



# Fern Hollow Bridge

## Emergency Replacement Project

National Project of the Year Award - American Society of Highway Engineers

January 2024



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## **Entry Form**



# AMERICAN SOCIETY OF HIGHWAY ENGINEERS

## National Project of the Year Award

### OFFICIAL ENTRY FORM

**AWARD CATEGORY** (Check One):  Under \$20 Million  Over \$20 Million

**SPONSORING REGION** (Check One):

- |                                               |                                        |                                         |
|-----------------------------------------------|----------------------------------------|-----------------------------------------|
| <input checked="" type="checkbox"/> Northeast | <input type="checkbox"/> Great Lakes   | <input type="checkbox"/> Northwest      |
| <input type="checkbox"/> Mid-Atlantic         | <input type="checkbox"/> North Central | <input type="checkbox"/> Rocky Mountain |
| <input type="checkbox"/> Southeast            | <input type="checkbox"/> South Central | <input type="checkbox"/> Southwest      |

### **CONTACT INFORMATION FOR SUBMITTING REGION:**

Contact Name: Scott R. Eshenaur ASHE Region Position: NPY Chairperson  
Phone (Office): 717-790-9565 Phone (Mobile): 717-580-8426 E-MAIL: sreshenaur@modjeski.com

### **PROJECT INFORMATION:**

ENTERING AGENCY/COMPANY'S NAME: HDR  
PROJECT NAME: Fern Hollow Bridge Emergency Replacement Project TYPE: Bridge  
PROJECT LOCATION: Pittsburgh, Pennsylvania  
CITY: Pittsburgh COUNTY: Allegheny County STATE: Pennsylvania  
FINAL CONSTRUCTION COST: \$18 million BUDGETED CONSTRUCTION COST: \$25.3 million  
PROJECT COMPLETION DATE: 12/22/2022  
PROJECT ASHE SECTION: ASHE Pittsburgh ASHE SECTION CONTACT NAME: Jason Zang, PE  
PHONE (OFFICE): 412-429-5000 PHONE (MOBILE): 412-401-9756 E-MAIL: jzang@pa.gov

### **PROJECT TEAM:**

PROJECT OWNER: Pennsylvania Department of Transportation, District 11-0  
STREET ADDRESS: 45 Thoms Run Road  
CITY: Bridgeville STATE: Pennsylvania ZIP: 15017  
CONTACT PERSON: Michael Szurley, PE PHONE: 412-429-5035  
E-MAIL ADDRESS: miszurley@pa.gov

PROJECT OWNER: City of Pittsburgh  
STREET ADDRESS: City County Building, 414 Grant Street  
CITY: Pittsburgh STATE: Pennsylvania ZIP: 15219  
CONTACT PERSON: Eric Setzler, PE PHONE: 412-477-6066  
E-MAIL ADDRESS: eric.setzler@pittsburghpa.gov

PROJECT DESIGN FIRM: HDR  
STREET ADDRESS: One Oxford Centre, 301 Grant Street, Suite 1700  
CITY: Pittsburgh STATE: Pennsylvania ZIP: 15219  
CONTACT PERSON: Jason Fuller, PE PHONE: 412-497-6051  
E-MAIL ADDRESS: jason.fuller@hdrinc.com

PRIME CONTRACTOR: Swank Construction Company, LLC  
STREET ADDRESS: 632 Hunt Valley Circle  
CITY: New Kensington STATE: Pennsylvania ZIP: 15068  
CONTACT PERSON: Chad Basinger PHONE: 724-335-6000  
E-MAIL ADDRESS: cbasinger@swankco.com

**Entry Form Completed By:** Jason Fuller **Date:** 1/10/2024



## **Project Narrative**

## Project Narrative

The Fern Hollow Bridge replacement was a collaborative effort between federal, state and local agencies, designers, contractors, and stakeholders to transform a tragic incident into a source of community pride.

### COMPLEXITY

Early on the snowy morning of Friday, January 28, 2022, the 447-foot-long Fern Hollow Bridge in Pittsburgh collapsed nearly 100 feet into a park ravine, carrying with it a mass transit bus and four passenger vehicles. Miraculously, no lives were lost. Pennsylvania Governor Tom Wolf's emergency declaration cleared the way for urgent action at all levels of government to restore the crossing.

Swank Construction Company was called in to help the National Transportation Safety Board (NTSB) clean up the site and was chosen by PennDOT as the contractor best able to build a replacement structure under the tight timeframe. The Monday after the collapse HDR was asked by PennDOT to serve as the lead designer for Swank under a design-build contract.

The project team carefully considered the superstructure type and final span arrangement for the proposed structure. Multiple options were considered including a prestressed concrete beam structure, a steel girder structure, and a steel or concrete arch structure. Regarding the span arrangement, the team avoided impacts to both Tranquil Trail and Fern Hollow Creek (which both reside below) while also considering how different span arrangements would impact both beam delivery and erection. Ultimately, when weighing fabrication lead times, delivery routes, aesthetics, beam erection, and estimated costs the team chose to proceed forward with a three-span composite prestressed concrete PA bulb-tee structure with a total structure length of 460-feet and made up of 21 – 8-foot-deep

by 152-foot-long PA bulb-tee beams (each beam weighing more than 200,000 pounds) delivered through city neighborhoods.

Determining the appropriate substructure types was also discussed at length. At the abutments, given the close proximity to the Frick Park Gatehouse, driven pile foundations could not be utilized. There was also a desire to minimize the need to replace the existing abutments as this would require extensive shoring, increase the project cost, and negatively impact the park. The project team decided to proceed forward with integral abutments located behind the original masonry abutments and founded on drilled-in steel piles.

All these complex decisions, which take months to years on a normal project schedule, were made in within a month.

### NEW APPLICATION OF EXISTING TECHNIQUES/ORIGINALITY/INNOVATION

Infrastructure design projects are usually very linear in process but, given the urgency of this situation, the HDR team worked with PennDOT to evaluate what design elements could be performed simultaneously, what existing/readily available data could be utilized, and where partial information could be submitted for review and approval.

The team formulated a baseline schedule early in project development that merged both design and construction activities to identify the project's critical path and determine if full or partial design submissions were appropriate to meet the aggressive construction timeline.

Sizing and designing the foundation elements were the top priority as they are the first items that need to be constructed. HDR made reasonable assumptions regarding the site

conditions. This allowed PennDOT and DOMI to review and accept HDR's recommendations for the foundations. The team quickly determined that drilled shafts were viable for the piers. Swank has strong capability to self-perform drilled shaft construction, which generally is a desirable solution in a sensitive area such as a park. The design team and Swank worked closely to verify equipment and material availability and determined that 8.5-foot-diameter drilled shafts were the optimum solution for design to expedite construction. The design moved forward with PennDOT and DOMI's concurrence. Swank's drilling rig was onsite, poised to start the moment the foundation plans were approved.

It was vital for the team to organize and prioritize design packages, allowing Swank to procure material and mobilize construction and proceed efficiently. The overall work was broken into parcels with components likely to have a longer lead time undertaken first. As previously stated, although bridge design normally proceeds from top down — deck to superstructure to substructure to foundations — a bridge is built from the bottom up in the exact opposite order. In addition, design-build delivery required the team to design with procurement, fabrication, and construction in mind so the contractor could start as soon as the winter weather cleared. Beam deliveries and erection plans were investigated during the first month prior to design completion. Design packages were created and prioritized to ensure fabrication and delivery schedules could be met. The first of these packages included beams and bearings since they have the longest lead times for procurement. Then came the foundations since they would be the first items constructed. As design progressed, the project ended up with just-in-time design to keep delivery/construction on track.

## **SOCIAL/ECONOMIC CONSIDERATIONS**

Within the sense of urgency, the community sought attention to aesthetics and to features such as bicycle and pedestrian use. For example, the community's requested improvements for pedestrian and bicycle traffic were addressed through the incorporation of a shared-use path (SUP). The new bridge is the same width as the old bridge, with the same number of required traffic lanes. However, the new design narrowed the traffic lanes slightly to make way for the wider SUP which helped increase the bridge ped/bike access by 50% across the bridge. This design decision was formed by the community based on their desires and was able to be incorporated into the design.

As the bridge is located on an NHS route that serves as the main detour route for I-376, getting the structure replaced and the roadway open to traffic was essential to maintaining commerce within and around the region. In addition, the bridge serves as a major EMS and commuter route for neighborhoods east of the Downtown business core and its absence resulted in extensive traffic congestion and road user delays. Construction was accelerated by almost four years for opening to traffic, thereby minimizing these concerns.

## **SAFETY**

Safer bridge access was also a community concern due to the many park trails tied into the road and bridge and connectivity between adjacent neighborhoods provided by the bridge. The team designed a mid-block signalized pedestrian crossing to facilitate appropriate access across Forbes Avenue that was not there before the project, which required widening the roadway to create space for a curb that guides visually impaired persons into the crossing area.

In addition, the SUP increased the total width for pedestrians and bicyclists and separates them by providing positive protection using a permanent barrier.

### **AESTHETICS AND SUSTAINABLE FEATURES**

Since the project is located in a park, there was a need to minimize impacts associated with the pier construction and blend in as much as possible. As such, two piers were selected with each pier having two less obtrusive columns and each pier column is founded on a single 8.5-foot diameter drilled shaft. The stone masonry from the gatehouse and the remaining stone from the existing abutments and walls was used as inspiration for the form liner on the new piers.

Art installations were provided above and below the bridge deck, as well as the use of aesthetic railing and lighting elements.

Future maintenance is always a sustainability consideration and, in this case, the longevity of the new structure would be critical to reestablishing trust with the public. This bridge eliminated all expansion joints within the superstructure using integral abutments, thus reducing the potential for deterioration of the substructures and bearings and extended the service life of the bridge. Protective coatings and material requirements meeting PennDOT's design manual and specifications all enhance the service life beyond 100 years. In addition, the use of prestress in the beams reduced the possibility of concrete cracking and a deck overlay was used to protect the concrete deck and extend its service life as well.

### **MEETING AND EXCEEDING OWNER'S/CLIENTS NEEDS**

The United States Department of Transportation (USDOT) and PennDOT designated \$25.3 million for oversight, design, and construction to rebuild the Fern Hollow Bridge. Emergency Federal Funds are a direct result of additional

money made available in federal fiscal year 2022 from the Bi-Partisan Infrastructure Law and did not impact any regionally funded projects. The project has remained under the designated budget.

A typical project of this size would take about five years to plan, design, and construct. Just over 10 months after the collapse, the new 460-foot-long, four-lane permanent bridge opened to traffic, accomplished through a fast-tracked design and construction process.

The project was heralded by an ever-supportive community. From the beginning of the accelerated, complex, high-profile effort, the entire project team focused on delivering high quality work that would quickly restore this important neighborhood connection. Less than a year after its tragic collapse, the permanent replacement structure reopened on December 22, 2022 — nearly four years ahead of a standard bridge construction effort.

### **PROJECT DESIGN TEAM**

- HDR - Design Lead
- Monaloh Basin Engineers - Survey & ROW
- The Markosky Engineering Group, Inc. - Cultural Resources & Utilities
- Santangelo & Lindsay, Inc. - Lighting
- Klavon Design Associates, Inc. - Landscape Architecture



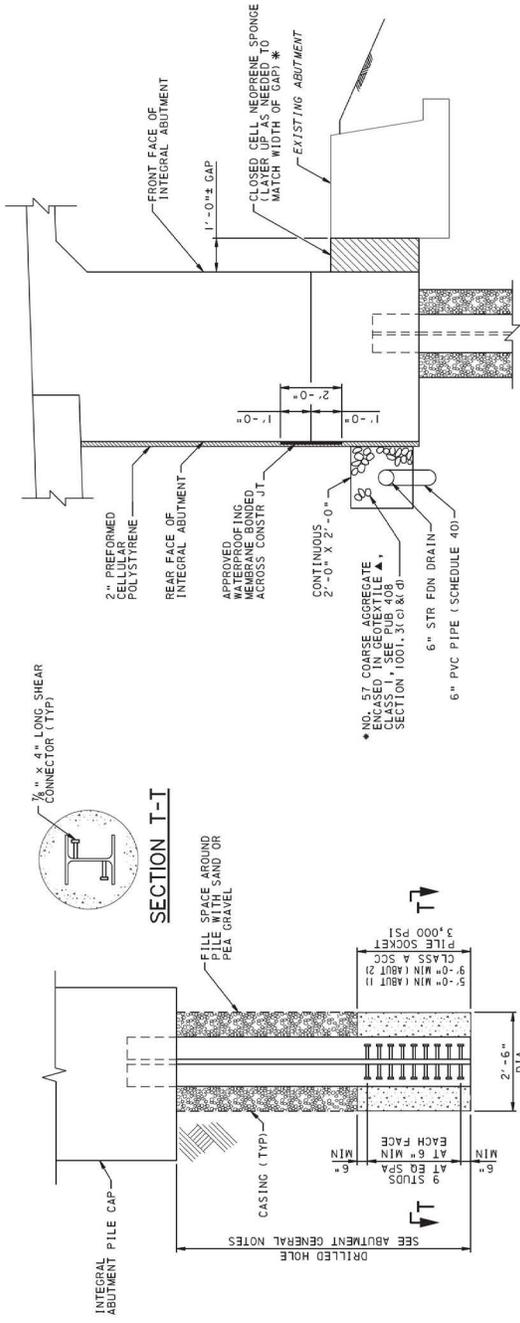
## **Construction Drawings**



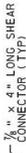




D-9002 CADD 102-100 REVISED 09-19-21



**PILE INSTALLATION DETAIL**  
 NOT TO SCALE



**SECTION I-I-1**

**FOUNDATION DRAIN & WATERPROOFING DETAIL**  
 NOT TO SCALE

- ◆ NO. 57 COARSE AGGREGATE ENCASED IN GEOTEXTILE IS NOT REQUIRED IF NO. 57 COARSE AGGREGATE BACKFILL IS USED.
- ▲ GEOTEXTILE IS INCIDENTAL TO THE NO. 57 COARSE AGGREGATE.

\* IF SPACE BETWEEN NEW ABUTMENT AND EXISTING MASONRY WALL IS GREATER THAN 2" NEOPRENE IS NOT REQUIRED AND GAP SHOULD BE FILLED WITH LOOSE AGGREGATE

- NOTES:**
1. FOR GENERAL NOTES, SEE SHEET 3.
  2. FOR ABUTMENT GENERAL NOTES, SEE SHEET 7.

REVISIONS			
Mark	Description	By	Chkd. Recm'd. Date

BMS STR ID# 02-7301-0000-3037 MPMS/ECMS PROJ 110319 BRKEY1 68913

**COMMONWEALTH OF PENNSYLVANIA**  
 DEPARTMENT OF TRANSPORTATION

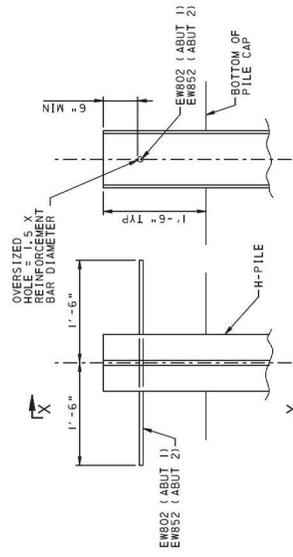
ALLEGHENY COUNTY  
 CITY OF PITTSBURGH  
 SR 7301 LOC FORBES AVENUE  
 STA. 23+00.00

OVER FRICK PARK, TRANQUIL TRAIL & FERN HOLLOW CREEK  
 3 SPAN COMPOSITE P/S CONC PA BULB-TEE BRIDGE  
**ABUTMENT DETAILS**

APPROVED FOR STRUCTURAL ADEQUACY ONLY  
 SEPTEMBER 22, 2022  
 SHEET 28 OF 83  
 L-403D



RELEASED FOR CONSTRUCTION



**VIEW X-X**  
 NOT TO SCALE

**H-PILE-TO-PILE CAP CONNECTION DETAIL**  
 NOT TO SCALE

DES: MAW DWG: ACE CKD: KRS



**PIER GEOMETRY DATA**

LOCATION	DIM A	DIM B	DIM C	ELEV W	ELEV X	ELEV Y	ELEV Z
PIER 1	62'-8 1/2"	20'-0"	20'-0"	936.69	874.00	854.00	834.00
PIER 2	68'-6 1/2"	14'-0"	17'-0"	931.51	863.00	849.00	832.00

**BEAM SEAT ELEVATIONS**

LOCATION	(B1)	(B2)	(B3)	(B4)	(B5)	(B6)	(B7)
PIER 1 SPAN 1	944.38	944.58	944.72	944.78	944.59	944.43	944.28
PIER 1 SPAN 2	944.30	944.50	944.63	944.69	944.50	944.34	944.19
PIER 2 SPAN 1	939.20	939.40	939.54	939.60	939.41	939.25	939.10
PIER 2 SPAN 2	939.12	939.32	939.45	939.51	939.32	939.16	939.01

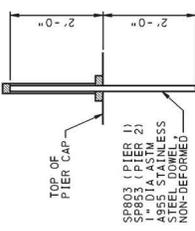
**NOTES FOR SLEEVE PLACEMENT:**

- PLACE SLEEVES LEVEL UNDERNEATH BEAMS.
- ADJUST PIER CAP REINFORCEMENT AS REQUIRED TO CLEAR SLEEVES.
- INSTALL THREADED PLUGS AT ENDS OF EACH SLEEVE.

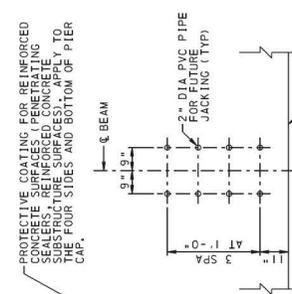
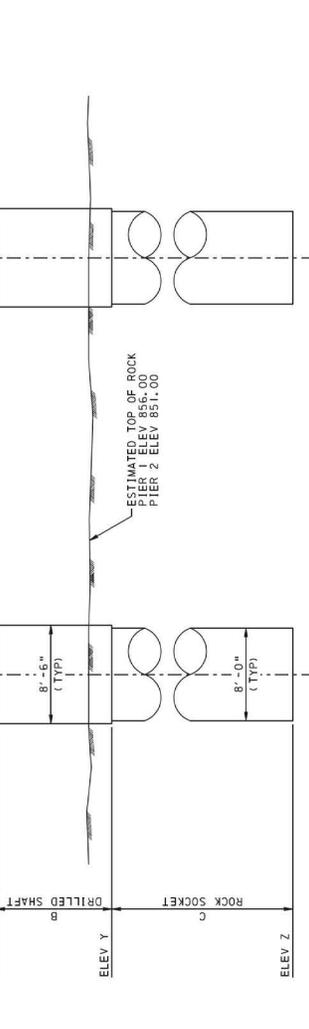
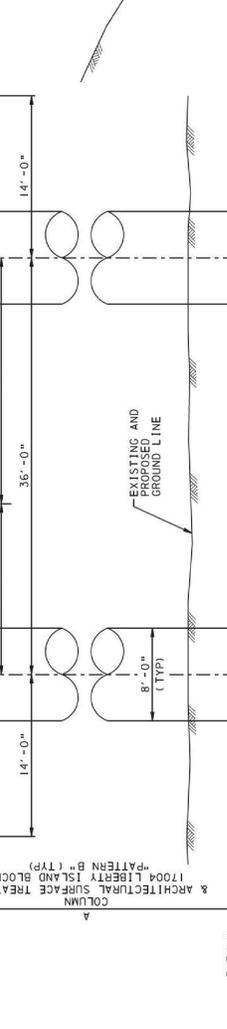
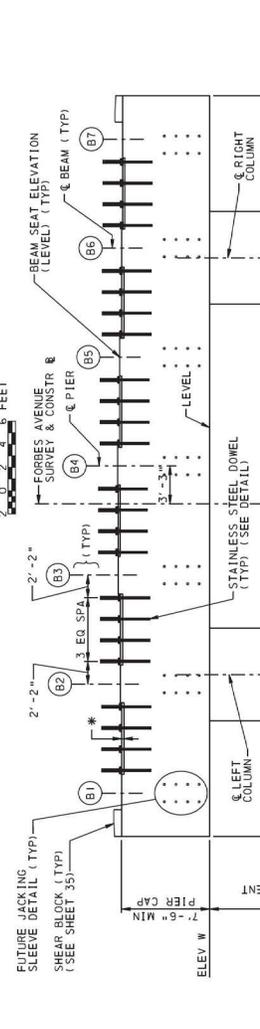
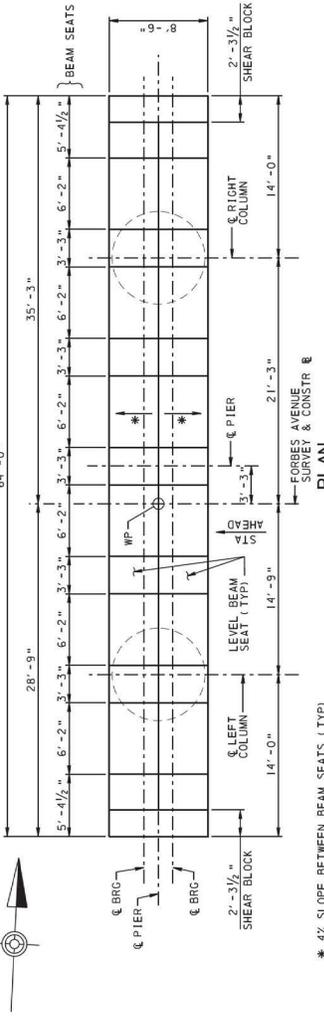
**ASSUMPTIONS FOR FUTURE JACKING:**

THE FOLLOWING ASSUMPTIONS WERE USED IN THE DESIGN OF SLEEVES IN THE PIER CAP:

- 3/4" DIA ASTM A722, GRADE 150 HIGH STRENGTH BAR.
- FRICTION COEFFICIENT BETWEEN FUTURE JACKING SUPPORT AND PIER = 0.40.
- JACKING PROVISIONS ARE ADEQUATE FOR DL.



**DOWEL DETAIL**  
 NOT TO SCALE  
 FOR ADDITIONAL DETAILS, SEE BC-775M



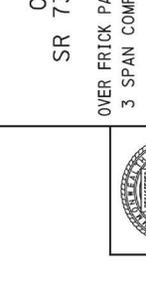
**FUTURE JACKING SLEEVE DETAIL**  
 NOT TO SCALE

**NOTES:**

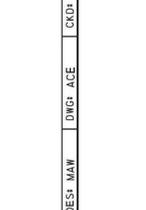
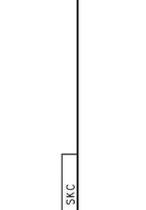
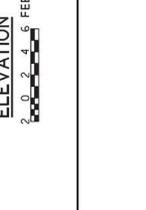
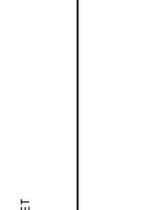
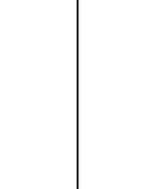
- FOR GENERAL NOTES, SEE SHEET 3.
- FOR PIER GENERAL NOTES, SEE SHEET 31.

**REVISIONS**

Mark	Description	By	Chkd	Recmtd	Date



**EXISTING AND PROPOSED GROUND LINE**





## Photographs













## **Verification of Substantial Completion**



Driver & Vehicle Services



REAL ID



511PA Travel Info



Submit Concern



Projects



Results



Forms, Pubs & Maps

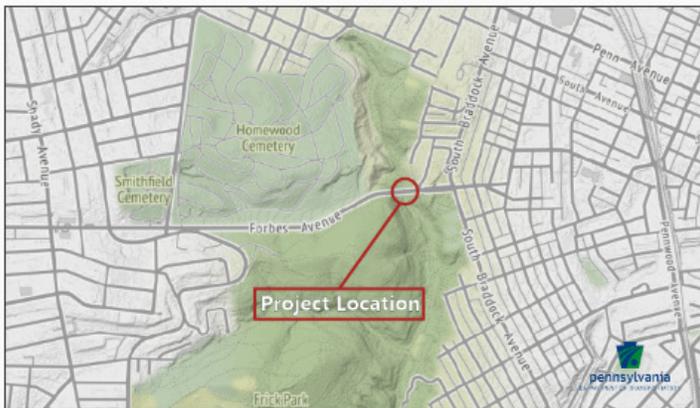


Funding

DOT > Regional Offices > District 11 > Construction Projects And Roadwork > Allegheny County Construction > Fern Hollow Bridge Project

# Fern Hollow Bridge Project

The new Fern Hollow Bridge is now complete and operational.



## Project Overview

The City of Pittsburgh and the Commonwealth of Pennsylvania have finalized a Reimbursement Grant Agreement which will allow the Pennsylvania Department of Transportation (PennDOT) to design and construct a new structure at the site of the Fern Hollow Bridge. PennDOT will be responsible for contract development, letting and award, design development activities, right-of-way acquisition, utility relocation, and other items related to the design and construction of the new bridge. Once the project is completed the City will assume jurisdiction over and maintenance responsibility of the bridge. This agreement allows the Commonwealth of Pennsylvania to execute an emergency contract with Swank Construction Company/HDR Inc. to immediately begin design efforts and mobilize to remove the existing bridge.

Officials announced that up to \$25.3 million in federal funding has been made available for this collaborative project. The federal funds are a direct result of the additional funds made available in Federal Fiscal Year (FFY) 2022 from the Bi-Partisan Infrastructure Law and will not impact any regionally funded projects.

## Project Photos



## Resources

[PennDOT Press Release\(3-8-22\)](#)

[City of Pittsburgh Press Release\(2-4-22\)](#) [↗](#)

[City of Pittsburgh Press Release\(1-30-22\)](#) [↗](#)

[Project FAQs](#)

[Project Photos](#)

## Comments

[Submit Comments](#) [↗](#)

[Submit Artist Feedback](#) [↗](#)

## Project Information

**County:** Allegheny

**Municipality:** City of Pittsburgh

**Local Name:** Fern Hollow Bridge

**Project Type:** Bridge

Replacement

**Start Month:** February 2022

**End Month:** To be determined

**Last Updated:** March 11, 2022

## Project Statistics

**Contractor:** Swank Construction and HDR

## Contact Information



**Statement of  
Commitment to  
Attend Awards  
Luncheon**



December 21, 2023

Dear ASHE Project of the Year Committee,

On behalf of HDR, we confirm that at least one representative from the project team will attend the awards luncheon, if selected as a winner.

Sincerely,

A handwritten signature in black ink that reads "Jason A. Fuller". The signature is written in a cursive style.

Jason Fuller, PE  
Vice President /Senior Project Manager  
jason.fuller@hdrinc.com  
412-497-6051