Stormwater Project Challenges: Lessons Learned from a Culvert Rehabilitation Project

Derek Vogel, NEORSD
Randall Berkley, Jacobs

JACOBS®

Northeast Ohio Regional Sewer District

NORTHEAST OHIO REGIONAL SEWER DISTRICT
REGIONAL STORMWATER MANAGEMENT PROGRAM

NEORSD Stormwater Design & Construction Program

Navigate using the tabs below and by clicking the images to view more details on our completed, current design, and current construction stormwater projects. Zoom in to view satellite imagery and Regional Stormwater System features (e.g. streams, culverts, conduits, etc). Use the "Zoom To" drop down menu to locate your watershed.

All Projects | Design | Construction | Complete

47 Spring Creek Culvert Rehabilitation

Project Name: Spring Creek Culvert Rehabilitation

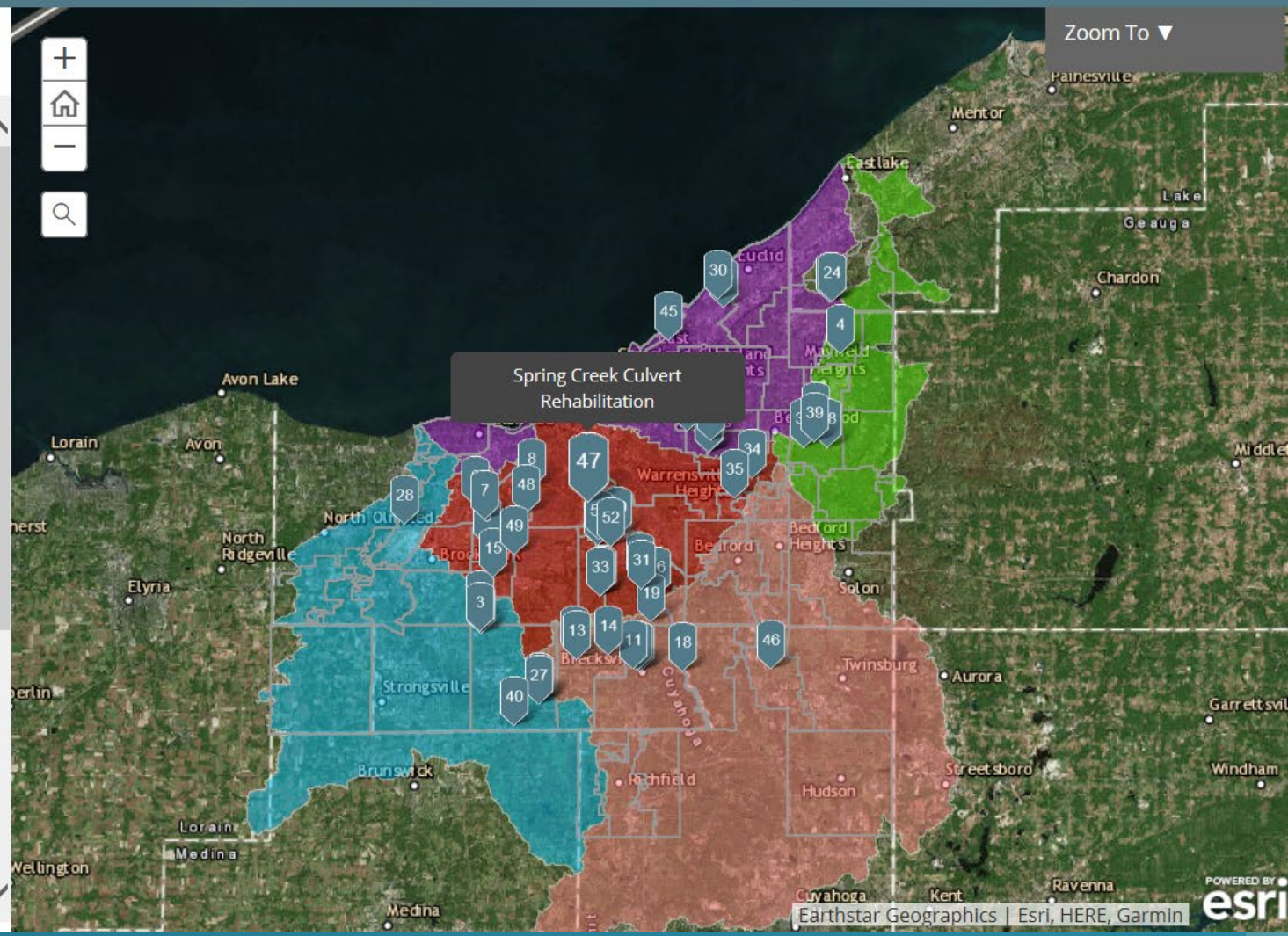
Community: Cleveland

Watershed Team Leader: J. Jowett

Watershed: Cuyahoga River North

Subwatershed: Spring Creek

Summary: The project includes replacing and rehabilitating a 72-inch culvert within the



https://www.neorsd.org/business-home/stormwater-construction-plan/

Overview

- Existing Conditions
- Project Design
- Construction
- Lessons Learned

Existing Conditions

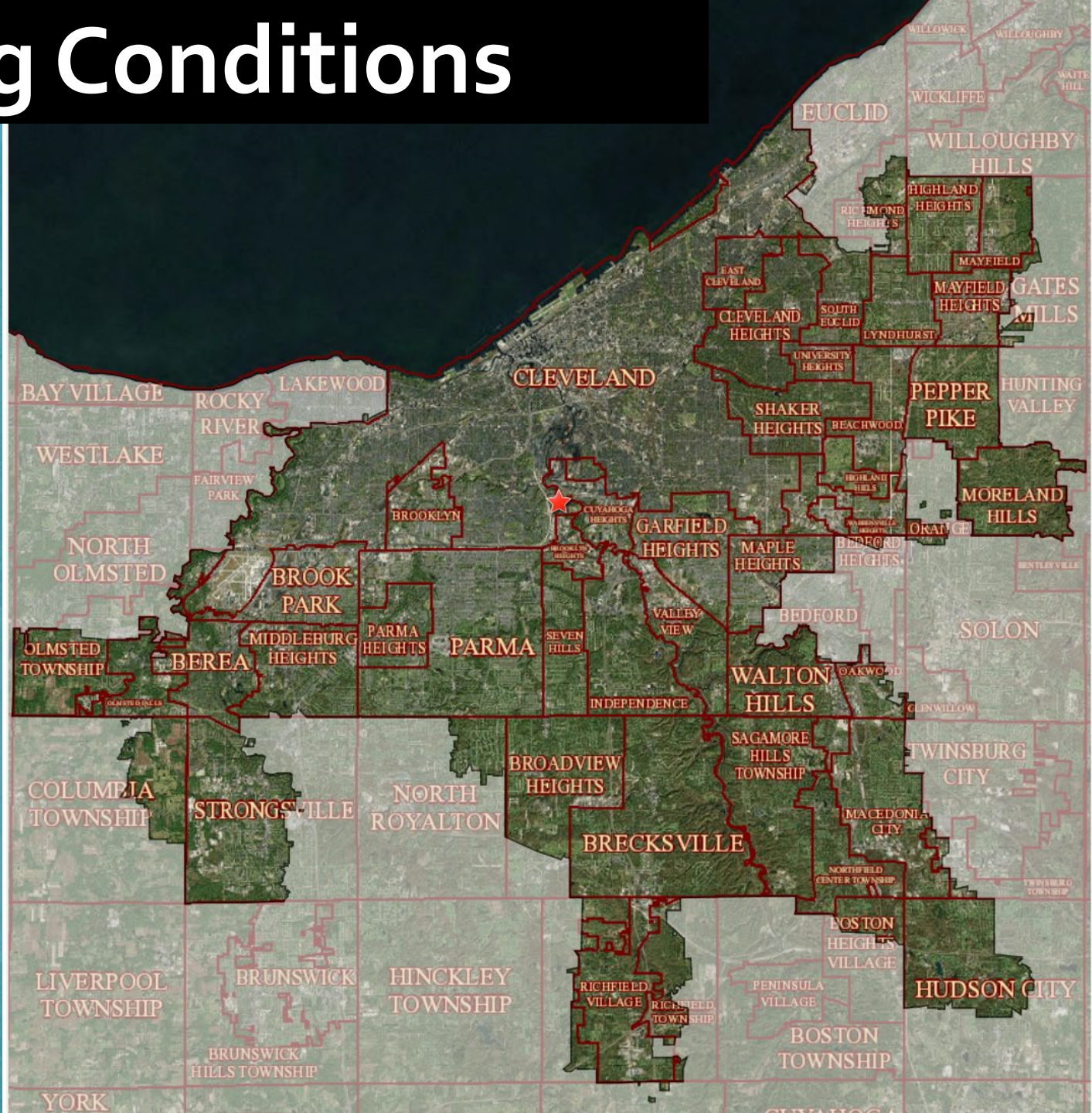
Project Location in Ohio

Northeast Ohio Regional Sewer District

@neorsd

Existing Conditions

Project Location Within NEORSD Service Area



Northeast Ohio Regional Sewer District

Existing Conditions

Existing Conditions

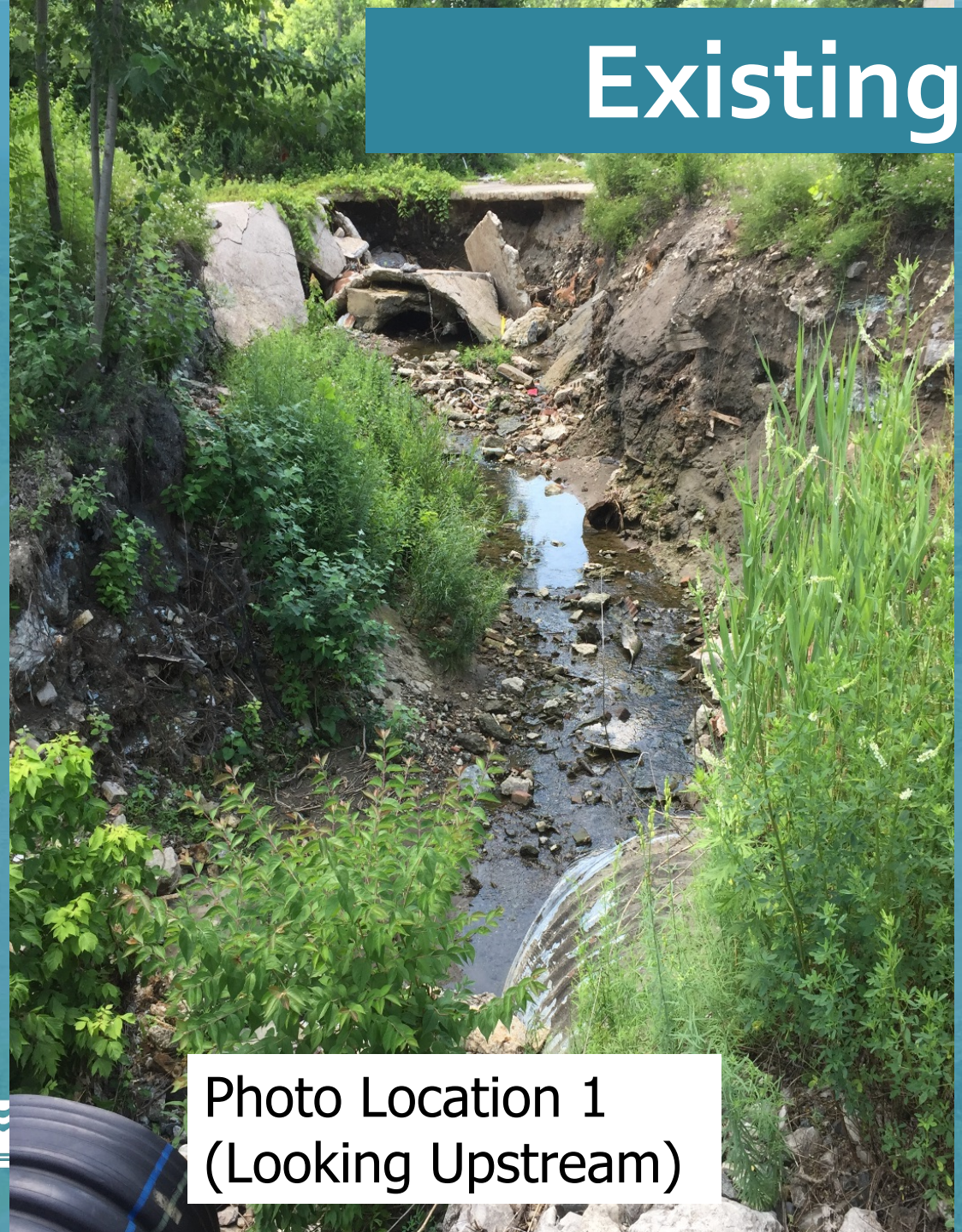


Photo Location 1
(Looking Upstream)

Photo Location 2 and 3
(Looking Downstream)

Existing Conditions

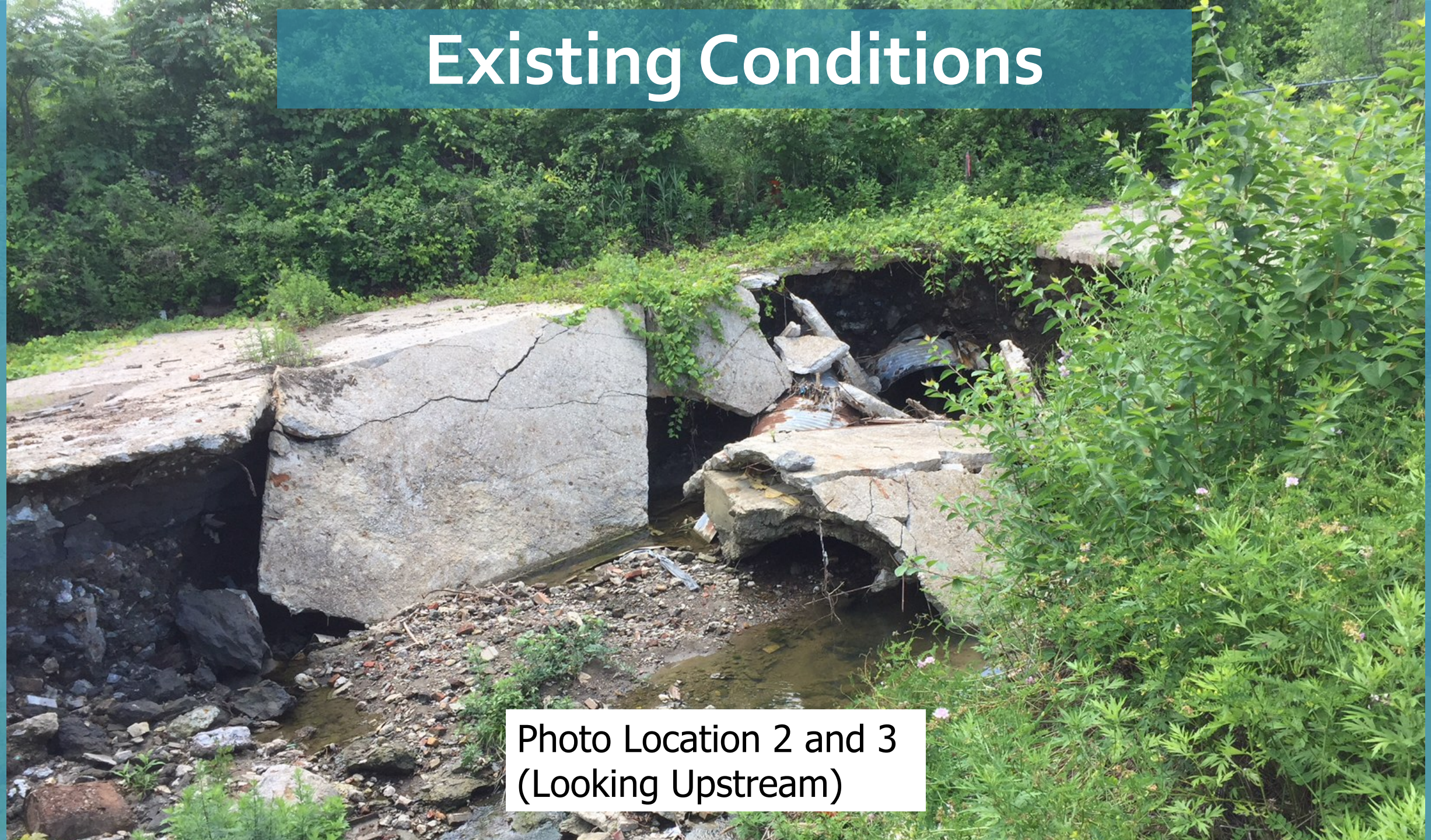


Photo Location 2 and 3
(Looking Upstream)

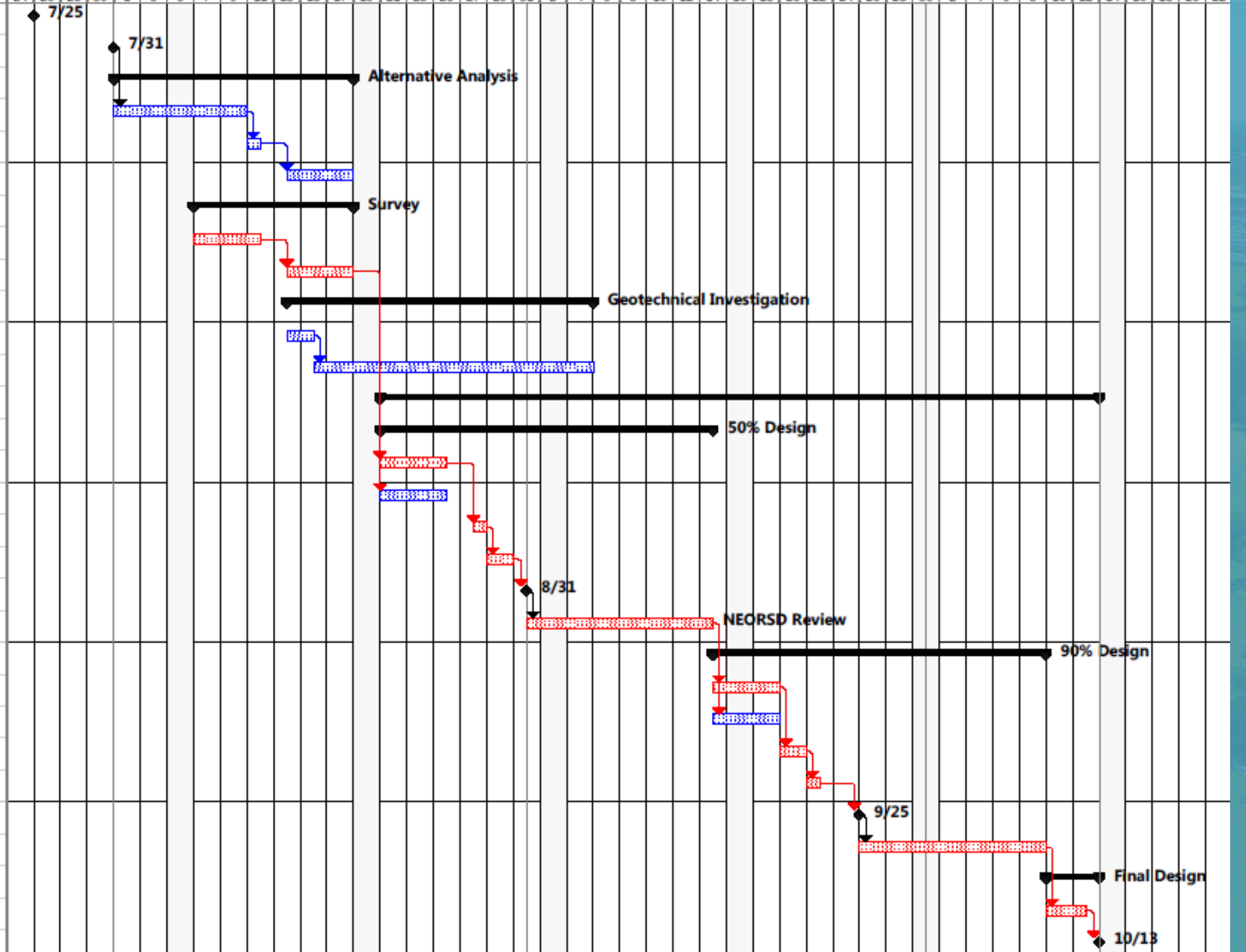
Existing Conditions

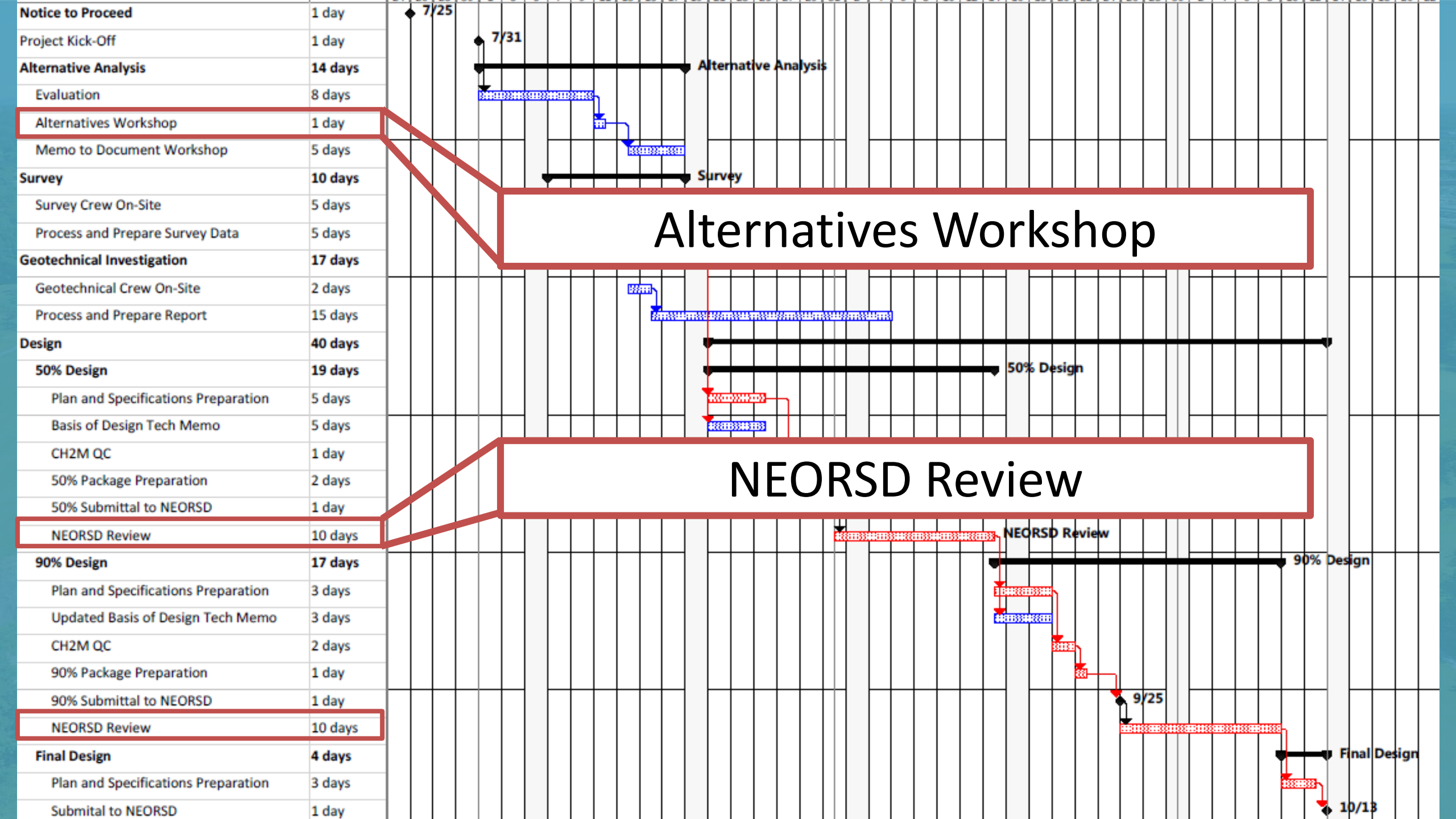
Photo Location 4
(Looking Upstream)

Overview

- Existing Conditions
- Project Design
- Construction
- Lessons Learned

Notice to Proceed	1 day
Project Kick-Off	1 day
Alternative Analysis	**14 days**
Evaluation	8 days
Alternatives Workshop	1 day
Memo to Document Workshop	5 days
Survey	**10 days**
Survey Crew On-Site	5 days
Process and Prepare Survey Data	5 days
Geotechnical Investigation	**17 days**
Geotechnical Crew On-Site	2 days
Process and Prepare Report	15 days
Design	**40 days**
50% Design	**19 days**
Plan and Specifications Preparation	5 days
Basis of Design Tech Memo	5 days
CH2M QC	1 day
50% Package Preparation	2 days
50% Submittal to NEORSD	1 day
NEORSD Review	10 days
90% Design	**17 days**
Plan and Specifications Preparation	3 days
Updated Basis of Design Tech Memo	3 days
CH2M QC	2 days
90% Package Preparation	1 day
90% Submittal to NEORSD	1 day
NEORSD Review	10 days
Final Design	**4 days**
Plan and Specifications Preparation	3 days
Submital to NEORSD	1 day




Notice to Proceed 1 day
Project Kick-Off 1 day
Alternative Analysis 14 days
Evaluation 8 days
Alternatives Workshop 1 day
Memo to Document Workshop 5 days
Survey 10 days
Survey Crew On-Site 5 days
Process and Prepare Survey Data 5 days
Geotechnical Investigation 17 days
Geotechnical Crew On-Site 2 days
Process and Prepare Report 15 days
Design 40 days
50% Design 19 days
Plan and Specifications Preparation 5 days
Basis of Design Tech Memo 5 days
CH2M QC 1 day
50% Package Preparation 2 days
50% Submittal to NEORSD 1 day
NEORSD Review 10 days
90% Design 17 days
Plan and Specifications Preparation 3 days
Updated Basis of Design Tech Memo 3 days
CH2M QC 2 days
90% Package Preparation 1 day
90% Submittal to NEORSD 1 day
NEORSD Review 10 days
Final Design 4 days
Plan and Specifications Preparation 3 days
Submital to NEORSD 1 day
7/25
7/31
Alternative Analysis
Survey
Alternatives Workshop
50% Design
NEORSD Review
NEORSD Review
90% Design
9/25
Final Design
10/13

Alternatives Workshop

- Diverse Team
- Inspection Results
- Alternatives Matrix

Diverse Team

- From the District
  - Project Team
  - Stormwater Supervisors
  - Construction Supervisors
  - Legal Counsel
- Jacobs Design Team
- Brown and Caldwell's Inspection Team

Alternatives Matrix

Comparison Criteria	Alternative #1 – Railroad will make Repairs	Alternative #2 – Slip line	Alternative #3 – Spray on Liner	Best in Criteria
Removal or Reduction of Risk	Negative – Unknown when repairs will be made	Positive – Full structural repair	Positive – Full structural repair	2, 3
Improvement to RSS Flooding	Unknown	Neutral – Minimal reduction in flow area, improved hydraulics with new pipe.	Positive – Least reduction in flow area, improved hydraulics with new lining.	3
Construction Cost	Low - RR cover repairs?	High	Low	1, 3
Expected service life	Unknown	Positive – New pipe	Neutral – 30 years	2
Purchase, Environmental Abatement, & Demolition Cost	Positive – RR Responsibility	N/A	N/A	1
Implementation (Regulatory, Schedule, Stakeholders, etc.)	Positive – RR Responsibility	Negative - RR Permit, possible permit need for access on outfall side	Positive - RR Permit, can repair through MHs	1, 3
Risks	Negative -Pipe continues to deteriorate prior to repair made.	Negative – Additional risk working under railway.	Negative – Additional risk working under railway. Pipe must be properly prepper/cleaned to remove all loose debris prior to lining to prevent lining failure.	--
Constructability Limitations (Access, Staging, Hauling, Safety, etc.)	Positive – RR Responsibility	Negative – Larger staging area and access chamber.	Positive – Small footprint and access through manholes.	1, 3
Operation & Maintenance (Regular/Small Repairs)	Unknown	Positive – New pipe	Positive – Full repair	2, 3
Replacement & Renewal	Unknown	Positive – New pipe	Neutral – Shorter useful life	2, 3

Alternatives Matrix

Comparison Criteria	Alternative #1 – Railroad will make Repairs	Alternative #2 – Slip line	Alternative #3 – Spray on Liner	Best in Criteria
Removal or Reduction of Risk	Negative – Unknown when repairs will be made	Positive – Full structural repair	Positive – Full structural repair	2, 3
Improvement to RSS Flooding	Unknown	Neutral – Minimal reduction in flow area, improved hydraulics with new pipe.	Positive – Least reduction in flow area, improved hydraulics with new lining.	3
Construction Cost	Low - RR cover repairs?	High	Low	1, 3
Expected service life	Unknown	Positive – New pipe	Neutral – 30 years	2
Purchase, Environmental Abatement, & Demolition Cost	Positive – RR Responsibility	N/A	N/A	1
Improvement to RSS Flooding	Unknown	Neutral – Minimal reduction in flow area, improved hydraulics with new pipe.	Positive – Least reduction in flow area, improved hydraulics with new lining.	3
Risks	Negative -Pipe continues to deteriorate prior to repair made.	Negative – Additional risk working under railway.	Negative – Additional risk working under railway. Pipe must be properly prepper/cleaned to remove all loose debris prior to lining to prevent lining failure.	--
Constructability Limitations (Access, Staging, Hauling, Safety, etc.)	Positive – RR Responsibility	Negative – Larger staging area and access chamber.	Positive – Small footprint and access through manholes.	1, 3
Operation & Maintenance (Regular/Small Repairs)	Unknown	Positive – New pipe	Positive – Full repair	2, 3
Replacement & Renewal	Unknown	Positive – New pipe	Neutral – Shorter useful life	2, 3

Benefits of Alternative Workshop

- An alternatives workshop can be a great tool to condense design schedule
- Allows all stakeholders to share their opinion

Project Design

- Pipe Rehabilitation
- Collapsed Section
- Railroad Property

Project Design

Pipe Rehabilitation – Geopolymer Lining:

- Consistent method of repair for multiple sections
- Minimal flow capacity reduction
- Structural integrity
- Low schedule impact

Northeast Ohio Regional Sewer District

@neorsd

Project Design

Collapsed Section – New Pipe:

- Soil Contamination
- Property Owner Approval
- Headwall

Northeast Ohio Regional Sewer District

Overview

- Existing Conditions
- Project Design
- Construction
- Lessons Learned

Construction – Junction Chamber

Northeast Ohio Regional Sewer District

Construction - Geopolymer

Northeast Ohio Regional Sewer District

Construction – Fiberglass Pipe

Northeast Ohio
Regional Sewer District

Construction - Headwall

Northeast Ohio
Regional Sewer District

Overview

- Existing Conditions
- Project Design
- Construction
- Lessons Learned

Lessons Learned

- Railroad / MCI
- Property Owner Coordination: Easements, Debris, Laterals
- Contaminated Soils

Lesson Learned: Railroad / MCI

Lesson Learned: Property Issues

- The easement value negotiation process
- Current and future use of the property
- Construction Access
- Debris Stockpiles
- Lateral Connections

Northeast Ohio Regional Sewer District

Lesson Learned: Property Issues

- The easement value negotiation process
- Current and future use of the property
- Construction Access
- Debris Stockpiles
- Lateral Connections

Northeast Ohio Regional Sewer District

@neorsd

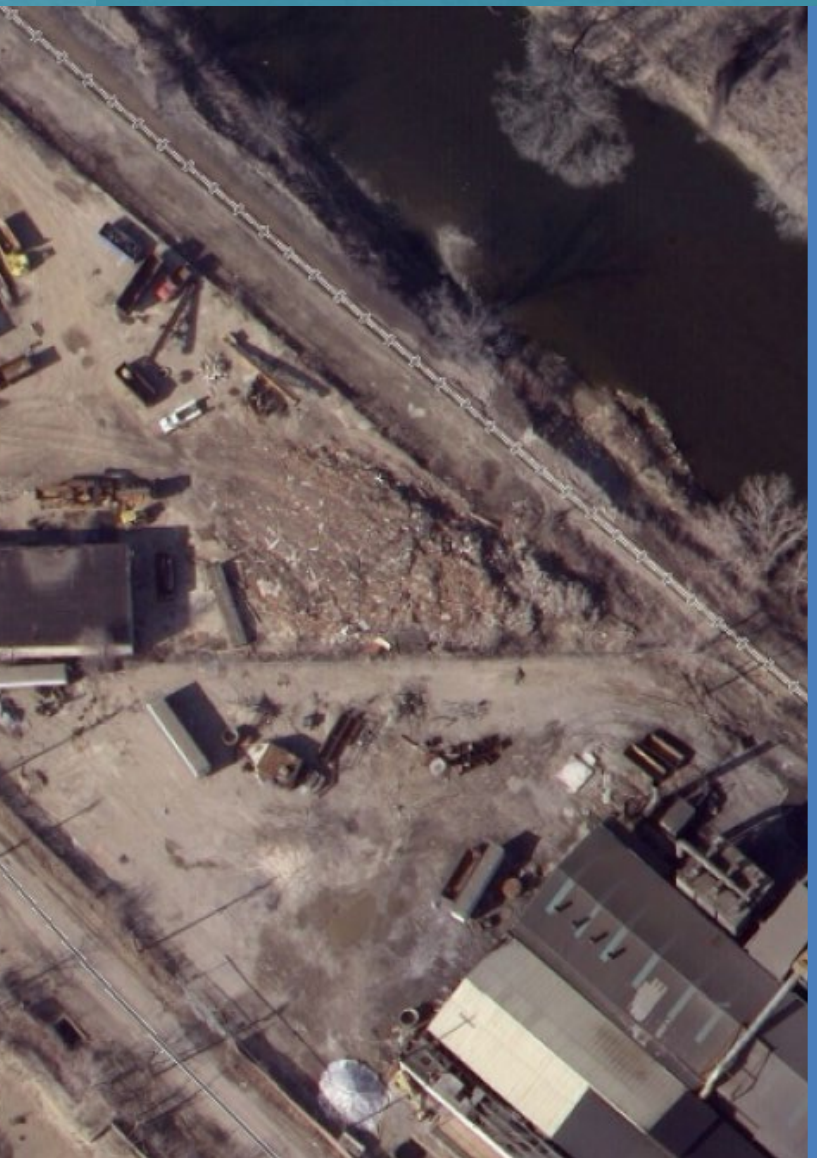
Lesson Learned: Property Issues

- The easement value negotiation process
- Current and future use of the property
- Construction Access
- Debris Stockpiles
- Lateral Connections

Northeast Ohio Regional Sewer District

@neorsd

Lesson Learned: Contaminated Soils



Lessons Learned Summary

- An alternatives workshop can be a great tool to condense design schedule
- However, don't underestimate the time and funds needed to handle multiple property owner requirements and site specific complications.

Questions?

Randall Berkley
Randall.Berkley@Jacobs.com
614-825-6782

Derek Vogel
vogeld@neorsd.org
216-881-6600