How to Rehabilitate a Leaking Major Drinking Water Supply Line in 120 days

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Presenters



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Agenda

1. Project History
2. Design
3. Construction
4. Emergency Project Lessons Learned

01

Project History

What Happened?

- April 3, 2024 – a leak occurred in a 24” concrete cylinder pipe (CCP) transmission main
- This pipe is the main supply line serving the City of Mercer Island
- Pipe owned by Seattle Public Utilities (SPU)

Project Schedule

- April 3, 2024 – Leak discovered; homes evacuated
- April 16, 2024 – HDR contacted by SPU
- May 10, 2024 – HDR delivers Basis of Design Report & Design Drawings
- June 20, 2024 – Repair construction starts
- August 1, 2024 – Water supply restored to Mercer Island

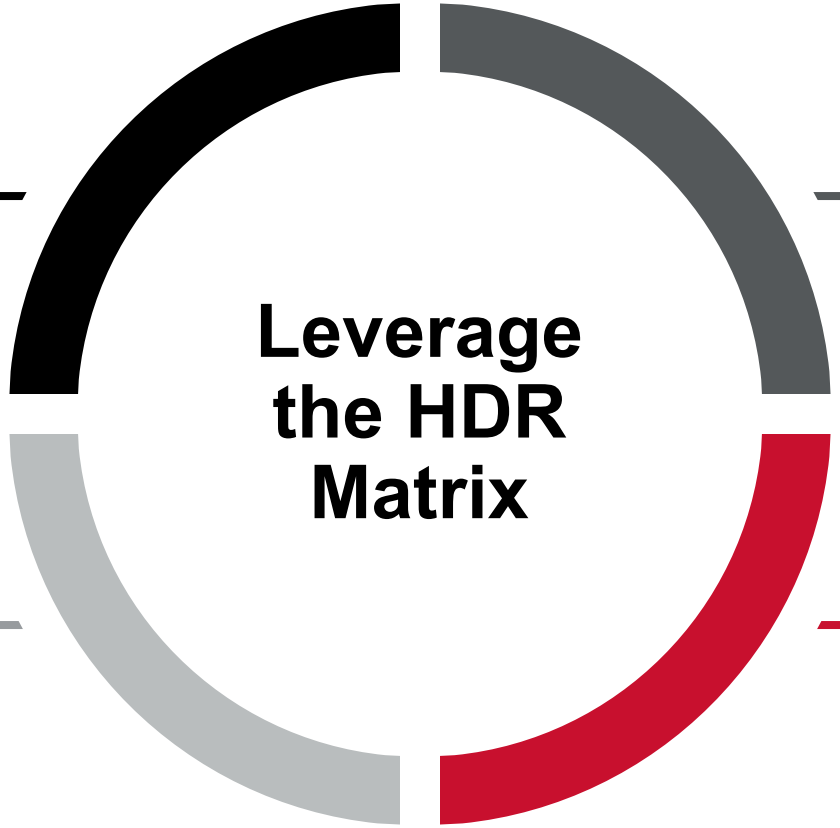
Unique Project Challenges

1. Accelerated Schedule
2. Client Mandated Rehabilitation Technology
3. Limited local HDR availability
4. Multiple Stakeholders
5. Staffing Disruptions
6. Design Build-ish

Staffing Issues/Disruptions

Client Manager was on PTO when SPU reached out & did not have availability to manage the Project

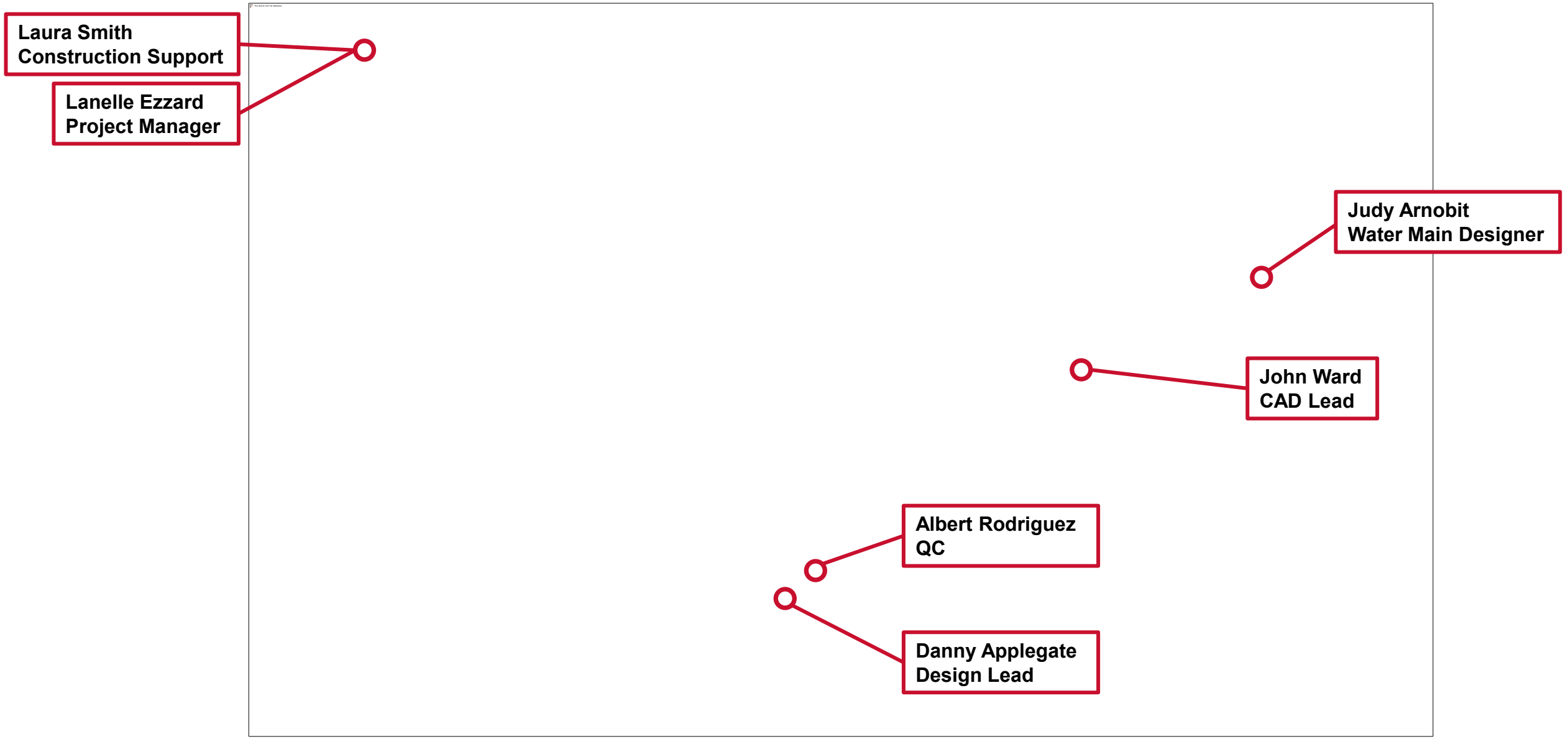
SPU specifically requested Danny Applegate to be the design lead



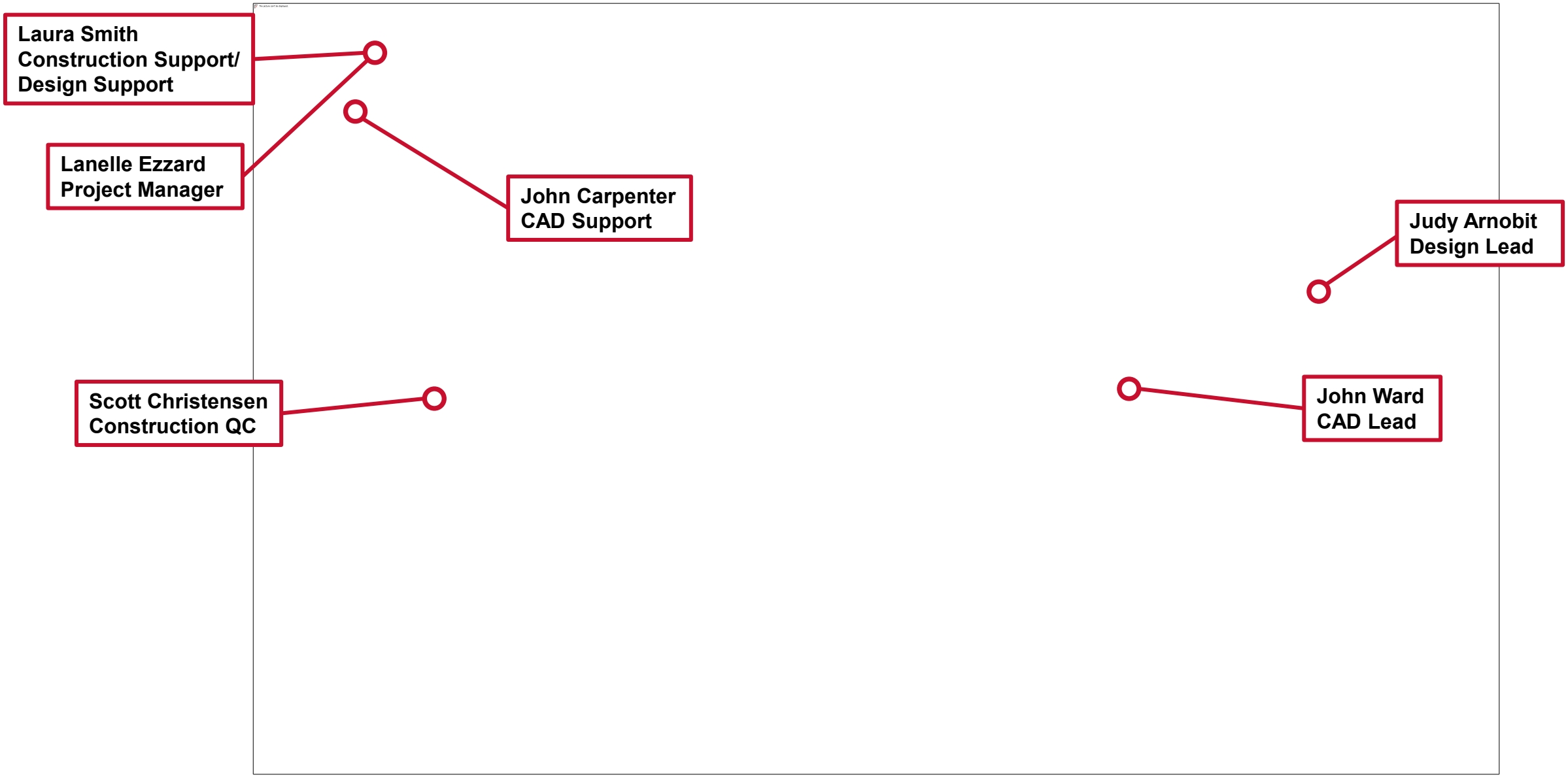
Limited local availability – only one engineer available and not until construction

No local CAD availability

Project Team Identified



Project Team when the Work Completed



02

Design

Project/Site Challenges

- Leak occurred in area inaccessible to crews for repair
- Steep Slope
- Homes built adjacent to pipeline
- Utility Poles adjacent to line
- Trees adjacent and on top of line

Rehabilitation Design Constraints

- Approximately 1,300 linear feet of pipe needed to be fixed
- Pipeline in a ravine with extreme steep slope exceeding 34% in some areas
- Existing Bar Wrapped CCP pipe with thin steel cylinder or <0.1”
- Utilize Steel Pipe in SPU yard for CCP Connections
- Reinstate MI distribution system connection

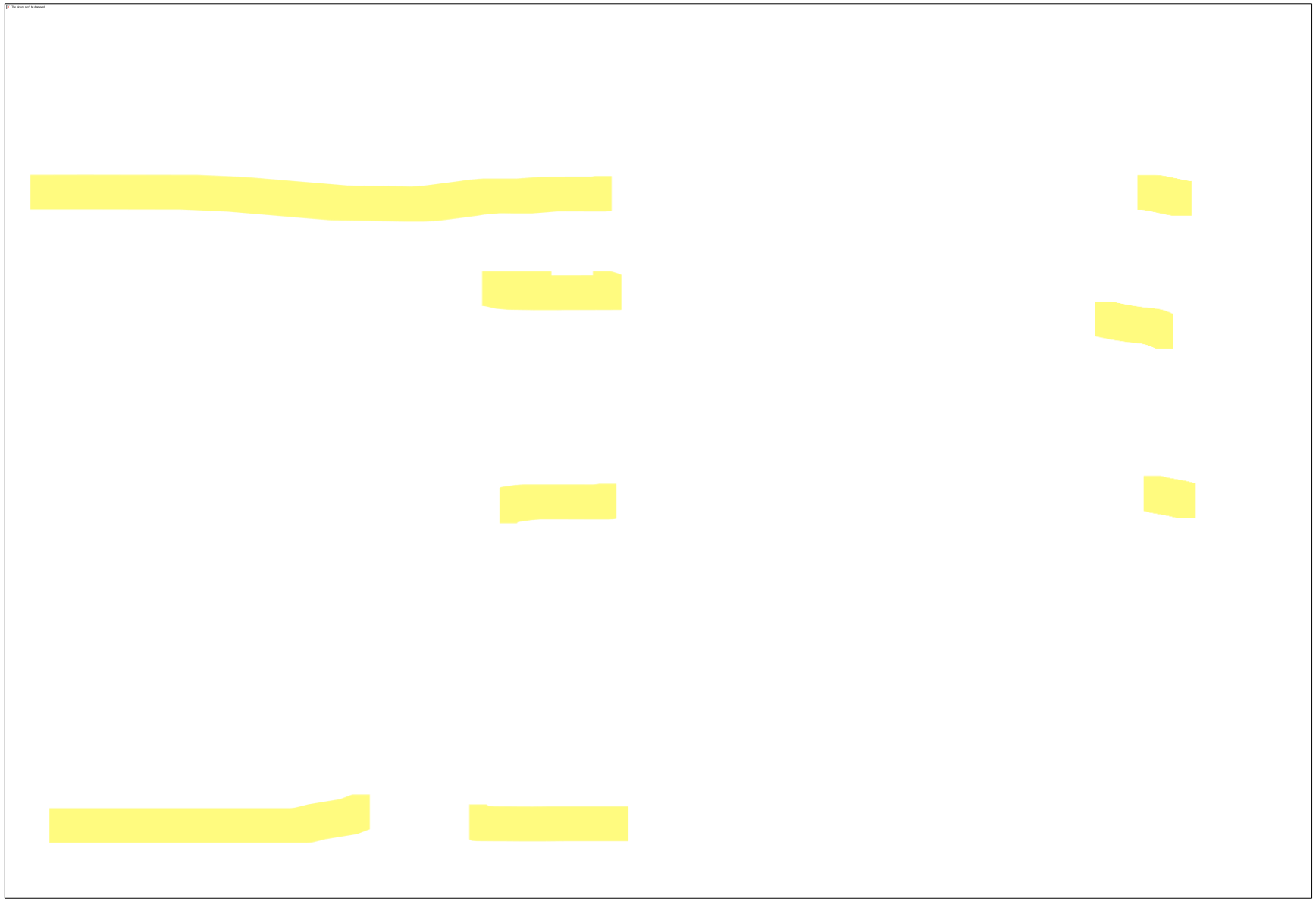
Primus Line

- SPU pre-determined that Primus Line would be used for the rehabilitation
- Primus Line is a flexible fabric reinforced pipe (FFRP) liner
- Similar to slipline installation
- Requires a proprietary FFRP liner end connector at each end
- 20” diameter liner is the largest size

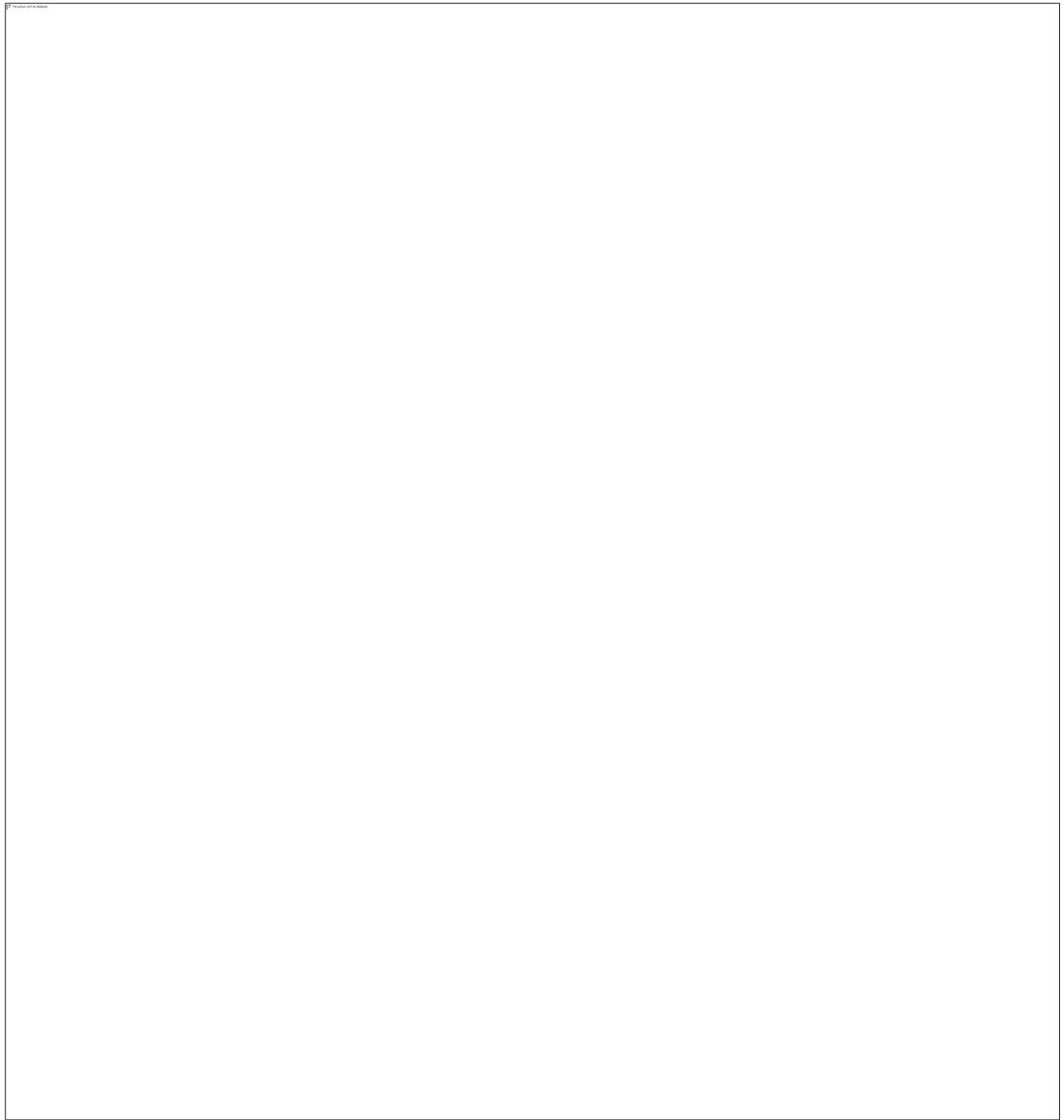
Primus Line Continued

- Liner cannot be tapped
- Liner can navigate bends
- ISO Standard 11295
- Recently included in AWWA M28

Primus Liner Specs



Proprietary End Connector



Design Drawings

- Select Profiles
- Connections to Existing CCP main

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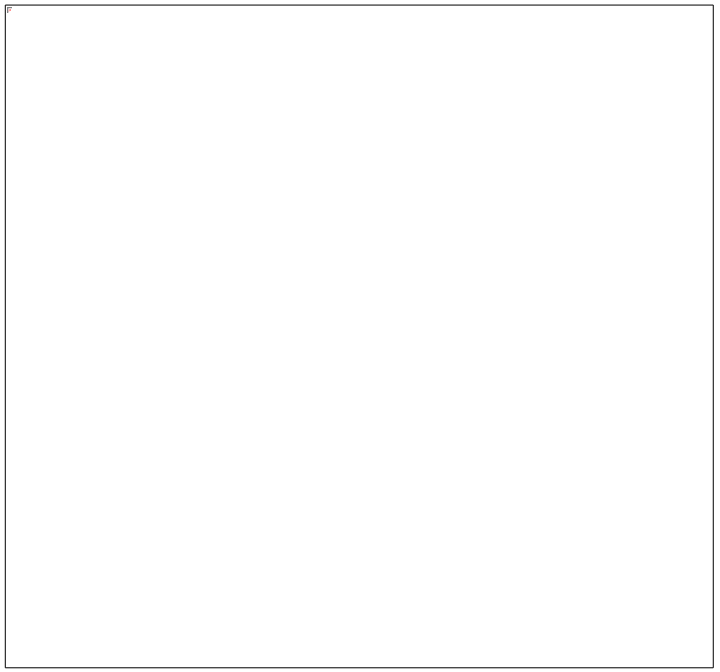
Select Profiles



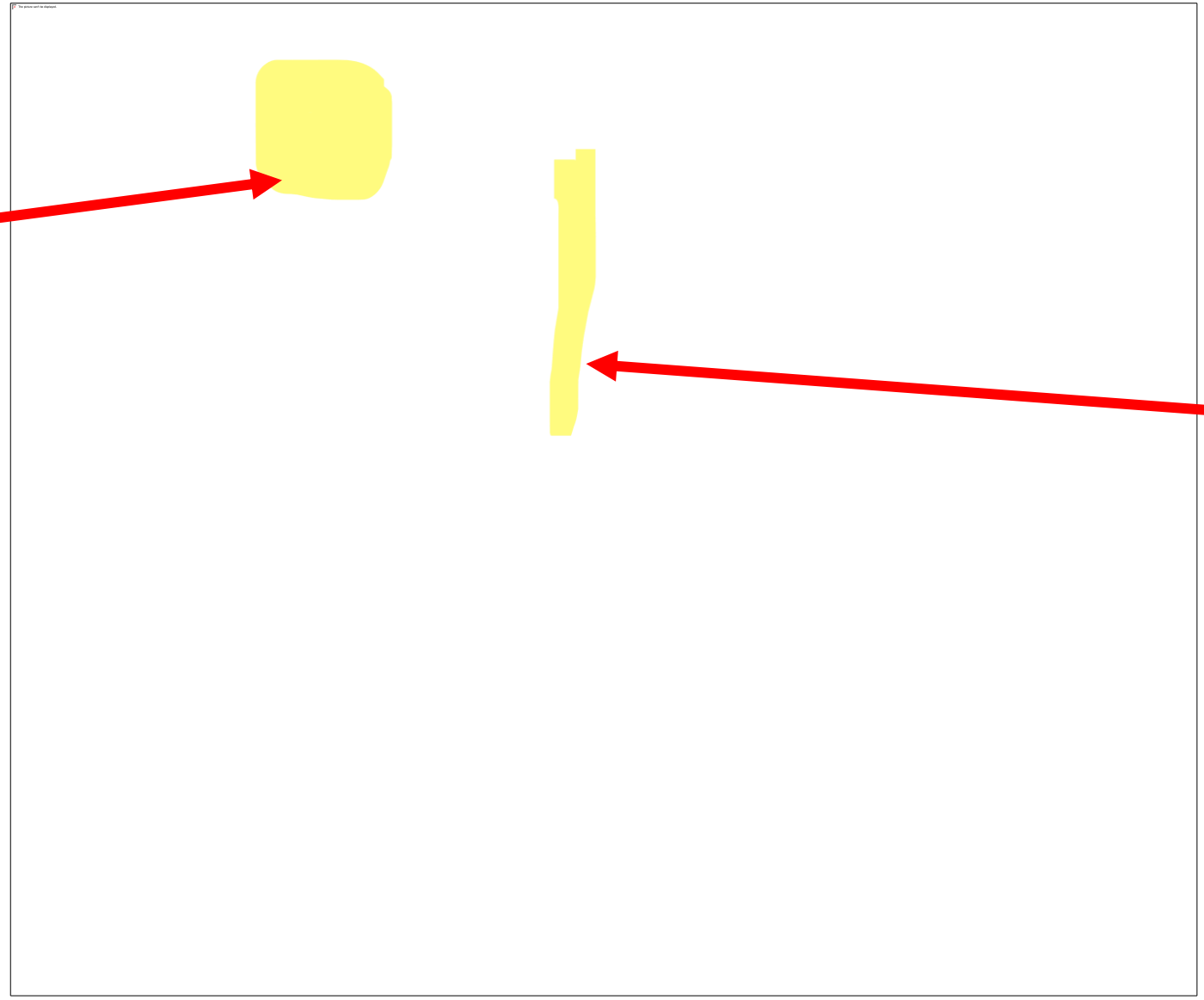


Primus Liner Connection to CCP Main

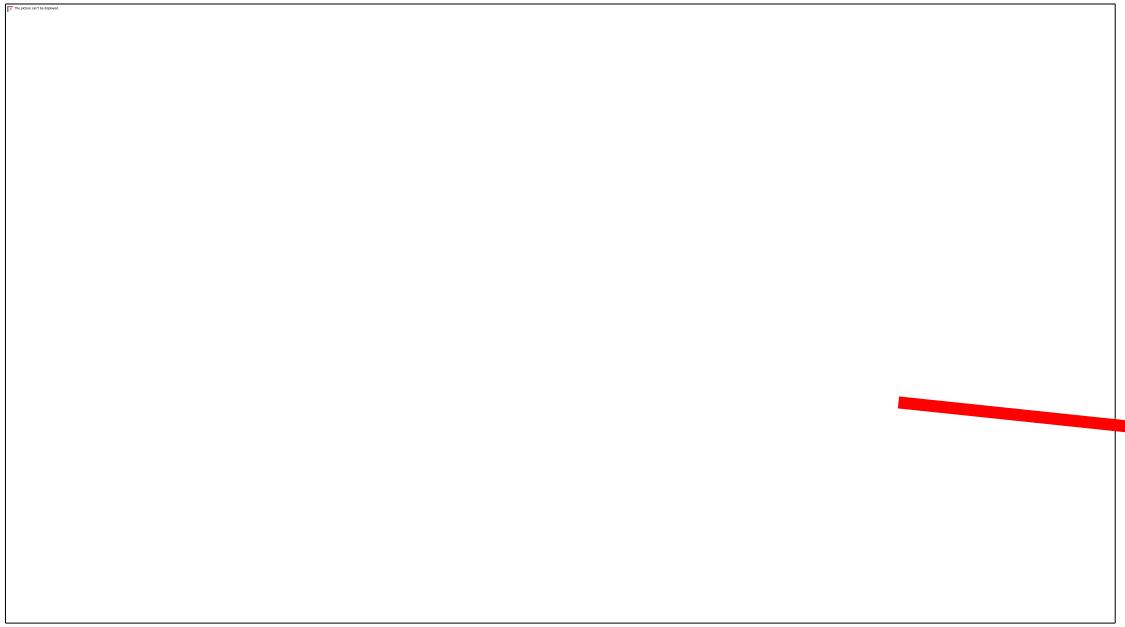




Primus Liner Connection to CCP Main



Addressing GW Infiltration





Connections to Existing CCP Main



03

Construction

Prior to FFRP Mobilization/Installation

- Pre-cleaning Inspection
- Cleaning
- Post-cleaning CCTV inspection

FFRP Lining Work Zone

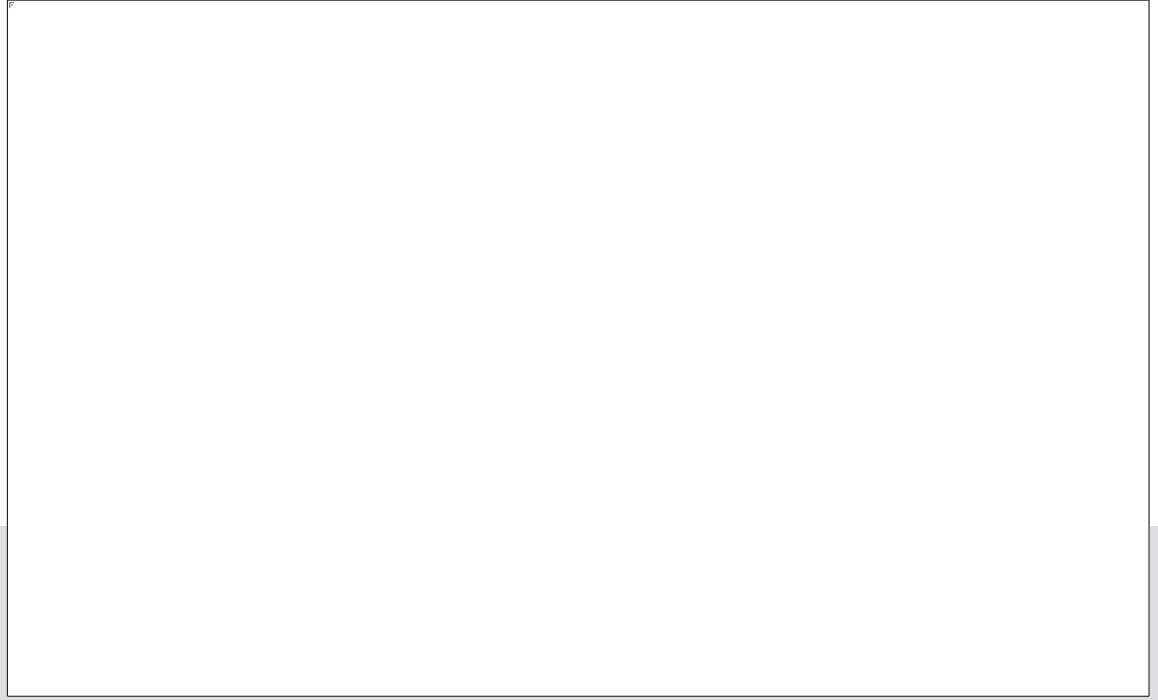
- Two Access Pits (Launching and Receiving)
- Minimal Heavy Equipment
- Excavation limited to areas for Work Zone and any service reinstatement

FFRP Installation

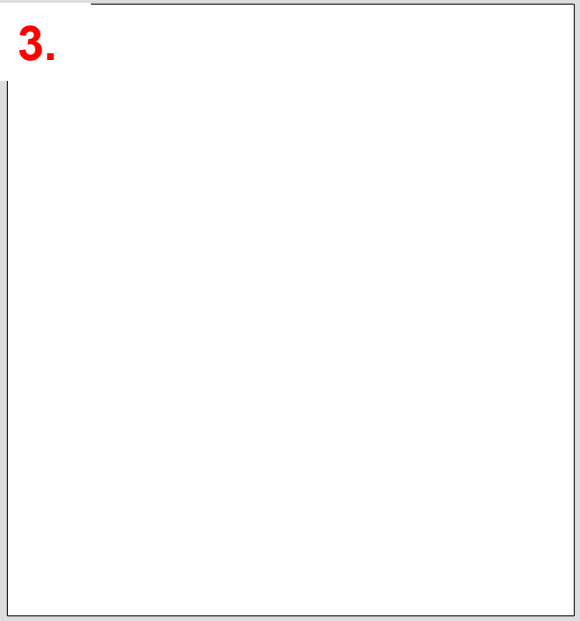
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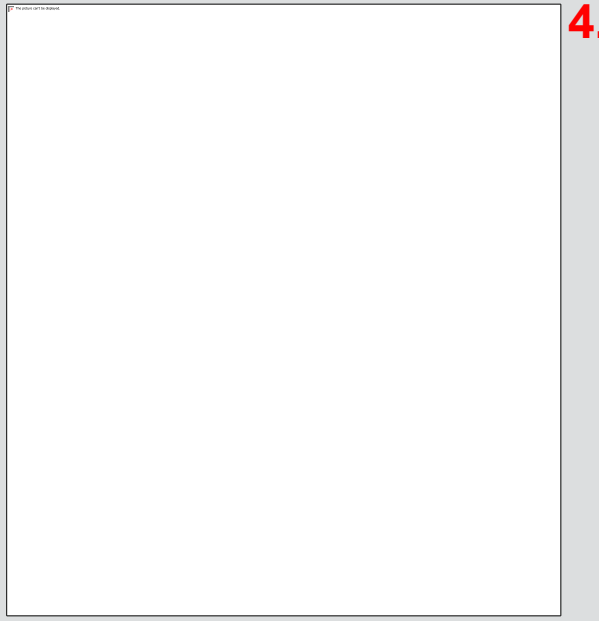
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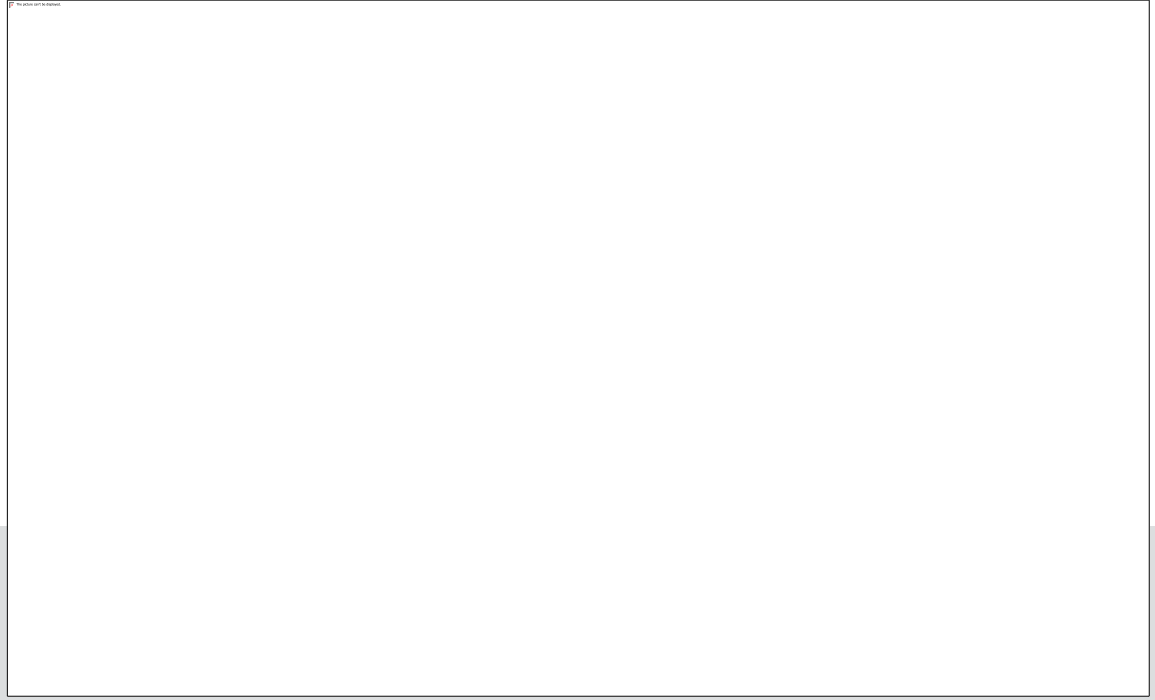


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Installation at Receiving Pit

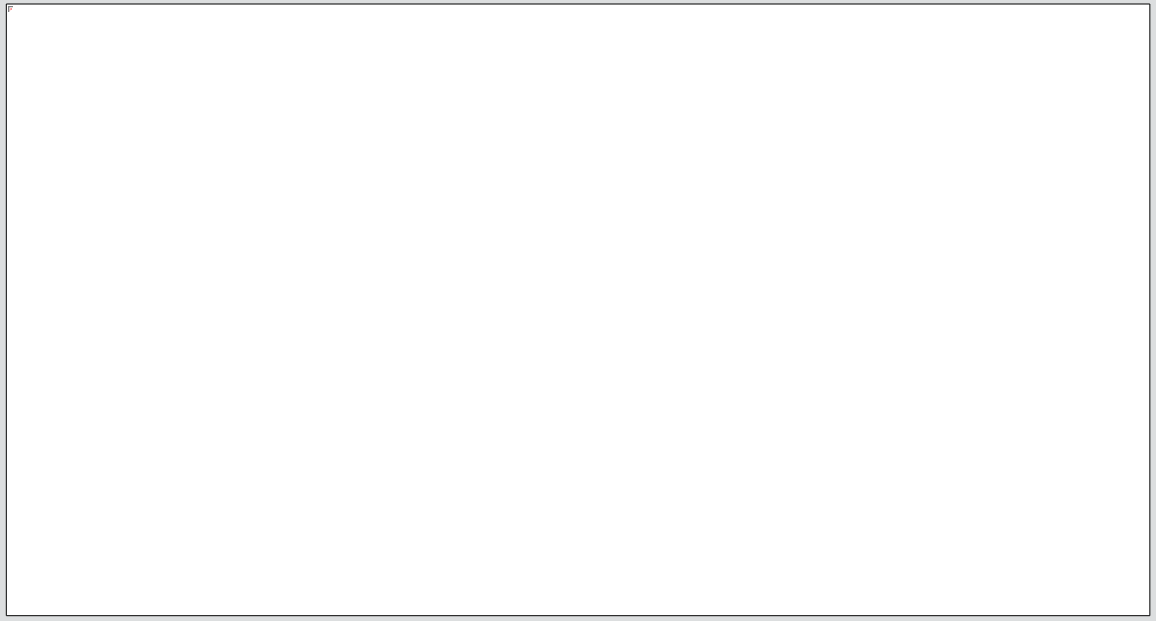
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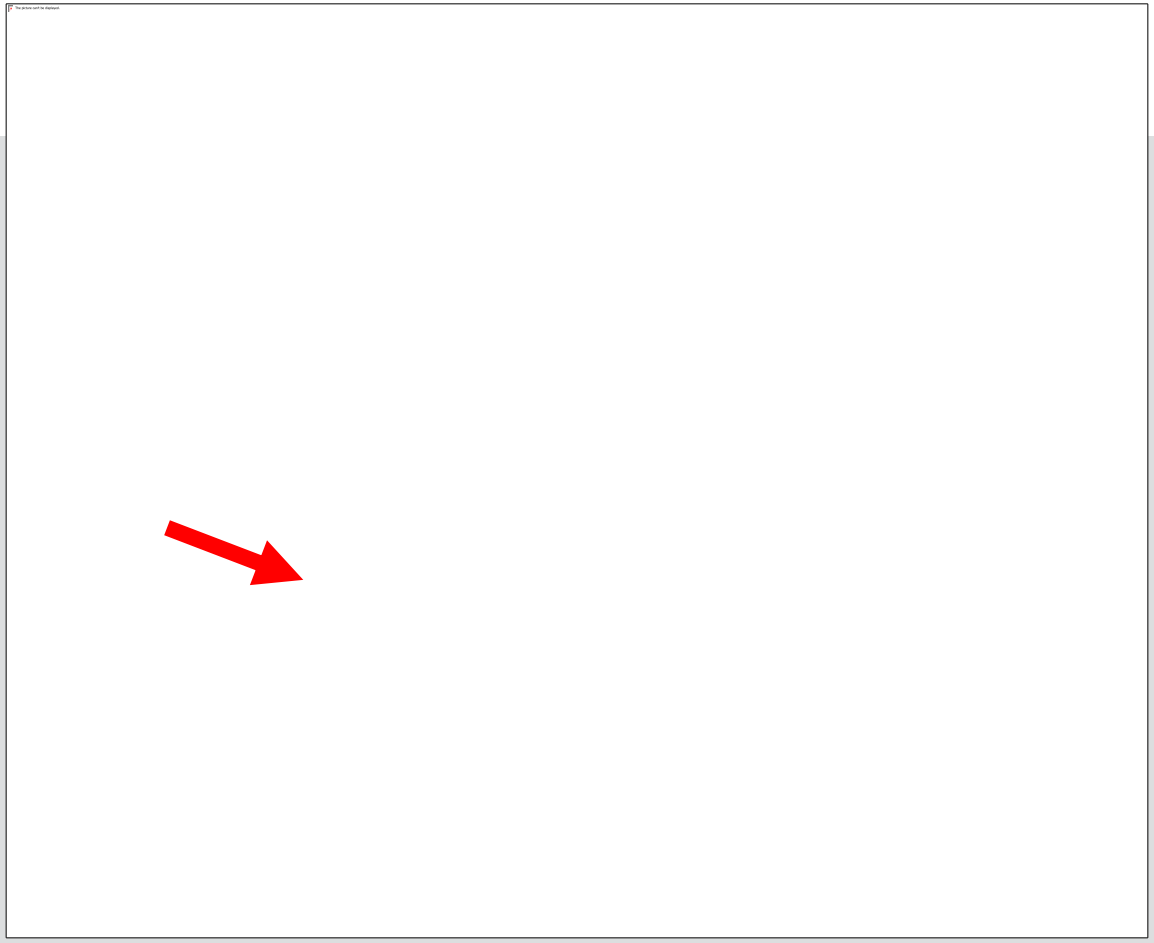


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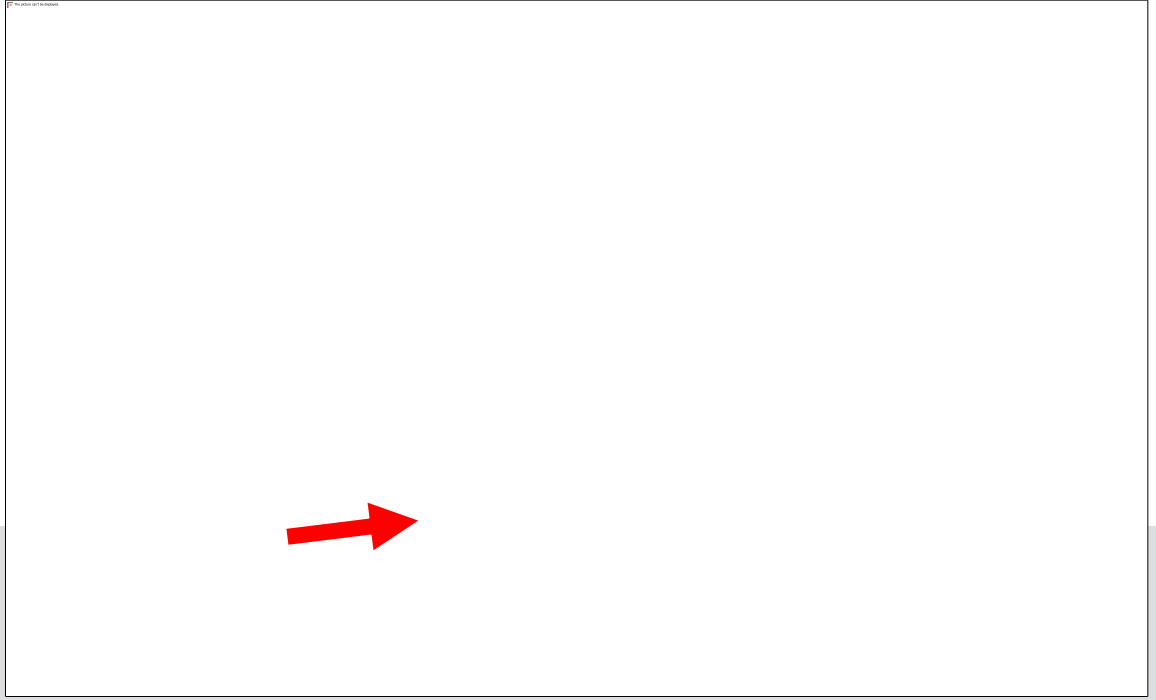


Liner End Connector

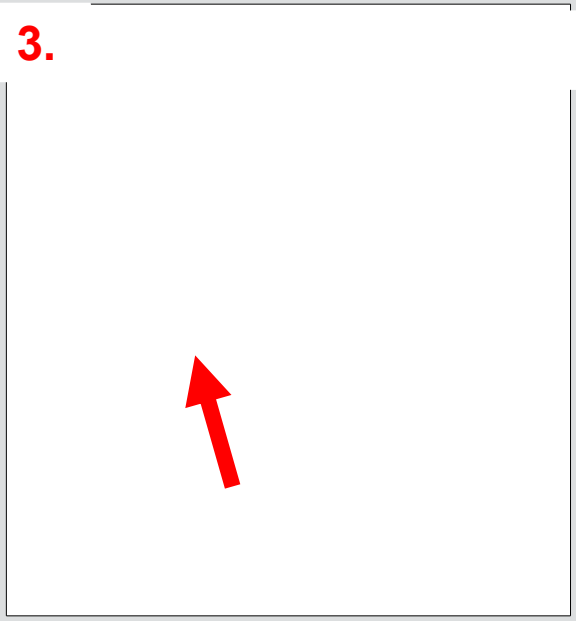
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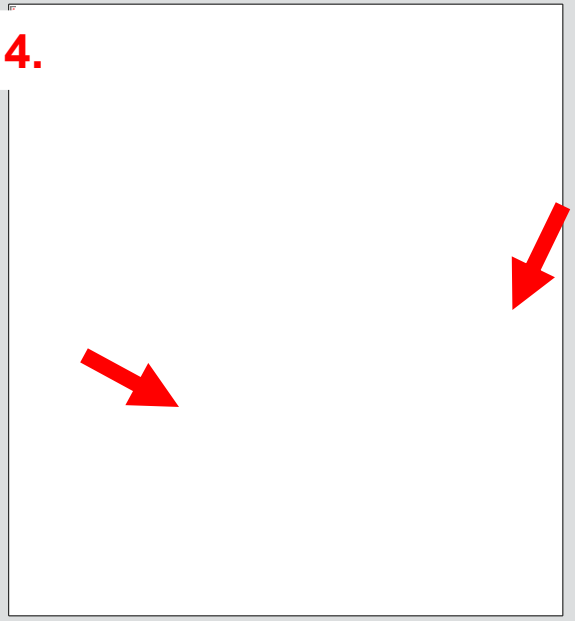
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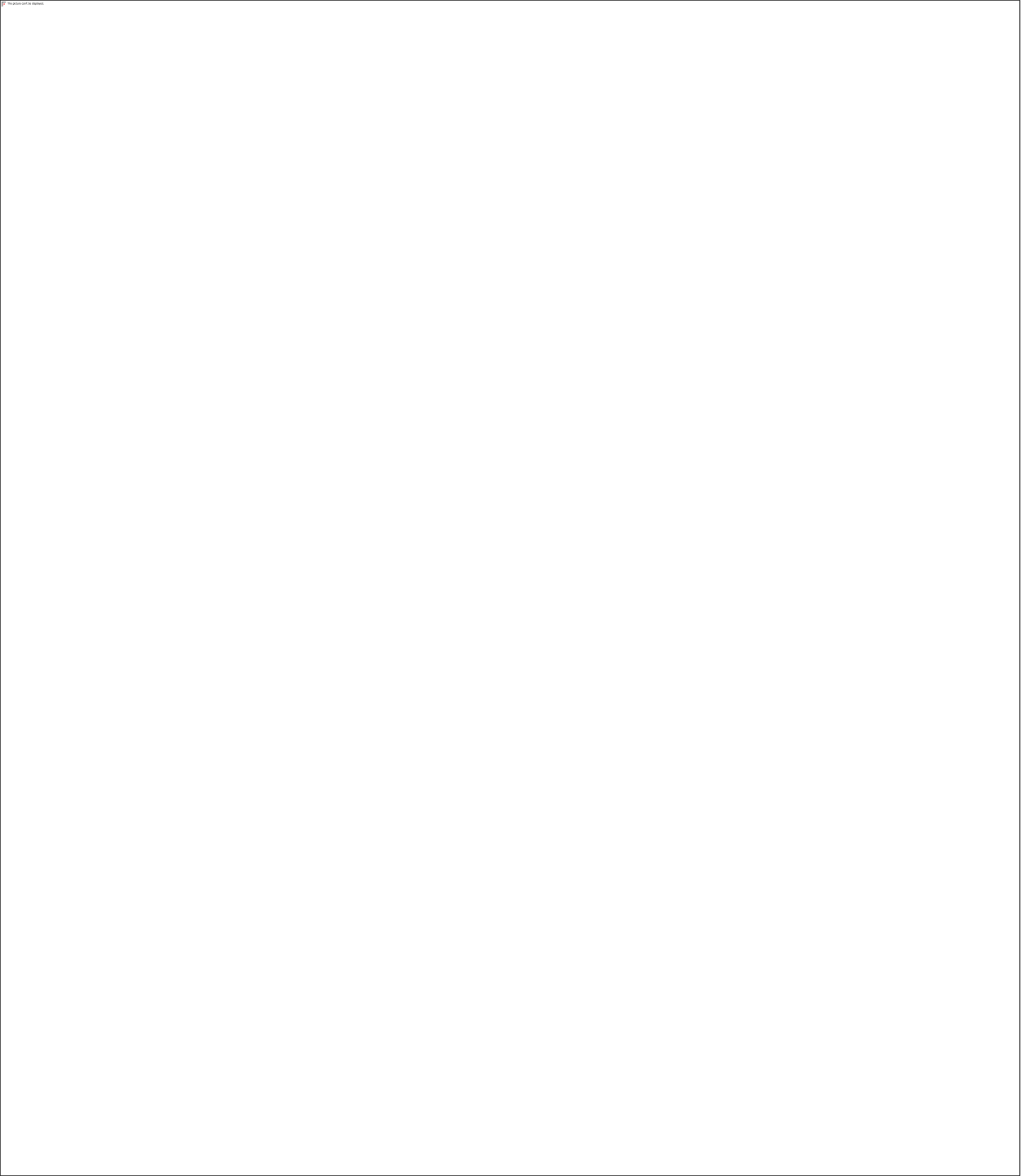


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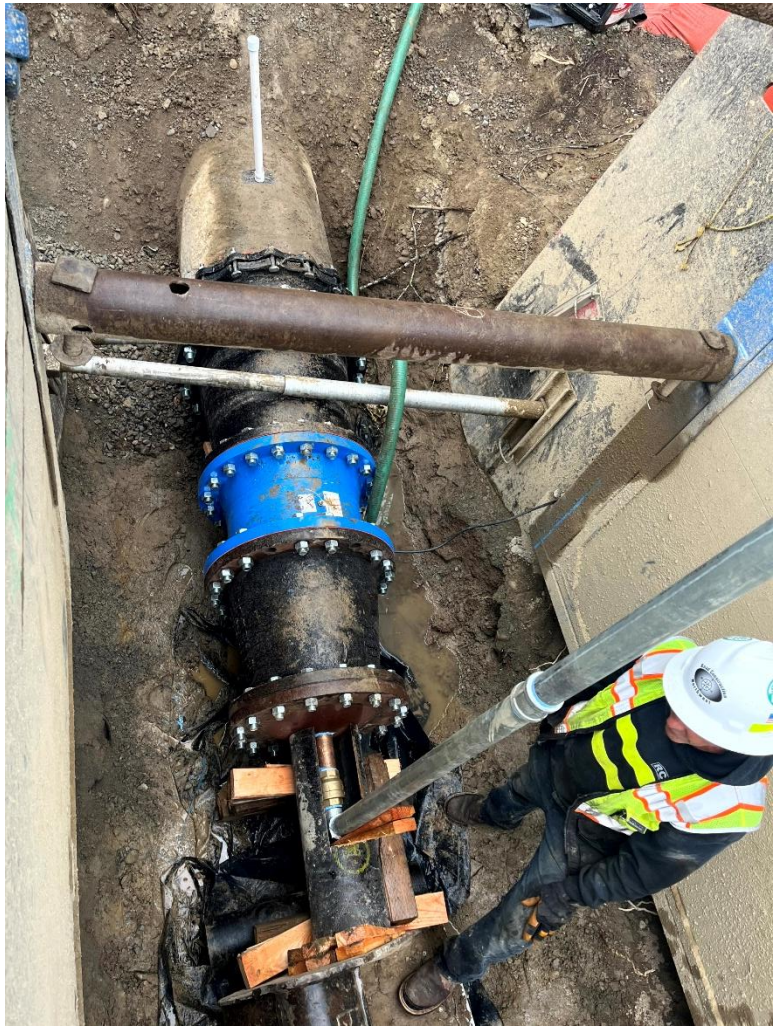




Connecting the Liner to the Host Pipe

- HDR reviewed multiple means of completing the connection
- It was determined that this would be left up to the Contractor
- The CCP pipe was cut and 24” restrained flange coupling adapters installed
- A reducer was also used to make it work with the 20” Primus fitting

Lining Completed – Testing & Disinfection



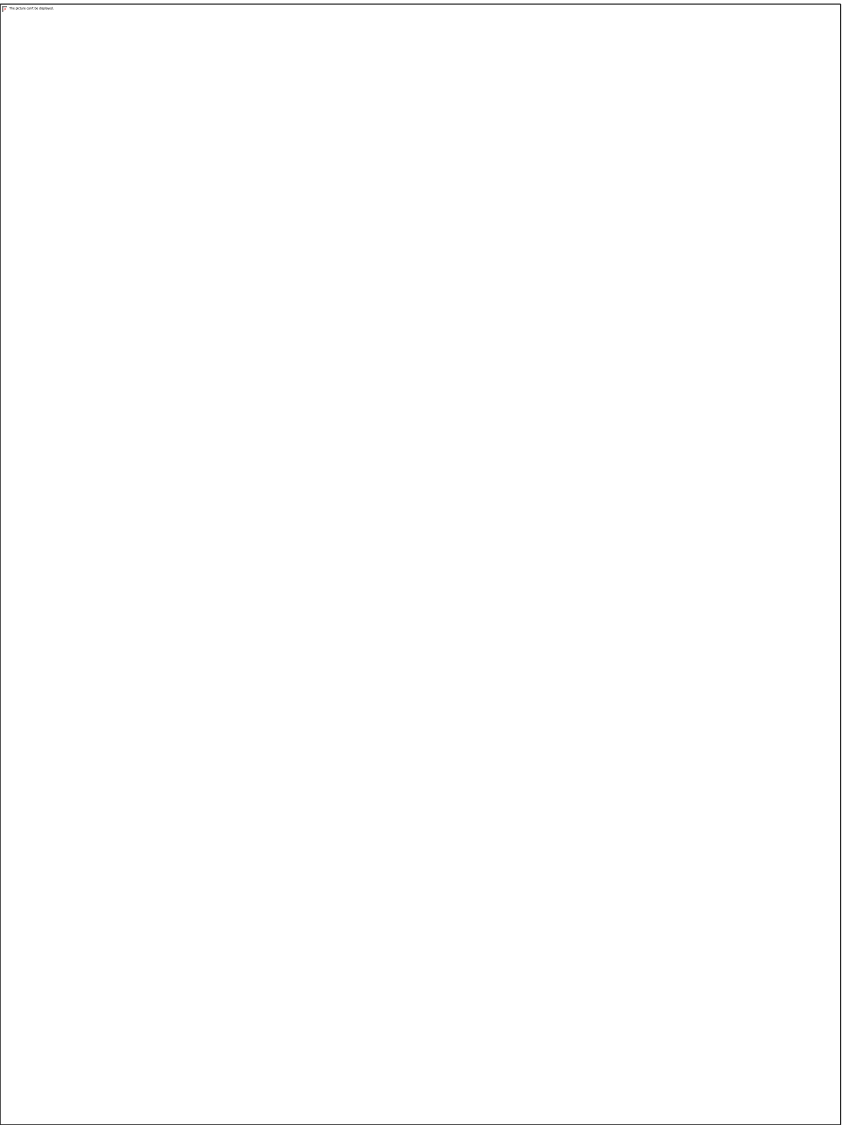


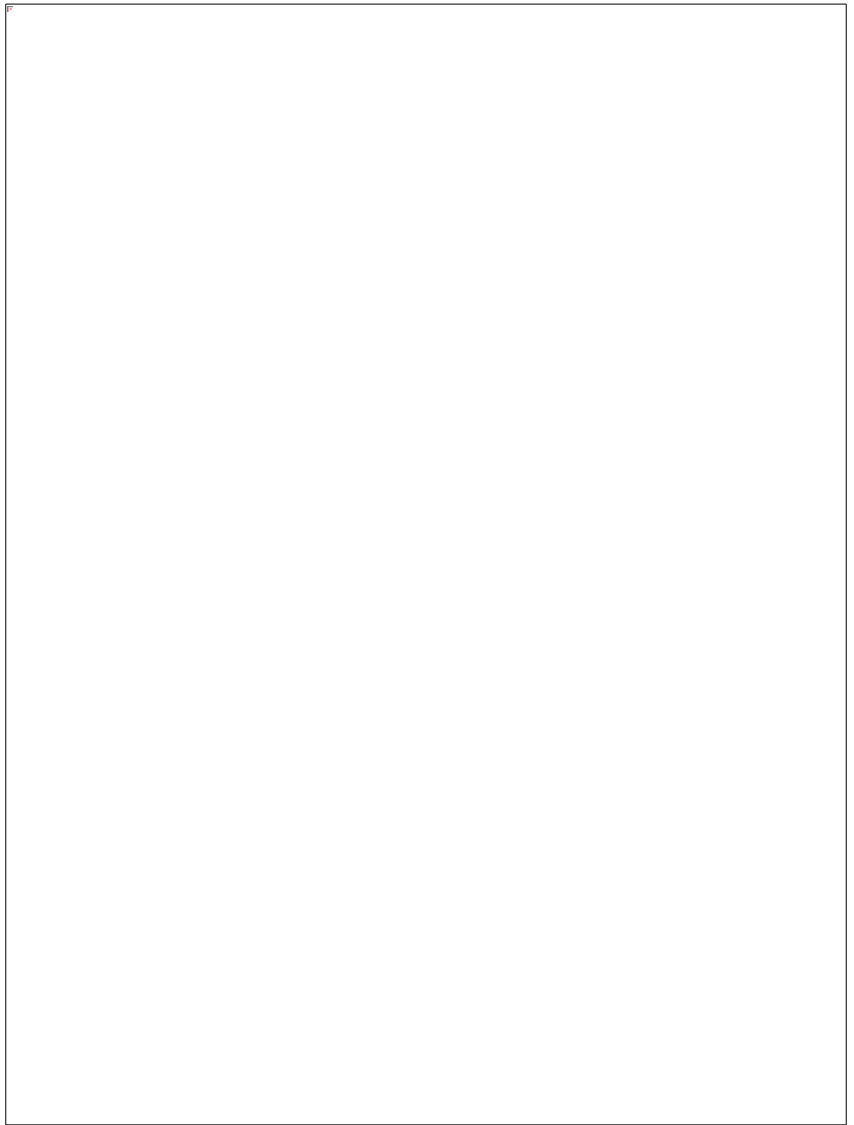
Field Change of CCP Connection

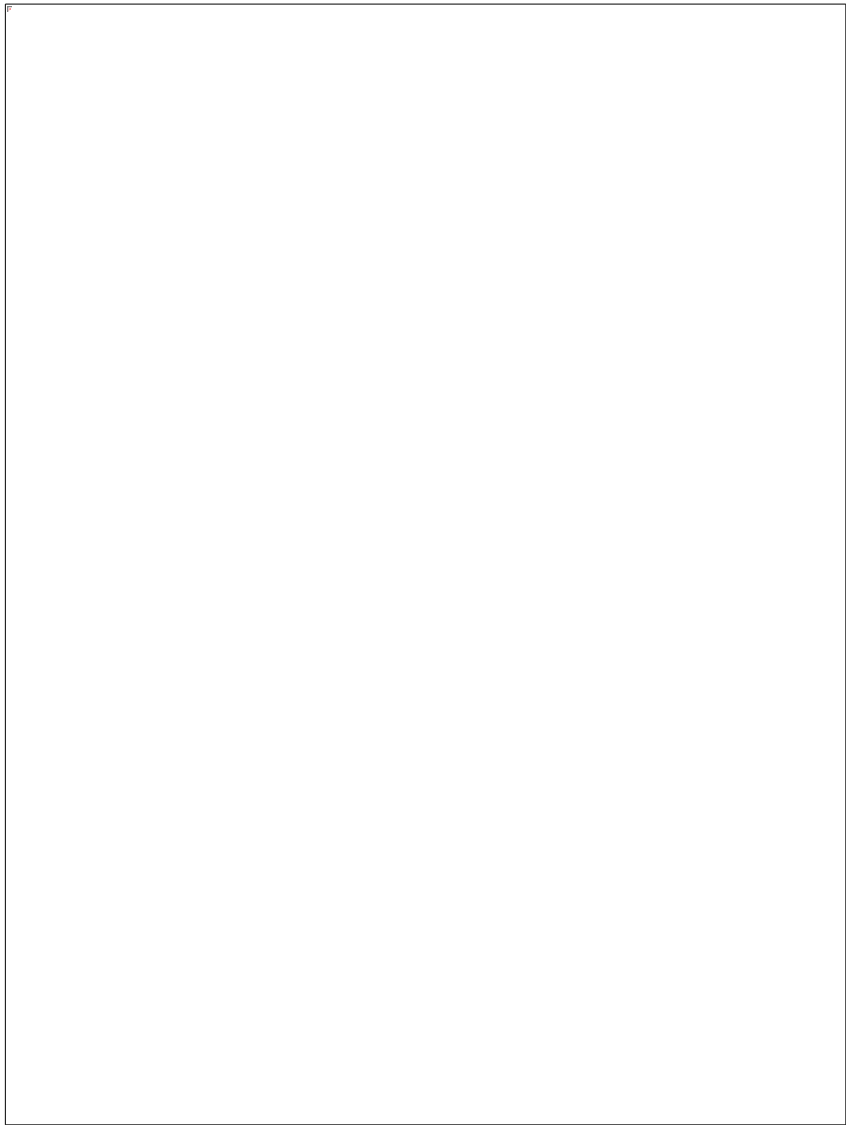




Field Change of CCP Connection







04

Emergency Project Lessons Learned

Emergency Project Lessons Learned

1. Develop a BOD or Design TM
2. Document Decisions at Every Level
3. Boots on the ground is important

Emergency Project Lessons Learned

4 Quality work is not rushed.

5 Communication drives successful project outcomes.

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Thank you!
Questions?

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