

# Fern Hollow Bridge Emergency Replacement Project



**Jason Fuller, P.E.**  
HDR

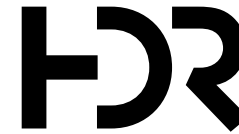
**Mike Szurley, P.E.**  
PennDOT District 11-0

**Chad Basinger, P.E.**  
Swank Construction Company, LLC

**2023 WESTERN BRIDGE  
ENGINEERS' SEMINAR  
PHOENIX, ARIZONA**

# Project Overview

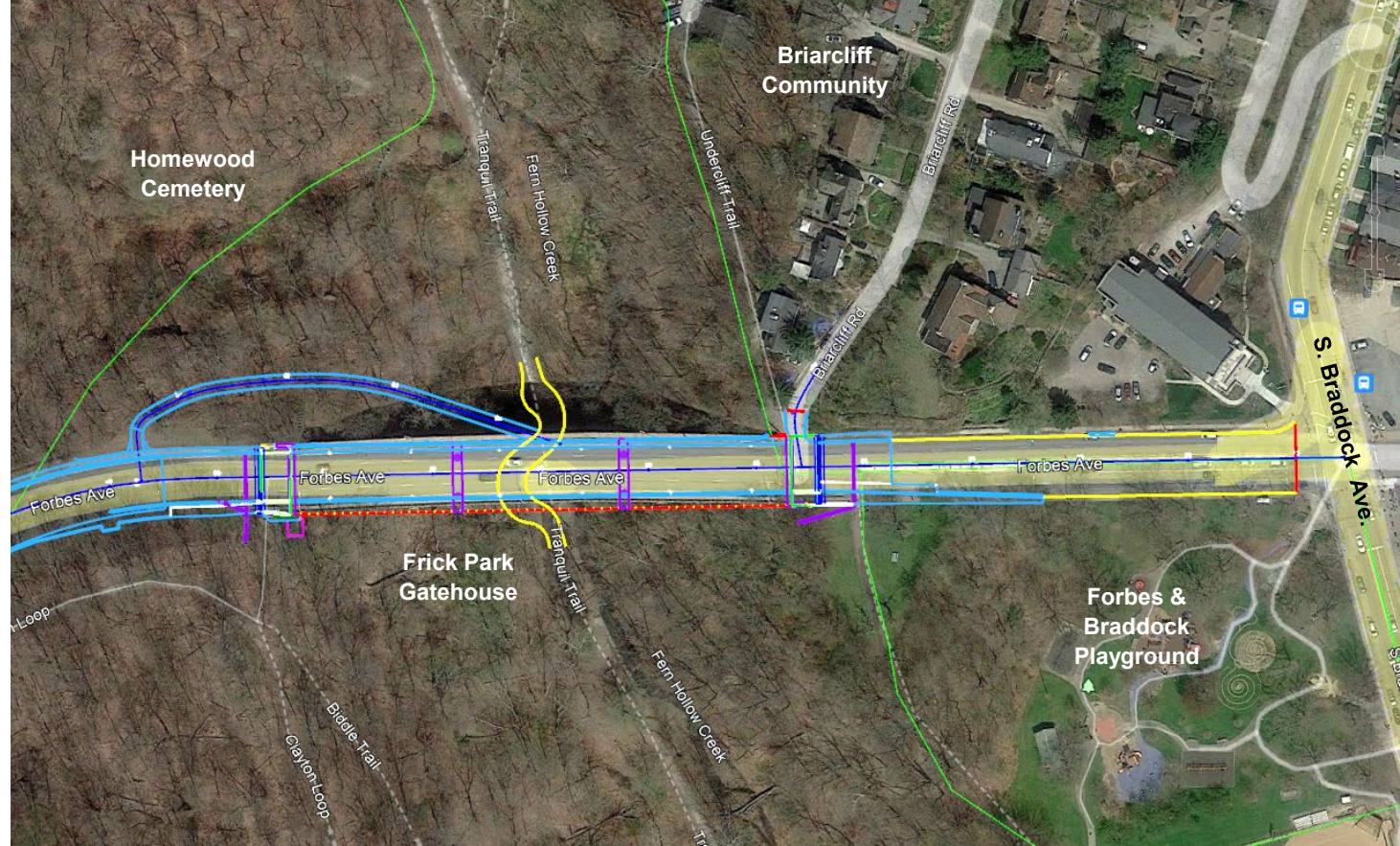
- **Owner:** City of Pittsburgh
- **Oversight:** PennDOT and FHWA
- **Contractor:** Swank Construction
- **Design Build Designer:** HDR, Inc.
- **Construction Inspection:** SAI Consulting Engineers Inc. with JMT & CCS, Inc.
- **Construction Management:** Michael Baker International with CCS, Inc.
- **Notice to Proceed:** 2/3/2022





# Project Location

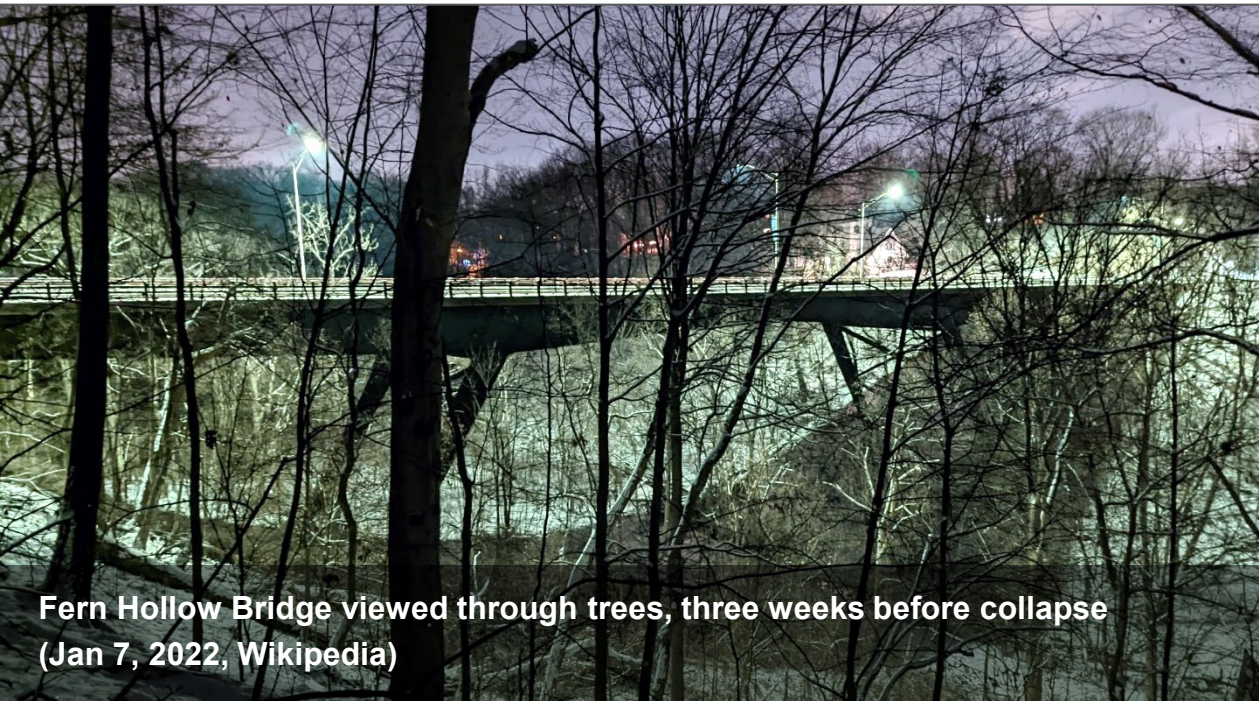
- Forbes Avenue is on the National Highway System (NHS) within the City of Pittsburgh, Allegheny County
- Provides travel over Frick Park, Fern Hollow Creek, and Tranquil Trail





# Project Overview: Background

- Existing Structure - continuous rigid K-frame design (447' long)
- Posted speed limit of 35mph and a Posted Weight Limit of 26 tons per vehicle
- Average Daily Traffic – 21,000 vpd
- Heavy Pedestrian and Bike Traffic, Mass Transit route for Pittsburgh Regional Transit, EMS
- Serves as an Alternate Route for Parkway East Traffic (I-376) during peak hours and closures.
- Collapsed on morning of Friday, 1/28/22



Fern Hollow Bridge viewed through trees, three weeks before collapse  
(Jan 7, 2022, Wikipedia)

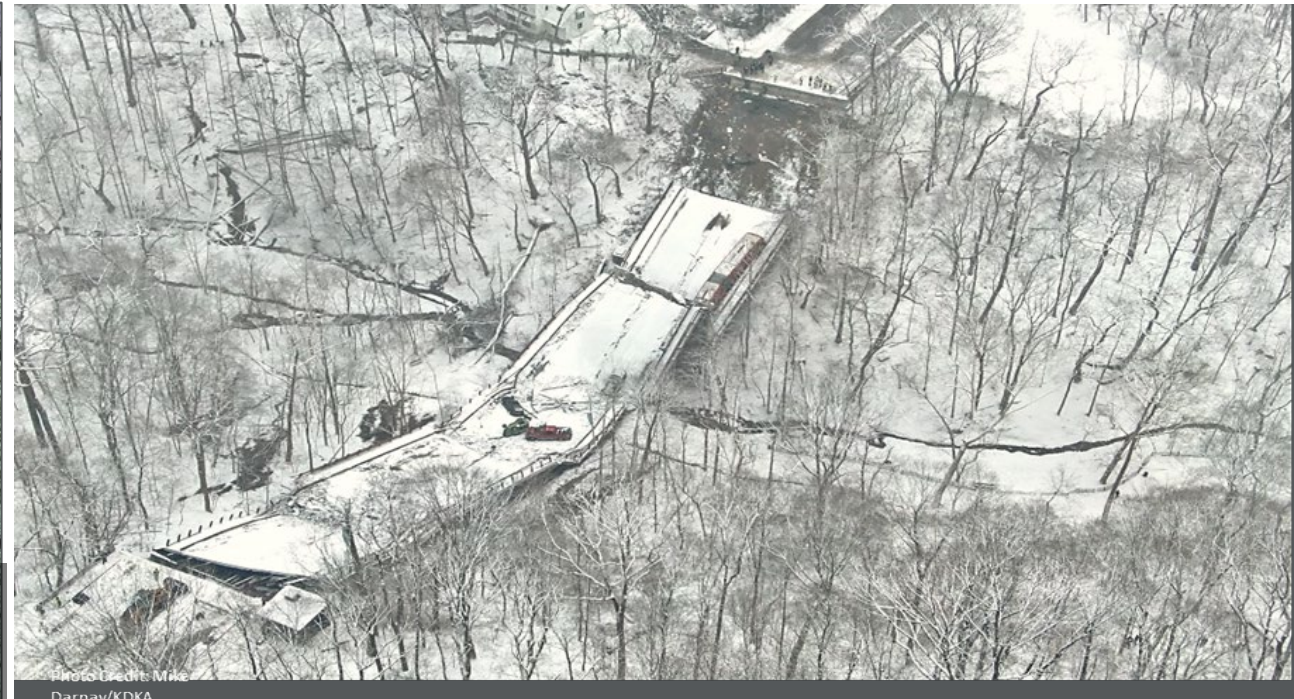


Photo Credit: Mike Darnay/KDKA



# Project Overview: Collapse

- National Transportation Safety Board (NTSB) responded immediately to obtain facts surrounding the collapse of the bridge.
- NTSB was onsite 1/31/22 during demo activities advising the construction team which structural members were necessary for their investigation.



NTSB investigators at the site of the collapsed bridge.  
(Source: James Anderson, NTSB)

- NTSB released preliminary findings on 2/7/22.
- Updates 5/5/22 & 1/26/23 & 5/18/23 “Maintenance of weathering steel bridges”
- NTSB investigation is ongoing.





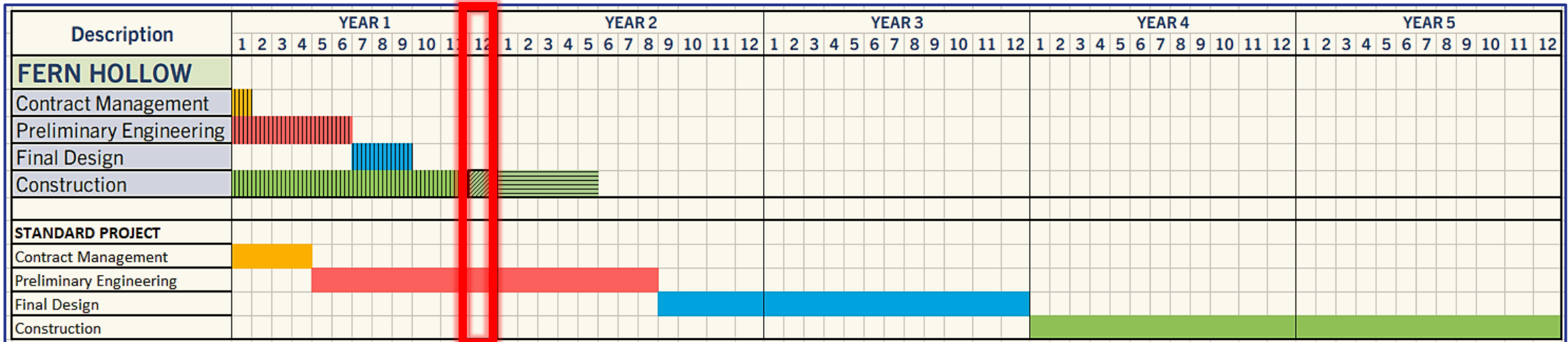
# Project Overview: Emergency Process

- A Proclamation of Disaster Emergency signed by Governor Tom Wolf on day of the collapse for the City of Pittsburgh; and subsequently, an Emergency Declaration was issued by Mayor Ed Gainey
  - Allowed PennDOT and the City of Pittsburgh to utilize all available powers, resources, and personnel deemed necessary to cope with the magnitude and severity of the bridge collapse. The City of Pittsburgh delegated the removal, design, and reconstruction of the bridge to PennDOT District 11-0 under a Reimbursement Agreement
  - The Proclamation of Disaster Emergency permits the use of emergency procedures for both the Right-of-Way, Utility, and Environmental Phases to streamline the design process and expeditiously enter the construction phase
  - PennDOT was permitted to execute a sole-source design/build construction contract with Swank Construction Company to immediately perform emergency cleanup activities and inform FHWA/PennDOT/City of Pittsburgh of current material lead times and procurement issues. Under the sole-source design/build construction contract Swank Construction Company partnered with HDR, Inc. to quickly establish the existing legal right-of-way limits, implement emergency erosion and sediment pollution controls, obtain project survey, and evaluate appropriate structure types
  - USDOT/PennDOT designated \$25.3 million to rebuild the Fern Hollow Bridge. Emergency Federal Funds are a direct result of additional funds made available in Federal Fiscal Year (FFY) 2022 from the Bi-Partisan Infrastructure Law and will not impact any regionally funded projects





# Design / Construction: Collaboration



Overall Project Schedule Comparison		
Description	Standard Project	FERN HOLLOW
Contract Management (Publish, Advertise, Consultant Selection, Issue NTP)	3-4 months	7 days
Preliminary Engineering Phase & Environmental Clearance	18 months	6 months
Final Design Phase	16 months	3 months
Construction Phase	24 months	* 17 months
<b>Total Duration:</b>	5 years	* 17 months
<b>Open to Traffic:</b>		<b>December 2022</b>
* Construction occurring in tandem with Design		

- Constant collaboration between FHWA, PennDOT, Swank, HDR, City of Pittsburgh and all Project Stakeholders.
- Emergency Declarations allowed the design team to utilize all available resources to handle the magnitude of this emergency and streamline the project delivery process.
- An experienced, knowledgeable, and trusted team was selected which allowed swift decisions and calculated risks for the project to proceed forward in an expedited fashion.



# Design / Construction: Jan / Feb 2022

- **Construction**

- First two weeks of February:
- Clean-up of Collapse
- Establish viable access
- Develop demolition plan
- Mobilize Equipment (primary equipment 888 Manitowoc, 85,000 lb. class excavators and processors)
- Finalize contract with PENNDOT/  
Finalize subcontract with HDR

- **Design**

- Kick-off Meeting held with entire team
- Concurrence on Design Deliverables/Design Submissions
- Organized a CPM Baseline Schedule that merged both Design and Construction activities





# Design / Construction: February 2022

- **Construction**

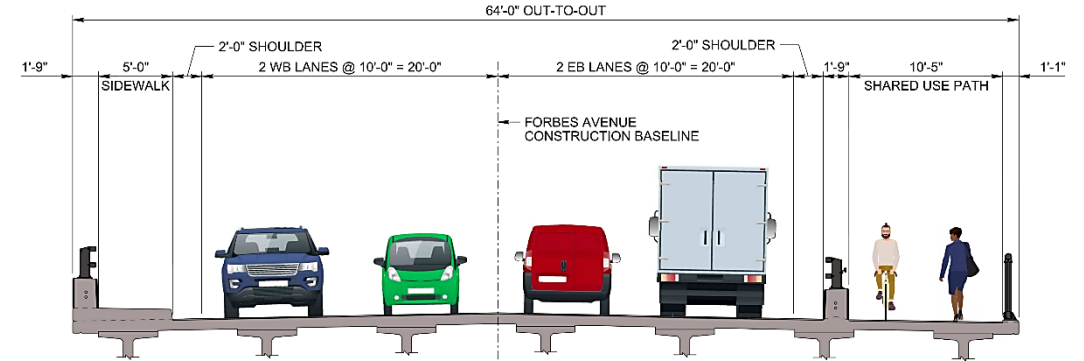
- Provide feedback on the following (from General Contractor perspective as well as information garnered from Industry):
  - Superstructure Alternatives
  - Span Arrangement
  - Column and caisson sizes based on company inventory of forms and drill tooling
  - Project Access
- Participate in utility relocation meetings/ feedback on utility schedule and scope
- Identify and begin procuring long lead time/ critical path materials to the extent possible.
  - Light Poles,
  - Architectural Form Liners
  - Integral Piles and Casing

- **Design**

- Major design decisions made in February – Collaborative decision making with the entire team:
  - Typical Section selected to minimize disturbance to surrounding features
  - Superstructure alternates evaluated and type selected
  - Span arrangement set with beam delivery and erection in mind
  - Substructure Type chosen based on site constraints as well as equipment and material availability
  - Determination of Limits of Disturbance based on design team and contractor feedback



# Design / Construction: February 2022



**Proposed Structure** – 3 Span Composite Prestressed Concrete PA Bulb-Tee Beams fabricated at PennSTRESS in Roaring Springs, PA.

- Total Structure Length = 460'
- 21 – 4' Width by 8' Depth by 152' long PA Bulb-Tee Beams (each beam weighing +200,000 lbs.)
- Over 15' pedestrian and bicycle access width (50% increase)
- Structure is 100' high over Frick Park
- Typical Cross Section maintains existing out-to-out width of 64'





# Design / Construction: March 2022

## • Construction

- Design and procure column and cap formwork as necessary to supplement in-house inventory.
- Protocol Established for Material Ordering and Physical Construction
  - Work began upon the second round of reviews where comments were shown to be addressed on the first submittals.
  - If schedule dictated, item-specific pre-approval was requested.
- Establish Protocol for Job Pricing:
  - Initial Discussions on Pricing
  - Normal Design-Build vs Department & GC/Designer Relationship
  - Risk of design changes
  - Project specific items / negotiations preceding work.
- Finish Existing Structure Removal

## • Design

- Initial press release, project website goes live, public involvement begins
- Pre-Application meeting with permitting agencies
- Coordination with impacted utility owners
- Begin Highway and Highway Lighting Design
- Review of aesthetics for the proposed structure
- Review of Design Criteria and Design Exceptions
- Core Borings and Survey are obtained
- BCRA Presented their 3 Big Goals (Mid-Block Crossing, Extension of Undercliff Trail, and Park Path Bridge)
- Design Submissions:
  - Temporary Traffic Control Plan
  - Line and Grade
  - Type Size and Location
  - Beam and Bearing Design – allowed beam shop drawing preparation to begin







# Design / Construction: April 2022

- **Construction**

- Project Site was quiet waiting for expedited design of Piers, Columns, and Caissons
- Analyzing Core Borings collected in March was an integral part of that process.
- Material Procurement

- **Design**

- Acceptance of Beam and Bearing Design
- GP-11 and GP-8 Permits Approved – allowed access across Fern Hollow Creek
- Coordination with OPA for artistic enhancements – artist workshop with nine artists
- Design Submissions:
  - Preliminary Lighting Report
  - Geotechnical Memorandum for Piers 1 and 2 (used conservative presumptive values based on Commercial Street)
  - Partial Submission – Pier Design (allowed drilling to begin for caissons and rebar procurement)
  - Abutment Memorandum for Integral Abutments
  - Safety Review Committee Submission
  - Initial Design Field View Submission





# Design / Construction: May 2022

- **Construction**

- Swank broke ground on the new bridge
  - 4 - 8' Diameter 30'+ Depth Caissons
- Toward the end of the month rebar and forming began on the pier columns



- **Design**

- E&SPC Plan Approved by Allegheny County Conservation District
- Acceptance of Partial Submission – Pier Design Calculations and Drawings
- Acceptance of Partial Submission – Abutment Design Calculations and Drawings
- Coordination with OPA for artistic enhancements continues
- Coordinated with Impacted Property Owners to Obtain ATE's
- Design Submissions:
  - Partial Submission – Abutment Design

# Design / Construction: June 2022

- **Construction**

- Column construction continued with 2 levels of 30' high placements
- Drilling of Integral Abutment Piles



- **Design**

- Coordination with FHWA/DOMI/PennDOT to implement a signalized Mid-Block Crossing near the Frick Park Gatehouse
- Recommendation Received by District SRC
- Coordination with OPA for artistic enhancements continues – selection of artists
- Design Submissions:
  - Released for Construction – Final Structure Package (remaining details including deck, wingwalls, approach slab, etc.)
  - Design Field View – Resubmission (including mid-block crossing)
  - ADA Committee Package



# Design / Construction: July 2022

- **Construction**

- Final Push Toward Concrete Beam Erection
  - Pier Caps
  - Abutments

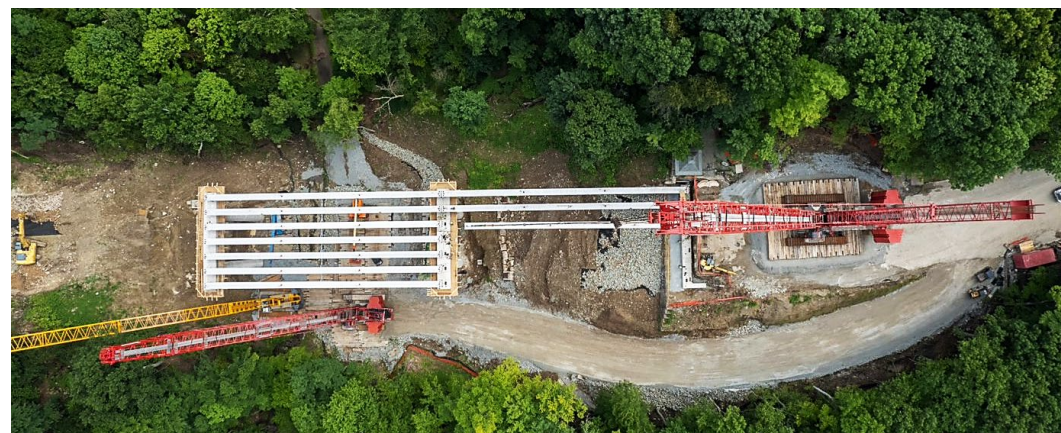


- **Design**

- Formal Acceptance of Non-Standard Barrier and Guiderail Form
- Formal Acceptance of Design Criteria and Line and Grade Submission (including Design Exceptions)
- Coordination with PWSA and owners of lateral sewer line impacted by bridge collapse
- Virtual Design Field View Meeting held
- Public Feedback Form for Artistic Enhancements went Live on Project Website
- Design Submissions:
  - 90% Right-of-Way Plan
  - Final Foundation Submission - documenting previously accepted design



# Construction: July 2022





# Construction: July 2022





# Design / Construction: August 2022

- **Construction**

- Deck Pan and Rebar Installation



- **Design**

- Coordination with the City of Pittsburgh regarding overall Site Restoration Plan
- Break-Out Session to review Final Right-of-Way Plan
- Formal Acceptance of Design Field View Submission
- Formal Acceptance of Final Foundation Submission
- Art Commission Meeting – Conceptual Review
- Design Submissions:
  - Released for Construction – Final Structure Package Resubmitted (remaining details including deck, wingwalls, approach slab, etc.)



# Construction: August 2022

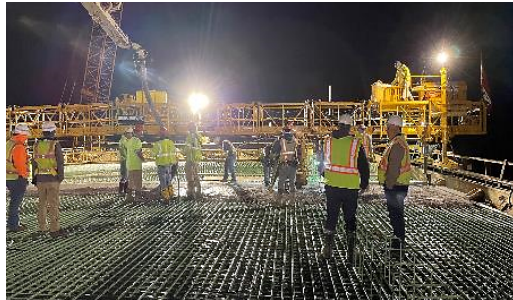




# Design / Construction: September 2022

- **Construction**

- First Deck Placement September 30th, 2022

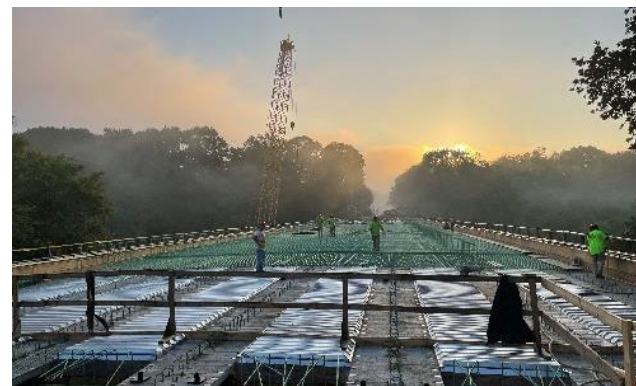
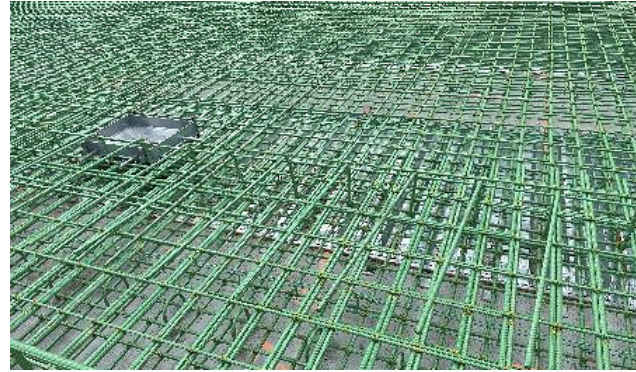


- **Design**

- Formal Acceptance of Released for Construction – Final Structure Package
- Development Activities Meeting (DAM) for conceptual art enhancements
- Section 106 Consulting Parties Meeting to review proposed barrier types and aesthetics
- Design Submissions:
  - Released for Construction – Final Roadway Package Submitted (Construction Drawings, Cross Sections, Signing and Pavement Markings, Traffic Signal Plan, Pavement Design)
  - Private Sanitary Line Re-Establishment Plan and GP-5
  - Draft Overall Site Restoration Plan
  - Final Highway Lighting Plan
  - Final Right-of-Way Plan



# Construction: September 2022





# Design / Construction: October 2022

- **Construction**

- Complete Deck Construction
- Begin Tie-In Work

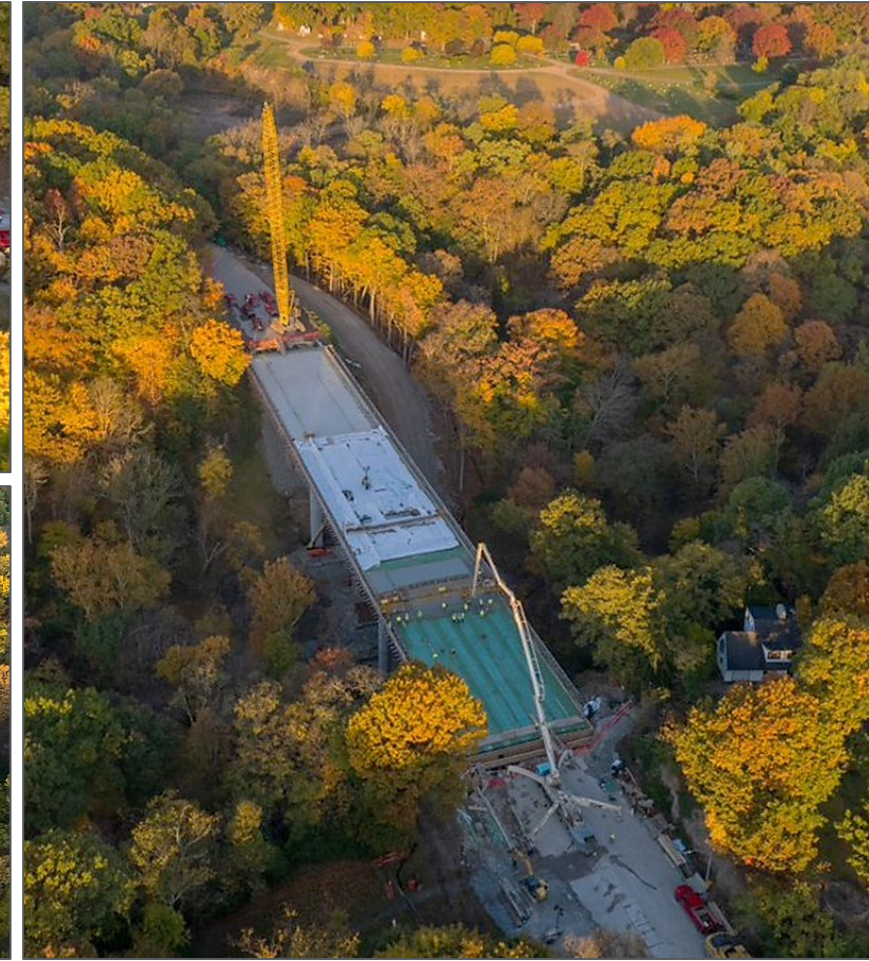


- **Design**

- President Joe Biden Visits the Fern Hollow Project Site
- Art Commission Meeting – Final Review of artistic enhancements for vehicular, pedestrian, and multi-modal users
- Formal Acceptance of Highway Lighting Plan
- Design Submissions:
  - Released for Construction – Final Roadway Package Submitted Resubmitted (Construction Drawings, Cross Sections, Signing and Pavement Markings, Traffic Signal Plan, Pavement Design)
  - Private Sanitary Line Re-Establishment Plan and GP-5 Resubmitted



# Construction: October 2022





# Design: October 2022

## Opportunity: Enhancing the Pedestrian and Cyclist Bridge User Experience

Sample Rub Rail Text on Shared Use Path

### THE AMES SEA

Approximately 300 million years ago, a warm shallow sea formed beneath you. This is evidenced by the presence of marine Limestone found at 872 feet above sea level (73' under you). During the time of the Ames Sea, the entire North American craton itself was rotated 90 degrees counter-clockwise and Pennsylvania was positioned along the equator. So in truth, what is now here, was never really even here.

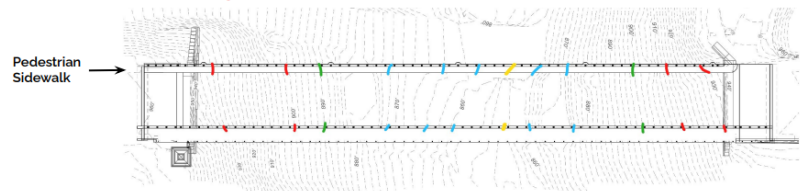


Rub rail text will be on the shared use path, opposite from the corresponding design on the pedestrian sidewalk.

John Peña, artist

16

## Opportunity: Enhancing the Pedestrian and Cyclist Bridge User Experience



Topo View of Bridge Deck:

Lake Pattern (4) in **RED**  
 River Pattern (2) in **GREEN**  
 Ocean Pattern (5) in **BLUE**  
 Creek Pattern (1) in **YELLOW**

**12 Total Pattern Locations:** Patterns are placed with deep-time events on outer edges of the bridge moving towards present day closer to the middle.

John Peña, artist

13





# Design / Construction: October 2022

- **Construction**

- Construct Deck Sidewalks and Barrier
- Construct Moment Slabs
- Grade for Approach Slabs and Roadway Tie Ins
- Install Drainage

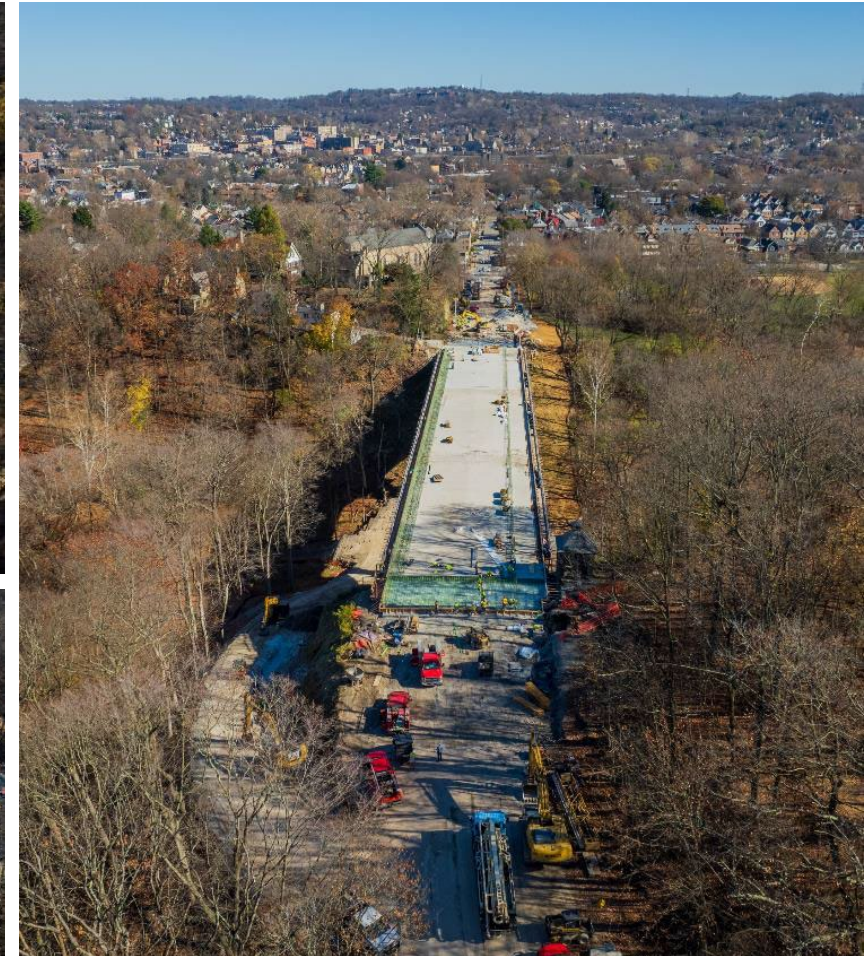


- **Design**

- Formal Acceptance
  - Roadway Plan
  - Traffic Signal
  - Private Sanitary
- Plans In Progress
  - Right of Way
  - Interim Traffic Control
  - Site Restoration



# Construction: November 2022





# Design / Construction: October 2022

- **Construction**

- Prepare for Opening
- Pave Roadway
- Install Pedestrian Railing and PA Barrier
- Install Private Sanitary Line



- **Design**

- Formal Acceptance
  - Interim Traffic Control
  - Signing and Pavement Marking Plan
- Plans In Progress
  - Right of Way
  - Site Restoration

**BRIDGE TO REOPEN  
DECEMBER 2022**

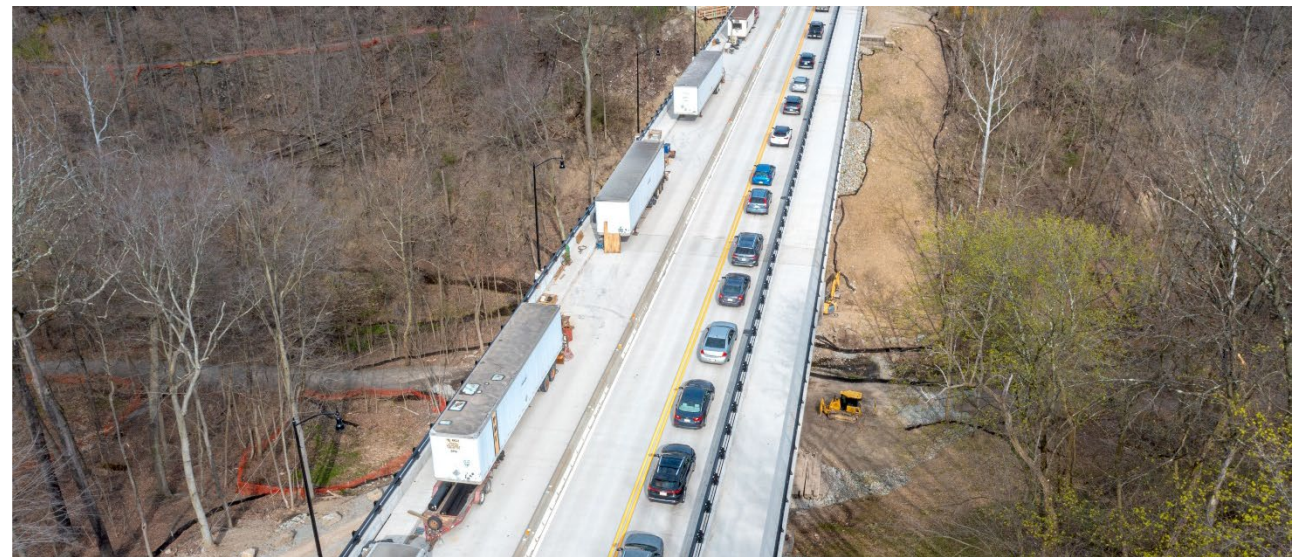


# Opening Event: December 21, 2022





# Open to Traffic: December 22, 2022



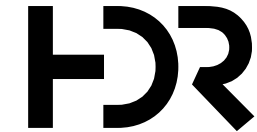


# Finished for Full Traffic and Restoration: July 7, 2023





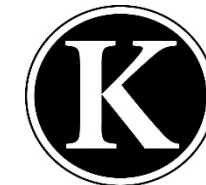
# Project Overview: Team



OFFICE OF PUBLIC ART



BRIARCLIFF HOMEOWNERS ASSOCIATION INC.





# Project Overview: Team



The "U" Company LLC



Brila Construction Supply, LLC



Shanefelter Industries



OFFICE OF PUBLIC ART





# Frequent Q&As

- Is the bridge safe since it was built so quickly?
  - **YES** - Meets or exceeds every design code and standard, quality processes were not compromised and verified it, all processes from regular job were still followed, but not necessarily in place “before” construction. Construction followed all specs and standard processes and was inspected to meet quality standard of every other project
- Is the bridge under budget?
  - **YES** – will not exceed budget set day of collapse.
- Did this project cost more by doing it this way?
  - **NO** – TBD but most likely no if you include all costs
- Can you do this on every bridge?
  - **NO** – Can’t put every project to top of list.







# QUESTIONS

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