

PennDOT's First SPMT Bridge Move: Shaler Street Bridge

ABC-UTC April 2020 Webinar

Presenters:

Lou Ruzzi, PE, PennDOT

Matt Cochran, PE, Lochner

Shane Szalankiewicz, PE, PennDOT





Owner

Pennsylvania Department
of Transportation

Contractor

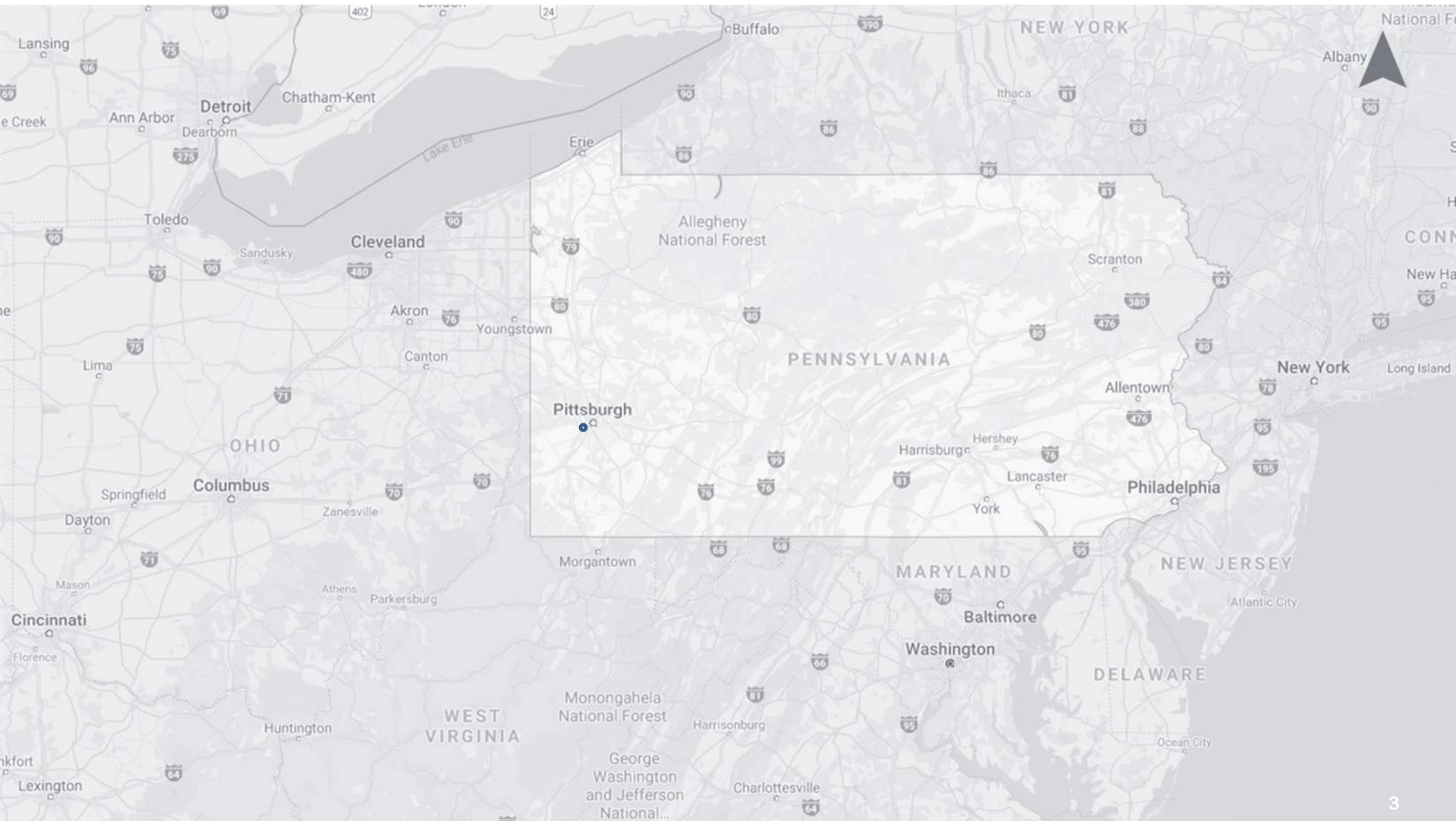
Swank Construction
Company, LLC

Designer

H. W. Lochner, Inc.

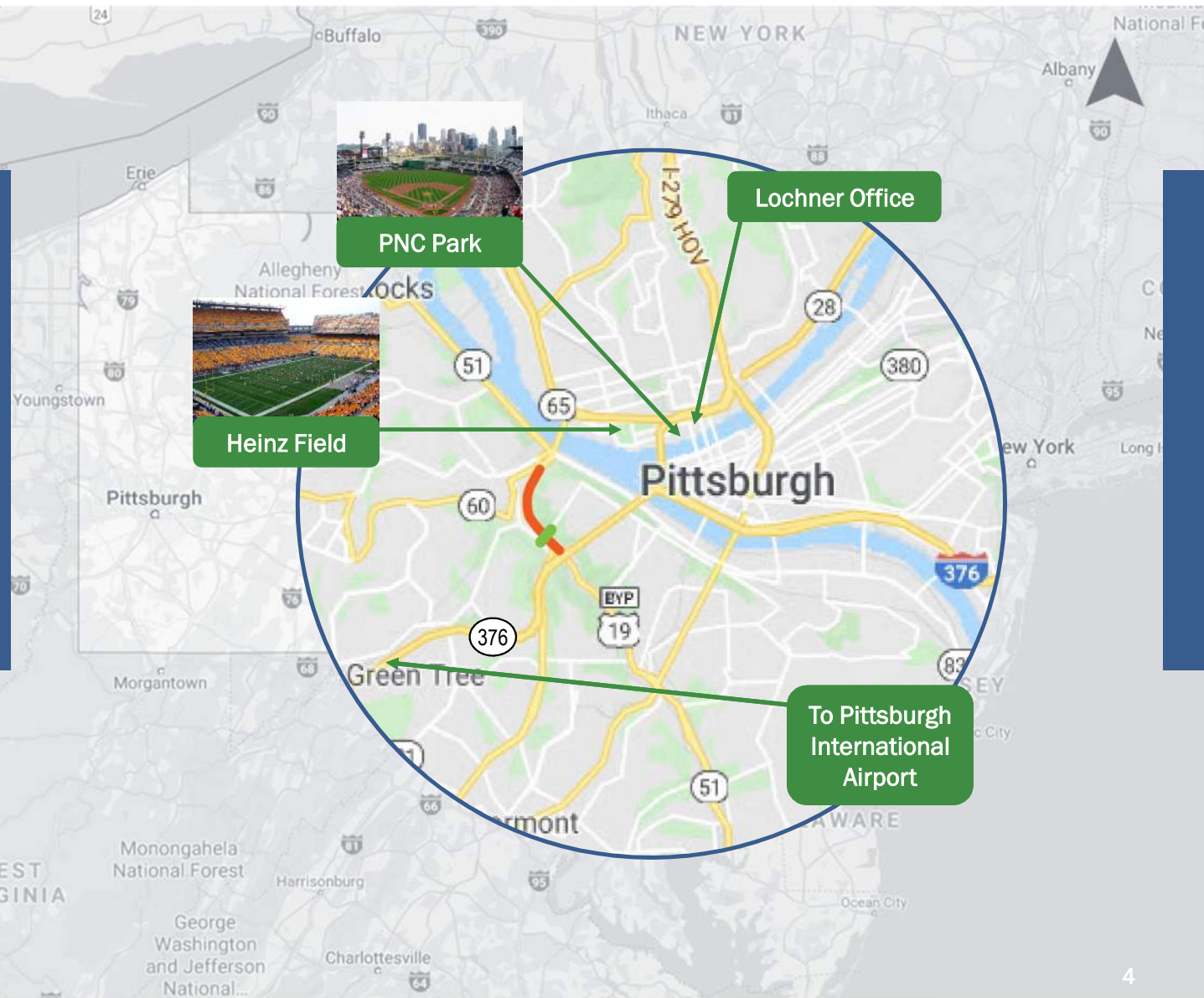
Heavy Move Contractor

Mammoet



Shaler Street (4,849 ADT) passes over SR 19 (27,000 ADT), connecting Pittsburgh to Interstate 79 and the Pittsburgh International Airport.

Existing structure was 162 feet long with 3 spans and climbed at a 14% grade over SR 19.

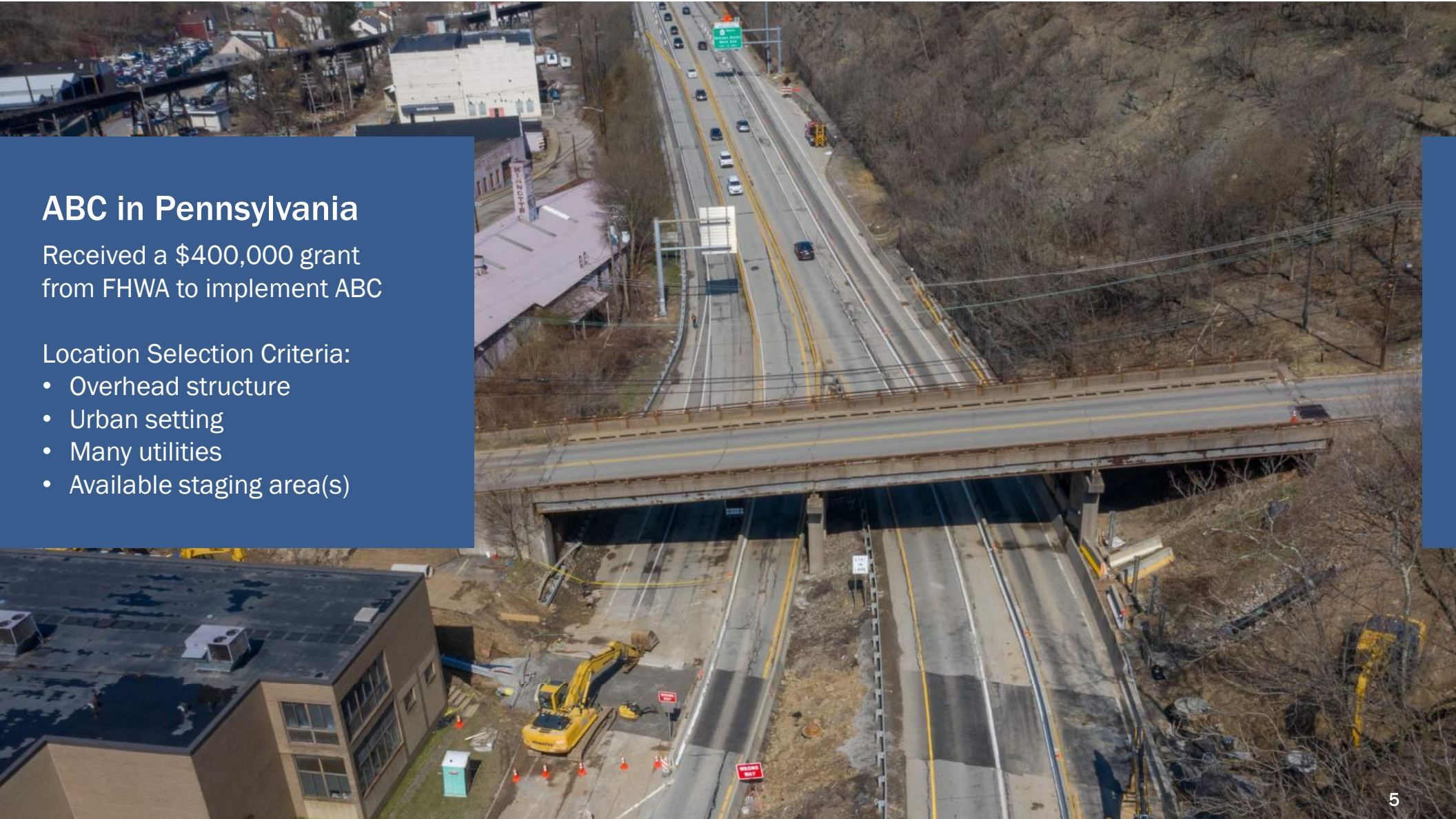


ABC in Pennsylvania

Received a \$400,000 grant from FHWA to implement ABC

Location Selection Criteria:

- Overhead structure
- Urban setting
- Many utilities
- Available staging area(s)



Existing Shaler Street Bridge

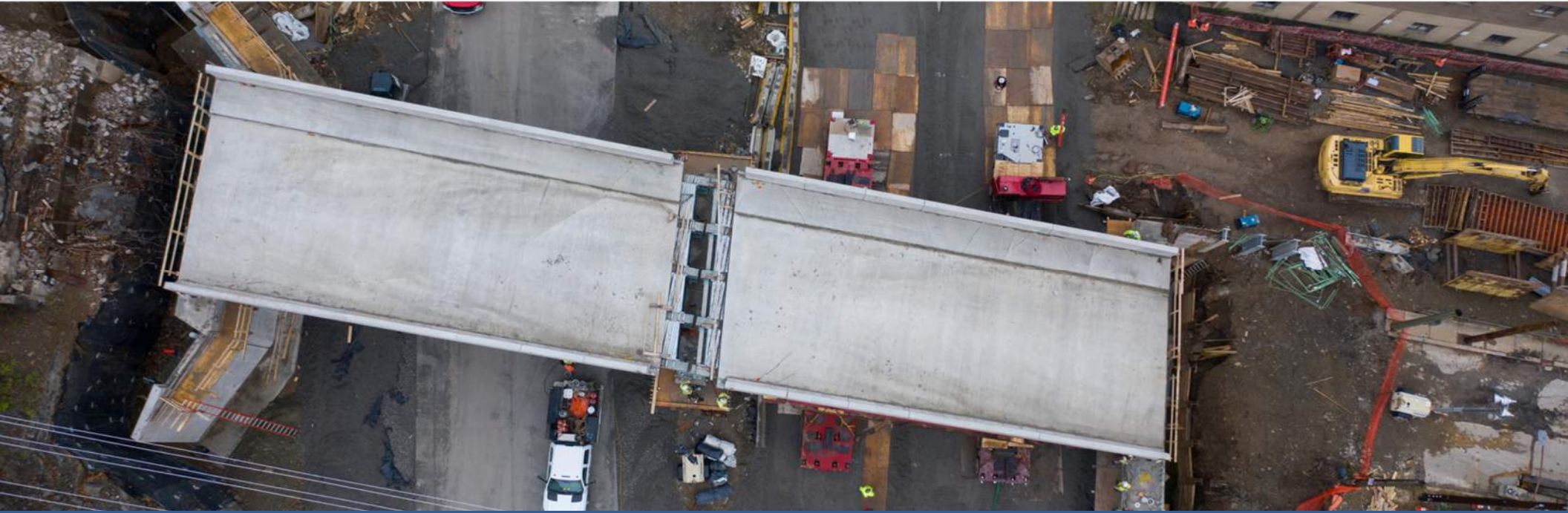
- Built in 1949
- 162 feet long by 35 feet wide (two 6' sidewalks, 24' wide roadway)
- Three span structure (span 1 – 60', span 2 – 56', span 3 – 42')
- Two abutments and two piers
- Profile Grade 14%



Proposed Shaler Street Bridge

- 34' 5" wide (one 5' 8" sidewalk, 26' wide roadway)
- Two span structure (spans 70' each)
- Five steel plate girders, concrete deck
- AASHTO M270/M270M Grade 50 steel (ASTM A709/A790M grade 50)
- Two abutments and one pier
- Profile Grade 14%





Bridge Construction Cost

- Engineer's Estimate: \$4.58 Million
- Low Bid: \$3.66 (Swank)

Project Construction Schedule

- Bid: September 2018
- NTP: October 2018
- Substantial Completion: December 2019
- Project Complete: June 2020 (20 months)
- SR 19 Closed 2 Long Weekends
- Shaler Street Closed 71 days
- 2-Day Demo
- 2-Day Bridge Move

Goals of the Project



Maximize use of SPMTs



Minimal impact to SR 19



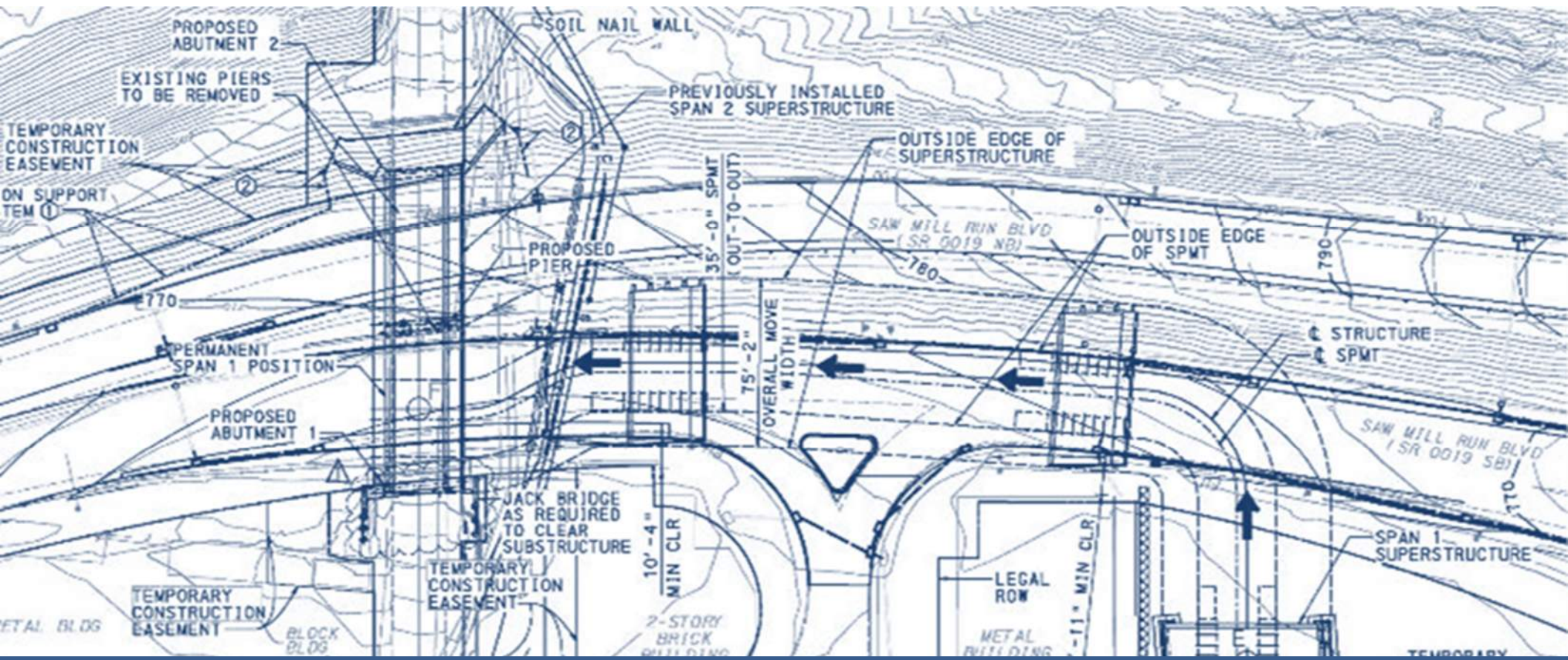
Construct bridge as quickly as possible



Build as much as possible before demolition



Public outreach



Design for Shaler Street





Feasibility Analysis

- RULD Savings
- Reached out to heavy move contractors
- Convey intent to contractors and inspection staff

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Substructure Choices

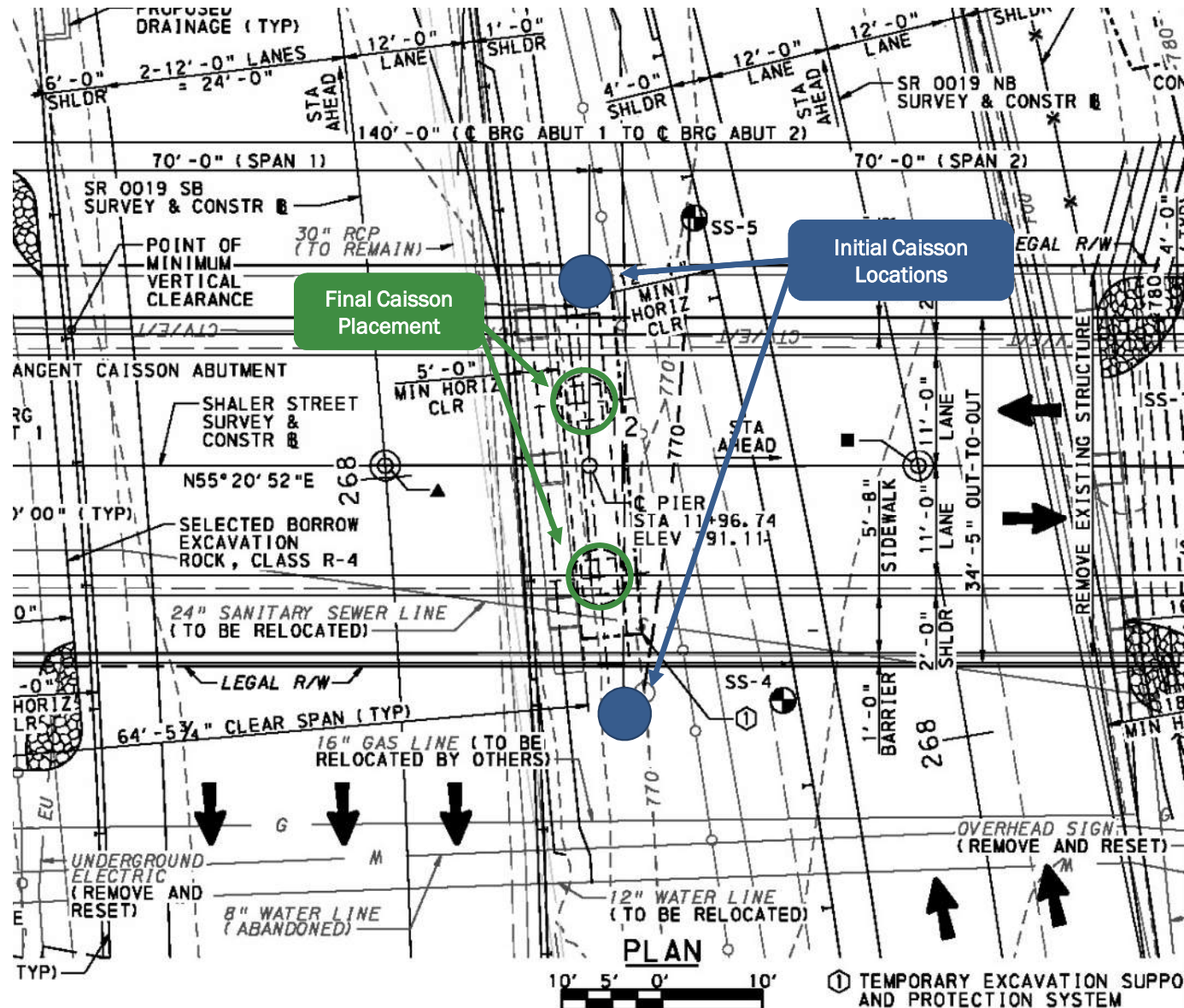
- Construction under traffic
 - Pier located under bridge, reconstructed after demolition
 - Abutment 1 location fixed due to available move path width

Soil Nail Wall & Geotechnical

- Soil nail wall needed because Abutment 2 was built under existing bridge

Need a pier that could be constructed quickly following demolition:

- Limited cure time prior to bridge move
- Evaluate constructing foundations prior to demolition
- Weight of cap dictated column location
- Caissons drilled after demolition of existing pier and located to avoid existing footers



Key elements included:

-

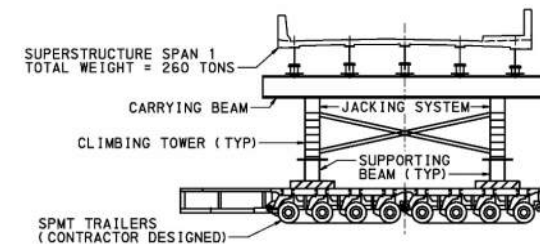
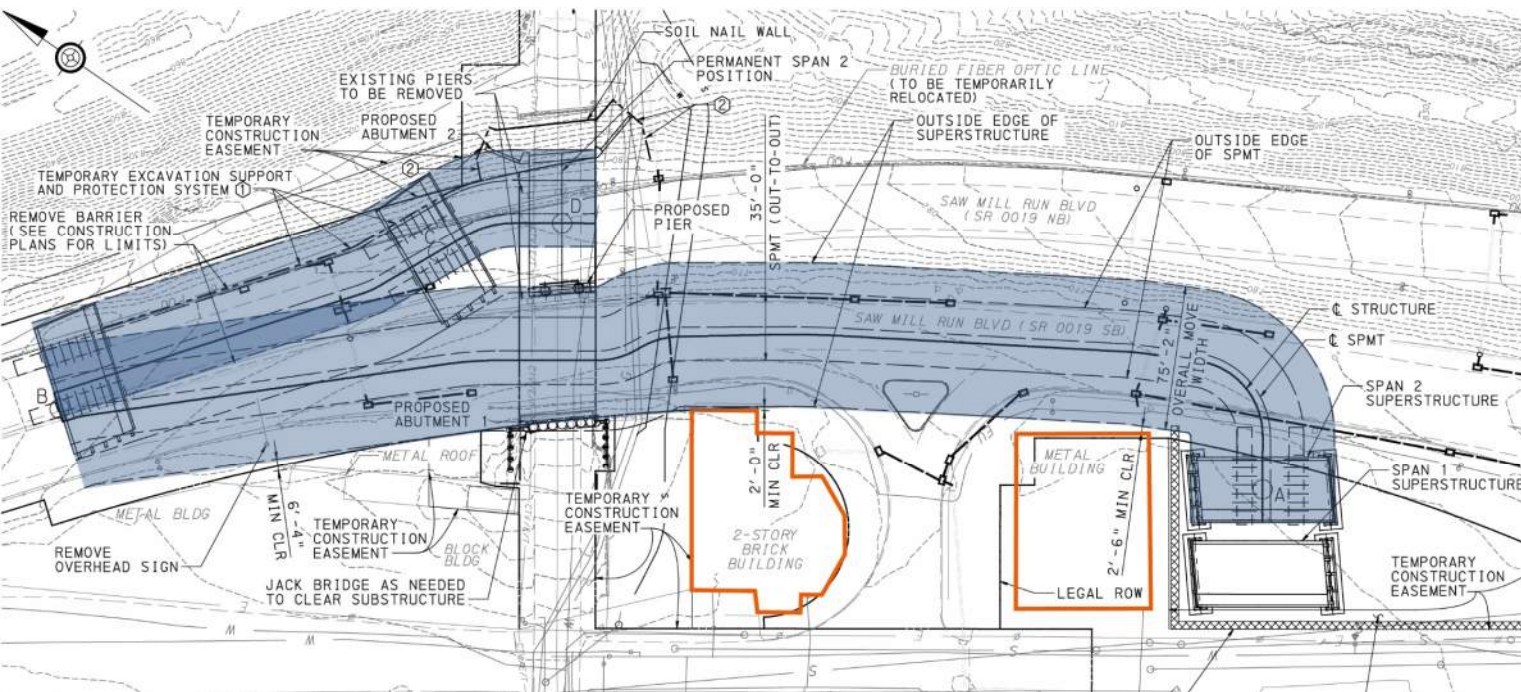
Farming Bridges

- Temporary abutments
 - Used LARSA model to analyze bridge during move and determine tolerances
- Agreement and discussions with Minnotte to determine needs for access during design
- Transition from Bridge Farm to the move path



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Graphic from LARSA Model



- Evaluated move path for horizontal clearances and grade changes
- Discussions with heavy move contractors during design to determine feasibility
- Included center-of-gravity of spans on plans for heavy move contractor to determine stability of overall system
- Each span weighs approximately 260 tons



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Pre-Bid Schedule

	JUN 2019	JUL 2019	AUG 2019	SEP 2019	OCT 2019	NOV 2019	DEC 2019
Soil Nail Wall & Abutment 2 Construction							
Closure of Shaler Street							
Demolition							
Pier Construction							
Abutment 1 Construction							
Bridge Move							
Closure Pours & Approach Slabs							

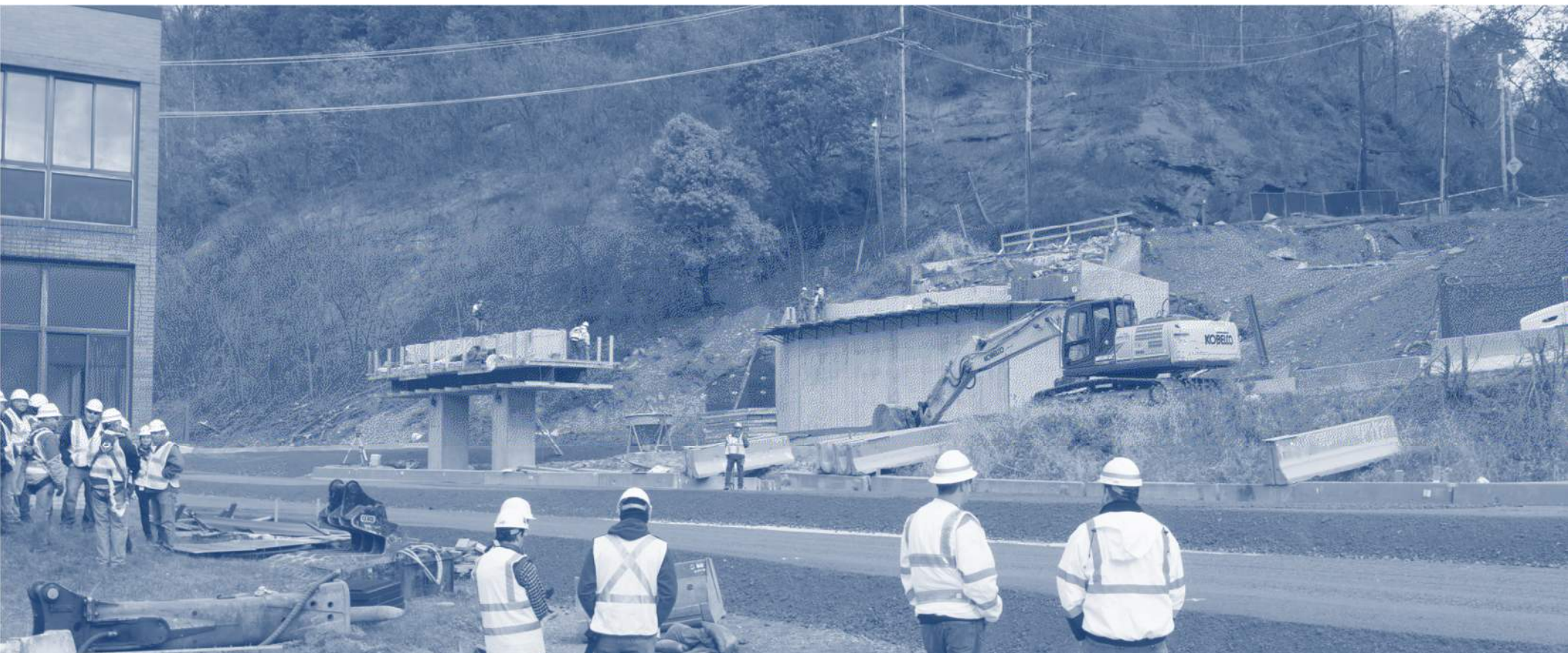
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Closure Pours & Approach Slabs							

Anticipated Challenges

- ¼ inch deck grinding/mechanical grinding
- Simple for Dead, Continuous for Live (SDCL) pier connections
- Move path – clearance envelope
- Bridge monitoring system (during bridge move)
- Contingency plan
- Coordination with Heinz Field events
- Dynamic movement





Construction for Shaler Street

Public Outreach



PennDOT engaged news stations and shared animation of bridge move before construction



Held pre-season construction conference on project site



Released progress updates via Twitter



On Move Day created “Press Corral” for easy coverage and made staff available for interviews



Released weekly road closure and restriction updates



Coordinated with Heinz Field for major events (i.e., Steelers games)



Design

- Abutment 1: tangent caissons
- Precast pier
- Precast cheekwalls
- 2-day SR 19 Closure\2 Long Weekends

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Construction

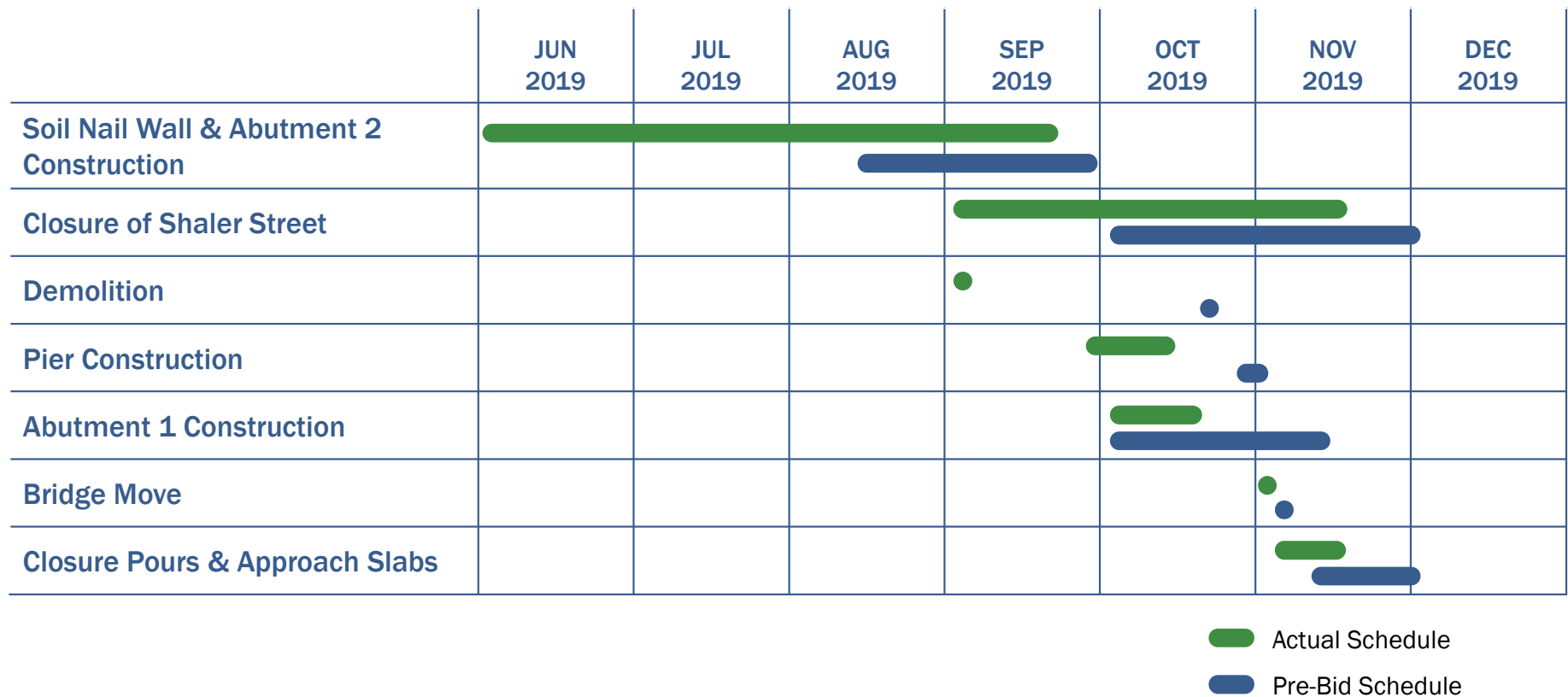
- Abutment 1: C.I.P. cantilever abutment
- C.I.P. pier
- C.I.P cheekwalls
- 2-day SR 19 Closure\ 1 Weekend – 1 (Sun to Tues)

Move Day

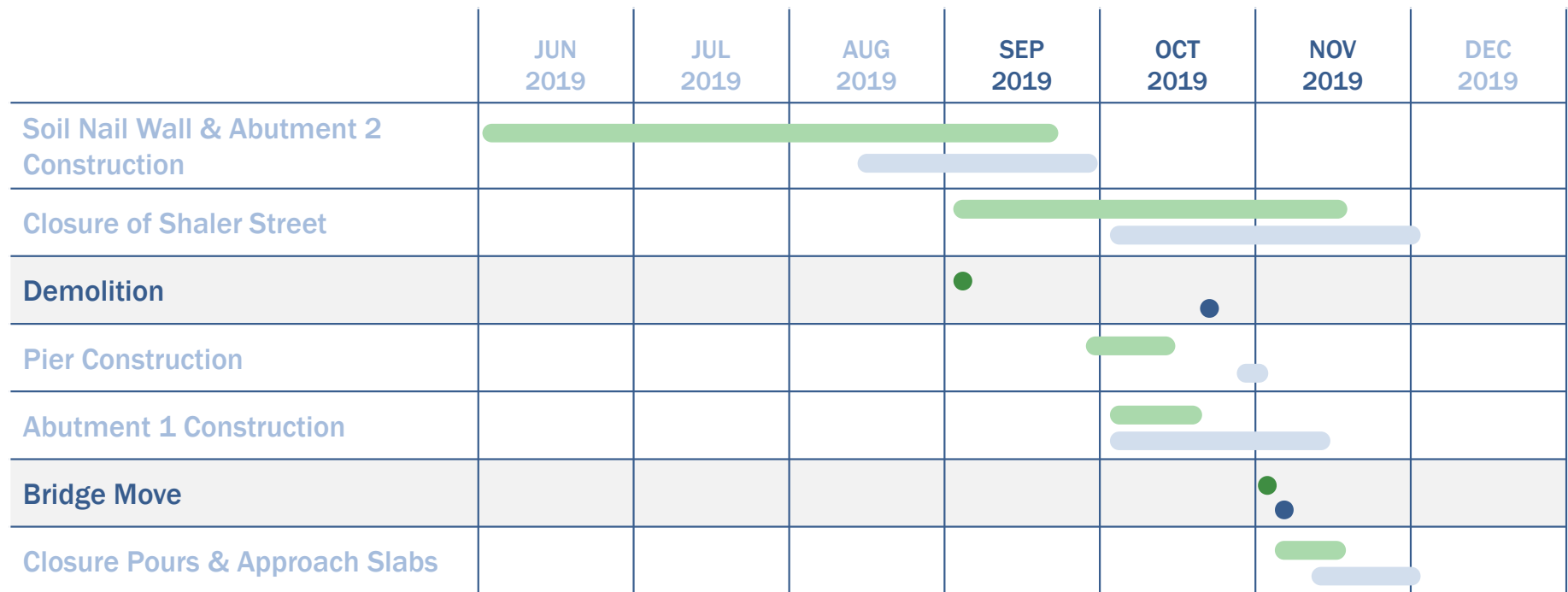
- Move path
- Temporary falsework/rigging under Superstructure
- Setting bridge and fine tuning
- Adjustments due to equipment





Actual vs. Pre-Bid Schedules



Actual vs. Pre-Bid Schedules



 Actual Schedule
 Pre-Bid Schedule

Event Coordination

October 2019						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2 PPG Phil Collins - 8pm	3 vs. Sabres - 7PM	4 PPG Marcy Me - 7pm	5 vs. Blue Jackets - 7PM
6 vs. Ravens, 1PM PPG Chance the Rapper - 7PM	7 PPG The Black Keys - 7PM	8 vs. Jets - 7PM	9 PPG Hugh Jackman - 7:30PM	10 vs. Ducks - 7PM	11 PPG The Chainsmokers - 7:30PM	12 PPG Carrie Underwood - 7PM COLUMBUS DAY WEEKEND
13 66 RUN COLUMBUS DAY WEEKEND	14 COLUMBUS DAY	15	16 vs. Avalanche - 7PM	17 PPG Bob Seger and the Silver Bullet Band - 7:30PM	18 vs. Stars - 7PM	19 vs. Golden Knights - 7PM
20	21	22	23	24 PPG Jurassic World Live 7PM	25 PPG Jurassic World Live 7PM	26 Pitt @ Heinz Field vs. Miami PPG Jurassic World Live 11AM, 3PM, 7PM
27 PPG Jurassic World Live 12PM, 4PM	28 vs. Dolphins, 8:15 PM	29 vs. Flyers - 7PM	30 HALLOWEEN	31		

November 2019						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 vs. Oilers 1PM	2 EJLT Pittsburgh 10 vs. Oilers 1PM
3 vs. Colts, 1PM Daylight Savings	4	5	6	7	8 PPG TOOL - 8PM	9 vs. Blackhawks - 7PM
10 vs. Rams, 4:25PM	11 VETERANS DAY	12	13 PPG Elton John - 8PM	14 Pitt @ Heinz Field vs. N Carolina	15	16 vs. Maple Leafs - 7PM
17	18	19 vs. Islanders - 7PM	20	21	22 vs. Devils - 7PM Light Up Night	23 PPG Luke Combs 7PM
24	25 vs. Flames - 7PM	26	27 vs. Canucks - 7PM	28 THANKSGIVING	29 Black Friday	30 Pitt @ Heinz Field vs. Boston

Construction Durations

Sep 6 Shaler Street Closed

Sep 6-8 Bridge Demolition
(2 Days)

Nov 3-5 Bridge Move
(2 Days)

Nov 22 Shaler Street Opened

SR 19 Closed 4 Days

Shaler Closed 71 Days

*Two Spans in Two Days –
bridge move a success!*

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4:02 55°
KDKA
2
@KDKA

Lessons Learned

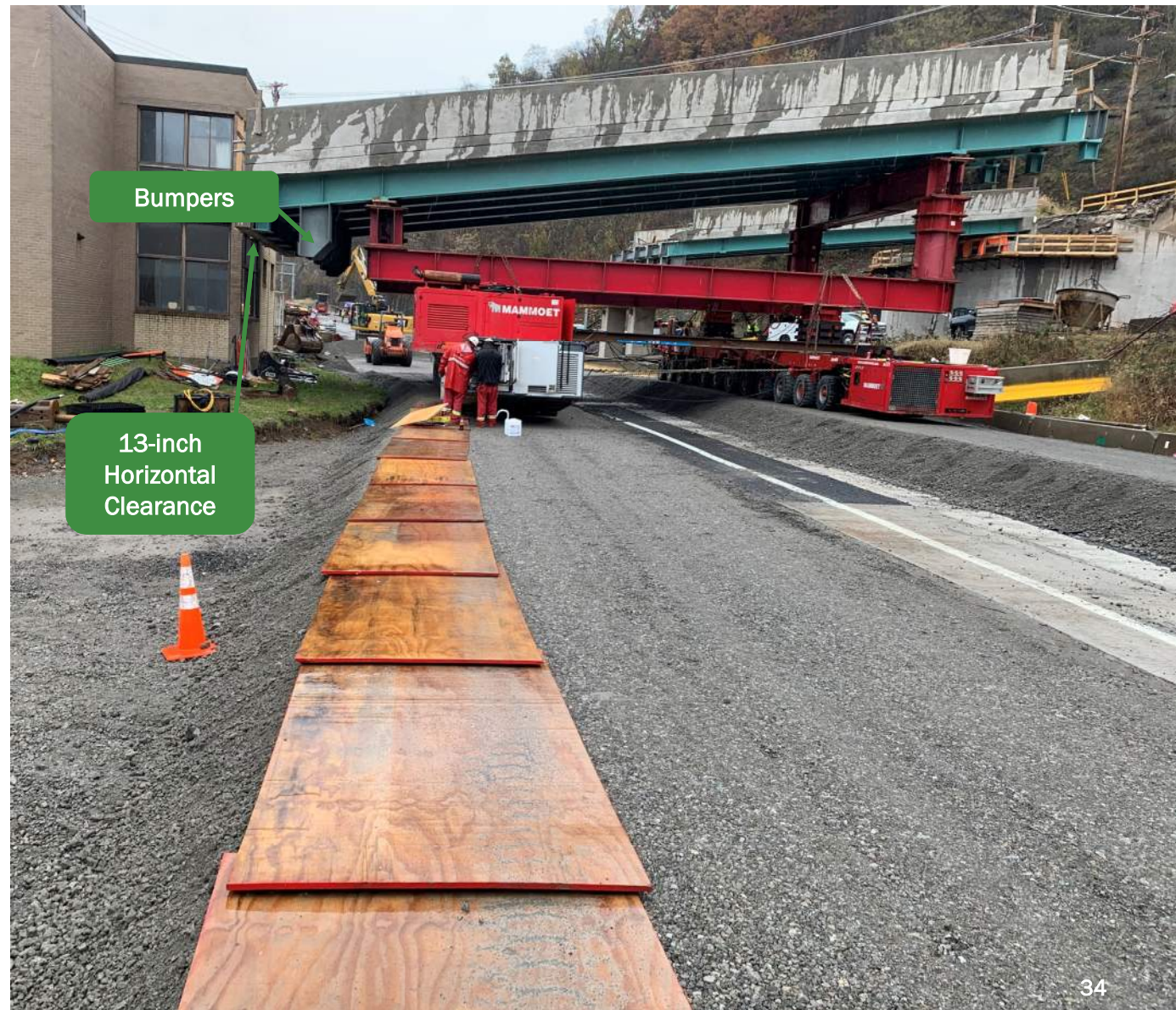
- Stakeout plan for superstructure in temporary location
- Maintain contact between jacking falsework and superstructure until final position is achieved
- Anchor bolt hole locations (drill after setting bridge or larger preformed holes)
- Move path elevations on move plan with available travel of SPMT's
- Contingency plan for equipment failures

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Lessons Learned

- Required SPMT move submissions
- Horizontal dimensions (clearances and width of road) to avoid interferences with power lines, formwork, buildings, trees, rockfall fence, etc.
- Plywood shoulder reinforcing
- Temporary diaphragms could have been permanent
- Temporary bumpers were difficult to work around while setting structure



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American Geotechnical &
Environmental Services, Inc.

mbe
monaloh basin
engineers

Michael Baker
INTERNATIONAL



mka
MCTISH-KUNKEL
and associates



SAI Consulting
Engineers



A.D. MARBLE
environmental-cultural-engineering



CDR | MAGUIRE



Contractor Team Members

Prime Contractor



Subcontractors



TRAFFIC CONTROL AND SAFETY PRODUCTS



Q & A

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Thank you!



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