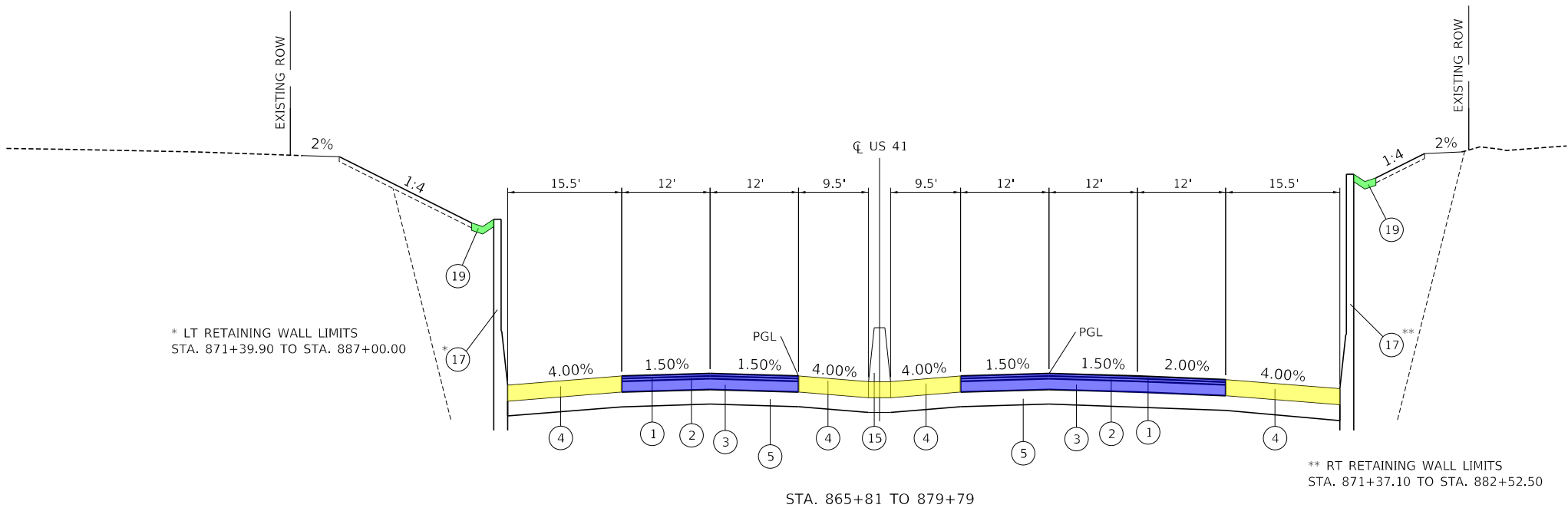
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CURB AND GUTTER

PAVED MEDIAN



PROPOSED LEGEND T.B.D.



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200 S. WACKER DR.
SUITE 1400
CHICAGO, IL 60606
TEL: 312-777-2900

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**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

**US ROUTE 41 AT IL ROUTE 176 INTERCHANGE
PAVEMENT DESIGN TYPICALS - US 41**

SCALE: N/A SHEET 1 OF 6 SHEETS STA. TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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CONTRACT NO. 62L32				
ILLINOIS FED. AID PROJECT				

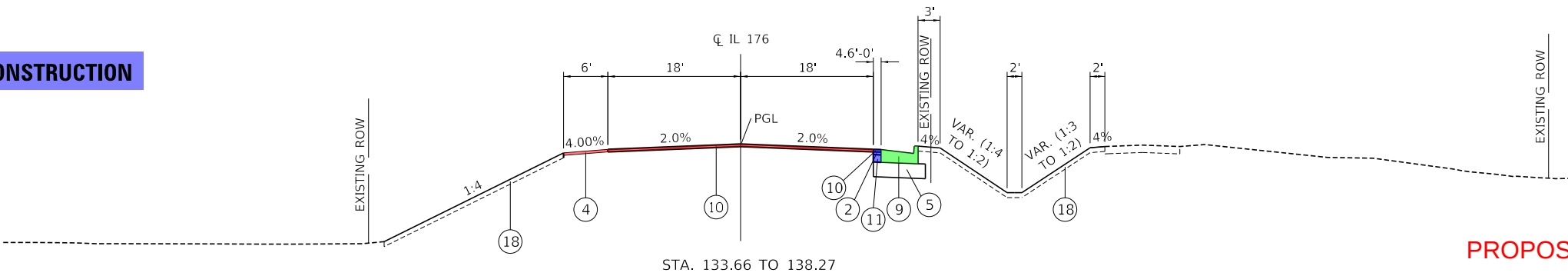
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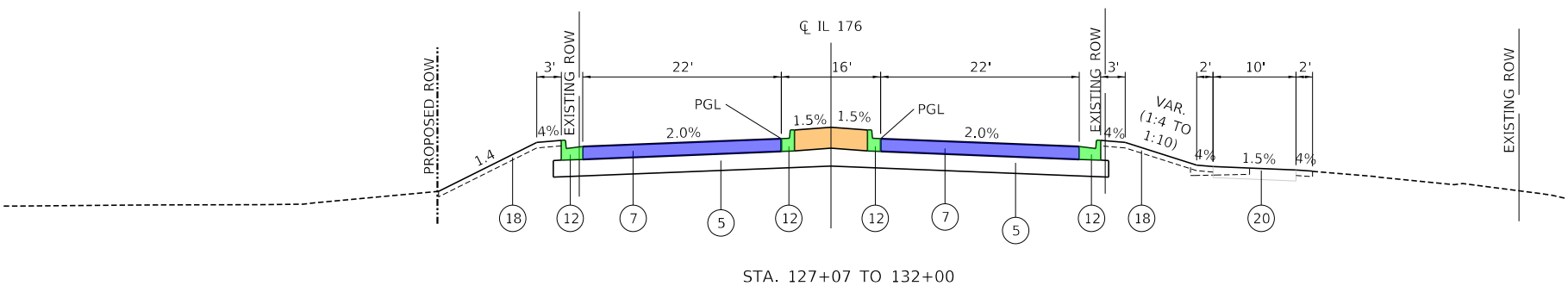
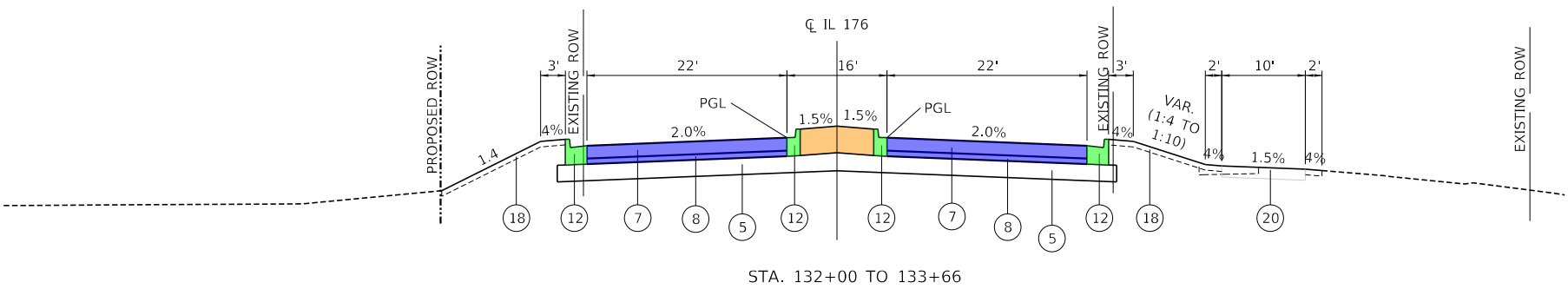
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CURB AND GUTTER

PAVED MEDIAN



PROPOSED LEGEND T.B.D.



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**STATE OF ILLINOIS
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**US ROUTE 41 AT IL ROUTE 176 INTERCHANGE
PAVEMENT DESIGN TYPICALS - IL 176**

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F.A.U RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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CONTRACT NO. 62L32				
ILLINOIS FED. AID PROJECT				

PAVEMENT RESURFACING

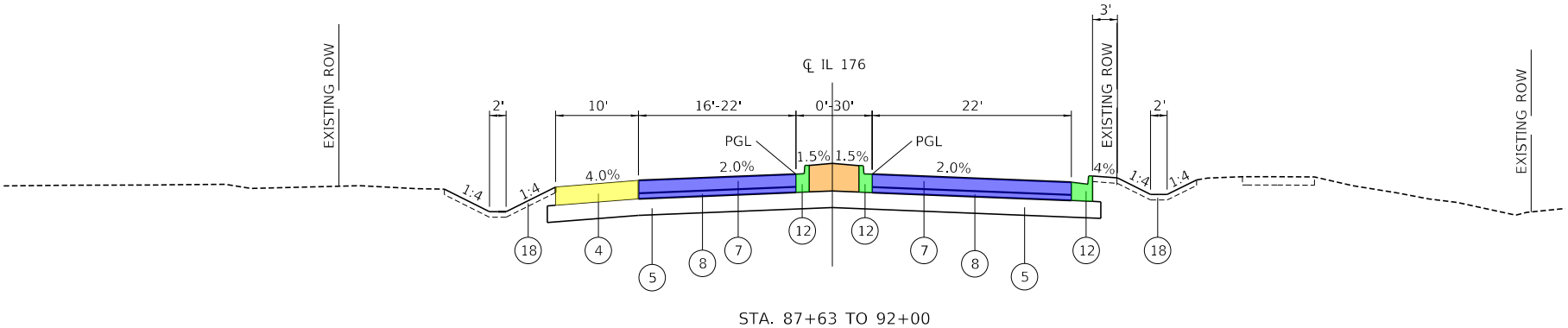
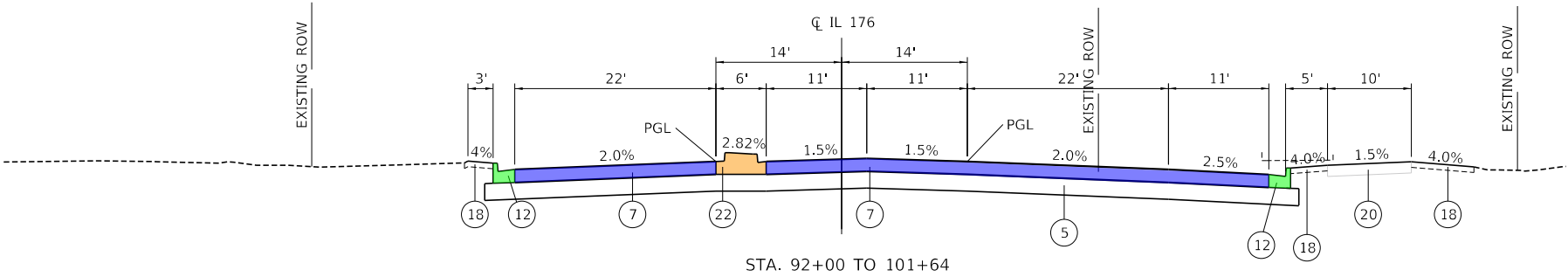
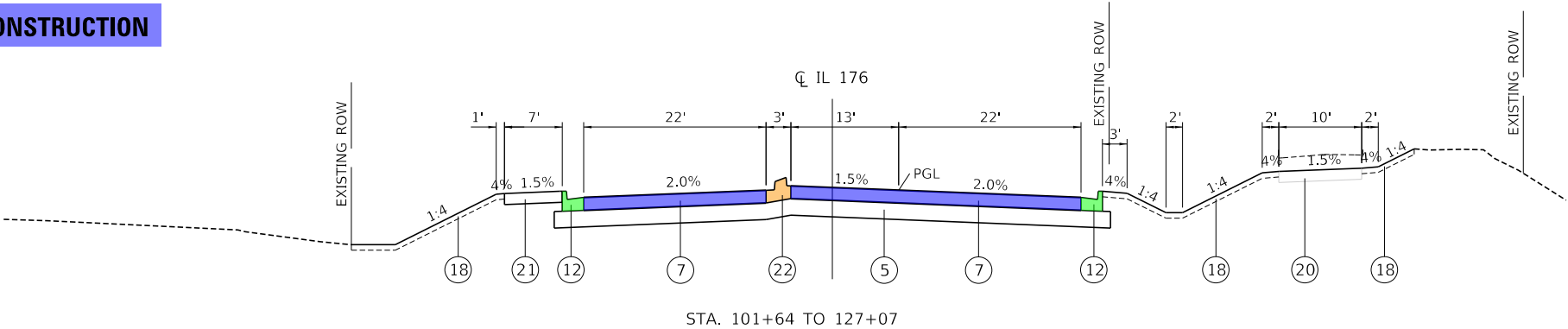
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PAVED SHOULDER

CURB AND GUTTER

PAVED MEDIAN

PROPOSED LEGEND T.B.D.



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**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

**US ROUTE 41 AT IL ROUTE 176 INTERCHANGE
PAVEMENT DESIGN TYPICALS - IL 176**

SCALE: N/A SHEET 3 OF 6 SHEETS STA. TO STA.

F.A.U RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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CONTRACT NO. 62L32				
ILLINOIS FED. AID PROJECT				

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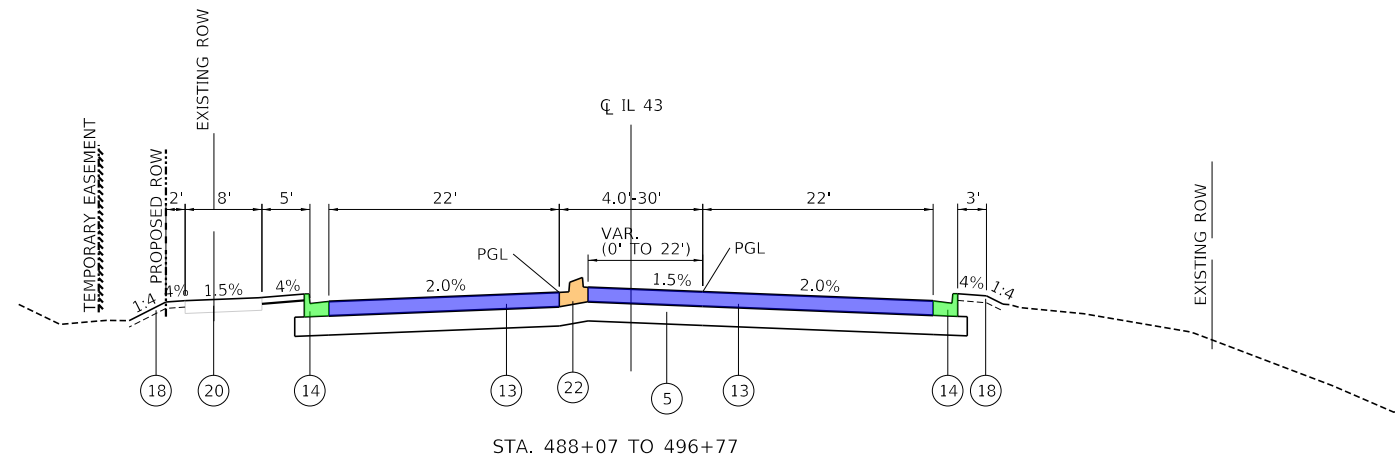
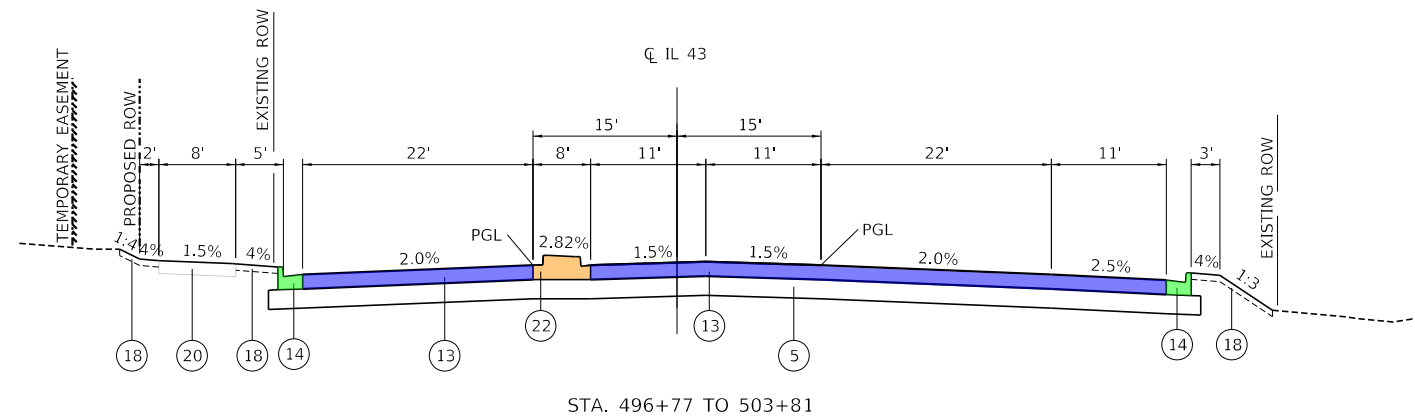
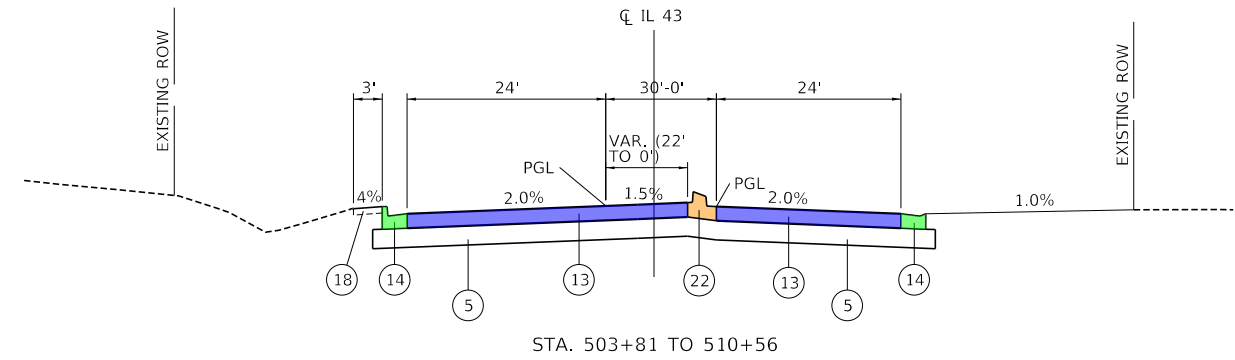
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CURB AND GUTTER

PAVED MEDIAN

PROPOSED LEGEND T.B.D.



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DATE	10/19/2021

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**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

**US ROUTE 41 AT IL ROUTE 176 INTERCHANGE
PAVEMENT DESIGN TYPICALS - IL 43**

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F.A.U RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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ILLINOIS FED. AID PROJECT				

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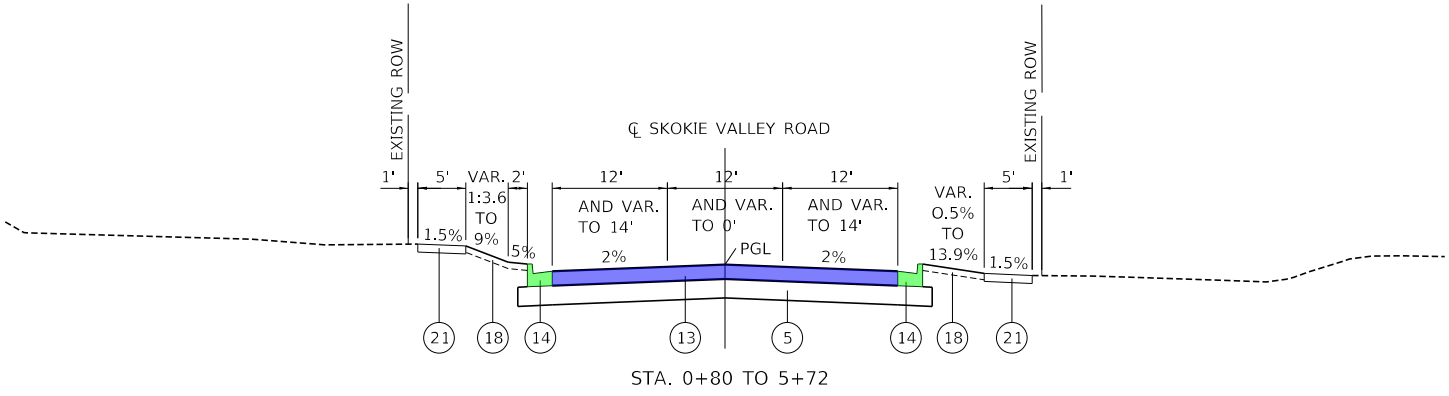
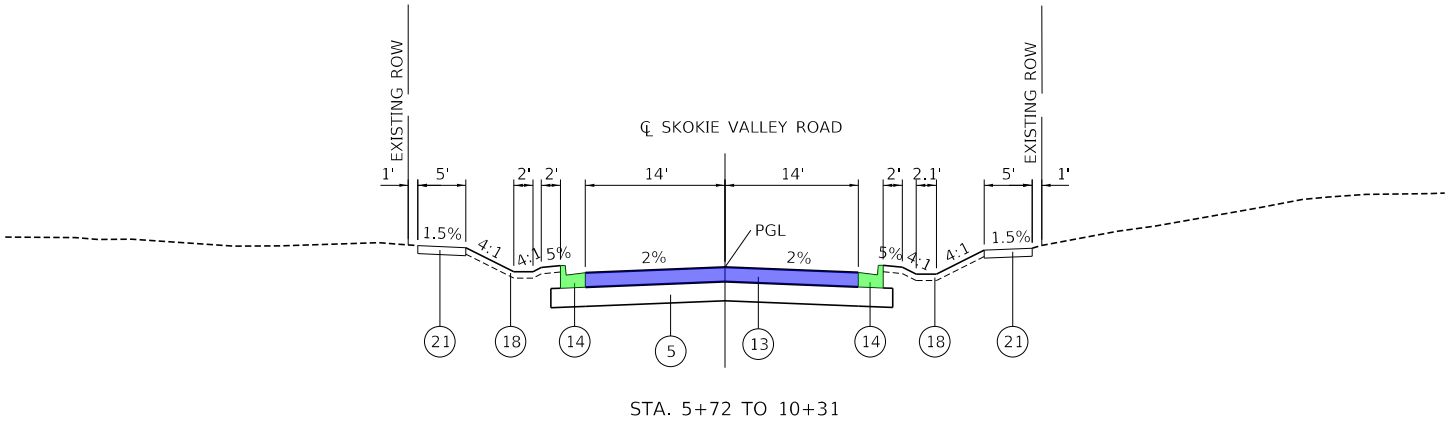
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PROPOSED LEGEND T.B.D.



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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

US ROUTE 41 AT IL ROUTE 176 INTERCHANGE
PAVEMENT DESIGN TYPICALS – SKOKIE VALLEY RD

SCALE: N/A SHEET 5 OF 6 SHEETS STA. TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
346	2020-144-W&R	LAKE		
CONTRACT NO. 62L32				
ILLINOIS FED. AID PROJECT				

PAVEMENT RESURFACING

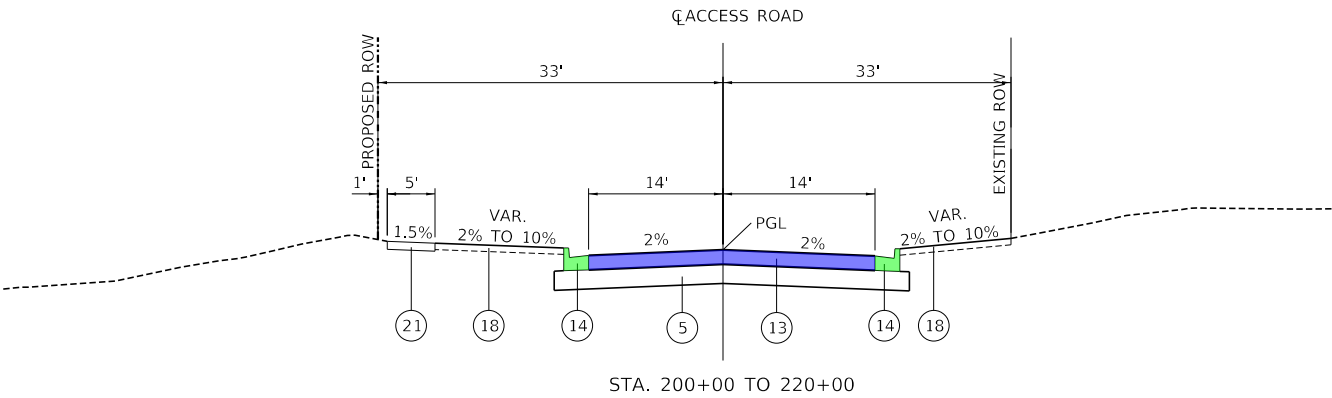
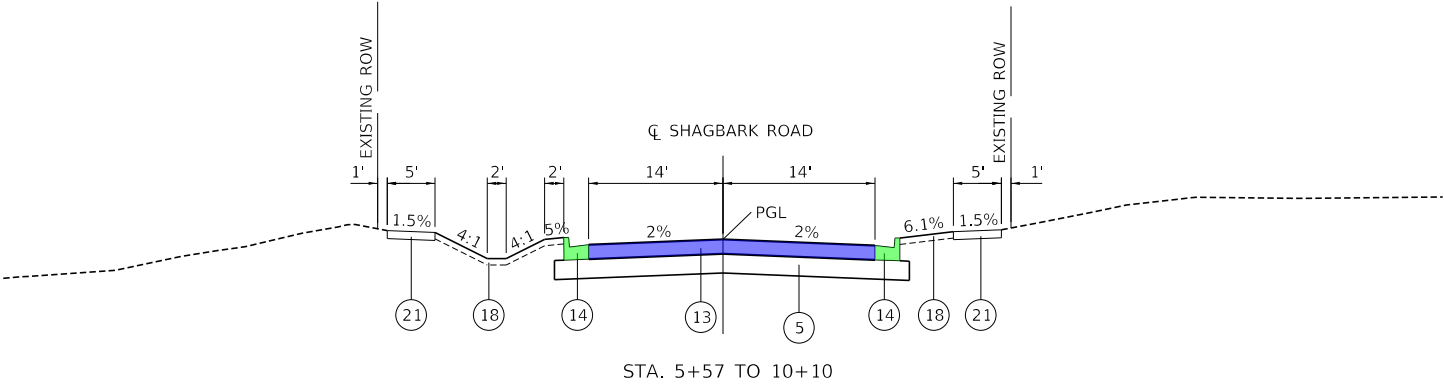
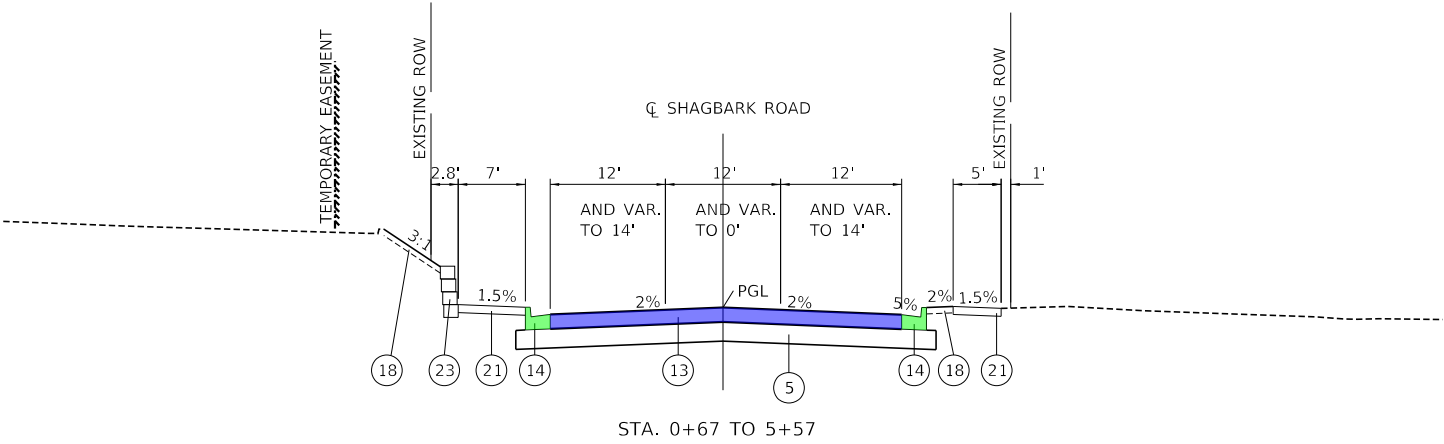
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PAVED SHOULDER

CURB AND GUTTER

PAVED MEDIAN

PROPOSED LEGEND T.B.D.



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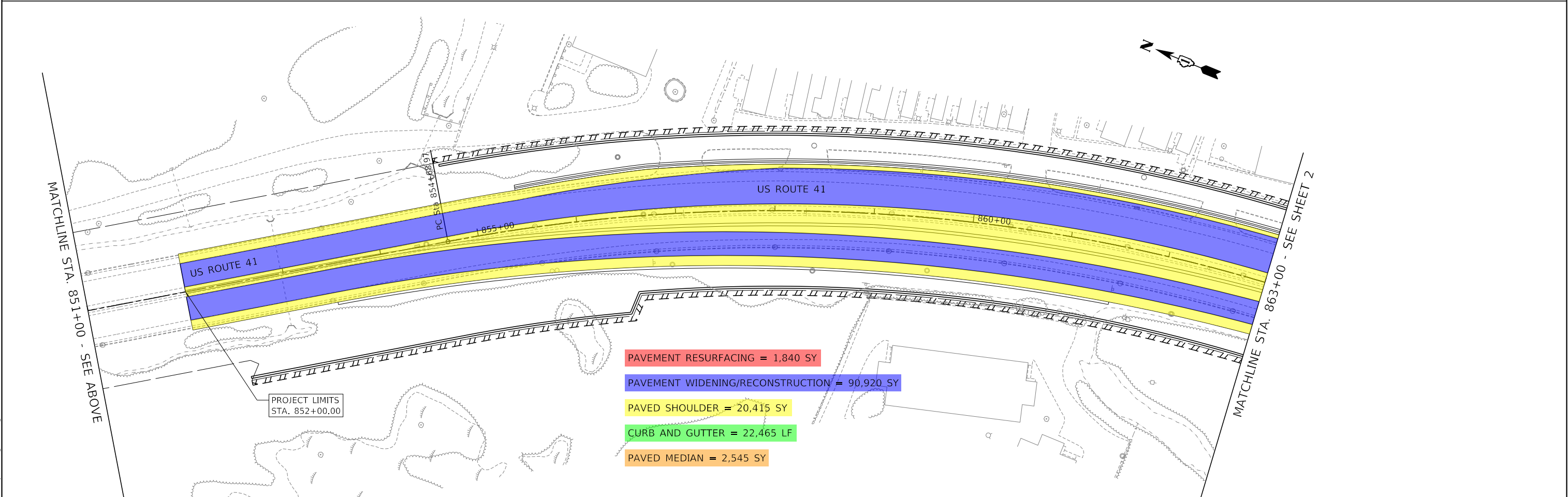
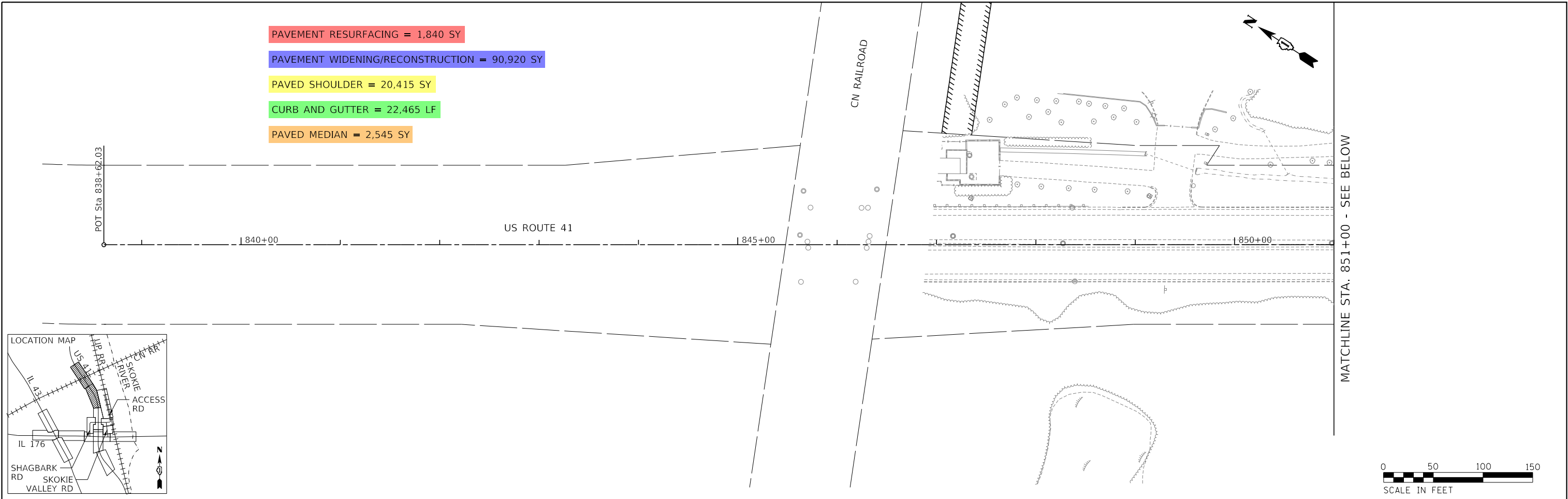
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**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

**US ROUTE 41 AT IL ROUTE 176 INTERCHANGE
PAVEMENT DESIGN TYPICALS - SHAGBARK RD /ACCESS RD**

SCALE: N/A SHEET 6 OF 6 SHEETS STA. TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
346	2020-144-W&R	LAKE		
CONTRACT NO. 62L32				
ILLINOIS FED. AID PROJECT				



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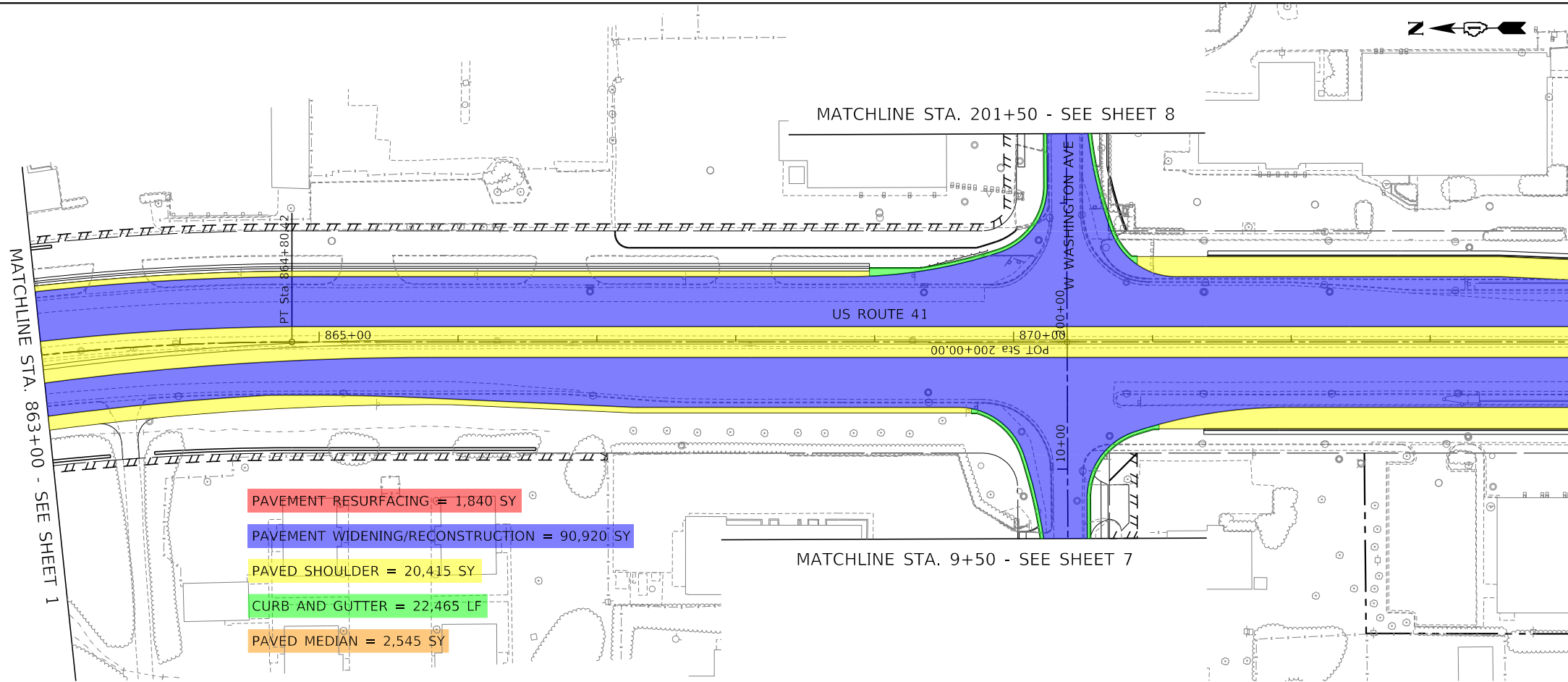
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**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

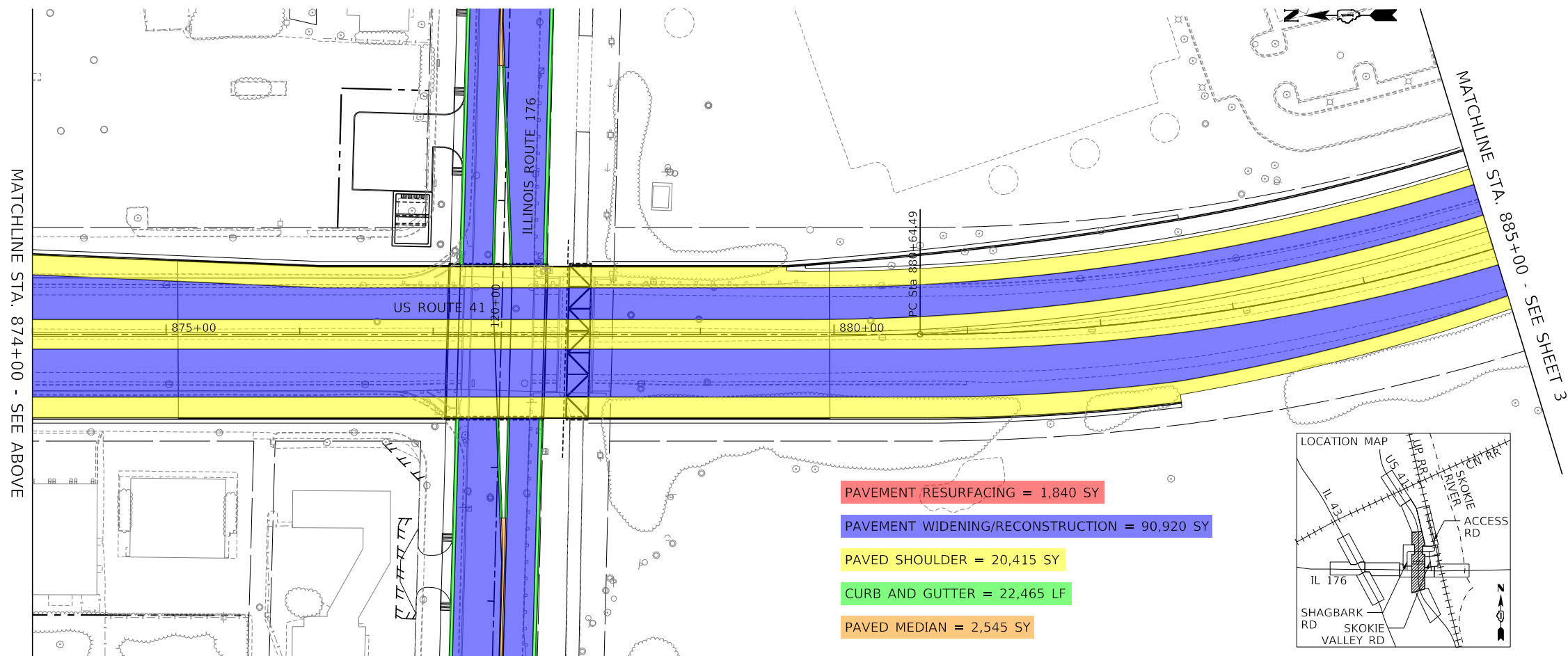
**US ROUTE 41 AT IL ROUTE 176 INTERCHANGE
PAVEMENT DESIGN EXHIBIT - US 41**

SCALE: 1"=50' SHEET 1 OF 8 SHEETS STA. 838+62.03 TO STA. 863+00.00

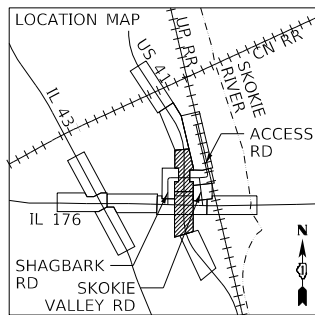
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
346	2020-144-W&R	LAKE		
CONTRACT NO. 62L32				
ILLINOIS FED. AID PROJECT				



MATCHLINE STA. 874+00 - SEE BELOW



MATCHLINE STA. 885+00 - SEE SHEET 3



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TYLIN INTERNATIONAL
200 S. WACKER DR.
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PLOT DATE	= 10/18/2021

DESIGNED	- BG
DRAWN	- BG
CHECKED	- MPG
DATE	- 10/19/2021

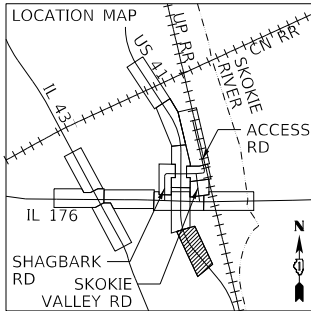
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**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

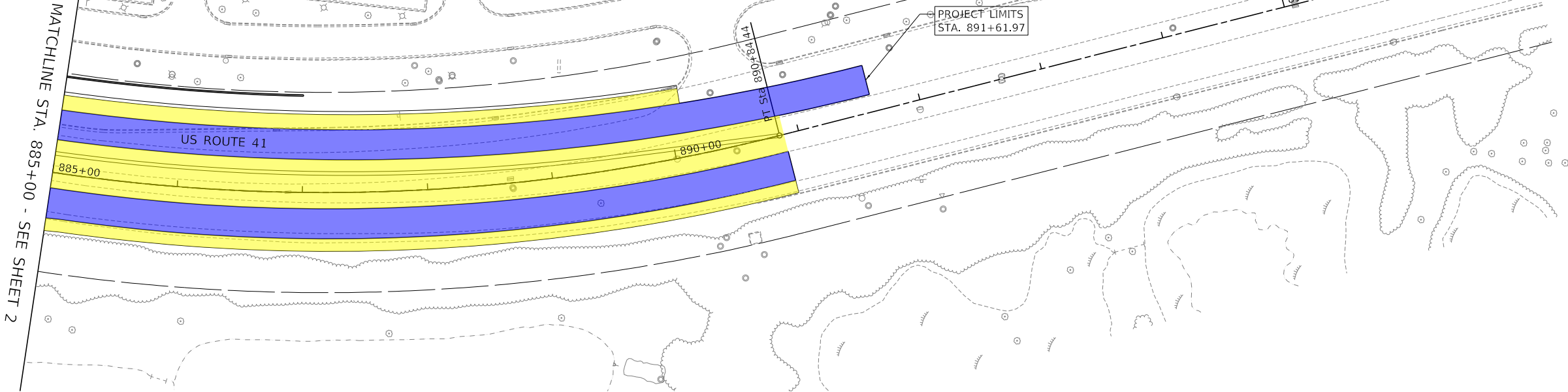
**US ROUTE 41 AT IL ROUTE 176 INTERCHANGE
PAVEMENT DESIGN EXHIBIT - US 41**

SCALE: 1"=50' SHEET 2 OF 8 SHEETS STA. 863+00.00 TO STA. 885+00.00

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
346	2020-144-W&R	LAKE		
CONTRACT NO. 62L32				
ILLINOIS FED. AID PROJECT				



- PAVEMENT RESURFACING = 1,840 SY
- PAVEMENT WIDENING/RECONSTRUCTION = 90,920 SY
- PAVED SHOULDER = 20,415 SY
- CURB AND GUTTER = 22,465 LF
- PAVED MEDIAN = 2,545 SY



MODEL Default
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TYLIN INTERNATIONAL
200 S. WACKER DR.
SUITE 1400
CHICAGO, IL 60606
TEL: 312-777-2900

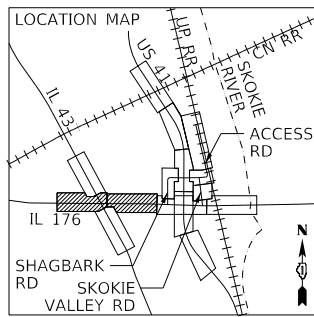
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**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

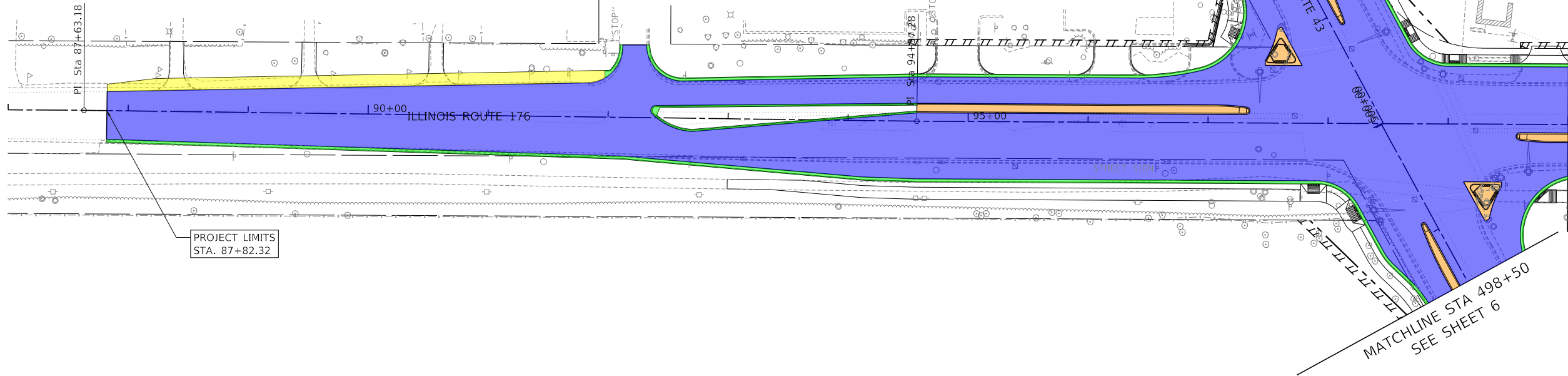
**US ROUTE 41 AT IL ROUTE 176 INTERCHANGE
PAVEMENT DESIGN EXHIBIT - US 41**

SCALE: 1"=50' SHEET 3 OF 8 SHEETS STA. 885+00.00 TO STA. 897+00.00

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
346	2020-144-W&R	LAKE		
CONTRACT NO. 62L32				
ILLINOIS FED. AID PROJECT				

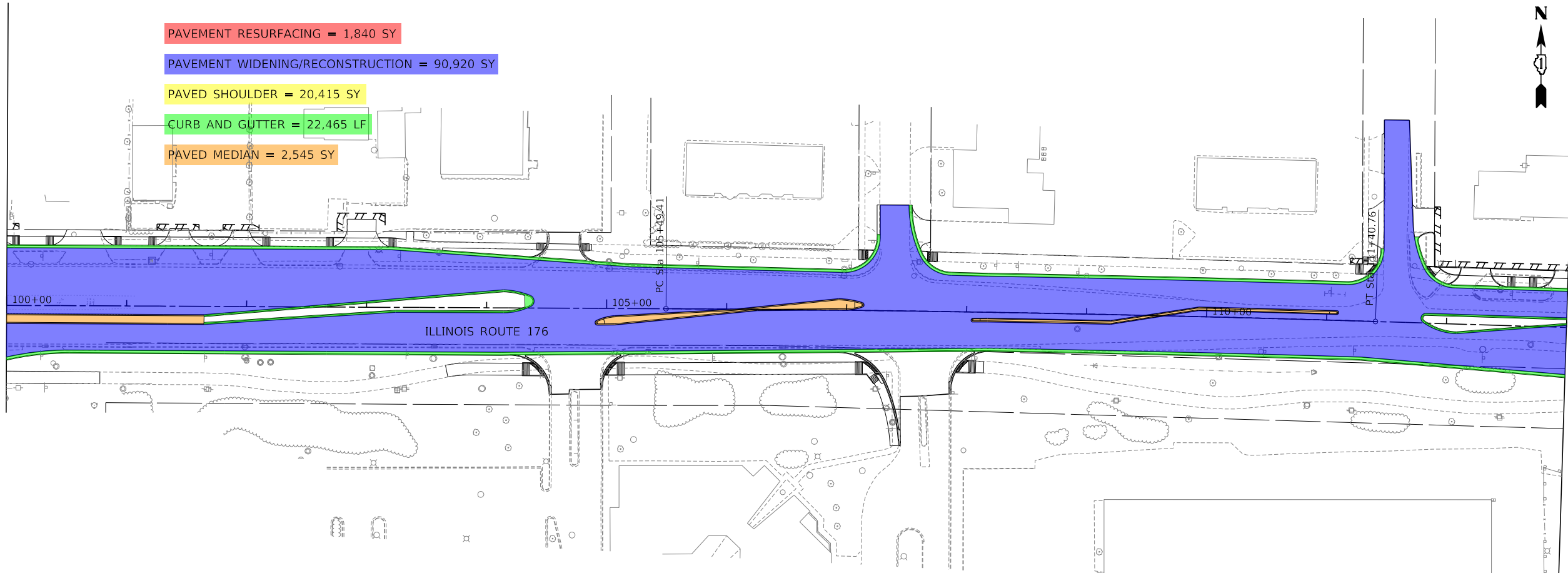


- PAVEMENT RESURFACING = 1,840 SY
- PAVEMENT WIDENING/RECONSTRUCTION = 90,920 SY
- PAVED SHOULDER = 20,415 SY
- CURB AND GUTTER = 22,465 LF
- PAVED MEDIAN = 2,545 SY



MATCHLINE STA 100+00 - SEE ABOVE

- PAVEMENT RESURFACING = 1,840 SY
- PAVEMENT WIDENING/RECONSTRUCTION = 90,920 SY
- PAVED SHOULDER = 20,415 SY
- CURB AND GUTTER = 22,465 LF
- PAVED MEDIAN = 2,545 SY



MATCHLINE STA 113+00 - SEE SHEET 5

MODEL Default
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TYLIN INTERNATIONAL
200 S. WACKER DR.
SUITE 1400
CHICAGO, IL 60606
TEL: 312-777-2900

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DRAWN -	BG
PLOT SCALE	= 100,0000' / in.
CHECKED -	MPG
DATE	= 10/18/2021

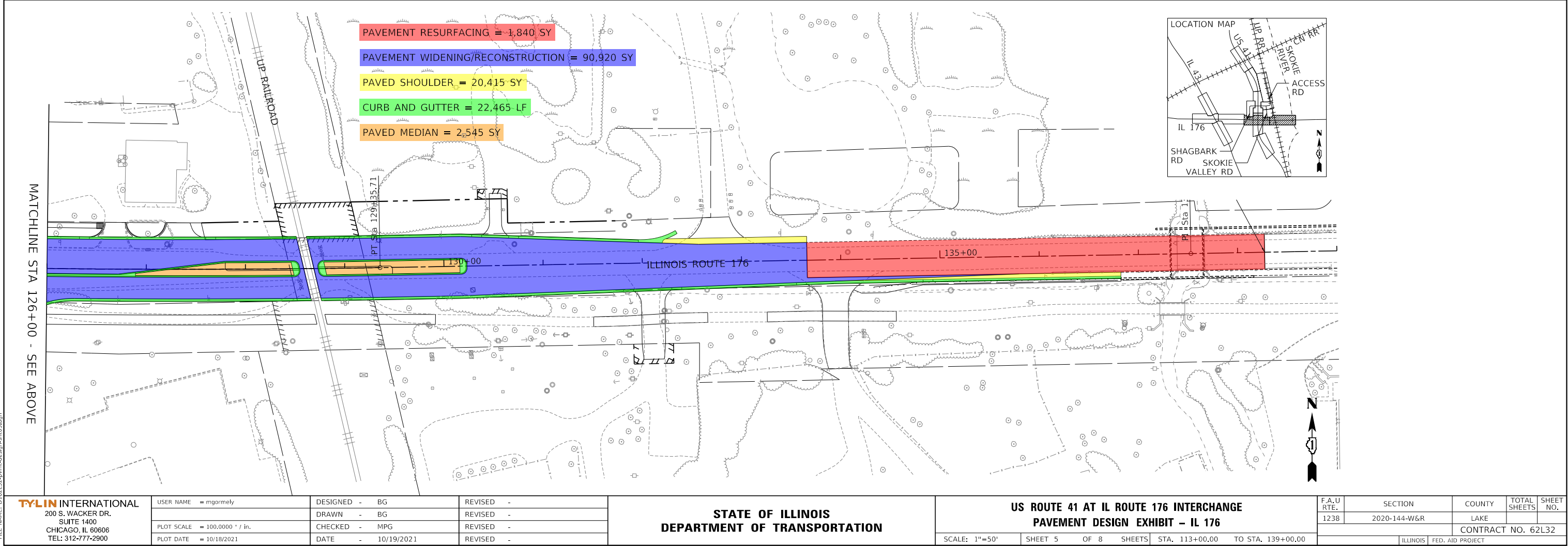
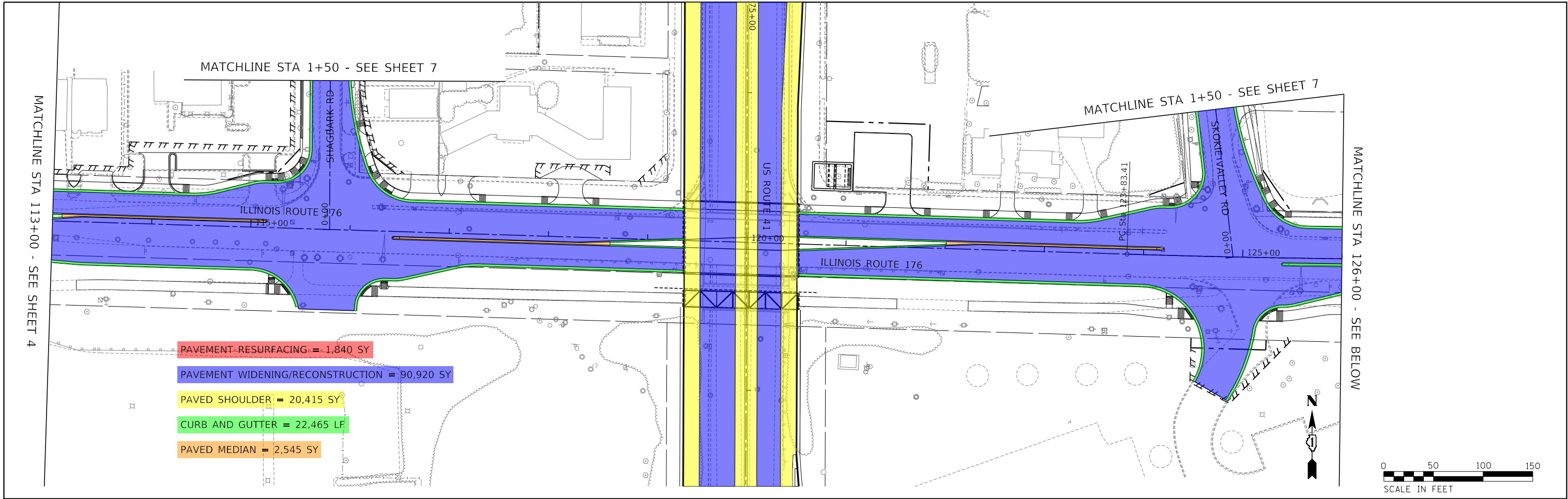
REVISED -	
REVISED -	
REVISED -	
REVISED -	

**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

**US ROUTE 41 AT IL ROUTE 176 INTERCHANGE
PAVEMENT DESIGN EXHIBIT - IL 176**

SCALE: 1"=50' SHEET 4 OF 8 SHEETS STA. 87+00.00 TO STA. 113+00.00

F.A.U RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
1238	2020-144-W&R	LAKE		
CONTRACT NO. 62L32				
ILLINOIS FED. AID PROJECT				



MODEL Default
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TYLIN INTERNATIONAL
200 S. WACKER DR.
SUITE 1400
CHICAGO, IL 60606
TEL: 312-777-2900

USER NAME	= mgormely
PLOT SCALE	= 100.0000' / in.
PLOT DATE	= 10/18/2021

DESIGNED -	BG
DRAWN -	BG
CHECKED -	MPG
DATE -	10/19/2021

REVISED -	
REVISED -	
REVISED -	
REVISED -	

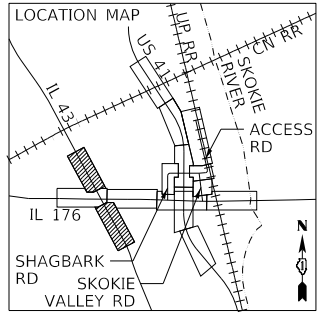
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

US ROUTE 41 AT IL ROUTE 176 INTERCHANGE
PAVEMENT DESIGN EXHIBIT - IL 176

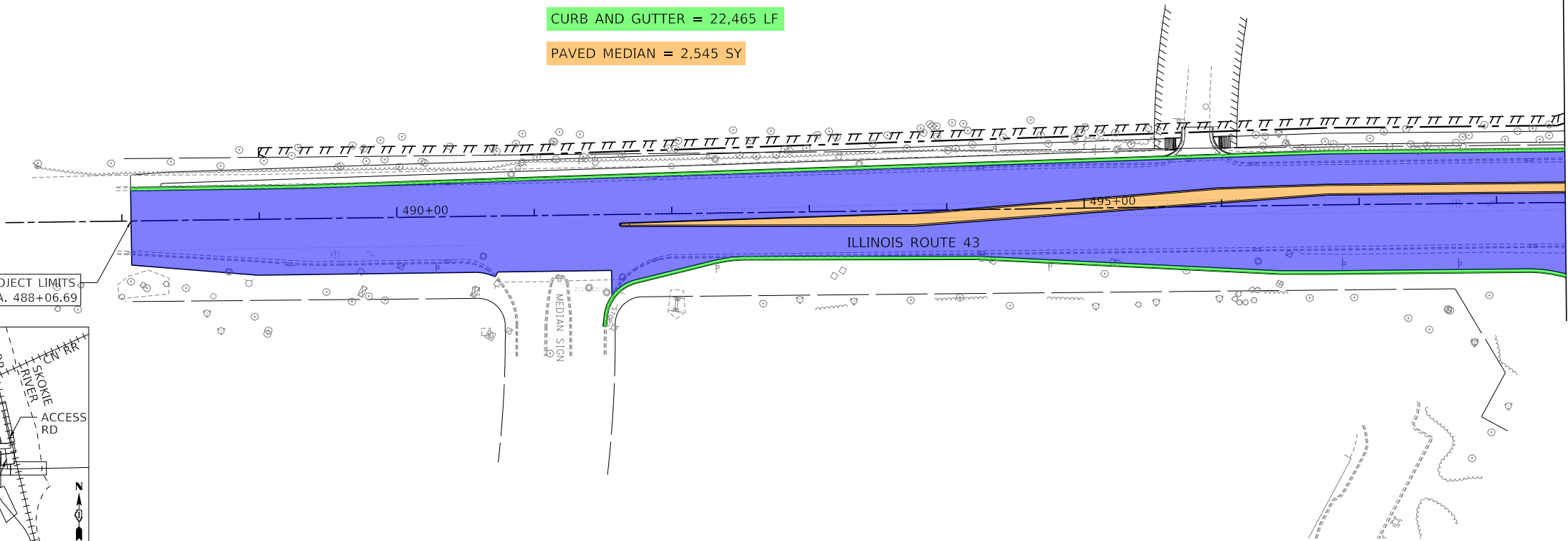
SCALE: 1"=50' SHEET 5 OF 8 SHEETS STA. 113+00.00 TO STA. 139+00.00

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
1238	2020-144-W&R	LAKE		
CONTRACT NO. 62L32				
ILLINOIS FED. AID PROJECT				

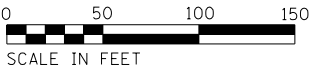
PAVEMENT RESURFACING = 1,840 SY
PAVEMENT WIDENING/RECONSTRUCTION = 90,920 SY
PAVED SHOULDER = 20,415 SY
CURB AND GUTTER = 22,465 LF
PAVED MEDIAN = 2,545 SY



PROJECT LIMITS
STA. 488+06.69

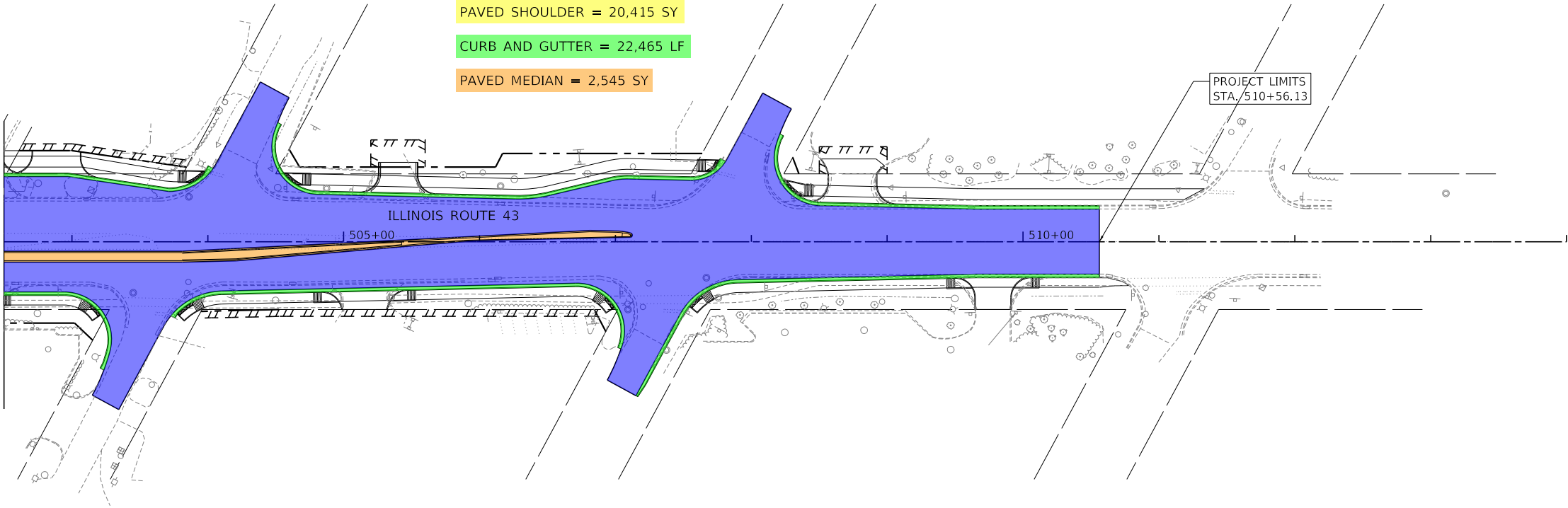


MATCHLINE STA 498+50 - SEE SHEET 4



PAVEMENT RESURFACING = 1,840 SY
PAVEMENT WIDENING/RECONSTRUCTION = 90,920 SY
PAVED SHOULDER = 20,415 SY
CURB AND GUTTER = 22,465 LF
PAVED MEDIAN = 2,545 SY

MATCHLINE STA 502+50 - SEE SHEET 4



PROJECT LIMITS
STA. 510+56.13

MODEL Default
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TYLIN INTERNATIONAL
200 S. WACKER DR.
SUITE 1400
CHICAGO, IL 60606
TEL: 312-777-2900

USER NAME	= mgormely
DESIGNED -	BG
DRAWN -	BG
CHECKED -	MPG
DATE	10/19/2021

REVISED -	
REVISED -	
REVISED -	
REVISED -	

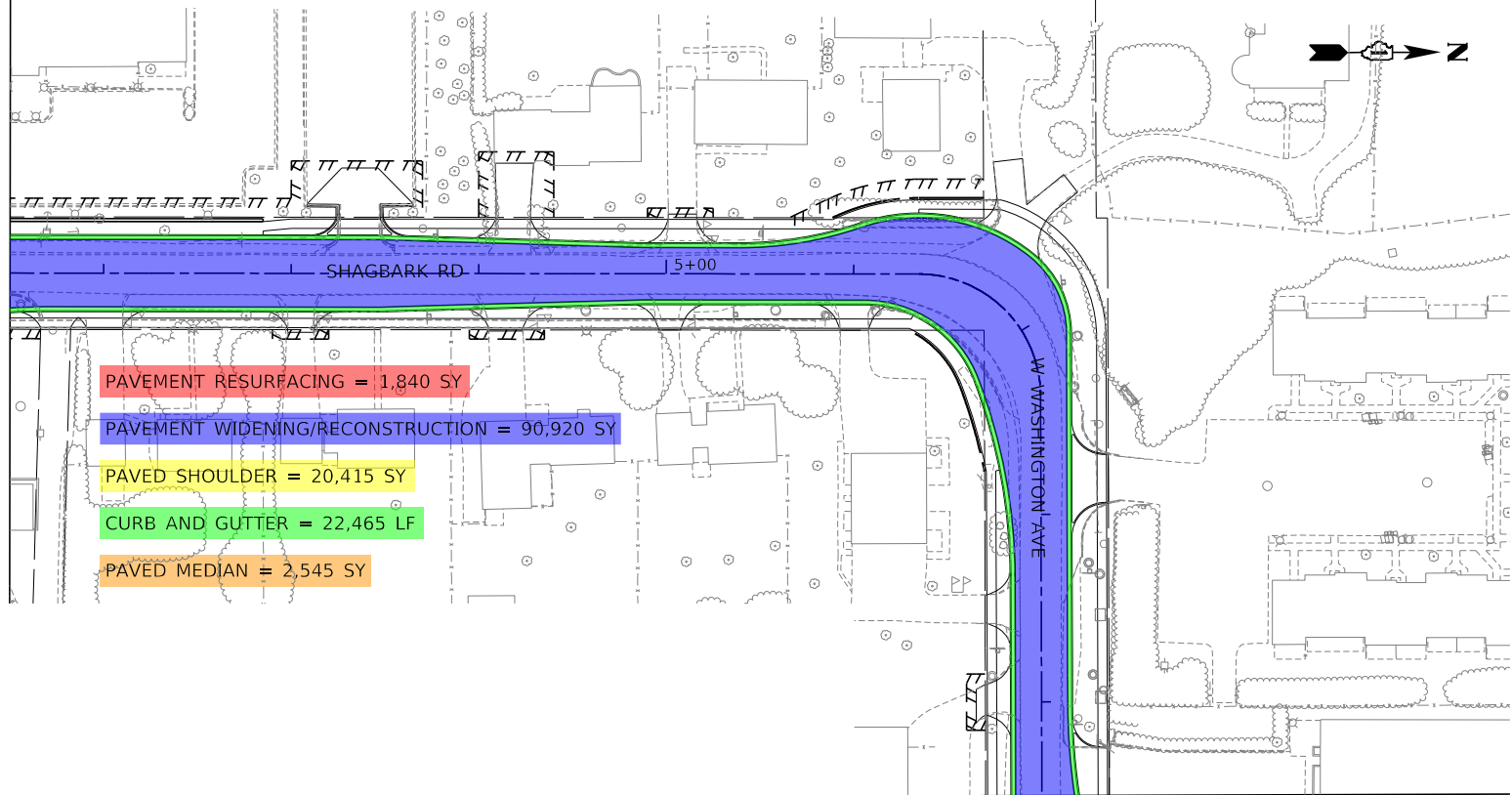
**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

**US ROUTE 41 AT IL ROUTE 176 INTERCHANGE
PAVEMENT DESIGN EXHIBIT - IL 43**

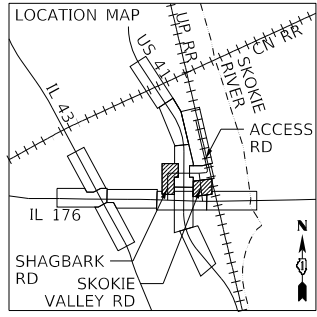
SCALE: 1"=50' SHEET 6 OF 8 SHEETS STA. 487+00.00 TO STA. 514+00.00

F.A.U RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
2706	2020-144-W&R	LAKE		
CONTRACT NO. 62L32				
ILLINOIS FED. AID PROJECT				

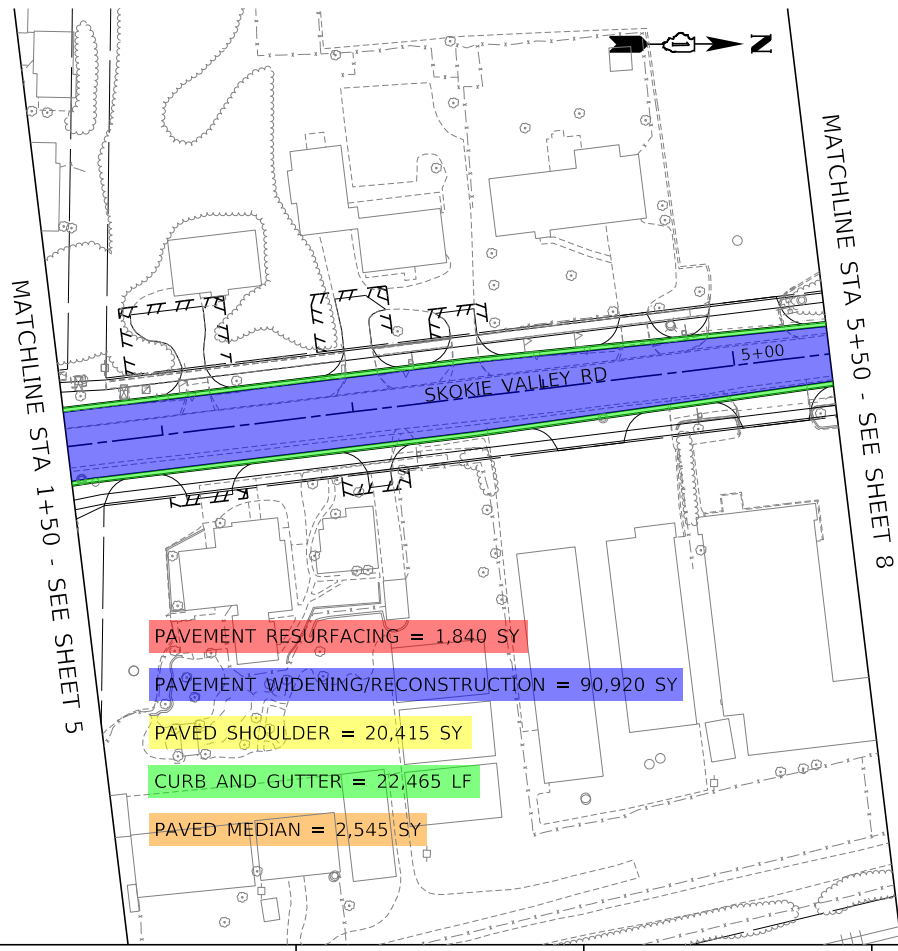
MATCHLINE STA 1+50 - SEE SHEET 5



MATCHLINE STA 9+50 - SEE SHEET 2



MATCHLINE STA 1+50 - SEE SHEET 5



MATCHLINE STA 5+50 - SEE SHEET 8

MODEL Default
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TYLIN INTERNATIONAL
200 S. WACKER DR.
SUITE 1400
CHICAGO, IL 60606
TEL: 312-777-2900

USER NAME = mgormely
PLOT SCALE = 100,0000 ' / in.
PLOT DATE = 10/18/2021

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DRAWN - BG
CHECKED - MPG
DATE - 10/19/2021

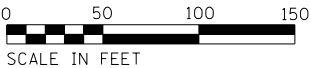
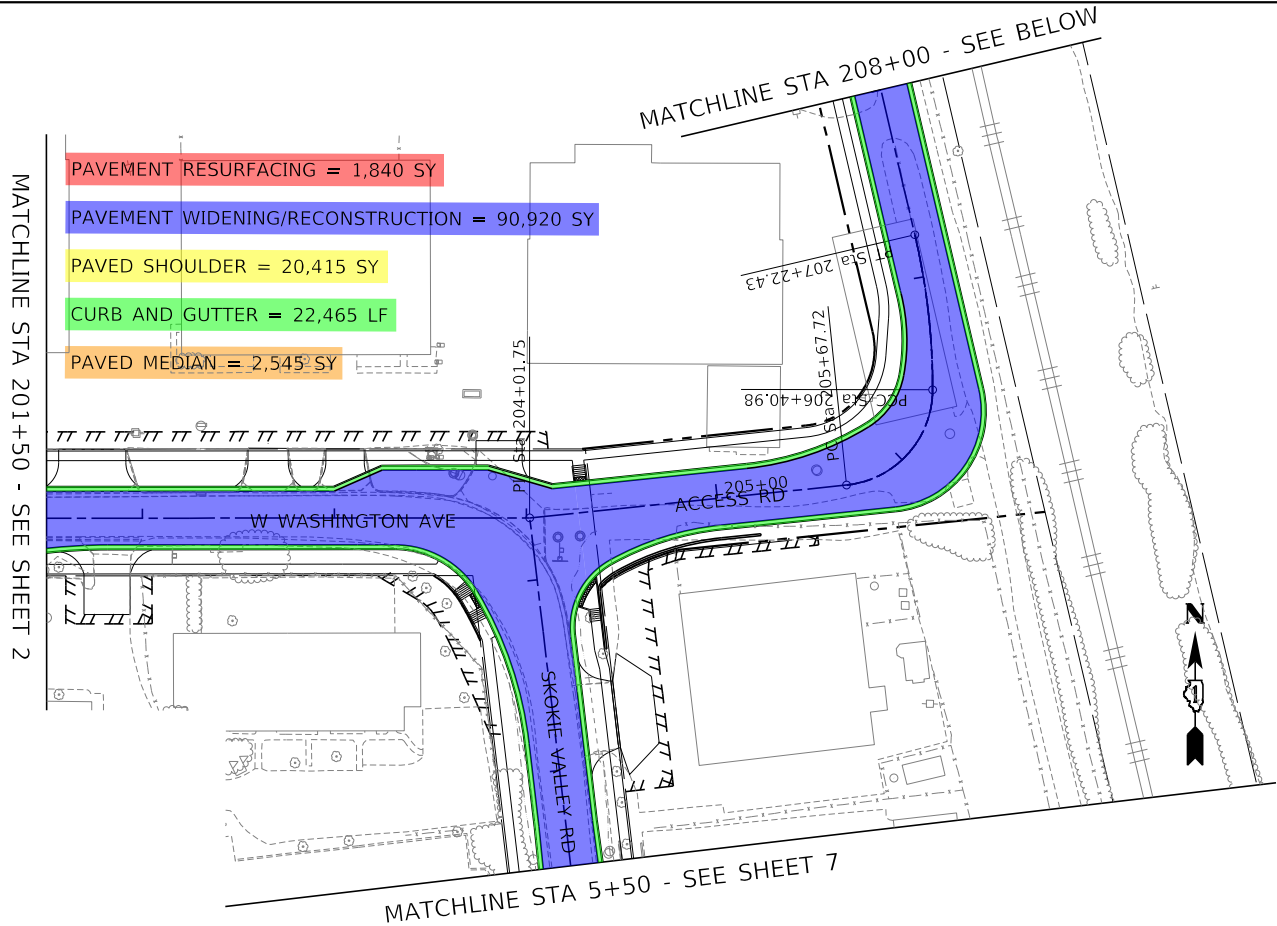
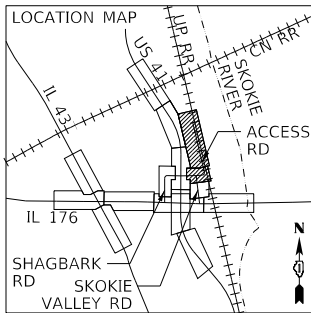
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REVISED -
REVISED -

**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

**US ROUTE 41 AT IL ROUTE 176 INTERCHANGE
PAVEMENT DESIGN EXHIBIT - SHAGBARK RD /SKOKIE VALLEY RD**

SCALE: 1"=50' SHEET 7 OF 8 SHEETS STA. 1+50.00 TO STA. 9+50.00

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
346	2020-144-W&R	LAKE		
CONTRACT NO. 62L32				
ILLINOIS FED. AID PROJECT				



MATCHLINE STA 208+00 - SEE ABOVE

TYLIN INTERNATIONAL
200 S. WACKER DR.
SUITE 1400
CHICAGO, IL 60606
TEL: 312-777-2900

USER NAME = mgormely
DESIGNED - BG
DRAWN - BG
PLOT SCALE = 100,0000' / in.
CHECKED - MPG
PLOT DATE = 10/18/2021
DATE - 10/19/2021

REVISED -
REVISED -
REVISED -
REVISED -

**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

**US ROUTE 41 AT IL ROUTE 176 INTERCHANGE
PAVEMENT DESIGN EXHIBIT - ACCESS RD**

SCALE: 1"=50' SHEET 8 OF 8 SHEETS STA. 201+50.00 TO STA. 220+86.17

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
346	2020-144-W&R	LAKE		
CONTRACT NO. 62L32				
ILLINOIS FED. AID PROJECT				

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: **US 41**
 Section: **2020-144-W&R**
 County: **Lake**
 Location: **at IL 176**

Comments: **US 41 at IL 176**
Phase II
 Design Date: **11/15/2021** **ONP**
 Modify Date: **05/12/2022** **ONP**

<-- BY	ADT	Year
Current:	39,500	2019
Future:	55,000	2040

Facility Type **Other Marked State Route**# of Lanes = **4**Road Class: **I**Subgrade Support Rating (SSR): **Poor**Construction Year: **2024**Design Period (DP) = **20** years

	Structural Design Traffic			% of ADT in Design Lane
	Minimum ADT	Actual ADT	Actual % of Total ADT	
PV =	0	39,446	78.0%	P = 32%
SU =	250	7,333	14.5%	S = 45%
MU =	750	3,793	7.5%	M = 45%
Struct. Design ADT =		50,571	(2034)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

Cpv = 0.15

Csu = **132.5**Cmu = **482.53**

TF flexible (Actual) = 25.25 (Actual ADT)

TF flexible (Min) = 3.56 (Min ADT Fig. 54-2.C)

RIGID PAVEMENT

Cpv = 0.15

Csu = **143.81**Cmu = **696.42**

TF rigid (Actual) = 33.30 (Actual ADT)

TF rigid (Min) = 5.02 (Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 25.25

PG Grade Lower Binder Lifts = **PG 64-22** (Fig. 53-4.O)HMA Mixture Temp. = **73.0** deg. F (Fig. 54-5.C)Design HMA Mixture Modulus (E_{HMA}) = 760 ksi (Fig. 54-5.D)Design HMA Strain (ϵ_{HMA}) = 48 (Fig. 54-5.E)

Full Depth HMA Design Thickness = 13.75 in. (Fig. 54-5.F)

Limiting Strain Criterion Thickness = **14.25** in. (Fig. 54-5.I)Use Full-Depth HMA Thickness = **13.75** inches

JPC Pavement

Use TF rigid = 33.30

Edge Support = **Tied** Shoulder or C&GRigid Pavt Thck. = **10.75** in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 33.30

IBR value = **3**CRCP Thickness = **10.75** in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Pavement Over Rubblized PCC

Use TF flexible = 25.25

HMA Overlay Design Thickness = 11.50 in. (Fig. 54-5.U)

Limiting Strain Criterion Thickness = in. (Fig. 54-5.V)

Use HMA Overlay Thickness = **999.00** inches

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = **NA** inches

CONTACT RESEARCH 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	2 lanes with ADT > 2000	2 Lanes	2 Lanes
Part of a future 4 lanes or more	One way Street with ADT <= 3500	(ADT 750 -2000)	(ADT < 750)
One-way Streets with ADT > 3500			

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

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 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%

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE US 41
SECTION 2020-144-W&R
COUNTY Lake
LOCATION at IL 176

FACILITY TYPE NON-INTERSTATE

PROJECT LENGTH 3950 FT == > 0.75 Miles
OF CENTERLINES 2 CL
OF LANES 4 LANES
OF EDGES 4 EP
LANE WIDTH - AVERAGE 12 FT
SHOULDER WIDTH HMA Inside 9 FT
HMA Outside 15 FT
Total Width of Paved Shoulders 48 FT

PAVEMENT THICKNESS (FLEXIBLE) 13.75 IN 14.25 IN MAX
SHOULDER THICKNESS 8.00 IN HMA_SD Standard Design
HMA OVERLAY THICKNESS 2.00 IN

FLEX PAVEMENT TRAFFIC FACTORS MINIMUM ACTUAL USE
3.56 25.25 25.25

HMA COST PER TON UNIT PRICE Read Me!
HMA SURFACE \$99.94 / TON
HMA TOP BINDER \$114.62 / TON
HMA LOWER BINDER \$73.85 / TON
HMA BINDER (IL-9.5FG or IL-4.75) \$86.90 / TON
HMA SHOULDER \$72.00 / TON

INITIAL COSTS ITEM	THICKNESS	100% QUAI UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(13.75")	26500 26,500 SQ YD *	\$64.09 / SQ YD	\$1,698,385 ~
HMA SURFACE COURSE	(2.00")	1.0069 2,376 TONS	\$99.94 / TON	\$0
HMA TOP BINDER COURSE	(2.25")	1.0217 2,712 TONS	\$114.62 / TON	\$0
HMA LOWER BINDER COURSE	(9.50")	1.0625 11,908 TONS	\$73.85 / TON	\$0
HMA SHOULDER	(8.00")	21067 9,438 TONS	\$72.00 / TON	\$679,526 ~
CURB & GUTTER		0 LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C (TONS)		4,218 TONS	\$25.00 / TON	\$105,450
IMPROVED SUBGRADE:	Aggregate Width = 109.	48,000 SQ YD *	\$7.00 / SQ YD	\$336,000
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		26,500 SQ YD *	\$15.00 / SQ YD	\$397,500
SHOULDER REMOVAL		21,067 SQ YD	\$10.00 / SQ YD	\$210,670
Note: * Denotes User Supplied Quantity			FLEXIBLE CONSTRUCT	\$3,427,531
			FLEXIBLE CONSTRUCT	\$186,862

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 M 2.00	\$11.27 / SQ YD
HMA OVERLAY PVMT	(2.00")	1.0069 2.00	\$11.27 / SQ YD
HMA SURFACE MIX	(2.00")	1.0069 Surface M 2.00	\$11.27 / SQ YD
HMA BINDER MIX	(0.00")	1.0139 IL-9.5FG or I 0.00	\$0.00 / SQ YD
HMA OVERLAY SHLD (Year 30)	(2.00")	Shoulder 2.00	\$8.06 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder 2.00	\$8.06 / SQ YD
MILLING (2.00 IN)		2.00	\$3.00 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill Surf)	Surface M 2.00	\$81.19 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder 2.00	\$78.06 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Binder Mix 2.00	\$79.73 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder 2.00	\$78.06 / SQ YD

LONGITUDINAL SHOULDER JOINT ROUT & SEAL		\$2.00 / LIN FT	
CENTERLINE JOINT ROUT & SEAL		\$2.00 / LIN FT	
RANDOM / THERMAL CRACK ROUT & SEAL	(100% Ref	\$2.00 / LIN FT	
FLEXIBLE TOTAL LIFE			\$4,343,627
FLEXIBLE TOTAL ANNI			\$236,805

PCC PAVEMENT

JPCP

ROUTE
SECTION
COUNTY
LOCATION

US 41
2020-144-W&R
Lake
at IL 176

FACILITY TYPE

NON-INTERSTATE

PROJECT LENGTH		3950 FT	= = >	0.75 Miles
# OF CENTERLINES		2 CL		
# OF LANES		4 LANES		
# OF EDGES		4 EP		
LANE WIDTH - AVERAGE		12 FT		
SHOULDER WIDTH	PCC	Inside		9 FT
	PCC	Outside		15 FT
	Total Width of Paved Shoulders			48 FT

PAVEMENT THICKNESS (RIGID)	JPCP	10.75 IN	TIED SHLD
SHOULDER THICKNESS		10.75 IN	

HMA OVERLAY THICKNESS 2.75 IN

RIGID PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		5.02	33.30	33.30
Worksheet Construction Type is	Reconstruction		The Pavement Type is	JPCP

INITIAL COSTS ITEM	THICKNESS	100% QUA UNIT	UNIT PRICE	COST
JPC PAVEMENT	(10.75")	26,500 SQ YD *	\$73.22 / SQ YD	\$1,940,330
PAVEMENT REINFORCEMENT		0 SQ YD	\$22.00 / SQ YD	\$0
STABILIZED SUBBASE	(4.00")	29,100 SQ YD *	\$19.00 / SQ YD	\$552,900
PCC SHOULDERS	(10.75" to 10.75")	21,067 SQ YD	\$40.00 / SQ YD	\$842,680
CURB & GUTTER		0 LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C	(~ 2.75")	1,856 TONS	\$25.00 / TON	\$46,400
IMPROVED SUBGRADE:	Aggregate Width = 109.	48,000 SQ YD *	\$7.00 / SQ YD	\$336,000
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		26,500 SQ YD *	\$15.00 / SQ YD	\$397,500
SHOULDER REMOVAL		21,067 SQ YD	\$10.00 / SQ YD	\$210,670
Note: * Denotes User Supplied Quantity			RIGID CONSTRUCTION	\$4,326,480
			RIGID CONSTRUCTION	\$235,871

MAINTENANCE COSTS: ITEM	THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 / LANE-MILE / YEAR
HMA OVERLAY	(2.75")		2.75	
HMA OVERLAY PAVEMENT	(2.75")	1.0095	2.75	\$14.61 / SQ YD
HMA SURFACE MIX	(1.50")	1.0052	Surface M	\$8.44 / SQ YD
HMA BINDER MIX	(1.25")	1.0148	IL-9.5FG or I	\$6.17 / SQ YD
HMA OVERLAY SHOULDER	(2.75")		Shoulder	\$11.09 / 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 M	1.50	\$78.39 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.75")		Surface M	2.75	\$85.39 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$2.00 / LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				\$2.00 / LIN FT
RANDOM CRACK ROUT & SEAL		(100% Rehab = 100.00' /		\$2.00 / LIN FT

RIGID TOTAL LIFE-C	\$4,885,479
RIGID TOTAL ANNUAL	\$266,346

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Re #####

CONSTRUCTION	INITIAL COST	JPCP		HMA
		PRESENT '1		
		ANNUAL C	\$4,326,480	\$3,427,531
			\$235,871	\$186,862
MAINTENANCE	LIFE-CYCLE COST	PRESENT '1	\$558,999	\$916,096
		ANNUAL C	\$30,475	\$49,944
TOTAL	LIFE-CYCLE COST	PRESENT '1	\$4,885,479	\$4,343,627
		ANNUAL C	\$266,346	\$236,805

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	===== HMA	\$236,805	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PE JPCP	\$266,346	12.5%

S:\pavetech\Pavement Designs\D-1\US 41 at IL 176 (62L32)\62L32 Pvmt Analysis (Updated)\Pvmt Analysis Files\[US 41 - BDE 5401.xlsm]PDFSheets

HMA_SD

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE

06/07/22

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

MAINTENANCE ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5						
LONG SHLD JT R&S	100.00%	15,800	LIN FT	\$2.00	\$31,600	
CNTR LINE JOINT R&S	100.00%	7,900	LIN FT	\$2.00	\$15,800	
RNDM / THRM CRACK R&S	50.00%	8,690	LIN FT	\$2.00	\$17,380	
PD PVMT PATCH M&F SURF	0.10%	27	SQ YD	\$81.19	\$2,192	
PWFn =	0.8626		PW =	0.8626 X	\$66,972	\$57,771
YEAR 10						
LONG SHLD JT R&S	100.00%	15,800	LIN FT	\$2.00	\$31,600	
CNTR LINE JOINT R&S	100.00%	7,900	LIN FT	\$2.00	\$15,800	
RNDM / THRM CRACK R&S	50.00%	8,690	LIN FT	\$2.00	\$17,380	
PD PVMT PATCH M&F SURF	0.50%	133	SQ YD	\$81.19	\$10,799	
PWFn =	0.7441		PW =	0.7441 X	\$75,579	\$56,238
YEAR 15						
MILL PVMT & SHLD 2.00"	100.00%	47,567	SQ YD	\$3.00	\$142,701	
PD PVMT PATCH M&F ADD'L 2.00"	1.00%	265	SQ YD	\$79.73	\$21,129	
HMA OVERLAY PVMT 2.00"	100.00%	26,500	SQ YD	\$11.27	\$298,682	
HMA OVERLAY SHLD 2.00 "	100.00%	21,067	SQ YD	\$8.06	\$169,882	
PWFn =	0.6419		PW =	0.6419 X	\$632,394	\$405,910
YEAR 20						
LONG SHLD JT R&S	100.00%	15,800	LIN FT	\$2.00	\$31,600	
CNTR LINE JOINT R&S	100.00%	7,900	LIN FT	\$2.00	\$15,800	
RNDM / THRM CRACK R&S	50.00%	8,690	LIN FT	\$2.00	\$17,380	
PD PVMT PATCH M&F SURF	0.10%	27	SQ YD	\$81.19	\$2,192	
PWFn =	0.5537		PW =	0.5537 X	\$66,972	\$37,081
YEAR 25						
LONG SHLD JT R&S	100.00%	15,800	LIN FT	\$2.00	\$31,600	
CNTR LINE JOINT R&S	100.00%	7,900	LIN FT	\$2.00	\$15,800	
RNDM / THRM CRACK R&S	50.00%	8,690	LIN FT	\$2.00	\$17,380	
PD PVMT PATCH M&F SURF	0.50%	133	SQ YD	\$81.19	\$10,799	
PWFn =	0.4776		PW =	0.4776 X	\$75,579	\$36,097
YEAR 30						
NON-INTERSTATE						
MILL PVMT & SHLD 2.00"	100.00%	47,567	SQ YD	\$3.00	\$142,701	
PD PVMT PATCH M&F ADD'L 2.00"	2.00%	530	SQ YD	\$79.73	\$42,258	
PD SHLD PATCH M&F ADD'L 2.00"	1.00%	211	SQ YD	\$78.06	\$16,472	
HMA OVERLAY PVMT 2.00 "	100.00%	26,500	SQ YD	\$11.27	\$298,682	
HMA OVERLAY SHLD 2.00 "	100.00%	21,067	SQ YD	\$8.06	\$169,882	
PWFn =	0.4120		PW =	0.4120 X	\$669,995	\$276,029
YEAR 35						
LONG SHLD JT R&S	100.00%	15,800	LIN FT	\$2.00	\$31,600	
CNTR LINE JOINT R&S	100.00%	7,900	LIN FT	\$2.00	\$15,800	
RNDM / THRM CRACK R&S	50.00%	8,690	LIN FT	\$2.00	\$17,380	
PD PVMT PATCH M&F SURF	0.10%	27	SQ YD	\$81.19	\$2,192	
PWFn =	0.3554		PW =	0.3554 X	\$66,972	\$23,801
YEAR 40						
LONG SHLD JT R&S	100.00%	15,800	LIN FT	\$2.00	\$31,600	
CNTR LINE JOINT R&S	100.00%	7,900	LIN FT	\$2.00	\$15,800	
RNDM / THRM CRACK R&S	50.00%	8,690	LIN FT	\$2.00	\$17,380	
PD PVMT PATCH M&F SURF	0.50%	133	SQ YD	\$81.19	\$10,799	
PWFn =	0.3066		PW =	0.3066 X	\$75,579	\$23,169
						\$916,096
ROUTINE MAINTENANCE ACTIVITY		2.99	Lane Miles	0.00	\$0	\$0
45 YEAR LIFE CYCLE	CRFn = 0.0407852				MAINTENANCE MAINTENANCE	\$916,096 \$49,944

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

MAINTENANCE ITEM		%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR	10						
	PAVEMENT PATCH CLASS B	0.10%	27	SQ YD	\$150.00	\$4,050	
	PWF _n =	0.7441		PW =	0.7441 X	\$4,050	\$3,014
YEAR	15						
	PAVEMENT PATCH CLASS B	0.20%	53	SQ YD	\$150.00	\$7,950	
	PWF _n =	0.6419		PW =	0.6419 X	\$7,950	\$5,103
YEAR	20						
	PAVEMENT PATCH CLASS B	2.00%	530	SQ YD	\$150.00	\$79,500	
	SHOULDER PATCH CLASS C	0.50%	105	SQ YD	\$145.00	\$15,225	
	LONGITUDINAL SHLD JT R&S	100.00%	15,800	LIN FT	\$2.00	\$31,600	
	CENTERLINE JT R&S	100.00%	7,900	LIN FT	\$2.00	\$15,800	
	PWF _n =	0.5537		PW =	0.5537 X	\$142,125	\$78,691
YEAR	25						
	PAVEMENT PATCH CLASS B	3.00%	795	SQ YD	\$150.00	\$119,250	
	SHOULDER PATCH CLASS C	1.00%	211	SQ YD	\$145.00	\$30,595	
	PWF _n =	0.4776		PW =	0.4776 X	\$149,845	\$71,567
YEAR	30						
	NON-INTERSTATE						
	PAVEMENT PATCH CLASS B	4.00%	1,060	SQ YD	\$150.00	\$159,000	
	SHOULDER PATCH CLASS C	1.50%	316	SQ YD	\$145.00	\$45,820	
	HMA OVERLAY 2.75" (PVMT)	100.00%	26,500	SQ YD	\$14.61	\$387,203	
	HMA OVERLAY 2.75" (SHLD)	100.00%	21,067	SQ YD	\$11.09	\$233,587	
	PWF _n =	0.4120		PW =	0.4120 X	\$825,610	\$340,140
YEAR	35						
	NON-INTERSTATE						
	LONGITUDINAL SHLD JT R&S	100.00%	15,800	LIN FT	\$2.00	\$31,600	
	CENTERLINE JT R&S	100.00%	7,900	LIN FT	\$2.00	\$15,800	
	RANDOM CRACK R&S	50.00%	7,900	LIN FT	\$2.00	\$15,800	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	5,050	LIN FT	\$2.00	\$10,100	
	PD PVMT PATCH M&F HMA 2.75"	0.10%	27	SQ YD	\$85.39	\$2,306	
	PWF _n =	0.3554		PW =	0.3554 X	\$75,606	\$26,869
YEAR	40						
	NON-INTERSTATE						
	PAVEMENT PATCH CLASS B	0.50%	133	SQ YD	\$150.00	\$19,950	
	LONGITUDINAL SHLD JT R&S	100.00%	15,800	LIN FT	\$2.00	\$31,600	
	CENTERLINE JT R&S	100.00%	7,900	LIN FT	\$2.00	\$15,800	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	7,574	LIN FT	\$2.00	\$15,148	
	RANDOM CRACK R&S	50.00%	7,900	LIN FT	\$2.00	\$15,800	
	PD PVMT PATCH M&F HMA 2.75"	0.50%	133	SQ YD	\$85.39	\$11,357	
	PWF _n =	0.3066		PW =	0.3066 X	\$109,655	\$33,615
							\$558,999
	ROUTINE MAINTENANCE ACTIVITY		2.99	Lane Miles	\$0.00	\$0	\$0
45	YEAR LIFE CYCLE	CRF _n = 0.0407852				MAINTENANCE MAINTENANCE	\$558,999 \$30,475

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: **IL 43 (Waukegan Rd)**
 Section: **2020-144-W&R**
 County: **Lake**
 Location: **at IL 176**

Comments: **US 41 at IL 176**
Phase II
 Design Date: **11/15/2021** **ONP**
 Modify Date:

<-- BY	ADT	Year
Current:	24,100	2019
Future:	32,500	2040

Facility Type: **Other Marked State Route**# of Lanes = **4**Road Class: **I**Subgrade Support Rating (SSR): **Poor**Construction Year: **2024**Design Period (DP) = **20** years

	Structural Design Traffic			% of ADT in Design Lane
	Minimum ADT	Actual ADT	Actual % of Total ADT	
PV =	0	28,746	95.5%	P = 32%
SU =	250	753	2.5%	S = 45%
MU =	750	602	2.0%	M = 45%
Struct. Design ADT =		30,100	(2034)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

Cpv = 0.15

Csu = **132.5**Cmu = **482.53**

TF flexible (Actual) = 3.54 (Actual ADT)

TF flexible (Min) = 3.56 (Min ADT Fig. 54-2.C)

RIGID PAVEMENT

Cpv = 0.15

Csu = **143.81**Cmu = **696.42**

TF rigid (Actual) = 4.77 (Actual ADT)

TF rigid (Min) = 5.02 (Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 3.56

PG Grade Lower Binder Lifts = **PG 64-22** (Fig. 53-4.O)HMA Mixture Temp. = **73.0** deg. F (Fig. 54-5.C)Design HMA Mixture Modulus (E_{HMA}) = 760 ksi (Fig. 54-5.D)Design HMA Strain (ε_{HMA}) = 84 (Fig. 54-5.E)

Full Depth HMA Design Thickness = 9.75 in. (Fig. 54-5.F)

Limiting Strain Criterion Thickness = **14.25** in. (Fig. 54-5.I)Use Full-Depth HMA Thickness = **9.75** inches

JPC Pavement

Use TF rigid = 5.02

Edge Support = **Tied** Shoulder or C&GRigid Pavt Thick. = **9.00** in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 5.02

IBR value = **3**CRCP Thickness = **8.00** in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Pavement Over Rubblized PCC

Use TF flexible = 3.56

HMA Overlay Design Thickness = 7.25 in. (Fig. 54-5.U)

Limiting Strain Criterion Thickness = in. (Fig. 54-5.V)

Use HMA Overlay Thickness = **999.00** inches

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = **NA** inches

CONTACT RESEARCH 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	2 lanes with ADT > 2000	2 Lanes	2 Lanes
Part of a future 4 lanes or more	One way Street with ADT <= 3500	(ADT 750 -2000)	(ADT < 750)
One-way Streets with ADT > 3500			

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

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 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%

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: **IL 176**
 Section: **2020-144-W&R**
 County: **Lake**
 Location: **at US 41**

Comments: **US 41 at IL 176**
Phase II

Design Date: **11/15/2021** **ONP**
 Modify Date:

<-- BY	ADT	Year
Current:	17,700	2019
Future:	25,000	2040

Facility Type **Other Marked State Route**

of Lanes = **4**

Road Class: **I**

Subgrade Support Rating (SSR): **Poor**

Construction Year: **2024**

Design Period (DP) = **20** years

	Structural Design Traffic			% of ADT in Design Lane
	Minimum ADT	Actual ADT	Actual % of Total ADT	
PV =	0	20,967	91.5%	P = 32%
SU =	250	1,031	4.5%	S = 45%
MU =	750	917	4.0%	M = 45%
Struct. Design ADT =		22,914	(2034)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

Cpv = 0.15

Csu = **132.5**

Cmu = **482.53**

TF flexible (Actual) = 5.23 (Actual ADT)

TF flexible (Min) = 3.56 (Min ADT Fig. 54-2.C)

RIGID PAVEMENT

Cpv = 0.15

Csu = **143.81**

Cmu = **696.42**

TF rigid (Actual) = 7.10 (Actual ADT)

TF rigid (Min) = 5.02 (Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 5.23

PG Grade Lower Binder Lifts = **PG 64-22** (Fig. 53-4.O)

HMA Mixture Temp. = **73.0** deg. F (Fig. 54-5.C)

Design HMA Mixture Modulus (E_{HMA}) = 760 ksi (Fig. 54-5.D)

Design HMA Strain (ϵ_{HMA}) = 75 (Fig. 54-5.E)

Full Depth HMA Design Thickness = 10.50 in. (Fig. 54-5.F)

Limiting Strain Criterion Thickness = **14.25** in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = **10.50** inches

JPC Pavement

Use TF rigid = 7.10

Edge Support = **Tied** Shoulder or C&G

Rigid Pavt Thick. = **9.50** in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 7.10

IBR value = **3**

CRCP Thickness = **8.50** in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Pavement Over Rubblized PCC

Use TF flexible = 5.23

HMA Overlay Design Thickness = 8.00 in. (Fig. 54-5.U)

Limiting Strain Criterion Thickness = in. (Fig. 54-5.V)

Use HMA Overlay Thickness = **999.00** inches

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = **NA** inches

CONTACT RESEARCH 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	2 lanes with ADT > 2000	2 Lanes	2 Lanes
Part of a future 4 lanes or more	One way Street with ADT <= 3500	(ADT 750 -2000)	(ADT < 750)
One-way Streets with ADT > 3500			

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

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 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%

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: Washington/Shagbark/N. Skokie Roads	Comments: US 41 at IL 176
Section: 2020-144-W&R	Use one design for all roads(ramps) to/from IL 176.
County: Lake	Design Date: 11/15/2021 ONP
Location: at IL 176	Modify Date:

Facility Type: Other Marked State Route	# of Lanes = 2 or 3
Part of future 4 lanes or more ?	No
One Way Street ?	No
Road Class:	II
Subgrade Support Rating (SSR):	Poor
Construction Year:	2024
Design Period (DP) =	20 years

	ADT	Year
Current:	4,550	2019
Future:	7,000	2040

	Minimum ADT	Actual ADT	Actual % of Total ADT	% of ADT in Design Lane
PV =	0	5,947	94.4%	P = 50%
SU =	250	176	2.8%	S = 50%
MU =	750	176	2.8%	M = 50%
Struct. Design ADT =	6,300	(2034)		

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT		RIGID PAVEMENT	
Cpv =	0.15	Cpv =	0.15
Csu =	112.06	Csu =	135.78
Cmu =	385.44	Cmu =	567.21
TF flexible (Actual) =	0.89 (Actual ADT)	TF rigid (Actual) =	1.25 (Actual ADT)
TF flexible (Min) =	3.17 (Min ADT Fig. 54-2.C)	TF rigid (Min) =	4.59 (Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement	JPC Pavement
Use TF flexible = 3.17	Use TF rigid = 4.59
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.O)	Edge Support = Tied Shoulder or C&G
HMA Mixture Temp. = 73.0 deg. F (Fig. 54-5.C)	Rigid Pavt Thick. = 9.00 in. (Fig. 54-4.E)
Design HMA Mixture Modulus (E _{HMA}) = 760 ksi (Fig. 54-5.D)	
Design HMA Strain (ε _{HMA}) = 86 in. (Fig. 54-5.E)	
Full Depth HMA Design Thickness = 9.50 in. (Fig. 54-5.F)	
Limiting Strain Criterion Thickness = 14.25 in. (Fig. 54-5.I)	
Use Full-Depth HMA Thickness = 9.50 inches	CRCP Thickness = 7.75 in. (Fig. 54-4.N)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Pavement Over Rubblized PCC	Unbonded Concrete Overlay
Use TF flexible = 3.17	Review 54-4.03 for limitations and special considerations.
HMA Overlay Design Thickness = 7.00 in. (Fig. 54-5.U)	
Limiting Strain Criterion Thickness = in. (Fig. 54-5.V)	
Use HMA Overlay Thickness = 999.00 inches	JPCP Thickness = NA inches

CONTACT RESEARCH 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%

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE Washington/Shagbark/N. Skokie Roads
SECTION 2020-144-W&R
COUNTY Lake
LOCATION at IL 176

FACILITY TYPE NON-INTERSTATE

PROJECT LENGTH 5705 FT == > 1.08 Miles
OF CENTERLINES 1 CL
OF LANES 2 LANES
OF EDGES 2 EP
LANE WIDTH - AVERAGE 14 FT
SHOULDER WIDTH HMA Left 0 FT
HMA Right 0 FT
Total Width of Paved Shoulders 0 FT

PAVEMENT THICKNESS (FLEXIBLE) 9.50 IN 14.25 IN MAX
SHOULDER THICKNESS 8.00 IN HMA_SD Standard Design
HMA OVERLAY THICKNESS 2.00 IN

FLEX PAVEMENT TRAFFIC FACTORS MINIMUM ACTUAL USE
3.17 0.89 3.17

Read Me!

HMA COST PER TON UNIT PRICE
HMA SURFACE \$98.14 / TON
HMA TOP BINDER \$97.75 / TON
HMA LOWER BINDER \$97.75 / TON
HMA BINDER (IL-9.5FG or IL-4.75) \$84.14 / TON
HMA SHOULDER \$72.00 / TON

INITIAL COSTS ITEM	THICKNESS	100% QUAI UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(9.50")	30600 30,600 SQ YD *	\$52.52 / SQ YD	\$1,607,112 ~
HMA SURFACE COURSE	(2.00")	1.0060 2,000 TONS	\$98.14 / TON	\$0
HMA TOP BINDER COURSE	(2.25")	1.0186 2,278 TONS	\$97.75 / TON	\$0
HMA LOWER BINDER COURSE	(5.25")	1.0409 5,432 TONS	\$97.75 / TON	\$0
HMA SHOULDER	(8.00")	0 0 TONS	\$72.00 / TON	\$0 ~
CURB & GUTTER		11,410 LIN FT *	\$30.00 / LIN FT	\$342,300
SUBBASE GRAN MATL TY C (TONS)		42 TONS	\$25.00 / TON	\$1,050
IMPROVED SUBGRADE:	Aggregate Width = 51.3	32,500 SQ YD *	\$7.00 / SQ YD	\$227,500
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		30,600 SQ YD *	\$15.00 / SQ YD	\$459,000
SHOULDER REMOVAL		0 SQ YD	\$0.00 / SQ YD	\$0

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCT \$2,636,962
FLEXIBLE CONSTRUCT \$99,537

MAINTENANCE COSTS: ITEM	THICKNESS	MATERIAL T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY			\$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	1.0060 Surface M 2.00	\$11.06 / SQ YD
HMA OVERLAY PVMT	(2.00")	1.0060 2.00	\$11.06 / SQ YD
HMA SURFACE MIX	(2.00")	1.0060 Surface M 2.00	\$11.06 / SQ YD
HMA BINDER MIX	(0.00")	1.0119 IL-9.5FG or I 0.00	\$0.00 / SQ YD
HMA OVERLAY SHLD (Year 30)	(2.00")	Shoulder 2.00	\$8.06 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder 2.00	\$8.06 / SQ YD
MILLING (2.00 IN)		2.00	\$3.00 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill Surf)	Surface M 2.00	\$80.99 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder 2.00	\$78.06 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Binder Mix 2.00	\$79.42 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder 2.00	\$78.06 / SQ YD

LONGITUDINAL SHOULDER JOINT ROUT & SEAL
CENTERLINE JOINT ROUT & SEAL
RANDOM / THERMAL CRACK ROUT & SEAL

	\$2.00 / LIN FT
	\$2.00 / LIN FT
(100% Ref	\$2.00 / LIN FT

FLEXIBLE TOTAL LIFE-	\$3,303,661
FLEXIBLE TOTAL ANNI	\$124,703

PCC PAVEMENT

JPCP

ROUTE
SECTION
COUNTY
LOCATION

Washington/Shagbark/N. Skokie Roads
2020-144-W&R
Lake
at IL 176

FACILITY TYPE

NON-INTERSTATE

PROJECT LENGTH		5705 FT	= = >	1.08 Miles
# OF CENTERLINES		1 CL		
# OF LANES		2 LANES		
# OF EDGES		2 EP		
LANE WIDTH - AVERAGE		14 FT		
SHOULDER WIDTH	PCC	Left		0 FT
	PCC	Right		0 FT
	Total Width of Paved Shoulders			0 FT

PAVEMENT THICKNESS (RIGID)	JPCP	9.00 IN	TIED SHLD
SHOULDER THICKNESS		9.00 IN	

HMA OVERLAY THICKNESS 2.75 IN

RIGID PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		4.59	1.25	4.59
Worksheet Construction Type is	Reconstruction		The Pavement Type is	JPCP

INITIAL COSTS ITEM	THICKNESS	100% QUA UNIT	UNIT PRICE	COST
JPC PAVEMENT	(9.00")	30,600 SQ YD *	\$66.95 / SQ YD	\$2,048,670
PAVEMENT REINFORCEMENT		0 SQ YD	\$22.00 / SQ YD	\$0
STABILIZED SUBBASE	(4.00")	0 SQ YD *	\$19.00 / SQ YD	\$0
PCC SHOULDERS	(9.00" to 9.00")	0 SQ YD	\$40.00 / SQ YD	\$0
CURB & GUTTER		11,410 LIN FT *	\$30.00 / LIN FT	\$342,300
SUBBASE GRAN MATL TY C	(~ 0.00")	0 TONS	\$25.00 / TON	\$0
IMPROVED SUBGRADE:	Aggregate Width = 51.3	32,500 SQ YD *	\$7.00 / SQ YD	\$227,500
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		30,600 SQ YD *	\$15.00 / SQ YD	\$459,000
SHOULDER REMOVAL		0 SQ YD	\$0.00 / SQ YD	\$0
Note: * Denotes User Supplied Quantity			RIGID CONSTRUCTION	\$3,077,470
			RIGID CONSTRUCTION	\$116,165

MAINTENANCE COSTS: ITEM	THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 / LANE-MILE / YEAR
HMA OVERLAY	(2.75")		2.75	
HMA OVERLAY PAVEMENT	(2.75")	1.0082	2.75	\$14.24 / SQ YD
HMA SURFACE MIX	(1.50")	1.0045	Surface M	\$8.28 / SQ YD
HMA BINDER MIX	(1.25")	1.0126	IL-9.5FG or I	\$5.96 / SQ YD
HMA OVERLAY SHOULDER	(2.75")		Shoulder	\$11.09 / 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 M	1.50	\$78.24 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.75")		Surface M	2.75	\$85.11 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$2.00 / LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				\$2.00 / LIN FT
RANDOM CRACK ROUT & SEAL		(100% Rehab = 100.00' /		\$2.00 / LIN FT

RIGID TOTAL LIFE-C	\$3,526,688
RIGID TOTAL ANNUAL	\$133,121

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Re #####

CONSTRUCTION	INITIAL COST	JPCP		HMA
		PRESENT 1	\$3,077,470	\$2,636,962
		ANNUAL C	\$116,165	\$99,537
MAINTENANCE	LIFE-CYCLE COST	PRESENT 1	\$449,218	\$666,699
		ANNUAL C	\$16,957	\$25,166
TOTAL	LIFE-CYCLE COST	PRESENT 1	\$3,526,688	\$3,303,661
		ANNUAL C	\$133,121	\$124,703

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	===== HMA	\$124,703	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PE JPCP	\$133,121	6.8%

S:\pavetech\Pavement Designs\D-1\US 41 at IL 176 (62L32)\62L32 Pvmt Analysis (Updated)\Pvmt Analysis Files\Washington_Shagbark_N Skokie_Access Rd - BDE

HMA_SD

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE

06/07/22

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

MAINTENANCE ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5						
LONG SHLD JT R&S	100.00%	11,410	LIN FT	\$2.00	\$22,820	
CNTR LINE JOINT R&S	100.00%	5,705	LIN FT	\$2.00	\$11,410	
RNDM / THRM CRACK R&S	50.00%	6,276	LIN FT	\$2.00	\$12,552	
PD PVMT PATCH M&F SURF	0.10%	31	SQ YD	\$80.99	\$2,511	
PWFn =	0.8626		PW =	0.8626 X	\$49,293	\$42,521
YEAR 10						
LONG SHLD JT R&S	100.00%	11,410	LIN FT	\$2.00	\$22,820	
CNTR LINE JOINT R&S	100.00%	5,705	LIN FT	\$2.00	\$11,410	
RNDM / THRM CRACK R&S	50.00%	6,276	LIN FT	\$2.00	\$12,552	
PD PVMT PATCH M&F SURF	0.50%	153	SQ YD	\$80.99	\$12,392	
PWFn =	0.7441		PW =	0.7441 X	\$59,174	\$44,031
YEAR 15						
MILL PVMT & SHLD 2.00"	100.00%	30,600	SQ YD	\$3.00	\$91,800	
PD PVMT PATCH M&F ADD'L 2.00"	1.00%	306	SQ YD	\$79.42	\$24,304	
HMA OVERLAY PVMT 2.00"	100.00%	30,600	SQ YD	\$11.06	\$338,347	
HMA OVERLAY SHLD 2.00 "	100.00%	0	SQ YD	\$8.06	\$0	
PWFn =	0.6419		PW =	0.6419 X	\$454,451	\$291,695
YEAR 20						
LONG SHLD JT R&S	100.00%	11,410	LIN FT	\$2.00	\$22,820	
CNTR LINE JOINT R&S	100.00%	5,705	LIN FT	\$2.00	\$11,410	
RNDM / THRM CRACK R&S	50.00%	6,276	LIN FT	\$2.00	\$12,552	
PD PVMT PATCH M&F SURF	0.10%	31	SQ YD	\$80.99	\$2,511	
PWFn =	0.5537		PW =	0.5537 X	\$49,293	\$27,292
YEAR 25						
LONG SHLD JT R&S	100.00%	11,410	LIN FT	\$2.00	\$22,820	
CNTR LINE JOINT R&S	100.00%	5,705	LIN FT	\$2.00	\$11,410	
RNDM / THRM CRACK R&S	50.00%	6,276	LIN FT	\$2.00	\$12,552	
PD PVMT PATCH M&F SURF	0.50%	153	SQ YD	\$80.99	\$12,392	
PWFn =	0.4776		PW =	0.4776 X	\$59,174	\$28,262
YEAR 30						
NON-INTERSTATE						
MILL PVMT & SHLD 2.00"	100.00%	30,600	SQ YD	\$3.00	\$91,800	
PD PVMT PATCH M&F ADD'L 2.00"	2.00%	612	SQ YD	\$79.42	\$48,607	
PD SHLD PATCH M&F ADD'L 2.00"	1.00%	0	SQ YD	\$78.06	\$0	
HMA OVERLAY PVMT 2.00 "	100.00%	30,600	SQ YD	\$11.06	\$338,347	
HMA OVERLAY SHLD 2.00 "	100.00%	0	SQ YD	\$8.06	\$0	
PWFn =	0.4120		PW =	0.4120 X	\$478,754	\$197,240
YEAR 35						
LONG SHLD JT R&S	100.00%	11,410	LIN FT	\$2.00	\$22,820	
CNTR LINE JOINT R&S	100.00%	5,705	LIN FT	\$2.00	\$11,410	
RNDM / THRM CRACK R&S	50.00%	6,276	LIN FT	\$2.00	\$12,552	
PD PVMT PATCH M&F SURF	0.10%	31	SQ YD	\$80.99	\$2,511	
PWFn =	0.3554		PW =	0.3554 X	\$49,293	\$17,518
YEAR 40						
LONG SHLD JT R&S	100.00%	11,410	LIN FT	\$2.00	\$22,820	
CNTR LINE JOINT R&S	100.00%	5,705	LIN FT	\$2.00	\$11,410	
RNDM / THRM CRACK R&S	50.00%	6,276	LIN FT	\$2.00	\$12,552	
PD PVMT PATCH M&F SURF	0.50%	153	SQ YD	\$80.99	\$12,392	
PWFn =	0.3066		PW =	0.3066 X	\$59,174	\$18,140
						\$666,699
ROUTINE MAINTENANCE ACTIVITY		2.16	Lane Miles	0.00	\$0	\$0
45 YEAR LIFE CYCLE	CRFn = 0.0407852				MAINTENANCE MAINTENANCE	\$666,699
						\$25,166

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

MAINTENANCE ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 10						
PAVEMENT PATCH CLASS B	0.10%	31	SQ YD	\$150.00	\$4,650	
PWF _n =	0.7441		PW =	0.7441 X	\$4,650	\$3,460
YEAR 15						
PAVEMENT PATCH CLASS B	0.20%	61	SQ YD	\$150.00	\$9,150	
PWF _n =	0.6419		PW =	0.6419 X	\$9,150	\$5,873
YEAR 20						
PAVEMENT PATCH CLASS B	2.00%	612	SQ YD	\$150.00	\$91,800	
SHOULDER PATCH CLASS C	0.50%	0	SQ YD	\$145.00	\$0	
LONGITUDINAL SHLD JT R&S	100.00%	11,410	LIN FT	\$2.00	\$22,820	
CENTERLINE JT R&S	100.00%	5,705	LIN FT	\$2.00	\$11,410	
PWF _n =	0.5537		PW =	0.5537 X	\$126,030	\$69,780
YEAR 25						
PAVEMENT PATCH CLASS B	3.00%	918	SQ YD	\$150.00	\$137,700	
SHOULDER PATCH CLASS C	1.00%	0	SQ YD	\$145.00	\$0	
PWF _n =	0.4776		PW =	0.4776 X	\$137,700	\$65,766
YEAR 30						
NON-INTERSTATE						
PAVEMENT PATCH CLASS B	4.00%	1,224	SQ YD	\$150.00	\$183,600	
SHOULDER PATCH CLASS C	1.50%	0	SQ YD	\$145.00	\$0	
HMA OVERLAY 2.75" (PVMT)	100.00%	30,600	SQ YD	\$14.24	\$435,893	
HMA OVERLAY 2.75" (SHLD)	100.00%	0	SQ YD	\$11.09	\$0	
PWF _n =	0.4120		PW =	0.4120 X	\$619,493	\$255,223
YEAR 35						
NON-INTERSTATE						
LONGITUDINAL SHLD JT R&S	100.00%	11,410	LIN FT	\$2.00	\$22,820	
CENTERLINE JT R&S	100.00%	5,705	LIN FT	\$2.00	\$11,410	
RANDOM CRACK R&S	50.00%	5,705	LIN FT	\$2.00	\$11,410	
REFLECTIVE TRANSVERSE CRACK R&S	40.00%	4,256	LIN FT	\$2.00	\$8,512	
PD PVMT PATCH M&F HMA 2.75"	0.10%	31	SQ YD	\$85.11	\$2,639	
PWF _n =	0.3554		PW =	0.3554 X	\$56,791	\$20,183
YEAR 40						
NON-INTERSTATE						
PAVEMENT PATCH CLASS B	0.50%	153	SQ YD	\$150.00	\$22,950	
LONGITUDINAL SHLD JT R&S	100.00%	11,410	LIN FT	\$2.00	\$22,820	
CENTERLINE JT R&S	100.00%	5,705	LIN FT	\$2.00	\$11,410	
REFLECTIVE TRANSVERSE CRACK R&S	60.00%	6,384	LIN FT	\$2.00	\$12,768	
RANDOM CRACK R&S	50.00%	5,705	LIN FT	\$2.00	\$11,410	
PD PVMT PATCH M&F HMA 2.75"	0.50%	153	SQ YD	\$85.11	\$13,022	
PWF _n =	0.3066		PW =	0.3066 X	\$94,380	\$28,933
						\$449,218
ROUTINE MAINTENANCE ACTIVITY		2.16	Lane Miles	\$0.00	\$0	\$0
45 YEAR LIFE CYCLE	CRF _n = 0.0407852				MAINTENANCE	\$449,218
					MAINTENANCE	\$16,957