

Cascade Metro Park Cuyahoga River Restoration Valley View Phase 2 (NA16NMF4630341)

Post-Construction Monitoring Report: Year 2 (2022)

January 2023



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Describing the methods and results of multiple metrics for post-construction monitoring for the former Valley View golf course restoration project in Cuyahoga Falls, Summit County, Ohio.

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i) **PERSONS INVOLVED WITH THIS INVESTIGATION**

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 - Project Manager, Design
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I INTRODUCTION

This report summarizes the post-construction and restoration monitoring efforts and results for the Cascade Metro Park Cuyahoga River Restoration Valley View Phase 2 Project (NA16NMF4630341) (*Project*), the methods for which are outlined in the Monitoring Plan for the Cascade Metro Park Cuyahoga River Restoration Valley View Phase 2 Project (NA16NMF4630341) (*Monitoring Plan*) [1]. Monitoring was conducted by Summit Metro Parks (SMP) biologists as well as EnviroScience, Inc., outside contractors.

Phase 1 Objectives:

The Project’s Phase I Objectives were to restore the 200-acre property from a heavily altered golf course back to an ecologically well-functioning section of the Cuyahoga River by and natural habitat by:

- Restoring approximately 33 acres of wetlands from former water hazard ponds
- Restore approximate 4,500 linear feet of headwater stream
- Remove exotic species throughout the property
- Seed approximately 200 acres with native seed mixes
- Reforest approximately 116 acres of the property

Phase 2 Objectives:

Phase 2 Objectives, about which this report is concerned, were to restore approximately 5,000 feet of the Cuyahoga River to remove Area of Concern (AOC) Beneficial Use Impairments (BUI) by implementing the following Project goals measured by the following performance goals.

Table 1: AOC BUI Project Goals and Performance Goals

Project Goals	Performance Goals	Monitoring Method
Improve the in-stream habitat to primarily focus on removing BUIs for fish population, benthos, and loss of fish habitat	Attainment of WWH Criteria with IBI Narrative Range Scores of ≥ 40 or 36-39	Ohio EPA biological criteria for IBI
	Attainment of WWH Criteria with ICI Narrative Range Scores of ≥ 34 or 30-33	Ohio EPA biological criteria for ICI
	QHEI 74-84	Ohio EPA biological criteria for QHEI
Restore hydrologic connection to an accessible floodplain	Bank Height Ratio 1.0-1.2 in Tier 1 floodplain expansion areas	Morphologic Cross Section Survey
	Increase bankfull recurrence interval flood prone width by at least 2x in floodplain expansion areas	Morphologic Cross Section Survey
	Verify regular inundation / utilization of restored floodplain areas	Visual Observations / USGS Gage readings / On-site water level monitor

Funding was secured from the National Oceanic and Atmospheric Administration (NOAA), The Great Lakes Commission (GLC), and Ohio Public Works, Clean Ohio Conservation Fund (Clean Ohio). Project

success and attainment is measured by several required metrics for reporting. Deviations from the monitoring plan, supplemental monitoring, and recommendations for further monitoring will be discussed in applicable sections in the body of the report.

These environmental data and related items of information have not been formally disseminated by NOAA, and do not represent and should not be construed to represent any agency determination, view, or policy.

Table 2: Monitoring Schedule

Monitoring Effort	Agency Reporting Requirements	Monitoring Year				
		Year 1 (2021) COMPLETE	Year 2 (2022)	Year 3 (2023)	Year 4 (2024)	Year 5 (2025)
As-Built Survey	NOAA, AOC/Ohio EPA	X				
Stream Morphology	NOAA, AOC/Ohio EPA	X	X	X	X	X
IBI	AOC/Ohio EPA	X		X		X
QHEI	AOC/Ohio EPA	X		X		X
ICI	AOC/Ohio EPA	X		X		X
USGS Staff Gage	NOAA, AOC/Ohio EPA	X	X			
Wreck Line Photos	NOAA, AOC/Ohio EPA	X	X			
Reporting	NOAA, AOC/Ohio EPA	X	X	X	X	X

Instream habitat enhancements included boulder and cobble clusters, as well as woody debris placements. Boulder types are ODOT A+, A, B, C, and D sizes, arranged as per plan. Specified quantities are included below.

Table 3: Cuyahoga River Habitat Enhancement Structure Descriptions and Quantities

Habitat Item	Quantity
Boulder Structures	359
Woody Habitat Structures	117

2 METHODS

Monitoring methods listed below are derived directly from the Monitoring Plan [1].

2.1 HABITAT METRICS

2.1.1 As-Built Survey / Stream Morphology / Hydrologic Reconnection

Per the Monitoring Report [1]: To satisfy NOAA Tier I monitoring requirements for hydrologic connectivity, as well as address the Ohio EPA BUI for hydrologic connectivity, EnviroScience completed an as-built survey with spatial coverage and resolution that is comparable to the level of detail and contours available from pre-design surveys and in the design drawings. The as-built drawings show the final elevations and cross sections of the channels, and land installed or altered by the project. Summit Metro Parks also evaluated morphologic cross sections following the approved QAPP and methods outlined within that document using sound surveying practices. Permanent cross-section pins were established to facilitate annual re-survey. Cross sections were established during the as-built phase of the project and marked with a start and end pin.

The cross-section locations identified in Attachment A are designed to evaluate the major work areas of the project and to demonstrate hydrologic reconnection of floodprone areas. These cross sections will be surveyed annually to evaluate changes each year for the duration of the monitoring period (five years). Data collection shall be performed by a qualified person that is trained in the identification and survey of morphologic features, as outlined in the approved QAPP.

The cross-sectional evaluation will identify key features annually at each cross section to facilitate comparison and analysis. Bankfull is a key feature that marks the active floodplain and provides a consistent reference point for use in comparing rivers. It is generally associated with the point prior to floodplain inundation. Correct identification is necessary for stream classification and description of morphological variables. Personnel performing the monitoring seek indicators in locations appropriate for stream types and use multiple indicators to reinforce bankfull estimates. Bankfull indicators should be generally consistent through an entire reach and at a consistent elevation above the water surface.

Each cross section begins on the top of the start pin called the “left end pin” (LEP) on the left bank of the river. The left and right banks are defined in a downstream direction. Cross-sectional data were recorded using specific notation to denote key features. Data recorded in-between key features were recorded with a “ground” or “g” note. The toe of the floodplain and top of bank on the grade out to the original terrace shall be identified. Bankfull (BKF) feature(s) were identified, at a minimum, on one bank right or left. The active channel begins below the bankfull location. Recording of station and elevation will continued into the active channel with changes every 0.1-0.3 ft in elevation. All shots were recorded as stream bed (SB) unless they are the following required locations. The stations and elevation of the current left and right edges of water (LEW and REW), which is where the water level hits the side of the bank, were marked. The thalweg (THL) was identified in each section. The thalweg is deepest point in the channel.

See the diagram below as a visual representation of the key features for each cross section. The number of points will vary for each section to capture the proper detail.

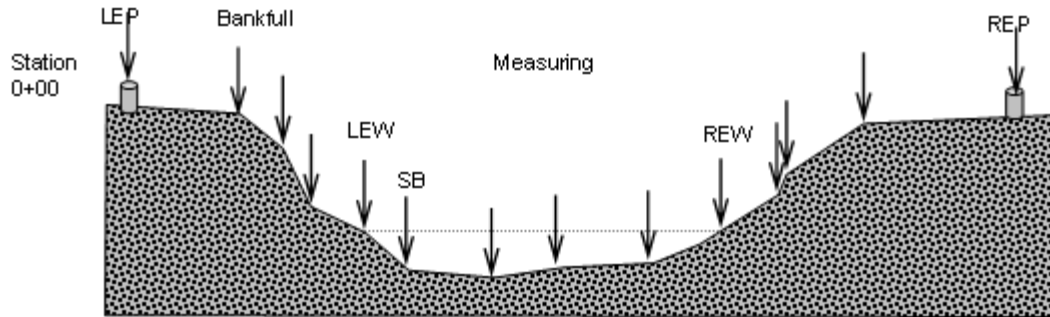


Figure 1: Key Features for Each Cross Section

2.1.2 USGS Staff Gage / Flood Monitoring

The USGS gage (USGS 04206000 Cuyahoga River at Old Portage OH) was used to determine major flooding events. Supplemental river level data was supplied by two Intellisense Systems, Inc. (20600 Gramery Place, Torrance, CA 90501; 310.320.1827) monitors installed at the southeast and northwest areas of the Project. Representative photos of river levels and debris were taken during flooding events where the Cuyahoga River has risen into the adjacent floodplain.

3 RESULTS: RESTORATION METRICS FOR PHASE 2

3.1.1 As-Built Cross Sections / River Morphology

Per the monitoring requirements, four cross sections of the restored Cuyahoga River floodplain were completed. As-builts were reviewed and approved by project partners. See Appendix A for data sheets and Appendix C for relevant photos.

Four cross sections (XS1-XS4) were surveyed to document the post-construction condition (Attachment A Sampling Locations). Each cross section should be evaluated with consideration of each respective X and Y axis scale, especially the X axis as some cross sections are considerably wider than others. Table 2 provides a morphologic summary of the cross-sectional data with respect to the bankfull (BKF) indicators. Width depth ratio (W/D) is a parameter to describe channel shape. The Cuyahoga River in this reach is characterized as a Type C channel by the Rosgen classification system. In other words, it is a meandering, low gradient (>2.0%) stream in a wide terraced alluvial valley.

Comparison between the Year 1 (2021) and Year 2 (2022) cross section data shows very little difference indicating a stable bed load and, hopefully, a completed restoration of the Cuyahoga River in this park.

Table 4: Morphologic Cross Section Parameters Summary

XS	BKFW (ft)	BKF Area (ft ²)	BKF mean depth (ft)	BKF max depth (ft)	W/D	Feature
1	111.2	468.2	4.21	7.11	26.4	Riffle
2	91.1	390.4	4.33	5.54	20.8	Riffle
3	87.5	565.2	6.46	10.22	13.54	Pool
4	94.6	582.2	6.16	8.82	15.36	Riffle

Please see Appendix A for completed Cross Sections.

3.1.2 USGS Staff Gage / Flood Monitoring / Hydrologic Reconnection

Per the Monitoring Plan, two flow meters (Intellisense Systems, Inc.) were installed at the Project site to corroborate the USGS staff gage just downstream (USGS 04206000 Cuyahoga River at Old Portage OH). Unfortunately, the monitors continue to be plagued by technical faults and the USGS gage remains the most reliable source of data.

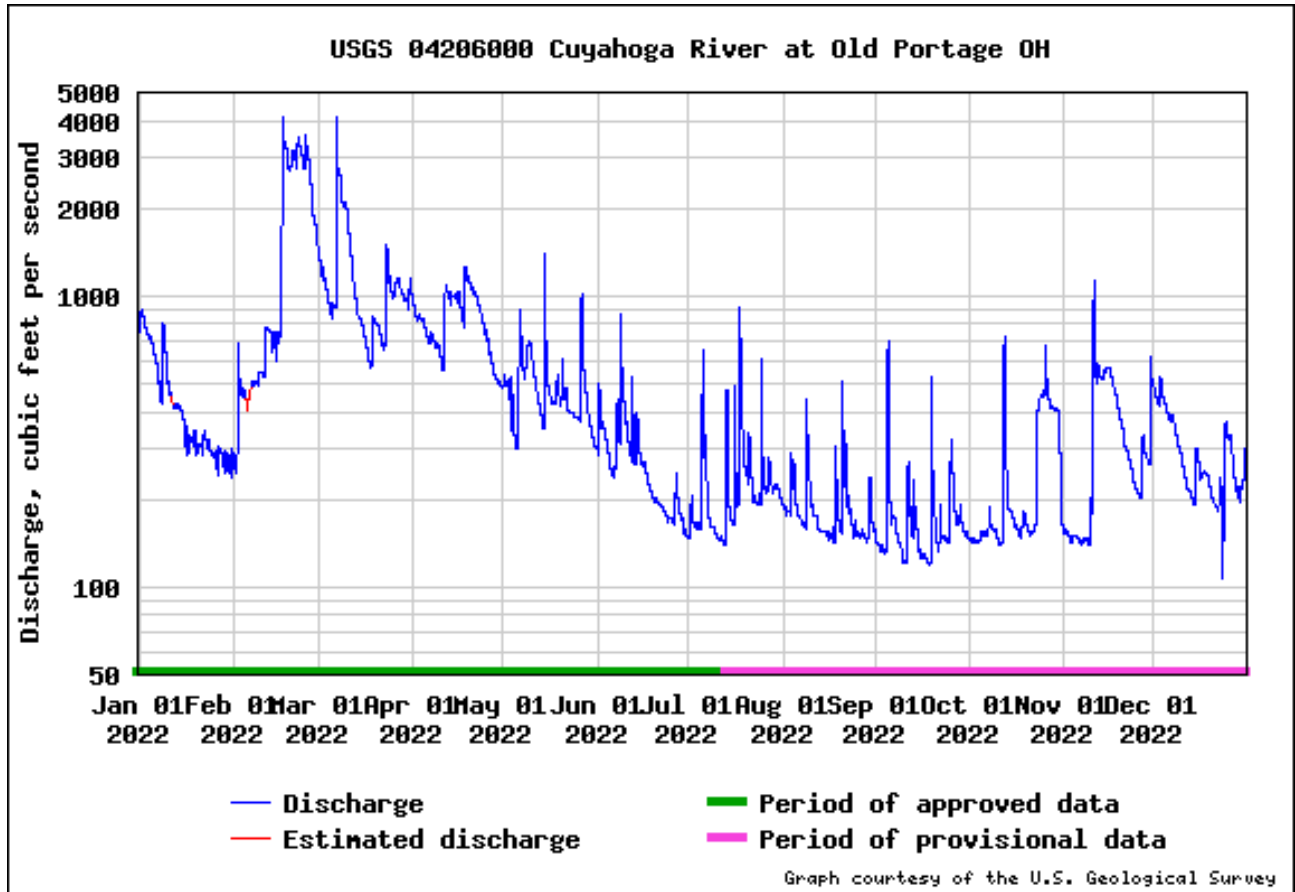


Figure 2: USGS Staff Gage at Old Portage Site, Valley View 2022

Two major flooding events were recorded in 2022, February 18 and March 8. Photos were taken of the flooding events and the floodplain is behaving as designed and desired. Discharges above ~3,800 cubic feet per second will expand the river into the restored floodplain and potentially alleviate downstream flooding events.



Photo 1: Flooding Event, Feb. 18 at Valley View Showing River Elevations and Debris Accumulation

Deviations from the Monitoring Plan: Onsite flood/flow monitors were malfunctioning or non-operational for much of the monitoring period and therefore could not be completely correlated with the USGS data.

Recommendations for Continued Monitoring: None. Year 3 (2023) will not have mandatory flood monitoring. Should the floodplain no longer behaves as designed, monitoring will continue.

3.1.3 Adaptive Vegetation Management

Davey Resource Group was contracted to manage invasive species in Valley View in 2022. Crews visited the site seven times through late summer treating woody shrubs and vines, as well as knotweed, mugwort, *Phragmites australis*, and non-native hops. This work completed remaining contract value of the \$50,000 contract for 2021 for 10 visits.

Additionally, River Reach had 899 trees replaced in early 2022 to fulfill their initial contract guarantee. Tree losses were identified by EnviroScience and agreed upon by all parties in late 2021. Monitoring funding of \$20,000 was agreed to be used to contract EnviroScience to cage these replacement trees (completed) and remove the cages after five years.

4 SUMMARY AND DISCUSSION

Restoration monitoring of the Cascade Valley Valley View Restoration consisted of cross sections / river morphology as well as flood events and wrack line monitoring.

Table 5 indicates the pre-and post-restoration attainment status for the sampling sites for the monitoring year 2021. Site 1 reached attainment in the first year following restoration, Site 2 is anticipated to reach attainment by Year 3 (2023) of monitoring as the restoration matures.

Monitoring will continue in 2023 with a full suite of metrics as noted in Table 2, except for the USGS gage and wrack line monitoring, which is now completed.

Table 5: Attainment Contrast Pre-and Post-Restoration Efforts for Year 1 (2021)

Year/RM		QHEI	IBI	MIwb	ICI Narrative WWH / CWH Result	Narrative	Attainment
2019 (Baseline)							
42.1 (Site 1)		73.50	34	6.93	Marginally Good	F ¹ /F	NON
41.6 (Site 2)		68.75	30	5.07	Fair	F/P ²	NON
41.4 (OEPA)		60.5	38	7.51	Marginally Good	MG ³ /F	PARTIAL
2021 (Year 1)							
42.1 (Site 1)			36	8.39		MG/MG	FULL
			38	7.83		MG ^N /F	PARTIAL
	Average	85.75	37	8.11	Fair	MG/MG	FULL
41.6 (Site 2)			38	7.83		MG/F	PARTIAL
			30	6.27		F/P	NON
	Average	85.00	34	7.05	Fair	F/F	NON

Phase I – Funded by Clean Ohio (1.14 million dollars)

Complete - A total of 120 acres of former golf course restored to natural area including:

- Wetlands (wooded wetlands, open marsh, emergent wetlands (28-acrtes)
- Headwater stream habitat (2,500 linear feet)

¹ F = Fair (significant departure from ecoregional biocriterion for attainment)

² P = Poor (significant departure from ecoregional biocriterion for attainment)

³ MG = Marginally Good (non-significant departure from ecoregional biocriterion for attainment)

- Upland meadow (that will transition to forest (90-acres)

Phase 2 – Funded by NOAA and GLC (2.5 million dollars)

Riparian/Floodplain Habitat Restored:

Complete - A total of 55.03 acres of riparian/floodplain habitats have been restored as detailed below:

- Floodplain Reforestation (non excavated) = 15 AC
 - These areas were existing floodplains that had been seeded with a native mix during the Phase 1 project and reforested as part of the Phase 2 project.
- Tier 1 Floodplain Forest (excavated) = 3.10 AC
 - Tier 1 floodplain was designed to be flooded by the 1.1-1.5 year storm, sand deposition and deep floodwaters are anticipated within these areas.
- Tier 2 Floodplain Forest (excavated) = 4.10 AC
 - Tier 2 floodplain was designed to be flooded by the (approx.) 1.5 – 2-year storm, and is on average 1.5-2 feet higher than the Tier 1 floodplain. To promote woody tree recruitment and limit competition from herbaceous species, topsoil was not replaced within this tier.
- Forested Wetland/Marsh = 4.2 AC
 - Two existing golf course ponds were filled to create wetland areas; minimal grading was completed in adjacent areas to create wetlands and allow additional flows to cross behind the floodplain tiers and outlet at the downstream end of the project area.
- Upland Area (Meadow/Savannah) Restored: 7 AC
 - This rare upland habitat was established in a small area around the proposed river access point and in association with the future access road
- Riverine Habitat = 13.63 AC
 - The surface area of the Cuyahoga River (bank to bank) was included as part of the proposed restoration area. The full extent of the riverine habitat was restored and is detailed in the section “Stream Habitat Made Available or Restored” (below).
- Post-COVID Public Reforestation Area – 8 AC
 - A small portion of the northwest project area is currently a mix of native meadow that was established during the Phase 1 project. It was not planted with trees during the Phase 2 project and is set aside for a future post-COVID volunteer/public tree planting.

Stream Habitat Made Available or Restored

Complete – A total of_ 4750 LF of mainstem of Cuyahoga River has been restored.

- Begin Construction @ Sta. 11+00 (N:533472.16, E: 2234087.36) – End Construction @ Sta. 58+50 (N:530872.45, E: 2235940.98)
 - Coordinates are in NAD83 OH-N, FT
- Within this stream habitat restoration area, approximately 4300 LF of floodplain was restored and 1946 LF of bank was stabilized. See planting, seeding, and habitat installation metrics below which also occurred within this 4750 LF reach.

Socioeconomic factors include decreased public hazard by reshaping steeply eroded and potentially hazardous banks to restore floodplain connectivity and protect existing infrastructure with the added

benefit of making river access safer and easier, total conversion from private, exclusive land access to public greenspace, and connectivity to the Cuyahoga River water trail.

Monitoring efforts will continue for Year 3 (2023).

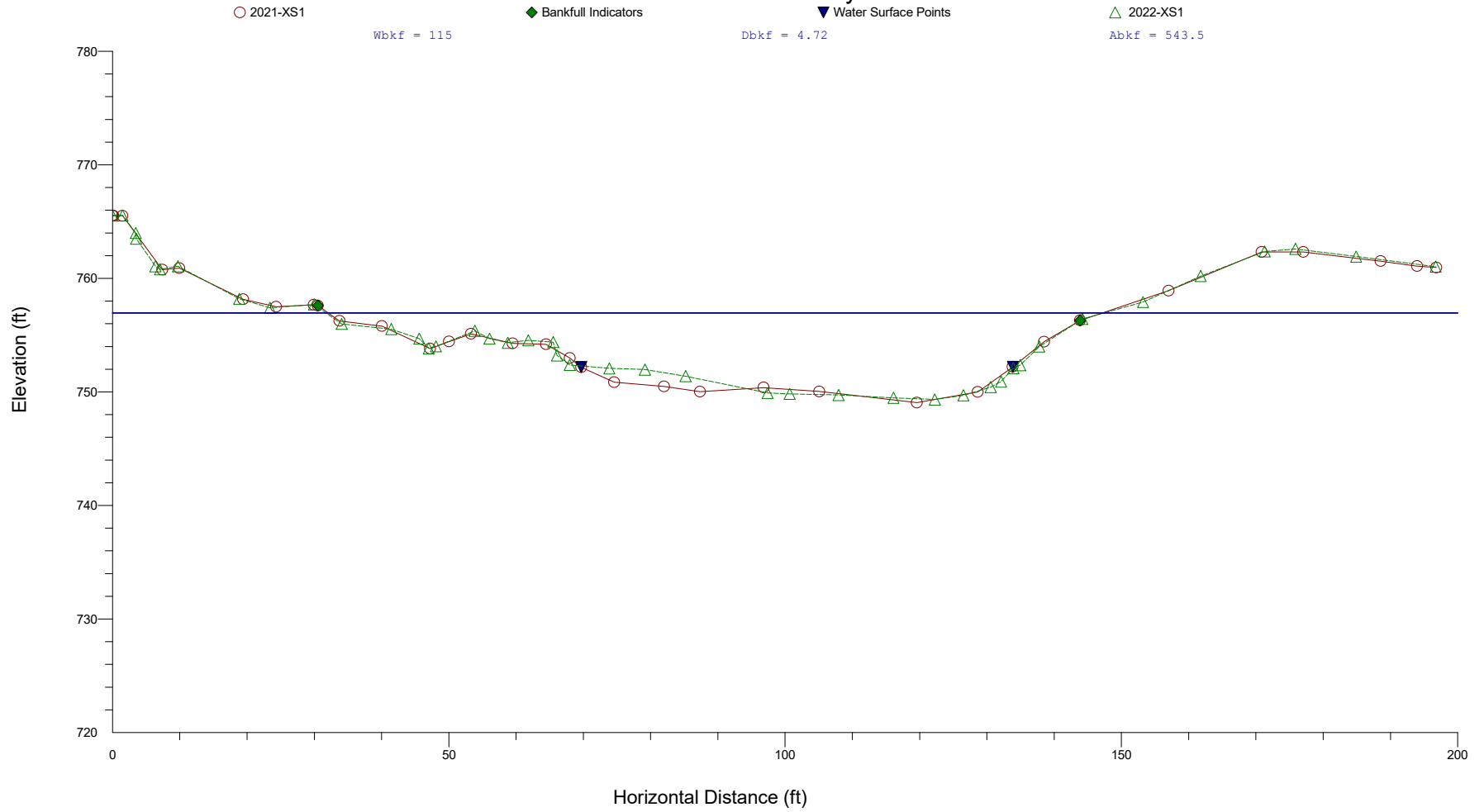
5 WORKS CITED

- [1] EnviroScience, "Monitoring Plan for Cascade Metro Park Cuyahoga River Restoration Valley View Phase 2 Project (NAI6NMF4630341)," 2020.

Appendix A

Data Sheets

XS1: 2021 & 2022 Overlay



2022-XS1

○ Ground Points

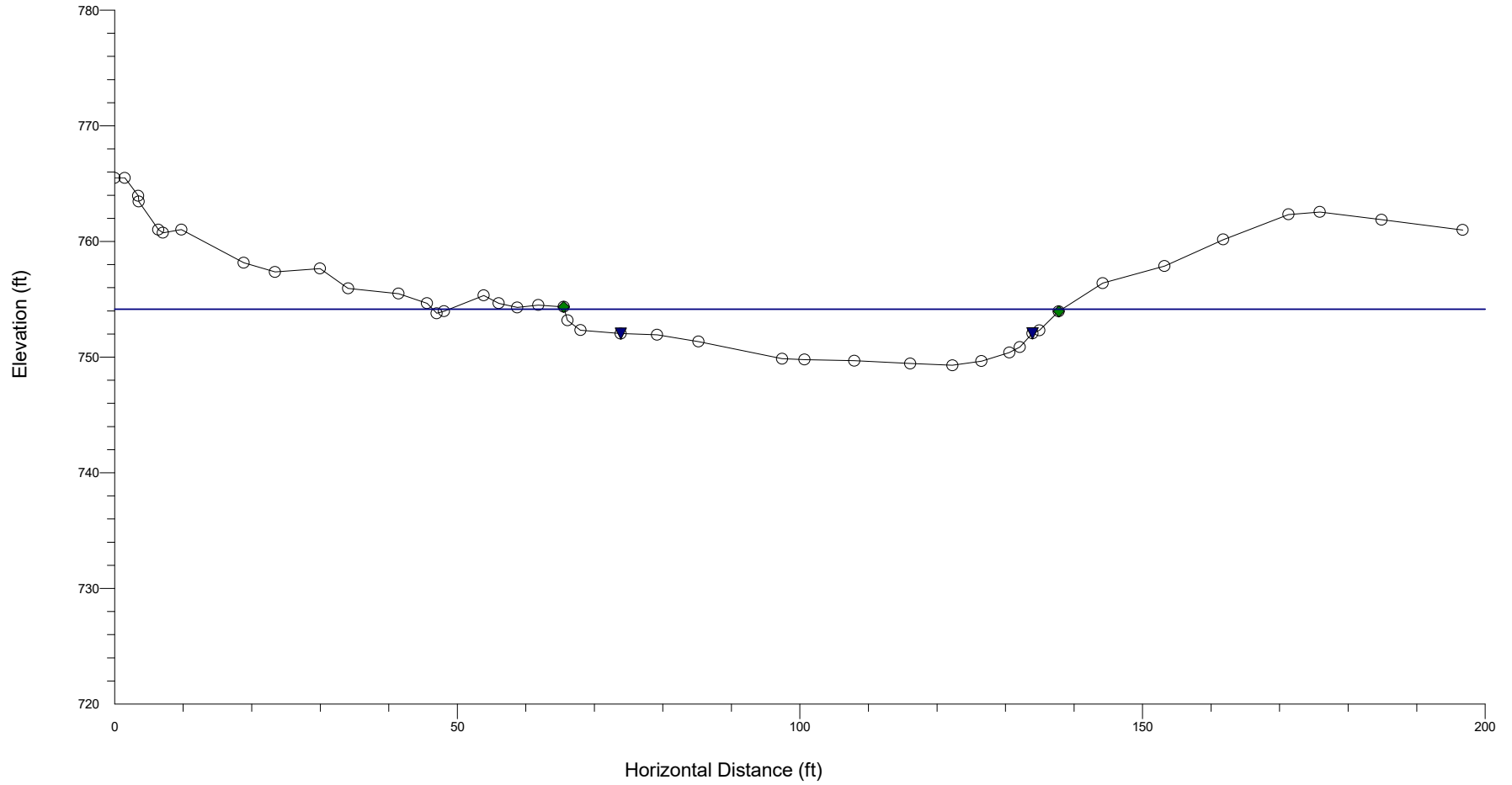
◆ Bankfull Indicators

▼ Water Surface Points

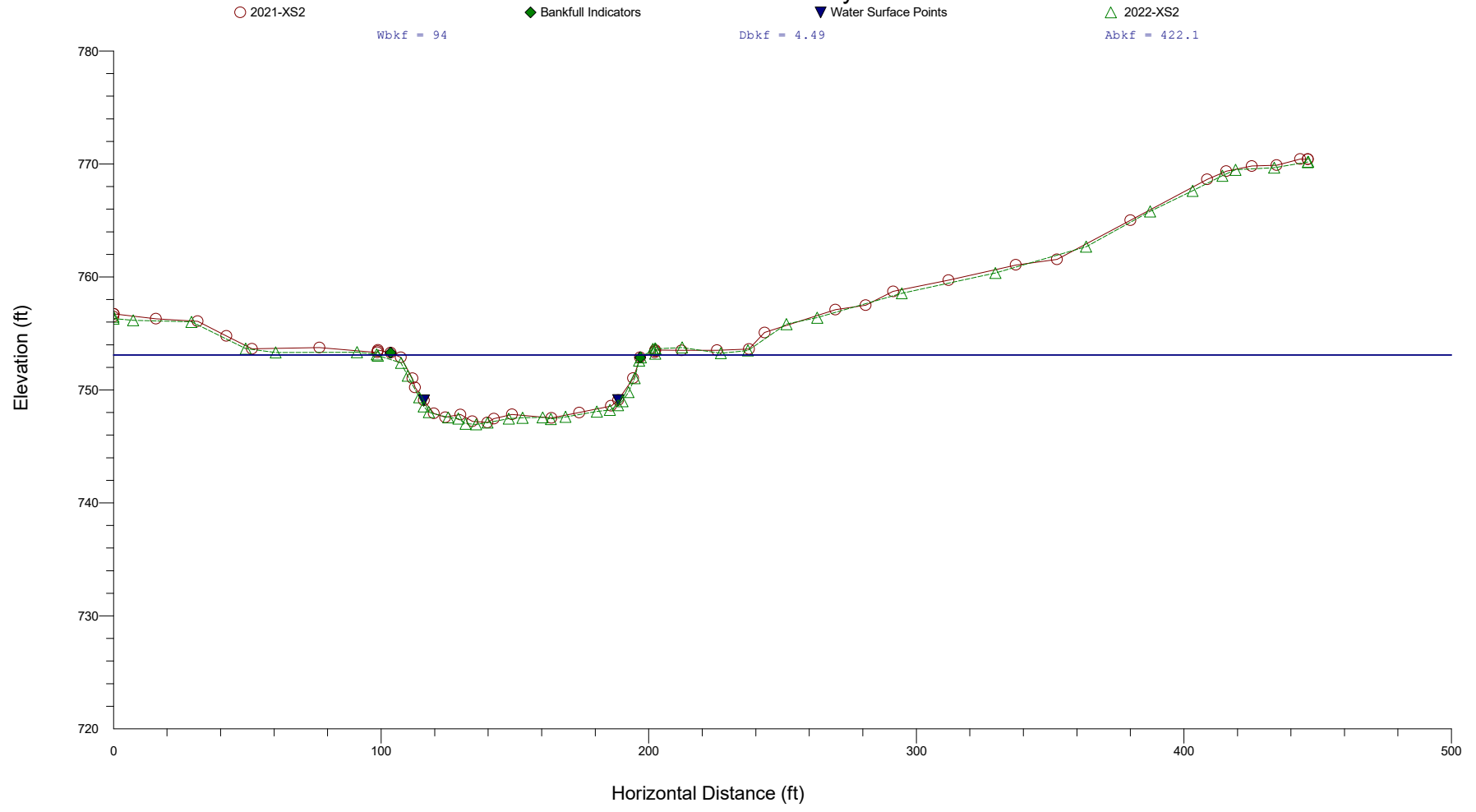
$Wbkf = 75.1$

$Dbkf = 3.33$

$Abkf = 249.8$



XS2: 2021 & 2022 Overlay



2022-XS2

○ Ground Points

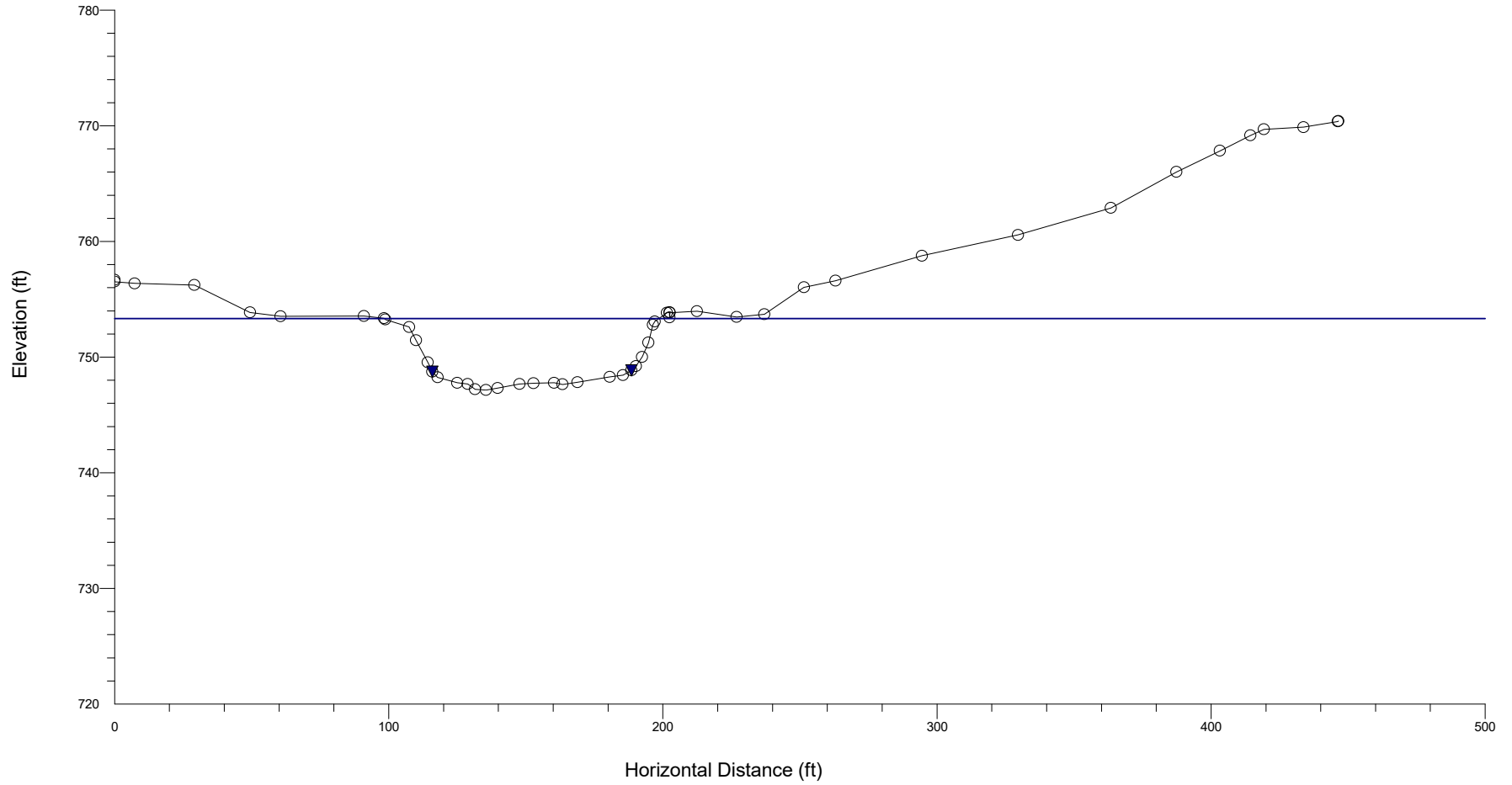
◆ Bankfull Indicators

▼ Water Surface Points

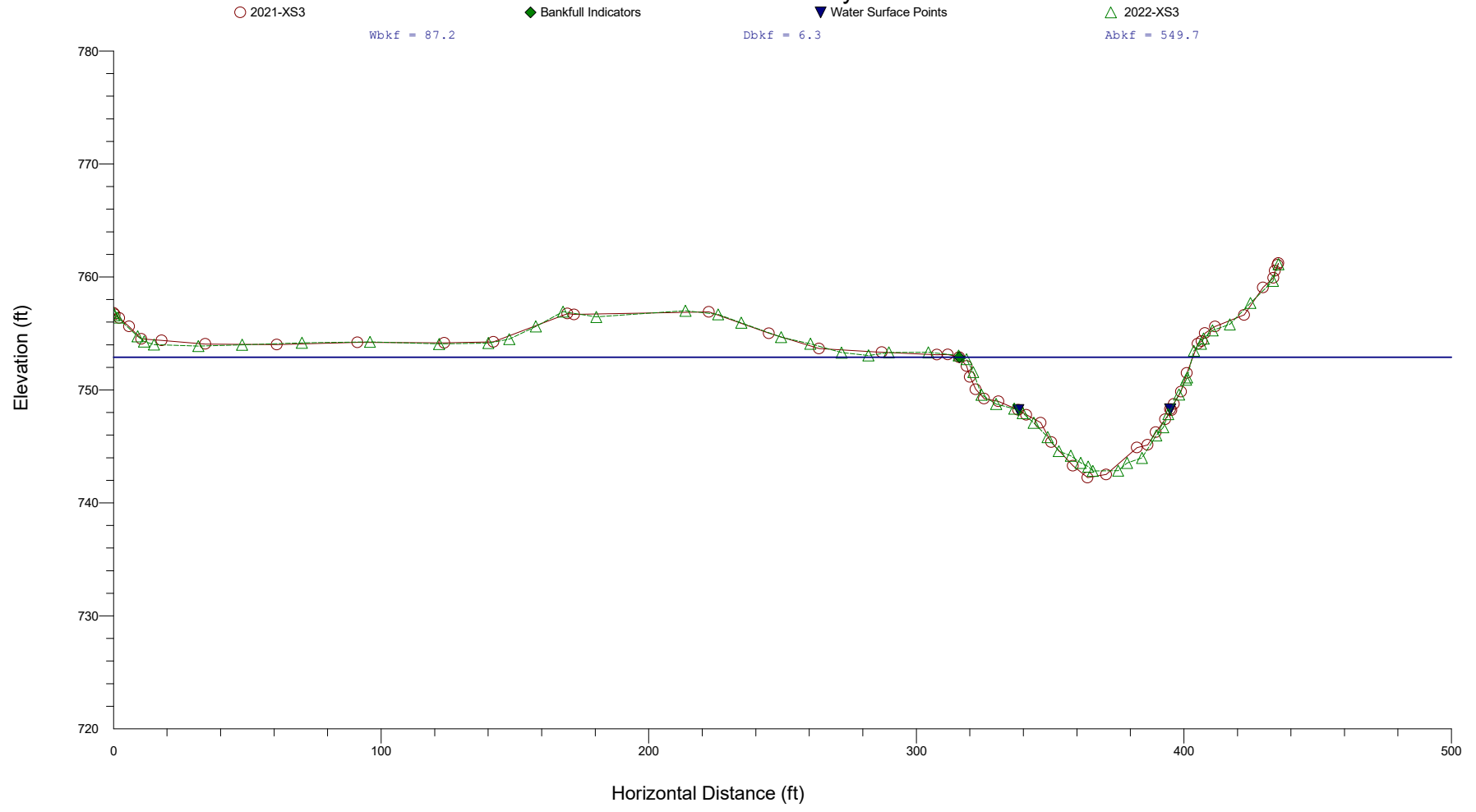
Wbkf = 100.1

Dbkf = 4.5

Abkf = 450.3



XS3: 2021 & 2022 Overlay



2022-XS3

○ Ground Points

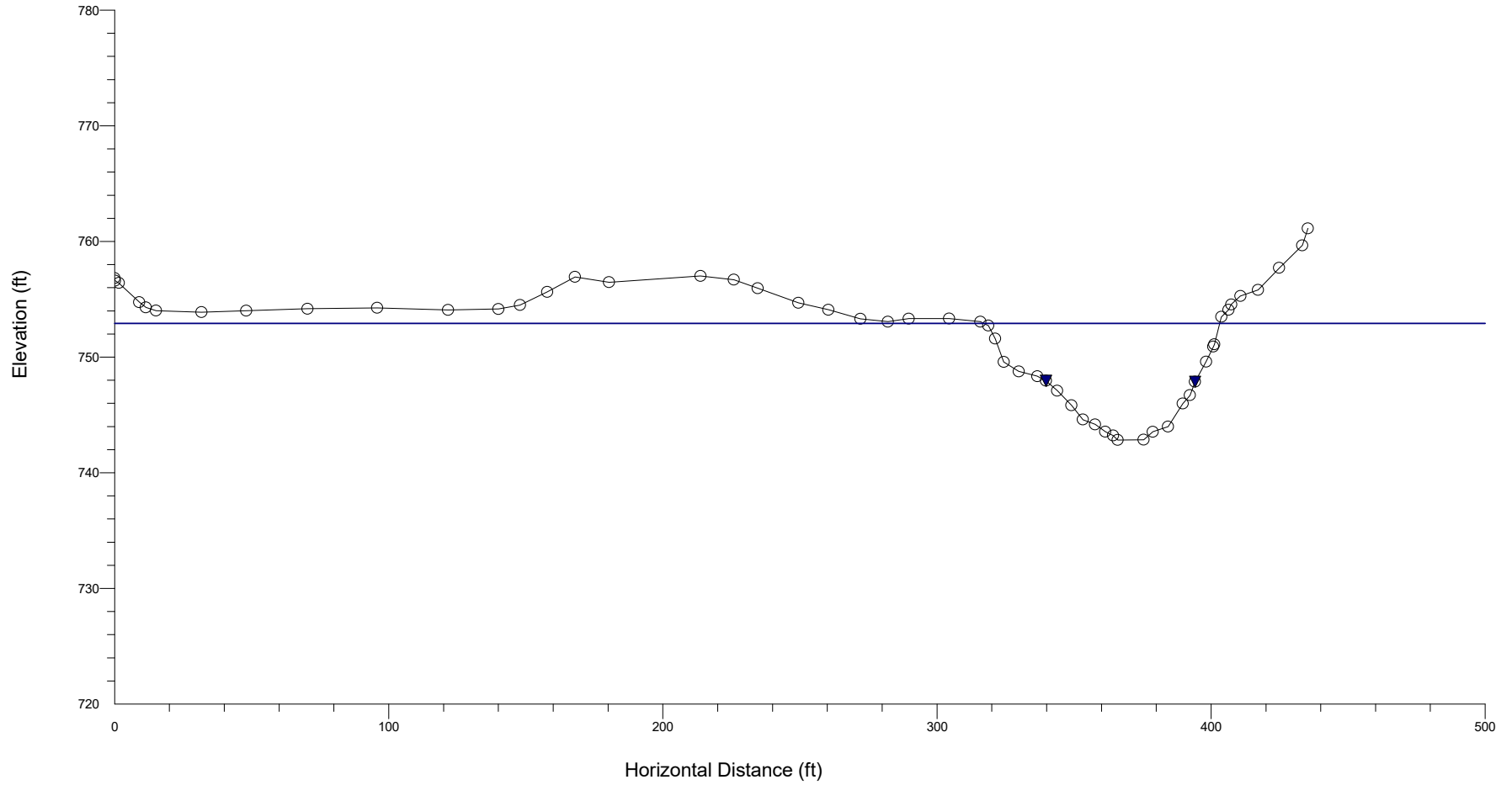
◆ Bankfull Indicators

▼ Water Surface Points

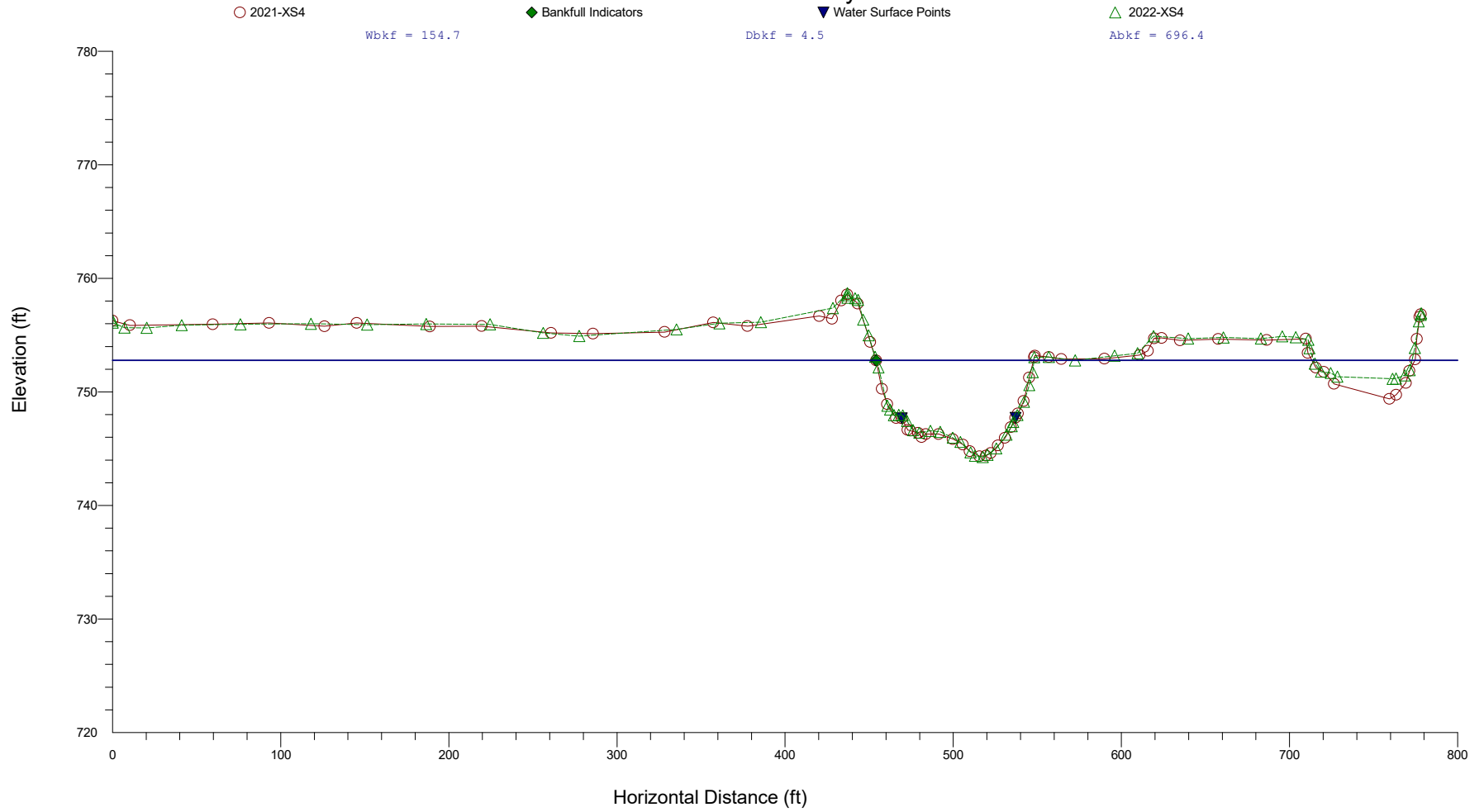
Wbkf = 86.1

Dbkf = 6.42

Abkf = 553.1



XS4: 2021 & 2022 Overlay



2022-XS4

○ Ground Points

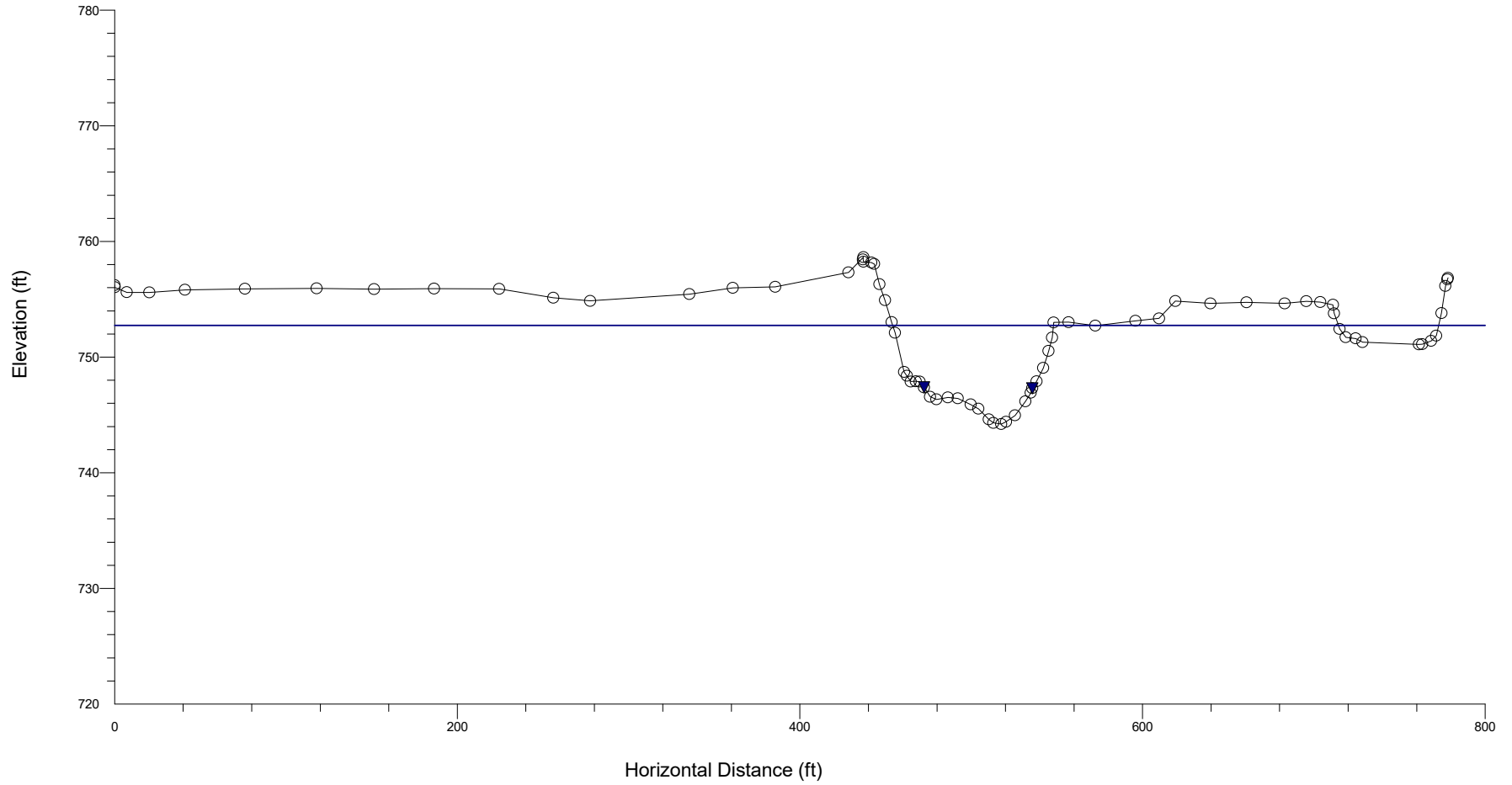
◆ Bankfull Indicators

▼ Water Surface Points

Wbkf = 154.4

Dbkf = 4.11

Abkf = 634.6



Appendix B

Project Mapping

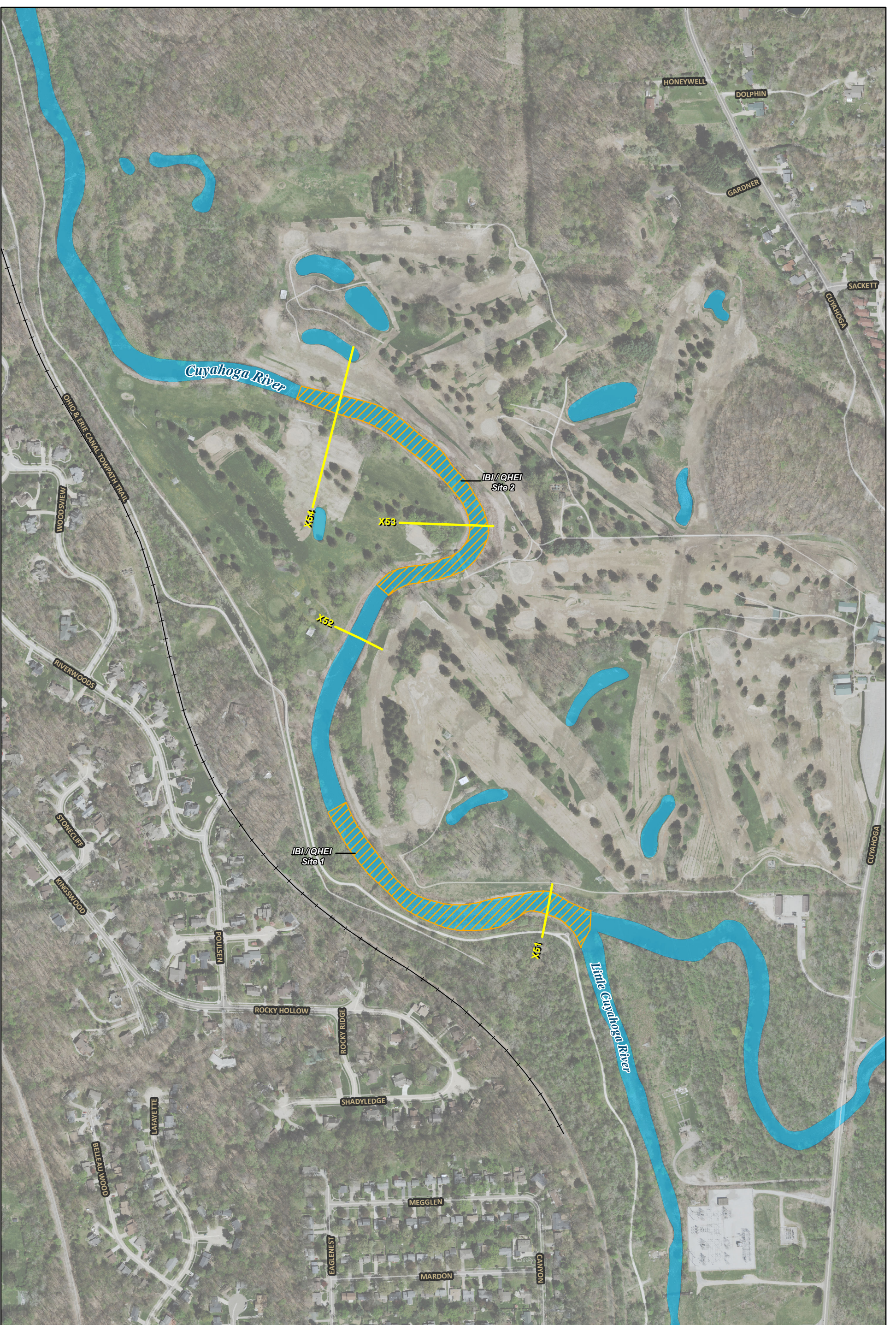
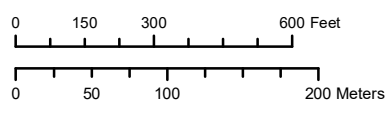


Figure 1. Site Map of Valley View Phase 2 Restoration Design. Summit Metro Parks.

- Cross Section
- IBI / QHEI Location
- Water



Appendix C

Photographic Record

Flooding Event: 2.18.2022



Flooding Event: 3.8.2022

