

Dirt Gravel and Low  
Volume Road Program  
January 19, 2023

# SPREAD FOOTER BRIDGES



## CDGRS

Maria Drees  
[maa241@psu.edu](mailto:maa241@psu.edu)

## Clarion Conservation District

Alicia Ramsey  
[ramseyccd@gmail.com](mailto:ramseyccd@gmail.com)

## Warren County Conservation District

Heather Wilcox  
[hwilcox@wccconservation.net](mailto:hwilcox@wccconservation.net)

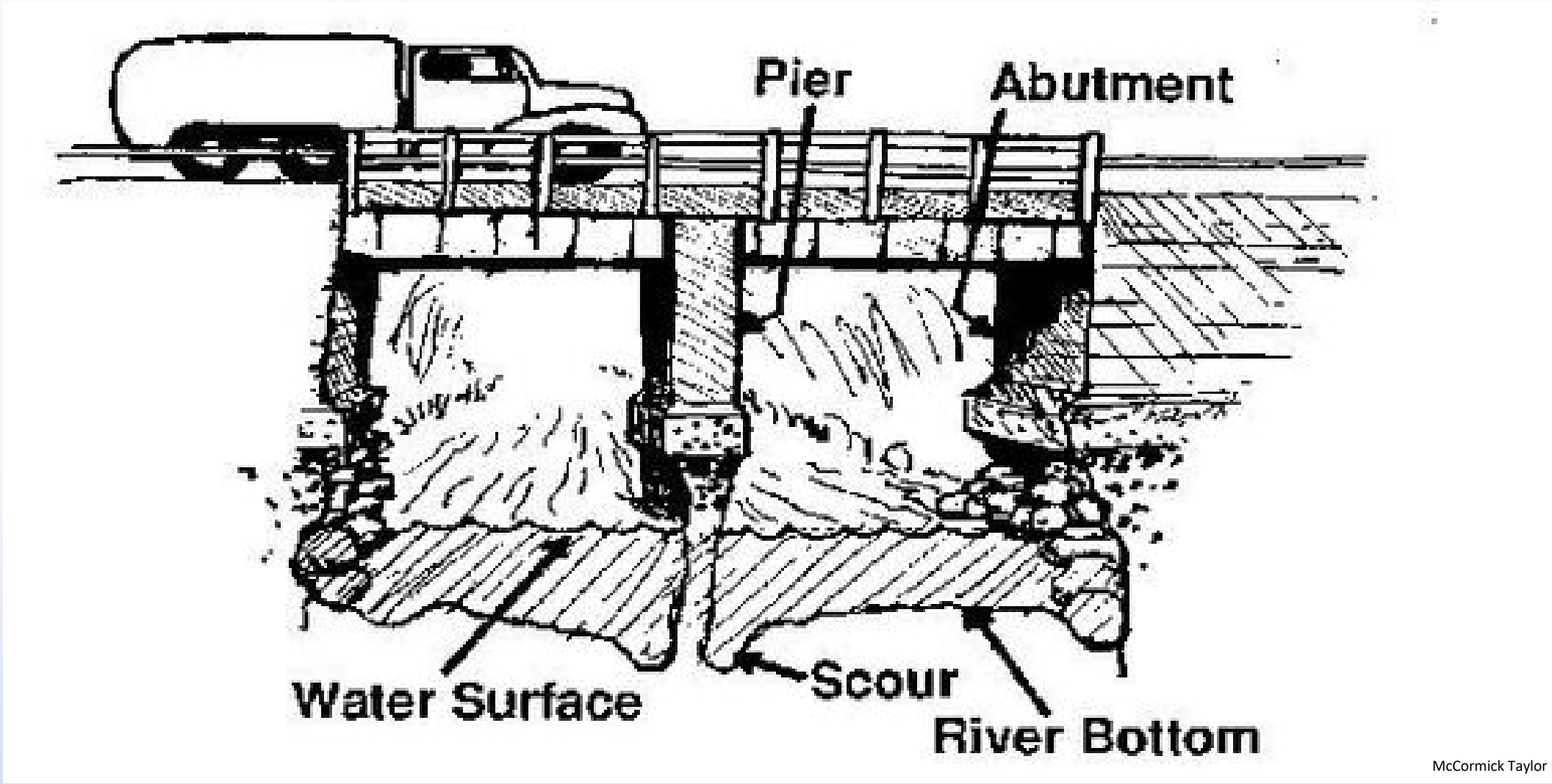


# SPREAD FOOTER BRIDGES

- **Spread Footer vs. Traditional Abutments**
  - **When to Consider a Spread Footer**
  - **Pros & Cons**
- **Spread Footer Project Installation Sequence - Barr Road, Indiana County**
- **Clarion County Gowdy Road Project**
- **Warren County Stoddard Road Project**

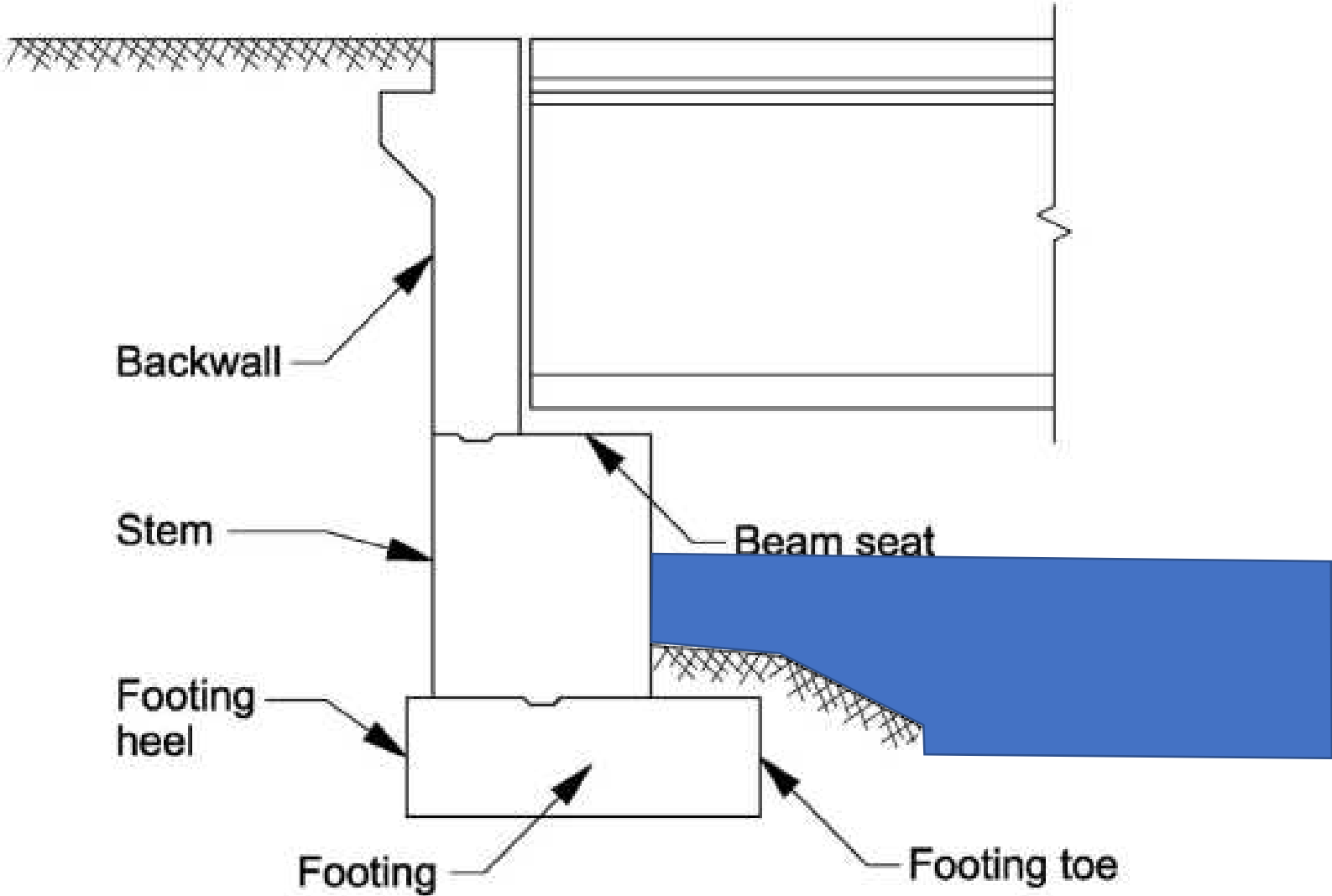
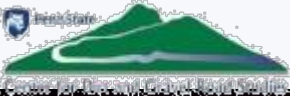


# Traditional Bridge Abutments



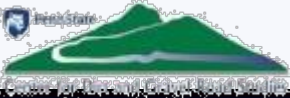
McCormick Taylor

# Traditional Bridge Abutments



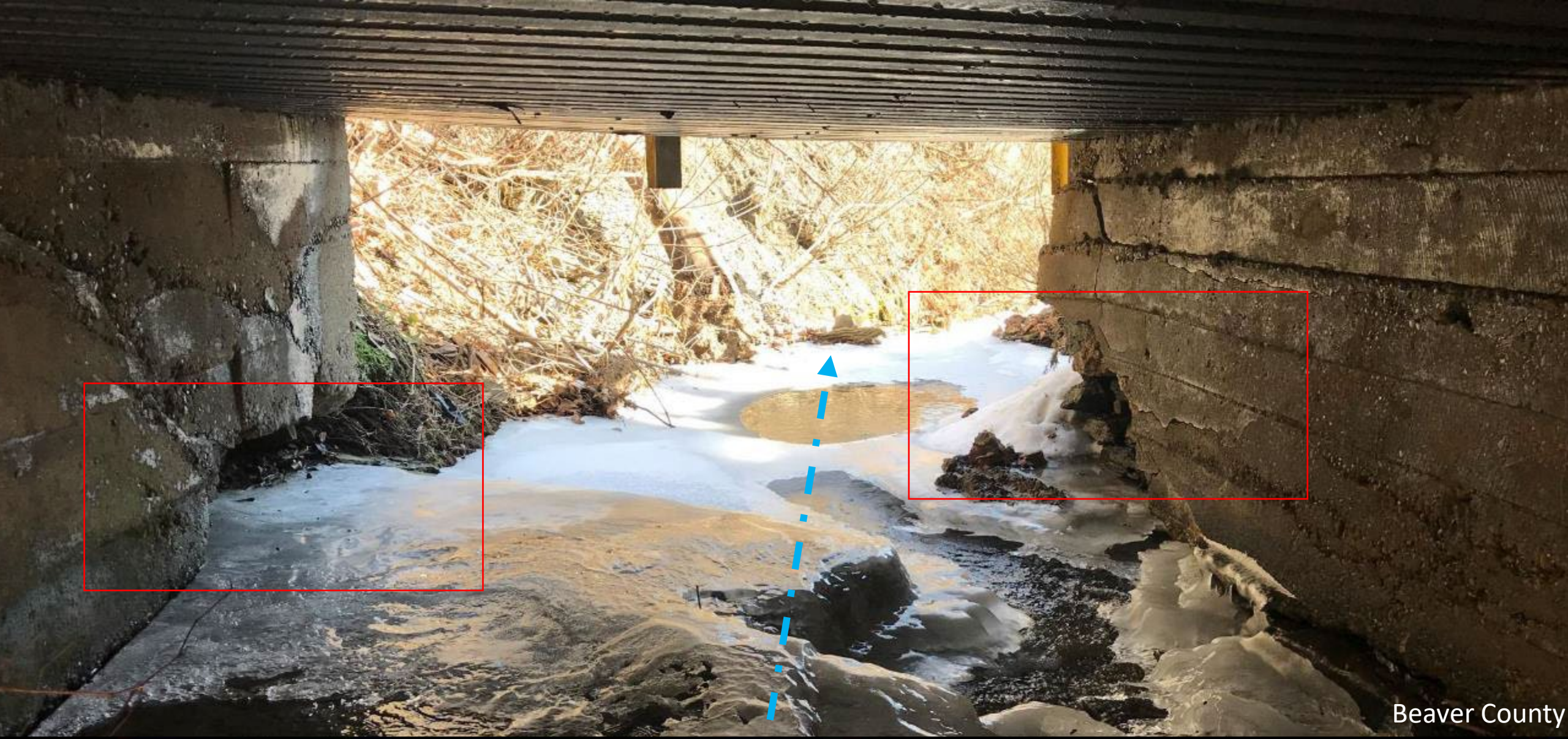
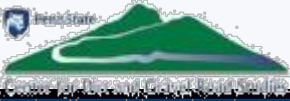
Wisconsin DOT

# Traditional Bridge Abutments



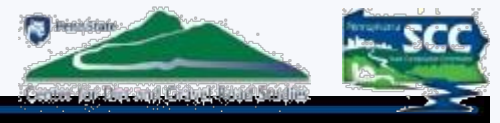
Beaver County

# Traditional Bridge Abutments



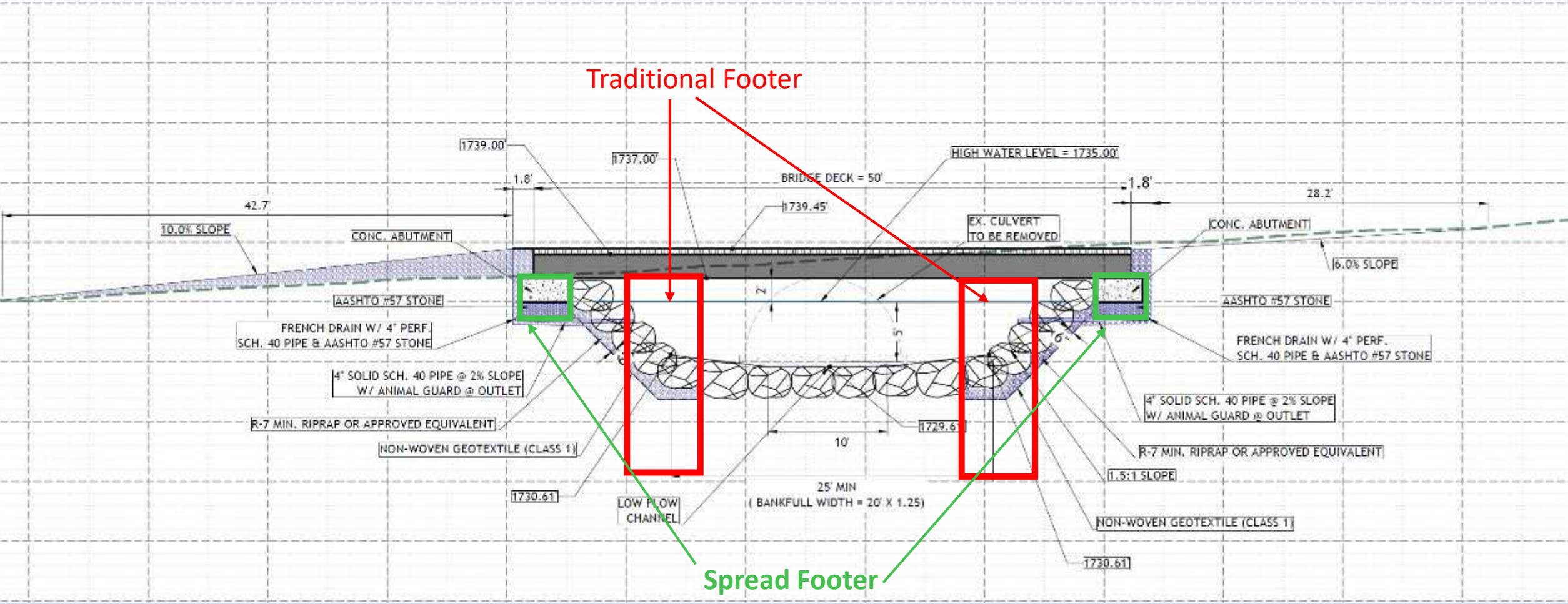
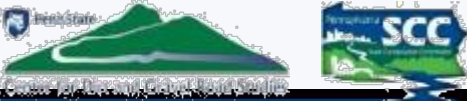
Beaver County

# Traditional Bridge Abutments



Wayne County

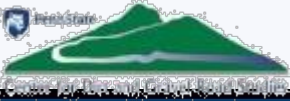
# Spread Footer Foundations







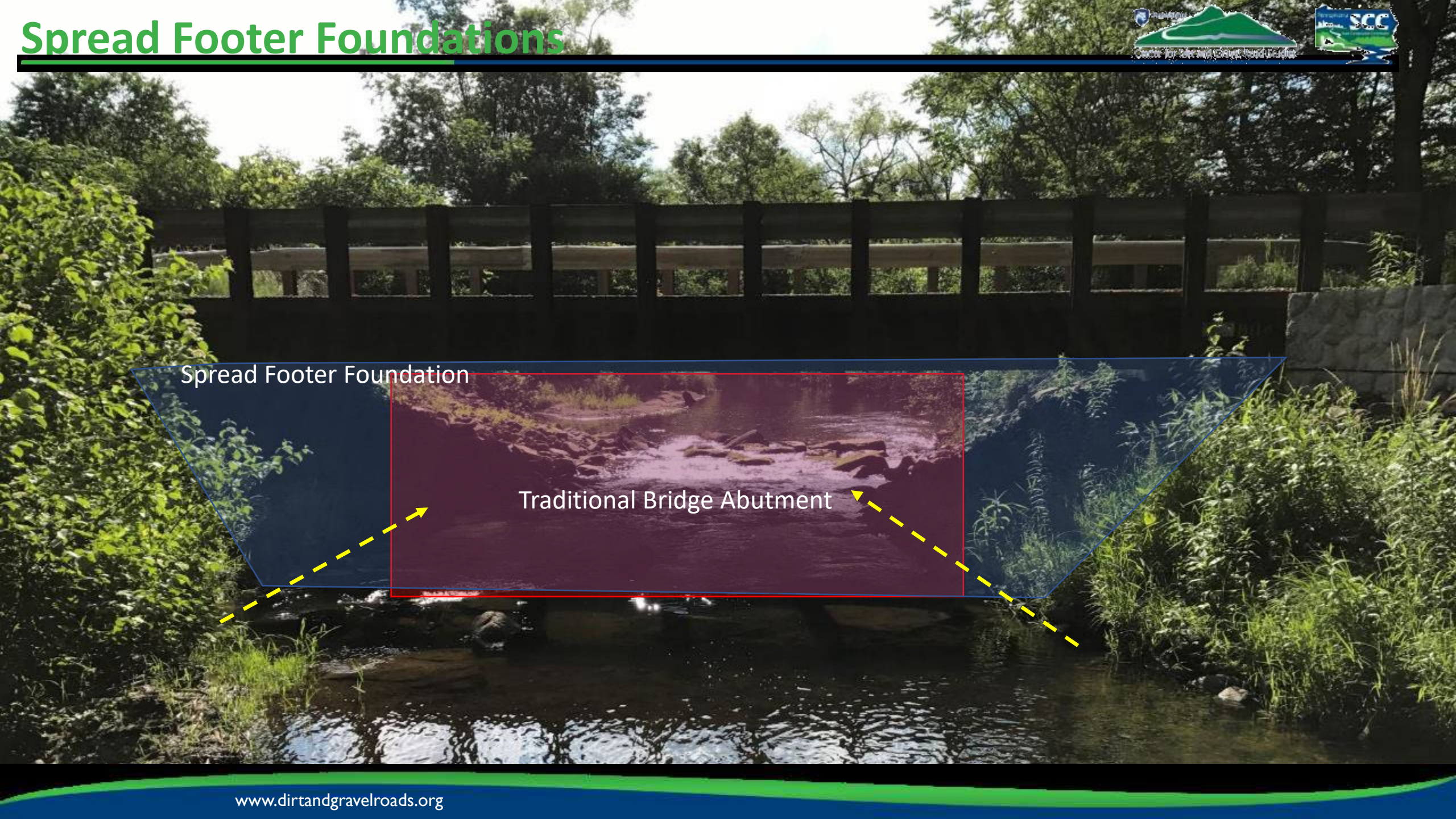
# Spread Footer Foundations



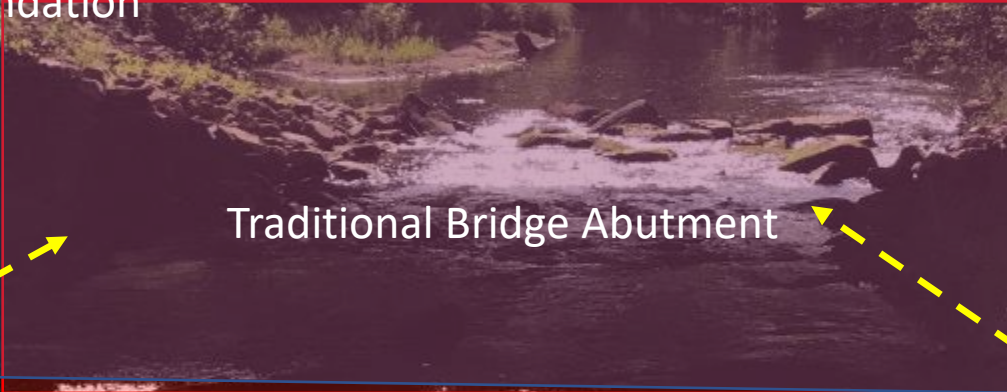
Existing Road Surface Elevation

Existing Road Base

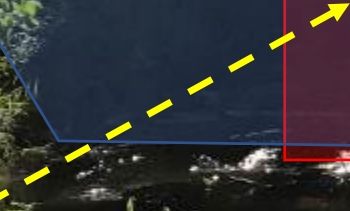
# Spread Footer Foundations



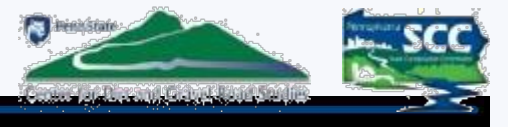
Spread Footer Foundation



Traditional Bridge Abutment



# When to Consider A Spread Footer



- Bankfull measurements that require structures 20' span or greater
  - \*~16.25 Bankfull Width
- Areas that require additional opening area to meet the Q100 at 80% of the structure capacity
- Areas where the vertical rise is limited for roadway elevation but additional span (width) is necessary
- Stream channels that exceed 4% continuity slope and require a bottomless structure

## Pros

- Reduced depth of excavation
- Less concrete and sequential concrete pours = less concrete cure time
- Expedited installation schedule = less environmental and community impact
- Increase structure capacity, better flood resiliency, lower maintenance requirements

## Cons

- Longer bridge spans required
- Cost analysis to determine if reduction in abutment costs offsets additional structure length expense
- Alternative design approach from Penn DOT Standard – may require additional discussion and coordination with design engineer and bridge inspectors.

# SPREAD FOOTER BRIDGES

- Spread Footer vs. Traditional Abutments
  - When to Consider a Spread Footer
  - Pros & Cons
- Spread Footer Project Installation Sequence - Barr Road, Indiana County
- Clarion County Gowdy Road Project
- Warren County Stoddard Road Project





# Indiana County

Green Township Barr Road

Spring 2020



Existing Inlet

5' Round  
Plastic Pipe






Existing Inlet


5' Round  
Plastic Pipe



Existing  
Inlet

A photograph of a stream in a forest. The stream flows from the background towards the foreground. The banks are covered in green grass and moss. A blue dashed arrow points upstream from the foreground towards the background. A white circular callout in the upper right corner contains the text "Upstream Conditions".

Upstream  
Conditions



Existing  
Structure

Downstream  
Outlet



Existing  
Structure  
Outlet

Downstream  
Conditions



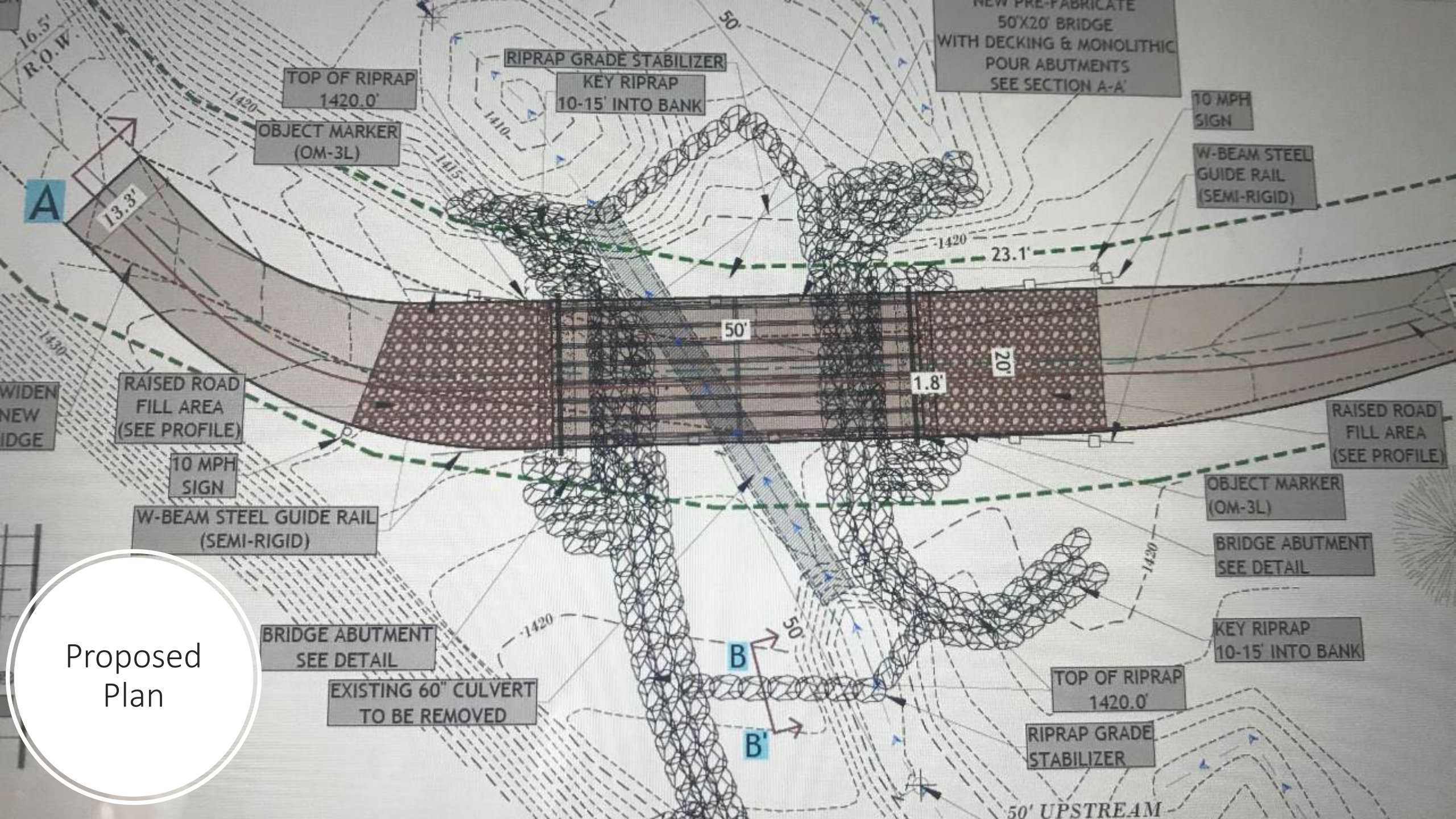
Existing  
Conditions

Roadway  
Approach



Existing  
Conditions

Roadway  
Approach



A

50'

20'

1.8'

B

B'

Proposed Plan

TOP OF RIPRAP  
1420.0'

OBJECT MARKER  
(OM-3L)

RIPRAP GRADE STABILIZER  
KEY RIPRAP  
10-15' INTO BANK

NEW PRE-FABRICATE  
50'X20' BRIDGE  
WITH DECKING & MONOLITHIC  
POUR ABUTMENTS  
SEE SECTION A-A'

10 MPH  
SIGN

W-BEAM STEEL  
GUIDE RAIL  
(SEMI-RIGID)

WIDEN  
NEW  
EDGE

RAISED ROAD  
FILL AREA  
(SEE PROFILE)

10 MPH  
SIGN

W-BEAM STEEL GUIDE RAIL  
(SEMI-RIGID)

RAISED ROAD  
FILL AREA  
(SEE PROFILE)

OBJECT MARKER  
(OM-3L)

BRIDGE ABUTMENT  
SEE DETAIL

BRIDGE ABUTMENT  
SEE DETAIL

EXISTING 60" CULVERT  
TO BE REMOVED

KEY RIPRAP  
10-15' INTO BANK

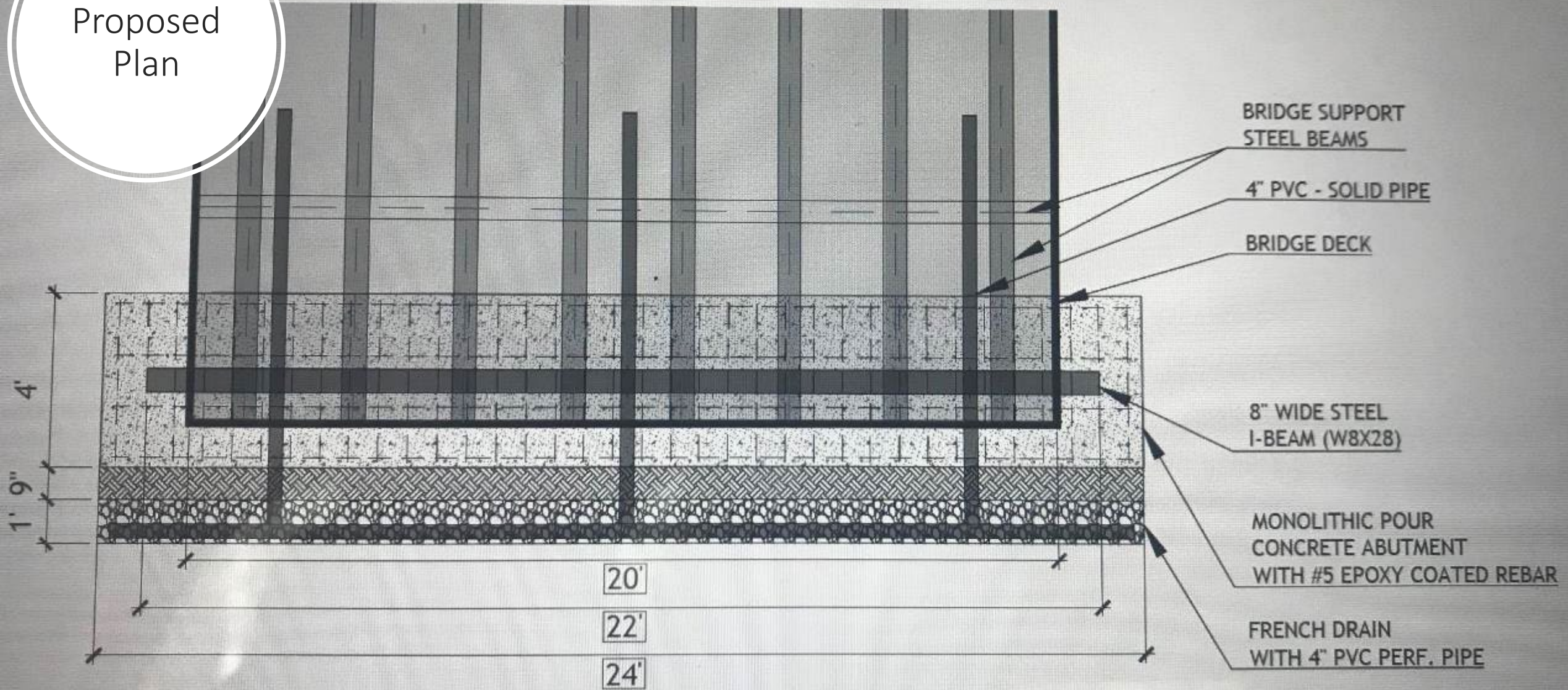
TOP OF RIPRAP  
1420.0'

RIPRAP GRADE  
STABILIZER

50' UPSTREAM

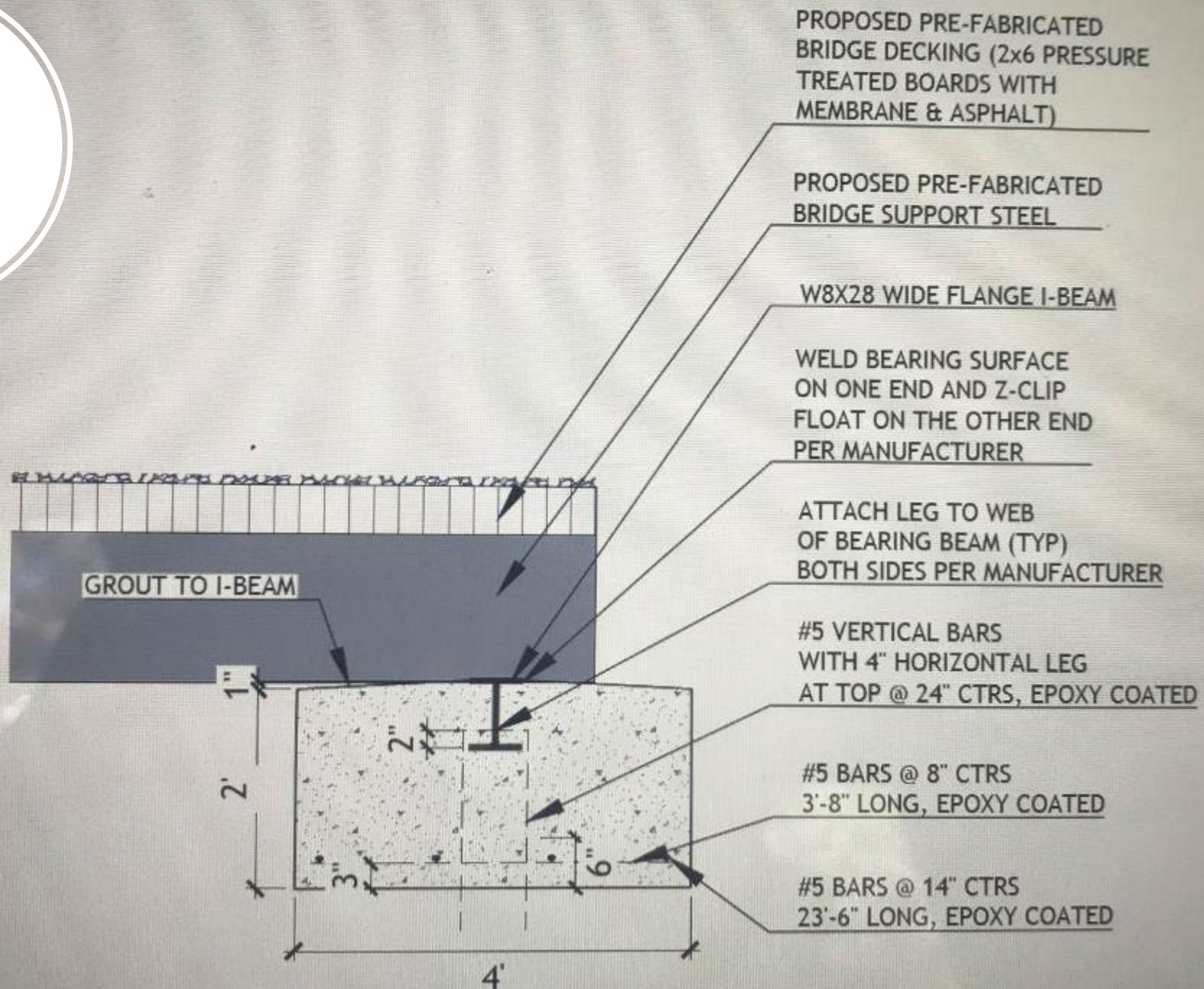


Proposed  
Plan



BRIDGE ABUTMENT LAYOUT PLAN

Proposed Plan





River Left  
Spread Footer  
Foundation  
Excavation



River Left  
Spread Footer  
Foundation  
Excavation &  
Drainage

A construction site showing a foundation excavation. The ground is covered with a layer of grey gravel, a black geotextile membrane, and a layer of brown soil. A person in a blue shirt and jeans is walking on the gravel. Two blue pipes are visible on the ground. The background shows a steep, rocky embankment.


River Left  
Spread Footer  
Foundation  
Excavation &  
Drainage



River Left  
Spread Footer  
Foundation  
Base  
Compaction



River Left  
Spread Footer  
Foundation  
Based  
Prepared



River Left  
Spread Footer  
Rebar  
Reinforcement






River Left  
Spread Footer  
Form and Rebar  
Reinforcement



River Left  
Spread Footer



Temporary  
Stream Bypass


Stream  
Channel  
Restoration



Stream  
Channel  
Restoration  
and  
Streambank  
Stabilization

A photograph showing the construction of a spread footer. The structure is a long, narrow trench lined with dark metal sheet piling. Inside the trench, a grid of green rebar is laid out. A central steel I-beam runs the length of the trench. The trench is supported by wooden bracing on both sides. The ground around the trench is gravel and dirt. A white bucket is visible on the right side. The text "River Right Spread Footer Framing" is overlaid in a white circle on the right side of the image.

River Right  
Spread Footer  
Framing



Completed  
Stream  
Channel  
Restoration &  
Streambank  
Stabilization



Delivery of  
Pre-Fabricated  
Modular Bridge

~9:00 am



Placement of  
Bridge on  
Spread  
Footers





Installation of  
Wood Deck



A photograph showing two construction workers installing wood deck panels. The workers are standing on a raised deck structure supported by dark green posts. One worker in a bright yellow shirt and blue jeans is pointing towards the structure, while another in a grey shirt and blue jeans is working on the panels. The background is a dense forest of green trees. A white circular graphic with a thin black border is overlaid on the right side of the image, containing the text 'Installation of Wood Deck Panels'.

Installation of  
Wood Deck  
Panels



Securing of  
Wood Deck  
Panels to  
Superstructure

A close-up photograph of a bridge expansion anchor. The anchor is a dark, rectangular metal component with a stepped profile, mounted on a concrete spread footer. The footer is a wide, flat concrete slab. The anchor is positioned at the end of a bridge girder, which is visible as a dark, textured surface at the top of the frame. The concrete footer shows some signs of wear and discoloration. A white circular callout box is overlaid on the right side of the image, containing the text "Expansion Anchor of Bridge to Spread Footers".

Expansion  
Anchor of  
Bridge to  
Spread  
Footers

Fixed  
Attachment of  
Bridge  
Superstructure  
to Spread  
Footer



A photograph taken from underneath a bridge, looking towards a stone abutment. The bridge's superstructure consists of several large, green-painted steel I-beams supported by a network of smaller steel members. The deck above is made of wooden planks. Below the bridge, a concrete curb is visible, followed by a large, well-constructed stone masonry wall. The scene is brightly lit, suggesting daylight.

Bridge  
Superstructure



Bridge Deck &  
Guide Rail  
Installation

~7:00 pm



Grading and  
Site  
Restoration  
Work





Stream  
Restoration

Low Water  
Level

A photograph showing a streambed. On the left, there is a well-constructed stone wall made of large, grey, rectangular stones. The streambed itself is composed of a mix of dark brown soil, gravel, and scattered rocks. On the right side, there is a large area of light brown dirt and gravel, possibly a construction site or a recently cleared area. The background is filled with dense green foliage and trees. In the top right corner, there is a white circular overlay with a black border containing the text "Downstream Condition Post Construction".

Downstream  
Condition  
Post  
Construction



Upstream  
Condition  
Post  
Construction



Final Project



May 5, 2022

~ 2 years post  
construction

Scope of Work Included:  
Removal of Existing Structure  
Installation (2) Spread Footer Abutments  
Stream Channel and Bank Restoration  
50' x 20' Pre-Fab Modular Bridge & Installation  
(4) New Cross Pipes  
Roadway Bridge Approach Work

Completed in 4 Weeks Due to Weather and  
COVID 19 Delays

**Total Project Value \$186,402.22**

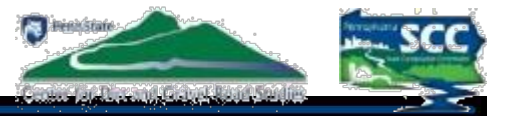


# SPREAD FOOTER BRIDGES

- Spread Footer vs. Traditional Abutments
  - When to Consider a Spread Footer
  - Pros & Cons
- Spread Footer Project Installation Sequence - Barr Road, Indiana County
- **Clarion County Gowdy Road Project**
- Warren County Stoddard Road Project



# Clarion County Gowdy Road - BEFORE



- Gowdy Road, Washington Township, Clarion County
- McCauley Run, EV stream





# Clarion County Gowdy Road - BEFORE



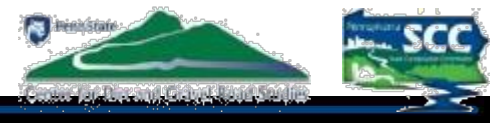
- Applicant requested tech assist
- 'Pre-app' meeting: applicant, CDGRS, District, and District engineer
- TU and CDGRS survey
- RFP process to select engineer (including on site meeting)
- 'Pre-design' mtg.: applicant, chosen engineer, CDGRS, District
- Design and GP
- Pre-bid meeting (x2): applicant, CDGRS, District, potential contractors
- Construction



# DURING CONSTRUCTION



# COMPLETED PROJECT



**20' x 60' bridge,  
Instream grade controls (4),  
modified mud sill, & root wad  
revetment**

08/08/2

**Overall project cost: \$312,000**

# COMPLETED PROJECT



# SUMMARY OF EXPERIENCE



- Lessons learned
- Advantages to this type of structure
- Time investment



# SPREAD FOOTER BRIDGES

- Spread Footer vs. Traditional Abutments
  - When to Consider a Spread Footer
  - Pros & Cons
- Spread Footer Project Installation Sequence - Barr Road, Indiana County
- Clarion County Gowdy Road Project
- **Warren County Stoddard Road Project**



# Warren County Stoddard Road - BEFORE







- Multiple Pre-Application site visits and project planning - Feb. through Oct. 2018
- Application Received Nov. 2, 2018 & approved for funding by CD Board on Dec. 18, 2018
- Held Contract signing meeting March 2019
- Multiple conversations and site visits with Engineer to develop site plans, GP11 permit package, and Bid Package – March 2019 through June 2020
- Public Ad in local newspaper June 29 and July 6, 2020
- Mandatory site showing held July 10, 2020
- Bid opening July 21, 2020
- Construction began August 31, 2020 and ended November 2020

# DURING CONSTRUCTION



# COMPLETED PROJECT





- **Final Project Value: \$217,775**
  - In addition to the stream crossing this included 16 cross pipes, 2,905 tons road fill, seeding, mulching and instream restoration work.
- No Road Closures Due to Flooding Since Project Completion
  - Better high-water flow under the new bridge
  - Series of (15) - 12 inch pipes provide flood relief through the road profile.
- Township has another LVR project to replace a multiple pipe crossing on a tributary to this stream
- **Lessons Learned**
  - Compaction of material right up to structure
  - Streams are going to flood - Plan for it!
  - Be as detailed as possible in your plan drawings and bid package.

# SPREAD FOOTER BRIDGES

## QUESTIONS?

**Special Thank You to:**

**Clarion Conservation District**

**Warren County Conservation District**

**Indiana County Conservation District**

