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Using Stream Restoration to Enhance a CSO Control Project

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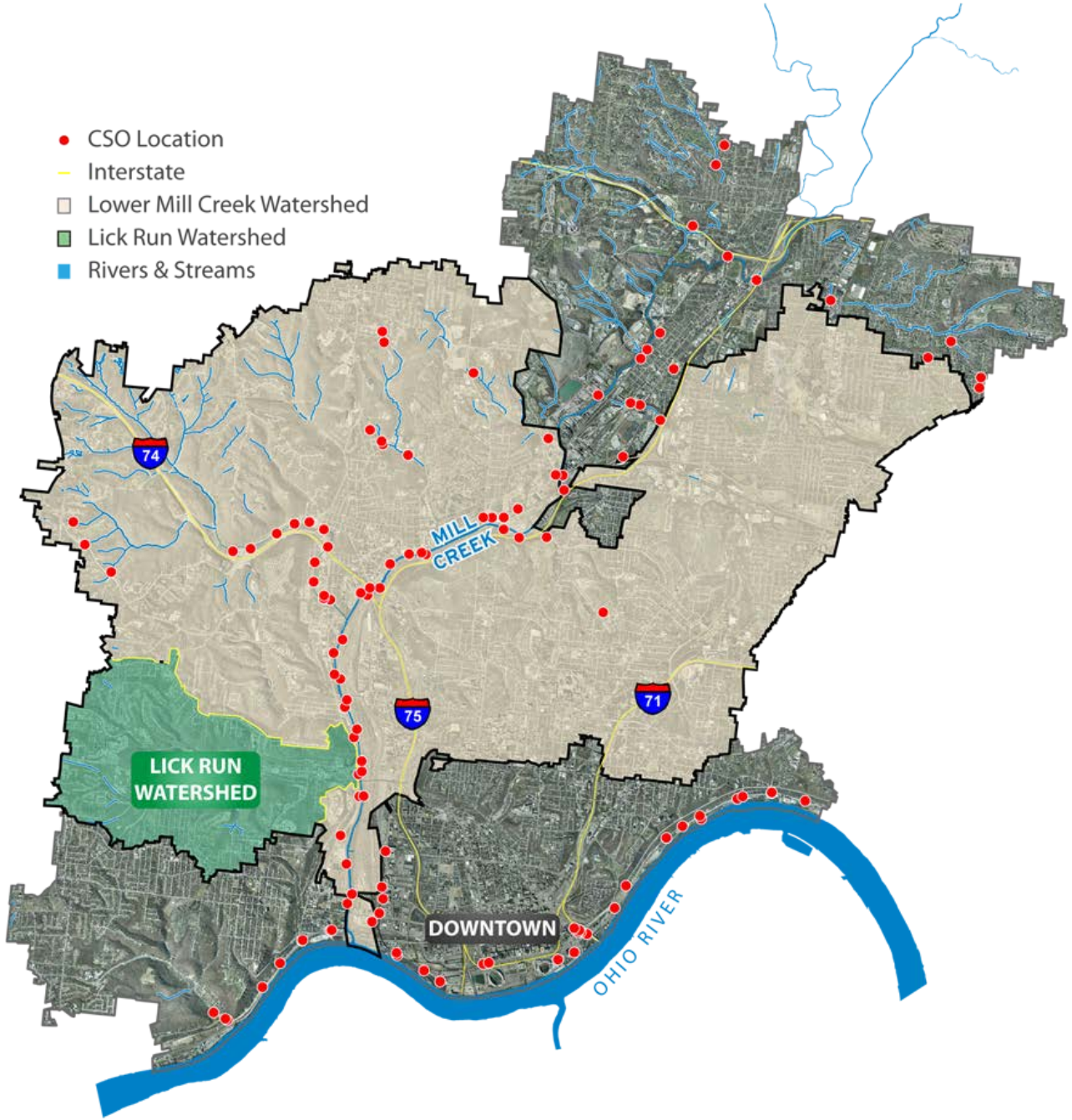
Lick Run Watershed

CSO #5, in the Lick Run Watershed, is MSDGC's largest CSO within the system.



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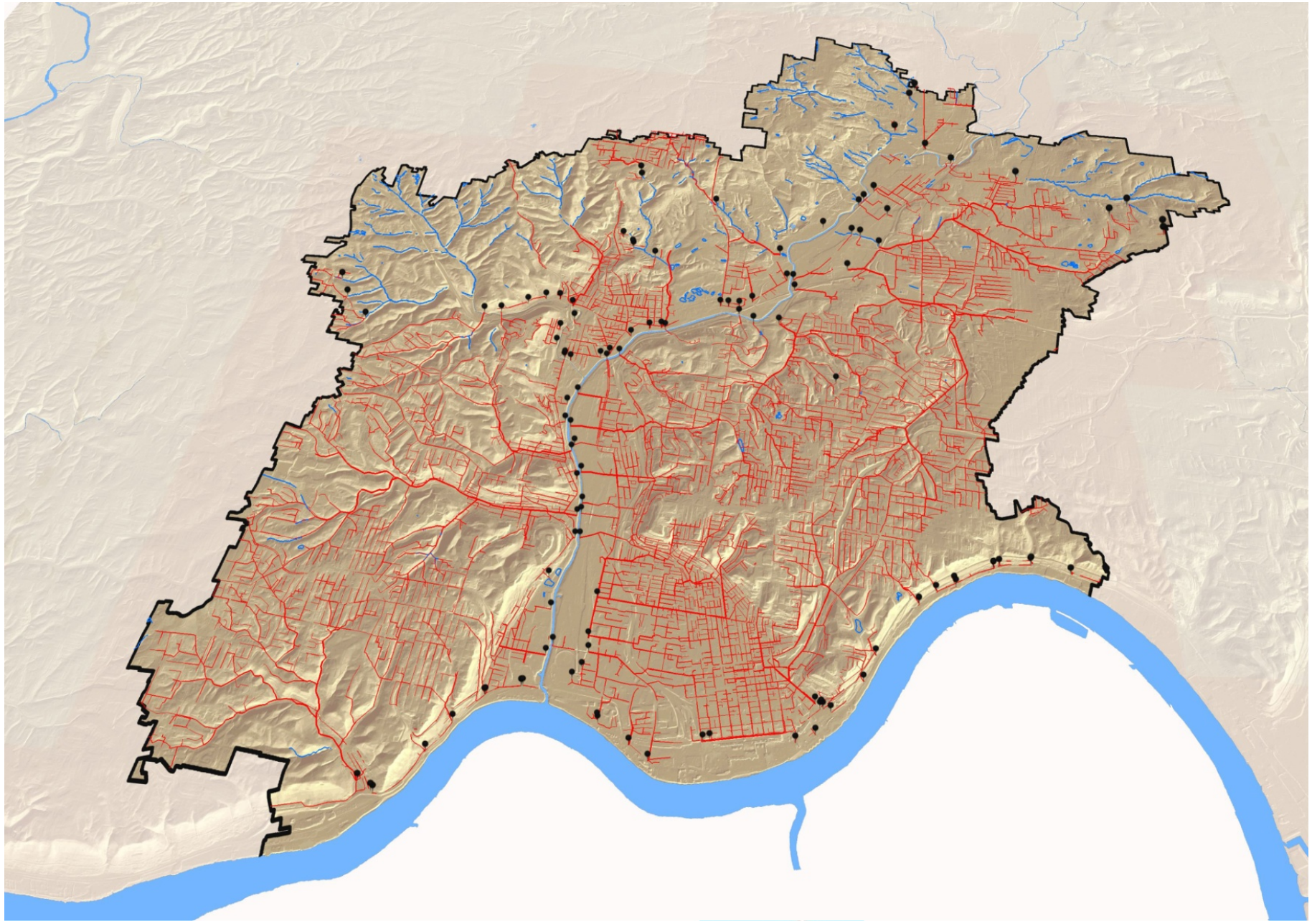
History of Lick Run Watershed



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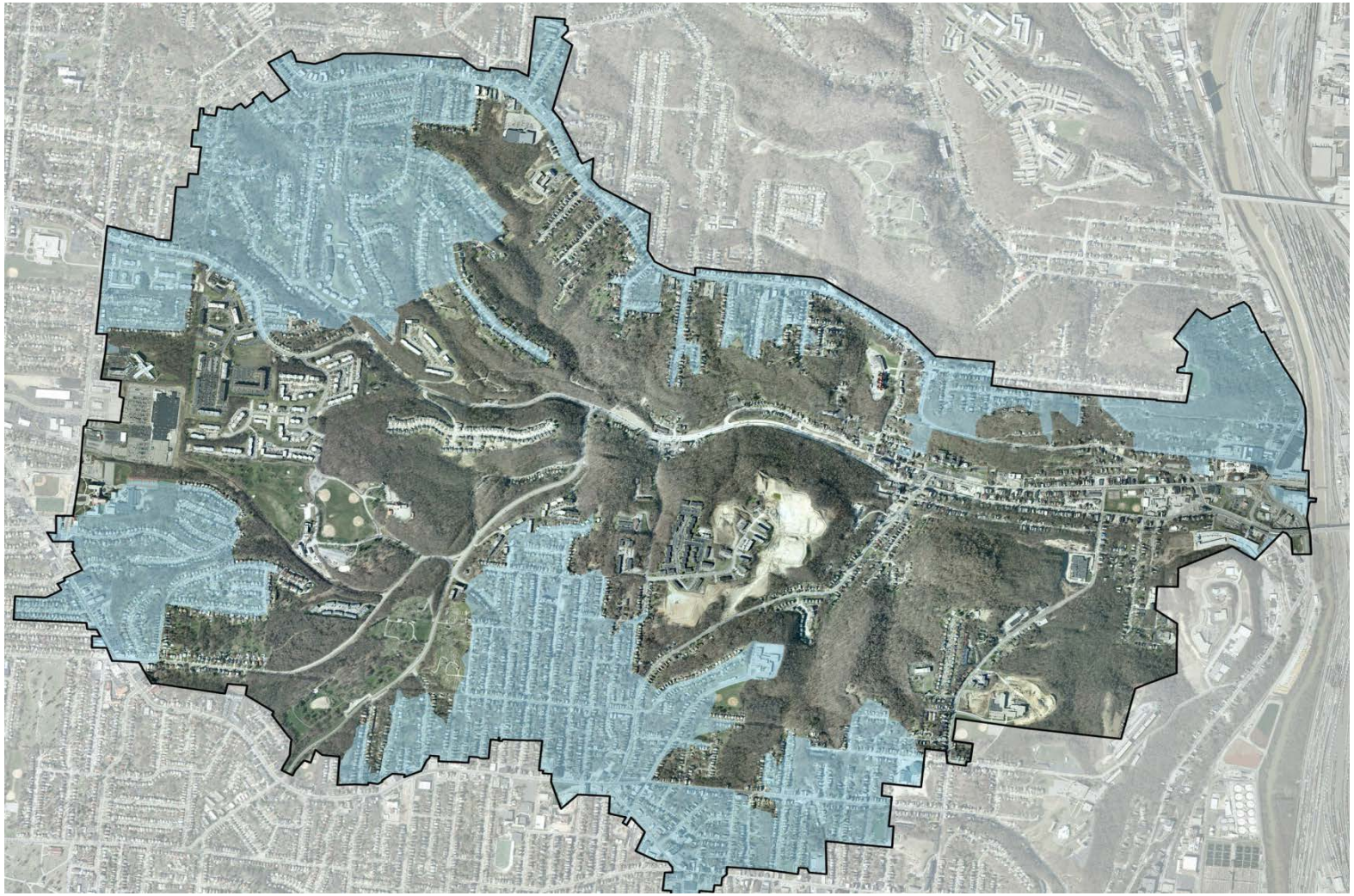
Strategic Separation



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Watershed Wide Strategy

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Quebec Heights Stream Restoration Site

- One of two strategic sewer separation projects utilizing a naturalized open channel within the Lick Run Watershed.

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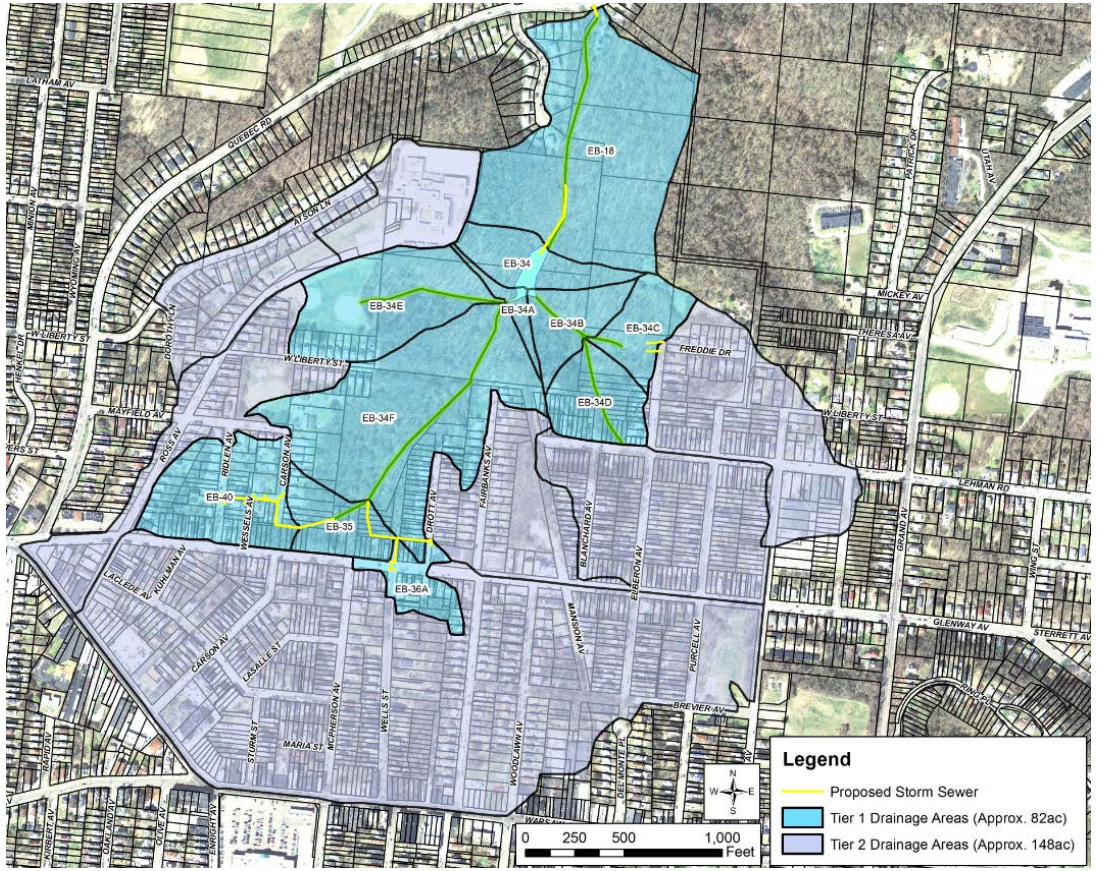
Project Background

- Combined sewer located in the channel area conveys flow from surrounding neighborhoods.
- Stormwater from the stream channel allowed to enter the combined sewer through various inter-connections.
- Existing erosion/hydromodification issues in the channel.



Quebec Heights Stream Restoration Concept Plan

- Open channel conveyance - stabilize and enhance 5,500 linear feet.
- Approx. 1,300 linear feet of separate storm sewer ranging from 12 inches to 15 inches.
- Capturing stormwater runoff from 82 acres - 49 million gallons of runoff volume per year.
- Remove this flow from the combined sewer, and reduce CSOs.

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Concept Plan

LEGEND
- Existing Combined Sewer
- Existing Storm Sewer
- CPB Boundary
- Proposed Detention Feature
- Proposed Storm Sewer

METROPOLITAN SEWER DISTRICT OF GREATER CINCINNATI
LICK RUN WATERSHED

*** GLENWAY WOODS CONCEPT PLAN: TREATMENT ZONES**

* THE CONCEPT PLAN DEPICTED HERE IS IN DRAFT FORM AND AWAITING FINALIZATION BASED ON POLICY DECISIONS FROM MSD.

Figure A-4
01/23/2012

Design Objective – Water Quality

- Improve water quality by passing runoff through a series of stormwater best management practices.
- Preserve and enhance habitat/ecology by designing around high quality trees.

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Design Objective – Water Quantity

- Use surface features to provide water quantity benefit
- Convey the 25-year event in the channel
- Safely pass the 100-year event in the valley

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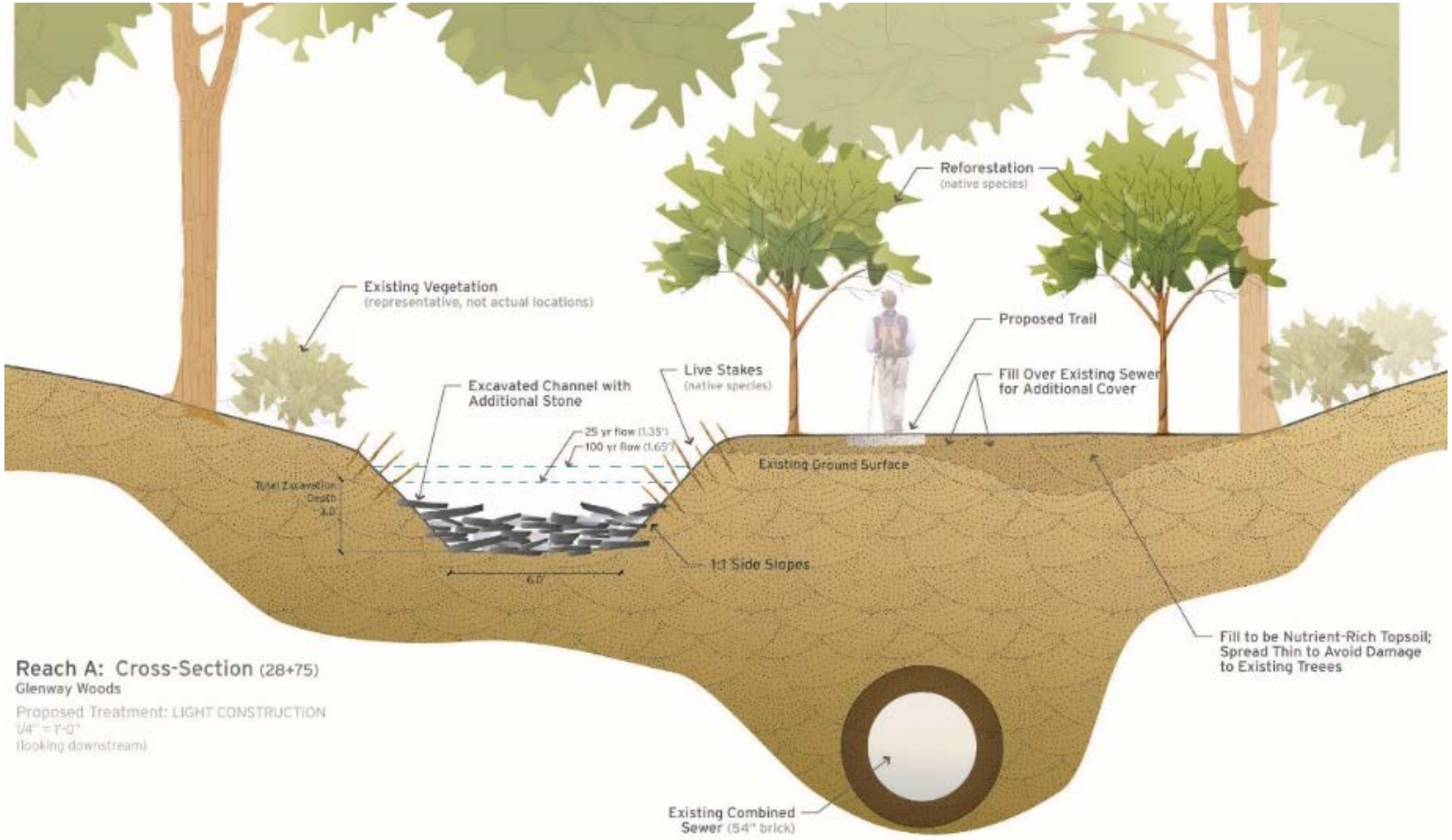
Quebec Heights Stream Restoration

- Approx. 3,100 LF channel restoration with rock
- 3,500 tons Rip-Rap
- 5,300 tons Limestone Creek Rock



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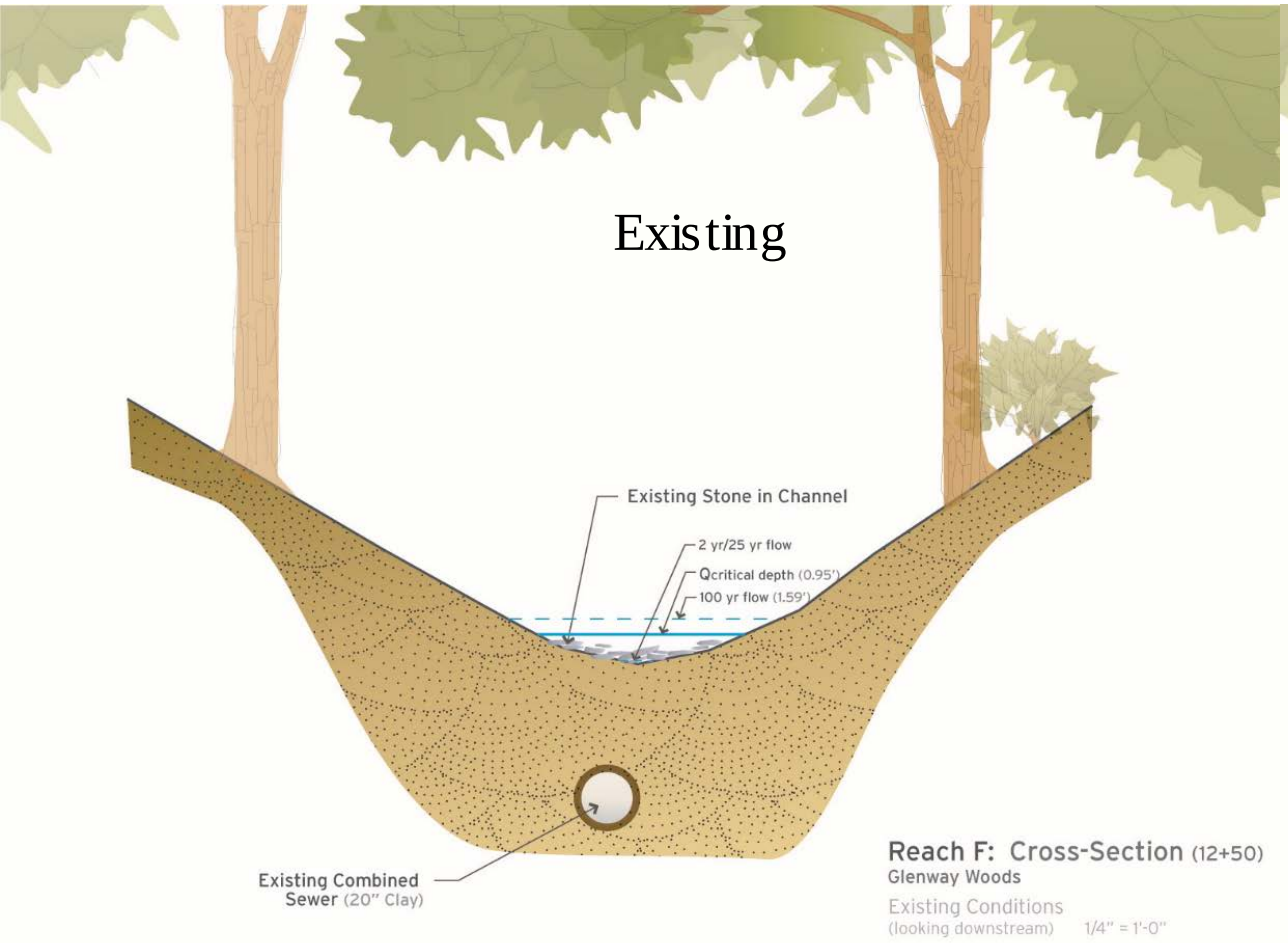
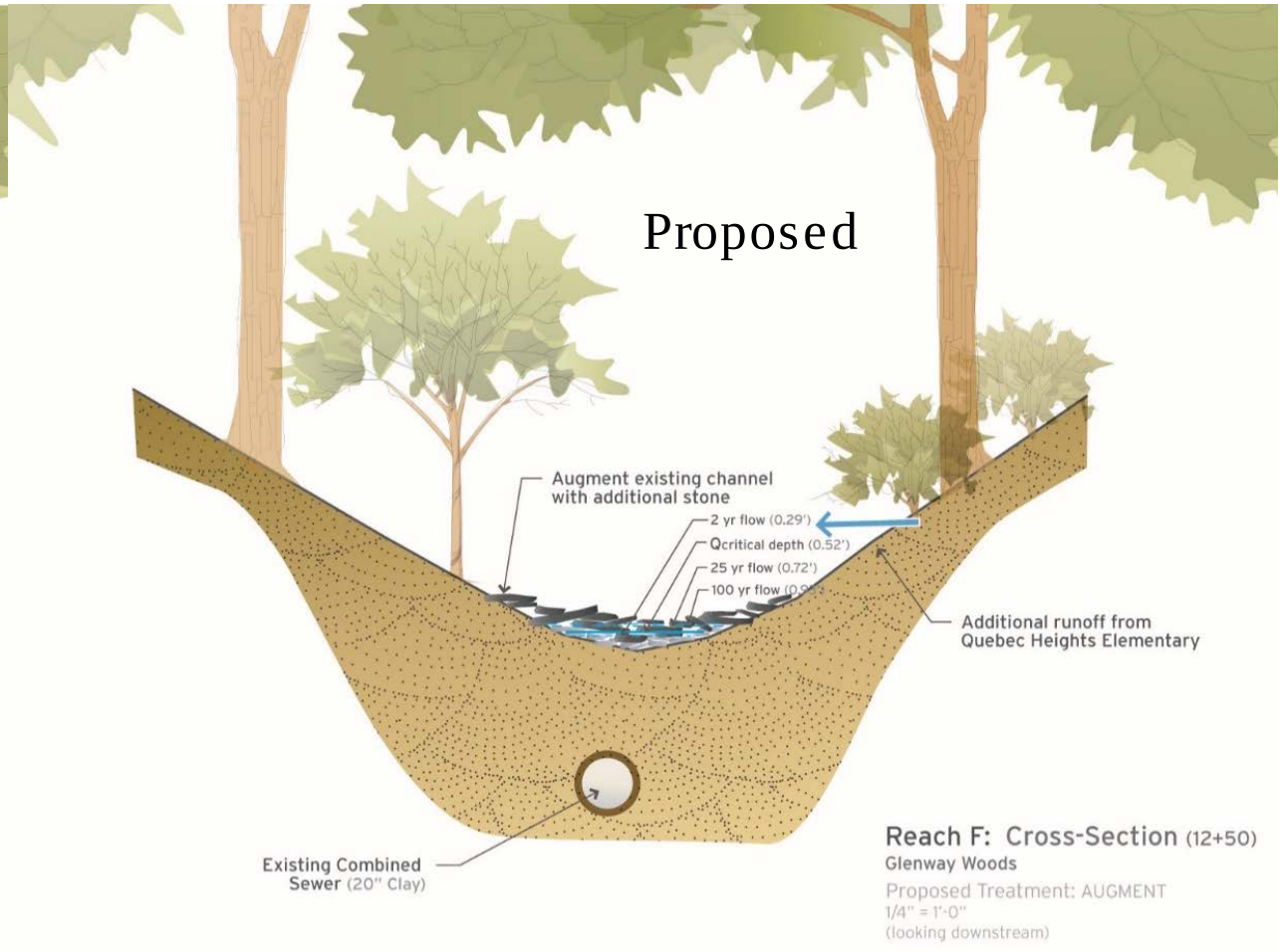
Reach A (12+50) – Upstream – Augment Channel





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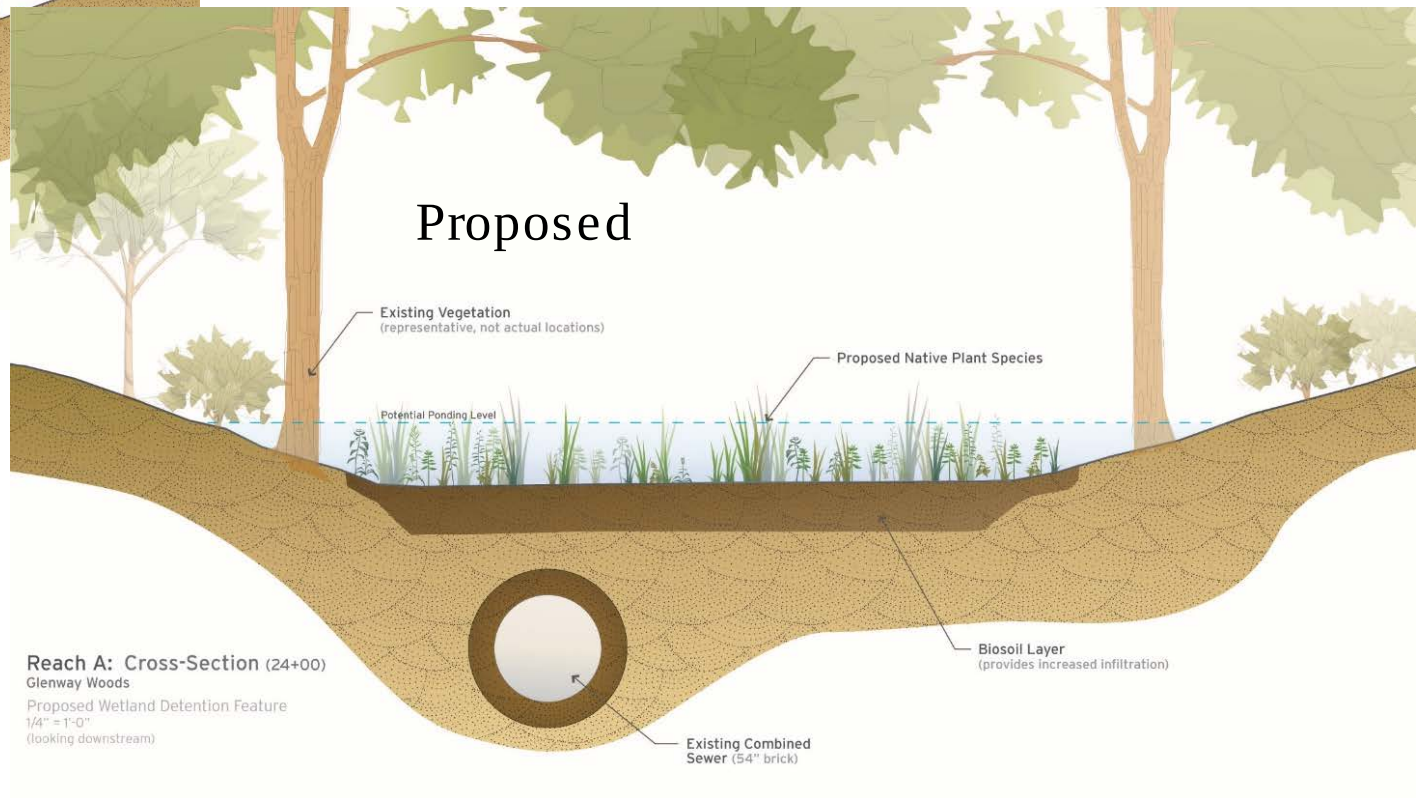
Reach A (24+00) – Detention Pond



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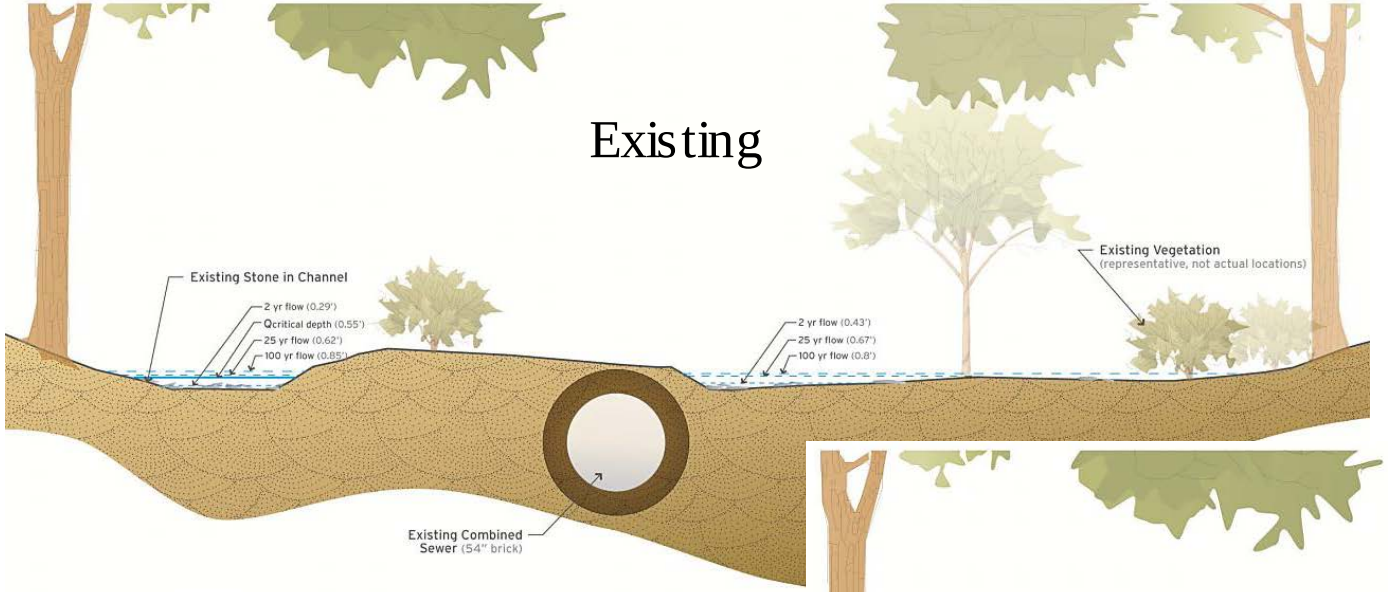
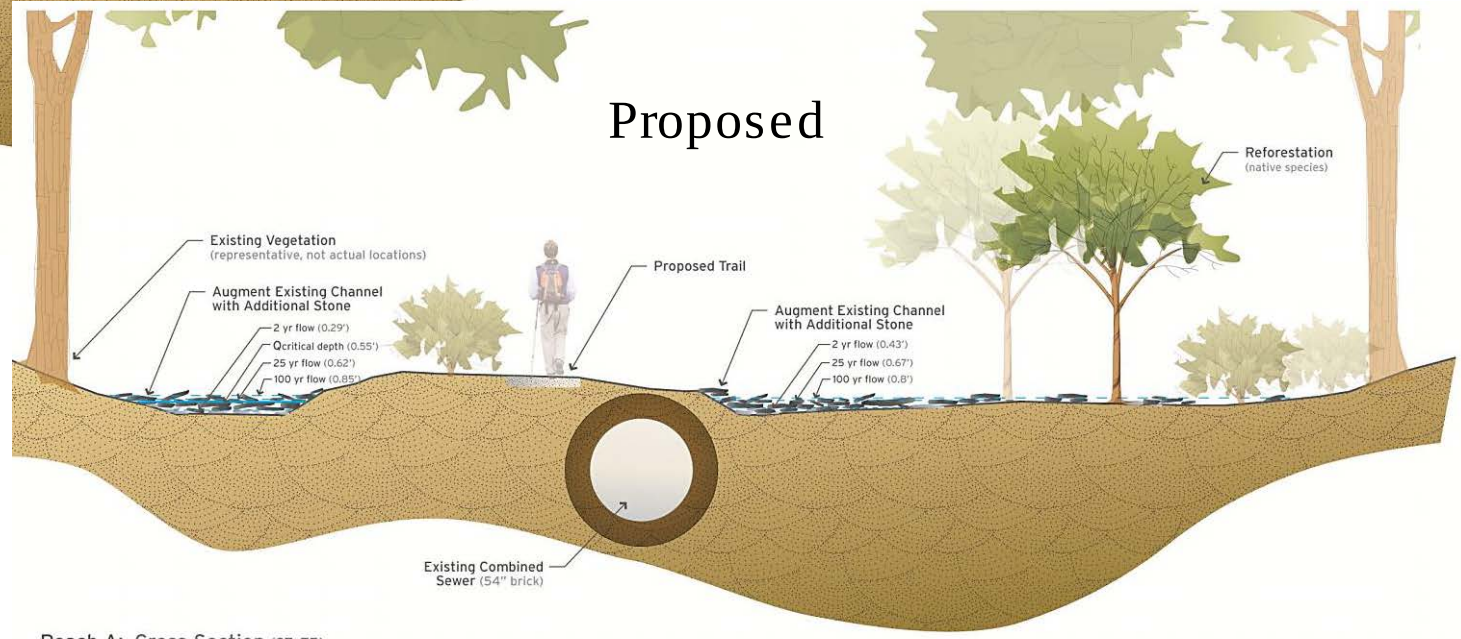
Reach A (37+75) - Downstream

Existing



Reach A: Cross-Section (37+75)
Glenway Woods
Existing Conditions
(looking downstream)
1/4" = 1'-0"

Proposed



Reach A: Cross-Section (37+75)
Glenway Woods
Proposed Treatment: STABILIZE
1/4" = 1'-0"
(looking downstream)

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Flat and Wide Reaches

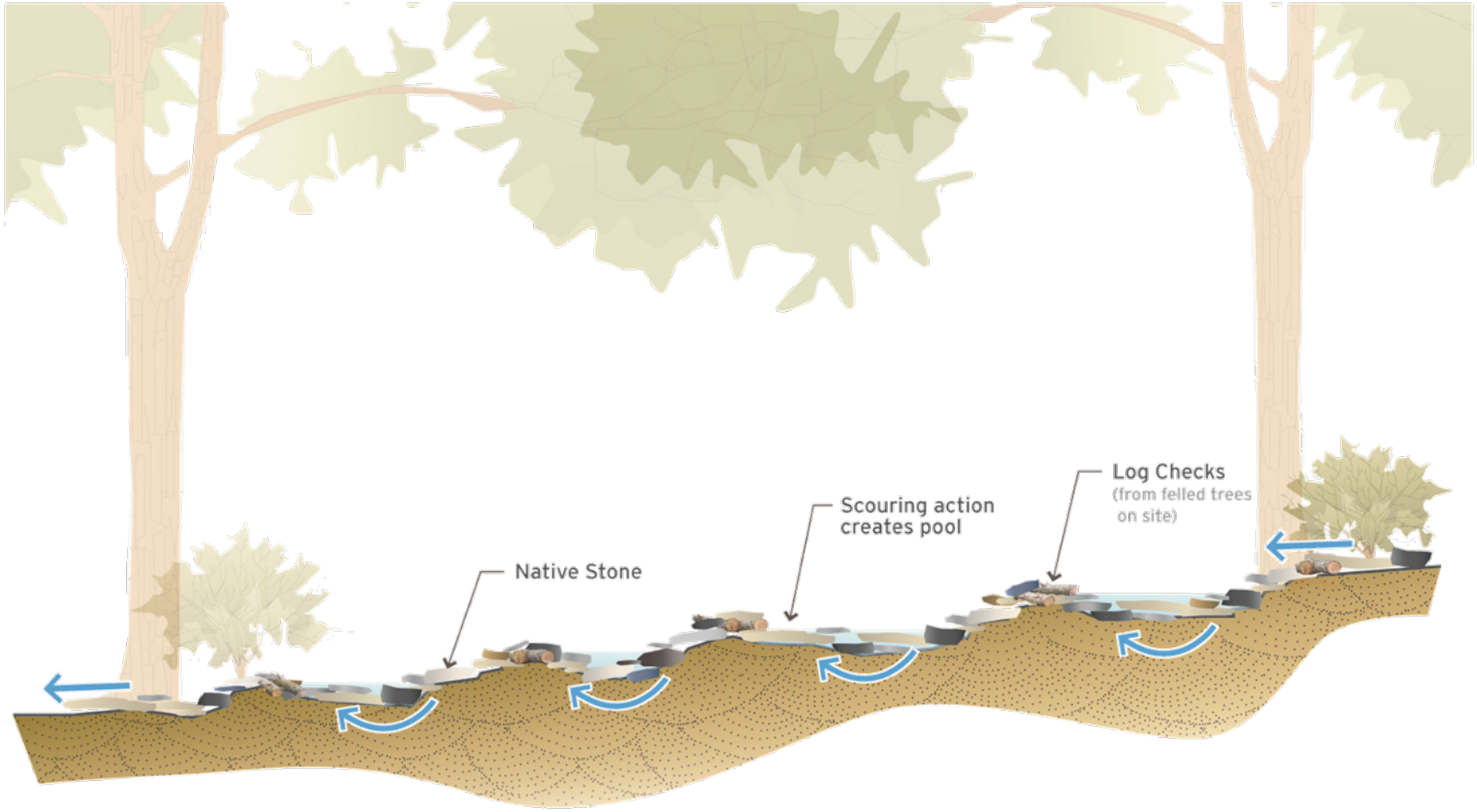
- Medium creek rock mixed with rip rap to create natural habitat, allow for gradual infiltration and promote the development of self-forming pools and riffles

Steep and Narrow Reaches

- Ledge rock cascade to maintain stability and prevent erosion

Step Pools Concept

- Step pools provide energy dissipation and habitat in steeper reaches



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Step Pools

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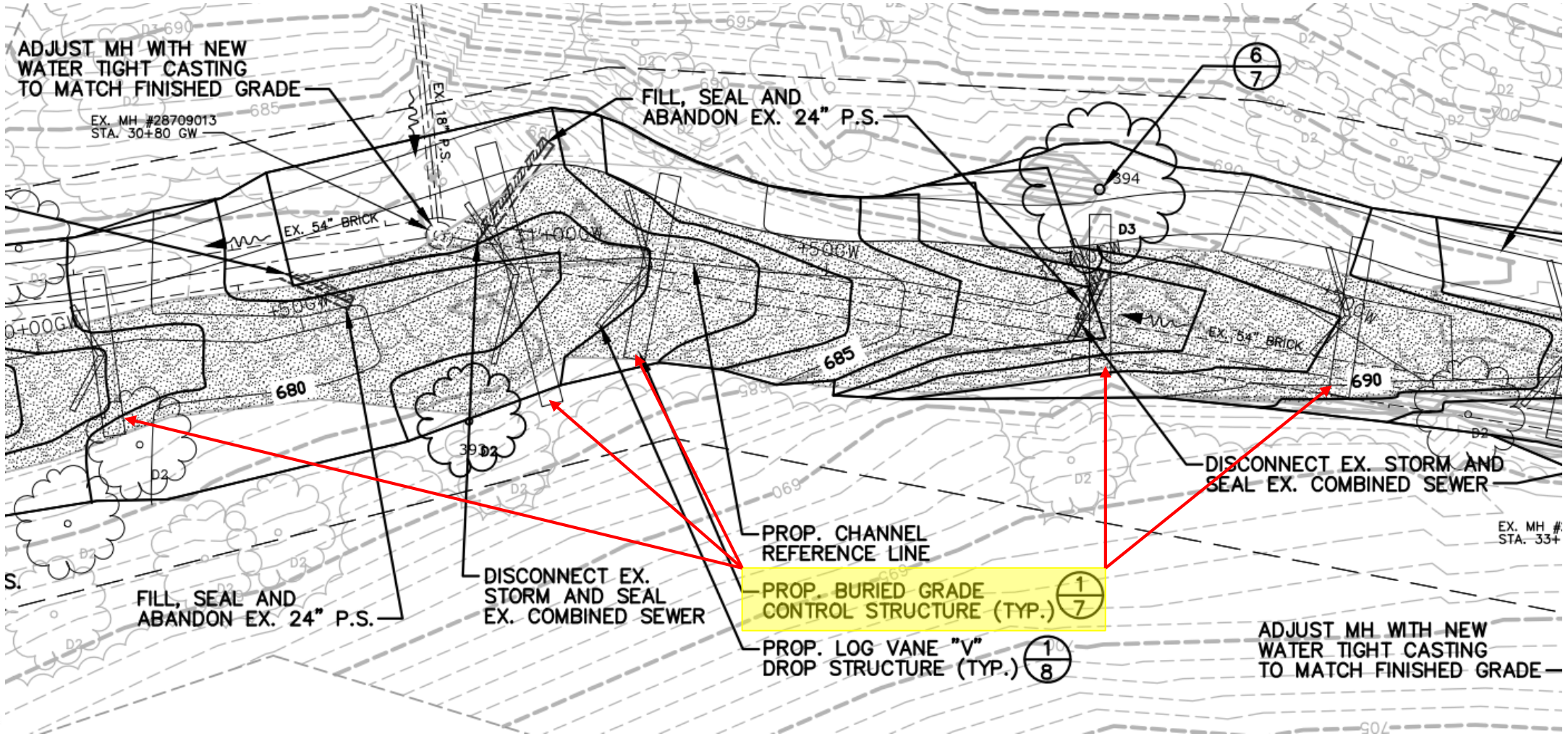
Grade Control Structures

- Buried Grade Control Structures located along channel
- At intervals corresponding to every 3-foot elevation drop with 1’ overlap
- Provide additional support to prevent erosion



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Wetland Detention

- Designed for the 10 and 25-year design storms

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Wetland Detention

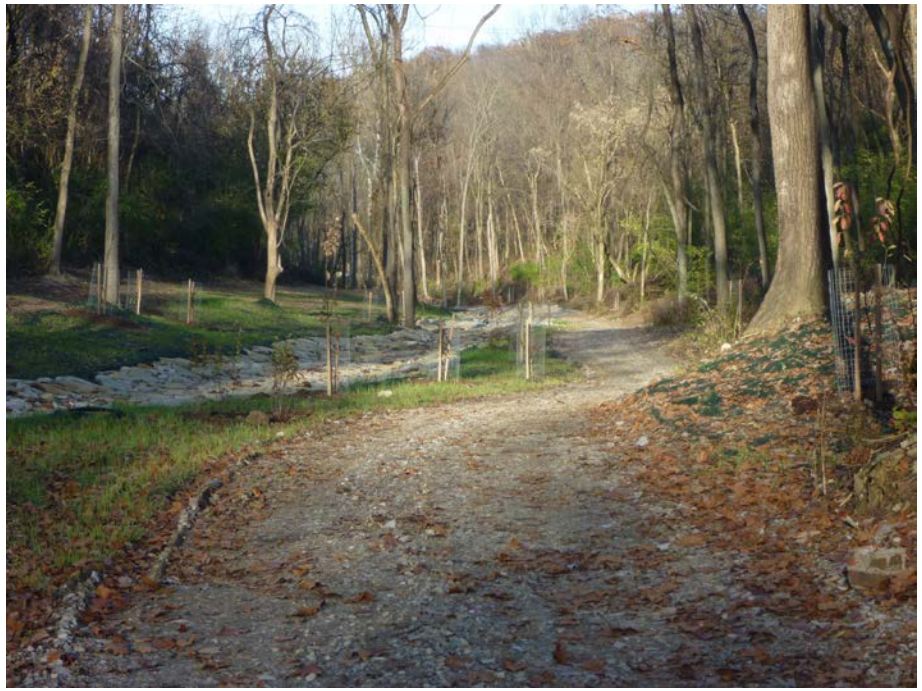
Detention Pond Forebay

Detention Outlet
Control Structure

Detention Pond Spillway

Trees and Vegetation

- 229 trees planted along channel
- 8,229 SY Native Seeding
- 32,612 Native Plugs
- 177 Woody Shrubs



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Native Plants and Habitat

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Site Timber Reuse

- Log vanes and large woody debris installed for habitat, water quality, geomorphic and ecological benefits.
- 16 total log vanes installed.

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Maintenance Path

- Minimum 8-foot-wide path adjacent to channel
- Potential to be used as a multi-use path

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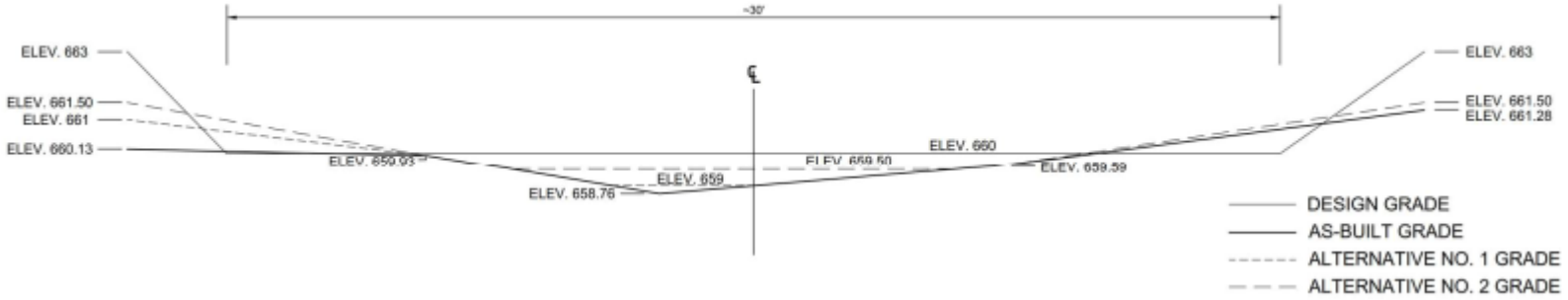
Lessons Learned

- As constructed, the overflow spillway did not conform to the design to control the 10-year and 25-year design storms
- Two modification alternatives were presented to MSDGC to meet design intent with minimal additional work.
- MSDGC decided on modifying the spillway according to alternative #2

	Design	Alt #1	Alt #2
Top Elevation of Spillway (ft)	663.00	661.00	661.50
Spillway Elevation (ft)	660.00	659.00	659.50
10-Year WSE (ft)	658.76	658.97	658.97
25-Year WSE (ft)	659.36	659.52	659.58
10-Year Total Peak Discharge (cfs)	11.79	5.74	5.74
25-Year Total Peak Discharge (cfs)	50.98	56.47	51.84
10-Year Flow Through Spillway (cfs)	0.00	0.00	0.00
25-Year Flow Through Spillway (cfs)	0.00	9.43	0.60



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Lessons Learned

- Detention basin outlet structure clogged with debris.

- Recommendations:
  - Remove trash grate and restrictor plate
  - Install perforated 4” PVC pipe and cleanout
  - Cover pipe with stone to filter out large debris

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Construction Cost

- Final Construction Cost: $3.14 million

- Significant Construction Elements
  - Channel Restoration: $1.3 million
  - Storm Sewers: $565,000
  - Ledge Rock Retaining Wall: $42,000
  - Log Vanes and Grade Control: $147,000
  - Trees, Vegetation, Erosion Mat: $375,000
  - Adjust Combined Sewer Castings: $40,000

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Quebec Heights By The Numbers

- 5,500 Total Feet of Channel
- 3,200 Feet of Channel Restoration
- 1,300 Feet of Storm Sewer
- 16 Log Vane Structures
- 16 Buried Grade Control
- 825 LF of Step Pools
- 11,500 SY Erosion Control Mat
- 8,229 SY Native Seeding
- 32,612 Native Plugs
- 177 Woody Shrubs
- 229 Trees 1.5” Caliper

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Project Summary

- Benefits of using natural open channel conveyance for combined sewer separation
  - Minimize disturbance to the natural areas
  - Convey the 100-year flow
  - Provide flood control benefits with in-line pond
  - Stabilize eroding channel
  - Eliminate cross-connections with sewers
  - Provide natural habitat – additional vegetation
  - Provide water quality and quantity benefits through BMPs

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