Whack-A-Mole

Waterproofing a 100-year-old Clear Well

for The City of Albany, Oregon

Presented by: Matt Hickey & Alex Bargmeyer

murraysmith

Agenda

01 Introductions

02 Project Background

03 The Problem

04 Investigation, Assessment, & Alternatives Evaluation

05 Design & Construction

06 Conclusion

07 Q&A

1. Introduction

Project Team

OWNER

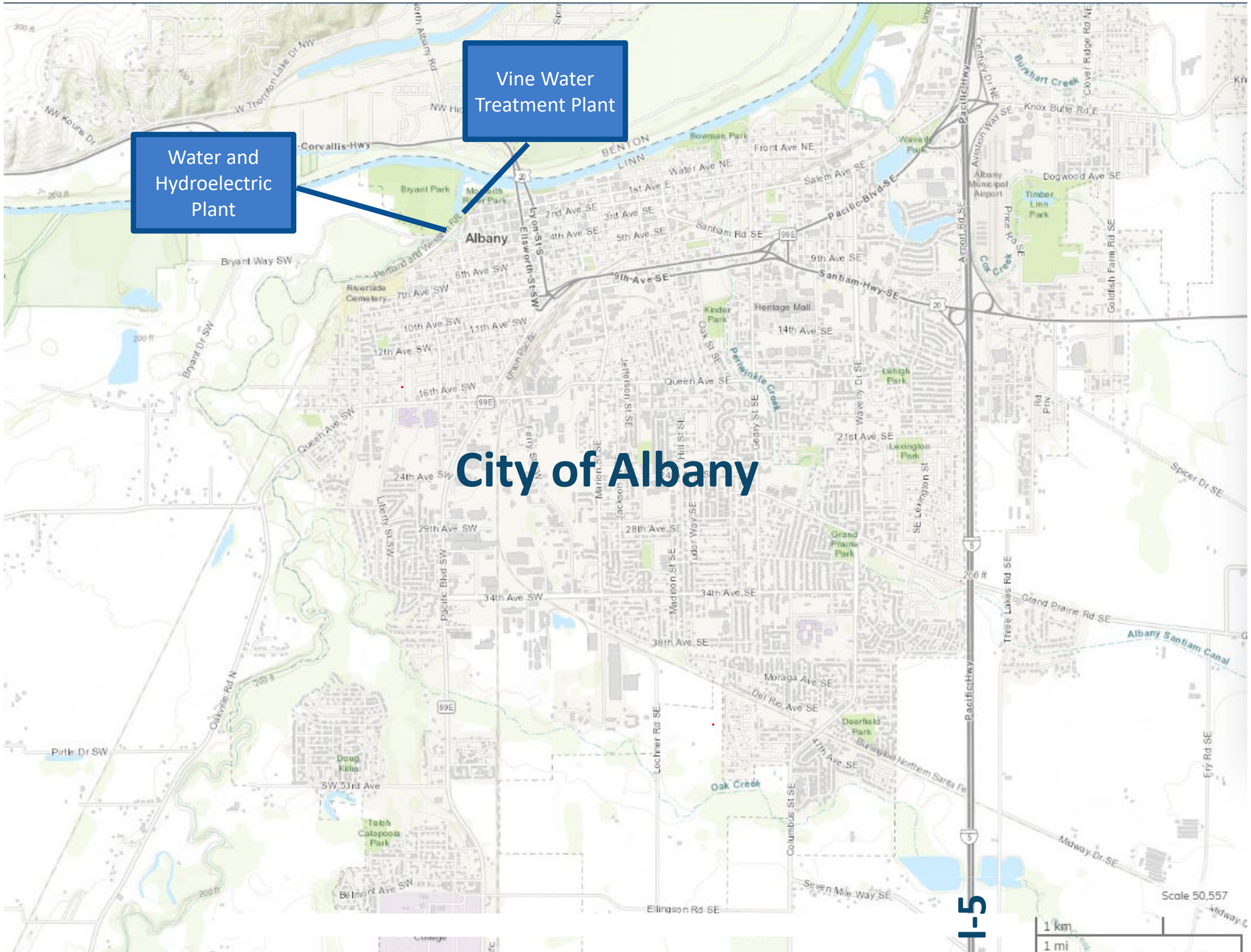
STRUCTURAL ENGINEERS

LEAD CONSULTANT

CONCRETE REPAIR SPECIALISTS

CONTRACTOR

2. Project Background



2. Project Background

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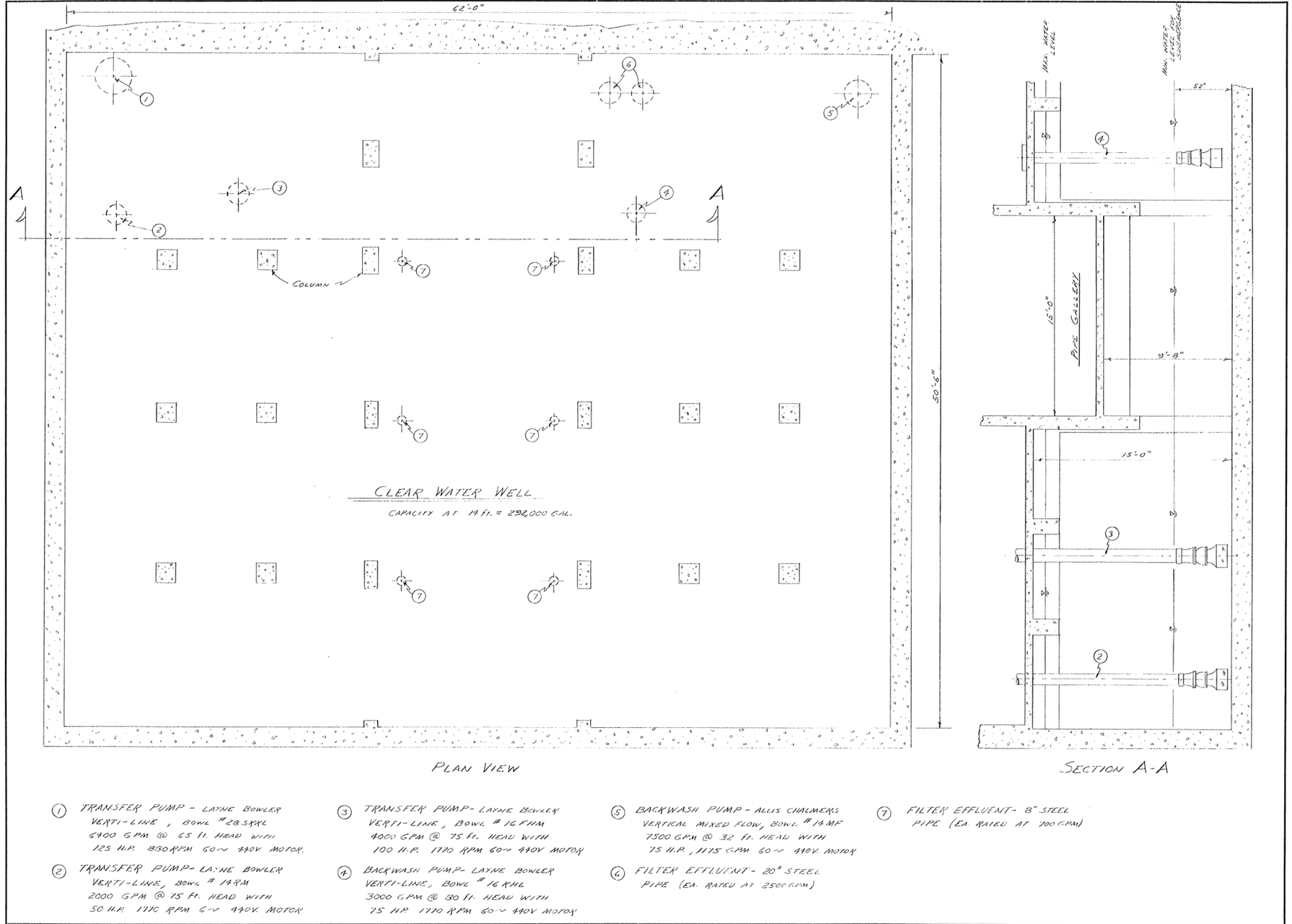


(1) TRANSFER PUMP - LAYNE BOWLER VERTI-LINE, BOWL #28 SKKL 6400 GPM @ 65 FT. HEAD WITH 125 H.P. 880 RPM 60~ 440V. MOTOR.

(2) TRANSFER PUMP - LAYNE BOWLER VERTI-LINE, BOWL # 14 RM 2000 GPM @ 75 FT. HEAD WITH 50 H.P. 1770 RPM 60~ 440V. MOTOR

(3) TRANSFER PUMP - LAYNE BOWLER VERTI-LINE, BOWL # 16 FHM 4000 GPM @ 75 FT. HEAD WITH 100 H.P. 1770 RPM 60~ 440V MOTOR

(4) BACKWASH PUMP - LAYNE BOWLER VERTI-LINE, BOWL # 16 KHL 3000 GPM @ 30 FT. HEAD WITH 75 H.P. 1770 RPM 60~ 440V MOTOR

(5) BACKWASH PUMP - ALLIS CHALMERS VERTICAL MIXED FLOW, BOWL # 14 MF 7500 GPM @ 32 FT. HEAD WITH 75 H.P., 1175 GPM 60~ 440V. MOTOR

(6) FILTER EFFLUENT - 20" STEEL PIPE (EA. RATED AT 2500 GPM)

(7) FILTER EFFLUENT - 8" STEEL PIPE (EA. RATED AT 700 GPM)

REVISION

BY	DATE	APP
ER	CH	

ER
DATE APRIL 21, 1965
DES DR G.H.S.
TR CH
APPROVED

ALBANY, OREGON
WATER FILTRATION PLANT
CLEAR WATER WELL
PLOT PLAN

PACIFIC POWER & LIGHT COMPANY
PORTLAND, OREGON

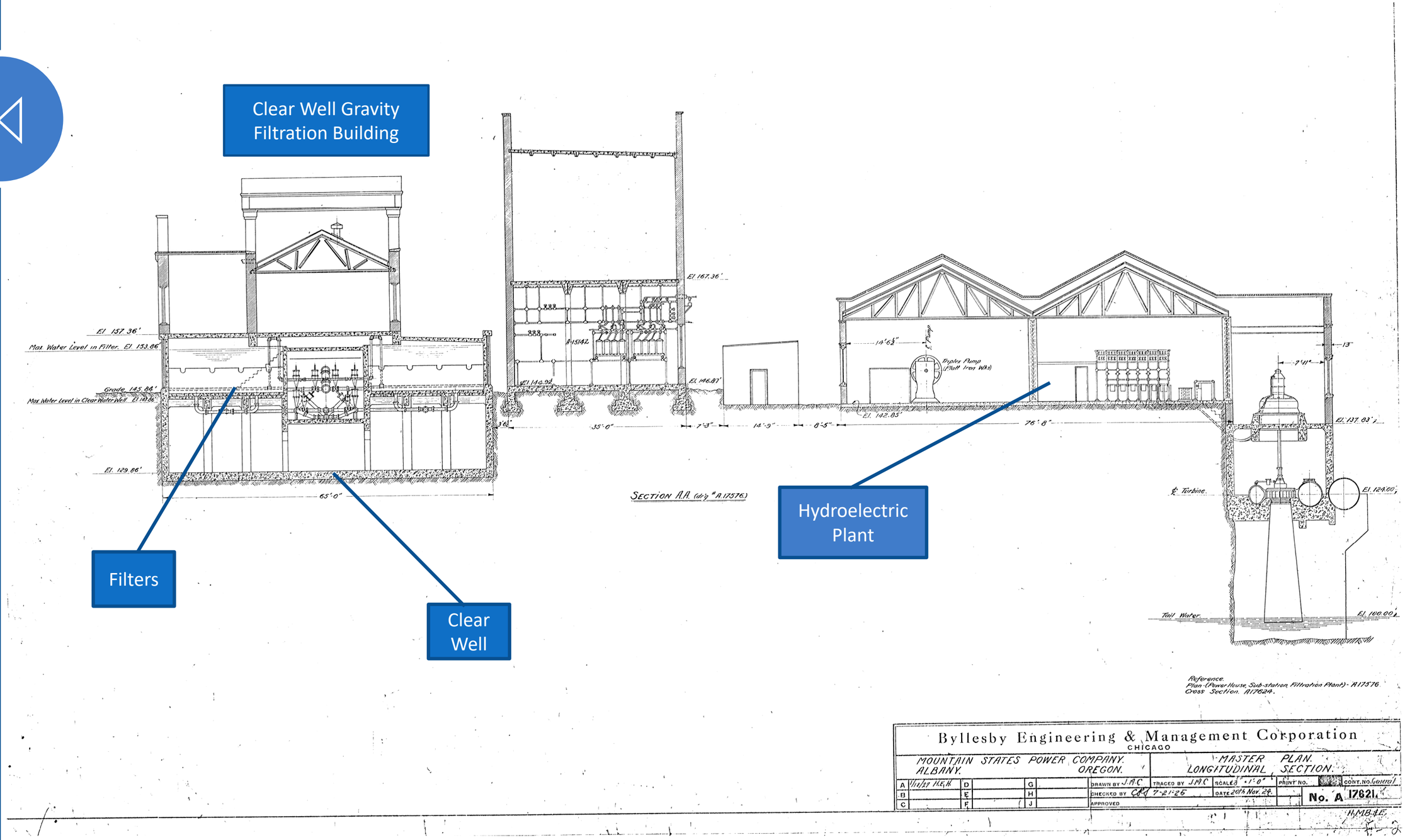
HEAD OF ELEC. ENGRG.

SHEET / OF /

PD-SKETCH

REV.

2. Project Background



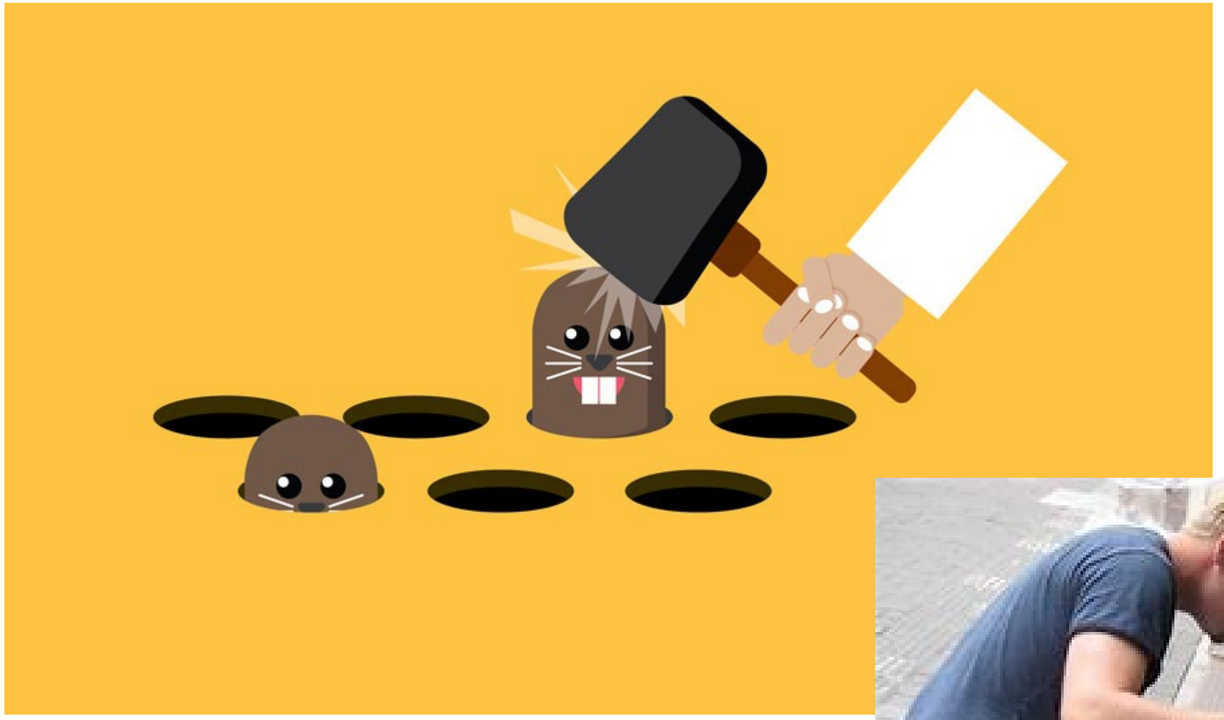
3. The Problem

COLUMN REPAIR

EAST WALL POLYURETHANE INJECTION

- 2010 Contech Completed Repairs
- Found leaks during repair work
- Injected concrete with polyurethane
- Once they injected one area the leaks move to another
- Source of water was unknown

3. The Problem

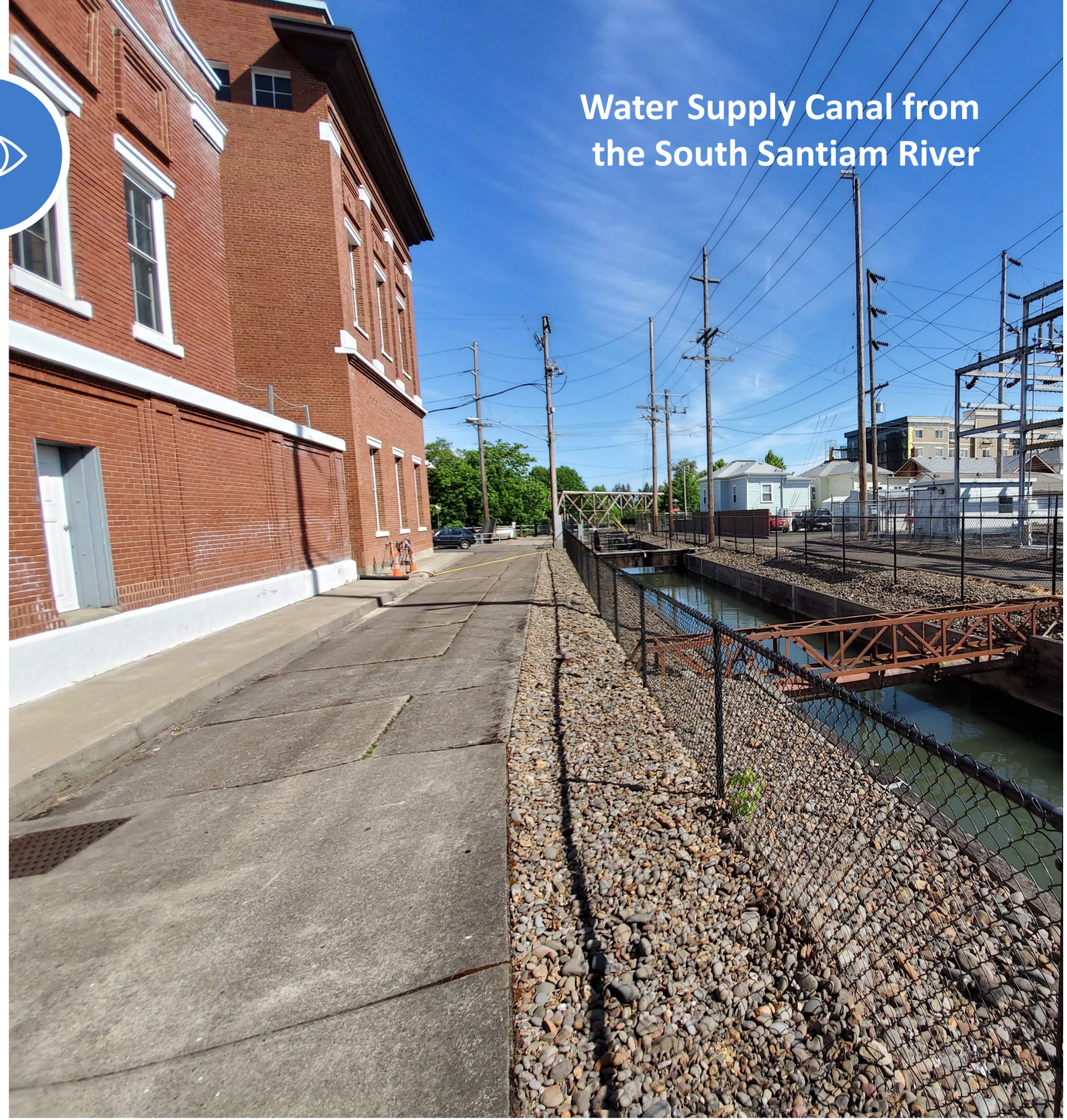


4. Investigation, Assessment, & Evaluation

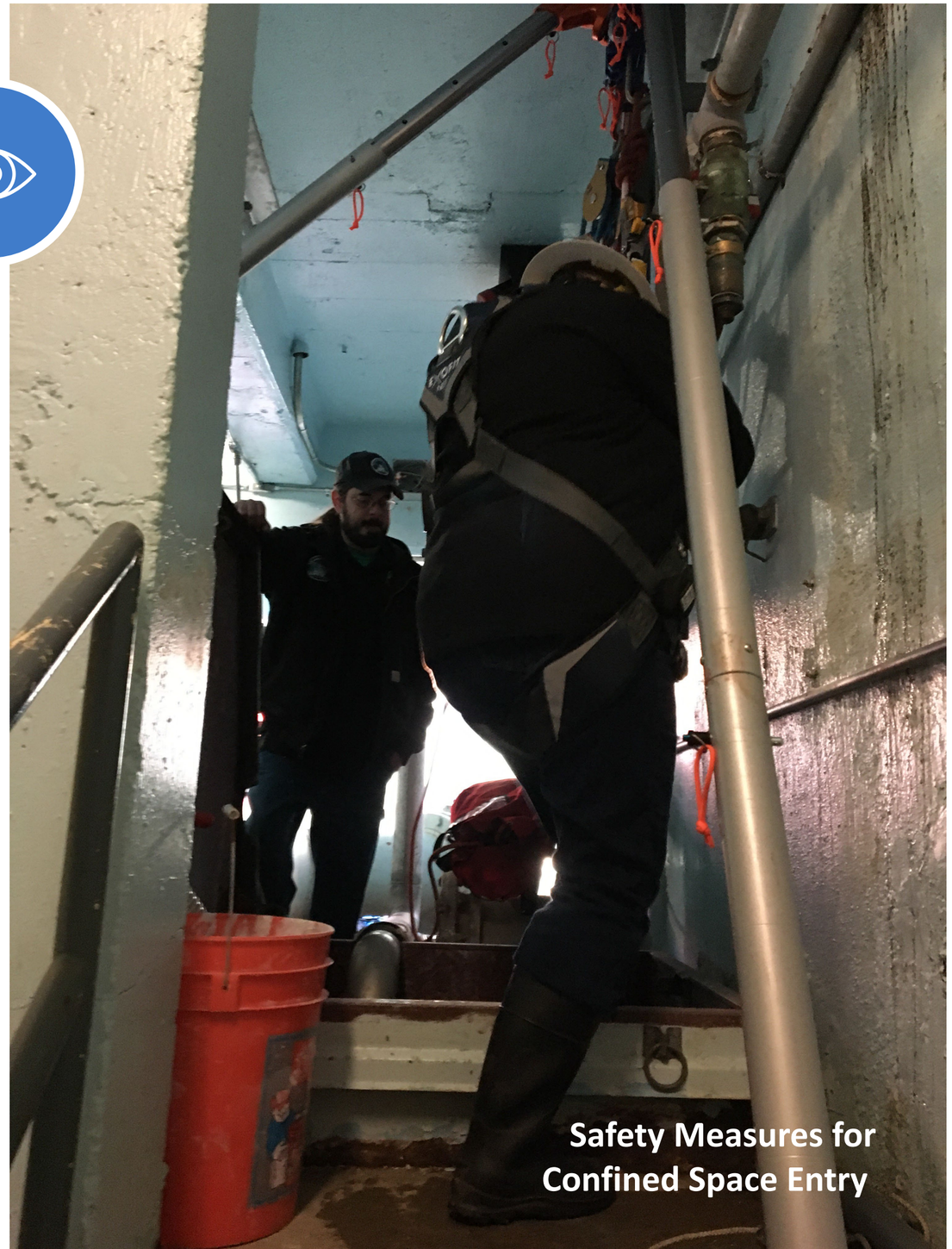
Investigated Perimeter of Clearwell and Adjacent Vault

North Wall of Clear Well and Filter Building

4. Investigation, Assessment, & Evaluation



4. Investigation, Assessment, & Evaluation



Safety Measures for Confined Space Entry

Site Visit To Inspect Concrete Condition

4. Investigation, Assessment, & Evaluation

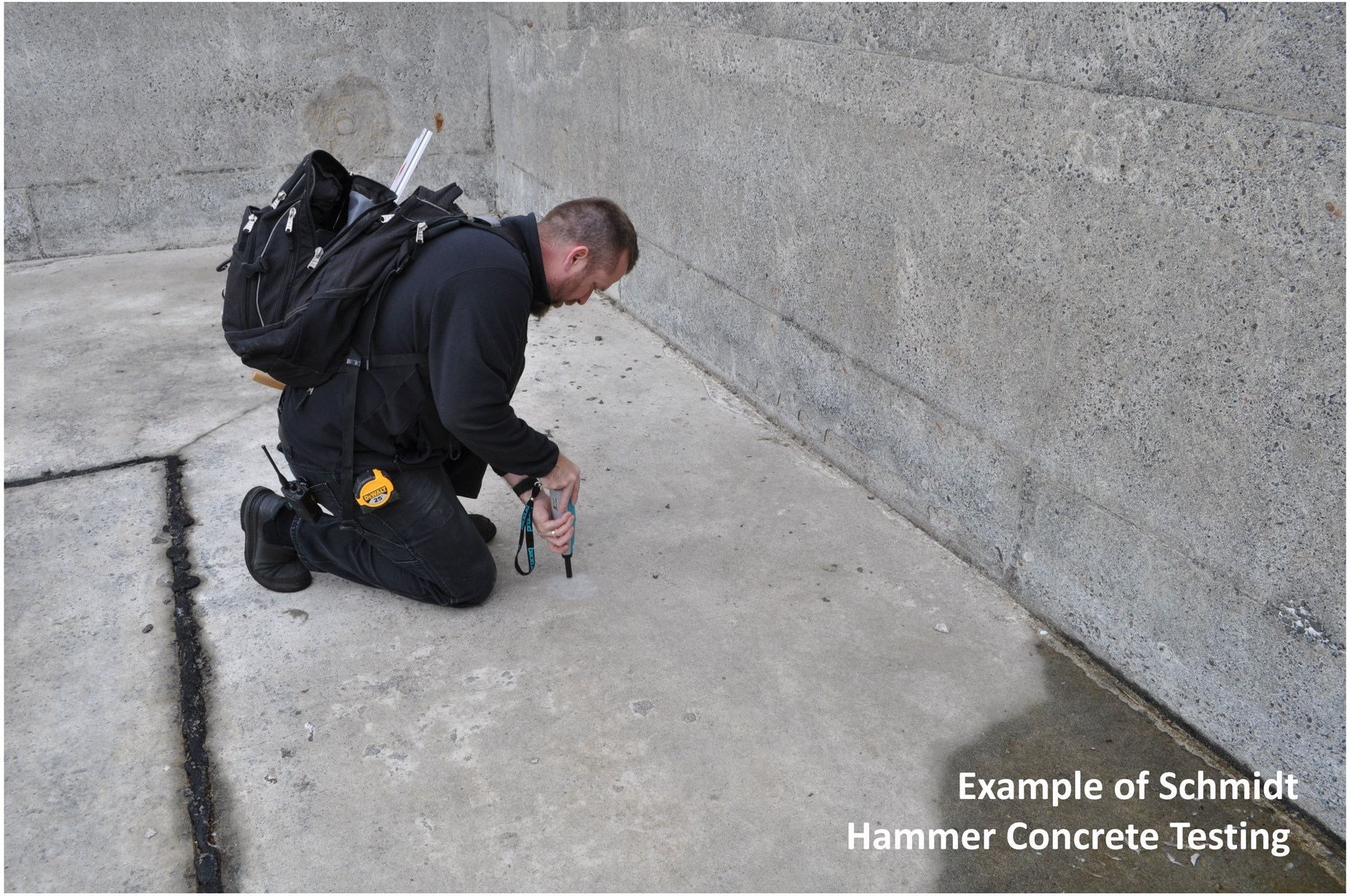
Deteriorated
Floor Concrete

Deteriorated
Wall Concrete

Areas Where Walls
Had Been Injected

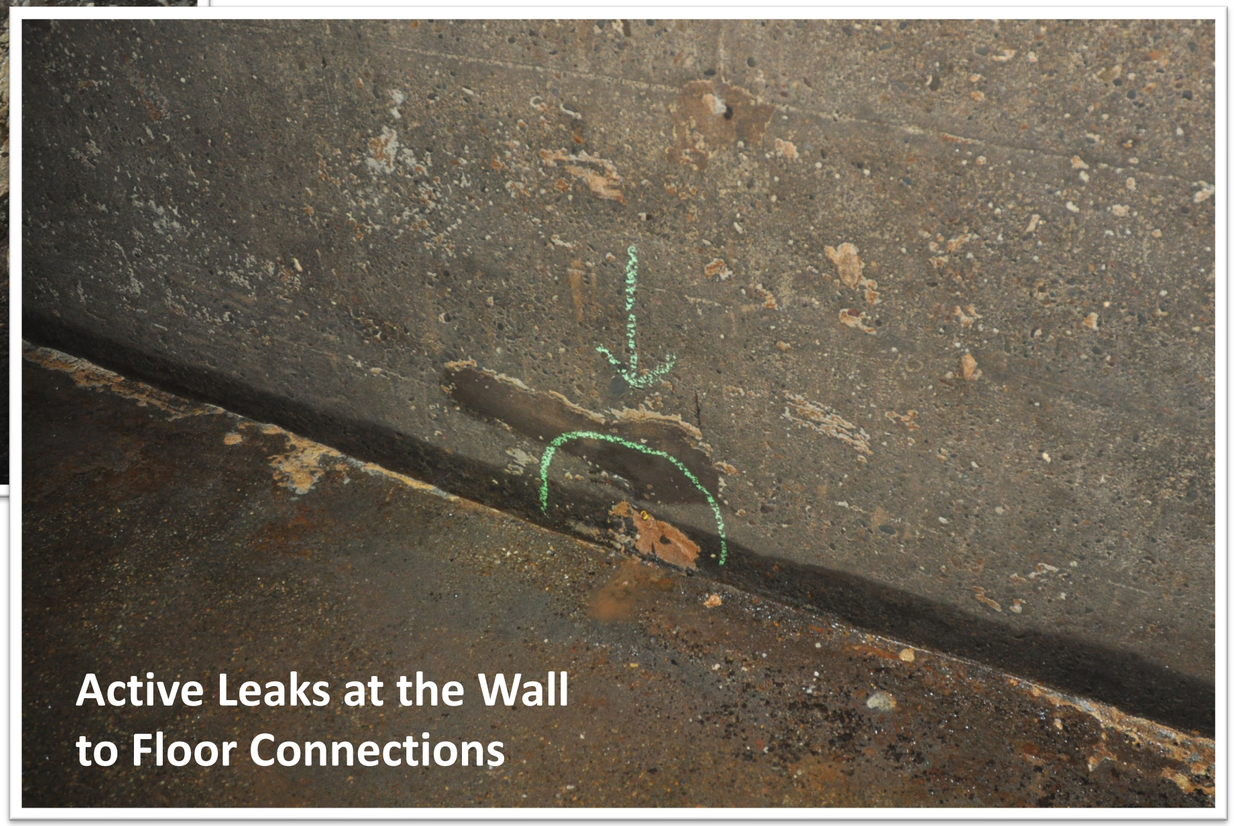
4. Investigation, Assessment, & Evaluation

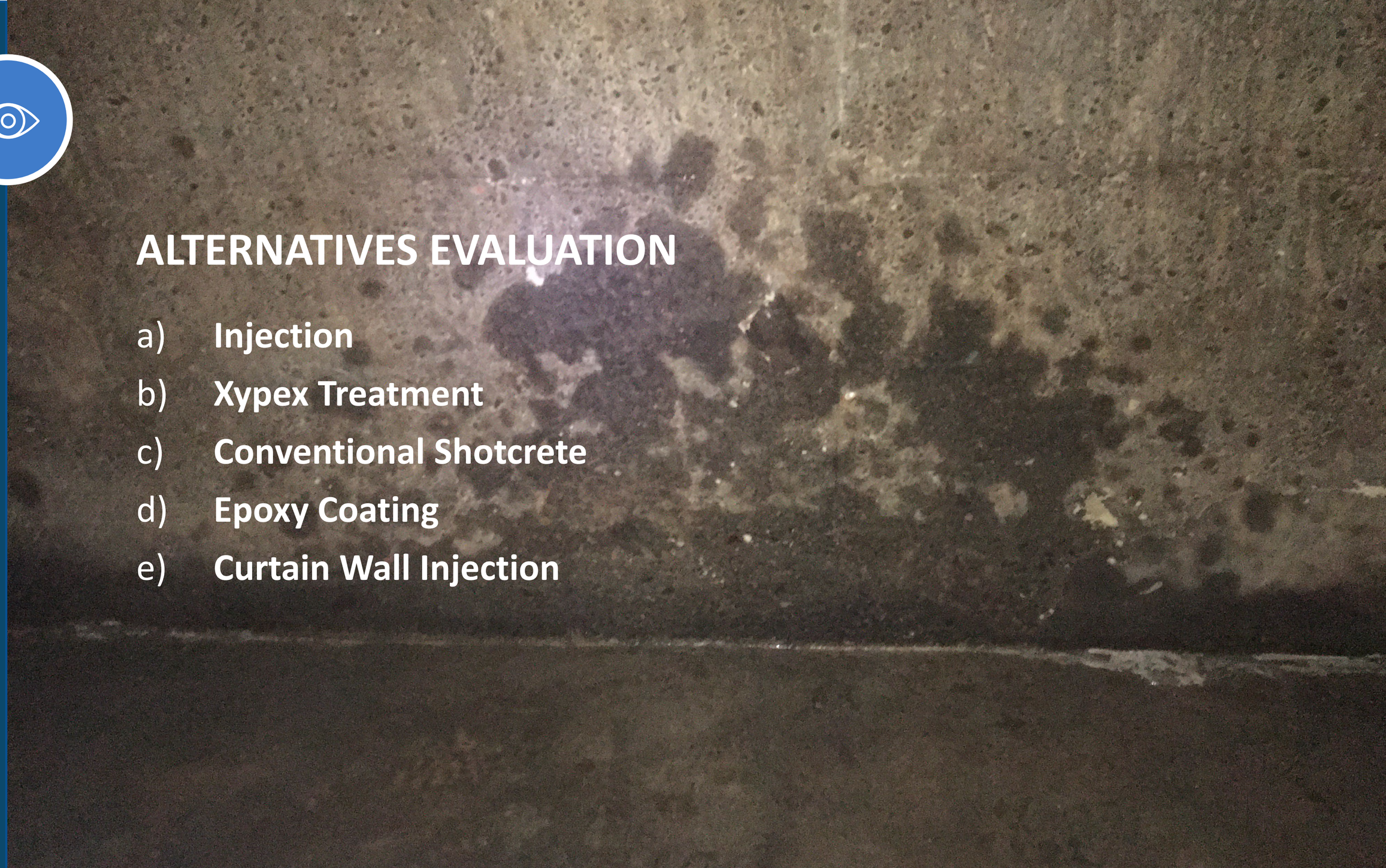
Exposed Aggregate on the Walls



Example of Schmidt Hammer Concrete Testing

Investigation, Assessment, & Evaluation





ALTERNATIVES EVALUATION

a) **Injection**

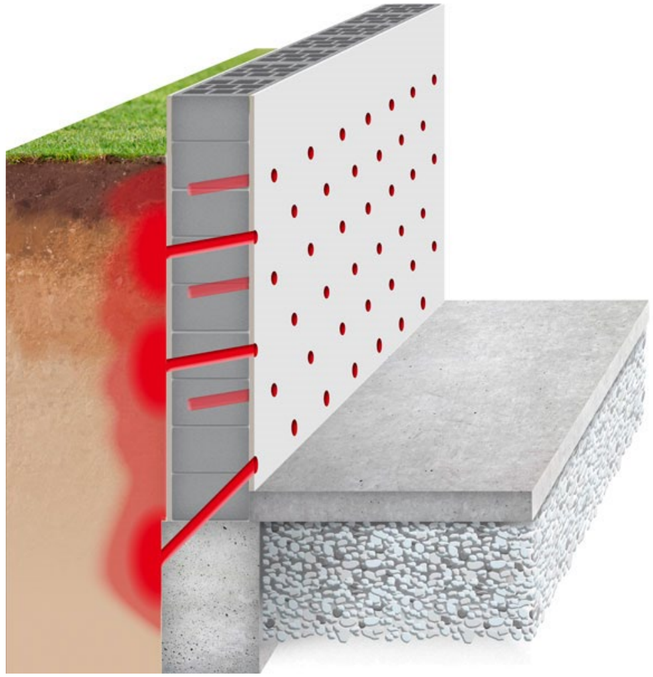
b) **Xypex Treatment**

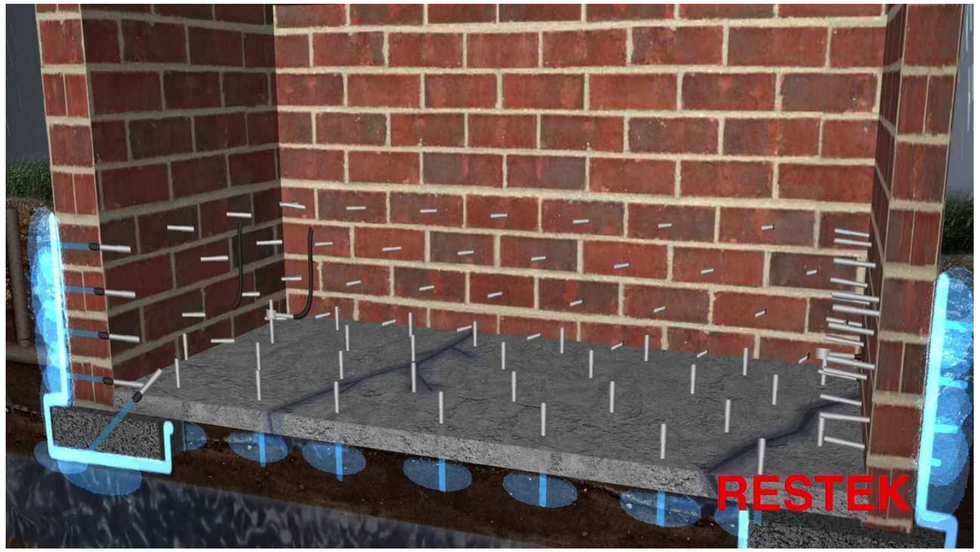
c) **Conventional Shotcrete**

d) **Epoxy Coating**

e) **Curtain Wall Injection**

4. Investigation, Assessment, & Evaluation



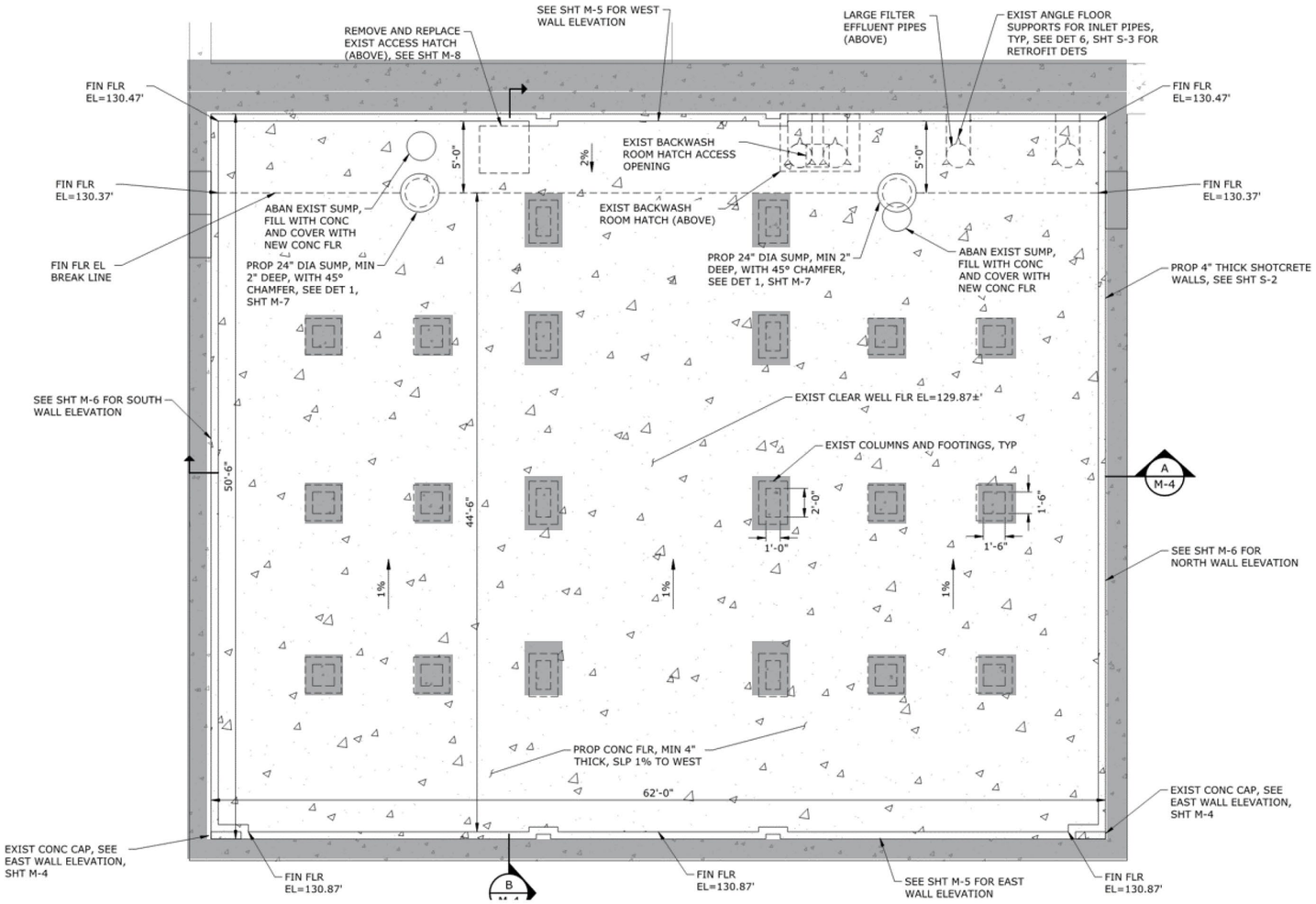


OTHER RECOMMENDATIONS

a) Well point outside the clear well.
   i. Potential ground water from the canal was getting to the outside walls of the clear well
   ii. recommended a well point to pump the ground water down and relieve pressure on the outside of the clear well.

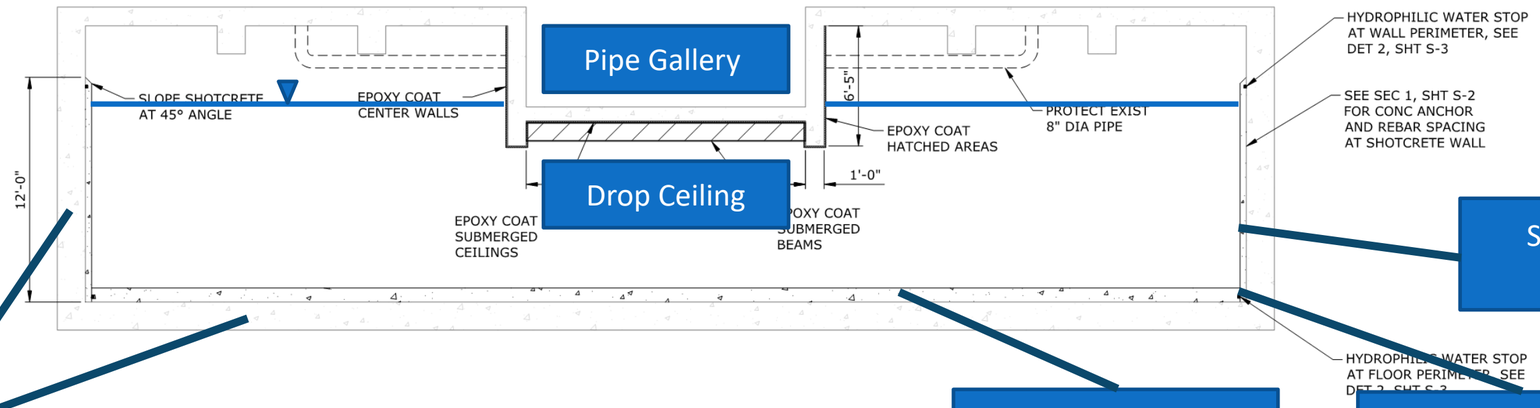
b) Safety improvements including ladder and hatch
c) Remove chemical build up on pipes
d) Reroute chemical piping to improve mixing
e) Epoxy coat columns and drop ceiling

Clearwell Floor Plan



5. Design & Construction

Clearwell North-South Section



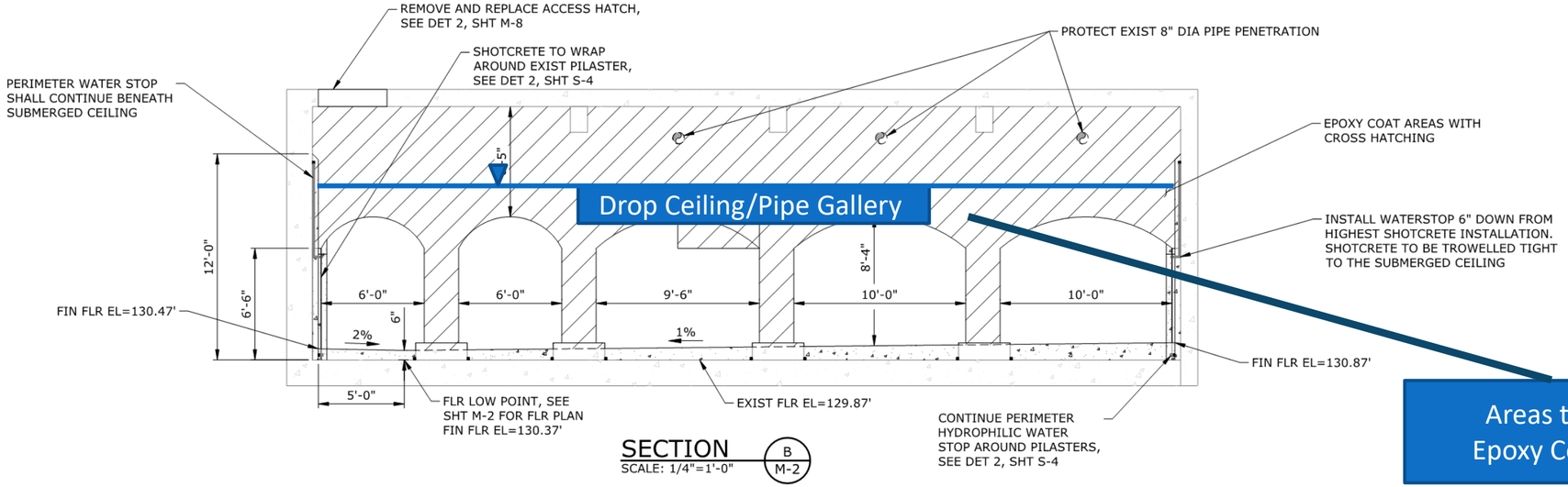
Shotcrete Wall Coating

Existing Concrete Floor and Walls

Floor Topping Slab

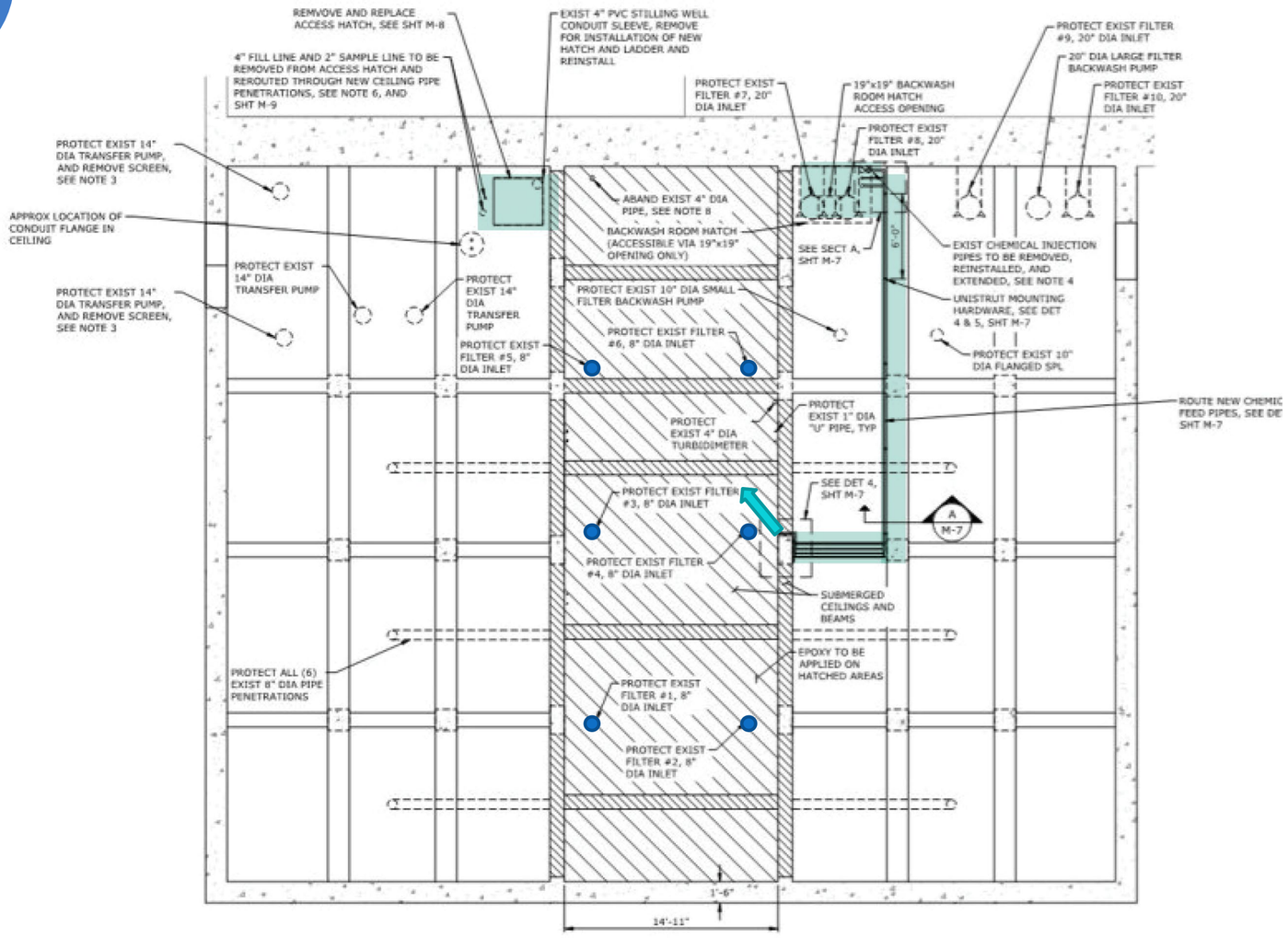
Hydrophilic Waterstops

Clearwell East-West Section

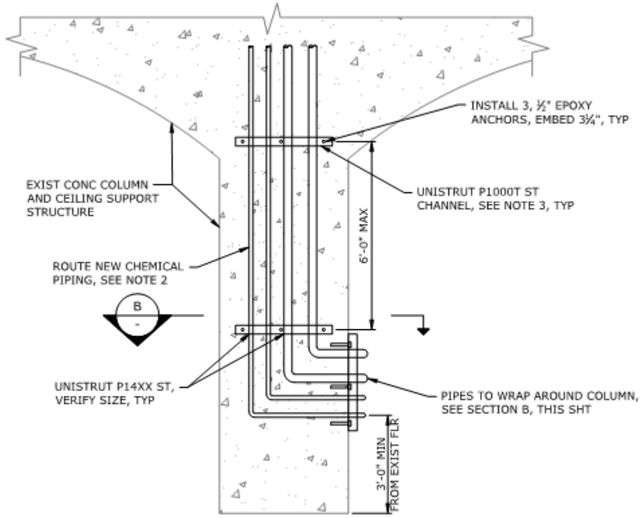


Areas to be Epoxy Coated

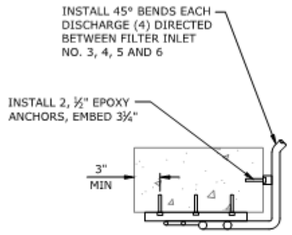
Other Improvements



PLAN
SCALE: 1/4"=1'-0"



COLUMN CHEMICAL PIPE BRACKET DETAIL (4 / M-3)
SCALE: NTS



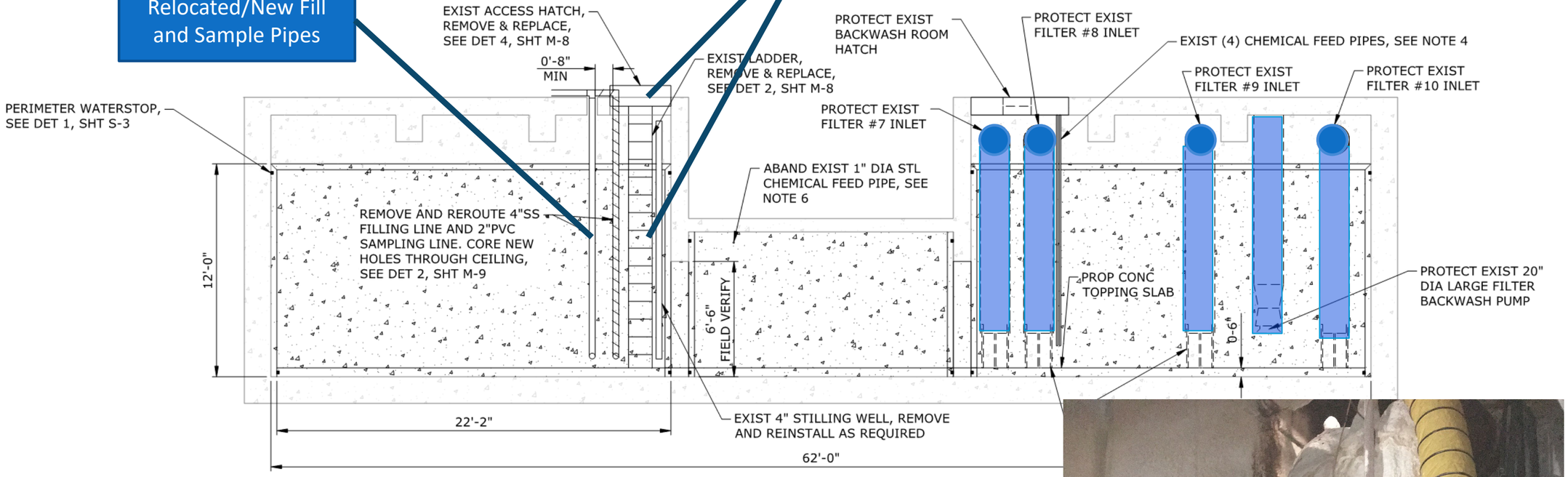
COLUMN CHEMICAL PIPE BRACKET SECTION (B / -)
SCALE: NTS

5. Design & Construction

West Wall Elevation

New Hatch & Ladder

Relocated/New Fill and Sample Pipes



Heavy Soda Ash Buildup on Inlet Pipes

Existing Pipes and Pump Suction Lines Created Challenges relative to the Concrete Floor and Wall Shotcrete

BIDDING

- Qualification of bidders was key.
- Bidders needed to show experience with shotcrete and concrete repair.
- Bidders required to show experience with repair of water containing structures.
- DN Tanks showed quals and was the winning bid.

5. Design & Construction

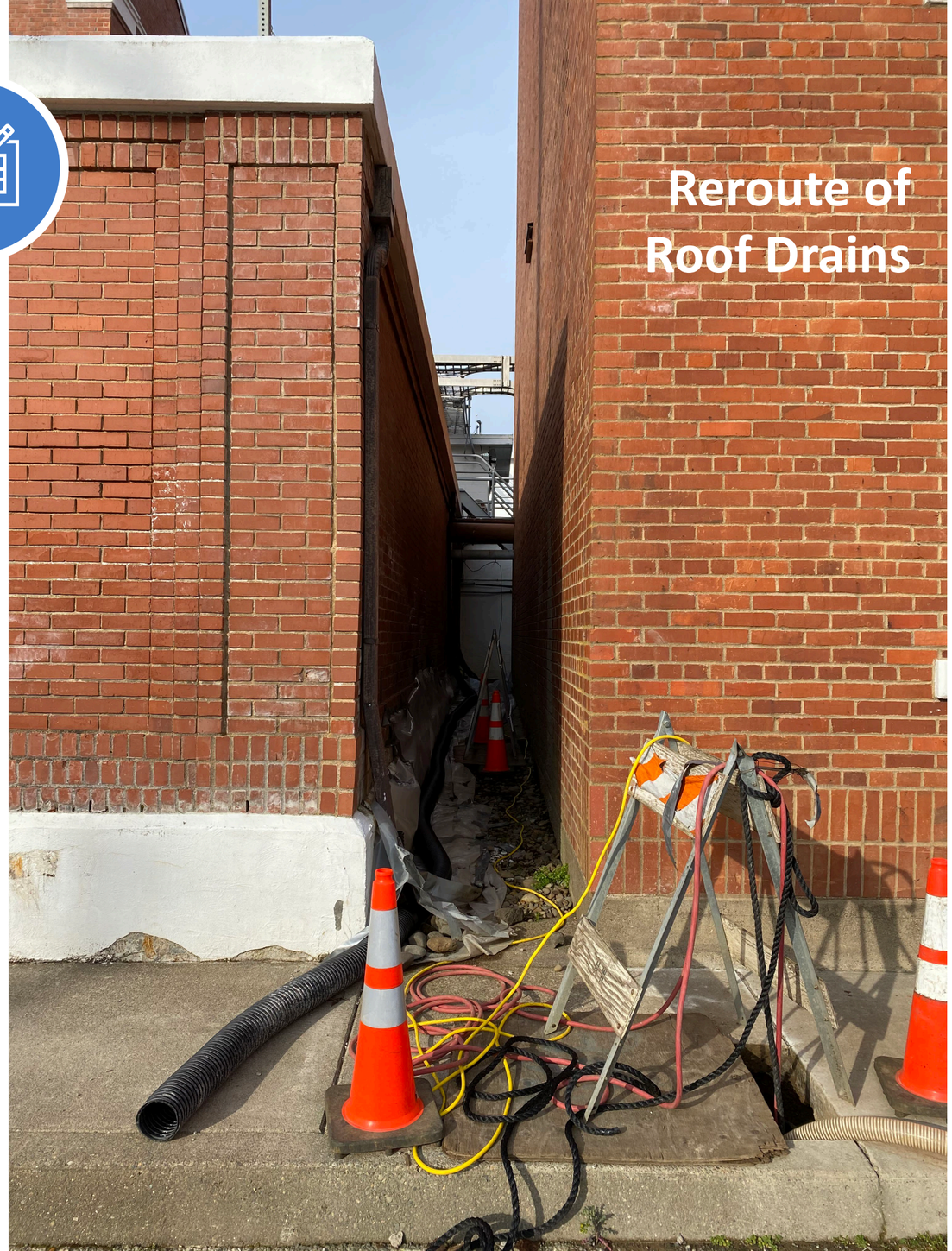
- Water Intrusion Continued During Construction

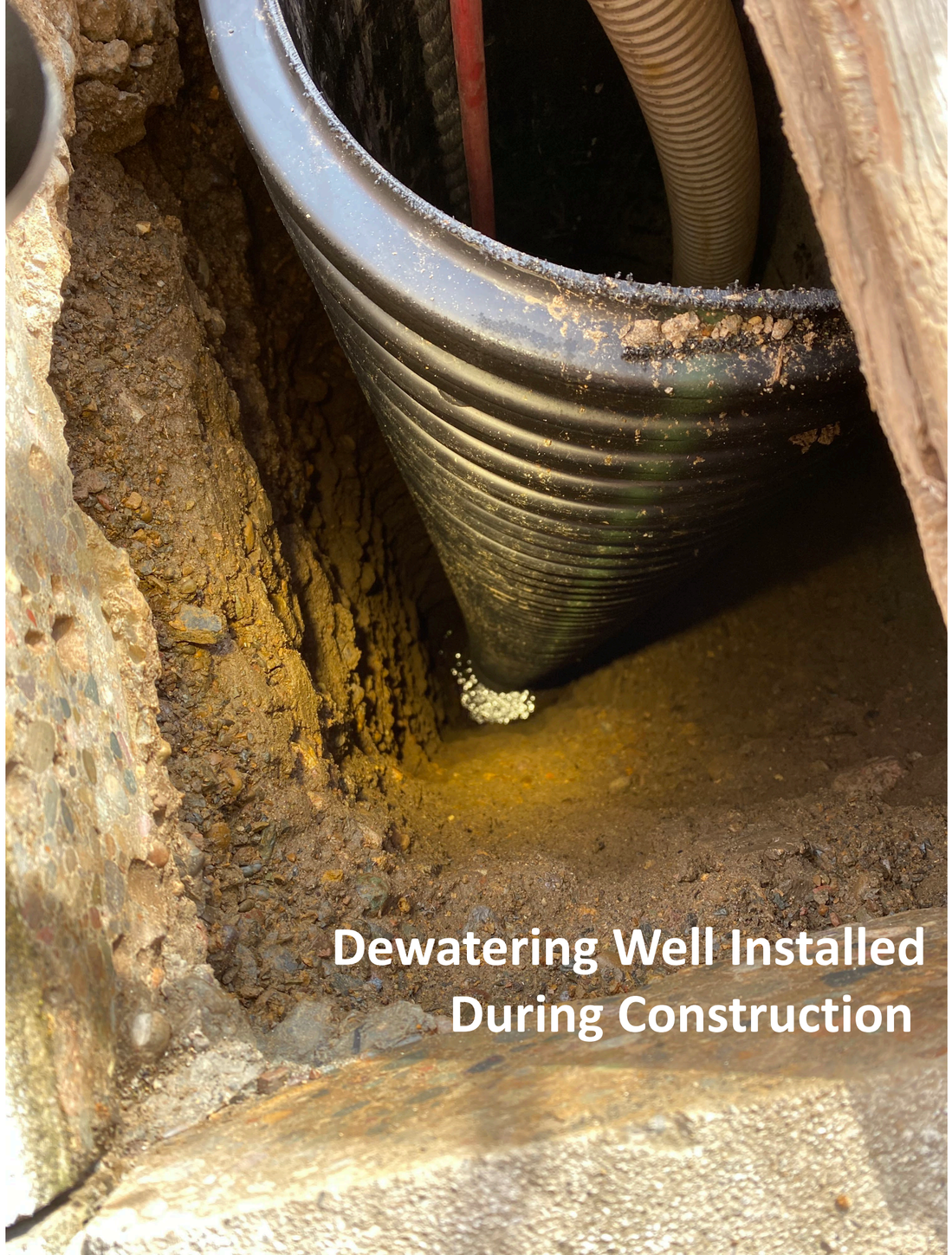
- Xypex Applied to Wall to Slow Water Intrusion
- Concern with Water Intrusion Impacting Strength of Shotcrete

5. Design & Construction

- Water Intrusion Was Extensive In The Floor As Well
- Concerns With Damage To The Floor Due To Water Pressure
- Changed Design To Add Dowels In The Floor

5. Design & Construction





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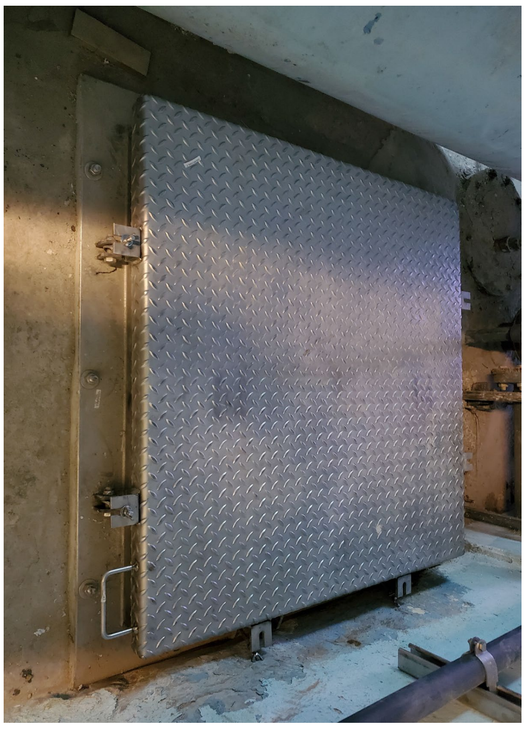

5. Design & Construction

6. Takeaways

- Detailed Investigation Critical
- Thorough Alternatives Analysis
- Design That is Cost Effective and Can Address Unknowns
- Collaboration with the Contractor
- Flexibility During Construction To Address Unforeseen Conditions

Q&A

Thank you!