2023 Bridge Forum

Presentation Title

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IOWA DOT Foth HNTB

Project **Location**

Lansing, Allamakee County, IA • Border of Wisconsin

Existing Bridge Geometry

3-Span Cantilevered Through Truss

237' - 653' - 237' Truss Spans

297' Suspended Span

1631' Overall Bridge Length

21' Roadway Width

Open Grid Steel Deck

Bridge **History**

IA 9/WI 82 Mississippi River Bridge at Lansing

Historical Timeline

1916
Initially the effort was organized under the Interstate Bridge Company in 1916. The name later changed to the Lansing Bridge Company and ultimately the organization would become the Iowa-Wisconsin Bridge Company.

1930–1940
Ownership of the bridge is contested and financial difficulties are noted.

1930
The bridge design changes from a suspension bridge to a cantilevered through truss design.

1931
The bridge opened as a toll bridge. Historic photos show it had a wooden deck.

1945
In March, *the Fern*, an ice cutter on a mission for the military, creates an ice dam that causes slough bridge damage that cannot be repaired by the Iowa-Wisconsin Bridge Company. The bridge closes until repairs can be made.

1948
Repair costs are estimated at $600,000 and estimates for a bridge replacement come in at $2M. Talks begin for the states of Iowa and Wisconsin to take over ownership of the bridge.

1956
Under the ownership of the states of Iowa and Wisconsin, the bridge is reopened without a toll.

2003-2004
Iowa and Wisconsin Departments of Transportation begin to assess the crossing for improvements.

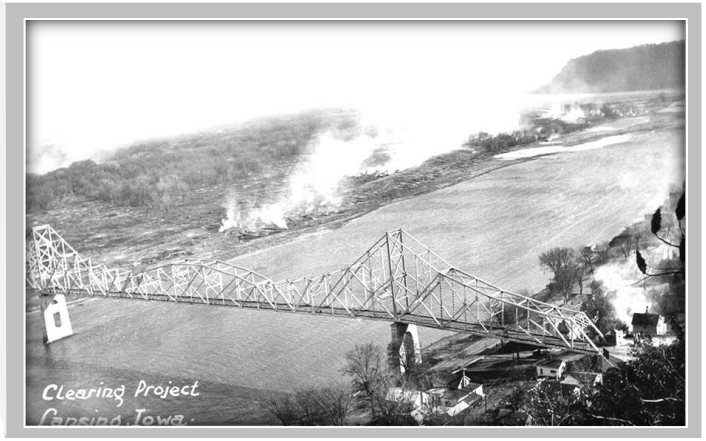
2017
The first public meeting is held to discuss improvements to the bridge.

2019
The bridge is evaluated for possible rehabilitation.

2021
The preferred option of replacing the bridge is discussed at a public meeting in June.

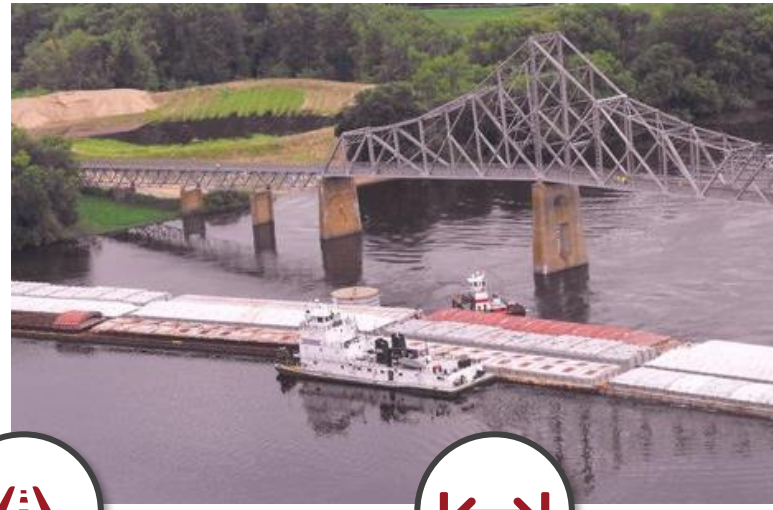
2023
The project to replace the bridge goes out for bids in August. Initial work on the replacement bridge is set to begin in September.

2026
Anticipated bridge opening.



Case Study **Overview**

Crossing the Mississippi River and connecting Iowa Highway 9 to Wisconsin Highway 82, updates to this bridge will improve safety and mobility to motorists and river enthusiasts. The bridge has served the area since 1931 and is in need for updates and improvements to better accommodate changed vehicle size, traffic patterns, and a wider, safer crossing.



Structural Condition

Current bridge rates limit commercial traffic and impact freight movement

Geometry

Tight turn radius for trucks

Safety

Bridge deck is a narrow 21 feet with no shoulders

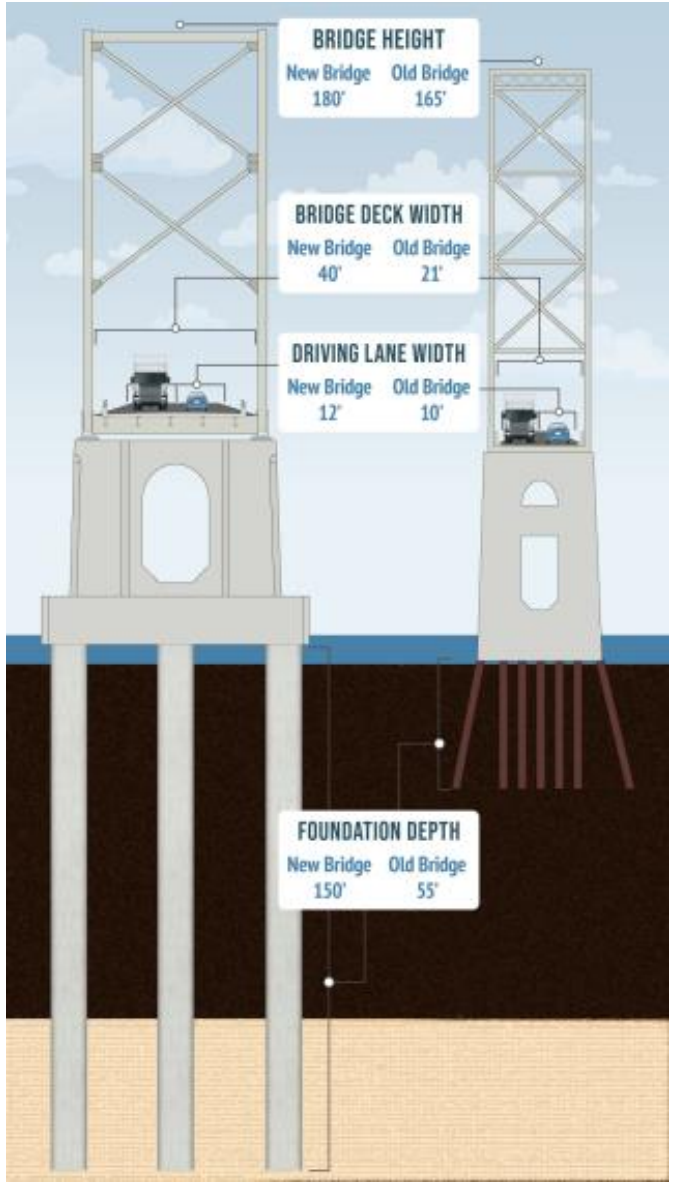
Ride

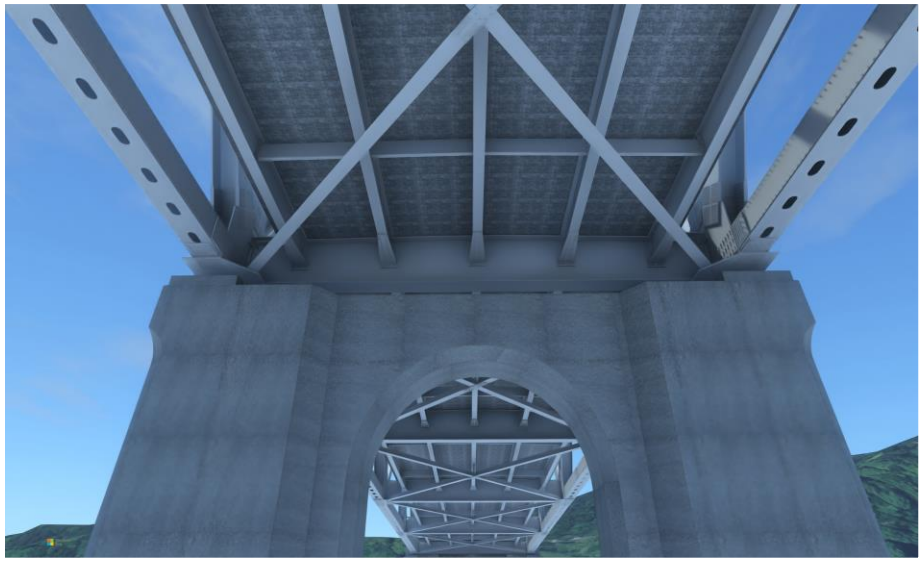
Steel grate bridge deck provides a rough ride and difficult winter maintenance

Navigation

650-foot-wide channel is problematic for barges to navigate

https://www.waukonstandard.com/articles/2023/09/13/iowa-dot-shares-some-initial-detail-insight-black-hawk-bridge-replacement





Proposed **Bridge**

Proposed Geometry

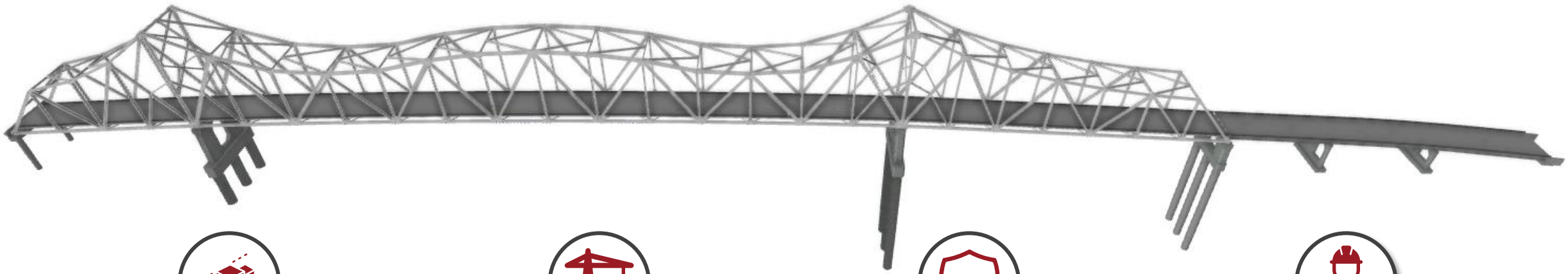
3-Span Continuous Through Truss
205' - 778' - 369' Truss Spans
3-Span PPCB East Approach Bridge
1724' Overall Bridge Length
40' Roadway Width
Concrete Deck

Project Let August 1, 2023
Low Bid - $124M
Project Awarded to Kraemer North America

New bridge will be built off-alignment north of existing bridge.

Existing bridge will be open to traffic during construction except for short-term closures to tie-in pavement at project limits.

Project **Schedule**



2024

Main Span Piers
West Abutment
Approach Bridge

2025

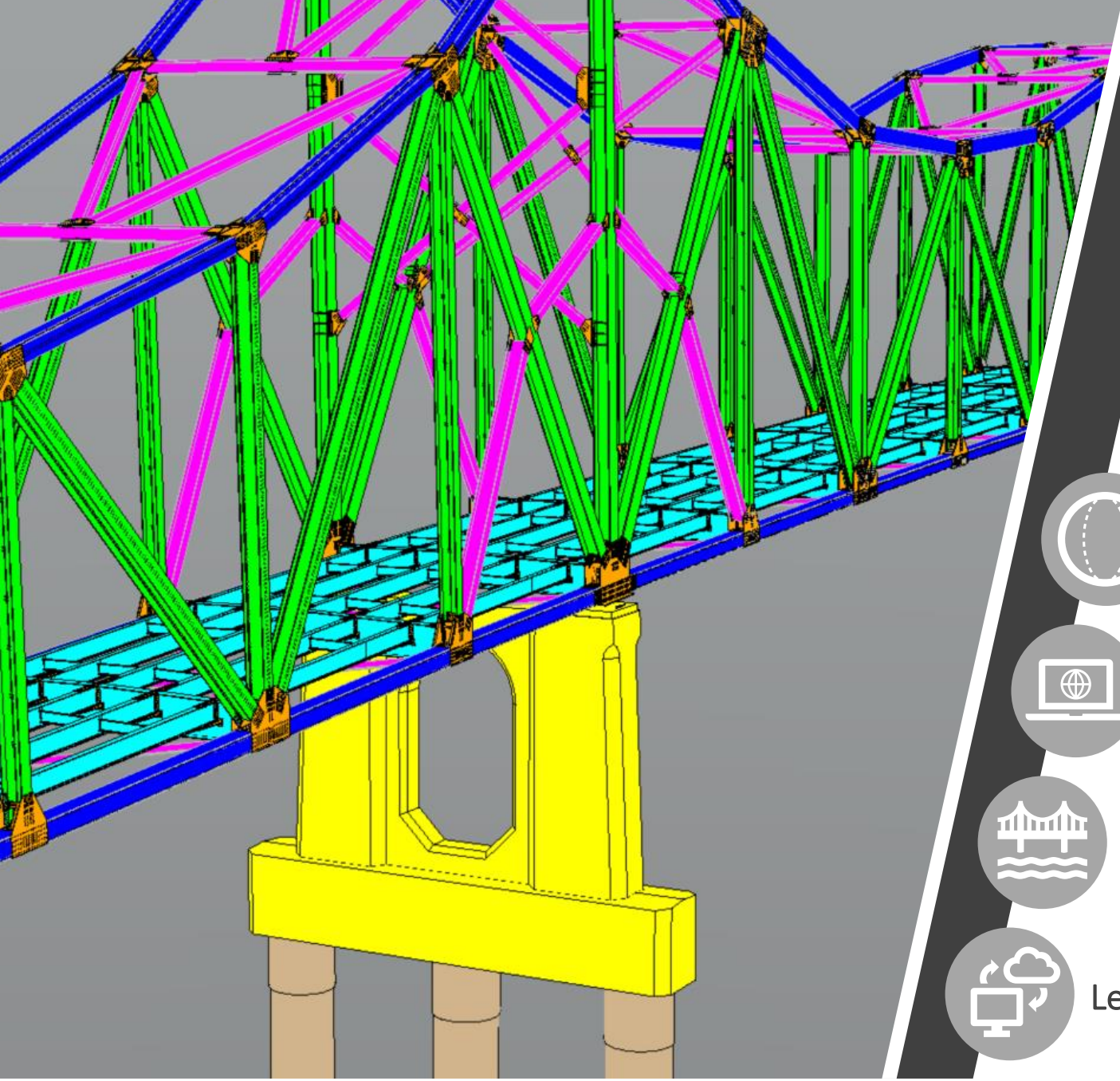
Steel Truss Erection

2026

Main Span Deck & Barriers
(Operationally Complete by
October)

2027

Complete Demo of
Existing Bridge



BIM
Development

- 3D Modeling Support During Design Development
- BIM Issued For Information Only with Contract Documents
- Focus on Truss and Pier Reinforcing
- Level of Development (LOD) 400

Modeling **Resources**

OpenBridge Modeler

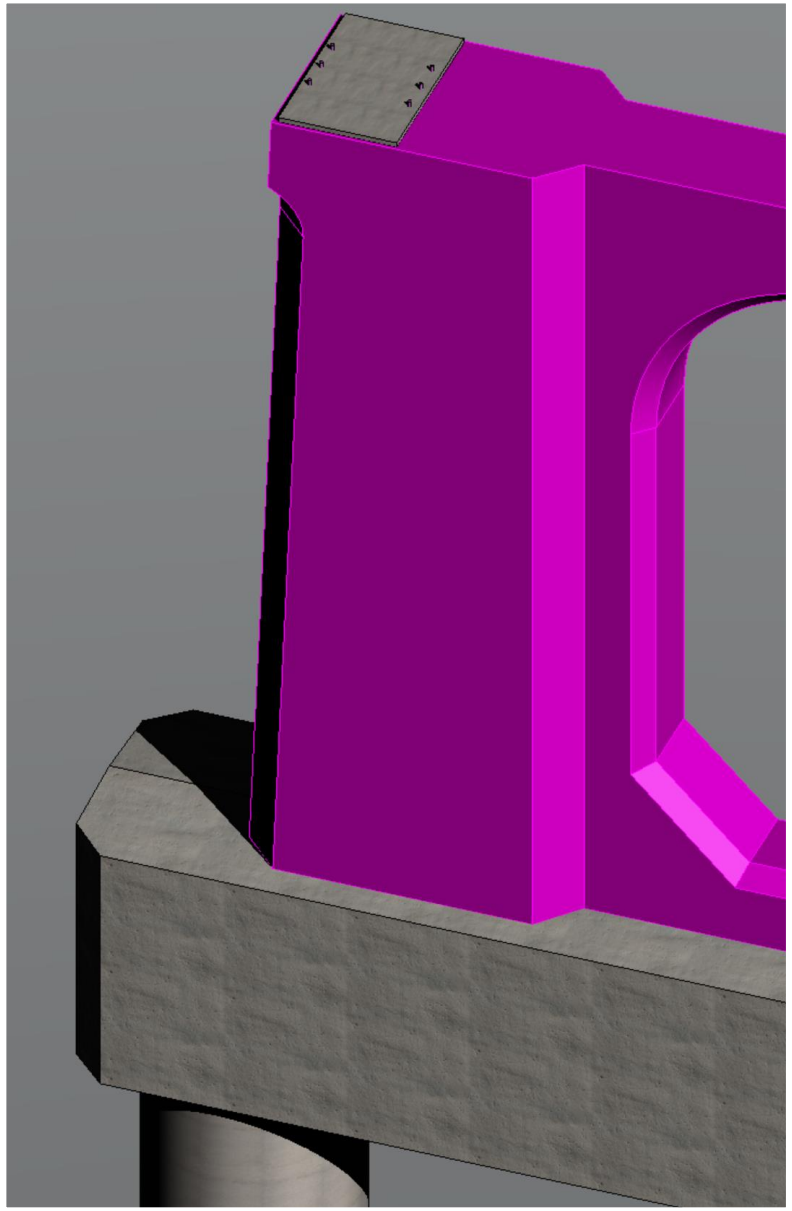
Deck
Rails
East Approach Bridge

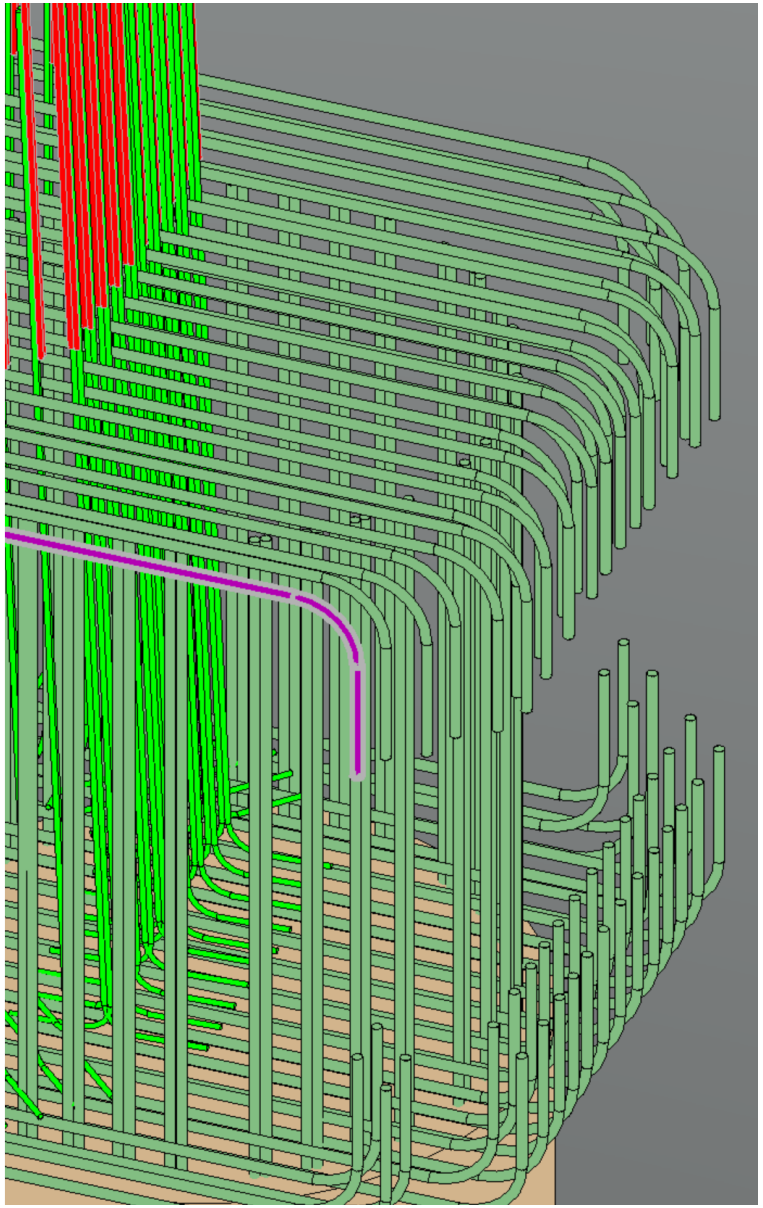
ProStructures

Truss
Piers
Abutment

iTwin Hub

Digital Delivery
Contractor Access
Information Sharing





Pier **Modeling**

Large Complex Elements

152 to 362 tons of reinforcing steel per pier

660 to 1246 cubic yards of concrete per pier

Grade 60 and Grade 80 reinforcing, both non-coated and epoxy-coated

Targeted Modeling Effort

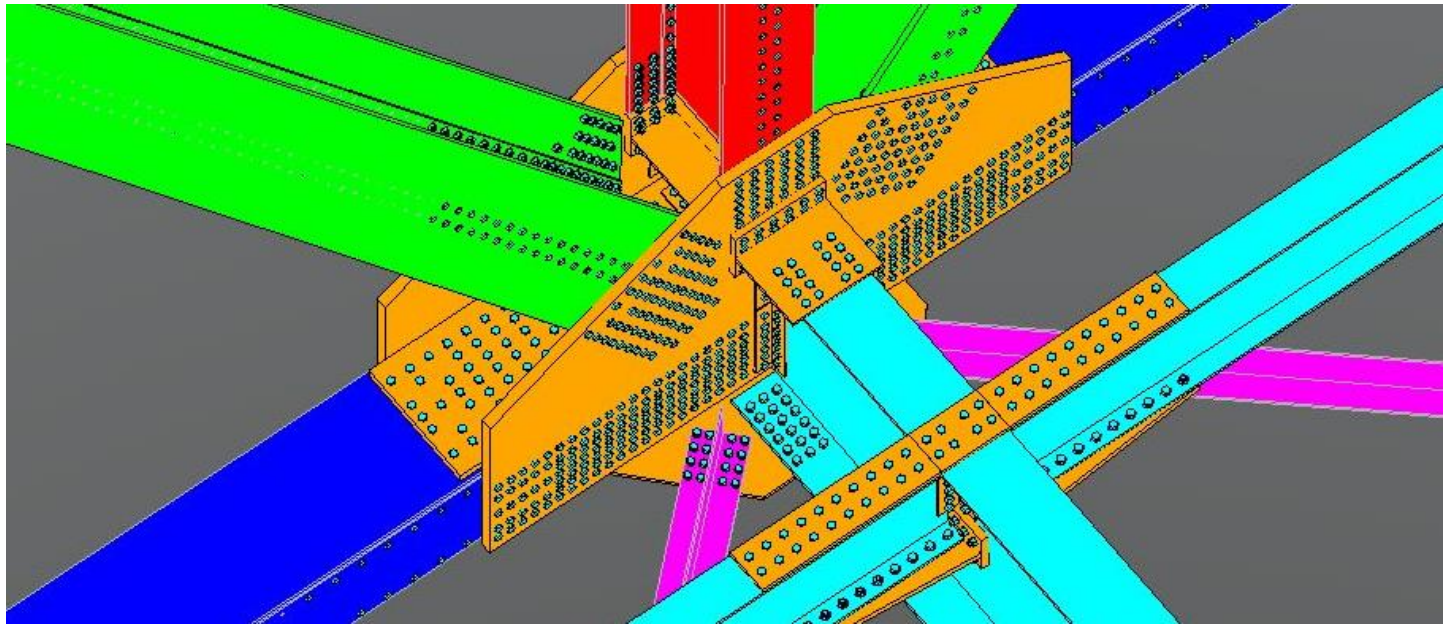
Primary reinforcing

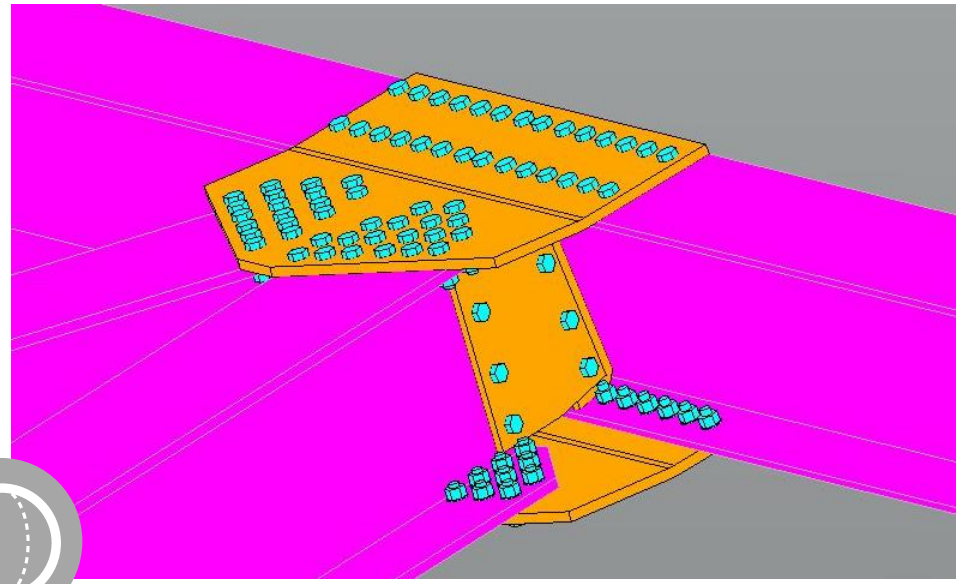
Intersecting bars

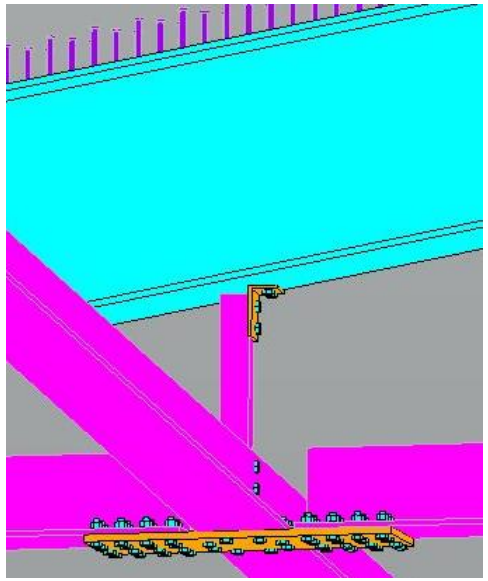
Complex bent bars

Truss **Modeling**

- 50 primary panel points on each truss with unique geometry and details at each connection
- Stringers set normal to roadway crown and made continuous through floor beam connections
- Primary members consisted of built-up bolted box sections, bolted I-sections and welded I-sections
- Six different steel grades
- Two bolt sizes
- Release and post-tension details at upper pier connections







Truss Modeling **Process**

Truss stick frame model provided by designer

Modified stick frame for member offsets

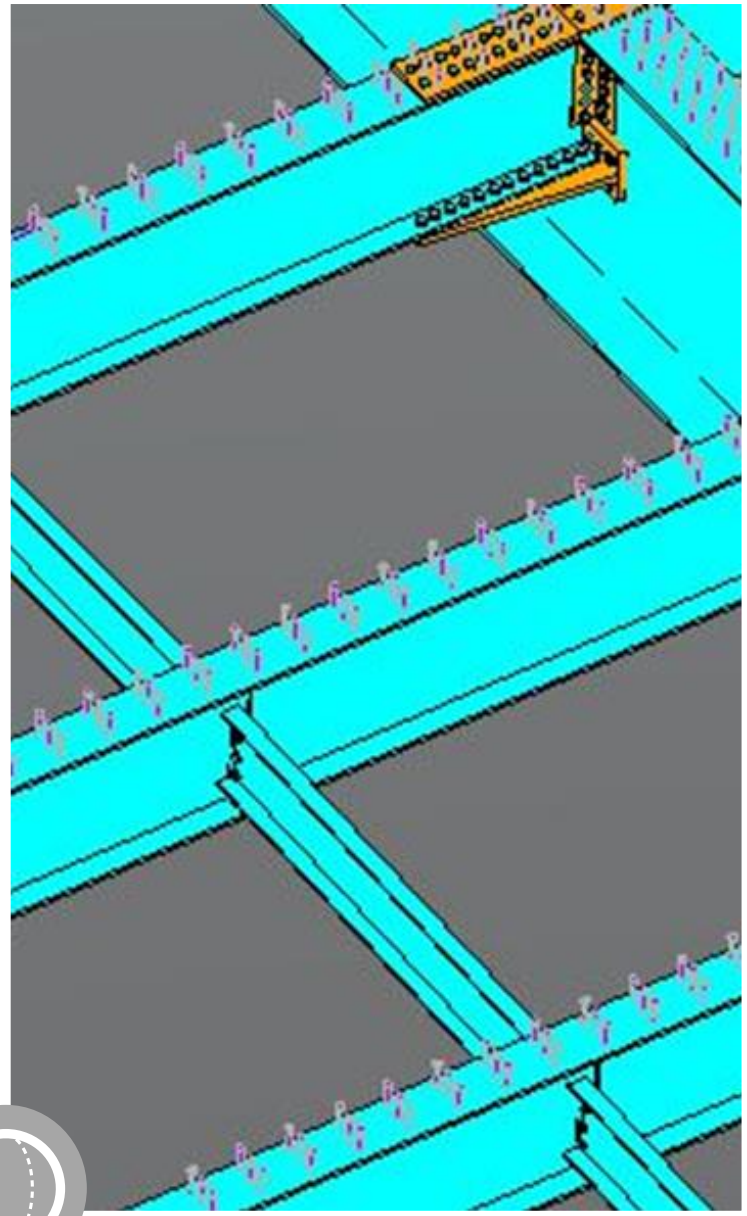
Created custom sections for built-up members

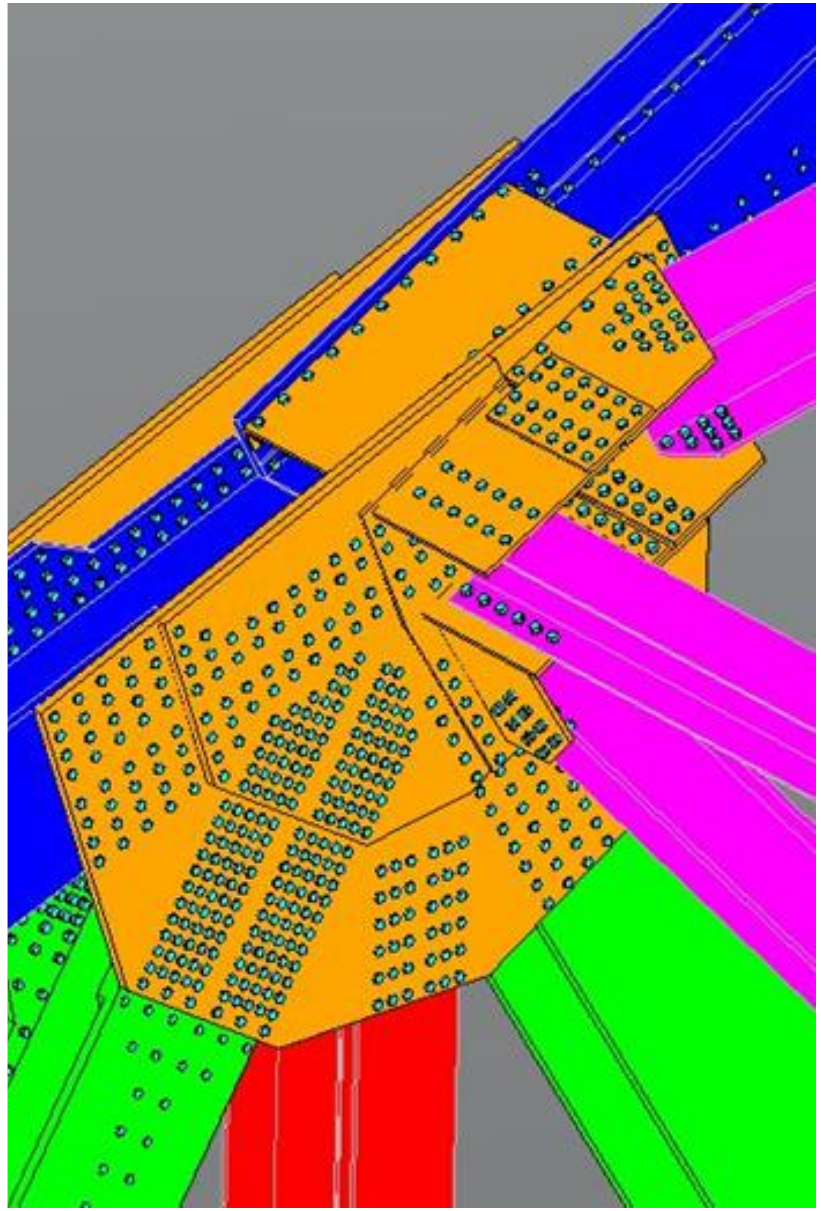
Individual models for north truss, upper bracing and floor system

Merge individual models into a single model and mirrored north truss to create south truss

Item types assigned for geometrical and material attributes

Imported model into Bentley iTwins Hub





Truss Model **Highlights**

5450 tons of structural steel

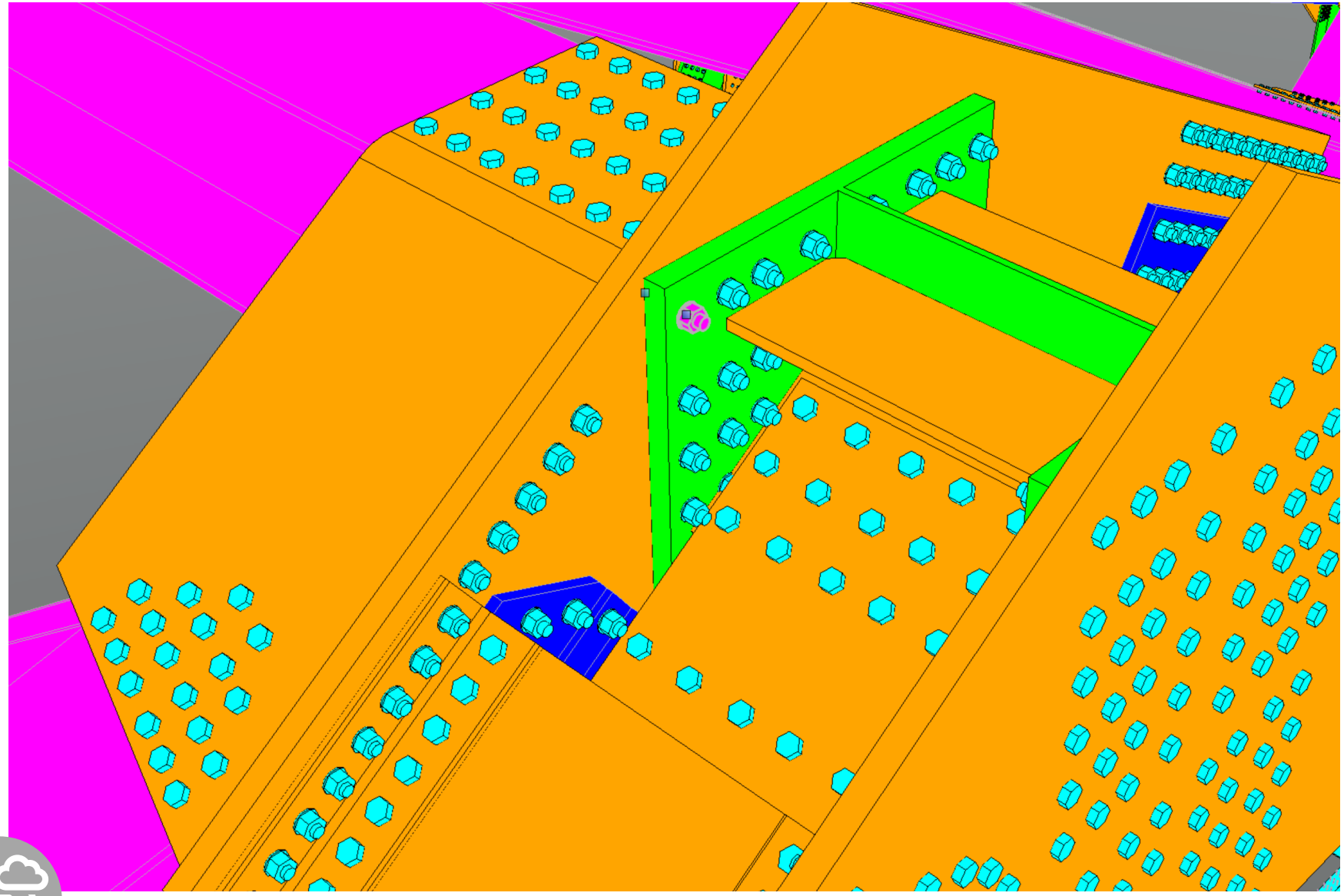
175,000 Bolts

28,700 shear studs

4600 connection plates

Four team members

1400 hours of modeling effort



Contractor **Relations**

Provided access to the model to assist in bidding

Model to be used in construction for coordination and issue tracking

Allow for real time feedback and a reliably up-to-date dataset

Construction Engineering and Inspection Bridge Construction Documentation

23 years experience in bridge work

10 years field experience in bridge construction

4 Mississippi River crossing – Owner's Rep

Transportation Research Committee –
AKC 40 Construction of Bridges and Structures Chair

Bridge Construction **Documentation**

Technical Data Collection Methods

- Field Book, Camera, Etc.

Inspector Daily Reports

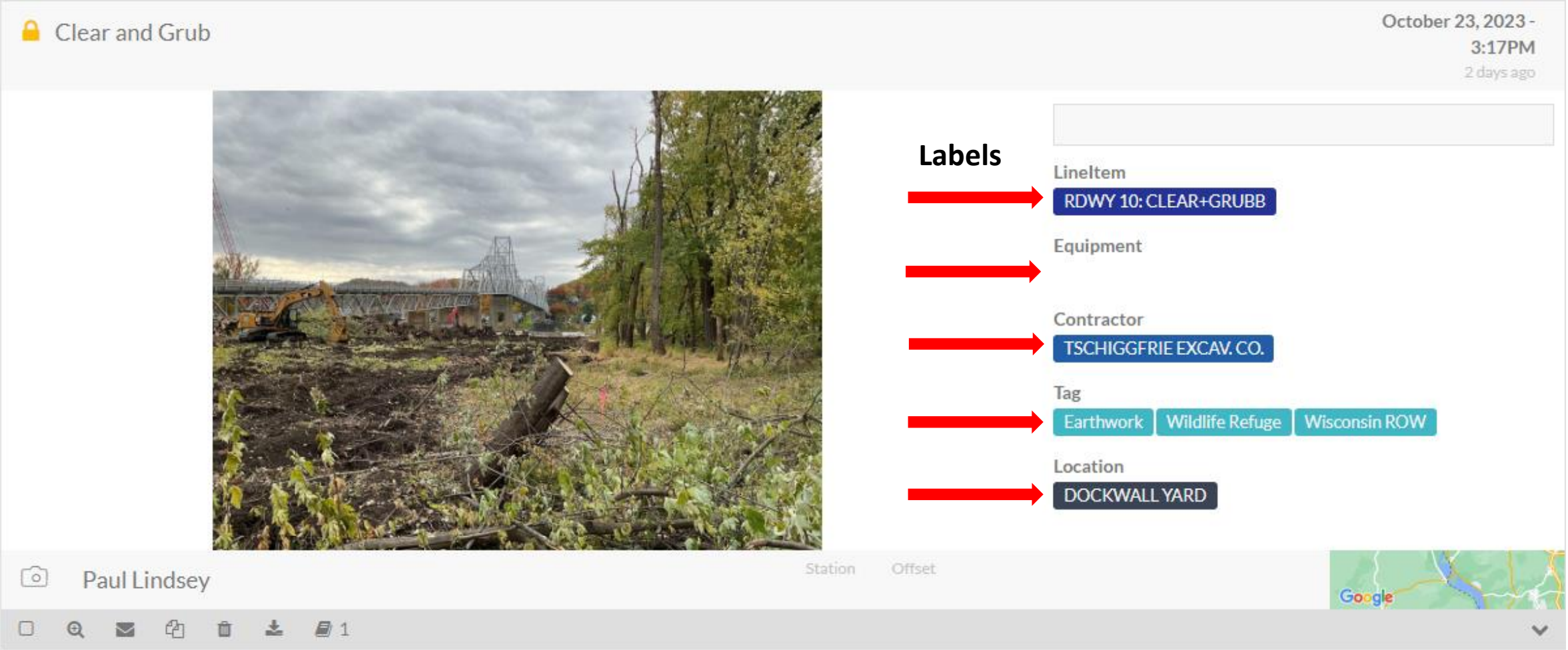
- Information not connected
- Limited sharing
- Recalling information

Digital Construction Documentation/ **Digital As-Builts**

HeadLight® is a digital application used to collect real-time field data by inspectors on iPads, for daily construction reports.

Headlight capabilities allow immediate identification of potential issues and fluid communication, leading to recommendations without the need for multiple individuals on site and will enable quick, well-informed decision making.

HeadLight Technologies



Lansing Construction Documentation **Field Observations**

PERSONNEL					
Trade	Name	Tag	Count	Hours	Total Hours
KRAEMER NORTH AMERICA, LLC					
Operator	Wisconsin	Mobilization	2	8	16
Superintendent	Dale Kehoe	Mobilization	1	8	8
Laborer	Wisconsin	Mobilization	1	8	8
Carpenter Foreman	Wisconsin	Mobilization	1	8	8
	Chad Matteson	Mobilization	1	8	8
Dump Truck Driver	Sommer Excavating	Earthwork	2	8	16
TSCHIGGFRIE EXCAV. CO.					
Superintendent	Donnie Moore	Earthwork	1	2	2
Laborer	Iowa	Earthwork	2	8	16
	Wisconsin	Earthwork	1	8	8
Operator Foreman	Steve	Earthwork	1	2	2
	Mitch	Earthwork	1	8	8
Dump Truck Driver	Wisconsin		2	8	16
Operator	Wisconsin	Earthwork	1	8	8
	Iowa	Earthwork	1	8	8
				Total Work Force Hours	132

Lansing Construction Documentation **Personnel**

EQUIPMENT				
Description	NbrPecs	NbrUsed	UsedHours	Remarks
KRAEMER NORTH AMERICA, LLC				
(Loader) Xtreme XR1245 Telehandler	1	1	2	Yard work
Superintendent Truck	1	1	8	
(Crane) Manitowoc 10000	1	1	2	Job prep
Foreman Truck	2	2	8	
(Loader) Caterpillar 279D Skid Loader	1	1	2	Yard work
(Dozer) Caterpillar D6N LGP	1	1	8	Sand stockpile
(Loader) Caterpillar 938M Front End Loader	1	1	4	Sand stockpile
Dump Truck	2	2	8	Sommer Excavating
TSCHIGGFRIE EXCAV. CO.				
Foreman Truck	2	2	8	
(Excavator) Caterpillar 329E	1	1	8	Clear Grub Wisconsin
(Excavator) John Deere 135G (Mini)	1	1	2	Clear Grub Iowa
Superintendent Truck	1	1	8	
(Excavator) Link-Belt 290	1	1	8	Clear Grub Wisconsin
Dump Truck	3	3	8	Dump Truck
(Excavator) John Deere 60G (Mini)	1	1	4	Clear Grub Iowa
(Loader) Caterpillar 279D3 Skid Loader	1	1	2	Clear Grub Iowa
(Lift) Haulotte 5533A (Rental)	1	1	4	Clear Grub Iowa

Lansing Construction Documentation **Equipment**

Lansing Construction Documentation **Working Days, Weather, River Guage**

WORKING DAYS

Contract Time	Change Order Time	Total Contract Time	Time to Date	Remaining Time	% Remaining	Start Date
550	0	550	25	525		09/18/2023

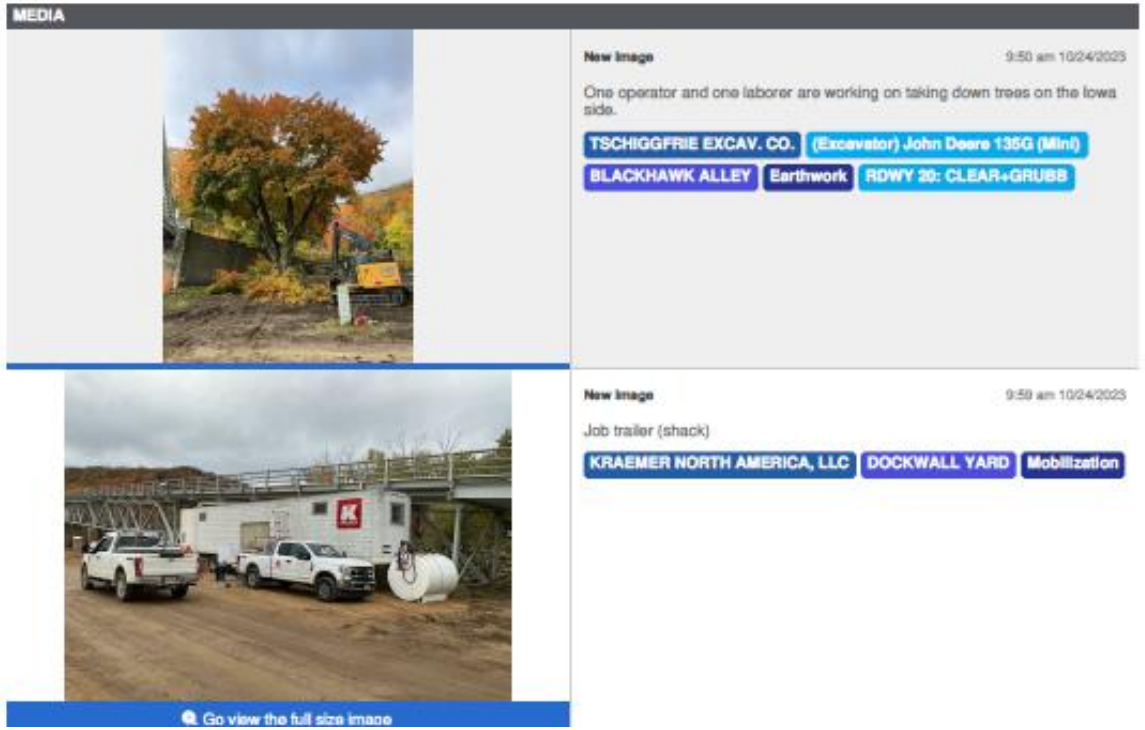
Date	Day of the Week	Type of Day	1.0 or 0.5 day?
10/24/2023	Tuesday	Working Day	1.0

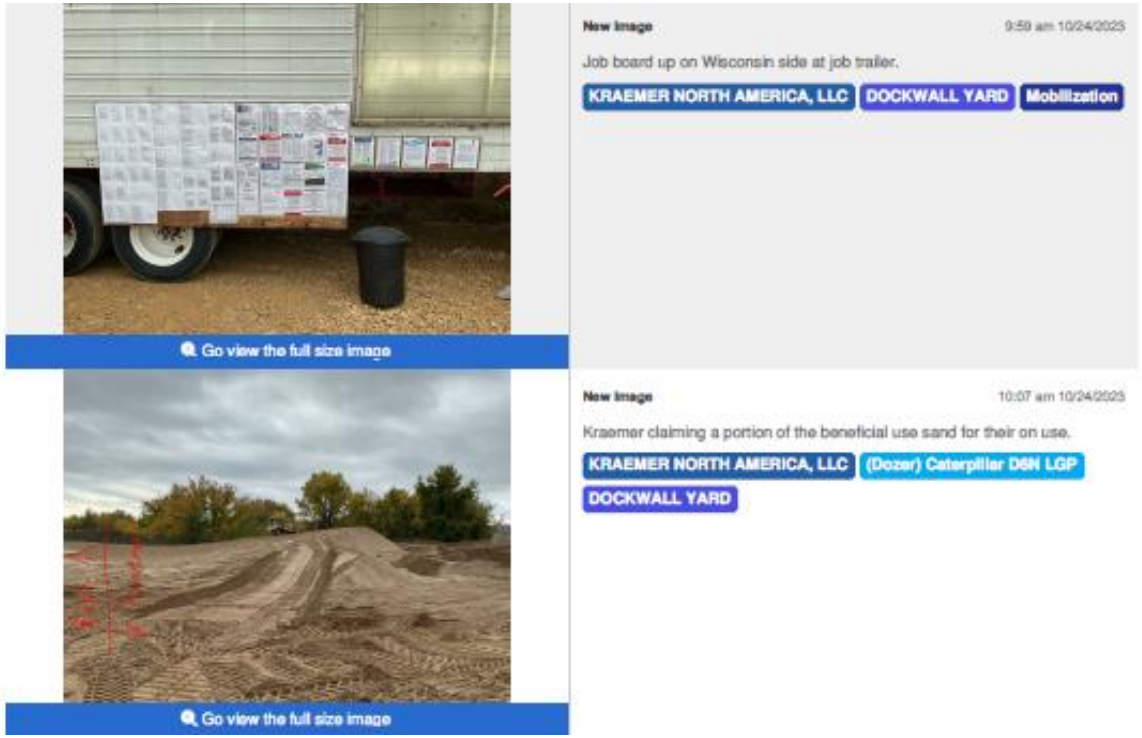
WEATHER

Date	Time	Conditions	Temperature	Wind	Humidity	Description
10/24/2023	7:01 AM	Mostly Cloudy	62.0°F	11 mph	90%	
10/24/2023	11:26 AM	Few Clouds	69.0°F	14 mph	83%	
10/24/2023	12:48 PM	Overcast	74.0°F	1 mph	83%	
10/24/2023	3:16 PM	Mostly Cloudy	78.0°F	15 mph	74%	

RIVER GAUGE

Date	Observed Time	River Gauge	Conditions	Comments
10/24/2023	12:00 PM	8.06	Partly Cloudy	EL 620.32





Lansing Construction Documentation
Example Report

Digital Construction Documentation/ **Model Integration**

Inspection Reports
Testing Reports
RFI and Plan Changes
Material Certs
Shop Drawings

Copy of HNTB Black Hawk Bridge - 2x.mp4 - Google Drive

Digital Construction Documentation/ **Model Integration**

There is further discussion regarding the need for coordination between the development of design, construction and asset management.

The discussion around what information is gathered during construction and then what information is needed through the asset management phase (most of structure's life).

What data is needed, how that data is provided, stored and then available for future use.

Q & A

Questions and Answers