

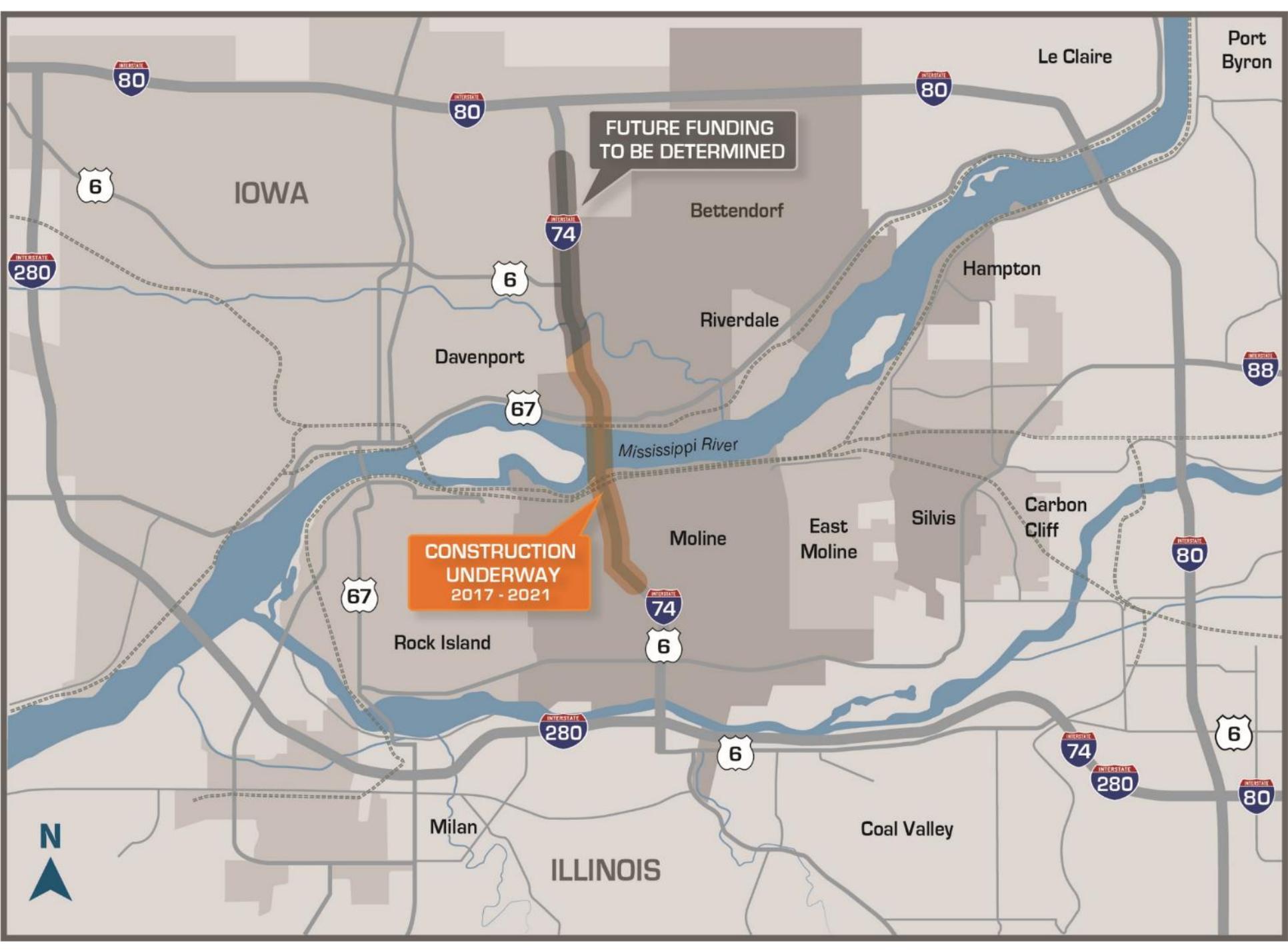
I-74 Bridge Over Mississippi River Construction



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2018 Midwest Geotechnical Conference, 27SEP18





State-of-the-art Mississippi River Bridge



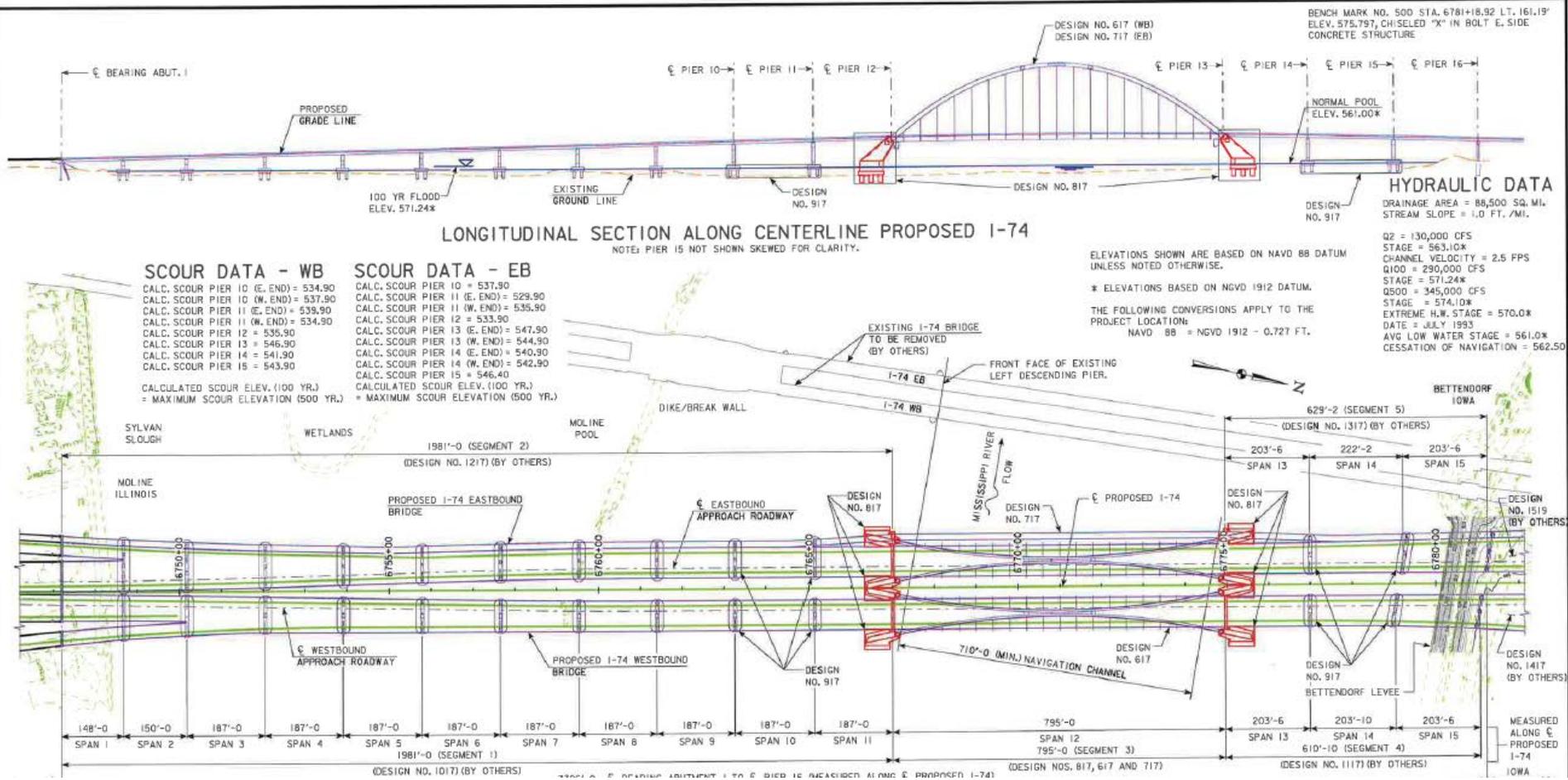
Project Leads



Project Team – 198M Contract (River Bridge)

- Designer
 - Benesch – EOR
 - Hanson – Geotech
 - Modjeski and Masters – Arch Spans
- General Contractor - Lunda Construction (\$322 M)
- Drilled Shaft Sub – Michels Foundation
- CEI – HNTB
- GEC – AMEC

Project Scope – 198M Contract (River Bridge)



Shaft Installation – 198M Contract (River Bridge)

- 239 Production Drilled Shafts
- Water Shafts
 - 196 – 7 ft diameter (Approach Piers 2-11, 13-15)
 - 37 – 10 ft diameter (Arch Foundation Piers 12 and 13)
- Land Shafts
 - 6 – 10 ft diameter (Pier 16)

Shaft Installation – 198M Contract (River Bridge)

- Iowa DOT Specifications 2433 Concrete Drilled Shaft
- Contract payment
 - Drilled shaft, length installed (included concrete)
 - Rebar – lbs in cage, contract rebar
- Acceptance by CSL – Iowa DOT

Soil and Rock Profile

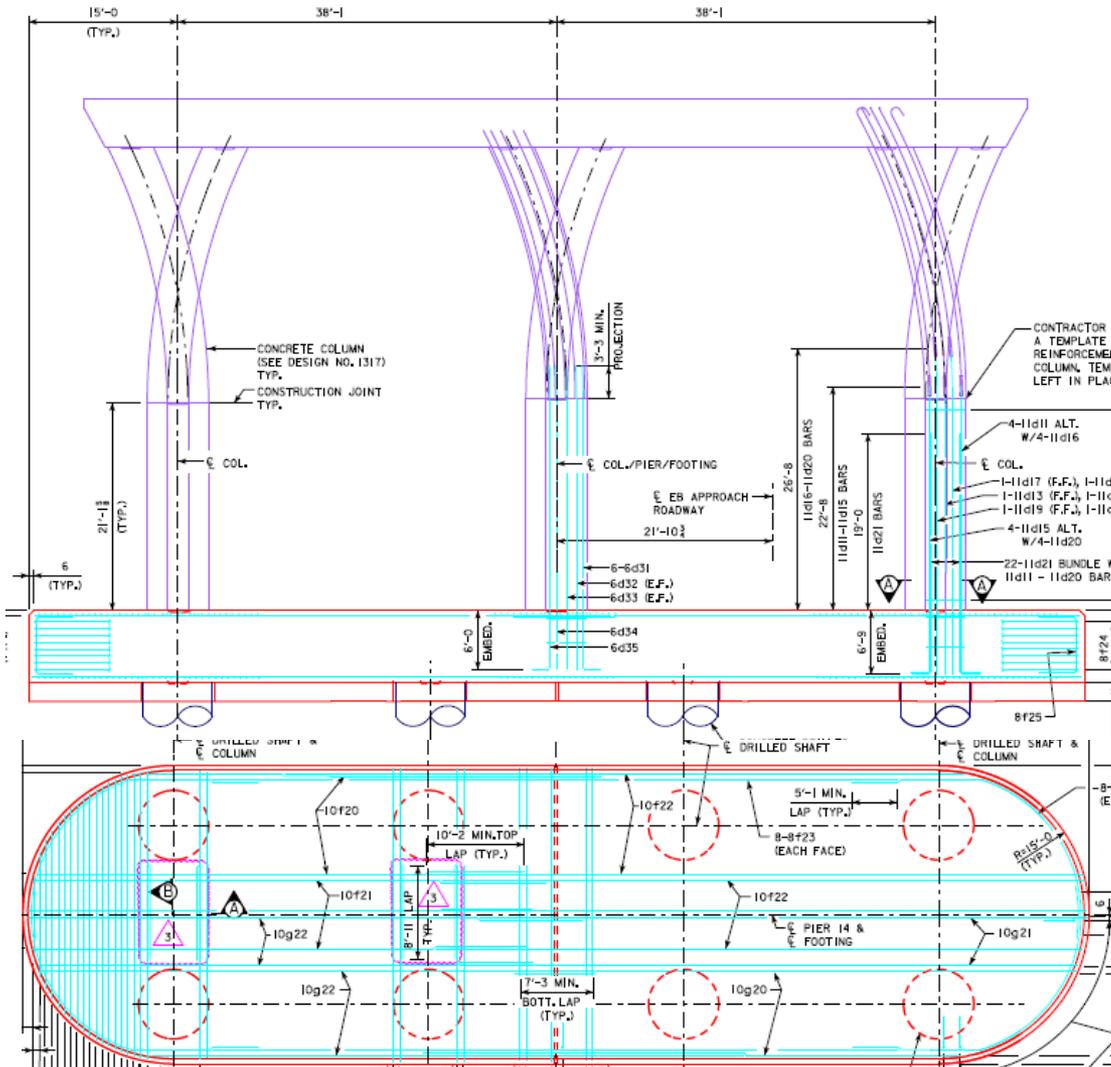


Drilled shaft Installation - CEI Tasks

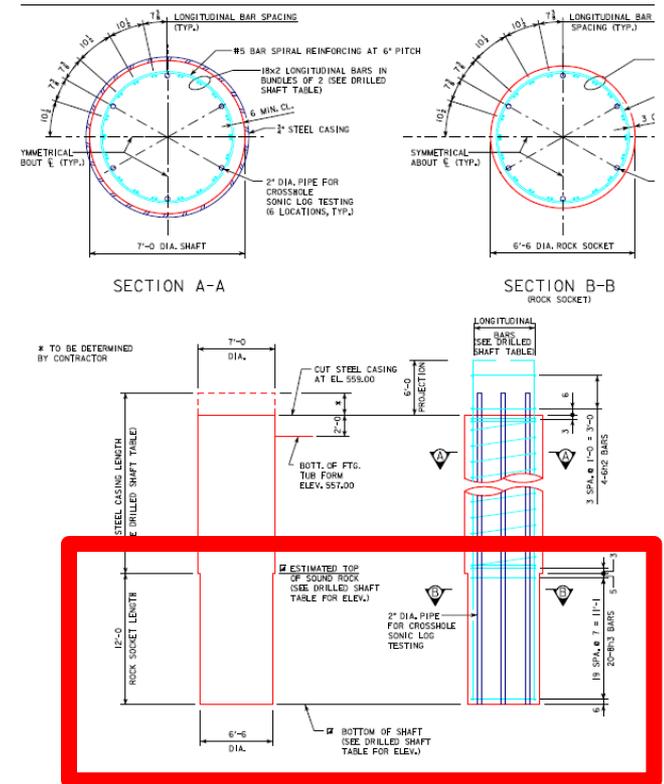
- Continuous inspection, they are out there, we are out there
- Top of rock determination
- Drilling progress – document what is coming up
- Determine shaft depth, hole preparation
- Concrete placement
- Drilled shaft report
 - Time line
 - Depth
 - Yield
- Posting for payment



Approach Piers/Foundations



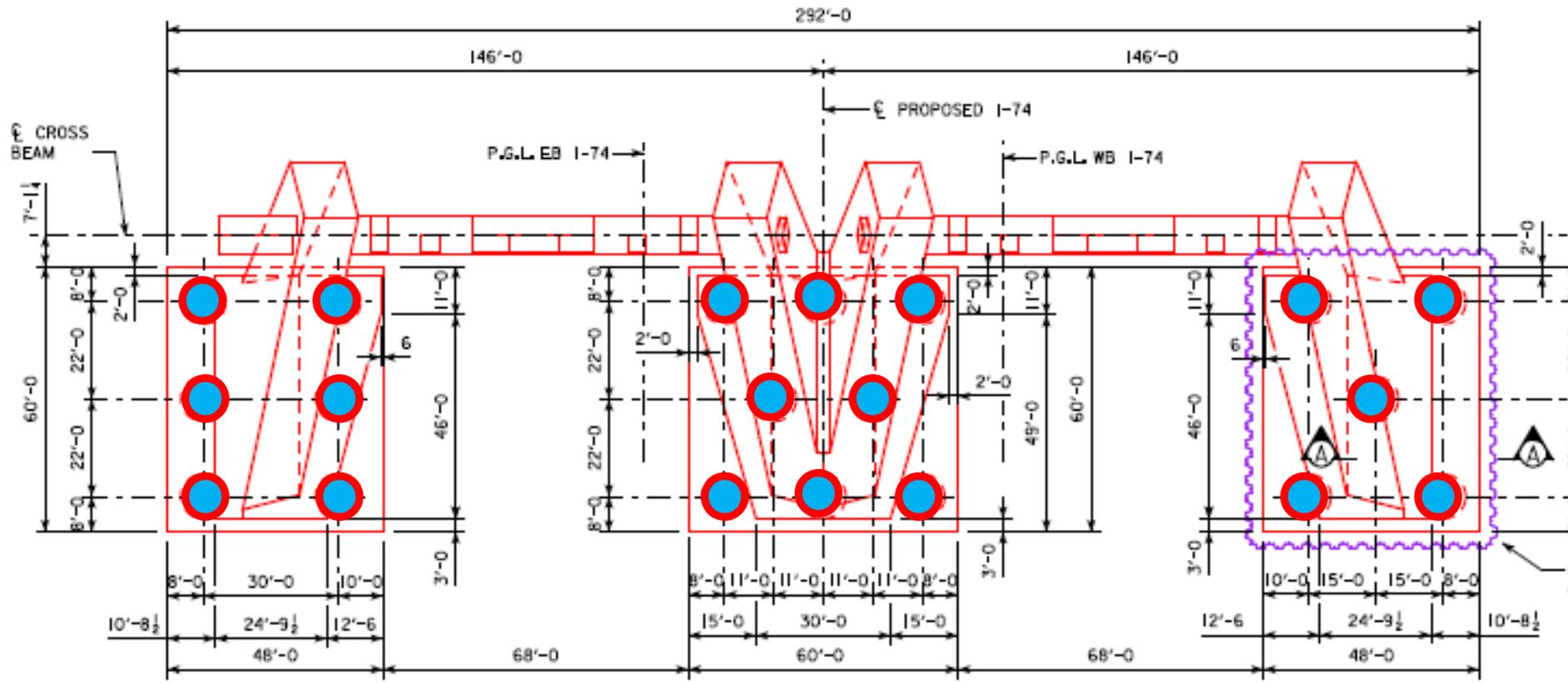
7 ft Drilled Shafts



Arch Pier/Foundations



Arch Pier/Foundations



PLAN - PIER 12

Rigs and Equipment

- Contractor had three rigs working simultaneously, 8 to 14 hour days, working off of barges
- 2 – Liebherr L36 machines
- 1 - IMF AF300 machine



Supporting Operations



Casing



Casing



Drilling Tools – Core Barrels and Augers



Drilling Tools – Flat Augers and Cleaning Pans



Drilling Tools



Drilling Tools – Down Hole Hammers



Drilling Tools – Down Hole Hammers



Drilling Tools – Down Hole Hammers



Establishing Top of Rock



Hole – Final Preparation



Environmental Requirements



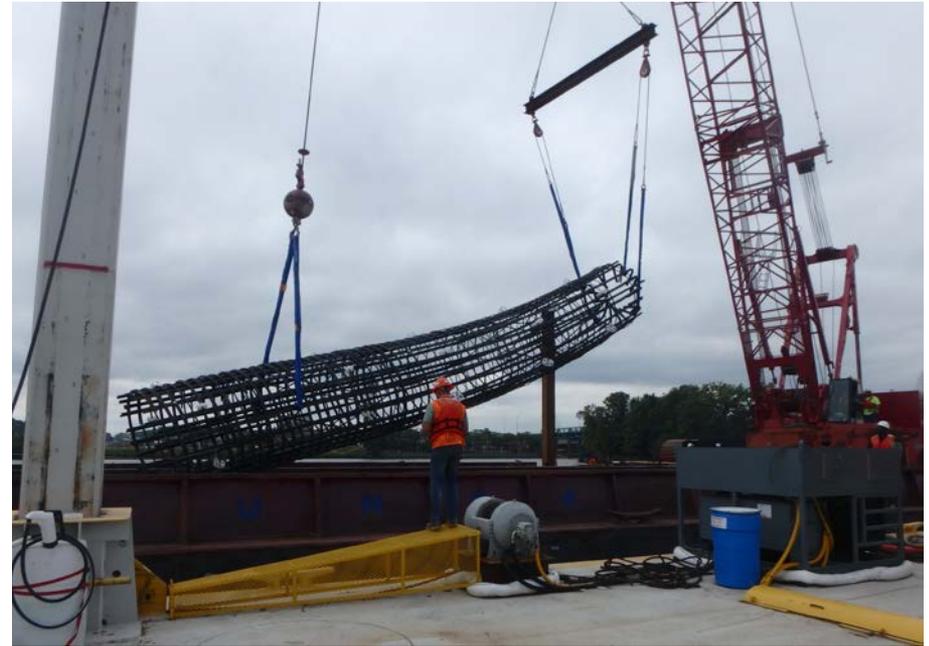
Environmental Requirements



Environmental Requirements - Sandbagging



Drilled Shaft Reinforcement – 7 ft



Drilled Shaft Reinforcement – 10 ft



Drilled Shaft Reinforcement – 10 ft



Drilled Shaft Reinforcement – 10 ft



Concrete Placement

- Iowa DOT mix D-57-C15



Concrete Placement



Drilled Shaft Reports – DSR

DownStream		Upstation	Upstream	
21	22	23	24	25
20	21	22	23	24
DownStation				

DRILLED SHAFT INSPECTION REPORT

Project Name: I-74 Bridge Replacement over the Mississippi River
 Contract No.: 82-0741-19B-M
 Contractor: Lunda Construction Co.
 Subcontractor: Michels Corporation
 Inspected By: Mitch Gibb
 Approved By: Kirk Nelson

Page: 1 of 1
 Pier #: 13
 Shaft #: 20
 Design #: 0817
 Pay Item #: 1960

Time Information		Dimensions	
Start	Finish	Plan	Actual
Set Casing: 9:53 AM 12/20/17	10:45 AM 12/20/17	10.00	10.04
Excavation of Overburden: -	-	2.50	3.78
Rock Excavation: 11:30 AM 12/20/17	12:00 PM 1/12/18	9.50	9.50
Shaft Clean Out/Inspection: 12:30 PM 1/12/18	1:15 PM 1/12/18	34.50	34.76
Set Rebar Cage: 1:30 PM 1/12/18	2:15 PM 1/12/18	37.00	37.04
Concrete Placement: 2:36 PM 1/12/18	5:19 PM 1/12/18		37

Plan	Actual
Top of Casing	565.47
Cut Steel Casing	549.00
Bottom of Flg / Tub Form	
Top of Ex. Rock	546.72
Bottom of River	546.72
Top of Sound Rock	546.50
Bottom of Casing	545.22
Bottom of Rock Socket	511.96
Over Excavation	

Depth (ft)	Elevation (ft)	Material Description & Notes
0	565.47	
18.75	546.72	Grey Limestone w/ Fossiliferous
23	542.47	Grey Limestone w/ Fossiliferous
28	537.47	Grey Limestone w/ Fossiliferous
33	532.47	Light Grey/Grey Limestone w/ Fossiliferous
38	527.47	Grey Limestone w/ Fossiliferous
43	522.47	Grey Limestone w/ Fossiliferous
48	517.47	Dark Grey/Grey Limestone w/ Fossiliferous
53.51	511.96	Grey Limestone w/ Fossiliferous

Sketch of Drilled Shaft

Reason

Rebar Cage: Meets Specifications Does Not Meet Specifications

CSL Tubes: Meets Specifications Does Not Meet Specifications

Plumbness: Meets Specifications Does Not Meet Specifications

Cleanliness: Meets Specifications Does Not Meet Specifications

Comments:

This Shaft: Is Acceptable Is Not Acceptable

Given to: Rob Osze Verbal Written

By: Mitch Gibb Time: 12:30 PM Date: 1 / 12 / 18

DRILLED SHAFT CONCRETE PLACEMENT LOG

Project Name: I-74 Bridge Replacement over the Mississippi River
 Project No.: 82-0741-19B-M
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Drill Shaft Diameter = 10 ft = 78.540 ft²
 Rock Socket Diameter = 9.5 ft = 70.882 ft²

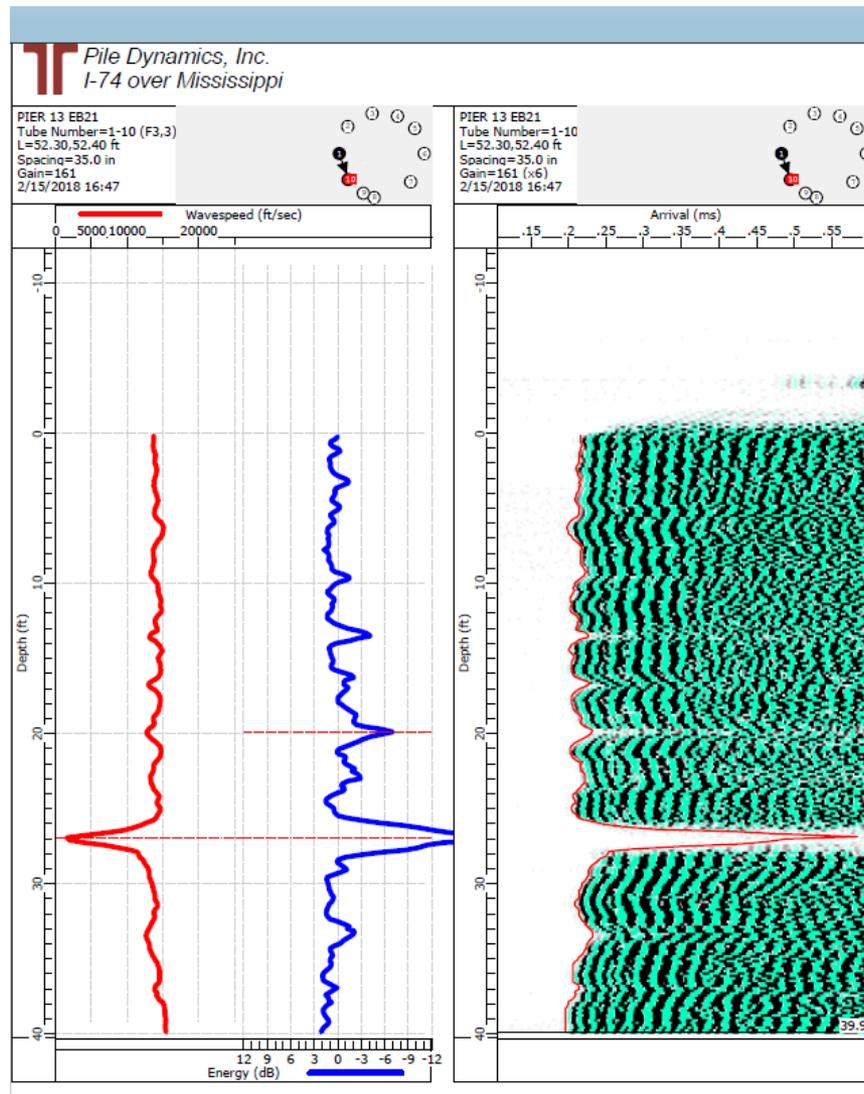
Elevation Sounding taken from = 565.47 = XXXXXXXXXX
 Top of Drilled Shaft = 549.00 = 16.47
 Top of Construction Joint = XXXXXXXXXX
 Bottom of Casing = 545.22 = 20.25
 Bottom of Rock Socket = 511.96 = 53.51

Actual Drilled Shaft Length = 37.04 ft

Concrete Curve

Theoretical				Actual			
Length (ft)	Volume (cyd)	Placed	Volume	Time	Sounding	Placed	Volume
0	0.0	0.0	0.0			0.0	0.0
Bottom						3.0	9.0
Socket	33.26	87.3	87.3			6.0	19.0
Casing	3.78	11.0	37.0			9.5	29.0
Overpour	2	5.8	39.0			12.0	39.0
						16.5	49.0
						19.5	59.0
						24.5	69.0
						27.5	79.0
						30.5	89.0
						34.5	99.0
						37.5	109.0
						39.0	113.0

Acceptance of Shaft - CSL Testing



Harsh Conditions



Summary

- Shaft 1 – September 18, 2017
- Shaft 239 – July 20, 2018

- Thank you –
 - Iowa DOT
 - Illinois DOT
 - FHWA

