STREAM RESTORATION FOR MS4 CREDITS IN THE SAWMILL RUN AND OHIO RIVER WATERSHEDS

PROJECT PARTNERS

pennsylvania
DEPARTMENT OF TRANSPORTATION

PITTSBURGH WATER
PGH2O

PENNA
TURN
PIKE

LRG

Hunt Valley
Environmental, LLC

THE MS4 PROJECT

What is MS4

- Municipalities must obtain permit coverage from the PA Department of Environmental Protection (DEP) to discharge stormwater from **M**unicipal **S**eparate **S**torm **S**ewer **S**ystems (**MS4**s) into rivers and streams.
- As part of the MS4 permitting program, municipalities submit a Pollution Reduction Plan (PRPs) which require reductions in the total amount of sediment, nitrogen, and phosphorus pollutants discharging into the waterways.
- The DEP's regional offices inspect MS4 municipalities to determine if the MS4 is meeting its permit obligations.
- The City of Pittsburgh (Pittsburgh Water), the Pennsylvania Dept of Transportation, and the PA Turnpike Commission all have PRPs with MS4 pollution loading reduction requirements

THE MS4 PROJECT

- PennDOT and Pittsburgh Water request bids for a project to construct Best Management Practices (BMPs) that reduce sediment pollution discharging to the Sawmill Run and Ohio River Watersheds

- All BMPs developed under this contract must conform to the Commonwealth of Pennsylvania Department of Environmental Protection (PADEP) Guidance Documents

- There must be direct nexus between the BMPs and water quality improvement for waterways in the watershed impaired by sediment from urban areas

THE MS4 PROJECT

- The services and required items of work includes:
  - Siting
  - Design, permitting (Chapter 102, Chapter 105, and any Pollutant Reduction Plan revisions)
  - Acquisition of property interests
  - Construction and inspection
  - Monitoring during- and after construction
  - Long-term operation and maintenance of the BMPs

SITING

- Pittsburgh Water site had to be located within the Sawmill Run Watershed in the Pittsburgh City limits
- The Sawmill Run watershed is 86% urbanized, site selection for the project was extremely limited
- The Turnpike Site had to be in an impaired watershed within a mile of the Turnpike System, in an urbanized area in the Ohio River Watershed
- Work had to be completed on a 1st, 2nd, or 3rd order stream

SITING

- Pittsburgh Water and PennDOT Sites
  - Moore Park Greenway
    - Owner: City of Pittsburgh and Pittsburgh Public Schools
    - Located below the soccer fields
    - Receives runoff from parking area, tennis courts, pool, soccer and baseball fields
  - Crane Ave Greenway
    - Owner: City of Pittsburgh
    - Receives runoff from Crane Ave and Brashear High School
- PA Turnpike Commission Site
  - Boyce Park
    - Owner: Allegheny County
    - Receives Runoff from the Boyce Park Ski Area, Lodge, and parking lots

DESIGN

- PRP Revision – Revisions needed to the PennDOT PRP, City of Pittsburgh PRP, and the PA Turnpike PRP
- The work had to adhere to one of the eligible protocols covered in the Chesapeake Bay *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects*
- This Project used Protocol 1 and Protocol 3 of the Recommendations
- Specifically, Stream Valley Restoration techniques were used to achieve the reduction goals
- This project used the 2020 recommendations additional updates occurred in 2022

DESIGN

- Protocol 1 – Credit for Preventing Sediment during Storm Flows
- Protocol 3 – Credit for Floodplain Reconnection Volume
- Stream Valley Restoration
  - Repositioning of the stream back to the center of valley
  - Reconnection to the floodplain – creating microtopography
  - Restoration of the groundwater table
  - Creating valley wide grade control
    - Allow some lateral movement of the channel, prevent head cut
    - Promote channel braiding and multiply channel development

DESIGN

Table 3. Designation of streambank armoring practices

Tier	Examples
Non-Creditable **Definition: Hard, permanent structures used to protect critical infrastructure and stabilize banks. Techniques are not consistent with long-term, comprehensive restoration approaches.**	• Concrete Retaining Wall • Sheet Piling/Planking • Gabion • Engineered Block Walls • A-Jacks • Dumped Rip Rap
Creditable w/ Limits[1] **Definition: Large rock or boulder structures that harden a limited portion of a bank or bank toe in a localized area.**	• Localized stone toe protection • Boulder Revetments • Non-biodegradable soil stabilization mats • Imbricated Rip Rap
Creditable **Definition: Structures that mimic naturally occurring streambank materials, features that provide aquatic habitat function, and limited in-stream grade control.**	• Root wad Revetments • Live stakes/coir logs • Soil lifts[2] • Riffle-weir series (including cobble in appropriate physiographic regions) • Berm-pool cascades • J-hooks and cross-veins

[1] Some bank stabilization practices used for stream restoration, such as imbricated riprap and boulder revetments, are designed to create void spaces that provide hiding and cover areas for fish. for a general description of common bank stabilization and grade control practices, please consult Appendix B of Brown (2000), which is reproduced as Appendix G of this report.

[2] Soil lifts typically require some form of toe protection. The toe protection used should establish the defining armoring category (ex. soil lifts over boulder revetment would be creditable with limits. Soil lifts over coir log would be creditable).

DESIGN

- Estimated Sediment Reductions:
  - 357,739 lb/yr for PennDOT;
  - 488,528 lb/yr for Pittsburgh Water,
  - 176,985 lb/yr for the Turnpike
    - all calculated at @ 50% efficiency
    - PennDOT reductions use BANCS Method at Moore Park and Crane Ave.
    - Pittsburgh Water used their default rate (115 lbs/ft) at Moore Park and BANCS Method at Crane Ave.
    - Turnpike used their default rate (115 lbs/ft) at Boyce Park

DESIGN

- Stormwater detention volume
- Pittsburgh Water had a self-imposed reduction of the twenty-five (25) year, twenty-four (24) hour storm event down to the one (1) year twenty-four (24) hour storm event peak rates due to localized flooding
- Two rain gardens were designed at Moore Park
- One rain garden was designed at Crane Ave

PERMITTING

Moore Park and Crane Ave:

- CCD E&S Approvals
- PA DEP Chapter 105 Waiver 16 from PA DEP Regional Permitting Coordination Office (RPCO)
- ACOE PASPGP-6 Approval
- City of Pittsburgh Stormwater Review
- Lands Operations Permit
- Pittsburgh City Forestry Coordination (Required replacement of trees removed)

- Boyce Park
  - CCD E&S Approvals
  - PA DEP Chapter 105 JPA from PA DEP Southwest Regional Office
  - ACOE PASPGP-6 Approval

PROPERTY INTEREST

- City of Pittsburgh
  - Moore Park – Right to Enter
  - Crane Ave – Right to Enter
  - Resource Management Plan
- Allegheny County
  - Boyce Park – Land Use Agreement
  - Resources Management Plan
  - Provide an endowment for long term O & M

CONSTRUCTION STREAM VALLEY RESTORATION

- Stream Valley Restoration
  - Stream were excavated and relocated to the edge of the valley

Restoration repositions the stream to the center of the valley

and reconnects it to the floodplain

CONSTRUCTION STREAM VALLEY RESTORATION

- Stream Valley Restoration

- Benefits
  - Improves Water Quality
  - Flood Management
  - Habitat Restoration and Biodiversity
  - Bank Stabilization
  - Recharge Ground Water
  - Climate Resilience

- Drawbacks
  - Ecological Destruction
  - Physical Constraints
  - High Cost

CONSTRUCTION STAGE ZERO

- **Stage 0 Stream Restoration** is a valley-scale approach that reverses degradation by filling incised channels to reconnect streams with their floodplains, creating a braided, resilient wetland network. It aims to "reset" the ecosystem to a pre-disturbance condition (Stage 0), enhancing habitat complexity, raising water tables, and promoting natural self-sustaining processes.
- **Key Aspects**
  - Valley Floor Reset
  - Process-Based
  - Anabranching Channels
  - Increased Biodiversity
  - Flood Mitigation

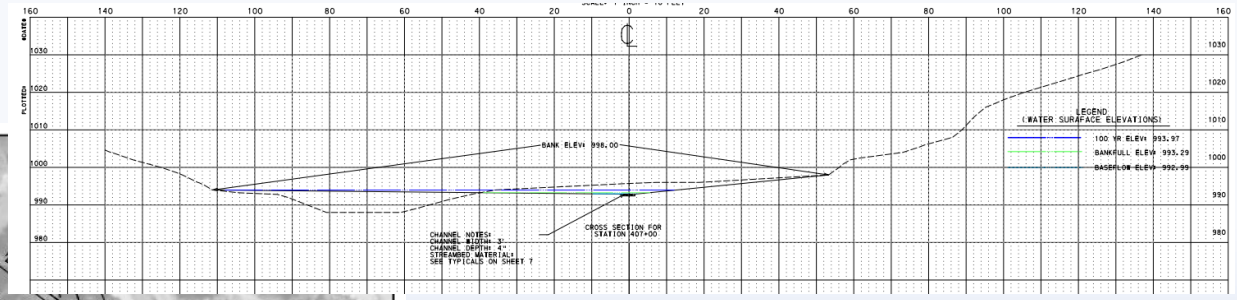
CONSTRUCTION MOORE PARK

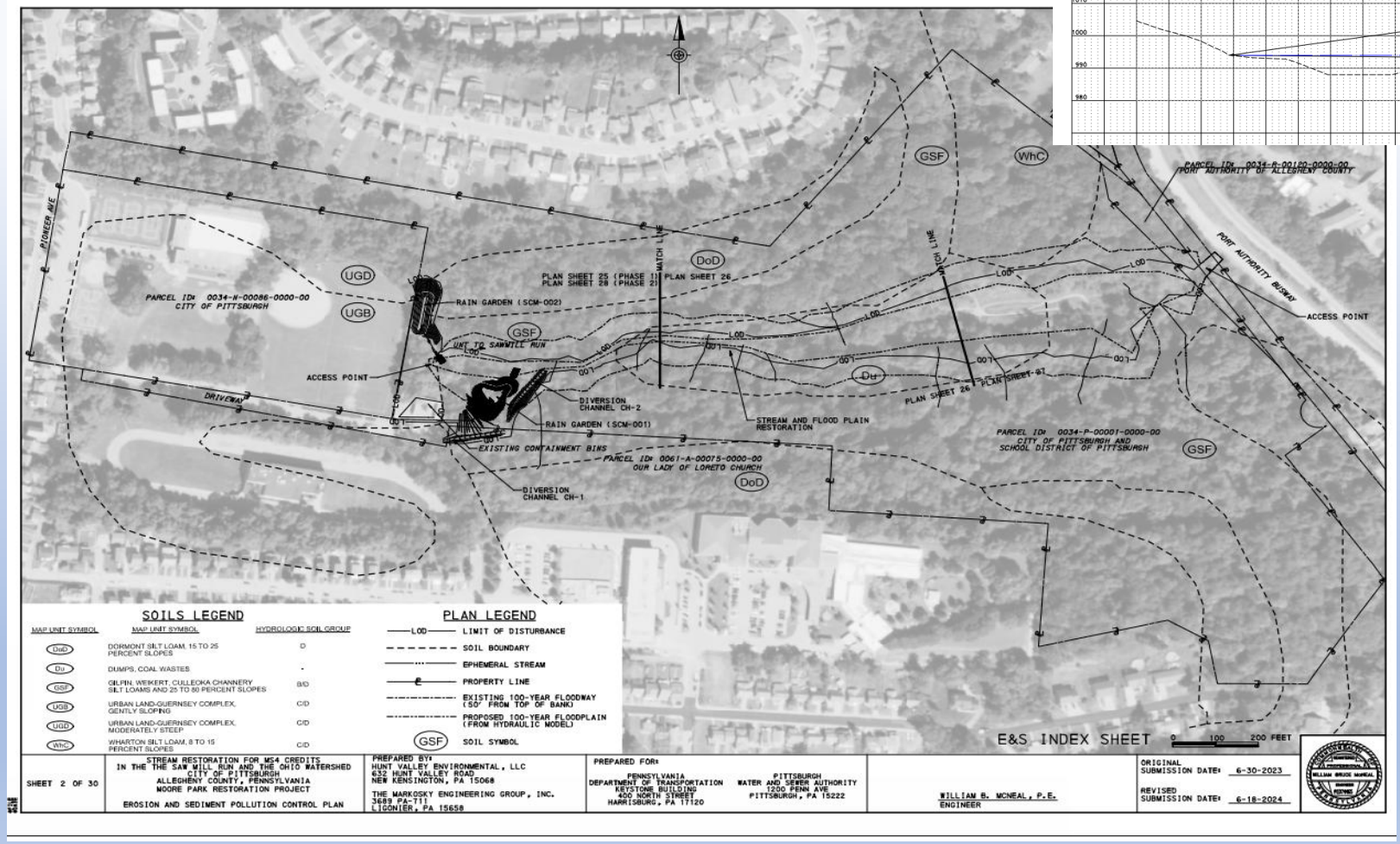
MOORE PARK PROJECT

- The property is owned by the City of Pittsburgh and the Pittsburgh Public Schools
- The stream is 1,981 LF in length originating at the Moore Park Soccer Fields flowing east towards the PRT Busway
- HVE completed stream and floodplain restoration and the construction of 2 bioretention/raingarden facilities at the headwater to reduce the sediment load of the stream and increase the stormwater retention

CONSTRUCTION MOORE PARK

MOORE PARK PROJECT





Restoration methods/BMPs :

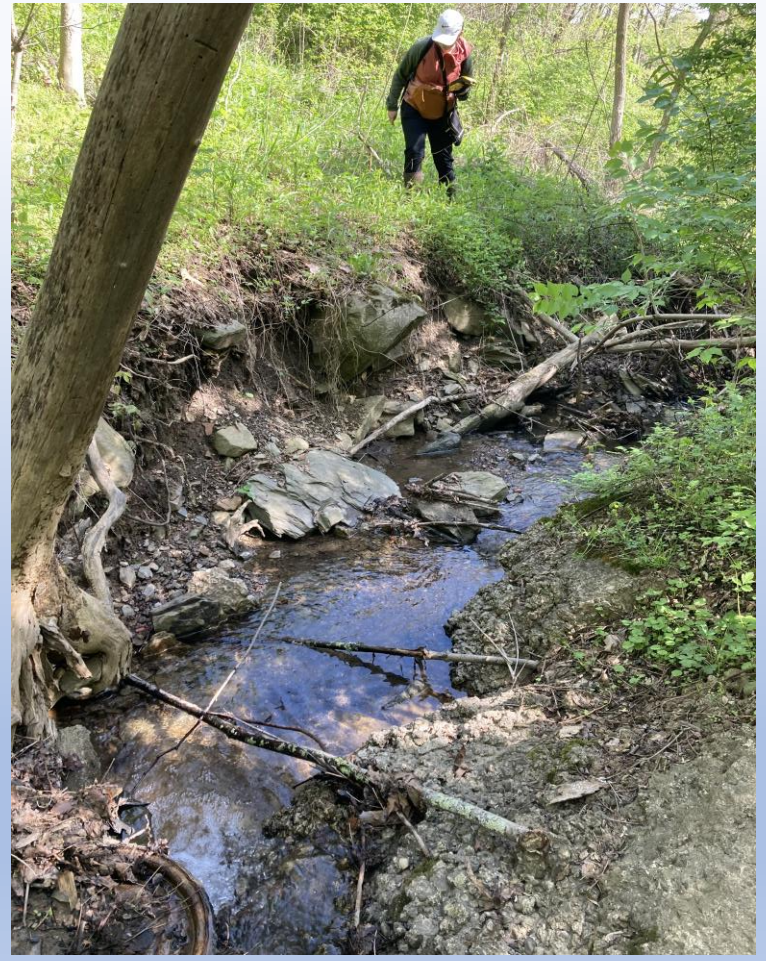
- Stream Valley Restoration
- Stream Channel Stabilization
- Rain Garden Construction
- Landscape Restoration

CONSTRUCTION MOORE PRK

Pre-construction Conditions

CONSTRUCTION MOORE PARK

Pre-construction Conditions



CONSTRUCTION MOORE PARK

- Vegetation Removal and Grading of the Stream Valley

CONSTRUCTION MOORE PARK

- Log Grade Control Installation

CONSTRUCTION MOORE PARK

- Planting the Restored Valley
  - Number of trees/shrubs being planted 2100

CONSTRUCTION MOORE PARK

Vegetation Re-establishment

CONSTRUCTION MOORE PARK

- Rain Garden Construction

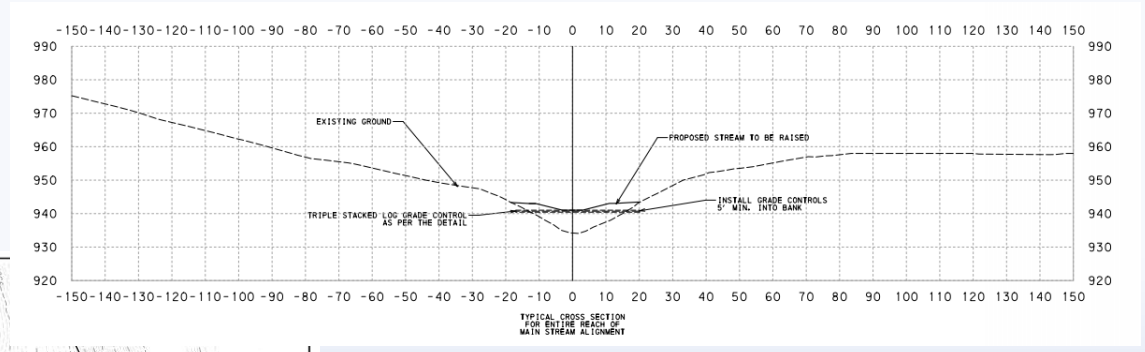
CONSTRUCTION CRANE AVE

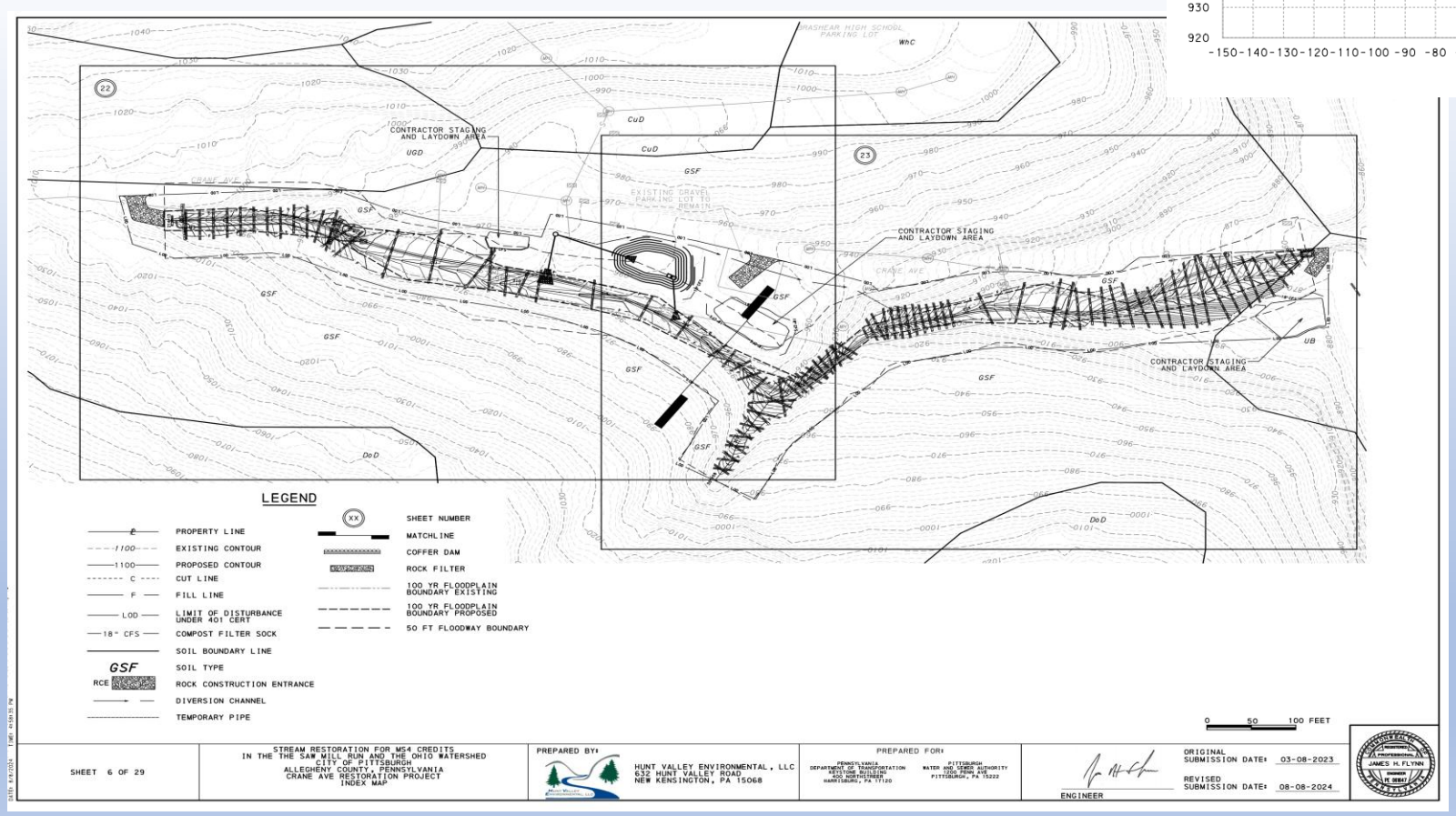
BEECHVIEW GREENWAY CRANE AVE PROJECT

- The property is owned by the City of Pittsburgh
- The stream is 1,722 LF in length originating at the Brashear Highschool Drive flowing east along Crane Ave.
- HVE completed stream and floodplain restoration and the construction of a bioretention/raingarden facilities to reduce the sediment load of the stream and increase the stormwater retention

CONSTRUCTION CRANE AVE

BEECHVIEW GREENWAY
CRANE AVE PROJECT





Restoration methods/BMPs :

- Stage Zero Restoration
- Stream Channel Stabilization
- Rain Garden Construction
- Landscape Restoration

CONSTRUCTION CRANE AVE

- Pre-construction Conditions

CONSTRUCTION CRANE AVE

- Stream Valley Grading

CONSTRUCTION CRANE AVE

- Final Grading and Matting Installation

CONSTRUCTION CRANE AVE

- Rain Garden Installation

CONSTRUCTION CRANE AVE

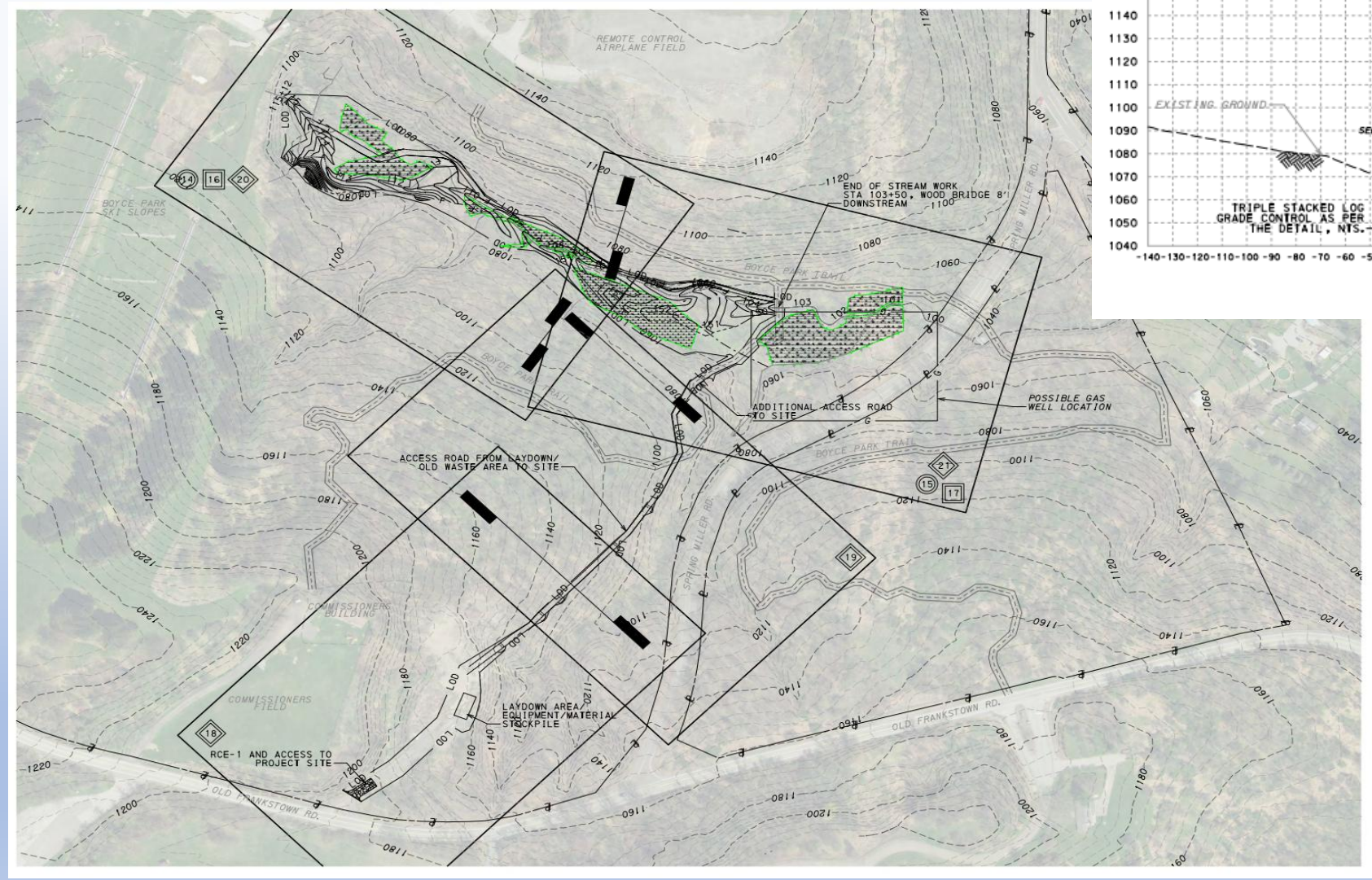
- Vegetation Re-establishment
  - number trees/shrubs being planted 1400

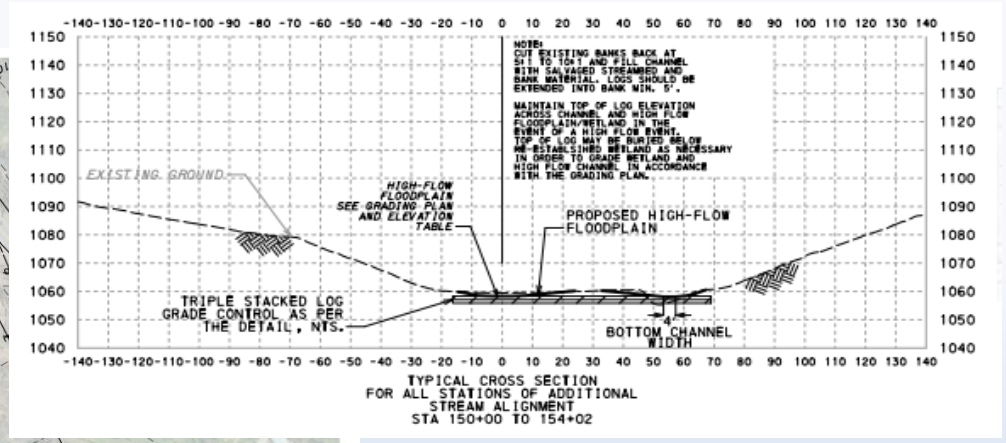
CONSTRUCTION BOYCE PARK

BOYCE PARK PROJECT

- The property is owned by Allegheny County
- The stream is 1,600 LF in length originating at Boyce Park Ski Area flowing north to Peirson Run.
- HVE completed stream and floodplain restoration and the construction of a stabilized runoff channel to collect snow melt from the ski area

CONSTRUCTION BOYCE PARK





Restoration methods/BMPs :

- Stream Valley Restoration
- Floodplain Restoration
- Stream Channel Stabilization
- Landscape Restoration
- Regenerative Stream Conveyance

CONSTRUCTION BOYCE PARK

- Pre-construction Conditions

CONSTRUCTION BOYCE PARK

- Floodplain Restoration and Collection Channel Construction

CONSTRUCTION BOYCE PARK

- Re-vegetation
  - number trees/shrubs being planted 1300

CONSTRUCTION STREAM VALLEY RESTORATION

Shrader Hollow Floodplain Restoration

Hempfield Township, Westmoreland County

CONSTRUCTION STREAM VALLEY RESTORATION

- Three Lick Run Floodplain Restoration
  - Allegheny Township, Somerset County

CONSTRUCTION STREAM VALLEY RESTORATION

- Furnace Run Dam Removal and Floodplain Restoration
  - Ligonier Township, Westmoreland County

MONITORING

- Monitoring Plan Assessments
  - Tree and shrub survey
  - Photographs of site after rain events
  - Pennsylvania Rapid Comprehensive Reach-Level Assessment Protocol (PA RCLRAP) survey
  - Visual stream observations with pictures
  - Grade control inspection
  - Riparian vegetation survey
  - Bank Assessment for Non-point Source Consequences of Sediment (BANCS) assessment

MONITORING

- Performance Standards

Monitoring Component	Performance Standard
Tree and Shrub Survey	Minimum 65% survivability and an average density of 435 plants per acre
Photographic Documentation	Evidence that the stream is accessing its floodplain under appropriate flow conditions
PA RCLRAP Assessment	Demonstrated improvement from pre-construction scores
Visual Inspections	No visible erosion, bank failure, or grade control instability
Riparian Vegetation	At least 70% stabilization and density across the project area
BANCS Evaluation	Rating of low or very low
Stream Geometry	Bank walls < 1 ft; bank full at a 2-year storm event; reduced bank angles; average width ≈ 4 ft; baseflow depth < 1 in; sinuosity consistent with pre-construction; stable substrate; slope within specified range

LONG TERM O & M

- Moore Park and Crane Ave.
  - Hunt Valley will be responsible for five (5) years of monitoring and maintenance
  - After five (5) years Pittsburgh City Parks Department will continue to monitor as needed

- Boyce Park
  - Hunt Valley will be responsible for five (5) years of monitoring and maintenance
  - After five (5) years Allegheny County Parks Department will continue to monitor as needed

- A fund will be established as needed to assist in the long-term monitoring and maintenance in the form of an endowment or one time payment

QUESTIONS

- Questions/Discussion?